European Commission

Would you drink your wastewater?

A water brochure for young people

Environment

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Water: a limited resource

Imagine the scene: you're getting ready to go to a party, but when you turn on the shower the water runs brown. You can't wash your hair in that! You go to get your jeans from the washing machine to dry, but they seem dirtier than before. What to wear now? Your friend calls to say the party's off; he's fallen sick after swimming at the beach yesterday. What a pain. Fed up, you go to the kitchen to make a coffee. The tap drips a few times, then nothing. Can the day get any worse?

We depend on water for almost everything we do. We take it for granted that we can drink, wash and swim in clean, safe water whenever we want to; and that the dirty water from our toilets, showers and sinks will be taken away somewhere where we won't have to see it, smell it or swim in it.

But this instant access to clean water and sanitation doesn't come cheap. The water in our taps has to be sourced from a plentiful supply, filtered, cleaned and pumped into our homes. It has to be tested to make sure it is safe to drink. Dirty water needs to be taken away through a sewer network and treated. It has to be stripped of disease-causing bacteria and man-made pollutants before being returned to rivers and the sea.

Water reservoir Lake Cap-de-Long (France)

We need to look after our water more than ever before. After all, we might live on a planet covered largely in water, but the fresh water that we need each day makes up just 2.5 % of all the water on Earth. Most of that is unusable, locked in ice caps, glaciers, snow and water vapour in the atmosphere. In fact, only 1 % of water is fresh and available, most of it stored in the soil and in layers of rock in the ground. Just a tiny proportion flows on the surface, in lakes, rivers and streams.

Fresh, clean water might be easy to come by if you live on a lonely mountainside by a stream uncontaminated by other people, animals or other sources of pollution. But most of us don't. We live in cities and towns where everyone wants to take a shower every day, keep our homes and cars clean and water our plants or gardens. When we have free time, we like to go to lakes and beaches to relax and swim, not to paddle in litter and human waste.

The study of water

The study of the movement, distribution and quality of water is known as 'hydrology' (from the Greek '*hudor*': water). An ancient discipline practised for at least 6 000 years, it has enabled major civilisations throughout history to divert waters for irrigation and prevent flooding, providing the means to feed and protect their populations.

Are we still drinking water that dinosaurs drank?

Water evaporates from the oceans, forms clouds, falls as rain (or snow), and returns in rivers to the ocean. The places it stays longest are in the deep ocean and in deep ground water, locked in for up to 10000 years. However, water is also destroyed chemically in photosynthesis (plants convert carbon dioxide and water to sugars and oxygen) and recovered again in respiration (basically the reverse of photosynthesis to make energy and CO_2). We can calculate how much water remains from the dinosaur age from the total amount of water on the planet and the amount of water taken up in photosynthesis per year. Based on this, we can say that it would take about 100 million years to destroy chemically most of the water. Dinosaurs lived 65 million years ago. So, *some* of the water we drink is the same water, but more than half is different water.

This is why it is so important to respect water. With a growing world population, more people living in cities, the change of weather patterns due to climate change, limited fresh water supplies and the costs of treating water before and after we use it, water quality is a hot topic. As scientists investigate how to keep the taps running and the seas clean in the face of these challenges, we can all do our bit to look after water.

Read on to explore the journey of water as we use it in our daily lives, from how it reaches our taps to its passage through sewers and treatment plants to rivers and the sea, where we can enjoy it once more.

Underground drinking water reservoir

Drinking water

Water on tap: essential for health

Imagine having to walk for hours to a well or queue at a standpipe to get the water you and your family need to drink, cook and wash. It might make you fit, but it wouldn't leave a lot of time or energy to do anything else. Or you might have to boil all your water before it is safe to use. This is reality for around 1 billion people worldwide who have no access to treated drinking water or sanitation. According to the World Health Organisation, using dirty water for bathing, washing, drinking or preparing food accounts for 10% of global diseases. Young children are at particular risk: waterborne diarrhoeal diseases are estimated to cause 1.8 million human deaths each year.

In Europe, we're extremely lucky by comparison. The introduction of sanitation – the safe removal of human waste and used water, and provision of clean water to households – has played a major role in improving public health, wiping out waterborne diseases such as cholera, typhoid and dysentery, and raising life expectancy.

Hidden treasure

For three-quarters of Europeans, our tap water comes from groundwater – water stored below the ground within the soil and rock, including large water-filled spaces known as aquifers. Groundwater is also the source for most surface water, welling up through springs and wetlands to provide rivers with more than 50% of their water all year round.

