



SUSTRAINY
Sustainable action Training for Youth



Co-funded by the
Erasmus+ Programme
of the European Union

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SUSTRAINY PROJECT



ENVIRONMENTAL

TOPIC N°5 RECYCLING

The project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



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Introduction to the topic

Recycling is defined as any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material into materials that are to be used as fuels or for backfilling operations.

The differentiation between the terms reuse, recycling is important for the understanding and application of the targets stated in EU waste legislation¹. Definitions for recycling and reuse in waste specific Directives partially deviate from the corresponding definitions of the Waste Framework Directive:

1) The term recycling specified in waste specific Directives does in particular not include backfilling operations.

2) Reuse as defined in the Packaging Directive 94/62/EC and the WEEE Directive 2002/96/EC comprises specifications, the Waste Framework Directive does not include.

At the European and International levels, many initiatives and articles were undertaken:

- **Environment: Higher recycling targets to drive transition to a Circular Economy with new jobs and sustainable growth**
- **A European strategy for plastic in circular economy**
- **EU Circular Economy Action Plan**
- **EU level instruments on water reuse**
- **Life and waste recycling**
- **Data on recycling waste in Europe**
- **Environment Action Programme to 2020**
- **Waste management and recycling**

In this module you will learn about main types of recycling, reuse and recovery , why it is important, main policies and objectives of the EU in terms of recycling as well as some best examples in the field.





Chapter 1 Recycling of Waste

1.1 The concept of waste recycling

As European society has grown wealthier it has created more and more rubbish. Higher living standards mean that people are buying more products. There are also more single-person households which tend to produce more waste per person than families or groups¹.

Waste is an issue that affects us all. We all produce waste: on average, each of the 500 million people living in the EU throws away around half a tonne of household rubbish every year. This is on top of huge amounts of waste generated from activities such as manufacturing (360 million tonnes) and construction (900 million tonnes), while water supply and energy production generate another 95 million tonnes. Altogether, the European Union produces up to 3 billion tonnes of waste every year.

All this waste has a huge impact on the environment, causing pollution and greenhouse gas emissions that contribute to climate change, as well as significant losses of materials – a particular problem for the EU which is highly dependent on imported raw materials. The amount of waste we are creating is increasing and the nature of waste itself is changing, partly due to the dramatic rise in the use of hi-tech products. This means waste now contains an increasingly complex mix of materials, including plastics, precious metals and hazardous materials that are difficult to deal with safely.

For more than 30 years, efforts to reduce and avoid the negative impacts of waste on the environment and human health have been central to EU environment policy. Significant progress has been made based on the principle of the waste hierarchy that prioritises waste prevention and sees landfill generally as the least favourable waste management option for the environment.

Finally, in January 2014, EU adopted the 7th Environment Action programme that will guide EU member states until the end of 2020 and has following objectives:

- To reduce the amount of waste generated;
- To maximise recycling and re-use;
- To limit incineration to non-recyclable materials;
- To phase out land filling to non-recyclable and non-recoverable waste;
- To ensure full implementation of the waste policy targets in all Member States

1 <https://ec.europa.eu/environment/waste/pdf/WASTE%20BROCHURE.pdf>

1.2 Main waste streams¹

Waste streams are flows of specific waste, from its source through to recovery, recycling or disposal. Together they make up the overall waste treated in the European Union. Waste streams can be divided into two main categories: material-related streams (including metals; glass; paper and cardboard; plastics; wood; rubber; textiles; bio-waste) and product-related streams (including packaging; electronic waste; batteries and accumulators; end-of-life vehicles; mining, construction and demolition waste). Each waste stream has its specific characteristics and applicable legislation, including in terms of treatment method, hazardousness, practical recovery and recycling possibilities. Broadly, a set of general principles apply across waste streams. A number of aspects need to be considered in assessing different waste streams: sources of waste to be treated and uses of treated waste; applicable recycling and recovery methods; specific opportunities and challenges, in particular related to recycling; and applicable European Union legislation and its implementation.²



Source: <https://www.europarl.europa.eu/EPRS/EPRS-Briefing-564398-Understanding-waste-streams-FINAL.pdf>

1.3 Food waste

In the EU, food waste is estimated at one third of the food produced, or 180 kg per capita every year. In total, in the EU, around 88 million tonnes of food waste are generated annually with associated costs estimated at 143 billion euro. According to the Commission, households and the food processing sector are the main sources of food waste. In its resolution of 19 January 2012 on avoiding food wastage, Parliament considers cutting food waste along the entire food chain to be vital, calls on the Commission and Member States to take action, and welcomes initiatives aimed at recovering unsold and discarded products throughout the food supply chain to redistribute them to people lacking purchasing power.

Wasting food is not only an ethical and economic issue but it also depletes the environment of limited natural resources. By reducing food losses and waste to help achieve Sustainable Development Goals, we can also: support the fight against climate change (food waste alone generates about 8% of Global Greenhouse Gas Emissions) save nutritious food for redistribution to those in need, helping to eradicate hunger and malnutrition (some 43 million people in the EU cannot afford a quality meal every second day) save money for farmers, companies and households.

