

Austria's Water Treasure

Protecting and using our
groundwater sustainably



Imprint

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Preface

Austria is in a fortunate position, as it has sufficient high-quality water at its disposal. Groundwater is a particularly valuable resource in this respect. After all, the groundwater from its wells and springs meets the country's entire drinking water demand. Water is also indispensable for agriculture, industry and trade as well as tourism.

As climate change progresses, it influences the hydrological cycle. The rising number of dry periods and heat waves in recent years has already resulted in lower groundwater levels and gives us an idea of how our water resources may develop in future. Many people across Austria are concerned with questions such as "Will we have enough water in the future?", "How will it be distributed?", and "What can we do to contribute to its protection?".

For this reason, I felt it was important to offer a detailed overview of the current and potential future methods of water utilisation on the one hand and the available sustainable water resources on the other. Of course, strict ecological criteria apply. The comprehensive study "Austria's Water Treasure" serves as a guide for water management across Austria until 2050 in order to enable sustainable groundwater utilisation in the future, too. This brochure summarizes the essential findings of the study.

Austria's groundwater is a treasure we must protect. Only a mindful approach to managing our water resources and their sustainable utilisation will ensure that this treasure remains an excellent source of livelihood for future generations.

It's our water treasure – let's protect it together!

Norbert Totschnig
Federal Minister of Agriculture, Forestry,
Regions and Water Management



Federal Minister
Norbert Totschnig

Our water – a real treasure

Water is life: It shapes Austria's landscape, attracts visitors from all over the world, nourishes our soil and quenches our thirst.

All of these attributes make it a real treasure that must be protected for future generations. This brochure will show where to begin this mission.

There are many reasons why Austria should take a closer look at its water resources – especially its groundwater: Austria has abundant water resources, however, they are distributed unevenly and cannot be used in the same way everywhere. Some regions are already struggling to meet their current water demand. Therefore, it is important to know how much water is at our disposal and can be used.



The effects of climate change and socio-economic developments greatly impact the available water resources and our water requirements, too. Extensive planning is required to avoid potential supply shortages to the Austrian water management in the future. The “Austria’s Water Treasure” study has provided a valuable foundation and has paved the way for sustainable and foresighted use of our water in future.

Game-changing insights



By presenting the findings of the “Austria’s Water Treasure” study, the Federal Ministry of Agriculture, Regions and Tourism has published comprehensive data for the whole of Austria for the first time:

- Data regarding current and future available groundwater resources
- Data regarding various economic sectors’ current and future water demand
- Data regarding the intensity of current and future groundwater utilisation

These findings will be helpful in the decision-making process that aims to ensure suitable water management and the continued supply of drinking water of the highest standard in future. In addition, these findings also tremendously benefit agricultural production and Austria as a business location, because using this newly acquired knowledge means that we can already begin to counteract potential future shortages in water supply.

The climate change challenge

Dry periods, as in the years 2003, 2015 and 2018, and extreme weather events are occurring more frequently in Austria, too.

Longer heat waves, longer dry periods and more frequent rainstorms: The effects of climate change are increasingly affecting us here in Austria and this has not left our water treasure unscathed.

We cannot be certain as to how climate change will impact our water resources and demand. However, some of the instruments used in climate research do give us an idea of possible future developments: The dataset “ÖKS15 – Klimaszenarien für Österreich” (ÖKS 15 Climate Scenarios for Austria) is one of the scientifically approved instruments this study is based on. Using this data, a realistic fluctuation margin showing the possible future effects climate change might have on our water resources and demand was compiled.



How precipitation turns into available groundwater

Successful future water management requires comprehensive knowledge about our current and future groundwater resources. This can only be achieved by means of an in-depth analysis of its origin, i.e., the formation of groundwater, and the impact climate change has on this process. All of these influences were taken into consideration in this study.

Precipitation (e.g., rain, sleet or snow) is essential to groundwater formation: Based on the long-term average, precipitation amounts to roughly 100 billion m³ per year in Austria. However, only 27 percent percolates downward to become groundwater and contribute to groundwater formation. All other precipitation flows into streams and rivers above ground or evaporates.

The available groundwater resources are distributed unevenly across Austria.

The term “available groundwater resource” refers to the amount of the newly formed groundwater that can be utilized in the end. The process of calculating the available amount of groundwater adheres to the principle of sustainability. Which is to say that Austria generally only uses as much groundwater as the ecosystems that depend on it can spare. The findings reveal that we can use roughly 20 percent of our total newly formed groundwater resources sustainably. In this case, that means we have 5.1 billion m³ of available groundwater per year, which is 5% of total precipitation. Illustration 1 depicts this process.

