

TAKE THE CHALLENGE
AND START THE 3R'S:
REDUCE, REUSE, RECYCLE.
PROMOTING ZERO-WASTE
LIFESTYLE AMONG ADULTS.

THE 3R's HANDBOOK

TAKE THE CHALLENGE AND START THE 3R's

Reduce, Reuse, Recycle.

Promoting zero-waste lifestyle among adults.

This document was developed by Partners of 3R's project, 2021

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THE IDEA OF ZERO WASTE



THE DEFINITION OF “ZERO WASTE”

The definition of zero waste' is adopted after the one of the Zero Waste International Alliance (ZWIA) which indicates that it is “the conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten 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:

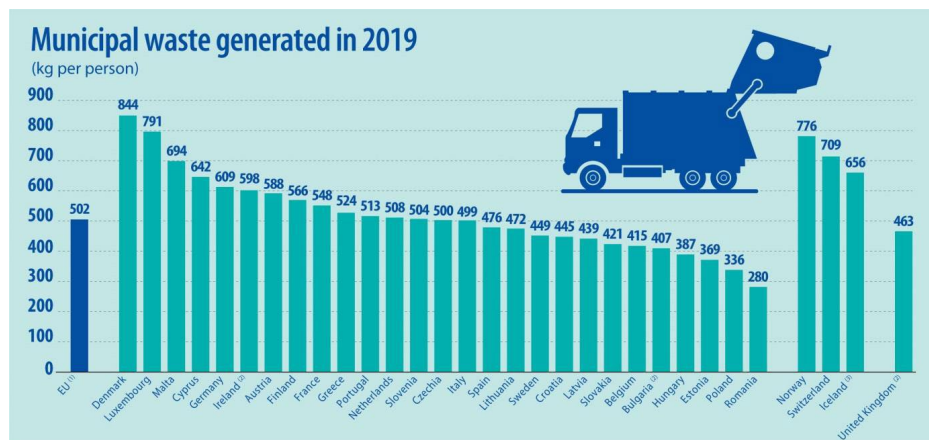
- reduce
- reuse
- recycle

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 zero waste 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.

THE PROBLEM OF WASTE, EXCESSIVE USE OF WATER AND ENERGY

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 2018¹. 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 Regulation²), 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 patterns³. 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

ec.europa.eu/eurostat

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

2 According to the Waste Statistics Regulation, other categories of total waste generated in the EU in 2018 are: construction (35.9%), mining and quarrying (26.6%), manufacturing (10.6%), waste and water services (9.8%). The remaining 9.1% was waste generated from other economic activities, mainly services (4.2%) and energy (3.4%).

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

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>

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 kg⁴).

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 EU⁵. 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,

⁴ <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20200318-1>
⁵ https://ec.europa.eu/environment/topics/waste-and-recycling_en

- 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.

As of today, the European Commission's report on the implementation of the Waste Framework Directive is not yet available⁶. 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 reference or managing and disposing of waste: preventing waste is the preferred way, sending waste to landfill should be the last option⁷.



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 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 Spain⁸.

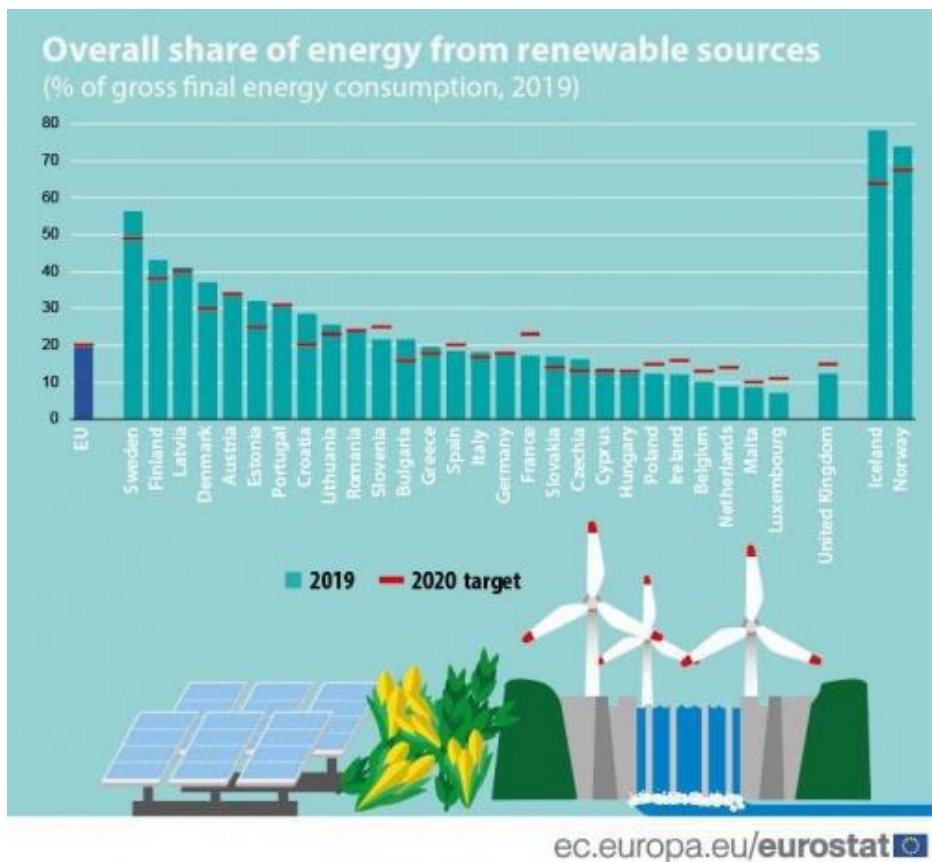
⁶ The Commission has conducted its first early warning study. Based on an in-depth review of Member States' recycling performance and waste policies, 14 Member States have been identified as at risk of missing the 2020 target of 50%¹⁴. These are: Bulgaria, Croatia, Cyprus, Estonia, Finland, Greece, Hungary, Latvia, Malta, Poland, Portugal, Romania, Slovakia and Spain. Scenario modelling confirmed that if no additional policy action is taken, some of the Member States concerned would probably not even meet the 50 % target by 2025. 2018 implementation report available: <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1537873850842&uri=COM:2018:656:FIN>

⁷ https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en

⁸ <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52018D-C0656&from=EN>

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 States⁹. In 2019, renewable energy represented 19.7% of energy consumed in the EU-27, only 0.3% short of the 2020 target of 20%.

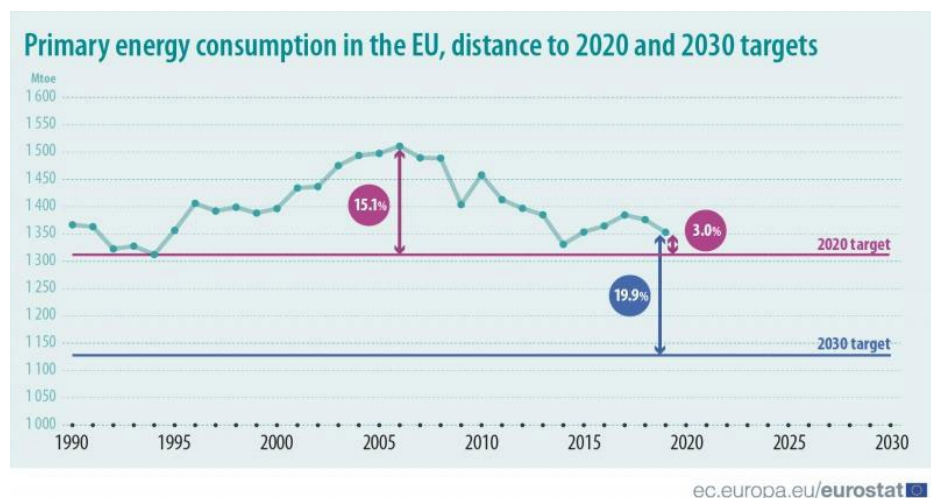


Source: Eurostat, https://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics#Share_of_renewable_energy_more_than_doubled_between_2004_and_2019

⁹ 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 transport¹⁰ (data for 2020 are not available yet). 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% reduction¹¹.

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>

¹⁰ <https://ec.europa.eu/eurostat/statistics-explained/pdfscache/7177.pdf>

¹¹ https://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_saving_statistics

WATER

Water is essential for life, it is an indispensable resource for the economy, and also plays a fundamental role in the climate regulation cycle. The management and protection of water resources, of fresh and salt water ecosystems, and of the water we drink and bathe in is therefore one of the cornerstones of environmental protection. This is why the EU's water policy over the past 30 years is focused on the protection of water resources. The last complete policy overview is provided in a document titled the 'Blueprint to safeguard Europe's water resources' (2012) which aims at ensuring that good quality water, in sufficient quantity, is available for all legitimate uses. Some more recent insight is offered by the fifth implementation report (2019) of the Water Framework Directive (2000), the central piece of environmental legislation concerning European waters.

Water resources refer to the freshwater available for use in a territory and include surface waters (lakes, rivers and streams) and groundwater. Renewable water resources are calculated as the sum of internal flow (which is precipitation minus actual evapotranspiration) and external inflow. Freshwater availability in a country is primarily determined by climate conditions and transboundary water flows (in other words, external inflows), while for total amounts, the size of the country matters. Therefore, France, Sweden and Germany had the highest amount of freshwater resources, with long-term annual averages ranging between 206 236 and 188 000 million m³ (see Table 1). Note that among the EFTA and candidate countries higher long-term averages were recorded for Norway (246 106 million m³) and Turkey (234 300 million m³). Freshwater resources per inhabitant are considered an important indicator for measuring the sustainability of water resources. When broken down by population, most countries' water resources range between 1 000 and 10 000 m³ per inhabitant, but in water-rich countries an inhabitant's share can be as high as around 20 000 m³ (Finland and Sweden), 29 000 m³ (Croatia) or 46 500 m³ (Norway).

Renewable freshwater resources - long-term annual average (million m³)

	A. Precipitation	B. Evapotranspiration	C. Internal Flow	D. External Inflow	E. Renewable freshwater resources - total	F. Renewable freshwater resources per 1000 inhabitants
	C=A-B				E=C+D	
Belgium	28 039	15 757	12 282	11 565	24 032	2.1
Bulgaria	73 310	57 252	16 058	83 731	99 789	14.2
Czechia	54 104	38 410	15 694	575	16 260	1.5
Denmark	38 485	22 145	16 340	0 ^(*)	16 340	2.8
Germany	278 000	161 000	117 000	71 000	188 000	2.3
Estonia	29 018	-	12 347	-	12 347	9.4
Ireland	87 632	38 308	49 324	3 469	52 793	10.9
Greece	115 000	55 000	60 000	12 000	72 000	6.7
Spain	333 657	226 453	107 204	0	107 204	2.3
France	512 563	317 327	195 236	11 000	206 236	3.1
Croatia	66 625 ^(*)	42 095 ^(*)	24 529 ^(*)	93 782 ^(*)	118 312 ^(*)	28.8 ^(*)
Italy	281 752	147 283	134 469	-	-	-
Cyprus	3 030	2 709	321	0	321	0.4
Latvia	43 220	23 573	19 647	16 992	36 639	18.9
Lithuania	44 886	31 584	13 854	8 413	22 267	7.9
Luxembourg	2 030	1 125	905	739	1 644	2.7
Hungary	55 707	48 174	7 533	108 897	116 430	11.9
Malta	177	93	85	0	85	0.2
Netherlands	31 618	21 293	10 325	81 500	91 825	5.3
Austria	99 800	43 100	56 700	29 300	86 000	9.7
Poland	195 656	142 772	52 884	7 669	60 553	1.6
Portugal	82 164	43 571	38 593	35 000	73 593	7.2
Romania	154 630	115 432	39 198	366	39 564	2.0
Slovenia	31 746	13 150	18 596	13 496	32 092	15.5
Slovakia	37 352	24 278	13 074	67 252	80 326	14.8
Finland	222 000	115 000	107 000	3 200	110 000	20.0
Sweden	344 572	164 623	180 474	14 859	195 333	19.3
Norway	374 833	141 052	233 781	12 325	246 106	46.5
Switzerland	61 207	21 382	39 825	12 560	52 385	6.2
United Kingdom	287 607	127 290	161 369	6 454	172 861	2.6
Serbia	57 029	43 714	13 315	158 330	171 644	24.5
Turkey	503 100	275 700	227 400	6 900	234 300	2.9
Bosnia and Herzegovina	55 863 ^(*)	25 940 ^(*)	29 922 ^(*)	2 000 ^(*)	-	-
Kosovo *	763	478	285	11	296	0.2

(-) not available; (*) estimated;

The minimum period taken into account for the calculation of long term averages is 20 years

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence

Source: Eurostat (online data codes: env_wat_res and demo_pjan)

eurostat 

Table 1. Source: [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Renewable_freshwater_resources_-_long-term_annual_average_\(million_m%C2%B3\)_2020.png](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Renewable_freshwater_resources_-_long-term_annual_average_(million_m%C2%B3)_2020.png)

According to the 'World water development report' of the United Nations, a country experiences 'water stress' when its annual water resources are below 1 700 m³ per inhabitant; among the EU Member States, this was the case in Poland, Czechia, Cyprus and Malta (where the lowest volume of water resources was recorded, at 178 m³ per inhabitant).

There are considerable differences in the amounts of freshwater abstracted within each of the EU Member States, in part reflecting the size of each country and the resources available, but also abstraction practices, climate and the industrial and agricultural structure of each country. Among EU Member States, total abstraction of freshwater ranged between 41 million m³ in Malta (2018 data) and 31 260 million m³ in Spain (2016 data). Turkey recorded an even higher total amount, namely 61 094 million m³ (2018). Between 2008 and 2018 – see Table 2 for the precise reference period covered for

each EU Member State – the total volume of freshwater abstracted rose at its fastest pace in Denmark (+54 %) and Turkey (+45 %). The largest decreases were recorded in Lithuania (-87 %, due to a reduction of cooling water needs in electricity production), Germany (-25 % from 2007 to 2017) and the Netherlands (-24 %).

Total water abstraction, 2008 - 2018

(million m³)

	fresh surface water		fresh groundwater		non-fresh water	
	2008	2018	2008	2018	2008	2018
Belgium	5 516.9	:	612.3	:	0.0	0.0
Bulgaria	5 809.6	4 858.8	615.8	566.5	0.6	10.4
Czechia	1 608.2	1 220.7	380.1	370.4	:	:
Denmark	7.8	202.5	688.3	872.1	:	:
Germany ⁽¹⁾⁽²⁾	26 476.4	18 362.0	5 824.7	5 963.0	:	:
Estonia ⁽⁴⁾	1 275.7	1 541.4	329.6	247.2	4.5	3.8
Ireland ⁽⁴⁾	561.0	:	213.0	:	:	:
Greece ⁽¹⁾	5 820.5	3 897.6	3 651.1	6 225.2	:	:
Spain ⁽⁴⁾	29 199.0	24 866.0	6 174.0	6 393.9	244.2	154.9
France ⁽⁴⁾	23 379.4	21 379.0	5 824.0	5 692.3	4 934.7	5 211.7
Croatia	278.5	248.9	440.5 ^(e)	423.7	324.9 ^(e)	295.9
Italy	:	:	:	:	:	:
Cyprus	30.5	51.6	130.0	155.0	:	:
Latvia	96.6	96.7	131.2	108.8	0.2	0.1
Lithuania	2 104.3	123.1	170.6	162.9	2.3	56.3
Luxembourg ⁽¹⁾	20.0	22.0	27.0	23.0	0.0	:
Hungary	4 925.8	3718.0 ^(b)	536.6	514.3	:	:
Malta	2.6	2.6 ^(e)	35.8 ^(e)	38.7 ^(e)	497.0 ^(e)	225.1
Netherlands	9 718.7	6 905.6	989.0	1 187.8	3 657.4	6 164.7
Austria	:	:	:	:	:	:
Poland	8 726.7	7 825.1	2 638.2	2 508.6	296.1	237.0
Portugal ⁽¹⁾⁽⁴⁾	:	2771.7 ^(b)	4794.0 ^(e)	2065.1 ^(b)	:	1 418.8
Romania	6 561.0	5 673.0	659.0	676.0	:	:
Slovenia	853.9	767.8	186.1	189.6	0.0 ^(s)	0.0
Slovakia	313.0	234.2	350.7	338.9	:	:
Finland ⁽⁴⁾	6 298.0	:	264.0	:	:	:
Sweden ⁽⁴⁾	:	:	346.0	:	11 832.0	:
United Kingdom	6 207.7	:	2 139.2	:	7 408.0	:
North Macedonia	560.8	:	155.0	:	0.0	:
Albania	:	858.7	:	99.2	:	:
Serbia	4 168.4	5 061.2	522.3	496.2	:	:
Turkey	29589.3 ^(e)	44913.6 ^(e)	12 419.0	16180.0 ^(e)	:	:
Kosovo *	:	243.1	:	16.4	:	:

(:) not available; (e): estimated; (s): Eurostat estimate; (b): break in series

⁽¹⁾ Data for 2007 instead of 2008

⁽²⁾ Surface water: data for 2017 instead of 2018

⁽³⁾ Groundwater: data for 2016 instead of 2018

⁽⁴⁾ Data for 2017 instead of 2018

⁽⁵⁾ Surface water: data for 2009 instead of 2008

⁽⁶⁾ Data for 2016 instead of 2018

⁽⁷⁾ Data for 2009 instead of 2008

⁽⁸⁾ Data for 2006 instead of 2008

⁽⁹⁾ Non-fresh water: data for 2007 instead of 2008

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence

Source: Eurostat (online data code: env_wat_abs)

eurostat 

Table 2. Source: [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:-Total_water_abstraction,_2008_-_2018_\(million_m%C2%B3\).png](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:-Total_water_abstraction,_2008_-_2018_(million_m%C2%B3).png)

The overall use of water resources can be considered sustainable in the long-term in most of Europe. However, specific regions may face problems associated with water scarcity; this is the case particularly in parts of southern Europe, where it is likely that efficiency gains in agricultural water use (as well as other uses) will need to be achieved in order to prevent seasonal water shortages. Regions associated with low rainfall, high population density, or intensive agricultural or industrial activity may also face sustainability issues in the coming years, which could be exacerbated by climate change impacts on water availability and water management practices.

