shayp

The Shayp of Water 2022:

Facing Water Scarcity with Water-Efficient Buildings

Water Scarcity in 2022

The year 2022 has set off alarm bells on how ill-prepared we are regarding water scarcity. From droughts to floods, the need to adapt to extreme water conditions has never been more evident. The saying goes: “If climate change were a shark, water would be its teeth”. There couldn’t be a better metaphor for the reality we must face in the coming years.

Water and climate change

As the UN warns, climate change affects the availability, quality and quantity of water for basic human needs. It is already threatening human rights to clean water and sanitation for 2 billion people. Water scarcity is only predicted to increase in the near future.

Climate change adds a layer of complexity to other issues, such as increased urban population density, intense and massive agricultural production and industrial pollution. For example, the water demand across Europe has been steadily rising over the past 50 years, partly because of the population density increase. That has led to a decrease in renewable water resources per capita by 24%.

Droughts

Extreme droughts in Europe

Europe has seen **the worst drought in 500 years.** About 50% of Europe was still in drought at the end of September:

- More than **60,000** hectares of land have burned.
- The status of water storage for irrigation is worsening.
- Across the continent, **crop yields are down**.
- Italy and The Netherlands saw **inland salt intrusion**, affecting drinking water supplies.
- French municipalities faced **water supply issues**.
- The river **Rhine’s low flows** affected dike stability, water distribution and transportation.

(source)

North America’s ongoing drought

In October, the US government reported that **46.5% of the USA** was still in drought. That effectively means:

- **343.7 million** acres of crops are at risk.
- **134.4 million** people were affected directly by drought.

(source)

Lake Powell, the second largest in the US, reached its lowest level since the mid-1960s.
The cost of drought is staggering. Since the 1980s, some states have spent $50 billion on drought damage.

Floods

Floods in Pakistan

Droughts are not the only extreme weather condition that increases water scarcity. Floods and rising sea levels are also contributing factors. They contaminate water resources and cause damage to water and sanitation infrastructure.
The most severe floods in Pakistan’s recent history left one-third of the country under water, impacting 33 million people. Pakistan already ranks 14 out of 17 countries with extremely high water risk. More than 80% of the country’s population faces water scarcity. The floods have intensified the existing water and humanitarian crisis.

Floods in Nigeria

Displacing over **1 million people** and **damaging infrastructure and farming land**, the 2022 flood in Nigeria was the worst the country has seen in years. Climate change is evident in Africa’s most populous country, and this year has yet again shown the consequences. The year has also shown that the climate change-induced water crisis affects those who contributed to it the least. It is a reminder that water is not just an environmental but a **social issue**.

Water scarcity in the rest of the world

Drought in **China** caused a shortage of hydropower. It also caused saltwater intrusion into the Yangtze, making the population of Shanghai fear restricted access to water.

In 2022, heavy floods also affected **Cambodia**, **Chad**, **Greece**, **Vietnam**, **Australia**, and **Mexico**.

How societies choose to address and adapt to the changing climate conditions in the next decade will be crucial. To ensure a resilient and safe future for everyone, we must take a careful look at how we currently consume and waste water.

> **“Next year, we’ll be in the same position unless there is a will to push for reversing the trend. For this, we need to move away from crisis thinking. We must stop focusing only on water scarcity and support positive solutions. The biggest barrier towards a more sustainable future is not that there is not enough water. It is the way we manage and distribute that water.”**

Gaëtane Suzenet
Co-Founder of the European Water Tech Accelerator

Water loss in buildings

Buildings are among the highest users of fresh water globally. From construction to operational and daily use, **buildings have a significant impact on water resources**. On average, the building sector accounts for **70%** of distributed water, depending on the amount of industrial usage within a region.

Shayp's data on over **5,000 buildings** shows that 21.8% of water is wasted on average due to **water loss**, such as **leakages** and **consumption anomalies**. The number differs per type of organisation. For example, **universities and schools are among the highest in water loss**.