¹ <https://www.europarl.europa.eu/EPRS/EPRS-Briefing-564398-Understanding-waste-streams-FINAL.pdf>

² <https://www.eea.europa.eu/data-and-maps/indicators/waste-recycling-1/assessment-1>

All actors in the food chain have a role to play in preventing and reducing food waste, from those who produce and process foods (farmers, food manufacturers and processors) to those who make foods available for consumption (hospitality sector, retailers) and ultimately consumers themselves. The central goal of EU food safety policy is to protect both human and animal health. We cannot compromise on these standards but, in co-operation with Member States and stakeholders, are looking for every opportunity to prevent food waste and strengthen sustainability of the food system.¹

1.4 The main challenges of waste management

1.4.1 Problems with plastic recycling

The main issues complicating plastic recycling are the quality and price of the recycled product, compared with their unrecycled counterpart. Plastic processors require large quantities of recycled plastic, manufactured to strictly controlled specifications and at a competitive price. However, since plastics are easily customised to the needs (functional or aesthetic) of each manufacturer, the diversity of the raw material complicates the recycling process, making it costly and affecting the quality of the end product. In consequence, the demand for recycled plastics accounts for only 6% of plastics demand in Europe.²

1.4.2 Infrastructure and financial challenges

Whether it is re-used, recycled, incinerated or put into landfill sites, the management of household and industrial waste comes at a financial and environmental cost. First, waste must be collected, sorted and transported before being treated which can prove expensive and result in greenhouse gas emissions and pollution of air, soils and water. One major challenge is the fact that a large amount of the waste generated each year – some 100 million tonnes – is hazardous, containing heavy metals and other toxins.

These substances make the waste particularly difficult to treat as special processes are needed to deal with the hazardous components. The EU is working to reduce the hazardous materials used in products which then end up in our waste, as well as ensuring that hazardous waste is dealt with in the safest way possible. Several types of chemicals have been banned and the use of other materials has been significantly restricted. Waste treatment facilities are being improved across the EU to make sure hazardous material can be dealt with safely. There is also a risk that hazardous waste is exported abroad where it may be dealt with in unsafe conditions. The EU is working hard to support Member States in monitoring activities to stop illegal waste shipments.³

1.5 Main principles of the EU waste policy

A key principle of EU waste policy is to move waste management up the ‘waste hierarchy’ (according to which waste prevention is the most favourable option, followed by preparing for reuse, recycling and other methods of recovery, and waste disposal is least favourable) and to follow the principles of a circular economy.

1 https://ec.europa.eu/food/safety/food_waste_en

2 <https://www.europarl.europa.eu/news/en/headlines/society/20181212STO21610/plastic-waste-and-recycling-in-the-eu-facts-and-figures>

3 <https://ec.europa.eu/environment/waste/pdf/WASTE%20BROCHURE.pdf>



The basic principles of a circular economy are to maintain resource value in the economic cycle for as long as possible and to prevent and reduce the negative effects of obtaining primary resources on the environment and society. Rising demand for and supply of primary resources weaken the EU's material self-sufficiency and put pressure on the environment. For this reason among others, recycling is one of the main ways to reduce the consumption of primary resources by replacing them with secondary materials made of recycled waste.

In 2015, the European Commission adopted the action plan for the circular economy. This plan contains a vision and a list of concrete actions along the whole value chain aimed at moving towards a circular economy in Europe, including in relation to design and production, through consumption to waste and secondary raw materials management. EU waste policies include a number of specific provisions and targets for the collection, recycling and diversion from landfill of different waste streams, such as packaging, end-of-life vehicles, batteries and municipal and biodegradable municipal waste.

The purpose of this indicator is to show the rate of Europe's progress towards the goal of recycling more waste. Municipal waste, packaging waste, waste excluding major mineral wastes and waste electrical and electronic equipment (WEEE) are used as examples; these waste streams represent significant sources of secondary materials and also, especially in the case of WEEE, sources of critical raw materials. In 2018, new targets for packaging waste were adopted: to achieve a minimum recycling rate by weight of all packaging waste of 65 % by the end of 2025 and a minimum of 70 % by the end of 2030. Targets have also been set for the recycling of individual packaging materials (i.e. plastic, wood, ferrous metals, aluminium, glass, paper and cardboard).¹

1.6 Examples and best practices

Numerous initiatives have been developed by different stakeholders in order to promote waste recycling and fight with waste and contribute to the circular economy. Here are some of the examples:

1.6.1 To good to go (in France)

It is an application that allows everyone to get involved in the fight against food wastage on their own scale, by enjoying themselves and forging close ties. Shopkeepers no longer throw away; you eat while reducing wastage, the environment is better off. It's a triple win, and so simple that you wonder why you didn't think of it before.²

1.6.2 Reduce waist (European level)

This initiative was created in the framework of Interreg financed EU project; The platform aims to identify regional, national and international opportunities for avoiding food waste and present it to its member organizations and individuals as a starting point for joint projects and strategies. The annual conferences, meetings, workshops and awards organized within the framework of the project should contribute to the active exchange of all participating organizations and, moreover, effectively involve the whole society.³

1 <https://www.euoparc.org/european-policy/eu-2020-biodiversity-strategy-7th-environmental-action-programme/>

