

Take the challenge and start the 3R's:Reduce, Reuse, Recycle.
Promoting zerowaste lifestyle among adults

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State of the Art

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Index

1.	4	
2.	6	
2.1.	7	
2.2.	8	
2.3.	9	
2.4.	10	
2.5.	12	
Waste production		15
The yearly water use per person is about		16
3.	14	
3.1.	15	
3.2.	16	
3.3.	17	
3.4.	18	
3.5.	19	
4.	21	
4.1.	22	
4.2.	23	
4.3.	24	
4.4.	25	
4.5.	26	
5.	29	
5.1.	30	
5.2.	31	
5.3.	31	
5.4.	32	
5.5.	34	
6.	36	
6.1.	37	
6.2.	37	
6.3.	38	

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6.4.	39	
6.5.	40	
7.	Summary of the most important information	46

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1. Introduction

This document was prepared for the implementation of the 3R Project “Take the challenge and start the 3R's: Reduce, Reuse, Recycle. Promoting zero lifestyle among adults” in the framework of the Erasmus + program in order to present the current situation in partner countries (Lithuania, Poland, Czech Republic, Spain and Hungary) in terms of the subject of the Project.

The document presents the main issues related to waste production, water resources and consumption as well as the production and consumption of electricity in partner countries; presents the activities of zero-waste and "less waste" initiatives and also presents legislation related to the subject of the Project.

The definition of "zero waste" is adopted after the one of the Zero Waste International Alliance (ZWIA) which indicates that it is "the protection of all resources through responsible production, consumption, reuse and recovery of all products, packaging and materials, without burning them, and without discharging them to the ground, water or air that endanger the environment or human health. ' "Zero waste" can also be treated as a lifestyle in which people try to generate as little waste as possible and at the same time not to pollute the environment.

Respecting the idea of zero waste means striving to minimize waste production and thus protect the nature that suffers the most from waste. The principle consists in trying to comply with 3R:

- reduce,
- reuse,
- recycle.

Reduction means shopping wisely and consuming everything we buy. Minimize what ends up in the trash, because what we throw away can take decades to hundreds of years of decomposition. Using things repeatedly means not throwing them away senselessly. Always think about whether the item can be used in another way or possibly sell or donate it. Recycling in the context of zerowaste does not mean recycling more, but less, because, on the contrary, the purchase is primarily made only in packaging that can be used more than once or in packaging that is recyclable.

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2. The current situation related to the production of waste, electricity and water consumption in partner countries

2.1. Lithuania

According to the research of the European Commission, in 2017 countries of the European Union produced 2500 billion tons of waste – 487 kilogram of household waste per person on average. In addition, in 2017 there were 455 kilogram of waste per person produced in Lithuania¹. According to the research carried out by the statistics agency “Eurostat”, in 2018 in the European Union 220 million tons of household waste in total were produced – 492 kilogram per person – and in Lithuania this index was 464 kilogram per person and this was the highest index among the Baltic countries². Despite the fact recycling becomes more and more popular, only 38 percent of waste is used for recycling. According to the Lithuanian statistical data, 44 types of waste are accounted under general system.

One more important factor is the waste sorting system itself and the system of recycling. Waste is burned in order to produce energy. The attention should be paid to the fact that due to the favorable climatic zone, Lithuania has many water resources. Despite the fact that the water pollution and lack of water are not very relevant problems, dry summers occur more often; as a result, soil is degrading due to the droughts. Therefore, there are no doubts that Lithuania will have to pay attention to the water problems because of the changing cycles of climate.

The system of waste management is quite well developed in Lithuania. Waste is transported to the landfills and secondary raw materials are sorted, recycled and used to produce energy. National, regional organizations, private and public legal entities as well as business enterprises are involved in the system of waste management. 65 enterprises are carrying out recycling activities at this moment in Lithuania. Glass, paper, paperboard, plastic, PET, metal, wood and other types of packages are recycled. Also, a part of recycled raw materials is exported.

Not only the system of the landfills is developed in Lithuania, but also organic waste is collected in 49 civic amenity sites for biodegradable waste. Organic waste gives off a significant amount of gas; thus, it is very important that this type of waste would be collected separately and composted. Also, a different system is developed for collection of bulky waste. Attention should be paid to the fact that the system “Teršėjas moka” (Eng. “Polluter Pays”) functions. The most important feature of this system is that the costs of waste management should be covered by the primary source of waste or producer or importer of the products causing waste.

Due to the growing number of various types of waste, Zero Waste philosophy becomes more and more popular. The number of manufactures prioritizing sustainable energy and production without waste is increasing in Lithuanian. The major issue still remains plastic – under the directives of the European

¹ Komisijos tarnybų darbinis dokumentas, 2019 m. ES aplinkos nuostatų įgyvendinimo peržiūra. Šalies ataskaita – Lietuva, 2019, prieiga internete https://ec.europa.eu/environment/eir/pdf/report_Lt_Lt.pdf

² Statistikos agentūra "Eurostat", 2019, Prieiga internete <https://sputniknews.lt/society/20200328/11732025/lietuvoje-vienam-gyventojui-tenka-daugiau-atlieku-nei-estijoje-ir-latvijoje.html>



Union the biggest supermarkets should eliminate plastic totally in 2022. At this moment the single producers are trying to use less plastic. Also, Lithuania encourages citizens to use the financial support for installation of solar power plants and use solar energy. However, installation of wind turbines is not very effective due to not favorable climatic conditions. Statistical data of total consumption of different types of renewable energies shows that in 2019 wind power was mostly used – 69,4 percent, and solar power was only 0,04 percent. Also, hydro energy and ambient heat energy were used as well.

According to the data of the Lithuanian Department of Statistics⁵, the environmental expenditures of Lithuanian industrial enterprises were 220,4 million EUR in 2019 and, in comparison with 2018, it increased by 24,9 percent. The majority of these expenditures – 52,5 percent – was devoted to the protection of water resources. The most significant amount of fuel and energy is used in transport sector (40,9 percentage), and the smallest amount is used in construction sector (0,8 percentage)³.

2.2. Poland

Waste production

According to the report on environmental protection prepared by the Central Statistical Office (Główny Urząd Statystyczny), almost 127 million tonnes of waste was generated in 2019, of which 10.1% was municipal waste, i.e. household waste (12.8 million tonnes).

In 2019, there was an average of as much as 332 kg of municipal waste per one inhabitant (an increase by 7 kg compared to the previous year). At the same time, the average amount of municipal waste generated per capita in the European Union (in 2018) was 489 kg.

In 2019, municipal waste collected in Poland was directed to the following processes:

- recovery - 7.1 million tonnes (56%), including:
 - recycling - 3.2 million tons (25%)
 - thermal transformation with energy recovery - 2.7 million tons (22%),
 - biological treatment processes (composting or fermentation) - 1.2 million tonnes (9%)
- disposal - 5.7 million tonnes (44%), including:
 - by landfilling - 5.5 million tonnes (43%),
 - by incineration without energy recovery - 0.2 million tonnes (1%).

In 2019, nearly 4 million tonnes were collected selectively (31% of the total municipal waste generated), which means an increase in the amount of this waste by 10% compared to the previous year. In 2019, 115 kg per capita were selectively collected in cities, and 86 kg per capita in rural areas.

³ <https://osp.stat.gov.lt/lietuvos-aplinka-zemes-ukis-ir-energetika-2020/aplinka/islaidos-aplinkos-apsaugai>



In many places, a major problem with waste is its incineration in domestic stoves and boilers, which causes the emission of substances that are hazardous to health, like dioxins. Domestic heating appliances are not equipped with filters, and the combustion temperature is too low to allow the substances contained in them to be burned safely (as is the case in professional waste incineration plants). Despite the growing public awareness of the health risks resulting from waste incineration, the analysis of inspection data in many places shows that it is still a common practice. In addition, the number of fires at waste disposal sites has increased in recent years in Poland. There is a concern that some of them may be caused by deliberate arson in order to get rid of waste.

Water resources and consumption

Poland is classified as one of the countries with poor water resources. The average water resources in Poland amount to approx. 60 billion m³, and in the dry seasons this level may drop even below 40 billion m³. Surface water resources in Poland are characterized by high temporal and territorial variability, which results in periodic water surpluses and deficits in rivers. Retention reservoirs are characterized by a small capacity, which does not provide sufficient protection against periodic excesses or deficits of water. The result is difficulties in supplying water in some parts of the country. Especially in the south of Poland, water-intensive industry and the development of demographic processes, as well as specific geographic and hydrographic conditions cause water shortages.

In 2019, the total demand for water for industry, fishing and the operation of the water supply network in Poland was 9.3 thousand. hm³. The largest share in water consumption (approx. 68%) was for production purposes. When it comes to the water consumption rate per capita, Poland places Poland, with water consumption of 241 m³ / capita in 2019, in the middle of the rate of European Union countries.

Electricity production and consumption

Electricity production in the period January-December 2020 amounted to 152,308 GWh. Domestic consumption then exceeded production by 13,224 GWh. The structure of electricity production sources in Poland on the selected date (January 14, 2021) is presented below. It can be noted that the dominant sources are coal (hard coal 54.5%, lignite 25.6%), the combustion of which contributes to climate change, which is one of the most serious problems in today's world.

2.3. Czech Republic

The general characteristics of the waste issue in the Czech Republic clearly state that waste production is increasing every year. The total waste production in the Czech Republic in 2017 was almost 25 million tons, in 2018 there were 28 million tons of waste. Compared to the previous year, 3,4 million tons more were produced, which means 14%. Year-on-year, waste production increased, i.e. in 2019 by 9.5% to 37,78 million tons. Since 2009, this is an increase of 17.1%. In per capita terms, the total waste production in 2019 was 3 555,7 kg, which is again 296.6kg more year-on-year. The highest values fall on the Prague region and the Central Bohemian region due to the high concentration of persons. The good news is that 83.4% of waste was recovered materially, 3.2% was used for energy, 9.4% was



landfilled and 0.2% of waste was incinerated, and these values are increasing, for example compared to 2017, when it was a total the value of 84% of the recovered waste. Both changes in waste treatment technologies and greater use of waste to replace primary raw materials play a role in this. The most common ways of material recovery of waste include the use of waste on the surface of the terrain, with the exception of the use of waste in landfills and the recycling of other inorganic materials and metals. Only a small part of the total waste production is used for energy. The share of energy use of waste in total production has long been around 3%.

