

# Train HTR 412 Blues



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 **Hitachi Rail STS S.p.A.**

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## Programme Information

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#### Social Life cycle assessment (S-LCA)

Social Life Cycle Assessment of train Hybrid Multiple Unit (HMU).

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Social Product Declaration in Accordance with ISO 14025

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SPDs within the same product category but from different programmes may not be comparable. For two SPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.

The SPD owner has the sole ownership, liability and responsibility of the SPD.

SPD shall not be used for communicating social information to consumers/end users of the product.

# 1. Introduction

Hitachi Rail is a fully integrated, global provider of rail solutions across rolling stock, signaling, service & maintenance, digital technology and turnkey solutions. With a presence in 38 countries across six continents and over 12 000 employees, its mission is to contribute to society through the continuous development of superior rail transport solutions. Drawing on the wider Hitachi Group's market-leading technology and research-and-development capabilities, the company strives for industry leading innovations and solutions that can deliver value for customers and sustainable railway systems that benefit wider society. For more information about Hitachi Rail, visit [www.hitachirail.com](http://www.hitachirail.com).

## 2. Objectives and aims of the study

This Social Product Declaration (SPD) is based on SPD-PCR 2023:01 Rolling stock and it aims to assess the social life cycle assessment (S-LCA) of a rolling stock (Hitachi Rail, 2023) and to enable B2B communication of the results. It assesses and quantifies the potential positive and negative social impacts generated along the entire product life cycle. Thus, it provides information on socio-economic aspects as a basis for decision-making towards company and product performance improvement, as well as well-being of the stakeholders involved. The SPD's target audience includes companies that decide to purchase the train (B2B) as well as other manufacturing companies of rolling stocks.

The evaluation starts from the extraction stage of the raw materials up to the use stage of the product. The disposal phase was not analyzed due to lack of data. The S-LCA methodology was applied following the most up-to-date bibliographic references such as:

- the UNEP revised guidelines for the assessment of the social life cycle of products and organizations (UNEP, 2020);
- the methodological sheets for the sub-categories in the assessment of the social life cycle (S-LCA) (UNEP, 2021).

Other methodological aspects and definitions have been reported in Annex 1.

### 2.1. The product and the functional unit

The product (UN CPC Code:495) evaluated in this case study is the HMU hybrid regional train called Blues; of the Trenitalia Regional railway service in 4-car version (HTR 412).

The engine features an innovative architecture that offers 4 operating modes:

- Electric (EMU) - Power supply from catenary 3kVdc // 25kVac 50Hz // 15kVac 16 $\frac{2}{3}$ Hz;
- Diesel-Electric (DEMU) - Powered by on-board Diesel Engine (HMU Boost);
- Hybrid (HMU) - Powered by an on-board diesel engine and traction batteries;
- Battery (BEMU) - Power supply from Traction Batteries (the simulation is not present in this document).

The HMU Blues hybrid train is based on a platform called Masaccio; it is made up of four bodies and three articulations and belongs to the category of passenger transport vehicles classified as "Regional" - "Medium to long distance between stations" - "Electric/diesel locomotives with single- and double-deck passenger coaches". The platform is characterized by a basic configuration

consisting of n. 2 battery packs of 66 kWh (flexible and scalable capacity) installed on the roof of the intermediate case TP, together with the related cooling systems. As far as the engine is concerned, it is a high-performance “Stage V” diesel cycle of the latest generation. The train configuration is shown in Figure 1.



Figure 1: HMU train configuration.

Dimensions	
Length	86,08 m
Width	2,80 m
Height from the Pdf	4,29 m
<b>Net weight</b>	162 231 kg
<b>Top speed</b>	160 (EMU) / 140 (DEMU/HMU)km/h
<b>Number of Passengers Use test</b>	498
<b>Maximum acceleration</b>	1,08 (EMU) / 0,78 (DEMU) / 0,78 (HMU)m/s <sup>2</sup>
<b>Maximum power</b>	1 330 (HMU) kW
<b>Load factor</b>	94%
<b>Specific Consumption Use test</b>	4,23 kWh/km (EMU)

In accordance with the relevant PCR, the functional unit (FU) is represented by the transport of 1 passenger per km or 1 ton cargo per km depending on whether the function of the train is the transportation of passengers and/or cargo. This is the same functional unit used in the EPD. However, in S-LCA applying the reference scale approach (also type I in UNEP 2020), the role of FU is definitely less important for reporting the final results.

It is not possible to define an exact annual mileage as the Regional train is operates on routes of very different lengths and according to different frequencies established by the contracting authority. The train is designed to provide an average annual mileage of 130 000 km. Considering the technical expected lifespan of 25 years, it is estimated to cover a total of 3 250 000 km during its lifespan.

### 2.1.1. Geographical scope

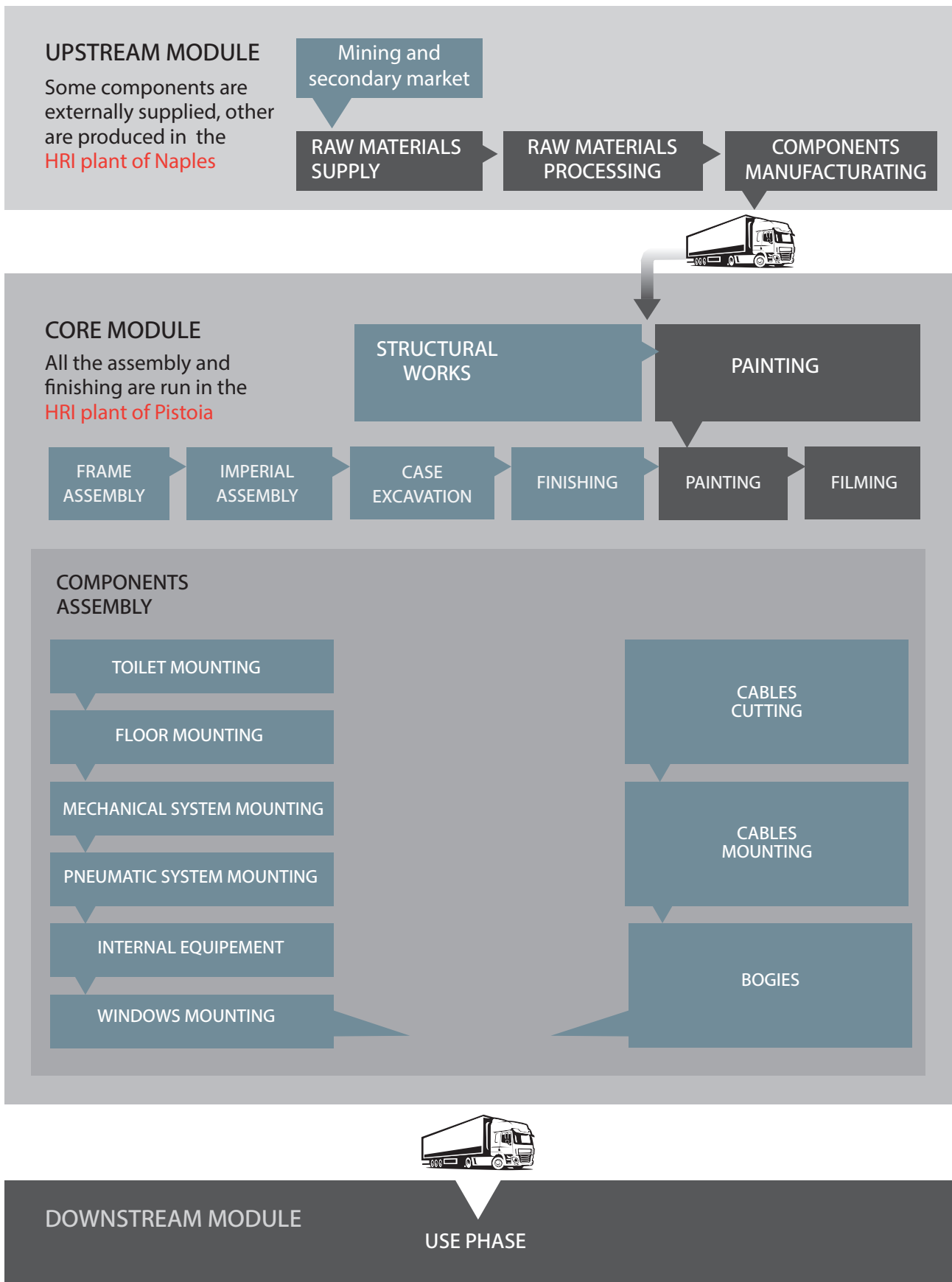
In terms of geographical scope, the train is assembled and manufactured in Italy, but the components are manufactured in Europe. For raw materials proxy data at the international level were used. As mentioned, the train is used for regional journeys in a national context. For the use phase, the Italian scenario has been considered.

