DELIVERABLE D.T1.1.4 "ANALYSIS OF PAPER-PLASTIC VALUE CHAIN AND INNOVATION SYSTEM IN SLOVENIA"

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FOREWORD - COUNTRY CONTEXT

Slovenia is a small country with a highly diversified economy, which is dominated by small and medium companies and a smaller number of large companies. Due to the small domestic market even medium companies, especially if operating in niches, export a significant part of their production. Slovenia's export is mainly oriented towards other EU countries, mainly Germany, Austria, Italy and France but also further afield. A consequence of high exports even in smaller enterprises are very active contacts with players in other economies, integration in international value chains and an understanding of sectoral trends. Exports of goods and services (% of GDP) in Slovenia was reported at 77.65 % in 2016.

Slovenia has a medium GDP among European countries which influences its cost basis. In 2017 our GDP was 43,000 million euros, which amountet to 20,815 euros per capita. The balance of trade was positive - it amounted to 4,181 million euros (9.7% of GDP) and contributed 1.3 percentage points to GDP growth. Exports of goods and services increased by 10.7% (compared to 6.4% in 2016), while imports of goods and services increased by 10.3% (compared to 6.6% in 2016). In 2017, prices of exported goods and services increased slightly less than prices of imported goods and services. Economic growth was also positively influenced by final consumption, which increased by 1.5%.

The most important goods producing segment in industrial sector is manufacturing, which accounts for 90% of total production. Main industries in Slovenia are the metal industry (18,4% of the value of sales of industrial products), chemical (12,2%), machine industry (12,2%), automotive industry (10,3%), food processing (8,9%) and electrical industry (8,3%).

Over the last 20 years Slovenian manufacturing has undergone a significant change. Inefficient enterprises were largely closed whereas mainly well established older companies or very gile new players with clear advantages now dominate. Petrol, the national fuel trader, remains the largest Slovenian company with 3.2 billion euros of sales. Slovenian pharma champion Krka created the highest profits with 102.8 million euros. The largest employer is the retailer Mercator, as the parent company within the group employed 8,901 people last year. Slovenia successfully follows guidelines of sustainable-oriented circular economy. A roadmap towards the circular economy in Slovenia is one of countries strategic development priorities closely tied to the Sustainable Development Goals and included in important national documents such as A Vision for Slovenia in 2050, Slovenian Development Strategy 2030 and Slovenia's Smart Specialisation Strategy. Following new guidelines for living well within ecological limits is showing as a positive trend at the waste management treatment and at an exploitation of secondary raw materials and as well at the competitiveness and innovation field.

We also successfully increased the usage of secondary raw materials instead of primary. Raw materials consumption, circling within the production process, increased from 5,9 % in 2010 to 8,4 % in 2014. Despite this trend there is still a lot to do in a field of promotion of actions within the waste quantities reduction and of promoting the re-use of waste and their return back to production processes.

Waste packaging represents a significant share of household waste. Statistisc show that the amount of packaging waste directly depends on the movement of GDP. The first significant decline in the total amount of waste packaging generated in Slovenia was observed at the beginning of economic crisis, when the quantities of packaging waste fell along with the GDP. The amount of packaging waste generated in Slovenia has been around 100 kg per capita per year in recent years. In 2014, a resident of Slovenia produced 102 kg of packaging waste, which is a few kilograms more than in the previous four years.

Complex packaging is produced by composing two or more materials (paper and plastic, a combination of paper, cardboard and different metals, etc.) to improve packaging properties, for example water, light and fat impermeability. Multilayer packaging material is produced by surface tratment (lacquering), by gluing, lamination or co-extrusion. With the development of complex packaging, new forms of packaging and new packaging systems emerged at the same time. There were 1047 tons of composite packaging wastes generated in 2016 in Slovenia.

Multimaterial papers and products are the production domain of the paper value chain. Plastics converters do not produce such products. So the more important industry for this sector is the paper industry. Multimaterial products are mainly used in 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 papers for print, packaging or other products and of packaging and other products with added barriers, windows, plastic envelopes etc.