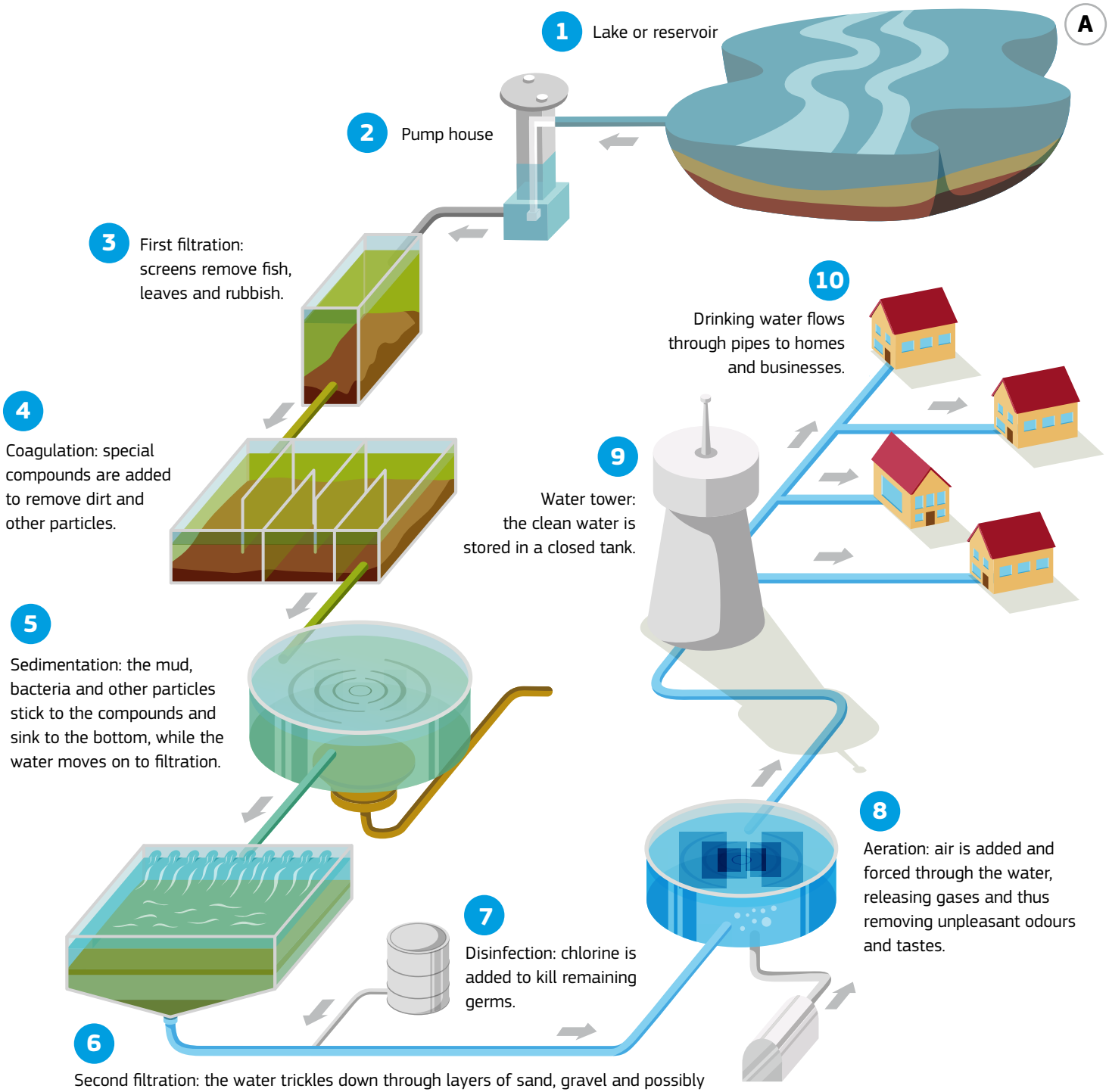
But this hidden treasure is at risk. In many countries, we are using water faster than sources can be replenished, outstripping the natural deliverable rate. As well as storing up problems for the future, this is already causing problems today: half of Europe's wetlands, which act as flood protection barriers and purify water, are endangered due to overexploitation of groundwater. Meanwhile, increased demand from the rapid development of tourism in some regions has caused desertification and salt-water intrusion: sea-water flowing into coastal freshwater zones. Nearly half of Europe's population lives in 'water-stressed' countries, and water scarcity affects 33 EU river basins[1].

Solid ground or sponge?

