RAIMS Study

Sector:

OPTICAL FIBRE CABLE

Risk Assessment in Materials Supply (RAIMS) Study

INTRODUCTION

METHODOLOGY

In the following study, the risk of the materials supply for producing an **optical fibre cable** has been evaluated using the ***Risk Assessment in Materials Supply (RAIMS)*** approach**.**

RAIMS is structured, standardized method for addressing the potential problems that the supply chain of a product may have in the future (e.g. problems arising from the scarcity of a natural resource, the upward trend in the price of a material, the customs policies of an exporting country, the environmental impact of a product etc.).

This study has been conducted in accordance with the document ***Methodology for the Risk Assessment in Materials Supply (RAIMS).*** This methodology specifies the steps necessary to evaluate the risk of the materials supply.

According to the document, a RAIMS study contains four main steps:

1. **Goal and scope definition** articulates the objectives, functional unit under consideration, and regional and temporal boundaries of the assessment.
2. **Material inventory analysis** entails inventorying all the materials that are included in the supply chain with regard to the system being studied.
3. **Risk assessment** evaluates risk in the supply of the materials.
4. **Interpretation of results** includes an evaluation of the risk assessment results within the context of the limitations, uncertainty, and assumptions in the inventory data and scope.

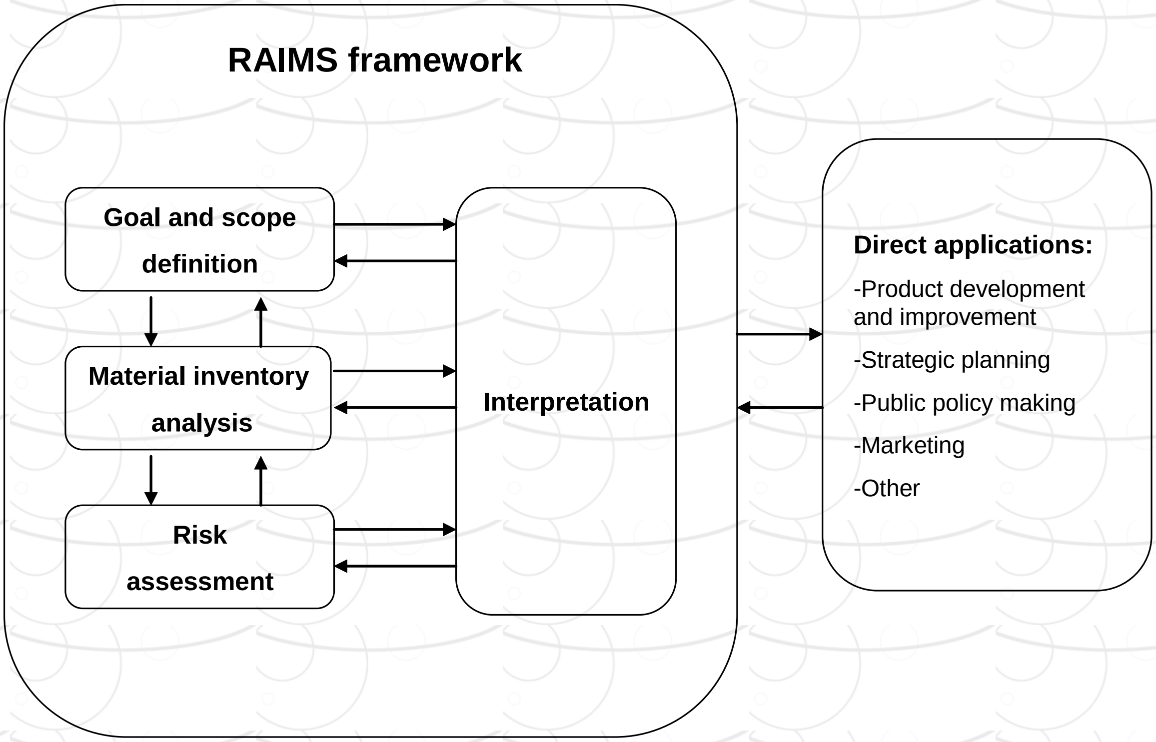


Figure 1. RAIMS framework.

RAIMS is a useful as a decision-making tool for new product development, as a guide for the optimization of raw material consumption as well as for the identification of solutions in risk reduction and possible substitution of risky materials. Consequently, the RAIMS is a powerful analysis for companies to anticipate to future supply problems, identify cost saving opportunities and gain competitive advantage of product/services, etc.

1. GOAL

The goal of the following study is to evaluate the risk of the materials supply for producing an **optical fibre cable** using the RAIMS approach. The main task is to identify the materials that are part of the supply chain and assess the risk of each element.

This RAIMS is firstly dedicated to "*Company Name*" internal audience. It will provide a clear picture of the overview of product's material supply, as well as point out the main supply problems on which the company should be focused. Consequently it will allow anticipating to future supply problems, becoming a reference for the company to define future technological, innovation and purchasing objectives.

The report will also be available for any interested party who wishes to understand the data, assumptions, and methodologies used to calculate the risk of the materials supply for producing an **optical fibre cable**. Public transparency on all data and parameters should be provided as far as confidentiality allows for it.

RAIMS results will be published in relevant journals for the scientific community as a comparative assertion…

As the results are intended to be disclosed to the public a critical review by an independent panel of experts is also required for the study.

2. SCOPE

2.1. Definition of the product

2.1.1. Background

An optical fibre is a flexible, hair-fine, transparent fibre made of high quality extruded glass (silica) or plastic. A fibre optic system consists of three different parts; a transmitter unit converts an electrical signal to an optical signal, an optical fibre carries the light, and a receiver accepts the light or photons and converts them back into an electrical signal.

Optical fibres are used for the transmission of high volume data by sending light pulses along long distances. Optical fibres are also used over shorter distances for fixed broadband access and within data centres. This technology enables the global data transmission underpinning the modern digital economy. Apart from communication uses, optical fibres can also be used for sensors, fibre lasers and illumination applications.

2.1.2. Corresponding international code

As it is pretended to develop a standardized supply chain, the name of the items must be internationally recognizable. For achieving this, using codes and descriptions of an international nomenclature is the best option.

In this study the international nomenclature that is going to be used for naming the different items is the **Europe Union's version of the WCO's Combine Nomenclature (CN)** for the classification of goods. The corresponding code and description for the product that is being studied is the next:

> ***85447000**: Optical fibre cables made up of individually sheathed fibres, whether or not containing electric conductors or fitted with connectors.*

2.2. System boundary

The system boundary determines which processes (manufacturing, packaging, transport, use, disposal etc.) of a product's life and which inputs shall be included within the RAIMS.

