

Annex
to Resolution No 136/2019
of the Council of Ministers
of 10 September 2019

ROAD MAP

towards the Transition to
Circular Economy



(CIRCULAR ECONOMY)

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Circular Economy



Adopted by the Resolution of the Council of Ministers of 10 September 2019

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INTRODUCTION

Circular economy (hereinafter “CE”) is an economic development model in which the following basic assumptions are met while maintaining the productivity condition:

- a) added value of raw materials/resources, materials and products is maximised or
- b) amount of waste generated is minimised and the resulting waste is managed in accordance with waste hierarchy (waste prevention, preparation for re-use, recycling, other recovery, disposal).

In view of the depletion of non-renewable raw materials, increase in their prices and Poland's growing dependence on their supplies from abroad, which causes risks for country's further economic development and challenges in the context of environmental protection, it is necessary for the public sector to take immediate action. In this context, supporting the transition to CE is an essential element of creating a low-emission, resource-efficient, innovative and competitive Polish economy.

The transition to CE requires taking actions at all stages of the life cycle, starting from product design, through the acquisition of raw material, processing, production, consumption, waste collection, and ending with its management. Thus, CE differs from the model of linear economy, based on the principle of “take – produce – use – throw away”. In the CE approach, if waste is already produced, it should be treated as secondary raw materials and used for re-production. This is to be achieved through mechanisms implemented at earlier stages of the life cycle. The CE approach is inextricably linked with the development of innovation, creation of new business models and society's increasing environmental awareness, which in effect contributes to increasing the competitiveness of the Polish economy in relation to our partners from other parts of Europe and the world.

At the end of 2015, the European Commission published the following Communication *Closing the loop – An EU action plan for the Circular Economy*. The document outlines proposals for policies to facilitate the shift in the economic development model to be implemented by the EU in the upcoming years. These actions focus on several priority areas such as plastics,

food waste, critical raw materials, demolition and construction waste, and biomass and biomass products. The Communication highlights the role of innovation in the transition to CE.

The economies of the EU Member States are different and therefore there is no one suitable model for the transition to CE for all of them. Therefore, the conclusions of the meeting of EU ministers at the June 2016 Environment Council proposed that Member States, following the guidance of the European Commission, should develop national programmes for the transition to CE. It is essential that this new model of economic development be implemented at all levels – starting from the EU, its Member States, and ending with the province and municipality level. This document is obligatory in terms of scope of action at the national level.

It must be stressed that Poland does not have to start from scratch. The public administration as well as scientific institutions and entrepreneurs have been implementing particular elements of CE for many years now, although they often call them by different names. The actions implemented so far under the slogan of green economy, cleaner production, sustainable development or carbon efficiency often contribute to “closing the loop”, because their primary objective is often to produce and use the product as efficiently as possible and to manage its waste in an economically and environmentally optimal way.

Moreover, it is also important to ensure consistency of activities in the area of CE implementation with activities in other areas of social and economic development in Poland. That is why the preparation of the Road Map towards the Transition to Circular Economy (hereinafter “CE Road Map”) is one of the strategic projects of the Strategy for Responsible Development (hereinafter “SRD”), and thus fits into the overall vision of the country's development. While working on the SRD project, a number of challenges for Poland were identified. These include, for example, imbalances in raw material markets and price competition among exporters, which may lead to a weakening of the development dynamics of the global economy, including the EU and Poland. The CE Road Map is a response in addressing select challenges identified in the SRD.

The CE Road Map aims to identify, in particular, actions aimed at maximising the added value of raw materials/resources, materials and products and reducing the generation of waste, while maintaining efficiency of the production and consumption processes. Moreover, looking at the big picture, the CE Road Map is supposed to be one of the elements of implementation of the main objective of the Strategy for Responsible Development, i.e. to create conditions for the growth of income of the Polish population while simultaneously increasing social, economic and territorial cohesion. The document may be updated in case any legal changes are introduced by the European Union after its adoption

In 2015, after public consultations, a Polish non-paper was developed which identified Poland's main priorities in the field of CE, which should have been included in the Communication *Closing the loop – An EU action plan for the circular economy*, which was developed at the time by the European Commission.

According to the non-paper, Poland's priorities within the framework of CE include:

1. innovation, strengthening of cooperation between industry and the science sector, and implementing of innovative solutions in the economy as a result;
2. creating a European market for secondary raw materials;
3. ensuring availability of high quality secondary raw materials;
4. development of the service sector.

The actions proposed in the CE Road Map should contribute to the implementation of the four Polish priorities mentioned above.

The CE Road Map is based on the CE model commonly used in the EU (developed by the Ellen MacArthur Foundation) which assumes the existence of two cycles: biological (renewable raw materials) and technical (non-renewable raw materials).

The aim of the CE Road Map is, on the one hand, to indicate horizontal actions which would affect the largest possible section of social and economic life. On the other hand, the CE Road Map prioritises the areas whose development will allow for taking advantage of the opportunities facing Poland, and at the same time will address the currently existing or expected threats.

In Chapter 1 “Sustainable industrial production” attention was drawn to the important role of industry in the Polish economy and new opportunities for its development. In Chapter 2 “Sustainable consumption” the need to take action on this stage of the life cycle, so far often underestimated in the context of its contribution to the transition to CE, is justified. Chapter 3 “Bioeconomy” outlines the management of renewable raw materials (the biological cycle of CE), which seems to have an unexploited potential in Poland. Chapter 4 “New business models” discusses the opportunities for reorganising functioning of various market participants based on the idea of CE. Chapter 5 covers the implementation, monitoring and financing of CE.

PRINCIPLE

1

Preserve and enhance natural capital by controlling limited stocks and balancing renewable resource flows

Renewable resources



Non-renewable resources



Substitute materials

Virtualise

Restore

Regenerate

Renewable flows management

Stock resource management

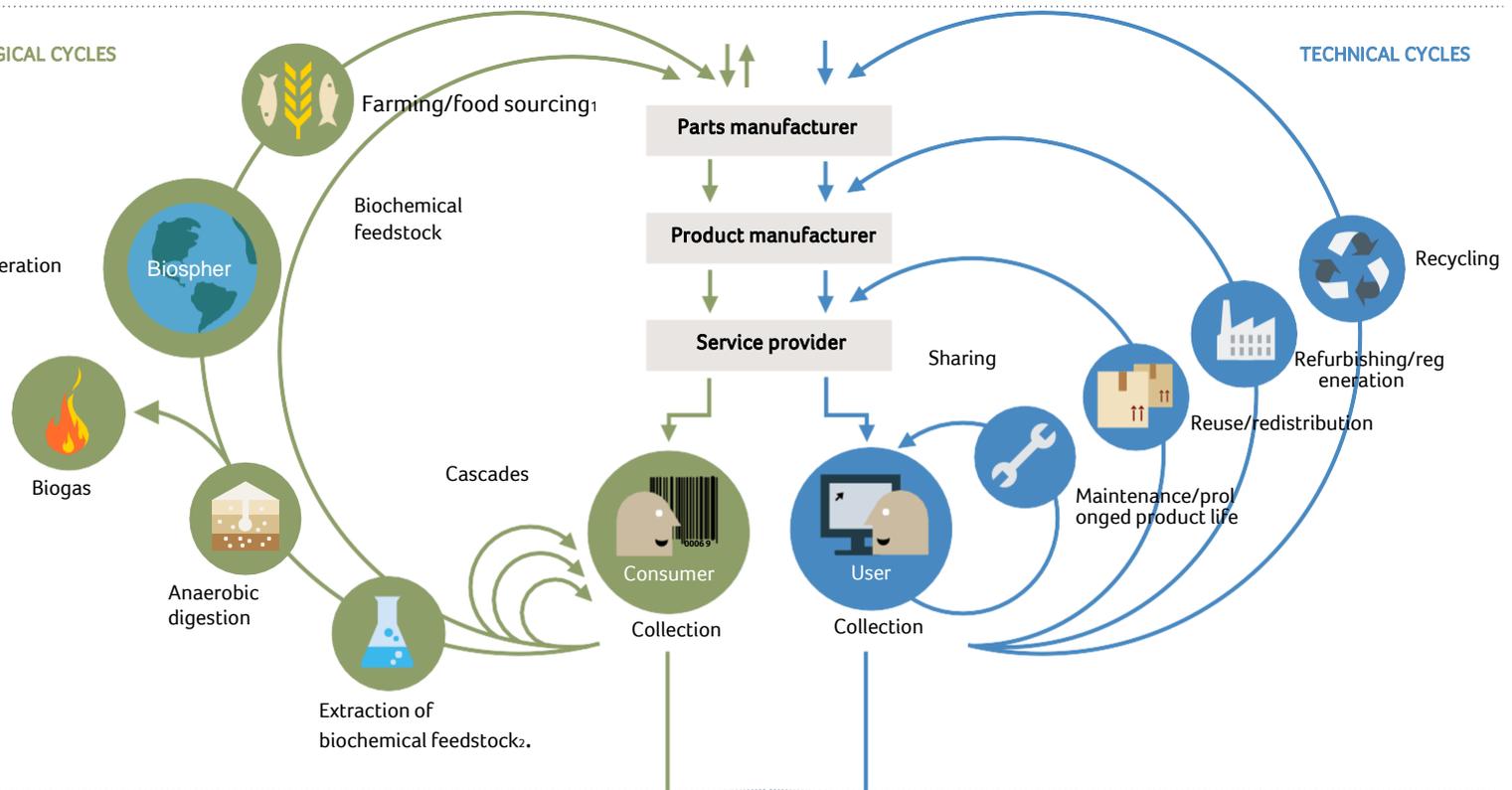
PRINCIPLE

2

Optimise resource yields by circulating products, components and materials in use at the highest utility levels at all times in both the technical and biological cycles

BIOLOGICAL CYCLES

TECHNICAL CYCLES



PRINCIPLE

3

Fostering system effectiveness system by revealing and eliminating negative externalities

Minimising systematic materials leakage and negative externalities

¹ Fishing and hunting

² Both post-harvest and post-consumer waste may be used as input material

Source: The Ellen MacArthur Foundation and McKinsey Center for Business and Environment; based on: Braungart & McDonough, *Cradle to Cradle* (C2C)

Figure 1
Circular economy

1.