Using up water supplies is just one side of the problem. The other is the threat to groundwater quality from human pollution sources, such as farming, industry, leaky sewers or septic tanks. More aware of the problem than ever before, we are protecting the quality of groundwater better today than in the past, but we could all do more to stop pollution before it happens. The ground beneath our feet might seem pretty solid when we walk on it, but just like a sponge it absorbs everything we dump on it, from heavy metals in waste batteries to all sorts of unpleasant substances found in plastics, fertilisers and cleaning products, drawing pollution into the water supplies we depend on. As water moves very slowly through the Earth's subsurface, it may take decades for contamination to work its way into below-ground aquifers.

Common water pollutants

Pathogens: disease-causing bacteria, viruses and other germs found in untreated sewage or farm animal waste
Chemicals: organic – detergents, fats, grease, solvents, herbicides, petroleum products, chemicals used in personal hygiene products and cosmetics; and **inorganic** – industrial discharges and by-products, fertilisers containing nitrates and phosphates, heavy metals and silt
Large items: rubbish and debris visible in water


A
1 Lake or reservoir
2 Pump house
3 First filtration: screens remove fish, leaves and rubbish.
4 Coagulation: special compounds are added to remove dirt and other particles.
5 Sedimentation: the mud, bacteria and other particles stick to the compounds and sink to the bottom, while the water moves on to filtration.
6 Second filtration: the water trickles down through layers of sand, gravel and possibly charcoal, removing small particles such as algae, bacteria and some chemicals.
7 Disinfection: chlorine is added to kill remaining germs.
8 Aeration: air is added and forced through the water, releasing gases and thus removing unpleasant odours and tastes.
9 Water tower: the clean water is stored in a closed tank.
10 Drinking water flows through pipes to homes and businesses.

Water tower stores clean drinking water

What's the water quality where you live?

The European Environment Agency publishes interactive maps of water quality in each EU country. They show test results of groundwater, rivers, lakes and coastal waters, with details for each country and testing station of levels of common contaminants, such as nitrites, nitrates and ammonium.
See: http://www.eea.europa.eu/themes/water/interactive

How is your tap water produced?

Tap water generally has no taste, no colour and no smell. Have you ever thought about how it gets like this? It might seem simple, but it takes a lot of work to be this good. Behind the scenes is a complex system of water collection, storage, treatment and distribution (see illustration A).

Companies that supply water are responsible for making sure drinking water is safe. They provide up-to-date information about water quality. Water bills and water company websites usually carry this information. They also charge money to cover the costs of delivering an excellent product. Wasting water costs money too. Could you use water more sparingly? Where would you make changes in your water use?

Bottled vs tap water

Europeans are buying more bottled water than ever before, despite the strict controls that ensure the vast majority of tap water is safe to drink. In contrast, bottled waters are much less strictly regulated and tested than tap water and there is no evidence that they are healthier either. Some natural mineral waters contain levels of minerals higher than are recommended for certain groups of people, such as babies and very young children, for example. There is also concern about the hazards of chemicals used in the plastic bottle.

Bottled water also has a significant environmental impact. Large quantities of resources and energy are required to make and dispose of the packaging, 80 % of which consists of single-use, non-refillable containers[2]. The plastic bottles that do not make it to recycling depots end up as plastic litter that can take generations to degrade. Finally, there is the transport impact of shifting bottled water from source to shop to homes, including noise, congestion, CO_2 and other exhaust emissions.

Nevertheless, in 2009, the average European bought 105 litres of bottled water. People in southern Europe buy a lot more: Italians drink around 200 litres per year per person, while people in Finland drink the least: 16 litres per person per year.

Do you and your family drink bottled water? Try testing the difference with friends by organising a blind tasting session. Can you taste the difference?

Why not drink tap water instead of bottled water? Tap water is monitored and regulated like no other drinking water, and delivered directly to your home.

As an alternative to buying plastic bottles of water when you are on the go, carry a steel water bottle that you can wash and refill over and over with tap water.

Country	Consumption	Average leakage loss
	liter / cap. / day	%
Poland	102	15
Portugal	107	40
Lithuania	116	25
Slovakia	128	32
Malta	130	15
Bulgaria	139	54
Hungary	152	18
Czech Republic	152	20
Belgium (Brussels & Flanders)	153	6
Belgium (Wallonia)	153	23
Germany	155	9
The Netherlands	184	5
Denmark	191	7
Romania	194	32
France	196	23
Austria	214	11
Luxembourg	221	30
Finland	231	17
Greece	239	35
England and Wales	241	23
Scotland	241	32
Italy	267	29
Spain	283	9
Sweden	302	18
Cyprus	310	18
Ireland	317	27
Total/average	**202**	**21**

Source: ENDWARE and EUREAU, Overview on Water and Wastewater in Europe 2008[4]

How much water do we use?

