Resource efficiency and circular economy in Europe – even more from less

An overview of policies, approaches and targets of Poland in 2018

July 2019

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The information is current as of March 2019, when members of Eionet verified the content of this profile.

This country profile was prepared as part of the 2019 EEA review of material resource efficiency, circular economy and raw material supply policies, which aimed to collect, analyse, and disseminate information about experience with the development and implementation of these policies in EEA member and cooperating countries.

At the time of writing, a summary report is being finalised. The report reflects on trends, similarities and differences in policy responses, showcases selected policy initiatives from member countries and identifies possible considerations for the development of future policies.

These country profiles were compiled and finalised by members from the European Topic Centre on Waste and Materials in a Green Economy, namely Bart Ullstein, Bettina Bahn-Walkowiak, Jeroen Gillabel, Margareta Wahlström, Jutta-Laine Ylijoki, Dirk Nelen, Theo Geerken, Veronique Van Hoof and Evelien Dils. The responsible EEA project managers for the work were Pawel Kazmierczyk and Daniel Montalvo.

Poland, facts and figures

Note: data in this section was sourced from Eurostat databases (April 2019), except where noted otherwise

GDP: EUR 467.2 billion (2.9 % of total EU28 in 2017)

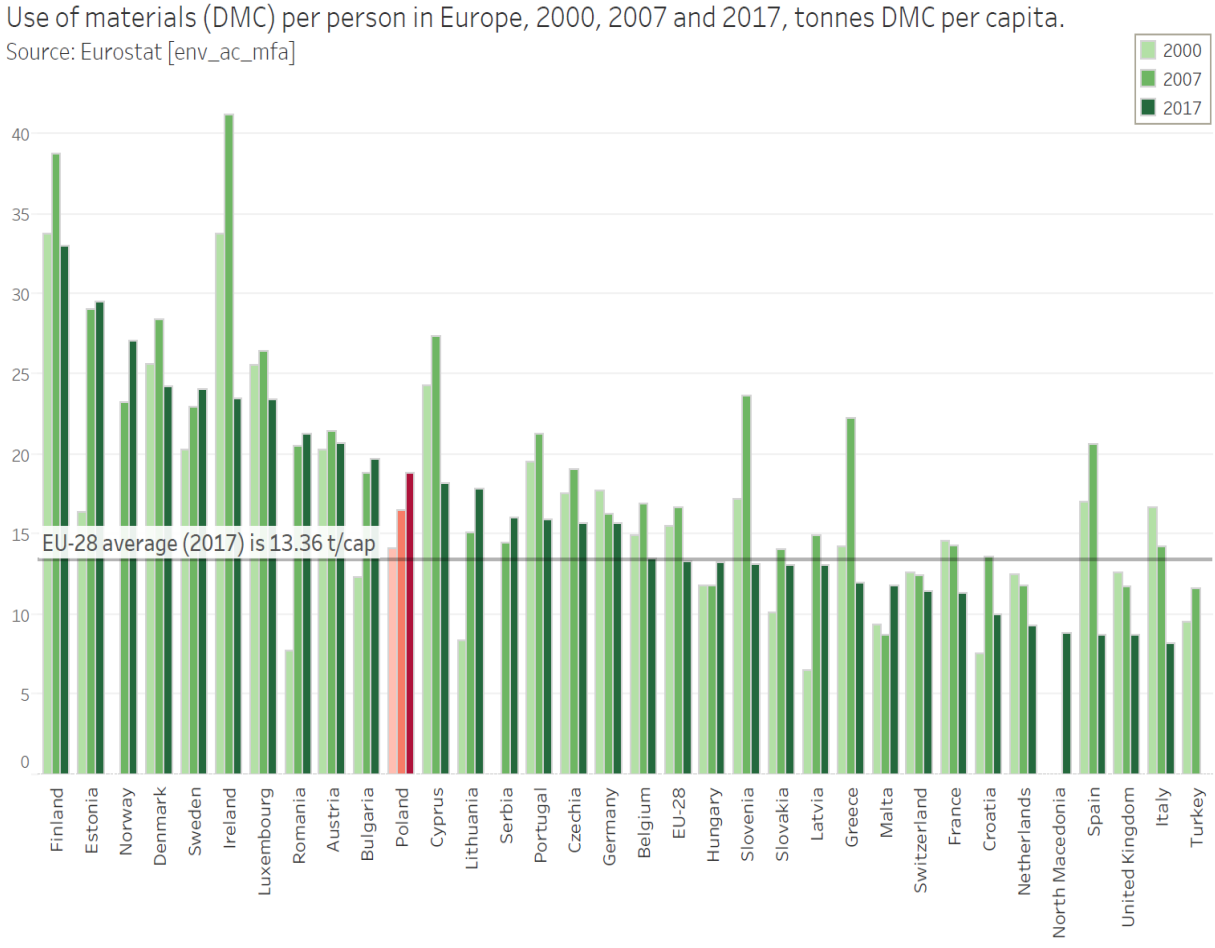
Per capita GDP: EUR 12,200 (purchasing power standard) (40.5 % of EU28 average per capita figure in 2017)

Use of materials (domestic material consumption (DMC))
712.3 million tonnes DMC (10.4 % of EU28 total in 2017)
18.8 tonnes DMC/capita (140.4 % of EU28 average per capita in 2017)

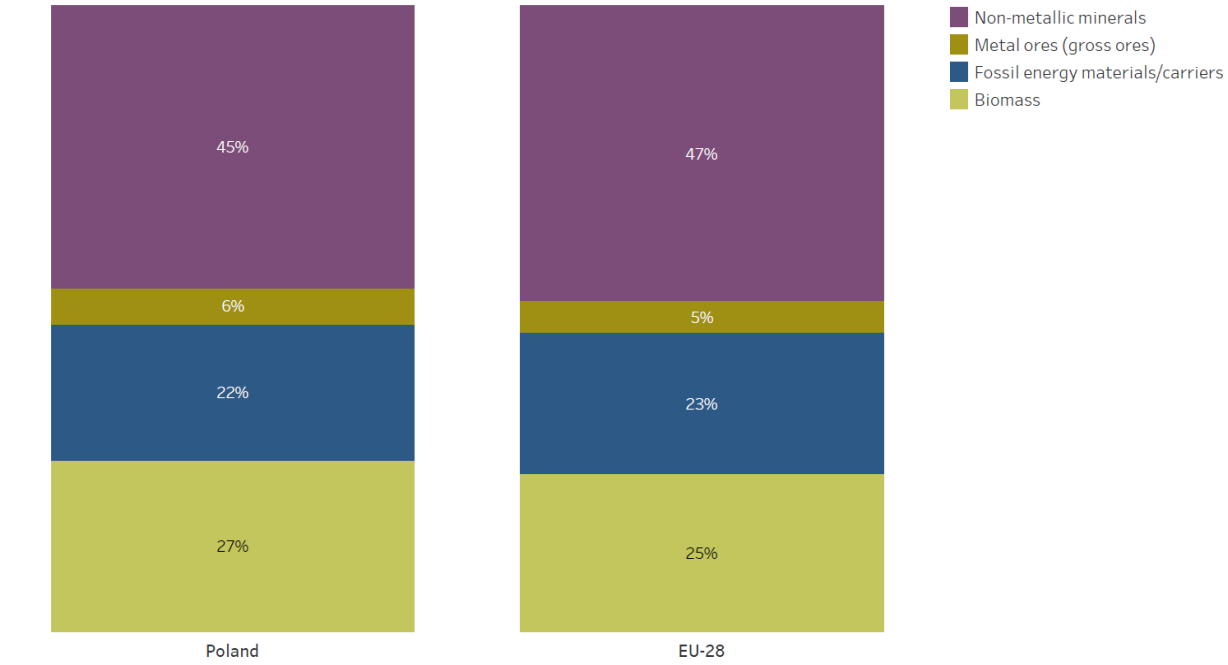
Structure of the economy:
agriculture: 3.2 %
industry: 32.9 %
services: 63.9 %

Surface area: 312.7 thousand square kilometres (km^2) (7.0 % of total EU28)

Population: 38.0 million (7.4 % of EU28 total in 2017)