73% of Czech residents regularly sort waste. A total of 413 089 waste sorting containers (colored ones) are located in the Czech Republic. The distance between the locations of the colored containers is given in the value of 91 meters. Each inhabitant of the Czech Republic sorts 62,9kg of waste a year (salary, paper, glass, beverage cartons and metal).

A total of 86 964 GWh of electricity was produced in the Czech Republic in 2019. The largest part of energy, namely 47,6%, was produced in steam power plants. Nuclear power plants produced 34,8% of energy, 6,3% of steam power plants and 4,2% of gas and combustion power plants.

The average daily water consumption per person in 2019 in the capital city of Prague was 114 liters, it is 41,6m³ per year. In other regions of the Czech Republic, the consumption per person is lower.

2.4. Spain

Waste production

The data on waste production available and reliable reaches up to 2018, there are two main classifications in the statistics:

- Municipal management waste: includes the domestic part, small industry, commerce and services and excludes waste from the following group. It refers to the waste whose management is assumed by the Local Entities
- Privately managed waste: waste generated in industries, agricultural activities, construction and demolition waste.

We describe the data from the first group, municipal management waste, which is the one in which there is the greatest influence capacity of the 3R's program. The second group responds more to a set of sector regulations and business dynamics over which our ability to influence is limited. In turn, it will be easier to compare different countries since the data presented are harmonized by codes EWC (European Waste Catalog).

Regarding the production of waste per person in Spain in 2018, it was 485.9 kilos, which is 0.4% more than in the previous year, and in general there is a downward trend. As you can see, Andalusia follows the same descending pattern but the volume of waste generated is greater.

Table 1: Amount of waste from municipal competition collected in Spain, 2018



Source	EWC code (European Waste Catalogue)					Total waste generated
		Recycling	Composting	Landfilling	Incineration	
MITERD*	Mixed municipal waste	786.394	3.132.247	11.291.932	2.435.989	17.646.563
	Paper and paperboard	1.067.384	0	0	0	1.067.384
	Glass	13.884	0	0	0	13.884
	Biodegradable kitchen and restaurant waste	0	495.977	184.288	56.111	736.377
	Biodegradable waste from parks and gardens	0	161.604	102.684	9.351	273.640
	Mixed packaging	473.330	0	224.108	46.119	743.556
	Glass containers	820.880	0	0	0	820.880
Ine**	Metal waste	27.859	0	16	0	27.875
	Plastic waste	19.037	0	4.015	997	24.050
	Wood waste	118.039	0	4.316	13.799	136.153
	Textile waste	24.203	0	13.576	2.565	40.344
	Discarded equipment	53.482	0	5.251	0	58.733
	Waste batteries and accumulators	1.890	0	0	0	1.890
	Market waste Bulky waste	601.214	0	57.704	14.577	673.495
	Lands and stones of parks and gardens	0	0	0	0	0
TOTAL		4.007.596	3.789.828	11.887.890	2.579.509	22.264.824
% of the total waste by type of management		18,0	17,0	53,4	11,6	100

Source: Ministry for the ecological transition and demographic challenge and INE (National Institute of Statistics)

Electricity production

To give a clear image of the energy production structure, the following table is presented, where the sources of production, net magnitudes and their relative weight are specified. In turn, a comparison is made between a period of 5 years, which provides an idea of the trend followed by the Spanish electricity generation system.

Table 2: Sources of energy production in Spain

	2015		2020 (Provisional)		Rate of Change
	GWh	%	GWh	%	
Hydraulics	28.382,58	10,6	30.548,66	12,2	3,68
Turbinacion pumping	2.895,37	1,1	2.745,92	1,1	-2,65
Nuclear	54.661,80	20,4	55.756,80	22,2	0,99
Coal	52.616,48	19,7	5.021,99	2	-82,57
Fuel + Gas	0,02	0	0,00	0	-100
Diesel engines	3.345,07	1,3	2.399,44	1	-16,46
Gas turbine	915,77	0,3	406,57	0,2	-38,51
Steam turbine	2.222,95	0,8	1.387,61	0,6	-23,14
Combined cycle	29.027,29	10,9	44.023,81	17,5	20,53



Hydroelectric	8,21	0	19,54	0	40,84
Wind	48.117,89	18	54.878,72	21,9	6,56
Solar photovoltaic	8.243,56	3,1	15.261,68	6,1	29,86
Solar thermal	5.085,24	1,9	4.538,30	1,8	-5,68
Other renewables	3.432,59	1,3	4.477,75	1,8	13,21
Cogeneration	25.200,88	9,4	26.952,56	10,7	3,36
Non-renewable waste	2.480,11	0,9	2.014,76	0,8	-10,35
Renewable waste	818,05	0,3	725,40	0,3	-6
Total generation	267.453.849,16	100	251.159.511,94	100	

Within domestic consumption (25% of total electricity consumption) there is great variation by type of household, but on average, each household consumes 3,272 kWh per year, which represents 9 kWh per day and annual CO2 emissions of 1,300 kg.

Water consumption

The measurement of real water consumption is complex, the data provided below refer to registered water (3,188 hm³), measured in user meters. Average household water consumption in 2018 was 133 liters per inhabitant per day, 2.2% lower than in 2016, of this category of registered water, the data indicates that household water use represents the bulk of consumption, with more than 70% of total consumption.

Table 1: Volumes of water registered and distributed to users. In hm³

	2018	%	% Var. 2 Years
Households	2.271	71,2	-1,1
Economic sectors	629	19,8	-0,5
Municipal consumption	288	9	6,5
TOTAL	3188	100	-0,4

To finalize, turning waste into a resource is one key to a circular economy. But only tackling waste management doesn't solve the problem of waste production, it is needed to speak about CIRCULAR ECONOMY as a whole, and focus as well in the phases of products design, use of resources, and policies to be fostered such as stimulate innovation in recycling, create incentives to change consumer behaviour, promote better services that final products, implement digitization policies to make services more efficient and need less resources, use of renewable energies, etc.

2.5. Hungary

Waste production



According to the summary of Eurostat, each Hungarian produces approximately 379 kg (year 2019) of waste each year, which means more than 1kg each day. Although, in Hungary the amount of waste production/person shows a decreasing tendency if compared with previous yearly averages, it is still a lot and it is way below the European average which is 487 kg.

The proportion of separately collected waste within the total volume of waste increased from 19% in 2010 to 30% in 2018, while its volume (1 million 128 thousand tons) increased by 373 thousand tons in Hungary. This is mainly due to the high prevalence of the separate collection method from the households. In the case of municipal waste management, landfilling is still the least environmentally friendly method, with landfilling accounting for almost half of the amount in 2018, but the proportion of landfilling is declining from 70% in 2010. At the same time the share of waste recovered as material increased from 20% to 37% from 2010 till 2018. The share of energy utilisation (burning) of waste was 13% in 2018. The amount of municipal waste generated per capita in Hungary was 381 kilograms in 2018, which was 78% of the EU28 average.

In Hungary, the segregation of waste in the collection phase is different in each region. The most developed waste management system is in the capital, but waste segregation is present in almost the whole country. The followings are collected from each household regularly:

- blue bin- paper
- yellow bin- plastic and metal
- garden/ green waste in green waste bags
- all the rest mixed

The followings are collected in the capital from “selective-waste drop-off islands”

Yellow bin-Plastic and metal / Green bin-Coloured glass /White bin-white/transparent glass / Grey bin-metal cans / Blue bin-paper

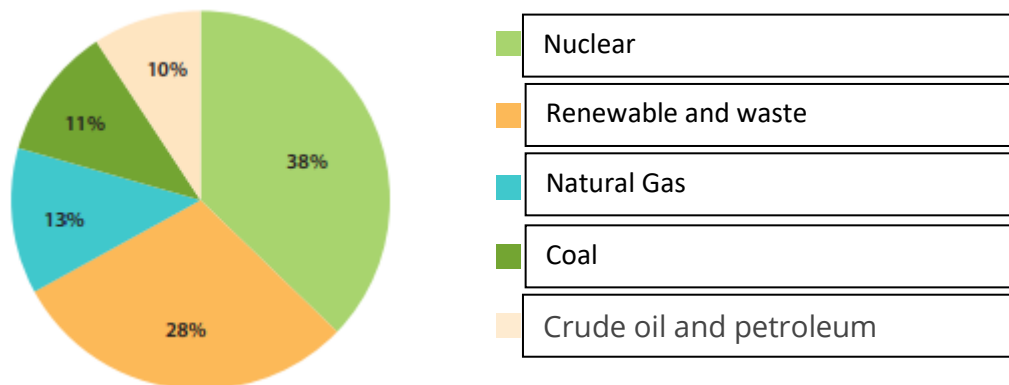
At most other cities in Hungary, the residents can collect recyclable and non-recyclable waste separately in different coloured dustbins/bags, which is then transported.

Hasardous waste and electronic waste are collected separately, regional waste companies have so-called “waste yards (hulladékudvar)” everywhere in the country, where these special types of waste can be placed. As a sign of change, some of them had started to resell usable furniture .⁴

Energy production

In 2018 Hungary produced 459,8 PJ (from which it exported 361PJ) and imported an additional 1008 PJ energy. more than the 3rd of the national energy production comes from nuclear energy (172,3 PJ), and 118,1 PJ from renewable, although most of it (90,6 PJ) is originated from biomass which is not too environment friendly.61PJ from natural gases,48PJ from coal,44PJ from crude oil and petroleum,2PJ wind 1PJ water. Most of the imported power comes from Natural gas and oil and petroleum products.

