The European Union
for Georgia
EU4Business

EU Innovative Action for Private Sector Competitiveness in Georgia (EU IPSC)

Road to Biodegradable Packaging in Georgia

Meeting Report

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for Georgia
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This report has been prepared with the assistance of the European Union (EU) and the United Nations Development Programme (UNDP). Its contents are the sole responsibility of the author and do not necessarily reflect the views of the European Union and the United Nations Development Programme

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Introduction

Consumption of plastic packaging has significantly increased in the world as well as in Georgia in recent decades. Disposable plastic products have become an integral part of our daily lives. Consequently, the amount of plastic waste is constantly increasing. It is well known that plastic pollution is considered to be the biggest challenge globally, in response to which more and more attention is being paid to alternatives to traditional plastics, in particular to packaging made from bioplastic materials. The global bioplastics industry is growing dynamically and is expected to grow by 15% over the next 5 years. 53 percent of the bioplastics produced in the world (1.14 million tons) are used as packaging materials.

Bioplastics is defined as plastics that are biodegradable, biobased, or both.[1] Biodegradable plastics are plastics that are decomposed by microorganisms in the environment. Microorganisms use biodegradable plastic structures for food and turn them into natural substances such as water, carbon dioxide and compost. The result is much less damage to the environment than in the case of traditional plastics, the decomposition of which can take decades. In addition, the issue of reducing plastics is receiving even more attention in international discussions related to climate change and the transition to circular economy.

In recent years, in Georgia there has seen a growing interest in bioplastics, which, in addition to global trends, is also related to gradual legislative changes in the country since 2018 that have affected the sector of packaging and packaging materials, in particular the production and import of polyethylene packaging bags. As a result of these changes,[2] as of April 2019, the production, import and sale of bags of plastic of any thickness and oxo-degradable bags are prohibited in Georgia. Only biodegradable and compostable shopping bags that meets the standards are allowed to be produced, imported and sold in the country. With the introduction of this regulation and the international dynamics, the interest in biodegradable materials in Georgia has increased. In order to satisfy this interest, the working meeting «Road to Biodegradable Packaging in Georgia» was scheduled and held on November 30. The meeting was held in the framework of the EU-UN joint initiative «EU Innovative Action for Private Sector Competitiveness in Georgia». Support for organizations involved in the packaging sector and production of packaging materials is one of the pilot directions of the initiative and includes assistance to these organizations in terms of cluster coordination, marketing, innovation, strengthening dialogue between the public and private sectors.

1 The definition is based on the definition of the European Bioplastics Association. https://www.european-bioplastics.org/about-us/organisation/

2 Resolution No. 346 of the Government of Georgia of July 26, 2019. "On technical regulation - rules of regulation of plastic and biodegradable packages" on amendments to the Resolution No. 472 of the Government of Georgia, of September 14, 2018. https://matsne.gov.ge/ka/document/view/4622676?publication=0

Working Meeting

One of the key goals of the working meeting was to give Georgian entrepreneurs in the packaging and packaging materials sector the opportunity to hear presentations by well-known professors and experts in biomaterials and, in particular, bioplastics. Learn more about current approaches, policies and challenges in Europe, as well as future perspectives. In addition, to get information from bioplastic packages manufacturers participating in the meeting about their experiences and get answers to questions of interest. Apart from the business sector, from the Georgian side, the meeting was also attended by representatives of the Ministry of Environmental Protection and Agriculture. It is this agency that is responsible (together with Municipalities) for enforcing the ban on plastic bags.

«The Ministry supports the exchange of European experience in Georgia. One of the principles of waste management in Georgia is the promotion of waste prevention in general, including plastics. Replacement of traditional polymers with biodegradable polymers is one of the important factors contributing to the prevention of plastic waste generation from packaging. Therefore the project initiative to exchange examples and experiences of international practice in this area is particularly welcome. The proposed format of the discussion, where representatives of both, the public and private sectors have an opportunity to hear the answers to their questions, is also interesting. I would like to express gratitude to the European Union and the United Nations Development Program for their support and encouragement,» stated in his welcoming remarks Solomon Pavliashvili, Deputy Minister of Environmental Protection and Agriculture, who attended and actively participated in the meeting.