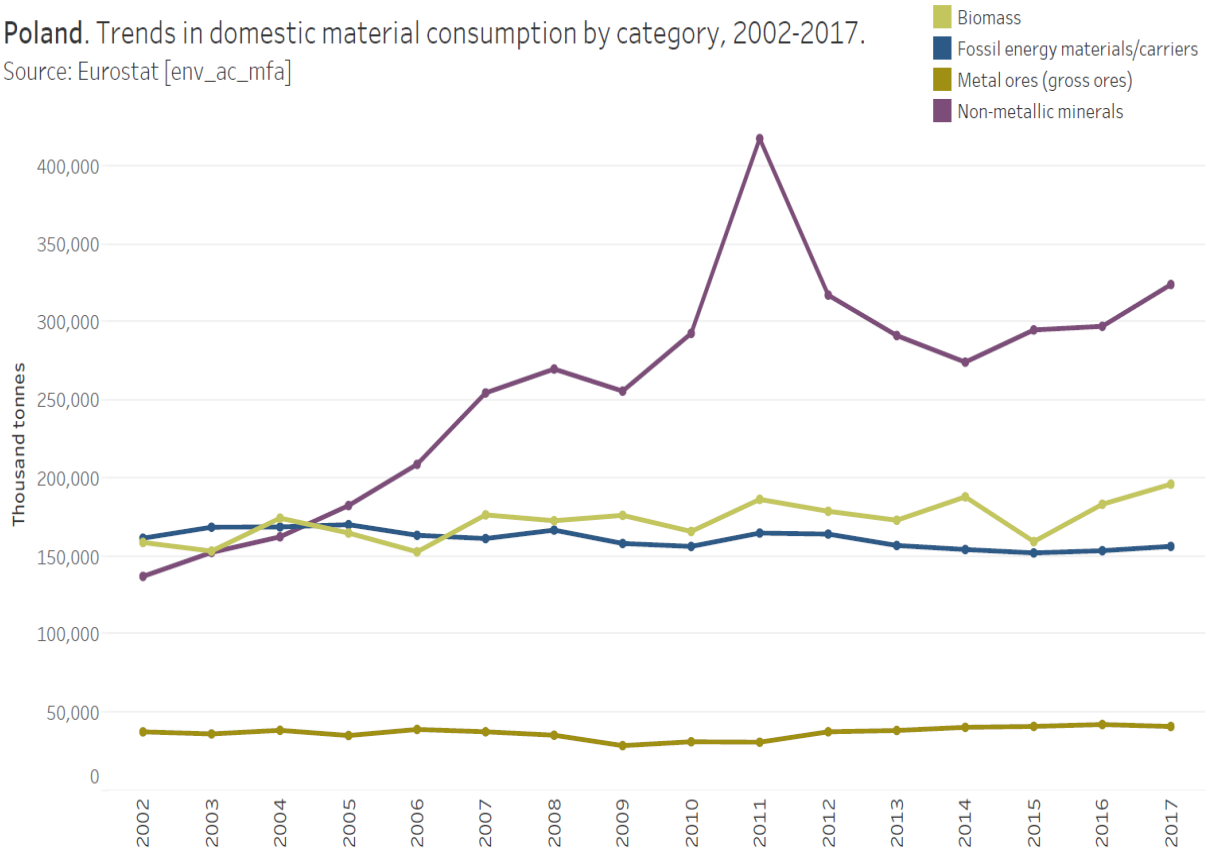


Poland & EU-28. Domestic Material Consumption by material category, 2017.
Source: Eurostat [env_ac_mfa]



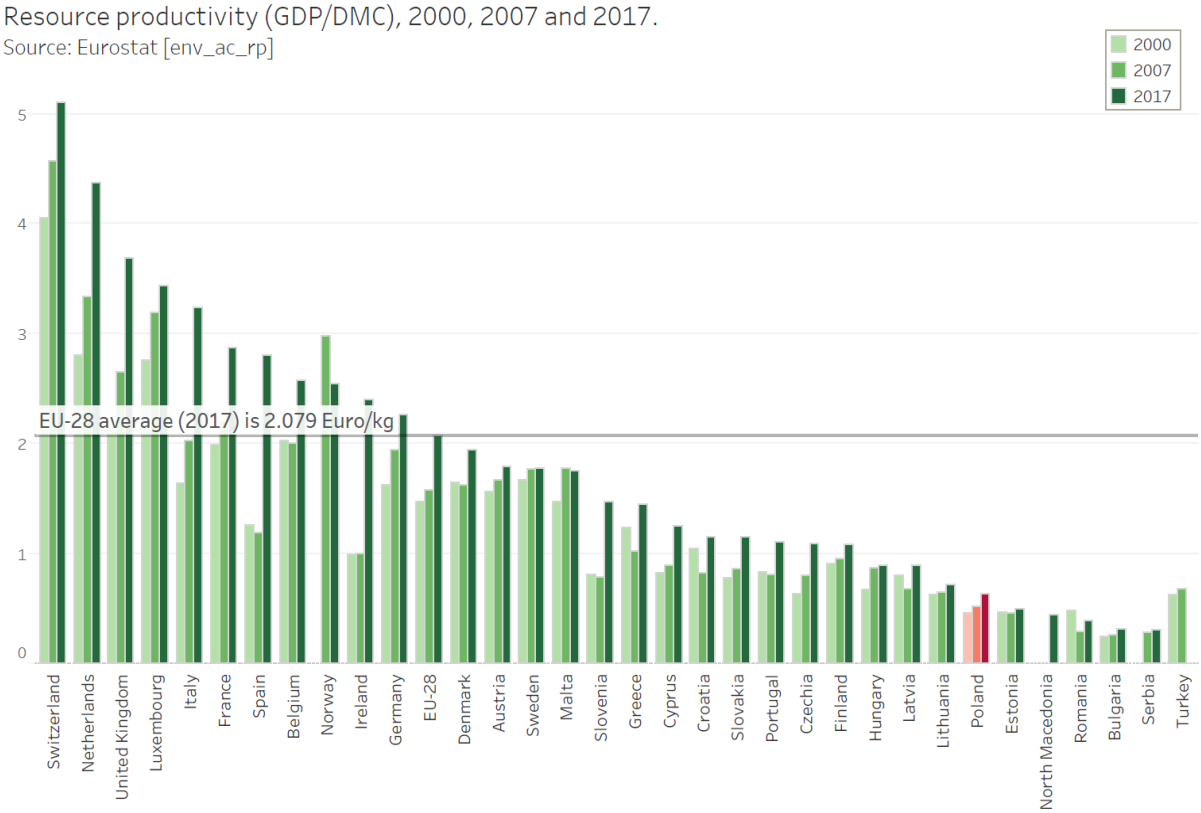
Note: The domestic material consumption categories 'other products' and 'waste for final treatment and disposal' are excluded from the figure.

Poland. Trends in domestic material consumption by category, 2002-2017.
Source: Eurostat [env_ac_mfa]



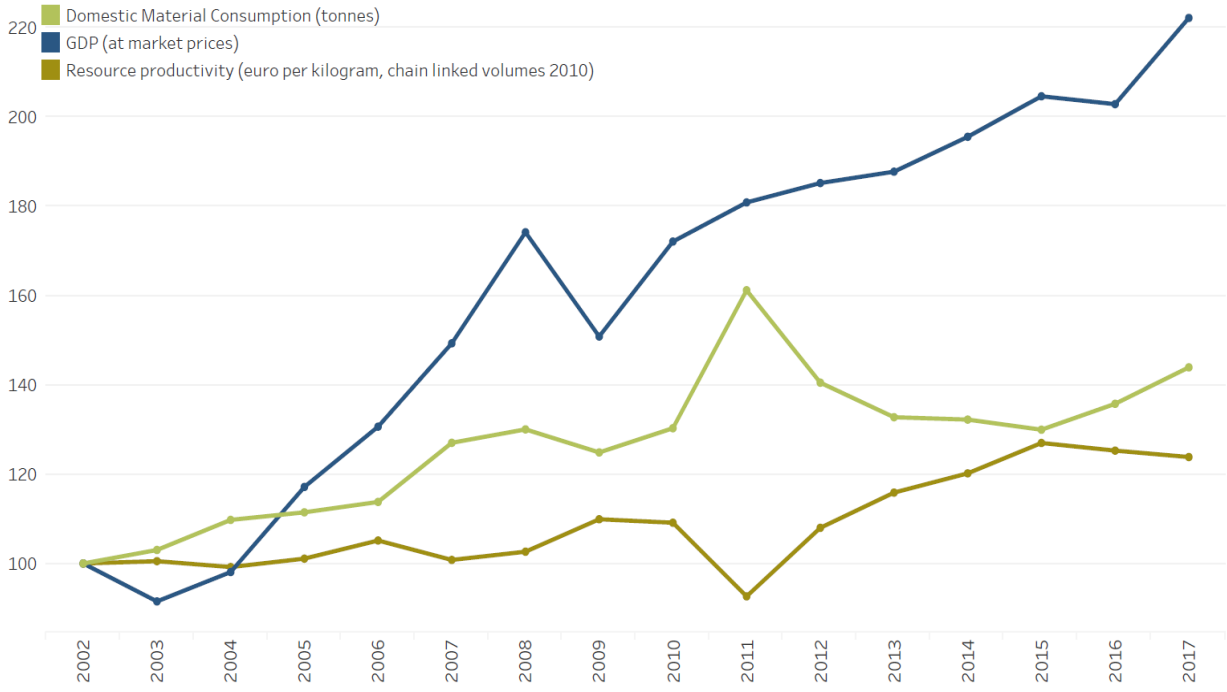
Note: The domestic material consumption categories 'other products' and 'waste for final treatment and disposal' are excluded from the figure.