⁴ <https://www.fkf.hu/szemleletformalo-kozpontok>, <https://www.fkf.hu/letesitmenyeink-hulladekudvar>



Energy and water consumption

The yearly energy use of the country in 2018 was approximately 1118PJ.

The yearly water use per person is about 34,7 m3. the yearly overall water use was 343 million m3 in 2018.

Short description of problem

Waste management

- We consume too much(consumerism)
- Not enough locally available alternative opportunity to shop waste-free
- Lack of proper/institutional education in the topic. not part of the national curriculum
- Inefficiency of recycling
- The waste management system is a for-profit business, which means the income has to cover the expenses of the company (tax, salaries, machines, investments etc.) and has to make profit. If there is no profit on a labor process, the company just won't deal with the issue because it is not worth it from the company's perspective (as it has to keep itself up). For example: Even though plastic is collected separately and transported to the waste processing company, it will mostly just deal with PET and some bigger pieces of plastic(profitable), because small pieces and certain types of plastic makes no profit if the invested energy and worktime of a person is calculated. And because of this, most of the selectively collected plastic eventually goes to landfill.
- At the same time in Hungary a state maximized price is in place for waste collection, which causes several waste companies to go bankrupt or not able to cover all duties at a required quality.
- neglecton of some environmentally friendly/renewable energy sources: eg. the installation of new wind turbines is prohibited now in Hungary, that was put in place without a proper reasoning several years ago.

3. Zero-waste and less-waste experiences in partner countries



3.1. Lithuania

According to the data of Eurostat, in 2018 approximately 2 percent of GDP was paid as environmental taxes in Lithuania and the majority of these taxes – approximately 1,8 percent – was taxes on energy. The following countries pay less environmental taxes than Lithuania: Spain, Germany, Luxemburg and Ireland. Landfill taxes applied in Lithuania are among the lowest in the European Union. In 2019 the tax rate remains 5 EUR per ton and it should increase up to 27,5 EUR per ton until 2020 and this tax should be composed of fixed and variable parts⁵.

Long and medium term programs for strategic planning promoting “Zero Waste” idea are approved in Lithuania. The National Waste Management Plan regulates the implementation of household, production and other types of waste management principles on national level, on regional level – regional waste management plans, on municipal level – municipal waste management plans and municipal waste management rules. The main Lithuanian national documents and strategic goals of documents related to the implementation of “Zero Waste” idea are presented below.

Documents of long term strategic planning:

- National environmental protection strategy. The National environmental protection strategy up to 2030 approved by Seimas of the Republic of Lithuania in 2015 highlights the four long-term priority areas of the environmental protection policy: sustainable use of natural resources and waster management, improvement of the quality of the environment, maintenance of ecosystem stability, climate change mitigation and adaptation.⁶
- National strategy for sustainable development have been prepared and approved by Government of the Republic of Lithuania in 2003. Lithuania has set up itself a long-term priority: to reach the current average of the European Union member states by 2020, according to the economic and social indices as well as the indicators of population health and the efficiency of consumption of natural resources, also ensuring a clean and healthy environment. The updated National Strategy for Sustainable Development maintained the same goal, but more firmly emphasized the importance of science, innovation, social responsibility of the private sector, and broader public involvement. The priorities and objectives of the Strategy were developed following the national interests, the strategic documents adopted, as well as the provisions of the Strategy for Sustainable Development of the United Nations and that of the EU, as updated in 2006.⁷

Documents of medium term strategic planning:

The National Waste Prevention Programme is closest to the implementation of “Zero Waste” idea. The following aims of the National Waste Prevention Programme for 2014–2020 are presented:

⁵ Komisijos tarnybų darbinis dokumentas, 2019 m. ES aplinkos nuostatų įgyvendinimo peržiūra. Šalies ataskaita – Lietuva, 2019, prieiga internete https://ec.europa.eu/environment/eir/pdf/report_Lt_Lt.pdf

⁶<https://am.lrv.lt/uploads/am/documents/files/Strateginis%20planavimas/Ataskaitos/NAAS%20leidinys%20EN.pdf>

⁷ <https://am.lrv.lt/lt/veiklos-sritys-1/es-ir-tarptautinis-bendradarbiavimas/darnus-vystymasis/darnus-vystymasis-ir-lietuva/nacionaline-darnaus-vystymosi-politika>



- to achieve, in a growing economy, a slower rate of waste generation from the manufacturing, construction and other services, and to ensure that the amount of waste generated does not exceed the average for EU Member States. Objectives: (1) to promote prevention in manufacturing and other sectors, (2) to increase the efficiency of use of materials and resources, (3) to improve the qualifications of employees in waste prevention in businesses, farms, agricultural enterprises and controlling authorities.
- to achieve, along with consumption growth, a slower increase of municipal waste, including packaging, waste electrical and electronic equipment and biodegradable waste and that the amount of municipal waste generated does not exceed the average of the EU Member States. Objectives: (1) to improve waste management legislation establishing requirements relating to the municipal waste prevention and reuse (2) to promote sustainable consumption, (3) to promote the reuse of products and preparation for reuse operations (4) to increase public awareness and improve the qualifications of municipal staff in waste prevention⁸.

3.2. Poland

The Polish government has been involved in promoting zero-waste ideas and implementing methods to combat waste. These methods are further detailed in the Polish “National Waste Management Plan 2022”. The plan discusses the current state of waste management in Poland and describes the different types of waste typically processed (falling under the categories of waste, hazardous waste, and biodegradable materials). As well, it provides a prediction of the various changes to be expected in waste management in the forthcoming years and then explicates the various steps that may be taken to prevent the creation of more waste and negate its adverse and harmful effects on the environment. The plan also describes how its implementation and usage may be monitored to ensure proper fulfillment. The “National Waste Management Plan 2022 “ is not a guarantee of a zero-waste future. However, it is an example of the steps being taken to facilitate the creation of such an existence and offers the potential for a zero-waste lifestyle to be fostered.

National regulations in the field of waste management define, inter alia, the method of selective collection of their selected fractions. The Uniform Waste Segregation System (Jednolity System Segregacji Odpadów) has been implemented since July 2017. Additionally, in order to reduce the consumption of plastic bags, which according to estimates were used in Poland as much as 11 billion per year, an additional fee was introduced on their sale.

Waste segregation - regulations

The detailed method of waste segregation in Poland is specified in the Regulation of the Minister of the Environment of 29 December 2016 on the detailed method of selective collection of selected waste fractions (Rozporządzenie Ministra Środowiska z dnia 29 grudnia 2016 r. w sprawie szczegółowego sposobu selektywnego zbierania wybranych frakcji odpadów) (Journal of Laws of 2017, item 19). From July 1, 2017 the Uniform Waste Segregation System applicable throughout the country is being

⁸ <https://www.e-tar.lt/portal/legalAct.html?documentId=e669ecd07ea611e4bc68a1493830b8b9>



implemented. Since then, municipal waste has been collected broken down into four main fractions and mixed waste: PAPER (blue), METALS AND PLASTICS (yellow), GLASS (green *), BIO (brown).

* If the fraction is broken down into colorless and colored glass, the following division is used: clear glass (white), colored glass (green)

Additional fee for plastic bags

It is estimated that as many as 11 billion plastic bags are used annually in Poland, i.e. from 250 to 300 bags per inhabitant. From January 1, 2018, an amendment to the act on the management of packaging and packaging waste and some other acts was in force, which introduced a recycling fee for each disposable plastic bag up to a thickness of 50 micrometers issued at the checkout, except for the very light bags (less than 15 micrometers). Later, the regulations were changed and now, from September 1, 2019, all plastic bags issued in stores, except for the very light bags, must be paid, also for bags with a thickness of over 50 micrometers. The recycling fee is PLN 0.20 per bag plus VAT, unless the seller is exempt from tax on goods and services.

3.3. Czech Republic

Currently, there is no legal framework in the Czech legislation that would regulate the issue of zero waste or minimize waste. In the Czech Republic, we can now speak only of interest groups that are not governed by law but are groups with different approaches, but the same goal, which is mainly zero waste and other activities that protect nature and the overall approach to a clean and healthy environment.

Recently we see a boom in new stores that are defined as "unpackaged". These are stores where the customer buys in their containers, which has already been approved by the Czech Hygiene, so this method of purchase can now be considered standard. In 2019, some supermarkets undertook to sell food unpackaged, which can be considered key from a zerowaste point of view, as supermarkets are at the top of the waste production point of view. The Albert chain, which is testing non-packaging sales of organic food in Nové Butovice, Prague, has been fully involved in this call. From October 2019, various types of legumes, cereals, dried fruits and nuts can be found in the shoppers.

Kaufland now has endless bags for buying fruit and vegetables. It can be purchased directly at the store for 30 CZK. Its weight can be deducted when weighing the goods and even has a special label for finding labels. Slightly different, but with the same function, these bags are offered by Penny Market and Globus. E-shops (kosik.cz, rohlik.cz) are not behind with these innovations and offer purchase in returnable packaging. Here is also a novelty with a backup PET bottle from the Mattoni company. Shopping without packaging is also supported by drugstores, ie Rossmann and DM too. In several Rossmann stores, the customer can "pour" washing gels, shampoos and soaps like at a gas station. DM currently offers to pump products from the Czech company Yellow & Blue.

The Lidl supermarket has also expanded its offer with a vending machine, where customers can buy coffee in their own mug or container.



3.4. Spain

In recent years, a huge number of laws and regulations directly related to the circular economy and in particular to waste management have been enacted, along with plans and strategies aimed at achieving it.