Europeans consume 100-320 litres of water per day on average for household use, varying by country[3]. (Household water consumption represents about 15 % of total water use in Europe, less than half the volume used for farming, which accounts for around one-third.)

Only 3 % of tap water is used for drinking, on average. The vast majority is for flushing toilets, washing and watering gardens. How much do you use?

One shower: 35-75 litres
One bath: 80 litres
Flushing toilet (once): 8 litres
Washing machine: 65 litres
Dishwasher: 25 litres
Washing car with hosepipe: 400-480 litres
Washing car with bucket (4 buckets): 32 litres

As a general trend[5], we are using less water in our homes than a few years ago, thanks to a combination of water-pricing in most countries (which requires us to pay for what we use), greater public awareness and more energy-efficient household appliances such as washing machines and dishwashers. As an example, consumption is higher than the European average in countries where water is free, or in other countries where the water network suffers from high losses (due to leaks).

Regulations governing plumbing systems in homes are designed to safeguard public health and promote the sensible and efficient use of water. Drinking water, in particular, must be protected from contact with wastewater or other contamination (see illustration B).


B
drinking water
wastewater

Respect water: what YOU can do

Tips on water use

- Swap a bath for a shower. Filling the average bathtub requires a lot more water than taking a short shower.
- Does your shower last longer than your favourite song? Short showers save water.
- Running the tap is water down the drain, so turn off the tap when you brush your teeth. Same applies to shaving, lads!
- Is your toilet smarter than you think? The quick flush mechanism of a dual flush system uses 70% less water than a standard flush.
- The toilet is not a 'wet bin': medicines belong back at the chemist's and sanitary towels, wipes and cotton buds in the bin!
- Never pour unwanted household chemicals down the sink or into the ground. Take them to your waste collection centre.
- Is your water too hot to handle? Do you need to add cold each time? Reduce the temperature and save energy too.
- Buy environmentally friendly (biodegradable) shampoo and use 'green' household products wherever possible.
- Squeeze more into your load! Fill your washing machine and dishwasher entirely and wash it all in one go (not two).

- Would your clothes be upset if you wore them again? Jumpers and trousers can easily be worn twice and will last longer if washed less, too.
- Choose economy cycles on washing machines and dishwashers and keep the amount of detergent used to the minimum.
- Do you love your water as much as your towel? Use your towel more than once as you are clean when you dry off after your shower!
- Make the most of a rainy day: collect rainwater in buckets or a water-butt to water plants or wash your car. You can also use greywater for this.
- Choose organic. Organic food is better for water quality as it is not treated with herbicides or pesticides.
- Growing your plants can starve the planet: recycle your vegetable waste to feed your plants home-made compost. You'll never need chemical fertilisers again.
- Become a water advocate. Get involved in local beach clean-up activities and help educate others about how they can protect water.

Find out more and meet Water Maniac Walter yourself by joining Generation Awake (**http://www.generationawake.eu/**) or visit our Facebook page here: **http://www.facebook.com/GenerationAwake**
Your choices make a world of difference.

Wastewater

Where does dirty water go?

All that dirty water we flush down our toilets, sinks and plugholes – and some of it is not so dirty – has to go somewhere, right? It doesn't go directly into the nearest waterway, river or beach, or so we hope!

Welcome to the world of wastewater, a fascinating but little-known realm that starts in drains and sewers and continues at that faintly smelly place on the edge of town: the treatment plant. This mysterious hive of activity operates 24/7, conducting a series of clever processes to get rid of the nasty bits. The water, once cleaned, can be discharged into the environment without the risk of spreading diseases or killing off plants and animals.

Sewage discharge

Not all poo is pollution

Rivers and the sea are naturally able to clean up a limited amount of organic waste – faecal matter and food leftovers – as it is biodegradable and can be processed by bacteria and micro-organisms. The problems start when there is more organic waste than can be processed without it interfering with public health. This is the case in modern society: many of us live in densely populated areas with limited access to fresh water sources. This is why water treatment is necessary.

Chemicals in wastewater

Treating organic waste is pretty straightforward; we just need to get the friendly bacteria to break it down. However, much wastewater contains contaminants common to modern society, which are discharged into drains from industry and households. Traces of pharmaceuticals, such as antibiotics and ibuprofen routinely show up in drinking water samples, a source of growing concern about their long-term health impacts for humans and other animals, not to mention the threat of 'superbugs' that have developed resistance to antibiotics.