Water loss per type of organisation

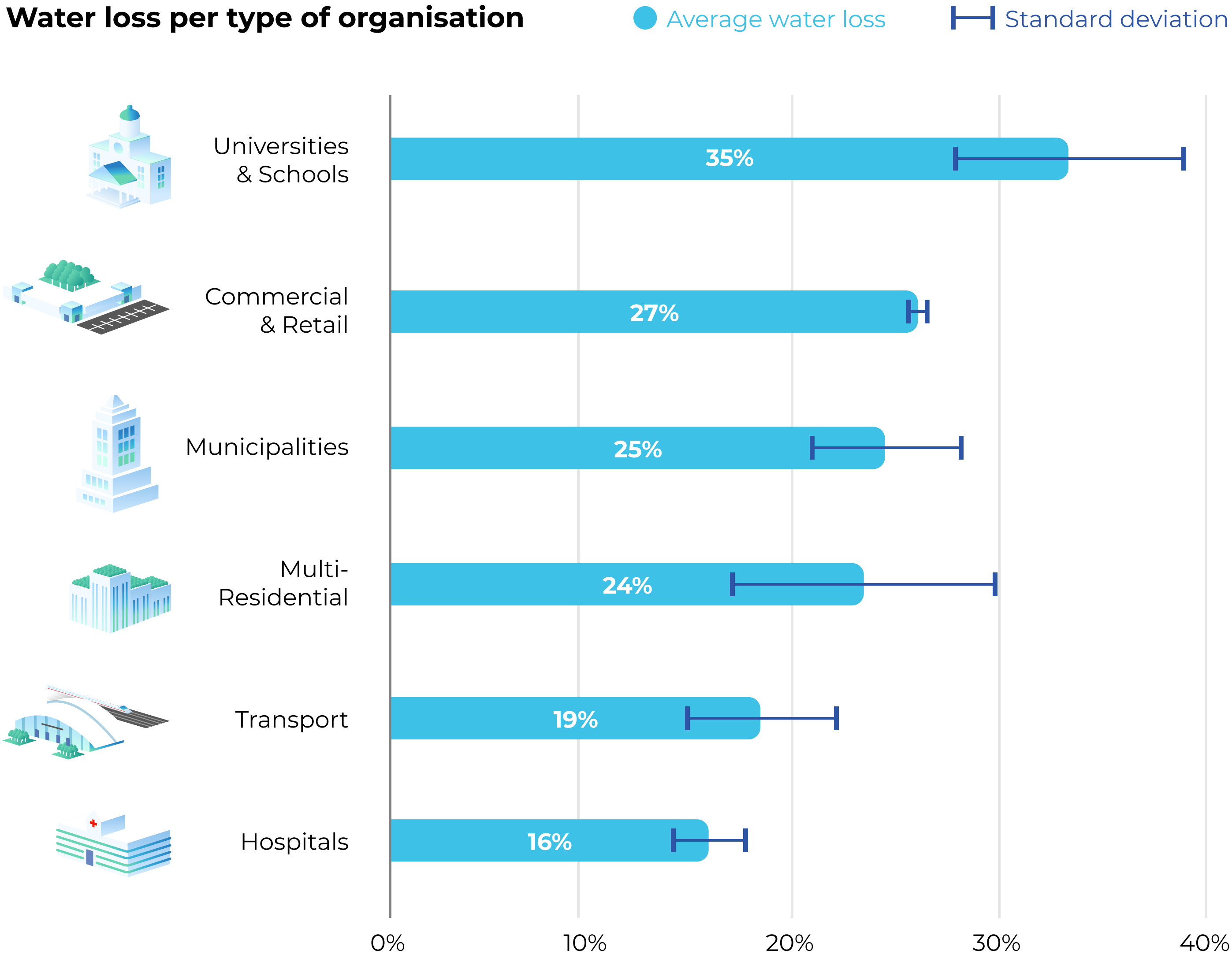


Figure 1: Water loss per type of organisation.

Methodology:

The **average water loss** is a result of calculating the water loss for each individual organisation and then averaging this number across all organisations in the same category.
Standard deviation means the difference in water loss between different organisations in the same category.

The educational sector, like **university** and **school buildings**, loses the most water on average. About **35%** of their water consumption can be considered lost. These organisations are followed by **commercial and retail** and **municipalities**, with **27%** and **25%**, respectively. However, it is important to note that municipalities as organisations take care of different types of buildings, like schools, offices, sports facilities, etc.

Multi-residential organisations lose about **24%** of their water consumption. They also show the highest standard deviation. That means that one group of buildings performs drastically differently than another group in the same category.