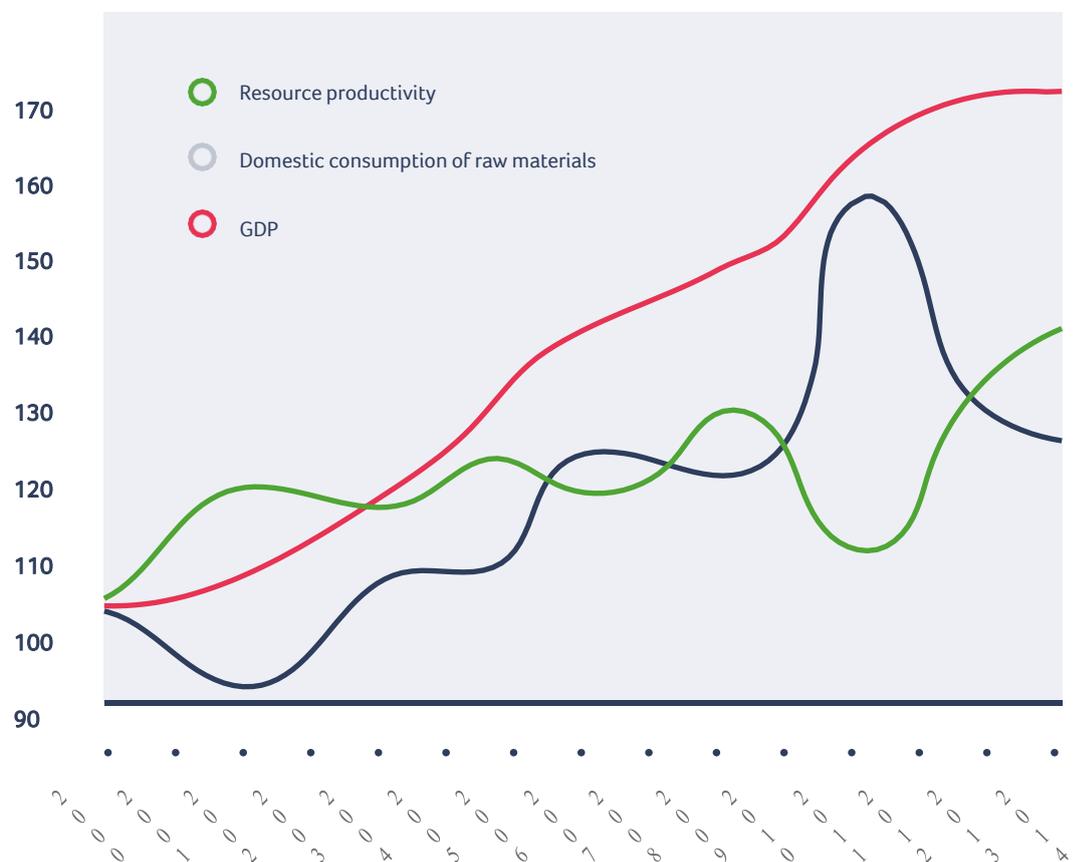
SUSTAINABLE INDUSTRY PRODUCTION

Reindustrialisation is one of the priority areas which allow for the achievement of specific objective I of the SRD, i.e. “sustainable economic growth based on existing and new advantages”.

In Poland, the share of industry in GDP (23.4% in 2016) is higher than the EU average (17.4% in 2016). In the years 2004-2016, the average annual growth rate of industrial production in Poland was 5.3% compared to 0.5% in the EU.

The development of industry depends on access to raw materials as production factors. Since 2011, Poland has seen an increase in resource productivity and resource decoupling, i.e. there is an increase in GDP coupled with a simultaneous decrease in domestic material consumption (DMC). However, due to the high share of industry in GDP, resource productivity measured as the ratio of GDP to domestic material consumption (DMC) is still relatively lower as compared to countries with a lower share of industry in GDP.

Figure 2 Trends in resource productivity in Poland (source: EEA “More from less – material resource efficiency in Europe” 2016)



Notwithstanding doubts about the validity of such a method of calculating resource productivity, it is one of the determinants of entrepreneurs' competitiveness.

The idea of sustainable production is based not only on the principle of increasing resource productivity, i.e. reducing the amount of raw materials used per unit of goods produced, but also on the assumption of reducing the negative environmental impact of production processes in particular in the context of reducing greenhouse gas emissions and the amount of waste produced.

In Poland, there is great potential for improvement as regards actions concerning industrial waste, in particular from mining and extraction, industrial processing, and energy production and supply. So far, relatively little attention has been paid in the public discussion to the issues of waste in the above mentioned areas while the issue of municipal waste has generated a lot of interest. Production generating less waste all the time, as well as managing the largest possible amount of industrial waste

from this activity for reuse in other production processes and in other sectors of the economy, can significantly contribute to increasing the profitability of production in Poland and reduction of its negative impact on the environment.

1) Waste from mining, processing industry and power generation

According to Central Statistical Office data ("Environmental Protection 2018"), 126 million tonnes of waste were produced in Poland in 2017, and only a small amount of this was municipal waste (12.0 million tonnes). The main source of waste in 2017 was, as in previous years, mining and extraction, industrial processing, and energy production and supply. In the last decade, the largest share in the amount of waste generated is waste generated during exploration, extraction, physical and chemical processing of ores and other minerals, and waste from thermal processes.

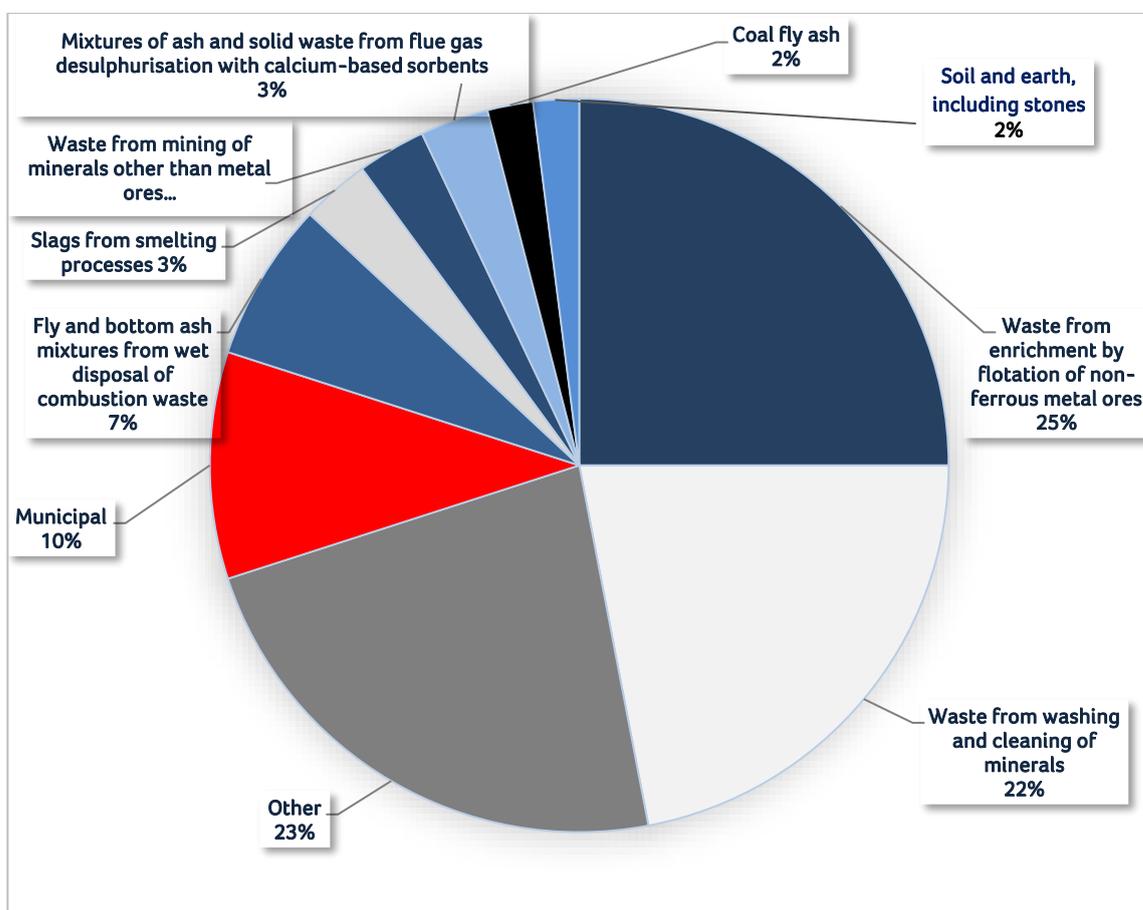


Figure 3 Waste produced in Poland in 2017

Source: "Environmental Protection 2018" (Central Statistical Office).¹

¹Data on industrial waste include units (plants) generating more than 1,000 tonnes of waste, excluding municipal waste, or having 1 million tonnes or more of accumulated waste during the year

Out of the total amount of waste (other than municipal waste) generated in 2017, 49.1% was recovered, 42.5% was disposed of by landfilling, 4.4% was disposed of in a manner other than landfilling. The total amount of waste on the plants' private landfills and facilities for mining waste disposal (heaps, settlement ponds) over the last decade has remained at the level of 1.7 billion tonnes ("Environmental Protection 2018"). By comparison, 42% of waste was recovered (other than energy recovery) in the EU-28 in 2014, while 36% of waste generated in the EU-28 in the same year was landfilled (Eurostat data).

