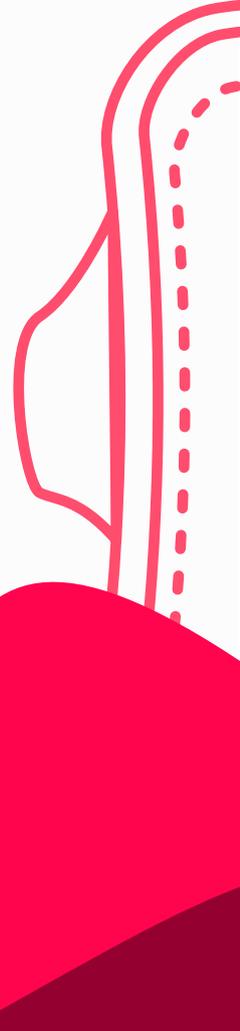




THE ENVIRONMENTAL &
ECONOMIC COSTS OF

**SINGLE-USE
MENSTRUAL
PRODUCTS,
BABY NAPPIES
& WET WIPES**

Investigating the impact of these
single-use items across Europe.



#break
free
from
plastic



Rezero
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residus i consum

reloop
resources remain resources

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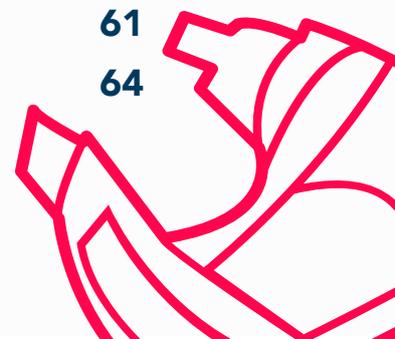
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Contents

Executive Summary	4
Introduction	7
Aim, Objectives and Scope	8
Methodology	10
Limitations	11
Single-use Menstrual Products, Baby Nappies and Wet Wipes	12
Menstrual Products	12
Baby Nappies	15
Wet Wipes	17
Consumption rates and waste generation	18
Menstrual products	19
Baby nappies	21
Wet wipes	23
Environmental Impacts	25
The Production and Consumption phase	25
Waste generation, Disposal and Treatment	26
Sewage Related Debris and Marine Littering	30
Economic Impacts for public administrations	32
Waste management	32
Marine Litter Costs	37
Costs coming from sewage related debris	39
Reusable Products	40
Single-use vs. Reusable products	48
Environmental Advantages	48
Waste Prevention	50
Economic Savings for Consumers	51
Conclusion	55
References	58
Annex 1 - Reusable manufactures list	61
Annex 2 - Toxic Talk	64



EXECUTIVE SUMMARY

In recent years, there has been growing interest and debate about the impacts coming from the current production, consumption, and disposal of single-use products, especially plastics.

Single-use menstrual products, baby nappies and wet wipes are examples of items that become waste after using them only once, and are mostly made of plastic. Due to their contribution in weight to the municipal solid waste stream and due to their environmental, economic and social impacts, these items require special attention.

This is a pioneer study which aims to analyse the impacts of single-use menstrual products, baby nappies and wet wipes as well as measures to prevent or minimise them. This report is the first of its kind at the European level, and goes beyond the limits to single-use items analysing the benefits of reusable products across a range of factors.

Overall Consumption Rates and Waste Generation

4

Single-use menstrual products, baby nappies and wet wipes still dominate the market, compared to reusable products, and their production in Europe has progressively increased in recent years.

In the 28 EU Member States, by 2017 (reference year), statistics have shown that:

- more than 49 billion units of menstrual products were consumed, meaning an annual generation of about 590,000 tonnes of waste,
- around 33 billion single-use baby nappies were consumed, resulting in 6,731,000 tonnes of waste per year, and
- around 68 billion individual wet wipes were consumed, which equates to 511,000 tonnes of waste per year.

Environmental and Economic Impacts

Single-use menstrual products, baby nappies and wet wipes result in serious environmental impacts throughout their lifecycle, from the production phase until the end-of-life.

Material, water and energy use: The impacts generated during the production process of these products result mainly from the use of large volumes of wood pulp, cotton, or viscose rayon for the production of super absorbent polymer (SAP), and other components such as polyester, polyethylene, polypropylene, adhesives, fragrances and dyes. In addition, significant amounts of water and energy are used during the production process.



CO₂ emissions: Single-use baby nappies and menstrual products also contribute significantly to global warming. It has been estimated that, throughout their lifecycle, those items emit approximately 3.3Mt of CO₂ equivalents and 245,000 tonnes of CO₂ equivalents per year, respectively.

Waste generation: Furthermore, because of the composition of these products (made of mixed materials types), as well as the presence of organic material after use, their recycling is technically difficult and economically expensive. Therefore, in Europe these products typically end up in landfills (87%) or are incinerated (13%), wasting resources and invoking negative environmental impacts (high land occupation rates, groundwater and soil contamination, greenhouse gases emissions, etc.).



The waste generation of single-use menstrual products, baby nappies and wet wipes accounts for approximately 7,832,000 tonnes (equivalent to 15.3kg per inhabitant per year) within the EU-28. This amount of waste accounts for 3% of total municipal solid waste and 4% of the total residual municipal waste stream.

Marine litter: Furthermore, single-use menstrual products and wet wipes are usually flushed down the toilet after use and thus, they may enter the marine environment through the waste water release system, resulting in big environmental and economic impacts. Single-use menstrual products and wet wipes are one of the most commonly found single-use plastic items in the marine environment (6.2% of waste collected on UK beaches or 5% of the floating waste in the Catalan coast, according to clean-up waste audits) and when they disintegrate they release a substantial amount of microplastics into the water. The negative impacts of plastic marine debris include both the impacts generated by chemical components and the visible and physical damage.

5

Costs for municipalities: Despite the big limitations to calculating the costs associated with the management (collection and final treatment) of waste coming from these products, it is estimated that the costs can range from €3 to more than €10 per inhabitant per year, depending on the country. As regarding the maintenance and unblocking of the sewer facilities, **it is estimated that the cost of waste disposal for sewage debris removed from wastewater treatment plants, equates to between €500 - €1,000 million per year for the European Union.** Furthermore, coastal municipalities must assume the high costs of removing these products from beaches. In the United Kingdom the removal of single-use menstrual products, wet wipes and other related debris from beaches is estimated to cost about €1.1 million annually, and from the aquatic surface its removal costs approximately €50,000 to the Government of the Balearic Islands each year.

Reusable products and benefits

This study also identifies the main reusable alternatives to single-use menstrual products, baby nappies, and wet wipes, and analyses the consumption trends and current accessibility and availability of these products in Europe.

Waste prevention: Among the environmental advantages of reusable products (compared to single-use ones), waste prevention is one of the biggest factors. For example, it has been

estimated that the use of a menstrual cup results in a reduction of 99% of the waste that would be generated using single-use products. Therefore, **if only 20% of menstruators would opt for the menstrual cup instead of single-use menstrual items, the amount of waste could be reduced by nearly 100,000 tonnes per year in EU-28.** Similarly, a family that chooses reusable baby nappies can also save about 99% of the waste that would be generated by using single-use ones. **If only 20% of babies using nappies switched to reusables, the amount of waste that could be prevented in the EU-28 would be more than 1 million tonnes each year.**



Economic savings: The waste reduction potential can be translated into really high economic savings for the municipality, due to lower management and treatment, as well as a reduction in the costs coming from removing waste from beaches and seas, as litter and sewage related debris would be reduced.



Reusable products also offer direct savings for consumers: Using a menstrual cup instead of tampons or pads, would result in annual savings of €18 to €119 per person while lifetime savings could exceed €4,400. Similarly, the use of reusable nappies results in savings between €200 to €2,000 per family compared to single-use ones. The saving increases if you take into account the fact that reusable baby nappies can be used by different siblings or bought second-hand.

Tackling menstrual poverty: Where statistics are available, **nearly one in five women struggle to pay for basic single-use menstrual products on a monthly basis in the EU,**⁷⁸ what can have a significant impact on the quality of a menstruator life. Considering the potential economic savings that reusable menstrual products can bring, making them widely available and accessible across the EU will help reduce menstrual poverty.

6

Availability of reusable products

Although during the last decade reusable menstrual products and baby nappies have become more popular and are beginning to experience an increase in the EU market share, the population that uses them regularly is still in the minority.

This is because such reusable products are not widely available across the EU. For instance, menstrual cups and cloth pads are mostly available through online shops in most European regions, but can also be found in a few pharmacies, supermarkets, local commerces or in handicraft shops. Their availability, however, differs a lot from country to country.

With regard to reusable nappies, their major suppliers appear to be online in European market. In most regions they are not yet accessible in pharmacies, supermarkets or local shops. In order to increment and generalize their usage, it is important that these reusable products are made available in most retailers shops and at accessible prices across Europe.

INTRODUCTION¹

Evidence that waste generation, especially from plastics, represents an environmental, social and economic problem has increased in recent years. And, we are realising that it requires the responsibility of all agents involved if we want to tackle the problem. A Europe that efficiently uses its resources is one of the main objectives of the Europe 2020 Strategy,¹ which aims to generate smart, sustainable and inclusive management of our resources.

Thus, in Europe, a new regulatory framework has been developed to push us towards a circular economy and away from single-use plastics, laying down the foundations for moving from a linear economy to an economy where products and processes are designed and managed to avoid and eliminate the volume of waste and toxicity of materials. If a product cannot be reused, repaired, rebuilt, refurbished, refinished, resold, recycled or composted, it should be restricted, redesigned or removed from production.

This is the case for single-use menstrual products, baby nappies, and wet wipes, which in the 21st century are being promoted in the European market on an ongoing basis, despite not being designed to be reused, composted, or recycled efficiently.

7 These single-use items are examples of products that become waste after being used only once - resulting in serious environmental impacts throughout their lifecycle, from the production phase until the end-of-life. The environmental impacts include the release of hazardous chemicals into the environment, as well as poor waste management of these single-use items, meaning that they end up in landfills or incinerators or even end up being discharged into the sea.

The disposal of these products also creates problems in public sewer systems impacting public health. Their management and clean-up, often leads to high costs for public administrations and consumers themselves. Furthermore, the recycling possibilities are very limited or non-existing for some of these products.

Despite reusable menstrual products, baby nappies, and wipes having existed for a long time, single-use products dominate the market. In fact, waste prevention and reuse, although being a top priority in the European waste hierarchy, are currently among the least represented measures when looking at the regulative level - which today are still very focused on downstream / end-of-pipe solutions.



AIM, OBJECTIVES AND SCOPE

Aim

This study aims to analyse the environmental and economic impacts of single-use menstrual products, baby nappies, and wet wipes at the European level.

Objectives

- Estimate the consumption rate of single-use menstrual products, baby nappies, and wet wipes and the associated amount of waste generated in Europe.
- Analyse the environmental and economic impacts derived from the production and consumption of single-use menstrual products, baby nappies, and wet wipes.
- Raise awareness about the impacts of single-use menstrual products, baby nappies, and wet wipes and identify the existing solutions and their environmental, economic and social advantages.

8

Scope

The scope of the work covers an analysis of single-use menstrual products, baby nappies, and wet wipes. Due to their economic, social, and environmental impacts, including their contribution in weight to the municipal solid waste stream, those items require special attention and the adoption of specific measures to prevent or minimise their impacts.

Adult nappies are not included in the study due to data limitations. However they contribute to a large extent to waste generation and, hence, to the impacts related.

Some of the products that will be analysed in this study (menstrual products and wet wipes) are among the 10 items that are addressed in the new European Directive tackling single-use plastics, - *EU (2019/904) of the 5th of June 2019 on the reduction of the impact of certain plastic products on the environment²* - as they are among the top 10 single-use plastic products more frequently found on the beaches and seas of Europe. The new Directive, however, does not address the reusability aspect of those items as well as the issue around the accessibility and availability of reusable products. In addition, it also

does not cover baby nappies which are another single-use product mostly made out of plastic, that also lead to serious environmental and economic costs to municipalities and consumers.

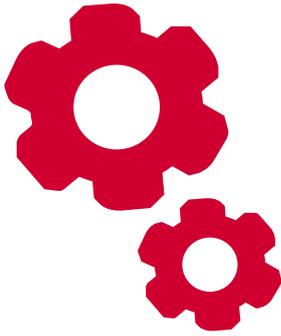
This analysis attempts to analyse the environmental and economic benefits of reusable products compared to current single-use ones which dominate the market.

The data included in this analysis is generally oriented towards the EU (EU-28) as a whole, although in some cases, data is only available for specific member states. Also, most of the calculations are based on data from 2017, which is the last year of publication by Eurostat of some important data sets such as municipal solid waste generation.



TOXIC TALK

Although it lies outside the scope of this study, it still includes a few relevant facts and remarks around the associated health impacts of single-use menstrual products and baby nappies, as it plays an integral part in the narrative and debate around best practices for such items. Those additional facts are outlined throughout the study within the “*Toxic Talk*” boxes across the different sections. The toxins often found in these products are proven to have a wide range of associated health impacts for the consumer. This is critical when considering the full context of single-use menstrual items, baby nappies and reusable products. Nevertheless, a specific study would be needed in order to investigate and explore in detail the health impacts to human health derived from the use of such items.



METHODOLOGY

The work has been carried out in three phases, as identified below.

Consumption Rates and Waste Generation

In the first phase of the report a description of the single-use products that fall within the scope of the study has been carried out, indicating both their use and their composition (compound ingredients used in their production).

Data has been collected and analysed on the current consumption rates of these single-use products and the amount of waste generated. Some of the numbers provided in the study come from product sales statistic reports and others have been estimated based on average consumption rates, outlined in detail throughout the report.

Environmental and Economic Impacts

10

In the second phase, we looked at the impacts of single-use menstrual items, wet wipes and baby nappies on the environment; including from the extraction of natural resources for their production, from greenhouse gas emissions, and/or from the pollution caused by the leakage of these products into the environment - especially on soil, beaches and seas during their disposal, and those generated by the waste management and treatment.

Also, this section includes an analysis of the impacts of these single-use items as regarding the costs beared by public administrations (including the collection, management and treatment of waste – landfilling and incineration - clean-ups and the associated public sewage issues) as well as the costs borne by consumers.

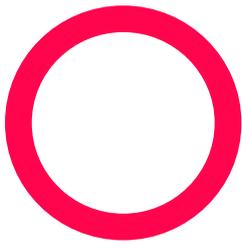
Information on this phase was taken from existing literature published by the European Environmental Agency (EEA), Eurostat, reports from European consultancy companies, scientific and non-profit organizations. Also, some calculations (i.e. waste generation and management impacts) have been developed based on the results obtained in the previous section and other data found in the literature review.

Reusable products and Benefits

This section describes the main reusable alternatives to single-use menstrual products, baby nappies, and wet wipes. In order to estimate consumption trends, the main manufacturers distributing menstrual cups, cloth pads and reusable baby nappies and wipes in Europe were contacted via mail and telephone and asked to provide us with 2018 annual volume sales (aggregated or per country) per units or kg of product. In addition, in order to assess

the accessibility and the price of the reusable products in different regions across Europe, a survey was circulated to Break Free From Plastic (BFFP) Europe and Zero Waste Europe (ZWE) networks.

At this stage, the potential waste prevention when switching from the conventional single-use products to reusable products is assessed by applying average usage rates and weight values. This section also includes, an estimation of the economic savings that consumers can obtain by replacing single-use products for reusable ones.



LIMITATIONS

This study intends to open up discussion on the impacts coming from the current production, consumption, and disposal of single-use menstrual products, baby nappies, and wet wipes in contrast to the reusable products. Although reusable products already exist and are proven to perform effectively, they are not yet widely accessible or used.

11

Obtaining data about the market share (in terms of volume sold in units or weight) for these products in Europe (either single-use or reusable) turned out to be difficult. Although some consultancy companies have such data, the information is usually not public. In order to obtain data about reusable products sales in Europe, the main manufacturers of cloth pads, menstrual cups and cloth baby nappies were contacted. However, not all the producers were keen to provide such data. Therefore, the numbers included in this study are only an approximation.