Resource productivity (GDP/DMC), 2000, 2007 and 2017.
Source: Eurostat [env_ac_rp]

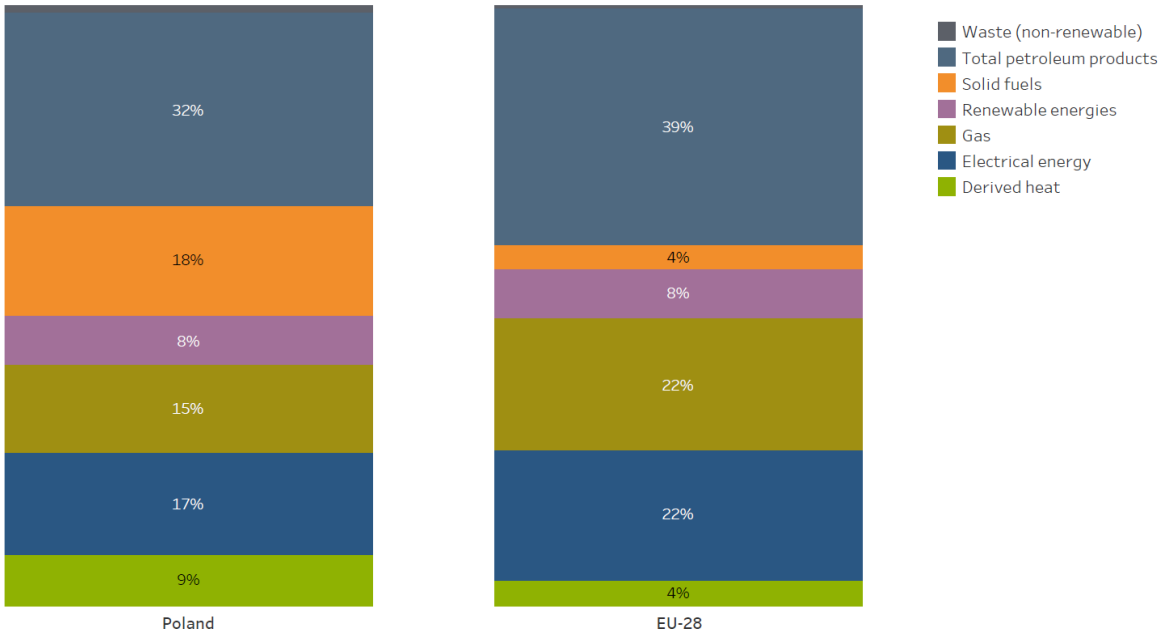


Note: GDP expressed in chain linked volumes 2010.

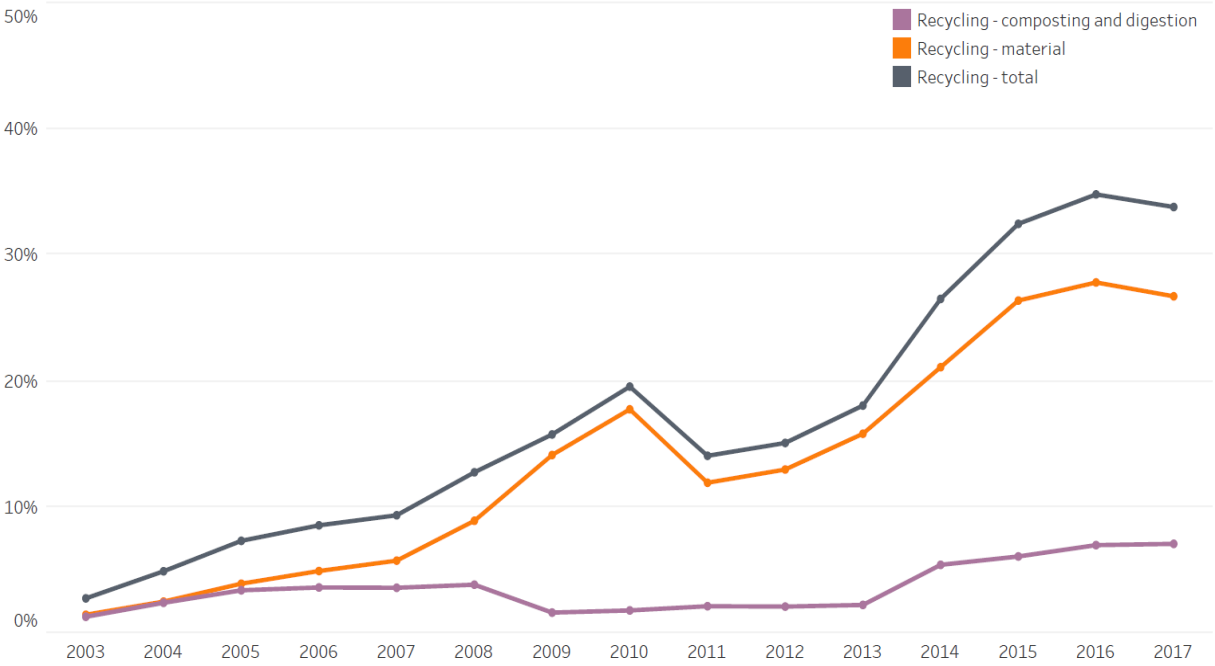
Poland. GDP, DMC and resource productivity trends, 2002-2017, index 2002=100.
Source: Eurostat [env_ac_mfa], [env_ac_rp] & [nama_10_gdp]



Poland & EU-28. Primary energy consumption by energy product, 2016.
Source: Eurostat [nrg_100a]



Poland. Recycling of municipal waste, 2003-2017, as share of total waste treatment.
Source: Eurostat [env_wasmun]



Note: The amount of municipal waste treatment is reported for the treatment operations incineration (with and without energy recovery), recycling, composting and landfilling.

Policy framework

Driving forces for material resource efficiency and circular economy

The main needs and motivations in Poland which drive the development and implementation of policies related to material resource efficiency, circular economy and raw materials supply are as follows.

1. **Climate and energy policy, regulatory requirements as well as global and European trends concerning environmental protection and circular economy.**
   The requirements and action are connected with material resource efficiency, the circular economy and raw materials supply. This concerns both to national needs and targets of EU policy.
2. **Natural conditions of Poland with reference to the need to keep and increase economic development and security as well as to enhance energy and production efficiency**.
   Fossil fuels are the main source of energy in Poland. Hard coal and lignite are the basis of the structure of electricity production, nearly 80 per cent. Domestic energy resources, in particular extensive coal reserves, are an asset for Poland, ensuring long-term energy security and providing one of the highest worldwide degree of energy independence. Taking account of national conditions, large coal deposits, the structure of the energy production and its pressure on the environment, as well as the international circumstances, changes in international markets including fluctuations in fuel prices and geopolitical implications, the efficient extraction and use of internal energy resources are highly important for the economic development of Poland and drive policy interventions.
3. **Reliance on raw materials imports with reference to the need to keep and increase the economic development and security as well as to enhance energy and production efficiency**.
   The development of Polish economy is, to a large extent, dependent on raw material supplies from abroad. Out of 140 energy and non-energy raw materials used in the Polish economy, imports account for 100 per cent of almost half of them. For several other raw materials, imports cover 50 per cent of national demand. This situation may have a negative impact on the competitiveness of Polish companies using imported raw materials due to price volatilities and possible trade policy measures impairing imports from third countries such as China.
   As regards the energy resources, one of the main ways to ensure energy security is to diversify sources of oil and natural gas supplies. Oil is the second-largest primary energy source in Poland after coal, providing about one-quarter of total primary energy supply in 2016. Indigenous oil production is limited and Poland is dependent on imports which cover approximately 90 per cent of domestic oil demand. Natural gas is the third-largest primary energy source in Poland, representing about 15 per cent of total primary energy supply. Poland produces about one third of its natural gas needs and imports the remainder. Poland has large deposits of coal which, considering the dependency of the country on the import of gas and crude oil, play the role of a major stabilising factor of Poland's energy security. For this reason, energy policy is targeted, *inter alia*, at enhancing the efficiency of mining and processing of coal.
4. **An additional opportunity for development at the local level**.
   Action based on the concept of a circular economy may be an effective impulse for development at the local level, taking into consideration systemic action in communes and other structures of local government, local social initiatives and support systems at the lowest organisational level of the state. At all stages, it is necessary to involve all interested stakeholders, including administration and civil society, as well as improving the efficiency of communication and sharing best practices. A great potential is seen in non-urban areas.
5. **The need to protect domestic raw materials and to reduce the pressures on the environment**.
   This is related to Poland's limited resources and the need to continue economic development (see points 3 and 4) as well as environmental protection. Environmental protection includes both the need to protect limited, rare resources, and other elements of the environment – air, water and land – that are affected by the extraction of resources and production processes.