## 2.2. System boundary

SPDs based on the PCR shall include all relevant upstream and core processes. The inclusion of the use and the end-of-life stages of the rolling stock are not mandatory because they extend over a long period of time and therefore it may be difficult, for the developer/manufacturer of the rolling stock, to track/forecast the social impacts of these stages.

In the present case study, the system boundary is “cradle to gate with options” (Figure 2): it starts from the evaluation of the hotspots related to raw materials up to the use phase.





**Figure 2:** The system boundary. All modules from the extraction of raw materials to the use phase are included.

In more detail, the system boundary includes:

- **Upstream module**, which includes the extraction and processing of raw materials and the manufacturing of components unless produced internally by the rolling stock manufacturer (such manufacturing is included in the core stage). This first stage includes three steps:
  - » Supply of raw materials;
  - » Processing of raw materials;
  - » Production of components.
- Some components of this stage are purchased from external suppliers from different countries of the world, others are produced in the plant in Naples. Specifically, it includes the production of materials and semi-products by suppliers for the assembly and production phase of the train. Exclusions are:
  - » Construction, maintenance and disposal of materials and energy for the machine and equipment at production plants;
  - » Construction, maintenance and disposal of supplier's infrastructures;
  - » Transportation of raw materials to suppliers;
  - » Packaging production.
- **Core module**, which represents the internal production of components and the activities of train assembly, internal transport between the HR plants, transport to the customer and the generation and treatment of plant waste.

In particular, three main phases can be identified:

- » Phase 1: structural works, comprising these stages: frame assembly, imperial assembly, case excavation, finishing;
  - » Phase 2: painting. This phase includes: painting and filming;
  - » Phase 3: assembly of components. This phase includes: toilet mounting, floor mounting, mechanical systems mounting, pneumatic equipment, windows mounting, cables cutting, cables mounting and bogies.
- These processes are excluded at this stage:
    - » Construction, maintenance, and disposal of production plants;
    - » Packaging of components / assemblies / products used.
  - **Use stage** of the train involves Trenitalia, a state-owned company, which is particularly important as the primary customer for the train made by Hitachi, has a near monopoly in the Italian railway system. In particular, the train under study will only be used by Trenitalia as a passenger train.
  - The EoL has not been considered because data are not available and an estimation of the social impact of rolling stock in 25 years is not feasible with the current database available.





### 3. Cut-off

The cut-off criteria were based both on the relevance of the materials and components in terms of mass, but also in terms of social hotspots related to the materials. Starting from the weight matrix it was possible to identify which of these materials are called “critical” according to the definition given by the European Community in the Critical Raw Materials List (CRM). Quantity and criticality were the criteria used as cut-off criteria capable of detecting the potential impacts and the most important social hotspots. In general, all the input/output flows (I/O) were considered in the study with the exception of the impacts related to corrective maintenance (production and transport of spare parts, transport and waste disposal).

Transport to the end customer and the end-of-life phase were also neglected. The latter due to the impossibility of obtaining data. Furthermore, the HMU train is the main product of the Trenitalia and the disposal phase takes place mainly in Italy or Europe, so no particular hotspots are highlighted in terms of country, and primary data is essential for greater detail.

### 4. Choice of the main stakeholders

In the S-LCA an important role is played by the stakeholders. A stakeholder category is a group of people who can influence or be influenced by the product/service throughout its entire life cycle.

In the case study, the main categories taken into consideration are:

- **Workers;**
- **Local community;**
- **Users and workers in the use stage.**

## 5. Content Declaration

In this section, the materials most commonly used in the realization of the regional hybrid HMU train called 'Blues' are listed.

The materials are:

- Aluminum, copper, silver, lead, nickel, zinc and bronze (non-ferrous metals);
- Crude steel, cast iron and iron ore (ferrous metals);
- Mica and silicon (minerals).

The gross weight of the material declared in the SPD must cover at least 95 percent of a unit of product, or at least 100% of materials and components which have the most relevant social impacts according to the social hotspot analysis. In this case we have considered 100% of materials and components which have the most relevant impact. For example, we have included all metals (from the extraction of raw materials), electronics, batteries, plastic, chassis and power train.

For each material considered, the major producing countries and the quantities produced have been collected as basis for the social hotspot analysis. Furthermore, the next section (Paragraph 6) provides an analysis of the social risks associated with the materials considered.

The extraction of raw materials is at the beginning of the supply chain of the rolling stock, for this reason collection of site-specific data is impossible. According to the SPD-PCR 2023:01 Rolling stock when site specific data are not available a social hotspot analysis shall be developed.

## 6. Social Life Cycle Inventory

The social life cycle inventory refers to the collection of all data necessary for the assessment of the rolling stock. In this case we have considered generic (or secondary) data for the main raw materials from the Social Hotspot Database (data 2021). In the case of first-tier suppliers and Hitachi Rail we have considered a mix of generic data (from secondary sources) from published sustainability reports (2021) and primary (site-specific) data collected through a questionnaire (2021-2022).

### 6.1. Analysis of the social hotspot of the main raw materials

The procedure of identifying social hotspots is necessary in here because there is no primary data on the raw material extraction stage. In order to have at least a hotspot analysis, data were collected on the main social risks in the main producing countries of the raw materials used in the HMU train through the use of the Social Hotspot Database (SHDB, 2023). The analysis of social hotspots is briefly described below:

- Identification of the main materials involved through consultation of the EPD of the HMU Blues creation of data collection questionnaires provided directly to the Hitachi Rail Italy (HRI) company;

- Identification of the main producing countries of these raw materials through databases such as USGS;
- Analysis of social data relating to the countries in which these raw materials are extracted and processed, through the use of the Social Hotspot database (SHDB).

For commodities, risks were identified using the SHDB database. It is a Risk Mapping Tool that shows a map of relevant social risks for productive sectors and compares the Social Hotspot Index for each country. The social hotspot analysis using the Risk Mapping Tool identifies the most pressing problems in the community where the material is mined and refined.

Consequently, the main hotspots across the SHDB related to the minerals and metals sector were determined for all countries associated with the mining and refining of the materials under consideration.

In particular, the materials analyzed with the database are: Bronze, Copper, Carbon Steel, Cast Iron, Aluminum, Cadmium, Mica, Lead, Zinc, Nickel, Steel, Silicon and Silver.

Not all materials were analyzed. Only minerals and/or metals could be analyzed because these materials have a database (USGS) which provides production data of raw materials and finished materials by country of production. Table 1 shows the countries involved in the extraction and processing of the materials listed above (see first row of the table).

