The sustainable freight railway: Designing the freight vehicle – track system for higher delivered tonnage with improved availability at reduced cost

SUSTRAIL

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Exploitable results table

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Executive Summary

The present document reports major considerations about the ”Exploitable Plan” of the Sustrail project, reflecting the consortium point of view at Month 12 of the project.

The project exploitation plan, delivered here in form of D7.3 “Exploitable results table”, is being carrying on within Task7.2 “Exploitation” as part of the project work-package WP7 “Dissemination and Exploitation”.

As previously mentioned, and in line with Annex I – DOW, D7.3 is due at Month 12 of the project. Given this it is worth noting that most of the technical activities related to the expected project results started only few months before the delivery of the present document, thus meaning that right now it is quite difficult to exactly know the technical outcomes of the project and their levels of exploitation. Indeed a clearer and more complete idea of how exploiting the results will arise during due course of the project when the most relevant technical activities will have been carried out and both laboratory and field tests will have demonstrated their feasibility and market implementability.

However since it was decided to identify and clearly define an exploitation strategy since the beginning of the project, D7.3 currently provides the project vision and plan to the exploitation of the foreseen results. Furthermore, as from Annex I – DOW, the exploitation table will be “living throughout the project” and will be updated at scheduled intervals each year. This means that two further progress versions should be expected by the end of the 2nd and 3rd year of the project and a final version to be released at the end of the project, aimed at highlighting the project outcomes and reporting the exploitation plan in a more comprehensive and market oriented approach.

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1. INTRODUCTION

D7.3 “Exploitable Results Table” reports the plan for the identified project exploitable results, by clearly identifying the key partners involved, the main steps need to be accomplishing to exploit the results and the potentiality of the result in the railway freight market Sustrail is looking for. A distinction in between results for the whole railway market and results which mainly deals with the freight market is made.

A preliminary discussion on the distribution of IPR is suggested and provided having in mind the current status of the project (at Month12) and the work flow and developments which are foreseen by the end of the project.

Finally the way forward to the future releases of this document is provided including the organisation of an Exploitation Workshop close to the end of the 3rd year of the project to finalize and details the exploitation results main features and their market oriented exploitation strategy.

2. EXPLOITABLE RESULTS TABLE

An Exploitation Plan has been elaborated by month 12 of the project and will be updated across the project timeline aiming at the commercial exploitation of the SUSTRAIL project's result on a global scale. The exploitation plan integrates individual and joint exploitation plans.

The exploitation mainly contains:

- The identification of the scientific and technical knowledge, products and services (deliverables) of the project susceptible to be exploited and classify them according to their commercial potential foreseeing expected barriers for the exploitation.
- An in-deep European and worldwide market analysis, identifying relevant target markets / groups, and assessment of the competitive environment surrounding the project. The market will be continuously monitored in order to detect new trends and possibilities;
- The assessment of the expected socio-economic impact of the knowledge and technology generated and the factors that would influence their exploitation (such as standardisation, regulatory aspects, etc) as well as the wide deployment of SUSTRAIL results.
- A methodology and strategy for an appropriated management of the knowledge generated in the project and IPR protection strategy stated in the Consortium Agreement.
- A Proposition of the Business Case/s regarding type of product/service, routes for exploitation covering the whole life cycle as well as type of customers, market and competitive environment.
- An assessment of Cost-benefit feasibility, future feasibility and self-sustainability of the project in the respective marketplaces.

The **Project Exploitation Committee** made of experts from the industrial members within the SUSTRAIL Consortium will actively support the consortium to exploit the Intellectual property Rights in Europe and abroad, critically revising the Plan for Using and Dissemination of the Knowledge and providing opportunities for the timely exploitation of the project results. It will be set up by Month18 of the project thus allowing becoming confident with the project results to start exploiting them from Month24 of the project.