Dedicated national strategies or roadmaps for material resource efficiency and a circular economy

Several policy documents in Poland, both existing ones and other in preparation, touch on the issue of material resource efficiency. Many of them are listed in the subsequent sections. Material resources efficiency is important to both environmental and economic policy.

The Ministry of Entrepreneurship and Technology, formerly the Ministry of Economic Development which was divided into the Ministry of Entrepreneurship and Technology and the Ministry of Investment and Economic Development, has prepared a draft of a Roadmap towards the circular economy transition[1].

The first draft was presented to a governmental working group, which was established by the Minister of Economic Development in June 2016 and includes representatives of all interested ministries. In addition, four multi-stakeholder working groups were established in the same year by the Ministry of Economic Development to discuss the following topics in more details:

1) waste;
2) bio-economy;
3) circular economy business models; and
4) education and promotion.

The call for expressions of interest to join the groups was published on the Ministry's homepage and all applications were accepted. The groups were led by the Ministry's officials and included interested experts from academia, non-governmental organisations (NGOs), business, and local and national administration. Three meetings of all respective groups were conducted in order to verify the content of the Roadmap draft and to propose improvements. As a result of the groups' work, the Roadmap draft was amended and published for inter-service review and public consultation in early 2018. The next, updated draft version was under public consultation in the end of 2018[2] . The final document is expected to be formally adopted by mid-2019.

In the draft, the following policy areas are prioritized:

- sustainable industrial production (industrial waste, extended producer responsibility, environmental footprint);
- sustainable consumption (municipal waste, food waste, education);
- bio-economy; and
- new business models.

Overview of dedicated national or sectoral strategies for raw materials

The Ministry of the Environment[3] is in the process of developing a State Raw Materials Policy that will be a strategic document on deposits, their conservation and exploitation. In November 2017 the Ministry began, through a public consultation process, a 12- month series of regional conferences in the largest cities of Poland to present and discuss the draft. The document was submitted to the Standing Committee of the Council of Ministers on the 1 February 2019 and is planned to come into force in the first half of 2019.

The document is the basis for planning action, possible methods and tools to be used. The main pillars of the State Raw Materials Policy listed in the draft document are as follows.

[1] https://mpit.bip.gov.pl/fobjects/download/458792/20181026_mapa-goz-konsultacje2-pdf.html (Polish)
[2] https://mpit.bip.gov.pl/projekty-zarzadzen-i-uchwal/mapa-drogowa-transformacji-w-kierunku-gospodarki-o-obiegu-zamknietym-nowa-wersja.html (Polish)
[3] The Ministry of Environment's webpage dedicated to national resources policy: http://psp.mos.gov.pl/ (Polish) and http://psp.mos.gov.pl/images/pdf/politykasurowcowapanstwa.pdf (Polish)

1. National needs for raw materials, including the evaluation of needs, identification of priority materials and material flows, using geological potential/rock structures for no-tank storage and identification of market niches.
2. Development of extracting raw materials from mineral deposits and the Earth's heat, including, for example, knowledge development, the assessment of current possibilities and new techniques, promotion of national potential, protection of mineral deposits and management taking into account legal regulations and spatial planning systems, decisions on the changes in the concession policy, awareness of social conditions such as identification of social problems generated by the mineral exploitation, building good relations with local level administrative structures and establishing financial compensation schemes for farmers.
3. Extraction of raw materials from waste with a focus on mining, industrial production, municipal and post-consumer waste; using substitutes – other materials with similar properties, which are cheaper or have smaller environmental costs – and rehabilitation and remediation, including, for example, building the knowledge base on the sources of raw materials from waste in Poland, stimulating recycling and using substitutes, action on renewable energy production, restoring former mining sites to be used for military, educational, recreational and other purposes, development of safe storage sites in geological structures.
4. Import of scarce raw materials, those for which supply is lower than demand; international cooperation including, for example, bilateral and multilateral cooperation; development of Polish geological and mining companies on the international market.
5. Changes in legal regulations on the geology and mining, including the creation of Polish Geological Agency.
6. Sharing knowledge on geology, mining and raw materials, including educational activities and cultural protection.
7. Developing an appropriate institutional set-up for implementing raw materials policy.
8. Limiting the investment risk and providing better planning processes to protect against the non-reversible loss of resources, amongst others.
9. Improvements in the tax and payment system.

The former Ministry of Economy prepared the Action Plan for Poland's security regarding non-energy raw materials to accommodate the short- and long-term needs of industry in terms of security of supply of high-quality raw materials at affordable prices. The key elements of the Action Plan were incorporated into the State Raw Materials Policy draft described above.

The core of the Action Plan was the identification of critical raw materials which are understood as those necessary for the growth of Polish industry and, at the same time, whose reliable supply is possibly endangered. The analysis was contracted to the Mineral and Energy Economy Research Institute of the Polish Academy of Science. The risk of supply disruption combined with the current and expected consumption levels gave a ranking of 25 key raw materials.

1. metallic magnesium;
2. ferroniobium;
3. fluorites;
4. metallic silicon;
5. metallic manganese;
6. lithium raw materials;
7. germanium oxides;
8. phosphorites;
9. magnesite;
10. talc;
11. rare earth elements;
12. metallic cobalt and cobalt compounds;
13. metallic titanium;
14. metallic bismuth;

15. potassium salts;
16. tin and tin alloys;
17. metallic antimony and antimony oxides;
18. manganese oxide;
19. iodine compounds;
20. iron ore and concentrates;
21. metallic zinc and zinc alloy;
22. ferromanganese;
23. tellurium;
24. metallic aluminium;
25. platinum group metals.

The list is driven by an assessment of the risk of supply disruption and reliance on one or a few sources.

Another issue is the general list of Polish key non-energy resources which includes large deposits available in Poland such as zinc and lead ore, copper resources, building materials and rock salt deposits. The Mineral and Energy Economy Research Institute compiled a list of 25 key resources, divided into three groups:

A – large deposits in Poland with stable supply and demand, developed processing, industry and experienced human resources;
B – unused, not well-known or skimpy resources;
C – scarce/missing resources.

The list is presented in an article[4] which discusses the importance of criteria used.

When the Ministry of the Environment prepared a draft State Raw Materials Policy the ranking of 27 key raw materials was determined:

1. natural gas;
2. petroleum (crude oil);
3. lignite;
4. coal;
5. metallic aluminium;
6. bauxite and alumina;
7. zins raw materials (concentrates, metal);
8. metallic silicon;
9. copper raw materials (concentrates, metal);
10. lead raw materials (concentrates, metal);
11. silver;
12. iron ore and concentrates;
13. ferroalloys;
14. amber;
15. industrial dolomites;
16. phosphites and apatites;
17. kaolinite clays (white-burning and refractory);
18. broken and blinding stones;
19. kaolin;
20. magnesite (raw, calcined, roasted and melted);
21. sands and gravels;
22. glass sands;
23. sulphur;

[4] http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.baztech-e7f17f5a-205c-4205-bf0d-69475582a752 (Polish)

24. potassium salts;
25. rock salt;
26. feldspar raw materials;
27. carbonaceous raw materials of the cement and lime industry.

In regard to the efficient extraction and use of domestic energy resources, the Ministry of Energy prepared two sectoral strategies: *Programme for the hard coal mining sector* (until 2030)[5] and *Programme for the lignite mining sector* – to 2030 with a perspective to 2050[6] – which were adopted by the Council of Ministers in 2018.

These documents provide sectoral development directions and action, referring to the past and future perspective.

An International Energy Agency (IEA) report on energy policy of Poland[7] (2017) is available.

The table showing national needs (national supply, import and demand) for mineral resources, including energy resources, is Annex 2 of the Draft State Raw Materials Policy[8].

The portal Mineral Resources of Poland of the Polish Geological Institute – National Research Institute presents data about almost 14,000 mineral deposits in the country[9].

The portal is based on the System of management and protection of mineral resources in Poland (MIDAS)[10], and on the report *The balance of mineral resources deposits in Poland*, with data as of the end of each year. The report has been published annually for more than 65 years and the latest edition, as of 31 December 2017, is available online[11].

Mineral Resources of Poland[12] is a periodic English publication of the Institute.

The 5 edition, June 2017[13], presents the data on particular raw material resources and extraction, legal regulations of geological and mining projects, the concession system, ownership of mineral resource deposits, the geological and mining administration and its responsibilities, geological documentation and requirements for licensed geologist candidates, taxes and levies, geological information sources in Poland and how they are used. A separate part is dedicated to the connection between the domestic resource classification system used in Poland and the international classification – United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (currently the United Nations Framework Classification for Resources), which is becoming more widely used in the world.