	Bronze	Copper	Crude steel	Cast iron	Alluminium	Cadmium	Mica	Lead	Nickel	Zinc	Iron ore	Silicon	Silver
China	x	x		x	x	x	x	x		x	x	x	x
United states	x	x					x	x		x		x	
Japan						x							
Germany													
India			x	x	x					x	x		
Chile	x	x	x										x
Perù	x	x						x		x			x
Congo	x	x											
Australia	x	x		x				x	x	x	x		x
Brasil				x							x		
Russia					x			x	x			x	x
Canada					x	x	x		x				
Korea						x	x						
Kazakistan						x							
Mexico						x		x		x			x
Finland							x						
Madagascar							x						
France							x						
Indonesia									x				
New caledonia									x				
Philippines									x				
Norway												x	
Poland													x
Bolivia													x

**Table 1:** Countries involved in the extraction and processing of the raw materials under consideration.

Materials	Child Labour	Working hours	Fair salary	Non fatal injuries	Fatal injuries	Gender Inequality Index (GII)	Freedom of Association and Collective Bargaining	Overall risks of High Conflict	Rule of Law	Control of corruption	Forced labour
Bronze	2	2	1	2	2	2	3	3	2	2	2
copper	2	2	2	2	3	2	3	3	2	2	2
crude steel	3	4	4	2	2	2	4	4	3	3	3
cast iron	2	2	2	3	3	2	3	2	2	2	2
aluminium	3	3	3	2	2	2	4	4	3	3	3
cadmium	2	3	3	2	3	2	3	3	2	2	2
mica	2	2	2	3	2	2	3	2	2	2	2
lead	3	2	3	2	2	2	3	3	3	3	2
nickel	3	3	2	2	2	3	3	3	3	3	2
zinc	3	3	3	2	2	2	3	3	2	2	2
iron ore	2	1	2	2	2	1	2	2	1	1	1
silicon	3	2	3	2	2	2	4	4	3	3	3
silver	2	2	3	2	2	2	3	3	3	3	2

**Table 2:** Social Hotspot database analysis results for all materials involved.

Using the Social Hotspot Database, it was possible to derive the main risks of each of the countries where the materials, listed above, are produced.

Table 2 shows the average risk values associated with each individual material. The first row shows the categories of social impact (concerning human and labour rights, child labour, forced labour, fatal and non-fatal work accidents, and freedom of association) and the first column shows the materials involved. Scores have been attributed on a scale ranging from 1 to 4, where they respectively indicate: 1 (low), 2 (medium), 3 (high) and 4 (very high), with a color scale ranging from green to red passing through yellow and orange, making the result obtained in accordance with the SHDB immediate and easy to understand.

Analyzing the table, it can be highlighted that most of the values are between 2 and 3, so they have a medium-high risk. Only in the case of crude steel, aluminum and silicon, scores of 4 are recorded, highlighting a critical situation. In the absence of primary data, the analysis allows to obtain an indication of the criticality of these three value chains that should be evaluated more carefully by Hitachi Rail IT.

## 6.2. Inventory data from suppliers and Hitachi Rail

Inventory analysis consists of the inventory of all flows in the system studied normalized by the functional unit. During the Life Cycle Inventory, information on the activity variable must be collected and data for social flows must also be collected. For more details on the inventory phase, please refer to Annex 2.

The collection of site-specific data has been done using two different approaches: assessing the sustainability reports of the companies that already have a sustainability report or collecting data through questionnaires. The results of the two analyses are reported below.

## 7. Social performance

The social life impact assessment is the phase of the S-LCA which aims to calculate, understand, and evaluate the extent and significance of the potential social impacts of a product along its life cycle and on the stakeholders involved. More methodological details on the impact assessment phase can be found in Annex 3.

### 7.1. Evaluation of suppliers

#### 7.1.1. Supplier evaluation with sustainability reports

The first supplier analysis focuses on the 8 companies whose inventory data was collected from online sustainability reports. The sustainability reports found on the companies' websites refer to the years 2016, 2019 and 2020. The suppliers are: 1, 2, 3, 4, 5, 6, 7 and 8.

Looking at table 3, for the worker stakeholder category, it can be seen that overall the companies did not obtain negative scores for almost all the indicators. For the **health and safety** subcategory, all companies obtained a neutral score which means that they are all compliant with the relevant regulations.

Considering the **wages** subcategory, supplier 1 obtained an overall neutral score even if information was found only for the salary/women and men ratio. Suppliers 2, 3, 4, 7 and 8 do not present data on this in the report, but since the social risk at country level, based on the SHDB, is low, a neutral score (0) was given. Instead supplier 5 obtained a higher score due to, for example, paid bonuses and overtime, respected minimum wages and working conditions.

For the **social benefits** subcategory, supplier 1 obtained a high score because particular information is provided on what the company does for employees who have disabled children and for disabled employees, on what is offered to employees' children, e.g., daycare and college discounts. In addition, deserving students are offered the opportunity to be employed in the company; in contrast, no information is given on respect for privacy. Supplier 7 also scored high because social benefits are provided to employees (measures for preventive health management, medical care, etc.), facilitated meals and transport and support for families are provided. In addition, suppliers 2, 5 and 8 have scored neutral so they are in compliance with the standards. For suppliers 3, 4 and 6, no information was found for this indicator in the reports, but since the social risk at country level, based on the SHDB, is low, a neutral score (0) was given.

With regard to the subcategory of **working conditions** the main data were found in the sustainability report and the most are compliant with the national law.

For the **discrimination** subcategory, all the companies achieved a neutral score, since they meet almost all the requisites required by the indicators for this social issue.

For the subcategory **freedom of association and collective bargaining**, suppliers 4, 6 and 8 scored negative since the relevant data are not found in their report, which could mean that the companies are not compliant. A neutral score was achieved for suppliers 1, 2, 3 and 7 since they are compliant with the regulations. More specifically for supplier 1 all data were sourced, however, for supplier 3 all data were sourced from the report except those related to union membership. For supplier 7, data on union membership and employees' right to organize collective bargaining activities were retrieved from the sustainability report. For supplier 5 however, no information on this social issue was found in the report, but since the social risk at country level, based on the SHDB, is low, a neutral score (0) was given.

With regard to the **training and education** subcategory, most companies achieved a high score, particularly for suppliers 4, 6, 7 and 8 information was found regarding employee training and adequate training before job placement. Instead suppliers 1, 2, 3 and 5 obtained a score of 0, because information was obtained only on one of the indicators considered.

Finally, for the last subcategory considered, i.e. **satisfaction and involvement** at work, three suppliers (1, 2 and 5) scored 0 as the activities and projects carried out by companies to involve workers are indicated in the sustainability reports but there is no data. In contrast, for suppliers 3, 4, 6, 7 and 8 no information was found regarding this social issue, but since there is no legal minimum for the impact category considered, a neutral score (0) was given.

Companies	Supp. 1	Supp. 2	Supp. 3	Supp. 4	Supp. 5	Suppl. 6	Supp. 7	Supp. 8
<b>Workers</b>								
Health and safety	0	0	0	0	0	0	0	0
Wages	0	0	0	0	1	0	0	0
Social benefit	1	0	0	0	0	0	2	0
Working condition	0	0	0	0	0	0	0	0
Discrimination	0	0	0	0	0	0	0	0
Freedom of association and collective bargaining	0	0	0	-2	0	-2	0	-2
Training and education	0	0	0	2	0	2	2	2
Job satisfaction and involvement	0	0	0	0	0	0	0	0
<b>Local community</b>								
Supporting the local community	0	1	0	0	1	0	2	0

**Table 3:** Social performance for the “workers” and “local community” categories (data from reports).

From table 3 for the local community stakeholder category it can be seen that almost all the companies obtained high scores. For example, suppliers 1 and 2 in the report communicate the activities that the company carries out for the local community. Also supplier 7, in addition to carrying out activities for local communities around the world organizes collective donations in which employees also participate. For the suppliers 3, 4, 6 and 8, no data was found regarding the local community category, but since there is no legal minimum for the impact category considered, a neutral score (0) was given.