Slovenian producers mainly specialize in laminated papers. Some of biggest manfactures on this field are Vipap Videm Krško, d.d., Količevo Karton, d.o.o. and Papirnica Vevče, d.o.o. The largest producer of multimaterial (windowed) bags is Dama, d.o.o., followed by Papirol, d.o.o. and Nova Kuverta, d.o.o., a sizeable producer of envelopes some of which contain windows.

Multimaterial packaging is routinely used by packers. The materials are mainly sourced from abroad, except for laminated papers and retail windowed bags taht are produced in Slovenia. The main considerations for the use of these materials are function and price. They are used primarly when the function (e.g. moisture barrier) is required or design (e.g. windows) is required. In our analysis we have not seen that environmnetal aspects such as recyclability or material efficiency was an important factor in choosing these materials.

To date only one example of an attempt to use sustainable alternatives in a company Žito, d.o.o., Ljubljana was recorded. The attempt was not successful as no suitable alternative was found (a major consideration was the price and the durability in terms of product storage time which would be reduced compared to conventional solutions).

From the survey carried out companies are open to new solutions if they can be offered (assuming that they are competitive with conventional solutions). On the other hand the Pulp and paper institute is conducting research in the use of biobased and biodegradable plastics such as PLA for pulp composites. The research has not yet been applied in practice. There is also research on packaging papers coated with biodegradable PLA available, made within Faculty of natural sciences and engineering.

Based on expert research and analysis the global packaging sales are projected to grow by 4% at an annual rate from 2013 to 2018. In those five years this market value will reach a value of approximatelly 840 billion euros. The global packaging market in divided into five main categories of materials – plastics, paper and board, glass, metal and wood. A vital role in packaging market evolving, play plastics and paper and board industry. The main packaging materials used in the world are flexible materials (36 %), paper and board (24 %) and rigid plastic materials (20 %). The most used types of packaging are bags and sachets.

The demand for flexible packaging (paper, plastic, complex/multi-layer materials) has greatly developed in the last decade, reaching the value of approximatelly 180 billion euros. It is projected to grow furthermore due to a higher demand largely in a field for packaged food, frozen foods and beverages.

While the raw material cost is one of the vital factors in determining the end products price, the fluctation in raw material prices is a mojour challenge to face with focusing on the global packaging market. The widening of the gap in the demand-supply in the last few years has led to a considerable increase in the price of raw materials. Any such increase in the price of raw materials increases the manufacturing cost of the packaging as well as reduces the profit margin of the vendors.

The growth of global packaging sales is being driven by a number of trends, depending on various geographical regions. A key social and market trends in Europe affecting the development of packaging economic market are the trends towards smaller households and accompanying rise in demand for more, smaller pack sizes, the increasing requirement for comfort among consumers, and the growing number of people interested in health and beauty products. An increase in living standards and personal dispute income in the developing regions encourage consumption across a broad range of products, with subsequent growth in demand for the goods packaging. One of the majour drivers of packaging market is also the global e-commerce market which is growing due to increased use of the internet in the emerging countries. The growth in the online retail sales has, for example, boosted the demand of packaging products for the safe products shipment. The ease of online shopping, has encouraged many customers to switch from the traditional shopping method to online shopping. Packaging market trends are focusing on sustainable packaging solutions, growing popularity of flexible and lightweight packaging, consolidation of the packaging market, improving product recyclability, optimizing packs for ecommerce and on smart packaging solutions. Industry players have to work on merging and acquisitions across the value chains in order to strengthen their product diversity and network distribution.

Value chains are an integral part of strategic planning representing links between full range of activities that firms and workers do to bring a product from its conception to its end use and beyond. It refers to the full life cycle of a product or process, including material sourcing, production, designing, distribution/sales, consumption and collecting/ recycling/ recovery/ disposal procesess.

The packaging value chain includes various actors who in one way or another face packaging as manufacturers of packaging materials or additives, packers, industrial designers, retailers, packaging end users, waste collectors, waste managers and also users of the second raw materials. All the packaging value chain actors have to constantly monitor the new possibilities developed in a new materials and techniques field. All the Slovenian potential key-players involved in value chain are listed and described in D.T1.1.3.