[5] https://www.gov.pl/documents/33372/436746/Program_dla_sektora_g%C3%B3rnictwa_w%C4%99gla_kamiennego_w_Polsce.pdf/4cd0f128-45a8-0f98-c4e0-c763d0f1754d (Polish). Article with a summary: https://www.gov.pl/web/energia/program-dla-sektora-gornictwa-wegla-kamiennego-w-polsce (Polish)

[6] https://www.gov.pl/documents/33372/436746/Program_GWB_2018.pdf/6ad8d7d4-80b0-00e8-48d8-8c0824829130 (Polish). Article with a summary: https://www.gov.pl/web/energia/rada-ministrow-przyjela-program-dla-sektora-gornictwa-wegla-brunatnego-w-polsce (Polish)

[7] https://www.apgef.com/wp-content/uploads/2017/03/Energy_Policies_of_IEA_Countries_Poland_2016_Review.pdf (English)

[8] http://psp.mos.gov.pl/images/pdf/politykasurowcowapanstwa.pdf (Polish)

[9] http://geoportal.pgi.gov.pl/surowce (English)

[10] http://geoportal.pgi.gov.pl/portal/page/portal/midas (English)

[11] http://geoportal.pgi.gov.pl/css/surowce/images/2017/pdf/bilans_2017.pdf (Polish)

[12] http://geoportal.pgi.gov.pl/surowce/mineral_resources_of_poland (English)

[13] http://geoportal.pgi.gov.pl/css/surowce/images/2017/pdf/mineral_resources_of_poland_2017.pdf (English)

The Statistics Poland[14] publishes the data on materials.
What is more an annual publication on materials management is available on-line[15].

Policies which include elements of material resource efficiency

- ***The Strategy for Responsible Development (SRD)***

This new key document – a mid-term development strategy of Poland adopted in 2017 – encompasses 185 strategic and flagship projects in a number of areas[16]. The strategic principle is to balance the development of the whole country in economic, social, environmental and territorial terms. The strategy covers activities up to 2020, but also provides a perspective to 2030.

The list of longer-term challenges for Poland presented in the Strategy includes the limited water, materials and energy resources – a threat to the security and quality of life as well as to the development of economic sectors that use these resources. The document notes that the shortages could also stimulate the search for new technological solutions to decrease the demand for resources and encourage more efficient use and recycling of waste (secondary raw materials).

The Strategy lists two key activities under the Resources for Industry/Reindustrialisation thematic area.
1) An action plan to facilitate the economic development of Poland by securing the supply of non-energy raw materials for industry, taking into account the circular economy approach, as an important input to the Poland's resources policy – as described in the section on Overview of dedicated national or sectoral strategies for raw materials – the work was coordinated by the former Ministry of Economic Development until 2017 and the results were used by the Ministry of Environment to prepare the State Raw Materials Policy which is currently in draft.
2) Ensuring the synergy of activities under the National Resources Policy described in the State Raw Materials Policy document. The policy involves many institutions. Currently a few legal acts affecting geological and mining, environmental protection and spatial management areas are the instruments for resource policy.

As regards energy, the Strategy lists, amongst other things, support for acquiring and using energy from new sources, the development of energy storage technologies, increasing energy efficiency and restructuring the coal mining sector (see section on Overview of dedicated national or sectoral strategies for raw materials).

As regards the environment, the following activities up to 2030 within waste management are mentioned:

- - waste management according to the waste hierarchy;
- - developing waste recycling;
- - striving to maximise the use of waste as raw materials.

The strategy notes that the biggest challenges are the development of a system for the selective collection of municipal waste at the local level that includes the collection of waste for recycling and the development of installations to process the bio-waste. It also emphasises the need for activities focused on affecting citizens' behaviour.

[14] http://stat.gov.pl (Polish) and http://stat.gov.pl/en/ (English)
[15] latest issue (December 2018): http://stat.gov.pl/en/topics/industry-construction-fixed-assets/industry/materials-management-in-2017,6,12.html (English)
[16] http://www.mr.gov.pl/media/38943/_Strategia_na_rzecz_Odpowiedzialnego_Rozwoju.pdf (Polish)

Horizontal development strategies

Horizontal development strategies, prepared to achieve the objectives of the National Development Strategy 2020 adopted in 2012, currently being updated or to be transformed, according to the new mid-term strategy SRD mentioned above, include the following.

- ***The Energy Security and Environment* Strategy (ESES)**[17]

The document is focused on energy and the environment and provides guidelines for Poland's Energy Policy. The main objectives are to provide a high environmental quality of life for present and future generations and to create conditions for the sustainable development of the modern energy sector to provide Poland with energy security and a competitive and efficient economy.

One of the three operational directions of ESES is the Sustainable Management of Environmental Resources, which aims, *inter alia*, for the rational and effective management of raw materials. The main actions include the development of research and the exploitation of raw materials as well as the reduction of the impact of research and exploitation on the environment and local society. The document also presents actions focused on more effective utilisation of energy resources and identifying new ways of its exploitation. It also discusses improvement of the state of environment, to be achieved, *inter alia*, by efficient waste management.

Due to the changes in the system of strategic planning in Poland, the ESES will be replaced by two strategies to be adopted in 2019:
1) Energy Policy of Poland, under the responsibility of the Minister of Energy;
2) National Environmental Policy to 2030, under the responsibility of the Minister of Environment.

- The Strategy for Innovativeness and Effectiveness of the Economy (SIEE)[18]

One of the Strategy's four specific objectives is increased resource and raw materials efficiency. This includes the transformation of the socio-economic system to consume less energy and fewer materials and creating conditions for sustainable production and consumption. It also includes supporting sustainable construction, including increasing energy and material efficiency for example by promoting the use of renewable resources and materials that can be recycled. It also encourages solutions that minimise the use of materials and water and generate less waste while promoting the use of materials from areas as close as possible to construction sites to minimise economic and environmental costs related to transport. The updated Strategy is expected to be adopted in 2019.

- The Strategy for Sustainable Development of Rural Areas, Agriculture and Fishing[19]

Pillars of the draft updated Strategy:

I. profitability of agriculture production;
II. quality of life and environment in rural areas;
III. non-farming jobs and active society;
IV. efficient agricultural administration.

The pillar dedicated to quality of life and the environment includes an intervention measure called *2.8 Circular economy and bioeconomy (including Renewable Energy Sources).*

[17] http://www.monitorpolski.gov.pl/mp/2014/469/1 (Polish)
[18] http://monitorpolski.gov.pl/mp/2013/73/1 (Polish)
[19] Current one (binding) https://www.gov.pl/web/rolnictwo/strategia-zrownowazonego-rozwoju-wsi-rolnictwa-i-rybactwa-na-lata-2012-2020 (Polish)
Updated draft: https://www.gov.pl/documents/912055/913531/SZRWRiR_2030.pdf/4ec31a53-8722-1e91-bc45-5b39e5e3a60d (Polish)

The Energy Policy of Poland until 2030 (EPP)[20]

The Energy Policy of Poland until 2030 was adopted by the government in November 2009. In the Policy the energy efficiency is given priority and the progress on it will be of key importance in implementing its objectives. One of the key EEP objectives is the enhancement of supply security of fuels and energy, assuming optimal use of domestic deposits of energy resources, as well as diversification of sources of import of crude oil and gas. The supporting measures and actions are detailed in strategic document and available annexes. As previously mentioned, the Ministry of Energy is working on the draft of the new energy policy document.

National Policy on Forests[21] *with National Programme for the Augmentation of the Forest Cover*[22] *and 2014–2030 Forest Management Strategy*[23]*, National Forest Programme*

The overarching goal of Poland's forest policy is to create a set of activities that show the relationship between humans and forests, protect forests and preserve their multifunctional role. Forests occupy almost 30 per cent of the territory of Poland, 9.1 million hectares. The vast majority are state forests, of which nearly 7.6 million hectares are managed by the State Forests Holding. According to the Act on Forests (1991) the objective of State Forests Holding is to manage forests belonging to the State Treasury sustainably and multifunctionally. Planned actions include providing conditions for optimum afforestation, increasing forest cover to 33 per cent of Poland's territory by 2050, and establishing ecological and economic priorities. Management in a sustainable way means using forests in a way and at a pace that ensures sustainable preservation of their biological richness, high productivity and regenerative potential, longevity and vitality, providing important protective, economic and social functions at local, national and global levels now and in the future, without harming other ecosystems.

The National Waste Management Plan 2022[24]

adopted by the resolution No 88 of the Council of Ministers of 1 July 2016 (item 784).