### 7.1.2. Supplier evaluation with primary data from questionnaires

The suppliers that provided data for the analysis were a total of 11; of these 11, the supplier 11 provided only very little quantitative data regarding the health and safety of workers. This company obtained a neutral score (0) on health and safety of workers, thus reflecting compliance with the relevant regulations but not a proactive behavior. Given the scarcity of data, supplier 11 was not included in the following tables.

<b>Workers</b>								
	Health and safety	Social benefits	Wages	Discrimination	Working conditions	Training and education	Freedom of association and collective bargaining	Job satisfaction
Supplier A	0	1	1	0	0	1	0	1

Workers								
Supplier B	1	0	1	0	0	1	0	0
Supplier C	0	0	1	1	0	1	0	0
Supplier D	1	0	1	1	0	0	0	0
Supplier E	0	0	0	1	0	1	0	1
Supplier F	0	0	0	0	0	0	0	1
Supplier G	0	1	0	1	1	1	0	1
Supplier H	0	0	0	0	0	1	0	0
Supplier I	0	0	1	1	0	1	0	0
Supplier L	0	0	1	1	0	1	0	0

Local community				
	Health and safety	Local employment	Cultural heritage and land rights	Poverty
Supplier A	1	1	0	1
Supplier B	0	1	0	0
Supplier C	0	1	0	1
Supplier D	0	1	0	0
Supplier E	0	1	0	-1
Supplier F	0	-1	-1	-1
Supplier G	1	0	1	1
Supplier H	0	0	0	0
Supplier I	0	1	0	0
Supplier L	0	1	0	0

**Table 4:** Social performance for the “workers” and “local community” categories (data from questionnaires).

From table 4 most of the subcategories obtained a score of 0; even many categories reached level +1, that is, a proactive situation. However, it is important to highlight that the values reported in table 4 are an arithmetic average of more indicators and values. More details are given in the following paragraphs.

Looking at the tables one could fall into the error of thinking that there were only a few negative indicators, in reality this is not the case. Therefore, a detailed analysis of the values obtained is reported below, to highlight the criticalities found.

Within the *worker* stakeholder category, for the *health and safety* subcategory, all suppliers, with the exception of supplier F, scored +2 in reference to injuries related to the use of harmful substances. Suppliers A, B, and C scored +2 with regard to general injuries, while the others were assigned a score of -1. In contrast, in the case of injuries due to the use of harmful substances, suppliers scored +2 because there were no cases of injuries, but it should be noted that the supplier does not use harmful substances. In addition, suppliers B and D are the only ones who scored +1 because unlike the others they have a health and safety committee and had more positive indicators than the others. It should also be mentioned that the results are arithmetic averages of the different indicators.

Regarding *social benefits*, again there was compliance for all companies. However, supplier D kept a score of -1 in reference to the “family allowance” indicator. In addition, the same supplier does not have a human rights code, so it does not comply with the regulations (-1), but on the contrary gets + 2, as does supplier A, for providing free meals, etc. Regarding *wages*, the critical issues concern only the wages of female workers and only for suppliers A, D and H, which do not reach

the minimum wage imposed by the regulations. While supplier G does not provide wages for trainees. These indicators were given the value -1. For the *discrimination* subcategory, only the supplier H gets -1 in relation to the indicator on workers' awareness on how to file a complaint related to discrimination.

With regard to *working conditions*, the critical issues concern only workers' vacation days, all of which are below the minimum allowed (thus score -1). The exceptions are suppliers D, F and G, which grant more vacation days than the regulatory minimum (thus +1 for them). For *training and education* almost all suppliers implement actions that favor it, so almost all scored +1. No negative aspects were recorded here (-1), neither for the remaining subcategories associations and *organizations and job satisfaction*.

Within the local community stakeholder category, no critical issues were identified for the *health and safety* subcategory; however, some suppliers (C and F) did not provide all the required data. In particular, supplier F provided only some data regarding health and safety. Supplier F, however, did not provide data on the other sub-categories (local employment, cultural heritage and land rights, and poverty), therefore it was assigned a negative score (-1). For *local employment*, almost all of them have a pro-active situation, except for the supplier F (-1), because they contribute to hiring workers from the area, also contributing to the reduction of unemployment and poverty.

The companies whose sustainability reports were found on the internet and for which it was possible to make the assessment are 8; for these 8 companies it was possible to get most of the data from the sustainability report.

### 7.1.3. Assessment of the social impacts of Hitachi Rail Italy

As regards **health and safety**, Hitachi Rail Italy, for both the Pistoia and Naples plant, presents most of the values in line with the current Italian national legislation, which is in turn aligned and compliant with the international legislation. There is, on the contrary, only one criticality regarding the number of hours of training for health and safety of each worker in Naples, which is lower (3h) than the average declared at corporate level (4-5h). Positive aspects for which the two plants exhibit a proactive behavior are: the number of offered courses, and the existence of a health commission.

As regards **wages**, reference was made to the tariff values of metalworkers from June 2021 to May 2022. Therefore, the salary values obtained through the questionnaire were compared with the reference values shown in table 5. In this case, the company in both plants has a rating of +1 in fact the wages are all higher than the tariff values. **With the renewal of the metalworkers industry contract, the salary tables in effect from 1 June 2021 to May 2022 are reported below:**





Salary € / month	Employee level hired
2 424,86	level A1 (former level 8 metalworker)
2 368,12	level B3 (former level 7 metalworker);
2 121,20	level B2 (former level 6 metalworker);
1 977,19	level B1 (former metalworking level 5S);
1 844,64	level C3 (former level 5 metalworker);
1 722,41	level C2 (former level 4 metalworker);
1 686,74	level C1 (former level 3S metalworker);
1 651,07	level D2 (former level 3 metalworker);
1 488,89	level D1 (former level 1 and 2 metalworker).

**Table 5:** Metalworkers Industry salary table from 1 June 2021 to May 2022<sup>1</sup>

As far as **gender equality** is concerned, the best practice of a company in the transport sector in relation to pink quotas is 17%. The value of Hitachi is lower than the sector best practice even though many improvements have been made to date and an improvement strategy has already been put in place (this brings the indicator to +1).

Workers								
	Health and Safety	Social Benefits	Fair salary	Discrimination	Working conditions	Training and education	Freedom of association	Job satisfaction
Pistoia average values	0	0	1	1	0	1	0	1
Napoli average values	0	0	1	0	0	1	0	1

**Table 6:** Hitachi Rail evaluation summary table

For aspects relating to **working conditions** (for example days of holidays, working hours, cover for maternity leave, compliance with human rights legislation, establishment of workplaces) no criticalities were found. In addition, the company has already implemented the process for SA 8000 certification. Hitachi Rail Italy aims at the implementation of a management system that has the SA 8000 Ethics Certification, for a correct management and constant monitoring of all related activities and processes that have an impact on issues inherent to the conditions of workers (human rights, development, enhancement, training and professional growth of people, health and safety of workers, non-discrimination, work of minors and young people) and its requirements also extend to suppliers and sub-suppliers.

As for the local community stakeholder category, Hitachi has not provided any data except a reference to the improvement of local infrastructures (e.g. telecommunications, road network, energy and water supply) to favor the activities, indicating that asphaltting has been carried out and signs have been added.

<sup>1)</sup> <https://job.fanpage.it/tabelle-retributive-metalmeccanici-industria-dal-2021-al-2024-stipendio-anno-per-anno/>

## 7.1.4. Evaluation of the use stage of HMU

In the use phase, we considered both workers and users of the train made by Hitachi rolling stocks and/or clients of the customer.

