DELIVERABLE D.1.1.5 "ANALYSIS OF PAPER-PLASTIC VALUE CHAIN AND INNOVATION SYSTEM"

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OVERWIEW OF PACKAGING GLOBAL TRENDS

Due to changes in life style, ageing of population, concern regarding food waste, packaging shows a growing relevance in our daily life. The global packaging market increased by 6.8% in value terms since 2013. Although much of this growth has recently come from the world's less developed regions, also in Europe trends like the spreading of the e-commerce industry, single doses food packaging and food delivery are affecting the packaging value chain. All these trends affect in a way or another the possibility to collect and treat properly the packaging waste.

Nowadays, particularly in Europe, sustainability and food safety concerns are important drivers of the sector, leading to higher rates of activity in areas such as reusing, reconditioning and recycling. Looking ahead, these are key challenges for packaging manufacturers to address the sustainability concerns now affecting the industry.

Features such **as recyclability and compostability are suppose to becoming an essential attributes while at the same time developing packaging capable of offering the traditional benefits** of safety and protection. Besides, developing packaging for different applications is also likely to assume increased importance, with a 'one size fits all' approach becoming steadily less relevant, in this context, **specific design for different product end of life will also gain importance**.

FOOD PACKAGING

In packaging food applications represent the leading segment within the consumer packaging sector, accounting for over 28% of worldwide sales in 2018 across all packaging markets. **Paperboard remains the most widely used material within the global packaging market**, accounting for a value share of more than 35% in 2018. Demand within the sector remains high, owing to the widespread global presence of formats such as folding and liquid cartons and corrugated packaging, as well as paperboard's suitability for many secondary packaging applications. **Paperboard packaging continues to benefit from strong sustainability credentials** – such as high recycling rates and the widespread use of accreditation schemes such as the Forestry Stewardship Council (FSC) – as well as the emergence of more opportunities within sectors such as foodservice, e-commerce and luxury packaging. Paperboard is increasing its share of the global foodservice packaging industry at the expense of plastic (products such as cartons and clamshells).

In the last couple of decades **changing of demographic patterns** have strongly affected the composition of households in Western Europe where the concentration of single-person households has grown around 30% in 10 years. This has a major bearing on the packaging industry, since it affects the way people shop for groceries and other consumer goods. Furthermore, **a substantial change to less formal eating patterns among consumers has caused a higher demand for street food** options **and food delivery in European countries**. This trend has been addressed by a variety of operators, ranging from supermarkets and convenience stores to bakeries and fast food restaurants. Many in the industry expect the trend towards eating on the go to continue driving demand for smaller and more portable packaging formats. Supermarkets have been one of the major contributor towards the expansion of this sector.

SUSTAINABILITY AND REGULATION

Sustainability issues are having a profound effect on regulatory activity. In this field, Europe appears to be at the forefront of much of the current regulatory activity via legislation such as the Packaging Waste Directive. EU first introduced measures aimed at limiting packaging waste in the early 1980s, it was not until the 1990s that to some extent harmonization was defined in Directive 94/62/CE, aimed at reducing the impact of packaging and packaging waste on the environment. The Directive was amended in 2004 to provide criteria aimed at clarifying the definition of the term 'packaging', as well as increasing targets for the recovery and recycling of packaging waste. Several more amendments have taken place since then, most recently in April 2015. The main aim of this amendment was to reduce consumption of lightweight plastic carrier bags across the EU region. Member states were given the option of ensuring annual consumption levels did not exceed certain levels stipulated by the Directive, or to adopt measures ensuring that lightweight plastic carrier bags are not provided free of charge at the point of sale of goods or products, or a combination of the two.
Recently, in May 2018, the EC adopted new waste management rules (852/2108/EU), which set down legally binding recycling targets for the EU28 region. These included targets for both 2025 and 2030, as part of the Council's aim of moving towards a more circular economy (see table below)

TABLE 3.1 New EU recycling targets for packaging materials, 2025–30 (%)

	By 2025	By 2030
All packaging	65%	70%
Plastic	50%	55%
Wood	25%	30%
Glass	70%	75%
Paper and cardboard	75%	85%
Ferrous metals	70%	80%
Aluminium	50%	60%

Source: European Commission

The plastics packaging sector is likely to face the greatest pressure in terms of recyclability and recycled content within its products. At present, the industry is making greater efforts to increase the recyclability of plastics packaging, in line with consumer and regulatory demands. Recycling rates, however, are lagging for flexible plastics in many parts of the world, although this situation may change given the growing emphasis on the circular economy.