In her opening remarks, Louisa Vinton, UNDP Resident Representative in Georgia, highlighted the fact that the packaging and packaging materials industry was an important sector whose activities could harm the environment on the one hand, but on the other hand, it had the potential to mitigate environmental impacts and solve pollution problems.

"Replacing plastic with biodegradable materials will help prevent waste generation, which is what we should strive for in the first place according to the well-known hierarchy of waste management. UNDP welcomes the Georgian government›s decision to ban the production, import and sale of plastic bags and stands ready to support its implementation", said Louisa Vinton.

The following speakers were invited to the November 30 meeting:

Mr. Grzegorz Ganczewski
Łukasiewicz Research Network, Packaging Research Institute,Poland

Ms. Barbara Woroch
REACH International Group

Prof. Artur Bartkowiak
Center for Bioimmobilization and Innovative Packaging Materials, Poland

The meeting was moderated by
Mr. Luk Palmen
International Consultant to the United Nations Development Program (UNDP).

The European experts talked about the biodegradable packaging policy as well as future development, standards, production and quality aspects. The presentations were followed by a discussion with representatives of the Georgian business sector and Ministry staff. The chapters below provide an overview of the presentations and a summary of the discussion questions.

Biodegradable Packaging, Standards and Requirements

(Grzegorz Ganczewski)

In his presentation Grzegorz Ganczewski reviewed the biodegradable packaging and packaging materials that meet the European standards and the requirements of these standards. He also spoke about the role of the Packaging Research Institute in supporting packaging companies and presented cooperation opportunities for companies in Georgia.

Plastic is a polymer-based material that is characterized by its plasticity. The main component of plastics is a polymer, which is "formulated" by the addition of additives and fillers to yield the technological material -plastics. Plastics are defined by their plasticity-a state of a viscous fluid at some point during processing. Raw materials used for the production of plastics can be derived from renewable (plant and animal) resources or non-renewable, fossil (oil, coal) resources. Plastic materials can be biodegradable or non-degradable, depending on the susceptibility of their microorganisms to the activity of enzymes.

- Biodegradable: polylactide -PLA, regenerated cellulose, starch;
- Non-degradable: polyethylene - PE, polystyrene - PS.

Plastic is an universal material. It can be used in many different fields such as packaging, construction, transport, electricity and electronics, agriculture, medicine, sports, and many more. Properties of the plastic can be easily modified, according to the new requirements. It is a low-density light-weight product that has excellent thermal and electrical insulation properties and corrosion resistance; it can be transparent and, therefore, used in optical devices. Thanks to these and other positive properties, we can say that today we live in a «Plastic Age». The mass use of plastic materials is also associated with many problems. The main problem is the high durability of polymeric materials, because they also withstand natural degradation and remain in the environment for many years. Consequently, plastic waste is very difficult to handle and in the absence of recycling, a landfill crisis is possible. Recycling plastic waste produces environmentally harmful toxic substances and greenhouse gases. Since most plastics are made from non-renewable resources, their price is directly related to the price of oil. Solving these and other problems and at the same time preserving the functions that plastics offer us is a major challenge for the entire world. Replacing plastics with bioplastics is considered to be the most important step in this direction.

The term bioplastics encompasses a whole family of materials which are biobased, biodegradable, or both. Biobased means that the material or product is (fully or partially) derived from biomass (plants), such as e.g. corn, sugarcane, or cellulose. The term biodegradable describes a chemical process during which microorganisms (without artificial additives), that are available in the environment, convert materials into natural substances such as water, carbon dioxide, and compost. The process of biodegradation depends on the surrounding environmental conditions (e.g. location or temperature), on the material and on the application. Of course, materials and products can feature both properties. They then offer all the benefits and additional options outlined.

There are different types of biodegradability:

- Compostable in industrial composting facilities
- Home compostable;
- Soil biodegradable;
- Water biodegradable;
- Anaerobic degradable.