Water is provided either by public water supply (public or private systems with public access) or is self-supplied (for example, private drills). While the share of the public water supply sector in total water abstraction depends on the economic structure of a given country and can be relatively small, it is nevertheless often the focus of public interest, as it comprises the water volumes that are directly used by the population¹².

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 State of the Art.

¹² https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Water_statistics#Water_as_a_resource

'ZERO WASTE' AND THE '3RS' PRINCIPLE - ENVIRONMENTAL AND ECONOMIC BENEFITS

ENVIRONMENTAL BENEFITS

Zero waste can be one of climate solutions. Not only because it reduces the trash we produce but also embodies waste-free and environmentally friendly production and distribution. It ensures that the entire life cycle of the product leaves no negative impact on the environment.

According to the estimations made by the EPA, 42% of all greenhouse gas emissions come from the production and consumption of products. Extracting and processing raw materials requires large amounts of energy that are often provided by fossil fuels. Burning fossil fuel generates large quantities of carbon dioxide.

Transporting materials and products also contribute to greenhouse gas emissions. Freight emits 50% of road transport emissions in urban areas. The landfill and incineration methods of waste management also produce GHG emissions. Solid waste management accounts for 5% of global CO₂e emissions. A zero-waste approach to production, consumption and disposal will significantly reduce the amount of waste sent to the landfill. And this will directly cut down on pollution¹³.

ECONOMIC BENEFITS

About 20% of municipal budgets are spent on waste management.¹⁴ If we produce less waste, budget allocations for its management will reduce. They could divert the saved allocation to funding more essential projects.

The zero-waste system has opened doors for waste-based businesses to exist and thrive. In Toronto, Canada composting and diversion programs create ten times more jobs than disposal does.

¹³ <https://www.trvst.world/sustainable-living/eco-friendly/importance-of-zero-waste/>

¹⁴ <https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management>

Recycling in the automobile industry can boost the job market demand by 120%. Business opportunities in the zero waste system are not exclusive to the recycling industry alone. The repair and reuse sectors also have a significant share in the job market. Repairing 1,000 tonnes of discarded electronics creates 13 times more jobs than recycling the same amount. Using Europe as a case study, reuse creates 80 jobs per 1,000 tonnes of collected municipal waste¹⁵.

‘ZERO WASTE’ AND ‘3R’ AREAS

Areas where the zero waste and 3R principles can be applied include:

- Shopping and food
- Beauty products
- Cleaning products
- Saving energy
- Saving water

The following sections of the manual describe each topic in detail.

¹⁵ <https://www.trvst.world/sustainable-living/eco-friendly/importance-of-zero-waste/>

HOW TO CHANGE YOUR HABITS? TIPS, EXAMPLES, GOOD PRACTICES

KNOW YOUR GARBAGE

The first thing to do is audit our waste. Take a look at your mixed and recycled trash to find out what exactly you are throwing away. The transition to a zero waste lifestyle is an individual journey. There is no one-size-fits-all method that is right for everyone. A waste audit will help you identify your individual needs and create an action plan aimed at reducing the waste produced. This way you will quickly find out where you are producing the most garbage - and your next step will be to find other solutions for the things you throw away the most. The best way to reduce rubbish is to reduce the number of products you buy or bring home. One of the waste that most often ends up in the trash is paper towels and food packaging.

BUY LESS

The easiest way to reduce the garbage generated is to simply reduce consumption. Since we don't feel any connection with our items, we buy lots of things that we don't need. We have to change our thinking. Before you buy something, ask yourself: Where does this item come from? What will happen to her when I no longer need her? How was it produced? Who made it? What resources had to be used up for it to be created? When we start to treat everything around us as valuable resources, our perception of the world and the bond that connects us with "things" begin to change.

SAVE WATER AND ELECTRICITY

Although zero waste is mainly associated with waste, remember that it is the idea of not wasting in a broad sense. How not to waste

electricity and water? A simple change of a few habits is enough. Turn off the light when you leave the room. Choose energy-saving household appliances. Only run the washing machine and dishwasher when they are full. Adjust the temperature in the refrigerator as appropriate. Take care that home appliances do not remain in standby mode. In the electric kettle, heat only as much water as you need at the moment. Use energy-saving light bulbs. Turn off the water while brushing your teeth.

REPAIR BROKEN EQUIPMENT

A broken lamp may mean a broken cable, which you will replace for a few zlotys. A gently torn sock can be sewn up, and a beaten ear in a cup - glued. Currently, we are no longer used to repairing items, although a dozen or so years ago it was quite normal.

TAKE CARE OF YOUR THINGS

Reducing the amount of rubbish you produce isn't just about repairing or reusing it. By properly taking care of your belongings, following the manufacturer's recommendations regarding their use and maintenance, you extend their life. This in zero waste is also very important.

DO NOT REPLACE WITH A NEWER MODEL

If your smartphone is working flawlessly and the TV still displays a beautiful picture, don't replace them just because a newer (or larger) model has appeared on the market.

USE ITEMS DIFFERENTLY

For example many packages can be reused - plastic boxes are perfect as containers for food.

BECOME A DIY FAN

This point is somewhat related to the previous one, as it is about reusing something that seems unnecessary at first glance. Online DIY tutorials (short for Do It Yourself) are a good source of information. You can make for example a cat bed from an old T-shirt, a photo board from wine corks, and a coffee table from old boards.

ORGANIZATIONS AND INSTITUTIONS DEALING WITH THE TOPIC OF “ZERO WASTE”

Zero Waste Europe (ZWE) is the European network of communities, organisations, local leaders, experts, and change agents working towards the elimination of waste in our society. We advocate for sustainable systems and the redesign of our relationship with resources, to accelerate a just transition towards zero waste for the benefit of people and the planet¹⁶.

<https://zerowasteeurope.eu/>

The Polish Zero Waste Association works to change public awareness of resources, preventing waste from being generated at source, promoting a waste-free lifestyle, and changing production and consumption patterns towards a circular economy. This mission is carried out by providing knowledge and tools to support the activities of citizens, institutions and enterprises, and by representing communities involved in activities for the environment.

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

The Buy Responsible Foundation is a nationwide organization that works for sustainable development and environmental protection, responsible consumption and production, as well as respecting human rights and the principles of environmental protection in business.

<https://m.ekonsument.pl/>

The Platform for Sustainable Development and Ethics (PURE) is a registered association that seeks to improve the protection of the environment, nature and animals as widely as possible, which it sees as a fundamental condition for the survival of humanity and the sustainability of life on Earth. PURE runs the Zero Waste Czechia project (<https://www.zerowastecsko.cz>)

<https://www.platforma8.org>

Žiedinė ekonomika (The Circular Economy) was established to help promote zero-waste production and lifestyles in Lithuania and to promote the principles of the circular economy among business and government. The Circular Economy works actively with municipalities and the Ministry of the Environment to share its knowledge and experience with the European environmental NGO networks Zero Waste Europe and the European Environmental Bureau.

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

Amigos de la Tierra – it is a non-profit environmental association with the mission to promote local and global change towards an environmentally friendly, just and caring society. Amigos de la Tierra denounce and put pressure on companies and administrations, while proposing various solutions to achieve a fairer world.

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

Hungarian Waste Management Federation is principally the industry federation of recycling companies in Hungary, with its currently 50 members representing a significant proportion of the Hungarian recycling industry.

<https://www.hosz.org/en/>

USEFUL LINKS, APPLICATIONS

<https://zerowasteurope.eu/>

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

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

<https://nula.shop/>

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

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

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

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

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

<https://zerowasterzy.pl/>

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

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

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

<https://www.oگرانiczamsie.com/>

<https://odpadyblog.pl/>

<https://ekowarszawianka.pl/>

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

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

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

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

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

<https://bezobalu.org/>

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

<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-chteli-vedet/>

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

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

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

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

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

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

<https://www.ecoembes.com/>
<https://economycirculard.org/>
<https://red2030.com/>
<https://www.sostenibilidad.com/>
<https://www.retema.es/>
<https://www.efeverde.com/>
<https://catedraeconomia-circular-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/>
<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
<https://open.spotify.com/show/3t90oo9ft4VCODBf105F7o?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
<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_SPAHOUSESEC_ACC_f68291a3.pdf
<https://zerowaste-europe.eu/about/>
<https://www.thezerowastecollective.com/>
<https://www.thezerowastecollective.org/>
<https://www.almostzerowaste.com/zero-waste-online-stores/>
<https://zwoice.com/en/>
<https://heyhilahey.com/en/besten-zero-waste-onlineshops/>
<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/

<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.hydrofinity.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/>



SHOPPING AND FOOD



INTRODUCTION

The aim of this module is to raise awareness on sustainability issues and solutions around the topic of shopping and food. This booklet will introduce how sustainability is becoming more and more important both for customers, and stores. We also will look into the food waste issue, and will dig deeper in its causes, consequences and ways of reduction in the amount of wasted food, which will lead us to the introduction of a more sustainable food supply chain.

THE TRANSFORMATION TOWARDS SUSTAINABLE SHOPPING

It is becoming more and more important to consumers to shop in a sustainable way. The big supermarket franchises as well as some small ones have already started to recognise the opportunity of attracting consumers by promoting a more sustainable approach and applying changes that leads to a more sustainable packaging and shopping system.

“With consumers increasingly considering and acting on sustainability issues when it comes to patronage and purchases, now is the time for supermarkets to actively examine the opportunities and challenges facing the industry, to best align with these growing consumer feelings,” said Michael Sansolo, research director of CCRRC North America. “Shoppers want local supermarkets to help them practice sustainability, and not doing so could mean losing shoppers down the road.

Incorporating sustainability practices and policies into stores will be even more important in connecting with the future consumer in the coming years as Gen Z and the upcoming generations are becoming more passionate about the environment, more so than any other generation.

The most popular sustainability initiatives according to consumers are:

- Providing on-site recycling bins
- Labeling products that are locally made/grown
- Offering points/prizes for waste saved through purchases and/or recycling
- Providing biodegradable bags for produce
- Selling products in a wider variety of sizes to help limit food waste

THE FOOD WASTE ISSUE:

The global volume of food wastage is estimated at 1.6 billion tonnes of “primary product equivalents.” Total food wastage for the edible part of this amounts to 1.3 billion tonnes. ... The direct economic consequences of food wastage (excluding fish and seafood) run to the tune of \$750 billion annually.

Source: Food and Agriculture Organization of the United Nations <https://www.fao.org/news/story/en/item/196402/icode/>

- Roughly one-third of the food produced every year (1.3 billion tonnes) gets wasted.
- Industrialized and developing countries dissipate roughly the same quantities of food - respectively 670 and 630 million tonnes.
- Global quantitative food waste per year is roughly 30 per cent for cereals, 40-50 per cent for root crops, fruits, and vegetables, 20 per cent for oilseeds, meat and dairy plus 30 per cent for fish.
- At the retail level, large quantities of food are wasted due to quality standards that over-emphasize appearance.

- Food loss and waste also amount to a major squandering of resources, including water, land, energy, labor, and capital, and needlessly produce greenhouse gas emissions, contributing to global warming and climate change.
- Even if just one-fourth of the food currently lost or wasted globally could be saved, it would be enough to feed 870 million hungry people in the world.

Global food waste is a far-reaching problem with tremendous financial, ethical and environmental costs. The causes range from bumpy roads to overly-selective customers, but regardless of cause, we can all pitch in to combat this global issue

The amount of food lost or wasted costs [2.6 trillion USD](#) annually and is more than enough to feed all the [815 million](#) hungry people in the world - [four times over](#).

Source: United Nations Environment Programme

<https://www.unep.org/thinkeatsave/get-informed/worldwide-food-waste>

WHAT IS FOOD WASTE?

The history of food waste is closely linked to globalisation. In an ever more networked world, supply chains get longer, and everything is available everywhere the whole year round. On that often-long journey from farm to table, food is lost or wasted at every stage, and fresh foods such as fruits, vegetables, dairy and meat are particularly vulnerable.

“Food waste” and “food loss” are commonly used terms but don’t quite mean the same thing.

- “Food loss” typically refers to food lost in earlier stages of production such as harvest, storage and transportation.
- “Food waste” refers to items that are fit for human consumption but thrown away, often at supermarkets or by consumers.

THE ENVIRONMENTAL IMPACT OF FOOD WASTE

- When edible items are discarded, all the resources required to bring food from the farm to your table: water for irrigation, land for planting, fuel for powering harvest and transport vehicles are wasted as well.
- [70 per cent](#) of fresh water is used for agricultural purposes, including crop irrigation and drinking water for livestock.
- According to the FAO's [Food Wastage Footprint](#) report, 250 km³ of water – three times the volume of Lake Geneva – is used each year to produce food that is ultimately lost or wasted.
- Twenty-eight per cent of the world's [agricultural area](#) is used to produce food that is ultimately lost or wasted each year. Not only does that result in unnecessary degradation of land, but clearing land for agricultural purposes is also a cause of deforestation, which eliminates wildlife habitats and wipes out greenhouse-gas-absorbing trees.
- The FAO estimates the [carbon footprint](#) of food waste is 3.3 billion tonnes of CO₂ equivalent per year. Not only are oil, diesel and other polluting fuels used to power production machinery and transport vehicles, but greenhouse gases are also emitted by food waste itself.
- Discarded waste rotting in landfills gives off methane, a potent greenhouse gas [25 times more efficient](#) at trapping heat than carbon dioxide.

WHAT CAN WE DO ABOUT IT?

According to the [United Nations](#), the world's population is expected to swell from 7.6 billion to 9.8 billion by 2050. As food production struggles to keep up with the rapidly growing global population, food waste is predicted to grow - if we don't do something about it.

- Help reduce loss in handling, storage, processing and transport
- Share, donate the surplus
- Turn waste into worth
- Educate people on food safety
- Change consumer behaviour

REDUCING FOOD WASTE:

Reducing food waste starts with smart shopping. By making a list with weekly meals in mind, you can save money, time and may eat healthier food.

Shopping tips for reducing food waste:

- Make your shopping list based on how many meals you will eat at home. Will eat out this week?
- Check what you have in your fridge and cupboards first to avoid buying food you already have.
- Include quantities on your shopping list to make sure you buy just what you need.
- Avoid marketing gimmicks that encourage you to buy more than you need.
- Buy fresh ingredients in smaller quantities more often so you waste less and enjoy fresher ingredients.
- Choose loose fruit and vegetables over pre-packaged to better control the quantity you need.

THE SUSTAINABILITY OF THE FOOD CHAIN

Food production has a significant impact on the environment. The way we produce and consume food is hurting the planet and ourselves. Issues like: greenhouse gases emissions, the use of land and water resources, pollution, depletion of phosphorus, and the use of chemical products such as herbicides and pesticides are now part of our everyday news.

A number of global trends are influencing food security, poverty and the overall of food sustainability and agricultural systems. Today we are living through the biggest food system failures that we have ever had and this are just a few:

- Population growth
- Climate change
- Hunger and extreme poverty
- Food waste
- Conflicts, crises and natural disasters are increasing in number and intensity.

A World Resources Institute (WRI) report states that global food production would have to increase 50% to feed the world's 10 billion mouths in 2050, requiring a landmass twice the size in India.