ANALYSIS OF THE VALUE CHAIN IN SLOVENIA

There is no actual existing raw material producers of bioplastics (this is the only missing actor in value chain in our country but it does not pose any problem due to possible imports) and just a small number of bioplastics packaging producers (no paper-bioplastics packaging producers) 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 the above mentioned new products business and trading.

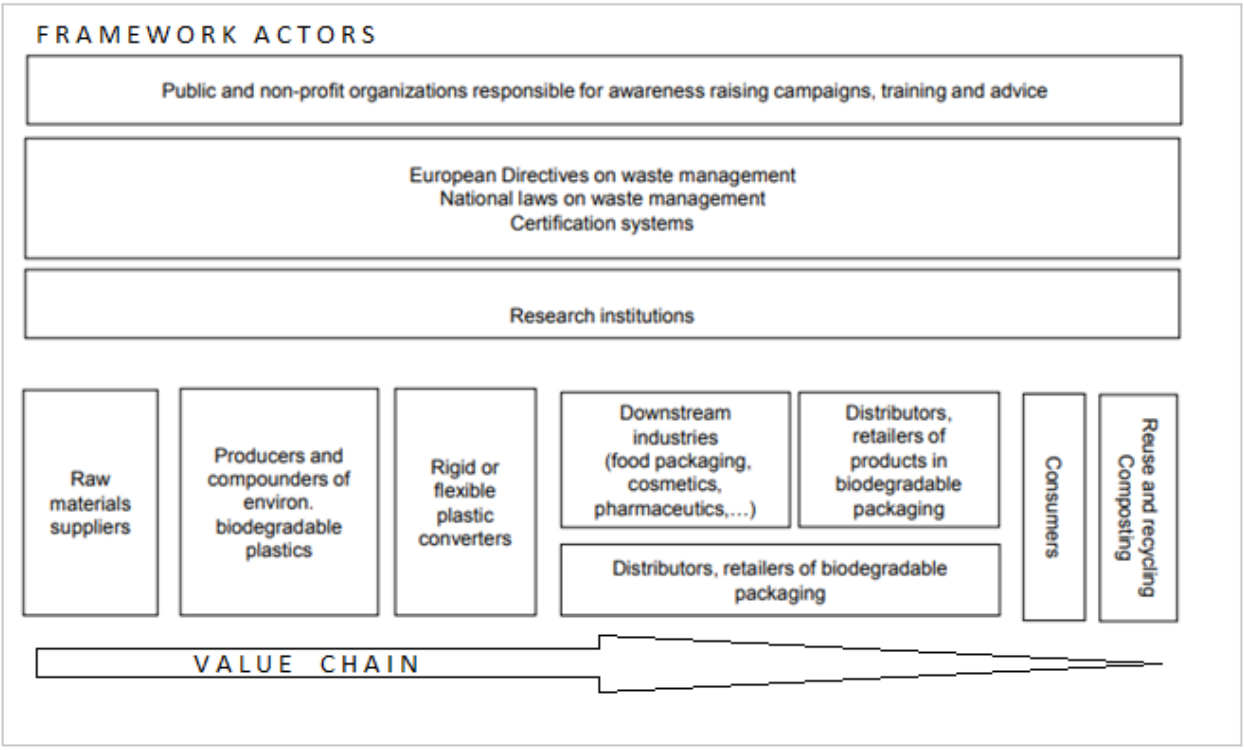

Figure 1: BIOPLASTICS VALUE CHAIN STRUCTURE

Following sections represents some recent data on sectors contributing to the paper-plastics packaging value chain helping us understand current situation and to outline the development opportunities related to bio-based packaging materials.