The first step in biodegradation is fragmentation. During fragmentation, the material is broken down into microscopic fragments. Biodegradation means the complete microbiological assimilation of fragmented material by microorganisms using it for food.

Composting is a manner of organic waste treatment carried out under aerobic conditions (presence of oxygen) where the organic material is converted by naturally occurring microorganisms. During composting, the material is completely assimilated into the appropriate environment within 180 days. During industrial composting the temperature can

reach up to 70° C and the process should take place in humid conditions. It is important to know that biodegradable plastics do not mean compostable plastics. However, all compostable plastics are definitely biodegradable. (Biodegradable ≠ compostable; compostable = biodegradable). Biodegradable plastics require more time and different conditions for biodegradation than compostable plastics. Determining the criteria needed to define compostable plastic is important because compostable materials that do not meet the standards may degrade the quality of the compost. Compostable plastics are defined by a series of national and international standards e.g. EN-13432, and ASTM D6900. These standards apply to industrial composting. According to both standards, a biodegradable / compostable product must be completely decomposed under appropriate composting conditions and within a certain period of time and must not leave any harmful residues. The EU standard EN-13432 defines the properties of packaging materials that are compostable and can be recycled as solid organic waste. EN 14995 extends the definition of plastics and covers not only packaging, but also applies to other uses besides packaging.. These standards are the basis for various certification systems.

Biodegradation of a Bioplastic bottle during composting

Biodegradable plastics can be divided into 2 groups:

(1) Biodegradable plastics from renewable resources;

(2) Biodegradable plastic from fossil resources.

Biodegradable plastics made from renewable resources include the following polymers:

- Thermoplastic starch (TPS);
- Polyhydroxyalkanoates; PHAs (made by microorganisms) PHBV, P3HB,P4HB, PHV;
- Polylactide (polylactic acid, PLA);
- Cellulose based plastics.

Polyesters obtained from fossil resources include:

- Synthetic aliphatic polyester - polycaprolactone (PCL);
- Synthetic and semi-synthetic aliphatic copolymer (AC) and polyesters (AP);
- Synthetic aliphatic-aromatic copolymer (ACC);
- Water soluble polymers - poly (vinyl alcohol) (PVOH).

Oxo-degradable plastics contain additives that help to decompose non-degradable plastic material into microfragments. For example, a catalyst that catalyzes oxidation or catalyzes thermal and/or photoactivation. Oxo-degradable materials are available on the market and are often aggressively advertised as degradable and less harmful to the environment. However, the fragmentation of oxo-degradable plastics is not conclusive. Biodegradation, such as mineralization, is not proved. Consequently, oxo-degradable material is not biodegradable or compostable, so its association with «green» plastics may mislead the user.

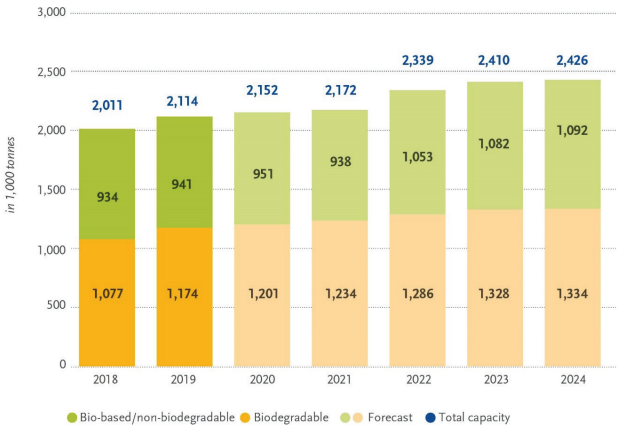
Agro-based feedstocks (carbohydrate-rich plants such as corn or sugarcane), ligno-cellulosic feedstocks (plants that are not eligible for food or feed production) and organic waste feedstocks can be used to make plastics from bio-based feedstocks. It is noteworthy that plastics made from biological resources may be non-biodegradable. For example, biopolyethylene (green PE). Biopolyethylene is plastics made from ethanol, which in turn is made from sugar cane. It is 100% bio but non-biodegradable. Biopolyethylene is the equivalent of traditional polyethylene (PE) and has a similar chemical formula: CH2-CH2-CH2. Like polyethylene produced from fossil resources, bio-polyethylene can be recycled 100% in the same way.