Buildings belonging to **transport**, like national railways and public transport, have an under-average water loss, **19%** on average. **Hospitals** perform overall the best, with **16%** of water waste. This is mainly due to the sheer amount of water they use. Therefore leakages tend to represent a lower ratio than general water usage. For example, a 10% water efficiency gain in a hospital could save more water than that in a retail store.

Hidden cause of water waste: leaks

Water loss in buildings is not always easy to detect. Based on Shayp's customer surveys and data, estimates show that **potentially 93% of leakages and consumption anomalies go either unreported or unnoticed**. Often, it is reflected in increased water consumption and water bills.

The data Shayp collected shows that leaks are a leading cause of water loss.

1 in 3 buildings is leaking every year.

Despite leakages being a common issue, most stay hidden and unaddressed for a long time. Even small leaks, like a dripping faucet, lead to vast amounts over time. Figure 2 below shows that small leaks occur more frequently, even if individually, they waste relatively little water.

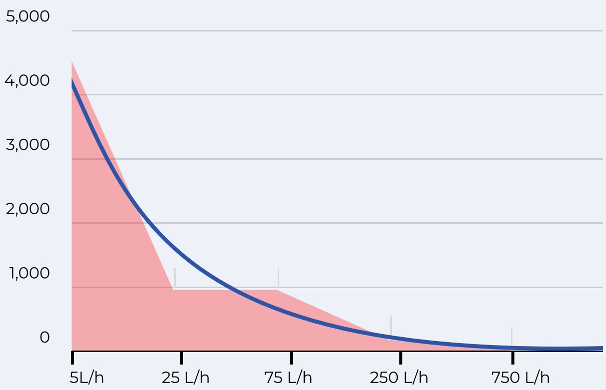


Figure 2: Number of leaks by leak flow*.

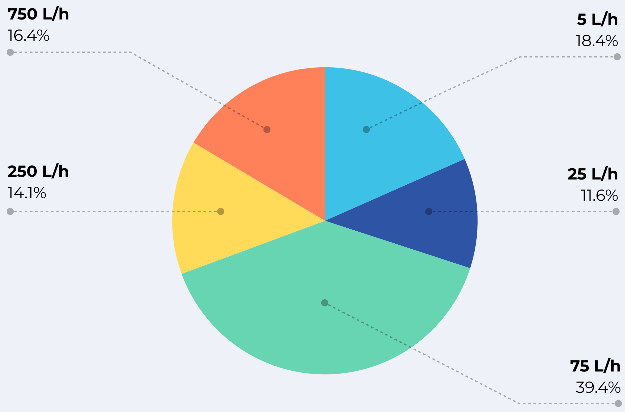
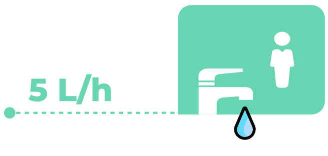
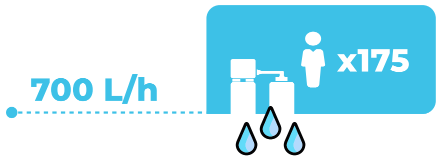


Figure 3: Volume of water waste over a day divided by leak flow*.

Figure 3 above shows that 30% of water waste comes from small leaks (up to 25L/h). About half of the water waste (51%) is due to leaks with a flow between 25L/h and 75L/h. Finally, large leaks, like burst pipes (typically with a flow around 750L/h or more), may occur less frequently, but they still waste significant amounts of water.

*Based on analysis of 17,361 leaks detected by Shayp in 2022.



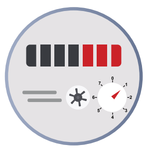


Why is this not addressed so far?

Common ways to monitor water consumption today

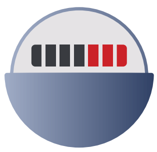
> ***"20% of the smart meters we had in use were no longer communicating without us knowing. We received a 6-figure water bill due to an unreported leak."***
>
> **City Energy Manager, South-West France.**

Analog readings:



- Requires **human reading**.
- Provides **monthly to weekly reads** that are difficult to draw conclusions with.
- Cannot be used to effectively detect existing leakages.
- Involves too much **uncertainty** to push towards an action.
- Spreadsheet reporting.