It should be noted that mining waste (produced, for example, in the process of washing and purification of minerals) and waste from various other industries (e.g. food or automotive)

are not homogeneous and, therefore, their management requires differentiated approaches.

The primary source of electrical power and heat in Poland is burning of hard coal and lignite. The combustion of this raw material generates both gases and the so-called combustion by-products, i.e. ashes, slag and dust. These are a source for many minerals, whose potential as an anthropogenic raw material is currently not fully exploited. For example, increasing the scale of aggregate production from combustion by-products could significantly contribute to the transition to CE in the energy and construction industries in Poland.

| Action | Competent agency | Schedule and regulations |
|--|---|--|
| 1. Analysis of the potential and proposal of legislative changes to increase the economic use of combustion by-products: <i>The combustion of energy resources results in large quantities of slag, ash and flue gas desulphurisation products. Appropriate preparation of raw materials, even before they are burnt, defining the quality (including environmental) requirements to be met by combustion by-products and creating conditions for their use (including eco-design) may increase the accessibility of raw materials for other sectors of the economy, while reducing the amount of waste disposed of through landfill. Combustion by-products could be used to a greater extent in the construction sector, e.g. as components of embankments, concrete or other structural layers, as well as a source of raw materials crucial for the Polish economy.</i> | <i>the minister competent for energy in cooperation with the minister competent for environment, the minister competent for construction, spatial planning and development and housing and the Inspectorate of Environmental Protection</i> | 2020–2021 Act of 14 December 2012 on waste |
| 2. Development of guidelines for Zero Waste Coal Power (ZWCP) aimed at minimising the environmental impact associated with coal mining and electricity and heat generation from coal combustion: <i>The action requires strengthening of cooperation with the science sector and, as a result, the implementation of innovative solutions extending the possibilities of utilising combustion by-products.</i> | <i>the minister competent for energy in cooperation with the minister competent for environment</i> | 2022–2023 |
| 3. Feasibility study on creating a dedicated platform for secondary raw materials: <i>A feasibility study will be carried out on creating a dedicated platform to serve market participants for information (supply and demand) and trading purposes.</i> | <i>the minister competent for economy in cooperation with the Stock Exchange, the minister competent for environment and the Inspectorate of Environmental Protection.</i> | 2021 |
| 4. Analysis of the potential of opening and utilizing waste heaps from processing and mining industries and analysis of the morphological composition of mining waste and possibilities of their utilization in particular branches of the Polish industry, as well as proposing legislative changes on the basis thereof: <i>For years, the basic method of waste management in many branches of the industry has been landfilling, including disposal on heaps. Taking into account technological progress, it is assumed that some of the heaps may become a source of raw materials for reuse in other sectors of the economy. Moreover, there is insufficient information on the composition of waste generated in the mining industry, on the one hand, and insufficient demand for it in other industries (including innovative industries), on the other hand.</i> | <i>the minister competent for energy in cooperation with the minister competent for environment, the minister competent for economy and the Inspectorate for Environmental Protection</i> | 2021–2022 Act of 14 December 2012 on waste the act of 10 July 2008 on mining waste |

2) Extended producer responsibility

Extended producer responsibility (EPR) is an approach that obliges producers to collect and manage waste generated from the same products that they place on the market. EPR reflects "the polluter pays" principle and at the same time provides an incentive for the producer to take into account the whole life cycle of the raw material from which their product is made. Therefore, they should use raw materials and technologies from the design and production phase, and introduce such design and use solutions that allow for the collection of more waste and for recycling as much of it as possible.

Under the current regulatory system, EPR is introduced in particular for packaging, end-of-life vehicles, used electrical and electronic equipment, tyres, batteries and accumulators, and lubricating oils. To be an effective tool, EPR should, on the one hand, grant unambiguous rights and impose obligations on producers and, on the other hand, not hinder their business activities. EPR cannot be a solution whose implementation is perceived only as an unwanted obligation imposed on the entrepreneur. It should be designed in such a way as to contribute to the acquisition of good quality raw materials for production and increase the producer's competitive advantages over other market players.

Analysis of the current EPR systems in operation leads to the conclusion that there are a number of issues that both producers and recyclers are facing. Given that the first element in waste hierarchy management is waste prevention, it is reasonable to extend the definition of EPR beyond what is implied by current regulations. The producer should not only be obliged to collect and manage waste,

but also to design and manufacture the product in such a way as to make a measurable contribution to extending its service life.

In the near future, there will be an opportunity to analyse the effectiveness of the current system and to introduce changes or completely new solutions in this respect, in connection with the revision of the European directives on waste. The new requirements provide in particular for increasing the recycling rates of municipal waste to 55% in 2025, 60% in 2030 and 65% in 2035. These high objectives concern also recycling of packagings alone – in 2025 a recycling rate amounting to 65% should be achieved, while in 2030 this rate should go up to 70%. Therefore, it is necessary to introduce modifications to the waste policies currently in force in Poland. In particular, it is necessary to define more clearly the roles and obligations of individual entities participating in the implementation of EPR, to impose obligations on entities other than producers, to set new objectives concerning preparation for reuse and recycling of individual waste flows, to develop a system for reporting on the implementation of EPR, and to ensure equal treatment of all entrepreneurs by the system. Small and medium-sized enterprises are particularly noteworthy in the above system. For them – by comparison with large enterprises – adaptation to new regulatory requirements constitutes a greater organisational and financial effort. It may turn out that it will also be necessary to analyse the role of individual market participants, including recovery organisations, and introduction of changes in the system financing. The tightness of the system and its connection to the product, packaging and waste management database is also important, taking into account the experience with solutions currently in place.

| Action | Competent agency | Schedule and regulations |
|--|--|--|
| <p>5. Review of regulations concerning packaging, end-of-life vehicles, used electrical and electronic equipment, tyres, batteries and accumulators, as well as lubricating oils and lubricating preparations, and development of proposals for changes in the Polish regulations in order to adapt them to the requirements of EU law and their orientation to stimulate the transfer to CE: The review aims to answer the question to what extent the current regulations cover the entire life-cycle of products and fit into the CE concept. The starting point will be the definition of EPR which needs to be applied to each stage of the raw material life-cycle. It is therefore necessary to evaluate and propose changes that go beyond waste management itself. Issues such as the responsibility of individual entities implementing EPR, the recovery organisation scheme and financing should then be assessed. The analysis should also cover potential and already existing alternative systems for collecting and managing particular types of waste. The analysis should result in a set of proposals for legislative changes, including in particular the transposition of provisions of waste directives into the Polish law in such a way as to create a clear legal environment supported by efficient control mechanisms.</p> | <p>the minister competent for environment in cooperation with the minister competent for economy</p> | <p>2019–2020</p> <p>Act of 14 December 2012 on waste</p> <p>Act of 13 June 2013 on packaging and packaging waste management</p> <p>Act of 20 January 2005 on the recycling of end-of-life vehicles</p> <p>Act of 11 September 2015 on used electrical and electronic equipment</p> <p>Act of 24 April 2009 on batteries and accumulators</p> <p>Act of 11 May 2001 on the responsibilities of entrepreneurs in the field of certain waste management and product fee</p> |
| <p>6. Analysis of strengths, weaknesses, opportunities and threats in terms of control and reporting under EPR and development of proposals to eliminate irregularities in this area: EPR should not be perceived as an unwanted obligation imposed on entrepreneurs, but one of the tools that can increase their competitiveness, including in particular obtaining good quality raw materials. Therefore, it is necessary, inter alia, to ensure that EPR-compliant activities are cost-effective. The proposal based on this analysis will aim at eliminating irregularities and creating a friendly business environment.</p> | <p>the minister competent for environment in cooperation with the minister competent for economy</p> | <p>2019–2021</p> <p>Act of 20 July 1991 on the Inspectorate of Environmental Protection</p> <p>acts listed in Action 5</p> |
| <p>7. Information campaign on the benefits entrepreneur's image from applying EPR: Environmental protection actions are increasingly associated not only with fulfilling regulatory obligations but they also have a direct impact on the image of the entrepreneur. Some consumers also take into consideration the environmental impact of the product while making their purchase decisions. Therefore, the aim of this action is to strengthen the entrepreneurs' conviction that public relations activities related to environmental protection may lead to a competitive advantage in relation to other producers on the market.</p> | <p>the minister competent for economy in cooperation with the minister competent for environment</p> | <p>2021–2022</p> |

3) Environmental life-cycle assessment

Currently, there are several dozen ways of calculating the environmental impact of products and several hundred types of environmental labels used worldwide. In this situation, it is difficult to clearly define what an environmentally friendly product is and how one can compare individual products, taking into account their environmental impact. At the same time, the competitive position of a given product and the company's position on the market may depend on the adopted method of calculating the environmental impact of their product.

LCA (life-cycle assessment) is one of the approaches to assessing the environmental impact of a product or business activity.