In this study the process that is going to be taken into account is the **Manufacturing** of the optical fibre cable**.**

Regarding the inputs, there are three different types of inputs according to their function:

- **Material inputs**: material elements, which are added in each unit process, that form part of the final product.
- **Auxiliary inputs:** material elements, which are added in each unit process, that are not part of the final product.
- **Active inputs:** other final products that are used for obtain the final product that is being studied.

This study encompasses **Material Inputs**.

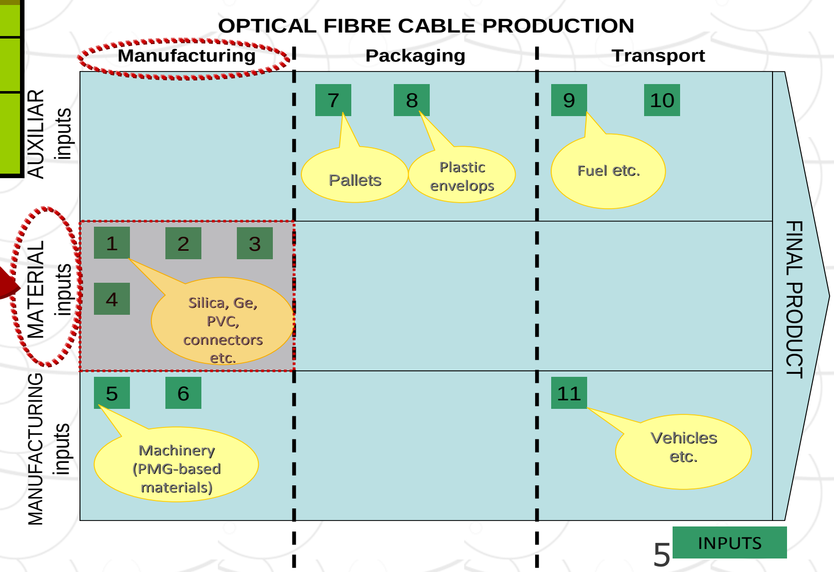
3. MATERIAL INVENTORY ANALYSIS

3.1. Product system description: Inputs

Taking into account the boundaries established in the previous phase, these are the material inputs that the company receives for the manufacturing of the **optical fibre cable**:

Optical fibre cables			
Part			**Material**
Optical cable			
	Cable core		Steel
	Coating		PVC
	Coated optical fibre		
		Glass fibre	SiO_4
		Dopant	Ge
Connectors (FC Type)			
	Spring		Stainless steel
	Ferrule Split sleeve		Zirconia
	Adapter Plug housing Receptacle		Brass

Table 1. Inputs



3.2. Research the origin of materials

Once the different inputs were defined, the next step was to find the elements that are needed for producing these inputs. A deep research was made, since the components of this elements found in the research also were detected. This procedure was repeated with all the elements that were found during the research. The research continued until elements without components were detected. These were considered resources (raw materials).

We decided to use a matrix for storing the data obtained in the research (*Table 3*). In this matrix, elements that have been found during the research have been recorded as components of their derivatives in the row, but also as potential compound elements in the column (the following research has determined whether a potential compound derives from other materials or not, being in that case considered a raw material). At the same time, in the **X** we have made a link to the information source, when it was needed.

We had to adapt the elements we found to the nomenclature we decided to use, due to not every element we found has a corresponding code, as for example, the *connectors* have *(Table 2)*. For example, even if we detected $GeCl_4$ as a main input of the fibre, there is not any specific code to express this substance, so we had to use a code that encompasses this substance (*28273985: Chlorides*)[1].

POPULAR NAME		CODE	DESCRIPTION
Connectors	→	85367000	Connectors for optical fibres, optical fibre bundles or cables

Table 2. Example of using the international nomenclature.

[1] Notice that, in this case study, understandable names have been maintained several times to facilitate the comprehension.

For the production of which element is this element used? / Which elements are needed for producing this element?			Components	Sub-assemblies				Manufactured products																		
			85367000	73121049	73209090	74072190	81099000	28273985	39042200	28273985	72061000	72181000	74032100	28256000	28061000	29173400	29032100	28011000	28492000	28291100	28041000	38237000	29173500	29012100	29121900
			Connectors for optical fibres, optical fibre bundles or cables	Stranded wire, ropes and cables, of iron or steel other than stainless steel, with a maximum cross-sectional dimension of <= 3 mm (excl. electrically insulated, twisted fencing and barbed wire, and plated or coated with copper-zinc alloys [brass])	Springs and leaves for springs, of iron or steel	Profiles of copper-zinc base alloys "brass", n.e.s.	Articles of zirconium, n.e.s.	GeCL4 -->Chlorides (excl. ammonium, calcium, magnesium, aluminium, iron, cobalt, nickel, tin and mercury chloride)	Plasticised poly"vinyl chloride", in primary forms, mixed with other substances	SiCL4-->Chlorides (excl. ammonium, calcium, magnesium, aluminium, iron, cobalt, nickel, tin and mercury chloride)	Ingots, of iron and non-alloy steel (excl. remelted scrap ingots, continuous cast products, iron of heading 7203)	Steel, stainless, in ingots and other primary forms (excl. waste and scrap in ingot form, and products obtained by continuous casting)	Copper-zinc base alloys "brass" unwrought	Germanium oxides and zirconium dioxide	Hydrogen chloride "hydrochloric acid"	Esters of orthophthalic acid (excl. dioctyl, dinonyl or didecyl orthophthalates)	Vinyl chloride "chloroethylene"	Chlorine	Carbides of silicon, whether or not chemically defined	Chlorate of sodium	Hydrogen	Fatty alcohols, industrial	Phthalic anhydride	Ethylene	Acyclic aldehydes
Products	85447000	Optical fibre cables made up of individually sheathed fibres, whether or not containing electric conductors or fitted with connectors	X	X				X	X	X															
Components	85367000	Connectors for optical fibres, optical fibre bundles or cables			X	X	X																		
Sub-assemblies	73121049	Stranded wire, ropes and cables, of iron or steel other than stainless steel, with a maximum cross-sectional dimension of <= 3 mm (excl. electrically insulated, twisted fencing and barbed wire, and plated or coated with copper-zinc alloys [brass])									X														
	73209090	Springs and leaves for springs, of iron or steel										X													
	74072190	Profiles of copper-zinc base alloys "brass", n.e.s.											X												
	81099000	Articles of zirconium, n.e.s.												X											
Manufactured products	28273985	GeCL4-->Chlorides (excl. ammonium, calcium, magnesium, aluminium, iron, cobalt, nickel, tin and mercury chloride)												X	X										
	39042200	Plasticised poly"vinyl chloride", in primary forms, mixed with other substances														X	X								
	28273985	SiCL4-->Chlorides (excl. ammonium, calcium, magnesium, aluminium, iron, cobalt, nickel, tin and mercury chloride)																X	X						
	72061000	Ingots, of iron and non-alloy steel (excl. remelted scrap ingots, continuous cast products, iron of heading 7203)																							
	72181000	Steel, stainless, in ingots and other primary forms (excl. waste and scrap in ingot form, and products obtained by continuous casting)																							
	74032100	Copper-zinc base alloys "brass" unwrought																							
	28256000	Germanium oxides and zirconium dioxide																		X					
	28061000	Hydrogen chloride "hydrochloric acid"																			X				
	29173400	Esters of orthophthalic acid (excl. dioctyl, dinonyl or didecyl orthophthalates)																				X	X		
	29032100	Vinyl chloride "chloroethylene"																X						X	
	28011000	Chlorine																							
	28492000	Carbides of silicon, whether or not chemically defined																							
	28291100	Chlorate of sodium																							
	28041000	Hydrogen																							
	38237000	Fatty alcohols, industrial																							X
	29173500	Phthalic anhydride																							
	29012100	Ethylene																							
	29121900	Acyclic aldehydes																							
	28253000	Vanadium oxides and hydroxides																							
	29024100	Xylene																							
	29012200	Propene "propylene"																							
	28362000	Disodium carbonate																							
	28070000	Sulphuric acid; oleum																							
	29022000	Benzene																							
	29023000	Toluene																							
	28142000	Ammonia in aqueous solution																			X				
	28043000	Nitrogen																							

