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Circular Economy oriented Value Chain Guideline for Plastic Packaging Waste Utilisation



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Circular Economy oriented Value Chain guideline for Plastic Packaging Plastic Utilisation



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List of Abbreviations

CBA	Cost Benefit Analysis
CCA	Central Coordination Authority
CCIS	Chamber of Commerce and Industry
CE	Circular Economy
CEVES	Centar za visoke ekonomske studije
CLO	Compost-Like Output
CSO	Civil Society Organisations
DRS	Deposit Return Systems
DKTI	Deutsche Klima- und TechnologieInitiative
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ELV	Emission Limit Values
EPF	Environmental Protection Fund
EPR	Extended Producers Responsibility
EU	European Union
GDP	Gross Domestic Product
GFA	GFA Consulting Group, GFA South East Europe
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GPP	Green Public Procurement
IFI	International Financing Institution
IRC	Informal Resource Collectors
IRS	Informal Recycling Sector
ISWA	International Solid Waste Management Association
LDK	LDK Consultants Engineers and Planners SA
MoEP	Ministry of Environmental Protection
MRF	Materials Recovery Facility
NGO	Non-Governmental Organisation
PAYT	Pay As You Throw
PP	Plastic Packaging
PREMA	Profitable Environmental Management
PRO	Packaging Recovery Organisation
PUC	Public Utility Company
RDF	Refuse-Derived Fuel
SaS	Separation at Source

SDGs	Sustainable Development Goals
SEPA	Serbian Environment Protection Agency
SeSWA	Serbian Solid Waste Association
SITRA	Suomen Itsenäisyyden Juhlarahasto (Finnish Innovation Fund)
SMART	Specific Measurable, Achievable, Realistic, Time-Orientated
SME	Small-Medium Enterprises
SRM	Secondary Raw Materials
STE	Short-Term Expert
SWIS	Solid Waste Information System
SWM	Solid Waste Management
UNECE	United Nations Economic Commission for Europe
VC	Value Chain
WBCSD	World Business Council on Sustainable Development
WFD	Waste Framework Directive
WM	Waste Management

Executive Summary

The present **Plastic Packaging Waste Utilisation Guideline** has been elaborated in the framework of the German Development Cooperation Project **DKTI Climate Sensitive Waste Management in Serbia**, hereafter called “the Project”, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. “A waste circular economy contributing to climate change mitigation is introduced in selected regions of Serbia” is defined as the module objective of the Project.

The sector specific guidelines aim to provide support to the user, both manufacturing companies as well as public authorities to utilize Plastic Packaging in their production process and to monitor such practices. In addition, the guidelines highlight the business opportunities by the incorporation of CE principles in the evolving waste management sector.

This guideline introduces the reader to the basic definitions of Plastic Packaging waste and gives a brief analysis of the relevant sector on EU level. The document also focuses on the analysis of the existing data and studies pertaining to the specific waste stream, the situation of the SWM sector in Serbia, with special focus on the production of Plastic Packaging waste, and identifies main actors within the sector. The current situation regarding the utilisation of PP as SRM is analysed based on the existing data, leading to the identification of the potential value chains.

Opportunities, basic tools and barriers for the transition to a CE model are thoroughly analysed and set of proposals are presented based on this analysis. Necessary legal and institutional reforms, and several technical and business aspects are discussed as well.

The document presents the requirements for the utilisation of PP in the production processes of the Serbian companies and elaborates on general directions for the promotion of CE practices.

Finally, the guidelines analyse additional ways (apart from PP utilisation) that may be followed for promoting CE in Serbia, with special focus on the issue of Plastic Packaging waste reduction through the adjustment of the design and marketing of current practices in the sector.

Most of the basic findings of the report are related with the fundamental legal and institutional deficiencies of the overall SWM sector operation in Serbia (e.g. harmonisation with EU legislation, availability of data, SWM best practices implementation, lack of infrastructure). One of the most important obstacles towards the full utilisation of the CE potential is the fact that currently there are no drivers for separation at source. For this reason the quality of plastic waste is not sufficient for increased efficiency in recycling, prevention of downcycling and thus moving towards a CE Value Chain. The road to the establishment of a circular Value Chain for Plastic Packaging waste passes primarily through the tackling of the most fundamental deficiencies of the SWM system of Serbia so that 1.adequate drivers are created for separation and separate handling of PP and 2.sufficient recyclable materials quality is ensured (establishment of Separation as Source schemes, establishment of deposit and Pay As You Throw schemes, institutional strengthening of municipalities and regional authorities, optimisation of data collection procedures especially at the initial levels of collection and transmission). Along with the tackling of these issues, there are several CE tools that can be applied, even at the present level of maturity of the system, such as the rethinking of business models of SME's of the sector for the reduction of PP waste produced and the utilisation of PP waste as a raw material and the awareness raising among the SWM actors and primarily among the citizens in order to create drivers for the establishment of more circular Value Chains in the PP value chain of Serbia.

More specifically, the structure of the guideline is as follows:

The first chapter (**Chapter 1**) is an introduction to the guideline and a presentation of the basic definitions of the Plastic Packaging waste, and a brief analysis of the relevant sector on EU level. Moreover, the target groups and the implementation boundaries of this guideline are defined.

The subsequent chapter of the guideline (**Chapter 2**) focuses on the analysis of the existing data and studies pertaining to the specific waste stream, the situation of the SWM sector in Serbia, with special focus on the production of Plastic Packaging waste, and identifies main actors within the sector. The

current situation regarding the utilisation of SRM is analysed based on the existing data, leading to the identification of the potential value chains.

In the **Chapters 3 and 5**, an analysis is done regarding the requirements for the utilisation of SRM in the production processes of the Serbian companies. Possible business benefits and opportunities are presented, financial requirements are defined, and specific proposals are made for the possible financing options and sources.

Chapter 4 presents the set of proposals. This chapter describes all necessary changes that have to be implemented. Proposals are based on how the identified barriers can be overcome. Furthermore, the necessary legal and institutional reforms, the basic directions for the promotion of CE practices as well as several technical aspects are analysed in Chapter 6.

Finally, the last chapter (**Chapter 6**) discusses possible alternative ways that can be followed (apart from the SRM utilisation) to promote CE in Serbia, with special focus on the issue of Plastic Packaging waste reduction through the adjustment of the design and marketing of current practices in the sector.

1. Introduction

1.1. Purpose of the guidelines

The Project **DKTI Climate Sensitive Waste Management in Serbia**, aims to support both local authorities and organisations active in SWM sector in Serbia, to tackle the existing challenges hindering the development of a sustainable and integrated SWM system. This is primarily done through the introduction of modern CE practices. The objective can be achieved by setting the foundations for the establishment of circular value chains by a set of practical steps that address all levels of value chain development:

a) by enhancing the collection of materials considered as waste, which should be deemed as inputs (or “nutrients”) to other processes under the concept of CE;

b) by ensuring the introduction/utilisation of these materials in the production processes of the SME’s; and

c) by the **elaboration of a strategic/policy framework** (taking into consideration the existing work already done by GIZ and other organisations active in this field) **in order to coordinate the various stakeholders and lead the change towards the desired outcomes.**

In the framework of the Project, the GFA-LDK consortium compiled two reports with guidelines for the development of CE oriented Value Chains for two priority SRMs (the present report is for Plastic Packaging and the other report cosubmitted in this framework is for HORECA food waste), including sector-specific guidelines for their utilisation. The sector specific guidelines aim to provide support to the user, both manufacturing companies as well as public authorities to utilize SRM in their production process and to monitor such practices. In addition, the guidelines highlight the business opportunities that can be triggered by the incorporation of CE principles in the country’s evolving waste management sector. To this direction, the team of GFA-LDK will use the guidelines to support Serbian SME’s in the introduction of CE through preparation of CE Action Plans. Three of these SMEs will be supported further by the GFA-LDK local experts to develop CE business models.

The selection of the two priority SRMs was based on the preparatory analysis provided by GIZ. GIZ had already researched the existing situation and developed a proposal for the transition to circular value chains for the two waste streams that have significant contribution to the percentage of waste landfilled each year in Serbia, notably Plastic Packaging waste and Plastic Packaging. The aforementioned priority sectors were chosen for the development of the SRM utilisation Guidelines.



Figure 1: Actors in Plastic Packaging waste VC

All actors dealing with Plastic Packaging waste (mentioned in detail in paragraph 2.2) should be considered in a plan for the implementation of CE principles in the business sector. That can be done,

though, at different phases of its implementation. The immediate target groups of this guideline are the members of the first four categories of actors, which will play a central role from setting the rules for a CE transition in the value chain of Plastic Packaging (e.g. MoEP, CCIS), to the initiation of any Separation at Source (SaS) scheme for the PP waste (municipalities, regional authorities). The central authorities must also undertake initiatives for the creation of a more enabling legislative framework that regulates and protects the market of plastic SRM in Serbia from interference from neighbouring markets, as well as the design and launching of a deposit system, so that Serbia can increase its capacity for PET bottle to bottle recycling.

The requirements on legislative and institutional level do not relieve the obligation of the private sector to contribute to the transition to a more circular value chain in plastic packaging. Several directions given in the guideline (especially in paragraph 4.6) are useful for private entities that are planning to incorporate SRMs in their production processes or move towards a more circular process with less waste produced.

1.2. Boundaries of the Guideline

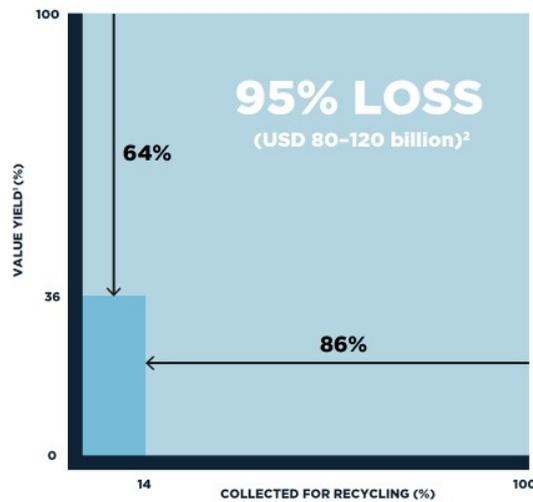
Plastic Packaging waste is a very broad term encompassing several different types of plastic. As it is mentioned in the online database of US EPA, (2017) packaging products comprise several different plastic resins: polyethylene terephthalate (PET) soft drink and water bottles, high-density polyethylene (HDPE) milk and water jugs, film products (including bags and sacks) made of low-density polyethylene (LDPE) and other containers and packaging (including clamshells, trays, caps, lids, egg cartons, loose fill, produce baskets, coatings and closures) made up of polyvinyl chloride (PVC), polystyrene (PS), polypropylene and other resins.

This guideline is based on and expands the previous study elaborated by CEVES (2019). As the CEVES assessment covers, separately, two types of PP, PET bottles and other PP, the same logic will be followed in this guideline: The proposed measures will have general application and positive impact in all PP sub-streams, but special focus will be put on PET plastics and PET bottles in particular. The origin of the PP discussed is from industrial, commercial and municipal waste.

1.3. Plastic Packaging waste

The portion of plastic packaging in worldwide packaging volumes has expanded from 17% to 25% between 2000 and 2015 driven by a solid development in the worldwide plastic packaging business sector of 5% every year. In 2013, the industry produced 78 million tonnes of plastic packaging. Plastic packaging production volume is estimated to continue increasing to double within 15 years and more than quadruple by 2050, to 318 million tonnes every year — more than the whole plastics industry today. (World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, 2016)

It is estimated that currently almost 95% of packaging materials value (equivalent to USD 80-120 billion) every year is lost after short use. The current recycling rates of packaging plastic material are still very low and not more than 14% and the recovered materials are used usually for the production of lower-value materials that are not again recyclable after use (see Figure 2). Overall, only 5% of the material value is retained for further use.



1 Value yield = volume yield * price yield, where volume yield = output volumes / input volumes, and price yield = USD per tonne of reprocessed material / USD per tonne of virgin material

2 Current situation based on 14% recycling rate, 72% volume yield and 50% price yield. Total volume of plastic packaging of 78 Mt, given a weighted average price of 1,100-1,600 USD/t

Figure 2: Plastic packaging material value loss after one use cycle (World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, 2016)

Higher use of plastics is in the plastic packaging production process. Plastics production is directly linked to oil production and use of fossil feedstocks. Almost 4-8% of the global oil production is used for plastics manufacturing. The expected growth of plastics demand in the future (which accounts almost 3.5% to 3.8% annually) will not be able to be met from virgin materials, since the oil demand rates is increasing in significant lower rates (only 0.5% annually). (World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, 2016).

Considering the results of the previous analysis and considering the environmental impacts related to the mismanagement of post-consumer plastics, a major challenge for the packaging plastics material industry is to effectively decrease the amounts of plastics leakage to the environment, returning them to the production process substituting the production virgin materials. For the majority of packaging plastics (including PET and LDPE), the most effective procedure for the creation of material loops is mechanical recycling. In this procedure, post-consumer plastics are processed into new resins that are used for the production of new plastic products. The following figures present an overview of PET bottles and LDPE films



Figure 3: PET bottle-to-bottle recycling process (Source: <https://www.plasticsrecyclers.eu/how-does-recycling-work>)



Figure 4: LDPE film recycling process (Source: <https://www.plasticsrecyclers.eu/how-does-recycling-work>)

On EU level current overall production of plastic is based mainly on virgin plastic raw materials. Based on data from the Plastics Europe, which is the leading pan-European association and represents plastics manufacturers active in the European plastics industry (www.plasticseurope.org), the overall plastic raw materials demand in Europe for 2018 was 61M tonnes, of which only 8.7% was covered by recycled materials. The following diagram (Plastics Europe, n.d.) provides an overview of European plastics market for the year 2018.

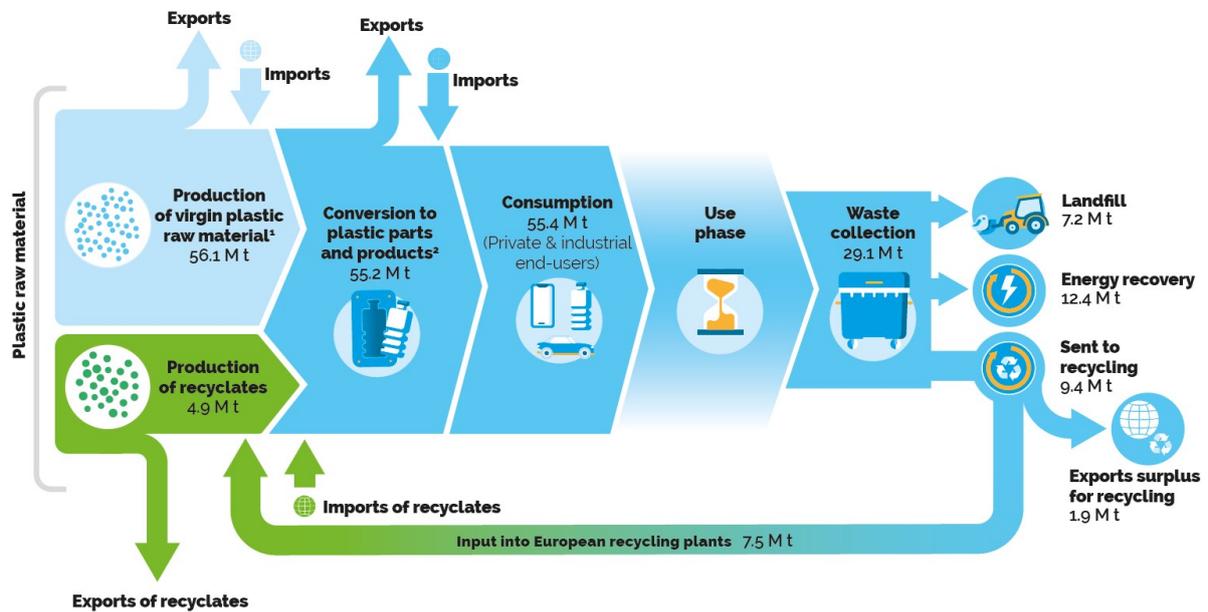


Figure 5: European plastics manufacturing market in 2018 (Plastics Europe, n.d.)

Following the current trend for proper management of post-consumer plastics and understanding the environmental impacts of plastic waste, the relevant industry supports circular economy committing itself to contribute to minimize waste by preserving post-consumer plastic materials’ value. In this direction the most value-preserving cycles are repairing and maintenance as well as reuse for which there is significant potential in durable plastics products (Crippa et al., 2019).

Currently, on EU level, the level of virgin materials substitution in plastics manufacturing industry is low. As it was shown in previous Figure 5, only 8.7% of recycled plastic material is used for the new plastic production. In Figure 6 the results of a study prepared by Deloitte Sustainability (2017) which focuses on the destination of the post-consumer plastics per type, are presented.