PULP AND PAPER INDUSTRY AND PAPER CONVERTING SECTOR

Paper and paper converting industry belongs to the oldest, traditional industrial sectors in Slovenia. This industry is a role model of sustainable principles implemented in industrial activities, as it uses recoverable raw materials in its

modern, automated and environmentally sound production processess developed during many years of systematic work, and makes products recycled after use.
The Slovenian paper and paper converting industry comprises 114 companies, 6 of them are papermills. In total they generate 831,4 million euros of revenues, 41.396 euros of added value per employee, and they are reliable employers of 4.294 employees. The share of sales on foreign markets amounts to 72,7% (all figures refer to 2017). On average, paper industry generates 90,2 % of the revenue abroad while the paper processing industry generates approximately 39,4 % of the revenue abroad. Since the Slovenian paper industry is highly export oriented the main concern of the companies is to remain internationally competitive**.**

Production covers packaging paper and board, graphic paper, sanitary and household paper and other paper and board products. Production of paper and board in 2017 was 747.469 tons of which 0,9 % specialty paper, 8,9 % tissue paper, 37,2 % graphic paper (20,7 % newsprint, 9,3 % uncoated graphics paper, 7,2 % coated graphics paper and board) and 53 % paper and board for packaging. The production of products covered in year 2016 was 225.000 tons of which 32 % board and corrugated board packaging, 26 % household, sanitary and tiulet, 20 % corrugated board, 4,4 % bags and other products. The paper and board consumption in Slovenia in 2013 was 425.000 tons which is 215 kg per capita (EU average is 162,5 kg).

The Slovenian paper industry covers the entire value chain from medium sized paper producers to final products and waste managers. This also includes products that combine paper and plastics. Main companies in Slovenia in the sector of production of paper and board are KOLIČEVO KARTON Proizvodnja kartona, d.o.o., Goričane, d.d., PAPIRNICA VEVČE, d.o.o. and VIPAP VIDEM KRŠKO, d.d. while in the production of board and corrugated board packaging the main company is DUROPACK-TESPACK Tovarna embalaže Brestanica, d.o.o. There is also many others, but much smaller. In the production of sanitary and household products from paper and board predominates Paloma, d.d. and in the production of office products from paper and board Muflon, d.o.o. and TCR Inpro, d.o.o.

The paper industry has a long tradition and is organized through The Paper and paper converting Industry Association (PPCIA) which serves as a joint meeting point and is also part of labour negotiations and an industry representative in dealing with government and policymakers. It is associated with the Chamber of commerce and industry of Slovenia (CCIS) which provides essential services for enterprises operating in Slovenia, and it is the ideal local partner for foreign investor.

Pulp and Paper Engineers and Technicians Association (DITP) organizes the annual international symposium. Together with the Pulp and Paper Institute (ICP) and the Chamber of Commerce and Industry it publishes the professional magazine twice a year. Each year, the association organizes visits for its members to paper and board mills (mainly in Europe) in order to provide additional information and give an opportunity for further education to the technical staff in Slovene paper mills. Pulp and Paper institute (ICP) is a central R&D partner of the paper industry. The institute is owned by the paper industry and is the focal point of research in this area. ICP is also very active at project works as well as training and education.

Graphical design at the Natural sciences faculty of the University of Ljubljana specializes in graphical and printing knowledge.

The University of Maribor has a specialized department (Faculty of Economics and Business) for environmental economics that focuses on packaging solutions and metrics for measuring sustainability of packaging.

PLASTICS SECTOR

Many different types of polymers are grouped under the common term of ‘plastics’. The specific polymer properties determine the possible applications of both virgin and recycled grades. The most suitable plastic materials for paper-plastics packaging are polyethylene and polypropylene, which are also most widely used in food packaging. They both possess a special combination of properties including flexibility, strength, lightness, stability, moisture and chemical resistance, easy processability, recycling and reuse suitability.

The plastics industry in Slovenia is characterized by its fragmentation - a large number of small companies which amounts to a whole 91 % of all companies included in the sector. Nevertheless Slovenia is one of the leading countries in the world speaking about the quantity of plastics products per capita produced (165 kg per capita). At the same

time we are significantly lagging behind with the amount of separately collected and recycled plastic waste so we have to work on the proper handling of end-user residues and recycling.
Plastics industry has a very strong focus on plastics processing. Slovenia is the world's leader in the amount of processed plastics per capita. The average Slovenian consumes 60 kg of plastics annually.

Our plastic production is, due to a small domestic market and demand for plastic materials, export oriented, mainly towards Germany, Austria, Italy, Croatia and United Kingdom. A sizeable sector is packaging, for example plastic bags production. The plastic industry does not combine plastics with paper. As already mentioned this is a production domain of the paper value chain.