A product's LCA involves identifying and quantifying so-called "inputs". (raw materials, energy, water, etc.) and "outputs" (product, waste, emissions, etc.) into and out of the product system and determining the environmental impact of these "inputs" and "outputs" in defined categories (e.g. depletion of water resources, soil salinisation, land use and conversion, global warming, ozone depletion, acidification, eutrophication, ecotoxicity, ionising radiation, smog, etc.).

The product system consists of various stages of the life-cycle, i.e. extraction of raw materials, their processing and production of goods,

product transport and distribution processes, product use and waste management phase.

The European Commission's objective is to create a competitive economy in which environmental resources are used in an efficient and sustainable way. One of the actions taken in this respect is the pilot phase for the development of uniform methodologies for calculating the environmental footprint of individual product groups and economic activities, which ended in April 2018 and was based on the LCA concept. In autumn 2018, it became a two-year transition phase, during which the companies concerned will test methodologies and, on the basis of these findings thereof, regulatory solutions will be discussed, which will include for instance:

- > defining criteria for the selection of products and services in public procurement,
- > designing instruments to support businesses and industries,
- > differentiating tax rates.

Although there are no regulations covering the environmental impact of individual product categories and economic activities yet, it is necessary to start the preparatory process for their future introduction now.

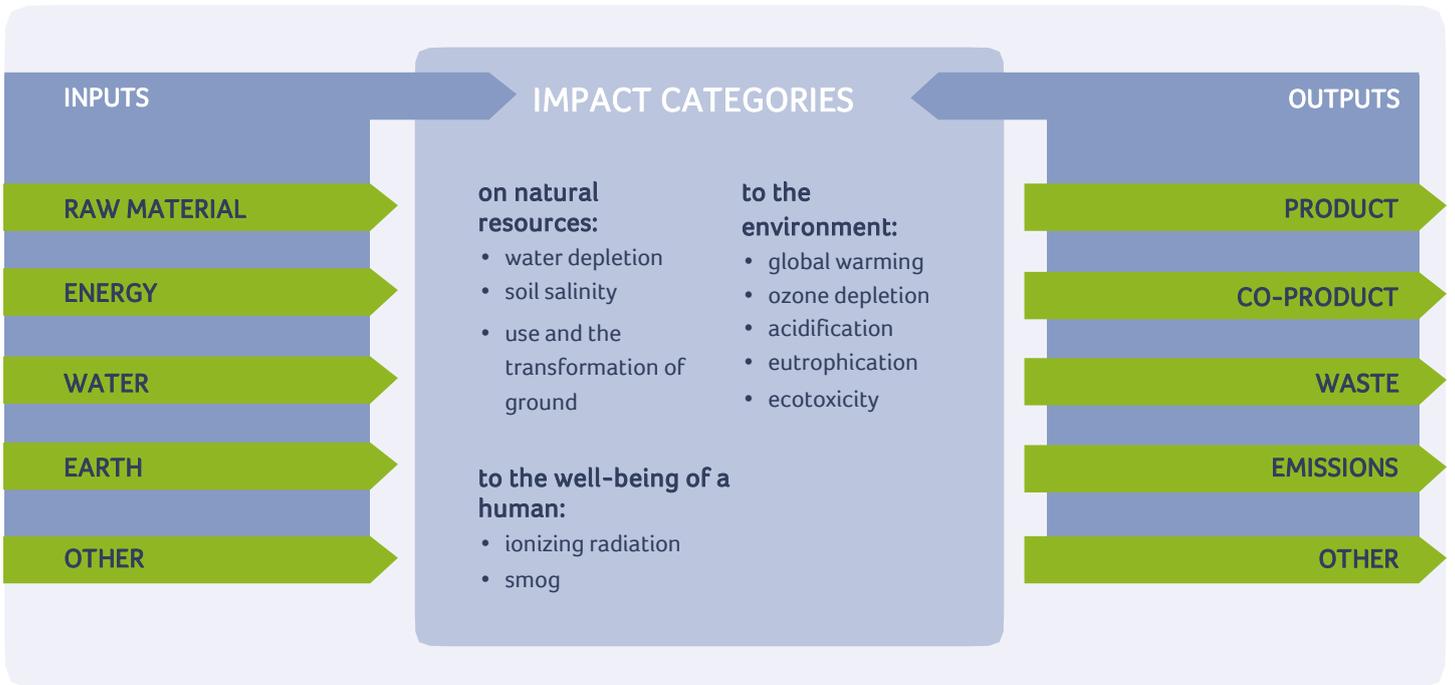
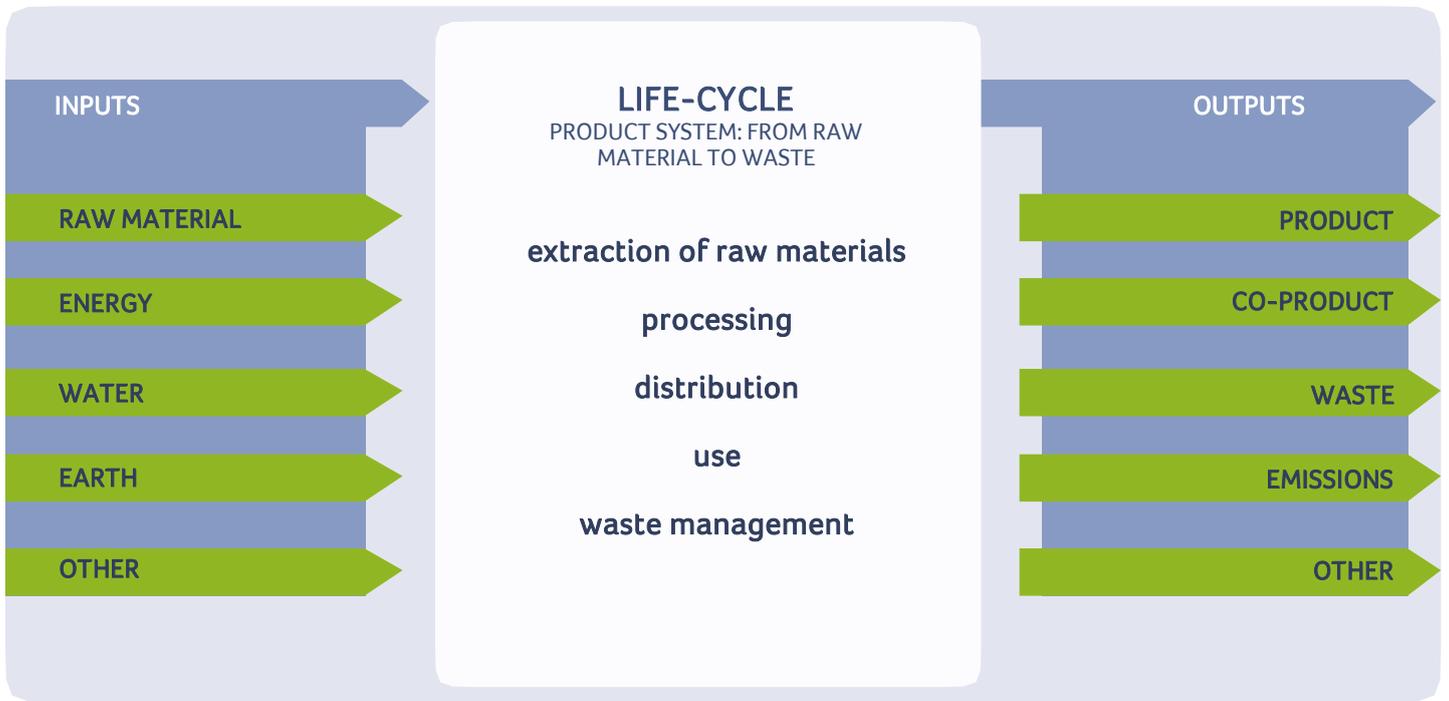


Figure 4 Life-cycle

| Action | Competent agency | Schedule and regulations |
|--|--|--------------------------|
| 8. Development of information and educational materials concerning the calculation of the environmental impact of products and economic activities based on the methodologies developed by the European Commission, including PEFCRs – Product Environmental Footprint Category Rules and OEFSRs – Organisation Environmental Footprint Sector Rules. | <i>the minister competent for economy in cooperation with the minister competent for environment</i> | <i>2019–2020</i> |

2. SUSTAINABLE CONSUMPTION

The habits and consumption patterns of the citizens of economically developed countries are hardly sustainable. The experience of Western European countries shows that the increase of society's wealth is followed by rapid consumption growth. This trend is also visible in Poland. For instance, according to the Central Statistical Office data, in the years 2000–2014 the real level of consumption expenditure more than doubled. As households' income increases, so does the demand for food, for bigger residential space, new appliances, furniture, cleaning products, as well as for clothing, transport, and energy. As a result of the economic development in Poland, generating demand for a highly skilled workforce, the middle-class is growing, which in turn results in increased consumption. According to the Central Statistical Office data, the increase in consumption in the first quarter of 2018 was about 5%.

As the European Commission emphasises in its Communication *Closing the loop – An EU action plan for the circular economy*, consumer choices may support or hamper circular economy. Consumer behaviour is therefore crucial to the success of the transition to CE.

Sustainable consumption means meeting basic human needs while minimising consumption of natural resources and reducing waste and emissions.

Consumer-oriented actions in the transition to CE include ensuring the accessibility of repair and spare parts information, better enforcement of warranties, elimination of false claims

on environmental impact or determining the maximum usefulness of a product without harming the consumer and the environment.

Raising consumer awareness is also of great importance. Education on sustainable consumption should be provided at all stages of formal, non-formal and informal education and training, starting at the pre-school level.