For the production of which element is this element used? / Which elements are needed for producing this element?			Manufactured products									Resources															
			28253000 Vanadium oxides and hydroxides	29024100 Xylene	29012200 Propene "propylene"	28362000 Disodium carbonate	28070000 Sulphuric acid; oleum	29022000 Benzene	29023000 Toluene	28142000 Ammonia in aqueous solution	28043000 Nitrogen	28044000 Oxygen	26011100 Non-agglomerated iron ores and concentrates (excl. roasted iron pyrites)	26100000 Chromium ores and concentrates	26030000 Copper ores and concentrates	26080000 Zinc ores and concentrates	26151000 Zirconium ores and concentrates	water	25010031 Salt for chemical transformation "separation of Na from Cl" for the manufacture of other	25051000 Silica sands and quartz sands, whether or not coloured	25010099 Salt and pure sodium chloride, whether or not in aqueous solution or containing added anti-caking or free-flowing agents (excl. table salt, salt for chemical transformation "separation of Na from Cl", denatured salt and salt for other industrial	27112100 Natural gas in gaseous state	27090090 Petroleum oils and oils obtained from bituminous minerals, crude (excl. natural gas condensates)	26159000 Niobium, tantalum or vanadium ores and concentrates	25210000 Limestone flux; limestone and other calcareous stone, of a kind used for the manufacture of lime or cement	28020000 Sulphur, sublimed or precipitated; colloidal sulphur	28530030 Liquid air, whether or not rare gases have been removed; compressed air
Products	85447000	Optical fibre cables made up of individually sheathed fibres, whether or not containing electric conductors or fitted with connectors										X															
Components	85367000	Connectors for optical fibres, optical fibre bundles or cables																									
Sub-assemblies	73121049	Stranded wire, ropes and cables, of iron or steel other than stainless steel, with a maximum cross-sectional dimension of <= 3 mm (excl. electrically insulated, twisted fencing and barbed wire, and plated or coated with copper-zinc alloys [brass])																									
	73209090	Springs and leaves for springs, of iron or steel																									
	74072150	Profiles of copper-zinc base alloys "brass", n.e.s.																									
	81099000	Articles of zirconium, n.e.s.																									
Manufactured products	28273985	GeCL4-->Chlorides (excl. ammonium, calcium, magnesium, aluminium, iron, cobalt, nickel, tin and mercury chloride)																									
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	72061000	Ingots, of iron and non-alloy steel (excl. remelted scrap ingots, continuous cast products, iron of heading 7203)											X														
	72181000	Steel, stainless, in ingots and other primary forms (excl. waste and scrap in ingot form, and products obtained by continuous casting)											X	X													
	74032100	Copper-zinc base alloys "brass" unwrought													X	X											
	28256000	Germanium oxides and zirconium dioxide														X	X										
	28061000	Hydrogen chloride "hydrochloric acid"																X	X								
	29173400	Esters of orthophthalic acid (excl. dioctyl, dinonyl or didecyl orthophthalates)																									
	29032100	Vinyl chloride "chloroethylene"																									
	28011000	Chlorine																X	X								
	28492000	Carbides of silicon, whether or not chemically defined																		X							
	28291100	Chlorate of sodium																			X						
	28041000	Hydrogen																				X					
	38237000	Fatty alcohols, industrial																									
	29173500	Phthalic anhydride	X	X								X															
	29012100	Ethylene																					X				
	29121900	Acyclic aldehydes			X																						
	28253000	Vanadium oxides and hydroxides				X	X																	X			
	29024100	Xylene						X	X																		
	29012200	Propene "propylene"																					X				
	28362000	Disodium carbonate								X								X	X						X		
	28070000	Sulphuric acid; oleum										X						X								X	
	29022000	Benzene																					X				
	29023000	Toluene																					X				
	28142000	Ammonia in aqueous solution									X																
	28043000	Nitrogen																									X

Table 3. Data matrix

3.3. Categorization of elements

As we can see in the data matrix (*Table 3*), all the elements found during the research have been classified into categories in order to place them in the corresponding stage of the global supply chain.

The categories that we used were the ones that are shown in the next figure (*Figure 2*) and paragraph. We have repeated this procedure with all the elements that we found in our research, until we arrived to an element that was considered resource (raw material).

Sector: this first category is used for defining inside which boundaries is located the studied product in the global market.

