LIFE CIRC-ELV

BOOSTING CIRCULAR ECONOMY OF PLASTICS FROM END-OF-LIFE VEHICLES THROUGH RECYCLING INTO HIGH ADDED-VALUE APPLICATIONS

Deliverable D_C2.2. Social Life Cycle Assessment (S-LCA) report

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PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
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LIST OF ABBREVIATIONS

ATF	Authorised Treatment Facility
ELV	End-of-Life Vehicle
HDPE	High Density Polyethylene polymer
IA	Impact Assessment
LCA	Life Cycle Assessment
PA	Performance Assessment
PP	Polypropylene polymer
S-LCA	Social Life Cycle Assessment

1. Summary and Objectives

LIFE CIRC-ELV project aims to develop a new management model for End-of-Life Vehicles (ELVs). This new model is focussed on the plastics that are present in ELVs for increasing their recovery ratio and their quality in an early stage, so they are suitable for recycling. Therefore, a new business model would arise for recycled plastics coming from ELVs, which is intended to be techno-economic and environmentally sustainable.

This deliverable is aimed for assessing the social impacts and socio-economic assessment of the different scenarios occurring along the LIFE CIRC-ELV project.

In that sense, first, a detailed qualitative social impact assessment is performed for Desguace CORTÉS, including the differences coming from the new LIFE CIRC-ELV model implemented.

Later, a detailed socio-economic assessment on workers, local community and society is conducted for the different ATFs involved along the LIFE CIRC-ELV project.

2. S-LCA for Desguace CORTÉS

2.1. Methodology and Development

An evaluation of the social impacts of the processes was performed by using the S-LCA methodology.

Social Life Cycle Assessment is an analytic tool which follows the same procedure as the Environmental Life Cycle Assessment (ISO 14040). It is used to evaluate social and socio-economic aspects of a product or process via its entire life cycle. These aspects can have a direct effect on the stakeholders which are involved in the life cycle of the product or process.

When doing a S-LCA, the information obtained helps on the decision-making when implementing actions in companies' policy but it is not intended to promote information on how a product should be developed. The main difference with the environmental LCA is that the data collected corresponds to aspects related with the organization throughout the chain, such as the behaviour of the company towards one type of policy or another.

The chain in what S-LCA methodology is centred, is defined by all the life cycle of the product/process: Identify, quantify, and evaluate social impacts is the implicit objective in every S-LCA. To associate these social impacts to the stakeholders described, it is necessary to develop subcategories.

Social impacts are social relations consequences born in the context of an activity and/or generated by it and/or by preventive actions or reinforcement carried out by the stakeholder parts. Due to social impacts should be obtained for all the chain, its evaluation must be carried out in all phases of the life cycle.

All these phases can be grouped into 5 social categories which constitute the stakeholders. Table 1 shows a relation between some subcategories that can be used to define the different stakeholders' effects.

Table 1. Stakeholder categories and subcategories.[1]

Stakeholder categories	Subcategories
Workers	Freedom of association, collective bargaining, and right to strike
	Child labour
	Forced Labour
	Fair salary
	Working hours
	Discrimination and equal opportunity
	Health and safety
	Social benefits/Social security
Local Community	Access to material resources
	Access to immaterial resources
	Offshoring and migrations
	Cultural inheritance
	Indigenous rights
	Safe and healthy living conditions
	Secure living conditions
	Local employment
	Community engagement
Society	Public commitment on sustainability issues
	Contribution to economic development
	Prevention and mitigation of armed conflicts
	Technological development
	Corruption
Value chain actors not including consumers	Fair competition
	Promotion social responsibility
	Supplier relationships
	Respect of intellectual property rights
Consumers	Health and safety
	Feedback mechanism
	Transparency
	End of Life responsibility

[1] UNEP (2009). *Guidelines for Social Life Cycle Assessment of Products*. Social and socio-economic LCA guidelines complementing environmental LCA and Life Cycle Costing, contributing to the full assessment of goods and services within the context of sustainable development. United Nations Environment Programme.

Stakeholder categories	Subcategories
	Privacy

Stakeholders can vary or be added in function of the study's objective. In that case, the corresponding subcategories must be elaborated.

Social and socio-economic mechanisms can take different forms, and so can the indicators. To obtain the data to prepare the inventory of indicators, they must be defined for each subcategory. Because some social and socio-economic impacts might be best captured through qualitative indicators, one can choose between quantitative, semi-quantitative and qualitative indicators depending on the goal of the study and the nature of the issue at stake.

A quantitative indicator is a description of the issue assessed using numbers, for example, the number of accidents by unit process. Qualitative indicators describe an issue using words. They are nominative, for instance, text describing the measures taken by an enterprise to manage stress. Semi-quantitative indicators are categorizations of qualitative indicators into a yes/no form or a scale (scoring system), for example, presence of a stress management program (yes-no).

Quantitative indicators can be directly related to the unit process output as it is the case in environmental LCA. Although semi-quantitative indicators cannot be directly expressed per unit of output process, it is possible to assess, in quantitative terms, the relative importance of each unit process in relation to the functional unit. This allows aggregation of final category results in a comprehensive and logical way[1].

Impact categories are 'logical groupings of S-LCA results, related to aspects of interests to stakeholders and decision makers'.

There are two types of impact categories according to the classification proposed by The Methodological Sheets for Subcategories in Social Life Cycle Assessment[2]:

- Type 1 impact assessment methods depend directly on the objective and the defined scope. They represent issues of interest to stakeholders and may include health and safety, human rights, working conditions, socio-economic impacts, cultural heritage, and governance. They do not use cause-effect chain models and are based on other information such as, internationally accepted levels of performance, to help understanding the magnitude and importance of the data collected in the inventory phase. These methods generally use an ordinal scale that either describes the risk (from very high to low), the performance (from non-

[2] UNEP (2013). *The Methodological Sheets for Sub-categories in Social Life Cycle Assessment (S-LCA).* Pre-Publication Version. United Nations Environmental Programme and SETAC.

compliant to best practice) or the degree of management from uncontrolled to under control.

- Type 2 impact assessment methods seek to obtain a model of social impact from inventory indicators to the category's human capital, heritage culture and human well-being. To develop them, quantitative cause-effect models need to be developed. Currently, this impact category is rarely used due to the difficulty of obtaining cause-effect models between social impacts and stakeholders.

The method selected for this study is the type 1 impact assessment method proposed by Andreas Ciroth and Julian Franze[2]. In this one, it is calculated a Performance Assessment (PA) and an Impact Assessment (IA) which the impact categories are:

- Work conditions (WC). State and/or circumstances in which the workers work.
- Health and safety (HS). Standards defined by the World Health Organization and by public entities such as the National Institute for Safety, Health and Welfare at Work.
- Human Right (HR). State defined by the Universal Declaration of human rights.
- Socio-economic repercussions (SER). Effects of an economic and social nature.
- Governance (G). Policy line of action.

A single result is obtained from each subcategory, regardless of the number of indicators. If a subcategory contains more than one indicator, an average is performed.

The main reason to obtain PA and IA are the reference impacts. For example, discrimination and child labour. That a company does not discriminate or does not have the presence of child labour does not have any effect by itself, but if the reference point for the subcategory is that companies do not discriminate and that the companies do not employ child labour respectively, the non-existence of discrimination and the non-presence of child labour have a positive effect on the corresponding subcategory. The same analysis must be carried out for the rest of the subcategories.

As previously mentioned, it is necessary to transform the information by indicators into a numerical subcategory result, both for PA and for IA (this is for the proposed methodology). The result is the evaluation of the impact in both cases, the difference is that the impact obtained for PA is the impact associated with the attitude or performance of the organization, and the impact itself for IA is the one associated with the behaviour of the organization.

To do this, a reference point will be taken for each subcategory. This will consist of a base state or scenario. Annex 2 shows for each stakeholder the subcategories included in the case study and the reference points.

There is no internationally accepted scientific method that allows the information obtained by the impact subcategory indicators to be transformed into an impact category, that is, there is no internationally established characterization step. In the absence of such a method, one of its own has been developed.

First, taking the definition of each of the impact categories, it is considered that a subcategory affects the corresponding impact category in 4 ways:

- Positively
- Positively mild. The term mild refers to the fact that the affectation is potential.
- Negatively mild. As in the previous case, it refers to a potential affectation.
- Negatively

For the present S-LCA, it is considered that an impact category is potentially affected when a direct affectation cannot be established but that in the context of the definition of the category an indirect affection can be established.

Secondly, to calculate the AI the following rules are followed:

- If the number of positives is greater than the negatives, the IA value is equal to PA – 1. In case PA is 1, the value of IA in this case is 1, since the scale goes from 6 to 1, see Table 2.
- If the number of positives is equal to the number of negatives, the IA value is equal to the PA. In this case, the number of positives or negatives in parentheses is considered.
- If the number of negatives is greater than the number of positives, the IA value is equal to PA+1.

The results obtained are based on a scale of 6 degrees where:

Table 2. Evaluation of PA and IA assessment by scale. Source: Adapted from LCA of an Ecolabeled Notebook[2].

Attitude assessment or behaviour	Impact evaluation	Colour	Factor
Very good	Positive impact		1
Good	Positive mildly impact		2
Satisfactory	There are no positive or negative impacts		3
Inadequate	Negative mildly impact		4
Poor	Negative impact		5
Very poor	Very negative impact		6

An important aspect to highlight is that the PA contextualizes the way in which the subcategory affects the impact category. This fact is considered when determining whether a category is positively or negatively affected. In this way, the influence of the author's subjectivity is subtracted from the IA result.

For all subcategories within the same stakeholder, the average value of PA and IA is calculated. The rules for PA are shown below, but the same principles apply for calculating the mean AI.

- If any subcategory has a PA value of 6, then the average PA value for the stakeholder cannot be less than 5.
- If any subcategory has a PA value of 5, then the average PA value for the stakeholder cannot be less than 4.
- If any subcategory has a PA value of 4, then the average PA value for the stakeholder cannot be less than 3.

In case any subcategory has an AI of 5 or higher, the process unit is considered a possible hotspot and, therefore, it is necessary to carry out an investigation to determine if it is or not.

2.2. Goal and Scope

The S-LCA goal is to calculate socio-economic impacts of the current model of ELVs plastic treatment (reference scenario) for its later comparison with the new model (LIFE CIRC-ELV) which includes the recycling of some of the plastic components (PP bumpers and HDPE fuel tanks) extracted from ELVs directly at the ATF stage.

2.2.1. System and boundaries description

The S-LCA system and boundaries will be the same as the ones from the environmental LCA (See Deliverable D_C1.1). The processes studied at the reference scenario are:

- Handling ELVs, pick up and transport from the concessionaire to the ATF.
- Hulk pressing, ELVs treatment done by the ATF.
- Transport, transport from the ATF to the shredder.
- Shredding, ELVs treatment done by the shredder.
- Landfilling, waste final scenario.

The S-LCA is applied to those organizations which processes affect the plastic stream, fixing like this the S-LCA scope.

2.2.2. Functional unit

The functional unit selected in this study is 1 ELV treated.

2.3. Life Cycle Inventory

The Guidelines define LCIA as being “the phase of a S-LCA that aim at understanding and evaluating the magnitude and significance of the potential impacts for a product system throughout the life cycle of the product.”

The organization involved are represented in Table 3.

Table 3. Organization involved in the studied system and its localization.

Process	Company	Localization
Handling ELVs	Desguace Cortés	Valencia, Spain
Hulk pressing	Desguace Cortés	Valencia, Spain
Transport	Desguace Cortés	Valencia, Spain
Shredding	Shredder 1	Valencia, Spain
Landfilling	Shredder 1	Valencia, Spain

Identification of Hotspots

Desguace Cortés withdraws the motors for its exportation at the African market. There is no data of which are the African countries where they are exported. Interviews with Cortés' representants indicate that the use of these motors is reutilization. Motors, as well as other ELVs parts treat in Europe are exported to non-member countries of the European Union as the regions from the East of Europe, former member countries of the Soviet Union and North Africa[3]. Social impacts derived from this activity cannot be attribute to the plastic flux studied. These emerge because of a business model based on exportation and commercialisation of motors[4] and specialise business (Japanese) on motor used exportation to Africa, so it is out of the scope of this study[5].