The global food production industry is responsible for up to 30% of total green house gases emissions. Today the world is facing the biggest food system failures that we have ever had.

SHORT FOOD SUPPLY CHAIN (SFSC)

SFSCs are the key to re-localized economy but also of a new, more eco-friendly, democratic and social system.

Definition of agro-ecological transition

A systemic transformation about making our agriculture and our food more ecological, impacting multiple stakeholders like farmers, supply chains, or natural resources managers, and which is marked with a deliberate political will to change. It is a political, economic and social process all at once. FAO's (Food and Agriculture Organization of the United Nations) definition of food sustainability. For our food to be sustainable, it must meet five criteria:

- It protects ecosystem biodiversity
- It is accessible and culturally acceptable
- It is economically fair and affordable
- It is safe, nutritionally adequate, and healthy
- It optimises natural and human resource use

Short Food Supply Chains

- Involving a limited number of economic operators, committed to co-operation, local economic development, and close geographical and social relations between producers, processors and consumers.
- Direct sales or short chains (the consumer and the producer contact directly or with one or as few as possible intermediate actors)

Economic benefits

- contribute rural development and economic regeneration
- buying local preserve small farms and sustain rural communities
- via multiplier effect it, strengthens local demand, preserve local jobs, and enhance local economy
- increase tourism due to local branding and recreational shopping opportunities

Social benefits

- strengthen social capital in local communities through the creation of new networks engaging both farmers and consumers
- enhance mutual trust and respect between producers and consumers
- increase the food awareness and culinary education of consumers
- strengthen cultural/regional identity, food provenance, sense of trust and of being food secure

RESOURCES:

1. <https://www.unep.org/thinkeasave/get-informed/worldwide-food-waste>
2. <https://publications.jrc.ec.europa.eu/repository/handle/JRC80420>
3. <https://www.fao.org/family-farming/detail/en/c/415240/>
4. <https://www.fao.org/food-systems/en/>
5. <https://www.fao.org/news/story/en/item/196402/icode/>



**BEAUTY
PRODUCTS**



LEGAL FRAMEWORK FOR COSMETIC PRODUCTS AND PROTECTION OF CONSUMER RIGHTS

The idea of 3R (reduce, reuse, recycle) is promoted in beauty industry while producing products and providing beauty services. "Green" marketing and development of customer's approach occupy a crucial role here. In recent times the growing digital advertising (influencers, visual advertising, native advertising and etc.) empowers the consumer to develop advertising and promote customers' trust in product. However, advertisements often do not reflect reality and mislead consumer. This encourages awareness and interest in ingredients of cosmetic products as well as detailed examination of labelling among consumers.

In general, some of the products commonly referred to as "personal care products" or „beauty products" are cosmetics. The assessment of whether a product is a cosmetic is presented in the Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 On Cosmetic Products. The definition of cosmetics is „cosmetic product' means any substance or mixture intended to be placed in contact with the external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance, protecting them, keeping them in good condition or correcting body odors". This definition is integrated to all EU countries legislation, for example, in Lithuania it is settled in Lithuanian Hygiene Norm HN 117: 2007 "Health Safety Requirements for Beauty Services". However, this legal act does not present the definition of ecological cosmetic product and how it should be labelled. Ecological or natural cosmetic product is not clearly legally defined not only in the EU, but also in the USA and Canada. Legal acts of this field are different in these continents; however, they are more similar than different and these acts serve more as recommendations not as regulations.

In order to inform the consumer properly about ingredients of cosmetic product, their labelling is also regulated. National Public

Health Center states that in order to implement the Regulation (EC) No. 1223/2009 of the European Parliament and of the Council of 30 November 2009 On Cosmetic Products (hereinafter – the Regulation (EC) 1223/2009), which defines how cosmetic products should be manufactured, labelled and provided for the market, and applying the Rules for the labelling of cosmetic products required in the official language of the Republic of Lithuania and for the labelling of non-prepacked cosmetic products packed only at the point of sale at the customer's request or packed directly for sale approved by Minister of health of the Republic of Lithuania June 19 order No.V-634, an example of a cosmetic product label has been prepared, which contains mandatory information (cosmetic product function, nominal content, ingredients list, particular precautions to be observed in use, name of producer, date of minimum durability, batch number) on the cosmetic product label that complies with the requirements established by these legal acts. It is not forbidden to present additional information in the labels.

While analyzing legal regulations regarding cosmetics in the EU, USA and Canada it is noted that there are more similarities than differences. However, these continents do not have an official definition of ecological or natural cosmetic product; in addition, there are no obligatory requirements for manufacturing, selling, labelling or advertising ecological cosmetic products. Also, there is no definition of ecological cosmetic in the Regulation (EC) No. 1223/2009. The only assistance to customer in differing ecological good from not ecological – special labelling. The categorization of cosmetics whether it is ecological or natural every country defines differently. To summarize it can be stated the category of ecological cosmetics include beauty products containing not less than 10 % of ingredients from ecological farms, and natural cosmetics cover products containing not less than 95 % of natural substances.

ENVIRONMENTAL PROBLEMS IN COSMETICS INDUSTRY

MANUFACTURE OF COSMETIC PRODUCTS

The cycle of manufacture of cosmetic products include:

- Ingredients of cosmetic products, their origin;
- Testing of cosmetic products;
- Supply of cosmetic products to the market, packaging.

The fact that people think that the naturalness of cosmetics depends on how many “chemicals” are used in beauty products, it is important to highlight the fact that all ingredients in cosmetics are chemicals – natural or manufactured by the human! Water is one of the most “natural” substance in the world; however, without discussions, it is a chemical substance compound of atoms and molecules. Nature, not a laboratory, is one of the major manufacturers of poisons. However, despite the origin of chemicals – natural or manufactured by the human – added to cosmetics, the ingredients are strictly controlled and supervised while following legal acts in every content in order to have beauty products, which are safe to the consumer.

Ingredients of cosmetic, their origin and forbidden ingredients

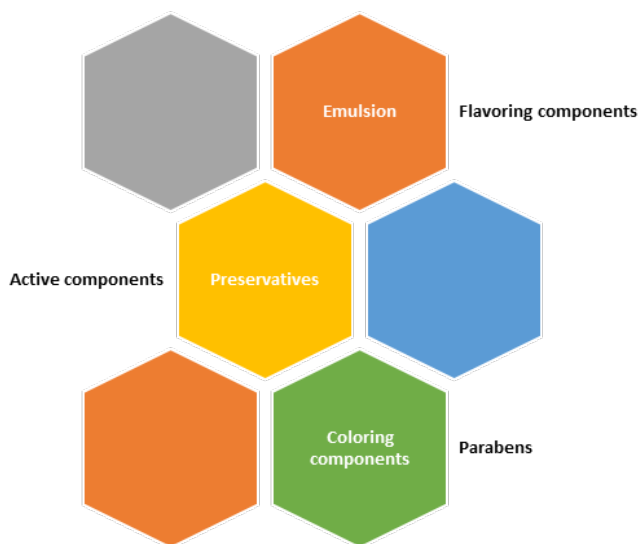


Figure 1. The main ingredients of cosmetic

- 1) **Emulsion (fats, water, emulsifiers).** This component is a base of beauty product. Fats can be natural or synthetic; also, there are oils and various fat substitutes (fatty alcohols, carbons, waxes, silicones, synthetic ethers). It should be noted that cold pressed oil and oil extracted in high temperature have the best quality while mineral oils are not natural and have nothing useful. Water compounds 60-90 % of cosmetic product and can be distilled or extracted from various plants while distilling. The main requirement for the water – sterility and cleanness. Water do not have to contain any impurities, because low quality water is one of the major reasons for spoiled cosmetics. Emulsifiers bind fats and water; according to their origin they can be classified to soluble and insoluble in water, natural and synthetic. The base of cosmetic product does not affect skin – it only helps active components penetrate into the deeper layers of the skin. The most natural emulsifiers are bee wax and cosmetic wax, but in the most cases protein (for instance, soy, milk), varieties of starch or plant polymers are used in cremes.

- 2) **Active components.** Natural and biologically active ingredients/effective chemical substances (vitamins, hormones, enzymes, component of plant or sea origin, oxygen, antioxidants and etc.) and pharmaceuticals. Active components make a direct impact on skin. Pharmaceuticals are inert derivatives, which biologically and physiologically changes function and structure of the skin. Oxygen can be used as very effective active component in cosmetics and products containing this component manufactured under licensed program are labeled with Aquaftem® label.
- 3) **Preservatives.** This is an ingredient used to improve cosmetic product durability; without this ingredient cosmetic product could be use no longer than one week or two. There are many discussions in the world regarding what kind of preservatives can be used in cosmetics; their usage is regulated by the Regulation (EC) No. 1223/2009. However, there are no natural preservatives in nature. It is suggested to use water-based preservatives, easily dissolves in water, easily synergizes with other ingredients and are statically stable. The amount of preservatives is limited in cosmetics; the most dangerous (it should be avoided) are parabens, phenoxyethanol, formaldehyde, DMDH hydantoin, Diazolidinyl Urea, Quaternium - 7, 15, 31, 60 (the most dangerous), isothiazolinone, ethylisothiazoline, methylchloroisothiazolinone. Vitamin E and vitamin C are also used as preservatives together with other preservatives, because these vitamins do not have antibacterial properties. The negative properties of preservatives: allergy, effects on mental health, burns, acne, poisoning, etc.
- Flavoring components.** Usually, in ingredients are not included many of these components – in order to create a nice smell of the product various ethereal oils are used; however, the attention should be paid to the origins of these oils. Natural ethereal oils are "friendly" while synthetic oils can cause allergic reactions. The list of flavoring components and allowed concentrations are defined in the Regulation (EC) No. 1223/2009.
- Coloring components.** Can be natural or synthetic. It is clear that cosmetic products containing synthetic colorings, which can cause allergy reactions, should be avoided. The list of col-

oring components and allowed concentrations are defined in the Regulation (EC) No. 1223/2009.

In principle, cosmetic product is base "plus" active components – other ingredients are not obligatory; they are used to improve durability, add fragrance or color. Thus, while choosing ecological or natural cosmetic, the priority should be made to such cosmetic, which do not contain additional, not necessary components, which may allergize your skin or conceal their affect in order to improve the durability of the product.

To sum up, it can be stated that the most harmful ingredients to human health used in cosmetics are the following:

- **Parabens.** The most popular are Metylparaben, Butylparaben, Ethylparaben, Isopropylparaben, Propylparaben, Isobutylparaben. These parabens can be found in shampoos, cremes, lotions, body washes and other cosmetic products. The higher concentration of parabens in our bodies has a negative impact: it can disturb activity of hormones, cause allergies, rashes, to weaken immune system; some groups of parabens are related to formation of cancer cells. The least harmful – Butylparaben and Isobutylparaben identified at the end of label.
- **Sulfates.** This ingredient is used for degreasing and are named Sodium laureth sulfat, sodium lauryl sulfat, Ammonium laureth sulfat, Natrium lauryl sulfate. However, sulfates have a negative impact on our bodies. They can irritate eyes, respiratory tract, skin. Sulfates used often and in great amounts can damage liver, lungs or immune system – it is possible that sulfates can have impact on fertility.
- **Scientists have proved that impact of harmful substances are directly related to their amount; thus, when these substances are in cosmetic products it does not mean that the product is polluted by hazardous substances. Hazardousness of substances totally depends on their amounts, which are controlled by legal acts. However, there are hazardous substances strictly forbidden in beauty products:**
- **Formaldehyde, a known carcinogen and Paraformaldehyde (type of formaldehyde).** Formaldehyde is a simple chemical compound of hydrogen, oxygen and carbon. All life forms -

bacteria, plants, fish, animals and humans - naturally produce formaldehyde as part of cellular metabolism. This chemical has good antibacterial properties and is used as a preservative in the manufacture of various products. Also, a toxic substance is Quaternium 15, which releases formaldehyde.

- Mercury (liquefied metal), which can damage the kidneys and nervous system.
- Dibutyl and diethylhexyl phthalates, which disrupt hormones and damage the reproductive system.
- The long-chain per- and polyfluoroalkyl substances known as PFAS, which have been linked to cancer.
- M- and o-phenylenediamine, used in hair dyes, which irritate and sensitize the skin,
- Estrogen is a strong hormone produced naturally in the body and acting on the body in various ways. Estrogen, both natural and synthetic, is strictly prohibited in cosmetics under the European Cosmetics Directive

TESTING COSMETIC PRODUCTS

Before beauty products get on the shelves and are advertised, they are tested for at least five years. Testing is a long process that involves scientists and it has to be proven that the effects written on the packaging are real. EU law regulates the development, production, labeling, safety and packing of cosmetics very strictly: all of these must be legally based. Animal testing of cosmetic products in the European Union was completely banned in September 2004. Animal testing has been cruel to animals. However, many beauty products are imported from countries where animal experimentation is not legally prohibited. If the product is brought to countries where such testing is prohibited, this fact is simply not indicated on the packaging. Therefore, there are organizations that are actively fighting against such testing.

During the process of product development, a lot of testing and research are done with a large number of people to make sure that the product works exactly as it will be written on the packaging. It is controlled worldwide by relevant consumer protection and adver-

tising services. If advertising control services receive complaints from consumers, all scientific data on the product will be re-examined and the advertising authorization will be reconsidered.

The everyday cosmetics have NOT been tested on animals. If the packaging says “dermatologically tested”, it means that the product has been tested on the skin. Various methods are used to check that the product is suitable for use on the skin. The intervention of a physician or dermatologist using these methods is not necessary, but these test methods were most likely tested by a medically qualified person.

There are many laboratories in the world that test beauty products according to the customer’s wishes, as well as help to introduce the product to the market. The laboratories are certified and here work experienced scientists. Laboratories are constantly developing new testing methods, which are certified and developing their legal basis, using the latest technologies. Laboratories are owned by every manufacturer of beauty products or they use the services of private laboratories.

SUPPLY OF COSMETIC PRODUCTS TO THE MARKET, PACKAGING

Beauty products are packaged. Various online sources state that between 120 and 150 billion packages of products are placed on the market worldwide each year. It would probably be difficult to calculate accurately, but it is obviously that it also consumes a huge amount of natural and artificial raw materials. Plastic, wood, aluminum and glass are mainly used for packaging. Some professionals use the terms “clean packaging” and “clean ingredients”. “Clean packaging” means the packaging that does not contribute to climate change during its life cycle, and “clean ingredients” means the packaging that is ethical and not harmful to health. Here, a large part of the responsibility lies with the manufacturer, where products are not expected to be tested on animals, only environmentally friendly and non-hazardous substances are used, the product is developed with scientists and the product information is provided on the label. One of the beauty industry’s reactions to conscious consumption trends is the “pure beauty” movement, to which such big companies as Sephora, Goop, Fenty Beauty and many others have already contributed. Currently, there is a growing trend when it is

possible to buy cosmetic products (shampoo, soap, creams, etc.) using customer's packaging. Be sure to check this possibility online or ask at the seller's store.

However, if you purchased the product in its packaging, try to use it for other purposes or sort it responsibly according to the recommendations below.

- Before disposing the packaging - rinse it (recommended with water without any detergent or with already used water after the laundry or washing) to remove any product residues (shampoo, soap, powder, etc.) from the packaging.
- Sort packages, especially if the package is marked by the GREEN DOT.
- If the packaging consists of several different parts made of different materials (plastic and rod, plastic and aluminum, paper packaging, etc.), separate these parts and sort them into specific containers.
- Aluminum packaging, which are usually dominated by hand or face creams, lip balms, are also sorted. Dispose of aluminum packaging in a plastic container if the packaging is made with a plastic cap - it also goes to the plastic container.
- Diapers, personal care products, paper towels, disposable handkerchiefs, toilet paper (but not cardboard rolls, which can be sorted as paper), toothbrushes, used kitchen and shower sponges, razor blades, adhesive tapes, ceramics, mirror crumbs and other household waste should be disposed in a mixed municipal waste container.

In the process of supplying beauty products to the market, the supplier is responsible for the proper and fair labeling of the beauty product, and the consumer is responsible for the interest in the information on the ingredients in general and the careful analysis of the information on the packaging. Without a doubt, the consumer may not know everything about the ingredients, but if it is marked on the packaging that it is certified, we can feel less stressed. Some of the most important certifications in the cosmetics industry are: "Certified Vegan" (the product is vegan-friendly, does not contain animal products and has not been tested on animals), "Made Safe"

(the product is safe - free of toxins and carcinogens, manufactured under the brand name) "EWG verified" (the product does not contain any of the thousands of substances included in the list of hazardous ingredients presented by the EWG team of toxicologists, chemists and epidemiologists), "Ecocert" (the product is produced without leaving a deep ecological footprint and in accordance with challenges of climate change control), "Fair trade" (every step of the "life cycle" of a product has been carried out in a fair and socially responsible way), "Ecocert Cosmos Organic" (the product is natural and organic). When you find a certification mark, it is still recommended to look at the ecological footprint of the brand.