Product: elements that are not a part of any other element. Final products (e.g. *laptop*)

Component: complex elements, whose summation can produce a specific product (e.g. *speakers*)

Sub assembly: elements, due to their lack of specificity, are susceptible to be part of different components and products. (e.g. *stainless steel screw*)

Manufactured product: primary forms of manmade goods. First steps in the manufacturing process, such as chemical products, human made substances, metal alloys etc. (e.g. *stainless steel*)

Resource / Raw material: natural resources and unprocessed primary products, such as materials derived form agriculture, forestry, fishing, mining and extraction of oil and gas. (e.g. *iron ores*)

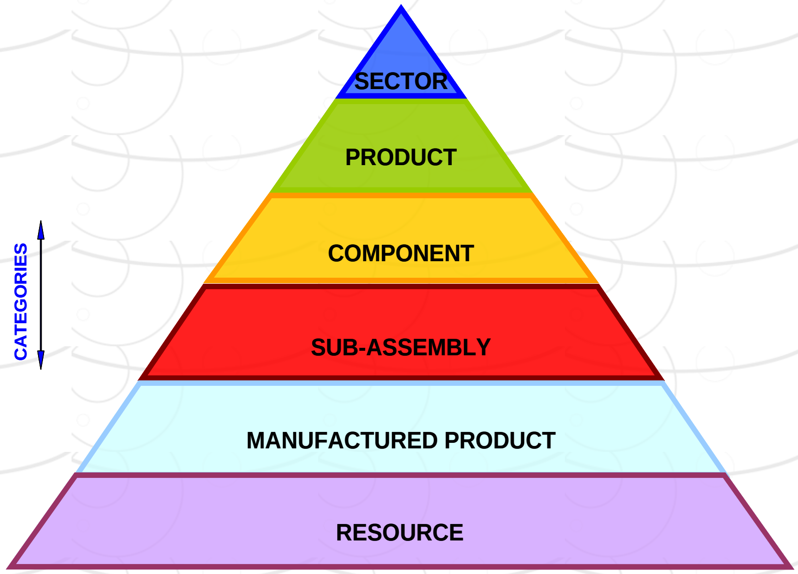


Figure 2. Categories

As a summary, in the next table (*Table 4*) we can see for each part how many elements we generated after our research.

Optical fibre cables							
Part			Material	Number of items related to each part by category			
				Components	*Sub-assemblies*	*Manufactured products*	*Resources*
Optical cable				**0**	**0**	**0**	**0**
	Cable core		Steel	0	1	1	1
	Coating		PVC	0	0	17	8
	Coated optical fibre			0	0	0	0
		Glass fibre	SiO_4	0	0	2	1
		Dopant	Ge	0	0	5	6
Connectors (FC Type)				**1**	**0**	**0**	**0**
	Spring		Stainless steel	0	1	1	2
	Ferrule Split sleeve		Zirconia	0	1	2	4
	Adapter Plug housing Receptacle		Brass	0	1	1	2

Table 4. Summary of research results

3.4. Mapping the supply chain

A graphical representation of all the information that has been recorded (all the elements, their relationships and their classification) is helpful for the understanding and comprehension of the supply chain. We decided to use organization charts with hierarchical relationships in this study. For building these charts the software that has been used is ***SharpCloud***.

Mapping methodology

Once we were clear about all the elements and their relationships, we started to make the supply chain's diagram using *SharpCloud* software.

For creating the diagram of the whole supply chain of the product into *SharpCloud*, we had to copy the format of the data (the headings of the columns) from *SharpCloud* to an *Excel* file; fill these columns with all the information from the data matrix that is needed (name, description, categories, which items are related etc.); and then put back the rows into *SharpCloud* data. The next picture shows a complete diagram of the product's supply chain (*Figure 3*).

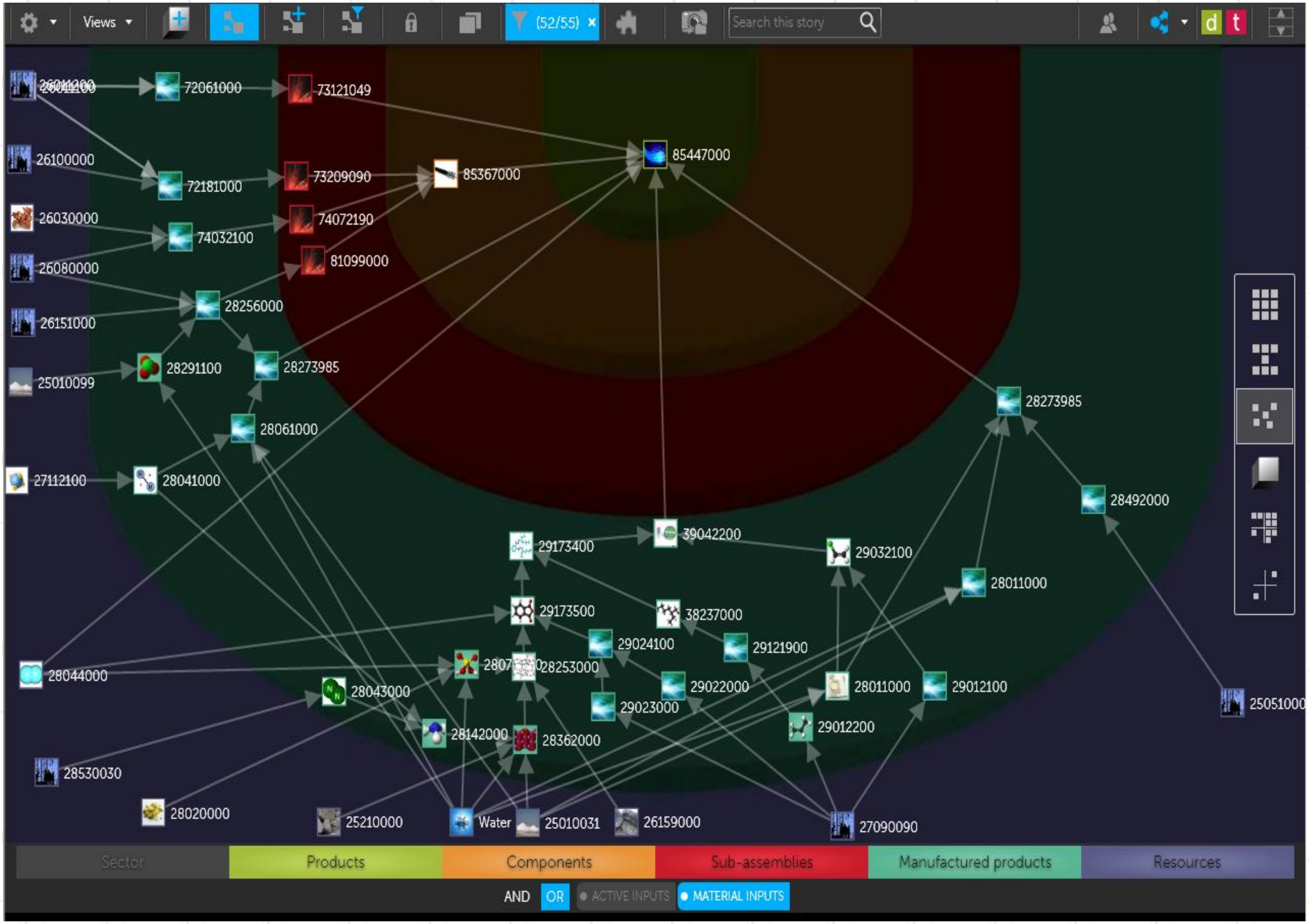


Figure 3. Complete Supply Chain

However, if is pretended to use a methodology that enables to develop the supply chain of any product of the market, there is another way of creating the diagrams that could be more suitable. We call to this specific methodology *Building Blocks*.