An important action on the part of the consumer is proper management of municipal waste, which – although it constitutes a small percentage of waste generated in Poland – directly contributes to the transfer to CE.

This chapter is divided into 3 subchapters:

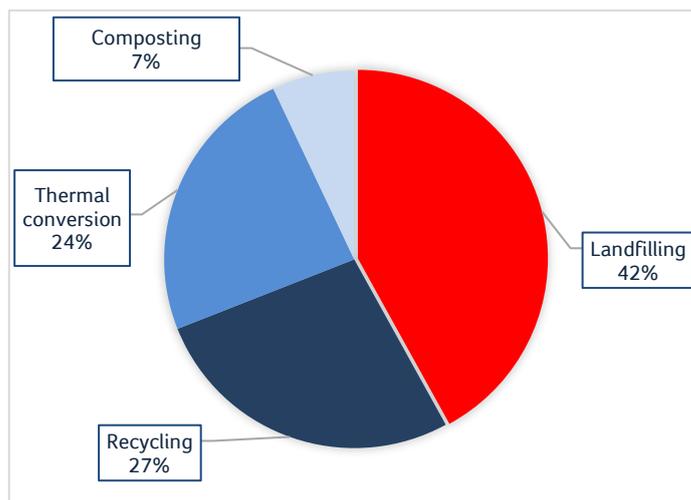
- 1) Municipal waste;
- 2) Food waste;
- 3) Education.

1) Municipal waste

The management of municipal waste in Poland still constitutes a challenge. In 2013, an amendment to the policy covering this waste flow was introduced, which delegated the management of municipal waste to the municipalities. Thus, entrepreneurs have been deprived of an opportunity to compete for individual clients and obliged to participate in tender procedures for municipal waste collection and management organised by municipal authorities.

Creation of an economy fully aligned with the CE approach will require increased efforts in the field of prevention and management of the largest possible amount of municipal waste by recycling. The latter requires selective collection of good quality waste. The quality of municipal waste is evaluated in particular on the basis of its cleanliness, meaning that it cannot be polluted by other types of waste.

In 2017, 11969 thousand tonnes of municipal waste were collected in Poland, 3199 thousand tonnes of which were recycled, 848 thousand tonnes were composted, 2922 thousand tonnes were thermally transformed, and 5000 thousand tonnes were landfilled. The diagram below shows that too much waste is still being landfilled and the raw materials contained therein are thus wasted.



Source: "Environmental Protection 2018" (Central Statistical Office)

The levels of recycling of municipal waste, which deviate from the maximum European levels, are a problem in Poland both from the environmental and economic perspective. The latter is related to the insufficient supply of secondary raw materials for the needs of the national economy. The reform introduced a few years ago increased the levels of waste recovery, including recycling. On the other hand, further systemic changes are required in order to meet very high levels of requirements in this respect, resulting from the amendments to the directives on waste adopted in 2018. Therefore, it is necessary to analyse and evaluate the existing system and propose changes therein. A reduction of the use of landfill by several dozen per cent could be one of the driving forces for economic growth in Poland, from the point of view of lowering demand for primary raw materials and switch to more extensive use of secondary raw materials, in particular.

The need for better management of municipal waste is also entailed by the requirements set out in the European regulations. The amendment to the Directive on packaging and packaging waste adopted in 2018 provides for a significant increase in the recycling rates for packaging waste (which has a significant share in municipal waste), including an increase up to 50% for plastic waste, 70% for glass and 75% for paper in 2025 and an increase up to 55% for plastic waste, 75% for glass and 85% for paper in 2030. At the same time, the opportunities for landfilling municipal waste will be significantly reduced – to 10% in 2035.

Figure 5
Municipal waste management in Poland in 2017 in thousand tonnes

| Action | Competent agency | Schedule and regulations |
|---|--|--|
| 9. Monitoring the effectiveness and efficiency of the current regulations and developing recommendations for adapting and amending national regulations on municipal waste: An analysis of the effectiveness of the current system of municipal waste collection and management will be conducted, taking into account, in particular, the demand for raw materials crucial for the Polish economy, as well as barriers to the collection and management of municipal waste. The outcomes of the analysis will be proposals for regulations necessary to make the CE concept of municipal waste a reality. | the minister competent for environment | 2021–2022 <i>Act of 13 September 1996 on maintaining cleanliness and order in municipalities</i> |
| 10. Preparation of proposals for regulations concerning hazardous waste: A proposal for legislative changes will be prepared in order to introduce separate collection of hazardous waste generated in households, which is not covered by the existing collection system. | the minister competent for environment | 2019–2021 <i>Act of 14 December 2012 on waste</i> <i>Act of 13 September 1996 on maintaining cleanliness and order in municipalities</i> |
| 11. Identification of all municipal waste flows, including post-consumed waste, which so far have been unrecorded and which are of great importance for the economy and achievement of recovery and recycling targets in waste management. A significant part of municipal waste already undergoes processes of preparation for reuse or recycling without being included in official records (e.g. kitchen and garden waste managed in household composters). Identifying all flows will also make it easier for the waste industry, including recyclers, to reach new materials that can be recycled. | the minister competent for environment | 2020–2021 |

2) Food waste

According to international estimates, over 9 million tonnes of food are wasted annually in Poland.² Food is wasted at the stage of production, distribution and consumption. Nearly 6.6 million tons of food waste are generated in the production processes, over 2 million tonnes are generated in households, while the amount of food waste from other sources is 0.35 million tonnes. Based on the above data from 2006, Poland ranks fifth among countries responsible for wasting most food in the EU – after the United Kingdom, Germany, France and the Netherlands. It is worth emphasizing, however, that in Western countries the scale of food waste is greater among consumers, while in Poland the Eurostat data points to the food industry as the main source of food waste.

² Based on the 2010 document commissioned by the European Commission – *Preparatory Study on food waste across EU 27*

Although there is no current data as to what extent consumers, producers and distributors are currently responsible for food waste in Poland, since September 2018 a PROM project (Development of a system for monitoring wasted food and an effective programme to rationalise losses and reduce food waste) has been implemented, and financed under the GOSPOSTRATEG programme by the National Centre for Research and Development (NCRD).

Taking into account European trends, particular attention should be devoted to consumers now. Losses of food at the consumption stage most often result from difficulties in determining the demand, incorrect planning of purchases and meals and inept storage. Selective collection of food waste and its management in appropriate installations is an important element of waste management, especially taking into account the fact that in Poland 39% of respondents admit to throwing food away. On the other hand, the most frequently mentioned reason for wasting food is exceeding of shelf-life.

| Action | Competent agency | Schedule and regulations |
|--|---|---|
| 12. An information campaign to raise awareness among consumers and producers on how to prevent food waste: <i>An educational campaign will be launched to raise awareness among consumers and food industry representatives about food waste, i.e. by promoting the notion of planning purchases in advance, processing food to extend its durability, storing products in appropriate conditions and sharing unnecessary food with people in need.</i> | <i>the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets in cooperation with the minister competent for environment, the minister competent for health and the minister competent for education and upbringing</i> | 2020–2021 |
| 13. Developing the concept of distribution mechanisms and appropriate handling of products approaching their date of minimum durability: <i>Many of the products collected (e.g. by charities) cannot be given out to people in need because of the restrictive rules on dates of minimum durability – under certain conditions, it leads to waste of food that is still fit for consumption.</i> | <i>the minister competent for economy in cooperation with the minister competent for agriculture, the minister competent for rural development, the minister competent for agricultural markets, the minister competent for health, the minister competent for environmental issues and the Chancellery of the Prime Minister</i> | 2020–2021 Act on food waste prevention (new) |
| 14. Developing the concept of a system of incentives and obligations for entrepreneurs to prevent food waste: <i>Taking into account the economic, environmental and social dimension of actions taken to reduce food waste, it is desirable to introduce mechanisms that will make enterprises engage more actively with charities involved in providing food to people in need.</i> | <i>the minister competent for economy in cooperation with the minister competent for agriculture, the minister competent for rural development, the minister competent for agricultural markets, the minister competent for social security and the minister competent for public finance</i> | 2019–2020 Act on food waste prevention (new) |
| 15. Conducting periodical statistical research on the scale, structure and directions of processes related to food waste in Poland: <i>Despite estimates made by various organisations (both public and private), the causes and scale of food waste in Poland are still not fully known. Therefore, periodic surveys based on a uniform methodology should be introduced into public statistics to monitor this phenomenon in Poland.</i> | <i>the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets in cooperation with the minister competent for the economy, the minister competent for the environment and the Central Statistical Office</i> | from 2021 |

3) Education

Environmental education is key to the success of transfer to CE. At the same time, however, studies on sustainable consumption indicate that the knowledge of consumer behaviour of Poles is still low. Consumers are generally unconvinced about their real impact on the environment in which they live, and consequently on the quality of life of present and future generations. Price is still the decisive criterion while making purchase decisions. Environmental awareness studies indicate that although Poles are aware of the risks resulting from excessive use of resources, they do not know of any practical ways to prevent this.

In this context, there is a strong need for education oriented towards changing consumer behaviours by raising their environmental awareness and increasing their knowledge

of their rights to access product and manufacturer information.