This issue is very complex due to several factors; the transposition into Spanish law of European directives has given rise to many legal texts, especially considering that the Spanish regulations on waste are made up of:

- Basic state legislation
- The legislative developments approved by the autonomous communities and,
- The regulatory authority of the municipalities for the development of regulations on this matter.

We, therefore, describe the regulations at the national, Andalusian regional level, and those provincial regulations that guide the regulatory developments of the municipalities.

We have taken into account both current regulations and those that are being drawn up and, although it is not approved, it is close to doing so, precisely because this regulation is the one that covers the issue of zero waste and circular economy in detail. Those aspects more related to issues that affect the citizen and not so much the productive sphere will be highlighted.

At the same time, we must not forget the certifications, figures that create incentives for the search for zero waste; in particular, we highlight the Waste zero Certification of the AENOR agency, an entity dedicated to the development of standardization and certification in all industrial sectors and services, in line with ISO standards.

A. National regulations, plans and strategies:

1. Law 22/2011, of July 28, on waste and contaminated soils
2. State Waste Management Framework Plan 2016-2022 (PEMAR).
3. Royal Decree 293/2018, of May 18, on reducing the consumption of plastic bags and creating the Register of Producers
4. Royal Decree 646/2020, of July 7, regulates the disposal of waste by depositing it in a landfill
5. Circular Economy Strategy of Spain. June 2020.
6. Law on Waste and Contaminated Soils (In the approval phase, preliminary draft)
7. Draft Royal Decree on Containers and Container Waste (In draft for approval)

B. Regulations, plans and strategies at the Andalusian regional government level:

1. Andalusian Strategy for Sustainable Development 2030. June 5, 2018
2. Andalusian Circular Bioeconomy Strategy. September 18, 2018
3. Law on Measures Against Climate Change: Law 8/2018, October 8
4. Comprehensive Waste Plan for Andalusia. Towards a circular economy in Horizon 2030. (Draft Decree in the approval phase)
5. Andalusia Circular Economy Law (LECA) (In approval phase)

C. Regulations, plans and strategies at the provincial level:

The responsibilities of municipalities in waste management are determined by:



- State laws (Law 22/2011, on waste)
- The legislative developments of the autonomous communities (Law of waste and contaminated soils, and the waste regulation of Andalusia, together with what is indicated in the Local Regime Basis Regulation),
- The specific regulations according to the types of waste.

3.5. Hungary

As a major impact in Hungary, the EU legislation has the greatest impact on waste regulation. EU legislation applies for Hungary as well (e.g. the Waste Framework Directive⁹), with municipal waste recycling target percentages (2020: 50%, 2025: 55%, 2030 60%, 2035 65%), but Hungary did not comply with the 50% target for 2020 amongst other European countries.¹⁰

According to another EU target, by 2030 the EU market for all plastic packaging should be recyclable, reduce the use of disposable plastics and the deliberate use of microplastics will be restricted.¹¹

The Circular Economy Action Plan emphasizes the need to move towards a life-cycle-driven 'circular' economy, reusing resources as much as possible and bringing residual waste close to zero. Hungary had started to prepare a national circular economy action plan in 2019, though it is not announced yet.

National legislation had a major step in 2020 that exceeded the EU regulation: A law to eliminate plastic pollution was enacted in July, 2020 in Hungary. This law also extends to plastic bags: it partially prohibits and strictly taxes them. The legislation is phasing out single-use plastics, banning a number of single-use plastic products and packaging from 1 July 2021, as required by EU law. On top of that as a success of a Greenpeace Hungary campaign¹², (supported by a quarter of a million people), Hungarian legislation also includes restrictions on the use of plastic bags that are exceeding the EU regulation.

Special taxes:

Landfill fee/tax (for waste): Hungary has a landfill tax increased from EUR 10/t (2013) to EUR 20/t (2014) and it remained at that level since then. It is questionable if the current fee can drive the necessary change, it does not have a strong incentive role at the present level.

Environmental Product Charge: the Environmental Product Award Act (from 2011) had put product charges on certain products (battery; packaging; other petroleum products; electrical and electronic equipment; vehicle tires; advertising paper; other plastic products; other chemical products; office paper). An environmental product fee must be paid for the packaging of products and the above listed ecologically harmful products delivered to the territory of Hungary or generated in Hungary. The amount of the product charge shall be determined on the basis of the weight of the part subject to the product charge. The yearly revenue is about 220 million Euro (2018), the level of the fees is moderately

⁹ <https://eur-lex.europa.eu/legal-content/HU/TXT/?uri=celex:32008L0098>

¹⁰ <https://kafkadesk.org/2019/01/11/poland-hungary-and-slovakia-among-europes-worst-recyclers/>

¹¹ <https://eur-lex.europa.eu/legal-content/HU/TXT/?uri=COM%3A2018%3A28%3AFIN>

¹² <https://www.greenpeace.org/hungary/sajtokozlemeny/7199/az-also-nagy-lepes-itthon-az-eldobhatomentes-vilag-fele/>



incentive and places a big administrative burden on all companies involved because of the strict procedure.

Programs, campaigns:

Though Hungary does not have a national program or campaign to zero-waste and less-waste ideas, from time to time such campaigns do happen partly as an EU campaign (e.g. European Week for Waste Reduction¹³, ¹⁴), or as a part of a world campaign like Plastic Free July.¹⁵

Beside these big campaigns, local and national organizations or schools, kindergartens have several actions throughout the year on waste reduction. Teachers and kindergarten teachers are eagerly conducting the new generations towards a less-waste lifestyle.

There is a national campaign in every spring to collect the litter from the streets and from nature, where volunteers do a great clean up on a weekend around their surroundings. It is a campaign for years now, and successful: tonnes of litters are collected each year from the streets, parks and nature areas. (TeSzedd ¹⁶ Hulladékszedési Hétfége - You Pick up the Garbage Weekend).

¹³ <https://ewwr.eu/>

¹⁴ <https://hulladekcsokkentesihet2019.hu/>, <https://hulladekcsokkentesihet2020.hu/>

¹⁵ <https://www.plasticfreejuly.org/>

¹⁶ <https://www.mme.hu/ujabb-siker-es-reszvetel-teszedd-onkentesen-tiszta-magyarorszagert-program-budapesti-helyszinein>

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4. Saving water and energy experiences in partner countries

4.1.Lithuania

At this moment intensive liberalization of the electricity market is taking place in Lithuania. Under legal acts of the European Union commercial consumers have bought electricity from independent suppliers since 2013. From 2021 all electricity consumers will gradually start buying electricity from the independent suppliers.

In May, 2020 the Seimas agreed on amendments of the Law on Energy and Lithuania joined the majority of member states of the European Union, where domestic electrical consumers have to choose the independent supplier. Up to now the price of electricity was determined by the National Energy Regulatory Council. However, in order to avoid shock caused by this change, this programme is implemented in three stages.

- By 10th December, 2020 all domestic consumers consuming more than 5000 kWh per year were obliged to choose the independent electricity supplier;
- By 10th December, 2021 all domestic consumers consuming more than 1000 kWh per year are obliged to choose the independent electricity supplier;
- By 10th December, 2022 all remaining part of consumers will have to choose the independent electricity supplier¹⁷.

According to the data of July, 2020, the following suppliers formed the electricity market: UAB Elektrum Lietuva, UAB Enefit, UAB Ignitis, UAB Inregnum, UAB "Perlas Energija", UAB "EGTO" energija, Birštono Elektra MB, Vilniaus elektra.

In addition to liberalization of the electricity market, awareness of consumers is raised to consume electricity in a sustainable manner in Lithuania. Lithuanian Energijos skirstymo operatorius (Eng. Operator of Energy Distribution) presents the following advices while implementing public communication campaigns and educating general consumers:

- In order to lighten home more, it is recommended to use as much as possible daylight and to turn off all unnecessary light sources when leaving room;
- It is recommended to unplug all unused electronic appliances, because appliances on standby mode use energy as well;
- Use energy saving modes in computers, mobile phones and other appliances when it is possible;
- Do full loads of laundry and use economic washing programme;
- Especially more attention should be paid while preparing food in the kitchen – turn on appliances only when it is necessary, save water and detergents. Also, optimal parameters should be determined in appliances¹⁸.

¹⁷ <https://www.vert.lt/Puslapiai/bendra/Elektros-energijos-tiekimas.aspx>

¹⁸ <https://ignitis.lt/lt/9-patarimai-kaip-taupyti-energija-daug-laiko-praleidziant-namuose>



As electricity suppliers state, every step of consumer contributes to electricity saving and, consequently, it is related to nature preservation and smaller resources of electricity production.

4.2. Poland

Poland's approach to water conservation is magnified by the struggles with drought some areas within the country experience. A pricing system for water consumption will be implemented to encourage consumer conservation of water resources, as well as the reuse of water. This system is addressed to all water clients, especially factories, private consumers, and farms. A massive update of the national water infrastructure was conducted from 2017 to 2020 in order to modernize water filtration, monitoring, and testing equipment. Water filtration is especially vital in Poland, as the need to reuse and conserve water has been spurred by the ongoing struggle with water scarcity. Industrial and manufacturing processes especially use considerable amounts of water annually. To combat this, water tariffs under the pricing system have been increased as a means of compelling industries to develop efficient methods of conservation and usage.

Selected national programs related to the support of water and energy saving are presented below.

“My Electricity” program - support for the development of prosumer energy

The My Electricity program is an instrument dedicated to supporting the development of prosumer energy, specifically the segment of photovoltaic micro-installations¹⁹. Program beneficiaries may be people generating electricity for their own needs, who have concluded a comprehensive agreement regulating issues related to the introduction of electricity generated in micro-installations to the grid. You can receive a grant in the form of a subsidy up to 50% of the eligible costs of the micro-installation included in the project, but not more than PLN 5,000. PLN for one project. Currently, the first two applications for the program have been completed.

