# All About Water

## BRITA Professional Filter Solutions

BRITA®

# Contents

# Water is a vital resource

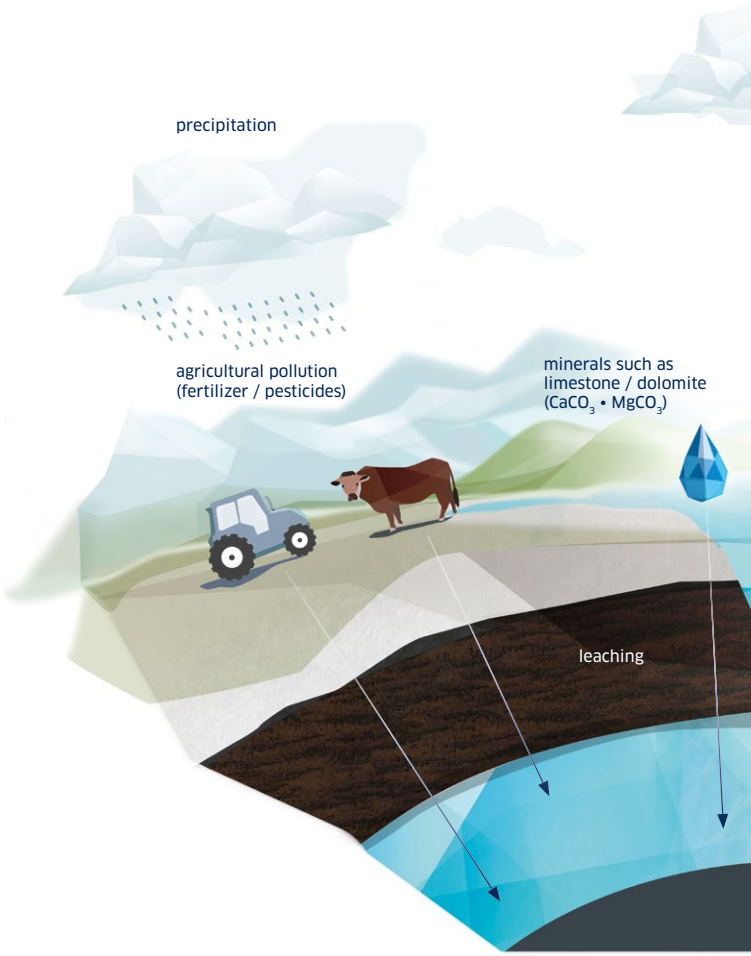
However you look at it, water is essential. It's vital for life and health. It's a beverage in its own right. And it's key to making tea or coffee, preparing food, and more.

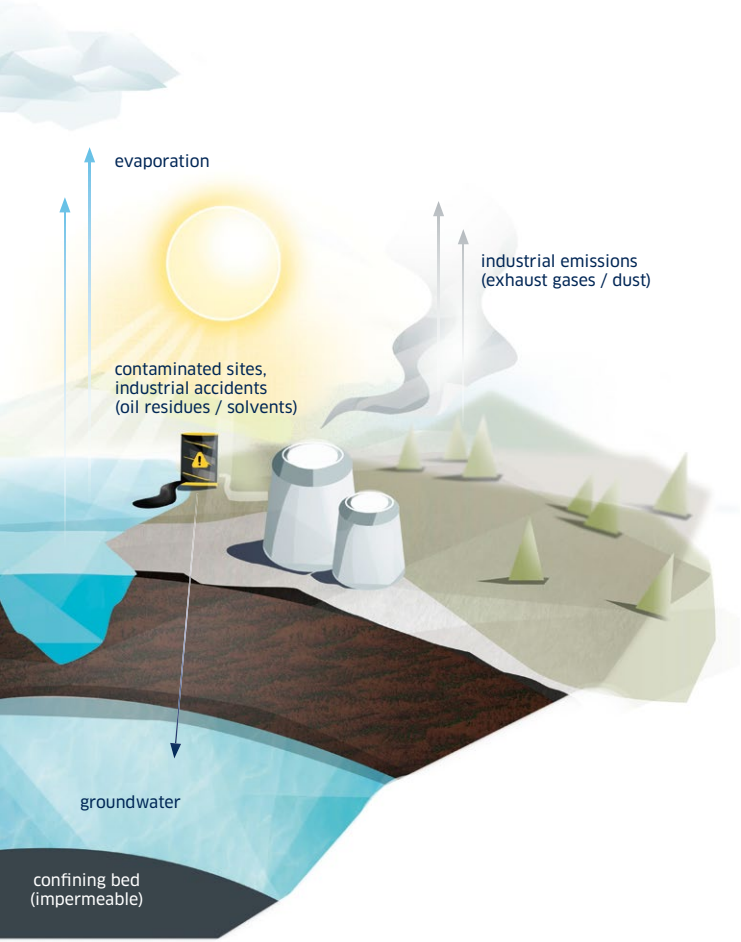
In a nutshell: Water is a natural resource of immense value to us all.