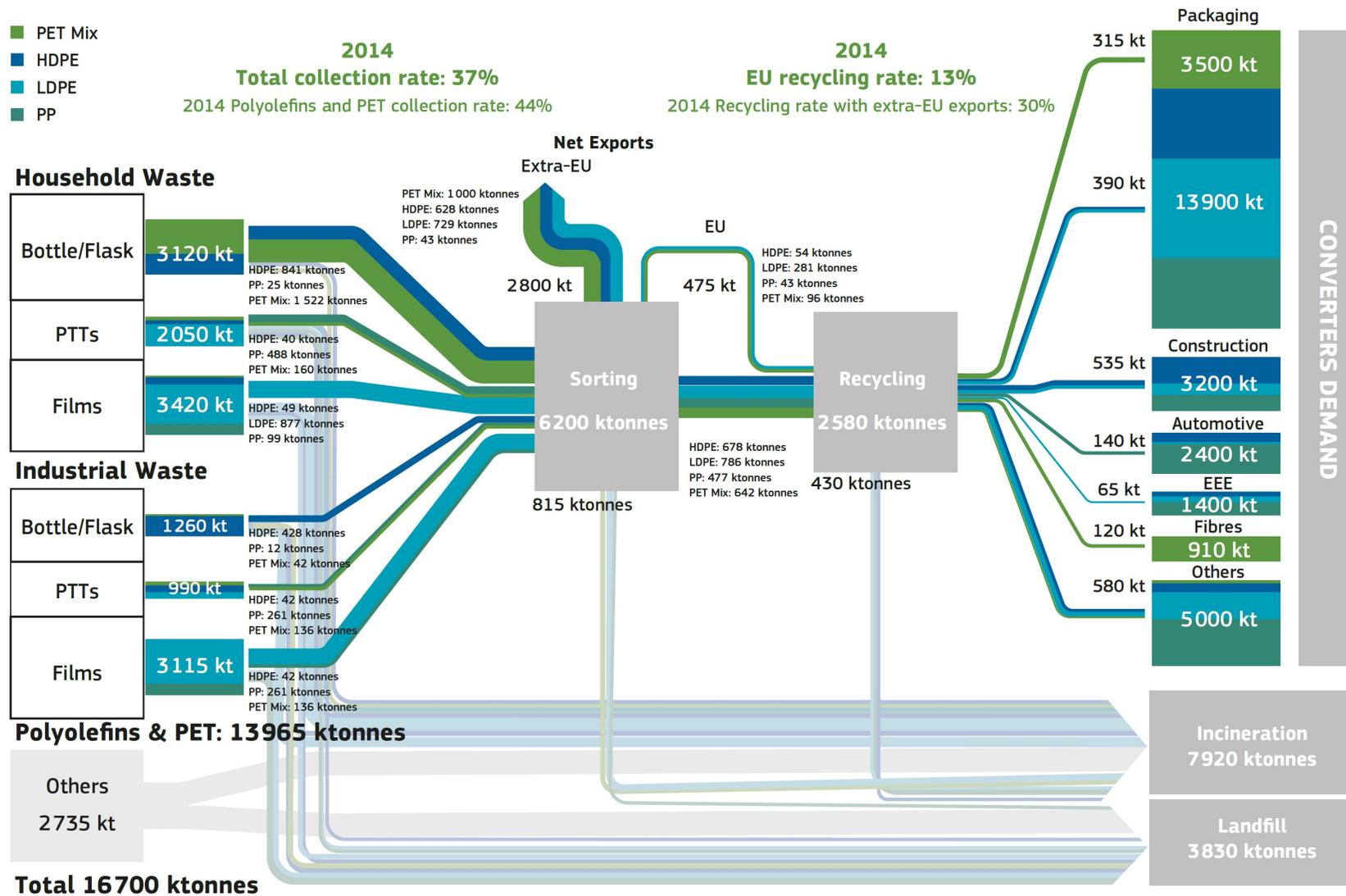


Figure 6: Overview of European plastics streams, 2014 (Crippa et al., 2019)

According to the diagram above, only 13% or 2.15 M tonnes of the total plastics volume collected reached European converters for the production of other plastic materials. From the rest, a significant amount (almost 17%) of the plastics collected separately is exported with limited information about their fate. Almost 33% of the recyclable plastics are used in packaging (15% of PET and 18% of LDPE and HDPE), 25% in construction, 6.5% in car industry, 3% in electrical and electronic equipment, 5.5% in fibres and the rest 27% in other sectors. In the year of reference (2014) the overall rate of separate collection of plastics was 37% (44% if reference is made to PET and Polyolefins). The study (Crippa et al., 2019) also mentions that the recycled plastic materials that reached the converters:

- rPET was used mainly in packaging (313kt), fibres (121kt) and other industries (107kt)
- rHDPE was used in construction (321kt), packaging (142kt) and other industries (107kt)
- rPP was used in automotive industry (125kt), packaging (69kt), construction (63kt), EEE (53kt) and other industries (76kt)
- rLDPE was used in packaging (180kt), construction (150kt), and other industries 320kt)

Moreover, the amount that resulted in disposal (incineration and landfilling) in 2014 was almost 70% of the total plastic waste. This rate was not improved significantly in the next years – in 2018 it was almost 67% (see Figure 5). This high disposal rate of plastics highlights also the fact that some plastic products are hard to be recycled due to their complexity resulted from the production of various composites, the production of multilayer materials (used in packaging from different polymer films) that improve packaging performance and the use of adhesives (polymers or resins) used to bind immiscible materials together.

Figure 6, shows that plastic recycling industry is greatly dependent on exports in other countries, especially in China. Despite the fact that 2014 was only some years ago, the situation is totally different after the “National Sword” policy, which bans the imports of separated collected materials in China. National Sword policy started in 2018 banning initially some categories of imported recyclables. National Sword has steadily expanded banning more recyclables since then. For many years, European recycled plastic materials were following the convenient route of exporting mainly to China, and consequently the European market did not have the motive to expand and grow adequately to absorb the recycled PP, to meet the plastics production needs, to innovate and to find new applications for recycled plastics. The need for a mature and viable recycling market for the PP will increase in the close future.

EU strategy on plastics

The EU sees great challenges and opportunities in dealing with plastics; plastic production has increased twentyfold in the last 50 years. The EU plastics industry employs 1.5 million people and in 2015 sales of EUR 340 billion were achieved. Around 26 million tonnes of plastic waste are generated across the EU, less than 30% of which is collected for recycling. The vast majority are either exported to countries outside Europe or treated within the EU. Thermal treatment has increased in recent years. The amount of plastic waste continues to increase; the intrusion of microplastics is another source of danger..

The central point in the EU strategy is a vision with the following messages:

- Intelligent, sustainable and innovative plastics industry;
- Consideration of the aspects of reuse, recycling and repair already in the design;
- Reduction of greenhouse gases;
- Less dependence on raw material imports;
- Broad support for corresponding innovations by the state, citizens and business for the circular economy.

The plastic strategy therefore formulates the following key areas of action:

- Improving the economic framework and the quality of plastic recycling;
 - Recyclable design;

- Boosting demand for recycled plastics;
- Better and more harmonized separate collection and sorting;
- Contain plastic waste and litter;
 - Creation of a clear legal framework for biodegradable plastics;
 - Increased attention to the issue of microplastic;
- Mobilizing innovations and investments for circular solutions;
- Support measures at global level.

The EU plastics strategy is highly relevant for Serbia in its process of joining the EU.

1.4. Tools and instruments for the transition to Circular Economy

The transition from linear to circular economic system constitutes a major change to the whole existing economic system. According to European Environmental Agency (European Environment Agency, 2019) this transition is a “wide-society process, engaging multiple stakeholders and depending critically on the emergence of innovation in technologies, social practices, organisational forms and business models”. Governments play significant role in this transition but not just through policy planning and implementation, due to the complexity and uncertainty of this systemic change. Governments can contribute by promoting and facilitating the transition, by providing direction and consistency to society – wide processes, by developing policies and strategies with clear visions, objectives and targets etc.

In this direction, the European Commission has presented in December 2015 the new CE package containing an Action Plan that includes a variety of measures to strengthen the implementation of the circular economy in the EU member states. The Circular Economy Strategy paper for Serbia (draft) (GIZ, 2017) summarizes the instruments and measures of the Action Plan that are presented in the following table:

Table 1: Policy instruments outlined in Circular Economy Action Plan (GIZ, 2017)

Type of instruments		Rationale	Tools / instruments	Scope of instruments and comments
Production oriented policy instruments	Support for Ecodesign of products	The Action plan encourages the eco-design perspective during the production phase that promotes the reparability, durability and recyclability of products. A sustainable design may enable recyclers to disassemble products in order to recover valuable materials and components	Ecodesign Directive	Alignment of different groups (producers, users, recyclers) interests
				Setting of minimum mandatory requirements so far mainly regarding the energy efficiency of products
				Prevention of trade barriers
				Improve product's quality
			Ecodesign Working Plans	Enhance environmental protection
				Development of product design and marking requirements
				Integration of resource efficiency aspects into the evaluation criteria for products that so far are dominated by energy efficiency aspects

Type of instruments		Rationale	Tools / instruments	Scope of instruments and comments
	Addressing planned obsolescence	A barrier to the circular economy is the planned obsolescence that occurs when a product is designed with the intention of it breaking, failing, or becoming unfashionable after a determined period of time.	No specific EU policy instrument and/or regulation is applied so far. Individual Member States can adopt a relevant law (e.g. France)	
	Extended Producer Responsibility (EPR)	The EPR calls for an environmental policy approach in which the producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle. Accordingly, producers are responsible for collecting or taking back used goods to sort and treat them for recycling. Incentives for producers to design easier recyclable products will further support the implementation of the EPR. Additionally, the industry will financially provide for collection and recycling	EPR is mandatory through WEEE, batteries and ELV Directives	In EU level, EPR is mandatory for WEEE, Batteries and End-of-life vehicles. Additional waste streams for which producer responsibility organisations have been most commonly identified within the European Union include tyres, waste oil, paper and card, and construction and demolition waste. However, a much broader range of waste streams are subject to obligatory or voluntary producer responsibility systems in some MS, including: farm plastics, medicines and medical waste, plastic bags, photo-chemicals and chemicals, newspapers, refrigerants, pesticides and herbicides, and lamps, light bulbs and fittings
	Support for SMEs	SMEs are the most important stakeholder to boost circular economy practices	The Commission has supported SMEs in their transition to the circular economy through the continued implementation of the Green Action Plan for SMEs	The Commission has supported SMEs in their transition to the circular economy through the continued implementation of the Green Action Plan for SMEs. Especially the Executive Agency for Small and Medium-sized Enterprises manages programmes on behalf of the European Commission and turns EU policies into action. It manages significant parts of large-scale projects, such as COSME, LIFE, Horizon 2020 and EMFF.
Consumption oriented policy instruments	Strengthening reuse and remanufacturing	As one of the key objectives the Action Plan addresses owners and society to promote reuse. The role of re-use and preparation for re-use in a circular economy has been significantly strengthened by the five-step waste hierarchy that now clearly states that reusing or	The Commission aims to encourage reuse in different ways	Scope of the Commission is to establish quality standards for reused and remanufactured products, to support local and regional reuse networks in order to support the professionalisation of the sector and to create economies of scale, to enable the access of reuse organisations to relevant waste streams for they get mixed up and to further

Type of instruments		Rationale	Tools / instruments	Scope of instruments and comments
		remanufacturing of products should be preferably over all kinds of recycling. Reusing allows maximal practical benefits from products and generates minimum amount of waste. Thus, the reuse of products or specific components will particularly efficiently help to reduce the demand for raw materials and especially maintain the physical assets and economic value of raw materials already contained in products.		strengthen reuse by general policy frameworks, such as the Green Public Procurement programme.
	Green Public Procurement	Europe's public authorities are major consumers. By using their purchasing power to choose environmentally friendly goods, services and works, they can make an important contribution to sustainable consumption and production - what we call Green Public Procurement (GPP) or green purchasing.	GPP is a voluntary instrument - EC supports it by issuing GPP criteria for different products	GPP requires the inclusion of clear and verifiable environmental criteria for products and services in the public procurement process. The challenge of furthering take- up by more public sector bodies so that GPP becomes common practice still remains. GPP criteria helps the single market to provide equal opportunities that will accelerate and help drive the single market for environmentally sound goods and services
Policy instruments in the field of financing the circular economy	Importance of innovative circular business models	Innovative business models based on closed cycles and resource efficiency are one of the most powerful drivers of the circular economy. Where successfully established, such business models will have a direct and lasting impact on the economic system and at the same time advance the adaptation of the necessary framework.	Policies and instruments that allow and promote of innovative circular business models is necessary	Different new innovative business models have been developed that can boost CE initiatives. For example, "using instead of owning" concept, turns the ownership of a product to a service. This business model provides the incentive to manufacturer for the production of long-lived product including an optimised return system using EPR. Other similar concept is the one sharing business model in which refers to sharing the use of a product with other customers instead of the limited use of the same product if owned.
	Investment strategies	The European Commission's Circular Economy Action Plan explicitly aims to shift public investments away from investments in end-of-pipe waste infrastructures	EU including EIB intends to modify investments' eligibility criteria and to finance CE projects instead of waste	

Type of instruments	Rationale	Tools / instruments	Scope of instruments and comments
	into such innovative business models: “Shifting the focus of waste management funds from waste incineration to closing material loops will financially push the implementation of the circular economy.” (European Commission, 2015).	management infrastructure	

The aforementioned list of tools is general and not all of them can be applied for the particular value chain and in the current conditions in Serbia. There are special prerequisites (such as closing the legal gaps for the establishment of separation at source systems and pay-as-you-throw systems, construction of the necessary infrastructure and provision of adequate equipment to the PUC`s and municipalities etc) in order that they become effective (legal framework and infrastructure prerequisites – see chapter no. 4). Following the creation of the necessary legal substratum and the implementation of the necessary infrastructure, the most relevant (for the current situation in Serbia) policy tools are the support for the SMEs and the promotion of innovative business models via the use of CE funds of various donors (see paragraph **Error! Reference source not found.**). Finally, the use of tools for the creation of competitive advantages to companies that have adopted CE principles should be considered during this stage (Green Public Procurement, promotion of circular economy-certified companies).

1.5. Benefits for the Public of using Secondary Raw Materials

The main benefits of reuse, recovery and recycling of plastic packaging waste are the following:

- Lower quantities disposed at the landfill, thus generating lower operational costs and longer lifetime of landfills as well as lower greenhouse gas emissions
- Less use of primary raw materials and increase of resource efficiency in the sector
- Full implementation of EU waste hierarchy (prevention, reuse, recycling, recovery, landfill)
- Potential resource efficiency gains
- Substitute high impact products
- Reduce waste throughout supply chain

1.6. Circular Economy and Value Chain terminologies used in the guideline

Waste streams

Waste is defined as any substance or object, which the holder discards, or intends, or is required to discard.

Value Chains can be defined as 1. The sequence of related business activities from the provision of specific inputs for a particular product or product range to primary production, transformation and marketing, up to the final sale of the particular product to the consumer, and 2. The set of enterprises that perform these business activities, i.e. the producers, processors, traders and distributors of the particular product. Enterprises are linked by a series of business transactions by which the product is passed on from primary producers to consumers in end markets.

Biodegradable waste means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard,¹

Household waste - waste from domestic activities that belongs to classes 15.01 and 20 of the European Waste List,

Hazardous waste – generic name for waste, which falls in the category of waste defined as hazardous and/or has at least one constituent or a property which is dangerous,

Household Hazardous waste – waste from households, which is hazardous.

Municipal waste – waste from households, as well as other waste sources which, because of its nature or composition, is similar to waste from households,

Packaging waste - any packaging or packaging materials that meet the definition of waste,

Recyclable waste - waste that may be material in a production process for obtaining the original or for other purposes,

Solid Waste - components from domestic or industrial activities, which have no value or applicability for user, and are collected to be handed by the sanitation service operator,

Special waste - waste, whose handling, collection, transport and storage are subject to a regime governed by legal acts in order to avoid adverse effects on human health, property and the environment,

Street waste - waste from the daily activity of the population on green spaces, from animals, from the filing of solids from the atmosphere,

WEEE - Waste Electrical and Electronic Equipment.

Products

Compost - the product resulting from the fermentation and aerobic/anaerobic processes or by microbial decomposition of organic component of waste.

Waste Management and Waste Operators

Public sanitation system - all the technological facilities, equipment and specific function facilities, construction and related land through which the service sanitation operates.

Waste management – collection, transport, recovery and disposal of waste, including the **supervision** of such operations and the **aftercare** of disposal sites, and including **actions taken** as a dealer or broker.

Operator - the natural or legal person responsible for a landfill in accordance with the **internal** legislation of the country where the landfill is located; this person may be in charge from the preparation to the after-care phase.

Producer of waste – anyone whose activities produce waste (original waste producer) or anyone who carries out pre-processing, mixing or other operations resulting in a change in the nature or composition of this waste.

Performance of Service

Performance indicators - parameters of sanitation service operations, which set minimum levels of quality and which track operator performance to license conditions.

Facilities

¹ It is noted that biodegradable waste stream is wider than the bio-waste of the WFD. It further includes paper, cardboard, wood, textiles, etc.

“**Dirty**” MRF’s – Materials Recovery Facilities that accept comingled municipal waste,

Landfill - final disposal site for waste storage on the ground or underground.

Transfer Station - space specially arranged for temporary storage of waste collected from the same locality or in different localities in order to transport them to a central MRF, Pre-treatment facility, Incinerator, or a sanitary landfill.

Green Collection Points / Green Disposal Point – a bring to point space specially arranged for the temporary storage of waste fractions collected from households of in order to transport them a central MRF, Incinerator, or a sanitary landfill.

A Civic Amenity Site or household waste recycling centre is a facility where the public can dispose of recyclable materials, hazardous waste, and bulky waste. Civic amenity sites are run by the local authority in a given area. Collection points for recyclable waste such as green waste, metals, glass and other waste types are available. The site is staffed with trained personnel, who can guide and monitor visitor’s behaviour. In Denmark, Sweden and Germany waste may be sorted into more than 20 different factions.

Activities

Collection - the gathering of waste, including the preliminary sorting and preliminary storage of waste for the purposes of transport to a waste treatment facility.

Separate collection - the collection where a waste stream is kept separately (ideally already at the source) by type and nature so as to facilitate a specific treatment.

Recovery - any waste management operation that diverts a waste material from the waste stream, which results in a certain product with a potential economic or ecological benefit. Recovery mainly refers to the following operations:

- Material recovery, i.e. recycling;
- Energy recovery, i.e. re-use a fuel;
- Biological recovery, e.g. composting; and
- Re-use.

Disposal - any waste management operation serving or carrying out the final treatment and safe disposal of waste:

Circular Economy:

is an economic system aimed at minimising waste and making the most of resources. In a circular system resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing energy and material loops; this can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling.

This regenerative approach is in contrast to the traditional linear economy, which has a 'take, make, dispose' model of production. The circular economy is not in contrast with the concept of economic growth, e.g. the same “output” can be achieved with less primary resources.

Nutrients:

In this definition, the distinction between the types of flows (technological or biological) is significant. According to Aldersgate (2012) “A circular economy is a restorative industrial economy in which materials flows are of two types: biological nutrients, designed to re-enter the biosphere safely, and technical nutrients (non-biological materials), which are designed to circulate at high quality, with their economic value preserved or enhanced”.

2. Existing Value Chain

2.1. Plastic Packaging value chain in Serbia

As it is mentioned in the three regional Waste Management plans elaborated with the technical assistance of GIZ and according to the National WM Strategy of Serbia (GIZ, 2019), the recycling and recycling of waste material is currently around 5% (in the EU an average of 36%).

