

Life M3P



Material Match Making Platform

for promoting the use
of **industrial waste** in local networks

LIFE15 ENV/IT/000697

This project is founded with the support of the Life Programme of the European Commission



Life M3P IN A NUTSHELL

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Project Reference

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Duration

1st October 2016 – 31st December 2019 (39 months)

Budget

€ 1.503.883,00

Funding

€ 885.709,00

Coordinating Beneficiary

Centro Tessile Cotoniero e Abbigliamento SpA (Italy)

Associated Beneficiaries

- Unione degli Industriali della Provincia di Varese (Italy)
- Material Connexion Italia (Italy)
- VITO (Belgium)
- Diadyma S.A. – Waste Management of Western Macedonia (Greece)
- Confederación Asturiana de la Construcción – CAC - ASPROCON (Spain)



The Project

BACKGROUND

The paradigm of the Circular Economy requires to rethink the entire life cycle of every production process, to optimize the use of resources (material and energy) and the consequent pressure exerted by mankind on the environment. It is increasingly urgent to **intervene on each level of the process of conception, production and consumption** of goods, ensuring that residues and waste are returned to the economic cycle. Thinking innovatively about material efficiency means to operate at cross-sectoral level working on other sectors, as well as the primary one in which a company operates, and evaluating the characteristics and functionality of materials not considered or investigated before.



AIM

The Life M3P project, co-funded with the support of the Life 2014-2020 Programme, is focused on **Circular Economy and Industrial Symbiosis** and it aimed to develop and implement an online platform to promote the exchange of industrial waste between companies of manufacturing districts in **4 European regions**: Lombardy (Italy), Flanders (Belgium), West Macedonia (Greece), Asturias (Spain).

The ultimate goal is to demonstrate and test a territorial model of industrial waste management in order to promote Circular Economy and Industrial Symbiosis. Through the proposed model, the project intends to encourage the overall efficiency of industrial processes in the target areas, increasing the use of industrial waste and reducing its transfer to landfills, storage and transport. It also promotes the search for new waste applications, as secondary raw materials, through creative design and innovative solutions.



The Environmental Context

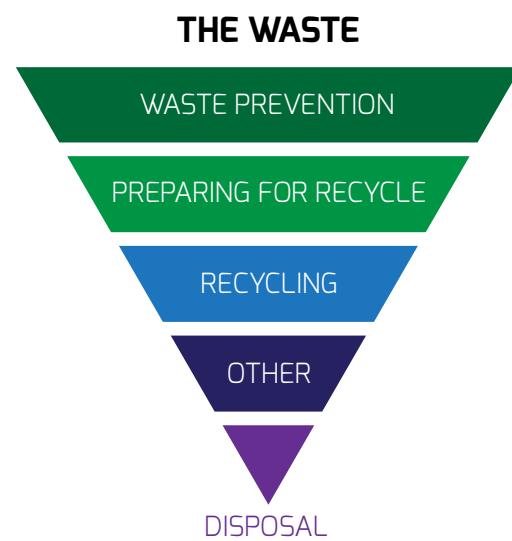
Ten years after the publication of the Directive 2008/98/EC¹, the thematic strategy on waste prevention and recycling proposed by European Union remains a basic important tool for reducing the waste mass generated in Europe.

The latest available European data (source: Eurostat) show that in 2016 the total waste generated by **all economic activities and households amount to 2,538 million tonnes in the EU-28**. This means 5.0 tonnes of waste were generated per EU inhabitant. In particular, the construction contributed 36.4 % of the total in 2016 and was followed by mining and quarrying (25.3 %), manufacturing (10.3 %), waste and water services (10.0 %) and households (8.5 %); the remaining 9.5 % was waste generated from other economic activities, mainly services (4.6 %) and energy (3.1 %).

As regards the two main treatment categories -recovery and disposal- during the period 2004-2016, the quantity of waste recovered, in other words recycled, used for backfilling or incinerated with energy recovery grew **from 960 million tonnes in 2004 to 1,198 million tonnes in 2016**. The quantity of waste subject to disposal decreased from 1,154 million tonnes in 2004 to 1,038 million tonnes in 2016, which was a decrease of 10.1 %. The share of disposal in total waste treatment decreased from 54.6 % in 2004 to 46.7 % in 2016. Even if progress has been made, by reaching slightly more than a half (53.3 %) of the waste was treated in recovery operations, further efforts will have to be made in order to reduce the remaining 46.7 % of waste that is still landfilled.

Waste treatment 2016 (% of total)	Recovery			Disposal	
	Recycling	Backfilling	Energy recovery	Landfill and other	Incineration without energy recovery
EU - 28	37.8	9.9	5.6	45.7	1.0

On July 2018 the **European Directives of the Circular Economy Package**, that the member states will have to implement by July 2020, stated that, among the new targets, recycling of waste is expected to reach at least 55% by 2025, while landfill will have to be reduced (to 10% by 2035). The objectives and targets set in European legislation (based on the "waste hierarchy") are **key drivers** to improve waste management, stimulate innovation in recycling, limit the use of landfilling, and create incentives to change consumer behavior. The Circular Economy Package defines clear targets for waste reduction and establish an ambitious and credible long-term path for waste management and recycling.



¹<http://eur-lex.europa.eu/legal-content/IT/ALL/?uri=CELEX:32008L0098>



KEY ELEMENTS OF CIRCULAR ECONOMY PACKAGE

EU common goal for the recycling of **about 65% of municipal waste** by 2030

EU common goal at for the recycling of **about 75% of packaging waste** by 2030

Binding target to reduce landfilling for **all waste down to 10%** by 2030

Landfill ban for **recycling waste**

Promotion of **economic means** to discourage landfilling

As regards the sectors involved in the **Life M3P project**, in 2016 the waste produced at European level shows the following situation (source: Eurostat):

Sector (NACE classification)	Total waste (tons)
Manufacture of textile, wearing apparel, leather and related products	2,250,000
Construction	40,230,000
Manufacture of chemical, pharmaceutical, rubber and plastic products	15,110,000
Manufacture of wood and of products of wood and cork, except furniture, manufacture of articles of straw and plaiting materials	17,350,000

In this evolving legal and environmental framework, the **M3P Platform** may support companies to comply with the circular economy requirements when implementing industrial processes that use recycled or secondary raw materials.