In the age of "lifelong learning", educational activities should be diverse and aimed at all social and age groups. Awareness-raising of future consumers should start as early as at the level of primary and general education. It is important that this knowledge is practical and reflects market trends. Moreover, it is necessary to launch social campaigns in order to disseminate practical knowledge on sustainable consumption among adults. Changing mindsets and consumer habits will ultimately put pressure on producers.

| Action | Competent agency | Schedule and regulations |
|--|--|--------------------------|
| <p>16. Developing the concept of a government information platform on CE: The platform will enable the exchange of information between the government administration, business and local governments. The platform should contain CE guidelines, information about incentives for entrepreneurs and current support programmes, as well as educational brochures.</p> | <p>the minister competent for the economy in cooperation with the minister competent for computerisation</p> | <p>2020–2021</p> |
| <p>17. Social campaign on sustainable consumption patterns: The aim of the campaign is to popularise sustainable consumption patterns (for example, sharing, waste management, food storage, purchasing functions instead of ownership of products, etc.) among all groups of the society.</p> | <p>the minister competent for environment</p> | <p>2021–2022</p> |

3.

BIOECONOMY

Closed-loop economy i.e. a biological cycle in the economy, is one of the two pillars of CE, alongside the technological cycle. The biological cycle in CE is related to the management of renewable resources – the so-called biomass – throughout its life cycle. This includes their processing, production of goods (e.g. food, feed, bioenergy), sale of goods, the use phase and bio-waste management. The bioeconomy is the basis for the functioning of the first sector of the economy, which consists of agriculture, forestry and fisheries, as well as many branches of the second sector, including industries such as food, fodder, forest and wood, pulp and paper, pharmaceuticals, textiles, furniture, construction, biotechnology, cosmetics, fuel and organic recycling.

Bioeconomy presupposes the management of renewable resources in an optimal, responsible and sustainable way. This means that these resources should be used in the most economically and environmentally beneficial way, taking into account the principle that food is the most important product. In addition, they should be managed in such a way as to ensure that resources, including soil, surface water and air, are fully recoverable.

One of the primary sources of biomass is agricultural production, which is used first for food, then industrial purposes and ultimately for energy. According to the Central Statistical Office data,

in 2017 the area of agricultural land in Poland amounted to 14620 thousand ha (i.e. ca. 47% of the size of the country), which translates into a significant potential for the development of bioeconomy based on this source of biomass. Another source of biomass is forest management, including the production of wood. Forests also perform natural and recreational functions and contribute to the protection of air, water and soil. Another source of biomass is fisheries, and bio-waste generated in all areas mentioned above, i.e. biodegradable substances of animal and plant origin.

Currently, apart from food production, biomass is most often used for energy purposes in Poland - mainly for direct combustion and, to a relatively small extent, for the production of liquid fuels. The combustion of biomass suitable for other uses does not fit in with the idea of CE, according to which it is crucial that biomass be kept in the economic cycle for as long as possible and that its value be maximised.

The CE Road Map focuses, on the one hand, on general actions aimed at creating conditions for the development of bioeconomy in Poland and, on the other hand, on activities concerning the development of bioeconomy in selected areas, i.e. creating local value chains, in industry in general, and in the power industry in particular.

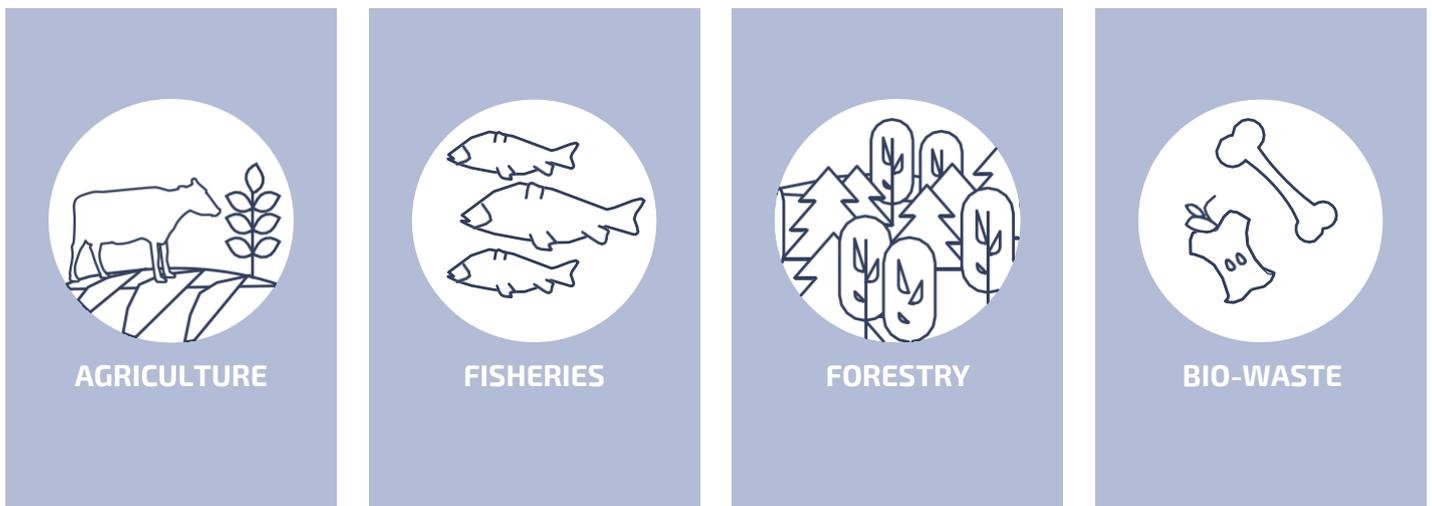


Figure 6 Biomass sources

The development of bioeconomy contributes to the reduction of pressure on the natural environment, *inter alia* by reducing the demand for non-renewable raw materials, limiting soil degradation and surface water pollution with biogenic elements (eutrophication), as well as reducing greenhouse gas emissions, in particular CO₂ and methane. The development of bioeconomy also contributes to creating new jobs, in rural areas in particular.

1) Key actions in the area of creating conditions for the development of bioeconomy

Due to the cross-sectional and intersectoral nature of bioeconomy, there is no single ministry in Poland responsible for shaping this framework and defining its development directions at the central level. Particular aspects of renewable resources management fall in particular within the competence of:

the minister competent for environment – responsible for forestry and waste, the minister competent for agriculture, rural development and agricultural markets – responsible for agricultural biomass and its use in value chains, the minister competent for economy – shaping industrial policy, and the minister competent for higher education and science – setting the directions of personnel training and financing of research in the area of bioeconomy. Such a silo approach makes it difficult to coordinate and create a sustainable framework for bioeconomy, which in the light of current challenges related to access to non-renewable resources has high priority in the policies of many countries.

Creating favourable conditions for biomass use requires a coherent approach not only at the central but also at regional level. Since biomass is managed locally, the types of available biomass in the given region should determine the directions of its management.

| Action | Competent agency | Schedule and regulations |
|--|--|--|
| 18. Establishing a permanent team of department directors at government agencies responsible for individual areas of bioeconomy and appointing a coordinator in charge of defining the development directions for bioeconomy, supervising the implementation of tasks in individual areas and improving the flow of information between these agencies: <i>The initially identified areas of activity of the team should cover: biomass for energy, food, soil, waste, forestry, greenhouse gases, water resources, industry, innovation, science. The first outcome of the team's work should be a report defining the institutional framework for the implementation of bioeconomy actions.</i> | <i>the minister competent for economy in cooperation with the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets, the minister competent for environment, the minister competent for higher education and science, the minister competent for energy, the minister competent for fisheries and the minister competent for water management</i> | 2019–2020 |
| 19. Review of existing regulations and development of uniform requirements/standards for biomass: <i>The aim of this action is to identify, analyse and compare biomass regulations in different legislative acts, in particular its definition and scope. The action also aims to propose amendments to existing regulations that will contribute to the definition and standardisation of requirements for biological raw materials and, consequently, to increase their usability. This should contribute to innovation and production in bioeconomy.</i> | <i>the minister competent for environment in cooperation with the minister competent for economy, the minister competent for energy, the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets</i> | 2021–2022 <i>Act of 20 February 2015 on renewable energy sources</i> <i>Act of 14 December 2012 on waste</i> |
| 20. Analysis of biomass supply potential at the national and regional level, preceded by the development of an appropriate methodology: <i>The aim of the action is to quantify how much biomass from different sources (agriculture, forestry, fisheries, bio-waste) is potentially available in Poland.</i> | <i>the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets in cooperation with the minister competent for environment and the minister competent for fisheries</i> | 2021–2022 |
| 21. Identification of research, development and innovation (R&D&I) priorities for the development of bioeconomy in Poland: <i>A comprehensive analysis of R&D&I areas important for the development of bioeconomy will be carried out in order to identify the priorities that can be included in the support instruments.</i> | <i>the minister competent for higher education and science in cooperation with the minister competent for economy and the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets</i> | 2021–2022 |

2) Actions in the field of building local value chains and raw material base

The production of innovative materials and products within bioeconomy requires a continuous supply of quality biomass. Therefore, it is important to build local *value chains* in the areas around local biorefineries, which will be able to produce high quality bio-residue material in the quantities consistent with entrepreneurs' needs. In this context, bioeconomy is a great opportunity for the development of local communities in rural municipalities. Cooperation between individual entities within the value chains may contribute to the creation of new, financially attractive jobs.

Biorefining, which involves the use of thermal, biological and enzymatic conversion technologies to process biomass, and is

comparable in some aspects to oil refining, may become a way to bring out the potential of biomass in Poland. An example of bio-refining is the method of enzymatic production of second-generation biofuels made from wood waste and waste lignocellulosic biomass of agricultural origin. It is important to note that bio-refining does not compete with food production, which the usual objection made against biofuel production.