Specific limitations of the waste production and management costs calculated for the menstrual products, baby nappies and wet wipes, linked to technical or data collection difficulties, are outlined in detail in the report. There are many different realities in Europe in terms of habits, consumption rates and waste management systems, which add complexity to the analysis. Most of the values provided in the study are based on average consumption rates and costs. Also, there is the danger of aggregated data (for example, waste management costs at the national level), which do not reflect the enormous variation between countries and regions. Further research based on real sold volume in Europe and more updated and accurate waste management costs at national and EU level should be carried out.



SINGLE-USE MENSTRUAL PRODUCTS, BABY NAPPIES, AND WET WIPES

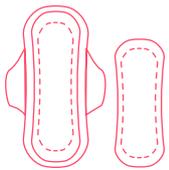
This study analyses the consumption trends and environmental and economic impacts coming from three single-use products: menstrual products, baby nappies, and wet wipes.

Baby nappies and menstrual products (tampons and pads) are included under the category of absorbent hygiene products (AHP), which are products designed to absorb excreted body fluids at various stages of a consumer's life.

Single-use AHP and wet wipes are examples of items that become waste after using them only once and, despite entailing serious environmental, economic and social impacts, their usage is expected to increase in the future unless technical or legal measures are implemented.

12

These single-use products are made of non-woven fabrics, defined as sheet or web structures bonded together by entangling fibre or filaments mechanically, thermally or chemically. They are typically made directly from separate fibres, molten plastic or plastic film.



MENSTRUAL PRODUCTS

Single-use menstrual products are used mainly by cis-women, as well as transgender men, and non-binary individuals all over the world, as they are a convenient choice for use during menstruation. These products include pads, liners and tampons and are considered single-use when there is no potential to wash them and reuse them multiple times, as the washing processes degraded the structure and function of the product.³

Pads and Panty Liners

It has been calculated that most conventional single-use pads are made out of 90% plastic.⁴ Polyethylene is the most abundant plastic (polyolefins being part of its family, which also includes LDPE, LLDPE, HDPE and PP), with other materials also used, such as adhesives and various fragrances.

Generally, conventional single-use menstrual pads and panty liners are composed of a series of raw materials which are distributed based on the different layers (Table 1).

Pad components	Infinity	Radiant	Ultra	Maxi	Pure and Clean
Top Sheet A soft fabric that is designed to pull fluid away from skin	Polyolefins, like those commonly used in clothing; with petrolatum and zinc oxide (ingredients found in skin lotions) on Infinity and Radiant				Polyethylene/ Synthetic fibers similar to those used in garments clothing
Absorbent Core A layer that acquires and stores fluid, locking it away	Absorbent foam (Flex Foam)		Absorbent wood cellulose (the absorbent material used in pads since 1920s) with absorbent gel, rayon, or polyester		Absorbent wood cellulose and super absorbent gel pearls to keep fluid inside
Back Sheet A soft moisture proof layer to keep the fluid inside	Polyolefins, like those commonly used in clothing (printed on Radiant)				Polypropylene and polyethylene/Synthetic layer moisture proof to keep fluid inside
Adhesives	An FDA approved food additive adhesive similar to craft glue sticks				Glue to ensure the layers in the pad keep together and adheres to panty
Fragrance Provides a fresh scen	Fragrance ingredients. Only on versions labelled as scented				Not present
Wrapper Protects the adhesives before the pad is used	Printed polyolefin like that used in clothing, and paper (Maxi only)				Printed polyethylene/ film to keep pad protected and convenient to carry
Wing paper Protects the wings adhesive before the pad is used	Printed paper				Paper to protect wing adhesive before pad is used

13

Table 1: List of components of Procter and Gamble's Always pads. Source: Always, 2019.⁷



TOXIC TALK

Some menstrual products also include fragrances/scents,⁵ which can interfere with the balance between good and bad bacteria. Synthetic fragrances can be made from a cocktail of up to 3,900 chemicals (styrene, chloromethane, chloroethane, chloroform, acetone, among others). Some of them are identified as carcinogens, neurotoxins, irritants, hormone disruptors and reproductive toxicants.^{6,11} The chemicals in these products can also modify the pH balance of the individual.⁵ However, most of the time these chemicals are not disclosed on the product by the manufacturer.⁸

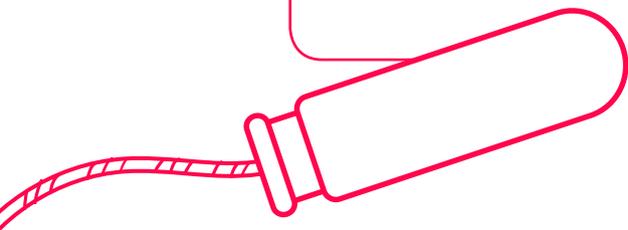
Tampons

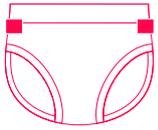
Generally tampons are mainly composed of absorbent materials (over 90% of the tampon), either rayon, cotton, polyester, or a mixture of these fibres, which are usually bleached. Usually the absorbent-core is covered by a thin, smooth layer of non-woven or perforated film helping to reduce loss of fibres and making the tampon easy to insert and remove. The withdrawal cord used to remove the tampon is usually made out of cotton or can be made out of polypropylene or polyethylene fibres. The tampon is individually wrapped with a paper wrapper or a thin film (e.g. polymeric plastic material or cellophane) before being packed into cartons. Tampons may come with an applicator of coated paper or hard plastic (polyethylene (PE) or polypropylene (PP)).¹⁰



TOXIC TALK

Many of the conventional single-use menstrual products (pads and tampons) and their packaging contain plastic and other synthetic materials like rayon, adhesives, artificial fragrances and toxic chemicals such as phthalates, bisphenol - A and petrochemical additives, which are recognized environmental pollutants and are also known to be endocrine-disrupting substances linked to some diseases, such as heart diseases, infertility and cancer. Even traces of dioxin, created when these products are bleached white, and pesticides and herbicides, including glyphosate, can be found in menstrual products.^{12,13}





BABY NAPPIES

Nappies are used to absorb and contain excreta produced by small children. Single-use baby nappies are designed to be disposed of after being used just once. Once used, the nappies containing excreta are generally thrown away with other household waste.

Single-use baby nappies typically consist of a plastic outer layer with integral fastenings and a core of absorbent materials with a protective top layer (Table 2).

Component	Functions	Material	Example of potential material components
Top Sheet (skin contact)	Brings comfort and keeps the skin dry/clean/comfortable transferring the liquid to the acquisition distribution layer (ADI)	Ultra-thin cover made of cellulosic fibres, synthetic fibres or film of synthetic polymers	Polyester Polyethylene Polypropylene Mixture of Polyethylene / Polypropylene Viscose / rayon Cotton
Acquisition distribution layer (if applicable)	Transports liquid from the surface to the core of the product, where the liquid is locked in	Porous material consisting of cellulosic or synthetic fibres or non-wovens made of synthetic polymers	Polyester Polyethylene Polypropylene Viscose/rayon Cotton
Core wrap	Material that encircles absorbent core for care integrity and to contain the super absorbent polymer (SAP) or a mix of SAP and cellulosic fibres	Synthetic fibres or non-wovens made of synthetic polymers or cellulosic fibres	Polyester Polyethylene Polypropylene Viscose/rayon
Absorbent core	Absorbs and locks in the liquids	Cellulosic or/and synthetic fibre with or without a super absorbent polymer (SAP) or SAP without fibres	Cellulose/pulp fibre Cotton Superabsorbent polymer Polyester Polyethylene Polypropylene
Containment flap with elastic	Prevent leakage out of the diaper and to optimise fit	Non-wovens made of synthetic polymers	Polyethylene Polypropylene Polyurethane Synthetic elastic
Waistband (if applicable)	Provides / improves fit around the waist	Non-wovens made of synthetic polymers	Polyethylene Polypropylene Polyurethane Synthetic elastic

Table 2: List of components of baby nappies. Source: Edana, 2008.¹⁴

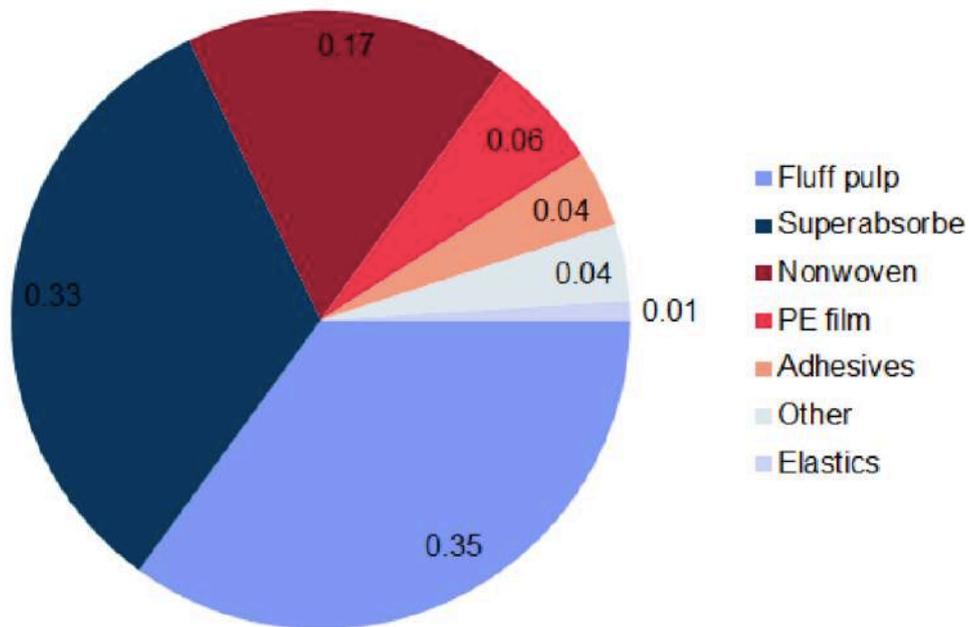


Figure 1: Average baby diaper composition. Source: Edana, 2008.¹⁴



TOXIC TALK

As it happens with menstrual products, many manufacturers of baby nappies do not specify all the ingredients used in the products, although some of them might be harmful for children. A recent risk assessment conducted by Anses (the French Agency for Food, Environmental and Occupational Health & Safety) detected a number of hazardous chemicals in disposable nappies that could migrate through urine, and enter into prolonged contact with babies' skin. The assessment showed that under realistic conditions of use, threshold values were exceeded for several chemicals, including fragrances (butylphenyl methylpropional, hydroxyisohexyl 3-cyclohexene carboxaldehyde), certain polycyclic aromatic hydrocarbons (PAHs), PCB-126, and all the DL-PCBs, dioxins and furans. Some of these chemicals are added intentionally, such as fragrances that could cause skin allergies. Other identified chemicals could come from contaminated raw materials or manufacturing processes.¹⁵



WET WIPES

Wet wipes are often used in as part of a baby's hygiene routine as substitutes for water and soap when changing nappies as well as for cleaning the baby's face and hands. However, their use has also become part of adults' everyday life, such as for domestic cleaning or personal hygiene.

Wet wipes are defined as products sold on the market as single-use wipes which are pre-moistened with lotion, and do not pass strict legally defined standards for 'flushables'.³

Wet wipes are made from non-woven fabrics and are saturated with a cleansing solution.

- **Non-woven fabrics:** The material used in wet wipes is a non-woven fabric or a synthetic plastic thread similar to the kind used in nappies. Usually, the fabric is made of fibres, such as cotton and rayon as well as plastic resins like polyester, polyethylene, and polypropylene.
- **Cleansing ingredients:** Water is the main ingredient and serves as a carrier and diluent for the other ingredients. Intimate hygiene wipes also contain mild detergents mixed with moisturising agents, fragrance and preservatives. Moisturising agents or humectants such as propylene glycol and glycerine are also added to prevent premature drying of the solution. Other ingredients include preservatives, such as methyl and propyl paraben and various fragrances. Sometimes wet wipes also include biocides, such as antimicrobial agents.
- **Packaging components:** The packaging is made of plastic (usually PET or PE) to keep wipes moist for a long time.

17



TOXIC TALK

Due to the presence of detergents, fragrances and preservatives in wipes composition, using them on a regular basis can put babies at risk of allergic reactions. This may be caused by repeated skin contact in an area where soaps have stripped the natural oils from the skin. If wet wipes residues are not rinsed off, babies are then vulnerable to absorb allergy-causing chemicals.¹⁶



CONSUMPTION RATES AND WASTE GENERATION

The absorbent menstrual products, baby nappies and wet wipes are used every day on a regular basis all over the world by a large proportion of the population.

Despite the fact that reusable products have existed for a long time, single-use products dominate the market and their production in Europe has progressively increased during recent years (Figure 2). From the graph, it can be seen that menstrual products, baby nappies, and wet wipes as well as similar articles of paper pulp, paper, cellulose wadding or webs of cellulose fibers in particular, increased their production drastically in 2016 and 2017.

18

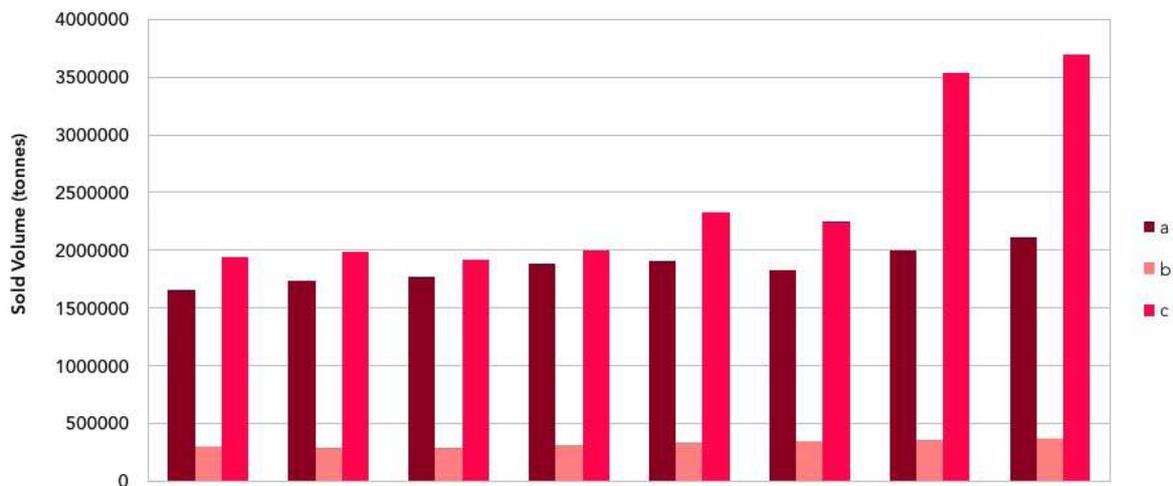


Figure 2: Statistics on the production of manufactured goods (sold volume) in EU-28 between 2010 and 2017. a) Wipes of paper pulp, paper, cellulose wadding or webs of cellulose fibres; b) Menstrual products of paper pulp, paper, cellulose wadding or webs of cellulose fibres; c) Nappies for babies and similar sanitary articles of paper pulp, paper, cellulose wadding or webs of cellulose fibres. Source: Eurostat, detailed data by PRODCOM list (NACE Rev.2).¹⁷

The sold volume included in Figure 2 should not be used as total figures for EU-28 however, as most of the member states had no available data (as it can be seen in Figure 3), either because it is considered as confidential or because the national estimated data is considered unreliable by Eurostat (the statistical office gathering such data).