2 <https://toogoodtogo.fr/fr>

3 <http://www.reducefoodwaste.eu/>



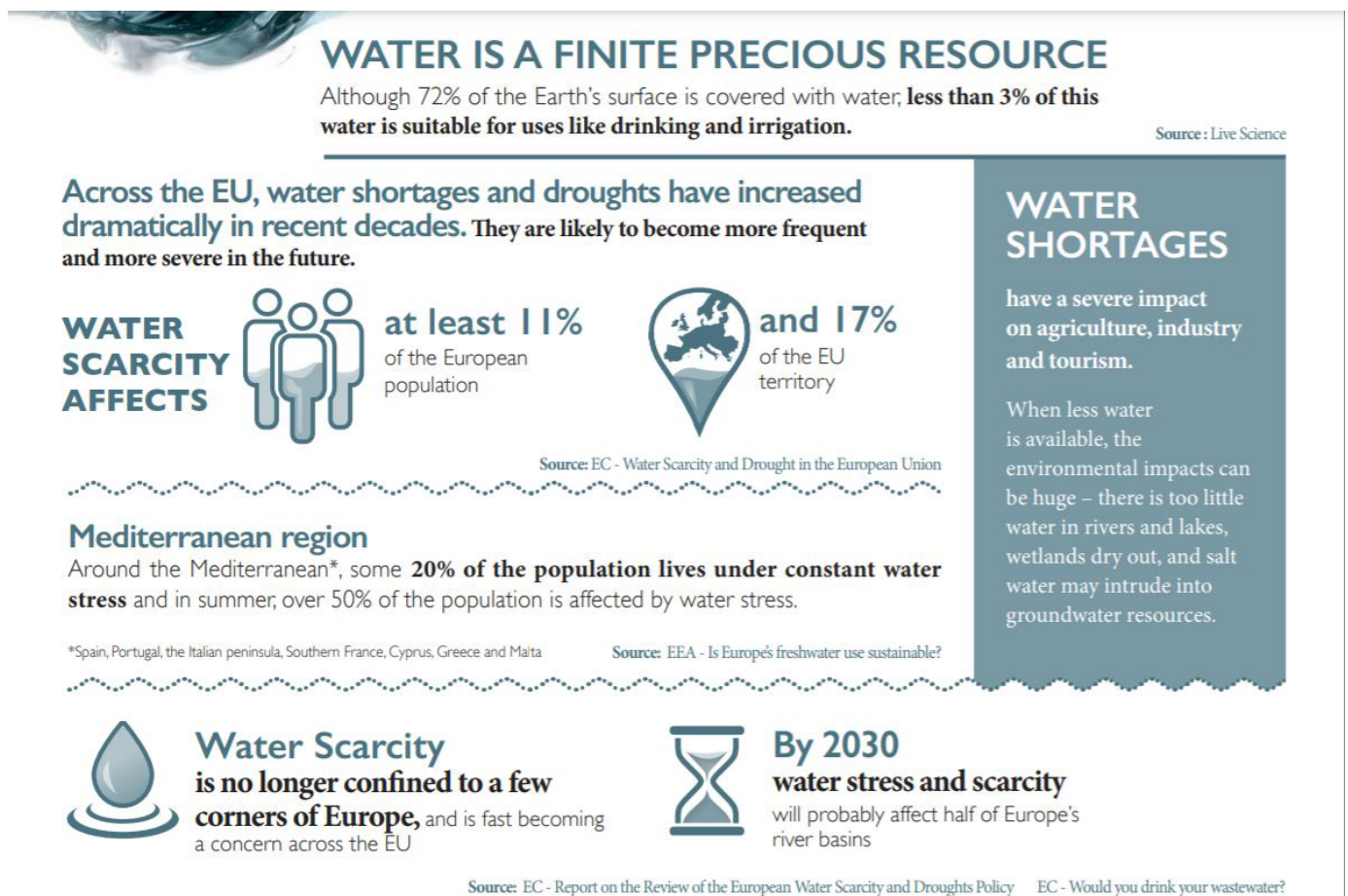


Chapter 2 Reuse of water

2.1 The concept of water reuse

Water over-abstraction is a major cause of water stress. Main pressures from water consumption are concentrated on irrigation and domestic demand, including tourism. Over the past thirty years, droughts have dramatically increased in number and intensity in the EU and at least 11% of the European population and 17% of its territory have been affected by water scarcity to date.

The potential role of treated wastewater reuse as an alternative source of water supply is now well acknowledged and embedded within international, European and national strategies. UN Sustainable Development Goal on Water specifically targets a substantial increase in recycling and safe reuse globally by 2030. Water reuse is a top priority area in the Strategic Implementation Plan of the European Innovation Partnership on Water.



Source: Water Reuse - Environment - European Commission

Reuse of treated wastewater can provide significant environmental, social and economic benefits. Moreover, when compared to alternative sources of water supply such as desalination or water transfer, water reuse often turns out to require lower investment costs and energy, also contributing to reduce greenhouse gas emissions.

Reuse of treated wastewater can be considered a reliable water supply, quite independent from seasonal drought and weather variability and able to cover peaks of water demand. This can be very beneficial to farming activities that can rely on reliable continuity of water supply during the irrigation period, consequently reducing the risk of crop failure and income losses.

Water reuse contributes to the broader water sector which is a key component of EU eco-industrial landscape. For this reason water reuse also encompasses significant potential in terms of the creation of green jobs in the water-related industry, and it is estimated that a 1% increase in the rate of growth of the water industry in Europe could create up to 20.000 new jobs.

At present, about 1 billion cubic metres of treated urban wastewater is reused annually, which accounts for approximately 2.4% of the treated urban wastewater effluents and less than 0.5% of annual EU freshwater withdrawals. But the EU potential is much higher, estimated in the order of 6 billion cubic metres – six times the current volume. Both southern Member States such as Spain, Italy, Greece, Malta and Cyprus and northern Member States like Belgium, Germany and the UK already have in place numerous initiatives regarding water reuse for irrigation, industrial uses and aquifer recharge. Cyprus and Malta already reuse more than 90% and 60% of their wastewater respectively, while Greece, Italy and Spain reuse between 5 and 12% of their effluents, clearly indicating a huge potential for further uptake.¹

2.2 Main types of water reuse

A 2017 report by UN-Water notes that water reuse is mainly driven by legislation and water prices. It distinguishes three main types of water reuse: 1) direct potable reuse, where appropriately treated waste water is fed into the water supply network; 2) indirect potable reuse, where treated waste water is released into surface waters and groundwater used as drinking water sources; and 3) reuse for non-drinking purposes, including agricultural irrigation, industrial use (for instance, as processing or cooling water), recreational use (for example, for snowmaking or golf course irrigation), environmental use (for instance, for groundwater recharge or wetlands restoration), and urban use (for example, for irrigation of public parks, fire protection systems or street cleaning). The report notes that the reuse of water in agriculture is one of the areas of great potential. A number of opportunities are associated with water reuse, including: increasing water availability in a sustainable way; delivering energy savings and reductions in greenhouse gas emissions from water treatment; and contributing to climate change adaptation.²