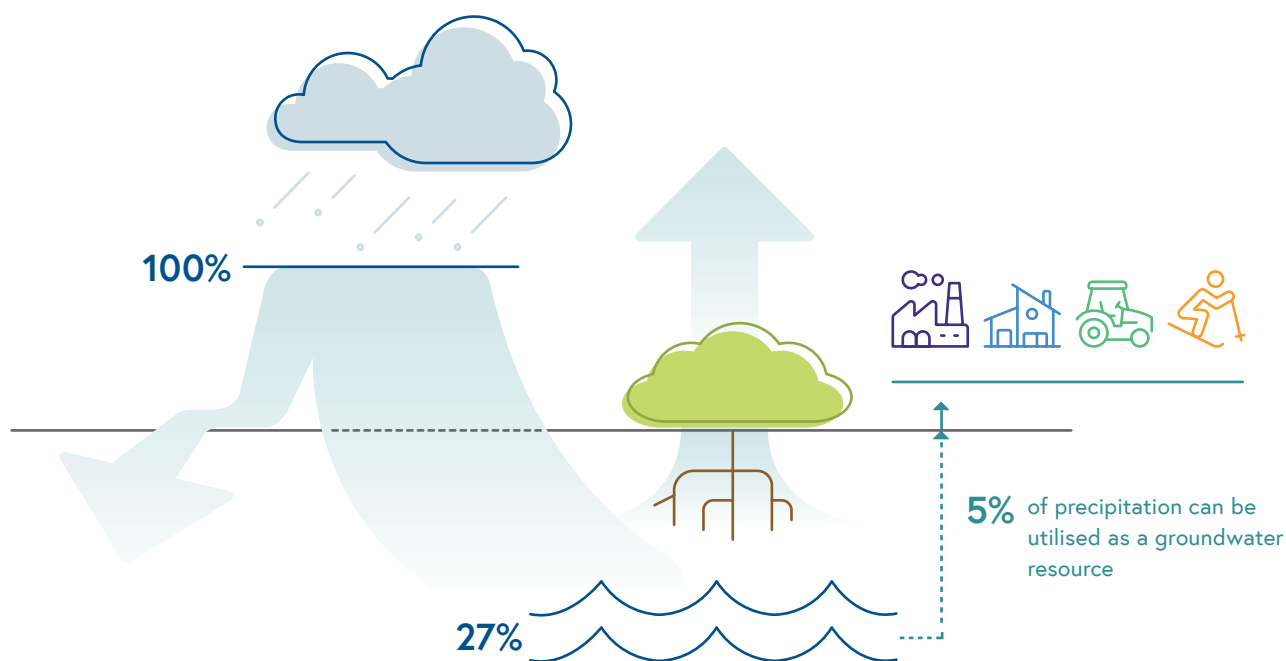


Illustration 1: Groundwater formation and available groundwater resources

The impact of climate change

The effects of climate change have a major impact on groundwater formation and, by extension, the amount that is available for use. This is because the amount of groundwater that can be replenished depends mainly on climate conditions. The climate scenarios used for this study show that the total amount of precipitation will shift throughout the seasons. This means that in future there will be more precipitation than before in winter and spring – but less in summer and autumn. In addition, rising temperatures will also lead to higher evaporation rates.



How much water will we have in future?

To get an idea of the future of Austria's water resources, we must ask ourselves: How are our available groundwater resources developing? The Water Treasure Scenarios offer an answer to this question.

There are two essential factors that determine the amount of water that will be available to us until 2050 and how much water we will need then: climate change and socio-economic changes. The effects of varying amounts of precipitation, changes in temperature as well as evaporation on Austria's water treasure were factored in when creating the aforementioned climate scenarios.



However, to get a comprehensive idea of the future, socio-economic developments, such as demographic change, the number of overnight stays in tourism, agriculture as well as technological advances must also be taken into consideration. This is why the study, whose purpose was to develop a sustainable groundwater management system, has identified two scenarios that account for these changes: the **Water Treasure Scenarios**.

In addition to climate change, social changes must also be considered.

In the light of these climatic and socio-economic developments – which vary greatly between different regions – the Water Treasure Scenarios also compare the amount of groundwater that will be available in future with our future expected groundwater demand. Drawing this comparison is very important. It reveals how much the groundwater utilisation intensity will change in Austria by 2050 and explains how we might prepare for our changing needs.

The findings propose two options for future groundwater utilisation intensity:

- The “favourable” Water Treasure Scenario is calculated based on the lowest utilisation intensity until 2050.
- The “unfavourable” Water Treasure Scenario is calculated based on the highest utilisation intensity until 2050.



The two Water Treasure Scenarios 2050 – “favourable” and “unfavourable”

Looking to the future with these changes and the Water Treasure Scenarios in mind, you get the following picture:

If the “favourable” Water Treasure Scenario occurs, available groundwater resources across Austria will not change much until 2050. Some regions in eastern Austria may however face a loss of up to 30 percent.

However, if the “unfavourable” Water Treasure Scenario occurs, by 2050, Austria’s sustainably available groundwater resources will have decreased by 23 percent compared to today. In this case, the annual amount of available groundwater would be 3.9 billion m³. In some regions, available groundwater resources may decrease by more than 30 percent. The decrease in available groundwater resources in western Austria will be worse than in the East.

Austria’s available groundwater resources could decrease by up to 23% by 2050.