Lombardy Region Varese district

Lombardy is a member of the **Four Motors for Europe**, a network of highly industrialized regions, strong both in terms of economic and research performances: Lombardy counts 93.7 patents per million inhabitants, **Varese** 130.5 (source: *EUROSTAT*, 2012). Within this Region, Varese district plays indeed a strategic and crucial economic role.

Looking at the industrial economy, Lombardy counts more than **816k active enterprises**, of which roughly 95k in the manufacturing sector, that means an average of **4 manufacturing companies per Km²**, while in Italy this figure amounts just to 1.6. The Province of Varese boasts an even higher concentration of manufacturing companies: with **8.6k active manufacturing enterprises**, the district counts **7.2 companies per km²** (source: *Chamber of Commerce*, 2018).

Looking at the labor market, ISTAT has estimated that in Lombardy, in 2018, there were **4,426,653 employed people** (19% of the Italian figure), while in the Province of Varese employed persons amounted to **387,253**. In 2018 the employment rate reached 67.7% in Lombardy (67.8% in Varese district), well above the Italian average 58.5%. With regards to the participation to the labor market, according to ISTAT, in Lombardy in 2018 the activity rate (workforce/people aged 15-64) was 72.1%, (72.2% in Varese district), still above the Italian figure (65.6%). This contributes to generate a high standard of living: looking at *EUROSTAT* data, among the Italian Regions, Lombardy has the highest GDP per capita and equal to 36,900 euros in 2016 (in the Province of Varese this figure amounts to 28,700 euros), well above the Italian average (27,900 euros).

NON-HAZARDOUS WASTE: LAST AVAILABLE FIGURES

Beneath, for Lombardy and Varese district, two tables summarize the last available data on industrial waste, and for the same periods, the number of employees and companies are reported (source ISTAT - local units and employees).

LOMBARDY	Year 2014	Year 2015	Year 2016
N° of companies	880.353	876.852	881.567
of which, in Manufacturing:	91.550	89.635	88.104
N° of employees	3.461.602	3.489.530	3.570.879
of which, in Manufacturing:	890.186	880.323	886.955
Non-hazardous waste (ton/y)**	12.667.290	12.761.375	12.546.037
of which, in Manufacturing:	5.547.897	5.447.904	5.563.427

PROVINCE OF VARESE	Year 2014	Year 2015	Year 2016
N° of companies	70.003	69.277	69.474
of which, in Manufacturing:	8.487	8.299	8.128
N° of employees	267.660	268.172	268.861
of which, in Manufacturing:	90.197	89.651	88.705
Non-hazardous waste (ton/y)**	804.283	962.540	878.307
of which, in Manufacturing:	363.311	385.688	368.270

** Except Hazardous waste, End of life vehicles, Waste from electrical equipment, Packaging, Construction and demolition waste. Source: ARPA Lombardia – regional agency for environmental protection



NON-HAZARDOUS WASTE: MANUFACTURE OF TEXTILES, CHEMICAL AND PHARMACEUTICAL, RUBBER AND PLASTIC PRODUCTS

The manufacture of textiles, of chemical and pharmaceutical, as well as rubber and plastic products represent some of the most important activities for Lombardy and Varese economies: ISTAT has estimated that in 2016 more than **164k people were working in these sectors in Lombardy**, equal to 19% of people employed in manufacturing. The contribution of these sectors to generate non-hazardous waste is also relevant, as showed in the infographic below.

FOCUS MANUFACTURING

LOMBARDY

 **88,104**

Local units - Manufacturing

 **886,955**

Employees - Manufacturing



Non-hazardous waste - Manufacturing - (ton/y)

5,563,427 of which



1.7% from Manufacture of textiles



5.2% from Manufacture of chemical and pharmaceutical products



3.8% from Manufacture of rubber and plastic products

PROVINCE OF VARESE

 **8,128**

Local units - Manufacturing

 **88,705**

Employees - Manufacturing



Non-hazardous waste - Manufacturing - (ton/y)

368,270 of which



3.6% from Manufacture of textiles



9% from Manufacture of chemical and pharmaceutical products



15% from Manufacture of rubber and plastic products

SOURCE: Arpa (wastes) or ISTAT (local units and employees) 2016



Flanders

Flanders covers 44.8% of Belgium's territory and represents the majority of the country's industry and workforce; the region provides 58.8% of the national gross domestic product (GDP) (*Eurostat, 2018*).

The Flemish unemployment rate of 4.4% (2017) is considerably below the EU28 (7.6%) (*Eurostat, 2018*).

In terms of labour productivity measured by GDP per person employed, Flanders is also well above the EU28 average (129.6%).

As Flanders has virtually no resources, **industry is exclusively focussed on processing**. In 2013, 20% of the gross value-added in the Flemish region was industry and 21.7% was trade, transport and restaurants. Other important sectors are **government, education, (health) care and communal services** (19.4%). The primary (1.1%), the culture, recreation and other services (1.8%) sectors are the smallest ones. Added value generated by medium high-tech and high-tech industries, accounted for 8.6% of the total added value of the region in 2013. The employment figures in these industries follow the same trend: 4.45% of the total employment in Flanders was in medium high-tech and high-tech industries in 2013, compared to 3.9% in the EU28 (*Eurostat, 2018*). **Flanders is an important logistic hub, due to its central location and its dense and integrated multimodal transport infrastructure.** Major multinational automotive companies are also active in Flanders, although their position is under pressure. The Flemish network economy mainly derives its power from SMEs often acting as supplier companies. In addition, the petro-chemical industry and ICTs are key sectors of the regional economy.

As you can see in **Cleantech report** (2017) a huge amount of this waste is already being collected and recycled afterwards. Flanders, one of Europe's major recycling hubs, has the **know-how**, enablers, projects and policies needed to support companies in the large-scale recovery and reuse of their materials. The region offers a solid business and knowledge ecosystem for activities in the circular economy. This includes research centers and platforms as well as cluster and other key organizations.

The **waste production** coming from Flanders for 2016 is about 63.152.384 tonnes/year. This is divided into 19 categories. The six biggest sectors represent almost 84%.