<u>"Building Blocks" methodology</u>

Instead of starting to create the whole diagram of the supply chain of a product, this methodology consist in generating small diagrams (called "***stories***" in *SharpCloud*), as puzzle pieces, that are connected by links (*Figure 4*). Thanks to this, if the studied product is modified in the future, we would be able to change any component for another that could be slightly or very different by changing only a link, without the need of having to make big changes in the supply chain. As it is said before, this methodology enables to develop the supply chain of any other product or different variations of the same product of the market, due to its flexibility.

Story characteristics:

- The stories would be about a single item (the story's and that item's name would be the same).
- The main item would be related to all the elements (products, components, resources etc.) that it can contain.
- The main item of the story will be the only item that is related
- The main item could be related to items of the same category or to lower category items.
- Items categorized as *Resources* can not have an own Story.

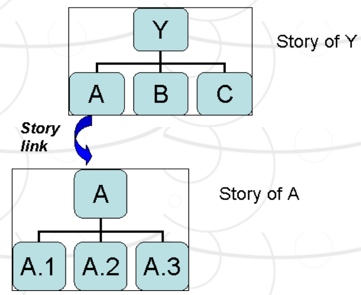


Figure 4. Building Blocks

Figure 5 shows the first building block of the supply chain of <u>optical fibre cables</u>, where we can see the main item (*85447000: Optical fibre cables made up of individually sheathed fibres*) related to the main material inputs. As an example of one of the subsequent building blocks, the *Figure 7* shows the building block corresponding to <u>connectors</u> (*85367000: Connectors for optical fibres, optical fibre bundles or cables*). Between the two building blocks, there is a link called "story link", that it is placed inside the item "85367000" of the first building block (*Figure 6*).

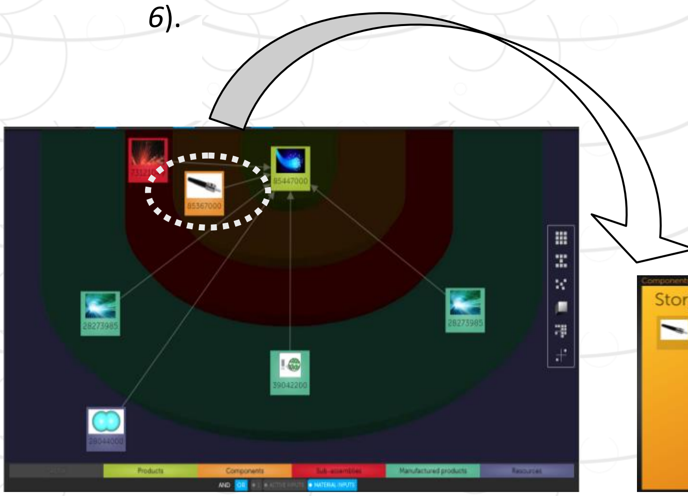


Figure 5.

Figure 6.

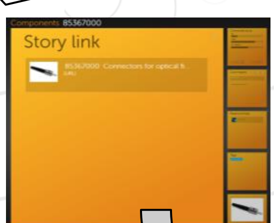
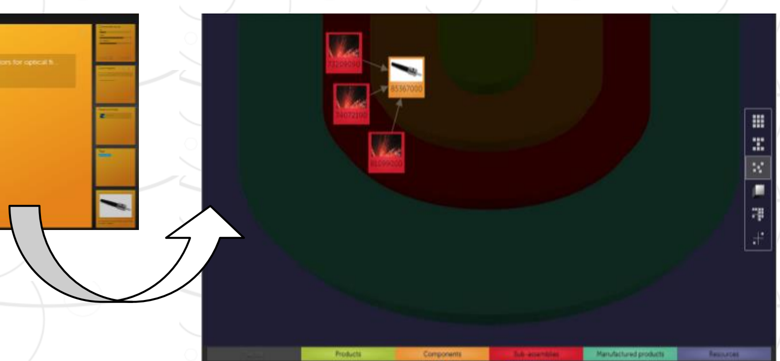
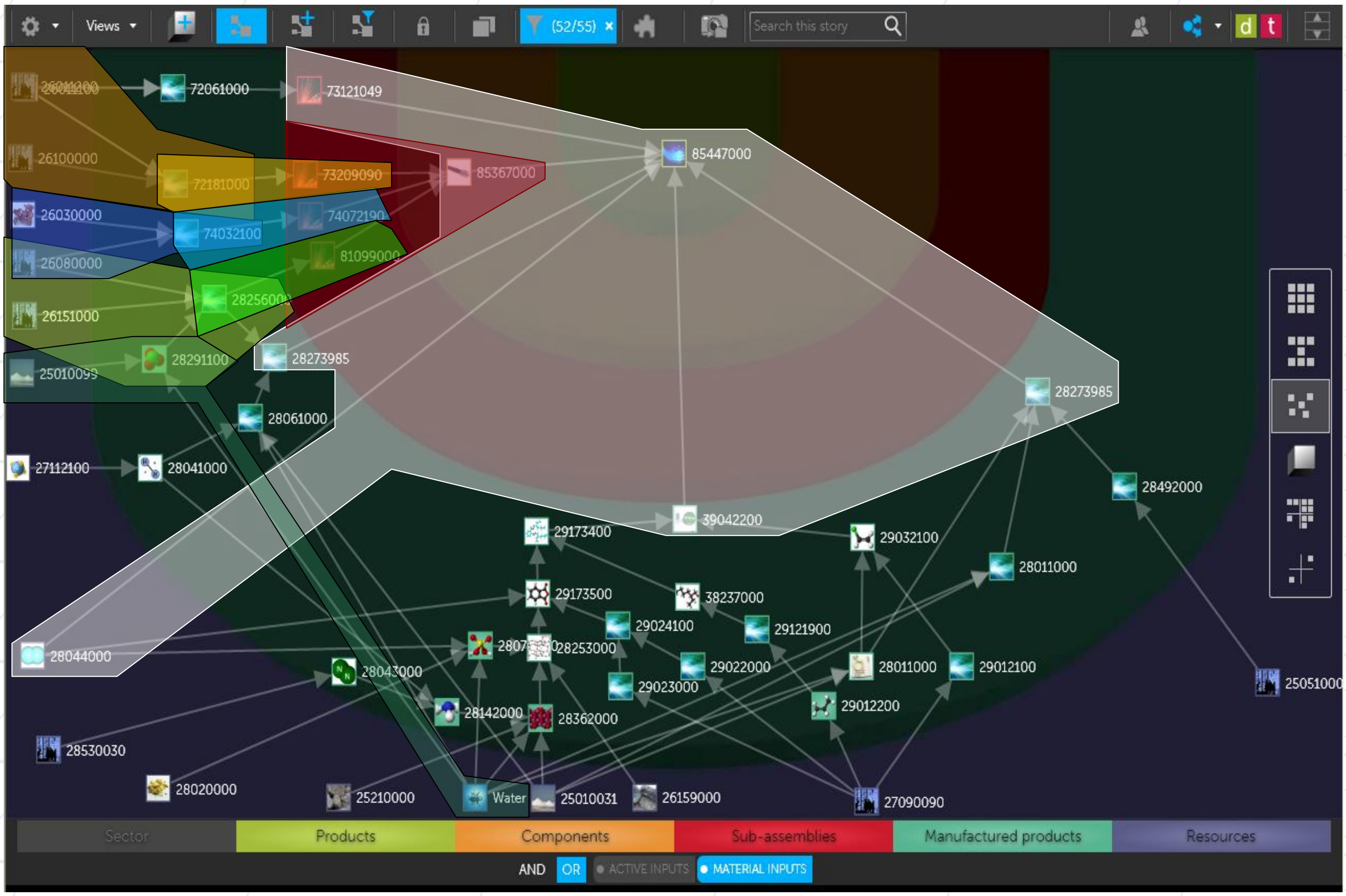