The evaluation on workers is reported in the following table.

Company	Health and Safety	Wages	Social Benefits	Working conditions
Customer	0	n.d.	2	0
	Discrimination	Freedom of association and collective bargaining	Training and education	Job satisfaction and involvement
	0	0	2	n.d.

**Table 7:** Table summarizing assessment of impacts on customer workers

Table 7 shows that for the social impact subcategories health and safety, discrimination, working conditions, discrimination and freedom of association and collective bargaining, the client scored neutral (0). Considering the impact categories social benefits and training and education, the client obtained a positive score of +2; on the other hand, for the impact subcategories wages and job satisfaction and involvement, no data could be found.

Furthermore, considering the health and safety social impact subcategory, the client is certified according to ISO 45001; in addition, there were 80 accident reports. Considering the social impact category wages, no information was found in the client's sustainability report, but since the social risk at country level, based on the SHDB, is low, a neutral score (0) was given.

Furthermore, considering the health and safety social impact subcategory, it can be said that the client is certified according to ISO 45001; in addition, there were 80 accident reports.

Considering the social impact subcategory wages, no information was found in the client's sustainability report.

On the other hand, considering the social impact subcategory social benefits, in the report, the company provides financial subsidies for employees with disabled children and employee support services for corporate welfare and supplementary health care initiatives.

Regarding the social impact category working conditions, information on full-time employees, apprenticeships, permanent employees and part-time employees was found in the client's sustainability report. In addition, information was also found on holiday days and coverage on maternity and parental leave and extraordinary leave. In addition, information was found on the fight against child labor and whether there are policies against the employment of children under the age of 15.

For the social impact subcategory discrimination, information was found in the client's sustainability report on actions taken to increase staff diversity and to promote equal opportunities. Information was also found on women in the workforce and whether employees know how to file a complaint.

For the social impact subcategory freedom of association and collective bargaining, information on employees who have the right to organize collective bargaining activities and employees who have the right to strike was obtained in the client's sustainability report.

For the social impact subcategory training and education, information was obtained in the client's sustainability report regarding the training of employees and appropriate pre-employment training.

Finally, considering the impact subcategory job satisfaction and involvement, no information was

found in the sustainability report, but since there is no legal minimum for the impact subcategory considered, a neutral score (0) was given.

For the assessment of the use stage, the train users are considered to and the data were collected as mentioned in the paragraph by consulting the sustainability report.

Train User	Health and safety	Feedback mechanism	Consumer privacy	Transparency for consumers
	0	1	0	0

**Table 8:** Table summarizing assessment of impact on train users

As can be seen from table 8, overall in the social health and safety impact subcategory, the company scored neutral (0). Furthermore, considering the subcategory number of consumer complaints, the company obtained a negative score of -1, and it also obtained a score of -1 for the subcategory number of defects detected per production batch. Considering the subcategories concerning the presence of management measures to assess consumer health and safety, quality of health and safety requirements and presence of a quality and/or product safety management system, the company scored neutral (0).

Considering the impact subcategory feedback mechanism, the company as a whole received a positive score of +1. Furthermore, considering the subcategory presence of a mechanism for customers to provide feedback the company scored neutral (0); while considering the subcategory concerning customer satisfaction practices the company scored positive +1.

Considering the social impact subcategory consumer privacy, the company scored neutral (0) overall. Also considering the subcategory strength of the internal management system to protect consumer privacy, the company scored positive (+1). On the other hand, considering the subcategory number of consumer complaints related to the breach of privacy or loss of data in the last year, the company scored negative (-1); finally, considering the subcategory number of complaints from regulatory bodies related to the breach of consumer privacy or loss of data in the last year, the company scored neutral (0).

Finally, considering the impact subcategory related to transparency for consumers, the company received an overall positive score of +1.

Furthermore, considering the impact subcategories concerning the publication of a sustainability report and the company’s rating in sustainability indices, the company obtained a positive score of +1. On the other hand, considering the impact subcategories concerning the quality and completeness of the information available in the sustainability report and the certification/labelling adhered to by the product/site organisation, the company scored neutral (0).



## 8. Interpretation of results

The main conclusions for the HMU blues are summarized in the following paragraphs. According to the goal and scope of the study the impact generated by the rolling stock cradle-to-use phase has been analysed with particular attention on the main relevant stakeholder categories: workers and local communities.

In accordance to the SPD-PCR 2023:01 Rolling stock all the relevant social subcategories have been included, also a few of those were optional. The data have been collected from different sources to get site-specific data as much as possible.

The evaluation done took in consideration the national and local norms and standards related to the topic analyzed.

A limitation can be identified in the assessment of the raw material extraction where generic data have been used. However, the data were collected for the considered sectors and geographical areas, and specific database for S-LCA were used.

Finally, the results are summarized below and coupled with possible measures to improve the social conditions.

### 8.1. Extraction and processing of materials

Taking in account the materials used for the construction of the train, raw materials and their extraction were considered, and for these the various subcategories were considered. Looking at each subcategory, the various countries where the materials are extracted, it can be said that there are no high risks because the average values are recorded. However, considering each individual material it is observed that for some countries there are high risks for some subcategories considered. For example, in the case of bronze, it was noted that:

- for the child labor subcategory, Peru and Congo present the highest risk;
- for the subcategories working hours, fair wages, freedom of association and collective bargaining and conflict prevention and mitigation (overall risks of strong conflicts in the sector) China presents the highest risk; for the subcategory freedom of association and collective bargaining, the United States also presents a high risk;
- for the subcategories equal opportunities or discrimination, conflict prevention and mitigation (legal provisions) and corruption control, Congo presents the greatest risk.

These are the countries considered that present the highest risks with regard to the extraction of bronze. Materials that present high risks for many subcategories and many countries are: carbon steel (China and India), aluminum (China, India, Russia), cadmium (China and India), nickel (Indonesia, New Caledonia, Philippines and Russia) and silver (Bolivia, China, Mexico, Peru, Russia and Poland). Therefore at least for these materials, it is advisable to proceed in the future in a detailed analysis, in order to know where these materials really come from and which companies are involved in the process of extracting the materials of the HMU train.

Some countries where the extraction of materials for the construction of the train takes place have obtained low risks for almost all the subcategories so they have not been taken into consideration.

## 8.2. Suppliers of the main components

Considering the suppliers, it was noted that of the 38 companies considered that supply materials to Hitachi for the construction of the HMU train, only 8 have online sustainability reports; the 26 companies without online sustainability reports received a questionnaire to obtain the data necessary to carry out the assessment. Of these 26 companies only 11 replied to the questionnaire.

The lack of response could be a sign of criticality. In fact, companies that are sensitive to social aspects and that already work proactively on these issues, do not have any difficulties in answering the questionnaire used to collect inventory data. However, even if the social assessment of the supply chain is not complete, the study includes all components with relevant social hotspots.

Comparing the data obtained through the questionnaires and those obtained through the sustainability reports, it can be seen that for the category of workers, all companies comply with the legal regulations regarding health and safety. We can also highlight some positive impacts, for all those categories and companies that have a +1 value.

With regard to the issue of wages, the companies to which questionnaires were administered provided data and it was therefore possible to assess their performance. This was not the case for suppliers with sustainability reports, which were not assessed due to a lack of data. The lack of published data in the report may be due to poor performance, so a follow-up survey would be useful.

For the theme of social benefits, it can be affirmed that even if some companies without reports present non-conformities for some indicators, such as the family allowance indicator, the companies with reports balance these non-conformities sufficiently because they present data in this regard.

For working conditions a critical aspect found in some supplier companies (some with reports and some with questionnaires) was the indicator related to the days of leave of workers, this in fact is in some cases below the minimum allowed. This aspect is one of the aspects that regulate the working conditions of the workers and that is strongly regulated in Europe, therefore it is advisable a deepening.