„My Water” program - protection of water resources

The My Water program aims to protect water resources by increasing the retention on the property next to single-family houses and the use of accumulated rainwater and meltwater, including through the development of green and blue infrastructure. The eligible costs of the Program include, inter alia, the purchase, assembly, construction, commissioning of such installations as: - drainage pipes for rainwater collected from gutters, inlets to an overground reservoir; underground, open or closed, sealed or infiltration; - drainage installation, aboveground, underground, open or closed, leakproof or infiltration reservoir; - elements for irrigation or other use of the retained water; allowing for the management of rainwater or snowmelt on the property covered by the project.

Clean Air Program - improving the energy efficiency of buildings and reducing emissions

¹⁹ <https://mojprad.gov.pl/informacje-szczeg%C3%B3w%C5%82owe-o-programie-m%C3%B3j-pr%C4%85d/>



The Clean Air Program aims to improve air quality and reduce greenhouse gas emissions by replacing heat sources and improving the energy efficiency of single-family residential buildings²⁰. The goal is achieved by co-financing the replacement of old and ineffective heat sources with solid fuel with modern heat sources that meet the highest standards, and by carrying out the necessary thermo-modernization works on the building. The subsidy may be up to PLN 30,000 for the basic grant level and PLN 37,000 for the increased grant level.

4.3. Czech Republic

The Czech Republic's approach to saving water is motivated from the point of view of combating the drought that the state has been struggling with for a long time. The Czech Republic is one of the European countries with the most endangered water shortages, where the price of water is 94 CZK/m³. In 2021, the Ministry of the Environment would like to introduce an amendment to the Water Act and relevant decrees within the framework of building law, the obligation for new buildings to accumulate rainwater or soak it up (retention tanks). At the same time, the budget should be increased by 2,5 billion CZK for water management structures and landscaping. Currently, the water deficit in the soil is set at 1000 liters per square meter. Last year, the Ministry of Agriculture spent 13,7 billion CZK on measures against drought. For example, it supported the restoration of 387 ponds for 1,25 billion CZK, thus creating a storage space of 2,5 million cubic meters of water. In some regions, cumulatively for the last 6 years, more than the annual total precipitation is missing, and nationwide, 60% of the annual total precipitation is missing on average. This is not only due to the decreasing amount of precipitation, but also due to the higher average temperature, and therefore higher evaporation and longer growing season. At present, 80% of underground wells are in a state of mild to extreme drought, mainly due to the accumulation of the deficit in the last 6 years and extremely little snow in the past winter.

The general legislative framework in the Czech Republic does not yet exist. The fundamental vision for water saving is the recycling of greywater, i.e. used water flowing from washbasins, washing machines, bathtubs, showers, sinks, etc. This recycled "gray" water (especially from bathrooms) can be used as process water after treatment, ie white as for example for flushing toilets, urinals or watering gardens. Gray water can generally be compared to well water. Recycling gray water can reduce the demand for external water supply by even more than 40%. The population of the Czech Republic living in family time produces 55-112 l of gray water per day. Depending on the type of house, the nature of the consumer, his habits or regional influences, 40-70% of the water can be reused from this amount. 75% of gray water comes from showers and baths, 15% from washers and dryers and 10% from washbasins.

Table No.1, Gray water sources (per person)

average shower time (min)	8
water flow (liter / min)	10
shower (average number per day)	1,25

²⁰ <http://czystepowietrze.gov.pl/wez-dofinansowanie/>



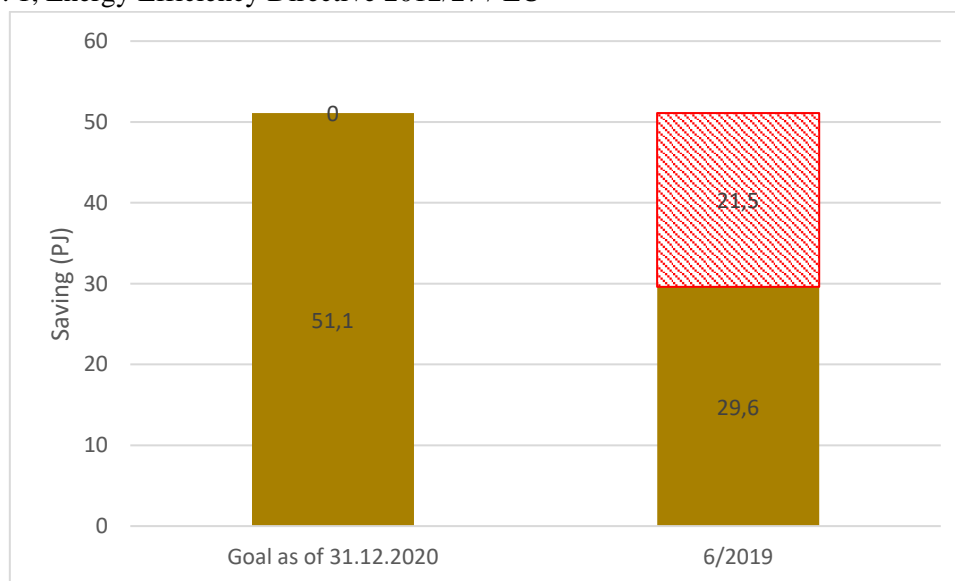
use of washbasin (1 person / day)	3
washing (liter / washing dose)	57
washing (dose / person / day)	0,33
total shower flow (liter / day)	95
total amount from washbasins (liter / day)	11
total amount from washing (liter / day)	18,5
total water consumption (liter / day)	125

source: <https://www.vodavdome.cz/recyklace-sede-vody-nevyuzity-zdroj-uvnitř-budovy/>

The current (average) price of 1 kWh of electricity in the Czech Republic is 4,08 CZK. The general principle of energy saving clearly states to use LED bulbs or fluorescent lamps, which consume up to 7 times less energy than conventional light bulbs. With regard to appliances (refrigerator, washing machine, mouse, dryer) it is necessary to follow the marking A +++.

The Energy Efficiency Directive 2012/27 / EU of 2012 states that the states of the European Union have an obligation to achieve new energy savings, which the Czech Republic is failing to do. The current analysis of the fulfillment of the commitment says that 29.6 PJ of new energy savings were achieved in the period 2014-2018. In the period 2014-2018, the Czech Republic thus achieved 70 PJ of accumulated energy savings. By the end of 2020, the Czech Republic was to achieve a total of 51.1 PJ of new savings and 204.39 PJ of accumulated savings. It is thus clear that the Czech Republic has not achieved its goal.

Graph No. 1, Energy Efficiency Directive 2012/27 / EU



source: <https://oenergetice.cz/uspor-y-energie/cr-stale-prehlizi-energeticke-uspor-y-cil-novych-uspor-rok-2020-jistotou-nesplni>

4.4. Spain



In Spain there has been placed different and abundant legislation related to sustainable energy promotion, mainly based in positive regulation of renewable energies and energy efficient technologies, and bases in public subsidies to different collectives related to promotion of these solutions.

The legislation is wide to be explained in the current document, but the main current strategies approved at national level are the following ones:

- Spain's National Energy and Climate Plan for 2021-2030:
 - https://ec.europa.eu/energy/sites/ener/files/documents/es_final_necp_main_en.pdf
- Spanish's 2050 long term strategy:
 - https://ec.europa.eu/clima/policies/strategies/2050_es
 - https://ec.europa.eu/clima/policies/strategies/2050_en

In those documents, all main objectives related to sustainable energy are fixed for the coming years to 2030 and 2050.

About the experiences in Spain, the country is one of the leaders at global level in most of the main renewable energy sources, solar and wind mainly. There are experiences at local level in municipalities, as well as big power plants of energy utilities. But if we speak about possibilities at citizen level, there is a compendium of actions that can be taken into account, with a lot of guidelines at different level.

To suggest two of the main ones we put here the following sources:

- Energy Neighbourhoods Project guidelines:

<https://ec.europa.eu/energy/intelligent/projects/en/projects/en2>

- Citizen guide promoted at national level by the national responsible institution:

https://www.idae.es/uploads/documentos/documentos_11406_Guia_Practica_Energia_3ed_A2010_50_9f8287.pdf (In Spanish)

Speaking about special taxes and or electricity rates, at the moment there are few instruments related to green fiscality in our country, with some few possibilities to implement bonification in taxes by local administrations in minor taxes, as well as a specific electrical rate in the night to shift the electricity consumption from day to night to promote electromobility.

If we speak about water savings, there is no specific rate related to water consumption at national level, neither specific bonification in taxes for less water use. The policies implemented go mainly in the direction of promotion of a responsible use of water, and the use of water efficient techniques in all sectors.

4.5. Hungary

Water saving



There is no legislation in place with the aim of water saving in Hungary. The only economic incentive is the price of water (and sewage) that is quite high in certain parts of the country, unfortunately in remote, rural areas mainly. This serves as a good incentive, people are trying to limit their water consumption not to pay a high bill for the water and wastewater.

There is one fee for water use (beside the service fee), the water supply contribution/fee, that is in place for non-household users. The water users are obliged to pay a water supply contribution for the amount of water actually used, but there are a large number of exemptions that are not obliged to pay this fee, eg. agriculture in drought does not pay this fee. This fee does not really serve as an incentive, the rate is too low and the exemptions are too broad.

Energy taxation is in place for fuels (petrol, diesel, etc.) as in every European country, the amount is similar to the neighboring countries, but since the price elasticity of fuels are very low, high fuel taxes/prices unfortunately do not serve as a good incentive for limiting their use.

There is an energy tax in Hungary for non-residential energy users, but with a very low rate. The tax is based on the quantity of energy product, some examples of the amounts: on coal 7 euro/1000 kg, on electricity 0,9 euro/ megawatt hour. To our view, this tax is also rather generating administration than supporting energy saving.