1 Water Reuse - Environment - European Commission <https://ec.europa.eu/environment/water/reuse.htm>

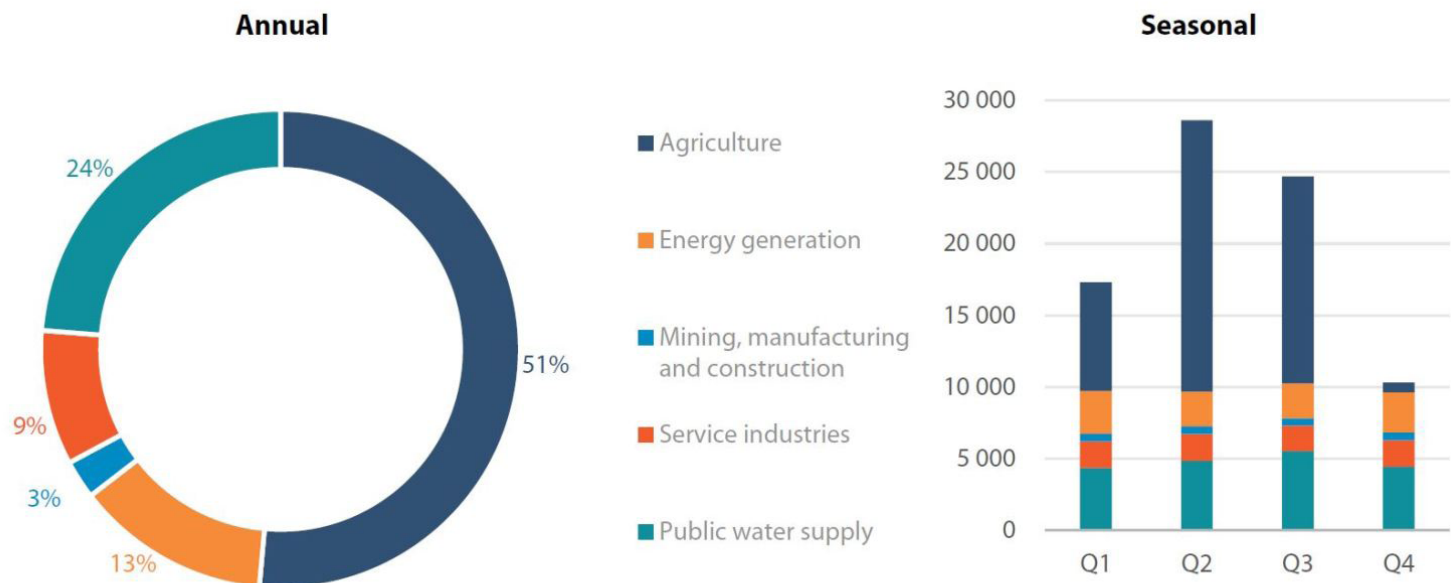
2 https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/625171/EPRS_BRI%282018%29625171_EN.pdf



2.3 EU Policy development on water reduce

Water reuse encounters numerous barriers in the EU, although this practice is commonly and successfully used in, for example, Israel, California, Australia, and Singapore. Limited awareness of potential benefits among stakeholders and the general public, and lack of a supportive and coherent framework for water reuse are 2 major barriers currently preventing a wider spreading of this practice in the EU. For these reasons the Commission is working on legislative or other instruments to boost water reuse when it is cost-efficient and safe for health and the environment.

Water use by sector in the EU (2014, hm³)



Data source: [European Environment Agency](#).

The Communication “Blueprint to safeguard Europe’s water resources” highlighted water reuse as a concrete and valid alternative supply option to address water scarcity issues. With maximisation of water reuse as a specific objective, the Commission identified the opportunity to develop a legislative instrument for water reuse.

To support this policy development, an impact assessment study was prepared and published in 2015. In line with Commission guidelines for the development of impact assessment studies, the report includes a description of the problem definition and of the baseline situation regarding water reuse in the EU, and elaborates on policy options to be developed in an initiative by the Commission.

To inform this impact assessment, the European Commission organised a Public Consultation on Policy Options to optimise Water Reuse in the EU in autumn 2014. The consultation gave both private citizens and stakeholders the opportunity to actively contribute to the design of this initiative. In addition to the on-line consultation, a stakeholders meeting was organised in December 2014 in Brussels. The public consultation led to a general agreement in support for the water reuse initiative, in particular concerning the development of EU-level common minimum quality requirements for reuse. The report on the public consultation includes the replies to the consultation itself and the feedback from the stakeholders meeting.

The Commission is also carrying out regular consultations with Member States and stakeholders in the framework of the Common Implementation Strategy (CIS) for the implementation of the Water Framework Directive. Proceedings of this activity, including presentations on Member State experiences with water reuse, are available on CIRCABC.

Published in April 2016, the Inception Impact Assessment on the initiative “Minimum quality requirements for reused water in the EU (new EU legislation)” sets out in greater detail the background, the policy objectives and options as well as their likely impacts.¹

2.4 Examples and best practices of water reuse

2.4.1 The European Water Movement

The European Movement for Water as a Commons is an open, inclusive and pluralistic network of movements, social organizations, committees, unions whose goal is to reinforce the recognition of water as a commons and as a fundamental universal right, an essential element for all living beings. We are part of the global water justice movement. We are united to fight against privatisation and commodification of this vital good, and to construct a public and communal management of water, founded on the democratic participation of citizens and of workers.²

2.4.2 Example of water reuse for horticulture in the Netherlands

The Dutch Water Authority ‘Schieland en de Krimpenerwaard’, together with ‘Aqua-Terra Nova’ and ‘PB Techniek’, has successfully operated the innovative AquaReUse facility since 2014. AquaReUse is a water treatment and buffering complex where all horticulture wastewater is collected in one central location in a made-to-measure facility. In this facility all the waste and surface water is treated to provide irrigation water, which meets all relevant quality requirements of the horticulture farmers and their clients. This facility enables reuse of wastewater and produces good quality irrigation water for vegetable crops and floricultures. The purified fresh water, on average approximately 123,000 m³ per year, is made available via a distribution system to the greenhouses (maximum flow rate of 52 m³/h). Where the purified water cannot be delivered directly, the surplus is injected into the ground to be used as a reserve.