For the issue of discrimination for companies with reports you have conditions of compliance with the laws, instead most of the companies analyzed with questionnaires, have positive scores.

Regarding freedom of association and collective bargaining almost no information was found in the reports, instead the questionnaires show compliance with national regulations.

As far as training and education are concerned, almost all the companies have obtained positive scores, so this shows a certain attention of the sector with regard to the training of employees before they start work.

On the other hand, regarding job satisfaction and involvement for many companies with reports, no data were found; on the contrary, it shows compliance with good practice.

## 8.3. Hitachi Rail STS

For Hitachi Rail STS overall, good scores were obtained for all categories considered. It can be said that as with suppliers, Hitachi also has compliance with regard to health and safety and social benefits, although there are some critical issues that mainly concern the number of programs related to family allowances, programs and benefits for the educational and economic growth of employees. At least that's in accordance with the data received.

On the other hand, regarding training and education they have a good score and this is due to the fact that they received detailed data about it. This led to a positive evaluation for this aspect.

A critical point is the issue of “gender equality”: according to the data received, a female employee receives less than her colleague for the same job. A more thorough investigation is deemed necessary.

Instead, Hitachi Rail STS complies with the regulations on the right of association and collective bargaining.

Lastly, as highlighted above, the absolute lack of data regarding the local community stakeholder category is highlighted.

## 8.4. Use phase

The use phase was evaluated considering two stakeholders: workers and users (or service users). The local community stakeholder was neglected because it is less relevant than the first two. In fact, in the use stage of a train, local communities play a less relevant role, the construction stage of a railway could have a relevant impact on local communities, this phase is outside the boundaries of the system.

As far as the performance of the workers is concerned, we can say that the customer is for the most part in compliance with the regulations in force; aspects of positive impact can be seen with regard to the training of workers.

Considering the various performance indicators, it was observed that for the health and safety indicators low scores were obtained for the indicators number of consumer complaints and number of defects detected per production batch. For the indicators presence of management measures to be evaluated, consumer health and safety, quality of health and safety labels, presence of a management system there is compliance with the standard.

For consumer feedback mechanisms, good scores were obtained for the various indicators considered, while for management measures to improve feedback mechanisms, no data were obtained. For consumer privacy, for the indicator number of consumer complaints about privacy breaches or data loss in the past year, the score is low, therefore improvements still need to be made in this regard.

For transparency for consumers, the indicators are almost all compliant with the standards, but some aspects are not available in the customer’s sustainability report and an in-depth study with primary data could be considered.



# 9. Conclusions

For the construction of the HMU train, comparing the results obtained with the United Nations Agenda 2030 (Sustainable Development Goals - SDGs) related to social aspects, it was noted that Hitachi Rail IT meets **Goal 8** “Encourage sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” and **Goal 10** “Reduce inequality within and between nations”.



*Figure 3: Goals for Sustainable Development, UN Agenda 2030 (UN 2015)*

In fact, the Hitachi company shows with S-LCA results that it will proactively contribute to all points of this goal through:

- Achieving higher levels of economic productivity through diversification, technology upgrading and innovation, through a focus on high value-added and labor-intensive sectors;
- The promotion of policies aimed at supporting the creation of decent work, entrepreneurship, creativity and innovation by promoting the formalization and growth of micro, small and medium-sized enterprises, including access to financial services;
- The achievement of satisfactory employment productivity and decent work for all women and men, including young people and people with disabilities by ensuring equal pay for work of equal value;
- Protecting the right to work and promoting a safe and secure work environment for all workers, including migrant workers, particularly migrant women, and those in precarious employment;
- Strengthening the capacity of domestic financial institutions to encourage and expand access to banking, insurance, and financial services for all.

The company also responds to **Goal 10** “Reduce inequality within and between nations.” Again, the company seeks to meet some of the points that this goal makes, such as:

- Empower and promote the social, economic and political inclusion of all, regardless of age, gender, disability, race, ethnicity, origin, religion, economic status or otherwise;
- Ensure equal opportunity for all and reduce inequalities in outcomes, including through the elimination of laws, policies, and actions to that effect;
- Adopt policies, especially tax policies, and wage policies of social protection, and progressively achieve greater equality.

In conclusion, it can be said that although Hitachi Rail meets some of the points set by Goals 8 and 10, it still has some things to improve within its company.



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## Annex 1 - Definition and methodological aspects

In this annex, reference is made to the definitions and methodology used in the study. In particular, there are methodological explanations of sections 2.2, 4 and 8.

### System boundaries

The system boundaries determine the parts of the product system that will be included in the system to be evaluated. The boundaries of the system must be consistent and relevant in relation to the objective of the study. They should be defined according to a life cycle logic, which includes all the phases of the upstream processes (i.e. processes related to raw materials, purchase of goods



and services by the company) to downstream processes (i.e. related to distribution, use, and end of life of the products) that are needed to fulfil the functional unit. The system boundary therefore determines the parts of the product system to be included in the evaluation.

## Choice of the main stakeholders

The stakeholders categories indicated by the UNEP 2020 Guidelines are: Workers, Consumers, Local Communities, Society, and Children. In any case and depending on the product, other categories of stakeholders specific to that product/service can be defined. The process for selecting the categories of stakeholders and interested parties to be involved in the study, as stated in the guidelines, must be documented in a transparent and justified manner.

In the case in question, the main categories taken into consideration are:

- **Workers.** In this case, workers are defined as personnel working both in the extraction and processing stages of raw materials and at the construction of the train and the use of the train. For this stakeholder category, data were collected on health and social well-being (health checks, risks, accidents, etc.), wages (salaries by employee category, overtime, bonuses, etc.), social benefits (employee support, family allowances, season tickets, unemployment benefits, etc.), working conditions (types of contracts, working hours, average age of employees, holidays, nursery, maternity/paternity, leave, employee relationships, etc.), discrimination (women employed in the workforce, complaints, sexual harassment etc.), freedom of association and collective bargaining, training and education, job satisfaction and involvement;
- **Local community.** Communities and organizations may share the use of material resources (natural and man-made) and have a mutual interest in protecting and enhancing the quantity and quality of local resources and infrastructure. For this stakeholder category, the data collected concern: health and safety (improvement of local infrastructures, risks generated by the activity, improvements in services,), local employment (creation of jobs, involvement of the population for decision-making processes, delocalization and migration) social benefits and losses (accidents, inflation, family allowances), cultural heritage and land rights, discrimination, emigration/immigration, community engagement, poverty and corruption;
- **Users and workers in the use phase.** "Users" are all the people who will use the train that is, passengers. "Workers", on the other hand, are those who will work on the train i.e. train drivers, train conductors, etc. Both of these stakeholders, Users and Workers were considered in the use phase and for the social data relating to this category of stakeholder reference was made to the sustainability reports published by Trenitalia, the principal/main customer of HMU.

## Interpretation of results

Social Life Cycle Interpretation is the final stage of an S-LCA in which all previous stages are re-examined. At the end of the iterative process of the study, the results of the S-LCIA phase are checked and discussed providing the basis for conclusions, recommendations and decisions according to the definition of the objective and scope of the study. In order to be interpreted, the results are not only discussed and synthesized but also analyzed at different levels. The information and data can be aggregated and / or divided at the stage of the life cycle, impact categories, impact subcategories, stakeholder categories or process level to obtain information. In this case, it was preferred to evaluate and interpret the subcategories and the related social performances separately to ensure greater transparency. The results interpretation phase is an iterative approach: the results of this phase may require a review of the objective and scope of the S-LCA study and also that of the data collected and the impact assessment.

## Annex 2 - Life Cycle Inventory (LCI)

Inventory analysis consists of the inventory of all flows in the system studied normalized by functional unit. During the Life Cycle Inventory, information on the activity variable must be collected and data for social flows must also be collected.