There is no direct legislation on saving energy (beside the taxes above), but there are indirect state-financed possibilities in Hungary: EU/Hungarian State financed programs/applications for improving thermal insulation of buildings, installing solar panels, and the proportion of the subsidy can go up to 100%. Another example is the interest free loan on solar panel installation at the households, this is quite widespread, a lot of houses have solar panels on the roofs. As a different but also effective way of saving energy is the improving building standards on energy efficiency (insulation): for newly built houses, offices or institutions in Hungary from 1st January, 2021 the building permit can only be obtained by a building that reaches almost zero level of energy consumption, around the energy use of a passive house.²¹

Green electricity: some of the Hungarian electricity suppliers offer green electricity from renewable sources to its large corporate customers. The involved companies receive a “GreenOrigin/ Zölderedet” certificate issued on the basis of EU standards, with which large consumers can prove that the amount of electricity they use comes in part or in whole from renewable sources.²²

Electric cars are also becoming more common in Hungary, some of the car-sharing companies operate only electric cars.

There are preferential electricity tariffs amongst residential electricity services. Tariff H and Geo are two of the available electricity tariffs. These were set up to ease the operation of heat pumps and heating systems based on renewable energy sources (eg. thermal heating or air-water/water-water heat pumps) by offering a reduced rate for this use. These special tariffs were established in a regulation in 2010 and has since been available within the framework of universal electricity supply.²³

²¹ <https://www.austrotherm.hu/tudastar/szabvanyok-es-rendeletek/az-uj-epueletenergetikai-rendeletrol>

²² <https://elmuemasz.hu/versenyiaci-szolgaltatas/szolgaltatasok/villamos-energia/aramszolgaltatasi-termekek/zold-partner-program>

²³ <https://www.eon.hu/hu/blog/otthon-kenyelme/minden-amit-tudni-akarsz-H-tarifa-kapcsan.html>

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5. Brief description of significant case studies in partner countries

5.1.Lithuania

System of reverse vending machines. This system started operating in Lithuania in 2016 and the oldest traditions of this system are in such countries as Iceland, Sweden, Finland, Norway. The main principle is that the consumer returns the packaging and receives a refund; thus, the interest to collect and return packaging is huge in Lithuania. According to the data of 2021, the cost of packaging is 10 euro cent so far. The system of reverse vending machines has rapidly expanded and now it is possible to return packaging in almost all supermarkets²⁴.

Earth Hour. Every year Lithuania joins a worldwide movement called “Earth Hour”. This event is held every year on the 28th-29th of March. The aim of this movement is to encourage people and various organizations to turn off non-essential electric lights for one hour. The main goal of this event is to reduce pollution for a little while and attract the attention of communities, countries, politicians to the ecological problems.

How detectives of Ignitis solved the riddle of energy saving. This educational children's book is prepared by energy company “Ignitis”. Two detectives – Sherlock Hertz and Dr. Watt – in a simple and funny manner solve riddles regarding energy saving. The book is available on the internet to all children in Lithuania²⁵.

“Kūrybos kampas 360°“ – is one of Lithuanian organizations, which has a social mission to show how used things can be brought to the second life. Also, it became quite a famous event, which had attracted attention of Lithuanian media, after the tour through Lithuania “Už švarią Lietuvą (Eng. For Clean Lithuania)”. More than 200 volunteers joined this tour around Lithuania and 1 tone 33 kilogram of waste was collected²⁶.

Campaign “Darom (Eng. Let’s Do It)”. National campaign in Lithuania was organized for the first time in 2008. At the beginning this campaign implemented the social mission to collect as much waste as possible during the national event. Enterprises, public initiatives, individual persons joined this event and the amount of collected waste from public areas was growing each year. The campaign became a part of business social responsibility when employees were allowed to clean chosen public area during working time²⁷.

Žiedinė ekonomika (Eng. Circular Economy). Žiedinė ekonomika VŠĮ was developed in order to encourage production without waste as well as to promote the principles of circular economy and

²⁴ <https://grazintiverta.lt/>

²⁵ <https://www.ignitisgrupe.lt/lt/i-energijos-taupymo-kelione-vaikus-kviecia-leistis-ignitis-detektyvu-knygele>

²⁶ <https://www.15min.lt/pasaulis-kiseneje/naujiena/per-lietuva/finisavo-zygis-uz-svaria-lietuva-surinktos-siuksles-bus-pristatytos-menineje-instaliacijoje-vartojimo-delione-642-1401906>

²⁷ <https://www.mesdarom.lt/>



interinstitutional cooperation. Also, it encourages various business enterprises to move to the circular economy business model and raise public awareness regarding the Zero Waste philosophy²⁸.

5.2. Poland

"Anti-smog house" from Zakopane

Podhale, which is one of the regions most visited by tourists in Poland, especially in winter, is also facing a huge problem of air pollution. In Zakopane, the largest town in the immediate vicinity of the Tatra Mountains, in 2019 the average annual concentration of benzo (a) pyrene was 6 ng / m³, which is as much as 600% of the norm.

Willing to change the local situation, an environmental engineer from Zakopane and an employee of the Tatra National Park built an "anti-smog house" in Zakopane, which, as he claims, is energy self-sufficient from spring to autumn. Building heating is based on an air-to-air heat pump powered by photovoltaic panels placed on the roof. Additionally, air pollutants from outside do not get inside because the air entering the building is carefully filtered. Only heat pumps provide heating for the house in winter, cooling in summer, and the preparation of hot water. They provide enough energy that electric heaters are only installed in the event of emergencies or extremely low temperatures. The heat is recovered by a recuperator before the used air leaves the building. It is similar with the heat from sewage - when using a shower, the recuperator recovers thermal energy before the sewage flows into the sewage system. Apart from the environmental aspect, the investment also turned out to be profitable in economic terms, as the annual cost of bills does not exceed PLN 800.

"Polskie Stowarzyszenie Zero Waste" (Polish Zero Waste Association)

"Polskie Stowarzyszenie Zero Waste" is a group dedicated to promoting the zero-waste movement in Poland. It works to eliminate waste from the very first step by preventing its generation and educating society as to how it can be more zero-waste in practice. The Association promotes the zero-waste lifestyle through education and public awareness. These efforts educate the Polish public and facilitate understanding and usage of the necessary tools for people to begin living their own zero-waste lifestyles. In this way, the association advocates for the individual by encouraging habits that will not only protect the environment, but also human health as the release of harmful chemicals in the environment through waste disposal is prevented. The Association also goes beyond Poland and looks to prevent waste generation that is connected with international trade. The Association's activities encourage the construction of a strong connection between the individual and the environment and encourage Polish citizens to develop beliefs and attitudes of concern for the environment's protection and zero waste.

5.3. Czech Republic

²⁸ <https://am.lrv.lt/lt/veiklos-sritys-1/es-ir-tarptautinis-bendradarbiavimas/darnus-vystymasis/darnus-vystymasis-ir-lietuva/nacionaline-darnaus-vystymosi-politika>



“Bezobalu” is a non-profit organization in the Czech Republic that researches and develops ways to prevent waste as effectively as possible. It spreads the idea of zerowaste to the general public and at the same time operates three packaging-free stores in the capital of the Czech Republic, Prague (Hradčanská, Radhošťská, Florenc). The organization focuses on three main activities:

- inspires: seeks solutions and offers people ways to change their thinking and habits. It spreads the concept of learning through the media, lectures, social events in schools. The organization itself organizes its own awareness-raising events, workshops or conferences,
- sells: the organization operates a total of 3 without packaging stores, where you can buy products in its own, reusable containers. In this way, it tries to prevent the generation of unnecessary waste, especially from disposable packaging, and at the same time tries to “educate” suppliers for more responsible distribution. Profit from sales is used for own non-profit activities,
- disseminate: efforts to establish cooperation with foreign zerowaste stores, communication with Czech supervisory authorities and development of methods for the local market. The organization also provides training, thanks to which it tries to pass on know-how to people interested in opening a similar business with the aim of zerowaste in the Czech Republic.

The organization has several visions:

- the worldview is based on a responsible approach to oneself, society, and the environment,
- through their actions they promote the careful use of natural resources and the sustainable way of living on the planet,
- strengthen the provision of genuine and truthful information through open communication,
- efforts to promote justice associated with accepting responsibility for the negative effects of economic activity,
- through their actions, they want to encourage civil society to take action.

source: <https://bezobalu.org/>

5.4. Spain

There are a large number of experiences or good practices in this regard, but we are going to focus on several actions of a different nature and belonging to the province of Granada, two of which are managed by the same Provincial Council.

1. Biofactoría Sur

<http://www.fundacionaguagranada.es/visitas-organizadas/visita-a-las-edars-estaciones-de-depuracion-de-aguas-residuales/>

We consider that an example to show is the South Granada Biofactory, a water management factory for part of the metropolitan area that has become a benchmark in Europe for the circular economy in the sector. It is an example of how to go from being mere water managers to becoming strategic partners in promoting sustainable development, changing the old paradigm of treatment plants for the benefit of the



environment. The objectives are the search for energy self-sufficiency, zero waste and the reuse of 100% of the treated water. Its roadmap for 2020 is 'Zero energy, zero waste'. An ambitious challenge that is being achieved, as indicated by the results, reaching its best peak of 122% energy self-sufficiency, and with an annual average above 100%.

2. Ecocentral Granada (Alhendín)

http://www.resurgranada.es/cma_loma_manzanares.php

The Granada Ecocentral has its origin in the automation and expansion of the old Loma de Manzanares recovery and composting plant. This waste management complex is made up of the following facilities:

- A mechanical-biological treatment plant that is characterized by being a hybrid plant, since the flow of the organic-resid fraction and packaging is processed in different work shifts.
- A leachate treatment plant to minimize the negative effects of said waste in an efficient and sustainable way
- A reject dump
- An environmental classroom: Isla Verde environmental classroom

In 2019, a biogas plant was incorporated into this complex that allows the degassing of the landfill and the use of said gas to generate electricity, generating electricity through two motors capable of offering up to 8,500 megawatt hours. In such a way that it self-supplies the own demand of the treatment plant and generates a surplus that is sold, which together allows a very large economic saving in waste management.