	Year 2017	Year 2016	Year 2015
N° of companies	570,340	547,503	524,614
N° of employees	2,811,837	2,771,085	2,740,495
Total waste		63.152.384	
Total Industrial Waste*	15.677.000	13.911.000	

*Except Hazardous waste

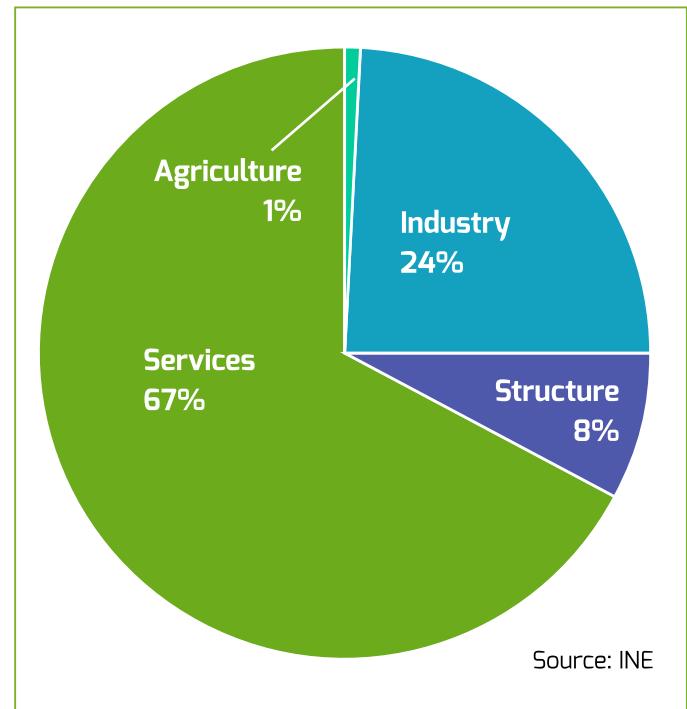


Asturias

According to the latest report of the Economic and Labor Situation of Asturias, presented at the last Assembly of the Asturian Federation of Entrepreneurs (FADE), the Asturian economy closed 2018 with a real growth of 2.3%, according to the first official estimate published by the National Statistics Institute. This data means that the regional progress is below that obtained by the whole country (2.6%), but also above the European one (1.8% in the Eurozone and 2.1% in the Union as a whole) and along the lines of the block of advanced economies (2.2%). This positive growth has been possible thanks to the continuity of impulses such as expansive monetary policies, although immersed in a context of weakening of the global economy and trade.

The slowdown in 2018 has been intense, although it falls within the expected and still leaves a positive growth figure, but it can also be worrisome to aggravate it, given that Asturias still has not recovered its level of activity or employment prior to the crisis, contrary to what happened in the whole country. Asturian GDP at 4.2% below the maximum level reached in 2008 in real terms (Spain is already 4.3% above) and 1.4% below in nominal terms (8.2% above the national). **Since 2010, the Asturian GDP recorded an average annual progress** of 0.06%, the lowest in the country (1.13% in Spain as a whole).

Thus, the value of Asturian GDP at market prices in 2018 stood at 23,650 million euros and its weight over the national total remains at 2.0% (between 2000 and 2012 it had fluctuated between 2.1% and 2.2%; between 2013 and 2015 it is 2.0%; and in 2016 it fell to 1.9% to recover 2.0% in 2017). The GDP per capita in Asturias has stood at 23,087 euros in 2018, after rising 3.8%, also driven by the loss of population. Thus, the regional figure is 10.7% below the national average, which stands at 25,854 euros per inhabitant, after growing 3.2%. Based on the sector structure offered by Regional Accounting, it is observed that **industry and construction are sectors that have a greater relative weight** in the Asturian economy than in Spain as a whole. Specifically, Construction (1.617 million Gross Value Added) represents 8% after the strong adjustment experienced during the crisis.



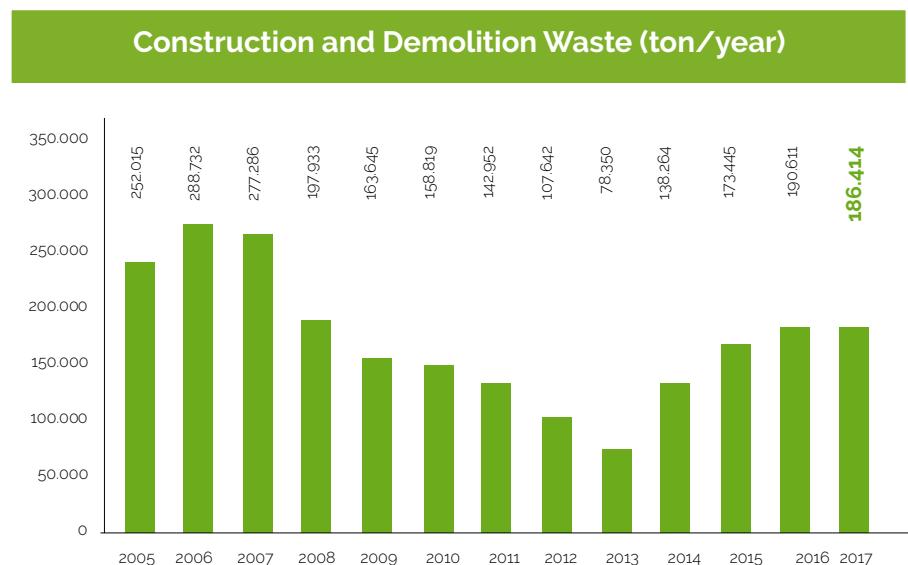
GENERAL DESCRIPTION OF INDUSTRIAL WASTE

Currently, the **management of construction and demolition waste** (CDW RCDs) in Asturias is carried out through the following channels: clean points, in the case of small home repair works; delivery to authorized container companies, in most cases, as carriers or waste managers, who deliver them, in turn, to authorized treatment plants; treatment plants, where companies directly deliver RCDs; mobile plants, in the case of major demolition works, prior administrative authorization.

Currently, the management of CDW in Asturias is mainly carried out through the **public company COGERSA**, which has a treatment plant and the only inert landfill authorized in Asturias to receive CDW. Currently, landfill deposit without prior treatment is prohibited.



If we turn to the Environmental report published by COGERSA, in 2017 186,414 tons of CDW were managed, of which 1,241 tons were converted into recycled aggregates for sale to construction companies, (0.6%), and 59% in use COGERSA internal as a material for covering the landfill and conditioning of facilities.