The paper and board packaging sector is currently in a much better situation, a figure of around 80% is estimated for Western European countries such as Italy, Germany and UK, although this is even higher in both Austria and Belgium, at nearer to 90%. Lower rates are apparent in Eastern Europe, owing to a lack of adequate recycling infrastructure.

BIOGRADABLE/COMPOSTABLE PACKAGING

Lately, linked to sustainability agenda, interest in forms of biodegradable or compostable packaging has grown. To date, however, limits in the technology available and costs have prevented large-scale commercialization of packaging fulfilling the criteria. Nevertheless, interest in biodegradable and compostable formats is expected to persist for the foreseeable future, driven by the greater interest in the lifecycle of packaging. However, the sector faces not only technological challenges but also suitable communication strategies to avoid encouraging consumers to ‘waste’ packaging since it is “biodegradable”. According to Smithers Pira the future development of the biodegradable/compostable sector is likely to focus on specific types of packaging, such as tea bags and coffee capsules, which would drag into composting plant not only the packaging material but also organic components with greater fertilization value.

On a broader scale, demand for biodegradable and compostable plastics has been boosted by legislation banning products such as plastic bags in the EU, the US and China. Data from Smithers Pira indicates that packaging applications now account for

60% of global production of bioplastics, with volume sales forecast to increase from 787,000 tons in 2015 to more than 2 million tons by 2020. However, within this market, the non-biodegradables sector has been the most dynamic in recent years, having recently overtaken biodegradable products. As can be seen in the table below, although both biodegradable and non-biodegradable bioplastics are expected to grow the outlook is higher for non-biodegradable biobased bioplastic.

TABLE 3.2 Global bioplastics packaging consumption by material type, 2015–20 ('000 tonnes)

	2015	2020f	CAGR (%)
Total non-biodegradables	465	1,453	26
Bio-PET	214	794	30
Bio-PE/PP	251	618	20
Bio-PEF	0	41	n/a
Total biodegradables	**322**	**586**	**13**
PLA	132	264	15
PHA	13	26	15
Aliphatic-aromatic polyesters	61	111	13
Cellulose acetate	13	17	5
Starch	74	110	8
Others (e.g. compounds)	29	59	15
Total	**787**	**2,040**	**15**

Source: Smithers Pira

Despite the challenges the sector faces, manufacturers have been developing biodegradable and compostable packaging products, with innovation expected to continue. There has been considerable activity within the coffee cups sector, due to concerns over the number that typically end up in landfill sites. The Butterfly Cup was recently developed as an alternative takeaway coffee cup in Ireland: this uses BioPBS instead of plastic and is therefore biodegradable. Meanwhile, Spar Ireland has switched to 100% compostable and fully biodegradable coffee cups for its Spar and Eurospar stores, which carry PEFC certification and use raw materials from plant sources Compostable Paper/PLA cups for hot liquids are available in Italy from Ecozema in all range of sizes, as well as Paper/PLA cold cups and paper water cones. Compostable and recyclable paper/biopolymer coated trays from Cartonspecialist are also available in Italy for catering services. Innovations such as micro-fibrillated cellulose (MFC) by companies such as Stora Enso raise the possibility of developing biodegradable barrier films which could potentially replace aluminium foil in liquid cartons..

Greater demand for biodegradable packaging has also led to the use of more novel and unusual materials. In the UK, a pizza restaurant in Southend has trialled new transparent pouch packaging made from seaweed, which is biodegradable in six weeks, for its ketchup and dipping sauces. This was developed by start-up company Skipping Rocks Lab and should be launched later in 2018 (source: Smithers report)

WESTERN AND EASTERN EUROPE PACKAGING MARKET

Western Europe has the world's third largest regional packaging market. Sales of packaging in many of its largest countries – i.e. Germany, France, Italy and the UK – remain considerable, even though many of these markets are highly mature and therefore displaying little significant growth. Demand for packaging from industries such as food, beverages, cosmetics and pharmaceuticals remains high in this part of the world. Furthermore, Western Europe is also home to several of the world's leading packaging suppliers, while it also has a well-developed regulatory environment. This continues to influence the packaging industry to a significant degree.