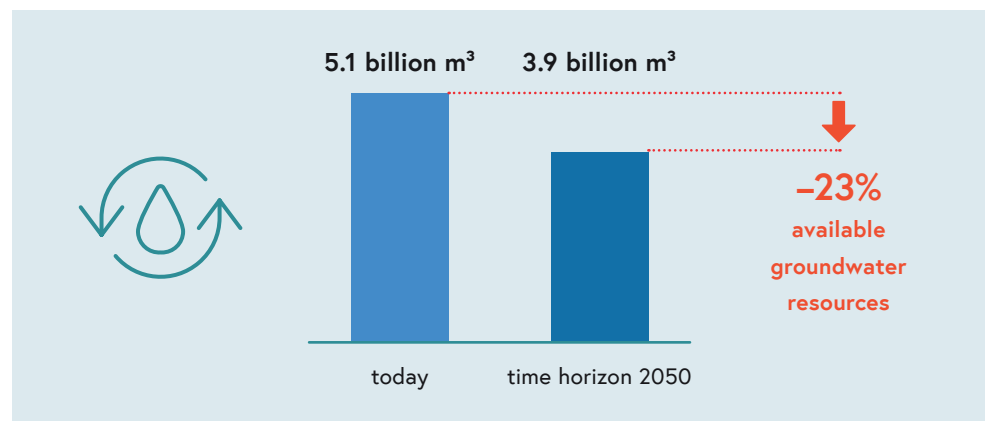
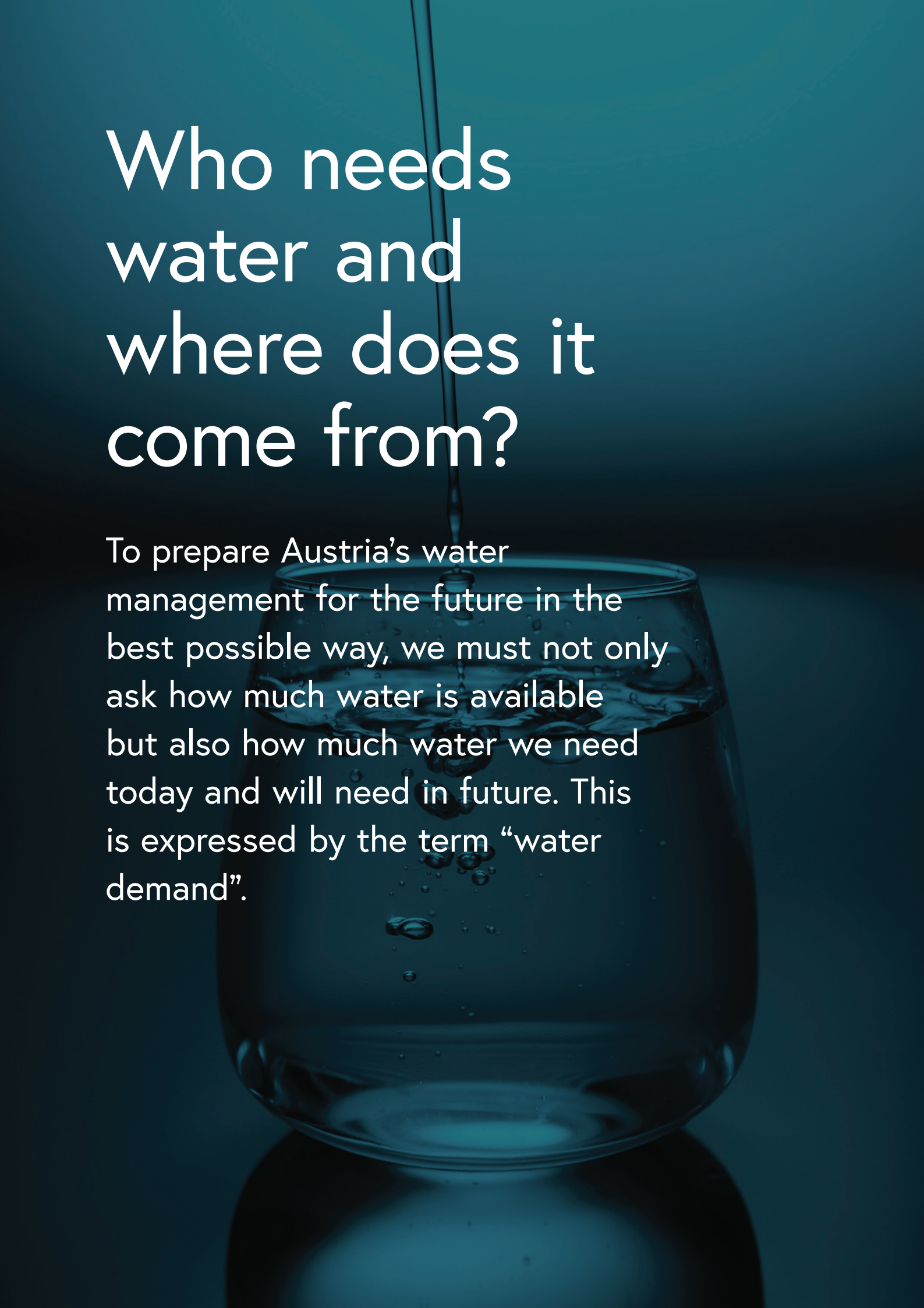


Illustration 2: Possible development of available groundwater resources (according to the “unfavourable” Water Treasure Scenario)

Challenging dry periods

The challenge: Regional dry periods combined with heat result in less groundwater and higher water demand.

Apart from the long-term tendencies which are already part of the Water Treasure Scenarios, the water management must also pay attention to short-term dimensions. These include dry periods. Climate change is causing more frequent and more intense periods without precipitation. This has a major impact on groundwater formation: Even today, in some years, groundwater formation has only amounted to half of the long-term average. Decreased groundwater availability due to long dry periods is already posing a challenge for Austria’s water management – especially in the East. In future this problem may spread and cause problematic groundwater crises in other regions, too.

A glass of water with a water droplet falling into it, set against a dark teal background. The glass is partially filled with water, and a single droplet is captured mid-fall, just above the surface, creating ripples and bubbles. The background is a solid, dark teal color.