	Year 2017	Year 2016	Year 2015
N° of companies	40	40	40
N° of employees	678	684	714
Total waste	847 MT	837 MT	839 MT
Total Industrial Waste*	372 MT	409 MT	401 MT

* Except Hazardous waste

Employment data Estimated from SADEI data, plus PERPA data. Waste data from COGERSA Annual Report 2017 (last published)



Western Macedonia

The Region of Western Macedonia is located in the Northwest part of Greece, bordering Albania to the west and Republic of North Macedonia to the north. Western Macedonia is the only region in Greece not bordering the sea and one of the less populated regions in the country. **The Region is well-known for its rich natural resources**, such as fossil fuels (lignite), ores (asbestos, chromite, marble etc.), forests (50 % of its total land) that form ecosystems defined by rich biodiversity, as well as pastures, while it also has **the greatest surface water potential in Greece** (approximately 65 % of the country). Western Macedonia has traditionally been reliant on mining and energy production. Being already in the post coal era, authorities are focused on developing a **green, smart and circular bioeconomy in the region**. Western Macedonia is being transformed into a post-coal region with the support of the EU's platform for coal regions in transition and in the future from the EU's and National Just Transition Fund.

Furthermore, **Greece has already committed to climate action and sustainability and strongly supports the strategic long-term vision for a climate-neutral European Union**, by 2050. But how can European regions with coal-based energy infrastructure, such as Western Macedonia, meet this goal?

Industrial symbiosis and circular economy will play a significant role in this transition. Agriculture, forestry and their related industries (wood/biomass, food and feed etc.) but also renewable energy production (electricity and/or heat) and storage (waste and by-products utilization, biogas, green hydrogen etc.) will be some of the elements for this transition.

Wood and Fur Sectors	Year 2017	Year 2016	Year 2015
N° of companies	1320	1.450	1.580
N° of employees	2900	3.300	3.700
Total waste	53.013.90	51.463.50	50.253.20

In addition, Greece has just recently (December 2018) developed a National Strategy for Circular Economy. The National Strategy sets the country on a path towards the long-term adoption of circular economy principles. This further supports Region's economic strategy shift in its quest to **transform the economy in a way that creates jobs and supports long-term** just and inclusive growth based on resource efficiency, promotion of SMEs, innovation and investment in new technologies, and strengthening of the "social economy" potential.

Manufacturing sector, while growing in importance, is concentrated in sectors facing strong international competition notably: **wood and fur sectors**. In this framework **LIFE M3P** for the Region of Western Macedonia focused its activities in those two sectors.

So, one of Western Macedonia's main resource assets is in the wood sector (forest cooperatives, wood industry, wood for heating – district heating, pellet production, associated SMEs). The area has the potential to provide large quantities of wood industry residues, unexploited forest wood residues and agricultural waste. In addition, the region of Western Macedonia has been active in the fur sector for more than 1.400 years. The fur processing and fur-bearing animal breeding sector constitutes the second most important activity in the manufacturing sector of the region.



Wood industry wastes	Year 2018	Year 2017	Year 2016
Ash	330 tons/year	320 tons/year	300 tons/year
Sludge	110 tons/year	100 tons/year	100 tons/year
Trimmings/shavings	4.120 tons/year	3.850 tons/year	3.630 tons/year
Sawdust	3.240 tons/year	2.920 tons/year	2.880 tons/year
Bark/wood chips with bark	19.800 tons/year	18.200 tons/year	17.000 tons/year

Fur industry wastes (2018)	Year 2018	Year 2017	Year 2016
Animals breeding (manner mixed with straw)	22.000 tons/year	22.600 tons/year	22.800 tons/year
Animal corpses	2.300 tons	2.400 tons	2.500 tons
Skin drying paper	240 tons	245 tons	250 tons

Fur skin dressing and dyeing industry	Year 2018	Year 2017	Year 2016
Used sawdust	450 tons/year	420 tons/year	400 tons/year
Sludge (dangerous waste, contains Cr)	220 tons/year	210 tons/year	200 tons/year
Used oils, mainly lanolin	200 tons/year	195 tons/year	190 tons/year
Ash	3.5 tons/year	3.2 tons/year	3 tons/year
Fur shavings	0.4 tons/year	0.3 tons/year	0.2 tons/year



The Approach

The **project Life M3P** aimed to promote a new model of Industrial Symbiosis based on an on-line platform to share waste and technologies in order to go beyond the fieldworks of the single companies and in order to develop matches of Industrial Symbiosis.

The underlying rationale of the development of the activities followed a "progressive deepening" path:



The development of the **M3P Platform** – and at the same time its promotion at the companies through specific workshops, conferences and personalized interviews in order to catalog as much waste as possible – was the core from which two research lines started.

The **first** one, more technological, has identified several matches (possible material demand / supply matches), from which technological feasibility studies have been developed (pilot cases). From the analysis of the pilot cases, **5 business cases** have been developed. One of these has seen the development and even the establishment of a new company. During match investigation, **specific needs about technological applications have been identified to transform scraps or waste**. A plug-in has been realized to search for available technologies.

The **second** research field has experimented, through the creative approach, innovative applications for the waste materials. This activity involved young designers -coming from three of the most-known design schools based in Milan- who created new concepts, using the industrial waste made available by companies on the **M3P platform**. Three different approaches have been used: **design for a circular economy, materials experimentation, possible new business solutions**. The different approaches highlighted the versatility and unpredictability of a design-driven investigation of industrial wastes as new unexpected raw materials.



The M3P Platform

The "Material Match Making Platform" is the key action of M3P Project, since it will allow SMEs of each local network to know **new market possibility for their scraps and waste** or to **find alternatives to the used raw material**. The Platform also allows companies that offer technologies for waste treatment to be registered.

M3P Platform has been designed and planned as a common tool for companies belonging to a cluster, to an industrial area, to an association. Therefore the management of such tool and its relevant services have been designed in order to comply with this scope.

The **M3P Platform** allows companies to fill the lack of **information regarding industrial waste produced** in a local area, through a systematic approach oriented to the **life cycle of the products** and the **supply chain** needed to achieve them.

The M3P Platform is a web-based application designed to facilitate the exchange of information between companies regarding industrial waste and potential solutions. It features a user-friendly interface with a navigation bar at the top and a search function on the left side of the main content area. The platform is currently being tested by partners from various countries, including Italy, Spain, and Portugal, and is intended to help companies find new markets for their waste products and explore alternative uses for discarded materials.



Through a **customizable interface**, the search engine can find any match by waste, technology, project proposal, collaboration opportunity, technology review by guaranteeing the confidentiality of company information.