Digital meter readings:



- Mainly **designed for billing** purposes.
- Provides daily to 15 min reads.
- **Underestimate** up to 30 times less water loss.
- Highly subject to **false positives** leading to loss of trust and decline in actions.
- Too much **guesswork** for pre-programming alerts.

Towards water efficiency

Water efficiency means **responsible use of fresh water and minimising wastewater**.

The term usually refers to **water-saving strategies** and **technologies**. In a more practical sense, it is the process of measuring the amount of water needed for any particular purpose and ensuring that consumption is limited only to what is required.

The main idea is that **better technology can help us do more with less water without sacrificing convenience**. Better technology involves anything from fixing the existing infrastructure to using Artificial Intelligence to optimise water use.

How to determine water efficiency?

Water loss

Determined by leakages and system anomalies in buildings. It is addressed through leak and anomaly detection combined with reactive maintenance.
Example: repairing a leaky shower head.

Overconsumption

Determined by the default consumption of fixtures, appliances and systems in buildings. That is addressed with improved water efficiency standards for building systems, appliances and fixtures.
Example: introducing low-flow shower heads.

Behavioural usage

Determined by the occupants' habits and behaviour. It is typically addressed with better education of occupants.
Example: a visual timer on the shower head to encourage shorter shower time.

Payback period for water efficiency projects

Investing in **energy efficiency** measures for buildings typically comes with a long payback period, usually counted in years. For solar panels, that period is typically between **5 and 8 years**. For heat pumps, it is close to **10 years**, while a rooftop insulation payback period is **11-15 years** on average.

Unlike other energy efficiency projects, **water efficiency requires no new infrastructure or big interventions** and will pay off within months*.

*based on what Shayp customers report.

94% of Shayp's clients saw a payback period of less than 12 months, **and nearly all** saw it within 2 years.

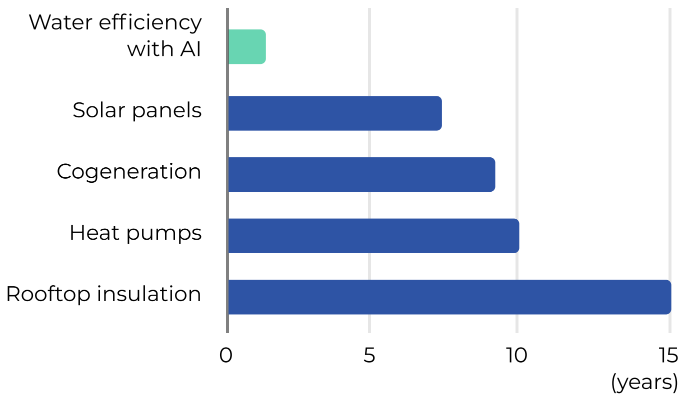


Figure 4: Average payback period for water vs. energy efficiency projects.

The investment needed to save 1m³ of water

How much does it really cost to save water?

Recognising that leakages could be a problem in buildings is the first step. Yet, once we understand this, we generally assume that repairs and maintenance costs are the next barriers to reducing water loss.

But is this true?

We have broken down the **average investment needed to save 1m³ of water** based on the following assumptions:

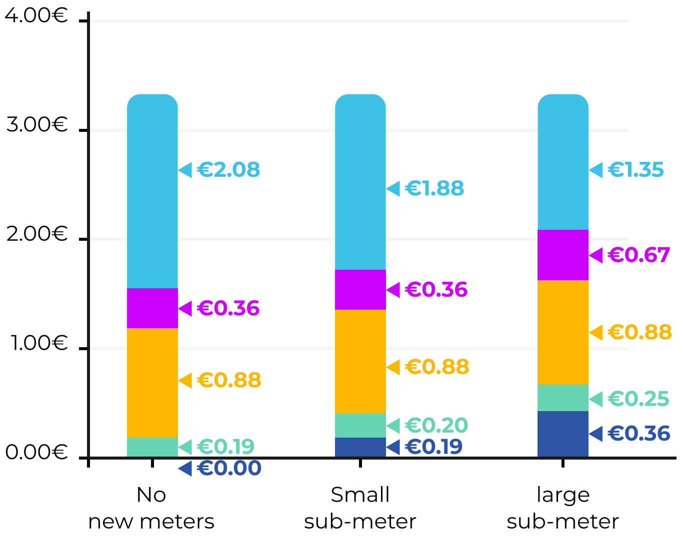
- Cost of 1m³ of water: **€3.5/m³**
- Average savings: **20%**
- Average Consumption per meter: **750m³/year**
- Buildings that leak: **34%** per year*
- Professional acoustic leak detection: required for **40%** of detected leakages
- Additional material investment: 15% of found leakages
- Investments made over 12 year period