$$C_6H_{12}O_{6(l)} + H_2O_{(l)} \rightarrow 2C_2H_5OH_{(l)} + 2CO_{2(g)} + H_2O_{(l)} + heat$$

It is important to know that, despite its biodegradable properties, such plastic waste is not intended to decompose in nature. Accordingly, it should be treated like any other waste.

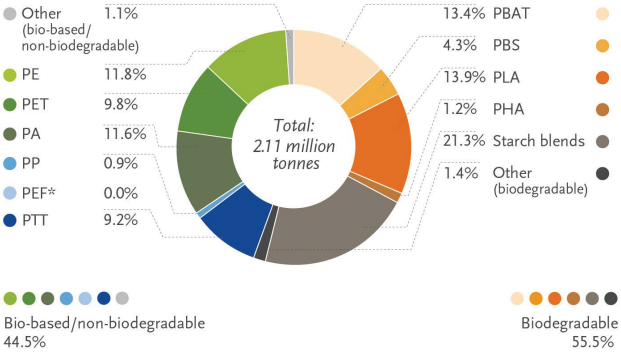
The global production capacity of bioplastics is constantly growing. And most of it is used in the packaging sector. Below are the production figures for bioplastics by region, market segment and material:

Global production capacities of bioplastics



Source: European Bioplastics, nova-Institute (2019)
More information: ***www.european-bioplastics.org/market*** *and* ***www.bio-based.eu/markets***

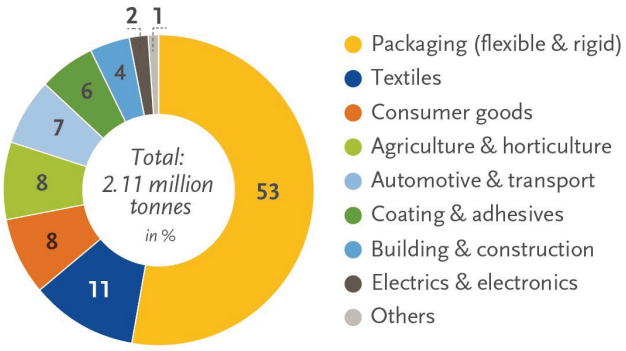
Global production capacities of bioplastics 2019 (by material type)



*PEF is currently in development and predicted to be available in commercial scale in 2023.

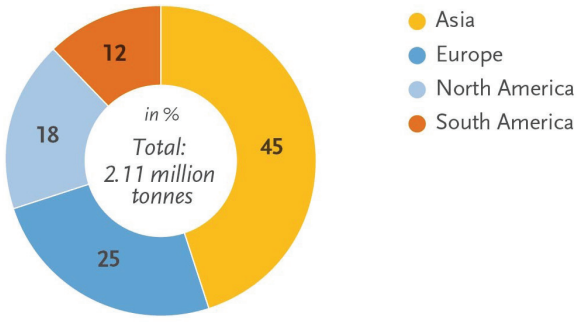
Source: European Bioplastics, nova-Institute (2019)
More information: ***www.european-bioplastics.org/market*** *and* ***www.bio-based.eu/markets***

Global production capacities of bioplastics in 2019 (by market segment)



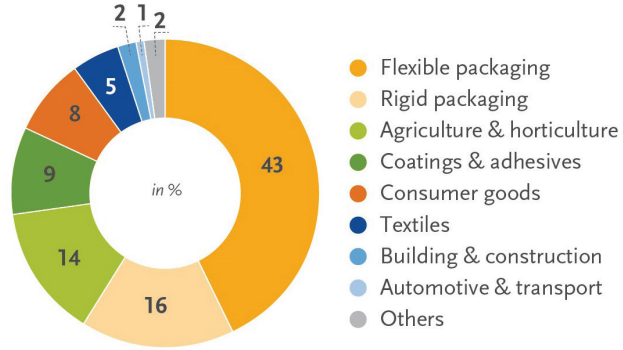
Source: European Bioplastics, nova-Institute (2019). More information: ***www.european-bioplastics.org/market*** *and* ***www.bio-based.eu/markets***