Whatever the scenario, you want water of the highest possible quality. Water that tastes good, and is easy on equipment – and the planet. And that is our passion. We have developed water dispensers and tried-and-trusted filtration technologies for diverse professional needs – for offices, hospitals, and other workplaces, for satisfied customers, guests, employees and patients.

The result is delicious water, less plastic waste, and better bottom lines. But why filter water in the first place? And how does filtration work? That's what this booklet is all about.

# The water cycle




evaporation
industrial emissions
(exhaust gases / dust)
contaminated sites,
industrial accidents
(oil residues / solvents)
groundwater
confining bed
(impermeable)

# What water is made of

Water is simply oxygen plus hydrogen, right? Well, it's not quite that simple.

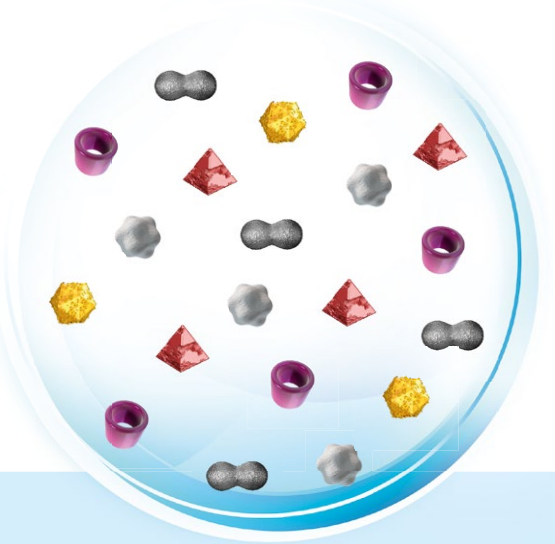
Drinking water is among the most carefully controlled foodstuffs. Yet water dissolves more substances than any other liquid.

That means it is often more than simply $H_2O$ – and its composition can vary greatly.

Water can contain:

| | |
|---|---|
| substances from the environment | (e.g. minerals) |
| substances from water treatment | (e.g. chlorine) |
| particles from piping | (e.g. rust, scale) |
| microbes | (e.g. Pseudomonas) |
| residues from pollution | (e.g. organic impurities, pesticides, hormones) |

Treatment plants play a crucial role. They remove unwanted substances, and make water safe to drink – to consistently excellent standards. However, the resulting drinking water can vary in terms of hardness (i.e. dissolved minerals), aroma,



Total minerals/salinity:

- carbonate hardness or lime
- permanent hardness or gypsum
- other minerals (non-hardness)

Undesirable substances:

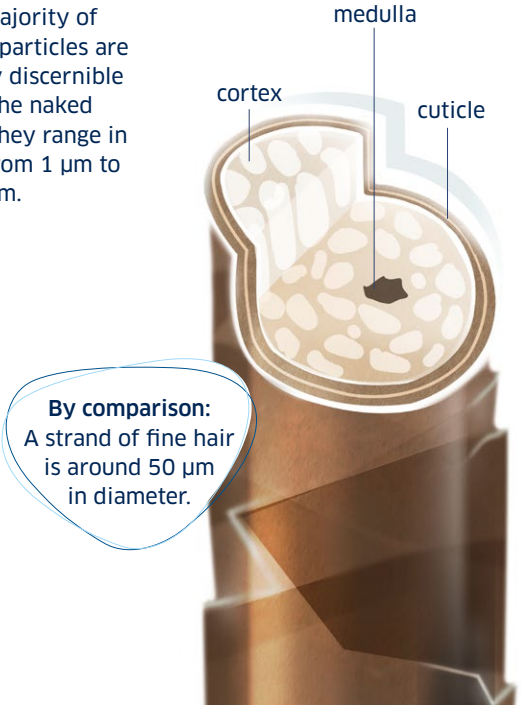
- odours and off-tastes (e.g. chlorine)
- coarse and fine particles

taste, and more. Which is where BRITA can help. To ensure the best possible water for your needs and preferences, we offer a broad range of filtration solutions.

# Particles in water

How do particles end up in drinking water? Piping is often the culprit. Over time, rust and limescale are deposited in pipes in the water supply network. A pressure surge can knock these materials loose. They can then build up downstream in mains-fed equipment, such as coffee machines, causing faults.

The majority of these particles are barely discernible with the naked eye. They range in size from 1 µm to 200 µm.

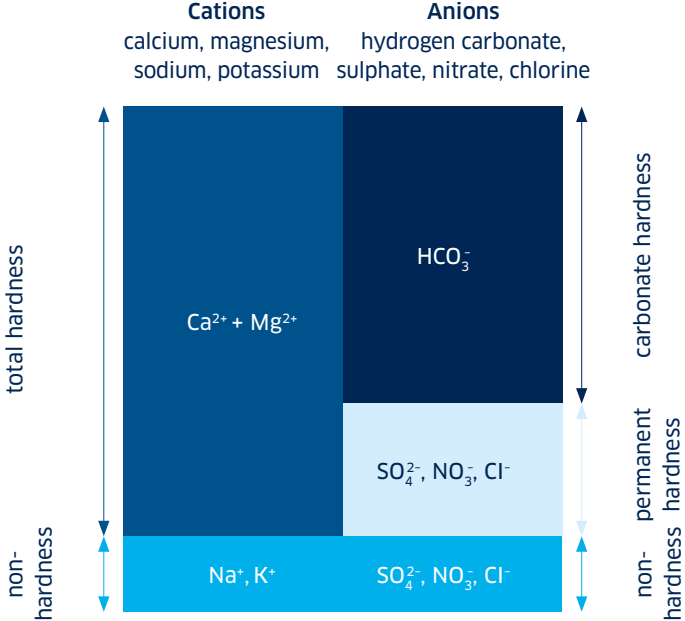



**By comparison:**
A strand of fine hair is around 50 µm in diameter.

# Minerals in water

We've all heard of minerals – but what are they exactly?

Minerals are naturally occurring chemical compounds. They consist of cations (positively charged ions) and anions (negatively charged ions). In water, the most important are:



# What's water hardness?

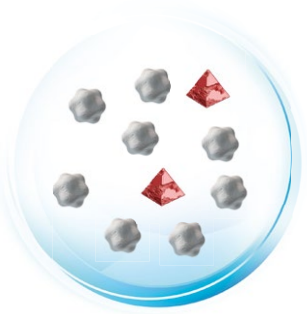
"Hard" water has a high mineral content. And there are different kinds of hardness. Total hardness, for instance, is the sum of carbonate hardness and permanent hardness (i.e. mineral content that cannot be removed by boiling).