The Eastern European packaging market remains considerably smaller than its Western European counterpart. Income levels and consumer spending are lower in this part of Europe, while penetration of modern grocery channels and the Internet also trails Western Europe. Sales of packaging in Eastern Europe amounted to $52.52 billion in 2018. Although value sales have declined by almost 14% from levels in 2013, sales should increase by a CAGR of 3.7% between 2018 and 2023, although much of this is likely to depend upon how the political climate affects economic growth in countries such as Russia. The region currently accounts for 5.8% of the global packaging market by value, a figure expected to increase to 6.2% by 2028. All material sectors of the Eastern European packaging market experienced a decline in value sales between 2013 and 2017. The market's largest sector is paper and board packaging, sales of which amounted to $19.34 billion in 2018. This equates to almost 37% of the overall market, although this figure is forecast to shrink to 35.1% by 2028.

In recent years, some countries within the region have experienced steady economic growth – with Poland one notable example. According to the information provided by the Polish Chamber of Packaging, the Polish market is growing at a rate of about 7% annually. The Polish market of the broadly sensed packaging is estimated to be worth roughly 33.5 billion zlotys.

According to the Equity Advisors advisory firm, the Polish packaging market will continue to grow dynamically until 2020 at a rate of around 7% a year, eventually reaching 46 billion zlotys.

The main driver of the increased number of packaging production in Poland will be an increased consumption, caused by the constant enrichment of the society (in 2016, consumption growth amounted to 3.6% year-on-year). The increase in the consumption of products and the use of ever smaller volumes / masses of packaged food products and the continuous development of distance sales will result in even greater usage of packaging. According to e-commerce forecasts, Poland will grow almost at the same pace as the packaging industry, only slightly ahead of the growth dynamics of the latter.

MULTIMATERIAL PAPER BASED PACKAGING VALUE CHAIN IN CENTRAL EUROPE

With respect to multi-material packaging products, in the region addressed by the project, Italy and Poland are by far the greatest markets. According to the official sources, in Italy 139.000 tons (2016) of rigid paper-based multi-material containers were placed on the market, whereas the total multi-material packaging in Polish market in 2014 was set at 90.000 tons. By contrast, in Slovenia only 1047 tons of composite packaging were generated in 2016. The main multi-material packaging introduced on the market are packaging with a dominant share of paper and cardboard (i.e. cardboard base for beverages, and coated flexible papers). In Poland their share in the stream of multi-material packaging is estimated to be around 82% (Fig.1) in Italy and the other countries is likely very similar. The statistics are mostly related to rigid packaging for beverages which is by far the predominant application in terms of volumes. According to Italian Packaging Institute, approximately 80% of the rigid paper based multi-material containers are for beverage applications. However, there is good potential for expanding the market beyond this sector in the future.