According to CEVES, 2019, the recycling sector is the heart of PP Value Chain, and in turn the recycling sector is strongly dependent on the waste collection in Serbia. The collection and recovery of plastic packaging (PP) waste from the municipal waste stream in Serbia, is conducted in the following ways:

1. Curb-side collection of mixed household waste, which is then sorted in “dirty” Material Recovery Facilities (MRFs). According to Mrkajić et al. (2018) there are ten municipalities with MRF;
2. Curb-side collection of bins with dry recyclables, which are separated from the organic/comingled waste. These streams are also sorted in MRFs;
3. Separation by informal resource collectors (IRC) at the landfills. The IRCs sell the materials they recover to the Landfill Operator (usually a PUC) at a specific price;
4. Informal collection from the waste bins. IRCs collect waste directly from the bins and sell them to private SWM companies or directly to recycling industries.

According to the most studies and persons interviewed (CEVES, 2019, Deloitte, 2018, Sekopak, 2019, Greentech, 2019) the first two ways represent less than 2% of the total separated PP, while the latter are the most prevailing ones.

Recycling industry receives material input from different sources. It is estimated (Greentech, 2019) that approximately 50% comes directly from the informal sector (informal resource collectors), 25 – 30% from PUCs operating the landfills (their teams are composed of IRCs as mentioned above), and another 20 – 25% from various private actors. Approximately, the same estimate derives from Deloitte’s study (Deloitte, 2018): as much as 87% originates from the informal sector, while only 13% is collected by Utility Companies or the packaging schemes directly.

PUCs (along with the informal sector are the primary actors collecting and providing recycling industry with PET. On the other hand, private companies cover mostly industrial waste. Overall, 25% of total input purchased refers to imports of plastic waste (CEVES, 2019).

As it is stated in the majority of the studies and articles used as references in the present report, data regarding SWM management in Serbia are very scarce. Regarding the actual quantities of PP waste put on the market and collected as recyclables, the most recent estimation is the one included in CEVES report (2019), and is compiled in the following table (Table 2). Based on this estimation, Serbia generates 16kg of plastic packaging waste per capita. This estimation implies significant increase in waste production during 2018.

Table 2: Plastic Packaging placed on market, wasted and collected by EPR systems (Source: CEVES, 2019)

Indicator	2013	2014	2015	2016	2017	2018
PP placed on market						
SEPA official data (k tonnes)	85,6	87,5	92,3	90,4	94,1	92
PP waste generated						
CEVES estimate (k tonnes)	99,1	110,9	116	116,4	118	119,6
o/w Commercial & Industrial	31,7	35,5	37,1	37,3	37,8	38,3
o/w Households	67,4	75,4	78,9	79,2	80,2	81,3

	o/w PET	38	42,6	44,5	44,7	45,3	46,6
	o/w other PP	61,1	68,3	71,5	71,7	72,7	72,9
PP recycled							
	SEPA official data (k tonnes)	13,6	15	15,2	18,2	25,6	26,2
	% of PP waste recycled*	13,7	13,5	13,1	15,6	21,7	21,9
	National recycling targets** (%)			14	17	19	21

The estimations of CEVES (2019) for the years 2013 – 2016 are corroborated by the thorough outlook on the evolution of packaging waste production, collection and recycling in Serbia, done by Vladimir Mrkajić et al. in 2018. This paper shows the trends for packaging waste during years 2013 – 2016 (Table 3). The quantities of municipal waste produced (P) and collected (C), the type and weight of overall packaging materials placed (P) on the Serbian market and collected (C) within the EPR system are expressed as kg/person.

Table 3: The quantities of municipal waste produced (P) and collected (C), the type and weight of overall packaging materials placed (P) on the Serbian market and collected (C) within the EPR system (adapted from SEPA, 2011- 2016) (Mrkajić et al. 2018)

	GDP per capita (€)	Municipal waste (kg/person)		Packaging materials (kg/person)							
					Plastic	Glass	Metal	Paper/Card.	Wood	Total (kg/person)	(%)
2011	4200	P	370	P	11,8	11,9	1,6	14,4	7,5	47,2	100
		C ^a	289	C	1,6	0,9	0,1	3,9	0,2	6,7	14,1
2012	4100	P	360	P	12,3	10,8	1,7	14,6	8	47,4	100
		C ^a	254	C	1,9	1,1	0,6	5,3	0,6	9,4	19,7
2013	4300	P	340	P	11,9	8,6	1,8	14,5	7,9	44,7	100
		C ^a	268	C	1,9	1,3	0,5	7,7	0,9	12,3	27,3
2014	4200	P	300	P	12,3	7,8	1,8	15	9	45,9	100
		C ^a	234	C	2,3	1,3	0,7	9,1	1	14,4	31,3
2015	4300	P	260	P	13	8,5	1,9	17,5	10	51	100
		C ^a	192	C	2,9	1,7	0,7	11,5	2,2	19	37,2
2016	4400	P	270	P	12,8	8,4	2	15,6	10,4	49,3	100
		C ^a	211	C	3,8	2,2	0,8	13,2	2,1	22,1	44,7

It is noted here that the calculations performed in this guideline were based on CEVES data, as they are the most recent ones.

The basic conclusions drawn from the aforementioned studies are that there is a clear trend for increase in the PP put on market (which follows the overall waste production). It is important that the quantities (both as absolute numbers and as percentages) of PP recovered and recycled, also show an increasing

trend. A negative trend shown in the paper of Mrkajić et al. (2018) is the participation of the PUCs in the total recovery of recyclables, as their capacity started diminishing from 2012 and onwards due to the abolishment of the Environmental Protection Fund (EPF) in 2012, which was the main source of financing for the municipalities for source separation and recycling programs. The abolishment of the EPF was made on the grounds of financial abuse, which highlights the institutional deficiencies of the SWM system in Serbia.

Significant discrepancy was found regarding the estimations of the actual percentage of recycled PP. CEVES states as primary source of the discrepancy the underestimated official data on generated PP waste, which led to reporting an overestimated recycling rate (27%). This discrepancy was found also in the estimated rates given by the recycling industry and the EPR systems (Greentech, 2019 and Sekopak, 2019). The divergence in this case is between 35% to 60% of the PET put on market. The basis of this divergence is the difference in the estimations of the actual PET put on market (recycling industry estimates 45kt while EPR systems estimate 30kt). Moreover, the discrepancies have to do with the consideration of imported waste (e.g. from Germany) and recycled here, or the PP waste exported to Croatia, which cannot be accurately determined (the estimations vary from 500 to 5.000 tonnes per year).

In any case, the most salient performance characteristics of the overall PP value chain do not change according to the aforementioned estimations. More specifically, a consensus was ascertained on the following:

1. The quality of the collected PP is very low due to the lack of SaS systems or the inefficient waste collection systems. This restricts the products which use PET as SRM to non-food packaging materials (construction and automotive industries), regenerated PET staple fibres as alternative to polyester fibres and PET strapping bands).
2. The current capacity of the recycling industries in Serbia suffices for the recycling of the quantities of collected PP.
3. No PET bottle to bottle capacity exists currently in Serbia. This is mainly due to the fact that a very small quantity of clear plastic not polluted by other waste streams is collected, which does not render any relevant investment feasible.

Very important factor that regulates the PP value chain in Serbia is the EPR scheme that operates in the country. The overall system is overseen by the MoEP of Serbia, which monitors the companies' compliance with the law, and the Serbian Environmental Protection Agency, which is responsible for collecting official statistics on packaging and packaging waste. The Law on Packaging and Packaging Waste (Official Gazette of RS, no. 36/09) allowed the introduction of the EPR mechanism and set the foundation for the current EPR scheme. According to this legislation, packaging producers that place over 1 t of packaging on the market annually are responsible for taking care of their packaging waste. This can be done by:

1. extending their responsibilities to a collective EPR company;
2. organizing an individual compliance system for packaging waste management;
3. paying a “polluter fee” prescribed by the Ministry of Environmental Protection (MoEP) in relation to their annual report on packaging quantities placed on the market.

The MoEP is responsible for overall monitoring of the compliance to the law, while the Serbian Environmental Protection Agency is responsible for data collection and management. The organisation of the EPR system of Serbia is shown in the following figure.

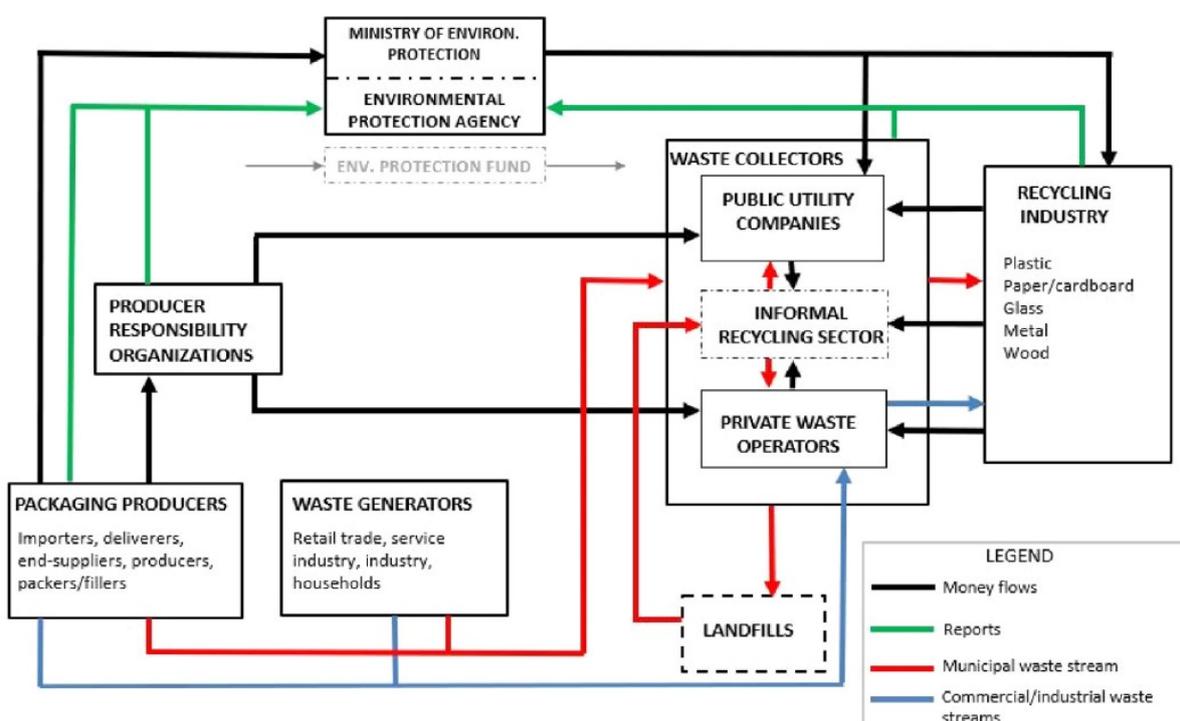


Figure 7: The administrative organization scheme of the Serbian Packaging Compliance Scheme (Mrkajić et al., 2018)

The system comprises seven private companies (SEKOPAK, EKOSTAR PAK, DELTA-PAK, CENEX, TEHNO EKO PAK, EKOPAK SISTEM and UNI EKO PAK), collecting the contributions by the packaging producers and redistributing the money with the aim to facilitate recyclables recovery from solid waste streams. In order to do this, the EPR companies reimburse PUCs or private companies for recyclables collection and delivery to the recycling facilities. The reimbursement rates for the collection and sorting of packaging waste paid by the Packaging Recovery Organisation (PRO) to the PUCs and private operators are usually determined on an annual basis. The amount paid by the PP producers to the EPR companies is ~26€/tonne of plastic (PRO EUROPE, 2019). For comparison, the relevant amounts from Bulgaria, Croatia and Greece are presented in the following table.

Table 4: Participation costs for plastic waste (source: PRO EUROPE, 2019)

Country	Participation costs (€/tonne)
Serbia	26
Bulgaria	58
Croatia	55
Greece	66

However, as it is stated in Mrkajić et al. (2018), the financial support received from the PROs represent the only subsidies for public and private waste operators. As these subsidies are not enough to cover their operation, a dominant part of the expenses related to the waste operators' service is covered by profit obtained by selling recyclables to processing industries, as well as from local waste management taxes.

A characteristic of the Plastic Packaging value chain in Serbia is the influence of international factors:

1. A significant quantity of collected Plastic Packaging is exported to Croatia (200-400 tonnes/month according to Greentek), that has a more protected market for the specific materials (assurance of specific prices). This interferes with the Serbian PP market which is not regulated.
2. There is an unspecified amount of imports of PP waste (PET and LDPE) from other countries (Croatia, Macedonia, BIH, Spain);
3. Some small collected quantities of colourless PET bottles are separately collected (and thus clean and without impurities from contact with organic waste) are currently sent to Romania in order to be recycled directly to PET bottles (Greentech, 2019).

According to CEVES (2019), in 2017, there were 57 active recyclers that reported that they recycled at least a kilogram of PP waste (according to Greentech mostly PET, LDPE and polypropylene). Out of those, the four largest recyclers accounted for 61% of total recycled PP waste. Ten major companies recycled more than 1000t, while 23 recycled less than 200t in 2017. Still, PET recycling in Serbia is highly concentrated. There are two large PET recyclers (“Greentech” and “Alwag”), which account for more than 95% of all PET recycling. The rest of the market is shared among several smaller recyclers.

Apart from the PET recycling market in Serbia, there are several other companies handling other streams of PP, such as LDPE film (Brzan and Intercord). Recycled LDPE can be used for production of waste bags, construction industry packaging materials, pipes-hoses for irrigation etc. The same goes for Polypropylene plastic (e.g. caps from bottles), which are hotwashed like the flakes of PET, and later used for the production of agricultural products (flowerpots etc).

The residual fraction of the PP waste, not collected and recycled, is disposed of in one of the following ways:

1. Landfilled on a sanitary landfill or dumpsite;
2. Illegally dumped;
3. Illegally burnt along with biomass or other materials;
4. Incinerated in cement factories for specific categories of the waste catalogue.

On the following page, a conceptual diagram of the current value chain for Plastic Packaging waste in Serbia is presented (Figure 8) based on the data included in CEVES (2019) reports. The current PP VC is mostly linear, with a significant but lower than the targets percentage being diverted from landfilling via recycling. The chain begins from plastic producers, continues to industry and retail shops and then it continues to the customers. From that point on, via the PUC’s or private collection companies the PP waste is collected and lead to the recycling companies which recycle the plastics for lower quality plastics (downcycling). A large percentage of the unsorted plastic in the comingled waste ends up in the landfills. Unfortunately, no separation at source schemes, no deposit schemes and thus no PET bottle to PET bottle recycling exists in Serbia.

In order to change the picture and move towards a more circular model, the VC presented in the subsequent figure should be established (Figure 9). More specifically, in this VC we have two major points of diversion from landfilling and avoidance of downcycling: one is the establishment of separation at source schemes and the other the establishment of a deposit scheme (the relevant law is currently under preparation). These two interventions will increase significantly the diversion from landfilling, as well as they will create the basis for the investments on PET bottle to PET bottle infrastructure and the creation of the relevant market.