Key objectives:

Municipal waste, including food and other biodegradable waste:

1) reducing the amount of generated waste:
   a) reducing food waste;
   b) introduction of separate collection of bio-waste from mass caterers.
2) increasing public awareness about proper municipal waste management, including food waste and other biodegradable waste;
3) ensuring the functioning of the waste management systems in accordance with the waste hierarchy:
   a) achieving recycling and preparation for reuse of at least of 50 per cent by weight of the following fractions of municipal waste by 2020: paper, metal, plastics and glass;
   b) by 2020, the share of incinerated municipal waste and waste from treatment of municipal waste must not exceed 30 per cent by weight of generated municipal waste;
   c) by 2025, 60 per cent of municipal waste should be recycled;
   d) by 2030, 65 per cent of municipal waste should be recycled;
   e) by 2030, municipal waste landfilling reduction to a maximum of 10 per cent of generated municipal waste;
4) reducing the share of mixed municipal waste in the entire collected waste stream – increasing the share of separately collected waste:

[20] http://www.me.gov.pl/Energetyka/Polityka+energetyczna (Polish)

[21] https://www.mos.gov.pl/g2/big/2009_04/34ba398d45e363aed16d2ad3b015136a.pdf (Polish)

[22] https://www.mos.gov.pl/fileadmin/user_upload/mos/srodowisko/lesnictwo/Krajowy_Program_Zwiekszania_Lesistosci.pdf (Polish)

[23] http://zlpwrp.pl/wp-content/uploads/2014/08/strategia-LP.pdf (Polish)

[24] https://bip.mos.gov.pl/fileadmin/user_upload/bip/strategie_plany_programy/DGO/Kpgo_2022_EN.doc (English)

a) ensuring the highest possible quality of waste collected by means of the appropriate systems of separate waste collection so that it can be recycled in the most efficient manner possible.

Waste generated from products – waste oils, end-of-life tyres, waste batteries and waste accumulators, waste electrical and electronic equipment, packaging and packaging waste, and end-of-life vehicles:

- achieving/maintaining minimum levels of recovery and recycling as in EU and national legislation;
- increasing public awareness, including entrepreneurs, about the proper handling of waste.

Waste from construction, renovation and dismantling of buildings and road infrastructure:

1) increasing awareness among investors and entities generating waste from construction and dismantling buildings and road infrastructure about the proper handling of above-mentioned wastes, in particular as regards selective collection and recycling;
2) maintaining the level of preparing for reuse, recycling and other forms of recovery of construction and demolition waste at minimally 70 per cent by weight.

Lines of action in respect of preventing waste generation and developing the waste management system:

a) reuse, in case of municipal waste other than food waste and biodegradable waste:
   - creating reuse centres to enable the exchange of used/second hand things, *inter alia*, at Municipal Waste Selective Collection Centres (MWSCC). These centres should allow people to leave working but no longer needed household appliances for others, and to take other useful things,
   - creating repair centres for owners who would like to continue to use products or, after their repair, pass them on to others,
   - arranging exchange of various things, including, in particular, household appliances, clothing and footwear;

b) eco-design;
c) education with regard to the rules governing municipal waste, including food and other biodegradable waste;
d) promotion and implementation of activities for preparing for re-use and recycling;
e) implementation of a sustainable system for the application of thermal methods for energy recovery from municipal waste,
f) campaigns promoting the waste hierarchy, including less consumptive lifestyles and eco-design.

The National Waste Management Plan 2022 includes ***The Waste Prevention Plan.***
The Waste Prevention Plan indicates, among others, the following directions of actions.

1) Designing new processes and products so that environmental impacts of production, use and end of life are as small as possible.
2) Promoting the inclusion of methods and possibilities of waste management in the design phase of projects. For example, the application of extraction waste or products resulting from recovery operations of extraction waste as well as ash and other incineration residues in the production of cement, concrete and aggregates replacing natural materials, and in particular in road, land reclamation and other construction projects.
3) Development of technical infrastructure for reuse of construction and demolition waste.
4) Application of activities to prevent packaging waste through the regular inclusion of environmental aspects in product design to improve the environmental impact of products during production and throughout their life cycles.
5) Promotion of repair and re-use of used electrical and electronic equipment.
6) Intensification of information and educational activities aimed at increasing public awareness, including entrepreneurs.

The National Waste Management Plan 2022 contains tasks for specific institutions, for example:

- carrying out a nationwide information and educational campaign on various types of waste, including the development of recommendations for municipalities related to carrying out information and publicity campaigns on handling waste, in particular as regards separate waste collections;
- coordination and support for the implementation of scientific and research work on waste management as well as research and demonstration projects on waste prevention technology and dissemination of research results.
- including the possibility of support for enterprises involved in activities changing technologies into low waste, innovative ones as in the energy efficiency programmes) and creating new forms of activities related to waste prevention in the financial priorities for the years 2014–2020 of the National Fund for Environmental Protection and Water Management (NFEPWM)/Voivodeship Fund for Environmental Protection and Water Management (VFEPWM);
- campaigns promoting the waste hierarchy, including less consumptive lifestyles and eco-design;
- promoting initiatives and competitions for low-waste municipalities;
- collecting and sharing educational materials for schools about waste prevention and the proper handling of waste;
- introducing the issues related to waste prevention and the proper handling of waste into the core curriculums of general and vocational education;
- preparing recommendations for the construction of a renovation and reuse network and developing guidelines for the minimum functionality of Municipal Waste Selective Collection Centre (MWSCC) for local government units.

Resource efficiency is also implemented by adopting EU regulations within domestic legislation, for example, in the Environment Protection Act of 27 April 2001, with further amendments, the Energy Efficiency Act of 20 May 2016 (with further amendments) etc. Moreover, as an effect of these documents, resource efficiency is widely promoted through eco-education. Based on the Environment Protection Act regulations, the National Environment Protection and Water Management Fund is allowed to co-finance various projects, educational or investments (industrial, urban development), bearing in mind resource efficiency with reference to sustainable development and other conditions.

National Smart Specialisations[25]**,** set by the former Ministry of Economic Development, within the financial perspective for 2014–2020 under the Smart Growth Operational Programme, to develop innovation and make the Polish economy more competitive include environmental-friendly raw material extraction and usage, substitutes usage, waste, energy and transport technologies.

It is also worth mentioning that the National Fund for Environmental Protection and Water Management implements many priority programmes and projects supporting innovation, research and development, and the low carbon economy[26].

Institutional setup and stakeholder engagement

The Ministry of Entrepreneurship and Technology has assumed the coordinating role for the governmental work on the circular economy. The Ministry of Environment has the leading role in the field of waste. The Ministry of Environment is also responsible for the State Raw Material Policy. The Minister of Environment supervises The Polish Geological Institute – National Research Institute founded in 1919. The energy policy is carried out by the Ministry of Energy.

To ensure the synergy of action concerning resources, as mentioned in section 'Seeking synergies with other policy areas', a government plenipotentiary for state raw materials policy and a governmental inter-departmental working group for state raw materials policy were appointed in 2016. The position of the

[25] https://www.gov.pl/web/przedsiebiorczosc-technologia/krajowe-inteligentne-specjalizacje (Polish)
[26] http://nfosigw.gov.pl/oferta-finansowania/srodki-krajowe/programy-priorytetowe (Polish)

plenipotentiary is held by the Secretary of State at the Ministry of Environment – the Chief Geologist of Poland. The group, consisting of the representatives of all ministries (the Secretaries or Undersecretaries of State), was established in May 2016 by the Prime Minister. The main objectives of the group include: drawing up the State Raw Resources Policy and ensuring instruments for its implementation.

A governmental working group for the circular economy, consisting of the representatives of all interested ministries, was established in June 2016 by the Minister of Economic Development. The aim of the group is to coordinate work on the Roadmap Towards the Circular Economy Transition. Eight ministries expressed interest in participating in this working group. In addition to the former Ministry of Economic Development, divided into the Ministry of Entrepreneurship and Technology and the Ministry of Investment and Economic Development, the group was joined by the representatives from the Ministries of Environment; National Education; Energy, Infrastructure and Construction; Science and Higher Education; Family, Labour and Social Policy; Agriculture and Rural Development; and Health.

As mentioned in the section on Dedicated national strategies or roadmaps for material resource efficiency and a circular economy, during the preparation of the Roadmap Towards the Circular Economy Transition stakeholders could participate in the work of one or more of the four multi-stakeholder working groups on waste, bio-economy, business models and education and promotion.

The Cooperation Programme of the Ministry of Economic Development with NGOs and other parties conducting public benefit activities determined the form, principles, and areas of cooperation between the Ministry and NGOs. The NGOs may establish direct contact with different departments of the current ministries with the aim of executing common projects, exchanging experience, or seeking possible sources of financing. Cooperation with stakeholders allows for engagement of society in the execution of public tasks and opening the Ministry to citizens' opinions and needs.

One of successful examples of awareness raising efforts on the circular economy in Poland was a special supplement to *Rzeczpospolita*, a daily newspaper, which was fully dedicated to the circular economy. It included relevant insights from policy makers, NGOs, consultancy companies and entrepreneurs[27].

It is also worth mentioning that the National Fund for Environmental Protection and Water Management implements many priority programmes and projects supporting innovation, research and development, and the low carbon economy[28].

Approaches to resource efficiency and circular economy policy evaluation

No special evaluation scheme dedicated to resource efficiency and the circular economy has yet been designed in Poland.

There is an obligation to prepare an ex-ante assessment of the impact of adopted regulations governed by the Regulations for the work of the Council of Ministers. Such assessment is required for every government normative act.