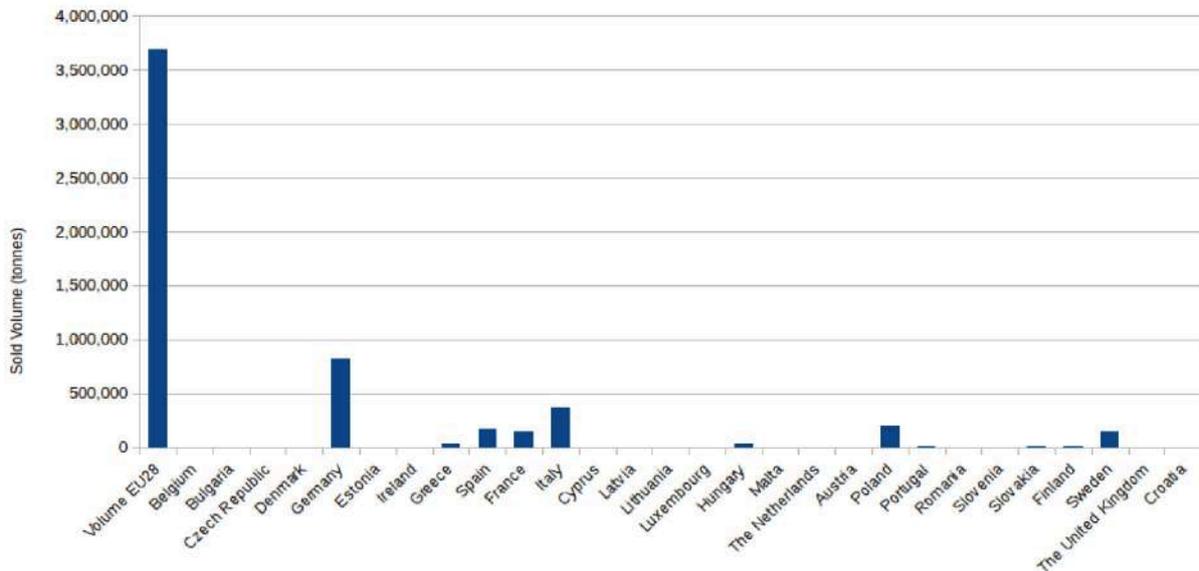
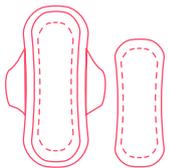


Figure 3: Statistics on the production of manufactured goods (sold volume of menstrual products, baby nappies and wipes) in EU-28 by country in 2017. Source: Eurostat, detailed data by PRODCOM list (NACE Rev.2).¹⁷

19



MENSTRUAL PRODUCTS

In order to estimate the amount of menstrual products consumed annually in the EU-28, demographic data were collected relative to the population using such products (females of reproductive age). It is necessary to point out the fact that not all females of reproductive age menstruate, for example because of pregnancy or health issues, and it is not only cis-women who menstruate. As already mentioned, people who menstruate include women, transgender men, and non-binary persons. However, only data from women has been included in the analysis due to difficulties in estimating these percentages for the whole menstruator population.

In 2017 the number of females of reproductive age (13-49)¹⁸ in the EU-28 was 118,213,566 representing approximately 23% of the total population. Meaning that at least 23% of the total population menstruates and therefore it can be assumed that uses menstrual products regularly. This population, has declined during the last 10 years and it is expected to continue along this trend due to Europe's aging population and relatively low birth rate.¹⁹

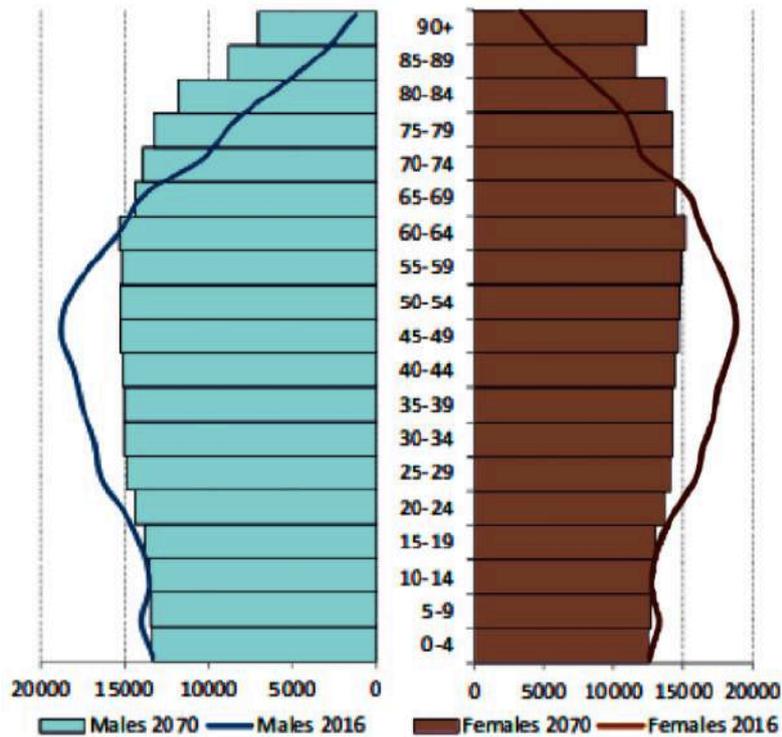


Figure 4: Population by age group and gender (2016-2070) in EU-28. Source: European Commission, 2018.¹⁹

20

Estimating the amount of menstrual products consumed across Europe it is not an easy task if we take into account that its usage by global consumers varies significantly by country, ethnicity, age, menstrual cycles and changing frequencies.²⁰ It should therefore also be noted that there is a percentage of menstruators that uses reusable products on a regular basis instead of single-use ones. However, as we will see later in the Reusable Products section (page 39), this percentage is still a minority.

In order to simplify the calculations, it has been considered that on average a menstruating woman consumes 32 single-use menstrual products (pads or tampons) per period²² and 416 products annually (if you assume 13 periods per year). That would mean that each menstruating woman uses about 14,000 menstrual products in their lifetime. When translating this consumption into waste generation, it is estimated that the weight of a period is 384g (considering each product after use, on average, weighs 12g),²² meaning that **if a woman has 13 periods per year and menstruates for 36 years, more than 180kg of single-use tampons and pads will be thrown away in a single lifetime for one menstruating woman.**



Based on these considerations, **it has been estimated that in the EU-28 nearly 50 billion units of single-use menstrual products were consumed in 2017, meaning an annual generation of about 590,000 tonnes of waste.**

As the number of women of reproductive age has decreased during the last 10 years, so has the consumption of menstrual products and therefore waste production (Figure 5), but it does not translate into a reduction in the consumption per person.

Number of women of reproductive age	Menstrual items consumption (units)	Waste generation (tonnes)
118,213,566	49,177,000,000	590,000

Table 3: Estimation of menstrual products consumption and waste generation of single-use menstrual products in 2017 for EU-28, based on the following considerations: a) Reproductive age goes from 13 to 49 year, b) each woman consumes 32 single-use menstrual items per period in average, c) Each period weights 384 grams in average, d) in a whole year a woman has 12 periods on average.

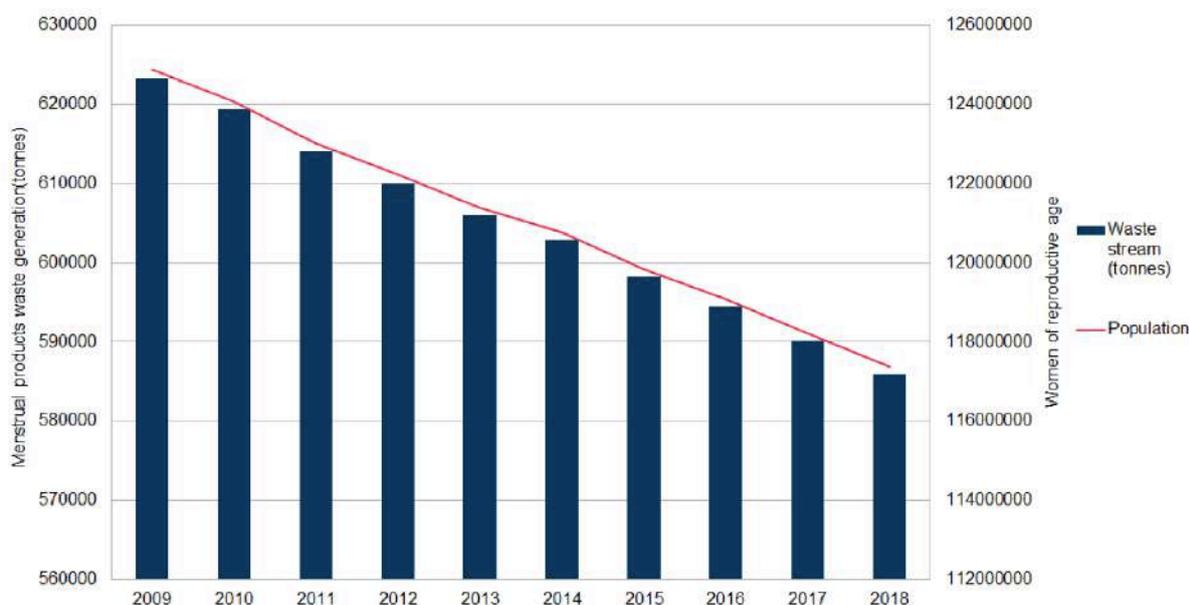
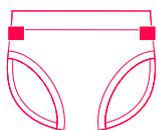


Figure 5: Estimation of the women of reproductive age (13-49 years) and menstrual waste generation in EU-28 (2009 – 2017).

21



BABY NAPPIES

Single-use baby nappies increased in popularity following the introduction of Super Absorbent Polymer (SAP) in the mid-80s, and nowadays the vast majority of parents use single-use nappies.

To estimate the amount of single-use nappies in Europe it is necessary to estimate the amount of users and then the average number of nappies used per child every day.

The average child is out of nappies after two years and two months, and after two and a half years, 95% of all children are out of nappies.²³ These estimates vary depending on the age at which it is considered that children are fully toilet trained (between two and a half to three years old). The functional unit used in this analysis considers the use of nappies during the first two years of a child's life due to statistics limitations (only annual data is available).

In 2017 within the EU-28 there were more than **15 million** children between the ages 0–2 years old using nappies. Considering an average of 6 changes per day for all children aged 0-2, it has been estimated that in 2017 there was a consumption of **33 billion** single-use baby nappies in the EU-28.



The waste generation associated with single-use nappies is likely related to the number of users of this product (if we assume that the majority uses single-use nappies) and, **in 2017, it was estimated that 6.7 million tonnes of single-use nappies were generated in the EU-28.** According to accepted statistics, the average weight of each of these nappies is around 200g (after being used). Each child can therefore be assumed to produce 438kg of dirty nappies annually - meaning that around 1 tonne of waste is produced for each child after two and a half years.

Number of babies 0-2 years old	Nappies consumption (units)	Waste generation (tonnes)
15,366,639	33,653,000,000	6,731,000

Table 4: Estimation of single-use baby nappies consumption and waste generation in 2017 for EU-28, based on the following considerations: a) the kids between 0 and 2 years use an average of 2,500 nappies per year; b) the weight of a used nappy is 210 grams.

22

During the last 10 years in the EU-28, the generation of baby nappy waste has remained above 5.5 million tonnes per year. Most of it ends up landfilled or incinerated (Figure 6).

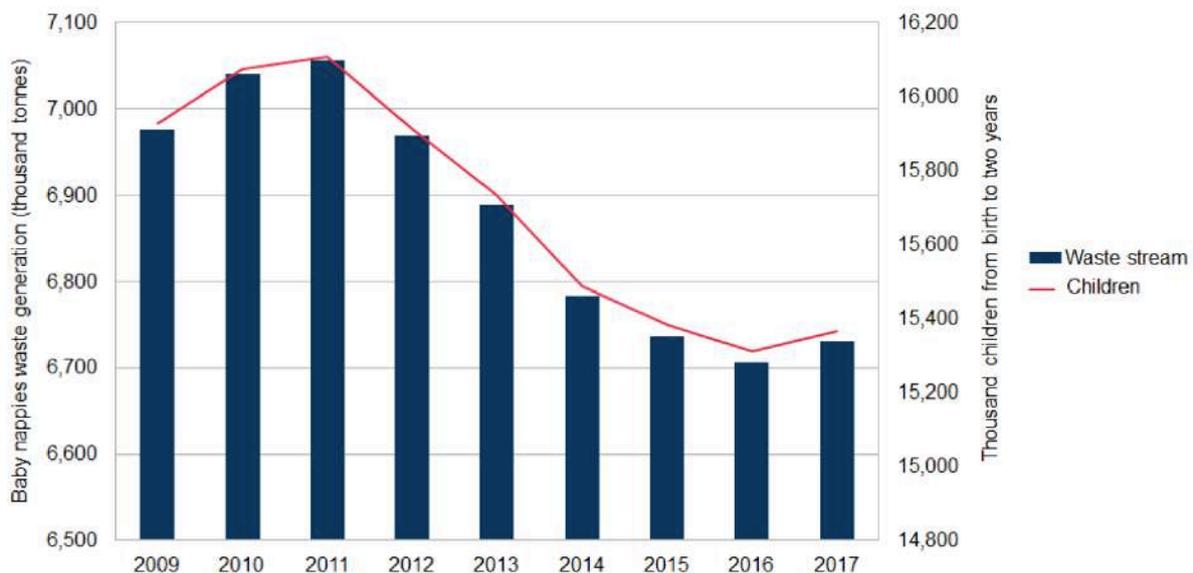


Figure 6: Estimation of the number of children using nappies (0-2 years) and baby nappies waste generation in EU-28 (2009 – 2017).

It is important to note that the amount of waste coming from nappies estimated in this study does not include adult nappies which considering Europe’s aging population, are likely to be an area that increasingly contributes to waste.



WET WIPES

In recent years the consumption of wet wipes has increased considerably to the point that nowadays they are used abundantly for the cleaning of babies, as a make-up remover and for household cleaning activities. In Europe, the wipes market is continually increasing and was, according to Euromonitor International, estimated to be worth more than \$3.3bn (€2.9bn) by 2016.²⁴ This equates to about 56 billion of pieces being sold in 2012 and 65 billion expected to be sold in 2016 in Europe, meaning a 4% annual increase (Figure 7).

The global market of wet wipes is projected to achieve an annual growth rate (2015-2021) of 7.0% (in monetary terms) and 6.1% (tonnes of products).²⁵

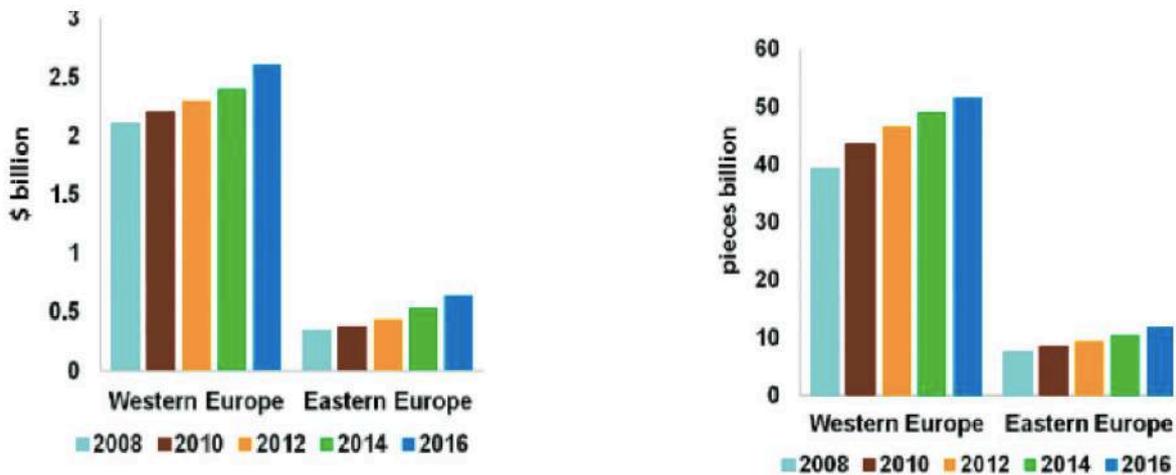


Figure 7: Wet wipes market value in monetary and unitary terms in Europe. Source: Euromonitor International (Engovist, H. 2014).²⁴

Baby wet wipes account for almost 70% of total wet wipe sales and, based on volume, these wipes represent over 80% of all wet wipes used in Europe with higher usage in Western Europe compared to Eastern Europe and variations between countries.²⁴



In 2017, about 68 billion individual wet wipes were consumed in the EU-28 (resulting in an annual consumption of 130 wet wipes per person on average), **which equates to 511,000 tonnes of waste** (1kg of wet wipes per person annually), **considering that a wet wipe weighs 7.5 grams.**²⁶

Wet wipes consumption (units)	Waste generation (tonnes)	Average waste generation per capita (kg)
68,000,000,000	511,000	1

Table 5: Estimation of wet wipes consumption and waste generation in 2017 for EU-28. Source: own elaboration based on data from Euromonitor International (Engovist, H. 2014).