In order to purchase the most 3R compliant products, look for the following labels on the packaging, which are the main criteria:

- palm-oil free
- vegan
- cruelty-free (tested on friends, never animals)
- as organic as possible
- all product packaging is either biodegradable or reusable (like their metal palates, bamboo applicator, and organic cotton storage bags)
- all labels are printed on recycled paper with eco-friendly ink.
- These criteria as basis can also be found in e-shops, for example www.etsay.com

In addition, pay special attention to the marking of environmentally friendly products on the packaging. List of existing EU and International Eco-labels and you can find at <https://www.greenspec.co.uk/ecolabels-used-in-europe/> .



NEGATIVE EFFECTS OF SUBSTANCES USED IN THE BEAUTY INDUSTRY ON HUMANS AND THE ENVIRONMENT

Consumers are offered a wide choice of beauty products, and the consumption of locally produced and imported beauty products is growing in large quantities every year. In the American market, for example, beauty products are imported from 181 countries, a lot of cosmetic products are imported from China. It is estimated that in the USA, one woman uses an average of 12 personal care products per day, which consist of 168 different ingredients. Men, meanwhile, typically use half of these numbers cosmetics. Most of these products are applied directly to the skin - the largest organ of the body, and when directly absorbed, they also enter the circulatory system. Chemicals from beauty products also enter the body through the respiratory tract, injections and internal use. Most of them are safe, but toxic substances can already be detected in beauty products. The substances and ingredients contained in beauty products may have the following negative effects on the human body:

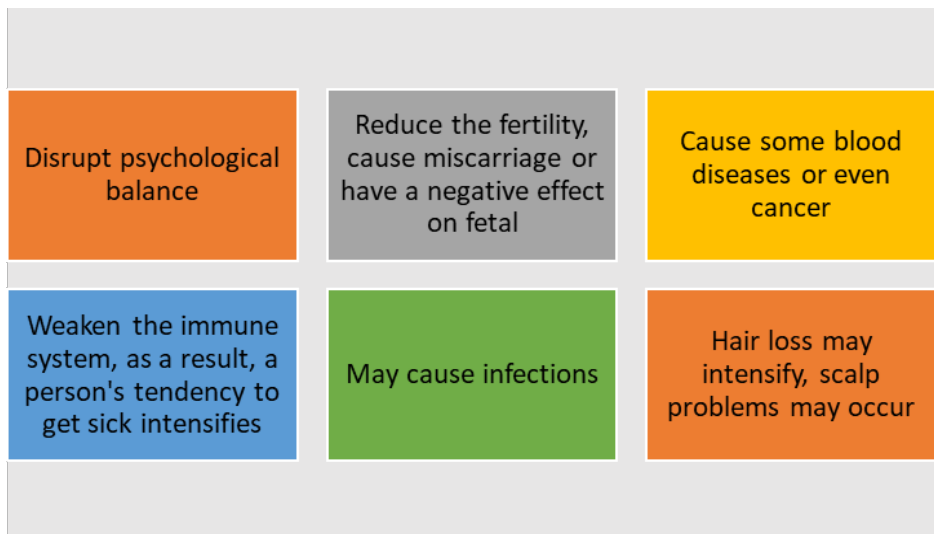


Figure 2. Negative effects

We have listed the main harmful effects on the human body, but the ingredients of beauty products can also negatively damage nature. All toxic substances enter nature when we wash them with water. Many chemicals do not decompose and enter our ecosystems - oceans, lakes, rivers and back into our water supply. As the water evaporates, clouds form from the contaminated water and the chemicals return in the form of rain. Contaminants that enter the earth also enter our agricultural produce, which we eat, so chemicals get back into our bodies and can cause diseases such as cancer. Chemicals in water reduce aquatic animal populations, and contaminated feed and air also have a negative effect on the animals we raise and eat.

FORMATION OF AN ENVIRONMENTALLY FRIENDLY APPROACH IN THE CONTEXT OF THE PRODUCTION AND USE OF BEAUTY PRODUCTS

Decisions and advice are not and cannot be just black or white, it is more about balance based on our values and ethics. We are individuals and cannot live in a completely sustainable way, but we can change our attitudes. Following the principle of 3R (reduce, reuse and recycle), we can naturally choose those beauty products and those beauty brands that implement initiatives to protect our beautiful planet. Below are suggestions that can help to protect nature.

- Choose beauty products that are made from 100 percent natural products and the packaging is made of recycled materials;
- Look for cosmetics that are certified as natural. For example, in Australia, Safe Cosmetics Australia has certified over 50 brands as toxic free. In the USA natural ingredients are evaluated by the EWG (Environmental Working Group, <https://www.ewg.org>), RGS (Research Global Services in European Union and Turkish Republic chemicals legislation, <https://www.reach-gs.eu>). Search for such information on the packaging or in the seller's online store;

- Choose brands of beauty manufacturers that participate in sustainability initiatives or eco-programs, offer minimal packaging or use self-degrading packaging, use renewable energy sources in the production process, such as <https://www.adorncosmetics.com.au/sustainability>;
- Search for beauty brands that declare using renewable ingredients such as Kakadu plum, a plant that is grown in regions of Australia that are historically separated from industry and inhabited by closed communities;
- Choose beauty brands that declare that they produce products certified as Vegan; this is helping to reduce the use of palm oil in cosmetics;
- Read the ingredients of beauty products carefully and take an interest in it. In the absence of a legal definition of organic or natural beauty products and strict requirements for production, sale, labeling and advertising, abuses under the guise of “green marketing” often occur. We remind you that toxic substances are listed at the end of the list of ingredients, but the manufacturer can also outsmart them by listing them elsewhere, closer to the natural ones. Of course, many substances are not familiar to the average consumer. In this case, use a variety of gadgets. For example, existing online gadgets can be used. One of them is the CLEANBEAUTY component identification program, which can be used to find out about the components of a specific product that are classified as dangerous (controversial components). All you have to do is take a photo of the label on your smartphone and you will get information about Controversial components;
- Until we cannot completely avoid plastic-containing products, we can choose to reuse the packaging we already have. Use your existing empty cosmetic packaging for other purposes or ensure that such packaging does not enter the environment;
- Do not throw your empty cosmetic packaging into plastic bags, sort them, do not wash them with extra clean water, but clean them with water that was already used for washing.

The producers of beauty products are changing behavior moving to more environmentally friendly by particular activities:

- increasing energy efficiency and using renewable resources;
- modern laboratories are establishing and using for creating and testing of the beauty products;
- recycled raw materials or biological sources are used instead of the plastic used in the packaging;
- proposing the delivering of beauty products without packaging;
- reduction the greenhouse gas emissions of each finished product;
- changing logistics of delivering the production to the market;
- setting up an eco-labeling scheme to promote sustainable decisions and inform customers;
- setting donations to fund projects to restore damaged natural marine and forest ecosystems as well as to fund the projects related to the circular economy;
- highlighting actions of producing more ecofriendly production as well as active participation in environmental protection in social media etc.

Most environmentally friendly beauty products are home made products and we will present some examples you can easily make by yourself

Homemade bath bubbles. You will need: 200 g. baking soda; 100 ml of citric acid; dish; pestle; chosen oil; chosen food dye; a bottle with a nozzle; molds. Crush the baking soda with a pestle. Pour citric acid or lemon juice, chosen oil, and dye into a spray bottle. Spray the resulting liquid on the crushed soda. As soon as the mass begins to solidify, place it in the prepared molds. If you wait too long, the mass will become too hard to form, and if you spray too much liquid, the mass will foam up. Leave the formed mass to solidify at room temperature for 3-4 hours.

Body scrub. Here are some of the possible recipes:

- **Coffee grounds scrub.** Do not throw away coffee grounds - mix them with a small amount of vegetable oil and massage it into the skin. Rinse after 10 minutes.
- **Mix a cup of sea salt with a glass of almond oil** (it's recommended to choose the smallest grain of salt so that it does not damage the skin). Massage the salt mixed with almond oil into the skin, wait a while and rinse with lukewarm water.
- **Mix some coarsely ground pepper with a pinch of cinnamon, a few teaspoons of olive oil, and a pinch of coarse salt.** This body peeling cleanses the pores, improves blood circulation, and helps to effectively fight cellulite.
- **Mix a few teaspoons of sugar with the same amount of cold-pressed olive oil.** Massage the skin, wait a few minutes, and rinse well under running water.
- **Grind a little oatmeal** (a coffee grinder is a perfect choice for this), mix with a few teaspoons of honey. After bathing, apply on skin, massage, wait a few minutes, and then rinse under running water.

Lip balm. You'll only need 2.5 g. of beeswax and 7.5 g. of the liquid oil you have (for example, you can use coconut oil or sweet almond oil). You can add 1 to 4 drops of essential oil (lime, sweet orange, lavender, etc.) to the mass of beeswax and oil dissolved in the water bath, which will give the desired smell. Mix everything well and pour it into the jars. The lip balm will freeze quickly, and you will be able to use it for lip care.

CASE STUDY

EXAMPLES FROM LT

A few months ago, the “Urban Green” salon with a low-consumption philosophy was established in Kaunas. For people who want to make less harm to themselves and the world around them. “The problem is that a lot of people think that such services are very expensive. However, this is not true and we are trying to dispel these myths”. The founder Ieva revealed how this place were opened, what is needed to maintain such a business and what services people can get here.

<https://9zuikiai.lt/tvarus-grozio-salonas-ar-tai-imanoma-kaune-toks-jau-yra/>

Mission of Urban Earth Lovers

We spread the ideas of simplicity, minimalism and nature-friendly life. We follow the attitude of responsible consumption, zero waste and low impact. Every day we work to reduce disposable plastic and waste, bring more lightness and cleanliness to life.

<https://www.urbanearthlovers.com/pages/apie-urban-earth-lovers>

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CLEANING PRODUCTS



INTRODUCTION – CLEANING PRODUCTS

Manufacturers of cleaning products have accustomed us that in order to do laundry or cleaning, it is enough to buy a ready-made detergent suitable for this purpose, but such products have not always been available. Detergents for washing or cleaning various surfaces can be equally made by yourself and it is not at all as difficult as it seems. People who decide to take this step are often surprised how little is needed to make washing powder or milk for cleaning the bathroom and how good the effects of a product prepared from such basic, natural ingredients as:

Source: <http://ekologiczni.com.pl/wplyw-detergentow-na-zdrowie-i-srodowisko/>

- baking soda or soda ash,
- spirit vinegar,
- tea tree oil,
- hydrogen peroxide,
- salicylic spirit,
- borax,
- marseille soap,
- lemon juice.

Ecological cleaning products are the best way to get rid of chemical preparations which may have a negative impact on our health. If we want to take care of cleanliness at home in a natural way, we can choose from two types of products. Home cleaning products based on the above mentioned ingredients or ecological cleaning products from the store.

Organic cleaning products can be divided into two types:

- Homemade liquids, cleaning sprays, pastes and powders that we prepare ourselves using products such as baking soda, citric acid, vinegar, borax and essential oils,
- Ready-made, organic cleaning products bought in the store.

Which of these remedies we opt for, should depend on our individual preferences. Of course, the most natural option will be home-made cleaning products. Their preparation and use will also be the most ecological and economical choice. Products of this type do not contain preservatives, are safe for health and the environment. If we are to talk about natural cleaning products without chemicals, it will be precisely the home detergents, which we will prepare ourselves. Ecological cleaning products, in turn, will be a better choice for people who do not have the time or desire to make homemade detergents, do not feel convinced about them and like to use ready-made solutions.

The cleaning products we all know from the shops may contain many harmful substances in their composition. These include:

- triclosan,
- reactive chlorine compounds,
- ammonia,
- phosphates,
- formaldehyde,
- MEA, DEA, TEA (foaming agents),
- sodium lauryl sulphate,
- strong preservatives,
- phenols,
- synthetic fragrances,
- optical brighteners.

And although these are substances approved for use in cleaning products, some of them may have adverse effects on our health. It is often the preparations we use for cleaning that cause our health problems. Weaker immunity, skin allergies, upper respiratory tract infections, irritated mucous membranes may be the result of toxic effects of the detergents we use. Additionally, chemical detergents harm the environment. Therefore, if we have a choice it is worth replacing popular detergents with ecological cleaning products. One of the most important advantages of ecological cleaning products is that we know their composition. Most manufacturers of well-

known brands of eco-detergents inform us on the label what substances are contained in their liquids, powders and other cleaning products. Unfortunately, this type of information is still missing on conventional cleaning products.

Advantages of eco-friendly cleaning products:

- composition based on safe ingredients,
- contain no enzymes, formaldehyde, optical brighteners, phosphates, petrochemicals, toxic fragrances, strong preservatives, synthetic fragrances, triclosan, irritating foaming agents,
- are biodegradable and environmentally friendly,
- do not contain raw materials from dead animals,
- have pleasant, natural scents,
- are gentle on the skin,
- do not cause such discomforts as tearing from the eyes, pinching in the throat, shortness of breath,
- are safe for health and allergy sufferers,
- Often their packaging is glass or paper and meets the requirements of the zero waste concept.

Being a conscious consumer, we should choose what is best for us and our health. Therefore, **natural and ecological cosmetics, healthy, unprocessed food and ecological cleaning products** should be the basic products we reach for when shopping and use every day.

Ecological cleaning products are becoming more and more popular and, consequently, more accessible. Currently, you can buy them even in chain drugstores, and many producers of conventional detergents decide to introduce eco-products to their offer. All this is good for us, consumers, because we have a better choice, lower prices and ecological products available at our fingertips.

HEALTH AND ENVIRONMENTAL IMPACTS OF DETERGENTS

Detergents - we use them every day. But do we think about the impact of detergents on health and the environment? And it turns out that this issue should not be underestimated and we should think whether the chemicals we use so far could be replaced by more ecological products. What are detergents? These are chemical compounds which are an active element of various types of washing and cleaning products. Such compounds are contained e.g. in washing powders, liquids for washing various surfaces, products for cleaning and disinfecting sanitary facilities, etc. The most important task of detergents is cleaning, but also whitening, shining or antistatic action. Some of the most dangerous ingredients of cleaning products are e.g. phosphates, triclosan, chlorine chemicals or some of the fragrances. Harmful substances can enter the human body through contact with the skin, eyes or respiratory tract. It concerns especially strong caustic preparations for cleaning sanitary facilities, but also other washing liquids and aerosols. Common symptoms of harmful effects of detergents are coughing, sneezing, skin allergies and headaches. These symptoms may disappear after discontinuing use of the product. However, toxic substances with prolonged exposure can cause, among others, cancer, hormonal disorders and problems with fertility. According to a study by scientists at the University of Bergen, very frequent use of chemical cleaning products can be as harmful as smoking 20 cigarettes a day!

What is the risk of inhaling cleaning products?

- **Respiratory, skin and eye irritation.** Irritation of the respiratory tract, skin and eyes can occur both from exposure to individual chemicals and from the interaction of several preparations. Combining preparations containing chlorine and ammonia leads to the production of highly irritating fumes, which cause nausea, coughing and eye problems. Mixing chlorine with acids can also result in skin or eye irritation.

- **Decrease in lung function.** A study conducted by Professor Øistein Svanes of the University of Bergen found that professional cleaners had a 17% lower lung capacity than those in other trades. That's not all, as a 14% reduction in lung capacity was also observed in study participants who do not clean professionally but perform routine household cleaning with chemical cleaning products.
- **Cancer.** Some of the chemicals present in household chemicals are proven carcinogens. The best example is formaldehyde, which is found, among others, in air fresheners and preparations to fight mould. Fragrance additives derived from petrochemicals are also a serious threat.

Source: <http://ekologiczni.com.pl/wplyw-detergentow-na-zdrowie-i-srodowisko/>

THE ENVIRONMENTAL IMPACT OF DETERGENTS

Detergents can also have a harmful effect on the environment. First of all, it is worth mentioning a rather obvious issue - the plastic packaging of detergents. When choosing detergents, pay attention to whether the bottles are made of the least harmful materials and whether they can be recycled. The second issue is the pollution of the environment with toxic substances. Phosphates added to products are particularly troublesome. Why? Because through sewage they get into waters and cause their eutrophication ("blooming" of water). That is why it is worth choosing environmentally friendly products that allow for equally effective cleaning,

Unclean cleaning products seep into waterways, which deteriorate the quality of soils and forests and kill fish that swim in them. Almost every home has at least one chemical cleaning product, whether it is for cleaning the bathroom, polishing the mirrors or cleaning the kitchen. Less environmentally friendly cleaning products are an integral part of everyday life. We use them to clean dishes, do the laundry or simply use them for bathing, unknowingly transferring a lot of negative substances to the environment, thus endangering our health and the health of our relatives. Bearing in mind the circular movement of water in nature - by polluting one container of our home water, we pollute the entire environment.