Carbonate hardness as a proportion of total hardness can range between

**25 - 90 %.**

Because the total and types of hardness can vary widely, water filters have to meet diverse requirements – and provide the right water treatment for your local conditions.

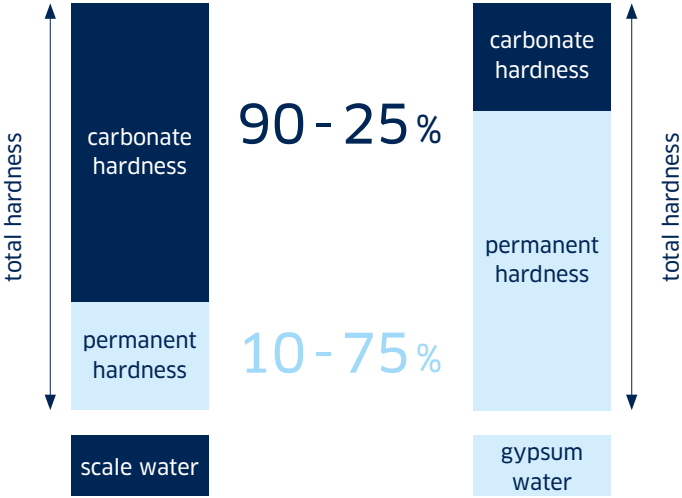
**Scale water:**
carbonate hardness higher than permanent hardness



**Gypsum water:**
permanent hardness higher than carbonate hardness

# The ratio of carbonate to permanent hardness

The ratio of these two types of hardness depends on soil conditions near the original water source. Compounds in the soil can leach into the water supply. This changes its composition.



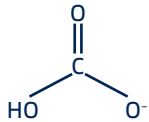
# How does scale end up in water?

1. Rain water absorbs carbon dioxide from the atmosphere as it falls to the ground.
2. Rain water becomes slightly acidic (carbonic acid).
3. Rain water seeps into soil that contains limestone (scale).
4. The solid limestone (scale) dissolves and forms calcium and hydrogen carbonate ions.
5. The water is now hard, as it contains a high volume of dissolved ions.
6. Solid limestone (scale) has become carbonate hardness in water.
7. Water has now reached the lime-carbonic acid equilibrium.

$H_2O + CO_2 + CaCO_3 = Ca^{2+} + 2\ HCO_3^-$


+

=

+



| | | | | | | |
|---|---|---|---|---|---|---|
| **rain water** | + | **limestone** | = | **calcium** | + | **hydrogen carbonate** |
| water + carbon dioxide | + | calcium carbonate | = | cations | + | anions |

# HOW DOES SCALE DEVELOP?

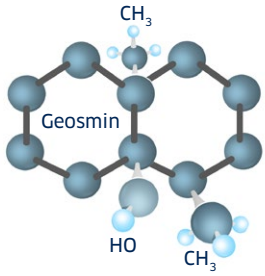
1. Water is heated.
2. Hydrogen carbonate decomposes into carbonate and carbon dioxide.
3. Carbon dioxide gas is released; pH rises, meaning the water becomes more alkaline.
4. The lime-carbonic acid equilibrium is disrupted.
5. Calcium combines with carbonate and forms limescale.
6. Carbonate hardness in water has returned to solid calcium carbonate.

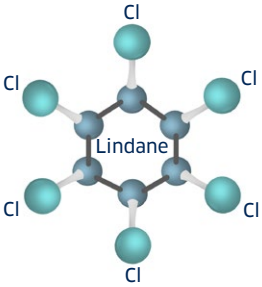
# Organic matter in water

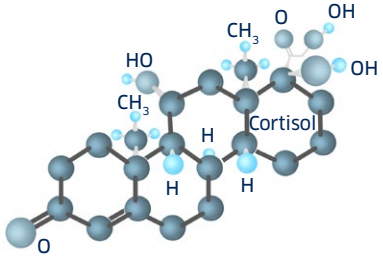
Organic matter includes a broad spectrum of substances. These are carefully controlled in drinking water. Some, for instance pesticides, are obviously undesirable, so there are very strict thresholds. Certain organic molecules can be smelled or tasted even in miniscule quantities – such as geosmin, the substance responsible for that musty, earthy aroma you associate with rain.