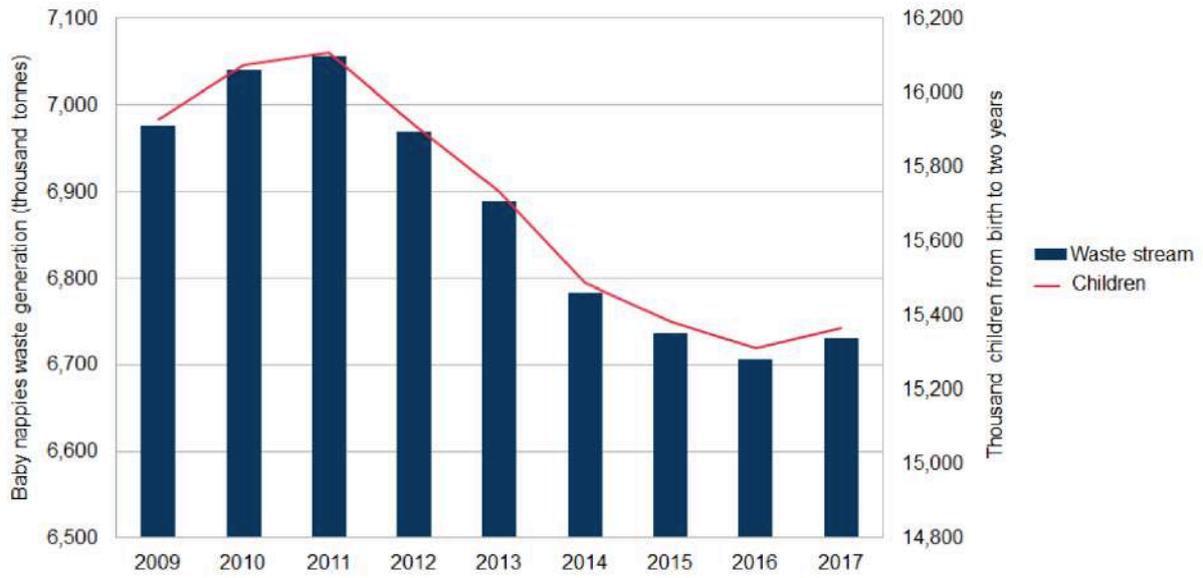
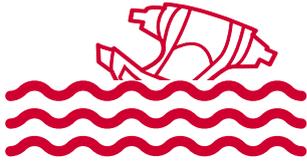


Figure 8: Estimation of wet wipes consumption and waste generation in EU-28 (2012-2017). Source: Own elaboration based on data from Euromonitor International (Engovist, H. 2014).





ENVIRONMENTAL IMPACTS

The environmental impacts of single-use menstrual products, baby nappies and wet wipes generally stem from the production process, including their distribution to retailers, their waste generation, treatment, and disposal after use.

THE PRODUCTION AND CONSUMPTION PHASE

The European region is a net exporter of menstrual products such as pads. The majority of wet wipes and nappies used in the EU are produced in Europe (including Turkey, who is a major producer of wet wipes for Europe).^{27, 28} However, it must be taken into account that some of the resources used in the production of these products are not produced within the EU geographical region, which implies additional impacts, as a result of the transportation of goods. For instance, according to manufacturers of fluff pulp, 90% of the production of this material takes place in North America with an average transportation distance of 2,000 km from Europe.²⁸

25

Trends suggest that a further increase in the production volume of these products, especially wet wipes and nappies for adults in the EU is likely; which could create additional pressures on the environment going forward.

The impacts generated during the production process of these products result mainly from the use of large volumes of wood pulp, cotton, viscose rayon, the production of super absorbent polymer (SAP), and other components such as polyester, polyethylene, polypropylene, adhesives, and dyes. For example: **it takes over 1,500 litres of crude oil to produce enough single-use nappies for a newborn baby until they become potty trained (at 2.5 years).**²⁹

The absorbent core of single-use baby nappies and menstrual pads is commonly made from wood pulp and sodium polyacrylate, with an inner layer of polypropylene (and possibly some additional fragrances). Wood pulp production can be the source of deforestation, soil impoverishment, and can lead to high depletion of natural resources. Similarly the lumbering process and other machine operations can result in the emission of CO₂ and other GHGs due to the use of gasoline powered devices. The manufacturing of wood pulp alone is highly water intensive and creates additional waste that needs to be treated on-site. Also, the pulp is usually washed with bleach and water to remove all the remaining lignin, usually by using either chlorine or peroxide. The pulp, after being bleached, is then mixed with polymer particles of an acrylic acid derivative, such as sodium acrylate.³⁰

In addition to the depletion of natural resources (wood, crude oil, etc.), significant amounts of water and energy are used during the manufacturing process, as the production and usage across Europe and the globe is enormous. For example, the production of wet wipes requires a high consumption of water to keep the fibres saturated. There are also impacts stemming from the extraction (petroleum) and transportation of the raw materials all along the lifecycle, beyond just the finished product.

In particular, **the production of single-use baby nappies has a greater environmental impact than its waste management.**²⁸ According to a Life Cycle Analysis conducted by The University of Queensland, more than 90% of water and energy consumption and land use occurs during the pre-use stage of the single-use nappy life cycle (softwood production, pulping and nappy industrial production).³¹



Likewise, the use of single-use nappies by an average child over two and a half years would result in a global warming impact of approximately 550 kg of CO₂ equivalents.²³ **This equates to an estimated total global warming potential in the EU-28 of approximately 3.3Mt of CO₂ equivalents per year (assuming there are 15 million babies using nappies).**

When it comes to single-use menstrual products, a Life Cycle Assessment of tampons conducted by the Royal Institute of Technology in Stockholm, found that the largest impact on global warming was caused by the processing of LDPE (low-density polyethylene), used in tampon applicators as well as in the plastic back-strip of a pad - requiring high amounts of fossil fuel generated energy.

26



A single year of menstruation for an average menstruating woman amounts to a carbon footprint of 5.3kg of CO₂ equivalents.³² **This means that the average annual consumption of approximately 46 billion single-use menstrual products in the EU-28 equates to 245,000 tonnes of CO₂ equivalents.**

WASTE GENERATION, DISPOSAL AND TREATMENT

Waste Generation Figures

In 2017 Municipal Solid Waste (MSW) generation in the EU-28 was of 248,653,000 tonnes.³³ According to the consumption statistics presented previously, 7,832,000 tonnes of waste coming from single-use menstrual products, baby nappies and wet wipes (equivalent to 15.3kg/inhabitant) was generated in 2017 within the EU-28, accounting for 3% of the total Municipal Solid Waste. These products, specifically single-use nappies, are one of the biggest identifiable products in the domestic waste stream.

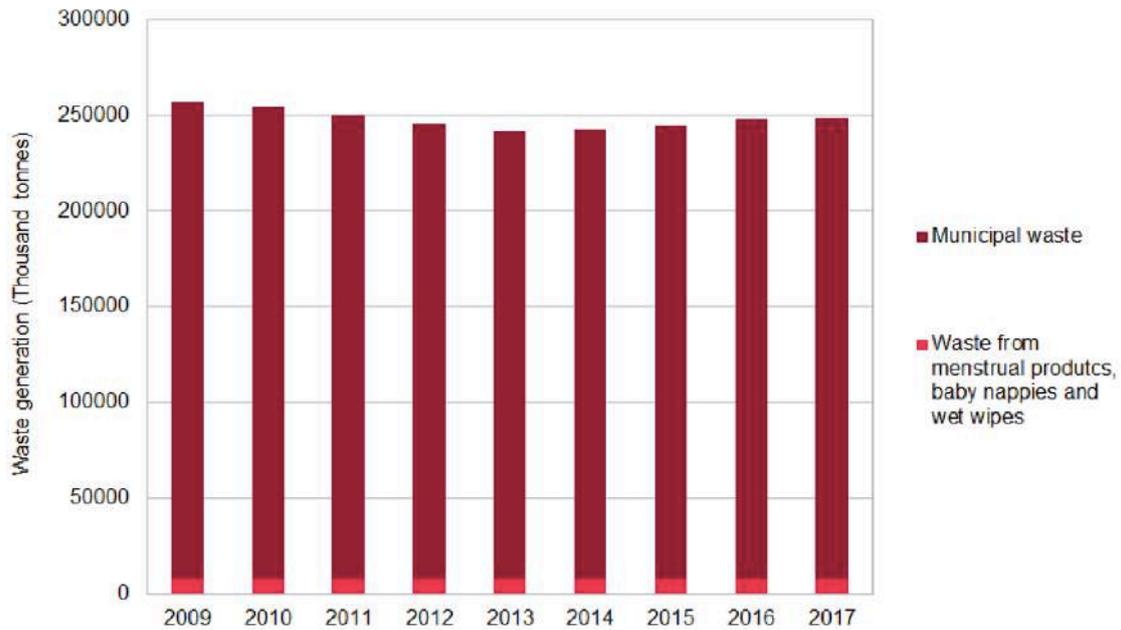


Figure 9: Evolution of the municipal solid waste generation and estimation of the waste coming from single-use menstrual products, baby nappies and wet wipes products in EU-28 (2009-2017).

	Waste generation (tonnes)	Percentage of the total municipal solid waste (%)
Menstrual products	590,000	0.2
Baby nappies	6,731,000	2.7
Wet wipes	511,000	0.2
Wet wipes	7,832,000	3.1

Table 6: Estimation of the amount of waste coming from single-use menstrual products, baby nappies and wet wipes and the percentage that represent over the total municipal solid waste in 2017 within EU-28.

27

On average, 75% of the waste generated in EU-28 capitals ends up in the residual waste bin.³⁴ Assuming similar results for the whole EU-28 territory, **the waste coming from single-use menstrual products, baby nappies and wet wipes collectively represents 4% of the total residual municipal waste stream**, although this percentage increases in regions presenting higher separate collection rates for other waste streams.

For instance, in Dublin and Ljubljana single-use menstrual products, baby nappies and wet wipes are estimated to represent nearly 12% of the total residual municipal waste stream whereas in Lisbon and Rome the percentage is closer to 3% (Figure 10). In Zero Waste municipalities, with high rates of selective collection, the waste coming from these products can represent up to 30-40% of the residual fraction. For example, in the Catalan municipality of Argentona, with a selective collection of 88%, 30% of the waste collected as residual fraction corresponds to single-use nappies, menstrual products and wet wipes. However, these items represent the same percentage as in other places of the Country (3.63% according to the average Catalan waste composition) if we look at total waste generation.

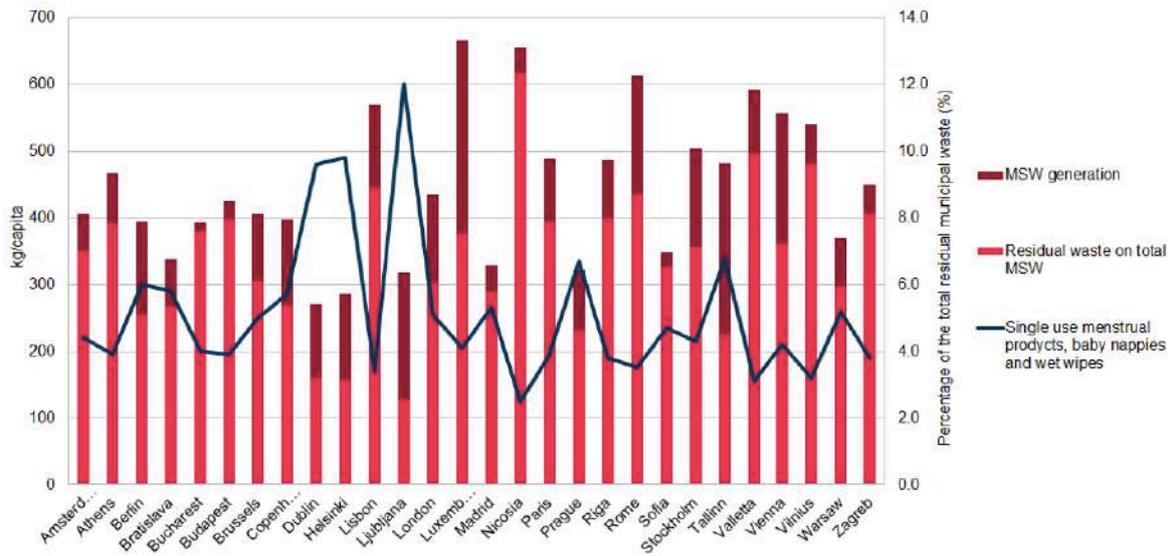


Figure 10: MSW, residual waste generation per capita and estimation of the percentage of single-use menstrual products, baby nappies and wet wipes on total residual municipal waste (based on average national generation per capita). Source: own elaboration based on data from the European Commission, 2015.³²

The varied composition of these products, together with the presence of organic/excreta after use (in the case of single-use menstrual products and baby nappies) makes their recycling technically and economically expensive.

28

Therefore, **in Europe 7.8 million tonnes of these products typically end up in landfills or are incinerated, wasting resources and invoking negative environmental impacts.**

Disposal and Treatment

In Europe, a pilot project for recovering plastic and other materials from inside single-use nappies at the Fater's AHP recycling plant, located in Treviso (Italy) is underway. However, the plant only addresses a very low proportion of the nappies being consumed in the country. The recycling plant is operating at about 10,000 tonne annual capacity, addressing about 2% of the single-use nappies being consumed annually in Italy alone. Local waste management utility Contarina SpA collects used single-use nappies and other AHP from curbside bins or large consumer hubs like hospitals from around 50 local towns and transports them to Fater's plant. After dry cleaning the nappies using contact steam, and disposing of human waste in wastewater treatment plants, one ton of AHP waste can only yield 150kg of cellulose, 75kg of absorbing material, and 75kg of mixed plastic,³⁵ meaning that only 30% of the material is able to be recovered.

As it is the case with Fater's recycling plant, many other single-use nappy recycling plants are facing limitations that challenge their ability to combat the single-use nappy problem. Collecting, cleaning and breaking nappies into their component parts is likely to remain a complex and expensive activity. This results in the vast majority of single-use nappies are being burnt in incinerators or landfilled.

In the EU-28 (2016), 37.8% of municipal solid waste is recycled, 9.9% is used for backfilling, 45.7% is landfilled, and 6.6% is incinerated (with or without energy recovery).³⁶

Since nowadays recycling and backfilling are not common disposal practices for single-use menstrual products, baby nappies and wet wipes, shares have been recalculated without taking into account recycled and backfilled fractions, following with the methodology used by Cordella et al. 2015²⁸ in their study. According to this, **the following disposal scenario has been considered for single-use menstrual products, baby nappies and wet wipes in EU-28: 87.4% landfill and 12.6% incineration.**

Sending such a large amount of AHP and wet wipes waste to landfills requires high land occupation rates and the plastic parts can take up to 500 years to break down in a landfill.³⁷

Furthermore, the decomposition of the organic matter may cause groundwater and soil contamination due to the leaching of organic components. It also produces landfill gases such as methane and CO₂, both of which are potent greenhouse gases which exacerbate climate change.