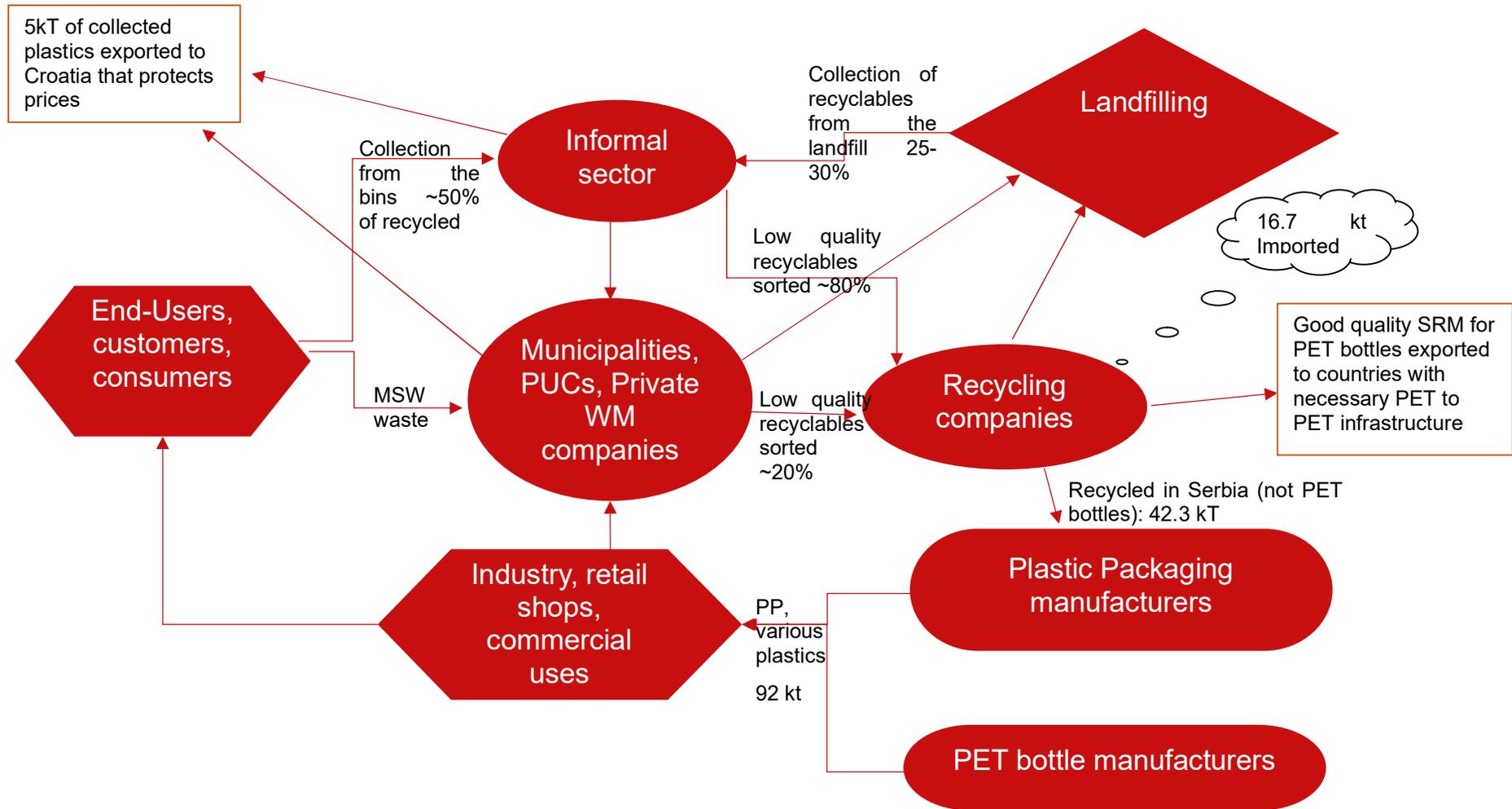


Figure 8: Current Value Chain for Plastic Packaging waste in Serbia

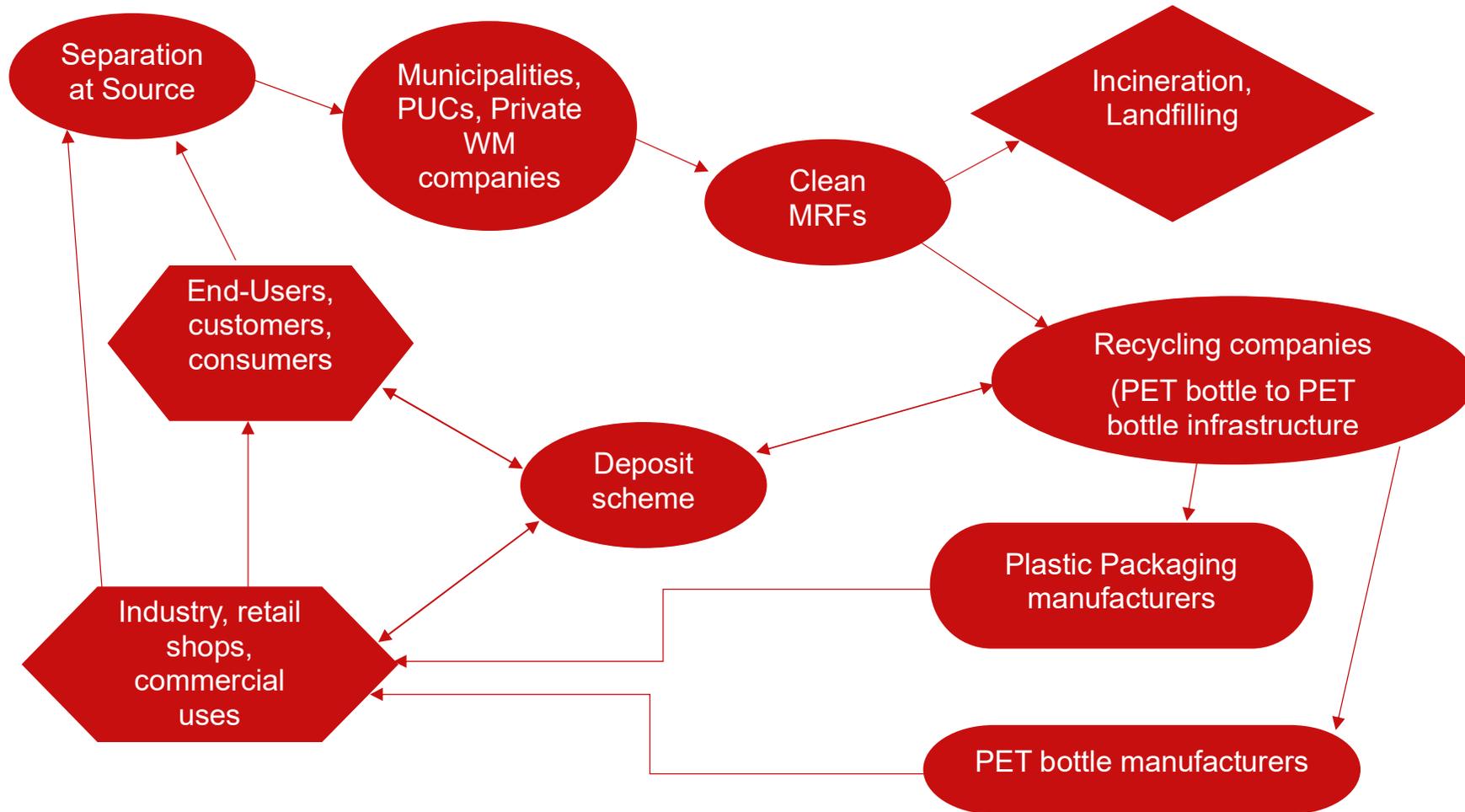


Figure 9: Proposed Value Chain for Plastic Packaging waste in Serbia according to CE principles

2.2. Identification of actors at different levels in the value chain

The actors at the different levels of the value chain can be grouped in the following broad categories:

1. State entities or other nationwide organisations such as Ministry of Environmental Protection, the Chamber of Commerce, SEPA (Serbian Environmental Protection Agency), SeSWA (Serbian Solid Waste Association) that can play a central role in the coordination of activities and the enhancement of the regulatory and institutional framework;
2. Public Utility Companies (PUCs), municipalities and other state entities responsible for collecting and transferring the generated waste. They have a central role in the collection and handling the recyclable waste, especially in case it is collected separately. Also, the collection methods play significant role in the quality of the PP waste as SRM;
3. Private SWM companies either transferring waste or treating it. These companies collect, especially, commercial and industrial PP waste. According to CEVES (2019), there are 70 firms registered for non-hazardous waste collection of any type, and 121 firms in total that obtained permit for waste collection by SEPA. These companies work directly with companies in commercial and industrial sector and collect or purchase waste from them. In many cases, they utilise network of informal collectors to buy waste and sell it to recyclers.
4. All the companies constituting the EPR scheme. These companies have been founded to facilitate recycling in Serbia (e.g. Sekopak, Ecostarpak etc). Their role in the value chain is of crucial importance, as the establishment of any separation at source scheme will require their involvement by supporting relevant actions (e.g. supply separate bins for collection or implementation of public awareness campaigns). One other type of actor, are the companies that have created or will create in the future other systems for the collection of specific waste streams (e.g. end-of-life vehicles, electric and electronic equipment);
5. Civil society of Serbia: charities, development NGOs, community groups, women's organisations, faith-based organisations, professional associations, trade unions, social movements, coalitions and advocacy groups. All the aforementioned types of organisations are central for the success of informational campaigns, as well as the organisation of separation at source systems and in general the promotion of CE practices;
6. Producers of Plastic Packaging: this category includes the operators of facilities producing PP for application in the industry, transportations, retail etc;
7. Producers of Plastic Packaging waste: all the users of PP in the various parts of production, retail, distribution (Industries, retail stores, transport companies etc).;
8. Informal sector: As it is confirmed by the findings of a thorough study on the informal sector of Serbia conducted by GIZ (2018), informal collectors of secondary raw materials have been the base of the recycling pyramid in Serbia for decades. The informal collectors, “sakupljači”, are responsible for collection of most of the secondary raw materials collected and processed in Serbia. Data processed by the Association of Packaging Waste Recyclers indicates that out of the total amount of packaging waste collected for recycling, as much as 87% originates from the informal sector, while only 13% is collected by PUCs, or the packaging schemes directly. It is evident from the above, that any transition to Circular Economy requires their participation. Based on CEVES (2019) estimations, individual collectors usually obtain from 49-60% of actual selling price of product to recyclers, while the difference goes to mediators and firms registered to waste collection. The major issue with individual collectors is the fact that vast majority of them is not registered in the waste management system.

2.3. Barriers to Circular Economy and utilisation of Plastic Packaging waste as SRM

In order to realise the potential which has been identified by the various studies and activities elaborated for the promotion of CE practices, the existing barriers must be removed or at least mitigated.

Serbian municipal waste management system is based mainly on disposal on sanitary landfills, or even on dumpsites. The treatment and recycling rates are very low. According to the official data, only 3% of the generated municipal solid waste is recycled, and only 1kg out of 257kg of collected waste is treated (Jovanović, 2019). The low level of materials separation at source inevitably leads to an under-developed market for secondary raw materials. The solid waste management system in Serbia is expected to develop rapidly in the near future, especially in the light of the country's accession to the EU. Although the whole picture seems discouraging for the adoption of CE principles and practices, the future development in the waste management system can create a major opportunity for the country.

The transition to circular economy of solid waste management systems and infrastructure designed in the past in a linear oriented economy is not an easy procedure. Due to the immaturity of the SWM system of Serbia there is an opportunity to build the whole system directly according to the CE principles. In this direction the strategic and regulatory framework of the solid waste management system must incorporate CE values and practices that will create favourable conditions towards materials sorting and post-consumer utilisation of waste as a resource i.e. development of separation at source systems, construction of infrastructure for waste recycling and treatment, involvement of stakeholders, informal sector integration, etc.

Taking into consideration that the economy in Serbia still faces significant challenges, the most relevant barrier for Serbia is the financial situation of the country. As it is stated in the same report, a major consequence of the economic recession from 2008 included significantly less funds allocated for environmental improvements as well as for research and development in the environmental technologies sector. The economic factor - low GDP level is mentioned as the most relevant barrier for any kind of SWM-related activity (Vujić and Tot, 2020) – will define the boundaries of possible interventions towards a more circular model in Serbia. Although significant steps have been done for the amelioration of the financial situation in Serbia and during the last years the GDP has steadily increased (World Bank, 2020), it is estimated that this aspect will remain the basic barrier during the next few years. This factor creates several deficiencies, which also act as barriers, such as the low priority level of research and innovation, whereas the brain-drain phenomenon persists. The same issue is with PUCs face issues when it comes to primary selection due to the lack of financing..

A basic issue is the insufficient regulatory framework that characterises SWM in Serbia. For packaging waste and plastics, a legislative framework is already in place (Law on Packaging and Packaging waste, and Decree on determination of Plan for reduction of packaging waste from 2015 – 2019). Following this Law, efforts were made by some public authorities for the establishment of SaS, which yielded only limited results.

Moreover, the strategy for SWM and the current SWM legislation in Serbia has become outdated. Taking into consideration the vision for country accession to EU and the need for CE application, the update of the overall policy, and consequently update of the relevant legislation with a clear view towards CE is necessary.

Apart from the basic barriers mentioned above, the following barriers have been also identified in the farce Strategy paper by GIZ (GIZ, 2017) as well as during the research for the elaboration of this guideline:

- Lack of central coordination of the attempts for the transition to CE-based model;
- Lack of common understanding of CE, and the necessary involvement of the business sector;
- Lack of financial tools (landfill tax), which will encourage (in a certain level) separate collection;

- Lack of strong enforcement mechanism that would ensure higher compliance with the law (CEVES, 2019). Institutional deficiencies for the enforcement of necessary measures required for this transition;
- Lack of human resources in order to monitor the implementation of existing environmental and especially waste legislation.
- Insufficient infrastructure and relevant investment in separate collection and recycling infrastructure;
- Inadequate access to finance for SMEs due to the financing conditions, as well as the insufficient investment readiness and underdeveloped financial mechanisms adapted to small and young enterprises; Limited funding to finance renovation and modernisation of the technology and machinery of Serbian enterprises;
- The resource pricing (cost recovery and pricing for the resource itself) is volatile and not fully transparent, which can lead to distorted economic signals;
- Insufficient infrastructure for waste treatment and secondary materials recovery provided by the market or the state;
- High uncertainty regarding the quality of SRM;
- Current laws and regulations are outdated and not yet fully harmonised with the EU circular economy package;
- The national SWM strategy, which serve as the framework for the development of laws and regulations, have not been updated and are not in compliance with the goals of circular economy;
- High share of informal recycling especially for valuable waste streams which renders possible SaS schemes non-feasible;
- Lack of sustainable procurement incentives for public authorities;
- Lack of knowledge and experience of the municipalities or regional authorities on best practices and implementation of the circular economy model;
- Lack of consumer information on origins of products (information on origins of products might for instance drive people to buy local products or products made from recycled materials);

The transition from linear to circular economy faces several barriers. The major challenge for all stakeholders is to find the way to overcome these barriers that hinder the creation of secondary raw materials markets.

Regarding the private sector and the industries involved in the CE activities, the European Environmental Agency (2019), presents the useful results of two surveys regarding the integration of circularity principles in business process. The surveys' results show that large companies integrate more CE practices than the smaller ones, and that the majority of companies reported that they took action in waste minimizing, but only few took actions regarding materials circularity and modification of the products' design to improve reuse, repair or maintenance possibilities (see Table 5 and Figure 10).

Table 5: SMEs and large companies actions related to circularity, based on a Eurobarometer survey, 2017 (Source: TNS Political & Social, 2018)

Action	SMEs	Large companies
Minimise waste	65%	80%
Reuse waste within the company	42%	59%
Improve design for maintenance, repair or reuse	25%	27%

Sell scrap materials to other companies	21%	30%
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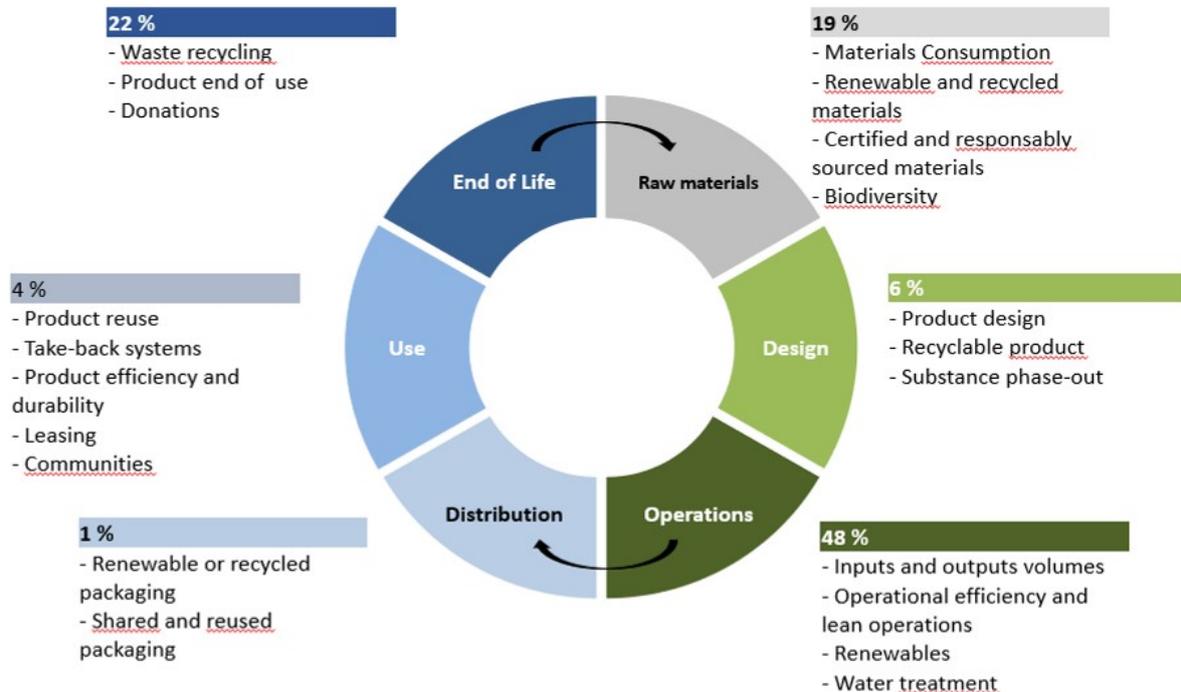


Figure 10: Overview of circularity metrics used by companies – results from WBCSD survey (Source:(European Environment Agency, 2019))

The results of these surveys show that despite the discussion and the policy debate done on the EU level about circular economy, there are barriers for companies to take circularity actions in their business process. According to the Eurobarometer survey, these barriers are mainly at operational level like complex administrative or legal procedures, the cost of meeting regulations or standards, and difficulties in accessing finance. However, more in-depth stakeholder analyses have revealed that the most prominent obstacles are corporate culture, market factors and system complexity.

A research regarding the barriers to the circular economy (Kirchherr et al., 2018) identified the main barriers and negative chain reactions for companies in the transition process to CE. The work done shows that cultural barriers and particularly: “Lacking consumer awareness and interest” and “Hesitant company culture” (see Figure 11), are the main barriers for a company to move forward and to adopt a CE concept in its operations. The author names that these barriers make transition to CE as a “difficult-to-implement” concept as it cannot bring direct and quick benefits to the company. Another category of barriers that slow down the transition to CE are the market barriers. More specifically the “Low virgin material prices” favours the linear type of production and “High upfront investment costs” make the companies reluctant to modify their current process.

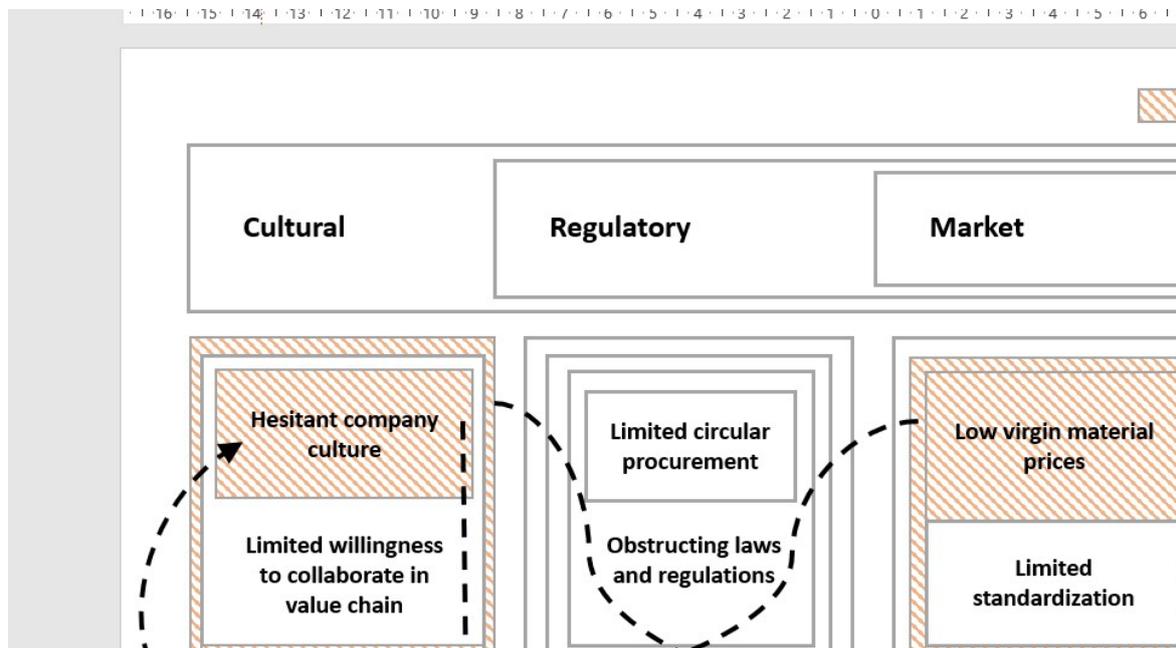


Figure 11: Main CE barriers and their interaction (Kirchherr et al., 2018)

The study also identifies the chain reactions between barriers that can lead to CE failure. For instance, “Low virgin materials prices” can cost the market position of the company in the market leading to “Hesitant company culture” barrier to the adoption of CE business models and the company continues “Operating in a linear system”. Interestingly, according to the conclusion of this research the technological barriers were not considered as serious barriers from the examined companies for their transition to CE.