Heavy metals, meanwhile, are not biodegradable and build up in river sediments, plants, insects and fish. They can become toxic to animals and humans. Ideally, we should prevent industrial pollutants from reaching the sewers, and, in our homes, use medicines, household and garden products responsibly, to limit the quantity of chemicals flushed and washed into drains and soil. The alternative, 'end-of-pipe' treatment to clean these substances from the wastewater is more expensive and not always successful.

Water treatment across Europe

Where technically and economically possible, households in Europe are connected to a sewage system and a wastewater treatment plant (see illustration C). In areas without municipal drains and sewage treatment, wastewater is either collected in a septic tank before being taken to a wastewater treatment plant,

C

or it flows into an individual system that processes the waste on site before discharging treated water into rivers or via the soil into groundwater. Specialist companies collect the remaining sludge for safe disposal.

What happens at a treatment plant?

The wastewater treatment plant is the makeover department for dirty water. A series of cleansing processes separate the solid from liquid waste, and strip out harmful contaminants so that what remains is clean enough to be discharged into nature.

This leaves two products: liquid wastewater (treated effluent) and solid waste (treated sludge), both of which can be returned to the environment safely. In Europe, treated effluent is mainly discharged into rivers or the sea. Treated sludge can be disposed of (often by incineration) or reused, for example as an agricultural fertiliser.

The cleaning process in detail

Pre-treatment: in the first of a two-stage preliminary step, everything that arrives via the sewer (see illustration D, site 1) is pumped in and screened (2) to remove solid rubbish, such as tree limbs, plastics, rags, stones and broken glass, which could otherwise damage or clog the plant's pumps and skimmers. The screened items are disposed of in landfill sites or incinerated. In the second stage (3), grit and sand are allowed to settle in channels, before being washed and reused, for example to build roads.

Anaerobic digestion tanks, wastewater treatment plant "Emschermündung" (Germany)

Primary treatment: sedimentation: a sedimentation tank (4) allows liquid and solid matter to separate. The sludge settles, while greases and fats rise to the surface. Sludge is removed for sludge treatment, while fats and greases are skimmed off. The remaining liquid goes for secondary treatment.

Secondary treatment: biological: in this stage (5), waterborne microorganisms – bacteria and protozoa – remove organic matter from the human waste, food waste, soaps and detergent. The tiny creatures consume the waste particles, cleansing the water.

Tertiary treatment: this final stage of treatment improves the quality of effluent still further. Different methods may be used depending on the contaminants that need removing (for example nitrogen or phosphorus as nutrients). They can also involve disinfection chemically or physically (by lagoons (6) or microfiltration).

Storm water channel: in heavy rainstorms, some of the sewage may be diverted into separate storm water channels or tanks (7) to await treatment at a time when the plant can cope with the extra volume. In extreme storms, these channels may overflow, releasing untreated or only mechanically treated sewage directly into waterways.

Discharge: the purified water is discharged via a drainage channel (8) into a body of water (river, lake or sea).

Sludge treatment: sludge must be treated to remove organic matter and disease-causing microorganisms. One way to treat it is in an anaerobic digester (10), a closed system in which sludge is mixed to give off biogas (methane and oxygen) (12), which is then combusted (like natural gas) to heat the digester to the right temperature to carry on with its decomposition process. Sludge is sometimes thickened (13) before digestion, and dewatered (11) afterwards, to reduce the fluid content as far as possible, and thus the costs of disposal or reuse.

Wastewater treatment plant

Chemicals may be added (14) at the start of treatment to cause phosphorous to precipitate, or sink to the bottom as sludge.

At the end of the process, the treated sludge can be reused as a fertiliser or compost for plants as it contains essential nutrients (nitrogen and phosphorus), as well as organic carbon that improves soil structure.

In some areas, sludge is contaminated with heavy metals or other pollutants due to industrial waste entering the sewer network. For this reason, many countries prefer to incinerate sludge to reduce the risk of spreading pollutants on farmland or gardens.

The problem with rain

Many older sewage systems struggle to deal with heavier-than-average rain. Overwhelmed by the large volume of water, drains become flooded and overflow, leaking raw sewage into streets and homes.

The problem has become urgent in many areas. On the one hand, climate change is likely to lead to more unpredictable weather events. On the other, modern towns and cities have a high proportion of 'sealed' surfaces: pavements, roads and buildings that prevent rainwater filtering into the grass and soil and so add to the burden on drains and sewers.