Once the implicated organizations are obtained, and the possible hotspots are evaluated, it is performed the inventory of indicators for the different stakeholders. This inventory is performed on Cortés' organization. Shredder 1 is excluded due to the only process done is the transport to a landfill, which has not enough dimension to apply a S-LCA.

In the following tables, indicators which define each subcategory selected for this study are selected.

[3] Kanari, N., Pineau, J. L., & Shallari, S. (2003). *End-of-life vehicle recycling in the European union*. JOM 55, 15-19. 10.1007/s11837-003-0098-7.

[4] Engines For Africa (2020). *Engines for Africa*. Online: https://www.enginesforafrica.co.za/ . Consulted [05/05/2022].

[5] Moreno-Giménez, A. (2015). *Request from to find project partners. Creation of a Method and a Specifications Tester for Used Automobile Engines*. Japan (NEDO) – Spain (CDTI) Innovation Programme (JIPS). Online: https://www.cdti.es/recursos/doc/Programas/Cooperacion_internacional/JSIP/Oportunidades_de_Colaboracion/37079_281228122015145034.pdf . Consulted [05/05/2022].

Table 4. Indicators for subcategories of the stakeholder 'Workers'.

Subcategory	Indicator
Freedom of association, collective bargaining, and right to strike	Evidence of restriction on freedom of association or collective bargaining.
	Evidence of the organization/sector not respecting or supporting the association or the collective bargaining.
	Freedom of workers to join through mechanisms of their choice.
Child labour	Presence of child labour.
Forced Labour	Percentage (estimate) of forced labour per region.
	Workers are free to terminate their employment within prevailing limits.
Fair salary	Description of the cost of living and the minimum wage in the country.
	Presence of suspicious deductions in the remuneration.
Working hours	Hours of work per employee on average.
	Company flexibility.
	Clear communication of the functioning of extra hours.
	Respect for contractual relations in terms of working hours.
Discrimination and equal opportunity	Percentage of women in the sector.
	Presence of formal policies on gender equality opportunities.
	Characterization of salaries.
Health and safety	Rate of occupational accidents in the country.
	Number/percentage of injuries or accidents fatalities in the organization for work.
	Presence of a formal health policy and safety.

Table 5. Indicators for subcategories of the stakeholder 'Local Community'.

Subcategory	Indicator
Access to immaterial resources	Freedom of expression in the country/sector.
	Annual arrests related to protests in the sector.
	Technology transfer levels (measures the influence of the transformation of the capital into technology).
	Patent filing.
Delocalization and migrations	Migration ratio in the country.
	Number of resettled individuals whose cause can be attributed directly to the company.
	Forced evictions stemming from development economic.
Safe and healthy living conditions	Disease burden by country.
	Pollution levels by country.

Subcategory	Indicator
	Presence of force of laws, safety regulations by country.
	Structural integrity management oversight.
	Management effort to minimize the use of hazardous substances.
Secure living conditions	State of Security and Human Rights in the country of operation.
	Crime rate.
Local employment Society	Unemployment rate in the country.
	Strength of policies in preferences of local hiring.
	Percentage of labour hired locally.
Community engagement	Government transparency, policy formulation.
	Public trust of politicians.
	Description of the relationship between the sector and the community

Table 6. Indicators for subcategories of the stakeholder 'Society'.

Stakeholder categories	Subcategories
Public commitment on sustainability issues	Commitment of the sector regarding the sustainability.
	Presence of public documents available such as promises or agreements on sustainability.
	Implementation of codes of conduct in the sector/company.
Contribution to economic development	Economic situation of the country/region (GDP, economic growth, unemployment, salary level, etc.) and relevance of the sector considered for the economy.
Technological development	Efforts of the sector in technological development.
	Investment in technology development/technology to transfer.
Corruption	End of Life responsibility

Table 7. Indicators for subcategories of the stakeholder 'Value chain actors'.

Stakeholder categories	Subcategories
Fair competition	National legislation and regulation.
	Sector regulation.
	Sectorial agreement.
Respect of intellectual property rights	General intellectual property rights and their relationship with the economic sector studied.

Table 8. Indicators for subcategories of the stakeholder ' Consumers'.

Stakeholder categories	Subcategories
Health and safety	Presence of management measures to assess the consumer health and safety.
	Existence of consumer complaints (to national, sectoral, organizational level).
Feedback mechanism	Presence of feedback mechanism.
	Management measures to improve feedback mechanism.
Transparency	Non-compliance with regulations regarding the transparency and presence of laws that regulate the transparency information.
	Quality and breadth of information available for the consumer of the organization/sector.
End of Life responsibility	Strength of national legislation relating to product disposal and recycling.
	Assistance and management in terms of end of life.
Privacy	Country classification related to regulations about data sharing.
	Strength of internal management system to protect consumer privacy, in general.

2.3.1. Indicator inventory

The last part of the S-LCA inventory is to elaborate the indicator inventory, which is summarized below. The complete inventory is on Annex 1.

According to Spanish legislation, when a vehicle ends its life happens to be a non-admitted in landfill waste, imposing the duty that all the ELVs must be treated in an ATF (dismantling and separation of the different waste components, including hazardous substance retirement). They also must be prepared to the reutilization of metal waste and components, and organic substances[6]. ATF functioning and creation is regulated by law, and it requires the authorization of the competent environmental organ[7].

Desguace Cortés by number of ELV treated, is the third largest ATF in Spain with a daily entry of more than 50 units/day in the last 5 years. It has several warehouses that extract

[6] Ley 7/2022, de 8 de abril, de residuos y suelos contaminados para una economía circular. *Boletín Oficial del Estado, 85*, de 9 de abril de 2022, pp. 48578-48733. https://www.boe.es/boe/dias/2022/04/09/pdfs/BOE-A-2022-5809.pdf

[7] Real Decreto 265/2021, de 13 de abril, sobre los vehículos al final de su vida útil y por el que se modifica el Reglamento General de Vehículos, aprobado por el Real Decreto 2822/1998, de 23 de diciembre. *Boletín Oficial del Estado, 80,* de 14 de abril de 2021, pp. 42534-42566. https://www.boe.es/boe/dias/2021/04/14/pdfs/BOE-A-2021-5868.pdf

different materials from the vehicles it treats, exploring market niches, such as the sale of copper.

It makes economic investments to improve both its business model and its energy management, and process optimization. The scrapping sector is not a sector which there is a business character. It is a business model that arose because of groups of 'junk dealers' who saw vehicles as a potential source of income. Desguace Cortés invested in its own development; increasing the number of processes for the extraction of materials and has a marked improvement policy that places it in a very favourable position compared to its competitors.

Percentage of women in the industry sector is 9,42%, statistics on the employability of women for this sector cannot be found. Making a similarity with the mechanics sector, it can be seen how it has a very low presence of women. Traditionally, the scrapping sector has been a masculinized sector, relegating women to administrative duties. Desguace Cortés has not female workers in dismantling tasks. 12 of the 136 workers from Desguace Cortés are women and they do administrative tasks and human resources. There are no evidence that this is because of a base discrimination. As a result of the fact that it is not a promoted sector for both sexes, the lack of supply of female workers may be the main cause of this fact. There is no wage discrimination among Desguace Cortés workers. For work and productivity reasons, the basic wages of the employees (both sexes) are higher than the wages of the workers in the dismantling zone (CAMPA operators).

The facilities comply with the regulated technical requirements of its activity. The company has an occupational risk prevention plan. The management supervises the conditions of the workers. There is no record of occupational accidents that have caused the worker to leave.

2.4. Life Cycle Impacts Assessment & Interpretation of results

Social life cycle impact assessment is the process by which inventory data is aggregated within subcategories and categories to help understand the magnitude and the significance of the data collected in the Inventory phase using accepted level of minimum performance[2]. This are defined according to methodological guidelines or by the authors of the work according to the desired objectives.

2.4.1. Impacts assessment Reference scenario

The analysis of the impact on the companies or sectors is based on the reference points shown in Annex 2.

What differentiates for the author a 2 from a 1 in the PA is the proactivity regarding the reference points, except for subcategories in which the reference point does not have no effect, for example discrimination.

With the data from the inventory phase and the methods described for the characterization, the following results are obtained.

Table 9. Socio-economic impact assessment of the reference scenario.

Stakeholder	Subcategory	PA	WC	HS	HR	SER	G	IA
Workers	Freedom of association, collective bargaining, and right to strike	2	+	+	+	+	+	1
	Child labour	1	+	+	+	+	+	1
	Forced Labour	1	+	+	+	+	+	1
	Fair salary	3	+	+	+	+	+	2
	Working hours	1	+	+	+	+	+	1
	Discrimination and equal opportunity	3	+	(+)	-	-	(-)	4
	Health and safety	2	+	+	+	+	+	1
Average Workers		**1,86**						**3**
Local community	Access to material resources	It does not apply						
	Access to immaterial resources	2	+	+	+	+	+	1
	Offshoring and migrations	2	(+)	(+)	(+)	(+)	(+)	2
	Safe and healthy living conditions	1	+	+	+	+	+	1
	Secure living conditions	It does not apply						
	Local employment	1	+	+	+	+	+	1
	Community engagement	3	No	(+)	+	(+)	+	2
Average Local community		**1,80**						**1,40**
Society	Public commitment on sustainability issues	1	No	No	(+)	(+)	+	1
	Contribution to economic development	1	+	+	+	+	+	1
	Prevention and mitigation of armed conflicts	It does not apply						
	Technological development	2	+	+	(+)	+	+	1
Average Society		**1,33**						**1,00**
Value chain actors not including consumers	Fair competition	2	No	No	No	+	+	1
	Respect of intellectual property rights	3	(+)	No	No	+	(+)	2
Average Value chain actors		**2,50**						**1,50**
Consumers	Health and safety	1	(+)	+	(+)	(+)	+	1

Stakeholder	Subcategory	PA	WC	HS	HR	SER	G	IA
	Feedback mechanism	3	No	(+)	No	+	+	2
	Transparency	4	No	(-)	No	(-)	(-)	4
	End of Life responsibility	3	(+)	(+)	(+)	No	+	2
	Privacy	1	(+)	(+)	+	(+)	+	1
Average Consumers		**3**						**3**

Due to the large amount of information that is handled in a social impact assessment, it is not possible to describe how each subcategory affects the respective impact categories. In this study, it is considered that there is only one organization that operates in a single country.

Workers

Discrimination and equal opportunity. The scrapping sector has been a masculinized sector, relegating women to administrative duties, human resources, and marketing. This means that the supply of female employees to working in this sector is reduced, therefore, even though in interviews Desguace Cortés confirms its willingness to hire women to work in its sector, the offer of female employees is reduced.

Local community

Access to material resources. Desguace Cortés is not a company whose activity requires the exploitation of material resources. The use of electricity, fuel for transportation, sanitary water, are auxiliar resources common to practically all the companies. Its use is not intensive, so in the context for which this subcategory is evaluated, analysing it for Desguace Cortés would give an optimal result of 1 and the result would not give the information sought with a social LCA.

Secure living conditions. Spain is a country with a very low crime rate in a context of 194 countries, so this subcategory based on the referent points in Annex 2 cannot be applied.

Society

Prevention and mitigation of armed conflicts. Desguace Cortés does not operate in markets where there is political instability, nor is there any evidence that its engine exports to the African market can generate conflicts of any kind, except those arising from economic competition, which are inevitable and do not cause damage to the economies or its inhabitants. Based on this, this subcategory is not considered.

Consumers

Transparency. The lack of information regarding the quality of the pieces does not fall directly on Desguace Cortés. Its minimum quality policy implies that its operators observe

the quality of the parts they sell to the market. Thus, although the market categories indicated are negatively affected (slight), their behaviour cannot be considered to generate a negative impact and this subcategory must be investigated as a hotspot.