**Other examples include:**

- Residues from pharmaceuticals, pesticides, solvents, industrial products such as paints
- Natural substances, such as residues from algae and bacteria
- Particulate matter



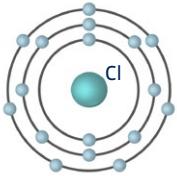



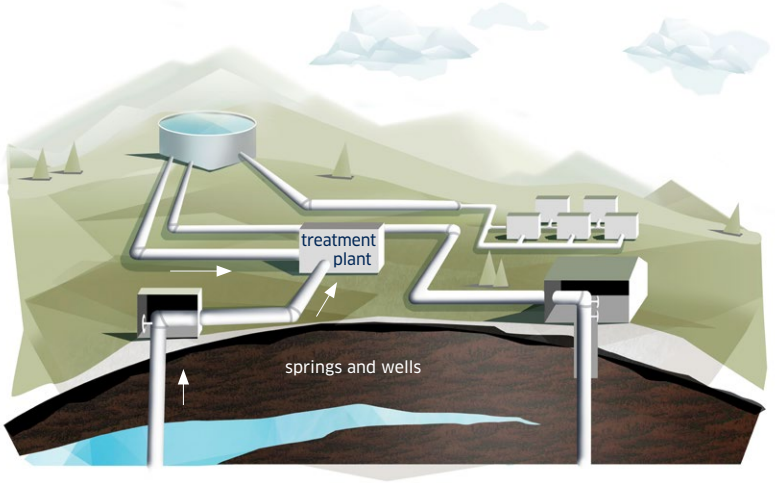
# Substances for treatment

Some substances in drinking water are deliberately added. These include, for instance:

- Substances to stop clouding (turbidity), e.g. iron or manganese
- A small amount of chlorine for disinfection. Chlorination is essential, as it kills potential pathogens. However, chlorine combined with organic residues can give water an unpleasant odour and taste.

Chloramines (formed from chlorine and certain compounds) are responsible for that characteristic swimming-pool smell.



# The right water makes a difference. Filtering your water helps prevent:

## Scale and gypsum deposits

Water with high carbonate or permanent hardness can lead to scale and gypsum deposits.

**Why it's a problem:**
- Equipment damage and downtime
- Higher electricity and maintenance costs
- Smears on dishes/glasses

Why filter? → It prevents deposits

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## Equipment downtime

Water with a high number of particles can clog or damage equipment.

**Why it's a problem:**
- Solenoid valves may not close properly
- Higher maintenance costs
- Dissatisfied customers

Why filter? → It protects machinery and cuts costs

Unpleasant aroma

Mains water may contain substances such as chlorine with a negative impact on taste and aroma.

This is where targeted filtration makes a difference.

**Why it's a problem:**

- Unpleasant taste and aroma
- Beverages do not look appealing
- Dissatisfied customers

Why filter? → It traps unwanted substances and creates the ideal mineral composition

# What you achieve by filtering water

Remove undesired odours and off-tastes (e.g. chlorine or organic impurities)

Prevent mineral and limescale deposits, and achieve an ideal mineral composition

Prevent unintended reactions between water and beverage ingredients (e.g. coffee)