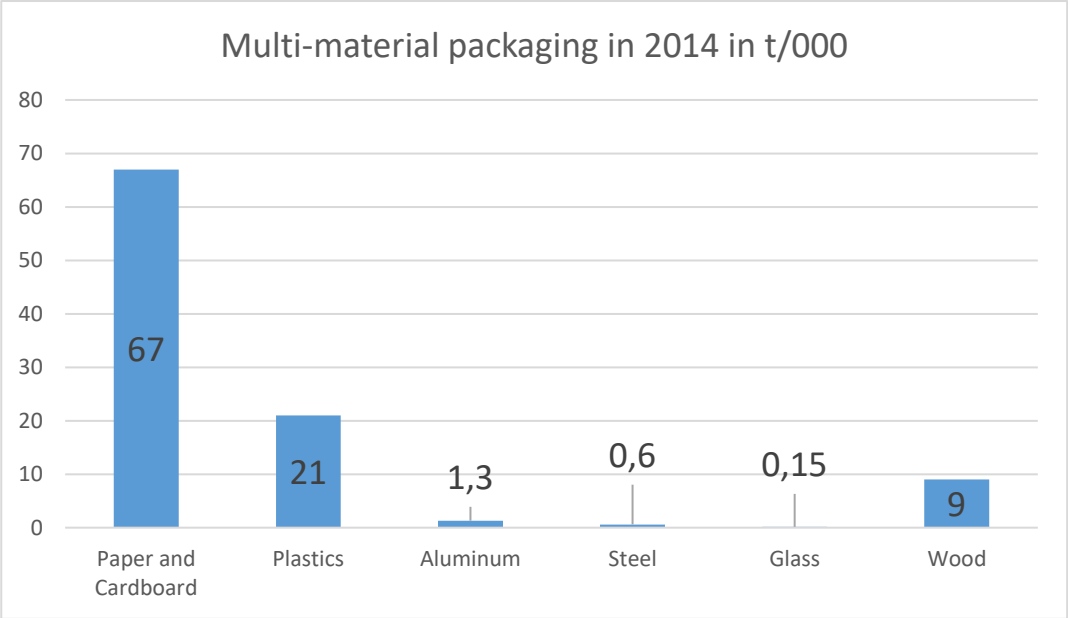

Fig.1. Polish multi-material packaging market share in 2014 in terms of mass

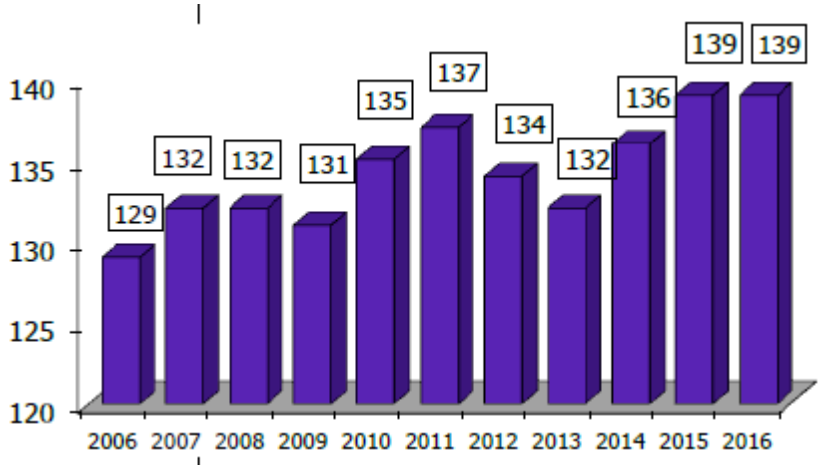

Fig.2. Evolution of rigid paper based multi-material containers (value in t/000) on the Italian market. (source: Institute of Italian Packaging)

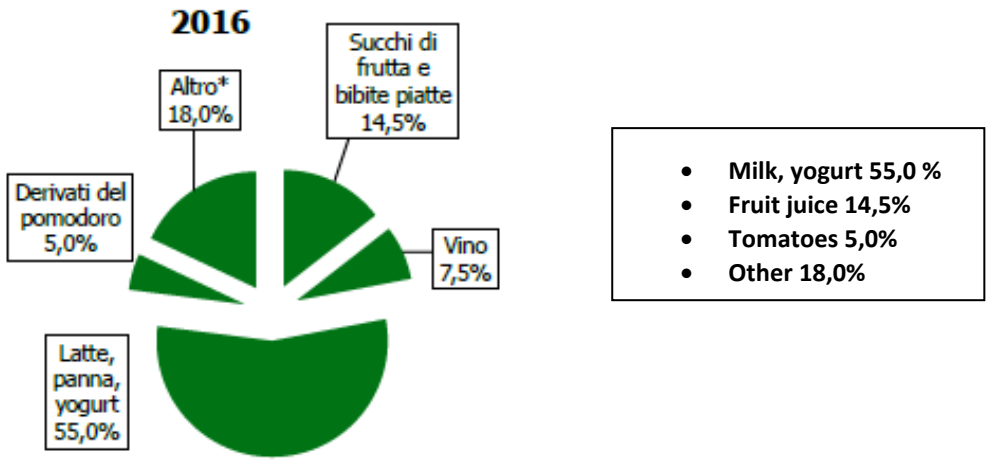

Fig. 3. Market segmentation of rigid paper based multi-material containers on the Italian market. (source: Institute of Italian Packaging).