Reusing rainwater and greywater

'Greywater' is a term for water used in sinks, baths, showers and washing machines, and not contaminated with sewage (blackwater). Homes can be fitted with treatment systems that allow this greywater to be reused to flush toilets. Collected rainwater can be used for watering gardens. Rainwater has long been collected and used in this way and in some countries houses are routinely fitted with rainwater collection tanks.

Newer systems are designed to cope with storm water. They divert it into specially constructed drains or to watercourses that can handle sudden large volumes of rainwater and runoff. Illustration D shows a typical treatment plant.

Closing the loop: recycling water

For dry regions with low rainfall or densely populated areas, it makes sense to recycle wastewater immediately after treatment rather than discharging it into rivers or the sea. In many cases, the recycled water is used only for non-drinking purposes, for example to irrigate parks or to flush toilets.

To meet future challenges of water scarcity and climate change, more research is needed into closed-loop water recycling, such as how to improve testing and cleansing. Current systems are unable to effectively remove certain germs, chemical and pharmaceutical residues, which is essential if the water is to be reused for drinking purposes.

Next stop: rivers and the sea

Europe has made enormous progress in treating wastewater in the past 20 years, but there is still room to improve. We need to get better at keeping harmful products out of our wastewater in the first place, develop more advanced treatment methods, and keep costs as low as possible.

Wastewater will ultimately, after flowing through rivers and watercourses, make its way to the sea, where any contaminants that have not been removed during the treatment process will add to the existing pollution in the marine environment. These include pesticides and fertilisers washed off the land, as well as products of industrial dumping and litter, particularly plastics. As many of these substances take years to degrade (a plastic bottle, for instance, takes several hundred years), they represent a real threat to the long-term health of our oceans, and ultimately to the source of all our water. Although we draw our water from freshwater sources, it eventually returns to the ocean to continue the water cycle that sustains life. The majority of the Earth's water supply (97.2 %) is found in the oceans and although it is possible to desalinate ocean water, it is costly and requires large amounts of energy.

What about wastewater treatment where you live?

The European Environment Agency's interactive maps include data on wastewater treatment across Europe. Discover the level of treatment in your country and city at:
http://www.eea.europa.eu/highlights/themes/water/interactive/soe-wfd/uwwtd

Drinking recycled urine in space

Astronauts aboard the International Space Station are able to drink recycled urine, thanks to a high-tech water treatment system installed on the craft in 2009. This allows the space station to remain self-sufficient for a longer period and reduces the load of resupply ships.

Wastewater treatment plant Duisburg-Kaßlerfeld (Germany)

1 Inlet channel
2 Screening building
3 Sand trap
4 Sedimentation tank
5 Biological treatment
6 Lagoons for sedimentation
7 Stormwater tanks
8 Drainage channel
9 Operations centre
10 Sludge digestion tanks
11 Sludge dewatering building
12 Gas tanks
13 Sludge thickener
14 Phosphate precipitation

Off to the beach!

Bathing in the sea and in rivers and lakes is one of our most popular pastimes. Each year, millions of Europeans flock to beaches to bathe and relax with family and friends. How, though, can we reconcile the holiday brochure images of clean beaches and smiling families playing in the sea with what we know about marine pollution? Industry, farming, fishing, tourism and leisure activities (such as boating), and large coastal population areas all eject waste into the sea that can pose a serious threat to the marine environment and eventually to swimmers. Bathing in dirty water can cause stomach upsets, respiratory infections and skin complaints.

People don't want cigarette butts on the beach!

Litter is a further – and growing – problem. Cigarette butts, plastic bags and bottle tops show up on beaches all the time. Some people also treat the toilet like a wet bin, throwing cotton buds, cigarette ends, sanitary towels, baby wipes, even nappies, down the loo. Not only does this risk blocking the pipes, but it also litters the environment as these items can eventually end up on beaches too. Flushing rubbish down the toilet is essentially no better than throwing rubbish on the street.

Certainly, wastewater treatment plants should be able to screen out most pollutants and litter (although they could do without it clogging up their filters). Even so, some flow directly into streams and rivers when storm channels overflow, bypassing the treatment plant entirely.

Toilet paper aside, remember this guideline: if it doesn't pass through you, don't put it in the loo.

Bathing waters are getting cleaner

But it isn't all bad news. If you like a dip in the sea, take heart: bathing waters in Europe have been getting cleaner since the 1970s, when quality control and testing began. Things improved greatly after 1990, thanks largely to the better treatment of wastewater. Before then, large quantities of untreated or partially treated sewage were routinely discharged into Europe's waters.