As reported in Annex I, the project exploitation committee will have access to and will be assisted by **The Rail Reference Group (RRG)**. The Rail Reference Group is an **external expert group** associated with the project consortium comprising mostly UIC and UNIFE members in their function as railway undertakings, infrastructure managers and rolling stock manufactures and suppliers. An extension of this group to universities and other bodies can be done in accordance with the partners' agreement. The members of the Rail Reference Group are called and supervised by UIC and UNIFE.

This group's main function is to provide input into the research project in terms of daily railway operation, good practice and user requirements. The Rail Reference Group will follow the main work stream and progress through the project. This experts' network will indirectly contribute to the successful finalisation of the deliverables by cross-checking and revising

them. The intention of the interaction between the research project and the Rail Reference Group is on the hand ensuring the project's intermediate and final results fitting the stakeholders' and all end-users' needs and requirements and guaranteeing a continuous dissemination of the project results on the other hand. The Rail Reference Group will work as a virtual group in order to act efficient and cost effective.

Access rights to the deliverables for the RRG, as non-project partner, will be further defined deliverable by deliverable in line with the Intellectual Property Rights and the decision of the Steering Committee.

Table 2.1: below reports the list of the project the exploitable results, identifying the actors in charge of the main innovations generated within the project and the possibly collaboration networks which could be activated in the project.

The list is currently composed by 10 self-standing exploitable results:

1) Novel wheel profiles and defect tolerant wheelsets
2) Improved suspension design for mixed traffic railway
3) Improved braked system for high speed low impact freight operations
4) Improved bogie design implementing lightweight materials and novel suspension systems
5) Lightweight body shell for high performance freight cars
6) Condition based predictive maintenance tools for freight rail vehicles
7) Condition based predictive maintenance tools railway tracks
8) Multifunctional geotextiles integrating sensoring functions for railway embankments
9) Optimised track system and geometry
10) Business case and related tools for freight vehicle-track integrated system

For each result, Table 2.1: summarizes the main achievements up to know (Month 12) and the next steps to exploitation. Colors are used to characterize the exploitation potential of each result and the associated risk in fully exploiting them:

- red for "*not exploitable*": it will be difficult to fully exploit the result and/or barriers have been identified preventing the exploitation in the duration of the project and/or further research is needed;
- orange for "*weakly exploitable*": this results have not been abandoned yet, but it is unlikely that they will turn to be exploitable by the end of the project.
- yellow for "*moderately exploitable*": the exploitation potential is not the highest in the main areas of the project; however market potential exist and future opportunities will be investigated;
- green for "*highly exploitable*": for those results concrete possibilities of exploitation exist.

Table 2.1: Exploitable results

Exploitable Results		Partners Involved	Relevant WPs	Relevant Deliverables	% Complete	Achievement date	Exploitable Result Manager
1	Novel wheel profiles and defect tolerant wheelsets	LUCCHINI POLIMI USFD	TASK3.1	D3.1	5%	M30	LUCCHINI
		Intended Progress past current SOA: Recent developments in passenger vehicles have led to a new generation of wheelsets (e.g. new wheel profiles such as the P12 'anti rolling contact fatigue profile, now on trial in the UK). Much less effort has gone into freight vehicle wheelsets, although there may be significant benefits from using the new developed technologies (optimised wheels, axles and inspection methods). The development is intended related to increase freight vehicles performances in terms of higher loads, higher speeds and with a higher level of safety (with the aim of non destructive inspection methods).					
		Exploitation Plan: Protection of results, where possible, will be carried out by patenting by LUCCHINI, with subsequent exploitation thought direct manufacturing and commercialisation or licensing. LUCCHINI wants to make available the newest technology (even already implemented with passenger vehicles) for the freight ones, increasing the reliability and the safety of the wheelset even in this market range. The other academic partners will benefit of consultancy for laboratory testing and share on IPR.					