The **M3P Platform** is based on the **Open 2.0 application**, developed and shared by the Lombardy Region with Open Source GPL3 license, and has been identified as a best practice within the Interreg Europe CircE project of which the Lombardy Region is lead partner.

The platform is **free** of charge, upon registration.

MAIN FEATURES:

- Flexible to access new databases (native and external);
- Dedicated plugin with Science, Research and Technologies database (European Enterprise Network – EEN, etc.);
- Dedicated waste, enterprises and technologies database plugins
- Social plugins to manage community and relations between users;
- Translation tools in different languages;
- Anonymous and strong authentication system to protect privacy of data and users.
- Matching through different search models:
 - Search by Keywords;
 - Search by Tag definition;
 - Advanced search through specific material properties.

From the analysis of the existing platforms and databases, market and outcomes of SWOT Analysis it emerges that

M3P Platform is unique for functions and themes, combining technological and market aspects.

Thanks to **M3P Platform properties**, i.e. matching between waste and technologies and between companies, the main high value added services are:

- R&D regarding technical development of matching activity;
- Secondary raw materials and industrial process testing and characterization;
- Consulting on waste management regulation;
- Consulting on technologies and best practices identification for waste treatment and reuse;
- Drawing up and participation to co-financed projects (i.e. Horizon 2020 – Horizon Europe);
- Activities for development of matches, in particular economic, social and environmental aspects

M3P Platform is an “one-stop shop” for industrial symbiosis services which are characterized by:

- Cross sectoral approach;
- Cross territoriality (both technologies and waste among secondary raw materials of European relevance).

M3P Platform has been published in the first stable release on June 2018. As every platform, **it is dynamic both in contents and technical specifications** with periodical new releases.

It is important to underline that a constant growth in users and registered enterprise has been encountered. Thanks to dissemination activities, the platform is the “recognized” one-stop-shop from many enterprises both from secondary raw materials offering and technological solution to recycle them.

M3P data (october 2019)

288 registered users
186 registered enterprises
362 waste
17 technologies



The Pilot Cases

ITALIAN PILOT CASE - COTTON PAPER

Match Cotton Paper: from cotton powder waste to cotton paper

The actors:

- An Italian weaving and finishing company that produce linings and fabrics.
- An Italian labelling company that produces decorative paper.



The idea

To replace pure cotton cellulose with textile cotton scraps, yarn and powder coming from industrial waste of weaving company giving aesthetic added value to the paper. The value of the paper could also be rised by adding different types of material or waste to water and cellulose (seeds, wood, coffee, sand).

COTTON PAPER

Waste (ton/year)	5
Recycling %	10%
Co ² eq saving (ton)	0.99
Water saving (m ³)	25,000
Raw material saving (ton)	0.70

The match

The waste-owning company has textile powder, yarn and fabric scraps coming from spinning and weaving process. The waste powder mainly has characteristics and aspect already suitable for the application and could be used as it is and substituted directly to the virgin cotton paper without altering the entire process. Eventually it could be necessary a cutting treatment to shorten the fibres. The waste-owning company discards 5 ton each year of cotton powder and send them to landfill (EWC code 04.02.22). The paper factory was able to produce in 2018 1.2 tons of handcraft paper (9344 sheets with 56x76 cm format), reflecting in use of 0.5 ton of recycled material and virgin raw material not used (40%).

The outcome

The final product has fine and precious visual and handtouch characteristics that could increase their market acceptance. The handcraft paper sheets can cut and used as labels.





BELGIAN PILOT CASE - EPDM RUBBER

The Belgian pilot case looks into a business that has a very strong presence on the Belgian market, namely the construction market. Bricks, concrete, pipes, electric wires, ... are all prominently present in a building. The window market is more of a customized market. In some cases there are big projects where a lot of identical windows are produced. Waste production can be optimized here. But most of the time they have inquiries from different customers with different demands.

Currently a **window frame** is available in different kinds of material: different kinds of wood, aluminum and PVC. But this is not the only kind of material used, you also have the iron hinges, the spacers in between the glass plates, different kinds of glue, polyamides, the rubber sealings. For wood, metals and glass there are recycling options enough. **The rubber sealings on the other hand are on this moment the most difficult item to recycle.**

Every window with different sizes needs different lengths of rubber sealings. The waste stream that is produced is mainly the off-cuts of these rubber sealings. Sometimes it happens that there is a production error in the rolls of **EPDM (Ethylene-Propylene Diene Monomer) rubber** which are also discarded directly. Initially they are collected separately which is a huge advantage.



EPDM rubber sealings are a very complex product. It can be treated with different kind of oils, it can have different proportions of Ethylene and Propylene of different colors. This makes it a product that is not wanted by rubber recyclers. They have enough rubber available to recycle coming from the car tire industry. Also this type of rubber is too flexible to shred which gives extra difficulties in recycling machinery.

The input of young designers showed that it is possible to use these offcuts as a filler material into one of the window handles that are also produced on the same production site. Window handles are a product that is necessary to operate windows.

In order to have an easy usage of this EPDM rubber waste it is better to take the more rigid rubber strands (because they are easier to shredder) and shredder them in pieces that are in the range of 2-5 mm long. Put these shredded rubber pieces into the mold of the type of window handle you like and pour some epoxy resin around it. Finally wait for several hours till the reaction of the epoxy resin is completed and remove the mold. **The first circular window handle is born!**

EPDM RUBBER	
Waste (ton/year)	100
Recycling %	100%
Co ² saving (ton)	97,67
Water saving (m ³)	169,77
Raw material saving (ton)	151,16



GREEK PILOT CASE - WOOD WASTE

The first potential matches came as a result from the questionnaires filling. Interconnection between wood industries but also interconnections between wood and fur industries were identified for different unexploited wastes that in most cases are ending up in land filling.

Bark wastes were the first wastes that had a strong potential for match up. **Surplus bark from the wood conversion industries are currently the most perplexing waste problem that wood industries in Western Macedonia are facing.** This is due to severe variations in quality (that are hard to control), high ash content and metals. Bark is the most unused waste and, in some cases, its long-term storage is creating operational and even environmental issues. Other wood wastes like shavings and sawdust were also identified, in many occasions mixed and with variations in quality, moisture and sizes that make it difficult to be properly exploited.