Measures to secure the required raw material base, which depends among other things on soil resources, are also crucial. In this context, it is important to ensure high availability and quality of soils (for example, through rational use of mineral and organic fertilisers, plant protection products, etc.).

| Action | Competent agency | Schedule and regulations |
|---|--|--------------------------|
| 22. Identifying local value chains: <i>On the basis of knowledge of biomass supply, demand and potential outlets for agricultural products made from biomass, several key local value chains with the greatest potential for development will be identified.</i> | <i>the minister competent for economy in cooperation with the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets</i> | 2011–2022 |
| 23. Feasibility study on the creation and development of local biorefineries: <i>As regards identified of local value chains, the technical and economic potential for the creation and development of biorefineries will be analysed, allowing for the production of new products from biomass or the integration of multiple value chains in one industrial plant in order to maximise the potential of the available biomass resources and achievement of maximum profitability on the project.</i> | <i>the minister competent for economy in cooperation with the minister competent for energy</i> | 2021–2023 |
| 24. Information campaign aimed at educating farmers and targeting their activities on CE | <i>the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets</i> | 2020–2021 |

3) Actions in the field of energy

Biomass is currently one of the most popular renewable energy sources in Poland. However, reasonable management of biomass should be cascading, based primarily on its use for food production and as a raw material for the chemical, pharmaceutical, paper and building materials industries as well as for the production of organic fertilisers. If possible, waste from these industries should be recycled. Only residual biomass and waste from the final stages of recycling should be used for energy purposes, with priority given to the production of biofuels and biogas. Technologies for the direct combustion of biomass residues should be reduced to the minimum necessary to transform them further into more advanced biofuels, which will provide a viable alternative to fossil fuels and complement other RES sources in the energy mix.

It is also necessary to ensure that biomass is used as close as possible to the place of production, in small local dispersed energy facilities, thus reducing emissions associated with its transport. There is a need to develop domestic production of advanced biofuels for transport purposes, i.e. biofuels produced from raw material which does not compete directly with food and fodder crops (lignocellulosic biomass resources, residues and waste as well as other non-agricultural biomass, including microorganisms).

Increasing the level of biomass utilisation will contribute to employment growth in agricultural areas. It will also enable the implementation of objectives set out in Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (OJ L 140, 5.6.2009, p. 16, as amended).

| Action | Competent agency | Schedule and regulations |
|---|---|--------------------------|
| <p>25. Information campaign on the principle of cascading use of biomass: A campaign will be launched to raise awareness of the need to reuse biomass in production cycles and to produce fuels and energy from residual biomass for which, from an economic and environmental point of view, other applications are not optimal, and of good bio-waste resource and energy recovery practices.</p> | <p>the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets in cooperation with the minister competent for environment, the minister competent for energy and the minister competent for water management</p> | <p>2020–2021</p> |
| <p>26. Analysis of barriers to the use of advanced biofuels in transport: Technical and non-technical barriers to the development of domestic production and use of advanced biofuels will be analysed in line with strategic transport objectives (Directive 2009/28/EC and the development of low-emission transport) and taking into account the specific time horizon in which the internal combustion engine will no longer be used as a vehicle propulsion system.</p> | <p>the minister competent for energy in cooperation with the minister competent for transport</p> | <p>2023</p> |

4) Activities in the area of industry

The use of biomass in industry is inextricably linked to biotechnology, listed by the European Commission as one of the key technologies for the further economic development of Europe.

Biotechnology is an interdisciplinary field of science and technology dealing with the change of living and non-living matter through the use of living organisms, their parts or products as well as models of biological processes

to create knowledge, goods and services.

The use of biotechnology allows not only for creation of new products, but also replacement of non-renewable (fossil) raw materials, including both energy and non-energy raw materials, with renewable raw materials (biomass) in the production of already existing goods.

Biodegradability and easy recirculation of unpolluted biomass enables using it as a raw material in industry in a way that facilitates reduction of harmful emissions to the environment during the whole life cycle of the raw material. Industrial biotechnology is also cheaper than processes based on chemical synthesis.

Bioeconomy can provide a strong stimulus for increasing the innovation and competitiveness of entire industries. For example, in the pharmaceutical industry, it can contribute to developing biopharmaceuticals with high added value, reducing the invasiveness of medical procedures, and improving waste recycling. However, the use of biomass by industry in Poland is still not widespread. For example, in the chemical industry – one of the key branches of the processing industry in Poland – bioeconomy has not been applied on a large scale. Although it should be noted that at present, optically active amino acids, carboxylic acids, alcohols, special purpose biopolymers (e.g. bacterial nanocellulose), vitamins and antibiotics are obtained using bio-processes. In addition, more and more cosmetic companies are using

renewable biological raw materials for cosmetics. New companies, usually small businesses producing locally detergents and cosmetics, for example soaps, fragrance oils or creams, are established in this sector. On the other hand, the pulp and paper industry uses wood biomass to produce paper. Many universities in Poland offer specialisation courses in this field of bioeconomy and industrial biotechnology, but graduates of these faculties have difficulties in finding jobs in this field domestically.

To support the development of the bioeconomy in the industrial sector, the principle of the cascading use of biomass is important, favouring the use of higher value-added technologies that allow the reuse and recycling of products and raw materials, and promoting the use of biomass for energy purposes only when other uses are exhausted. The priorities are to focus material use before energy use, which is motivated by the irreversible loss of raw materials in combustion and energy production in combination with 'parallel products', such as compost, instead of energy production itself.

| Action | Competent agency | Schedule |
|--|--|------------------|
| 27. Information campaign on biomass products: <i>The aim of the action is to stimulate demand by making consumers aware that products made from biomass can be of the same or better quality as those made from non-renewable raw materials, while being environmentally friendly.</i> | <i>the minister competent for economy in cooperation with the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets</i> | <i>2020–2021</i> |
| 28. Drawing up norms and standards for particular categories of products made from biomass: <i>Standardisation activities should contribute to consumer confidence in products made from biomass, including compost and other organic fertilisers.</i> | <i>the minister competent for economy in cooperation with the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets</i> | <i>2019–2023</i> |
| 29. Developing a concept for an information platform on current quantity, quality, place and source (agriculture, forestry, fisheries, bio-waste) of biomass: <i>This action aims to create a tool for entrepreneurs interested in obtaining biomass with certain parameters (quality and source), in certain quantities and in certain areas. Due to environmental issues, it is not feasible to transport biomass over long distances. Suppliers and recipients of biomaterials should come from the same region.</i> | <i>the minister competent for agriculture, the minister competent for rural development and the minister competent for agricultural markets in cooperation with the minister competent for computerisation, the minister competent for environment and the minister competent for fisheries and the Central Statistical Office</i> | <i>2021–2023</i> |
| 30. Establishment of a working group with entrepreneurs to develop the concept and creation of a cluster for bio-economic development in the B2B model, taking into account intersectoral and trans-regional policies. | <i>the minister competent for economy</i> | <i>2019–2020</i> |

4.

NEW BUSINESS MODELS

The transfer to CE requires reorganisation of the functioning model of practically all market participants, including entrepreneurs, public institutions and consumers.

Traditionally, the business model refers to an enterprise and is defined as the sum of resources and activities that the enterprise organises and performs in order

to deliver measurable value to the customer. According to the canvas below, the business model of the company consists of the following elements: key partners/suppliers, key actions, key resources, customer relations, distribution channels, customer segmentation, costs and revenues.

Figure 7 Business model canvas according to A. Osterwalder



In addition to enterprises, other actors operating on mesoeconomic scale (e.g. cities and municipalities) and macroeconomic scale (e.g. States) have specific business models. For example, designing a public transport system in a city requires a certain business model.

The CE Road Map refers mostly to business models of companies, understood as the sum of resources and actions that simultaneously serve to provide value to the customer and “close the loop.”

the CE business model of an enterprise

delivering value to the customer + working towards “closing the loop”

The novelty of the business models, which is to enable the transfer to CE, involves both introducing innovations into the elements included in the business model template presented above, and adding new elements to this template.

For example, a new factor which is not explicitly included in the traditional approach and which plays a special role in CE is reverse logistics. In the B2C (business to consumer) approach, it means ensuring the flow of waste generated from the consumer to the producer for proper management. Reverse logistics may concern many products, from beverage bottles through household goods to industrial machinery. The effectiveness of reverse logistics in practice depends not only on the actions of entrepreneurs, but also largely on the involvement and awareness of consumers.

Cooperation, not only between consumers and producers, but also among producers themselves and among entrepreneurs, scientists and the public sector, is a new element of business models that is key to the success of the transition to CE.

There is a great potential for cooperation between entrepreneurs operating in the same or similar industries as well as in different industries. Within the same industry or at the borderline of different industries, cooperation in clusters is a great opportunity. This may include: sharing production tools (e.g. large machines), whose volume of wear is low, or joint research and development activities for increasing process innovation (including increasing production efficiency), product and organisational innovation. Furthermore, cooperation may also benefit market participants from different industries, for example under the process industrial symbiosis, in accordance with the principle "your waste is my raw material". In turn, the development of innovative technologies often requires the involvement of representatives of the scientific world, as well as financial support from public funds.

Within the elements included in the above business model template, according to the Ellen MacArthur Foundation's ReSOLVE classification used by the European Commission, the following actions can be distinguished to enable the transition to CE:

- > regenerate: use of renewable energy and raw materials in production processes, preservation and restoration of ecosystems, return of recovered biological resources to the biosphere,
- > share: sharing real estate (e.g. premises) and movables (e.g. cars), prolonging the life of products by proper design and use, reuse of products,
- > optimise: increasing the efficiency of production processes, minimising waste, using large data sets and automation,
- > closing the loop: by recycling, component reuse, recovery of biochemical components from bio-waste,
- > virtualise: indirect (for example, online shopping) and direct (for example, non-material books and records),
- > exchange: including the use of new technologies (e.g.