These results create a totally new field for companies that they want to move forward and to make a real transition to CE. The changes that companies must make are deep, getting in touch even with the foundations of their organisations (and sometimes of their existence) i.e. their business culture and perception. Governments that want to motivate and support this transition must adopt policies and make the necessary real and practical interventions that will enable companies to achieve circularity in their processes, e.g. reduced taxation for CE activities (remanufacturing, reparation etc) or for CE supporting activities like transportation of SRMs etc. Kirchherr et al. (2018), state that current governmental interventions regarding the CE may be ineffective since many of them are focused to overcome the technological barriers that according to their research and the surveyed companies they are not considered as barriers to the CE. To support this argument, the study mentions the example that European Commission funds a number of proposals in the “Horizon 2020 Work Programme from 2018 to 2020” that focus on the engineering and technological aspects.

Apart from the above which refer mostly to SME`s, there are material-specific barriers for implementation of CE:

- The market for recycled plastics has not fully developed: As it was mentioned in paragraph 1.3, European recycling industry was greatly dependent on exports in other countries, especially in China. Moreover, industrial needs for recycled plastics was covered by the high-quality materials, exporting the remaining amounts of lower quality. In these conditions, there were no incentives for the development and expansion of the industry to be able to absorb recycled plastics, and to meet plastics production needs. Moreover, the market is not able to receive lower quality recycled plastics and to convert them to high quality recyclables.
- Lack of data about industrial sector: As a consequence of the export of plastics, it is not clear how much recycled plastics, and which quality grades can be absorbed by the national market. These

data are absolutely necessary to define and develop a CE strategy for plastics, where all the recycled plastics will be absorbed, and the market will be able to meet the plastics needs.

- Prices of virgin versus secondary plastics: The market price for virgin plastics depends on the price of oil, which is highly volatile. This is a very important barrier that affects the demand for secondary plastics, especially during the periods of low prices in virgin plastics. For example in October 2019, the recycled plastic cost for 1 tonne was USD72 higher than the newly made plastic (Ambrose, 2019). Prices fluctuations is a major disincentive for many market players to adopt a CE strategy.
- Complexity of plastic products: Plastic products often include a complex blend of additives (like flame retardants, stabilizers, plasticizers and pigments), or other materials that are used to improve the products' properties or to reduce its cost. The additives raise some concerns regarding their impacts on the environment and human health, especially in their long-term exposure. With these impurities, almost 30% of the plastic products will never be reused or recycled (World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, 2016). Products redesign and innovation are the keys to increase the circular potential of the plastic materials.

3. Plastic Packaging utilisation business potential

3.1. Baseline Considerations

The reduction of plastic packaging waste through the implementation of circular economy principles in the upstream supply chain (especially in the design and packaging of products and the enhanced reuse through deposit refund schemes and/or recycling of PET bottles) can produce significant savings (reduction of the cost of handling and transfer, less raw materials required, more effective use of materials).

For any remaining plastic waste that is unavoidable in Serbia, significant value can be achieved by the utilisation of waste for recycled plastic products, where feasible. The waste hierarchy includes:

- prevention of waste by smart packaging design;
- reuse, especially of bottles;
- processing and recycling for upcycled and downcycled products;
- use as an industrial resource such as RDF.

The study from CEVES (2019) commissioned by GIZ, identified the following features, which are used as assumptions in the present analysis:

- Plastic Waste Collection

Following market actors participate in plastic waste collection:

- PUCs, in charge of collection of household waste:

There are 79 municipal PUCs. However, there is a lack of collection and sorting capacities, among others, caused by insufficient financial means due to low tariffs for the population.

- Private firms registered for waste collection, mainly from industrial and commercial waste producers:

There are 70 firms registered for non-hazardous waste collection of any type, and they employ approx. 900 workers:

- Individual waste collectors, mainly vulnerable groups, collecting and sorting plastic waste from landfill or other disposal sites:

There are no reliable data on how many individual collectors are operating in Serbia. There is a rough assessment that approx. 35-50 thousand individuals are engaged in the process of separate collection of different types of waste (PP, EEE, metal, paper etc.).

- Operators in charge of packaging waste management:

They collect fee from producers (the polluter) and use financial flows to improve system of primary selection. They also pay certain compensation to collectors for waste they collected. In terms of physical flows, they act as intermediaries between waste collectors and recyclers. In 2018, there were 7 registered operators in charge of managing waste for 1.9 thousand firms

- Plastic Waste Recycling

For the recycling of plastic packaging waste there are two major market segments, (i) PET bottle recycling and (ii) other plastic packaging recycling.

In 2017, there were 57 active recyclers that reported to have recycled at least a kilogram of PP waste. Out of those, 4 largest recyclers accounted for even 61% of total PP waste recycled. Ten

major recyclers recycled more than 1000t, while 23 recycled less than 200t in 2017. Still, PET recycling in Serbia is highly concentrated. There are two large PET recyclers (“Greentech” and “Alwag”), which account for more than 95% of all PET recycling. There are also several smaller recyclers of PET.

National targets for Serbia are: (i) by 2025 meet the target in recycling of 55% and recovering of 60% of packaging waste, according to Packaging Waste Directive, and (ii) by 2030 meet the target for re-use and recycling of 50% by weight of waste materials from households and similar to waste from households, according to the Waste Framework Directive

The study from CEVES (2019), further identified considerable business potential in the plastic waste sector. According to this study, approx. 120.000 tonnes of plastic packaging waste is generated in Serbia every year. 22% of this waste is recycled and the rest is currently landfilled without any treatment. In its analysis CEVES assumes that by 2030 the target of 55% recycling rate will be achieved, and that 100% of plastic packaging waste will be collected. This means that 80.000 tonnes of plastic packaging will be recycled each year. In all three scenarios the collection will be improved, and for the most positive scenario the following collection structure will be achieved:

Table 6: Collection Forecast, Source: CEVES (2019)

PET waste collected	100%
Public Utility Companies	60%
Individual collectors	40%
Other PP waste collected	100%
Public Utility Companies	37%
Private firms registered for collection	45%
Recyclers themselves	15%
Individual collectors	3%

Under these assumptions the following CE impact in the Plastic Packaging sector has been identified:

Table 7: Business Potential acc. to CEVES (scenario 3), (2019)

Action	Number of Jobs (n)	Gross Added Value (million EUR cumulative until 2030)
Total Collection	2.231	51,2
of which Formal	473	36,3
of which Informal	1.758	2,8
Recycling	1.436	107,0
Total	3.667	158,3

After investigations and discussion with several stakeholders (Greentech, 2019, Sekopak, 2019) it has been concluded that there is already considerable and sufficient capacity for recycling available, and thus the main focus of the value chain development should be put on the collection activities and to provide sufficient material in the required quantities to recycling companies.

This means that the focus should be put on the collection capacities and infrastructure. This view is also shared by academic research, where “low supply of collected recyclables from MSW stream” is identified as the major challenge for the Serbian recycling sector (Mrkajić et al. 2018). The same research concludes that it will be necessary to increase the supply of recyclables from MSW.

3.2. Business Rationale for the Plastic Packaging Value Chain

The rationale for the application of a value chain for residual, unavoidable plastic packaging waste comprising (i) better collection of MSW, and (ii) PP and PET recycling and the arising business potential and opportunities has been assessed using four criteria:

- Economic criteria
 - National/international market demand prospects
 - Comparative advantages of production
 - Opportunities for employment creation
- Social criteria
 - Inclusion of disadvantaged groups
 - Need to improve working conditions
 - Impact of the VC on surrounding communities
- Environmental criteria
 - Impact of the VC on the environment
 - Impact of the environment on the VC
 - “Green” opportunities
- Institutional criteria
 - National policy priorities
 - Needs for public investment/new laws
 - Evidence of own initiatives of VC actors
 - Synergies with other programmes
 - Feasibility and outreach of interventions

The results of this assessment for improved collection and the full use of recycling capacity are shown in the tables below:

Table 8: VC Criteria Assessment – Improved MSW Collection

Criterion	Fulfillment*	Remark
Economic criteria		
National/international market demand prospects	XXX	The demand for plastic material is high and will remain high, since recyclers are looking for high quality material; thus there is market for plastic packaging waste.
Comparative advantages of production	--	na
Opportunities for employment creation	XXX	CEVES has shown that up to 2.200 jobs can be created by the introduction of CE principles.
Social criteria		
Inclusion of disadvantaged groups	XX	Disadvantaged groups can be included esp. in the collection of waste. Esp. The creation of formal jobs and the assumption of these jobs by informal workers can bring

Criterion	Fulfillment*	Remark
		considerable benefits.
Need to improve working conditions	XX	Currently informal waste pickers and transporters often work under bad working conditions. Health and safety requirements are often not met.
Impact of the VC on surrounding communities	XX	The separate collection of plastic packaging waste can reduce the waste quantities in surrounding communities.
Environmental criteria		
Impact of the VC on the environment	XXX	Plastic packaging waste in the environment has very negative impacts. Hence the environment will benefit from a reduction of plastic packaging in the environment
Impact of the environment on the VC	X	This impact is limited.
“Green” opportunities	XXX	The application of the CE principles provides many green opportunities, for instance in innovative business models and increased resource efficiency. .
Institutional criteria		
National policy priorities	XXX	The increase of the recycled quantities and the reduction of waste generation and esp. waste deposited at landfills is fully in line with national and EU policy priorities and requirements.
Needs for public investment/new laws	XXX	Currently, public investment is limited. Hence, there is a need for more public engagement, esp. in the separated collection of plastic packaging waste.
Evidence of own initiatives of VC actors	XX	There are already certain private companies active in the collection of plastic packaging waste; the initiatives of PUCs still has some potential for improvement.
Synergies with other programmes	XX	Plastic packaging is closely interlinked with other sectors, in this case, specifically local PUCs for waste collection can benefit from demand for secondary plastic raw material.
Feasibility and outreach of interventions	XXX	The separate collection of plastic waste is an already well known and proved practice which is available in Serbia, so the feasibility of the intervention is given.

* X: low fulfilment of criteria, XX: medium fulfilment of criteria, XXX: high fulfilment of criteria

Table 9: VC Criteria Assessment – Plastic Packaging and PET Recycling

Criterion	Fulfillment*	Remark
Economic criteria		

Criterion	Fulfillment*	Remark
National/international market demand prospects	XXX	The demand for secondary raw material (granulate and others) is given and there is market for such products in Serbia and abroad.
Comparative advantages of production	XX	The use of high quality secondary raw material for the production of granulate and other products may be cheaper than primary raw materials.
Opportunities for employment creation	XXX	CEVES has shown that up to 1.400 jobs can be created by the introduction of CE principles.
Social criteria		
Inclusion of disadvantaged groups	X	Disadvantaged groups can be included esp. in the collection and sorting of plastic packaging waste.
Need to improve working conditions	XX	Currently informal waste pickers and transporters often work under bad working conditions. Health and safety requirements are often not met.
Impact of the VC on surrounding communities	XX	The separate collection of plastic packaging can reduce the waste quantities in surrounding communities.
Environmental criteria		
Impact of the VC on the environment	X	The production secondary raw materials uses less CO ₂ than the primary raw materials and can thus have a negative impact on the environment.
Impact of the environment on the VC	X	This impact is limited.
“Green” opportunities	XX	The application of the CE principles provides some green opportunities, for instance recycled pet bottles.
Institutional criteria		
National policy priorities	XX	The increased use of recycled plastic packaging waste is in line with national recycling targets.
Needs for public investment/new laws	XX	Currently, public investment is limited. Hence there is a need for more public engagement, esp. in the separated collection of plastic packaging waste.
Evidence of own initiatives of VC actors	X	Private recycling companies already in Serbia.
Synergies with other programmes	XX	The sector is closely interlinked with other sectors, in this case, specifically local PUCs for waste collection.
Feasibility and outreach of interventions	XXX	The recycling of plastic packaging waste is an already well known and proved technology which is available in Serbia, so the feasibility of the intervention is given.

* X: low fulfilment of criteria, XX: medium fulfilment of criteria, XXX: high fulfilment of criteria

In conclusion it can be stated that there is a strong rationale under economic, social, environmental and institutional criteria to establish such value chains.

3.3. Business Opportunities and Actors along the Value Chain for Plastic Packaging

Along the identified Value Chain, the following business opportunities and actors can be identified:

- **Collection and transport of plastic packaging waste**
 This includes the provision of options for households and businesses for the separation of plastic packaging waste at source by making available standardised collection bags and/or bins. Also, the collection can take place in public collection points designed for the delivery of plastic packaging waste. Next steps include organisation of the transport to receiving facilities (recycling plants). For this, logistic arrangements and necessary investments in trucks have to be implemented.
 In principle this business opportunity is available for both public and private entities, whereby the collection at the source (businesses) might be more attractive for the private sector and the collection at public collection points might be more adapted to the public sector, e.g. municipal PUCs.
- **Recycling of plastic packaging waste**
 This includes planning and implementation of investments in the respective plants, equipment and other installations, as well as marketing activities for the sale of products (granulate, flakes, etc.). The estimated capacity currently is at approx. 40.000 tonnes of plastic packaging waste per year (expert interviews and estimates). Under the assumption made by CEVES, under which 80.000 tonnes per year are to be recycled, then the current recycling capacity is not sufficient and more recycling capacity can be created, thus generating a potential investment opportunity..

A graphic representation is shown below.

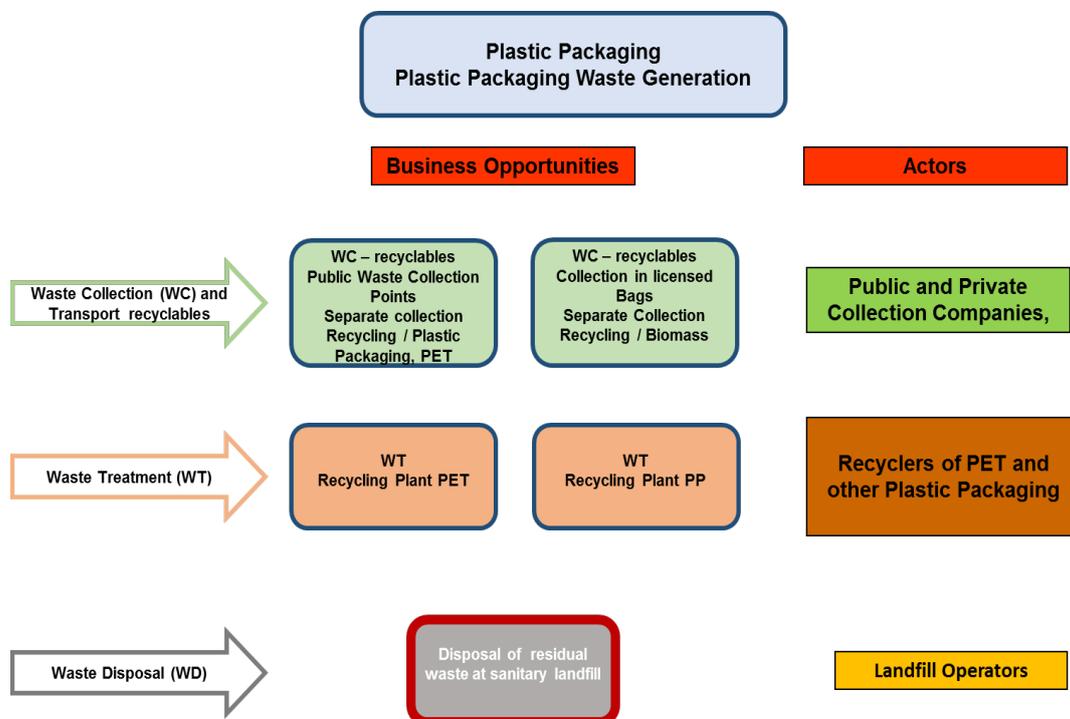


Figure 12: Plastic Packaging Waste Value Chain

In order to implement this value chain, the actors have to conclude several agreements, among others:

- Customer Service Contract between collectors/transporters and plastic waste generators
- Delivery Contract between collector/transporter and off taker of secondary raw material (recycling plants)

3.4. Business potential for collectors/processors of Secondary Raw Materials

A rough model calculation for estimating the business potential has been carried out using available data. In order to assess the business potential in detail, further studies and investigations are required.

3.4.1. Collectors and transporters of Secondary Raw Materials

In order to assess the business potential for collectors of solid waste, the following assumptions are being made:

- No distinction is made between public and private solid waste collection companies.
- 100% of all generated plastic waste is sold for recycling, no quantity is delivered to the landfill.
- According to Mrkajić et al (2018), plastic and PET waste recyclers are willing to pay approximately EUR 262,00 per tonne of plastic waste (depending on the material between EUR 186,00 and EUR 338,00 per tonne) delivered. This would be approx. EUR 20,8 million per year for approximately 80.000 tonnes of collected and sorted plastic waste.
- According to Deloitte (2018), the costs for collection and sorting amount to approx. EUR 197,00 per tonne.
- The investments in trucks and containers for separate collection are not included in this assessment. Further analysis and investigations are needed regarding:
 - Existing transport equipment and any shortages;
 - Existing bins/containers for separate collection and any shortages.

3.4.2. Processors of Secondary Raw Materials

In order to assess the business potential for processing, a rough model calculation, using the target scenario from CEVES (PP waste recycling rate of 55%) has been carried out.

The business potential for plastic packaging can thus be estimated as follows:

- Total operational costs of EUR 599,00 per tonne, which include the cost of secondary raw material of EUR 309,00 per tonne,.
- The revenues, also according to CEVES (2019) are at approx. EUR 691,00 per tonne².

The estimations show the business potential at an aggregate level. However, the realisation of this potential can happen also on a smaller scale and within smaller individual projects implemented by private and/or public companies.

² Calculated from CEVES 2019: In 2018 approx. 26.200 t have been recycled.

Total costs were approx. EUR 15,7 million (EUR 599,00 per ton) of which raw material costs were approx. EUR 8,1 million (EUR 309,00 per ton). Approx. EUR 18,1 million of revenues have been generated, this is approx. EUR 691,00 per ton.

However, the full realisation of this potential would also imply further investments in the recycling capacities, which are not included here. These aspects require further studies and investigations.