BE: 5€/m³ UK: £3.5/m³ FR: 4€/m³ DE: 3.2€/m³ ... (Average water tariffs per country)

*based on Shayp data

Investment and benefit of saving 1m³ of water with AI technology*

Benefit per m³ of water · Metering · Datalogging · Software & Analytics · Search & repair



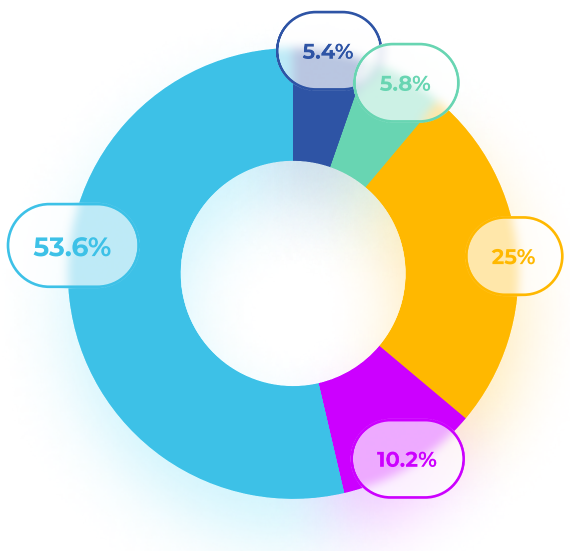


Figure 5: Investment and benefit of saving 1m³ of water with AI technology expressed in Euros*.

Figure 6: Investment and benefit of saving 1m³ of water with AI technology expressed in percentages*.

*Based on costs and benefit of saving water with Shayp.

The above figures show that Search and Repair are, on average, only a 10% additional investment, with significant benefits. To conclude, it is not the costs of repairing that should discourage any course of action. What truly costs the most is to allow leakage to happen.

Benchmarking water efficiency in buildings

New data-driven approach

Comparing **energy efficiency** between buildings typically means considering their **energy consumption per square metre**. However, the same logic does not apply when it comes to **water efficiency**.

> **Water use in buildings depends greatly on the number of occupants rather than the size of the building.**

Analysing water consumption in real-time and collecting data from a wide range of buildings across multiple countries, Shayp has seen **a strong correlation between the number of occupants and water consumption**.

Yet, simply comparing the water consumption over the number of occupants is not enough.

The **buildings can still be used differently**, even with the same function. For example, school A might be empty during the summer holidays, whereas school B hosts summer activities.

Because of that, **we introduce a correction factor: occupancy rate**.

Thanks to the algorithm, it is possible to **determine the ratio of occupants** in the building on any given day and hour. As a result, we get **a clear picture of water efficiency based on the actual water consumption**, excluding leakages from the calculation.

How does the above apply to building management?

Water Efficiency Remote Audit (WERA™)

Collecting and analysing the water consumption data allows **a new method for benchmarking water efficiency**. We named this the **Water Efficiency Remote Audit or WERA™**. The WERA method is **a way to assess which buildings perform better** than others solely based on the type of fixtures and the true behaviour of occupants.

The WERA™ method also helps to **identify the factors that increase efficiency**. It is possible to calculate the quick wins by simulating different scenarios. In other words, based on water consumption data, building managers can **identify the best solutions to invest in for a particular building**.

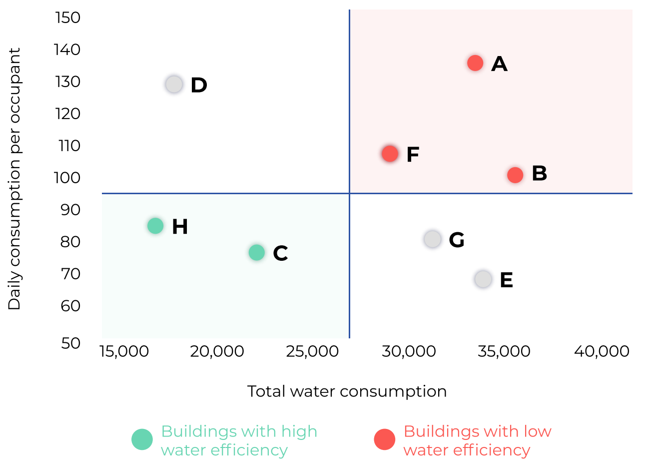


Figure 7: Comparing water efficiency in buildings based on daily consumption per occupant and total water consumption.