The economic importance of the production of plastics products in Slovenia is significant. The Slovenian plastics industry comprises 522 companies. In total they generate 1,49 billion euros of revenues, 39.961 euros of added value per employee, and they are reliable employers of 10.687 employees. Added value per employee is approximately 10% lower regarding the average in manufacturing. The share of sales on foreign markets amounts to 61,5% (all figures refer to 2017). On average, plastics industry generates 55% of the revenue abroad. The six larger European countries (Germany, Italy, France, Spain, United Kingdom, Poland) and the Benelux covered almost 80% of the European plastic demand in 2016.

To facilitate the identification and elimination of the problems which manufacturers and processors of plastics are facing with, Plastic and rubber section at Chamber of Commerce and Industry of Slovenia within The chemical industry association (GZS-ZKI) was established.

Within the Chamber of Commerce and Industry of Slovenia also Slovenian Plasttechnics Cluster was established in 2002. The cluster unites the most important companies and accompanying institutions in the plastic industry and is becoming an important Europen part of the global offer on high-demanding products/service of plasttechnics and integral solutions for the most demanding purchasers on the global market. The cluster companies master the most up-to-date technologies from the field of plastics remodelling, tool making and construction, laser and tool technologies. They also develop plastic products and offer service. The purpose of linking is to increase competition with uniting of developmental and marketing activities and exchange of knowledge and information.

The Slovenian association of most important companies and accompanying plastic industry institutions are trying to establish a better connection and organization in the so-called PolyRegion, which includes 115 companies from Slovenia and Austria. The project managed by the Faculty of polymer technology with partners, aims to improve cooperation and raise the competitiveness of enterprises, knowledge institutions and research institutions in the field of polymeric materials and technologies in cross-border cooperation between Slovenia and Austria.

BIOPLASTIC AND CONVERTING SECTOR

Bioplastics represent about one percent of the arrround 320 million tonnes of plastics produced annually in Europe. That market is set to increase from 2.05 million tonnes in 2017 to approximately 2.44 million tonnes in 2022.

A share of 27% of the world production of bioplastics is produced in Europe, mostly from starch, and experimentally from whey and other renewable sources. The EkoPlastik d.o.o. is the only Slovenian company, distributing biodegradable polymers within the European Union. There is no manufacture of biopolymers in Slovenia, because there is no market for such products in our country yet. Some companies just processes bioplastics, making a few packaging products as biodegradable bags are. The latter is meaningful for us, knowing, there is available biodegradable foil in our country. There is also a company producing PLA (polylactic acid) bottles, but only for the purpose of export.

Biodegradable products are available for customers in most of the larger and better stocked markets and online in Slovenia. Companies as Piskar, d.o.o., Oberč, d.o.o. and Izdelava polietilenskih vrečk Mlakar Jože, s.p. are primarily various packaging manufacturers, who also includes bioplastic products in their offer, searching for new business opportunities. There is one for sure in bioplastics packaging market while the impact of numerous activities in Slovenia, concerning plastics environmental and human health, already results in increased knowledge and consequently interest and demand for this type of products. Bioplastics products sale rate in Slovenia is for now very

modest, maybe also because the field of bioplastics use is presented only as a substitute for packaging. This field should be extended in purpouse of better sales.

RETAILERS

The retail market in Slovenia consists of two sectors: retailers (large and small) and producers that use packaging or other products made form paper and bioplastics. The second group is dominated by food producers.

Large and small retailers at the moment do not use bioplastics or combined paper/bioplastics products. They offer bioplastic (compostable) bags in their stores. An exception of smaller users is under the guidance/ownership of the city of Ljubljana where a decission was made to use exclusively compostable bags (Ljubljana pharmacies, Ljubljana main food market and events organized by the city). This illustrates one possibility how to induce the use of more sustainable packaging or products.

Large retailers have expressed interest in using more sustainable packaging however the (higher) cost is normally a limiting factor. Producers that use combined paper/plastic packaging are a group with high potential for use of paper/bioplastic products. Especially in product lines for bio- eco- food products where they wish to complement the environmental product with sustainable packaging. Several attempts at finding such packaging have been mentioned however at the moment none are used commercially.