Who needs water and where does it come from?

To prepare Austria's water management for the future in the best possible way, we must not only ask how much water is available but also how much water we need today and will need in future. This is expressed by the term "water demand".

How much water do we need overall?

Austria's water demand currently amounts to about 3.14 billion m³ per year. Industry and trade require the most water. Water supply services follow in second place. The sectors agriculture and selected services require the least amount of water on average in the whole of Austria.

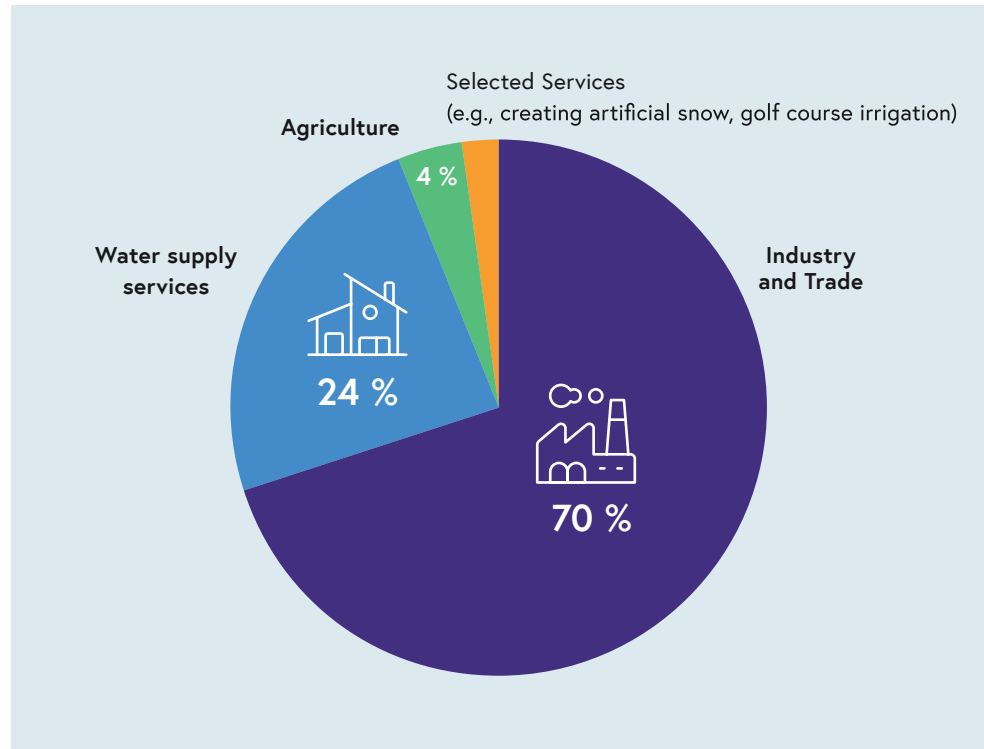


Illustration 3: Current water demand per sector.

However, water demand will not remain unchanged. The Water Treasure Scenarios 2050 suggest an increase in demand of between 5 and 7 percent. Our water demand would then amount to 3.33 billion m³.

Austria's annual water demand will increase by 5–7% by 2050.

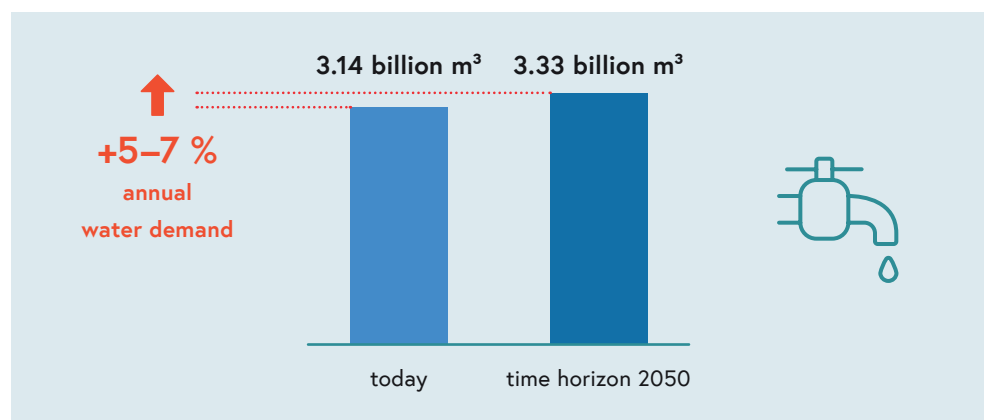


Illustration 4: Development of Austria's annual water demand.

Where does the water come from?

The project “Austria’s Water Treasure” is focused on groundwater, which is extracted from wells or springs. This valuable treasure, hidden away beneath us, is a vital component of our water management. 40 percent of our water demand is covered by our available groundwater resources. Looking at the distribution of water demand illustrated below, you will see: The majority of groundwater demand is covered by wells and a large part of it is used for water supply services. Industry and trade, agriculture and services use significantly less groundwater on average across Austria, however, there are some regions which require large amounts. The other 60 percent of our water demand is covered by surface water from rivers or lakes. The vast majority of it is used for cooling purposes in the industry and trade sector. Most of it is later fed back into the local hydrological cycle.

Groundwater is a hidden treasure – it lies underground and can be extracted from wells or springs.