Smokers take note: the beach is not a giant ash-tray

Cigarette butts are the most commonly littered item – over 4.5 trillion are discarded as litter each year, worldwide – and can take up to 25 years to decompose. As well as being made of a type of plastic, the filters contain a toxic residue from all the chemicals found in cigarettes – including arsenic, lead, benzene and formaldehyde. These chemicals get into the waterways and the sea, where birds and sea mammals eat them, mistaking them for food. If you smoke, carry a pocket ash-tray and put your butts in a bin or dispose of them at home.

E

EU countries have been taking yet more steps since 2006 to improve bathing water quality in order to protect health and the environment. The rules apply to any waters where bathing is either authorised or practised by a large number of people, including lakes, rivers, beaches, reservoirs and ponds. They do not apply, however, to waters used for other recreational, non-bathing purposes, for example surfing or sailing, or to swimming pools.

In 2011, 21 000 bathing water sites were tested across the EU, two-thirds of them coastal waters, the rest rivers and lakes. Most are of good quality: more than nine out of 10 sites tested met minimum quality standards set by the directive. The share of non-compliant bathing waters was only 1.8 %; only 1% of bathing waters were banned or closed (208 sites).

Just because you can't see it, doesn't mean it isn't there

What gets tested?

Most bathing sites must be tested at least four times over a bathing season, starting before the season begins. Water samples are tested for levels of two bacteria: E. coli and intestinal enterococci. Both bacteria are present in the gut of both humans and animals, and make up the normal healthy flora of the intestine. However, their presence in water indicates that the water is polluted by sewage or livestock waste.

Swimming in polluted water is a health risk, especially when people swallow faecal matter. Not all E. coli strains are harmful, but some can cause serious stomach upsets. In rare cases, E. coli contamination can lead to life-threatening illnesses. This is why it is so vital to treat wastewater (see illustration E) and avoid swimming in areas polluted with waste. It is also why we wash our hands after using the toilet and before preparing food.

Bathing waters are also profiled to assess the risk of other sources of pollution that can affect bathers' health, such as blue-green algae (cyanobacteria), which can be harmful if swallowed and can cause skin rashes, or macro algae and/or marine phytoplankton. They are also inspected for visible signs of pollution and waste.

Look up your favourite bathing spot

The Eye on Earth[6] platform provides real-time data on bathing water quality through its WaterWatch feature. Its interactive map shows the water quality of bathing areas in 28 countries in Europe. Zoom in to view – and comment on – water quality near you.

European Environment Agency

Interactive maps give more detailed information about individual bathing areas:
http://www.eea.europa.eu/themes/water/wise-viewer

The Blue Flag was created in France in 1985. Today, 41 countries participate in the programme. In 2010, 3 450 beaches were awarded Blue Flag status. See http://www.blueflag.org/

Blue Flag beaches

The Blue Flag is a well-known label awarded by the NGO Foundation for Environmental Education (FEE) to clean beaches and marinas. To qualify, beaches must meet strict standards of water quality and cleanliness. They must also have adequate toilet facilities, rules on camping and dog control, safe access, emergency response equipment, and environmental information and education for users.

Marine litter

Each year, millions of tonnes of litter end up in the ocean – and stay there. The plastic, wood, metal, glass, rubber, fabric and paper waste is generated mostly by human activity and comprises the only type of waste that nature cannot digest (see illustration F). It comes from land, transported by wind or rivers from badly managed landfill sites, storm drains and street litter (for example fast food packaging or drinks cans). But it also comes from the sea: waste dumped from boats and human activities that have an impact on the marine environment, such as sea mining and fishing (for example discarded fishing gear).

Discarded fishing nets can kill turtles

Marine litter poses a health hazard: medical or sewage waste contaminates the water while sharp or broken items can cause injuries to beach-goers. It has an economic impact: cleaning beaches and harbours is a costly business, and ships and fishing gear can be damaged. And it represents a threat to marine life: seals, whales and marine turtles have been found entangled in balloon ribbons, 'six-pack' plastic rings, and discarded fishing nets causing them to suffocate and / or drown. Mammals, birds and fish can also mistake plastic litter for food, causing internal injury or blocking their digestive systems. Plastic, in particular, is a threat as it does not biodegrade, but breaks up into ever-smaller pieces, eventually becoming microscopic 'plastic dust'. In some products (like scrub creams) microplastics are added. They pass the sewage system and ultimately end up in the marine environment. In addition, the oil base in the fragments attracts other chemicals floating in the ocean, such as persistent organic pollutants (POPs) and PCBs. These concentrate on the fragments in levels up to a million times higher than the ambient levels in seawater, turning the plastic fragments into tiny poison pills. The absorbed chemicals from ingested plastic can easily enter the food chain and might thus end up on your plate too.