Exploitable Results		Partners Involved	Relevant WPs	Relevant Deliverables	% Complete	Achievement date	Exploitable Result Manager
2	Improved suspension design for mixed traffic railway	SIRV SPT KTH MMU	TASK3.1	D3.1	7,5%	M30	SIRV
		Intended Progress past current SOA: The demand for a high payload has resulted in vehicles with a very large difference between tare and laden mass and this creates significant challenges in controlling the vehicle behaviour through a suspension which has to accommodate both states. In addition the traditional freight vehicle suspension such as the Y25, common in Europe or the three piece bogie, ubiquitous in all heavy haul operations worldwide, are manufactured under severe cost constraints. The SUSTRAIL approach is towards the use of novel solutions for the critical elements in the suspension. This implies the adoption of computer modelling for the optimization of the suspension system which is aimed at on improvements of the suspension design by working on the unsprung mass, or by correcting the stiffness and damping of the system or by lowering primary yaw stiffness. In the case the aforementioned modification will not bring a significant advantage, more radical solutions, such as working on active suspension systems will be investigated.					
		Exploitation Plan: Protection of results where possible will be carried out by patenting by SIRV, with subsequent exploitation thought direct manufacturing and commercialisation or licensing. The academic partners KTH, MMU and SPT will benefit of consultancy for laboratory testing and share on IPR, as they contribute from a research point of view on both the design and testing of the improved suspension system.					

Exploitable Results		Partners Involved	Relevant WPs	Relevant Deliverables	% Complete	Achievement date	Exploitable Result Manager
3	Improved braked system for high speed low impact freight operations	KES LUCCHIN POLIMI TUB SIRV	TASK3.2	D3.3	10%	M36	KES
		Intended Progress past current SOA: Braking activities have become increasingly complex, both in the field of passenger cars and freight cars. This leads to increased requirements with regard to the brake systems applied. The existing pneumatic and electro pneumatic brake systems which have been in operation for years have stood the test, but have scarcely been modified in the past decades despite the rapid development of technical opportunities. Therefore, the disadvantages of the mentioned systems have not been removed so far despite technical innovations and increased safety has not been taken into consideration. By the future-oriented and innovative brake and monitoring system for SUSTRAIL wagon the persisting problems and imperfections of the present brake systems should be solved and the new technical opportunities should be taken into account. The requirements which are to be fulfilled by innovative and future-oriented freight cars are: - higher axle load - increased speed - lower noise emission - lower LCC through intelligent overhaul and - universal application for different operation modes (S-traffic or SS-traffic) The existing conventional brake systems for freight car cannot fulfil the requirements which an innovative freight car has to comply with. Therefore, for SUSTRAIL an innovative, electronic distributor valve will be designed which has the above advantages and includes extensive diagnosis functions. The innovative SUSTRAIL wagon will reach a higher sped than the existing freight cars. In order to be able to achieve the brake distances at this speed, a disk brake will be used for SUSTRAIL. The disk brake offers the big advantage that the wheel surface is not influenced by the brake and thus the noise emission is reduced considerably. The new electronic distributor valve disposes of a wheel-slide protection system which avoids the blocking of axles at low adhesion values. An axle generator to generate sufficient energy for the electronic and for charging the backup batteries during driving mode is designed to safeguard power supply. The electronic distributor valve is prepared to enable a brake test before departure, thus reducing the costs of train composition. Moreover, it offers the opportunity of electronic derailing and hot box monitoring. The electronic distributor includes telematics which can transmit all important information to the desired recipient.					
		Exploitation Plan: Patenting is foreseen for the new developments of the braking system by KES. Licensing will be considered by SIRV. TUB and POLIMI will benefit from consultancy activities and requests for laboratory test for certification and validation.					