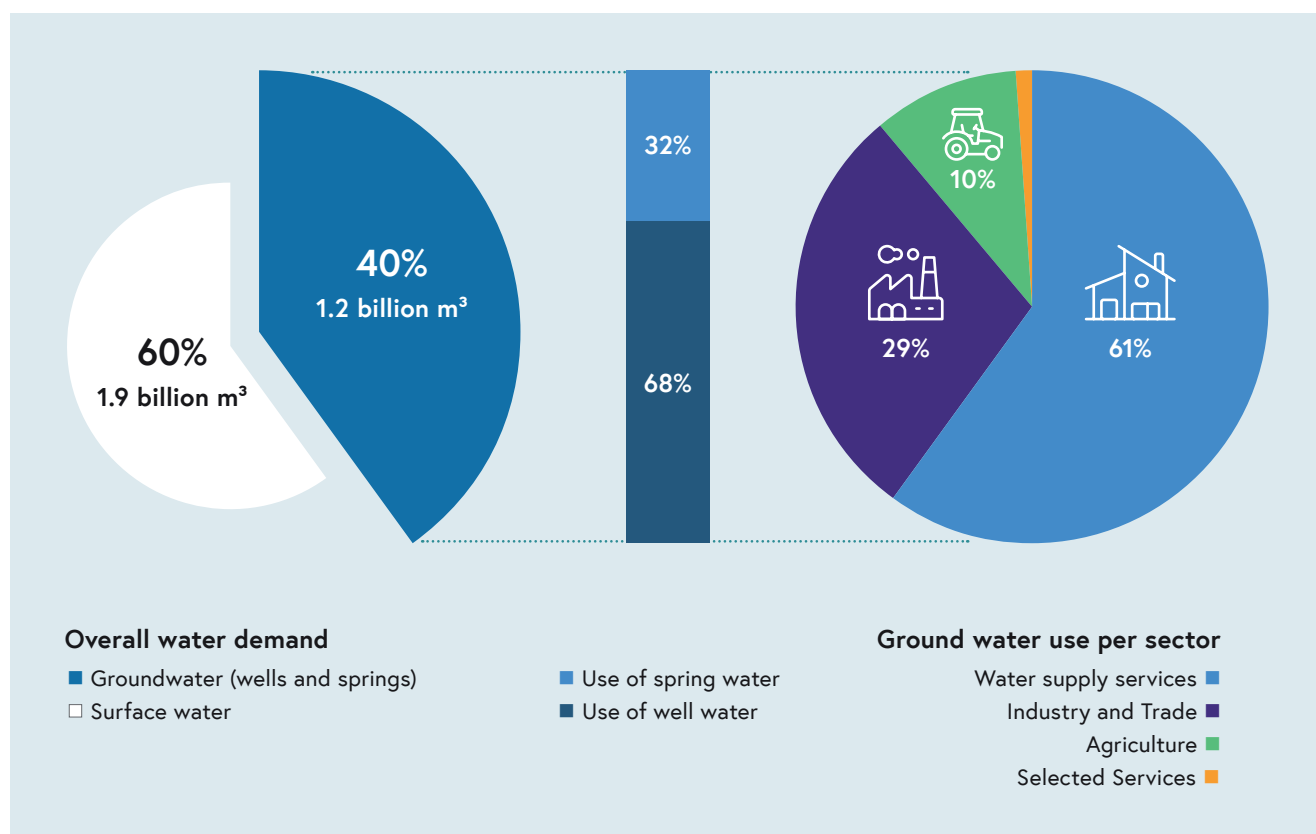


Illustration 5: Overall water demand (groundwater and surface water), Distribution of groundwater demand from wells and springs as well as according to economic sectors.

Illustration 6 shows how the different types of water resources are distributed among sectors. This reveals that the demand for water supply services is completely covered by water from wells and springs. In contrast, the sectors industry and trade, as well as services require large amounts of surface water.

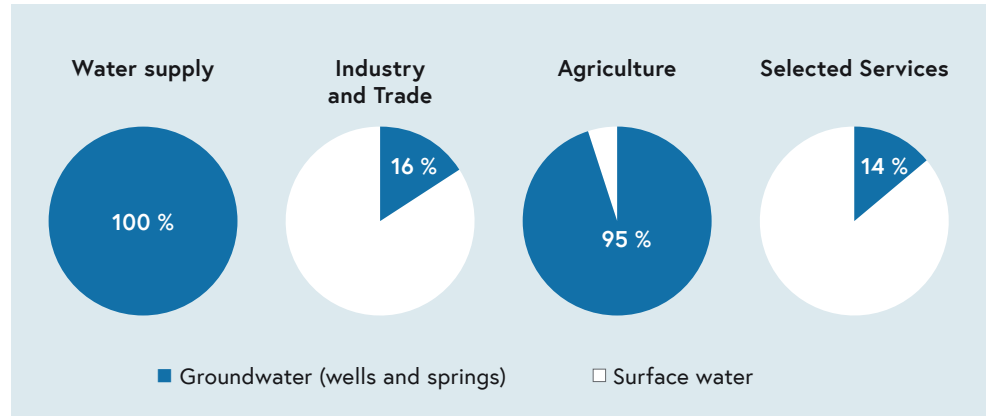


Illustration 6: Overall water demand and use of resources per economic sector.