The most time-consuming phase of data collection is to collect stakeholder-specific data and sub-categories of impact included in the study from organizations and sites related to the value chain and involves visiting thousands of sites. An S-LCA is an iterative procedure, it is possible, therefore, to make an initial analysis using a database and software to identify the social hotspots of the product system; all of this can form the core of the S-LCA study by integrating it with other data sources for some of the processes and making it more specific over time in an iterative way. Data collection for impact assessment in the S-LCA is comparable for two types of impact assessment. Data are collected at the company and product level for stakeholder groups and subcategories or impact categories. The data collected relate to the life cycle stages defined in the product system.

Corresponding inventory indicators must be identified for each of the selected subcategories and impacts and must be compatible with the selected impact assessment approach. Social inventory indicators are defined as simple variables that provide the status of a given topic/phase/life cycle process. In S-LCA, indicators can be qualitative, semi-qualitative or quantitative in nature, they can also be company specific, site specific, generic, primary or secondary. Typical data sources for S-LCA include: interviews, surveys, audit results, scientific and grey literature publications, generic databases, and others.

Site-specific data is collected by visiting specific or relevant production sites or working with respective organizations. Site-specific data may be collected through direct contact with organizations and companies, through NGOs or similar organizations, through observation of on-site business/production processes, or through interviews or surveys with stakeholders/stakeholders. Primary data are relevant to the priority processes and if the specific process or product performs better or worse than the average defined based on the hotspot assessment, they are very important to measure the positive impacts, their contribution to the specific product, plant or company compared to the local condition. It is necessary to collect primary data to verify risk and be able to analyse impacts.

Site-specific data is sometimes not primary data; it can be secondary data. Data analyse the relationship between an organization and its stakeholders. Site-specific data can be generated through document audits, interviews, questionnaires, participatory evaluation, etc. There are several methods available, to choose the appropriate method one must consider what data is needed and how relevant and meaningful it is.

Hotspot analysis was primarily done by applying it to the raw material extraction phase, where primary data was not available, and at an early stage of the supplier chain assessment.

As far as raw materials are concerned, Hitachi does not have direct contact with suppliers and it is unthinkable to date to trace all the companies producing raw materials. Therefore, based on the inventory data of the Environmental Product Declaration (EPD) made just before the beginning of this project, it was possible to define which are the main materials involved contained in the HMU, Table 1. Obviously, in turn, the suppliers "source" from further suppliers and so on until the extraction of the raw materials involved. Obviously, to think of collecting this "indirect" data through surveys and questionnaires is unthinkable and therefore, the Social Hotspot Database (SHDB) was used to collect the data.

More in detail, once all the materials used for the realization of the train were identified, their origin was studied and thanks to this database it was possible to highlight the main social risks present in the country of origin of the material. The analysis was then carried out for the main impact categories and for each country involved, even indirectly, in the process.

## Social inventory analysis

In our study, the inventory analysis phase can be summarized in the following phases:

- Identification of the suppliers of the various components, provided by Hitachi Rail Italy;
- The analysis of the sustainability reports available on the suppliers' online site;
- Creation of data collection questionnaires sent to all suppliers involved who do not have a sustainability report or the same does not contain significant data for a social analysis;
- Data collection through questionnaires and analysis of the same.

For the collection of primary data, detailed questionnaires were created and administered directly to suppliers and the HRI company. The questionnaires were administered in early October 2021 and then repeated in early November 2021. Further data and clarifications were obtained from direct interviews and surveys.

In particular, in the questionnaires sent to suppliers and to the HRI company, data regarding the following stakeholders were requested: workers and the local community. The data have been differentiated for each single processing phase (see section 2.2). Specifically, three phases have been identified for the HRI company: structural work (phase 1), painting (phase 2), assembly of components (phase 3). In turn, each phase has several steps, and the data was requested for each step involved.

Those steps are:

- » Phase 1: frame assembly, imperial assembly, case excavation, finishing;
- » Phase 2: painting, filming;
- » Phase 3: toilet mounting, floor mounting, mechanical systems, mounting pneumatic, systems mounting, internal equipment, windows mounting, cables cutting, cables mounting, bogies.

Furthermore, for the “workers” category, data was requested on:

- » Health and social well-being (health checks, risks, accidents, etc.);
- » Wages (salaries by employee category, overtime, bonus etc.);
- » Social benefits (employee support, family allowances, season tickets, unemployment benefits, etc.);
- » Working conditions (types of contracts, working hours, average age of employees, holidays, rooms for nursery schools, maternity / paternity leave, leave, etc.);
- » Discrimination (women employed in the workforce, complaints, etc);
- » Freedom of association and collective bargaining;
- » Training and education;
- » Satisfaction and involvement at work.

While for the “local community” category, data was requested on:

- » Health and safety (improvement of local infrastructures, risks generated by the activity, service improvements, etc);
- » Local employment (job creation, involvement of the population in decision-making processes, etc.);
- » Social benefits and losses (accidents, inflation, family allowances etc.);

- » Cultural heritage and land rights;
- » Discrimination;
- » Emigration / immigration;
- » Poverty;
- » Corruption.

Once all the necessary data had been collected, it was possible to build a real inventory of the data (see chapter 4) necessary for the evaluation of the same.

## **Social analysis of inventory of suppliers driven by sustainability reports**

There were 38 suppliers whose websites were searched for their sustainability reports; of these, only 8 presented the report online. The suppliers are: 1,2,3,4,5, 6,7 and 8.

The social issues about which workers were found most include:

- Health and social well-being;
- Social benefits;
- Working conditions;
- Discrimination;
- Freedom of association and collective bargaining;
- Training and education;

As regards the local community, little information was found in the reports of the various suppliers for the local community support indicator.

With regard to the 8 mentioned suppliers, the news found mainly concerns:

- The presence of the sustainability report;
- The average rate of accidents at work;
- Site and personnel certifications;
- Social benefits provided to workers (eg unemployment benefit, health insurance, etc.);
- Employee support - provision of season tickets (eg gym) or accommodation (eg apartment);
- New employees hired in the last year;
- Maternity coverage;
- Parental leave and / or extraordinary leave (eg for disability, bereavement...);
- Human rights;
- Women employed in the workforce;
- Employee training.

## **Suppliers analysed with primary data**

In order to have a complete picture and to collect all the necessary data, in addition to those already identified by the sustainability reports of the various suppliers, taking into account that some suppliers did not have their own sustainability report, a direct data collection was carried out through the administration of simplified and easy-to-fill questionnaires to all direct suppliers of the HRI company.

Also in this case, the questionnaire requested data regarding the main stakeholders: workers and the local community. The data have been differentiated for each single processing phase.

The simplified questionnaires were sent in early October 2021. As many companies did not respond, they were invited again, in early November. The companies interviewed to fill in the questionnaire were 26 and they are all suppliers of the HMU Blues train that did not have sustainability reports.

To date, of the 26 companies mentioned above, only 11 (about 40%) have responded to the questionnaire.

All data received are reported in the annex and will be analysed in the social performance evaluation phase.

The companies, as far as workers are concerned, answered almost all the questions concerning the topics:

- Health and safety;
- Wages;
- Social benefits;
- Working conditions;
- Discrimination;
- Training and education;
- Freedom of association and collective bargaining;
- Job satisfaction and involvement.

On the other hand, with regard to the local community, companies responded to almost all the questions concerning the following issues:

- Health and safety;
- Local employment;
- Cultural heritage and land rights;
- Poverty.

Overall, the companies answered most of the questions asked in the questionnaire for workers and the local community, with only one company answering only the questions on workers for the health and safety issue.