3.4.3. Best practices cases

One interesting best practice case is briefly presented below for illustrative purposes:

Pet2Pet, Müllendorf, Austria (<https://www.pet2pet.at>)

PET to PET Recycling Österreich GmbH was founded in April 2006 and is jointly operated by leading companies in the Austrian beverage industry. The company has been in operation since 2007 and places tremendous emphasis on the highest quality and ongoing innovation in the interest of sustainability. In 2010, the recycling plant in Müllendorf was expanded with the addition of a granulating plant. Five years after the cornerstone was laid for PET to PET, a new automated bottle sorting stage was launched, and a silo plant installed. The company’s investments help to ensure that PET bottles are recycled in a resource-efficient manner within a closed-loop system.

Each year, more than 23,000 tonnes of used PET bottles are converted into so-called washed PET flakes in three colours. In a second stage, the washed flakes are treated in order to achieve food-grade standards. State-of-the-art methods – such as the URRC process and Starlinger granulation – guarantee the highest level of quality. Depending on the bottle type, new bottles contain at least 30-40% recycled PET.

4. Necessary changes

4.1. Basic elements for the transition to the proposed value chain

Based on waste hierarchy, the methods for Plastic Packaging waste management are as follows (by order of preference):

1. reduction of Plastic Packaging waste;
2. reuse;
3. recycling without downcycling (e.g. PET bottle to bottle);
4. recycling for lower grade materials, and
5. incineration.

The first two methods (reuse in the sense of utilisation of the material for the same purpose without significant treatment) do not fall directly under the definition “utilisation of PP waste as SRM” so they will be briefly discussed in Chapter 5. The present chapter focuses on proposals which lead to the increase of efficiency of the three latter methods.

The analysis of several interviews with Serbian SWM experts, has shown that the most relevant policy instruments create drivers for both companies and users to adopt CE practices. More specifically, due to the lack of relevant legislation that promotes waste reduction, separate collection and in general CE practices promotion, it is difficult to utilize other tools that require the existence of legal drivers. For this reason, the enhancement of the SWM legislation with focus on the creation of financial drivers for the reduction and separation of the produced waste and the waste ending at the landfills, will be the cornerstone of the overall effort for the creation of circular VCs for plastics in Serbia.

After the regulatory base is set, the subsequent level of action is the coordination of the various actions, the enforcement of the existing laws, as well as the accurate monitoring of the results of the implemented strategy. This has to do with the institutional capacity of the state (mechanisms for control of environmental performance of the sector).

Based on a solid regulatory and institutional basis, the encouragement of the utilisation of PP waste as SRM has the following prerequisites:

1. utilisation of policy tools and financial instruments, such as production-oriented ones (ecodesign, EPR etc) and consumption oriented ones (Green Public Procurement, reuse/remanufacturing) - see paragraph 1.4 **Error! Reference source not found.**;
2. implementation of the necessary infrastructure for collection, management and distribution of the SRM (source separation, construction of MRF's, PET bottle to PET bottle facilities);
3. setup of distribution networks and their rationalisation by inclusion of the informal sector;
4. establishment of a Deposit Refund System;
5. rethinking of existing business models for utilisation of the SRM;
6. the awareness raising for individuals, SMEs and the capacity building in state and private entities to support the implementation of such a system.

4.2. Establishment of a regulatory environment that encourages Secondary Raw Materials utilisation

The first issue that should be considered for the promotion of the utilisation of PP waste as SRM is the creation of drivers for its alternative management and subsequently its diversion from landfilling.

The transition to a more circular VC for PP in Serbia has two aspects:

1. rethinking of the waste management fees paid by citizens and companies in Serbia, so that the inclusion of PP waste in the comingled waste increases the fees. Thus, the value of the PP materials is being increased indirectly by creating the driver for the alternative management of the said waste stream;
2. implementation of all the necessary infrastructure for the preservation of value of PP waste as SRM during all the steps of collection, transfer and treatment.

Necessary investments (point no. 2), especially by the private sector, with regards to the creation of the necessary infrastructure cannot take place unless a stable environment is created by the tackling of the first issue.

The establishment of a Pay As You Throw system will reinforce efforts for establishment of SaS schemes which is necessary for increasing the quality and the quantity of the collected PP waste. This requires detailed design and extensive legal reforms. If this type of legislation is put into place, then a solid base is set for the development of private initiatives and innovative solutions. Currently, instead of PAYT systems, the collection of SWM fees by the authorities is based on an outdated model: each household or enterprise pays a fee according the surface area of the building/apartment (see Infostan aggregate bills in Belgrade), and not based on the actual amount of produced waste (Krnjeta and Aćimović, 2018). This situation does not create any need for reduction of SWM that is handed to the comingled waste management chain by separating PP waste. The change in the SWM fees system will also help the establishment of a DRS.

One crucial point in the overall effort is the regulation of various parts of the plastic packaging VC such as:

1. regulation of the market, especially with regard to the influences of neighbouring markets that accept exported waste from Serbia;
2. full harmonisation with EU legislation for solid waste management, plastic waste management and handling of plastic-related streams.

Apart from the legal reforms, the long anticipated new strategy for 2020-2025 represents a necessary step for the coordination of all the efforts towards CE. The previous strategy (2010 – 2019) has been rendered obsolete. One other major issue is the achievability of the targets set by the existing strategy. Many actors in the sector noted that some targets set are not by any means attainable and this fact does not provide incentives for making any effort to achieve them.

A very useful tool that could be utilised at this level of reference, is the EU Green Public Procurement (GPP) set of criteria (EC, 2017 and EC, 2019). This set is designed to make it easier for public authorities to purchase goods, services and works with reduced environmental impacts. The criteria have been formulated in such a way that they can, if deemed appropriate by an individual authority, be integrated into the authority's tender documents. GPP criteria have been issued for several sectors such as cleaning services, transport services, catering services and vending machines.

The GPP criteria are split into selection criteria: technical specifications, award criteria and contract performance clauses. The criteria are of two types: 1. Core criteria—which are designed to allow for easy application of GPP, focusing on the key area(s) of environmental performance of a product and aimed at keeping administrative costs for companies to a minimum. 2. Comprehensive criteria — take into account more aspects or higher levels of environmental performance, for use by authorities that want to go further in supporting environmental and innovation goals.

4.3. Institutional framework

It must be mentioned here that the operation of the existing EPR system in place is monitored by MoEP for its compliance to the law and the data produced are collected by SEPA. Apart from legal compliance and data management, the first prerequisite for the implementation of any CE policy, financial instrument, legal reform in the sector of the PP waste management is the central coordination of all efforts in the

various levels of administration (vertical) as well as horizontally between the CSOs, NGOs and international funding institutions active in the sector.

To this direction, Serbian MoEP has launched the Group for the Circular and Green Economy within the Sector for Strategic Planning and Projects. This Group is in charge of managing CE issues on cross-sectoral level in order to facilitate gradual implementation of CE in Serbia. Its current focus is the development of Program for CE with Action plan from 2021 – 2023, which represents the main public document for CE in Serbia and expected to be adopted in 2020. The Action plan is supposed to set the measures and activities to be implemented for the period of 3 years. To this day, there is still no cohesion legal or institutional framework that could properly generate and monitor programs to provide support for the CE (PLAC III).

After consultation with the head of the Group for the Circular and Green Economy, (2020), some of the current challenges include: inconsistency with EU regulations and directives, lacking local systematic incentive measures or an appropriate institutional solution, the lack of understanding of the concept itself and its benefits.

Some of the steps that can be carried out include:

- establishment of independent financial institution in charge of financing and capacity building, and investments in various CE projects;
- development of national media plan for promotion of CE.

Apart from the above, the Group for the Circular and Green Economy could also play a significant role for the clarification of roles between the various state authorities and avoid overlapping, as well as avoid duplication of work between the various non-state actors in the field.

The action plan under elaboration could also be further developed to elaborate any existing guidelines (such as the one at hand) and define in more detail actions relevant to the local context. Each action should undergo a Cost-Benefit Analysis (CBA) analysis and feasibility studies should be elaborated for each proposed action. Each proposed action should have one or more owners so that the next day of the plans’ approval, its implementation will begin. On this field, significant work has been performed by GIZ with the elaboration of the ValueLinks 2.0: Manual on Sustainable Value Chain Development (Springer-Heinze, 2018).

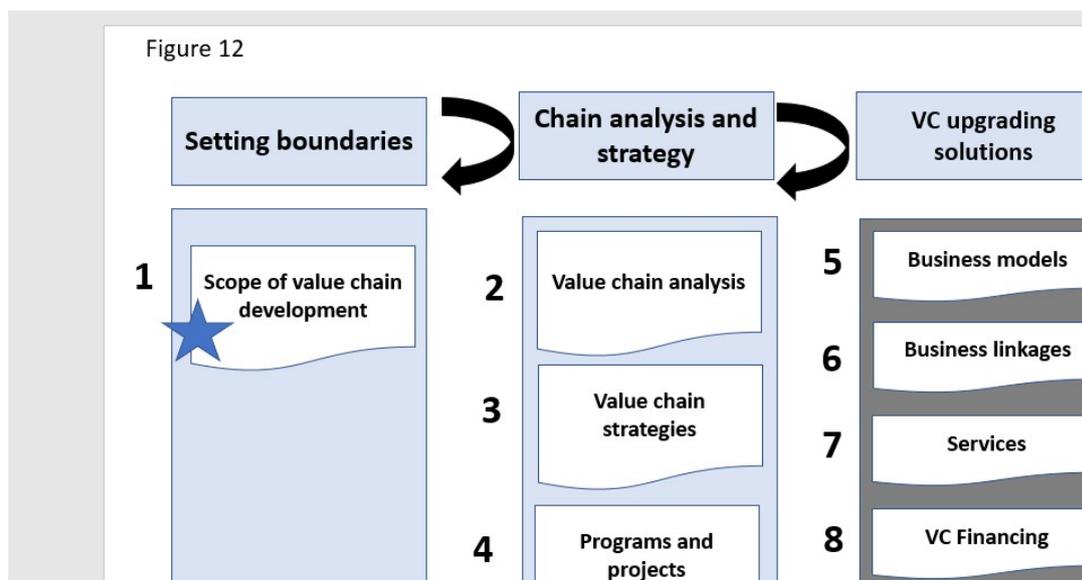


Figure 13: Conceptual diagram of a detailed VC development action plan (from Valuelinks 2.0, Springer-Heinze, 2018)

One other issue that has to be tackled at the institutional level is the monitoring of all the relevant activities, so that conclusions are drawn regarding the efficiency and the effectiveness each policy adopted. Moreover, monitoring will help in the enforcement of specific measures for SWM, clarify accountability of different actors and contribute to the collection all necessary data for future research activities or baselines elaboration.

In the same manner, if a sound monitoring mechanism is established, the best practices regarding SRM collection, distribution and utilisation will be identified. This monitoring mechanism will be the basis of any data collection procedure/system (see paragraph 4.7 for more details) and its implementation will enhance research and innovation in the sector.

In order to establish separate collection and management of PP waste, so that it can be used as an SRM, several institutional adjustments have to be made on local and SME level:

1. Organisation of separate collection of PP waste. This issue has to be tackled in the beginning at a municipal level, since any kind of private investment at the present phase cannot be considered if there is no steady demand for this type of waste. The role of the municipalities is crucial, especially in the beginning of any transition to a CE model.
2. Creation and regulation of distribution networks and rationalisation of the existing ones. New networks will sprout out and need regulation, while the old ones need to be rationalised (mainly by inclusion of the informal sector).
3. Capacity building and raising of awareness on the local level (municipalities and SMEs). This will ensure that any mechanism for separate collection will become efficient on the one hand, and on the other, that the SMEs will be able to be guided through the rethinking of their business models (see paragraph 4.6) so that they can handle the adaptation to a new CE model.

Moreover, the overall operation and funding of waste collection and management services in PUCs has to be radically reformed. With the exception of Belgrade and other large cities, in most Serbian municipalities the activity of waste management is performed by mixed utility companies which, at the same time, perform other utility activities. Even in Belgrade, which is the largest city, the utility company conducts not only waste management activities, but also cleaning of public city areas and emptying of septic tanks, which means that it is not specialized for this activity entirely. This has certain consequences in relation to the manner of financing, even collection of receivables, especially in the case when one company performs several activities which are financed not from the budget, but from the price of its services. The situation becomes dire due to the lack of funds which are a result of the current fee collection system. As a rule, utility companies cannot collect almost one third of their receivables for the waste management service (Krnjeta and Aćimović, 2018).

Finally, an issue raised by many interviewed sector experts is the necessity for increase of the fees paid to the EPR companies, and subsequently the refunds that the collection companies get for the recyclable materials delivered to the recycling industry. As it is shown in Table 4: Participation costs for plastic waste (source: PRO EUROPE, 2019) the EPR system in Serbia is severely underfunded compared to other neighbouring countries with more or less similar conditions. A significant increase is required to the relevant fees, so that the necessary level of collection services and the subsequent increase in the quality of the SRMs is achieved.

4.4. Introduction of Deposit-Refund Schemes for Packaging

Deposit return systems (DRS) for plastic bottles, but also for other items (cans, other plastics etc.) are the systems where consumers pay an up-front deposit on a product (e.g. bottle of water) at point of purchase, which is redeemed on return of the empty container (Voluntary and Economic Incentives Working Group, 2018). It is a system that operates in cooperation with the traditional source separation systems.

The DRS is based on offering of an economic or other incentive (vouchers, prize draw, credits etc.) for consumers to return empty container to shops that participate in the DRS. This is a system that operates in more than 40 regions worldwide with very encouraging results (Zero waste europe, 2020). In the EU28

+ EFTA countries in 2018, 133.1 million people had access to DRS and the results were showing a return rate between 82.7% and 98.4% - the majority of the countries were over 90% (CM Consulting Inc. and ReLoop platform, 2018). The countries reviewed in this study were countries with advanced solid waste management system, like Germany, Sweden, Denmark, etc, but also countries similar to Serbia like Croatia, Estonia and Lithuania. In these countries, the return rates were between 82.7% (Estonia) and 91.9% (Lithuania).

Except of the increased collection rates of empty containers, DRS have also some other benefits like decreased effort and cost to local authorities for cleaning litter, better preparation for reuse/refill than typical curb side separate collection schemes, high quality of recycled material, etc. But the most important issue is that through the deposit return, citizens can effectively see a direct result on their recycling effort which is the key for the increase of active participation rates.

Currently, the Law on Packaging and Packaging Waste is under reform in order to establish a Deposit Refund Scheme (DRS) in Serbia. The Government of the Republic of Serbia, adopted the conclusion and public consultation was held from February to March 2020. This reform is based on a thorough study has been elaborated by the University of Novi Sad in 2018 in which the potential for the implementation of a DRS system in Serbia was researched (University of Novi Sad, 2018). The results show that a DRS can successfully operate in Serbia. Moreover, it can be a self-financed system and an effective tool to implement the Extended Producer Responsibility principles. The proper implementation of a newly established DRS needs planning, wide stakeholders' engagement and participation. Some recommendations from the UK DRS (Voluntary and Economic Incentives Working Group, 2018) that need to be taken into consideration when preparing a DRS in Serbia are as follows:

- Proper investigation of the potential in order (i) to encourage collection and recycling of the materials consumed outside the home; incl. costs and benefits of implementation, (ii) the potential benefit and (iii) the consumer responsiveness in relation to potential locations of collection points.
- The potential DRS must be prepared in cooperation with businesses, consumers, local authorities and other interested parties to ensure that this DRS is well-designed, and the costs and benefits are fully assessed; and that the risks of potential unintended consequences are minimal
- DRS design must focus also on the diversion of high-value materials in order to decrease curb side collection where the risks for informal collection of these economically attractive materials are very high.
- Attention to effective DRS schemes in other countries and examination whether they can be applied to the specific situation in Serbia.

4.4.1. Deposit-Refund Schemes for reusable packaging

Most of the beverages that can be consumed in reusable bottles can be included in a deposit-refund scheme. The scheme functions as a sequence and involves producers, whole- and retail seller and customers:

1. When delivering bottles to whole- or retail sellers the latter pay a deposit for each bottle delivered.
2. This deposit is then passed on the customer at the purchase of the bottle.
3. When the customer returns the bottle to the retail seller the deposit is returned.
4. The bottle, incl. the deposit goes back the same way to the producer and the deposit is returned at each step.
5. When a bottle is not returned then the deposit is lost.
6. At the end of the chain the producers get back the bottle and pay back the deposit. No public or other institution is involved.

This scheme is successful because it enjoys widespread support and acceptance of both, producers and customers.

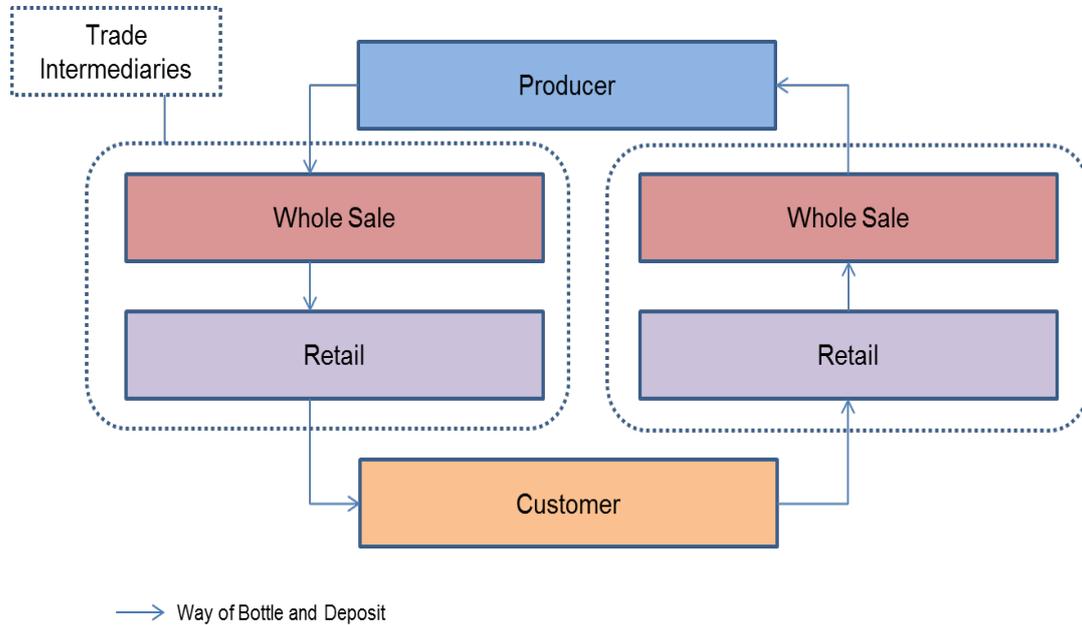


Figure 14: Deposit-Refund Scheme Reusable Bottles

4.4.2. Deposit-Refund Schemes for one-way packaging

These schemes can be applied also for disposable one-way packaging. They have, as primary objective, to encourage and increase the recycling of the packaging. They are applied mainly on materials, such as plastic bottles and metal cans for alcoholic and non-alcoholic beverages.