The different sectors do not use groundwater in the same way in all parts of Austria. As displayed in illustration 7, regional differences can be discerned: In eastern Austria, for example, there is a high demand for groundwater in the agricultural sector. In individual regions across all federal provinces, a large amount of the available groundwater is used by the industry and trade sector.

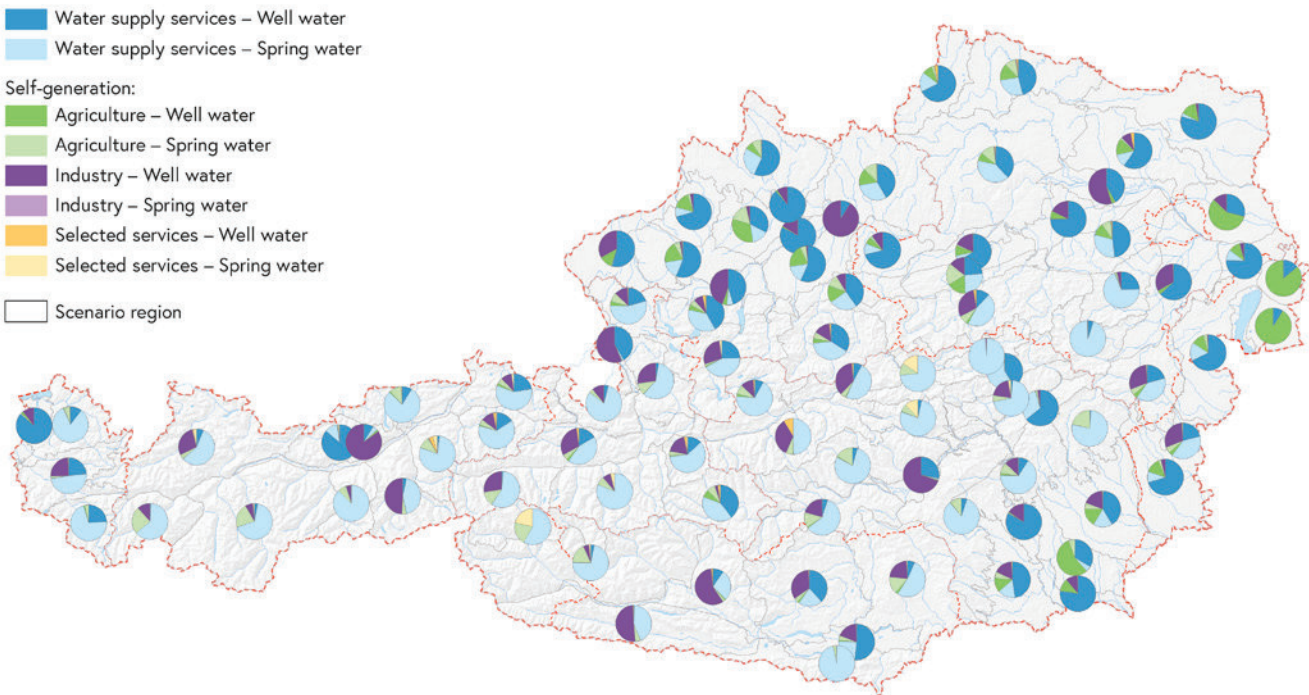


Illustration 7: Groundwater use per sector: current situation.

How much water does each sector need?

To be able to plan the future of our water in the best possible way, we need to take a closer look at individual sectors and their current and future water demand.



Water supply services

The term “water supply services” refers to all the water required for private housing and companies that are connected to the public water supply system. Currently, this sector’s water demand amounts to about 750 million m³. 55 percent of this is covered by well water, while 45 percent is spring water. The Water Treasure Scenarios estimate this demand will increase by 11 to 15 percent by 2050. This means that Austria’s water management must prepare for a future water demand as high as 830 to 850 million m³ for this sector. Individual municipalities might even face an increase of more than 50 percent. The main reason for the increase in water demand in this sector is population growth.

On average, households currently use around 126 litres of water per day per person.



Agriculture

Agriculture requires water for irrigation and animal husbandry. 69 million m³ of water are currently used for farmland irrigation per year. According to the Water Treasure Scenarios, an 80 percent increase can be expected. Animal husbandry currently requires 55 million m³ per year. This amount is expected to increase by 46 percent by 2050.

The Water Treasure Scenarios estimate an 11% decrease in farmland by 2050 and a simultaneous increase in water demand.



Industry and Trade

The industry and trade sector requires the largest amount of water in Austria: roughly 2,210 million m³. About 84 percent of that is surface water, 15 percent is extracted from wells and only 1 percent from springs.

The industry and trade sector’s water demand is expected to remain about the same until 2050.



Selected Services

How much water is needed for ski slopes and golf courses? While golf course irrigation currently only requires 4 million m³ of water, a lot more water is necessary for creating artificial snow: 48 million m³ of water are currently used for this purpose per year. 90 percent of this is currently covered by surface water and only 10 percent comes from groundwater. It is estimated that by 2050, the demand for this sector will increase by 35 percent.

Tyrol and Salzburg combined use about 32 million m³ of water for artificial snow.

Will we still
be able to
cover our
groundwater
demand in
future?

Groundwater utilisation intensity is an important indicator: It shows how much of our available groundwater resources we use. It is calculated by comparing the amount of water extracted from wells to the available groundwater resources.

Why is this indicator so important? It reveals whether Austria is using its available groundwater resources sustainably and will therefore be able to meet its groundwater demand in the long run.