Exploitable Results		Partners Involved	Relevant WPs	Relevant Deliverables	% Complete	Achievement date	Exploitable Result Manager
4	Improved bogie design implementing lightweight materials	SIRV MMU UNEW	TASK3.3	D3.5, D3.7	5%	M42	SIRV
		Intended Progress past current SOA: The first composite bogie developments were carried out at end of 1970s by MBB for application on ICE1. HLD-E and HLD-L prototypes were put on track under BPMZ car in 1986 and the prototypes ran almost 2 Million km (600 000 km at 200 kph). Experiences were made on HLD-300 prototype bogie, with manufacturing in 1992 and testing on roll-bench in 1993. Prototypes put on track under ICE car in 1993. New development was resumed by ADTRANZ in 1997. In 2000, ALSTOM-Transport started a very innovative long-term research project, named Composite Bogie, to introduce composite materials in the design of bogie. SUSTRAIL approach is based on the use of lightweight materials and novel solutions for the critical elements of the bogie for higher overall performance. This will be done by retrofitting the conventional Y25 bogie, being the most common in European freight vehicles. The retrofitting process will be achieved through structural adaptations and by the use of lightweight materials for bogie subcomponents New materials for specific subcomponents, together with suspension optimization and a disk based braking system for noise reduction.					
		Exploitation Plan: Patenting is foreseen from SIRV which will manufacture the novel (i.e. optimized) bogie. The academic partners MMU and UNEW will benefit from consultancy and use of the novel solutions for further research and training activities.					

Exploitable Results		Partners Involved	Relevant WPs	Relevant Deliverables	% Complete	Achievement date	Exploitable Result Manager
5	Lightweight body shell for high performance freight cars	SIRV UNEW TRAIN MMU	TASK3.3	D3.4, D3.7	5%	M42	SIRV
		Intended Progress past current SOA: In the railway industry, steel and aluminium constructions represent the state of the art for car body shells. For applications in which weight is a significant factor, aluminium is currently the material of choice. Freight cars for heavy loads are generally constructed using steel welded elements. Lighter materials for the carbody should be considered when aiming for increased speed and increased performance of the freight vehicles. In Sustrail a conventional and a futuristic option for the vehicle bodyshell are foreseen. The conventional is aimed at the retrofitting of existing freight vehicles, such as ordinary open high sided vehicles by making it lighter and more aerodynamic, while the futuristic option looks for a more advanced and redesigned type of vehicle based on structural optimization by using composite materials and modularity concepts for the wagon elements.					
		Exploitation Plan: Patenting will be considered by SIRV, UNEW and TRAIN. SIRV also will benefit from direct manufacturing and commercialisation of the novel lightweight freight car. MMU as academic partners will benefit of the improved vehicle bodyshell for further research and consultancy activities.					

Exploitable Results		Partners Involved	Relevant WPs	Relevant Deliverables	% Complete	Achievement date	Exploitable Result Manager
6	Condition based predictive maintenance tools for freight rail vehicles	MERMEC TRAIN TUB UNEW POLIMI LUCCHINI	TASK 3.4	D3.6	30%	M36	MERMEC
		Intended Progress past current SOA: The intention is to develop condition monitoring tools to control the standard of the vehicles from the infrastructure point of view and monitoring tools to control the condition of the infrastructure to avoid failures in the opposite direction, in a holistic approach. Cost effective rolling stock asset management is critical to the ongoing success of all railway operations. Proper care and cure of rolling stock and condition monitoring of the interaction between railway infrastructure and rolling stock can bring countless benefits, especially for freight railway infrastructure. In fact, the rail vehicles are subject to innumerable elements and activities that have a detrimental effect on its condition and potentially on the safety of passengers and freight. Today, as railways increase their capacity and speeds, it is more important than ever to be completely aware of the state of vehicles fleet's condition to ensure the highest quality and safety standards, as well as being able to maintain the costs as low as possible. At this purpose, MERMEC is developing a new technology able to perform a thermal inspection of the axle load. This technology is still under testing. Moreover, MERMEC is especially pushing the development and testing of the Wheel Surface Defect System, a wayside system based on vision technology to detect crack, flats and other kind of defects present on the wheel and wheel tread in order to provide important information on the wheel status. From this information is thus possible to understand, especially on freight vehicles, what happens to the system track/rolling stock and how heavy loads can affect it (form a holistic point of view). The Wheel Surface Defects is a real-time measurement system using a combination of lasers and video cameras to automatically profile and inspect the wheel. Mounted wayside in the track area, the system acquires images at high speed and with high accuracy of the wheels. System's analysis and reporting software provides wheel performance trending and predictive identification of fault components. Its robust, mechanical design guarantees continuous operation even in critical environments, as well as extended product life. The system can be easily installed on any type of rail based infrastructure, without modifications to the existing line. Minimal civil work translates to minimal track out-of-service. All measurement units are enclosed in sealed and temperature controlled galvanized steel boxes. Shock from passing trains is greatly reduced due to the system's installation on shock absorbing components.					
		Exploitation Plan: From the MERMEC perspective, the proposed systems are currently under design and test phase and their feasibility has already been proved. MERMEC intends to propose both systems to the end users for diagnostic purposes and, actually, some tests installation in France has already produced good results. At the end of the design and testing process, MERMEC will start carrying out demonstrative measurement campaigns and will propose these systems in conferences. MERMEC also thinks it will be possible to work together third party supplier for the integration of these systems with other wayside system. Moreover, patenting will be considered by the involved partners as well as consulting activities and presentation of the innovative technologies at exhibitions and conferences.					