2.4.3 Example of industrial reuse of treated wastewater

The Tarragona site in the south of Catalonia, Spain, utilises secondary effluent from two municipal wastewater plants, treating it for industrial users. The Tarragona area is highly water stressed and water availability hinders further growth in the region. Water reuse in an industrial park (a petrochemical complex) will free up existing raw water rights to meet future local (municipal and tourism) demand. The final target is to meet 90% of the water demand of the industrial park from water reuse.

¹ <https://ec.europa.eu/environment/water/reuse.htm>

² <http://europeanwater.org/about-the-european-water-movement>

2.4.4 Reuse of treated wastewater for indirect drinking water use after retention in an aquifer

The Torreele water plant in Koksijde is on the Belgian North Sea coast. Since 2002 it has treated municipal wastewater from the Wulpen WWTP, which is used for artificial recharge of the dune aquifer of St-André, which is then abstracted for further treatment for drinking water use. Over several years, the groundwater level has lowered and this has led to saline intrusion. The artificial recharge was implemented to prevent this. The plant has a treatment capacity of 6,850 m³ /d and applies a double membrane process: ultrafiltration and reverse osmosis.

2.4.5 Hydraloop Smart Water Saving

It offers a variety of smart, innovative water recycle products for residences, buildings and boutique hotels. Recycling water contributes towards LEED & BREEAM sustainable building certification and future proofs buildings, herewith increasing its value and reducing water and energy bills.

Hydraloop products also contribute towards the Sustainable Development Goals of the United Nations (UNSDG) and are ideal for off grid situations or in arid areas where there is an unstable or insufficient water supply, and can contribute towards a sufficient quantity of water for your home, building or hotel. ¹



1 <https://www.hydraloop.com/>



Chapter 3 Energy recovery

3.1 The concept of energy recovery

The concept refers to a form of resource recovery in which the organic fraction of waste is converted to some form of usable energy. Recovery may be achieved through the combustion of processed or raw refuse to produce steam through the pyrolysis of refuse to produce oil or gas; and through the anaerobic digestion of organic wastes to produce methane gas.¹

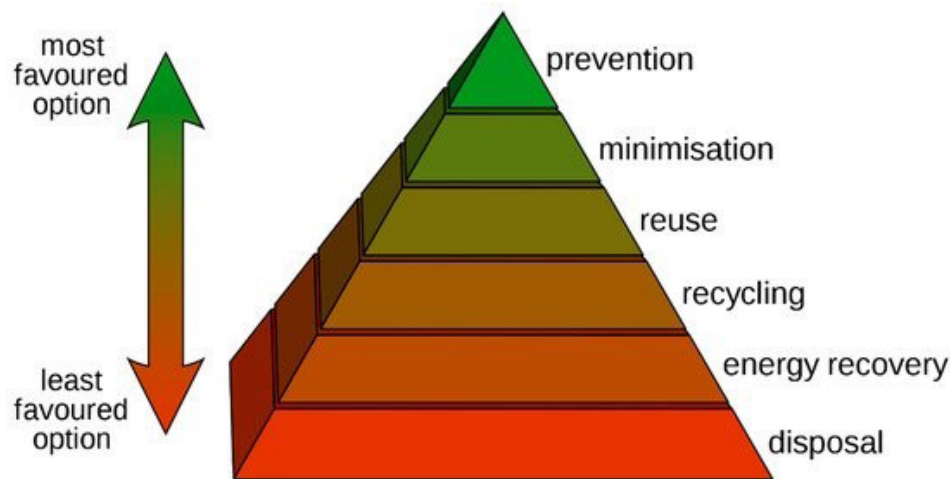


Figure 1. Waste hierarchy²

In 2015 the European Commission issued a package of documents on Circular Economy concerning an integrated revision of legislative proposals on waste management. Three indicators are proposed in this paper to contribute to the assessment of the energy recovery management performance in a scenario of circular economy. The above indicators, proposed and discussed in this paper, have to be integrated with other ones in order to complete the quantification of the role of Municipal Solid Waste management in term of energy recovery under a circular economy strategy.³

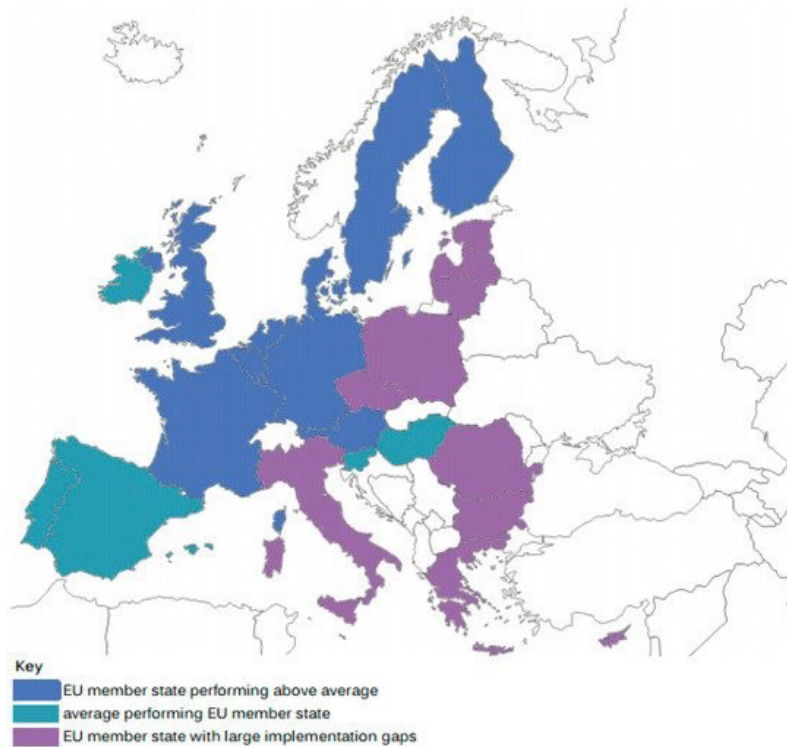
¹ <https://www.eea.europa.eu/help/glossary/eea-glossary/energy-recovery>