How much groundwater do we currently use?

The current utilisation intensity of groundwater at regional level shows that, at present, water demand can be met by groundwater. Some regions in the northeast, east and southeast of Austria do have higher utilisation intensity rates, however, none of the regions exceeds the 100 percent mark (as shown in illustration 8).

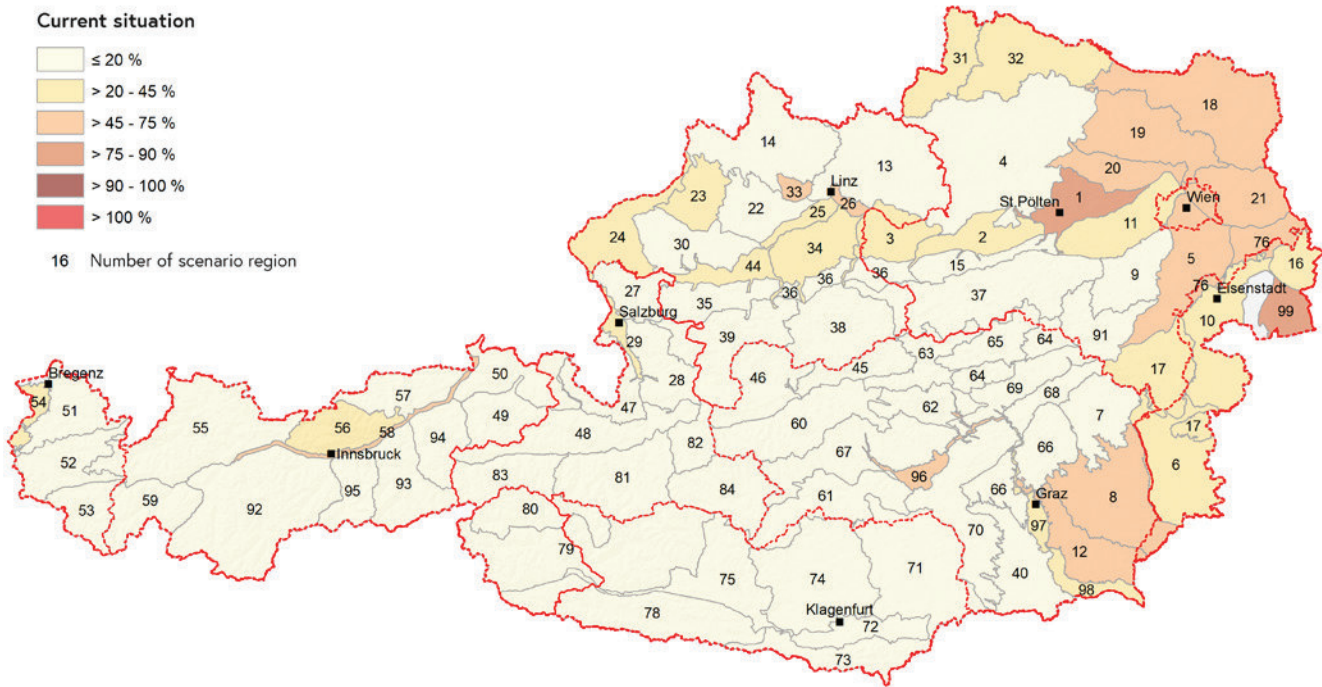


Illustration 8: Utilisation intensity of groundwater from wells: current situation. The numbers refer to the regions devised for this study. For more detailed descriptions and details regarding the borders between the regional division used in the scenarios, consult the study's executive report "Austria's Water Treasure".

How high will our groundwater demand be in future?

The “favourable” Water Treasure Scenario 2050 estimates that some regions’ utilisation intensity rates will rise. The number of regions whose percentage of well water use is above 75 will increase, too. However, none of the regions will exceed the 100 percent mark. Thus, in the event of this scenario, Austria will be able to meet its water demand in all regions until 2050. The map in illustration 9 displays each region’s specific utilisation intensities.

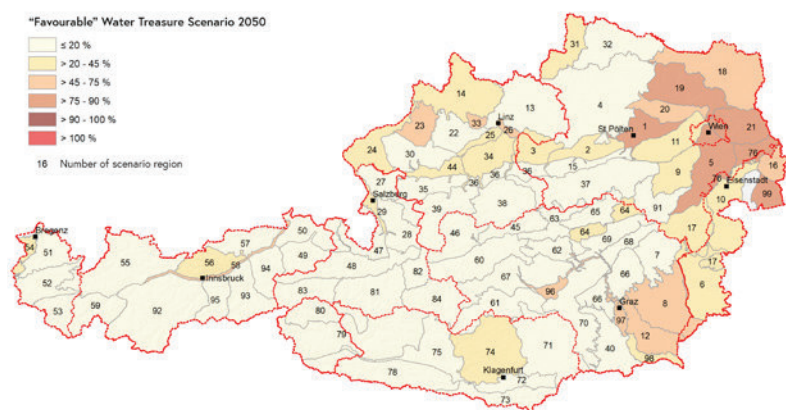


Illustration 9: Utilisation intensity of groundwater from wells: “favourable” Water Treasure Scenario 2050

In contrast, however, the “unfavourable” Water Treasure Scenario 2050 estimates that a number of regions will exceed the 100 percent mark. In this event, available groundwater resources would no longer meet the well water demand. This will affect regions in eastern Austria in particular. The affected regions are highlighted in illustration 10.