Global production capacities of bioplastics in 2019 (by region)



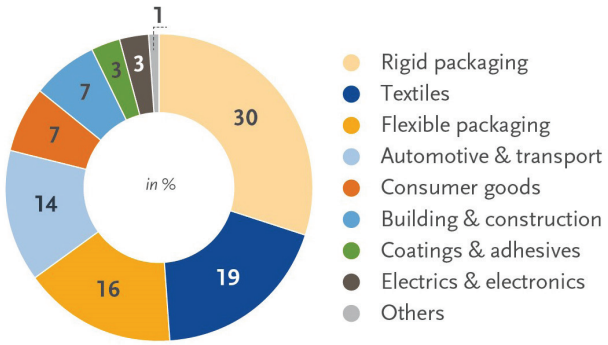
Source: European Bioplastics, nova-Institute (2019). More information: ***www.european-bioplastics.org/market*** *and* ***www.bio-based.eu/markets***

Biodegradable plastics (by market segment) 2019



Source: European Bioplastics, nova-Institute (2019). More information: ***www.european-bioplastics.org/market*** *and* ***www.bio-based.eu/markets***

Bio-based plastics (by market segment) 2019



Source: European Bioplastics, nova-Institute (2019). More information: ***www.european-bioplastics.org/market*** *and* ***www.bio-based.eu/markets***

Having an appropriate certification scheme in place is crucial to support the use of biodegradable and compostable plastics. In general, certification refers to the formal confirmation/validation of certain properties of an object, person or entity.

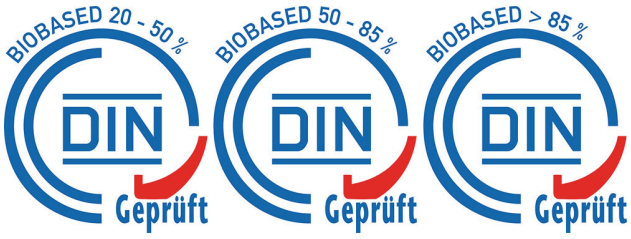
This confirmation is often, though not always, based on research, evaluation or audit by a third party. In today›s society, product certification is a common form of certification. Such certification determines whether a product meets minimum standards.

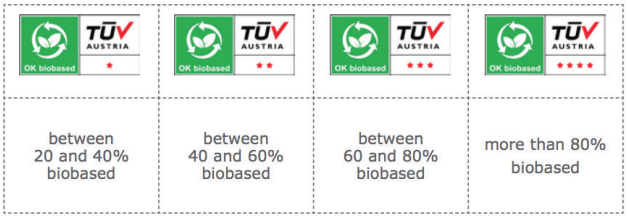
The harmonized European standard EN 13432 "Requirements for packaging recoverable through composting and biodegradation" is used for certification of compostability. Compliance with this certificate requires at least 90% disintegration after twelve weeks. The standard also includes tests on eco-toxicity and heavy metal content. It is the standard for biodegradable packaging designed for treatment in industrial composting facilities and anaerobic digestion. The EU standard EN 14995 contains the same requirements and tests as EN 13432, but applies not only to packaging but also to plastics in general.

Compostability certification includes the following indicators:

1. Chemical composition - the material must not contain substances harmful to the environment, the level of heavy metals and other hazardous substances must be within the relevant standards;
2. Biodegradation - more than 90% of organic carbon must be converted to CO2 within a maximum of 180 days;
3. Disintegration during composting - materials must disintegrate quickly (12 weeks, sieve fraction);
4. Eco-toxicity - the germination rate and the volume of biomass should have a positive assessment in the testing of the compost quality;
5. Labeling - labeling should follow a certification scheme to be able to identify inhibitors and collect organic waste in a waste container.