In some of the world's oceans, circular currents have led to massive floating islands of rubbish. The best known, the Great North Pacific Garbage Patch, is hundreds of kilometres wide, and consists of large items and a high concentration of tiny plastic particles. There have been few studies on the impact of this 'plastic soup', but there is growing concern about the potential toxic effects on the food chain of chemicals used in the production of plastic and known to harm humans, through ocean contamination. A recent study of one species of bird, the Northern Fulmar, in the North Atlantic, found a significant quantity of plastic in the stomach of nearly every dead bird collected.

Help reduce marine litter by reusing your plastic bag; don't throw rubbish on to the street, into toilets or waterways; and take part in beach-cleaning days: http://www.signuptocleanup.org. We can always improve waste management on land to stop waste reaching the oceans, but on a larger scale, we all need to become more **aware of the consequences of our actions**.

If you swallowed as much rubbish as a seabird, relatively speaking, it would be as big as a hamburger!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What the EU is doing

Signs for water protection areas in Europe

Because water flows freely across frontiers, EU countries have agreed to manage water resources collectively using river basin units, regardless of national borders. They have identified 110 river basin districts[7] including tributaries, estuaries and groundwater. Countries work together and share the responsibility for the river basin, agreeing a management plan with the other countries that share it. Each then has to implement the plan within its own territory. The goal, set out in the EU's Water Framework Directive, is to get all EU waters into good condition by 2015 (with extensions of the deadline in special cases).

Protecting drinking water sources

Tap water has been regulated in the EU since 1998. The Drinking Water Directive sets minimum quality standards that oblige Member States to ensure that water is supplied to households safe and clean. The standards are reviewed every five years to take account of current knowledge and any changes in World Health Organisation guidelines.

Any supply for more than 50 people has to be tested regularly for 48 features, from colour, odour and taste to the presence of metals such as aluminium, cadmium, iron and lead, chemicals, and potentially harmful bacteria. The large majority of drinking water supplied in Europe meets these standards, although there is room for progress in the quality of drinking water supplied to small communities (up to 5 000 people).

Improving wastewater treatment

To avoid harming our health and the environment through exposure to untreated wastewater – sewage and used water from households, and wastewater from industry – the EU's **Urban Wastewater Directive**, introduced in 1991, takes steps to reduce the pollutants discharged into the environment.

Local authorities must collect and treat water from villages and towns with 2 000 or more inhabitants. Treatment plants must achieve minimum standards. Stricter standards apply where the water may damage sensitive environments or human health. Most EU countries have now put most of the wastewater systems into place to meet the rules of this Directive; newer Member States have until 2018 to do so. Countries that do not comply can be fined.

Keeping bathing waters clean

Each year, the European Commission publishes details of bathing water quality in Europe. In 2011, the bathing water report showed results from 21 000 sites, based on information provided by Member States under the EU's **Bathing Water Directive**. National governments are also obliged to inform the public about bathing water quality in time for the bathing season, especially in areas where bathing is not advised or prohibited.

Cleaning seas and oceans

The issue of marine litter is being addressed under the EU's 2008 **Marine Strategy Framework Directive**. Member States are required to ensure that their seas achieve 'good environmental status' by 2020, drawing up a strategy for monitoring and to achieve targets.

Excellent bathing water quality

- ★★★ excellent
- ★★ good
- ★ sufficient
- – poor

EU rules help to guarantee clean bathing water

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Further reading

- European Commission Directorate-General for Environment – what the EU is doing to protect water quality: http://ec.europa.eu/environment/water/index_en.htm
- European Commission Directorate-General for Environment - Our Oceans, Seas and Coasts: http://ec.europa.eu/environment/marine/index_en.htm
- Marine Litter leaflet (2010) and Marine Litter in the Mediterranean leaflet (February 2012): http://ec.europa.eu/environment/marine/publications/index_en.htm
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- European Environment Agency – reports and statistics on the state of water in Europe: http://www.eea.europa.eu/themes/water
- WISE - The Water Information System for Europe: http://water.europa.eu/
- World Health Organisation – water, health and sanitation at a global level: http://www.who.int/topics/water/en/
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