A third potential group of users are stores that offer take-away / fast food services that currently do not use compostable plastic products. The interested actors from trading field for the Biocompack-CE project are bakeries (Žito, d.o.o.) and mixed goods trading company Lidl Slovenia.

CONSUMERS

The environmental awareness among consumers is in the ascent and consequently also interest and the demand for environmentaly friendly products is growing. Understanding the importance of sustainable materials is expanding by the impact of numerous activities in Slovenia, concerning sustainable development and a good management development dictating that resources should be retained within the manufacturing and consumption cycles for as long as possible to retain the value of products, raw materials and material resources, and to minimize the production of waste. Changing patterns of consumption by improving the effectiveness of product use is a really important goal to reach. The abandoning of old consumption patterns is contributed to digitalization, cultural changes, changes in the value system, products new longer or easy to repair/reuse/modify designs, etc.

COMPOSTING SECTOR

Composting is the process of aerobic degradation of organic substance into CO_2, water and compost while anaerobic decomposition process (in the absence of air) converts organic substance into CH_4 and CO_2 (biogas), traces of H_2 and H_2S, and cell biomass. Industrial composting is a process during which a conversion of biodegradable waste into stable, hygienised products that are further used in agriculture, takes place. This is why it is important that compostable plastics do not introduce toxic substances into compost.

The trend of composted bio-waste is directing to the increasing quantities. In 2017, 300.102 tons of waste were processed with composting and in biogas plants, which is, compared to the previous year, 15.188 tons more. 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 23 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. The biggest two processors of biological disposable wastes to compost are Kogal, d.o.o. and Snaga Javno podjetje, d.o.o. According to the period from 2012 to 2016 each year we produce more waste, but we are also more efficient in separate collection of municipal waste and in processing them. This is attributed to the increasing environmental awareness of the

population and the regulations, dictating separate collection of municipal waste fractions. The most common way of processing biodegradable waste is composting. In Slovenia 95% of biodegradable waste is composted.

Biogas plants (for instance Koto, d.o.o. and RCERO) treated 202.241 tons of waste in 2017, meanwhile the composting sector processed 97.860 tons of waste. Slovenian most important waste management facility is a Regional Waste Management Center (RCERO) located in Ljubljana, started operating at the end of 2015, bringing a long-term regulation of waste management issues for a one third of Slovenia. The key parts of the regional center are the three objects in which mechanical-biological treatment of waste takes place. In their reactors in the presence of bacteria, anaerobic fermentation takes place, producing compost from separately collected bio-waste. During fermentation, a lot of gas is generated, which is captured and used for electricity and heat production.