2.4.2. Impacts assessment LIFE CIRC-ELV scenario

In the new scenario, a new process is added. For each stakeholder, its effect on the subcategories is analysed.

Workers

Working hours. Adding a process without increasing the workforce causes the company to have to reorganize the work schedule to distribute the tasks that the operators must perform. This implies increased working hours and/or increased workload. The way in which this situation is going to be managed consists of transferring workers from storage and control areas to the CAMPA part where the cutting work is carried out.

Local community

Local employment. The incorporation of the extraction and pressing process increases the treatment time of ELVs. The added time is 8,25 minutes for bumper removal and 7,5 minutes for fuel tank removal. However, Desguace Cortés cannot increase its workforce for the sole purpose of having operators for this task. Not being able to increase their workforce, operators must increase their workload.

Society

No relationship is found between the model implementation and this stakeholder.

Value chain actors

Desguace Cortés becomes a supplier by selling pressed bumpers and fuel tanks to recyclers.

Consumers

No relationship is found between the model implementation and this stakeholder.

The subcategories commented are the ones that are affected, and the way in which it affects is argued based on the definition of each one. For the rest of the subcategories, no cause-effect relationship is found between the new model and the other subcategories.

With all this, the impact assessment is represented in Table 10.

Table 10. Socio-economic impact assessment of the LIFE CIRC-ELV scenario.

Stakeholder	Subcategory	PA	WC	HS	HR	SER	G	IA
Workers	Freedom of association, collective bargaining, and right to strike	2	+	+	+	+	+	1
	Child labour	1	+	+	+	+	+	1
	Forced Labour	1	+	+	+	+	+	1
	Fair salary	3	+	+	+	+	+	2
	Working hours	1	+	+	+	+	+	1
	Discrimination and equal opportunity	3	+	(+)	-	-	(-)	4
	Health and safety	2	+	+	+	+	+	1
Average Workers		**1,86**						**3**
Local community	Access to material resources	It does not apply						
	Access to immaterial resources	2	+	+	+	+	+	1
	Offshoring and migrations	2	(+)	(+)	(+)	(+)	(+)	2
	Safe and healthy living conditions	1	+	+	+	+	+	1
	Secure living conditions	It does not apply						
	Local employment	1	+	+	+	+	+	1
	Community engagement	3	No	(+)	+	(+)	+	2
Average Local community		**1,80**						**1,40**
Society	Public commitment on sustainability issues	1	No	No	(+)	(+)	+	1
	Contribution to economic development	1	+	+	+	+	+	1
	Prevention and mitigation of armed conflicts	It does not apply						
	Technological development	2	+	+	(+)	+	+	1
Average Society		**1,33**						**1,00**
Value chain actors not including consumers	Fair competition	2	No	No	No	+	+	1
	Respect of intellectual property rights	3	(+)	No	No	+	(+)	2
Average Value chain actors		**2,50**						**1,50**
Consumers	Health and safety	1	(+)	+	(+)	(+)	+	1
	Feedback mechanism	3	No	(+)	No	+	+	2
	Transparency	4	No	(-)	No	(-)	(-)	4

Stakeholder	Subcategory	PA	WC	HS	HR	SER	G	IA
	End of Life responsibility	3	(+)	(+)	(+)	No	+	2
	Privacy	1	(+)	(+)	+	(+)	+	1
Average Consumers		**3**						**3**

Table 10 shows the same results as the ones shown in the current scenario (Table 9). This means that the incorporation of an operation such as the removal of bumpers and fuel tanks will not imply a significant change in the social impacts that are analysed in the quantifiable reference scenario in accordance with what is proposed by que methodology proposed.

The increase in hours worked, the restructuring of the workforce and the economic remuneration arising from the implementation of the new model do not significantly affect the impact categories, therefore, the is also no variation in the calculated IA, compared to the reference scenario. No relationship was found between the restructuring of the workforce and the rest of the subcategories selected for the S-LCA.

2.5. Conclusions

From the operative point of view, the new LIFE CIRC-ELV model leads to an increase in the number of tasks that an operator must carry out and therefore, for the same time available per ELV, it is necessary to increase the employee's productivity or restructure the workforce. As it can be seen in the social impact assessment of the LIFE CIRC-ELV scenario (Table 10), this does not imply a change in the result of the impact categories.

This is ascribed to the fact that social hotspots still remain the same since the new LIFE CIRC-ELV model does not tackle social aspects but environmental ones.

3. Socio-economic assessment

As it is explained in the previous sections, social life cycle analysis evaluates socio-economic aspects that may directly or indirectly affect stakeholders (workers, local community, consumers, value chain actors and society), such as human rights, working conditions, health and safety, socio-economic repercussion, and so forth.

In this section, the impacts of the project have been identified and analysed on the following groups: workers, local community, and society.

3.1. Methodology

This chapter describes the methodology that was deployed in the project, the role and contribution of each participant (member of the consortium), the duration of the tasks, and the possible methodological deviations.

A monitoring and assessment of the socio-economic impact of the unitary operations of the recycling process of bumpers and fuel tanks (labour, energy, transport, consumable, waste treatment…) has been conducted on the local/regional economy and population and compared with the impacts of the current scenario for ELV plastic treatment, from removal to transformation into recycled material. ELVs treatment scenarios have been created according to the customer's human, technological, and budgetary means to enable an economic and social comparison of results.

The information required for the development of the S-LCA study was provided by other project partners and stakeholders. Industrial partners have supplied socio-economic data directly related to their production process (investment and operating costs, job creation, working conditions, and so on), while other socio-economic data have been obtained thorough discussion with stakeholders (researchers, industry, policymakers, NGOs…) as well as from literature.

3.2. Impact on workers

3.2.1. Risk assessment procedure

Risk assessment can be defined as the process of assessing the risks associated with each of the hazards identified so that appropriate control measures can be implemented based on the probability, i.e. likelihood that harm, injury, or ill health may occur and how severe the consequences of exposure might be. The risk assessment is an approach structure in five steps based on different tools.

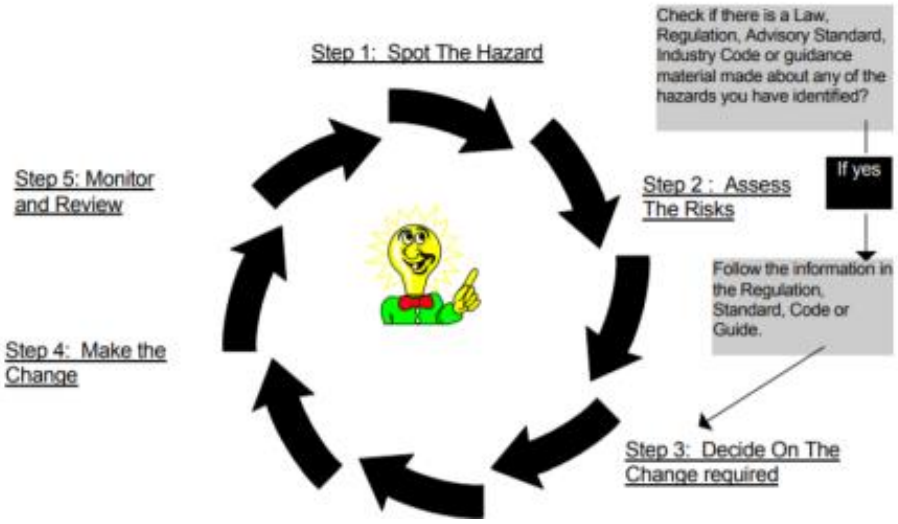

Figure 1. Risk assessment approach.

Step 1. Identify hazards, i.e., anything that may cause them.

This is the process of examining each work area and work task for the purpose of identifying all the hazards are 'inherent in the job'.

Table 11 shows the risks that have been identified.

Table 11. Risks list.

Risks list	
R1	Risks of tripping, bumping or other disturbance of movement.
R2	Risks of falls from height.
R3	Risks linked to internal traffic.
R4	Road risks on mission.
R5	Risks linked to physical load of work.
R6	Risks linked to mechanical handling.
R7	Risks linked to products, emissions, and wastes.
R8	Risks linked to biological agents.
R9	Risks linked to work equipment.
R10	Risks related to collapses and falling objects.
R11	Risks and nuisances linked to noise.
R12	Risks linked to thermal atmospheres
R13	Risks of fire, explosion.

Risks list	
R14	Risks linked to electricity.
R15	Risks linked to luminous atmospheres.
R16	Radiation risks.
R17	Psychosocial risks.
All risks	All risks

Step 2. Assess the risks and take an action.

The process of assessing the risk is undertaken by reviewing any available information about the hazard, and by using the personal work experience about what sort of accident or illness the hazard could create and how likely this would be to happen.

A risk assessment is the used to categorise the exposure and the severity or consequences of each hazard and to give it a 'risk rating'.

Table 12. Reference value of exposure and probability of occupational risk.

Exposure (normal mode)	Probability (accidental mode)	Note
Continued	Several times a year	5
Several times a day	At least once a year once	4
At least one a week	Once every 5 years	3
At least once a month	At least once in the life of the installation	2
At least once a year	Likely but never appeared	1

Table 13. Reference value of the severity of occupational risk.

Severity	Note	Risk of injuries	Noise risk	Chemical risk
Very grave	8	Long work stoppage or death of the victim	> at the VLCT or > at the VME	Recommendation > 10%
Graves	6	Accident or illness with sequalae	From 66 to 100% of the VLCT or the VME	Recommendation + 10%
Serious	4	Accident with work stopping, but no sequalae	From 33 to 66% of the VLCT or the VME	If equal to the recommendation
Benign	2	Accident without work stopping	From 0 to 33% of the VLCT or the VME	If less than the recommendation

A 'veto' threshold automatically associates a criterion with a category, obtained by the product of exposure and gravity.

Risk = Exposition x Gravity

Table 14. Occupational risk assessment thresholds.

Severity	8	8	8	16	24	32	40
	6	6	12	12	18	24	30
	4	4	8	8	12	16	20
	2	2	4	4	6	8	10
	Note	1	2	2	3	4	5
		Exposure/occurrence					

Once a risk rating is determined, each hazard is then to be given an order of priority on the Hazard Summary Sheet so that the area or site within UWS can easily see the priority of corrective action for all the hazard listed on the sheet. These priorities for risk are listed as follows:

Table 15. Priorities for risk rating.

	Top Priority – Isolate the hazard immediately. Must fix the cause(s) now.
	Medium Priority – Isolate the hazard as soon as practicable. Must fix the cause(s) within 1 month. Regularly monitor the cause(s) and hazardous until rectified.
	Low priority – Must fix the cause(s) when time and resources permit, but within 3 months. Regularly monitor the cause(s) and hazard rectified.

Step 3 & 4. Decide on the change required and make the change.

Having identified the hazards in the workplace and assessed their risks, they must be removed or fixed before people are hurt, become ill or there is damage to plant, property, or the environment.

Step 5. Review the risk assessment.

A risk assessment must be kept under review to ensure that agreed safe working practices continue to be applied, undertake a hazard and risk assessment when there is a change to the workplace including when work systems, tools, machinery or equipment change, provide additional supervision when new employees with reduced skill levels or knowledge are included to the workplace.

3.2.2. Risk assessment evaluation

Ten professional risk assessments have been conducted regarding the inherent activity of workers. Indeed, six scenarios for bumper and four scenarios for fuel tank were

developed based on the different companies (the recycling centres and ATF centre of the partners Villeton, Gizzi, MPA, Copa, Cortés) to consider their differences in terms of size, model, and operating ways.

The following employee categories are subjected to the risks analysed:

- Dismantler, driver, charger, depollution, and forklift operator from the ATF centre.
- Operator from the shredding centre.
- Operator from the compounder centre.
- Operator from the moulding centre.
- Charger from the collect platform.

The 'Hazard Identification Risk Assessment' is in Annex 3.

From the professional risk table, a risk assessment was created for each scenario for all the dismantling steps to determine the R-value and to be able to compare scenarios.

All the scenarios can be found in Annex 4 (for bumpers) and Annex 5 (for fuel tanks). The Table 16 sumps up the total risk assessment from these scenarios.