Filter out particles that could lead to equipment downtime

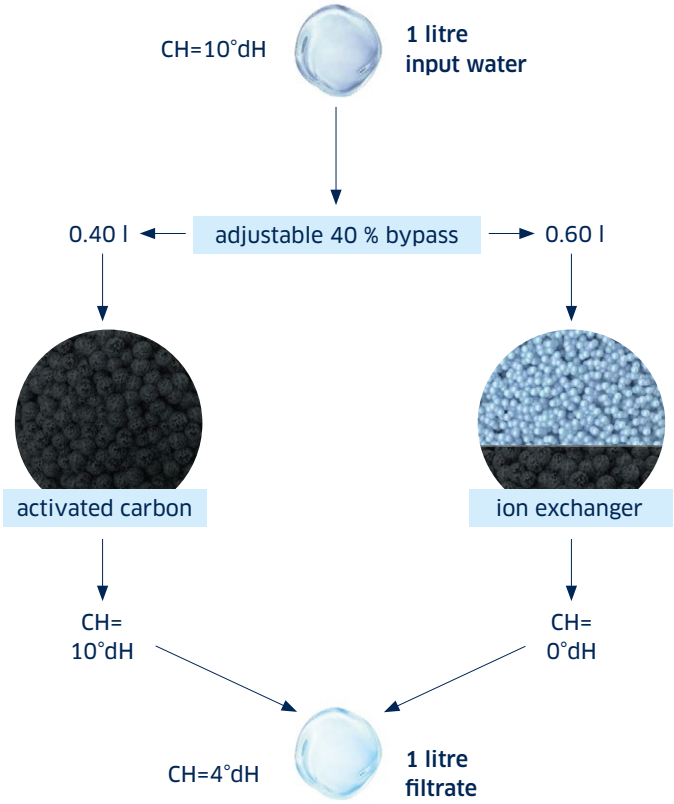
# What BRITA® filter components do

**Ion exchanger**
- Decarbonisation – lowers carbonate hardness
- Softening – lowers total hardness
- Full demineralisation – removes all minerals
- Reduction in volume of metals such as lead, copper, zinc, iron

**Activated carbon**
- Improvement in water odour and taste
- Reduction in chlorine and chlorine compounds
- Reduction in organic impurities
- Increase in clarity

**Particle filter**
- Removal of particulate matter, e.g. rust, scale
- Removal of organic material, e.g. fibres
- Removal of particles (µm range)

# The water bypass setting: For the right composition

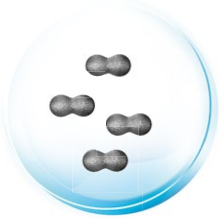


# Water and the senses: Taste, aroma and more

> Water is essential to life, and can stir deep emotions. It also has an unexpectedly nuanced and broad range of tastes.

Water is an excellent solvent for a wide variety of substances. That means it can contain diverse materials. Many have an impact on taste, aroma, appearance and mouthfeel. These include, in particular:

**Minerals**
e.g. calcium, magnesium and sodium



**Water treatment substances**
e.g. chlorine, chloramines and by-products of disinfection

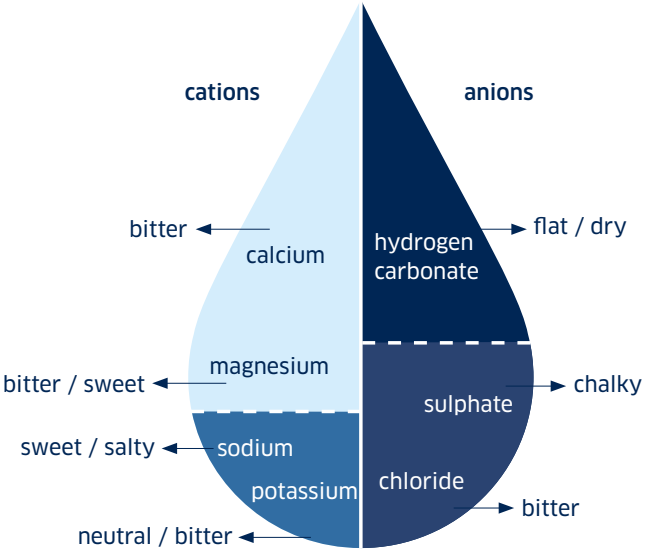
**Organic compounds**
e.g. methylisoborneol, geosmin and trichloroanisole


GOODBYE TO
CHLORINE TASTE.
HELLO TO
BETTER
WATER.