THE EFFECTS OF CHEMICAL ABUSE:

- **Eutrophication of waters** - explained as increase of water fertility, as a result of high concentration of phosphorus and nitrogen, which enters the water bodies. Although the initial stage of this process may seem beneficial for the environment, exceeding a certain limit disturbs the biological balance, leading to intensive water bloom, strong algal and plankton growth and decline of many aquatic species. Phytoplankton covering the entire water surface takes up a significant amount of oxygen and prevents light from penetrating deep into the water, thus stopping plant growth and animal life.
- **Soil degradation** is a problem caused mainly by air pollution, acid rain carried by atmospheric fronts and the use of artificial fertilisers. Soil fertilization alone may therefore be insufficient. It is important to use environmentally friendly cleaning agents that do not affect the composition of the water that is released into circulation.
- **Increasing amount of plastic waste** - natural cleaning products, apart from having an eco-friendly content, are in most cases biodegradable packaging that decomposes quickly. Most bio-packaging can also be recycled and reused, thus reducing the amount of waste being thrown away.

The toxicity of cleaning products is harming the entire world, and the most dangerous ingredients include:

- **Benzenes, phthalates, formaldehydes** - which have strong carcinogenic effects and increase the likelihood of liver disease. These ingredients are most often found in air fresheners. Artificial fragrances - which in most cases are petroleum derivatives and cause severe allergies.
- **Chlorine compounds** - most harmful to the respiratory system.
- **Sodium hydroxide** - which in large quantities can cause burns and wounds.
- **Optical brighteners** - the most common among washing powders and other laundry detergents. They are highly toxic and irritate the skin.

- **Optical brighteners** - the most common among washing powders and other laundry detergents. They are highly toxic and irritate the skin.
- **Softeners** - found mainly in fabric softeners. They contain benzyl acetate and pentane, which are considered some of the most dangerous household chemicals.

HOW TO MAKE CHANGES ON A PERSONAL LEVEL

Have you ever wondered about the harmfulness of such cleaning products as floor cleaner or ordinary liquid soap? Research shows that popular chemicals are harmful not only to us, but also to the environment, and the number of allergies they cause continues to grow. Every mother who has ever seen a worrying rash on her child's face knows about the consequences of using untested washing powders. Such products harm us and are one of the causes of environmental degradation, water and soil pollution.

Source: <http://ekologiczni.com.pl/wplyw-detergentow-na-zdrowie-i-srodowisko/>

How to counteract it? Are there eco-friendly cleaning products that are safe for all of us? Fortunately, the answer to this question is "Yes!" - you can get your home cleaned in eco style today.

To make cleaning "nice and pleasant" we need good cleaning products. By "good" we mean such that are effective, but at the same time safe for us and all household members (pets, plants, etc.). Unfortunately, the vast majority of available cleaning products contain many toxic substances which irritate our skin, often causing allergies. The awareness of using body cosmetics with natural ingredients is growing, but cleaning products are neglected, and yet, when cleaning, a lot of substances are emitted, which we inhale and which remain on the surfaces where we eat or play with children. It is very important for our health that our cleaning products also contain ingredients that are safe for us.

Fortunately, we already have a selection of natural ready-made cleaning products, but we can also make such products at home.

Most zero waste cleaning products can be prepared from simple and commonly available ingredients: baking soda, vinegar, household soap, lemons.

Eco-friendly dishwashing liquid

Ingredients:

- 500 ml of hot water,
- 10 g soap flakes (e.g. from marseille soap or farm soap),
- a tablespoon of vinegar, a tablespoon of soda,
- 3-4 drops of essential oil (e.g. tea tree, peppermint).

Preparation: Dissolve the flakes thoroughly in hot water, leave to cool, stirring a few times during this time. The mixture should thicken slightly. When the liquid has cooled down, add the vinegar, baking soda and oil. Stir and pour into a bottle.

Homemade floor cleaner

Just dissolve 30-40 g of grated economic soap flakes in 2-3 liters of water and add 3 tablespoons of vinegar (it will strengthen the effect of the liquid).

Zero waste multi-purpose liquid

Ingredients for approximately 500 ml of liquid:

- 1 teaspoon each of baking soda, borax,
- 2 tablespoons of vinegar,
- 1 tablespoon of liquid household soap,
- 2 cups of hot water,
- 10 drops of your favorite essential oil.

Preparation: Mix all the ingredients and pour into a bottle with an atomizer.

The ecological way to clean carpets

Ordinary kitchen soda can help. Its amount depends on the size of the carpet. Spread a thin layer of baking soda on the carpet and leave for 30 minutes (it is better not to have small children or pets in the room during this time). Vacuum as usual.

Source: <http://ekologiczni.com.pl/wplyw-detergentow-na-zdrowie-i-srodowisko/>

Natural product for wooden furniture

To prepare it, mix 2 teaspoons of lemon juice, 2 teaspoons of olive oil and 2 teaspoons of water. The quantities given are enough to prepare a portion for one cleaning. Lemon juice loses its freshness quickly, so you can't prepare it to spare.

DIY oven cleaner

To remove food residue and grease from the oven grill and baking tray, place the grill on a baking tray and pour boiling water over them. Add about 25 g of grated household soap and 5 tablespoons of baking soda to the water. Leave for about 2 hours. After this time, the dried residue can easily be removed with a washer or brush.

Eco-friendly glass cleaner

How to make an eco-friendly and effective glass cleaner? Nothing simpler! Mix vinegar and water in a ratio of 1:1 and pour into a spray bottle. The vinegar smell fades quickly!

Source: <http://ekologiczni.com.pl/wplyw-detergentow-na-zdrowie-i-srodowisko/>

Eco-friendly kettle descaler

To remove limescale from your kettle, you don't need to buy special products. Just vinegar mixed with water (1 glass of vinegar and 1 glass of water). Pour the mixture into the kettle, boil, leave for 90 minutes and rinse.

Homemade bedding spray

Ingredients:

- 2 tablespoons of vodka,
- ¼ cup of water,
- 10 drops of essential oil (e.g. lavender, grapefruit).

Preparation: Mix water and vodka, add essential oil. Pour into an atomizer bottle and shake to thoroughly combine the ingredients.

Pipe-cleaning agent

An important preparation in household cleaning. Fortunately, the pipes can be cleaned expressly by natural means. Pour ¼ cup of baking soda into the pipes and pour 1 cup of vinegar over it. Leave this mixture in the pipes for at least 20 minutes so the ingredients can react and remove the dirt. Then pour hot water over the mixture in the pipes.

Liquid soap

Ingredients:

- 30g of grey soap,
- 500 ml of water.

Preparation: Boil the water, in the meantime grate the grey soap.

Put the soap in a bowl, pour boiling water and stir with a whisk until completely dissolved. Allow to cool, pour into dispenser bottle. If the soap is too thick, add warm water and stir. If too thin - add more soap.

Both homemade liquid soap and other cleaning products should be prepared in glass bowls, never in plastic containers.

Source: <http://ekologiczni.com.pl/wpływ-detergentów-na-zdrowie-i-srodowisko/>

As you can see, we only need a few simple ingredients to create homemade cleaning products. Thanks to this, we do not destroy our planet, our health, but also our wallet.

There are more and more brands on the market that create their products in the spirit of sustainability and care for the environ-

ment. Just look for it! We believe that there will be more and more such companies and that they will soon win the battle for customers' favour, thanks to which the level of environmental degradation will be significantly reduced.

We are living in times that seem to be a turning point in the history of mankind, and it is up to our generation to decide whether this will be a period of prosperity and universal happiness, or the beginning of a complete collapse.

Technology and civilisation will nevertheless remain factors that destroy the environment, in a way their natural antagonists. Therefore, the issue of pollution is slowly becoming the subject of interest of more and more countries.

LONG-TERM EFFECTS OF THE CHANGES INTRODUCED

Industrial development is changing our planet more and more. Weather phenomena are becoming more dynamic, and more animal species are becoming extinct. Do we have any influence on what is happening around us? What can we do? Give the next generation a chance, we can do a lot by changing our habits. The ultimate goal is to shape a generation that will look at the environment from an "I do" perspective. Instead of demonizing and fighting with huge corporations, we should shape our consciousness in such a way that large corporations will have to adapt to the requirements of consumers, because the legislative fight of individual countries against them is a lost cause.

As part of the 3Rs, you can ensure that you use as few chemicals as possible in your home. Giving up or at least significantly reducing the purchase of chemicals will reduce the negative impact on the environment. It is worth thinking about, especially that they can be easily replaced by others.

The 3Rs not only tell us how to buy less cleaning products. Thanks to them we learn how to use the potential of the items we own. It is worth to be aware, check the composition of the products, learn, look for new solutions. You don't have to take the plunge right

away. By taking small steps you can introduce significant changes. Important for yourself, for the environment, and above all for the planet. It is an effort to reduce the production of waste, and thus not to pollute the environment.

Allergies now affect 30% of the population. One in three people is therefore allergic, and the incidence of allergies is increasing along with the chemicals we buy. Natural cleaning products are therefore not only an excellent alternative to chemicals, but also a healthy and comfortable way to clean in the homes of allergy sufferers. After all, constant itching of the skin, sneezing or rashes can be a nuisance during daily activities. Eco-friendly hypoallergenic cleaning products meet the special requirements of allergy sufferers with very sensitive skin. They do not irritate, are fragrance-free and yet equally effective. Manufacturers of eco-friendly cleaning products offer special product lines without fragrance, certified for allergies and newborns, as well as with bleaching agents exclusively based on active oxygen and without brighteners or optical brighteners. In this way, every allergy sufferer can feel clean and fresh in their own home without sudden attacks of shortness of breath or disturbance of the hydrophilic film of the skin.

The environmental impact of cleaning products is well researched, but despite this, there are still many myths associated with the subject. The most common one is that the only "green" preparations are the "chemical-free" cleaning products. The second - that "green" products are ineffective. The third - that the household cleaners we use are "disposed of" in sewage treatment plants.

In most of the popular preparations there are a lot of detergents which are dangerous for the environment - especially products designed for unblocking pipes, various types of stain removers and bleach are on the ecological "black list". They contain corrosive and irritating substances such as sodium hydroxide, hydrogen peroxide, sodium carbonate or sodium hypochlorite. They are extremely effective in removing dirt and polishing surfaces, but they have one basic disadvantage - they take a very long time to decompose and are - literally - deadly.

Synthetic cleaning agents, which constitute a part of municipal wastewater, are not fully removed in wastewater treatment plants and, therefore, pollute water bodies - in extreme cases, this may

lead to the destruction of local flora and fauna. The most common phenomenon associated with the discharge of incompletely treated wastewater is eutrophication of waters (the so-called blooming of reservoirs associated with high phosphate and nitrogen concentrations), as well as soil degradation. The consequence of this is water contamination, which becomes unusable not only for animals, but also for us - cleaning our homes, but polluting everything else.

What can you do to clean "healthier"?

- Remember that natural cleaning products can sometimes be as effective as synthetic alternatives,
- If you use common detergents from the store shelf: use personal protective equipment. Protective gloves are acceptable, but a mask and goggles seem excessive to you? Look for information about being around fumes from ammonia, chlorine, quaternary ammonium salts and formaldehyde - all of which are found in most common cleaning products,
- Read labels of cleaning products - the labels will tell you exactly what kind of dangers are connected with using a given detergent,
- experiment - think about where you need industrial detergents and find it hard to give them up (e.g. washing powder) and where you can make room for natural cleaning products. Not only will your health benefit from this, but you will also produce less waste and probably save a lot of money,
- Don't be discouraged - everyone will sooner or later come across an „ecological junk“ which will not work for them. A good example is laundry nits, which many people describe as completely ineffective in cleaning clothes. However, this does not mean that all „green“ products are ineffective.
- recycle - „professional chemicals“ or synthetic cleaning products from leading companies are usually packaged in bottles that are perfectly recyclable. You can also reuse them by filling them with homemade bio cleaning products,
- use cleaning products not tested on animals.

The hygiene hypothesis, a theory that emerged with the end of the 19th century, argues that the human body needs exposure to different types of microorganisms. Thus, it stimulates the human immune system as early as infancy and childhood.

Cleaning the house too intensively, especially with strong preparations with germicidal properties, may lead to the deterioration of immunity, development of allergies, asthma or other diseases.

RESOURCES

<https://homespot.pl/blog/dbamy-o-powietrze/toksyny-w-srodkach-czystosci>

„Zero waste lifestyle. Garbage less, live better”; Amy Korst; Vivante Publishing, Białystok 2017.

<https://pandawanda.pl/pl/n/Wiosenne-porzadki%2C-czyli-7-przepisow-na-domowe%2C-ekologiczne-i-bezpieczne-srodki-czystosci/94>

<http://ekologiczni.com.pl/wplyw-detergentow-na-zdrowie-i-srodowisko/>

<https://odplastikowani.pl/>

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<https://triny.pl/blog/ekologiczne-srodki-czystosci-dobry-wybor-dla-twojego-domu-i-zdrowia/>

<https://www.ekomaluch.pl/Ekologiczne-srodki-jak-dbac-o-dom-i-nie-szkodzic-srodowisku-blog-zul-1533717149.html>

http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.baztech-825d4172-9b61-4a9a-be09-303363e168f7/c/Nowak_R_Ryzyko_1_2015.pdf

<https://www.zdrowezdrowie.pl/2018/05/30/dom-bez-chemii-przepisy-na-domowe-srodki-czyszczace/>

<https://www.mjakmama24.pl/dom/porzadki/jak-zrobic-domowe-srodki-czystosci-10-sprawdzonych-przepisow-aa-WYHu-3sJE-JVXR.html>

<https://www.mykitchenlife.pl/5-przepisow-na-domowe-srodki-czystosci/>

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<https://wrzucnaluz.com/naturalne-i-tanie-sprzatanie-9-pomyslow-na-porzadki-zero-waste/>

<http://www.kupujepolskieprodukty.pl/2019/07/marka-zielko-naturalne-srodki-czystosci.html>

<https://www.golddrop.eu/pl/tps/ekologiczne-srodki-czystosci-do-domu>



**SAVING
WATER**



IMPORTANCE OF WATER

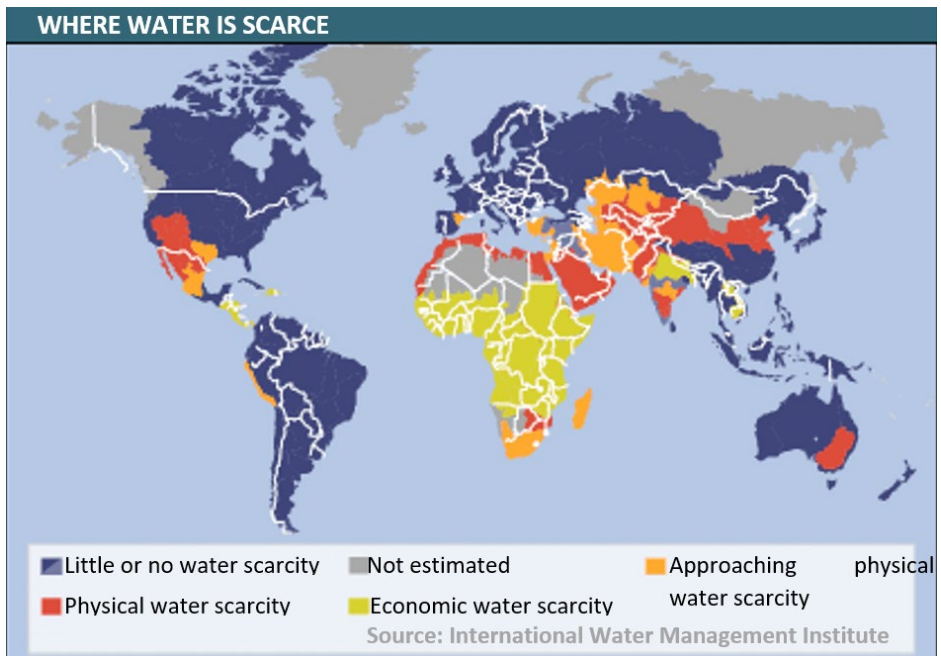
The aim of the module called saving water is to introduce the forms of saving water through the use and reuse of greywater, rainwater and blackwater, which is a very current topic today. The topicality of this issue can be seen regarding the environment, the financial situation of households and as an effective tool against the long-term problem of drought.