Table 16. Total Risk Assessment per scenario and per company.

Scenario	Company	Total	Top Risk	Medium Risk
Bumper	1- Villeton ND	592	208	384
	2- Gizzi ND	624	240	384
	3- MPA Destructive	520	208	312
	4- Copa	704	272	432
	5- Cortés Destructive	504	192	312
	6- Cortés manual ND	552	192	360
Tank	1- Cortés manual ND	752	296	456
	2- Cortés Destructive	680	296	384
	3- ATF shredder 3 D	568	232	336
	4- MPA Destructive	424	184	240

In Figure 2, it is represented the result of bumper risks for the six scenarios.

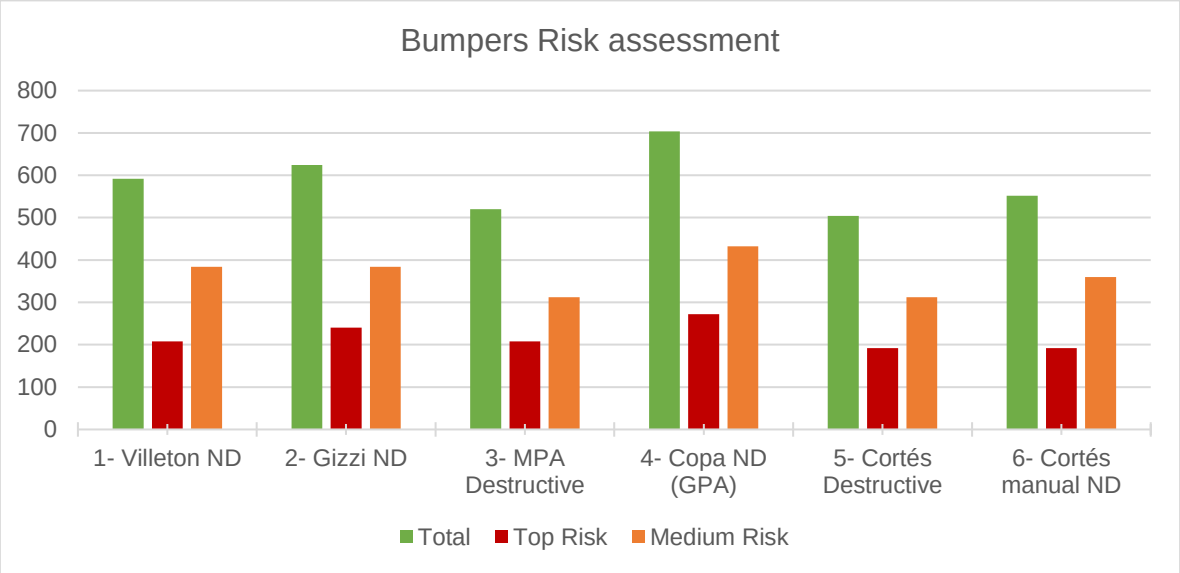

Figure 2. Bumpers risk assessment for each scenario.

For the case of bumpers, the scenarios which use non-destructive methods in the removal step, and which have additional stages such as the collection platforms are likely to have higher values of medium risk and top risk (Villeton, Gizzi, Copa, Cortés manual).

The Cortés and MPA scenario, which use machines for the removal step without a collect platform, represent the least professional risk.

Figure 3 shows the result of bumper risks for the four scenarios.

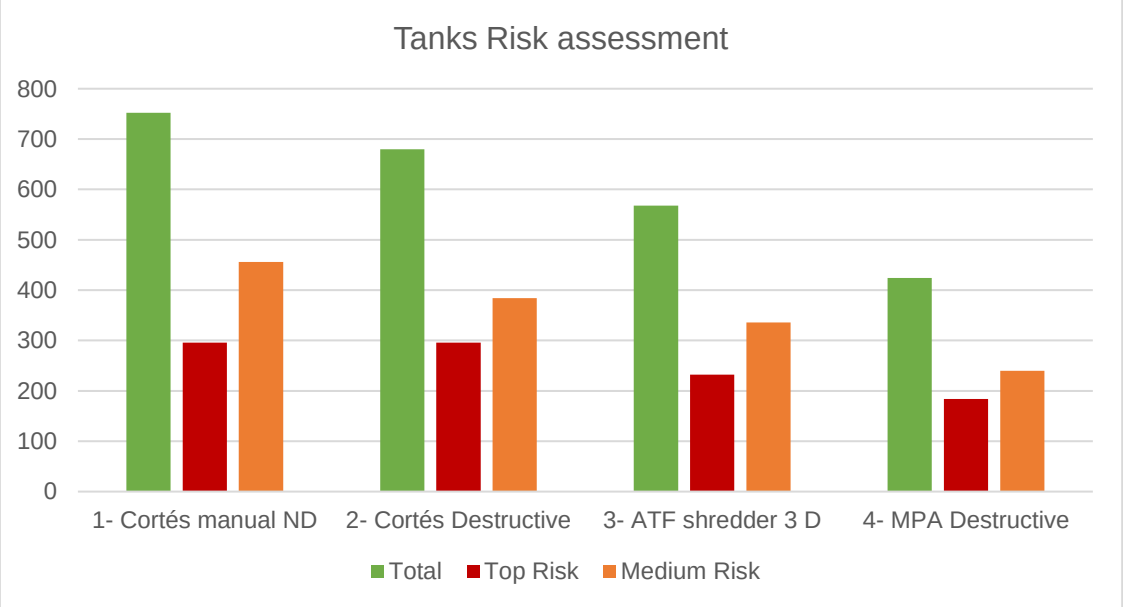

Figure 3. Fuel tanks risk assessment for each scenario

For the case of tanks, the non-destructive scenario 1 represents the greatest total value of the risks compared to the destructive scenarios. The other destructive scenarios which use machines for the removal step represent the least professional risk. Moreover, if the destructive scenarios are compared, the 2- MPA scenario has the greatest risk because it contains an additional stage collect platform compared to the others.

3.3. Impact on local community

3.3.1. Local employment

The recycling of ELV plastics can have a reinvigorating effect on the local employment in the EU. Indeed, the new recycling chain will need job creation to operate efficiently.

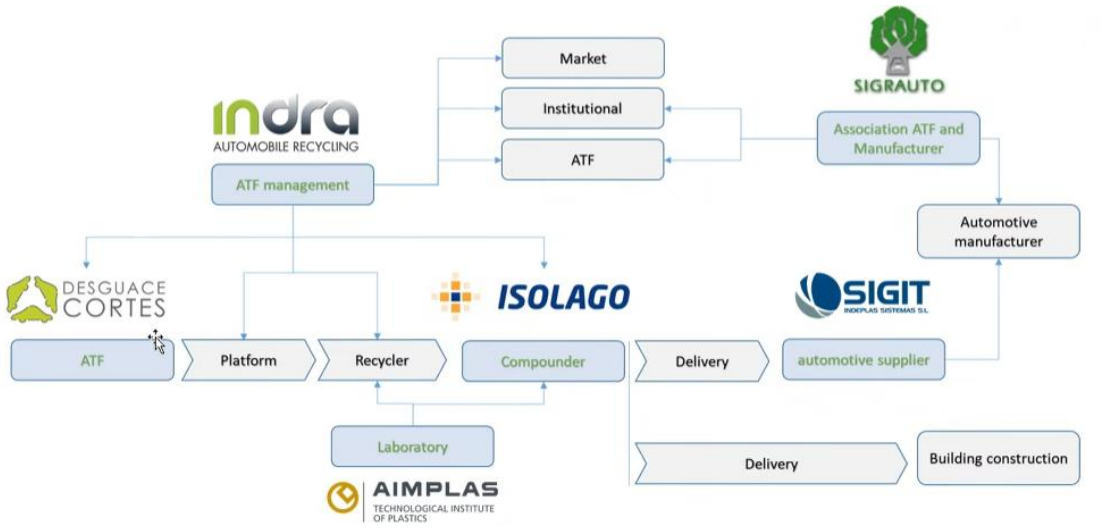

Figure 4. Value chain of the ELV plastics recycling.

The ATF Desguace Cortés will develop a new activity of removal and dismantling of bumpers, and transport flows will be needed between this centre and the compounder Isolago. On the ATF management side, Indra will need additional labour force to animate the network of 380 ELV centres by managing IT, administrative and financial flows, and by operating collection platforms and transporters. It would be necessary to find private actors like Indra who would lead these new local networks elsewhere in Europe and contribute to mutualize IT administrative and financial flows. It is a societal challenge to make it exploitable and offer technical solutions to both small and big dismantling companies.

3.3.2. Local employment

In the proposal, it was estimated that 0,47 new jobs will be created during the project to manage the plastics from 1.000 ELVs used for demonstration. The number of direct jobs created in the ELV plastic recycling value chain of plastics by 2026 was estimated at 58, with 87 additional indirect jobs created to support the sector and its operations.

To assess the jobs created, it is necessary to count the time necessary for operations and the number of ELVs treated. The number of potential jobs simply corresponds to the quotient of the total time necessary for all the operations carried out during a day, over a reference period of 8 hours which represents a job.

$$Number\ of\ Jobs = \frac{Total\ time\ of\ operations}{Reference\ period\ of\ 8\ hours}$$

According to Eurostat[8], in 2018, a total 7.568.390 ELV in Europe could be treated. According to Desguace Cortés, three minutes are required to dismantle one bumper with the destructive removal method, and seven minutes with the manual dismantling method.

$$Number\ of\ Jobs = \frac{7.568.390\ x\ 3\ minutes}{8\ hours\ (480\ minutes)}$$

The result is approximately 47.300 jobs. It is required to add to this calculation the number of ELV that will be treated in the new recycling chain.

In 2021, 2.000 ELVs have been treated within the project. Assuming 5% of ELV in the EU will be treated within the CIRC-ELV model five years after the end of the project, the total amount of ELV would be of 378.419.

According to the expected FTE indicated in the proposal, 37,93 indirect jobs in the plastic dismantling FTE were calculated.

Table 17. Expected social benefits during the Project and 5 years after the end of the Project.

Environmental performance indicator	Per ELV treated	At the end of the project (2021)	5 years after the project (2026). Assuming 5% ELVs in the EU treated under CIRC-ELV model [Amount per year]
Amount of ELVs treated (units)	1	1,000	307,500
Amount of ELV plastics treated (tonnes)	0,0134	13,44	4,132
Amount of recycled ELV plastic produced (tonnes)	0,0121	12,09	3,719
Amount of recyclable plastics diverted from energy recovery route (tonnes)	0,0121	12,09	3,719

[8] Eurostat (2022). *End-of-life vehicle statics. Eurostat Statics Explained*. On line: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=End-of-life_vehicle_statistics . Consulted: [03/06/2022].

Environmental performance indicator	Per ELV treated	At the end of the project (2021)	5 years after the project (2026). Assuming 5% ELVs in the EU treated under CIRC-ELV model [Amount per year]
Direct jobs in ELV plastics dismantling (FTE)	1,2E-04	0,123	37,93
Direct jobs in ELV plastics pre-treating	3,1E-05	0,031	9,39
Direct jobs in ELV plastics recycling/compounding (FTE)	3,6E-5	0,036	11,16
Avoided jobs by diverting ELV plastics from energy recovery routes (FTE)	1,2E-06	0,001	0,37
Direct jobs created due to ELV plastics recycling (FTE), calculated as the difference between direct and avoided jobs	1,9E-04	0,189	58,10
Indirect jobs created due to ELV plastics recycling (FTE)	2,8E-04	0,283	87,15
Total jobs created due to ELV plastics recycling (FTE), including direct and indirect jobs	4,7E-04	0,472	145,25

Notes:

- FTE means full-time equivalent(workers).
- Direct jobs in ATFs were based on data from the economic analysis at industrial-scale level: 92 and 23 FTE for dismantling and pre-treatment of 10.000 tonnes of input plastics, respectively. The values are higher than those provided by Hestin et al. (2015): 40 FTE in total (but this value is referred to plastics as a whole with no distinction by waste source).
- Direct jobs in recycling/compounding and avoided jobs in energy recovery sector were based on data on job intensity in the plastics recycling value chain from Hestin et al. (2015): 30 FTE for recycling/compounding and 1 FTE for energy recovery per 10.000 tonnes of input plastics.