The Ministry of Environment in 2015 carried out an ex-post evaluation of the effects of environmental projects under the Operational Programme Infrastructure and Environment 2007–2013. According to the Statistics Poland the length of the wastewater and water supply system in all regions has increased, the amount of industrial and municipal wastewater requiring treatment has decreased, and water consumption for industrial purposes has been stabilised. With regard to waste management, the decreasing amount of municipal waste collected during the year and a significant increase in the amount of waste collected separately, as well as a reduction in the share of mixed municipal waste deposited in

[27] http://www.rp.pl/Gospodarka-Obiegu-Zamknietego/171019753-Nowe-podejscie-do-gospodarki.html (Polish)
[28] http://nfosigw.gov.pl/oferta-finansowania/srodki-krajowe/programy-priorytetowe (Polish)

landfills was observed. In addition, enterprises implemented projects for the rationalization of resources and waste management, including the rationalization of water and wastewater management.

It is estimated that within the Operational Programme Infrastructure and Environment (OPI&E) 2007–2013 the amount of recovered waste generated by enterprises which received co-funding increased by almost 126 thousand tonnes per year and water consumption was reduced by slightly more than 2 million cubic metres per year.

According to the Evaluation Plan for Operational Programme Infrastructure and Environment 2014–2020, the Ministry of Environment will be carrying out on-going and *ex-post* evaluations of environmental projects co-funded under the Programme. The impacts are assessed using the measures adopted in each programme/strategy.

Monitoring and targets

Targets for resource efficiency and circular economy

No targets have been adopted yet in Poland, but it is planned to do so in the framework of the Roadmap for Transformation Towards Circular Economy.

Indicators to monitor progress towards a resource-efficient circular economy

According to Regulation (EU) No 691/2011 of European Parliament and of the Council of 6 July 2011 on European environmental economic accounts, the Statistics Poland is responsible for the annual transmission to Eurostat of the Economy-Wide Material Flow Accounts (EW-MFA) questionnaire. These have been introduced into the Polish legal framework (into the Programme of Statistical Surveys of Official Statistics).

The general purpose of EW-MFA is to describe the interaction of the domestic economy with the natural environment and the rest of the world economy in terms of flows of materials, excluding water and air. EW-MFA is a statistical framework conceptually embedded in environmental-economic accounts and fully compatible with the concepts, principles, and classifications of national accounts – thus enabling a wide range of integrated analyses of environmental, energy and economic issues, for example, through environmental-economic modelling.

Various indicators are derived from material flow accounts – most prominently DMC and resource productivity. DMC measures the total amount of materials directly used by an economy and is defined as the annual quantity of raw materials extracted from the domestic territory, plus all physical imports minus all physical exports. Resource productivity quantifies the relationship between economic activity and the consumption of natural resources. Natural resources include biomass, metal ores, non-metallic minerals and fossil energy materials. These indicators are available in the Eurostat database – for Poland since 2000[29].

Eurostat has also published the European Resource Efficiency Scoreboard. It is a tool for presenting key indicators relating to natural resources and illustrating the progress towards increased resource efficiency of Member States and the European Union as a whole. For this scoreboard, a limited set of already available indicators was selected. The scoreboard is made up of two lead indicators: resource productivity and domestic material consumption, eight macro indicators regarding land, water and carbon (dashboard

[29] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_mfa&lang=en (English) and http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_rp&lang=en (English)

indicators) and additional indicators, grouped into three themes: transforming the economy, nature and ecosystems and key areas.

This database is regularly updated based on statistics from Eurostat, the European Environment Agency and other internationally recognised source.

For more information on the indicators, see Eurostat's resource efficiency scoreboard websites[30].

Eurostat has also developed a model to estimate raw material consumption (RMC) for the aggregated EU economy. RMC is defined as the annual quantity of raw materials extracted from domestic territory, plus all physical imports and minus all physical exports, both expressed in raw material equivalents.

In 2017, Statistics Poland started presenting and disseminating SDG data via Sustainable Development Indicators Application available on its official website (see more details in the following section on Resource efficiency, circular economy and the 2030 Sustainable Development Goals).

Green economy indicators for Poland: the second edition, published at the end of 2017[31], presents indicators to assess the state of the green economy in Poland. They have been included for four core areas: natural asset base, environmental and resource productivity of the economy, environmental quality of life, economic opportunities and policy responses. The report is complemented with context indicators, which are a source of basic information about the socio-economic situation of the country. Next edition of the publication with updated data will be released at the end of 2019.

In 2018 the Ministry of Entrepreneurship and Technology, together with three other partners – Statistics Poland, the Mineral and Energy Economy Research Institute of the Polish Academy of Sciences and Cracow University of Economics – obtained a National Centre for Research and Development grant to develop a circular economy measurement framework for Poland. The project will start in April 2019 and will last for 32 months.

Resource efficiency, circular economy and the 2030 Sustainable Development Goals

In 2017, Statistics Poland started presenting and disseminating SDG data through the Sustainable Development Indicators Application available on its official website[32]. In 2019, the application was upgraded to conform with the international standardisation of global reporting on the SDGs, and relaunched as Poland's National Reporting Platform (NPR). At present, the Polish NRP includes two sets of indicators: global and national. The former comprises indicators monitoring the SDGs. The latter is likewise structured along the 17 SDGs, however, it is composed of indicators monitoring Poland's sustainable development priorities, established at the ministerial level. All data available for Poland are presented from 2010 onwards, together with existing proxy indicators. The Ministry of Environment is actively engaged in providing indicators as well as data, if available, to monitor the progress of the implementation of the SDGs in the environmental domain.

Apart from data and metadata, Poland's NRP provides key information on the SDGs and the role of Polish official statistics in the process of their monitoring.

[30] http://ec.europa.eu/eurostat/web/europe-2020-indicators/resource-efficient-europe (English) and http://ec.europa.eu/eurostat/web/environmental-data-centre-on-natural-resources/resource-efficiency-indicators/resource-efficiency-scoreboard#top (English)
[31] http://stat.gov.pl/en/topics/environment-energy/environment/green-economy-indicators-in-poland-2017,3,2.html (English)
[32] http://sdg.gov.pl/ (Polish)

Examples of innovative approaches and good practice

Examples of good practice and innovative approaches

Poland implements a number of initiatives that support resource efficiency and/or circular economy. Examples of good practices include the following.

1. Transition from linear 2 circular: Policy and Innovation[33]
   For the first time, the Ministry of Entrepreneurship and Technology has been involved in a Horizon 2020 project entitled R2Pi – tRansition from linear 2 circular: Policy and Innovation. Its aim is to accelerate the transition to a circular economy by supporting the implementation of new business models and related policy measures. Fifteen partners from nine countries are analysing the obstacles to a more circular approach at market and policy levels and will develop case studies to understand how companies are managing their transition. Based on the analysis, the R2Pi consortium will produce a toolbox and policy guidelines to support both businesses and policy makers. The project will be finalised by October 2019.

   This is a good example for international cooperation on circular economy, as well as for involvement of a national administration entity in work on the ground, including close cooperation with those companies analysed as case studies.

2. GreenEvo – Green Technology Accelerator[34]
   The GreenEvo – Green Technology Accelerator project aims to transfer Polish green technologies worldwide, and to build an international network through organisation of and participation in various meetings and conferences. The project, initiated and managed by the Ministry of Environment, aims to select the most interesting green technologies, support their brand by providing quality assurance, and finally endorse their development on the global market.

   In order to create the most stimulating environment for the companies, the key element of the project is a contest. The companies willing to gain public support engaged in a simple and free-of-charge application procedure that allowed the Ministry to thoroughly try out and test the technologies. The technologies had to fulfil five basic requirements:
   - be a technology – not just an idea;
   - be green – it should support environmental protection;
   - be implemented – outside the company: it should be already commercialised;
   - be Polish – it should have been invented in Poland and be owned by a Polish company, as defined by EU rules;
   - be transferable – it should have potential to be implemented in foreign markets.

   The support did not consist of direct funding, rather it provided specific services – training, market analysis, trade missions, networking and matchmaking. The support provided was in line with the EU *de minimus* rule of public aid, which means it should not influence the European market significantly. The training was vital to prepare the companies to take part in trade missions. An agenda of such a mission usually included fairs, profiled conferences, business-to-business (B2B) and business-to-administration (B2A) meetings, and matchmaking sessions. Participating companies had the opportunity to present their offer in a short and simple manner, get in contact with potential partners and experience the reality of foreign markets. On average, around a dozen missions were organised every year. The specific destinations are chosen on the basis of market analyses, prepared annually.

[33] http://www.r2piproject.eu (English)
[34] http://greenevo.gov.pl/en/ (English)

Since the beginning of the programme, the best Polish environmental solutions, selected in subsequent editions, have been promoted in more than 50 countries on all continents. Participating in more than 100 foreign missions, organised under GreenEvo, has enabled entrepreneurs to establish international cooperation with many partners.

The project was carried out between 2009 and 2015[35]. During that period, six editions were held, and the Ministry of Environment reactivated the project in 2018[36].