The situation can in reality be much worse if these products are not discarded properly, and end up in rivers and natural areas.

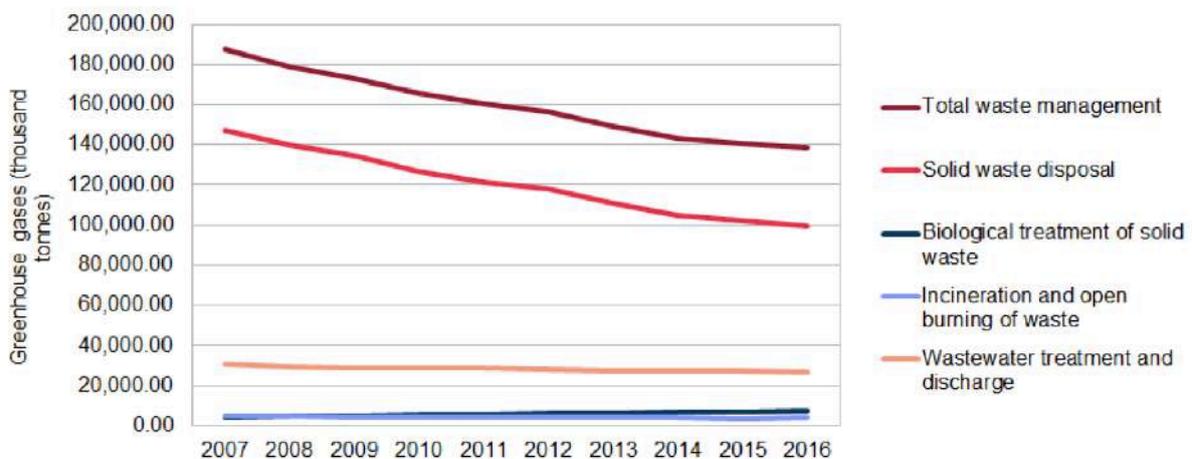
Also, the toxic chemicals and additives that can be found in some of these products may leach while degrading or when in water.

Finally, when these products end up in incinerators, the burning of plastic and other substances present in the waste releases dangerous substances such as heavy metals, persistent organic pollutants (POPs), and other toxins into the air alongside ash waste residues, impacting on public health and food production.

29



Furthermore, **the incineration of municipal waste involves the generation of climate-relevant emissions, mainly CO₂, N₂O, NO_x, NH₃ and organic C, measured as total carbon.**^{38,39} The generation of greenhouse gases coming specifically from the incineration of single-use menstrual products, baby nappies and wet wipes has not been possible to estimate.



*Greenhouse gases (CO₂, N₂O in CO₂ equivalent, CH₄ in CO₂ equivalent, HFC in CO₂ equivalent, PFC in CO₂ equivalent, SF₆ in CO₂ equivalent, NF₃ in CO₂ equivalent).

Figure 11: Greenhouse gas emissions by waste management system. Source: Eurostat (European Environment Agency).²⁰

SEWAGE RELATED DEBRIS AND MARINE LITTER

Single-use menstrual products and wet wipes are one of the top 10 single-use plastic items most commonly found in the EU marine environment. **The European Commission ranks the category known as “sanitary applications” as the fifth most common single-use plastic items in Europe.** These top 10 items make up 86% of all single-use plastic in beach litter and is responsible for more than half of plastic marine litter.²⁷

Although it is not always easy to estimate exactly the source and the pathway of each item of marine litter, single-use menstrual products and wet wipes are usually flushed down the toilet by consumers (due to a lack of understanding, shame or inappropriate labelling) and thus, they enter the marine environment through the waste water release system. Consumers often think that these products biodegrade or disintegrate once in the sewer system (like toilet paper), however the reality is that they cause substantial damage to both sewage systems and the environment.

Wet wipes and single-use menstrual products flushed down the toilet can also cling to bends, junctions or obstacles in the sewer and accumulate to form highly resistant solid compact masses, retaining other elements that should not be discarded down the toilet such as cotton buds, pads or nappies - blocking pipes and pumps. Also, in addition to being hydrophilic, fatty materials can be impregnated in the wet wipes and menstrual products themselves and attract organic pollutants that are in the sewer. **In the United Kingdom, 75% of the weight of the identifiable items found clogging pipes came from wet wipes alone.**⁴¹ **In Valencia, a Spanish city of nearly 800,000 inhabitants, 1.5 tonnes of solid waste (mainly wet wipes) are removed every day from the wastewater treatment plant, which equals to 2-5kg per capita each year.**⁴²

30

Single-use wet wipes and menstrual products are made of non-woven cellulose and plastic and therefore, do not completely disintegrate in the waste water that passes through sewers.⁴³ Many wet wipes on the market specifically labelled as “flushable” or “biodegradable” fail the water industry’s disintegration tests and still cause issues down the line.⁴⁴ Moreover, they release a substantial amount of microplastics⁴⁴ (small pieces of plastic litter <5mm in diameter) into waste water, which may be transferred to the environment or the sewage sludge.

Wet wipes and single-use menstrual products that make their way to wastewater treatment plants are not completely removed in the screening phase. Therefore, part of the fibres are usually transferred into the environment.⁴⁵ In particular, during storm events, the overflow resulting from high water levels and rainwater in combined sewers (most European cities operate combined sewer systems in which both wastewater and stormwater are drained in one sewerage system) is then discharged into waterways. The excess flows spilled at the overflow have the potential to cause pollution in receiving waters as a result of the debris and contaminants.⁴⁵ **Sewage related debris make up approximately 6.2% of beach litter in the UK alone.**⁴⁶

The negative impacts of plastic marine debris include both the impacts generated by chemical components and both the visible and physical damage.⁴⁷ The best-known physical effects of marine debris are related to their intake or adhesion to the body of organisms. These effects can modify their physical conditions and compromise their ability to move and reproduce, as well as to capture food, digest it, and the ability to escape from predators.⁴⁸ The ingestion of microplastics is of particular concern since a wide range of organisms, including small animals, which are the base of the food, may ingest them due to their wide

distribution and small sizes.⁴⁸ Single-use plastic items do not readily break down in marine environments and usually contain chemical additives potentially toxic, such as phthalates and parabens, which can be released in the water or directly ingested and introduced into the marine food web.⁴⁹ In addition, plastic debris attracts and concentrates other marine pollutants such as polychlorinated biphenyls (PCBs), Dichlorodiphenyldichloroethylene (DDE) and nonylphenols, allowing these substances to be added to the food chain when the debris is eaten.^{48,50} Some of these plastic components contribute to the transport of invasive species (also known as rafting) and microbial contamination.²⁷ For example, plastic waste can promote microbial colonisation by pathogens implicated in outbreaks of disease in the ocean.⁵¹

The impacts caused by these products in public sewer systems, as well as their management, treatment and clean-ups, lead to high costs for public administrations and for consumers themselves, as it is going to be further explained in the next section.





ECONOMIC IMPACTS FOR PUBLIC ADMINISTRATIONS

WASTE MANAGEMENT

Analysis of waste management costs are not particularly well understood in Europe and the data available is insufficient or outdated. Furthermore, there is an enormous variety of management approaches adopted across the EU and its analysis and associated costs should consider the local context in which they apply. This situation also makes it very difficult to analyse the costs associated with the management of single-use menstrual products, baby nappies and wet wipes at the European level.

As already explained, these products are collected under the residual municipal waste stream. The most exhaustive analysis of waste management costs in Europe, which was financed by the European Commission and published in 2002, compiles residual waste collection costs in different European countries.⁵² Although this data is outdated, for those countries where provisions under the EU Landfill Directive 99/31/EC (which includes the obligation for pretreatment before waste is landfilled and in turn, drives costs higher) are not cost-factored into the report, we have assumed the highest range of costs reported to try and reach an estimate close to what would result after the EU Landfill Directive is implemented (Table 7).

The cost varies depending on many factors such as the collection system (surface containers, underground containers, door to door or pneumatic), the number of materials being collected separately as recyclables, and biowaste, the frequency of collection, and the sophistication of the collection equipment, among other factors.

For instance, the low costs per tonne reported in Finland might be explained by the fact that Finland does not include the purchase and maintenance costs for the containers, which are borne by households. On the other hand, countries like Denmark and the Netherlands, which show high collection costs is probably as a result of higher rates of selective collection, which substantially reduce the volumes of residual waste.⁵²

	Costs (€/tonne)			Costs (€/inhabitant/year)		
	High	Low	Average cost	High	Low	Average cost
Germany (urban)	81	39	67			30
Germany (rural)	91	48	71			40
Austria			70			
Belgium (Flanders)	92	58	75	22	14	18
Belgium (Wallon.)			56			
Denmark			126			62
Spain	91	19	60	43	10	25
Finland (urban)			15	37	17	
Finland (rural)			32			
France (urban)	65	54	60			
France (rural)	74	63	70			
Greece (urban)	36	25	30			32
Greece (rural)	67	40	55			57
Ireland	70	60	65	80	70	75
Italy	255	48	75	45	15	25
Luxembourg	104	85	85			
Netherlands	123	75	100			
Portugal			45			
United Kingdom (urban)	50	32	42	38	24	31
United Kingdom (rural)	80	50	60	60	38	45
Sweden	80	59	65			

Table 7: Collection costs for residual waste in Europe. Source: Eunomia Research & Consulting, 2002.⁵²

The collection costs reported do not generally include transport other than for returns to a depot, or similar movements. Also, it's important to note that where the ultimate destination of material is some distance from the point of the collection, which is usually the case of landfills, costs for collection and transport may be higher.⁵²

Considering that single-use menstrual products, baby nappies and wet wipes are a high proportion of total residual waste, ranging from 2.9 to 12.4% depending on the region (see Figure 10), the collection costs related to this waste stream in Europe may be significant. The cost varies from €1 per inhabitant and year in some regions in Greece and Italy, to almost €10 in Ireland.

Furthermore, there are the costs resulting from the final treatment of this waste stream, consisting of incineration, landfill and mechanical biological treatment (MBT). However, no study analysing MBT costs at European level has been identified. Also, in the incineration and landfill costs, both taxes (a levy charged by a public authority for the disposal of waste) and gate fees (a charge set by the operator of the landfill for the provision of the service) should be also considered.

Most Member States currently have landfill taxes in place for the disposal of non-hazardous municipal waste sent to legal landfills. The level of taxation ranges widely, from €3 per tonne in Lithuania (2017) to up to €87 per tonne in Austria and €93 per tonne in United Kingdom (2016).

	Landfill tax (€/tonne)
Belgium	77.6
Bulgaria	18
Czech Republic	20
Denmark	63
Estonia	30
Ireland	75
Greece	40
Spain	0 in Spain, except in Catalonia (30)
France	35
Italy	Varies between regions from 5.2 to 25.8
Latvia	10
Lithuania	3
Luxembourg	8
Hungary	20
Netherlands	17
Austria	87
Poland	26.6
Portugal	5
Romania	17
Slovenia	11
Slovakia	10
Finland	70
Sweden	50
United Kingdom	93

Table 8: Landfill tax in the EU Member States (2016).

The total typical charge to landfill of one tonne of municipal waste in the EU (the tax, plus the middle of the range of gate fees) ranges from €17.50 in Lithuania to up to €155.50 in Sweden (Figure 12).

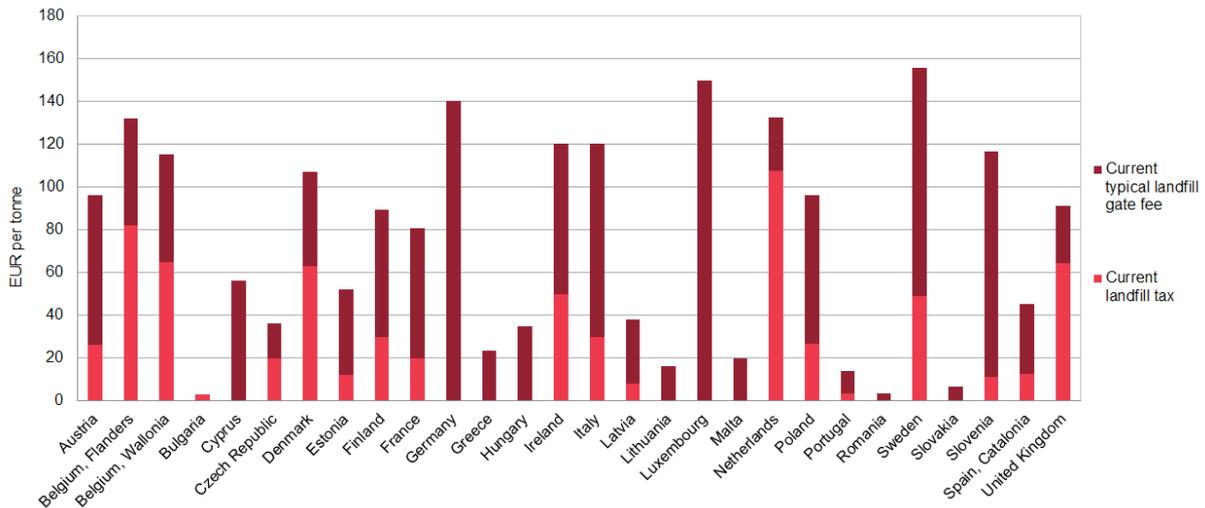


Figure 12: Typical charge (gate fee and landfill tax) for legal landfilling of non-hazardous municipal waste in EU Member States and regions. Source: European Environment Agency, 2013.⁵⁴

35

With regards to incineration costs, the level of taxation ranges widely in Europe, from €8 per tonne in Austria to €52 per tonne in Denmark. The total typical charge for incineration (tax plus the middle of the range of gate fees) of one tonne of municipal waste in the EU ranges from €46 in Czech Republic to €174 in Germany.⁵⁴

In Spain, although there is no national tax, Catalonia has implemented one since 2010 and in 2017 the tax was €14.5 per tonne tax and it is planned to be increased until it reaches €25 per tonne by 2020.

In France, since 2015 there has been a tax of €15 per tonne - but this is the base rate that is applied before any rebates. However, the huge majority of incineration plants in France benefit from big rebates (for air filter devices, for energy recovery, etc.), so the actual rate for most of the plants in France is now very low (paying only €3 per tonne). A gradual increase in the tax rate is planned for the upcoming years so it should start to become a real incentive. Unlike other regions in Europe such as Catalonia, in France, the money collected from the tax goes directly to the general budget of the State and it is not transferred to municipalities that achieve good results, and it is not connected to any national actions regarding waste reduction/recycling.

	Incineration tax (€/ tonne)	Incineration gate fee (2012) (€/ tonne)
Belgium	11.3 (2017)	110
Czech Republic		46
Denmark	52 (2011)	36
Netherlands	13	
Austria	8 (2012)	125
Germany		174
France	15 (2017)	
Catalonia	14.5 (2017)	

Table 9: Incineration tax and typical Incineration gate fee in some EU Member States.
Source: ADEME, 2017;⁵⁶ European Commission, 2012.⁵⁵

An example of the estimated costs associated with the waste treatment of menstrual products, for three European countries are presented in Table 11. MBT costs are not included as no data has been found for Europe. Based on data from waste treatment data,³⁶ the following disposal scenario has been considered for this analysis (since recycling and backfilling are not common for these waste streams):

36

- Belgium: 27.7% landfill and 72.3% incineration
- Czech Republic: 77.2% landfill and 22.83% incineration
- Germany: 59.2% landfill and 40.8% incineration

	Waste coming from intimate hygiene products (thousand tonnes)	Total waste in landfill (thousand tonnes)	Total waste in incinerators (thousand tonnes)	Total landfill cost (million €)	Total incineration cost (million €)	Total treatment cost (€/inhabitant/year) treatment cost (million €)	Total treatment cost (€/inhabitant/year)
Belgium	187	51.8	135.2	6.2	16.4	22.6	2.0
Czech Republic	170	131.2	38.8	4.7	1.8	6.5	0.6
Germany	1,182	699.7	482.3	98	84	182	2.2

Table 10: Estimated costs associated with waste treatment of single-use menstrual items, baby nappies and wet wipes in Belgium, Czech Republic and Germany (2017).