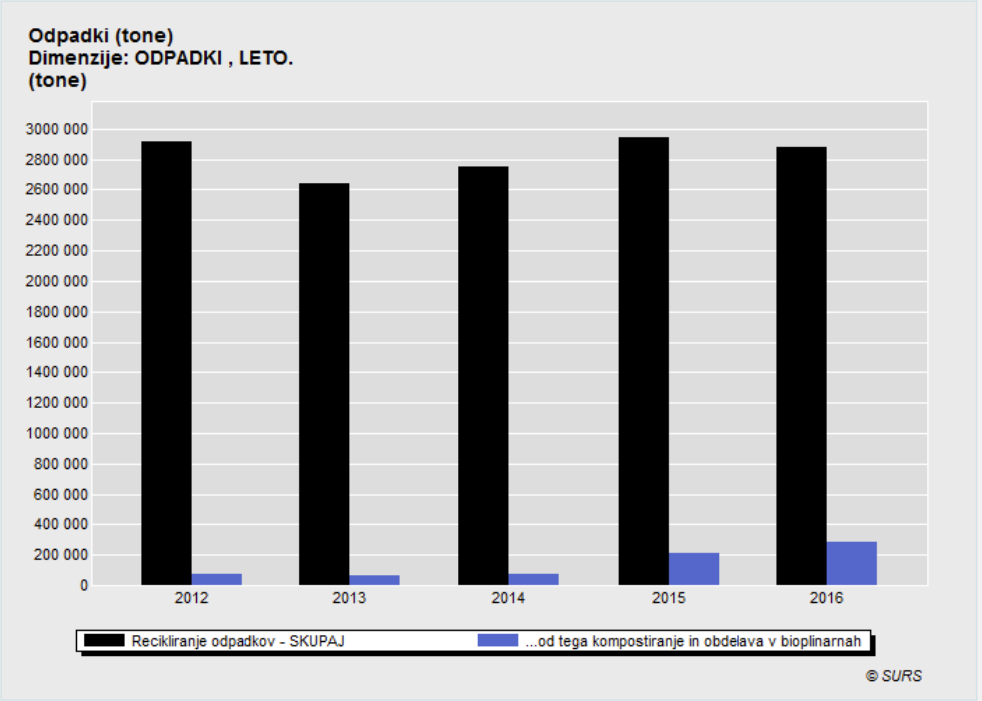

Figure 2: Composting in Slovenia in 2012-2016

RECYCLING

To reduce our dependency on imported materials and to retain value within our domestic economy, we have to close the material loop, reaching it through successful waste collection and recycling. Slovenians are successful collecting municipal waste resulting in 67% of all municipal fractions sorted in 2016. But we are also successful when it comes to recycling, as the municipal waste recycling rate increased from 22,4 % in 2010 to 54 % in 2015 which is 9 percentage points more than in the EU-28 overall. Recycling of waste packaging increased by 6 % and reached 67 % in 2015. Recycled waste proportionis are showing the considerable efforts of the Slovenian economy investment into waste recycling and waste re-use processes.

The problematic materials that we currently can't suitably 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, which further strengthens our projects goals.

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 plastics products are made from a range of polymers and are highly customised and this diversity complicates the recycling process, making it more costly, and affect the quality and value of recycled plastic. Specific design choices, some of which are driven by marketing considerations can also negatively affect the value of recyclates. The market for recycled and innovative plastics is successfully established, with clear growth perspectives as more products

incorporate some recycled content. Demand for recycled plastics in Europe has grown four-fold, providing a stable flow of revenues for recycling sector and job security for its growing workface. The leading company in the field of recycling plastic waste in Slovenia is Omaplast, d.o.o.which processes 20.000 tons of plastics packaging annually. There is also Plasta, d.o.o. and KBK, d.o.o. working in the same field as Omaplast, d.o.o.

LEGISLATION CONTEXT

The field of packaging and packaging waste management in Slovenia is governed by the Environmental Protection Act (ZVO-1) and its regulations in line with the European guidelines. Efficient handling of packaging is provided by the Decree on packaging and packaging waste handling. The regulation prescribes rules on the packing and packaging of goods for taxable persons, and provides for ever greater shares of the processing of packaging waste. Companies placing packaging or packaged goods the first in the market of the Republic of Slovenia is responsible for the packaging waste handling. Taxpayers can transfer their obligations to the chosen waste management company, which ensures the collection and processing of packaging waste in accordance with environmental objectives.

According to the Decree on packaging and packaging waste handling, composite packaging is a packaging made up of different types of packaging material that can not be manually separated. The definition clearly links just to the laminated materials. Speaking of paper-plastics packaging, the subject of our research, we are able to separate both components manually, so this multimaterial group is not acknowledged in any specific regulation and its products come with no instructions as to their handling.

The only acknowledged regulation for multi-material packaging is the Article 4 of the mentioned decree, stating, that the waste composite is classified according to the type of packaging material which, depending on the mass, prevails in the individual composite. Paper-plastics products are by default or due to the larger mass of the paper portion routinely considered as paper packaging. One can assume that the portion that evades mixed waste enters the paper waste collection and only a smaller part is collected through packaging waste collection. This is also the information obtained from major waste management companies and a huge issue, that should be directed by the government policies. All the following regulations of related fields mentioned below plays an important role dictating trends for the paper-plastics packaging industry.

Bioplastics and packaging made of it have no specific regulations in Slovenia.

In Slovenia, the field of materials and articles for contact with food is covered by the Act Regulating the Sanitary Suitability of Foodstuff, Products and Materials Coming into Contact with Foodstuffs not mentioning neither bioplastics nor multi-material materials.