It is also a sequence of steps:

1. For the customer the procedure is the same as for reusable packaging. The deposit rendered is returned back when the packaging is given back to the retail seller.
2. For the retail seller the procedure is still the same when giving back the packaging to the wholesale.
3. The wholesale trader, instead of giving back the packaging to the producer, hands it over to a clearing institution.
4. This clearing institution pays back the deposit and notifies the producer that it has taken over a bottle of its provenience.
5. The producer now pays the deposit to clearing institution.
6. The clearing institution hands over the bottle, together with the deposit to the recycling company.

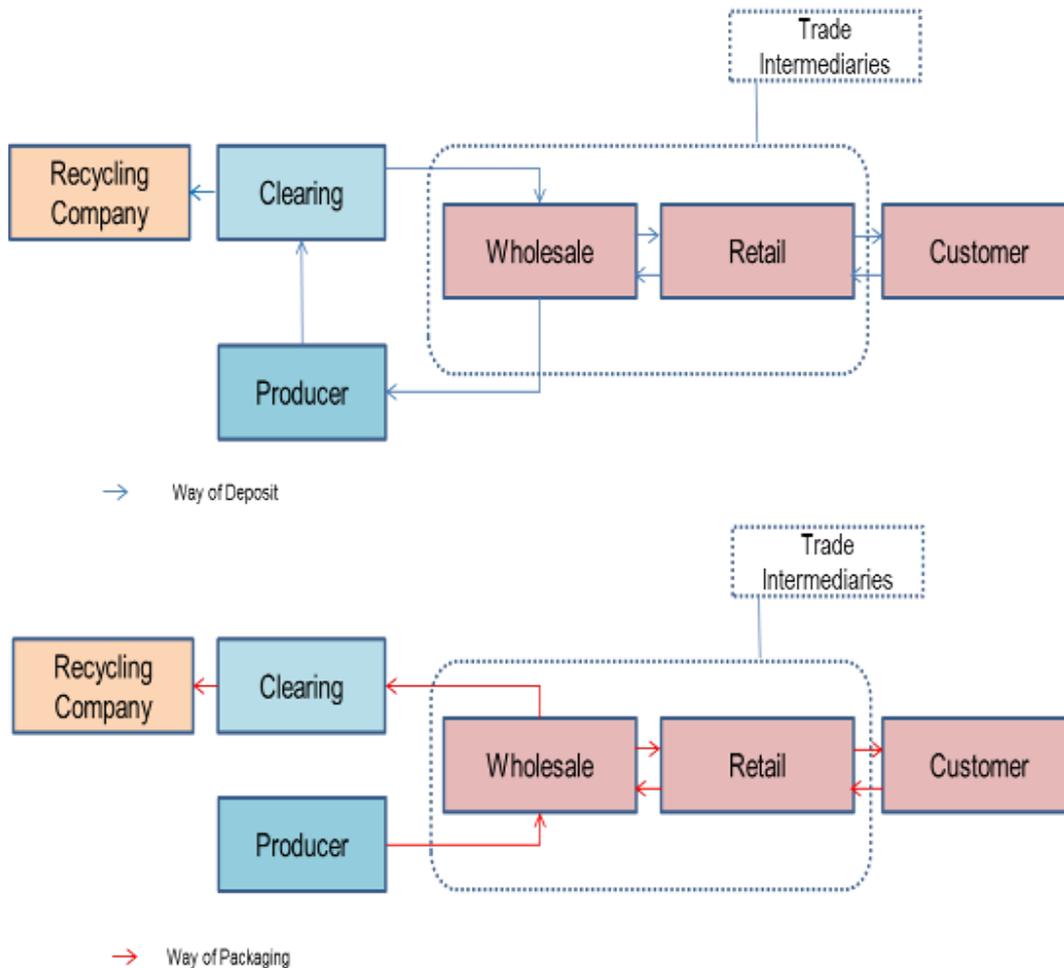


Figure 15: Deposit-Refund Scheme Disposable Packaging

This scheme presents various features:

- On the one hand it encourages recycling because of the deposit paid the various actors along the trade chain.
- On the other hand, the producers have no incentive that their packaging is returned back and recycled. They have to procure a new packaging in any case.
- If the packaging is not handed over to a clearing institution then the producer can keep the deposit, achieving additional revenues at no extra cost.

4.5. Operational resources and technical requirements

4.5.1. Plastic packaging supply and distribution

Technologies for separating unsorted (mixed) municipal waste are available and have been implemented in the EU and in Serbia. However, it is not possible that the use of these technologies alone will provide the required recycling rates for the plastic waste without ensuring the preservation of the quality of the SRM during the collection.

The basic challenge in ensuring the supply of SRM is the establishment of a collection system that provides SRM of high quality (no deterioration of the quality from mixing with other streams or due to the conditions of their transport).

The PP waste management system must be effectively supported from a network that will enable the separate collection at source and its distribution and transportation to their destination for further use i.e. treatment facilities.

This has two aspects that have to be considered:

1. **Separate collection of streams.** Plastic packages from bars or cafes that do not come in contact with other organic waste must be handled carefully so that it is not mixed with other waste that can contaminate it. Other streams (such as clear PET plastic bottles) should not be mixed with other inferior streams (coloured bottles).
2. **Storage facilities and transport infrastructure.** In order to establish financially feasible system of PP waste collection and transfer to SMEs that will utilise it as SRM, the logistics should be affordable so that the price of the SRM does not become higher than the one of the primary raw materials.

The collection of PP material must be done in dedicated bins for packaging material only (the types of packages should not be able to contaminate each other). These bins will have to be located in all areas but most significantly in businesses/organisations with high PP waste generation rates.

Preferably, residences should be served by door-to-door collection system. Collection and transportation must be implemented by specialized vehicles either by local authority or by individual contractors.

4.5.2. Necessary infrastructure

The increase of the utilisation of PP waste as SRM requires the construction of specific infrastructure. In the following paragraphs some basic directions are given:

1. For **source separation**, apart from the establishment of the relevant mechanisms discussed in the previous paragraphs, Civic Amenity sites or Green Points have to be constructed all around Serbia, at least in the bigger municipalities. In these sites, the population and the businesses can bring recyclables (also special streams such as bulky waste or electronic equipment), and thus contribute to the increase of the recycling and reuse percentages of the country. These sites can use incentives, such as the exchange with items that can be reused or a financial refund for the participation. These sites can either be small ones (10-20m²) located in central urban areas (public squares), or larger (500m² or more) that can be located in the suburbs/countryside.
2. For the separation of mixed collected material, Material Recovery Facilities are required, They can be designed as so called „clean MRF“ to separate mixed recyclables, e.g from dry bins, or as „dirty MRF“ to recover recyclables from comingled waste.
3. **PET bottle to bottle infrastructure.** When Deposit Refund System is established and source separation of clean bottles is ensured, specialised machinery has to be installed in the existing factories so that the PET bottle to bottle recycling takes place in Serbia.

As VCs are not technically “constructed” by an organisation, but are the result of several interactions between a multitude of actors and new emergent structures not anticipated may arise, after the VC starts moving towards a more circular modus operandi, new infrastructure requirements will emerge. In order to support and promote this movement, more investments in research infrastructure (laboratories, universities, innovative SMEs) will be necessary.

4.6. Business Model Rethinking

4.6.1. Tools

During the last decades, as the environmental awareness increases among citizens, there is an increasing pressure to maintain appropriate levels of social, environmental and ethical standards in addition to producing quality products. As a result, more and more buyers are emphasizing green and ethical purchasing. Green purchasing involves applying environmental considerations, such as reducing waste, re-using, recycling, protecting biodiversity and using environmentally sustainable materials and energy sources (ITC, 2017). Based on this trend, all businesses eventually will have to rethink their business model so that they can stand their ground in the market and create a more competitive profile. SMEs can upgrade their potential by applying CE principles where relevant in their business activities and meeting the quality requirements, ISO benchmarks and codes of conduct of buyers.

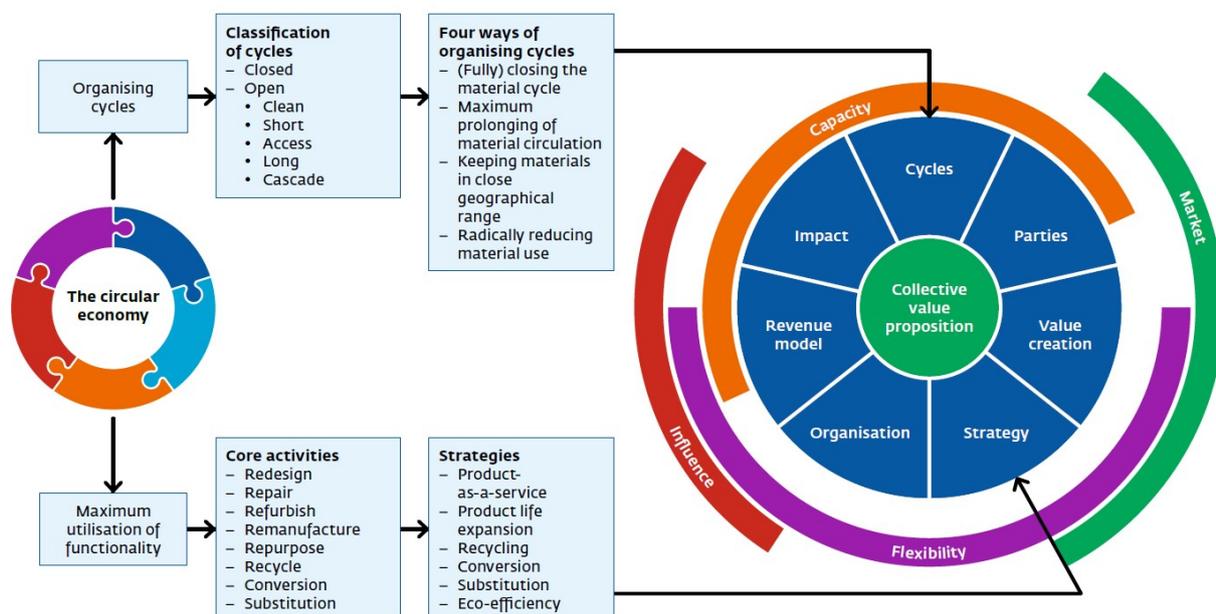


Figure 16: Business model rethinking for CE transition, according to the CE workbook (Jonker et al., 2018)

Several tools have been developed with guidelines and roadmaps on how to rethink and restructure business models and production chains, based on incorporating CE practices in the everyday operation of the company. In the present guideline, some basic guiding principles and insights will be presented. For more detailed information interested readers can refer to the material included in the following indicative list:

1. Profitable Environmental Management (PREMA®), developed GTZ-P3U and further elaborated by GIZ, for micro, small and medium-sized companies;
2. Playbook by SITRA, Circular economy business models for the manufacturing industry. Circular Economy Playbook for Finnish SMEs;
3. Organising for the Circular Economy. A workbook for developing Circular Business Models (Jonker et al., 2018);
4. Small Business Waste Reduction Toolkit issued by Midwaste Regional Waste Forum 2012.

All these tools, and several other approaches that are proposed in the literature, share some basic common objectives, some common approaches and some common methods to lead this change.

More specifically, all methods aim at the reduction of the production costs, the reduction of environmental impacts and enhancing the capacity of the company by resolving weaknesses and finding opportunities for improvements.

PREMA means a triple win for a company

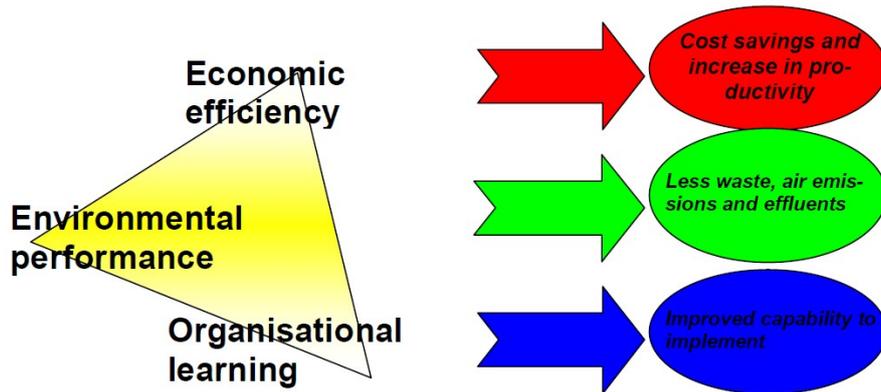


Figure 17: Basic objectives according to PREMA®

Initially, a desk phase is required for analysis of the characteristics, structure, products and position in the market of the company. Then, through a collaborative approach, all methods try to involve all stakeholders in the process of scrutinising the production chain and proposing improvements. This is done through workshops, one-to-one interviews, etc. Each method has several success cases and their study gives several hints to the interested companies.

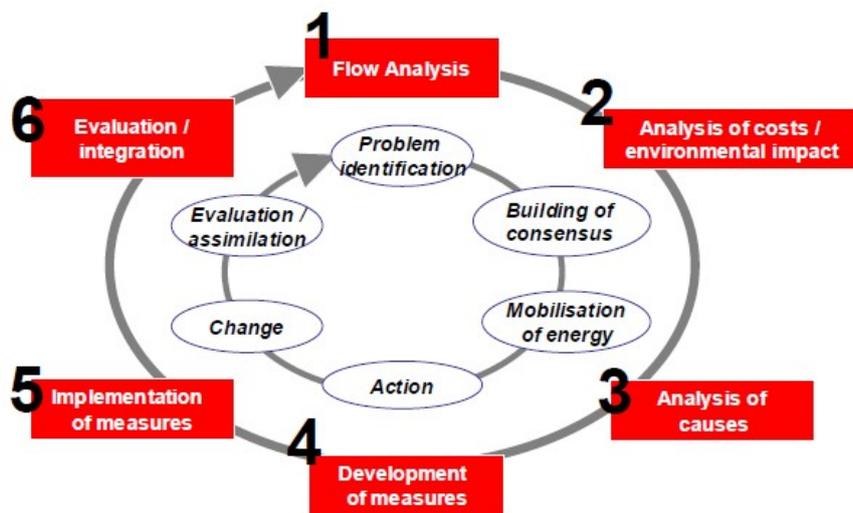


Figure 18: PREMA® cycle of change

Illustrative

		Culture		
		Values	Mindset	Behaviours
Function-specific	Company-level	<ul style="list-style-type: none"> Sustainability Customer value creation Collaboration/ Teamwork 	<ul style="list-style-type: none"> Minimising resource consumption and environmental impact is key for license to operate Things that increase client value are prioritised Sharing among colleagues is caring 	<ul style="list-style-type: none"> Voice new ideas Use impact on client value as measure to prioritise activities Share know-how and experience across functions
	Design/ R&D		<ul style="list-style-type: none"> The resource efficient way will be the better way in the long-run 	<ul style="list-style-type: none"> Apply circular design criteria Consider the whole life cycle in design
	Sourcing & Procurement		<ul style="list-style-type: none"> Recycled/ reused/ renewable material should be used where possible 	<ul style="list-style-type: none"> Explore new suppliers for material sources
	Manufacturing		<ul style="list-style-type: none"> Repairing a product or component is better than producing a new one 	<ul style="list-style-type: none"> Support designers in design for repair
	Sales & Aftersales		<ul style="list-style-type: none"> Every unmet request of a customer is a potential new solution 	<ul style="list-style-type: none"> Have dialogue with customers to explore unmet needs
	Take-back & Recycling		<ul style="list-style-type: none"> Failing high recovery rates is failing value capturing 	<ul style="list-style-type: none"> Aim at recovering and recycling as much as possible of products
	Strategy & Leadership		<ul style="list-style-type: none"> Leading by example is most effective 	<ul style="list-style-type: none"> Publicly praise employees for their contribution to the journey

Figure 19: Function specific components for adapting to CE culture (SITRA et al., 2018)

Apart from the issue of business model rethinking, which is a mainly internal issue of each company, there are two issues which cross the boundaries of each company:

1. The issue of the requirements that govern the quality of the end-product which has incorporated SRMs in the manufacturing processes and the possible health and safety issues arising from the reuse of discarded materials. In all cases the standards imposed by national legislation must be maintained. This does not mean that all possible quality problems are foreseen by the legislation. The competent authorities overseeing the application of CE practices should proactively monitor all these processes and act accordingly if unforeseen problems arise.
2. The VCs into which the SMEs operate are not only local or national, but also international. As a more circular VC starts being created and several previously waste materials start gaining value as SRMs the interaction with the international market has to be monitored by the competent authorities (Group for the Circular and Green Economy see paragraph 4.3) so that there are no distortions in the market and competition remains smooth.

4.6.2. Green financing

Like with any systemic change, the transition to a circular economy requires several elements of the system to change simultaneously. The inertia and resistance of the current linear economic systems can prevent the transition from occurring. Concerted actions by a host of stakeholders are needed. Government at all levels, businesses, innovators, investors and consumers all have to play their distinct roles and contribute to the process. (EC, 2019b)

Thus, the rethinking of the business model involves also the financing sector and the way financing institutions may look at investments in the circular economy. This can be summarised under Sustainable or Green Finance. Green Finance instruments are also increasingly recognised and promoted by the EU. The recommendations for a greener finance and the enhancement of financing options for CE activities include, among others:

- elaboration of a taxonomy for sustainable finance
- establishment of a “quality label” for green finance products as well as standards for green finance.

Furthermore, rethinking of the business model from a financing point of view must also comprise more stringent consideration and disclosure of risks inherent to linear business models and projects.

Financing should also encourage the broadening of the knowledge base in circular economy and risk sharing approaches for innovative approaches and first movers.