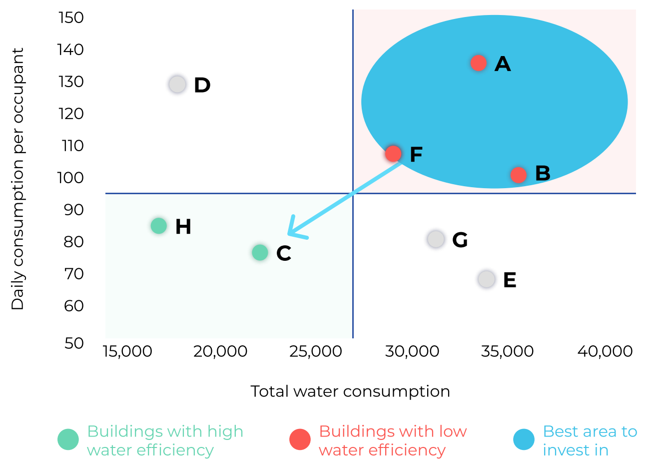


Figure 8: Best area to invest in water efficiency.

Figure 7 compares different buildings of the same type according to how water-efficient they are. The **X axis** is the **total water consumption** (excluding leaks). The **Y axis** shows the **daily amount of water used per occupant** with the correctional factor (occupancy rate).

The best area of improvement: buildings in quadrant 1.

Buildings in quadrant 1 have a high total water consumption and daily consumption per occupant (corrected using the WERA method). These are **the least water-efficient buildings**. Effectively, those are the buildings where **strategic changes can help save the most water**. Bringing down the daily consumption per occupant will consequently decrease the total water consumption of the building. **In such buildings, investment in water efficiency will have the most significant impact**.

The above is an example of what can be achieved remotely without an auditor visiting the building. The WERA method* helps to give a global and fast approach for auditing water consumption in buildings based on data rather than manual and on-site work.

*On-demand service available to Shayp customers.

Water efficiency in 2022 and beyond

The EU estimates that we could increase water efficiency by nearly **40%** through technological improvements alone. Changes in human behaviour and production patterns could further increase savings.

In particular, the public water supply sector, which includes households, the public sector, and small businesses, could achieve considerable savings.

About 50% of savings can come simply from reducing leakages in water supply networks, introducing water-saving devices, and using more efficient household appliances.

Water warnings and restrictions in 2022 due to extreme weather conditions have put water on the agenda for many. The EU policymakers are now recognising the importance of water management for climate change mitigation and adaptation.

Market trends

Key drivers towards water efficiency

Why act now?

What about the rising energy prices?

Since spring 2022, the world has seen record-breaking energy price increases. In the UK, the average direct debit default energy bill has increased by 54%. That means that **1 in 4 UK households are in fuel poverty**. The situation in the EU is not much different, with equally soaring prices and fuel shortages.

That is precisely the reason to focus on optimising water consumption.

Organisations, like schools and businesses, use over 24 million litres of water daily for electricity, gas, steam and air conditioning supply in the UK alone. Saving water in buildings is the key step to reducing energy consumption and, as a result, utility bills.

> **"Water efficiency is no longer an option but an essential step towards climate adaptation and mitigation. Water is the biggest investment we can make in our businesses and our future."**
>
> **Alexandre McCormack,**
> CEO & Co-Founder of Shayp

Thank you for reading!

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What is Shayp?

Shayp is a cloud-based AI using water meter data to reveal water usage inefficiencies in buildings. Detecting leakages and water consumption anomalies in real-time, we guide building operators to improve the situation. So far, we have saved over 6 billion litres of water in total, working with organisations, universities, and cities, such as Lidl, Ikea, and the City of Brussels.

www.shayp.com

Shayp in 2022:

5 billion
litres water saved

600,000+
leaks detected and repaired

700,000+
kg carbon emission avoided