Within rainwater can replace up to half of the rare drinking water used and thus prevent its shortage. The use is very diverse, these are common activities such as cleaning the household, washing, flushing toilets or, perhaps most typically, watering the garden. It may not seem so, but up to 50% of the daily household water consumption can be replaced by rainwater. As a standard, each person consumes up to 100 litres of water per day

Water can be wasted in every day's small tasks which we even don't realize. In total, a dripping tap can waste a total of 1 litre of water per hour, i.e. 90 litres of water per week. A similar calculation is with a shower or bath. It certainly doesn't matter to take a bath occasionally, but regular and frequent bathing in the bath is not optimized at all. In comparison: taking a bath means 200 litres per bath, the shower adds about 50-70 litres. A very similar system can be found in older washing machines vs. new, old washing machines consume 80-90 litres of water per wash cycle, new only half, i.e. 40-45 litres. When brushing teeth, washing hands or hair, it is necessary to turn off the water, otherwise 15 litres of water per minute will flow.

According to the World Economic Forum, wasting water is, in terms of impact, the biggest global risk in the next decade, which is compounded by the lack of freshwater resources. This is reflected in partial satisfaction or absolute non-satisfaction of needs, competition for water quantity or quality, disputes between users, irreversible depletion of groundwater resources and negative environmental impacts. One fourth of the world's population (2 billion people) live in conditions of severe water shortage for at least 1 month a year. Half a billion people worldwide face severe water shortages

throughout the year. Half of the world's largest cities are facing water shortages. Although only 0.014% of all water on Earth is readily available fresh water (the remaining water is made up of 97% salt water and slightly less than 3% difficult-to-access water), technically there is enough fresh water for all of humanity worldwide. However, due to the uneven distribution (exacerbated by climate change), there are some very humid and some very dry geographical areas on Earth and the sharp increase in world demand for fresh water in recent decades, especially for industrial purposes, is leading to a water crisis in 2030, if current trends continue, demand will exceed supply by 40% ([United Nations Environment Programme](#), 2016).



Source: <http://news.bbc.co.uk/2/hi/science/nature/5269296.stm>

WATER SCARCITY

The basis of global water scarcity is the geographical and temporal mismatch between freshwater demand and availability. The main drivers for growing global water demand are a growing world population, improved living standards, changing consumption patterns and the expansion of irrigated agriculture. Climate change, such as weather changes (including droughts or floods), deforestation, increased pollution, greenhouse gases and inefficient use of water are the main causes of water shortages. At the global level and on an annual average, there is enough fresh water to meet this demand, but the spatial and temporal differences in water demand and availability are large, leading to (physical) water shortages in several parts of the world during certain times of the year. Most of causes of water scarcity are related to human interventions in the water cycle. The scarcity varies over time due to natural hydrological variability, but changes even more, as a function of the prevailing approach to economic policy, planning and management. Deficiencies are expected to intensify in most forms of economic development, but with the correct identification of causes, many of its causes can be foreseen, avoided, or at least mitigated.

Some countries have already shown that it is possible to separate water use from economic growth. In Australia, for example, water consumption fell by 40% between 2001 and 2009, while the economy grew by more than 30%. The most effective way to separate water intensity from economic growth is to create holistic water management plans that consider the whole water cycle: from source to distribution, economic use, treatment, recycling, reuse and return to the environment.

The total amount of easily accessible fresh water on Earth in the form of surface water (rivers and lakes) or groundwater (e.g. in aquifers) is 14,000 km³. Of this total, humanity uses and recycles "only" 5,000 km³. In theory, therefore, more than enough fresh water is available to satisfy the world's current population of 7 billion people and even to support population growth of 9 billion or more. However, due to uneven geographical distribution and especially uneven water consumption, water is a scarce resource in some

parts of the world and in some groups of the population. The lack of water due to consumption is mainly due to its widespread use in agriculture and livestock farming and in industry. People in developed countries generally use about ten times more water a day than people in developing countries. A large part of this consumption is made up of indirect uses in the production processes of consumer goods, such as fruit, oilseeds and cotton, which are water intensive. As many of these production chains have been globalized, much water is used and polluted in developing countries to produce goods for consumption in developed countries. Water scarcity can result from two mechanisms:

- physical (absolute) lack of water,
- economic water shortage.

Physical water scarcity results from insufficient natural water resources to supply demand in the region, and economic water scarcity is the result of poor management of sufficient available water resources. According to the United Nations Development Program, economic scarcity is more often considered to be the cause of water scarcity in some countries or regions, as most countries or regions have enough water to meet domestic, industrial, agricultural, and environmental needs but lack the means to provide it in an accessible way. Approximately one-fifth of the world's population currently lives in regions affected by insufficient physical water supply, where there are insufficient water resources to meet demand in the country or at the regional level, including the water needed to meet the efficient functioning of ecosystems. Arid areas often suffer from physical water shortages. It also occurs where water appears to be sufficient water, but where resources are over-depleted, such as through the overuse of irrigation. Symptoms of physical water scarcity include environmental degradation and declining groundwater, as well as other forms of overuse.

Economic water scarcity is caused by a lack of investment in infrastructure or technologies to pump water from rivers, watercourses, or other water sources, or by insufficient human capacity to meet water demand. A quarter of the world's population is affected by economic water shortages. Economic water scarcity includes a lack of infrastructure, which means that people without reliable access to water must travel long distances to bring water that is

often contaminated from rivers for domestic and agricultural purposes. Much of Africa suffers from economic water shortages; the development of water infrastructure in these areas could therefore contribute to poverty reduction. Critical conditions often arise in economically poor and politically weak communities living in an already arid environment. Consumption increases in most developed countries with the growth of GDP per capita, the average consumption is about 200-300 litres per day. In less developed countries (e.g. in African countries such as Mozambique), the average daily water consumption per capita was less than 10 litres, in connection with its transport of 1km to the place of household from the place where it is possible to obtain water. Increased water consumption is related to growing income, measured by GDP per capita. In countries that suffer from water scarcity, water is often the subject of speculation.

WASTEWATER TYPES AND LEGISLATION BACKGROUND

There are three types of wastewater, which can be reuse and recycle to some degree:

- Greywater
- Blackwater
- Rainwater

Each wastewater type must be treated differently and can be used in various ways.

Greywater is ideal for garden watering, with the appropriate precautions, such as using low or no sodium and phosphorus products and applying the water below the surface. Appropriately treated greywater can also be reused indoors for toilet flushing and clothes washing, both significant water consumers.

Blackwater requires biological or chemical treatment and disinfection before reuse. For single dwellings, treated and disinfected blackwater can be used only outdoors, and often only for subsurface irrigation. Check with your local council or state health department on local requirements.

Blackwater is the mixture of urine, feces and flushwater along with anal cleansing water (if water is used for cleansing) and/or dry cleansing materials. Blackwater contains the pathogens of faeces and the nutrients of urine that are diluted in the flushwater.

Characteristics of rainwater functionality in numbers:

It is not the same in the whole of Europe, but as an example in the middle of Europe, on a roof with a vertical diameter of 100 square meters in the Czech Republic at an altitude of 300 meters, 70 cubic meters of water fall annually. Of this, only about 49 cubic meters can be used for the toilet, because November to March cover the need only partially and about 6 cubic meters must therefore be supplied from the water supply. This results in a total surplus of about 21 cubic meters of water per year, which is enough to water a garden of 600 square meters (calculated for grass that consumes during the growing season up to 70 litres / square meter, half of which gets rain).

Graywater got its name from the inevitable color change that occurs during longer storage. It is usually defined as wastewater from bathrooms (washbasins, showers, baths and sometimes also washing machines) that does not come into contact with black water (ie water from toilets).

The primary problem arises in legislation that is not completely comprehensive. Greywater legislation in the EU says that Greywater management in the European Union is not yet addressed by a single piece of legislation (Regulation of the European Parliament and of the Council of the EU), although the use of treated greywater is happening more and more frequent. Each country addresses the issue individually by using the recommended ISO standards in its legislation and using Regulation (EU) 2020/741 of the European Parliament and of the Council on minimum requirements for water reuse, implementing EU directives into their legislation. These are mostly Council Directive 91/271 / EEC concerning urban waste water treatment (Guidelines on the integration of water reuse into water planning and management in the context of the Water Framework Directive) and Directive 2006/7 / EC of the European Parliament and of the Council of 15 February 2006 on the management of bathing water quality and repealing Directive 76/160 / EC.

Water reuse can be considered in many sectors and includes both the recycling of urban and industrial water to irrigate land; industrial use; to use non-potable and recycled water in cities for flushing toilets; for firefighting; for environmental and recreational use, for the operation of ornamental water features, replenishment of water bodies and car washing. Last but not least, the use of grey-water from households, apartment buildings, hotels and shopping centres for reuse for flushing toilets or for irrigating urban greenery or gardens.

HOW TO REUSE AND RECYCLE WASTEWATER

- **Non-wasting water** - within households and company buildings, it is necessary to avoid the following difficulties, which at first glance may not show such losses. During long-term, repeated activities, it can be even a weekly loss of 90 litres. Suitable and effective seals for water taps are essential. Within the household, it is recommended to shower instead of taking a bath. The reason is simple, saving up to about 150 litres of water. The use of new technologies is "green" in terms of water savings. In comparison, older washing machine technology is less economical by up to 40 litres topicality washing program. Daily brushing of teeth, washing hands several times a day, or washing hair is necessary to turn off the water in the meantime. With a constant flow of water, up to 15 litres of water flow in 1 minute. Other possible measures are to install a dual flush or low flow toilet or put a conversion kit on your existing toilet, or use perlizers in all taps of your house.
- **Recycling** - using various tools. The wastewater flows through the mechanical dirt filter of the reaction tank, where the water is biologically treated. A membrane module is fitted in the reaction tank, in the lower part of which an aeration system is fitted. Above the membrane module, a pump is located, which sucks the water through the membranes under vacuum and drains the already purified water into the purified water storage tank. Water from the storage tank is pumped into the process water distribution system. The reaction tank is equipped

with an emergency overflow. The system can be topped up with drinking water.

- **Rainwater** - using by common activities such as cleaning the household, washing, flushing toilets or, perhaps most typically, watering the garden. Up to 50% of the daily household water consumption can be replaced by rainwater. The solution is large tanks located near, for example, for water falling from the roof.
- **Natural well** - A well, in some European regions, means a reliable source of drinking water, thanks to which water supply costs can be reduced. According to valid legal regulations, a natural person can only dig to a depth of three meters, which is usually not enough to achieve quality water. Therefore, it is a suitable investment to hire a well company, which usually offer a comprehensive service from obtaining the relevant documentation and permits through finding a suitable place for the well and installing pumping equipment to the approval of the finished well. This solution is not possible in all European countries since the use of wells might be highly regulated for the control of aquifers (current situation in Spain).
- **Water saving tools** - Today's market offers countless options and tools for saving water. The market is diverse, where accessories range from adapters to adapters. The principle is simple; the accessory works in the form of a limiter, in several stages of setting. Up to 50% water savings can occur, i.e. up to 14 litres of water flow through the water faucet in one minute, the limitation means that only 11 litres or even only 5 litres per minute flow.

BLACKWATER RECYCLE/REUSE PROCESS

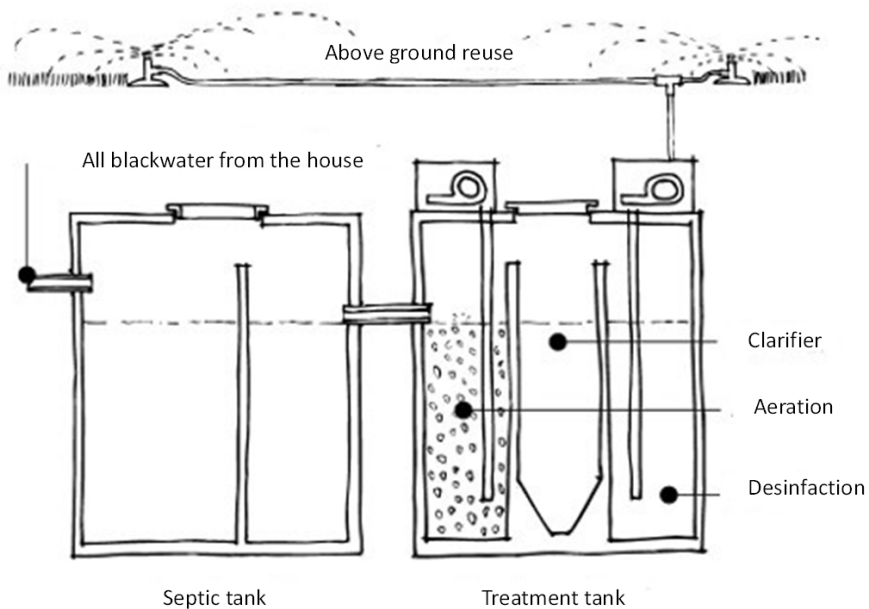
Blackwater, which is sometimes referred to as sewage is the wastewater that comes from toilets, garbage grinders, and dishwashers. How to minimise the production of black water:

- Minimise the use of cleaning chemicals. Use natural cleaning products where possible.
- Do not dispose of household chemicals down the toilet.
- Use a sink strainer in the kitchen to help prevent food scraps and other solid material from entering your wastewater.
- Blackwater treatment systems for outdoor reuse

Outdoors is the only place where treated and disinfected blackwater can be safely reused. There are many different types of blackwater treatment systems suitable for outdoor use.

Currently the most common wastewater treatment and reuse system is the aerated wastewater treatment system and many commercial models are available. After the wastewater solids have settled, the effluent is aerated to assist bacterial breakdown of organic matter, followed by a further stage of disinfection, usually using chlorine pellets.

On-site wastewater treatment systems using microfiltration are now available for domestic use in certain types of homes as individual homes. These systems require no chemicals but do need energy. Some treatment systems use worms and microbes, and little energy and no chemicals, to treat all household wastewater. They produce effluent suitable for subsurface irrigation and compost as a by-product.



In a blackwater recycling system, all of the blackwater is routed to an initial tank via gravity. The blackwater is given time to settle and a primary colony of bacteria goes to work on the waste for 24 hours similar to a normal septic system. Then the settled blackwater goes into another tank that is divided into 3 chambers; Aeration, Clarifier and Disinfection (Green Living Tips, 2009).

- ❁ **Aeration stage:** water and air are injected into the tank at timed intervals so that the contents of the tank are churned. Bacteria in the tank then settle so they can feed on the sludge in the tank. When that is finished, the water is moved to the sludge settling chamber
- ❁ **Sludge Settling Chamber:** the results of the aeration stage are then piped into a sludge settling chamber. A bacteria biomass mechanism forces sludge downwards and the partially treated water upwards to be collected and sent on to the irrigation chamber stage
- ❁ **Irrigation Chamber:** The remaining effluent passes into the irrigation chamber. Here, it is clarified and chlorinated, which is the last step of the process. The water can then be piped into ground irrigation systems for use in gardens.

The water that is recycled from blackwater recycling systems should never be used as drinking water or on food crops because they could still contain harmful bacteria. It can be used for watering lawns or non-food gardens.

Watering lawns and non-food gardens are not the only benefits of a blackwater recycling system. It also benefits the environment in many ways such as:

- **Energy conservation:** The removal of harmful bacteria from blackwater in processing plants is expensive and uses a lot of energy.
- **Water conservation:** Using recycled blackwater to water lawns and non-food gardens helps to conserve the fresh water that would otherwise be wasted.
- **Natural resource conservation:** Plants that are grown using recycled blackwater do not need fertilizer because the water is already nutrient rich and the plants feed off of them, this eliminates the need for polluting the environment with fertilizing chemicals.
- **Habitat protection:** Recycling blackwater lessens the chance of the wastewater seeping into natural habitats.

Just as there are advantages of recycling blackwater, there are also some disadvantages. These disadvantages include: these systems can be expensive, the process can produce a bad smell and it requires on-going maintenance.

RAINWATER CATCHMENT AND REUSE

Harvesting rainwater has gained attention in recent years. Rainwater harvesting systems conserve water and help with storm water management. Use of collected rainwater reduces the use of potable water for outdoor water uses, such as watering landscape plants and washing vehicles. By collecting rainwater, homeowners divert the water away from their home's foundation and reduce the amount of water that runs off the roofs, over the land and into creeks and storm drain systems that ultimately discharged into our rivers and lakes.

Rainwater catchment systems are not difficult or expensive to install on a home or other buildings. A system can be retro-fitted to existing buildings or integrated into new building design. The system consists of two basic components: the collection and the storage. Parts for both can be purchased from many sources, such as farm and building supply stores, as well as online.