# Water and coffee

Water is the main ingredient in coffee. So it's a pretty big deal. The Specialty Coffee Association of Europe (SCAE) has created a special chart to raise awareness of water's impact on coffee quality. SCAE also promotes a measure-aim-treat approach. If you want to know how this can help you brew better coffee, simply contact your local BRITA team.

The taste of water – and therefore coffee – is significantly influenced by the volume and types of dissolved minerals:



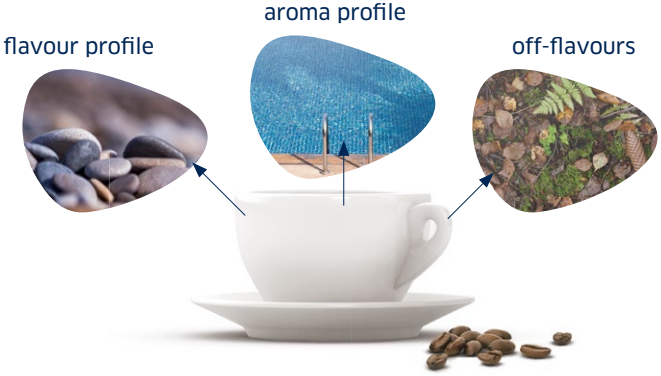
# How water's taste affects your brew

Dissolved minerals influence the way water extracts coffee from grounds. And this affects your coffee's flavour profile.

Some minerals also interact with components in coffee. Hydrogen carbonate, for example, reacts with coffee acids. Too much can lead to a "flat", unbalanced flavour.

Substances from water treatment can cause unwanted corky, chlorine or musty tastes. Some can even influence how coffee smells – altering its aroma profile.

Plus, organic contaminants in water can often lend an off-flavour to coffee. In particular, water with these types of solutes can produce coffee with a distinctive earthy or musty taste (geosmin).



# Mains-fed water dispensers: The advantages

**Excellent quality:**

In most countries, drinking water is among the most highly controlled foodstuffs. You can enjoy excellent-quality $H_2O$ straight from the tap – however much you want, and for a low price. And BRITA VIVREAU mains-fed dispensers ensure your water tastes its best.

**Cost-effective:**

Mains-fed water dispensers save money compared to single-use bottles. Water from the tap is inexpensive – a dispenser typically pays for itself after just a year. What's more, they are a long-lasting solution.

## Eco-friendly:

Water dispensers connected to the mains cut out the $CO_2$ emissions, time, expense and hassle associated with transporting, purchasing and storing bottled water. Moreover, they preserve precious resources: No PET bottles have to be manufactured, for example.

## Healthy:

Simply put – drinking water is healthy. And just having a readily available supply of clean, delicious water encourages better hydration habits.

# Filter components: A closer look

**ion exchanger**

The ion exchange resin is made from certified food-grade material. It removes certain ions, such as calcium, from water. These captured substances are later dissolved and removed when the BRITA ion exchanger is recharged – the resin is then ready for reuse.

**activated carbon**

Activated carbon is a natural material. It has a high degree of microporosity, with a pore size generally larger than 0.2 ml/g, and a huge internal surface area that can exceed 1000 $m^2/g$ (that's four tennis courts!). As a result, it can efficiently absorb a broad range of substances.

The activated carbon in BRITA filters is made from coconut shells.

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**particle filter**

Particle filters typically remove particulate matter from drinking water through mechanical, rather than chemical, means.

Specifically, particles are trapped on the surface of the filter, and within the filter fleece.