Exploitable Results		Partners Involved	Relevant WPs	Relevant Deliverables	% Complete	Achievement date	Exploitable Result Manager
7	Condition based predictive maintenance tools for railway tracks	NR ADIF NRIC AFER TATA STEEL KTH LTU MMU POLIMI TRAIN DAMILL MERMEC	TASK4.1, TASK4.5	D4.1, D4.5	5%	M42	NR
		Intended Progress past current SOA: As for the previous result, the intention here is to develop condition monitoring tools to control the standard of the vehicles from the infrastructure point of view and monitoring tools to control the condition of the infrastructure to avoid failures in the opposite direction, in a holistic approach. This will be done at a preliminary level by means of analysis and scouting of the available technologies and solutions with particular attention paid to NR, DAMILL and MERMEC proposed solutions for track monitoring and measurements of the effects on the track due to unbalanced loads. Solutions where data are collected from track-based load measurement systems as well as solutions were data are collected from the use of train-borne measurement systems will be investigated. Subsequently after screening the current solutions, the attention will be paid to the definition of constraints and boundaries (e.g., along the railway distributed sensors, at fixed location punctual sensors) which make these solutions feasible or not for the application in mixed railway lines. Finally, based on a reliability analysis, the most effective solution among the ones proposed by project partners will be selected.					
		Exploitation Plan: Depending on the chosen solution, patenting will be considered by the involved industrial partners, which will be looking for selling the new tool. The academic partners will look for consulting and training activities, as well as for further research. NR, ADIF and NRIC as infrastructure managers will benefit of the condition based maintenance tool as end user and will be looking for offering it for consultancy.					

Exploitable Results		Partners Involved	Relevant WPs	Relevant Deliverables	% Complete	Achievement date	Exploitable Result Manager
8	Multifunctional geotextiles for railway embankments	TRAIN NR ADIF NRIC LTU UNEW USFD	TASK4.2	D4.2	5%	M42	TRAIN
		Intended Progress past current SOA: Many different sensors are used in geotechnical applications, for the measure of tilt, convergence, displacement, geographic position (GPS receivers), strain, load, vibration, overburden, level, flow, creep, and force. Monitor geotechnical performance is relevant for several reasons including indicate impending failure and provide a warning, reveal unknowns and evaluate critical design assumptions, minimize damage to the running vehicles, provide data to help select remedial methods to fix problems, satisfy regulators, and advance state-of-knowledge. Generally however sensors are just able to provide the main function of monitoring single parameters at one specific point. In addition geotextiles and geogrids are widely used in earth constructions (for the stabilisation of rail ways), but their behaviour in service can be only estimated indirectly from the behaviour of the overall structure, being direct measurement systems not generally available. The integration of sensing technologies (e.g. monitoring capabilities) in geotextiles structures (e.g. reinforcing/retrofitting capabilities) is the key factor for obtaining a smart and multifunctional solution able to fix embankment reinforcing issues and to provide condition monitoring of the railway track across kilometres of lines.					
		Exploitation Plan: Prototypes of sensor integrated geotextiles, where the sensor is integrated into the textile (since the manufacturing stage) and protected from the surrounding fibres from external actions are available for validation and testing. The sensors run straight along the main direction of the textile and several sensors can be accommodated within the fabric width, depending on the needed acquisition density. TRAIN is planning to establish cooperation with textile and sensor partners to provide the sensor integrated geotextiles. TRAIN is aimed at provide consultancy service related to data analysis and processing from sensors embedded geotextiles.					