Should the “unfavourable” Water Treasure Scenario 2050 occur, some regions will not be able to meet their groundwater demand from wells.

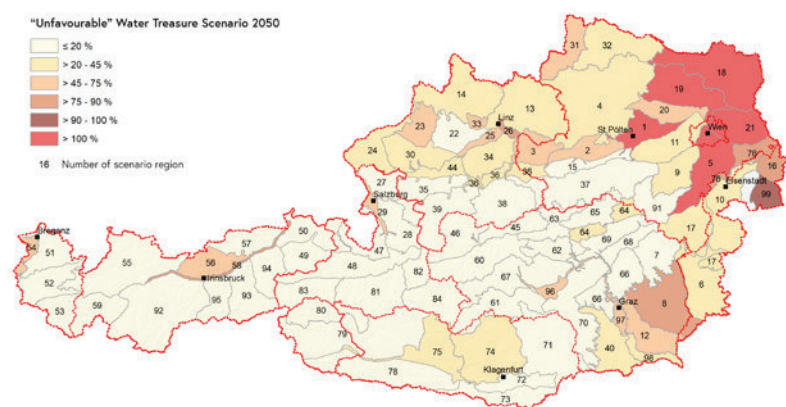


Illustration 10: Utilisation intensity of groundwater from wells: “unfavourable” Water Treasure Scenario 2050.

How can we protect our water treasure sustainably?

These findings provide the foundation necessary to plan the future of our water. These newly found results will be helpful to the decision-making process, so that Austria may have sufficient groundwater resources of the highest quality at its disposal in future, too.

The Water Treasure Scenarios have shown us that the future is not set in stone. We can influence it with our actions. Extensive planning is vital to the process of mastering the challenges climate change poses for Austria's water management.

The future of our water is in our hands, so we should already be developing the best solutions for tomorrow today.

The results of the "unfavourable" Water Treasure Scenario 2050, in particular, demonstrate the importance of the existing and future measures to protect the climate. The specific efforts that will need to be made to protect Austria's Water Treasure will need to be tailored to each region individually, given their vastly different developments. For this reason, the recommendations for action proposed below are very general.

Water demand

- Improve efficiency (e.g., of irrigation) by providing information and increasing the use of digital technologies for water demand control
- Reduce water demand by changing or adapting management approaches where possible



Water resources

- Foster groundwater formation, e.g. by unsealing the soils, as well as the water retention in the region
- Ensure drinking water supply by expanding supra-regional supply systems and creating fail safe infrastructures



Decision basis

- Improve available data on the current volumes of water withdrawal
- Check permitted volumes of water withdrawal and adjust if necessary
- Document dry periods and their effects
- Compile instruction manuals for dealing with water shortages based on previous experience with dry years
- Conduct further examinations on cooling water withdrawal and water temperatures



How the study “Austria’s Water Treasure” came about

Austria’s Water Treasure needs lots of people to look after it. For this reason, experts from a wide range of disciplines joined together and used their experience and knowledge to create a foundation for the successful future management of Austria’s water.

For more than two years, the project partners from the Environment Agency Austria, the University of Natural Resources and Life Sciences and the engineering company DI Holler have been cooperating to create this study, with the involvement from all nine Federal Provinces and representatives from all relevant interested bodies.

“By creating this study, we have fulfilled the long-standing wish for a comprehensive evaluation of current and future water demand and provided an integral reflection of resource utilisation. The results represent an important information advantage to meet future challenges head on.”

Dr. Roman Neunteufel
University of Natural Resources and
Life Sciences Vienna (BOKU)



“The ‘Water Treasure’ project has provided us with comprehensive knowledge of the amount of Austria’s water that can be used sustainably and its regional distribution. And for the first time there is also a preview of how these resources may develop as climate change progresses.”

Christian Holler
Ingenieurbüro für Kulturtechnik, Wasserwirtschaft, Natur- und
Landschaftsschutz
(engineering company for agricultural engineering, water
management, nature and landscape preservation)

“Water demand for farmland irrigation differs regionally and is much higher seasonally. That is already a big challenge in regions with low precipitation rates and solving this issue is essential to ensure adequate food supply is provided. Climate change will cause this demand to further increase by 2050.”

Helga Lindinger
Environment Agency Austria



“In Austria, the industrial sector requires the largest amount of water. The results show which regional groundwater supplies are already being used up to a great extent and what this water is used for. This important information is helpful in securing Austria’s position as a business location.”

Arnulf Schönbauer
Environment Agency Austria

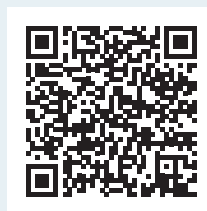
“I thank everyone who contributed to this impressively wide-ranging study. It clearly shows that Austria, too, despite its abundant water resources, is faced with challenges caused by climate change. It is the responsibility of us all to protect our water treasure sustainably by using it carefully.”

Head of Directorate General Günter Liebel
Federal Ministry Republic of Austria –
Agriculture, Forestry, Regions and Water Management



Download the overall results of the study here
(only available in German):

**„Wasserschatz Österreichs –
Grundlagen für nachhaltige Nutzungen
des Grundwassers“**



The Federal Ministry of Agriculture, Forestry, Regions and Water Management’s website provides up-to-date information and important advice regarding more careful water usage:

www.wasseraktiv.at