Fur industry on the other hand has two sub-sectors that produce wastes. The fur animal breeding sub-sector has three major wastes: mink manure (also containing soiled straw bedding), the animal carcasses that remain after the extraction of the fur and paper that is used to retrieve the moisture of the fur right after its extraction from the animal. The second sub-sector is the fur processing industry and specifically the fur dressing and dyeing industry. Different kinds of wastes are produced like fur shavings from the skin and weight reduction of the fur,





wood shavings (specialised sawdust) and oils (1/3 lanolin) from the fur treatment, bottom ash from the incineration units and sludge (hazardous waste, contains Cr) from their water treatment facilities.

A **potential match** was identified for the use of the wood shavings. For the treatment of the fur (dressing) a special wood shaving (specific hard wood sawdust with specific size) is imported and used at wood drums for the treatment of the fur. After several "washes" at the drums, different qualities of waste wood shavings are obtained. These waste wood shavings are ranging from "low quality" (wet, fatty with fur impurities) to "almost clean". These are going to land filling at the moment.

A **pellet manufacturing company** was also found through the questionnaires. After the identification of the potential matches a modification of the licence was needed. **DIADYMA** assisted the company throughout the whole procedure in order to transform its licence and became a waste management company for those specific wastes (bark wastes and wood shavings from the fur dressing and dyeing industry). After the licence change two separate contacts were established between the pellet manufacturing company and the two companies: the wood conversion industry (sawmill) and the fur dressing and dyeing industry. **Those contacts were finally successful and led to two different matches and exploitation of those wood wastes for the production of wood pellets and briquettes.**



BARK WASTE		WOOD SHAVINGS	
Waste (ton/year)	500	Waste (ton/year)	200
Recycling %	3%	Recycling %	50%
Co ² eq saving (ton)	14.70	Co ² eq saving (ton)	98
Water saving (m ³)	25.50	Water saving (m ³)	170
Raw material saving (ton)	20.93	Raw material saving (ton)	139.50



SPANISH PILOT CASE - RECYCLED AGGREGATES

CAC Asprocon, on February 19, 2019, organized a joint informative talk with various companies related to construction sector that had shown interest about the evolution of the tool and applicability to their company. This exhibition also included companies from the waste management sector interested about the evolution of the platform.

This meeting was attended by more than **15 construction and civil engineering companies, 4 auxiliary industry companies** and **3 companies related to the environmental services sector**.

After the exposition of the tool, a colloquium / workshop was generated where construction companies expose the problem of waste management, and the capacity of **M3P tool**:

- Very dispersed waste production (construction works) and normally in small individual amounts.
- Diversity of wastes: stony and not stony.
- Complex segregation of the wastes at origin: small space, necessary tools.
- Low value of wastes and recycled products.

RECYCLED AGGREGATES	
Waste (ton/year)	45.000
Recycling %	80%
Co ² saving (ton)	35.280
Water saving (m ³)	61.200
Raw material saving (ton)	50.220

Finally, a simulation of data entry is carried out by the waste producing agents, all included within the CAC.

In this meeting it is agreed to quantify the Asturias construction sector waste production and expose them centralized through the platform, entrusting that work to CAC Asprocon.

As a result of that meeting, a match is done! One of the auxiliary companies, CAC partner "Excavaciones JOSA", dedicated to excavation works together with a waste and container transport company also CAC partner "Contenedores DEVA", and two waste managers, (metal waste manager and urban solid waste manager)- INVALMET and GRIN, initiate talks aiming to search for a centralized solution to this sector's waste.

BIRTH OF A COMPANY

On March 2019, company **Reciclajes Del Cantabrico** borns. The collaboration achieved from an excavation and demolition company, two waste management companies and a waste transport company, gave results. Its aim is the recycling of stony and non-stony wastes from construction sector, through the installation of a recycling plant by separation, cleaning and crushing of CDW, for its transformation to recycled aggregates.

- The volume of CDWs ranges between 2 and 3 kilograms per inhabitant per day (rate higher than household waste) / 720-1.080 kg/inhabitant/ year.
- In Spain at year 2016, around 129 million tons of wastes were generated, from them aprox 35.8 million tons correspond to construction and demolition waste (Eurostat 2018). This assumes a generation rate of 766 kg /inhabitant/ year.
- The percentage of this waste that is currently recycled or reused in Spain is less than 50%, so far from countries like Holland (90%), Belgium (87%) or Denmark (81%). This target reuse rate should be increased to a rate> 70% before end 2020.





The Creative Prototypes

In parallel to the activities needed to implement pilot cases from matches, a specific task to valorise the identified waste materials was foreseen from the start of the initiative: **aspiring product designers attending well-known design schools in Milan have been involved in order to explore and analyse some industrial waste identified thanks to the Life M3P material match platform**, identifying some innovative applications for these unusual raw materials.

Aiming at high quality outputs of this activity, all the design schools present in Milan, undiscussed European heat of the Design community, have been informed about this interesting opportunity to collaborate on a such highly significant topic for the future professionals of product design. To be in line with the academic activities and thus facilitate the inclusion of the proposed activity in the didactic planning, the design schools have been contacted during Autumn 2017 right at the beginning of **Life M3P project**. In March 2018 the activity was officially launched with a dedicated event where representatives of the participating design schools and some of the waste providing companies had the opportunity for a direct exchange.

The challenge to investigate waste materials as a new material source for new applications with a creative approach, was caught by the three major design schools present in Milan, that is: **IED Milano** – Istituto Europeo di Design, **NABA** – Nuova Accademia di Belle Arti and **PoliMi** – Politecnico di Milano, School of Design. Having these three famous design institutions on board permitted to have more than **150 design students** directly contributing to the Life M3P initiative.

A total of 54 waste materials were identified as suitable for the creative exploration by the design students and collected by the M3P consortium partners from companies located in Belgium, Greece, Italy and Spain. Subsequently, two kind of briefs have been produced: a general design brief to guide the young designers in approaching the task and assure the requested outputs, and a brief for each selected waste material to highlight special issues linked to the specific waste material stream. As a result, more than half of the selected waste materials were investigated with a design-driven approach and a multitude of design concepts collected, each of them using industrial wastes as secondary raw materials for different applications in furniture, interior decoration, product design and fashion.

From the large amount of presented design concepts (more than 150), **a total of 19 have been selected by the project consortium to produce the final prototypes providing a tangible result** to the project's effort in disseminating the benefits of industrial symbiosis and implementing concrete tools for a circular economy.