The costs resulting from the final treatment (incineration and landfill) of single-use menstrual products, baby nappies and wipes can range from €0.6 per inhabitant per year in Czech Republic to €2.2 per inhabitant per year in Germany.

Considering both collection and treatment costs, the management of waste coming from these single-use items can cost each inhabitant about €3 and €5 per year in Belgium and Germany, respectively and in other countries like Ireland the costs can exceed €10 per inhabitant and year.

MARINE LITTER COSTS

As explained in the previous section, single-use menstrual products and wet wipes are among the top 10 single-use plastic items most commonly found in EU beaches. The economic costs associated with marine litter can be differentiated into three large groups:⁵⁸

- Actual economic costs linked to expenses: costs of cleaning up the beaches, costs associated with the obstruction of the engines, costs of hospitalization due to the impact on human health, etc.
- Economic costs caused by loss of production or income: income losses in the fishing industry due to a reduction in the population of fish or its own pollution, loss of income in the tourism sector, etc.
- Economic costs associated with welfare: impacts on human health, loss of aesthetic and cultural values, etc.

37

Beach Clean Ups, Tourism and Recreational Activities

Coastal municipalities must assume high costs of cleaning beaches in order to keep them clean, safe and attractive for tourism and recreational activities, these costs include: the collection, transportation, management and disposal of waste, as well as the administrative costs linked to the management of contracts and coordination with clean-up services. In the most tourist coastal municipalities, cleaning of beaches on a regular basis can incur considerable costs.

For example, it is estimated that in the United Kingdom the cost of eliminating marine litter on the beaches of all coastal municipalities amounts to up to €18 million annually, representing an annual cost per municipality of €146,000.⁵⁷ **As 6.2% of the beach litter in United Kingdom correspond to wet wipes, menstrual products and other related debris,⁴⁶ the cost of removing these products alone from beaches is estimated to be about 1.1 million annually for the Country.**

It is estimated that the average cost of removing waste from beaches ranges from €7,000 to €7,300 per km each year, but it can be considerably increased in municipalities where cleaning operations are more intensive; especially in tourist hubs and densely populated areas. This is the case for different Spanish municipalities, which show beach cleaning costs per km of €38,190 ~ €87,500 per year.⁵⁷

The removal of floating debris from the sea surface also represents high costs for the municipalities. For instance, the removal of floating debris costs €1 million annually for the Government of the Balearic Islands. **Considering that 5% of the floating debris in the Mediterranean Sea corresponds to single-use menstrual products, wet wipes and other**

sanitary waste,⁵⁹ it can be considered that the removal of these products from the sea surface costs each year approximately €50,000 to the Government of the Balearic Islands.

In coastal municipalities, especially those where beaches contribute significantly to the local economy, the indirect economic impacts of marine littering are even more important. Several studies show that the presence of marine litter can lead to a decrease in visitors (loss of hotel occupancy and recruitment of recreational activities on the coast) and lower expenditure on the local economy.⁵⁸

Although the costs of managing single-use menstrual products, baby nappies and wet wipes in the environment are believed to be big in Europe, it is very difficult to estimate them. Data about the economic costs of removing marine litter from beaches and aquatic surface is not available for Europe as a whole and the data that is available only refers to specific regions and does not segregate by waste typologies.

Maritime Transport and Fishing sector

Marine litter also creates significant economic impacts on economic activities such as ports, marinas and nautical stations, that have to front the costs of the removal of waste present in their facilities and on the aquatic surface. This is to keep them safe and attractive for users and to avoid material damage by interference with helix, rudders, and aspiration valves. In the United Kingdom it is estimated that these costs can amount to €2.4 million per year, representing a cost of up to €8,000 per port annually. And for the ports in Spain, it is estimated that the costs are 7 times higher than those in the United Kingdom.⁵⁷

Also, the fishing and aquaculture sector must face the direct economic impacts related to the need to repair or replace equipment and fishing gear (propellers, rudders, pipes, etc.) damaged or lost when coming into contact with marine waste. They also have to deal with loss of income due to the reduction of catches or the capture of waste.⁵⁷

The sector also experiences indirect economic losses associated with the loss of value in fishery resources, either due to a reduction in the number of fish and shellfish populations or due to the impact on the quality of catches (for example, for ingestion and contamination of plastics or for persistent organic pollutants - POPs).

Again, it is very complicated to calculate which part of the costs these economic activities have to face is related specifically to single-use menstrual products, nappies and wet wipes.



TOXIC TALK

Furthermore, the contamination of water due to marine debris could also cause serious problems such as increased risk of bacterial (eg E. Coli) and viral contamination of coastal waters. The consumption or contact with contaminated water can increase the risk of contracting hepatitis, cholera, typhoid fever, diarrhoea, bacillary dysentery and skin rashes.⁶⁰

COSTS COMING FROM SEWAGE RELATED DEBRIS

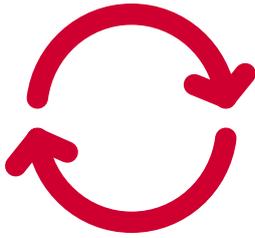
Wet wipes, single-use menstrual products and other sewage related debris, cause substantial damage to the sewer networks. Some of the consequences of flushing such products down the toilet include: blocking of pipes which cause drainage problems; clogging the screens of pumping stations, clogging pumps and inhibiting electronic sensors (creating knock-on effects for pumping stations leading to sewage spills). These various disturbances increase the frequency of maintenance requirements for facilities. Infrastructure clogged with wet wipes and other sewage related debris leads to operational constraints and significant additional operating costs, primarily in terms of labour, waste disposal and premature replacement of equipment such as pumps and equipment parts.⁴³

It is estimated that the maintenance and unblocking of these facilities, together with the waste disposal of sewage debris removed in wastewater treatment plants costs to the European Union between €500 - €1,000 millions per year.⁴³ This cost is passed on to all consumers through water bills regardless of whether they use these products or not.

For the United Kingdom alone, the pipe repair costs are estimated at £100 million (€113 million) per year and many Member States report similar estimates.⁶¹

The Catalan Water Agency, for example, has calculated that for a city of 200,000 inhabitants, the improper management of wet wipes and other similar products generates, on average, an annual extra cost in the sanitation system of €150,000.⁶² Also, data presented at the National Environmental Congress (Conama-2012) by the Spanish Association of Water Supply and Sanitation (AEAS) indicated that this situation causes an 18% increase in the cost of maintenance of sanitation systems.⁶³





REUSABLE PRODUCTS

Reusable and toxic-free alternatives to single-use menstrual products, baby nappies and wet wipes already exist. This section showcases a series of advantages related to these reusable products, including benefits for the environment, public health, cities' budgeting and for consumers' pockets.

Menstrual Products

Although there are many reusable products that can replace single-use menstrual products, the population that knows their benefits (environmental, economic and social advantages) and that uses them regularly is still in the minority. Nevertheless, during the last decade such reusable products have become more popular and are beginning to experience an increase in market share. The practice of Free Bleeding, under which nothing is used to block or collect the period flow, has also been subject of public debates recently helping to shift the narrative.⁶⁴ The choice of menstrual product is swayed by a combination of factors such as peer opinions, cultural approach, product marketing, health facts, and product cost. The environmental aspect is also a factor depending on individual attributes.²¹

Reusable period products include menstrual cups, washable pads, period underwear and reusable tampon applicators.

The most common types of reusable menstrual products:

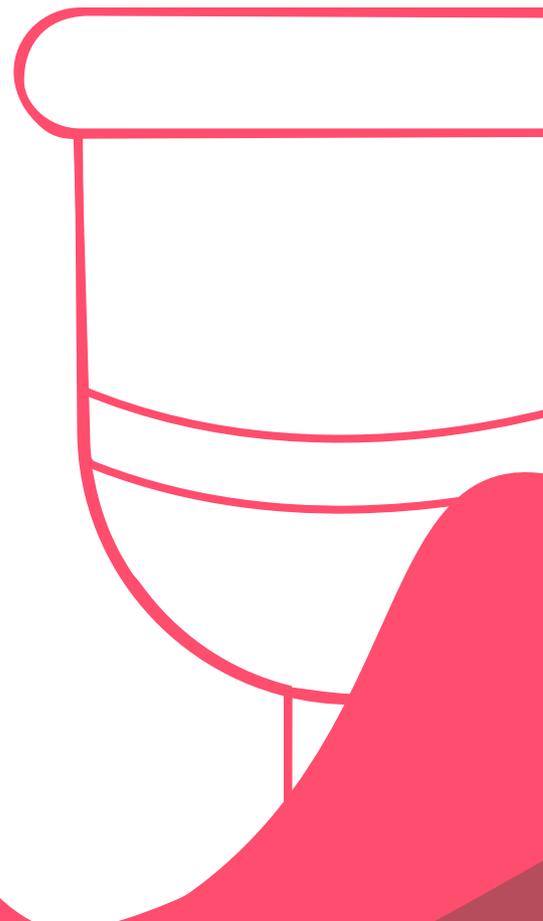
- **Reusable Menstrual Cup:** It is a flexible cup designed for use inside the vagina during the period to collect menstrual blood. The cup collects the menstrual flow rather than absorbing it like tampons or pads do. It has a bell-shaped design like a bell with a stem, which is used for insertion and removal. The cup can be easily emptied, rinsed and reused as many times as is necessary. Menstrual cups are usually made of flexible medical grade silicone, although latex and thermoplastic elastomer are also options. According to the information from different manufacturers, the reusable menstrual cups can last up to ten years.

- **Washable Cloth Pads:** Cloth menstrual pads are cloth pads worn in the underwear to prevent menstrual fluid from leaking onto clothes. They are used in the same way as the single-use pads but instead of throwing them away after usage, they can be washed, dried and then reused. Generally, they are made from layers of absorbent fabrics (such as cotton or hemp) used to absorb the flow of blood from the vagina, or to protect the underwear from regular discharge of vaginal fluids. Cloth pads tend to “breathe” better than single-use items because they aren’t made of plastic (although some cloth pads have a waterproof breathable lining). The cloth pads can last between one to five years.
- **Period Underwear:** Period underwear are usually fabricated using combined tissues. They typically have layers of cotton and waterproof material. The area in direct contact with the vulva is usually made of cotton. Underneath, there is the technical tissue, which is absorbent, waterproof, antibacterial and breathable. The external layer works as a barrier to possible leaks and it can be made of elastane or nylon. They are washable and reusable and can last up to three years.⁶⁵

The availability of reusable menstrual products in Europe:

The menstrual cup and the cloth pads are the most popular reusable products in Europe.

Nowadays they can be easily found in online shops in many European regions. Also, these products can be found in some pharmacies, supermarkets, local commerces or in handicraft shops, although their availability depends on the country. For example, in Bulgaria menstrual cups and reusable pads are really hard to find in local commerces, pharmacies or supermarkets, whereas in Hungary these products can be found in these points of sale, although their availability is not generalized.



Availability (1. Available, 2. Available but not generalized, 3. Really hard to find)

	Local commerce	Handcraft markets	Pharmacies	Supermarkets	Online shops
Spain (Catalonia)	2	2	2	2	1
Portugal	3	2	3	2	1
Estonia	2	3	1	2	1
Netherlands	2	3	2	2	1
Hungary	2	2	2	2	1
Latvia	3	3	3	3	1
Bulgaria	3	2	3	3	2
Austria	2	2	3	2	1
Czech Republic	3	2	2	2	1
Italy	3	3	2	3	1
Switzerland	3	2	1	2	1
United Kingdom	3	3	3	3	1
Belgium	2	1	3	3	1
Slovakia	3	1	3	3	2
Slovenia	3	1	2	2	1
Bulgaria	3	2	3	3	1
France	3	2	3	3	1
Denmark	2	3	1	2	1
Poland	3	2	2	3	1

Table 11: Availability of different reusable menstrual products across Europe. Source: Break Free From Plastic and Zero Waste Europe member organizations.

Market tendency of reusable menstrual products:

The menstrual cup global market is expected to grow at a compound annual growth rate (CAGR) of around 4.6% from 2017 to 2023.⁶⁶ However, in countries like the UK where the popularity of these products is growing, reusables already make up 5% of the menstrual products market.²² Some producers have reported that sales have been growing at double digit rates over the last 10 years.⁶⁷

A list of 31 and 26 manufacturers distributing cloth pads and cups, respectively, in Europe have been identified (Annex 1). Some of the largest distributors and manufacturers of cloth pads and menstrual cups in Europe have been asked about their volume of sales in Europe in 2018 but only few shared their data. The volume of sales of two of the main menstrual cup manufacturers in Europe was around 250,000 units in total in 2018. Estimating the volume of sales of cloth pads in Europe was much more difficult as most of them are

produced by local and small manufacturers. In 2018 three manufacturers distributed together about 60,000 units in Europe.

The reasons behind the growing popularity of these reusable products is probably connected to cost savings in the mid and long term (see Single-Use vs. Reusable Products section on page 47), environmental awareness, higher availability, and their promotion as healthy and toxic-free alternatives for menstrual protection.

The increasing number of Google searches for reusable products is indicative of their growing popularity, with the menstrual cup proving the most popular. The search for "menstrual cup" has multiplied by 4 during the last five years (Figure 13).⁶⁷

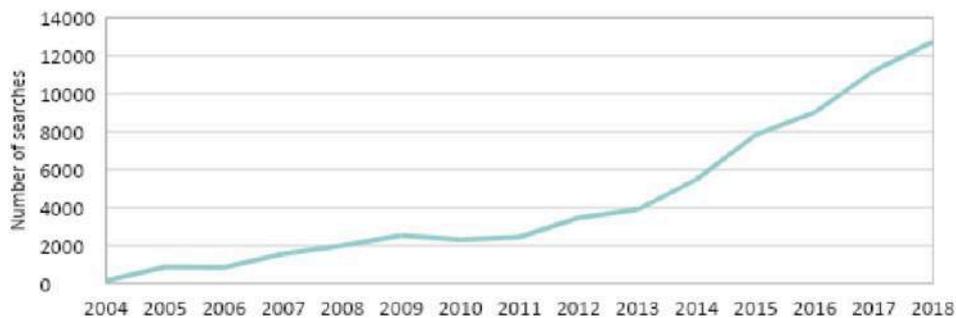
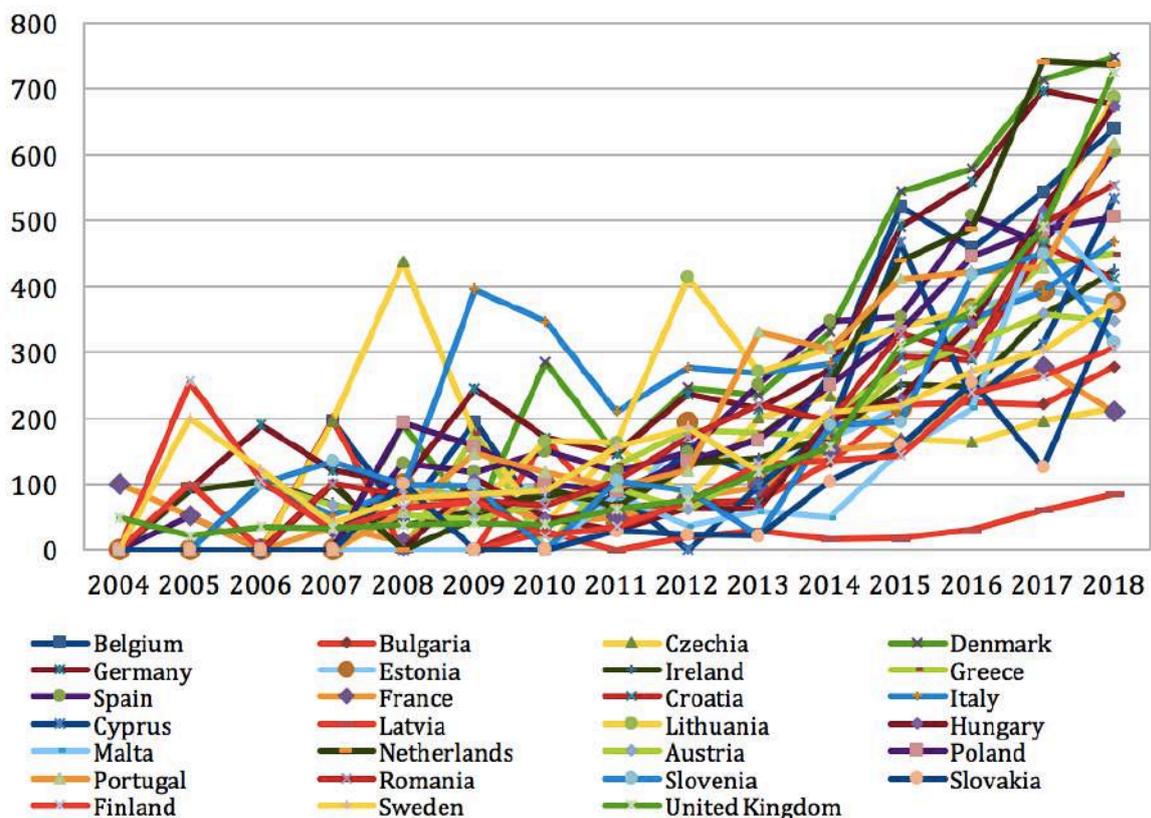


Figure 13: Popularity of search term "menstrual cup" in EU-28 (2004-2018). Source: Own elaboration based on Google Trends index of search terms.