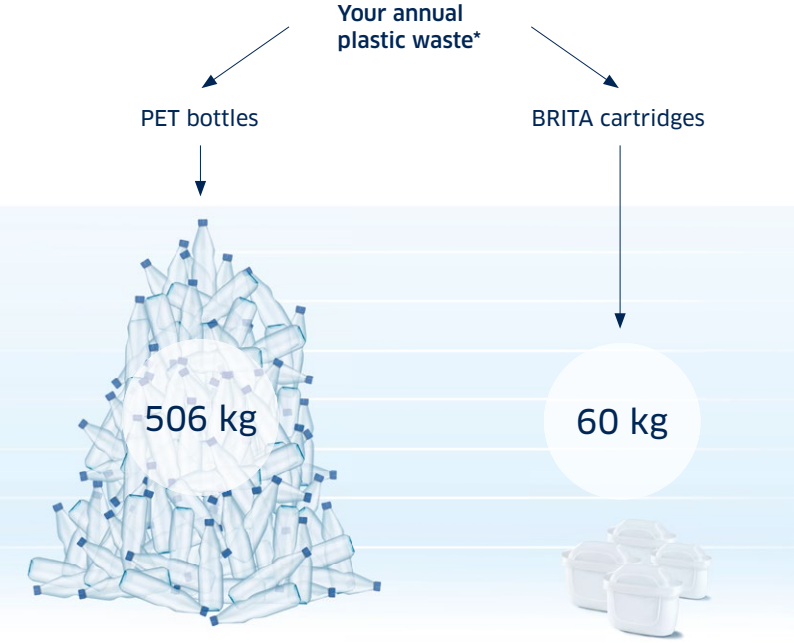
# BRITA and sustainability

You care about the environment. And so do we. That's why we are putting sustainability front and centre. For example, we are making our offices and production plants as energy-efficient as possible. 90 % of the electricity we use comes from renewables. And our manufacturing sites use 100 % green power.

What's more, we set up our first recycling programme back in 1992. Nearly all components of our cartridges can now be recycled or reused. The ion exchanger resin and activated carbon are regenerated. And the plastic parts and grey water are reclaimed.

# Ditch single-use plastic with BRITA

Go green: BRITA products make it easy for you to help protect the planet. By switching to a BRITA VIVREAU dispenser, you can avoid a whopping 506 kg of single-use plastic waste per 100 employees per year. Plus, it cuts your impact by up to 30 % compared to transporting glass bottles e.g. over distances of 300 km.




*Guide to Avoiding Waste at Local Authority Level, Bavarian State Ministry of the Environment and Consumer Protection, 2016

# The BRITA cartridge recovery cycle

Maximising resource efficiency and minimising waste is a matter close to our hearts. As early as 1992, we established a recycling programme for our filter cartridges – the first in our industry.

Recycling cartridges not only conserves precious raw materials. It shrinks the carbon footprint of our water filters – a win-win for all.

Our plant in Taunusstein, Germany, processes cartridges from both the hospitality industry and private households. The majority of individual parts can be recycled, either internally at BRITA or externally.

In use

Replacement

Cartridge installation


Returned to BRITA

Recycling

The **ion exchanger** material is processed via our BRITA regeneration plant. It can be regenerated up to 100 % for use in new BRITA cartridges.

The **activated carbon** is returned to the original suppliers. They then regenerate it for use in diverse filtration processes (e.g. waste water treatment).

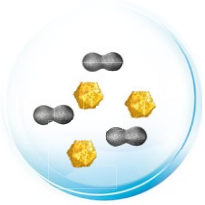
The **cartridge container** made of PP and 20 % fibreglass, and the PP sieve in the base, can both be processed by the plastics industry. Only the top of the cartridge must be disposed of thermally.

# In summary

Drinking water is more than simply $H_2O$. Depending on its source and treatment, water can vary widely in its composition of dissolved minerals and hardness. BRITA filters help create consistently high-quality water – improving its taste as well as ensuring it has the ideal properties for its end use.

**The goals of water filtration:**

achieve the ideal mineral composition



remove chlorine and particles

reduce carbonate hardness

lower maintenance and energy costs

minimise machine downtime

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# Your source of better water.

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