3. Provincial composting activity

<https://www.compostajegranada.es/>

In line with the philosophy of rational management of urban waste from home sources and the need to reverse the waste management pyramid, the Provincial Council has been adopting a series of programs to reduce the amount of biodegradable waste that is deposited in landfill, and one of them is the promotion of municipal decentralized composting initiatives.

It is a program in which a large number of municipalities participate and that adopts different modalities, providing support to those municipalities of the province that wish to implement experiences of this type on a small scale and in different modalities: at the domestic level, in urbanizations, neighborhoods, schools. It consists of different activities that are being implemented to advance in the fulfillment of a series of objectives associated with the promotion of the circular economy at a local scale:

- Prevent and reduce the organic fraction of urban solid waste.
- Reduce the mass of urban solid waste and gardening that reach the containers.
- Recover the cycle of matter, through the development and consolidation of school and social gardens.
- Reflect on our consumption model, reducing food waste and promoting healthy habits and promoting responsible consumption.



5.5.Hungary

“Energy Communities/Neighbourhoods”: Since 2011, “Energy Communities/Neighbourhoods” has been established in Hungary and organized every year by the GreenDependent Institute, with the support of the E.ON Hungária Group since 2013. The purpose of the program is to help families, households, small communities live in an energy-efficient way, and promote, distribute carbon-poor, green lifestyle. Launched in the fall of every year with a competition, the organizers point out that via changing our daily practice, our routine a significant energy - and thus money -. saving arise without major investment. Another important message is to have a climate-friendly, green lifestyle accessible to everyone just simply through changing daily routines. Also it became evident that the change to energy-conscious lifestyle is much easier in a small community.

Each small community (5-10 households) had a trained coordinator, who led the families (the households) through the competition where energy (electricity and gas) and water savings were the target. The competition started with a survey of the present situation, and by receiving tips every week on possible savings the consumptions become lower. After the 6-months period all utility meters were checked and the total savings were calculated, and the saving percentages were summed for the small communities. The results of the competition were based on the percentage decrease of the communities. Most of the communities made a saving around 10%, but the winners usually reached 18-20% saving in their energy bills!

Over 200 communities have participated in the Energy Communities program over the past 8 years from all over Hungary, affecting about 1,070 households, and over 230 voluntary climate coordinators were trained. As a result several households have turned to enthusiastic "energy savers" since the beginning. E.ON Energy Communities program goal was and is to save energy in a way that the quality of life does not decrease but, based on participants 'reports, increases.²⁹

Zero Waste examples: 1. There are some initiatives for zero waste, “package free shops” is an example. There are unfortunately not many of these shops, and although just a small percentage of the population shops at these places, (partly because these are not available locally at most places) and though slow, but it is definitely a growing trend, magnifying more and more people. Examples: A collection of zero waste shops from around the country:<https://dailynewshungary.com/hungarys-most-environmentally-conscious-stores/>. Map of zero waste stores: <https://xforest.hu/csomagolasmentes-boltok-terkepe/>, Most liked zero waste shop that also advising on zero waste life: <https://www.facebook.com/Tebe-hullad%C3%A9kmentes-bolt-1451111051696892>

PLASTIC Cup/PET CUP on Tisza river: In the summer of 2020, as a continuing yearly program on Tisza river, the non-profit initiative Plastic Cup, together with the Authority of Water Management committed themselves to clean up Hungary’s second largest river, the Tisza. The waste pollution on river Tisza is a huge environmental problem, tons of floating waste is entering Hungary every year from upstream areas. The PLASTIC Cup, this non-profit, non-governmental initiative, was created to eliminate this problem. This environmental action contributes to clean river Tisza by organizing events, waste collection campaigns and competitions spanning several months, team-building activities,

²⁹ <http://www.energiakozossegek.hu/hu/eon-energiak%C3%B6z%C3%B6ss%C3%A9gek> ,
<http://www.energiakozossegek.hu/hu/home>, <https://intezet.greendependent.org/en/node/120>

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exhibitions and professional discussions throughout the year. In a year, nearly 80 tonnes of waste is removed from the river by volunteers .³⁰ It is fun, it is adventure, it is team-building – all participants love it and returning regularly.

³⁰ <https://petkupa.hu/en/> <https://bbj.hu/economy/environment/recycling/zero-waste-tisza-program-achieves-its-goal-at-half-time>

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6. List of sources of knowledge on zero-waste and saving water and energy

6.1.Lithuania

Kaip Ignitis detektyvai energijos taupymo mįslę sprendė (Eng. How detectives of Ignitis solved the riddle of energy saving)

<https://www.ignitisgrupe.lt/lt/i-energijos-taupymo-kelione-vaikus-kviecia-leistis-ignitis-detektyvu-knygele>

<https://www.urbanearthlovers.com/collections/all>

<https://nula.shop/>

Tour „Už švarią Lietuvą (Eng. For Clean Lithuania)“

<https://www.15min.lt/pasaulis-kiseneje/naujiena/per-lietuva/finisavo-zygis-uz-svaria-lietuva-surinktos-siuksles-bus-pristatytos-menineje-instaliacijoje-vartojimo-delione-642-1401906>

System of reverse vending machines „Gražinti verta (Eng. Useful to Return)“

<https://grazintiverta.lt/#slide-intro>

Campaign “Darom (Eng. Let’s Do It)”

<https://www.mesdarom.lt/>

Žiedinė ekonomika (Eng. Circular Economy)

<http://www.circulareconomy.lt/#aboutus>

6.2. Poland

Websites:

<https://zero-waste.pl/>

<https://zerowasterzy.pl/>

<https://www.nanowosmieci.pl/>

<https://naszesmieci.mos.gov.pl/>

<https://ekowymiar.pl/blog-o-ekologii/>

<https://www.ograniczamsie.com/>

<https://odpadyblog.pl/>

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<https://ekowarszawianka.pl/>

<https://waste-less.pl/>

YouTube channels:

<https://www.youtube.com/c/AniaGemma/featured>

<https://www.youtube.com/c/AgataBokiej/featured>

6.3. Czech Republic

Information portals:

<https://www.zerowastecesco.cz/zero-waste/>

<http://konference.bezobalu.org/>

<https://bezobalu.org/>

<https://www.hnutiduha.cz/>

Blogs:

<https://www.czechzerowaste.cz/>

<https://bezpopelnice.cz/o-odpadcich/zero-waste/>

<https://bioplace.cz/zero-waste-je-trend/>

<https://zalepsizivot.cz/vse-co-jste-kdy-o-zero-waste-hteli-vedet/>

<http://blog.zerowastelife.cz/>

E-shops:

<https://www.zerowejst.cz/>

<https://www.zerowastelife.cz/>

<https://www.obchod-zerowaste.cz/>

<https://www.muizerowaste.cz/>



6.4. Spain

Links:

<https://www.ambientum.com/>

<https://www.ecoembes.com/>

<https://economiecircular.org/>

<https://red2030.com/>

<https://www.sostenibilidad.com/>

<https://www.retema.es/>

<https://www.efeverde.com/>

<https://catedraeconomiecircular-us.es/>

<https://reciclamas.eu/>

www.emasagra.es

<https://eco-circular.com/>

<https://www.miteco.gob.es/>

<https://rethinking.org/>

<http://anavam.com/>

<https://www.laboratorioderesiduos.es/>

<https://www.ecoticias.com/>

Podcasts o similares:

<https://radioecogestiona.com/>

<https://www.podcastidae.com/>

https://www.ivoox.com/podcast-bosque-habitado_sq_f159917_1.html

https://www.ivoox.com/podcast-actualidad-empleo-ambiental_sq_f1660761_1.html

https://www.ivoox.com/podcast-efe-radio-mangas-verdes_sq_f1108996_1.html



Hablemos de Economía Circular:

<https://open.spotify.com/show/3t9ooo9ft4VCODBf1O5F7o?si=m73vuERNRr252mdQFE1qCg>

<https://www.circulareconomyclub.com/listings/podcast-alternativas-empresariales-sostenibles-desde-la-economia-circular/>

https://www.ivoox.com/podcast-podcast-economia-circular-podcast-1_sq_f1573804_1.html

Studies and resources on the subject:

<https://www.a21-granada.org/red-gramas/actuaciones/residuos>

<https://www.a21-granada.org/red-gramas/actuaciones/educacion-ambiental-y-participacion-ciudadana>

https://www.idae.es/uploads/documentos/documentos_Informe_SPAHOUSEC_ACC_f68291a3.pdf

6.5. Hungary

Community:

<https://zerowasteurope.eu/about/>

<https://www.thezerowastecollective.com/>

<https://www.thezerowastecollective.org/>

Stores:

<https://www.almostzerowaste.com/zero-waste-online-stores/>

<https://zwoice.com/en/>

<https://heylilahey.com/en/besten-zero-waste-onlineshops/>

Influencers/Podcasters/Youtubers:

<https://www.hausvonedden.com/sustainability/zero-waste-influencer-unsere-internationalen-top-5-und-ihre-besten-tipps/#inline>

<https://thebadgeronline.com/2019/03/green-on-screen-the-zero-waste-influencers-of-youtube/>

https://blog.feedspot.com/zero_waste_podcasts/



Initiatives:

Five of the top 'zero waste' initiatives of 2020

<https://www.nationalgeographic.com/travel/lists/zero-waste-eliminate-sustainable-travel-destination-plastic/>

<https://ewwr.eu/> (European Week for Waste Reduction)

<https://www.plasticfreejuly.org/> (Plastic Free July)

<https://www.spottedbylocals.com/blog/zero-waste-cities-and-local-initiatives/>

<https://www.hydrofinitly.com/blog/water-saving-technology>

<https://www.energy.gov/eere/femp/water-efficient-technology-opportunities>

<https://www.directenergyprotects.com/learning-center/plumbing/water-saving-technologies>

<https://www.wur.nl/en/show/Sustainable-water-saving-technologies.htm>

<https://www.homeselfe.com/save-water-using-smart-home-technology/>

<https://www.forbes.com/sites/houzz/2015/03/31/11-ways-to-save-water-at-home/>

<http://ecoinnovative.eu/tag/energy-saving-technologies/>

<https://greenlivingguy.com/2020/02/10-energy-saving-technologies-for-homes-you-should-consider/>

<https://www.prismengineering.com/resources/technologies>

<https://www.worldenergy.org/publications/entry/world-energy-perspective-energy-efficiency-technologies>

<https://www.directenergy.com/learning-center/25-energy-efficiency-tips>

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7. Summary of the most important information

Waste

Increasing volumes of waste is one of the biggest environmental problems today. In the EU in 2019 there was generated almost 225 million tonnes of municipal waste. This corresponds to 502 kg per person and this is a small increase compared to 2018³¹. Data for individual European countries are presented below.