Exploitable Results		Partners Involved	Relevant WPs	Relevant Deliverables	% Complete	Achievement date	Exploitable Result Manager
9	Optimised track system and geometry	TATA STEEL TRAIN NR ADIF NRIC KTH LTU MMU USFD POLIMI	TASK4.3	D4.3	5%	M42	TATA STEEL
		Intended Progress past current SOA: the creation of optimized track related components has been studied in the INNOTRACK WP3.1 which is setting the SoA. Two radically different trackforms were considered; the first is the Baulfour Beatty Embedded Slab, which replaces the conventional girder rail profile by a solid rail with a roughly rectangular section, resiliently embedded in a concrete slab. The other concept is a two-layer trackform developed by TATA STEEL, which consists of a stiff frame supported on a load-spreading platform. This means that the components can be delivered to site pre-assembled. This former design is the one further developed and analysed within SUSTRAIL.					
		Exploitation Plan: The industrial partners are active on patenting. TATA STEEL main exploitation plan is related to the production of the novel track system for a wider market. The academic partners look for providing testing and assistance to the industrial partners.					

Exploitable Results		Partners Involved	Relevant WPs	Relevant Deliverables	% Complete	Achievement date	Exploitable Result Manager
10	Business case and related tools for freight vehicle-track integrated system	UNILEEDS NR GCLAS LTU ECOPLAN VTU MARLO UPM	WP5	D5.1-D5.7	0	M42	UNILEEDS
		Intended Progress past current SOA: bring together the LCC and RAMS analysis and benefit analysis to determine an overall assessment of the innovations in vehicle design and in track infrastructure. Provide recommendations on appropriate ways to implement proposed new innovations including means to redistribute whole system savings and incentivise uptake via access charges and how to phase the introduction of proposed new technologies.					
		Exploitation Plan: development of tools to be exploited in consultancy services and recommendations for policy purposes.					

The ways the above results will be secured can vary. However, at the current stage of the project (Month12), patenting is being considered by:

- LUCCHINI, as industrial partner, for result n°1 “Novel wheel profiles and defect tolerant wheelsets”.
- MERMEC, as industrial monitoring partner, for result n°6 “Condition based predictive maintenance tools for freight rail vehicles”.
- SIRV, as industrial vehicle manufacturer partners, for result n°2 “Improved suspension design for mixed traffic railway” and result n°4 “Improved bogie design implementing lightweight materials”.
- KES, as industrial partner, for the improved breaking system developed under result n°3 “Improved braking system for high speed low impact freight operations”.
- SIRV in junction with UNEW and TRAIN for result n°5 “Lightweight body shell for high performance freight cars”.
- TATA STEEL, as industrial partner, for result n°9 “Optimised track system and geometry”.

In a similar way, exploitation by consultancy is being considered by:

- TRAIN for result n°8 “Multifunctional geotextiles for railway embankments” with reference data processing and elaboration of data collected by the sensing units embedded into the geotextiles.
- NR, as infrastructure manager, for result n° “Condition based predictive maintenance tools for railway tracks”, where licensing is a further credible option.
- UNILEEDS, as academic partner, for results n°10, “Business case and related tools for freight vehicle-track integrated system”.