According to this calculation, the potential job creation in Europe to dismantle the bumper within the new recycling chain would be of 19,3 FTE, with the destructive removal method (3 minutes needed). With the manual dismantling method (7 minutes needed), the number of FTE needed would be equal to 45.

To conclude, the risk analysis and job creation analysis have both shown that one scenario cannot prevail as it needs to be adapted to the different type of dismantling companies involved in the project. Indeed, they differ in terms of size, organisation, skills,

equipment used or owned, methods of dismantling and technical solutions. This diversity demonstrates the limit of standardization of the project.

3.4. Impact on the society

3.4.1. New collect and transport flows

By simulating local economies, the recycling chain will require new collect and transport flows, which represents a negative impact on the society due to the CO_2 emissions. Indeed, the current situation of ELV recycling is that the materials to be recycled are mixed and transported all together. The new recycling chain will sort the materials to valorise them so they will need to be collected and transported separately. For the collect flows (blue line in the figure below), an average of 4 lorries (capacity of 1,4 ton of bulk bumpers for 20 m^3) will be required to treat the plastics from 1.000 ELV. For the transport flows (orange line in the figure below) an average of 0,3 lorries (capacity of 20 ton for 90 m^3) will be required to treat the plastics from 1.000 ELV.

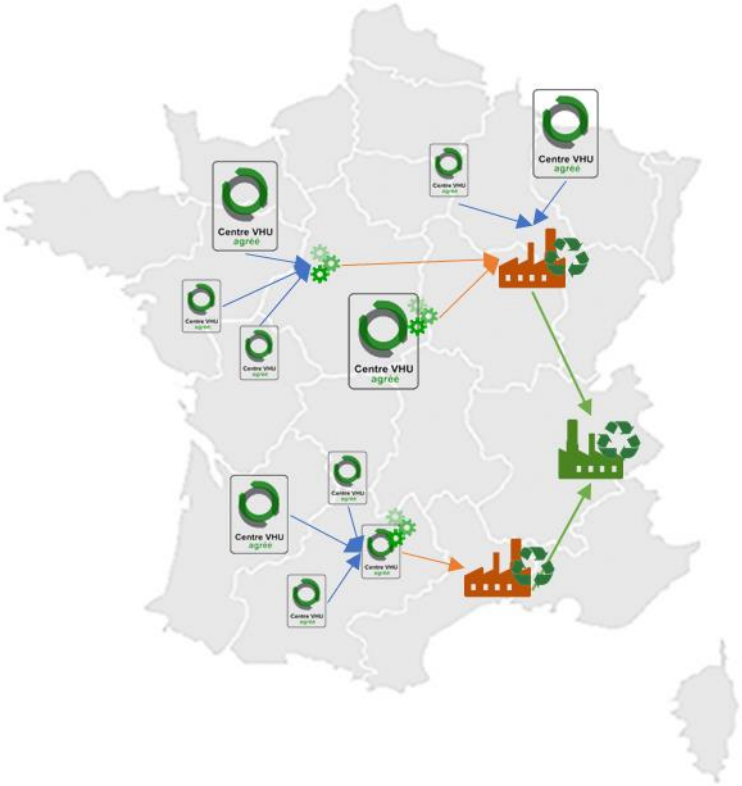

Figure 5. ELV plastics recycling flows in France.

However, these new collect and transport flows could be reduced if the compounder companies integrate the per-treatment and washing of plastics waste, thus optimizing the value chain.

3.4.2. Economic independence on the national level

The recycling of plastic will not only contribute to the development of local economies and job creation, but it will also contribute to reduce the use of virgin materials and their oil consumption, thus enabling States to decrease their dependence from other countries producing and exporting them, which can be crucial when geopolitical conflicts arise.

3.4.3. Compliance with regulation

Additionally, the recycling of plastics from ELV will enable States to comply with the European Directive 2000/53/EC[9], which sets targets to be achieved in terms of environmental performance:

- A minimum re-use and recycling rate of 85% by mass of the ELV
- A minimum re-use and recovery rate of 95% by mass of the ELV

There is no common monitoring tool neither common rule among the EU member states to assess the achievement of this objective. However, the setup of a common monitoring toll is currently being discussed, which might motivate the member States to better monitor the recycling rate of the ELV and preventing them from being financially sanctioned by the European Court of Justice if they do not meet these standards.

Moreover, the European and national regulations are being discussed to push the use of recycling materials in the vehicle, which will promote the development of dismantling companies.

3.5.Conclusions

The work performed has enabled to highlight the positive and negative impacts of the ELV recycling chain, which are listed below.

Positive

- Local job creation for dismantling, sorting, and transport.
- Reduction of States dependence on virgin material and oil.
- Enabling States to compliance with current and future regulation on ELV recycling.

Negative

- Professional risks on health and security of workers.
- Increasing the CO_2 emissions by increasing collect and transport flows.

While the positive impacts demonstrate the importance of developing the ELV plastics recycling chain for society and the environment, identifying the negative impact enables

[9] Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of-life vehicles – Commission Statements. *EUR-LEX*. OJ L 269 21.10.2000, p. 34. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02000L0053-20200306

the consortium members and the external stakeholders to imagine new solutions to mitigate them.

4. Annex 1

In this Annex 1, it will be described the indicators which constitute the Social Life Cycle Inventory.

Table 18. S-LCA inventory. Company: Desguace Cortés. Stakeholder: Workers.

Subcategory	Indicator	State
Freedom of association, collective bargaining, and right to strike	Evidence of restriction on freedom of association or collective bargaining.	Spain is classified according to the International Trade Union Confederation as a grade 3 country. Countries in this degree imply that there are regular violations of rights. Some big companies in time of financial hardship set up services minimum of 95% or carried out operations of sale of their headquarters ignoring requests trade union[10].
	Evidence of the organization/sector not respecting or supporting the association or the collective bargaining.	Desguace Cortés does not present behaviours that undermine the rights of their workers. Their shift structure is negotiated with their employees who are free to unionize or be associated in the terms indicated in the Spanish legislation. No violation complaints found of the rights of free association and collective bargaining towards Desguace Cortés. Each Autonomous Community has the possibility to receive support and information for the ATF from the associations, in the case of Desguace Cortés, is registered in ADECOVA (Asociación de Desguaces de la Comunitat Valenciana – Scrapping Association of Valencian Community). It is very helpful to have the industry colleagues to share experiences and be informed of any novelty and/or future changes. For national scope, they have AEDRA (Asociación Española de Desguaces y Reciclajes del Automóvil – Spanish Association of Scrapping and Recycling cars). Interviews with Desguace Cortés' representatives indicate that there is much variability in the behaviour of scrapping's owners in terms of favouring the workers. It is not appreciated that this fact put employees of the different Spanish scrapyards at risk.
	Freedom of workers to join through mechanisms of their choice.	The main Spanish unions are CC.OO. (Confederación Sindical de Comisiones Obrerars – Trade Union of Workers' Commissions), ELA Euskal Sindikatua (Eusko Langileen Alkartasuna – Basque Workers Solidarity), UGT (Unión General de Trabajadores

[10] ITUC CSI IGB (2021). Informe sobre las violaciones de los Derechos Sindicales. Libertad Sindical, Negociación Colectiva, Huelga. Online: https://survey.ituc-csi.org/spain.html#tabs-3 . Consulted [06/05/2022].

Subcategory	Indicator	State
		– General Union of Workers), and USO (Unión Sindical Obrera – Workers Trade Union). The right to organize workers is recognized and guaranteed in the Constitution[10]. There are no obstructions to the exercise of this right by Desguace Cortés.
Child labour	Presence of child labour.	Defining child labour as employment that is performed by a minor under 16years of age, in Spain it is prohibited by law[11]. Desguace Cortés does not employ minors under 16 years.
Forced Labour	Percentage (estimate) of forced labour per region.	Spanish constitution prohibits forced jobs. Clandestinely, there are cases of forced labour in the prostitution sector as sexual slavery. The sector under study has nothing to do with these facts.
	Workers are free to terminate their employment within prevailing limits.	The conditions under which the employment relationship can be terminated appear in article 49 of the status workers. In compliance with the law, the workers of Desguace Cortés are free to agree with the company the termination of their labour contracts[11].
Fair salary	Description of the cost of living and the minimum wage in the country.	CAMPA – 12.600 €/year Office – 14.400 €/year Haulier (transport) – 15.600 €/year *Data are from 2019*
	Presence of suspicious deductions in the remuneration.	There is no evidence that the company has had to penalize an employee via salary reduction. Some cases of dismissal have been consequence of very serious offenses such as theft or destruction of machinery due to negligence, reasons for which the cessation of the activity is in accordance a right and justified.
Working hours	Hours of work per employee on average.	Due to the workload of Desguace Cortés, it can be considered that the 100% of the workers work 8h/d. Which implies 2 shifts distributed in 7:30 – 16:00 and 16:00 – 00:30.
	Company flexibility.	Workers have own business days. Due to the pace of work of the company, the workers with a greater schedule strictness are CAMPA operators; those who work by disassembling ELVs. Due to operational needs, the carriers also have a greater commitment since they work by collection, and once they unload the ELVs in the scrapyard, begins the work of the operators.

[11] Real Decreto Legislativo 2/2015, de 23 de octubre, por el que se aprueba el texto refundido de la Ley del Estatuto de los Trabajadores. *Boletín Oficial del Estado, 255*, de 24 de octubre de 2015, pp. 100224-100308. https://www.boe.es/boe/dias/2015/10/24/pdfs/BOE-A-2015-11430.pdf

Subcategory	Indicator	State
	Clear communication of the functioning of extra hours.	The workers have specified in their contracts the regulation of extra hours. They are always voluntary.
	Respect for contractual relations in terms of working hours.	The hours of work, as well as the schedules of workers are described in the contracts and meetings that have the organization with the worker. There is no evidence to indicate that the agreements signed are not being respected.
Discrimination and equal opportunity	Percentage of women in the sector.	Percentage of women in the industry is 9,42%[12]. 12 of the 136 workers from Desguace Cortés are women (2019 data) which represents an 8,82%. The scrapping and sale of second-hand spare parts sector is a sector with little supply of female employees. It is predominantly a masculinized sector, but this fact cannot be attributed to discrimination for culture or for organizations themselves. Women's work in this sector is relegated to administrative duties. Interviews with female employees and the management, confirm that there is no impediment to the incorporation of women in the company and the small existence of supply of female employees to work in the following jobs: - Removers - Decontaminators - Mechanics - Carriers/drivers (in towing vehicle, van, or lorry). - Machinist
	Presence of formal policies on gender equality opportunities.	There is no obligation of equality plans in private companies (unless they are owned by 51% of capital from of the public sector). Law for effective equality of men and women. Although Desguace Cortés plans to implement the plan for equality as a 2020 goal.
	Characterization of salaries.	CAMPA – 12.600 €/year Office – 14.400 €/year Haulier (transport) – 15.600 €/year *Data are from 2019* Salary differences stem from factors such as the risk in the workplace, the hours worked and other supplements such as diets and training.

[12] The World Bank (2022). *Employment in industry, female (% of female employment) (modelled ILO estimate) – Spain, 2019*. Organization International Labour Organization, ILOSTAT database. Online: https://data.worldbank.org/indicator/SL.IND.EMPL.FE.ZS?end=2019&locations=ES . Consulted [06/05/2022].

Subcategory	Indicator	State
Health and safety	Rate of occupational accidents in the country.	In Spain there were 90.508 work accidents with sick leave and 77.835 work accidents without sick leave during January-February 2022. It cannot be found accident information in the scrapyard sector[13].
	Number/percentage of injuries or accidents fatalities in the organization for work.	There is no data.
	Presence of a formal health policy and safety.	The company has a security plan and labour risk prevention. All employees receive based on the risks to which are exposed formation in the field of safety at work.