- **Collection** - the gutters on building collect and move rainwater from the roofs, through a downspout to the rain barrel. A diverter can be added to the downspout to direct the water flow into the rain barrel or away from the building in the normal discharge.
- **Storage** - the average residential rain barrel holds 50 gallons (189 litres) of water. They are typically a food grade barrel made of high density polyethylene. Homeowners sometimes find used barrels of various sizes for sale from businesses or use new heavy duty garbage cans. Always use caution and know the history of the contents of the used barrels. Do not use barrels that contained anything other than food material or water; never use a barrel that contained industrial chemicals, petroleum products or pesticides. All used barrels should be scrubbed with soap and water or power washed and triple rinsed. To collect as much of the rainwater as possible, install a larger tank or connect several rain barrels together so that the overflow from a full barrel can be routed into empty barrels. An overflow outlet at the top of the barrel can be designed to channel the excess water when the barrel is full. A spigot near the bottom of the side of the barrel fitted with hose will enable easier access. A cover on the rain barrel will reduce mosquitos and contaminants from entering the water. Set the water collection tank on a solid level surface. It is a good idea to elevate the tank a few feet off the ground so that a watering can or bucket can fit under the spigot.

RAINWATER USES

Harvested rainwater can be safely used for non-potable activities, such as yard and landscape irrigation, watering potted plants and washing vehicles. Collected rainwater should NOT be used for drinking or other potable purposes if it is not filtered and disinfect-

ed before use. Gardeners often collect water in a rain barrel with little to no protection from the roof's "first flush" of runoff. The first flush water is the initial rainwater that drains off an impervious surface, such as a driveway, parking lot or roof and has shown to have the highest levels of contaminants.

Primary substances of concern in roof runoff include heavy metals, polycyclic aromatic hydrocarbons (PAH's) microbes, pathogens and pesticides. Birds, insects, and small mammals deposit faecal matter on rooftops and in gutters, contributing to bacteria and pathogens in the runoff water. On metal roofs, water can react with the roof surface and absorb metals, such as zinc, copper, and aluminium. Roofs with wooden or asphalt shingles can increase concentrations of chemicals used for waterproofing/weathering treatments. The question is whether these levels are high enough to be of concern for a gardener who uses a rain barrel to water a vegetable garden. A certain amount of caution should be taken when using harvested water to water a vegetable or herb garden to reduce the risk of exposure to a harmful contaminants, like *E. coli*. The best practices when using rainwater for food crops are:

- Use of a drip irrigation is the best way to utilized harvested rainwater in a food garden to avoid getting water on the plant itself.
- Always wash produce under cool running water before consuming.
- Treat the tank monthly to reduce the risks caused by pathogens.

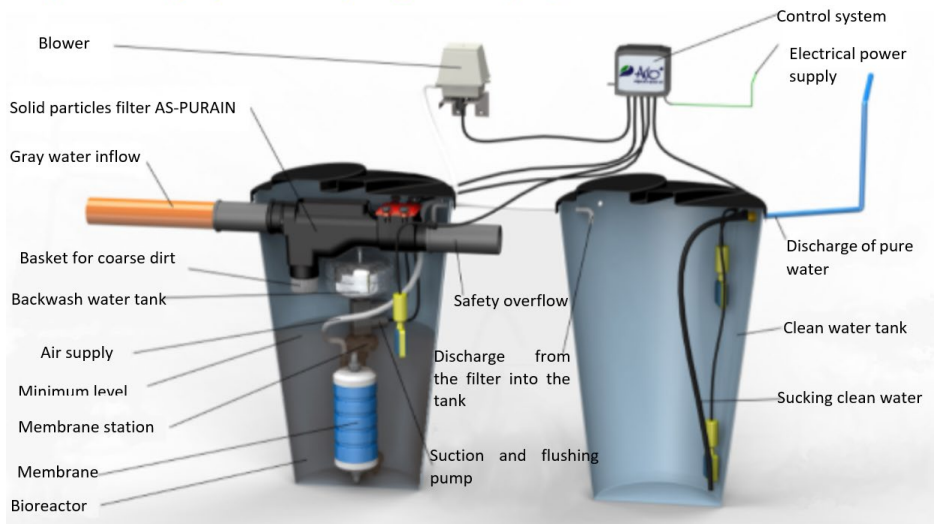
FUTURE OUTLOOK

Based on saving water primarily in households (dripping taps, showering, washing water when brushing hands, brushing teeth or hair) it is noticeable, according to research (World Health Organization, 2017), savings of almost half of running water are expected.

In the long run, the most effective form is saving and recycling water using tools such as:

Graywater recycling system

System for graywater recycling AS-GW/AQUALOOP



It is also worth mentioning the forms of water saving in individual industries. In the food industry, water consumption is significant. It also pays attention to its quality. One kilogram of beef is balanced by the consumption of 15 thousand litres of water, one kilogram of chocolate to 17 thousand litres of water. The paper industry consumes water mainly in the process of washing, filtering, bleaching, or shaping paper. One litre of paper consumes 300 litres of water. The location of large chemical companies is also often located near watercourses, due to their significant demand for water consumption. Water is used to produce products, but also for cooling or washing gases. This creates a large amount of wastewater, which is often suitable for recycling, up to 50%.

It is therefore necessary to treat water, its filtration, and other technologies, thanks to which it is possible to significantly reduce water consumption today.

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**SAVING
ENERGY**



CLIMATE CHANGE, ENERGY AND SUSTAINABILITY

The objective of this module is to establish a clear vision of the field of energy and its importance both in the economy and in daily life, its current importance as a scarce resource, the degree of incidence regarding global warming and the actions that are being taken, carried out at different levels of political decision.

At the same time, and as the main objective, different types of actions are proposed, which, especially from an individual point of view, can be implemented more or less easily in daily life and which can lead to an improvement in terms of environmental impact.

For this, the specific context or antecedents must be described; climate change and its relation to energy. Climate change is caused by the increase in the Earth's temperature (global warming) which comes from adding more greenhouse gases to the atmosphere than those occurring naturally add or without human intervention. These extra greenhouse gases mainly come from burning fossil fuels to produce energy, as well as from other human activities like cutting down rainforests, agriculture, farming livestock and the production of chemicals. Because of this, stable long-term strategies are crucial to help achieve the economic transformation needed and broader sustainable development goals, as well as move towards the long-term goal set by the Paris Agreement – holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C.

Energy has been proven as the main sector that creates GHG emissions that affect Climate change; thus, better energy production (green energy) and energy saving is essential to achieve global and local objectives related to climate change, and EU policies. These are the main greenhouse gases, their origin and relation to energy:

- **Water vapor.** It arises as a consequence of evaporation and its amount in the atmosphere depends on the temperature of the ocean surface. It is largely a natural process in which human action is not directly involved.

- **Carbon dioxide (CO₂).** It is the most important in two senses; it is the most dependent on human activities and the main responsible for the greenhouse effect. The concentration in the atmosphere is mainly due to the use of fossil fuels for energy production, industrial processes and transport / mobility. Its emission comes from combustion processes (oil, coal, wood) or from volcanic eruptions or forest fires.
- **Methane (CH₄).** Due mainly to fermentations produced by specialized anaerobic bacteria found in swampy areas, crops and in emissions from the intestinal tract of livestock. It is also produced by the leaks from natural deposits and industrial pipes.
- **Nitrous oxide (N₂O).** Caused mainly by the massive use of nitrogen fertilizers in intensive agriculture. Also due to other sources such as thermal power plants, automobile exhaust pipes and aircraft engines, biomass burning, and the manufacture of nylon and nitric acid.
- **Chlorofluorocarbons (CFCs).** They are man-made chemical compounds that are present in small concentrations in the atmosphere but are extremely harmful in the greenhouse effect. They have multiple industrial uses in refrigeration systems, such as aerosol components, aluminum production and electrical insulators, among others.
- **Tropospheric ozone (O₃).** Largely caused by burning polluting energy sources.

Moreover, to achieve objectives of energy saving is not only good to fight climate change and take care of our planet and animal species, but as well is obviously good for our economy, as doing this we learn to do the same with less resources and thus with a lesser energy invoice.

Nowadays is clear that the EU is achieving to create employments related to the green energy sector, maintain its activity, and save money at the same time. There are plenty of already proven technologies and techniques to achieve these results.

We are going to take a tour of the different areas in which effective solutions can be proposed and that are in our hands. In any

case, it should be noted that, in addition to the transition to green energy production and the progressive abandonment of fossil fuel consumption, it is increasingly important to save energy in a general way (individual behaviors and lifestyles, production of goods and services, insulation of buildings and homes ...), only in this way will we be able to get closer to achieving global and local objectives regarding climate change, and therefore to the objectives set by institutions such as the EU and the United Nations.

MAIN INITIATIVES OF INTERNATIONAL ORGANIZATIONS

Concern for climate change, and more generally for environmental issues, is not new to the main international organizations, and especially the European authorities. There are many international encounters and attempts that have been progressing in the conception of the phenomenon of climate change.

MAIN EU ACTIONS

The European Union has been one of the most active supranational entities in this regard, with a strong concern that is recorded in the main milestones reached.

- Energy and Climate Change Package 2013-2020
- Roadmap 2050
- Frame 2030
- European Climate Pact
- European Green Deal 2019
- European climate law 2021
- European Adaptation Strategy 2021

Expense information about EU policies and strategies related to better energy use and energy transition can be found in the following links:

1. EU Energy policy can be consulted here:

<https://www.europarl.europa.eu/factsheets/en/sheet/68/energy-policy-general-principles>

2. As well as EU Energy Strategy:

https://ec.europa.eu/energy/topics/energy-strategy-and-energy-union_en

The EU has placed different policies aimed at reducing our consumption of energy and use it in a more intelligent way. That advances of the EU can be checked in the following link:

https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_saving_statistics

DIFFERENT STRATEGIES AGAINST CLIMATE CHANGE: MITIGATION AND ADAPTATION

Before continuing, it is necessary to make a distinction in the actions and strategies aimed at combating or facing climate change: Mitigation and Adaptation Strategies:

Climate change Mitigation:

It refers to actions aimed at moderating or reducing net emissions of Greenhouse Gases (GHG) whose current levels have led us to the climate emergency in we are. Therefore, they are all those actions that seek not to increase the problem, to act today to stop the climate emergency

Climate Adaptation:

Strategies that detail what we can do in the future and present to protect ourselves from the impact of climate change, seek to limit the risks derived from climate change, reducing our vulnerabilities

It is important to clarify that mitigation and adaptation are clearly complementary: without mitigation, our adaptive capacity will be more quickly overwhelmed. On the other hand, an adaptation that is not low in Greenhouse Gas emissions is meaningless, since it intensifies the change, whose effects are to be avoided.

Regarding this we can make several reflections, many of us have seen - and even experienced - the effects of climate change. However, it is not extreme weather like floods, droughts and hurricanes. Slower and less noticeable changes in our climate have the potential to completely alter the way we live. The changes produced by

climate change have the power to transform our world, affecting food and water supplies and our health. The bigger the problems, the more difficult and expensive it will be to solve them - which is why taking early action to deal with climate change is the best option. From the traditional economic logic, we are delaying certain costs, transferring negative externalities to the future, but this will imply that the cost will be much higher and that perhaps we can reach points of no return, with serious consequences in food production, scarcity of resources and even an increase in conflicts associated with these situations in the long term.

FACT AND COMMON PROBLEMS IN ENERGY SAVINGS

The question in energy is that it has been, is and will be a key sector, but at the present time, with the high degree of dependence of many territories and the increase in global consumption, both due to the increase in production and consumption, it means that energy becomes even more important, even as a geostrategic element.

Likewise, the geostrategic component and generator of employment makes it a particularly sensitive sector, in which any intervention is uncertain in economic terms from a macro point of view, even so we can speak of a certain transition to cleaner energies. These days, it should be noted that despite the problems posed by any transition, the EU is achieving the creation of jobs related to green energy, maintaining economic activity and saving money at the same time. There are plenty of already proven technologies and techniques to achieve these results.

As we propose in this project, it is necessary to act from an individual-collective logic, to develop actions at the micro level to achieve macro effects, which will allow many small improvements and energy savings, which in aggregate terms will be especially valuable. Our scope for action is limited, but it contributes to collective achievement.

It is necessary to fight the usual attitude that part of the citizenship shows in which it is considered that other institutions, organizations or states are the only ones responsible, to start assuming our

own part of responsibility as individual citizens, how we produce, how we consume, how we move. In addition to the fact that many contributions allow a change, we establish a strategy of visibility and exemplarity for others and of pushing towards institutions and companies, from the bottom up. Move from consciousness to individual action to achieve collective achievement. As indicated later, the data support that the European population is clear about the seriousness of the problem.

The EU has conducted a citizen European survey and the results are clear, as European citizens now identify climate change as the single most serious problem facing the world. Over a quarter of Europeans (29%) chose either climate change (18%), deterioration of nature (7%) or health problems due to pollution (4%) as the single most serious problem we face. Moreover:

- 93% of EU citizens see climate change as a serious problem and 78% see it as a very serious problem. 90% of respondents – and at least three quarters in each Member State – agree that greenhouse gas emissions should be reduced to a minimum while offsetting the remaining emissions, in order to make the EU economy climate-neutral by 2050.
- 87% think the EU should set ambitious targets to increase renewable energy and support energy efficiency.



96%
of Europeans
have taken at least **one action**
to tackle climate change.



93%
of Europeans
believe climate change
is a **serious problem**.



90%
of Europeans
agree that greenhouse gas emissions
should be reduced to make
the **EU climate-neutral by 2050**.

HOW TO TACKLE THE DESCRIBED ISSUE/PROBLEM? GENERAL AND PERSONAL LEVEL

There are different ways to expand our knowledge and skills to be able to act in an increasingly responsible way and in accordance with the care of the environment. Especially thanks to new technologies we have the ability to expand our knowledge about human action (more and more measurement and sensorization of space is greater) and on the other hand, the tools and ways of dissemination are multiplying, being able to orient efforts to different audiences' objective.

Doing a simple search on the internet we can find various guides and projects to guide action on energy saving, guides that are usually relatively easy to follow and that provide advice adapted to different areas. It must be taken into account that many of the contents of these tools will be conditioned by the place where you live, others, however, may be easily exportable or interchangeable in different European countries.

Another very useful resource is the private initiative platforms that have been created to cover certain needs and / or promote certain guidelines or lifestyles in line with energy saving. In this sense, those solutions of the so-called collaborative economy that help to expand the servitization of certain assets for private use stand out, as is the case of the private vehicle through car-sharing in all its modalities.

Also, it is necessary to highlight institutional platforms aimed at increasing awareness or providing certain answers to the subject at hand, in this sense the following are a good example of educational platforms whose contents or experiences can be applied at the local level. They collect both results and a compendium of actions to take into account, with different levels of complexity:

- Initiative of the county council of Granada EN CLAVE DE SOL: www.enclavedesol.eu, a traveling exhibition that has traveled throughout the province of Granada and is currently available online with the aim of promoting a new energy model.

- **“Euronet 50-50”** (<http://www.euronet50-50max.eu/en/>) which aims to mobilize energy savings in public buildings by applying the 50/50 methodology in 500 schools and nearby of another 50 public buildings in 13 EU countries. The 9-step methodology increases the energy awareness of building users and actively involves them in energy saving actions. The financial benefits obtained are shared equally between the users of the buildings and the local authority that pays the energy bills. It won the 2013 European Prize for Sustainable Energy. Thanks to the new project the 50/50 network will be extended across Europe with the participation of new schools and other public buildings. The tool is in several languages and we propose to follow it as an activity.
- **Our planet, our future. Fighting Climate change together.** Specific informative platform to help citizens understand why change is necessary and what we can do about it, including a “teacher center” that contains classroom exercises and relevant materials for the “Causes”, “Impacts” and “Solutions”. Made from the EU
- https://ec.europa.eu/clima/sites/youth/solutions_en
- https://ec.europa.eu/clima/sites/youth/teachers_en?field_clmtl_topic_tid_i18n=61
- **Energy Neighborhoods Project guidelines:** A very useful database to search for actions and different matters related to energy.
- <https://ec.europa.eu/energy/intelligent/projects/en/projects/en2>
- **Spanish national energy agency guide:** Finally, we want to highlight a Spanish national guide with a large number of resources and tips.
- <http://guiaenergia.idae.es/>

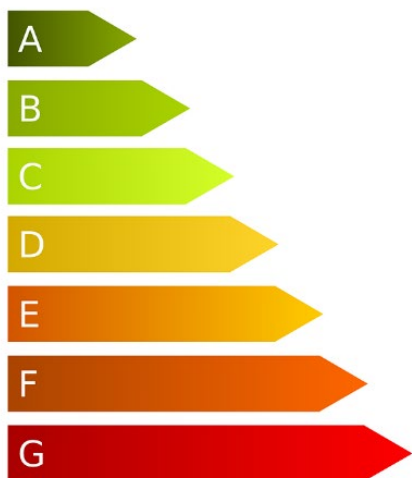
We also propose two practical activities to do.