² <https://www.mdpi.com/1996-1073/12/19/3718/htm>

³ https://www.researchgate.net/publication/319012192_Energy_recovery_from_Municipal_Solid_Waste_in_EU_proposals_to_assess_the_management_performance_under_a_circular_economy_perspective

3.2 EU Policy on energy recovery: analysing the energy efficiency of EU member states

In 2008, Guidelines on the interpretation of the R1 energy efficiency formula for incineration facilities dedicated to the processing of Municipal Solid Waste according to Annex II of Directive 2008/98/EC on waste. To date many EU Member States have failed to implement waste prevention practices and therefore the regulations that have been set out by Waste Framework Directive of the EC. In general Southern and Eastern Europe countries are shown to have the largest implementation gaps regarding their waste management systems. Figure below illustrates EU Member States that have been performing above (blue), below (purple) and average (green) regarding their waste management.¹



Source: http://www.waste2go.eu/download/1/D2.2_Waste%20profiling.pdf

A significant part of the Europe 2020 growth strategy has been sustainable growth towards a ‘smart, sustainable and inclusive economy’ under the notion of the circular economy, while achieving lower greenhouse gas emissions by 20% compared to levels of 1990, generating 20% of its energy from renewable sources and to increase energy efficiency by 20%. The framework of measures for the promotion of energy efficiency is set out by Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency addressing the achievement of the 20% target on energy efficiency in 2020.

In addition to those, the 2030 climate and energy framework covers EU-wide targets and policy objectives for the period 2021 to 2030, with the main targets being: at least 40% cuts in greenhouse gas (GHG) emissions (from 1990 levels), at least 32% share for renewable energy and at least 32.5% improvement in energy efficiency. Moreover the 2050 EU long-term strategy stresses the opportunities that a climate neutral Europe may bring as well as challenges that may appear, without revising the 2030 targets or launching new policies.

¹ According to the recommendation paper: <https://www.mdpi.com/1996-1073/12/19/3718/htm>

Energy efficiency improvement can provide many benefits apart from cost efficiency such as energy savings, air pollution control and GHG emission reduction as well as energy security and health benefits. It is essential to combine technological options and implementation approaches to improve energy recovery efficiency of the urban and industrial system and achieve low-carbon cities. In those regards, the development of advanced computational techniques has enabled the evaluation of energy efficiency.

3.3 Examples and best practices

3.3.1 Confederation of European Waste-to-Energy plants¹

CEWEP, Confederation of European Waste-to-Energy Plants, is the umbrella association of the operators of Waste-to-Energy (incineration with energy recovery) plants, representing about 410 plants from 23 countries. They make up more than 80% of the Waste-to-Energy capacity in Europe. CEWEP focuses on contributing to European environmental and energy legislation that can affect Waste-to-Energy Plants through:

- Close and permanent contact with the European Institutions
- Careful analysis and proactive contributions to EU environment and energy policy
- Participation in on-going studies (UNEP, OECD and EU)
- Undertaking our own studies e.g. based on Life Cycle Thinking, composition and recycling of bottom ash etc.

CEWEP organises plant visits, congresses, workshops and debates, often in the European Parliament, in order to inform decision makers and the public about Waste-to-Energy.

3.3.2 Tibber: changing the game for renewable electricity consumers

The innovative Norwegian company, Tibber, has recognized a need to find smarter solutions for purchasing energy. Tibber has replaced the original power company with an app to help you reduce your own electricity bill². Tibber is on a mission to change the way we buy and consume electricity. In this regard, the company offers customers the ability to lower their energy bills using a simple app, where the purchasing of power is automatically done by its bots. Tibber has a highly unique technology where smart algorithms buy electricity for you automatically.

3.3.3 Plastic Odyssey, turning plastic into a boat fuel

It is the first boat that succeeded to turn plastic from the oceans into boat fuel. Plastic Odyssey aims to combat plastic pollution around the world, particularly that which affects the ocean. To contribute to this goal, Plastic Odyssey seeks to recover existing plastic waste to make a resource out of it and to limit the amount of plastic waste that has not yet been produced. To promote its project and accelerate the dissemination of its knowledge and technologies, Plastic Odyssey is currently carrying out a three-year expedition around the world on a recycling ambassador ship that is making progress thanks to the energy generated by plastic waste.³

¹ <https://www.cewep.eu/what-is-waste-to-energy/>

² <https://tibber.com/en>

³ <https://plasticodyssey.org/>





Chapter 4 Raising public awareness about recycling and re-use

4.1 Why raising awareness

Awareness of recycling and reuse avenues should be promoted to householders and end user businesses at every opportunity; this can be achieved by a number of different methods such as a local communication campaign, call centre staff dealing with initial enquiries from the public through layout/signage and the training of site operatives. By addressing issues using all these avenues the greatest impact can be achieved.



4.2 Main importance of recycling

Recycling is one of the best ways for you to have a positive impact on the world in which we live. Recycling is important to both the natural environment and us. We must act fast as the amount of waste we create is increasing all the time.

The amount of rubbish we create is constantly increasing because:

- Increasing wealth means that people are buying more products and ultimately creating more waste.
- Increasing population means that there are more people on the planet to create waste.
- New packaging and technological products are being developed, much of these products contain materials that are not biodegradable.
- New lifestyle changes, such as eating fast food, means that we create additional waste that isn't biodegradable.