4.7. Access to information

Legal framework in Serbia regarding the reporting on waste is regulated by Law on Waste Management (“Official Gazette of the RS” No 36/09, 88/10 and 14/16), Law on charges for usage of public goods (“Official Gazette of the RS” No 95/2018) and Bylaw on products that become specific waste streams after use, on the daily log form for records of the quantity and type of products produced and imported, and on the annual report, on the method and time frame for submitting the annual report, on the fee payers, the calculation criteria, the amount and the method for the calculation and payment of the fee (“Official Gazette of the RS” No 54/10, 86/11, 15/12 and 03/14). Reporting on packaging and packaging waste is regulated by Law on packaging and packaging waste (“Official Gazette of the RS” No 36/2009).

All legal entities that produce or deal with waste are obligated to report data about waste production, disposal, reuse, export, import and collection on daily and annual basis. Also, all legal entities that produce or deal with packaging and packaging waste are obligated to report about the amounts produced, imported, exported, placed on the market, and reused or disposed of, as well as about any other relevant packaging and packaging waste management information.

Serbian Environmental Protection Agency (SEPA) is the central authority in charge of collecting all the reports and incorporating them in the National Register of Pollution Sources. Database on collected data within the National Registry is publicly available on the SEPA website. In addition, SEPA publishes annual Reports on Waste Management in Serbia, where collected data on waste, packaging and packaging waste is comprehensively presented.

According to SEPA, reporting on waste should be distinguished between municipal waste and industrial waste. The legislation stipulates that all required forms on waste must be filled in and reported prior to completing the trade. Therefore, data collection system on commercial waste is fully operational and accurate. On the other hand, there is an issue about reporting the data on municipal waste, which has to be conducted by public utility companies, or private companies in charge of waste management on behalf of the municipalities. Most of the available data relies on record by the major operators and service providers, with no possibility (even if the mandate and the capacity existed) from any government counterpart to validate, verify and analyse. Therefore, the accuracy of this information is not always fully ensured.

A very important prerequisite for accurate master planning and subsequent design and implementation the necessary SWM projects that will support the transition to CE, is the existence of solid baselines regarding all aspects of biodegradable waste production and management with special focus on the food waste VC. For this reason, it is of utmost importance that baselines for food waste VC are elaborated. At the present time, all quantitative estimations are based on outdated, scarce and many times contradictory data. The most important solid waste composition analysis on which most of the subsequent analyses have been performed more than 10 years ago (RS, 2010, FTS-UNS, 2009). No stream-specific data exist that are universally accepted by the national scientific community. A lot of work has to be done in this sector: research has to be funded and the elaboration of detailed baselines for all streams and subsectors of SWM should be procured.

All research and studies elaborated in the sector have to be collected centrally (by the SEPA but also to be able to be accessed and completed by the Group for the Circular and Green Economy) and should be readily available to the authorities, civil servants, professionals, researchers active in the sector, e.g. through the existing SEPA’s internet platform. The facilitation of data flow will also help in the institutional aspect related to clarifying responsibility and setting accountability measures. The data flow will be managed by SEPA in order to support the coordination, monitoring and management of the sector.

SEPA’s platform, after the inclusion of all data mentioned above, should have at least two levels of access:

1. Access to general quantitative information about the various SWM sectors, aggregated data on national, regional municipal level, studies elaborated, baselines produced etc. The access to this level will be free to any interested party;
2. Access to raw data from monitoring and ongoing activities. The access to this level should be available only to state or other specially authorised entities.

The information system currently in place should be enhanced so that it covers the full cycle of Solid Waste Management – from generation through transfer and treatment to disposal of each specific waste stream (currently there are some gaps regarding the data collection of some smaller waste streams).

4.8. Awareness creation among citizens, businesses and municipalities

The framework for CE initiatives in plastics with a special focus on PET and LDPE packaging plastics is an ambitious process that needs promotion, increase of awareness and communication activities for the achievement of the CE goals. The scope of these activities is to engage relevant stakeholders and to change behaviors and attitudes towards plastics production, use, and post-consumer actions.

The stakeholder engagement process involves a wide range of key actors from almost every section of society. Policy makers, universities and academic society, businesses in the involved sectors, industry associations and chambers, general public, informal sector, and other stakeholders play a role in the transition process towards plastics management according to CE principles.

Following the conclusions of the previous chapters, the CE practices for plastic packaging, and more specifically for PET and LDPE, corresponds to the development and implementation of a communication plan to increase source separation and recycling rates of plastic materials in accordance to the technical capacity of the industry to absorb plastic recyclates (SRMs) substituting the use of virgin/primary raw materials in the production process.

WRAP in 2013, developed a practical and straightforward guidance document based on the UK experience from the implementation of communication and awareness activities for the improvement of recycling and waste prevention performance. This guidance uses a step-by-step approach, which is visually described in the following figure.



Figure 20: Communication planning cycle (WRAP, 2013)

This communication plan is already effectively being implemented in the UK. This experience and the relevant guidance of WRAP can be applied for the preparation and development of the communication plan for the plastics CE initiatives with a special focus on PET and LDPE.

The communication planning cycle consists of the following 9 steps:

Step 1: Background – baseline information

This part of the communication process refers to the collection and management of the information needed to understand the current situation and to proceed to the situational analysis (next step of the planning cycle). The elements that are needed to be collected are the following:

- Demographics of the area (location, geography, population profile, housing types, businesses, urban/rural population, etc).
- Current waste management and recycling services, i.e. waste management services and infrastructure covering all streams, collection types and frequency, services, etc.
- Waste data and targets based on the waste management plan
- Other available data like other reports regarding waste management and recycling, information about previous communication activities, feedback from collection personnel, etc.
- Initial budgeting and research about potential funding sources for the implementation of the communication plan

Step 2: Situational analysis

Based on the information gathered and analysed in step 1, the situational analysis will be developed. This step enables the communication team to understand the framework of the communication process that will be followed and to identify the goals of the whole plan. The phases that must be followed in this process are the following:

- Current situation analysis i.e. demographic analysis and projections, operational analysis of the current waste management and recycling system, communication analysis and approach
- Outline of the future targets the overall management system
- Description of the targets and explanation of how and why these targets need to be set

Step 3: Define the aim and objectives

The communication plan must have clear aims and objectives that characterize where the plan focuses, and which are its results. Aim and objectives must be clear, understandable and SMART (Specific, Measurable, Achievable, Relevant, and Time-bound). This step includes the following procedures:

- Definition of plan's aim: the aim is a general statement of what is needed to be achieved with the implementation of the plan.
- Setting objectives: the objectives include several statements that all together add up to meet the overall aim.

Step 4: Identification of target audience

This step focuses on the recognition and classification of the target groups of the communication plan. It is essential to identify target groups since different groups of stakeholders have a different impact on the overall waste and recycling plan and they need different messages or different channels of communication to be developed for every different group.

In CE initiatives regarding PET and LDPE packaging, the following target groups are identified:

- Policy makers: Strong commitment and engagement of policy makers are absolutely necessary for the proper implementation of CE initiatives. They are the ones that will prepare the whole framework and will create the necessary condition that will not only allow the CE, but facilitate and encourage other stakeholders to actively participate.
- Plastics market: CE cannot become a reality if the private sector and industrial players are not engaged in the overall CE plan. Plastics market is a wide term that includes manufacturers, designers, resellers, recyclers (or converters), industries that use plastic materials, etc. The adoption of new business models that will allow organizations to move from the current linear economic and development model to CE must be recognized from the communication team and be effectively incorporated in the communication plan and the expected results and targets.
- Citizens and Consumers: The role of the plastics consumer is fundamental for the successful implementation of the relevant CE initiatives. They are the ones that affect the post-consumer

fate of the plastic products that they use and the amount and quality/clarity of the recycled materials. The necessity to change behaviour and consumption pattern is necessary.

- Waste management system: It includes all the activities related to waste management and recycling. Its role to any CE initiative is mainly to prepare the conditions that enable the separated collection of the target materials in every aspect like permanent storage capacity, collection frequencies, transportation to dedicated facilities, etc.

The specific characteristics and interests of each target group must be identified, as well as the barriers and difficulties for the implementation of the actions related to the CE initiative.

Step 5: Branding and message

After the identification of the target audiences and their needs, the communication brand must be developed. The development of the right brand is not an easy procedure and needs time, research and effort to be consumed in order to get a brand that is easily communicated to the target groups and can gain wide public recognition. The message must be able to engage, inform, motivate and even inspire the target audiences. It must be personal, since different audiences may need different messages therefore separate specific messages may be developed to engage specific target audiences.

Step 6: Strategy and communication methods

The next step of the communication planning cycle is the selection of the communication strategy and methods most appropriate to achieving the plan goals. In this step, the communication team must consider the following:

- Overall approach: This refers to the most effective communication approach that will effectively bring the message to the target audiences and are the answers to the following questions (WRAP, 2013):
 - o Do I need to reach everyone (broad brush communications)?
 - o Do I need to target particular audiences or people in particular areas (targeted communications)?
 - o What type of information do I need to communicate (simple or detailed)?
- Communication method: The answers to the above questions will guide the communication team to the selection of communication methods more appropriate for every different audience. Every method and channel of communication has a different impact on the targeted audience. WRAP (WRAP, 2013) presents the following examples:
 - o TV is good for targeting people across an entire region with the same message
 - o Radio, depending on its coverage, is better to target people in smaller areas, say a single local authority area (although broadcast areas will probably overlap with other local authorities)
 - o Local weekly newspapers may target people in particular areas of a local authority
 - o Door-to-door canvassing is effective if used in a targeted way in relatively small areas e.g. particular estates
 - o Signage at recycling sites will only target people visiting that site
 - o Social media channels can be an effective way to target information about services and allows you to engage in a two-way dialogue with residents to spread messages, improve customer service and build relationships.
 - o Mobile phone text alerts and information services e.g. reminders to put recycling bins out can be an effective way to target residents.

Step 7: Campaign activities

The result of the process of step 7 will be a mix of communication methods to bring the message to every targeted audience. In this step, the communication team will further analyse and break down every method in certain activities. For every individual activity, a set of aims and objectives must be set that will allow monitoring the result of every individual activity in order to be able to be clear which activity performs well or not and to report on successful practices. In this direction step 7 of the communication plan must include the following:

- Individual aims and objectives: For each communication activity, an individual set of aims and objectives must be developed that allow the communication team to supervise and to estimate the effectiveness of the activity. The characteristics of the aims and objectives must be again (see step 3) clear, understandable and SMART (Specific, Measurable, Achievable, Relevant, and Time-bound).
- Communication tactics: every communication activity must include a break-down and an analysis of the tactics that will be used
- Monitoring & evaluation method: Each activity must have its own monitoring and evaluation system to measure the results and the activities' effectiveness that will be used to provide the feedback and to lead to the corrective actions that will be needed.

Step 8: Activities planning

This step refers to the implementation plan for every communication activity. Provided that all the other aspects of every activity have been already set in the previous steps, in this step the communication team must ensure that the activities are completed within a given time (scheduling) and within the budget limitations of the plan.

The schedule of every activity must be in accordance with the implementation of the corresponding planned operational activities and services provision e.g. the promotion of materials recycling and separate collection activities must start after the instalment of the relevant collection infrastructure and the beginning of the local MRF facility.

Scheduling and activities timetable must also be in accordance with the implementation of other similar activities at a wider level e.g. at the national level or even globally. For example, participation in the clean-up days of the Let's Do It Foundation can result in the collection of a significant number of post-consumer plastics, especially PET.

Step 9: Monitoring and Evaluation

Continuous improvement of the communication plan and activities is totally linked to a very detailed and straightforward monitoring and evaluation process. In this process, the performance of the communication activities is measured and evaluated against the set and objectives of the plan.

5. Financing options and sources

5.1. Financing Options

CE projects, as all innovative and new approaches, require adequate financing and funding options. In the same time, due to their innovative character, the risk is higher than with the traditional approaches. Hence, a combination of private capital, public funds and/or guarantees is required for mobilising the required financial resources.

The main options for investment financing are as follows:

- *State Budget*

Measures and activities, which are not directly financially viable, such as accompanying measures, parts of waste collection and recycling, remediation and/or construction of dump sites and landfills, as well as environmental protection measures can be financed from the state budget.
- *Grants*

Grants are used for enhancing and complementing state and private interventions. Grants are available from IFIs under different targeted programmes.
- *Loans and Guarantees*

Loans are used for financing of economically viable projects. Guarantees are for projects to make them more attractive to other investors. Loans and guarantees are available from IFIs and local financial institutions under different programmes.
- *Private Sector Investments*

Private sector can be interested in activities which are financially viable, such as solid waste collection activities, waste-to-energy projects and certain recycling activities. This implies that the tariff level is such to attract private sector investments.
- *Equity/Venture Capital*

Venture capital funds generally invest relatively small amounts of equity capital in companies. These investments tend to be in companies in their start-up or expansion phase that may also require access to managerial expertise and networks.
- *Insurance Products*

Insurance products can be used in certain limited circumstances to reduce project risks and so enhance the capacity/possibilities for investments.
- *Green Finance Instruments*

Green Finance Instruments are financial instruments specifically issued for financing of environmentally friendly investment projects.

The above-mentioned financing instruments are made available by (i) international institutions and (ii) local banks, often in cooperation or joint partnership. Often a mix of different instruments is applied. The detailed design of a financing structure depends on a case-by-case basis, this means that each investment project has to be assessed separately and financing mix has to be adapted to the individual project.

In principle, the following options exist:

- Project finance (non-recourse or limited recourse financing)

- Pledge on the project facility and revenues expected from the activity
- More common for IFIs
- Recourse financing
 - Pledge on the project facility and other assets or guarantees provided by the investor
 - More common for local FIs
- Mezzanine
 - Hybrid of debt and equity financing that gives the lender the rights to convert to an ownership or equity interest in the company in case of default

A very important aspect for the funding of projects is the set of criteria that have to be fulfilled so that the resources are used in an effective and efficient way and the projects are viable. This aspect becomes even more important in countries where the SWM and environmental licencing procedures are not yet fully developed and for this reason, each financing institution has a set of requirements for the selection of the projects to be funded.

The basic criteria for project financing by the institutions can be summarized in the following:

- Solid project concept
- Feasibility study including at least:
 - Institutional and planning framework - Existing situation of solid waste management
 - Project scoping - Demand analysis and design parameters
 - Site screening and evaluation
 - Preliminary design - Options analysis
 - Cost/revenue estimates - Financial and economic analysis
- Legal and environmental requirements fulfilled (Scoping, EIA study)
- Project implementation plans
- Reliable technology solution (Mature technical studies - Approval of design that details the basic technical aspects)
- Long term availability of raw material supply
- Vertically integrated fuel supply
- Availability of acceptable collateral

5.2. Investors and/or contractors with previous experience - Financial Institutions active in Serbia

The following financial institutions are active in Serbia and provide financing, often in partnership for circular economy projects

- International Funds, International and Development Financial institution
 - GIZ – www.giz.de
 - Green for Growth Fund - www.ggf.lu
 - Regional Energy Efficiency Programme (REEP & REEP Plus) – www.wb-reep.org
 - European Investment Bank - www.eib.org
 - Western Balkans Investment Framework (WBIF) - www.wbif.eu

- Kreditanstalt für Wiederaufbau - www.kfw.de
- Deutsche Entwicklungsgesellschaft DEG - www.deginvest.de
- European Bank for Reconstruction and Development – www.ebrd.org
- World Bank – www.worldbank.org
- United Nations Development Programme – www.undp.org
- Local Financial Institutions (Banks and Leasing companies) in Serbia
 - Addiko - <http://addiko.rs>
 - Banca Intesa - <https://www.bancaintesa.rs>
 - Erste - <https://www.erstebank.rs>
 - Halkbank RS (Cacanska Banka) - <http://www.halkbank.rs>
 - Intesa Leasing Beograd - <http://www.intesaleasing.rs>
 - Komercijalna banka - <https://www.kombank.com/sr>
 - NLB Bank – <https://www.nlb.rs>
 - ProCredit Bank RS - <https://www.procreditbank.rs>
 - Raiffeisen Leasing - <https://www.raiffeisenbank.rs>
 - Sberbank - <https://www.sberbank.rs>
 - UniCredit - <https://www.unicreditbank.rs>

These local banks are the primary source of local retail finance and cooperate with the above mentioned international institutions such as EBRD and the EU.

6. Going beyond Secondary Raw Materials utilisation

6.1. Further CE potential in the Sector

Further promotion of CE practices in dealing with plastic packaging is to reduce the plastic packaging waste generation. The EU has already adopted measures to work towards a reduction of plastic packaging waste.

Reducing overall plastic use, and especially single-use plastics, has the potential to create new markets and local jobs, stimulate new technologies and provide opportunities for dynamic businesses, while preserving the natural resources upon which we all depend.

More specifically, tools like the Single-Use Plastics Directive of the EU can be examined. The said Directive bans:

- (i) cotton bud sticks,
- (ii) cutlery (forks, knives, spoons, and chopsticks),
- (iii) beverage stirrers,
- (iv) straws,
- (v) plates (including paper plates with plastic lining),
- (vi) sticks for balloons,
- (vii) expanded polystyrene food containers, beverage containers and cups as well as
- (viii) oxo-degradable plastics by mid-2021.

The EU establishes different measures for each of these products, including market restriction, product design, marking/labelling requirements, awareness raising measures, EPR schemes, and separate collection.

Reduction targets for further products, incl. food and beverage containers are also included in this Directive. For lightweight plastic carrier bags countries are required to reduce their consumption, through charges or national maximum consumption targets. Several countries have already adopted these measures for plastic bags.

A way to achieve an important reduction in the consumption of food containers and cups is to promote reuse systems and reusable alternatives, to ensure the latter are made available at the point of sale to the final consumer. This could be done by providing economic incentives to the implementation of local reuse schemes, where possible (Zero Waste Europe, 2019).

Moreover, a lot of things could be done by research in the packaging design and product design in general so that utilisation of plastics for wrapping, protection, promotion of the products is minimized. The promotion of ecological packaging with simpler materials without the use of colours and chemicals may enhance the recycling potential of several packages. Significant tool to this direction is the Ecodesign Directive issued by EU (2009/125/EC), which provides consistent EU-wide rules for improving the environmental performance of products, such as household appliances, information and communication technologies or engineering. The Directive sets out minimum mandatory requirements for the energy efficiency of these products. This helps prevent creation of barriers to trade, improve product quality and environmental protection.

All the measures mentioned above can be coupled with the promotion of selling/using products in bulk so that wrapping is totally avoided.

Finally, the redesign of current standard practices in the industrial sector of the country by carefully analyzing and meticulously tracking and measuring the PP waste produced by each company and in each step of the production can provide several innovative approaches that will further promote CE in the sector.

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