Table 19. S-LCA inventory. Company: Desguace Cortés. Stakeholder: Local community.

Subcategory	Indicator	State
Access to immaterial resources	Freedom of expression in the country/sector.	Spain is classified as a free country in terms of regarding freedom of expression[14]. As a member country of the European Union, there are commercial agreements that assume that the sector respects freedom of expressions.
	Annual arrests related to protests in the sector.	No information was found about arrests related to protests in the scrapping sector.
	Technology transfer levels (measures the influence of the transformation of the capital into technology).	Spain ranks 31st of 151 countries in regarding foreign investment in development technology in the country[15].
	Patent filing.	There are no patented methods, but there is confidential information.

[13] MITES (2022). *Estadística de accidentes de trabajo. Avance enero-febrero 2022*. Ministerio de Trabajo y Economía Social. Gobierno de España. Spain.

[14] Freedom House (2022). *Freedom in the world 2022. Spain*. Online: https://freedomhouse.org/country/spain/freedom-world/2022 . Consulted [06/05/2022].

[15] The World Bank (2022). *Foreign direct investment, net inflows (% of GDP) – Value (World Development Indicators) – Spain, 2017*. TCdata360. Online: https://tcdata360.worldbank.org/countries/ESP?indicator=1541&viz=line_chart&years=2007,2017&country=ESP . Consulted [06/05/2022].

Subcategory	Indicator	State
Delocalization and migrations	Migration ratio in the country.	In the year 2021 (January-June) 201.638 people of foreign nationality arrived in Spain (There is not age difference)[16].
	Number of resettled individuals whose cause can be attributed directly to the company.	No evidence can be found that Desguace Cortés or scrapping sector causes demand for resettlement or movements of immigration/emigration.
	Forced evictions stemming from development economic.	Although Desguace Cortés has presence in the African market, does not have a significant demand for immigrant workers. Its export activity generates a demand for materials, which does not imply a reduction in GDP per capita associated with African market, which can produce the imported products.
Safe and healthy living conditions	Disease burden by country.	Spain has a ratio of 16.984 DALY which corresponds to a very low level on a 5 values international scale. If a scrapping is poorly managed, it means a threat in terms of contamination. Hazardous waste (fats, oils, batteries, fuels) is managed. Desguace Cortés complies with all the regulations applicable to the handling and management of hazardous substances. The facilities have measures of passive and active safety to prevent contaminant transfer. It reuses the remains of fuel present in the vehicles treated.
	Pollution levels by country.	The main pollution problem in Spain is the air's quality. The quality of the water comes marked as an objective in the Water Framework Directive. The scrapping sector does not require large amounts of energy. Its greatest impact lies in transportation tasks.
	Presence of force of laws, safety regulations by country.	Spain is a legal state subject to law. The security is guaranteed by the bodies and forces of state security. There is also the presence of private security. The exercise of private security is regulated by law and described by the security code private[17].
	Structural integrity management oversight.	A department of the company is in charge of the investigation and characterization of new ELV models that they receive at their facilities. As a result of the extracted data, the security policies are inspected in order to update and/or propose

[16] INE (2021). *Cifras de población (CP) a 1 de julio de 2021. Estadística de Migraciones (EM). Primer semestre de 2021. Datos provisionales*. Instituto Nacional de Estadística. Notas de prensa.

[17] Agencia Estatal Boletín Oficial del Estado (2021). *Código de Seguridad Privada. Edición actualizada a 27 de mayo de 2021*. BOE. Madrid, Spain.

Subcategory	Indicator	State
		new security measures. An example are some electric vehicles whose battery requires safety protocols larger than conventional model batteries.
Secure living conditions	State of Security and Human Rights in the country of operation.	The use of dangerous substances is a result of their presence in the vehicles, such as batteries, fuel, capacitors ai-conditioning system. All the operators who handle these substances have received training in management and handling of dangerous substances.
	Crime rate.	Spain has a low crime rate. The country's low homicide rate stands out '0,7 per 100.000 inhabitants in 2017' (Homicide study united nations unodc). In the global peace index, Spain stands at ranked 31st out of 163 countries[18].
Local employment Society	Unemployment rate in the country.	The most recent unemployment rate data are[19]: - 2022QI: 13,65 - 2021QIV: 13,33 - 2021QIII: 14,57 - 2021QII: 15,26 - 2021QI: 15,98
	Strength of policies in preferences of local hiring.	Not any development employment encourages in the municipality, where the business is, plan has been found. Desguace Cortés currently works with 136 employees and plans to increase its workforce. *Data are from 2019*
	Percentage of labour hired locally.	The company is ubicated in Benaguasil, which has 11.369 residents[20]. There is no data on the active population by municipality. The most accurate data corresponds to data by province.
Community engagement	Government transparency, policy formulation.	Spain has a rating of 4,18 on a scale from 1 to 7. The level of difficulty with which companies obtain information about changes in

[18] IEP (2021). *Global Peace Index (GPI) 2021: Measuring Peace in a Complex World.* Institute for Economics & Peace. Sydney.

[19] INE (2022). *Unemployment rates by different age groups, sex, and Autonomous Community*. Instituto Nacional de Estadística. Online: https://www.ine.es/jaxiT3/Tabla.htm?t=4247&L=1 . Consulted [06/05/2022].

[20] INE (2021). *Official Population Figures referring to revision of Municipal Register 1 January 2021*. Instituto Nacional de Estadística. Online: https://www.ine.es/jaxiT3/Tabla.htm?t=2903&L=1 . Consulted [06/05/2022].

Subcategory	Indicator	State
		policy that affects your business is rated as medium difficulty[21].
	Public trust of politicians.	Spain has a rating of 2,24 on a scale from 1 to 7, which implies that there is distrust on the part of citizens towards the politicians[22].
	Description of the relationship between the sector and the community	Its business model does not include meetings with social groups such as neighbourhood organizations of the nearby municipalities. There is also no need for it, since the activity carried out in its facilities does not generate inconvenience and complies with all regulations corresponding. On the other hand, its direct economic impact on the zone and its activity considered strategic (ATF) have made that different politician among them mayors of the municipality have used the image of the company to promote the area. Also, they have been visited by the director of the Consejería de Medio Ambiente. As for sponsorship, it is always closely linked to sport. They are usually present at the Ricardo Tormo Circuit in Cheste, in the most important vehicle events. They patronize local football teams and promote sport within the company with popular careers to animate the workforce and foster camaraderie and team.

Table 20. S-LCA inventory. Company: Desguace Cortés. Stakeholder: Society.

Subcategory	Indicator	State
Public commitment on sustainability issues	Commitment of the sector regarding the sustainability.	Most of the participants of the sector look for a fast benefit accomplishing the minimum that the law imposed. The management team of Desguace Cortés try to go one step ahead of the law, searching for those business opportunities that let them an adaptation to the new legal measures that the administration imposed them. Wastes generated by its activity are treated by a manager authorized.

[21] The World Bank (2022). *Transparency of government policymaking, Index – Spain, 2017*. TCdata360. Online: https://tcdata360.worldbank.org/indicators/h7da6e31a?country=BRA&indicator=687&viz=line_chart&years=2007,2017 . Consulted [06/05/2022].

[22] The World Bank (2022). *Public trust in politicians – Spain, 2017*. TCdata360. Online: https://tcdata360.worldbank.org/indicators/h45ea0a18?country=BRA&indicator=665&viz=line_chart&years=2007,2017 . Consulted [09/05/2022]

Subcategory	Indicator	State
		They have recently expanded the business by creating a department that research and propose solutions field of waste management in mechanicals workshops.
	Presence of public documents available such as promises or agreements on sustainability.	As a result of its proactivity with the field of sustainability, Desguace Cortés participates in a European project that seeks to increase circularity of vehicles.
	Implementation of codes of conduct in the sector/company.	In the scrapping sector there are no codes of conducts of any kind. Desguace Cortés has no documents written about conduct code. It is operated according to criteria professional and responsible.
Contribution to economic development	Economic situation of the country/region (GDP, economic growth, unemployment, salary level, etc.) and relevance of the sector considered for the economy.	Data not available.
Technological development	Efforts of the sector in technological development.	The little scrapping has a low economical margin to implement investments that result in higher technological level. Desguace Cortés is the third largest scrapping from Spain and as such, it is investing in technological improvements.
	Investment in technology development/technology to transfer.	Desguace Cortés has invested 2 million euros in expanding its company, and recently has just acquired a new piece of land in Vilamarxant for the expansion of their facilities.
Corruption	End of Life responsibility	There is no data.

Table 21. S-LCA inventory. Company: Desguace Cortés. Stakeholder: Value chain actors.

Subcategory	Indicator	State
Fair competition	National legislation and regulation.	Facing unfair competition, law contemplates a series of actions requested in before of court[23].
	Sector regulation.	They apply 2 main laws at the ATF sector:

[23] Ley 3/1991, de 10 de enero, de Competencia Desleal. *Boletín Oficial del Estado, 10*, de 11 de enero de 1991, pp. 959 – 962. https://www.boe.es/buscar/pdf/1991/BOE-A-1991-628-consolidado.pdf

Subcategory	Indicator	State
		- Royal decree 731/1982, of March 17, on control of establishments dedicated to the dismantling of motor vehicles[24]. - Royal decree 265/2021, of April 13, on vehicles at the end of their useful life[7]. It regulates the scope of application and it is regulated with greater detail the operations that must perform the authorized centres for the treatment of vehicles at the end of its useful life.
	Sectorial agreement.	There are no agreements.
Respect of intellectual property rights	General intellectual property rights and their relationship with the economic sector studied.	There is no certainty that in the sector is used material protected by patents or other means under intellectual protection. However, it is usual that in the scrapping of larger size to develop investigations whose results do constitute sensitive information of confidential character.

Table 22. S-LCA inventory. Company: Desguace Cortés. Stakeholder: Consumers.

Subcategory	Indicator	State
Health and safety	Presence of management measures to assess the consumer health and safety.	The risks related to product health and safety that sells Desguace Cortés are very low. The products are mechanical parts for the automotive sector. - Cutting risks. - Risk of entrapment.
	Existence of consumer complaints (to national, sectoral, organizational level).	There is no data.
Feedback mechanism	Presence of feedback mechanism.	Desguace Cortés has reclamation papers to client's provision. They have social networks as Facebook, LinkedIn, WhatsApp, and Instagram.
	Management measures to improve feedback mechanism.	There is not implemented a plan of digital image enhancement of the company. It is needed more marketing training and digital profiles. This would need an in-depth analysis of their model of business and how to adapt it to the e-commerce and image.
Transparency	Non-compliance with regulations regarding the transparency and presence of laws that regulate the	There are no complaints of breach.

[24] Real Decreto 731/1982, de 17 de marzo, sobre control de los establecimientos dedicados al desguace de vehículos de motor. Texto consolidado, 2001. *Boletín Oficial del Estado, 93,* de 19 de abril de 1982, p 9874. https://www.boe.es/buscar/pdf/1982/BOE-A-1982-9141-consolidado.pdf

Subcategory	Indicator	State
	transparency information.	
	Quality and breadth of information available for the consumer of the organization/sector.	Interviews with members of the sector indicate that the users do not conserve the documents of all the reparations and maintenances that are done to their vehicles. Because of this, there is a loss of information.
End of Life responsibility	Strength of national legislation relating to product disposal and recycling.	The regulation about the treatment of vehicles at heir end life is defined by the royal decree 265/2021, of April 13, on vehicles at the end of their useful life[7]. The waste generated during the useful life of the vehicle are governed by the law 7/2022, of April 8, on waste and contaminated soils for a circular economy[6], and by the royal decrees specifics for each type of waste.
	Assistance and management in terms of end of life.	The main market niche of scrapings is the selling of spare parts of second hand. Because of the nature of their products, when they are converted into a waste by the workshops end in landfills. When a vehicle is converted into a waste, the spare parts that can have, end as a landfill waste or as a raw material in the steel industry.
Privacy	Strength of internal management system to protect consumer privacy, in general.	Desguace Cortés handles character data staff such as: name, email, phone number, DNI photocopy, checking account number, and vehicles documentation. To protect consumers privacy, the company follows the principles of legality, loyalty and transparency. The information is used for the purpose of manage the contractual relationship; manage the sending of the information that is requested; provide to the interested parts offers from their services and/or products of interest. Data is kept: the minimum time necessary for the correct provision of the service offered; to meet the responsibilities that may arise of the same; and any other legal requirements. Desguace Cortés S.L. does not communicate personal data to third part, unless be expressly informed. Regarding consumer rights, correspond to those reflected in the Organic Law of December 5, of Protection of Personal Data and guarantee of digital rights[25].