Certification of biobased plastics is also necessary for informing entrepreneurs and the population and for placing bioplastics waste in an appropriate container. Since bioplastics are a material similar to traditional plastics and it is difficult for the public to distinguish between them, it is important to indicate whether the waste of a particular product should be placed in compost / biowaste or plastic waste. Consequently, labeling the bioplastic product is also important in this regard. Sample labels of certified products are shown below.





Experience in Biodegradable Packaging Production and Providing Biodegradable Materials to the Eastern and Central European market on the Example of the REACH International Group

(Barbara Woroch)

REACH International Group is a young (4 years old) Polish company that produces compostable shopping and waste bags. The representative of the company, Barbara Woroch, spoke about why and how the company started production of compostable packaging (originally produced HDPE packaging), how it moved from HDPE production to PLA production, which was the international market demand.

REACH International Group was founded in 2016 in Robakowo, Poland. Until 2018 it produced shopping and waste bags made from HDPE. In 2018, in response to increased demand in Poland, as well as at the international market, they conducted their first trials on the production of compostable bags. After testing different materials, today 80% of the company's products are made from composite materials (PLA) and 20% from HDPE. Due to the global pandemic in 2019, the company began manufacturing gloves from HDPE, and in the near future they are planning to produce compostable disposable gloves.

It is noteworthy that the shift from HDPE to PLA was also a responce to a declining trend in plastic packaging in the EU and an increasing trend in eco-awareness among consumers.

Therefore, the company-made shopping and bio bags have the inscription "I am bio bag" and the corresponding certification label.

The company uses certified PLA-based compounds and natural polymers based on corn and potato starch to make compostable bags. The material undergoes full composting within 3 to 6 months. REACH International Group is the exclusive distributor of this material in Eastern and Central Europe. The company can also provide technical assistance regarding the use of the material and the production process. The contact information of the company is given below:

Reach International Group Co. Ltd.
ul. Firmowa 8, 62-023 Robakowo, POLAND
Barbara Woroch +48 883 206 677
barbara@reachinternational.eu

Quality Aspects of Biodegradable Packaging for Food Applications

(Professor Artur Bartkowiak)

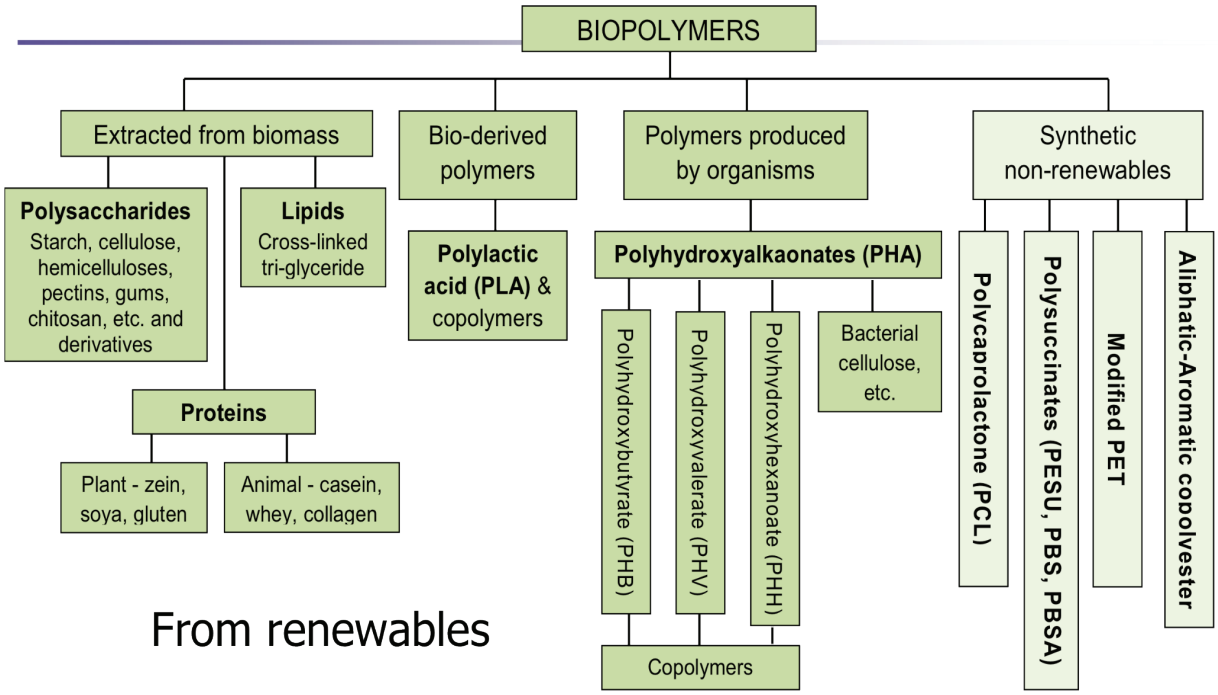
Artur Bartkowiak, Professor at the Szczecin (Poland) University of Technology and Director of the Center for Bioimmobilization and Innovative Packaging Materials, spoke about the issues to be considered when developing biodegradable food packaging. He discussed aspects of quality and research methods and opportunities for cooperation with Georgian companies.