The Impact

A **new circular economy model** proposed by EU aims to reach **sustainable growth** by minimising waste and maintaining the value of **products, materials** and **resources** in the economy for as long as possible.

This model can create jobs in Europe and boost the EU's competitiveness by creating new business opportunities, promoting innovation to give a competitive advantage and fostering more efficient methods of production and consumption. At the same time, the transition will reduce the environmental footprint often associated with economic growth.

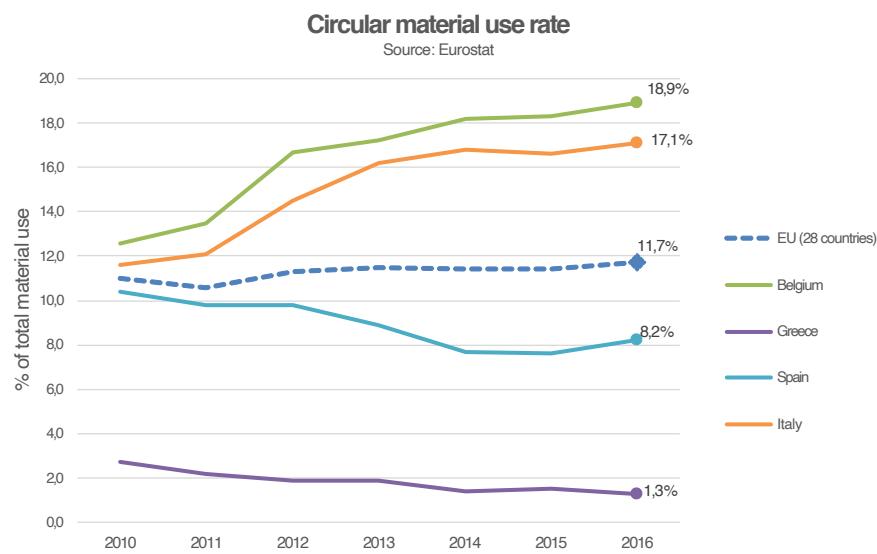
Secondary raw materials represent an interesting European market that can grow and has already shown an upward trend in some countries. The picture shows **CMU indicator** (Circular Material Use rate) that measures the share of material recovered and exploited, thus saving extraction of primary raw materials.

Life M3P project focuses on resource efficiency by matching industrial scraps or waste, secondary raw materials and technologies, to have a new environmentally and economically sustainable way of using materials.

ENVIRONMENTAL IMPACT

During the period **2010-2016** both **Italy** and **Belgium** experienced an upward trend of CMU indicator. In 2016, this indicator reached 18,9% in Belgium and 17,1% in Italy, while in Spain and Greece it touched lower levels (respectively, 8,2% and 1,3%). A higher CMU rate value means that more secondary materials substitute for primary raw materials thus reducing the overall environmental impact.

Life M3P Platform may also play an important role in boosting CMU indicator, facilitating industrial symbiosis and contributing to feed back into the economy industrial waste and secondary raw materials.



² <https://ec.europa.eu/eurostat/web/circular-economy/indicators>



Working on resource efficiency is part of the circular economy. From an environmental point of view this has several advantages. The extraction and production of virgin materials asks for a lot of energy and natural resources. Savings on these virgin materials indirectly leads to saving on energy and greenhouse gas emissions.

Actually, the investigated pilot cases show some figures regarding reducing of waste, CO₂, used industrial water and used virgin materials.

Pilot Case	Waste Recycling (ton/year)	Recycling %	CO ₂ saving (ton/year)	Water saving (m ³ /year)	Raw material saving (ton)
IT1	5	10%	0.99	25,000	0.70
BE1	100	100%	98	169.70	151.16
GR1	500	3%	14.70	25.50	20.93
GR2	200	50%	98	170	139.50
SP1	45,000	80%	35,280	61,200	50,220
Total	47,805		35,492	86,565	50,532

SOCIO-ECONOMIC IMPACT

Flash Euro-barometer underlines that, implementing activities related the circular economy, the European SMEs experienced more difficulties with **complex administrative procedures** (34%) and **costs** to comply the regulations and standards (32%). Over quarter (27%) faced difficulties in accessing finance. Lack of human resources and lack of expertise to implement these activities were felt by 21-22% of companies.

	EU28	Belgium	Greece	Spain	Italy
Lack of human resources	21%	24%	13%	18%	14%
Lack of expertise to implement these activities	22%	24%	19%	30%	15%
Complex administrative or legal procedures	34%	38%	36%	31%	38%
Cost of meeting regulations or standards	32%	39%	18%	31%	30%
Difficulties in accessing finance	27%	15%	45%	30%	33%
Other	3%	1%	2%	2%	4%
None	38%	38%	38%	37%	29%
Don't know	2%	1%	1%	2%	1%



³"Difficulties implementing Circular Economy activities experienced by companies"
https://ec.europa.eu/environment/ecoap/indicators/business-operations_en



The **M3P Platform** can help companies overcome the difficulties related to the "Lack of expertise" and "Complex administrative or legal procedures" (first problem in EU media with peaks of 38 % in Belgium and Italy and 36% in Greece).

Several types of companies did take part to **Life M3P project** to take a look at their own business models, production processes or waste streams. These ranges from non-profit organisations to SME's and multinationals. According to **Life M3P** experience, micro and small enterprises – specially handcraft companies – are sensible to circular economy approach.

For these companies, it is possible to underline the following facts:

- handcrafted jobs were disappearing;
- waste recycling can have easier approach in little batch and flexible production;
- large industries have strong difficulties to introduce recovered waste in industrial production process;
- traditional production works in a niche market with high added values.

Life M3P project can deliver a higher resource efficiency and even extra jobs creation when a standard/linear business model is turned into a circular business model.



POLICIES RECOMMENDATIONS

Waste legislation

Good waste management implementation by Member States maximises the opportunities for companies to use Europe's waste streams and minimises landfilling.

Companies also point to the lack of predictable and reliable policy frameworks at national level for long-term investment decisions. Others state that there is not a uniform application of EU legislation across different regions and countries concerning material reuse and end-of-waste, leading to difficulties and barriers from a managerial and operational point of view.

Secondary raw materials

In order to maximise the value of our resources, the circular economy priority from a business perspective is to



develop a market for quality secondary raw materials and circular products. This will require both supply- and demand-side measures, including a much stronger engagement by consumers. Many companies show a large willingness to move forward and become even more circular, but identify barriers and untapped opportunities to create such a market.