In Italy the multi-material cellulose-based packaging represents approximately only 3-4 % of the total paper based packaging produced in the country. This calculation takes into account rigid multi-material products such as milk containers as well an estimation of the share of flexible multi-material packaging made of paper/plastic. Multimaterial papers and products are the production domain of the paper value chain. Plastics converters do not produce such products. So the most important industry for this sector is the paper industry. Besides beverage cartons, multimaterial products are mainly used in flexible packaging, especially in retail (e.g. large quantities of windowed paper bags) and for food stuffs where they serve to display, protect and preserve the product. Other less specific and very varied products are also packaged in combined materials (pharmaceuticals, batteries ...). Products mainly consist of laminated or extruded plastic polymers on papers for print, packaging or other products and of packaging and other products with added barriers, windows, plastic envelopes etc.

PAPER –BIOPLASTIC VALUE CHAIN ANALYSIS IN CE

Paper packaging production is present in all countries, while bioplastic production is set only in Italy. Among the countries addressed in the project, Italy is therefore the only one where all actors of the value chain are present, from material producers (paper and bioplastic) to packaging converters, collectors, and recycling facilities. In all others, bioplastic production is not located on the territory and recycling facilities (advanced recycling paper mills treating multi-material products and composting accepting bioplastic) are limited or under development.

Currently, the availability of bioplastic raw material it is not a major constrain due to the fact that applications are still limited and the raw material is commercially available through imports. On the contrary the small number paper-bioplastics packaging converters which are not present in some countries like Slovenia may become an issue at local level in shorter period. Even in Italy, in contrast with the growing demand there are relatively few companies dealing with paper-bioplastics packaging converting especially for extrusion coating while lamination is more common. Large converters are still focused on conventional plastic and do not produce constantly the material due to occasional orders from retailers. In Hungary, Slovakia and Croatia there are already some players among converters and some new investments are expected in a relatively short term period.

CURRENT MARKET IN CE

In Poland, it is difficult to talk about a market for products made of biodegradable plastics or packaging made from the bioplastics market and biocomposites before 2016. There are numerous marketing activities aimed at showing the advantages of this type of products, mainly in the ecological aspect, but their sale rate is still very modest. In Slovenia there is no market developed for the paper-bioplastic packaging products yet, nevertheless, it has a good potential to develop as demand for such products is rising. All the players involved in the value chain of the paper-bioplastic packaging are already well represented, the only question is, how and when they will get started with new products business and trading. The market appears still very limited in Hungary, Slovakia and Croatia although interest of several stakeholders is driven by global trends and will likely facilitate the development in the near future.

INNOVATION SYSTEM

Innovation in this sector is taking place in many CE countries although the market is restricted by higher cost of biobased and/or biodegradable plastic. In Italy, Novamont, one of the global players in the field of biodegradable plastic is expanding production as well as entering in new fields of application beyond the classical shopping bags and mulching sheets. Furthermore, some large companies such as Burgo group, Seda and Medac have developed facilities for paper extrusion coating of bioplastic. Several SMs converters are developing new products in this field, among them, (i) Ecozema besides PLA products produces compostable Paper/Mater-bi cups for cold beverages, paper/PLA cups for hot beverage and paper-based plates as well (ii) Cartonspecialist

has developed an interesting line of compostable and recyclable paper/biopolymer coated products (BioPAP®RE) for street food, retail and catering services. Paper based trays are suitable for freezer, microwave and reheating at 175°C up to one hour.

Fig.4. Examples of available compostable and recyclable paper based products on the Italian market.