For the transition to a circular economy, i.e., an economic model focused on eliminating waste and continuously reusing resources already in use, recycling plastic waste is essential. In the future it will only be possible to replace some plastic with biodegradable materials, the rest will still remain in the recycling scheme. European legislation requires 50% of plastic waste to be recycled, 20% to be reused, and only 30% to be fundamentally transferred to other materials. This is where biodegradable plastics come into play.

One of the difficulties associated with traditional plastics relates to composites, which are composed of different materials that are difficult to handle and difficult to recycle. Accordingly, European policy is aimed at introducing more mono-materials. Contamination of plastic waste with food makes it much more difficult to recycle. It is recommended that plastic waste be washed to prevent contamination, but this leads to another environmental problem as water consumption increases. Food packaging made of biodegradable materials helps to avoid this problem because such packaging can be disposed of with the food waste.

For the mass introduction of biobased plastics, it is necessary to exchange information and cooperate with manufacturers.

The bioplastics and biodegradable materials available on the market today are as follows:



Expanding the use of biodegradable materials has its advantages as well as some challenges. Among the main problems associated with innovative materials for food packaging, the cost of materials should be mentioned in the first place. Today, the price of innovative biopolymers is 2-5 times higher than the price of traditional polymers on the market. Existing processing technologies are intended for large-scale production, making it difficult to produce customized packaging for different food products. It is also necessary to consider the physical and chemical characteristics of the materials, which are decisive for their functional purpose. In particular, biopolymers are characterized by a lack of water barrier. They also have a low gas barrier. Significant issues are the compatibility of biopolymers with post-processing (molding, welding, printing), as well as their mechanical properties (effect temperature and storage time) and resistance to external/internal conditions such as: humidity, temperature, UV and others. In this case, it is necessary to consider for what kind of food product the bioplastic packaging is intended and for how long. It is recommended to use biodegradable packaging for short-term food storage, whereas, for long-term (6-18 months) food storage we cannot consider it as an alternative to traditional packaging. In order for biobased and biodegradable packaging to bring maximum benefits when implementing a circular economy, it is necessary to consider aspects of the production process such as:

- Complete packaging should consist of biological and safe materials, including plasticizers, dyes, etc. ;
- New compound materials can improve the biobarriers. For example, it is possible to cover basic materials with a thin layer, which constitutes only 5% of the total weight of the material, but is functionally essential. Accordingly, different materials and technologies should be integrated;
- Functional coating can also include coating with thin and inhibitory biomaterials (EB curing, SiOX, Ormocer, AlOX,plasma, bio-additives), as well as multifunctional ones (antimicrobial, low adhesion, easy open/re-close);
- In the case of innovative, the so-called “active and intelligent ” packaging, the direct integration of biobased regulators/indicators/ sensors into the coating/printing processes is important;
- We must consider not only the restructuring of old technologies, but also the introduction of new technologies. For example, EB curing, bio-ink-jet printing, cellulosic composite material -injection molding and thermoforming;
- The constantly changing regulations and legal framework should also be taken into consideration, especially in the case of exporting packaged products to the EU market.