4.2.1 Environmental importance

Recycling is very important as waste has a huge negative impact on the natural environment.

- Harmful chemicals and greenhouse gasses are released from rubbish in landfill sites. Recycling helps to reduce the pollution caused by waste.
- Habitat destruction and global warming are some the affects caused by deforestation. Recycling reduces the need for raw materials so that the rainforests can be preserved.
- Huge amounts of energy are used when making products from raw materials. Recycling requires much less energy and therefore helps to preserve natural resources.

4.2.2 People importance

Recycling is essential to cities around the world and to the people living in them.

- Reduce financial expenditure in the economy. Making products from raw materials costs much more than if they were made from recycled products.
- Preserve natural resources for future generations. Recycling reduces the need for raw materials; it also uses less energy, therefore preserving natural resources for the future.

4.2.3 Economic rationale and business relevance

Analysing success stories of circular business models from a subset of EU manufacturing sectors, the Ellen MacArthur Foundation found potential for annual net material cost savings ranging from €265 to 490 billion,² which equates to up to 23% of these sectors' current total input costs. The most pronounced cost savings potential was found in the automotive sector, followed by the machinery and equipment sector, and electrical machinery (Ellen MacArthur Foundation, 2012).



Beyond cost savings, closing loops and increasing the re-use of materials will reduce demand for virgin materials and thus help to mitigate both demand-driven price volatility on raw material markets (e.g. for iron ore) and supply risks (World Economic Forum et al., 2014). In addition, more circular business models were found to be associated with significant (technological and organisational) innovation and employment potential (for instance in the recycling sector), as well as with reduced liabilities and warranty costs of firms due to longer-lasting, healthier and more environmentally friendly products (Ellen MacArthur Foundation, 2013).

While the capacities of larger firms facilitate the adoption of and realisation of benefits from circular business models, also small and medium-sized enterprises (SMEs) are increasingly aware of the benefits of closing loops and improving resource efficiency: saving material costs, creating competitive advantages and new markets are among the main reasons for European SMEs to take action. From the SMEs surveyed, more than two-thirds are satisfied with the return on their investments in resource efficiency improvements; more than one-third of the SMEs have experienced reductions in their production costs in the past two years (European Commission, 2013).¹

4.3 Education and awareness of recycling schemes

Recycling schemes can sometimes succeed with little attention but more often than not, presenters and trainees have to be helped by being reminded of the importance of recycling. It is also important to ensure that people are provided with up-to-date information to help them contribute to the various schemes:

- Arrange a programme of events that will help to raise awareness of your recycling schemes. Specifically this should include an induction for both new and existing trainees and speaker and may tie in to broader environmental and sustainability issues.
- Use posters and publicise your initiatives in different press as well as over the institution's intranet. Posters can be obtained from recyclers such as ALUPRO or down loaded from the web. Additional information and free publicity material can be obtained from various sources available in the country.
- Develop and publicise a web page with basic useful information on where and how to reuse/recycle. Good examples are Leeds Metropolitan University and Oxford Brookes University (if in English).
- Develop incentives for the presenters and trainees to participate in recycling and for them to suggest ways to increase the amount recycled. Prizes, cash or goods, could come from the income generated by the sale of recycled materials or donated by local companies or suppliers.²

¹ https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/GreenEconet_CEPS_SMEs_Circular_Economy.pdf

² https://www.sustainabilityexchange.ac.uk/education_and_awareness_of_recycling_schemes

4.4 Best practices and existing initiatives for raising awareness on recycling

There are numerous initiatives on raising awareness and educational materials on recycling and reuse: from very little ones to the adults and seniors.

4.4.1 Sustainability Exchange

One of the good examples is the platform called “Sustainability Exchange” in the UK. Leading organisations from across the further and higher education sector have joined forces to create the Sustainability Exchange. Combining resources and experience from top sustainable development and education bodies, the Sustainability Exchange is the number one resource for sustainability in tertiary education, sharing a wealth of information that is available to everyone.

Delivered by the EAUC, the Sustainability Exchange provides sector professionals with up to date resources, insight, webinars, news, events and jobs connecting together sector professionals across the world, stimulating debate and the sharing of knowledge.¹

4.4.2 TetraPak Poland – Improving mixed collection

Tetra Pak Poland has been active in improving multi-material packaging collection, particularly in the region of Wroclaw. By raising community awareness around segregation and recycling, they have increased the market potential for municipalities and recycling companies. For example, in schools, they ran a five-week long eco-festival, alongside town halls, waste operators and a local exhibition centre, including a range of exhibitions and attractions, social media, competitions, a short TV movie and workshops for families and teachers that showed that we each have a responsibility to reduce and recycle waste. Following the campaign beverage carton recycling in the district, now stands at 241 tonnes, against a target of 200. Furthermore, the Wroclaw municipality is firmly committed to offering separate collection and recycling and incentivising recycling start-up businesses and entrepreneurs to get on board. The goal is to achieve a 50 percent recycling rate by 2020.²

¹ <https://www.sustainabilityexchange.ac.uk/about>

² <https://www.tetrapak.com/sustainability/cases-and-articles/raising-consumer-awareness-of-recycling>





Chapter 6 JOIN THE MOVE

Networks and communities

There are numerous existing networks, communities and supporting initiatives that support recycling concept on EU and international levels. Here are some of the relevant examples:

REFRESH Community of Experts (European level)

This network is a website open to all relevant stakeholders who wish to share their experiences in food waste prevention. The Community of Experts is a virtual resource centre which allows users to easily find and share information about food loss and waste prevention and reduction initiatives across the EU.

More Information and contact: <http://www.refreshcoe.eu/>

Zero Waste Europe

Zero Waste Europe, is an initiative leading a fast-growing movement of communities, local leaders, businesses, experts, influencers and other “change agents” working towards the same vision: eliminating waste in our society.