[25] Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales. *Boletín Oficial del Estado, 294,* de 6 de diciembre de 2018, Pp. 11978 – 119857. https://www.boe.es/boe/dias/2018/12/06/pdfs/BOE-A-2018-16673.pdf

5. Annex 2

In this Annex 2, it will be described the reference points for each subcategory selected to realize the impact assessment, for the studied system.

Table 23. Reference points for the subcategory selected. Stakeholder: Workers.

Subcategory	Performance basis
Freedom of association, collective bargaining, and right to strike	It should be guaranteed the trade union freedom and collective negotiation. The training and membership of independent unions should be possible.
Child labour	There is no occurrence of child labour.
Forced Labour	-
Fair salary	The salary level should guarantee a standard of living worthy. The minimum salary payment is often not enough. In addition, the companies must pay on time and not delay wages.
Working hours	Working time must not exceed 8 hours per day and 48 hours per week.
Discrimination and equal opportunity	There is no discrimination. In addition, the companies must employ minorities and the employment ratio between men and women must be balanced.
Health and safety	Proper management of health and safety, so that the risk of workers is low.
Social benefits/Social security	Companies must provide social benefits, such as health insurance or pension insurance, which guarantee a standard of living decent.

Table 24. Reference points for the subcategory selected. Stakeholder: Local community.

Subcategory	Performance basis
Access to material resources	Companies must not overexploit resources materials and must implement systems environmental management certified to minimize resource consumption. In addition, the companies should improve the infrastructure of the community if infrastructure is underdeveloped or is not enough for a worthy life level.
Access to immaterial resources	Companies must promote freedom of expression; besides, they must support the communities in the education or other community services, if necessary.
Delocalization and migrations	Companies must not cause resettlement or migratory movements to big scale. If the resettlements are necessary, companies must provide appropriate compensations.
Cultural inheritance	It does not apply
Indigenous rights	It does not apply
Safe and healthy living conditions	Companies must minimize their environmental pollution to not put the community members health in danger.
Secure living conditions	In countries with high rate of crime, the companies must contribute to guarantee conditions of life through staff private security.
Local employment Society	Companies must contribute directly or indirectly, through local suppliers, to a reduction of the local unemployment.

Subcategory	Performance basis
Community engagement	Companies must participate in their communities in different areas. In addition, the companies should include stakeholders of the community in the relevant processes of decision-making.

Table 25. Reference points for the subcategory selected. Stakeholder: Society.

Stakeholder categories	Performance basis
Public commitment on sustainability issues	Companies must contribute to the sustainability development of the society regarding the impacts of their activities.
Contribution to economic development	Companies must contribute to the local economy development through different aspects such as wages payment, the purchase of raw materials and supplies, investments, etc.
Technological development	Companies that operate in relevant areas for technology must commit to the development of efficient and ecological technology.

Table 26. Reference points for the subcategory selected. Stakeholder: Value chain actors.

Stakeholder categories	Performance basis
Fair competition	Companies must act fairly, that is, not anticompetitive.
Promotion social responsibility	Companies must promote social responsibility between providers, including monitoring, audits, and training with respect to social behaviour responsible.
Supplier relationships	-
Respect of intellectual property rights	Companies must respect the intellectual property rights and they must not infringe the patent rights.

Table 27. Reference points for the subcategory selected. Stakeholder: Consumers.

Stakeholder categories	Performance basis
Health and safety	Companies must minimize the risks of health and safety of the products.
Feedback mechanism	Companies must implement mechanisms of feedback to enter in contact with consumers of a simple way.
Transparency	Companies must communicate about their product and social liability in a transparent way. The communication must allow an informed choice of consumer.
End of Life responsibility	Companies must provide information to consumers with regarding appropriate options for the end of useful life, if applicable. The electronic product manufactures must set up return systems of products and must guarantee the proper disposal of products.
Privacy	Companies must not compromise the consumers' data of personal character.

6. Annex 3

In this Annex 3, it will be described the Hazard Identification Risk Assessment. The type of injury is explained in Table 31, and the risk type is explained in Table 11.

Table 28. Hazard Identification Risk Assessment. Zone: ATF centre. Sub-Activity: non-destructive removal. Description: Electric screwdriver. Employee: Dismantler and driver (transport). *G: Gravity, E: Exposition, R: Risk.*

Principal activity	Danger	Type of injury – Risk	Risk type	G	E	R
Depollution	Projections	050 060 070 080	R8	6	4	24
Removal	ELV fall, overturning of the bridge or the bridge gives away	Staff crush	R10	8	3	24
	Heavy piece to carry manually	TMC	R5	6	4	24
	Presence of COVs	Inhalation, skin contact	R7	6	4	24
	Twists	030 050	R1	6	4	24
	Projections	050 060 070 080	R9	6	4	24
Subset transfer in box	-	-	-	-	-	-
Subset transfer	-	-	-	-	-	-

Principal activity	Danger	Type of injury – Risk	Risk type	G	E	R
Dismantling	Unsuitable posture on and under the vehicle	TMC	R1	6	4	24
	Noised caused by the use of tools	Hearing disorder	R11	8	4	32
	Sharp edges of bodywork and parts	Cuts	R6	6	4	24
	Falling up or down stairs, falling from trolleys, when storing parts	000 010 020 030 Contusion crush hematoma.	R2	8	4	32
Subset transfer	Greasy liquid on the flor	-	R1	6	4	24
	Movement of machinery	Serious injury	R4	8	4	32
Volume reduction	-	-	-	-	-	-
Transport	Road accident	000 010 020 030 050 060 Contusion crush hematoma	R4	8	4	32

Table 29. Hazard Identification Risk Assessment. Zone: ATF. Sub-Activity: Storage and non-destructive removal. Description: S. T in Storage and Electric screwdriver. Employee: Charger (storage) and dismantler (electric screwdriver). *G: Gravity, E: Exposition, R: Risk.*

Principal activity	Danger	Type of injury – Risk	Risk type	G	E	R
3a	Dust flight	-	R7	6x4	24	16
	Fire	-	R13	6x2	16	32
	Moving an object. Burns on a hot exhaust pipe, use of disassembly/assembly tools, handling/storage of parts, etc.	010 020 030 060 Contusion crush hematoma.	R6	6	4	24
	Crushing fingers or + while using tools, cutting, use of bridges, hoists, etc. Projections of products/material in the eyes and on the skin.	000 010 020 030 060 Contusion crush hematoma.	R9	6	4	24
	Falling pieces, battery, car, falling cardboard… Engine Removal.	000 010 020 030 050 Contusion crush hematoma.	R10	8	3	24
	Use of impact wrench, chisel (expertise and position 4), hydraulic groups, CPD crushing area.	050	R11	8	4	32
	Heat in summer, cold and bad weather in winter.	050 060	R12	2	1	2
	Start of fire (vehicle, fluid storage, etc.)	000 060 070 080	R13	8	3	24

Principal activity	Danger	Type of injury – Risk	Risk type	G	E	R
	Use of electrical appliance, receipt, and processing of electric vehicles.	000 050 060 080	R14	8	4	32
	Brightness, bad position.	030 050	R15	2	4	8
	Physical and verbal aggression by outsiders or internal people. Training. Customer contacts.	000 010 050	R17	8	4	32
	Use of impact wrenches, screwdrivers, trolleys, hydraulic shears, etc.	030 050	R1	6	4	24
	Twists, stations 4, 1, 6.	030 050	R1	6	4	24
	Wasps, rats in vehicles, dog bites…	010 050 070	R17	6	2	12
	Contamination of shower water (*Legionella*).	0703 – Infection	R8	4	1	4
	Cardiac problem.	000 050 120	All risks	8	1	8

Table 30. Hazard Identification Risk Assessment. Zone: Employees equipped with a telephone and a laptop. *G: Gravity, E: Exposition, R: Risk.*

Danger	Type of injury – Risk	Risk type	G	E	R
Dependencies of digital tools	120	R17	6	4	24

Table 31. Type of injury.

Type of injury[26]	
000	Type of injury unknown or unspecified
010	Wounds and superficial injuries
020	Bone fractures
030	Dislocations, sprains, and strains
040	Traumatic amputations (Loss of body parts)
050	Concussion and internal injuries
060	Burns, scalds and frostbites
070	Poisonings and infections
080	Drowning and asphyxiation
090	Effects of sound, vibration, and pressure
100	Effects of temperature extremes, light and radiation
110	Shock
120	Multiple injuries
999	Other specified injuries not included under other headings

[26] European Commision, Eurostat (2013). *European statistics at work (ESAQ): Summary methodology.* Publications office. doi: 10.2785/40882.

7. Annex 4

In this Annex 4, it will be described the risk assessment for bumper for each scenario.

Table 32. Risk assessment for bumper for Villeton scenario.

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
ATF	Removal	Non – Destructive removal	Electric screwdriver	Dismantler	Twisted	R1	6	4	24
					Hearing disorder	R11	8	4	32
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	Subset deposal	-		Greasy liquid on the floor	R1	6	4	24
	Dismantling	Subset dismantling	Manual screwdriver		Twisted	R1	6	4	24
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	S. T in box	Container		Greasy liquid on the floor	R1	6	4	24
		S. T in VR	Electric forklift	Forklift operator	Falling cars	R2	8	4	32
	Volume reduction	Pre-shredding	12-16 mm	Charger	Presence of VOC	R7	6	4	24
					Projections of products/material	R9	6	4	24
	Storage	S. T in Storage	-		Dust flight	R7	6	4	24
					Fire	R13	8	2	16
	Subset transfer	S. T in lorry	Shovel machine		Serious injury	R4	8	4	32
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Shredding centre	Volume reduction	Shredding	6-8 mm	Operator	Presence of VOC	R7	6	4	24

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
	Washing	-	-			R7	6	4	24
	Sorting	-	-			R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Compounder centre	Compounding	-	-	Operator	Presence of VOC	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Moulding centre	Moulding	-	-	Operator	Presence of VOC	R7	6	4	24
Total									**592**

Table 33. Risk assessment for bumper for Gizzi scenario.

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
ATF	Removal	Non – Destructive removal	Electric screwdriver	Dismantler	Twisted	R1	6	4	24
					Hearing disorder	R11	8	4	32
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	Subset deposal	-		Greasy liquid on the floor	R1	6	4	24
	Dismantling	Subset dismantling	Manual screwdriver		Twisted	R1	6	4	24
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	S. T in box	Container		Greasy liquid on the floor	R1	6	4	24
		S. T in lorry	Shovel machine	Charger	Serious injury	R4	8	4	32
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Collect platform	Volume reduction	Pre-shredding	12-16 mm	Charger	Presence of VOC	R7	6	4	24
					Projections of products/material	R9	6	4	24
	Storage	S. T in Storage	-		Dust flight	R7	6	4	24
					Fire	R13	8	2	16
	Subset transfer	S. T in lorry	Shovel machine		Serious injury	R4	8	4	32
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Shredding centre	Volume reduction	Shredding	6-8 mm	Operator	Presence of VOC	R7	6	4	24

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
	Washing	-	-			R7	6	4	24
	Sorting	-	-			R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Compounder centre	Compounding	-	-	Operator	Presence of VOC	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Moulding centre	Moulding	-	-	Operator	Presence of VOC	R7	6	4	24
Total									**624**

Table 34. Risk assessment for bumper for Magic Piece (MPA) scenario.