3D printing), popularising new business models in transport (e.g. electric vehicles, autonomous vehicles, multimodal transport, hyperloop technologies), new products and services and substitutes for non-renewable raw materials.

For example, with regard to key partners/suppliers, it is important from the CE perspective that, when purchasing raw materials and semi-finished products, companies assess them in terms of their potential use according to the CE concept. This means, for example, that the constituent raw materials and semi-finished products should enable the product to be designed in such a way that it can be dismantled in a technologically accessible and financially viable way and then the waste can be optimally managed. The global nature of supply chains is both an opportunity to choose suppliers whose business strategy fits the idea of CE best and a threat due to the considerable length of supply chains, and thus the amount of waste and emissions generated by them.

With regard to providing value to customers, in the context of transition to CE, the dilemma between extending product life (in line with the CE concept) and the desire to continuously increase sales and profit for the enterprise (according to traditional business logic) becomes apparent. At first glance, it may seem that extending the life of products is not in the interest of entrepreneurs, because it causes a decrease in sales volumes and thus may result in a decrease in the enterprise's income. In fact, however, it may be beneficial due to the innovative approach of enterprises, in which the function of the product is sold rather than ownership. For instance, it is possible to use a model where the consumer buys a number of kilometres instead of tyres or hours of lighting instead of a light bulb, while at the same time the entrepreneur remains the owner of the product and is responsible for ensuring the functionality of the product throughout its lifetime and, as a result, they have the incentive to extend the life of the product.

The product as a service model (PaaS model), instead of selling ownership, can also be used in transport, in particular as part of automation and robotisation processes as well as in conjunction with the idea of sharing. Nowadays, passenger cars are usually used by only one person or family who own them. Studies show that, as a result, the car is parked for about 94% of the time during the day, which is a sign of waste. Once the idea of car-sharing is implemented, cars (including self-driving cars) may be the key to solving this problem. According to the CE approach, cars offered as part of a sharing service could be on the move most of the time, picking up and carrying passengers to specific destinations. This would result in a relatively high intensity rate of use of such vehicles, limited production of new cars (which would lead to saving natural resources, including in particular non-renewable fossil resources that are used in production processes) and less urban traffic, which in turn would contribute to reducing emissions.

With regard to sharing business models, the major challenge is to ensure their sustainability. It can be seen that, for example,

a short-term rental of vacant residential space or short-distance car transport systems were launched as initiatives well suited to the idea of CE, since they involved optimising the use of private goods by making full use of vacant space, but at present they are increasingly different and resemble classical economic activities. However, it might be possible that business models of sharing can be permanently integrated into the concept of CE. One such positive example is the car-sharing system for intercity travel.

The involvement of social and solidarity economy actors, for example social cooperatives, associations, foundations, can be the source for new solutions and business models. Thanks to

their roots in local communities, these entities provide services (e.g. municipal waste management, goods sharing, running food cooperatives) tailored to the needs of these communities, while at the same time contributing to raising their awareness, as well as the social and professional reintegration of people at risk of social exclusion and creation of new jobs on the local market. Thus, in accordance with the concept of sustainability, they contribute to the simultaneous achievement of economic, environmental and social objectives.

In order to create the right conditions for the development of CE business models, the following actions are suggested:

| Action | Competent agency | Schedule and regulations |
|--|--|---|
| 31. Analysis of the possibility of amending the tax system, which would allow for the increase of competitiveness of enterprises operating on the basis of CE business models: <i>The analysis should result in regulatory change proposals, which would create incentives for economic activities such as: recovery of key raw materials, product reuse, repair services, sharing (movables, real estate, production tools, transport), rental, product quality improvement.</i> | <i>the minister competent for public finance in cooperation with the minister competent for environment and the minister competent for economy</i> | 2019–2021 <i>Act of 11 March 2004 on tax on goods and services</i> <i>Act of 15 February 1992 on corporate income tax</i> |
| 32. Developing a proposal for a legislation on shared property and shared use of real estate and movables, in particular short-term rental of vacant residential space and passenger transport. | <i>the minister competent for economy in cooperation with the minister competent for public finance</i> | 2020–2022 |
| 33. Analysis of the opportunities for introducing reporting and control reliefs <i>for entities applying environmental standards (e.g. EU Eco-label, EMAS, ISO etc.) and for entities registered in the Polish Register of Cleaner Production and Responsible Entrepreneurship.</i> | <i>the minister competent for environment</i> | 2021–2022 <i>Act of 11 March 2004 on tax on goods and services</i> |

| | | |
|--|--|---|
| <p>34. Developing proposals of amendments to public procurement law, which would generate demand for products and services produced within the CE business models.</p> | <p><i>the minister competent for economy</i></p> | <p>2019–2021 Act of 29 January 2004 – Public procurement law</p> |
| <p>35. Developing a concept of a support ecosystem for enterprises based on CE business models, including financing, education and promotion at the development and commercialisation phase of green technologies (the GreenInn project).</p> | <p><i>the minister competent for economy</i></p> | <p>2020–2021</p> |
| <p>36. Developing guidelines for increasing the role of CE in economic clusters in the field of circulation of raw materials and waste from particular industry sectors, including the processing industry: The creation and cooperation of clusters should be even more CE-oriented. The analysis of the waste management options will be carried out by individual sectors of the economy, in particular taking into account the intersectoral potential and the creation of economic clusters.</p> | <p><i>the minister competent for economy in cooperation with the minister competent for environment and the Inspectorate of Environmental Protection</i></p> | <p>2020–2021</p> |
| <p>37. Creation of a CAD (Connected Automated Driving) Contact Point in the field of automation of road transport to provide substantive support for the effective functioning and competitiveness of the national automotive market (including car parts and ICT market) and to activate society with the aim of promoting and developing the ways of operation of autonomous systems to improve mobility, shorten the route to destination and travel time, and developing the idea of automated car-sharing.</p> | <p><i>the minister competent for transport</i></p> | <p>2019–2021</p> |
| <p>38. Developing a concept for the creation of a nationwide multi-industry Internet platform that would enable lending products and sharing products with low usage frequency.</p> | <p><i>the minister competent for economy</i></p> | <p>2022–2023</p> |
| <p>39. Establishment of the National Intelligent Specialisation for CE focused on the development of R&D&I in the area of technologies related to CE (especially in the area of water, non-renewable raw materials and waste) in cooperation with entrepreneurs, scientists and public institutions.</p> | <p><i>the minister competent for economy</i></p> | <p>2019</p> |
| <p>40. Developing a system of incentives for universities to introduce research programmes and curricula concerning CE, e.g. subsidies for scientific research, support for subsidizing laboratories/design studios, support for subsidizing the activity of academic associations, competitions for engineering and master's theses on CE.</p> | <p><i>the minister competent for higher education and science</i></p> | <p>2019–2021</p> |

5.

IMPLEMENTATION, MONITORING AND FINANCING OF CE

1) Implementation of CE

The implementation of individual actions provided in the CE Road Map will be carried out by the entities indicated in the tables of actions, including in particular the ministers responsible for individual sectors of the economy. The minister competent for economy – as the minister in charge of coordination

of the implementation of CE in the Polish government administration will analyse the progress of implementation of the CE Road Map, on the basis of reports from individual ministries responsible for particular actions in particular.

2) Monitoring of CE

Monitoring of CE is a major challenge due to the complexity of the CE concept itself, which includes policies covering multiple areas and the interdependence between them, and due to the multidimensional impact of the transition to CE on the socio-economic development of the country.

Therefore, within the framework of the CE Road Map, a separate action has been identified to develop a conceptual approach to monitoring CE in Poland.

| Action | Competent agency | Schedule |
|--|------------------------------------|-----------|
| 41. Implementation of the “oto-GOZ” [“this-is-CE”] project (the Gospostrateg programme): The aim of the “oto-GOZ” project is to develop two methodologies which would allow for evaluation of 1) the progress of transformation towards CE in Poland and 2) the impact of CE on social and economic development at the mesoeconomic (regional) and macroeconomic (national) levels. | the minister competent for economy | 2019–2021 |

3) Financing of CE

The CE Road Map has not been assigned a separate framework for financing since the document identifies actions to be taken only by the government administration in order to create appropriate general framework for the transfer to CE in Poland. The actions proposed in the CE Road Map concern mainly analytical, conceptual, informational, promotional and coordination tasks in the areas within the competence of individual ministries.

The concept of CE is firmly established in the country's strategic documents, including the SDR, the draft Productivity Strategy and the draft State Environmental Policy. As the basis of the country's development policy, these documents are, and will continue to be in the future, a reference point for the direction of the support system in the area of CE, including in particular the Cohesion Policy and

the Common Agricultural Policy. CE will be reflected in particular in investments and actions aimed at innovation, research and development. Financial support for CE-related actions should also be reflected in the funds currently included in the HORIZON 2020 programme.

The implementation of CE can also be financed from other sources of public sector funding, such as environmental fees. In the future, if such legislative changes are introduced to the waste management system, financing can be provided from the deposit systems within the environmental protection system.

The implementation of CE will require commitment of the staff with regard to the ministries responsible for various actions included in this CE Road Map.

GOZ

GOSPODARKA O OBIEGU ZAMKNIĘTYM
(CIRCULAR ECONOMY)