Figure 7.



Finally, even if *Building Blocks* methodology has been used for creating the supply chain, if we found interesting to have a complete diagram of the product, we could transfer the data (items and relationships) from all the building blocks to a single story, so we can get the same diagram as in *Figure 3*.

For expressing how this methodology works, in the next picture (*Figure 8*), we have expressed inside the complete diagram the building blocks that are needed only for developing the part of the supply chain corresponding to connectors.



Story of 85447000 (Optical fibre cables)

Story of 85367000 (Connectors for optical fibres)

Story of 73209090 (Springs of steel)

Story of 72181000 (Stainless steel)

Story of 74072190 (Profiles of brass)

Story of 74032100 (Brass)

Story of 81099000 (Articles of zirconium)

Story of 28256000 (Zirconium dioxide)

Story of 28291100 (Chlorate of sodium)

Figure 8. Complete Supply Chain and building blocks for the connectors

Display options

Even if in this study only **Material Inputs** are been taken into account, if analyzing other type of inputs would have been found interesting, using "*Tags*" in SharpCloud could have been a useful tool for differentiating the elements of the diagram according to the type of input they belong to. As an example, if **Active Inputs** would have been included in the study (due to the use of PMG-based materials in the production of the machinery), we would have been able to set them in the diagram but with a different *tag*, so by using the *tag filter* we would be able to make them appear and disappear.

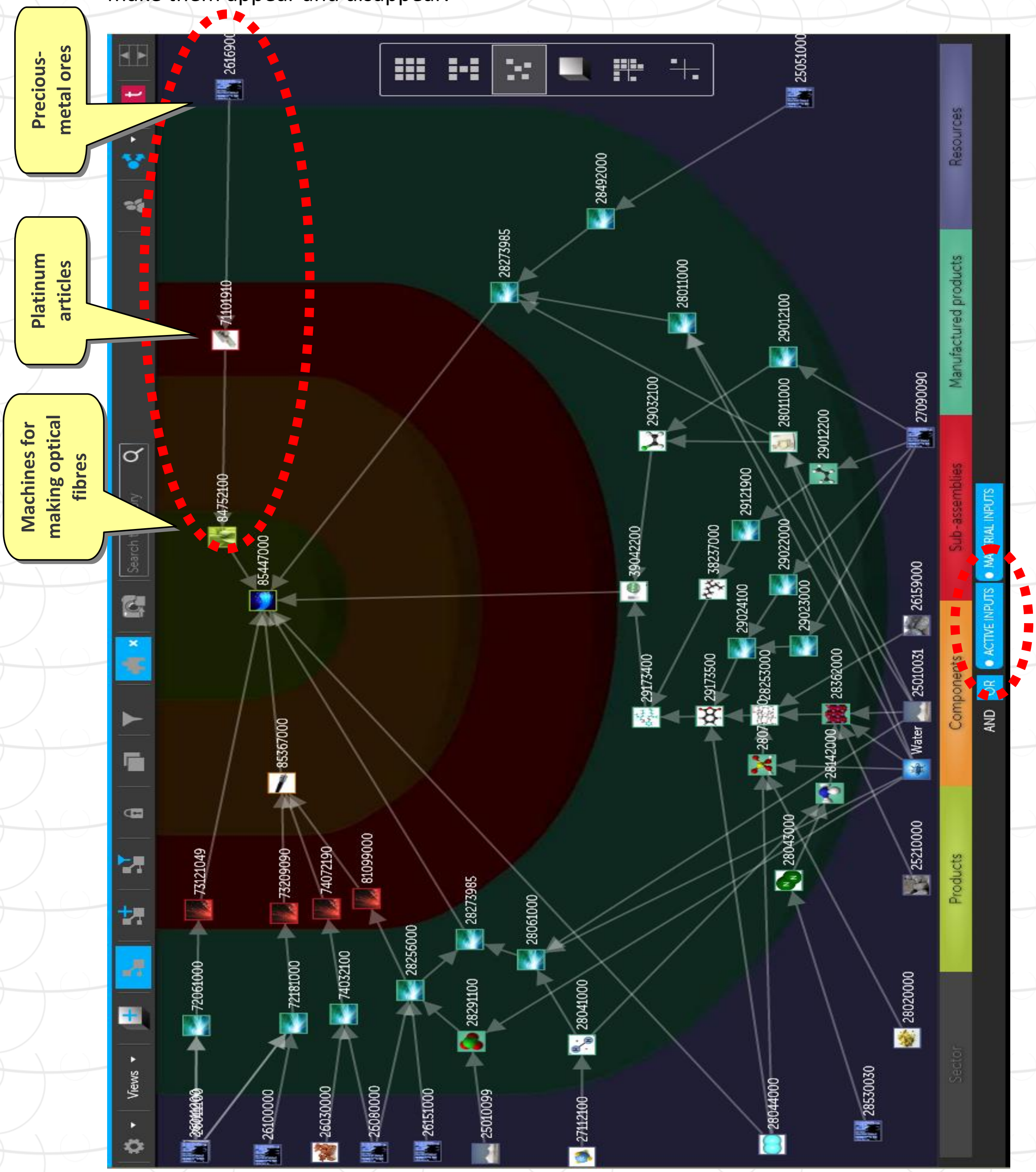


Figure 10. Complete Supply Chain with active inputs.