With reference to the exploitable results, the project exploitation strategy is detailed in terms of access rights (e.g. background and foreground knowledge) in the Intellectual Property Rights (IPR) and exploitable structure table provided below.

Since most of the results will be developed in collaboration, co-ownership scenarios are foreseen for some of them.

To make things as simple as possible, letters have been used in the IPR table to describe the exploitation strategy partner by partner with reference to each result. The meaning of this letter comes as follows.

B: **IPRs on background Information**, excluding foreground information, brought to the project from existing knowledge, owned or controlled by project partners in the same or related fields of the work carried out in the research project. Only relevant information for the project can be considered background.

F: **IPRs on Foreground Information** including all kind of exploitable results generated by the project partners or 3rd parties working for them in the implementation of the research project

Apart from background and foreground rights, 4 additional levels (**M**-**U**-**L**-**O**) can reflect the intention of the partners to exploit the results.

M: Intention of the partners to exploit the results by making them and selling them

U: Intention of the partners to exploit the results by using them internally (further research) or to make something else for sale;

L: Intention of the partners to exploit the results to license them to 3rd parties;

O: Intention of the partners to exploit the results to provide services such as consultancy, training, etc.

Table 2.2: IPR and Exploitation Structure

Part. n°	Part. Short Name	Result n° / name									
		1	2	3	4	5	6	7	8	9	10
		Novel Wheel Profiles	Improved Suspension Design	Improved Brake System	Improved Bogie Design	Lightweight Bodyshell	Condition Based Tools for Freight Vehicles	Condition Based Tools for Railway Tracks	Multifunctional geotextiles for railway embankments	Optimized Track System	Business Case
1	TRAIN					B, F, O	B, O	B, O	B, F, L, O	B, F, L, O	
2	NR							B, U, L	B, U, L	B, U, O	F, U, O
3	NRIC							U	U	U	U
4	ADIF							B, U, L	B, U, L	B, U	U
5	BDZEAD										
6	LUCCHINI	B, F, M		U			U				
8	MERMEC						B, F, M	B, F, M			
9	GCLAS										B, F, M, O
10	MARLO										B, U, O
11	AFER							L, O			
12	DAMILL							B, F, U, O			
13	TATA STEEL							B, O		B, F, M, L	
14	ECOPLAN										B, U, O

15	VTU										B, O
16	UNEW				B, F, U, O	B, F, U, O	B, U, O		B, F, O		
17	LTU							B, U, O	B, F, O	B, O	B, O
18	MMU		U		B, F, O	U, O		B, U, O		B, U, O	
19	TUB			B, U, O			U, O				
20	UNILEEDS										B, F, M, U, L
21	USFD	B, F, O							B, O	B, O	
22	UPM										B, O
23	KTH		B, F, O					B, U, O		B, O	
24	POLIMI	B, F, O		B, U, O			B, U, O	B, U, O		B, O	
25	SPT		B, F, O								
26	GTU										
27	UIC										
28	UNIFE										
29	SIRV		B, F, M	U, L	B, F, M	B, F, M					
30	KES			B, F, M, L							

3. CONCLUSIONS

The present document reports the plan for the project exploitable results, reflecting the consortium point of view and feeling at the current project stage (Month12).

The exploitation results are sorted in form of a table, where their progress beyond the state of the art, their exploitation potentiality, and the key partners involved, the exploitation managers, and the way the results will be secured are presented.

It is worth nothing that the content of the project exploitable results and the type of exploitation may be updated across the project activities and developments. Indeed progress versions of this plan are foreseen at the end of the 2nd and 3rd years, together with a final version at the end of the project.

Moreover to finalize the exploitation plan, to better detail the exploitation strategy and the market approach a project Exploitation Workshop is aimed to be organized at the end of the 3rd year of the project. This will be the occasion for all the partners directly involved as exploitation manager to verify the potential market penetration of their results and to certify the way IPR and foreground should be protected.