All the following regulations of related fields mentioned below plays an important role dictating trends for the paper-plastics packaging industry.

The field of packaging and packaging waste management in Slovenia is governed by the Environmental Protection Act (ZVO-1) and its regulations. The main piece of legislation governing packaging and packaging waste in Europe is The EU Packaging and Packaging Waste Directive. The revision of the Packaging and Packaging Waste Directive occurred on 29 April 2015 with the adoption of Directive (EU) 2015/720 of the European Parliament and of the Council amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags. Its domain is to specify measures on the consumption of such bags as the current levels of plastic carrier bags result in high levels of littering and an inefficient use of resources. Littering results in environmental pollution and aggravates the widespread problem of litter in water bodies, threatening aquatic eco-systems worldwide. The accumulation of plastics in the environment has also a negative impact on certain economic activities. Recycling rates of lightweight plastic carrier bags are very low and, due to a number of practical and economic difficulties, are not likely to reach significant levels in the near future. In accordance with the above mentioned EU Directive, also Slovenian legislation needed to revise our Decree on packaging and packaging waste handling. In July 2017 Slovenian government revised some decree articles, among others also the one, directing the environmental objective of consumption of carrier plastic bags. It dictates that the annual consumption level of light plastic carrier bags may be up to 40 light plastic carrying bags per person and also to ensure (the distributer) that plastic carrying bags at the point of sale of goods or articles are not available to consumers for free.

The area of materials and products intended to come into contact with food is at EU level regulated by two main regulations - Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC and Commission Regulation (EC) No 2023/2006 of 22 December 2006 on good manufacturing practice for materials and articles intended to come into contact with food. In Slovenia, the field of materials and articles for contact with food is covered by the Act Regulating the Sanitary Suitability of Foodstuff, Products and Materials Coming into Contact with Foodstuffs. In addition there is also a Decree on obligatory registration and treatment of companies, who produce, process and place materials on the market and articles intended to come into contact with food. The aim of those regulations is to ensure a high level of protection of human health and the interests of consumers and to ensure the effective functioning of the EU's internal market with materials and products, coming into contact with food.

In December 2015, the Commission adopted an EU Action Plan for plastics in a circular economy, identifying plastics as a key priority and committed itself to prepare a strategy addressing the challenges posed by plastics throughout the value chain and taking into account their entire life-cycle. The Commission confirmed it would focus on plastics production and use, working towards the goal aiming that all plastic packaging is recyclable by 2030.

INNOVATION SYSTEM

Key actors included in innovation system by implementation of projects and activities related to sustainable development of packaging products in Slovenia are the Pulp and Paper Institute, National institute of chemistry, Faculty of polymer technology, University of Maribor and University of Ljubljana by different departments.

The most important support actors are The chemical industry association (GZS-ZKI) within the Chamber of Commerce and Industry of Slovenia and The Paper and paper converting Industry Association (PPCIA) also organized within the Chamber of Commerce and Industry of Slovenia.

CONCLUSIONS

Bioplastics undoubtedly brings a change in the market both for consumers and producers. The market is turbulent and the supply/demand system uncoordinated. Recently in European Union the biopolymer products in the rise are thermoplastic foil products.

Due to many ongoing activities concerning Slovenia's strategic development priorities with the main goal of improving everyone's life quality, the environmental awareness increased masively and consequently also interest and bigger demand for environmentaly friendly products. But the development of the market is conditioned by legislation and until the country will not legally support the use of bio-plastic products for commercial purposes, there will be no success in that field. Companies (potential stakeholders as biopolymers producers are) are waiting the state regulations and are not responding to the demand until government response. Slovenia has a potential for a development of bioplastics and paper-bioplastics products market. Producers being at the same time buyers and also retailers (for instance ecologically friendly product lines) maybe represents a group with the highest potential for use of sustainable packaging. Interest in such products has been exposed from Some of them already showed some interest but unfortunatelly their attempts were not succesful.

One of our project's points should therefore be also a linkage to the Governments and responsible ministry, to tackle the mentioned issue. To accelerate the biopolymer market development, and consequently paper-bioplastics packaging market development, for a good background we need to set a good starting point, suggested to be an overview of good practices, and their problems exposure.