ACTIVITY 1: CARRY OUT MEASUREMENTS IN THE HOME WITH AN INFRARED THERMOMETER FOR DOMESTIC USE.

Since the insulation of the home is one of the aspects that most influences the energy consumption of a home, it may be an opportunity to work on an activity that increases awareness. It is proposed to make measurements at different points in the house and at times of the day, making a small follow-up in a table that can later be extrapolated to a small graph, in addition, these data can be contrasted with those of classmates or with data from the school. This device is not an extremely sensitive tool like professional devices for detecting thermal leaks, but it does have the necessary sensitivity for this activity and it may also be available in many homes since it is an increasingly common object.

It is proposed to make a sketch of the house and 4 different points are chosen: Glass of a main window, window frame or profiles, main façade wall, secondary façade wall. A measurement would be made at two different times of the day (with sun and at night) to compare the energy leaks at both times.

The result will make it possible to become aware of how the use of some materials or others generates significant energy losses.



ACTIVITY 2. ANALYSIS OF CONSUMPTION THROUGH SMART METER ACCESS APPLICATIONS

Another proposal is to carry out an analysis of consumption patterns in the home and the consumption of certain electrical appliances, through access to the smart electricity meter.

The implementation of the smart metering system is not similar in all countries, but this activity is proposed for cases where it is possible. It is a very practical activity, where through the platforms of electricity distributors a basic analysis of family consumption can be carried out, in order to be aware of their own consumption patterns that are carried out, and therefore how we could try to reduce that consumption. Although each electricity marketer has a different format, the following data can usually be seen through the different platforms:

- Record with hours and consumption
- Record by days
- Maximum consumption peaks
- Possibility of seeing consumption in real time (connecting and disconnecting electrical appliances, for example, when turning on the oven, the power peak could be seen).

In general, it provides different statistics that are very useful to be able to make certain decisions at home, optimize consumption or even to assess the possibility of changing the company or the type of contract depending on the use made.

Of course, there is a lot of other materials in each country in local languages, our suggestion is to ask the national ministry related to energy or environment, that usually promotes different campaigns and/or educational material related to the topic.

Without intending to be exhaustive, we are going to collect here some of those that we consider may be more relevant and/or useful, synthesizing from different sources, both European projects, institutional information, as well as companies in the sector.

There are some general actions to be taken:

- Look on how you move yourself; whenever possible go in ac-

tive modes (walking/cycling) or in public transport. When not possible, share your trips, and try to use cleaner vehicles.

- Check how you use lights in the rooms you are, try to change those lights for other that consume less energy, use the lights only when needed and take advantage of natural light when possible. The use of clear colours is an option to reduce the need of light.
- Look on how you use heating and cooling systems, can you reduce the energy consumption by wearing other type of clothes? It is possible to better adjust the thermostats? Do you leave open windows and doors?
- When using home appliances, buy efficient ones when possible, use their efficient working programs when possible, and check how you use those to be more efficient (don't leave fridge door open, use adequate programs in the dishwasher, etc.)
- When you cook, use residual heats when possible, close the pans to heat faster, and do not put hot things in the fridge.
- When you buy things, those needed an amount of different resources, including energy. Think about it and see the real use of those things or if there is an option to share the product or rent it.

As well, actions that are more specific are presented grouped by themes:

Sustainable mobility

On the subject of mobility, the marginal gains for each person who leaves the private vehicle are very high, it is necessary to reflect on the way we move, whenever possible go in active modes (walking / cycling) or in public transport. When not possible, share your trips, and try to use cleaner vehicles.

The recent advancement of electrical devices for individual use may be an avenue to explore for those who cannot enjoy the above options, especially when green energy production solutions are spread in cities.

Domestic environment

- **Ironing.** Do not iron what is not necessary, do the maximum amount of clothes possible at one time, start with the clothes that need less ironing, continue with those that need more ironing and end up taking advantage of the residual heat for those that need less.
- **Refrigerator.** Make a planned use to avoid opening it excessively (Eg. Put the yogurts or the cans already separated previously so as not to do it inside). It is also necessary to adapt the temperature to the season of the year and the volume of products, avoid placing the refrigerator next to heat sources. Do not put hot food in the refrigerator.
- **Washing machines and dishwashers.** Avoid washing with unnecessary temperature, as well as using them at half load. Avoid pre-washes whenever possible and try to use the eco programs if you have them.
- **Dryer.** Whenever possible, avoid its use or use it to finish drying clothes after a first drying in the open air.
- **Devices on stand by.** It is necessary as far as possible to avoid the use of this option, for example through power strips to disconnect several appliances at once, or also through the use of smart plugs.
- **Cooking.** In addition to a good selection of the most efficient appliances, a good planning of the menus is important to cook adequate quantities (double servings for another day, cook several dishes in the oven at the same time...). It is also important to know the actual cooking times of food and the use of timers, the use of residual heat, the choice of pans and pots that optimize energy, either by more efficient materials (eg cast iron), type of construction (thick base) or cooking mode (pressure cookers) and using lids to concentrate the heat.
- **Maintenance of household appliances.** In some cases, simple maintenance actions will facilitate gains in energy savings such as cleaning the refrigerator coil, cleaning the oven, purging the radiators, maintaining the heating pressure.

- **Lighting.** Substitution of light bulbs by the most efficient modalities and in cases where it is appropriate to establish presence sensors to avoid forgetting when turning off the lights. The use of clear colors is an option to reduce the need of light.
- **Windows and doors.** If the windows are not very efficient, the ideal is to replace them, for which there are a multitude of very advanced technical options and at this time the availability of public subsidies for this. If they cannot be replaced, it is necessary to put weatherstripping and even curtains that create some insulation.
- **Heating.** Maintain the comfort temperature by controlling the opening of windows, and adapt to a reasonable temperature according to the time of year, adapting our clothing to it. It is also important to ensure that heating installations have good thermal insulation. In the field of heating, there is a very high potential for savings using complex or simple home automation systems, such as a basic open window warning system. The use of smart thermostats that allow calculating optimal use for air conditioning can be especially useful. Take advantage of natural light for air conditioning, use of blinds and awnings, cross ventilation, adapting these actions to each area, for example, the use of colors to take advantage of irradiation (dark awnings in winter and light in summer). The use of fans as an alternative to air conditioning is also very useful, especially ceiling fans and with a programmer.
- **Other domestic aspects.** The hot water temperature can be regulated, getting used to a lower comfort temperature and trying to shower in the bathrooms closest to the water boiler.

Work environment

In workspaces, you can act from management or individually. From the organization:

- Promote telework days as much as possible
- Promotion of sustainable mobility. Create collective or coordinated transportation systems. Promote bicycle transportation policies. In this regard, there are many options, such as applications that are based on gamification such as the competition of kilometers on a work trip by bicycle.
- Adapt lighting and heating with smart sensors.

Individual Actions

- As far as possible, adapt our clothing to the temperatures of the work space
- Analyze the electronic devices of habitual use for a correct use, an example could be to configure the computers in the most sustainable configurations, to use the screen shutdown.

Responsible consumption

- The production of goods and services largely involves the use of energy, as consumers we must be responsible and proactive, ask ourselves if we really need the products that we are going to buy, what more sustainable alternatives are there, and try to buy zero kilometer products or short distribution chains.
- Despite the fact that in today's society repair is not always the cheapest option, it is necessary to increase the rate of repair of household items.
- It is also necessary to take into account, with respect to certain goods, to what degree we do not need your property and we do need its specific and limited use as a service eg. Motorbike or electric bike. Collaborative platforms have been a catalyst in this regard and their use must be encouraged.
- Take advantage of the information provided by labeling systems such as the efficiency of household appliances or homes to make conscious and responsible purchases

Renewable energies and home: photovoltaic

In this document, we are interested in considering the options that for to existing homes, for new homes there are increasingly demanding standards, especially in insulation.

Although for domestic use there are other sustainable energy options such as biomass, photovoltaic becomes the main option to consider. Its benefits exceed the individual, starting with the obvious environmental benefits, but also the ability to increase the degree of energy autonomy (and its geopolitical consequences) and to loosen the energy grid system by creating a more decentralized and optimized system, avoiding energy losses.

Profits

- **Clean energy** without disturbances, compared to other options, and except in the case of places with special protection (natural or patrimonial) there are usually no problems.
- **Long duration.** The cost of the installation is easy to amortize since it is very durable equipment, with an average of 25 years of useful life.
- **Low maintenance.** Maintenance is very easy, on many occasions, it is enough to carry out the established periodic reviews, and as it is managed electronically, it is easy to detect possible errors or malfunctions.
- **Savings.** Especially in recent years, the decrease in the cost of the bill is increasing with these systems, especially due to the increase in the cost of energy. Now market conditions make it interesting.

System and Modalities

Energy production can be done in two ways, centralized or distributed, which is when energy is created at the same point it is consumed. Specifically, the domestic photovoltaic system is made up of the following elements:

- **Solar panels:** or similar devices (solar tiles, glass...), fixed to the roof or other surface by means of a structure
- **Other connection elements** such as inverters, cables and connectors.

- **Battery storage system**, this would be an optional component

These systems can work in different ways:

- **Turning your energy into the general network**
- **Consuming directly the energy produced**
- **Storing the energy produced for later use.**

With the previous three options and depending on the regulations of each country and the choice of the consumer-producer or “prosumer”, different combinations can be made to create multiple complex mixed systems. In any case, the current trend is towards self-consumption, and in this sense the regulations have gone from encouraging the transfer of energy (via “feed in tariff” premiums) to encouraging consumption at the point of production. So it ends up being more profitable for the “prosumer” consumption.

The photovoltaic model has evolved a lot not only from the technical point of view of efficiency. Legislative changes in the sector and the lowering of its cost imply the possibility of adopting different modalities, including even participation in solar production initiatives without having space for it thanks to the so-called energy communities and virtual solar plants. These are new formulas that extend the possibility to more citizens and not only to those who enjoy certain material conditions (location, space, orientation, individual housing...)

Installation Decision

In the case of wanting to assess the possibility of making a solar installation, a series of parameters must be taken into account to make the decision:

- **Prioritization of actions:** The basic condition, especially for self-consumption, is to achieve good insulation and then consider the option of solar production.
- **Analysis of personal casuistry:** Analysis of one's own habits or lifestyle (quantity of consumption, hours in which it is consumed...) and the necessary dimensioning, current regulation (if there is a net balance system, if it is worth dumping energy)
- **Material capacity:** If the conditions are met to do so, there are no legal limitations, good condition of the house in which it is

going to be installed, especially the roof, solar irradiation, absence of shading... In this sense there are some tools (sig's and online calculators) for a first approach to the subject https://joint-research-centre.ec.europa.eu/pvgis-photovoltaic-geographical-information-system_en

ROLE OF STATE SUBSIDIES

In many of the previous tips, we talk about the benefits that the substitution of certain goods for other more efficient ones (vehicles, windows, electrical appliances ...) can bring, but the obvious cost implies a brake that. If we want a change to take place relatively fast, in most cases for the average citizen only possible if there are certain economic incentives or subsidies. A recent positive example is the bicycle buying campaigns carried out in Italy.

In this sense, the existence of national programs to promote the substitution of these goods, either by financing part directly or by means of tax deductions, is usually common. This mechanism must be fine-tuned to achieve maximum efficiency, preventing bureaucratic obstacles from preventing its execution or altering market prices.

Regarding economic aid for energy efficiency, in the context of the next generation funds, a very ambitious system is being articulated that will allow the rehabilitation of both public buildings, neighborhood communities, as well as private homes.

MAIN CHALLENGES

It is evident that the main challenges are multiple and a synthesis is difficult, but we believe that as a first approximation the following challenges should be highlighted:

- **Resistance to change.** People tend to keep doing things the way they have been doing over time. Both personal guidelines and cultural guidelines associated with the culture to which they belong imply a way of acting. Therefore, certain changes imply a degree of initial discomfort that must be overcome,

through awareness-raising and through the aforementioned tools, cultural change is possible. And these small changes achieve a degree of individual commitment that goes beyond simple social demands, little by little, which is confirmed in the new generations, there is an ethical commitment that will be a fundamental impulse for the necessary changes. In this sense, a creative approach is necessary to achieve both attention and commitment.

- **Belief systems**, although we live in the knowledge society and with an unparalleled degree of scientific and technical development, there are still belief systems that deny widely contrasted empirical realities, such as the denial of climate change or the false trade-off between economic development and sustainability. In this sense, although it is difficult to break this barrier, it is necessary to be persistent and continue with awareness-raising efforts to try to reduce the effect of these approaches.
- **Private interests not aligned with sustainability**, especially in productive economic dynamics, short-term views predominate and above all a tendency not to take into account the externalities of the economic process. However, this economic approach is changing intensely, whether due to brand image objectives, citizen demands, legislative push, or due to conviction, companies are increasingly aware of and committed to responsible and sustainable production.
- **Cost in terms of employment**, it is evident and true that certain actions with an environmental focus have a short-term cost with respect to employment. However, in many cases the opposite effect is not taken into account, in which not only new sources of employment appear, but also a driving effect on the economy. In this sense, the states have a difficult task to combine the necessary maintenance of the existing economic dynamics and at the same time discourage certain sectors or industries such as everything related to fossil fuels. In many cases, social protest can represent a considerable brake on the push that states can exert, both in economic and legislative terms.

EXPECTED RESULTS IF WE CAN APPLY THE CURRICULUM AND IMPLEMENT CHANGES IN OUR BEHAVIOUR

Talking about the consequences in the short or long term of actions like those mentioned, can simply become a wish list falling into generalities if we are not minimally rigorous, which is difficult. However, thanks to the results provided by the European Energy Neighborhoods document, there is evidence that as a consequence of the change in behavior in energy matters there is a potential of saving nearly 20% of energy consumption with low-cost or zero-cost measures. So the potential of real impact after promoting educational materials among young adults is huge. This implies net improvements, together with an increase in the degree of environmental commitment, which probably extends to other facets of each person.

Moreover, in marketing is well known the fact that the best advertisement is the advice of a relative, this is "word of mouth". Because of this the implementation of successful educational materials among citizenship will promote them to become new promoters of the need to save energy and use it in a better way, and enlarge the impact to other wider audience.

RESOURCES

Institutions

- FEDARENER: <https://fedarene.org/>
- MANAGENERGY: <https://www.managenergy.net/>
- COVENANT OF MAYORS: <https://www.covenantofmayors.eu/>
- National Contact Points: <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/support/ncp>

EU Policies and Facts

- General principles on energy policy: <https://www.europarl.europa.eu/factsheets/en/sheet/68/energy-policy-general-principles>
- EU Energy Strategy: https://ec.europa.eu/energy/topics/energy-strategy-and-energy-union_en
- EU Climate Action: https://ec.europa.eu/clima/policies/eu-climate-action_en
- EU Statistics on Climate Change: <https://ec.europa.eu/eurostat/web/climate-change>
- EU Energy Saving Statistics: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_saving_statistics

Facts and Educational materials

- EU site for youths on Clima: <https://ec.europa.eu/clima/sites/youth/>
- EU site for youth Teachers on Clima: https://ec.europa.eu/clima/sites/youth/teachers_en?field_clmtl_topic_tid_i18n=61
- Satellite information about Climate Change: <https://climate.copernicus.eu/ESOTC/2020>
- Affection to daily life of Clima: <https://www.edf.org/card/7-ways-climate-change-affecting-daily-life>
- National Geographic Climate Change: <https://www.national->

geographic.com/climate-change/how-to-live-with-it/index.html

- EU Citizens and Clima: https://ec.europa.eu/clima/citizens/support_en
- Citizen Climate Action toolkit: <https://www.climatecouncil.org.au/wp-content/uploads/2018/11/climate-action-toolkit.pdf>
- How to prepare a workshops on climate change: <https://climateoutreach.org/reports/how-to-have-a-climate-change-conversation-talking-climate/>
- Resources for climate change: <https://communitiesforfuture.org/get-resources/>
- Climate visuals: <https://climatevisuals.org/>
- Facts about Climate emergency: <https://www.unep.org/explore-topics/climate-action/facts-about-climate-emergency>
- 10 myths about climate change: <https://www.wwf.org.uk/updates/10-myths-about-climate-change>
- EU Energy Projects: <https://ec.europa.eu/energy/intelligent/projects/en/projects/en2>
- EU 50/50 program for schools: <https://www.matchup-project.eu/news/valencia-50-50-an-educational-project-to-reduce-energy-consumption-in-schools/>

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