In Hungary, with the aim to produce PLA, 6 years ago Nitrokémia Zrt. planned to set up a bio-refinery in its factory site, in Balatonfűzfő within a Hungarian-Chinese joint venture. The capacity was planned for 80.000 tons per year and the costs of investment was budgeted for HUF 40 million. However, the project has not been implemented yet. On the other hand there are global players as Burger King Magyarország open for environmentally friendly products on the domestic market. Coated paper cups are currently purchased from abroad. The operator of Burger King Magyarország has provided their forecasted demand of paper cups by 2018 that means about 10 million pieces of paper cups. On average a paper cup weights 14 g and a 7-9% PLA coating might be applied, that means 1,12 g/cup on average. The annual PLA usage by Burger King, in case of coating 9,5 million pieces of paper cups means approx. 10,6 tons of PLA.

In Croatia, there are two major companies at the market that produce biodegradable films and foils, EcoCortec in Beli Manastir and Weltplast in Odra / Zagreb. In its production program, Eco Cortec offers products based on three types of biodegradable polymers – PLA, PHA and fossil-based biodegradable polymer, while Weltplast works with BASF biodegradable polymers. EcoCortec and University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture have been involved in the CIP Eco-innovation project, funded by the European Union – MarineClean (Marine debris removal and preventing further litter entry), with the scope of developing plastic packaging material, degradable in seawater.

In Slovakia the company PANARA a.s. entered into bioplastics area since 2006 with the goal to develop biodegradable- bio based blends for different types of plastic processing. Strong

partnership with Slovak university of technology escalated into common excellent and unique Centre called CEPOMA (Center for Applied Research of environmentally friendly polymeric materials) which is technological and technical base for research and development activities connected with new biodegradable and bio based blends. Presently there is no bioplastic production, however, the company PANARA s.r.o. will realize in 2018 the construction of production units of these materials in the SR with an initial capacity of 1.2 kt/year and after running the production unit plans to expand production capacity to a minimum of 40 kt/year.

Presently, in Poland there are no producers of biopolymers. However, three companies have biocomposite products in their offer, though they are not widely used yet and have a small share in the packaging market. On the Polish market there are products from this group made of paper (paper, cardboard or cardboard), laminated with NatureFlex cellulose film (paper plates, various types of cardboard boxes). In addition to aqueous glue and paints, they consist entirely of cellulose-derived materials. The SILBO company offer was recently presented during the Warsaw Pack Fair (as part of the Polish Chamber of Packaging showroom), during which the BIOCOMPACK-CE project was also introduced.

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Fig. 5. 100% biodegradable paper plates laminated with NatureFlex cellulose foil and the SILBO company offer during the Warsaw Pack Fair.

RECYCLING AND COMPOSTING INFRASTRUCTURES

Paper products show the highest recycling rate in Europe while biodegradable bioplastic is normally collected with organic waste for being treated in composting plants. In contrast, multi-material products still represent a relevant issue because of their low level of recyclability in standard recycling mills and therefore often they are still sent to thermo-valorization or even to landfills. In order to develop the concept of circular economy and comply with new EU strategies and legislation the most relevant recycling infrastructures with regards to multi-material products made of paper and bioplastics are paper recycling mills and composting plants.

In a general context, multi-material products should be design to facilitate recycling operations both in standard paper mills and in specialized paper mills. In Italy as results of a previous CE project (EcoPaperLoop) a national standard for assessing the recyclability is under development and expected to be finally approved in the beginning of 2019. Currently the methodology has already been agreed within the paper value chain and it is available through the Technical Association of the Italian Paper Industry (www.aticelca.it) thus contributing to proper development of recycling oriented eco-design.

In Italy there are over 50 paper recycling mills, however only two of them with specific equipment for treating multi-material paper-based products. In all other countries paper mills are present with good capacity but without the possibility to treat properly multi-material paper based products. The further development of product eco-design, proper collection systems and advanced recycling infrastructures are key strategies for enhancing the recycling rate of multimaterial paper based products. In short and medium term the following priorities are seen in the value chain:

- Ecodesign of multi-materials
    - Using scientific approach based on laboratory assessment of recyclability
- Collection
    - Improve domestic separation and start collection of street food packaging
- Sorting of multi-materials
    - Improving automation and infrastructures
- Improving recycling infrastructures

- Increase investments in new infrastructure and machinery

During discussion in national workshops, especially in Italy, it has been pointed out that multi-material predominantly made of paper, when clean should be recycled in specialized paper mills to keep the fibers within the loop and favoring circular economy. In Northern Italy two specialized paper mills already recycle pre and post-consumers beverage cartons making new products (paper sacks and toilet paper) and few others have invested in more advanced equipment for cleaning domestic collection. Apparently, from laboratory data there is not a great difference in the recyclability behavior of paper based products laminated with conventional plastic or biodegradable plastic on the market.