More information and contact: <https://zerowasteeurope.eu/>

ECN – European Compost Network

The European Compost Network (ECN) is a European non-profit membership organisation promoting sustainable recycling practices in composting, anaerobic digestion and other biological treatment processes of organic resources.

More information and contact: <https://www.compostnetwork.info/>

RReuse

RREUSE represents social enterprises active in re-use, repair and recycling.

More information and contact: <https://www.rreuse.org/>



Here are some tools of references and guidelines to develop recycling sustainable businesses:

1) Waste-management practices in the SME itself

Showing example by doing yourself and starting from educating your own employees.

2) Going paperless

Privilege digital information and mails avoiding printing materials.

3) Recycling

There are numerous methods how SME may promote recycling: cardboards, coffee, water reuse, alternative energy promotion etc

4) Encouraging remote work

In the XXI century it is not a secret that home office can be twice efficient as working in the office. Good leader and employer will encourage remote work for the employees which will also promote sustainability actions.

5) Sustainable suppliers

Privilege sustainable suppliers in all fields of business life: from business cards to coffee machines and recycled materials.

Recycling business has all opportunities to become successful and profitable company thanks to its strong marketing campaign.¹

Here are some tips and strategies for installing the recycling company²:

1) Create Awareness for Recycling

Creating awareness among people about the importance of recycling will always bring an added value and meaning to your business. Thus, it will raise an interest in customers' eyes in what you do.

2) Offer Waste Disposal Alternatives

Make detailed research on the market of waste disposal initiatives available in your municipality /region. Make sure you can offer disposal alternatives adaptable to this precise environment.

3) Advertise Your Products

Make sure you use all available ad channels in the field. If you product designed for general public, you should address to wide sources of advertisement: Journals, TV, posters.

4) Establish a Web Presence

Establishing a Web presence is an effective way to market your company. Develop a website dedicated to the promotion of your recycling efforts, and provide information on the kind of waste materials you recycle, the products you generate and how people should deliver their waste materials or purchase your products. Adding photos helps people understand the kind of recycling business you operate. Having an email service for the community, a blog and a fans page on social media are also smart ways to enhance your promotional activities.

¹ <https://www.businesswest.co.uk/blog/waste-not-want-not-how-smes-are-setting-recycling-trend-large-enterprises>

² <https://yourbusiness.azcentral.com/promotion-strategies-recycling-company-23558.html>



Chapter 7 TO GO FUTHER

Here are some additional resources to go further into the topic videos, further readings, extra resources, etc.

EU's approach to waste management:

<https://ec.europa.eu/environment/waste/pdf/WASTE%20BROCHURE.pdf>

Main waste stream recognized in the EU:

<https://www.europarl.europa.eu/EPRS/EPRS-Briefing-564398-Understanding-waste-streams-FINAL.pdf>

The Circular Economy: Barriers and Opportunities for SMEs:

https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/GreenEconet_CEPS_SMEs_Circular_Economy.pdf

Increasing SME Recycling :

http://www.wrap.org.uk/sites/files/wrap/SME_Recycling_-_Summary_Report.pdf

LIFE KNOW WASTE - Awareness raising campaign for the promotion of waste Reduction, Re-use and Recycling:

https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&nproj_id=4926&docType=pdf

Iberdrola group : a target of practically zero emissions in Europe by 2030:

<https://www.iberdrola.com/sustainability>

Raising public awareness of recycling and reuse:

<http://www.wrap.org.uk/sites/files/wrap/2.0%20Raising%20public%20awareness%20of%20recycling%20and%20reuse%20-%20Online.pdf>

Sustainable Exchange: resource for sustainability in tertiary education, sharing a wealth of information that is available to everyone:

<https://www.sustainabilityexchange.ac.uk/about>

How to start a recycling business: 50 business ideas:

<https://www.youtube.com/watch?v=ZnZe-P-9D0w>



Chapter 8 PRACTICAL ACTIVITIES

Activity 1 Quiz : How much do you know about the recycling around the world? ¹

1) Which country has the highest recycling rates in the world?

Sweden
Germany
Belgium
Switzerland

2) Which European country sends the lowest amount of waste to landfill?

Sweden
Belgium
Denmark
Switzerland

3) Which nation has held the world's top spot for aluminium recycling since 2001, with a rate of over 90%?

Argentina
Singapore
Brazil
Taiwan

4) Which country claims the number one spot for recycling outside of Europe?

South Korea
Singapore
China
Canada

5) Which country has the lowest recycling levels in Europe at 0%, joining Turkey and Serbia at 1%?

Croatia
Lithuania
Latvia
Bosnia and Herzegovina

6) After Germany and Singapore, which country has the third best recycling rates in the world?

Austria
South Korea
Wales
Slovenia

¹ <https://www.thejournal.ie/recycling-around-the-world-4656440-May2019/>

Activity 2: Name alternative to plastics stuff

Name at least 15 plastic-free alternatives to the everyday life.

| Item/Action | What for |
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Possible answers: carry reusable shopping bags, give up bottled water, carry your own containers for take-out food and leftovers, a stainless steel travel mug or water bottle at all times for coffee and other drinks while out in the world, Treat yourself to an ice cream cone, Shop your local farmers market, Buy fresh bread that comes in either paper bags or no bags, clean with vinegar and water, use natural cleaning cloths and scrubbers instead of plastic scrubbers and synthetic sponges, use natural rubber gloves, use plastic-free feminine hygiene products, look into plastic-free sunscreen options, choose a glass blender, don't buy water filter cartridges unless necessary, make your own soy or nut milk.¹



1 More ideas here : <https://myplasticfreelife.com/plasticfreeguide/>



Conclusion: This is a beginning - My action

We've given you some advice; now it is time to turn this info into action... your action!

Write here your own remarks:





Conclusion: This is a beginning
- My action