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
ATF	Removal	Destructive removal	Grapple dismantler platform	Dismantler	Presence of VOC Projections of material	R7	6	4	24
	Subset transfer	S. T in lorry	Hydraulic shovel machine	Charger	Serious injury	R4	8	4	32
Transport	Subset transfer	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Collect platform	Dismantling	Subset dismantling	Manual screwdriver	Dismantler	Twisted	R1	6	4	24
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	S. T in box	Container		Greasy liquid on the floor	R1	6	4	24
	Volume reduction	Pre-shredding	12-16 mm	Charger	Presence of VOC	R7	6	4	24
					Projections of products/material	R9	6	4	24
	Storage	S. T in Storage	-		Dust flight	R7	6	4	24
					Fire	R13	8	2	16
	Subset transfer	S. T in lorry	Shovel machine		Serious injury	R4	8	4	32
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
Shredding centre	Volume reduction	Shredding	6-8 mm	Charger	Presence of VOC	R7	6	4	24
	Washing	-	-	Operator		R7	6	4	24
	Sorting	-	-			R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Compounder centre	Compounding	-	-	Operator	Presence of VOC	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Moulding centre	Moulding	-	-	Operator	Presence of VOC	R7	6	4	24
Total									**520**

Table 35. Risk assessment for bumper for Copa scenario.

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
ATF	Removal	Non – Destructive removal	Electric screwdriver	Dismantler	Twisted	R1	6	4	24
					Hearing disorder	R11	8	4	32
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	Subset deposal	-		Greasy liquid on the floor	R1	6	4	24
	Dismantling	Subset dismantling	Manual screwdriver		Twisted	R1	6	4	24
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	S. T in box	Container		Greasy liquid on the floor	R1	6	4	24
		S. T in lorry	Fuel forklift	Forklift operator	Falling cars	R2	8	4	32
	Volume reduction	Bale compressor	-	Charger	Projections of products/material	R9	6	4	24
	Subset transfer	S. T in camion	Fuel forklift	Forklift operator	Falling cars	R2	8	4	32
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Collect platform	Volume reduction	Pre-shredding	12-16 mm	Charger	Presence of VOC	R7	6	4	24
					Projections of products/material	R9	6	4	24
	Storage	S. T in Storage	-		Dust flight	R7	6	4	24
					Fire	R13	8	2	16

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
	Subset transfer	S. T in lorry	Hydraulic shovel machine	Driver	Overturning of the engine	R2	8	4	32
					Projection of foreign bodies	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Shredding centre	Volume reduction	Shredding	6-8 mm	Charger	Presence of VOC	R7	6	4	24
	Washing	-	-	Operator		R7	6	4	24
	Sorting	-	-			R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Compounder centre	Compounding	-	-	Operator	Presence of VOC	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Moulding centre	Moulding	-	-	Operator	Presence of VOC	R7	6	4	24
Total									**704**

Table 36. Risk assessment for bumper for Cortés Destructive scenario.

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
ATF	Removal	Destructive removal	Grapple dismantler platform	Dismantler	Presence of VOC Projections of material	R7	6	4	24
	Subset transfer	S.T in box	Container		Greasy liquid on the floor	R1	6	4	24
		S. T in dismantling	Fuel forklift	Forklift operator	Falling cars	R2	8	4	32
	Dismantling	Subset dismantling	Manual screwdriver	Dismantler	Twisted	R1	6	4	24
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	S. T in box	Container		Greasy liquid on the floor	R1	6	4	24
		S. T in VR	Forklift	Forklift operator	Falling cars	R2	8	4	32
	Volume reduction	Cutting	Sabre saw	Dismantler	Lesions	R9	6	4	24
		Bale compressor	-	Charger	Projections of products/material	R9	6	4	24
	Subset transfer	S. T in lorry	Fuel forklift	Forklift operator	Falling cars	R2	8	4	32
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
Shredding centre	Volume reduction	Shredding	6-8 mm	Charger	Presence of VOC	R7	6	4	24
	Washing	-	-	Operator		R7	6	4	24
	Sorting	-	-			R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Compounder centre	Compounding	-	-	Operator	Presence of VOC	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Moulding centre	Moulding	-	-	Operator	Presence of VOC	R7	6	4	24
Total									**504**

Table 37. Risk assessment for bumper for Cortés manual ND scenario.

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
ATF	Removal	Non – Destructive removal	Electric screwdriver	Dismantler	Twisted	R1	6	4	24
					Hearing disorder	R11	8	4	32
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	Subset deposal	-		Greasy liquid on the floor	R1	6	4	24
	Dismantling	Subset dismantling	Manual screwdriver		Twisted	R1	6	4	24
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	S. T in box	Container		Greasy liquid on the floor	R1	6	4	24
		S. T in VR	Fuel forklift	Forklift operator	Falling cars	R2	8	4	32
	Volume reduction	Cutting	Sabre saw	Dismantler	Lesions	R9	6	4	24
		Bale compressor	-	Charger	Projections of products/material	R9	6	4	24
	Subset transfer	S. T in lorry	Fuel forklift	Forklift operator	Falling cars	R2	8	4	32
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Shredding centre	Volume reduction	Shredding	6-8 mm	Charger	Presence of VOC	R7	6	4	24
	Washing	-	-	Operator		R7	6	4	24
	Sorting	-	-			R7	6	4	24

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Compounder centre	Compounding	-	-	Operator	Presence of VOC	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Moulding centre	Moulding	-	-	Operator	Presence of VOC	R7	6	4	24
Total									**552**

8. Annex 5

In this Annex 5 it will be described the risk assessment for fuel tanks for each scenario.

Table 38. Risk assessment for fuel tank for Cortés manual ND scenario.

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
ATF	Depollution	Drilling and aspiration	Hydraulic aspirator	Depollution	Twisted Greasy liquid on the floor	R1	6	4	24
					Hearing disorder	R11	8	4	32
					Projection	R9	6	4	24
					Start of fire	R13	8	3	24
	Removal	Non-destructive	Electric screwdriver	Dismantler	Twisted	R1	6	4	24
					Hearing disorder	R11	8	4	32
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	Subset deposal	Container		Greasy liquid on the floor	R1	6	4	24
	Washing	-	Residual fuel extraction	Charger	Presence of VOC	R7	6	4	24
	Dismantling	-	Electric screwdriver	Driver	Twisted	R1	6	4	24
					Hearing disorder	R11	8	4	32
					Lesions	R9	6	4	24
					Cuts	R6	6	4	24
	Subset transfer	S.T in VR	Forklift	Forklift operator	Falling cars	R2	8	4	32
	Volume reduction	Pre-shredding	-	Dismantler	Presence of VOC	R7	6	4	24
					Projections of products/material	R9	6	4	24

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
	Storage	S. T in Storage	-	Charger	Dust flight	R7	6	4	24
					Fire	R13	8	2	16
	Subset transfer	S. T in lorry	Hydraulic shovel machine	Driver	Overturning of the engine	R2	8	4	32
					Projection of foreign bodies	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Shredding centre	Volume reduction	Shredding	6-8 mm	Charger	Presence of VOC	R7	6	4	24
	Washing	-	-	Operator		R7	6	4	24
	Sorting	-	-			R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Compounding centre	Depollution	-	-	Operator	Presence of VOC	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Moulding centre	Removal	-	-	Operator	Presence of VOC	R7	6	4	24
Total									**752**

Table 39. Risk assessment for fuel tank for Cortés Destructive scenario.

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
ATF	Depollution	Drilling and aspiration	Hydraulic aspirator	Depollution	Twisted Greasy liquid on the floor	R1	6	4	24
					Hearing disorder	R11	8	4	32
					Projection	R9	6	4	24
					Start of fire	R13	8	3	24
	Removal	Destructive removal	Grapple dismantler platform	Dismantler	Presence of VOC Projection of material	R7	6	4	24
	Subset transfer	S. T in box	Container		Greasy liquid on the floor	R1	6	4	24
		S. t in VR	Fuel forklift	Forklift operator	Falling cars	R2	8	4	32
	Volume reduction	Cutting	Sabre saw	Dismantler	Lesions	R9	6	4	24
		Bale compressor	-	Charger	Projections of products/material	R9	6	4	24
	Subset transfer	S. T in lorry	Fuel forklift	Forklift operator	Falling cars	R2	8	4	32
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Collect platform	Volume reduction	Shredding	6-8 mm	Charger	Presence of VOC	R7	6	4	24
					Projection of product/material	R9	6	4	24
	Sorting	-	-	Operator	Presence of VOC	R9	6	4	24
	Storage	S.T in Storage	-	Charger	Dust flight	R9	6	4	24

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
					Fire	R13	8	2	16
	Subset transfer	S. T in lorry	Hydraulic shovel machine	Driver	Overturning of the engine	R2	8	4	32
					Projection of foreign bodies	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Shredding centre	Volume reduction	Shredding	6-8 mm	Charger	Presence of VOC	R7	6	4	24
	Washing	-	-	Operator		R7	6	4	24
	Sorting	-	-			R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Compounding centre	Depollution	-	-	Operator	Presence of VOC	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Moulding centre	Removal	-	-	Operator	Presence of VOC	R7	6	4	24
Total									**680**

Table 40. Risk assessment for fuel tank for ATF shredder 3 D scenario.

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
ATF	Depollution	Drilling and aspiration	Hydraulic aspirator	Depollution	Twisted Greasy liquid on the floor	R1	6	4	24
					Hearing disorder	R11	8	4	32
					Projection	R9	6	4	24
					Start of fire	R13	8	3	24
	Removal	Destructive removal	Grapple dismantler platform	Dismantler	Presence of VOC Projection of material	R7	6	4	24
	Subset transfer	S. T in box	Container		Greasy liquid on the floor	R1	6	4	24
		S. t in VR	Fuel forklift	Forklift operator	Falling cars	R2	8	4	32
	Volume reduction	Pre-shredding	12-16 mm	Charger	Presence of VOC	R7	6	4	24
					Projections of products/material	R9	6	4	24
	Sorting	-	-	Operator	Presence of VOC	R7	6	4	24
	Storage	S. T in storage	-	Charger	Dust flight	R9	6	4	24
					Fire	R13	8	2	16
	Subset transfer	S. T in lorry	Hydraulic shovel machine	Driver	Overturning of the engine	R2	8	4	32
					Projection of foreign bodies	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Shredding centre	Volume reduction	Shredding	6-8 mm	Charger	Presence of VOC	R7	6	4	24

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
	Washing	-	-	Operator		R7	6	4	24
	Sorting	-	-			R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Compounding centre	Depollution	-	-	Operator	Presence of VOC	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Moulding centre	Removal	-	-	Operator	Presence of VOC	R7	6	4	24
Total									**568**

Table 41. Risk assessment for fuel tank for Magic Piece (MPA) scenario.

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
ATF	Depollution	Drilling and aspiration	Hydraulic aspirator	Depollution	Twisted Greasy liquid on the floor	R1	6	4	24
					Hearing disorder	R11	8	4	32
					Projection	R9	6	4	24
					Start of fire	R13	8	3	24
	Removal	Destructive removal	Industrial grapple dismantler	Dismantler	Presence of VOC Projection of material	R7	6	4	24
	Subset transfer	S. T in box	Container		Greasy liquid on the floor	R1	6	4	24
		S. T. in lorry	Hydraulic shovel machine	Driver	Overturning of the engine	R2	8	4	32
					Projection of foreign bodies	R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Shredding centre	Volume reduction	Shredding	6-8 mm	Charger	Presence of VOC	R7	6	4	24
	Washing	-	-	Operator		R7	6	4	24
	Sorting	-	-			R7	6	4	24
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Compounding centre	Depollution	-	-	Operator	Presence of VOC	R7	6	4	24

Zone	Activity	Sub-activity	Description	Employee	Danger	Risk type	G	E	R
Transport	Transport	-	Dump lorry 30 m^3	Driver	Road accident	R4	8	4	32
Moulding centre	Removal	-	-	Operator	Presence of VOC	R7	6	4	24
Total									**424**