Cooperation between research institutes, packaging manufacturers, and professional associations (e.g., cluster organizations) will be critical in the future to address the aforementioned and many other challenges.

Question - Answer Session and Summary of Discussion

During the meeting, participants were given the opportunity to ask questions and participate in the discussion.

Mariam Muskhelishvili, a representative of Ecosense Packaging, expressed their organization's attitude towards the ban on plastic bags in Georgia. The company Ecosense Packaging welcomes this regulation and believes that this is the right decision made by the state. The company has invested heavily in tangible and intangible resources to bring its new compostable packaging technologies in line with business regulations. In addition, they have introduced a large number of compostable bags, the realization of which has created difficulties because the compliance with the rules prohibiting the use of plastic bags in the country has proved to be unsatisfactory. There is also a large-scale falsification taking place in Georgia today. As a result, instead of biodegradable bags, the Georgian market is still dominated by plastic bags, the price of which is, of course, lower than that of compostable bags. This puts law-abiding companies in a non-competitive position. A lawyer from the same company spoke about the specific amendments that need to be made to the technical regulations banning the use of plastic bags.

A representative of the company "Bioplastic" also said that the improper implementation of the above-mentioned regulation had brought damage to their company and put it in a rather difficult situation.

Grzegorz Ganczewski noted that the existence of an appropriate certification scheme in the country and its proper functioning played a major role in overcoming such problems. According to Artur Bartkowiak, the government's role in enforcing regulations is important. In addition, restraining penalties should be considered for counterfeiting companies and improperly certified product manufacturers and distributors. Irma Gurguliani, from the Department of Waste and Chemicals Management of the Ministry of Environmental Protection and Agriculture, commented that Georgia had recognized the European standard EN 13432 as a national standard. Therefore, only products certified according to this standard are allowed to be imported. As for the certification of local production, starting from the next year, companies producing biodegradable bags will be required to have the appropriate certification. The lack of an appropriate laboratory in the country to directly control the composition of products still remains a problem. Overall, Georgia continues to move toward the prevention of plastics, which in the future will affect other packaging besides bags.

Neli Korkotadze, from the Department of Environmental Supervision of the Ministry explained that despite the pandemic, the department managed to control the enterprises. The Ministry is also working to tighten administrative sanctions, as existing sanctions (including product confiscation) have shown insufficient preventive results. The introduction of a manufacturer certification obligation from January 2021 will also significantly simplify control.

Konstantin Chanturia, UNDP component manager of the EU IPSC project, noted that the cluster management organization for packaging material manufacturers can play an important role in this regard and carry out advocacy activities on behalf of member companies. The organization is a member of the Association of European and Global Packaging Organizations. Accordingly, it can also take on the function of a news hub in this direction. In addition, it will be possible to create a platform in which investment projects for the transition to new technologies will be supported through joint efforts. New skills and abilities will also be developed.

About the Project

"The EU Innovative Action for Private Sector Competitiveness in Georgia" is a joint initiative of the four EU and UN agencies, including the United Nations Development Programme (UNDP), the Food and Agriculture Organization (FAO), the Industrial Development Organization (UNIDO) and the International Organization for Migration (IOM). The initiative is a response to Georgia's 2017 Economic and Business Development Action Plan and responds to one of the program's three components: "Strengthening Business Development".

The Initiative cooperates with the Ministry of Sustainable Development and Economy, the Ministry of Environment and Agriculture and the Department of Diaspora Relations of the Ministry of Foreign Affairs and private sector development stakeholders - businesses and entrepreneurs, public and industry business associations, educational institutions, trade associations and unions.

Expected results within the framework of this project implemented by the United Nations Development Program (UNDP):

- Development of a pilot cluster in the packaging sector to encourage value chains;
- Support strategic investments in companies and / or projects to develop clusters.