Although municipal waste is only part of total waste generated (about 10% when compared with the data reported according to the Waste Statistics Regulation), it is very important group of waste because of its complex character, its composition, its distribution among many sources of waste, and most of all - its link to consumption patterns³². We describe mostly the data from this group (municipal waste), because there is the greatest influence capacity of the 3R project.



⁽¹⁾ Estimated
⁽²⁾ Bulgaria, Ireland, United Kingdom: 2018 data
⁽³⁾ Iceland: 2017 data

Country	Czech Republic	Spain	Lithuania	Hungary	Poland
Municipal waste generated in 2019 (kg per person)	500	476	472	387	336

Source: Eurostat, <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210216-1>

³¹ <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210216-1>

³² https://ec.europa.eu/eurostat/statistics-explained/index.php/Municipal_waste_statistics



As we can see above, the Czech Republic has the highest rate of municipal waste production per person among all the countries participating in the 3R project and it is 500 kg per person (in 2018 it was 351 kg³³).

In 2019 48 % of municipal waste in the EU was recycled (material recycling and composting). It is not a very large number, especially if we take into account the obligations of European Union countries in terms of waste management.

EU waste policy aims to contribute to the circular economy by extracting high-quality resources from waste as much as possible. European Green Deal aims to promote growth by transitioning to a modern, resource-efficient and competitive economy. As part of this transition, several EU waste laws will be reviewed. The Waste Framework Directive is the EU's legal framework for managing waste in the EU³⁴. To comply with the objectives of this Directive, countries should take the necessary measures to achieve the targets:

-by 2020: preparing for re-use and the recycling of waste materials (paper, metal, plastic, glass) from households shall be increased to a min. of overall 50% by weight,

-by 2020: preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste shall be increased to a min. of 70% by weight,

-by 2025: preparing for re-use and the recycling of municipal waste shall be increased to a min. of 55%, 60% and 65% by weight by 2025, 2030 and 2035 respectively.

The foundation of EU waste management is the five-step waste hierarchy, which was established in the Waste Framework Directive. It describes an order of preference for managing and disposing of waste: preventing waste is the preferred way, sending waste to landfill should be the last option³⁵.



The European Commission in 2018 published early warning reports for Member States at risk of missing the 2020 target of 50% preparation for re-use/recycling for municipal waste. Based on an in-depth review of Member States' recycling performance and waste policies, 14 Member States have been

³³ <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20200318-1>

³⁴ https://ec.europa.eu/environment/topics/waste-and-recycling_en

³⁵ https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en

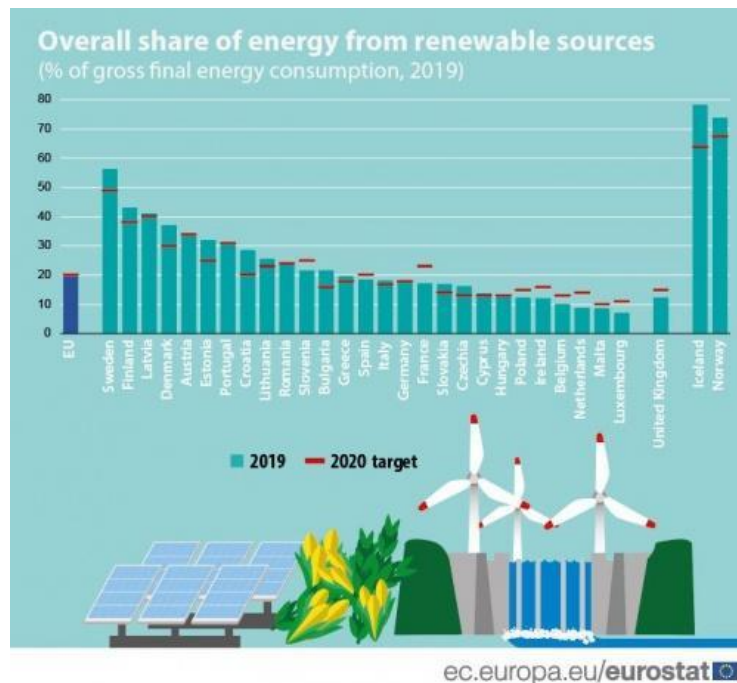


identified as at risk of missing the 2020 target of 50%. These are: Bulgaria, Croatia, Cyprus, Estonia, Finland, Greece, Hungary, Latvia, Malta, Poland, Portugal, Romania, Slovakia and Spain³⁶.

Energy

The EU seeks to have a 20% share of its gross final energy consumption from renewable sources by 2020. This target is distributed between the EU countries with national action plans designed to plot a pathway for the development of renewable energies in each of the Member States³⁷.

In 2019, renewable energy represented 19.7% of energy consumed in the EU-27, only 0.3% short of the 2020 target of 20%.



Source: Eurostat, https://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics#Share_of_renewable_energy_more_than_doubled_between_2004_and_2019

While the EU as a whole is on course to meet its 2020 targets, some Member States will need to make additional efforts to meet their obligations as regards the two main targets: the overall share of energy from renewable sources in the gross final energy consumption and the specific share of energy from renewable sources in transport³⁸ (data for 2020 are not available yet).

³⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52018DC0656&from=EN>

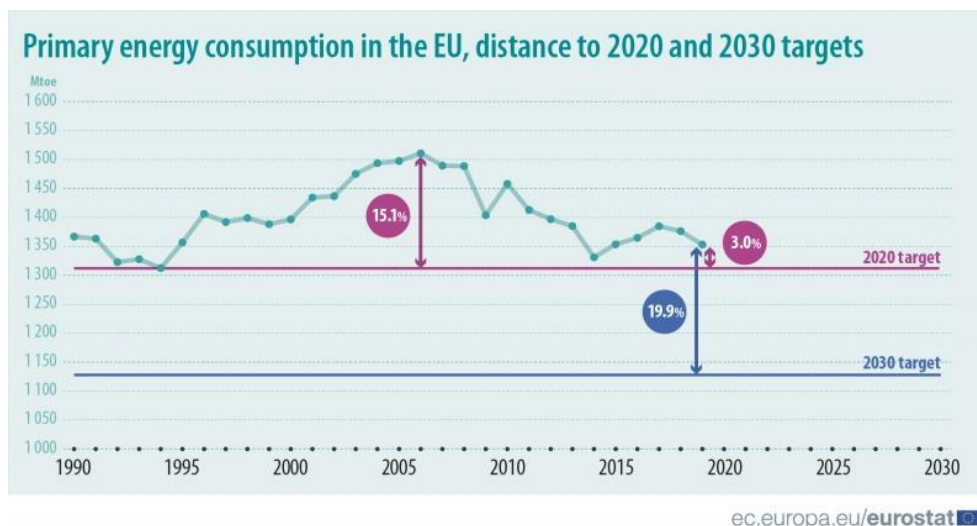
³⁷ https://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics#Share_of_renewable_energy_more_than_doubled_between_2004_and_2019

³⁸ <https://ec.europa.eu/eurostat/statistics-explained/pdfscache/7177.pdf>



Furthermore, EU has committed itself to a 20% reduction of energy consumption by the year 2020 (compared to baseline projections). This objective is also known as the 20% energy efficiency target. For 2030 the binding target is at least 32.5% reduction³⁹.

In 2019, primary energy consumption in the EU was 3% above the 2020 energy target and 19.9% above the 2030 target. Data for 2020 are not available yet.



Source: Eurostat, <https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Primary-energy-consumption-highlights-2019.jpg>

Legislation and forms of assistance to zero-waste and saving water and energy initiatives

Each of the countries participating in the project has a different system of supporting zero waste initiatives as well as initiatives related to saving water and energy. For example in Spain in recent years a huge number of laws and regulations directly related to the circular economy and in particular to waste management have been enacted, along with plans and strategies aimed at achieving it. On the other hand, in Czech legislation there is no legal framework that would regulate the issue of zero waste or minimize waste. In the Czech Republic, we can now speak only of interest groups that are not governed by law but are groups with different approaches, but the same goal, which is mainly zero waste and other activities that protect nature and the overall approach to a clean and healthy environment. Detailed information is presented in the chapters dedicated to individual countries.

Despite these significant differences between countries, all partners agree that there is a great need for further activities aimed at disseminating knowledge and skills related to the 3R project. The system for reducing waste production and saving water and energy should be supported by appropriate tools, including those generated by the project and properly extended. Despite many valuable initiatives in partner countries (mentioned in chapter 5 and 6), materials produced by partners together within the 3R project, using mutual experience and good practices, will constitute a great added value to be used regardless of the country in which the recipient is located.

³⁹ https://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_saving_statistics

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