43



* Data from Luxembourg is not available

Figure 14: Popularity of search term "menstrual cup" in EU-28 by country (2004-2018). Source: Own elaboration based on Google Trends index of search terms.

Baby Nappies

The most common reusable solution to single-use baby nappies are the reusable cloth nappies.

The most common types of reusable baby nappies:

There are several types of reusable baby nappies. Cotton, hemp, a mixture of both, and microfibres are the materials generally used in the absorbent part while plastic and cloth are used for the protector. What differentiates these nappies from others is that they are laundered and re-used many times and considerably reduce waste generation. The only waste is the excreta of the babies which is predominantly treated by the sewerage system. Some use a cloth or lining between the skin and nappy so that it is easier to pick up the faecal matter.

The different reusable nappy systems can be divided into the following categories:

- **All-in-ones shaped**, fitted nappies with velcro or popper fastenings, which include a waterproof cover. No folding or pinning is required.
- **Shaped nappies** - similar to all-in-ones, but wraps or pants have to be purchased separately to provide the waterproof cover. These do not require folding. They are fastened by velcro or poppers.
- **Prefolds** - require folding and a separate waterproof wrap/pant, with fasteners used in some cases.
- **Wraps/pants** are used to hold up nappies and to prevent leakage. They are made from different materials and combinations of materials, such as: nylon, polyester, cotton, wool, PVC, EVA, hemp and polyurethanes. Wraps/pants are not considered as durable for use as nappies, and hence may need to be replaced. For any given size, the frequency of replacement is dependent on the care they receive. Some wraps/pants are adjustable and are designed for use from birth to potty; others are replaced when necessary to fit a growing baby.

It is estimated that in Europe, 20% of the parents use reusable nappies for their children, 15% for economic reasons and 5% because of environmental reasons.⁶⁸ Their use is uneven between EU countries, some with high percentages and some with very low. Although no published market data has been found, various sources refer to a market entrance for reusable baby nappies of between 5% and 15% for children in UK.⁶⁹ However, the manufacturers of reusable baby nappies contacted in this study indicate an increase in sales in recent years. Furthermore, there has been an expansion in the number of suppliers in most European countries over the last few years, making them more available, suggesting that, indeed, the market share of reusable baby nappies is growing.

A total of 35 reusable baby nappy manufacturers distributing in Europe have been identified (Annex 1). The major suppliers appear to be online in most European regions. Reusable baby nappies are, in most regions, not available in pharmacies, supermarkets or local shops. In some countries in Eastern Europe and in Spain, for example, reusable baby nappies may be purchased in handcraft markets.

Availability (1. Available, 2. Available but not generalized, 3. Really hard to find)

	Local commerce	Handcraft markets	Pharmacies	Supermarkets	Online shops
Spain (Catalonia)	2	2	3	3	1
Portugal	3	3	3	3	1
Estonia	3	3	3	2	1
Netherlands	3	3	3	3	1
Hungary	2	2	3	3	1
Latvia	3	3	3	3	1
Bulgaria	3	2	3	3	1
Austria	3	3	3	3	1
Czech Republic	3	2	3	2	1
Italy	3	3	3	3	1
Switzerland	3	3	3	3	1
United Kingdom	2	2	3	1	1
Belgium	2	1	3	3	1
Slovakia	3	2	3	3	2
Slovenia	3	2	2	3	1
France	3	3	3	3	1
Denmark	2	3	3	3	1
Poland	3	3	3	3	1

Table 12: Availability of reusable baby nappies in Europe. Source: Break Free From Plastic and Zero Waste Europe member organizations.

Although most people choose to wash the reusable baby nappies at home there are commercial laundry services for nappies that involve a centralized laundry working in some regions like in UK, Netherlands, Belgium, Slovenia, Germany, Italy, among others.

⊗ FALSE SOLUTIONS

Many producers have been introducing new 'plant-based' plastic, also known as bio-based plastic, in single use menstrual products, such as tampons applicators, and baby nappies which many people mistakenly confuse with biodegradable and compostable alternative to plastic.⁷⁰ However, this is misleading as people often confuse the concepts of "plant-based"/"bio" materials, and "biodegradable" ones.

Bio-based plastics are plastics made partly or fully from organic matter from plants and animals (such as sugar, starch, animal waste or lignocellulosic biomass), often in combination with fossil fuels.

Bio-based are not necessarily biodegradable. Actually less than 40% of bio-based plastics are designed to be biodegradable.⁷¹ This means that most of bio-based plastics are designed to behave as conventional plastics, with similar end-of-life management.

Therefore, many products marked as 'plant-based' are identical to oil-based plastic, and are no safer for the environment as the end product is often polyethylene (PE) or polypropylene (PP), which do not biodegrade or decompose in any natural environment and could also include concerning chemical additives.⁷⁰

As regarding the concept of **"biodegradability"**, it has been wrongly used for describing very different realities. There are different types of biodegradable plastics, including industrially compostable, home compostable and recently even soil biodegradable and marine biodegradable. In this line, even a real biodegradable material will not biodegrade anywhere, each of them need to meet specific conditions to enable the biodegradability process to take place. Therefore, most of these products labelled as such do not actually decompose or biodegrade, and certainly not anywhere in the natural environment, or at home compost as often claimed. In reality, these products usually break down very slowly, and most of them actually end up in the garbage and finally in a landfill or incinerator, or being flushed down the toilet and into the local wastewater treatment plant.

Reusable Wipes

Likewise, there are many alternatives to wet wipes that help prevent negative environmental and economic impacts derived from their production, consumption, waste management and disposal.

The most common reusable wipes in Europe are the following:

- **Reusable cloth wipes or towels:** Those items could be homemade or purchased. They are absorbent and durable, usually made from bamboo or cotton. They can be used already wet or moistened in the moment using a spray. These towels can be washed and reused several times and can be easily found in shops alongside reusable baby wipes and reusable make-up erasers.
- **Sponges:** Sponges are another good solution to wet wipes. To keep them clean, they have to be washed with cold water after each use and once a day with hot water and soap. To disinfect the sponge, they can be washed in the washing machine. Another option would be to use a mitten, which can also be washed and reused several times.
- **Toilet paper:** Although it is not a reusable item, it has a lower impact than wet wipes as this tissue paper product breaks down very easily. Toilet paper is easy to find in most public toilets, and there are recycled toilet papers.
- **Water and soap:** It is the easiest and most effective alternative to wet wipes. A sink or bidet can be used to get access to water and then make use of natural and neutral pH soap.

47

Water and soap: It is the easiest and most effective alternative to wet wipes. A sink or bidet can be used to get access to water and then make use of natural and neutral pH soap.





SINGLE-USE vs. REUSABLE PRODUCTS

Reusable products offer many environmental and economic advantages when compared to single-use menstrual products, nappies and wet wipes, as explained in detail below.

Nevertheless, it is important to highlight that reusable products will not be suitable for everyone and for every situation. For instance, homeless people, refugees and asylum seekers who generally live in accommodation without reliable access to lockable bathrooms and/or washing facilities and possibility to clean and dry their reusable period pads/panties/nappies/wipes and could find it unmanageable to switch to reusable products. Also, shame around menstruation may also prevent people from switching to reusable menstrual products, including washing reusable menstrual products or menstrual cups in common or public spaces.

It is acknowledged that consumers have the right to choose the product that they feel more comfortable with and that suits better their needs. This study wants to raise awareness about the existence of alternatives to the traditional single-use applications - which currently dominate the shops' shelves - in order to enable free choice from the side of the consumers when all the options are available.

48

ENVIRONMENTAL ADVANTAGES

Menstrual Products

Although the production of any product has an impact on the environment, reusable products are designed to be re-used rather than disposed off and their environmental impact is lower compared to single-use products. There are a wide range of menstrual products, including cloth pads, menstrual cups, period underwear and reusable tampon applicators. **Taking the example of a menstrual cup, during one year, it produces the least amount of abiotic depletion, fossil fuel depletion, global warming potential, acidification and eutrophication compared to single-use menstrual products (single-use pads and tampons with and without applicators).**²¹



Based on life cycle assessments of different menstrual products it is estimated that a reusable cup will only create a 0.04kg CO₂ equivalent for one year, while a year's worth of tampons will require a 5.26kg CO₂ equivalent.³² **With the expected lifespan of a menstrual cup being five years, this means that menstruators can save 26.1kg CO₂ equivalent every five years (5.22kg annually) by choosing a reusable cup over tampons.**⁷²

In addition, reusable products like menstrual cups, cloth pads and period underwear are usually toxic-free products. Mostly menstrual cups are free from dyes, BPA, toxins, pesticides or bleaches,⁷³ and are usually safe to use while being just as effective as other menstrual products in preventing leaks.⁷⁴ Nevertheless, it should be highlighted that not all cups are made of the same materials, and sometimes it is unclear what ingredients they contain.

Baby Nappies



As indicated previously, an average a single-use baby nappy would result in a global warming impact of approximately 550kg of CO₂ equivalents used over the two and a half years a child is typically in nappies. **The carbon footprint of a nappy can be reduced by 40%, equivalent to some 200kg of CO₂ equivalents, over the two and a half years, by swapping to reusables.** This reduction is possible by washing nappies in a fuller load, outdoor line drying all of the time, not washing above 60°C and reusing nappies either with a second child (if it is the case) or acquiring them via the second-hand market.⁷⁵

The impacts of reusable nappies are highly dependent on the way they are laundered and, in contrast to single-use nappies, it is consumers' behaviour after purchase that determines most of the impacts from reusable nappies.⁷⁵ Therefore, the more consciousness is the consumer during the use of these products (e.g: washing, etc.), the lower is the overall impact.

Furthermore, single-use baby nappies use 20 times more land for production of raw materials and require three times more energy to make than baby cloth nappies. Although water usage can be higher for reusable nappies, the difference compared to single-use ones is not that representative if washed in a water-efficient front-loading washing machine and line-dried (Table 14). Also, reusable baby nappies reduce chemical exposure for the baby as they are usually made from plastic-free materials like cotton, hemp or wool.

	Cloth Nappies (home washed)	Single-Use Nappies
Land area for raw materials (m ² /year)	13-40	407-829
Water resource depletion (m ³ /year)	48 -80	35 - 71
Energy consumption (MJ/year)	0.8 - 1.3	3.1 - 6.3
Waste production (kg/year)	8-14	720 - 900

Table 13: Environmental impact of baby cloth nappies and single-use baby nappies. Source: O'Briet et al., 2009.³¹

WASTE PREVENTION

Menstrual Products

In relation to waste generation, the use of a menstrual cup, for example, results in annual waste prevention per menstruator of about 5kg of non-recoverable waste, which equates to 99% of the waste that would be generated.

	Average weight of one used item (g)	Number of items used per year	Menstrual waste (g/year)
Single-use menstrual product (pad or tampon)	12	416	4992
Menstrual cup	20	1	4

** Calculation considerations: Single-use products: an average of 32 products are used per period and there are 13 periods per year.²² The menstrual cup is considered to be washed and used again during menstrual days, meaning there is no need to have any spare cups (although in some areas it is recommended to have two cups, to be able to sterilize one after use, and use the already sterilized one instead. It depends on the water and hygiene quality). According to the manufacturers, the menstrual cups are designed to last up to ten years. However, for this study a life span of 5 was counted, since it has been considered that maintenance will not always be adequate. The weight of the menstrual flow was not considered given that it is flushed down the toilet entering into the waste water treatment system.*

Table 14: Single-use and reusable menstrual products waste generation per person.

50

Assuming that 20% of menstruators would opt for reusables instead of single-use options, the amount of waste coming from menstrual products could be reduced by nearly 100,000 tonnes per year, which would result in a total waste generation of 490,000 tonnes, compared to 590,000 tonnes being generated annually under the current scenario.

Furthermore, reusable products help to prevent marine litter as they are unlikely to be flushed down the toilet or abandoned in the natural environment.

Baby Nappies

A family that chooses reusable baby nappies can prevent 99% of the waste that would be generated by using single-use ones. These reusable nappies can reduce nearly 900kg of waste generated by one child during the first 2 years of age. Moreover, these nappies can be reused when the baby has grown up, meaning that they could be used by other children, relatives, friends, or by other people.

	Average weight of one nappy used (g)	Number of nappies used per kid during the first 2 years	Number of nappies used per kid during the first 2 years	Nappy waste per 2 kids (kg)
Single-use nappies	200	4380	876	1752
Reusable nappies (All-in-one, only size)	200	24	4.8	4.8

Table 15: Single-use and reusable baby nappies waste generation per kid during the first two years of age.
Source: Rezero, 2008.⁷⁶

If only 20% of children using nappies switched to reusables, the amount of waste that could be prevented in the EU-28 would be more than 1 million tonnes being generated annually, going from 6.7 to 5.4 million tonnes.



This potential waste reduction can be translated into really high economic savings for the municipality, due to lower management and treatment costs (for example, lower collection costs thanks to a reduction in the frequency of collection), as well as a reduction in the costs coming from removing waste from beaches and seas, as litter and sewage related debris would be reduced.

51

Although a quantitative analysis has not been included, switching from single-use wet wipes to reusable wipes would result in significant waste reductions too.

ECONOMIC SAVINGS FOR CONSUMERS

Menstrual Products

The costs of buying single-use menstrual products vary significantly depending on the EU country. According to the survey passed to different environmental organisations working across Europe, the price of a standard single-use menstrual pad in the EU ranges from **€0.05 to €0.15** and the price of a standard single-use tampon ranges from **€0.05 to €0.30** per unit.

If, on average, a menstruator consumes 416 products annually (either single-use pads or tampons), that would mean that each menstruator spends between **€21 and €125 each year** in menstrual products, which equals to an expenditure of **€749 - €4,493** during the lifetime of a menstruator on average. The cost of single-use menstrual products is even higher for people with heavy menstrual cycle durations.

Compared to other expenses, the price of menstrual products does not seem as much annually, however, these small costs add up over time.