The development of a market for secondary raw materials is still hindered by a number of factors, such as the availability of materials of sufficient quality, the lack of waste management infrastructure and the cost of these materials.

The interface between raw materials, products and waste legislation should be improved.

Tools for Industrial Symbiosis and Circular Economy

At this moment the circular economy is really getting into an accelerating process. Different platforms for materials are trying to make their way to the market. But so far it has felt like all these platforms do not have the capability to maintain their existence without governmental support/subsidies.

The subsidies until now were a very interesting instrument to start up all these ideas/platforms but the projects did not focus enough on the afterlife of such systems. Some of them probably died a silent death, some still exist in smaller communities. They have experienced the advantage of a local platform and keep it functional with their own money. Focussing on the afterlife of such platforms in future projects is strongly suggested towards policymakers. This self-sustaining aspect of the platforms is very important to keep it up and running. Business models of these platforms must be investigated so that circular platforms become financially independent.

Making a sustainable business case out of this will not be the biggest problem. On the other hand, reliability of the inputs on the platform could be seen as a weakness. When there is nothing wrong with the waste streams it is no problem. Controlling the resources available should be a standard procedure. But if there is a polluted waste stream and this pollution is not mentioned some people could be exposed at some risks. To avoid situations like these it could be interesting to link a certain universal quality label to a certain waste product. In this case, the 'buyer' of this resource has a guarantee on the quality of the bought product.

Another aspect about material databases is that there are several approaches to organise something like this. For example, it could be interesting to organise these platforms by cluster organisations. Obviously, the building industry has totally different kinds of waste than the chemical industry for instance. This can be taken into account for future platform developments.

The geographical part is also an important side of the story. Of course it is also important to share your resources more locally but some products just have the need of a wider transportation. That is why we would suggest to look more into an overall European platform, where the data coming from each region, sector, ... can be integrated in this overarching platform. The focus on search engines that can work with different inputs coming from different databases would be a very powerful tool.

End-of-Waste: the Italian case

"Zero Waste" goal today could not only be a cultural horizon, but a technological possibility which may give strength and competitiveness to the Italian economy.

Unfortunately, from another point of view, waste recovery in Italy still represents a complicated and intricate system.



The cycle of waste processing is in a critical situation due to the stop of authorizations of "end of waste" status on a "case by case" basis and the situation is getting worse, since the Law 55/2019 came into force.

A sentence of the State Council dated 28th February 2018 has effectively paralyzed the waste recycling operations because it has established that the regions cannot issue the pertinent authorizations in the absence of a state or European regulation that expressly provides for it.

The Law 55/2019 did not resolve the stalemate on the subject safeguarding only the types and the few recycling activities provided for and regulated by dated government regulations, thus excluding those that have been developed in over 20 years - which are the most of them - and therefore the most innovative and safeguarding processes and technologies for recycling and protecting the environment and health, as well as the most competitive for Italian economy, a net importer of raw materials from abroad.

The impossibility to develop new recycling streams prevents the transition towards the circular economy and obliges to use landfill sites or incineration for waste, even if they could be potentially recycled; this results in an increase of costs for industries and citizens. It is urgent a legislative intervention that gives back Regions the competence to authorize the end-of-waste status on a "case by case" basis, that is correct in law.

Wood Waste: the Greek case

Circular woody economy and the utilisation of wood waste could contribute further in achieving those SDGs and, notably, contribute to the CO₂ emissions reduction and, thus, to climate neutrality EU goal by 2050. After all, the impact of improper disposal or land filling of waste wood on the environment affects both the aquatic and terrestrial ecosystems. The exploitation of these wood wastes and residues will reduce the pressure on forests, improve the environment, create wealth and employment in local areas. Major sources of environmental impacts occur throughout the wood supply chain. Utilisation of most of the available waste wood and proper wood waste management can minimise those impacts. Moreover, there needs to be proper policy support to promote the concept of industrial symbiosis in wood sector with effective coordination and collaboration among relevant stakeholders. That collaborative work will not only help reduce the environmental footprint of wood related industries, but also will improve the local socio-economic figures and enhance the industry competitiveness.

Specific policy support systems could enhance the waste wood utilisation such as feed-in tariffs schemes for electricity and/or heat production, quota obligations and tax breaks.

Furthermore, a stable economic environment is needed that will clearly state whether subsidies are only temporarily or not, and if so, how and when they will be (gradually) reduced.





Dissemination

The communication activities were carried out in parallel and in line with the technical activities.

On the basis of the foreseen target groups, the partners organized "customized" events in order to involve them in the activities planned in the project.

COMPANIES

As regards the involvement of the companies, partners organized meetings, seminars and practical workshops, during which the entrepreneurs and the technicians had to actively participate to round-tables and discuss each other about their wastes, scraps and technologies.





YOUNG DESIGNERS

They are reached through the involvement of **3 design high schools**. Launching events were organized with the participation of the students and the representatives of the companies that provided wastes and scraps for the activities to be done.



OTHER STAKEHOLDERS

Public authorities, technical experts, R&D centres, etc., have been involved to participate to workshops, symposia, fairs, conferences especially dedicated to the Circular Economy subject.



REPLICATION

The M3P Platform has been adopted in two other European projects:

- **ENTeR** - Expert Network on Textile Recycling (CE 1136 – Central Europe Programme)
- **DigiPrime** - Digital Platform for Circular Economy in Cross-sectorial Sustainable Value Networks (GA 873111 – Horizon 2020)



MAIN EVENTS

- Textile ETP Annual Conference, Bruxelles, 30th-31rd March 2017
- Poster at 5th Panhellenic Conference Green Chemistry and Sustainable Development, Patra 20th-22nd October 2017
- Speech at International Exhibition Ecomondo 2018, Rimini, 8th November 2018
- Workshop: "L'economia circolare che ispira: come nascono nuovi prodotti e processi industriali", Gallarate 22nd March 2019
- Poster M3P@Smart City, event-exhibition during 'Milan Digital Week' and 'Milan Design Week', Milan 13th March - 13th April 2019
- Speech at 22nd European Forum on Eco-innovation: Closing the Loop – delivering circularity in the textiles sector, Vienna, 7th - 8th May 2019
- Speech at "Jornada Construcción 4.0", Gijón 6th June 2019
- Speech at 7th International Conference on Sustainable Solid Waste Management, Heraklion 26th June 2019

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a new
beginning

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