Using “*Tags*”, but in this case attaching them to the relationships (instead of attaching them to the items), could be useful to visualize more easily which materials are used for each part of the final product. As an example, in the next picture we have used the *relationship filter* for only showing the materials that are related to the connectors of the cable.

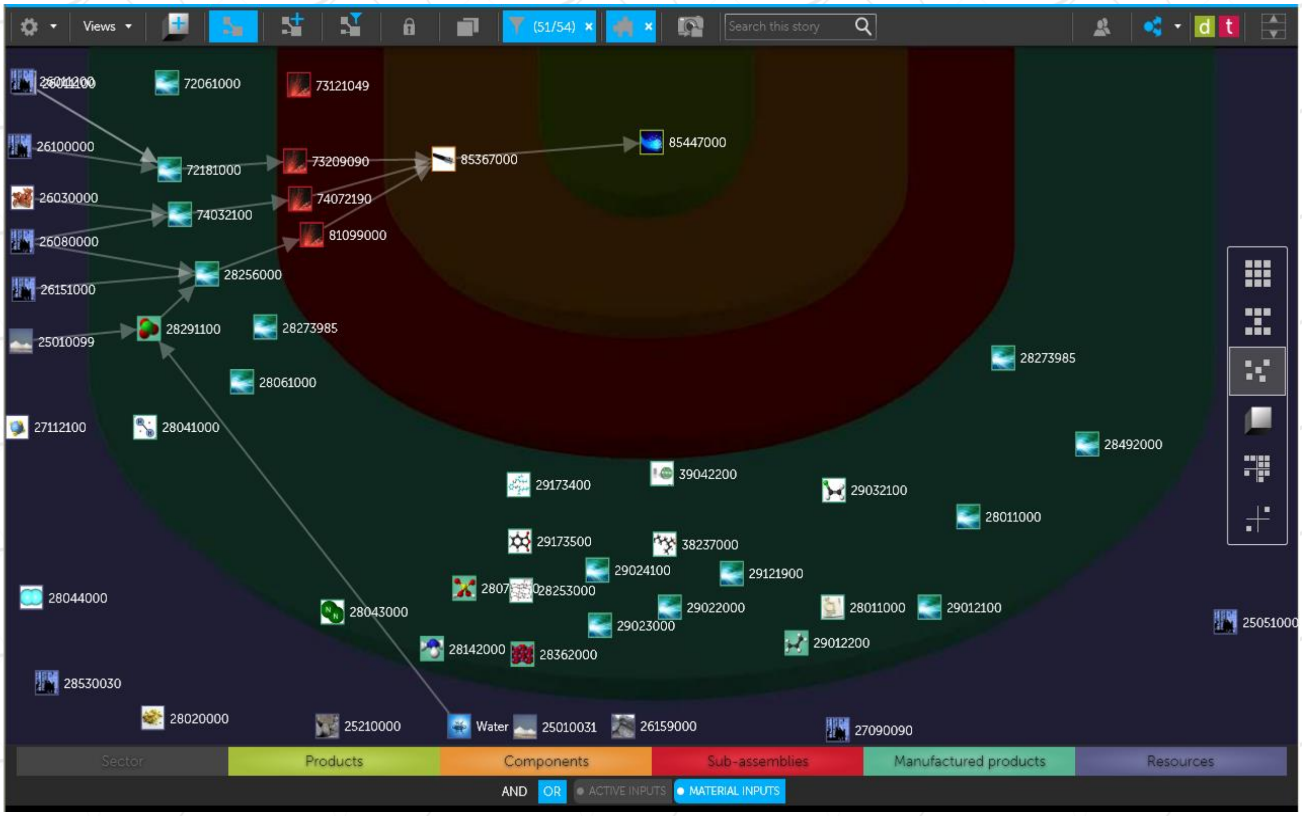


Figure 11. Complete Supply Chain only expressing the relationships needed for creating the connectors

4. RISK ASSESSMENT

4.1. Setting Properties

In *SharpCloud*, items can have attached properties that can be given numerical values. (Could not be the same properties for all the elements, or may be, could be the same but calculated in different way or with different indicators). Each property is a column in the data of *Sharpcloud* (the items are in the rows). Thanks to this, if we use software like *Excel* to calculate the values of these properties, we can transfer the value easily to the supply chain's diagram. As an example, we decided to set up three properties in the supply chain: **Risk**, **Impact** and **Mitigation.**

4.1.1. Establishing the calculating methodology

For calculating the values, a matrix like the next could be useful (*Table 5*). In this table different parameters are set up for each property. Meanwhile, the last three columns calculate the overall value for each property.

Property	Risks								Impact			Mitigation					Overall Risk	Overall Impact	Overall Mitigation
Parameter	Regulation	Price	Price Volatility	Global Market Size	Supply Concentration	Supply Flexibility	Stability of Nations	Growth Rate of Use	GHG Emissions	Water Use	Local Impact	Recycling	Substitubality	Reuse	Longevity	Research levels			
Units	Number	$/kg	Mean standard deviation	$million	Number	Number	Number	% change / year	tonnes CO2	m3/ 1000$	Water scarcity for country	%	Number	Number	Years	No. References			
Cooper ores																			
Zirconium ores																			
Limestone																			
...																			

Table 5. Example of calculating methodology of three properties: Risk, Impact and Mitigation

4.2. Calculating the risk

The blank cells of the matrix shall be filled with values obtained from referenced information sources.

4.2.1. Attaching the properties to the elements

For transfer the values into *SharpCloud*, we have to copy the format of the data (the headings of the columns) from *SharpCloud* to an *Excel* file; fill these columns with the numerical values that have been calculated in the last three columns; and then put back the rows into *SharpCloud* data.

5. RESULTS INTERPRETATION

5.2. Identification of the supplies of materials that are at risk

The objective of this phase is to structure the results from the MIA and RA phases in order to help to determine the supplies of materials that are at risk.