In Poland there are 10 main paper recycling mills which have 78% market share in Polish market, plus many smaller ones that account for the rest, but the number is too difficult to estimate

In Hungary there is one large and five smaller paper mills. The large one, Hamburger Hungária Ltd, it is the member of the Austrian Prinzhorn Group and produces paper by the recycling of the waste paper-corrugated sheet, its annual capacity is about 600.000 tons. The main raw material is the waste paper-corrugated sheet but there is not enough quantity in Hungary therefore producers need to import. The Hamburger Hungária Ltd's paper recycing technology is not suited for handling of drinks carton or other paper products which are combined with plastic in huge volume. There is not any information about it from the other producers. At present waste bales of drink cartons are taken to Austria. In Slovenia recycling of waste packaging increased by 6 % and reached 67 % in 2015. In 2015, 235.000 tons of paper were recovered and the recycling rate was estimated at 64 %. Slovenian largest paper recyclers are Vipap Videm Krško, d.d. and Količevo Karton, d.o.o. The problematic materials that currently can't suitably be sort or recycle retain in cycles of use or processing, and this way inhibiting a successful progress of the domestic economy. Paper-plastics packaging products are also representing a recycling challenge.

Compostable infrastructures are present to a different extent in all countries. In Italy the composting sector has been growing significantly (Fig. 6), currently, there are 352 composting plants, among them 52 are integrated with anaerobic digestors producing biogas. Due to the fact that compostable bioplastic bags for organic collection have been available for long time and

compostable shopping bags are mandatory since few years ago most of the infrastructures accept bioplastic and are equipped for screening of conventional plastic contaminants. Even though legislation on bioplastic shopping bags has been effective for long time conventional plastic represents a serious matter, presently only 31.7% of plastic entering the plants is bioplastic the remaining is conventional plastic that must be screened off (Fig.7).

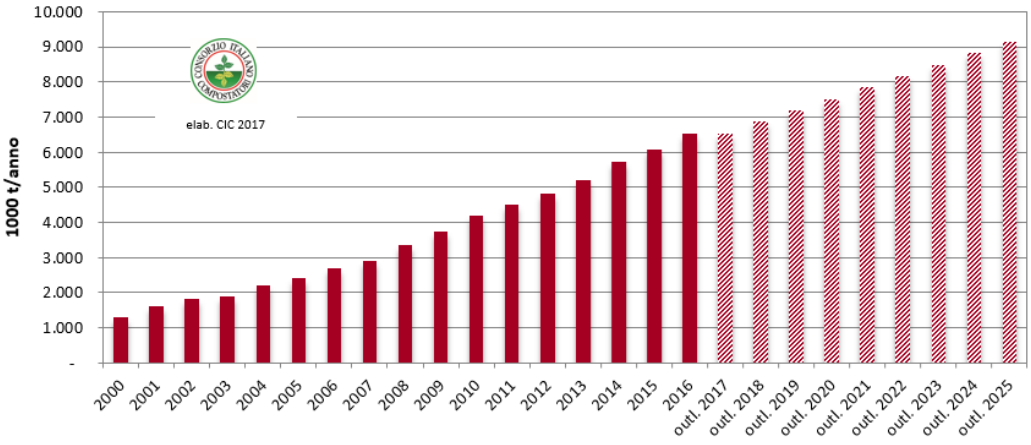

Fig. 6. Growth of composting sector in Italy in the last 15 years and forecast to 2025 (source: Association of Italian composting plants- CIC)