Money can be saved when using reusable menstrual products compared to single-use items. For instance, the price of a menstrual cup in Europe is between **€15 and €30**, depending on the country and the manufacturer. If a menstrual cup lasts up to five years on average, then seven cups would be needed in a lifetime of a menstruator, which results in an average lifetime cost of between **€105 and €210 or between €3 and €6 annually**. Although the up-front cost of a menstrual cup may be expensive for women from low-income households, using a menstrual cup instead of single-use tampons or pads, would result in annual savings of **€18 to €119** and over a lifetime savings could exceed **€4400**.

	Number of items used per year	Number of items used in a lifetime of menstruating for one woman	Cost per unit (€)	Annual cost (€)	Lifetime cost (€)
Single-use menstrual product (pad or tampon)	416	14,976	Pad: 0.05 – 0.15	20.8 – 62.4	748.8 – 2,246.4
			Tampon: 0.05 - 0.30	20.8 – 124.8	748.8 – 4,492.8
Menstrual cup	1	7*	15-30	3-6	105-210

* A life span of 5 years was counted per menstrual cup.

Table 16: Single-use and reusable nappies cost.



OTHER RELEVANT ISSUES

Gender inequality: The cost savings associated with reusable menstrual products are especially important if we consider that the cost of menstrual products is often closely connected to politics of gender; disproportionately affecting cis-women, transpersons and non-binary individuals, who typically have less disposable income. In fact, across the EU there is an average gender pay gap between men and women of as much as 16%.⁷⁷

Menstrual poverty: Furthermore, where statistics are available, nearly one in five women struggle to pay for basic single-use menstrual products on a monthly basis in the EU.⁷⁸ Not being able to afford menstrual products can significantly reduce the quality of a menstruator life.⁷⁹ Menstruators from low-income families in Europe might not be able to attend work, school, or even socialise during their periods (usually around 5 days a month), impacting on their education, work and long-term prospects.⁸⁰ Therefore, considering the potential economic savings that reusable menstrual products can bring, making them widely available and accessible across the EU will help reduce menstrual poverty.

Period tax: In addition, it is important to point out that tampons and other period products are currently classed as luxury or non-essential items by the European Commission, so they can be taxed in member states. Almost half of the 28 EU Member States continue applying the same VAT on menstrual products as on jewellery, wine, beer and cigarettes. In 10 of these countries, this rate is over 20% (Hungary, Croatia, Switzerland and Denmark). Other countries, such as Spain and France, apply a reduced VAT rate to menstrual products and Ireland is the only country that does not have a tax.⁸¹

53

Baby Nappies

One of the biggest costs in the early years of being a parent are the cost of nappies. According to a survey passed to different environmental organisations working across Europe, the price of a single-use baby nappy across Europe ranges from €0.11 to €0.61 per unit, depending on the country. Considering an average of 6 changes per day from birth to two years (4,380 single-use baby nappies in total) costs can range between **€482 and €2,672 per child.**

On the other hand, a set of 24 all-in-one reusable baby nappies would be needed for the first couple of years of a baby's life. The price of these reusable nappies varies between €12- €25 per unit, meaning an average total cost of **€288 - €600** per child from birth to two years.



The use of reusable nappies results in significant economic savings (between **€200 and €2,000**) compared to single-use ones. The saving increases if you take into account the fact that reusable baby nappies can be used by different siblings or bought second-hand. Even taking into account the laundering costs, the savings could be up to €1,800 for a first child and significantly more for subsequent children.

	Number of nappies used per kid during the first 2 years	Cost first kid (€)	Total cost of two kids (€)	Cost/kid (€)*
Single-use nappies	4380	481.8 – 2,671.8	963.6-5,343.6	481.8 – 2,671.8
Reusable nappies (All-in-one, only size)	24	288 -600	288 -600	144-300

*This column refers to the cost per child in the case of having two non-simultaneous children that allow the reuse of nappies.

Table 17: Single-use and reusable nappies cost.

54

If the associated economic cost of washing reusable nappies is considered, it would add a few hundred Euros to the total cost. Assuming that for one wash 60 litres of water and 1 kWh of electricity is needed, the average associated economic cost is €0.68 per wash: €0.15 of water (considering an average cost of €2.5 per m³, although there is a high diversity of prices across Europe);⁸² and €0.21 per kWh⁸³ of electricity; €0.32 of detergent cost. If a family washes nappies every two days (12 nappies per wash), that would result in 365 washes in two years, with an associated cost of approximately **€250**. However, it is important to point out that the vast majority of people wash them together with other clothes so this cost could be neglected.

Some local councils offer economic incentives - free trial packs, loan schemes or cashback - to encourage parents to go for reusable baby nappies or to sign up for nappy laundry services.

Furthermore, it is important to note that the price of single-use nappies doesn't include the costs of collection, treatment and clean-ups, which are externalised from public administrations and hence borne by the consumer. Therefore, society ends up paying these costs when the producer, following the polluter pays principle and the extended producer responsibility approach, should be the one assuming these costs. If these costs were to be internalised in the price of single-use nappies the economic advantage for reusable nappies would be even greater.

CONCLUSIONS

First of all it is worth mentioning that there is an important complexity when it comes to obtaining data about the market share of menstrual products, baby nappies and wet wipes (both single-use and reusable) and to calculate the costs of managing these products once they become waste, linked to technical or data collection difficulties. Hence, further research should be carried out based on real sold volume in Europe (not on estimations based on consumption rates) and more updated and accurate waste management and clean-up costs at national and EU level.

Consumption and waste generation

Single-use menstrual products, baby nappies and wet wipes are examples of items that become waste after using them only once. They are mostly made of plastic and, despite entailing serious environmental, economic and social impacts, they still being promoted and expected to increase (especially the wet wipes market) in the future in Europe.

The study has estimated, that, having 2017 as a reference year, in the EU-28:



- More than **49 billion units of single-use menstrual products were consumed, meaning an annual generation of about 590,000 tonnes of waste**. More than 180kg of single-use tampons and pads are estimated to be thrown away in a single lifetime for one menstruating woman.



- About **33 billion single-use baby nappies** were consumed, resulting in **6,731,000 tonnes of waste per year**. Each child, on average, produces 438kg of dirty nappies annually - meaning that around 1 tonne of waste is produced for each child after two and a half years.



- About **68 billion individual wet wipes** were consumed, which equates to **511,000 tonnes of wet wipes per year** (1kg of wet wipes per inhabitant and year).

Environmental and economic impacts

Single-use menstrual products, baby nappies and wet wipes result in serious environmental impacts throughout their lifecycle, from the production phase until the end-of-life. The impacts generated during the production process of these products result mainly

from the use of large volumes of wood pulp, cotton, viscose rayon, the production of super absorbent polymer (SAP), and other components such as polyester, polyethylene, polypropylene, adhesives, and dyes. Also, significant amounts of water and energy are used during the manufacturing process.



The amount of single-use nappies and menstrual products used in EU-28, would result in a global warming impact of approximately 3.3Mt of CO₂ equivalents and 245,000 tonnes of CO₂ equivalents per year, respectively.

The estimated consumption rates of single-use menstrual products, baby nappies and wet wipes in EU-28 result in a total of approximately 7,832,000 tonnes of waste per year (equivalent to 15.3kg per inhabitant and year). This amount of waste accounts for 3% of the total municipal solid waste and 4% of the total residual municipal waste stream. This percentage increases in regions presenting higher separate collection rates for other waste streams (it can represent up to 30-40% of the residual fraction in zero waste municipalities).

The varied composition of these products, together with the presence of organic material after use makes their recycling technically and economically expensive. Therefore, in Europe these products typically end up in landfills (87%) or are incinerated (13%), wasting resources and invoking negative environmental impacts (high land occupation rates, groundwater and soil contamination, greenhouse gases emissions, etc.).

Although it is very difficult to analyse the costs associated with the management of these products at European level, it is estimated that the costs resulting from their collection and final treatment may cost from €3 to €5 per inhabitant and year in countries like Belgium and Germany or exceed €10 per inhabitant per year, as it happens in Ireland. The costs can vary significantly from one region to another, depending on many factors (collection system, number of materials being collected separately, the frequency of collection, incineration and landfill taxes implemented, etc.).

Furthermore, single-use menstrual products and wet wipes are usually flushed down the toilet by consumers and thus, they may enter the marine environment through the waste water release system, resulting in big environmental and economic impacts. Single-use menstrual products and wet wipes are one of the most commonly found single-use plastic items in the marine environment and when disintegrate release a substantial amount of microplastics into the water. The negative impacts of plastic marine debris include both the impacts generated by chemical components and the visible and physical damage.

It is estimated that the maintenance and unblocking of the sewer facilities, together with the waste disposal of sewage debris removed in wastewater treatment plants costs to the European Union between €500 - €1,000 million per year. Furthermore, coastal municipalities must assume high costs of removing these products from beaches (only in United Kingdom the removal of single-use menstrual products, wet wipes and other related debris from beaches is estimated to cost about €1.5 million annually) and from the aquatic surface (its removal costs approximately €50,000 to the Government of the Balearic Islands each year). Although the costs of managing single-use menstrual products, baby nappies and wet wipes in the environment are believed to be big in Europe, it is very difficult to estimate them for the whole territory.

Reusable products and benefits

Although during the last decade reusable menstrual products and baby nappies have become more popular and are experiencing an increase in market share, the population that uses them regularly is still in the minority. Menstrual cups and cloth pads, for instance, are accessible through online shops in many European regions and can also be found in some pharmacies, supermarkets, local commerces or in handicraft shops, although their availability depends on the country. In regards to reusable baby nappies, it is estimated that in Europe, 20% of the parents use them, although their use is uneven between EU countries. The major suppliers of reusable baby nappies appear to be online in most European regions and in most regions they are not yet accessible in pharmacies, supermarkets or local shops.

Among the environmental advantages of reusable products compared to single-use ones there is the waste prevention potential. For example, the use of a menstrual cup results in annual savings per menstruator of about 5kg of non-recoverable waste (or a reduction of 99% of the waste that would be generated using single-use products). **If only 20% of menstruators would opt for the menstrual cup instead of single-use options, the amount of waste could be reduced by nearly 100,000 tonnes per year.** On the other hand, a family that chooses reusable baby nappies can reduce nearly 900kg of waste generated by one child during the first 2 years of age (or save 99% of the waste that would be generated by using single-use ones). **If only 20% of children using nappies switched to reusables, the amount of waste that could be prevented in the EU-28 would be more than 1 million tonnes annually.**

57



Reusable products also offer direct savings for consumers. For instance, **using a menstrual cup instead of single-use tampons or pads, would result in annual savings of €18 to €119 per person and over a lifetime savings could exceed €4400. Likewise, the use of reusable baby nappies results in savings between €200 to €2,000 per family compared to single-use ones.** The saving increases if you take into account the fact that reusable baby nappies can be used by different siblings or even be bought at the second hand market.

The potential waste reduction can be translated into really high economic savings for the municipality, due to lower management and treatment, as well as a reduction in the costs coming from removing waste from beaches and seas, as litter and sewage related debris would be reduced.

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ANNEX 1 - Reusable manufactures list

List of manufacturers distributing reusable menstrual products in Europe:

Brand	Reusable Menstrual products		
	Menstrual cup	Cloth pad	Absorbent panties
Adira Intimates			x
Anigan	x		x
Blossom cup	x		
Blueberry		x	
Bububibi		x	
Cocoro			x
Dear Kate			x
DivaCup	x		
Domino pads		x	
Dutchess	x	x	
Earth girl		x	
Earthwise Pa		x	
Eco Rainbow		x	
Eco-femme		x	
FemiCup	x		
FemmeCup	x		
FemmyCycle	x		
Femtis			x
Fleurple	x		
Flux Undies			x
Glad Rags	x	x	
Hannah pad		x	
Heart Felt		x	
Hesta Natural product CO		x	x
Highoh		x	
Honour Your Flow	x	x	

Imse Vimse	x	x	
Intimina	x		
Iris cup		x	
Itti Bitti		x	
Jade&Pearl	x	x	
Jobebe		x	
Keeper	x		
Knix			x
Kulmine		x	
LadyCup	x		
Langsprit		x	
Lena	x		
Lilova			x
Lunacup	x		
Lunapads		x	x
Lunette	x		
Meluna	x		
Mimacup	x		
Minivivi		x	
Modibodi			x
Mooncup	x		
Naturcup	x		
Organic cup	x		
Party in my pants		x	
Pixie Cup	x	x	
Rubycup	x		
Ruby love			x
Sckoon organic	x	x	
TCS Eco		x	
Tickle Tots		x	
Thinkeco		x	
Thinx			x
Tree Hugger		x	
Vv SkiVvys			x
WillowPads		x	
WUKA			x

List of manufacturers distributing reusable baby nappies and wipes in Europe:

Brand	Baby nappies	Wet wipes
Adz Nadons	x	
Baba&Boo	x	x
Babipur	x	x
Bambino Mio	x	x
Bambooty	x	x
Blueberry	x	x
Bright Bots	x	
Bububibi	x	x
Bumgenius	x	x
Bumkins	x	x
Bummis	x	x
Charlie Banana	x	x
Close parent	x	x
Disana	x	x
EasyPeasy	x	x
FLIP	x	
FuzzieBunz	x	
Grovia	x	x
Happy Heiny's	x	
Honour Your Flow Sanitary Towels		x
Imse Vimse	x	
Itti Bitti	x	x
Little Lamb	x	x
Motherease	x	x
Mowgli	x	
MuslinZ	x	x
Nappy Guru	x	x
Ones & Two	x	
Popolini	x	x
Smartipants	x	
The Nappy Lady	x	
Tickle Tots	x	
Tots Bots	x	x
Wegreeco	x	
Wonderoos	x	

ANNEX 2 - Toxic talk

Potential health hazards associated with single-use menstrual products, baby nappies and wet wipes:

Product	Hazardous ingredients that may include	Potential health hazards
Tampons	Dioxins and furans, pesticides and herbicides residues, unknown fragrance chemicals and disulphide (in tampons made of rayon).	Cancer, reproductive harm, endocrine disruption, menstrual disorders, hormonal disturbances and allergic rashes.
Pads	Dioxins and furans, pesticide and herbicides residues, unknown fragrance chemicals, adhesive chemicals such as methyl dibromoglutaronitrile and BPA, phthalates and other petrochemical additives	Cancer, reproductive harm, endocrine disruption and allergic rashes.
Nappies	Dioxins and furans, pesticide and herbicides residues, synthetic fragrances (butylphenyl methylpropional, hydroxyisohexyl 3-cyclohexene carboxaldehyde), certain polycyclic aromatic hydrocarbons (PAHs), PCB	Cancer endocrine disruption and allergic rash.
Wet wipes	Methylchloroisothiazolinone, methylisothiazolinone, parabens, quaternium-15, dmdm Hydantoin and unknown fragrance chemicals.	Cancer endocrine disruption and allergic rash.

64

Source: Women's Voices for the Earth, 2013⁴ and Anses, 2019.¹³

#break free from plastic

#breakfreefromplastic is a global movement envisioning a future free from plastic pollution made up of 1,400 organisations from across the world demanding massive reductions in single-use plastic and pushing for lasting solutions to the plastic pollution crisis.



Zero Waste Europe is the European network of communities, local leaders, businesses, experts, and change agents working towards the elimination of waste in our society. We empower communities to redesign their relationship with resources, and to adopt smarter lifestyles and sustainable consumption patterns in line with a circular economy.

Rezero

Fundació prevenció
residus i consum

Rezero – Waste Prevention and Responsible Consumption Foundation – is a Catalan non-profit and independent organization. We want to change the current production and consumption model towards a Zero Waste Strategy, by networking with social, political and economic agents. We promote responsible consumption and waste prevention actions through the development of transformative strategic campaigns, plans and policies and research studies at local, regional and European level.



Reloop Platform is an international non-profit organisation whose vision is of a world free of pollution, where an ambitious and integrated circular economy allows precious resources to remain resources, so that people, businesses and nature can flourish. As an inspiring and trusted organisation, our mission is to work with governments, industry and society to accelerate the global transition to a circular economy.