For each risk property the value above which it is considered that the risk is high shall be established (or may be an overall or average value of all the properties). Since the properties are different from each other (the way of calculating their values, their significance etc.) this value does not have to be the same.

***Risky element**:* in this study an element can be considered risky……….

- when its values exceed the set values in all the properties, or
- when its values exceed the set values in specific properties at the same time.
- when its values exceed an established overall value of all the properties
- when its values exceed an established average value of all the properties

Material elements		Numerical values of the risk properties *(from 0 to 100)*		
		RISK	IMPACT	MITIGATION
Risky element		50	80	60
85447000	Optical fibre cables made up of individually sheathed fibres, whether or not containing electric conductors or fitted with connectors	52,89	62.04	36.65
85367000	Connectors for optical fibres, optical fibre bundles or cables	22.67	69.76	57.42
73121049	Stranded wire, ropes and cables, of iron or steel other than stainless steel, with a maximum cross-sectional dimension of <= 3 mm (excl. electrically insulated, twisted fencing and barbed wire, and plated or coated with copper-zinc alloys [brass])	19.66	63.16	10.02
28273985	GeCL4-->Chlorides (excl. ammonium, calcium, magnesium, aluminium, iron, cobalt, nickel, tin and mercury chloride)	80.99	88.7	63.95
39042200	Plasticised poly"vinyl chloride", in primary forms, mixed with other substances	39.6	95.5	69.98
28273985	SiCL4-->Chlorides (excl. ammonium, calcium, magnesium, aluminium, iron, cobalt, nickel, tin and mercury chloride)	40.99	28.71	26.9
28044000	Oxygen	8.46	10.58	19.04

Table 6. Example of established values of risk in each property

Material elements		Numerical values of the risk properties *(from 0 to 100)*				
		RISK	IMPACT	MITIGATION	Overall	Average
Risky element					185	61.67
85447000	Optical fibre cables made up of individually sheathed fibres, whether or not containing electric conductors or fitted with connectors	52,89	62.04	36.65	98.69	49.35
85367000	Connectors for optical fibres, optical fibre bundles or cables	22.67	69.76	57.42	149.85	49.95
73121049	Stranded wire, ropes and cables, of iron or steel other than stainless steel, with a maximum cross-sectional dimension of <= 3 mm (excl. electrically insulated, twisted fencing and barbed wire, and plated or coated with copper-zinc alloys [brass])	19.66	63.16	10.02	92.84	30.95
28273985	GeCL4-->Chlorides (excl. ammonium, calcium, magnesium, aluminium, iron, cobalt, nickel, tin and mercury chloride)	80.99	88.7	63.95	233.64	77.88
39042200	Plasticised poly"vinyl chloride", in primary forms, mixed with other substances	39.6	95.5	69.98	205.08	68.36
28273985	SiCL4-->Chlorides (excl. ammonium, calcium, magnesium, aluminium, iron, cobalt, nickel, tin and mercury chloride)	40.99	28.71	26.9	96.6	32.20
28044000	Oxygen	8.46	10.58	19.04	38.08	12.69

Table 7. Example of established overall and average values of risk

5.2.1.. Graphical representation according to the properties

A graphical representation of the elements according to properties is helpful for comparing elements and properties.

In this study XYZ scatters can be used for comparing elements. For building them we can take advantage of the tools and different views of *SharpCloud.* This software has different types of views (*Grid*, *Compare* and *3D*) that are useful for compare the items according to one or more properties. In the next picture we can see an example of 3D view.

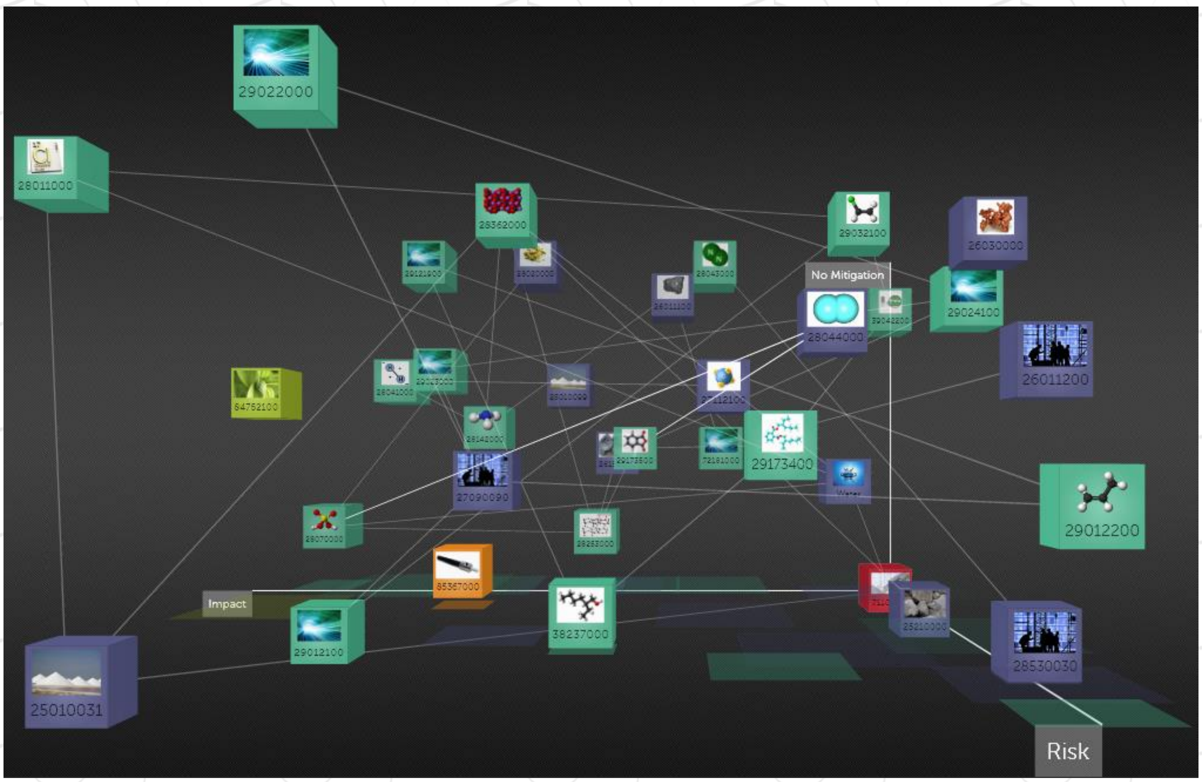


Figure 12. XYZ scatter