## Hitachi

For the realization of the data inventory for the Hitachi company, as already mentioned above, the previously described questionnaires were created and administered. Further data were obtained through interviews and surveys and the consultation of the sustainability report, of the information published on the website of the same company. The collection of data through different sources is perfectly compliant with UNEP 2020, in fact it allows on the one hand to complete the data and on the other to verify those already obtained through the so-called Triangulation process<sup>2</sup>.

The data obtained, for the Pistoia and Naples plants, relate to the following issues:

- Health and social wellbeing;
- General safety-related accidents: the overall value of accidents is definitely monitored, as well as the health checks carried out periodically;
- Provision of free meals for employees: it is stated that all employees have a free canteen and a badge is used to access the service, but no data is provided;
- Definition of the main working time: the main working time is considered to be from 8:00 to 16:30;
- Documented working conditions (e.g. regular contracts): in particular, every worker employed directly by Hitachi Rail is subject to the national employment contract. Regarding external companies, there are contracts regulated by regulations (e.g. DURC and similar). In the case of data collection, the percentage of internal and external workers present in the two plants was not reported;
- Stability of jobs: from an interview with the sustainability manager it seems that there have been no redundancies, except in justifiable cases. However, no data was provided;
- Number of working hours performed by employees forced to leave personal documents: no employees are forced to leave documents;
- Number of audits and monitoring cycle on working conditions by external certifiers: no specific audits are carried out but the path to implementation and future certification according to SA 8000 has been undertaken. A management system that has SA 8000 Ethical Certification is therefore an effective tool that allows the organization that has implemented it to correctly manage and constantly monitor all the activities and processes related to them that impact on issues relating to workers' conditions (human rights, development, enhancement, training and professional growth of people, health and safety of workers, non-discrimination, employment of minors and young people) and its requirements also extend to suppliers and subcontractors. This certification allows the verification of many aspects contained in an S-LCA. SA 8000 certification has been obtained by Hitachi in January 2022;
- Actions taken to increase the diversity of personnel and/or to promote equal opportunities: a corporate function dealing with Diversity & Inclusion was already defined in April 2020. Furthermore, already in November 2017, the company had set a target to increase the number of women in management positions in the corporate from 2.5 to 10% by the end of the 2020 fiscal year. The target was achieved in April 2021. A further target set for 2030 for the whole company including the Japanese office is to reach a share of 30%;
- It is confirmed that all employees have the right to form associations and can join trade unions;
- Employees have the right to organize collective bargaining activities: in fact, contracts at the Naples and Pistoia sites are negotiated through trade unions;
- Job satisfaction and involvement survey (you do not have any monitoring of the level of sa-

<sup>2)</sup> UNEP 2020 Triangulation implies that different perspectives are considered when investigating a research object or question. These perspectives can be expressed in different applied methods, in the different theoretical approaches that are applied or more frequently in a combination of different data types or data collection methods. It also refers to the collection of data from different people or stakeholders or stakeholder groups that are at odds with each other.



tisfaction): a survey is carried out annually at corporate level with the focus on the various business units and periodically we are given a feedback on the outcome of the survey and the improvement actions taken;

- Employee salaries: the data shown in table 36 are detailed and also allow us to make some assessments on gender equality;
- Violations of laws and regulations concerning employees in the workplace: it was stated by human resources that there were none;
- With regard to local employees, no precise figure was given on how many there are, but it was stated that for blue-collar workers and “standard” employees they are mainly local, while managers, top managers and middle managers can be from anywhere;
- The company has no policy against the employment of children under the age of 15 and the number of hours worked by trainees aged between 15 and 18 is not given either, because the company does not hire employees under the age of 18;
- Identified complaints related to discrimination: HR stated that there are no complaints in this regard.

As regards training, differentiated data were provided for the two plants in Pistoia and Naples. For the Naples plant, a distinction was made between safety and environment for each type of course, and for the participants a distinction was made between Manager, Employee, Clerk and Worker. A percentage was also calculated to see how many participated in the course; in the case of the Naples plant since a distinction was made between participants then the percentage was calculated considering the number of managers, employees and workers present in the plant.

Finally, no data has been provided on the local community apart from that relating to the improvement of local infrastructures (e.g. telecommunications, road network, energy and water supply) to favor activities, indicating that asphaltting has been carried out and signs have been added.

The data are mostly aggregated by plant, and given that a certain number of trains are produced and assembled in the same plants and in the same production lines, it is not possible for these plants to carry out a detailed product analysis. On the other hand, it was possible to obtain primary data referring to a certain number of indicators and by subcategory of impact. Thanks to the fact that we will use the referencing scale methodology, the allocation to the functional unit of the product is not relevant. However, the fact remains that we are following the supply chain and the life cycle of the HMU Blues product, considering the direct suppliers of this product and not all the suppliers of the company itself and for this reason we can still talk about S-LCA and not SO -LCA. In the case of SO-LCA we should have considered all the suppliers and customers of the Hitachi Rail Italy company.

## **Use phase S-LCI**

The customer, or rather the sustainability balance sheet of its holding company, was taken into consideration for the inventory analysis of the utilisation phase, which consists of four operating sectors: transport, infrastructure, real estate services and other services. In the use phase, the significant stakeholders are the consumers or users (of the train) and the workers involved in the service.

The holding has a sustainability report and the data necessary for the social assessment were obtained from the same in 2020.

## Annex 3 - Life Cycle Impact Assessment (LCIA)

The assessment of social impacts is the phase of the S-LCA aimed at calculating, understanding and evaluating the extent and significance of the potential social impacts of a product along its life cycle and on the stakeholders involved.

A potential social impact is defined as the likely presence of a social impact, which results from the activities and behaviours of organizations related to the product/service life cycle and the use of the product itself.

It is necessary for the assessment to develop or use reference scales for each indicator used, and each level of the scale must be defined. Reference scales are ordinal scales, typically consisting of levels from 1 to 5, each of which corresponds to reference performance points (PRPs). PRPs are thresholds, targets, or goals that set different levels of social performance or social risk, which allow for an assessment of the magnitude and significance of potential social impacts associated with organizations in the product system. PRPs are dependent on social and geographic context and are often based on international standards, local legislation or industry best practice - regulatory benchmarks - but in some cases may represent the targets set by the company commissioning the study.

Comparison of relevant inventory indicator data with these levels allows a negative or positive performance to be defined (by various degrees within or between the two poles).

The reference scales can be increasing - ranging for example from negative performance to positive performance, but they can also be decreasing - ranging from very low risk to very high risk of potential negative impacts (see Figure 4). They may or may not cover both negative and positive impacts and you can use numbers to identify levels or just colours. In the case in question, the scale taken in reference is the one shown in figure 4.

Scale level	Description
+2	Ideal performance. Best in Class
+1	Beyond compliance
0	Compliance with local and international laws and/or basic societal expectation
-1	Slightly below compliance level
-2	Starkly below compliance level

**Figure 4:** Descending reference scale for the evaluation of social performance

For the evaluation phase, starting from the inventory data and defining the reference values, we proceeded from the attribution of a score to each indicator to the evaluation of the average of the scores attributed. The final total score, however, was not obtained from the recorded arithmetic average but more from a weighted average; based on the value of one indicator with respect to another.

Specifically, as already mentioned, the indicators were assigned a score on a scale ranging from -2 (worst case scenario) to +2 (ideal condition) (see Figure 4). The 0 or neutral value indicates when, for the specific indicator, values that comply with national and / or international regulations are reached. The +1 value is obtained when the company for that aspect has a proactive behaviour that

positively exceeds simple compliance with current national and international legislation. And finally, the value -1 on the contrary highlights one or more non-compliance for that social aspect considered. The referencing analysis was made for each inventory indicator and then a final value was reached for that impact category in order to be able to give an overview of the positive or negative impacts of the HMU product along its life cycle.



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