3. Exchange of things initiatives

There are many interesting initiatives held at different levels – from local (even ones initiated by a group of people) to more cross-regional or even national ones. Following the circular economy approach, they also have an important role in building a sense of community among people.

- An all-Poland Exchange of Historical and Peculiar Things in Łódź[37] with hundreds of exhibitors attracting a few thousand visitors from Poland and abroad. The 36th edition will be organised in November 2019. The event gives *inter alia*:
  - a great opportunity to buy, sell, exchange or just see interesting things and collections;
  - the possibility of getting an expert evaluation and take professional advices;
  - a unique atmosphere and a chance to meet people with similar interests.
- Bookcrossing initiatives – to share books and follow their progress
  In November 2017 there were more than 300 000 books registered in the Polish service of this international initiative[38].
  Additionally, *ad-hoc* actions were organised in public places in many cities, including action in public transport in Gdańsk[39] and public libraries in Warsaw[40].
- Various local actions held by different organisations and people, including:
  - *Ad hoc* initiatives organised by individuals or groups of neighbours. In May 2018, a group, together with a local educational institution in Warsaw, organised a small toys market at which parents and children could exchange undamaged toys[41].
  - Charity actions at churches and other places to which people can bring or exchange clothes and everyday articles. An interesting example of a more advanced approach is a yearly lottery organised by charity teams in some Catholic parishes to which people bring unneeded things in good condition to be won as prizes. All profits from lottery tickets go to charity. As such initiatives are focused on local communities and do not have professional advertisements, they are much more common than some people think.

Seeking synergies with other policy areas

The Strategy for Responsible Development calls for the moderate use of natural resources and the implementation of strategic programmes: Action Plan for Poland's Security Regarding Non-Energy Raw Materials and State Raw Materials Policy to identify the resource needs and the most optimal way to meet them. Many other actions and programmes mentioned in the Strategy for Responsible Development touch the issue of synergy between resource efficiency/circular economy and other policy areas. The State Raw Materials Policy is the answer to the need of a more integrated approach to the management of resources.

[35] The brochure on the project is available at: http://greenevo.gov.pl/wp-content/uploads/2014/07/GreenEvo-2015_broszure-EN_net.pdf (English)
[36] http://greenevo.gov.pl/pl/reaktywacja-programu-greenevo-akcelerator-zielonych-technologii/ (Polish)
[37] http://www.gieldakolekcjonerska.com.pl/ (Polish)
[38] https://bookcrossing.pl/ (Polish) and http://www.bookcrossing.com (English)
[39] http://gdansk.naszemiasto.pl/artykul/szybka-ksiazka-miejska-czyli-zostaw-ksiazke-w-kolejce,3149093,art,t,id,tm.html (Polish)
[40] http://www.bibliotekabielany.waw.pl/index.php/dzialo-sie/1071-wez-ksiazke-i-zostaw-ksiazke (Polish)
[41] http://lubiewarszawe.pl/wymiana-i-maly-targ-zabawek/ (Polish)

In 2016 the key action for the synergy was the appointment of the government plenipotentiary for the State Raw Materials Policy and the governmental inter-departmental group for the State Raw Materials Policy.

As environmental requirements are key for socio-economic development the following activities are listed in the State Raw Materials Policy:

- efficient use and development of the resources, such as water, biodiversity, soils, mineral deposits, space and landscape;
- activities for circular economy model;
- ecosystems mapping and evaluation;
- resource policy;
- priority for secondary use of space in investments in cities; and
- a decrease in sealed areas.

As explained in section 'Dedicated national strategies or roadmaps for material resource efficiency and for circular economy', the work on a Roadmap Towards the Circular Economy Transition is going on.

Poland was involved in the pilot phase of the product environmental footprint and organisation environmental footprint category rules (PEF/OEF) which was facilitated by the European Commission's DG Environment and successfully finalised in April 2018[42]. The work involved the assessment of environmental impacts throughout the entire life cycle of chosen categories of products and organisations, which – considering the global character of value chains today – may have considerable consequences for trade.

On a national level, the Ministry of Economic Development held some promotional activities through dedicated working group and a website to raise companies' awareness of and to deal with their environmental footprints.

The current Ministry of Entrepreneurship and Technology provides such information at: https://www.mpit.gov.pl/strony/zadania/zrownowazony-rozwoj/slad-srodowiskowy (Polish)

Resource efficiency and circular economy policy initiatives from subnational to local level

Numerous subnational and local initiatives are being implemented in Poland. Among these are:

Circular economy in a municipality – a pilot programme[43]

There is an interesting initiative of the Polish Minister of Environment. The National Fund for Environmental Protection and Water Management (NFEP and WM) and five municipalities/districts – Krasnobród, Łukowica[44], Sokoły, Tuczno and Wieluń – agreed in 2017 to pilot implementation at the local level circular economy and resource efficiency projects.

The programme, which is implemented in 2017–2020, with a budget of PLN 45 million (approx. EUR 11 million), includes the implementation of measures that will reinforce further action by municipalities in the transition to a circular economy and resource efficiency model with a particular focus on local knowledge and public education. The following action will be financially supported by the NFEP and WM:

- separate waste collection, recycling and prevention;
- circular economy in households, in agriculture and in processing of agricultural products;

[42] http://ec.europa.eu/environment/eussd/smgp/ef_pilots.htm (English)

[43] http://nfosigw.gov.pl/oferta-finansowania/srodki-krajowe/programy-priorytetowe/gospodarka-o-obiegu-zamknietym/ (Polish)

[44] Łukowica municipality application within the Programme https://www.lukowica.pl/pl/254/607/-pilotazowy-program-gospodarka-o-obiegu-zamknietym.html (Polish)

- environmental-friendly transport particularly public transport;
- energy efficiency;
- material and water saving as well as a decrease in waste generation by households, municipal management and local enterprises;
- rational land management including reuse of contaminated sites;
- education for the circular economy including shaping social behaviour, building competencies of leaders, sharing experience and good practice, providing necessary infrastructure.

The pilot nature of the programme will allow the NFEP and WM to gain experience for the development of future, optimal support instruments for similar projects.

The ecological benefits and methods of their assessment will be determined after analysing the implementation of the pilot programme in individual municipalities.

Regional waste management plans
Revised voivodship waste management plans were adopted in 2016 and 2017.
A reference to circular economy is included in the plans for example by:

- introducing uniform rules throughout the country for the separate waste collection of the following fractions of municipal waste: paper, metal, glass, plastic and biodegradable waste.
- creation of repair points for items and products at municipal waste selective collection centres. The effect of activities related to waste prevention in voivodships is, for example, an increase in the number of municipal waste selective collection centres with repair and reuse points, for example in Łódzkie or Podkarpackie.

Other resources

Examples of policies which go beyond "material resources"

The Roadmap towards Circular Economy Transition, as explained under section 'Dedicated national strategies or roadmaps for material resource efficiency and for circular economy', is based on a broad definition of a circular economy, including business models, the bio-economy, environmental footprints, etc.

Poland is actively involved in implementation of United Nations Convention to Combat Desertification New Strategic Framework with sustainable land use and sustainable use of water resources as one of the priorities.

At the same time, within the Polish implementation model for climate change adaptation policy, the sustainable use of water, biodiversity protection and action taken to increase its retention are the most important priorities.

The way forward

Reflections on future directions of policies on resource efficiency and circular economy

Poland sees the following main challenges and ways to tackle them, when it comes to the implementation of resource efficiency, the circular economy and raw materials policies.

1. Making all the actors, including policy-makers, companies, consumers, and academia, aware that some aspects of their activities concern the circular economy. National and international activities and debates the Polish government was involved in show that most stakeholders associate the circular economy mainly with and/or is confined to waste management – indicating a lack of awareness of the concept's true meaning. This may impair the involvement of some actors in the work on transformation towards circular economy in Poland.

2. Implementing a system approach, required by the circular economy concept, which – considering the complexity of various environmental/natural and industrial processes – poses a considerable challenge for policy makers. For example, recycling may require a lot of energy, which in the end may not be as efficient as it might seem and may under some circumstances not support a circular economy transformation.
3. Linking science and industry to deliver innovative solutions with the number of instruments needed to help the business sector better identify and apply technology development solutions. National investment, support for eco-innovation and environmental technologies, and incentives are required, including choosing the right financial tools, to support business models in a closed-loop economy.
4. Influencing consumers' behaviour by engaging many stakeholders and communicating, promoting and sharing best practice at all stages of the implementation of a closed-loop economy.
5. Developing reliable indicators, both for the transformation to a circular economy and the impact of the circular economy on socio-economic development, which is particularly challenging due to the complexity of the circular economy concept.
6. Creating a European market of good quality secondary raw materials suitable for use in further production processes recovered from high quality waste.
7. Developing a strong service sector with qualified and experienced craftsmen, providing, *inter alia*, repair services to prolong products' lives. It will also help in lowering unemployment in some areas.

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