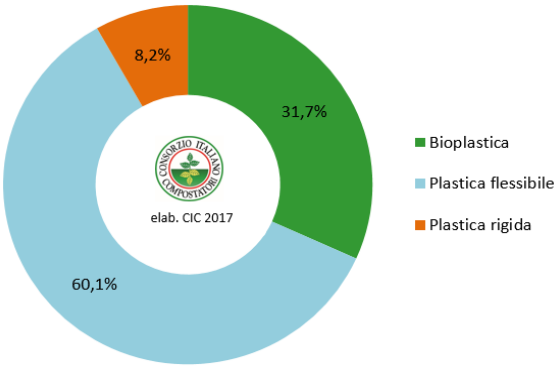

Fig. 7. Composition of plastic contaminants in composting plants (source: Association of Italian composting plants- CIC).

The composting sector is well developed in Slovenia. The trend of composted bio-waste is directing to the increasing quantities, 284.914 tons of waste were processed in 2016. The population sees bio-waste as a source of income by turning it into a new product with market potential. Such treatment of waste is

extremely positive in the environmental sense, as it produces new usable raw materials and at the same time reduces the pressure on the waste landfills by disposal. In Slovenia there are 22 processors of biodegradable waste to compost that are registered and have an environmental permit compliant to Article 68 or 82 of the Environmental Protection Act. These numbers place the country in good position as far as the development of biodegradable compostable products is concern. Similarly, in Slovakia 357.000 tons of biowaste were processed in 2016, however the authorities estimate a potential capacity up to 915.000 tonnes that will further increase to 1.292.000 tons within 2020.

In Poland composting plants are currently in technical modernization. According to 2016 data there are 10 composting plants which are technologically ready to receive bioplastics, and over 100 are in development and probably ready for bioplastics processing within 2-5 years. In addition to that there are many hundreds very small composting plants that are suitable just for green waste such as grass, leaves and branches.

As far as aerobic compost sector in Hungary there are several companies, such as the Főkert in Budapest, the Szegedi Környezetgazdálkodási Nonprofit Kft. in Szeged, which have these kind of services. Furthermore exists a biowaste management company – PROFIKOMP- who installs such systems. Mostly not for biodegradable plastics but the opportunity is given in the future in Hungary.

CONCLUSIONS AND PERSPECTIVES

The current status of the packaging value chain in the region was analyzed and shortly described. Based on the above reported global trends and local status a preliminary overall picture can be summarized in the following main points

Paper industry is well developed in all countries, however only in Italy there are few advanced paper recycling mills with the possibility to treat efficiently multi-material paper based composites.

Italy is the only country producing Bioplastic raw material with one global player (Novamont) producing mainly modified thermoplastic starch (TPS) and a smaller ones, Bio-on producing polyhydroxyalcanoates (PHAs). Additionally, there are some potential investments in Slovakia and Hungary foreseen in the next years. Anyway, raw material is available from other Western Europe suppliers located mainly in Germany, UK and Netherland.

Converting facilities is a key point that may represent a constrain in the value chain. Paper and bioplastic monomaterials' converters are widely distributed, on the contrary, large converters extruding or laminating paper on a daily basis with conventional plastic have difficulty to cope with occasional orders for paper/bioplastic products.

In recent years the innovation system has grown from placing on the market several new bio-based or biodegradable compostable paper/bioplastic products for many packaging applications. The main

hindrance is still the cost in comparison to conventional solutions, nevertheless, the innovation is often driven by global players and large retailers asking for more sustainable products. At local level there are also interesting examples of the use of compostable single use products in catering service for schools based on the calculation of environmental and social costs.

Paper/bioplastic composites have basically two sustainable end of life options: (i) recycling in the paper stream, since the majority of the products is made with approximately 80% of paper, OR (ii) organic recycling in composting plants. Both options are possible for recycling whereas compostability is possible only when a biodegradable/compostable polymer is laminated or extruded with paper.

In general stakeholders would prefer recyclability which is also more reasonable for the life cycle perspective of the fibers. Paper Industry claim a greater sustainability for the recovery of the material instead of biodegradation in compost, on the other hand composting plants are normally willing to accept compostable packaging when it drags some additional nutrients (e.g. leftover food). These feedbacks already state some general indication.

Based on the above stated considerations a suitable strategy will be developed during the next steps of the project.