Every Drop Counts—Pathways to Restore Germany's Water Balance

Study Summary

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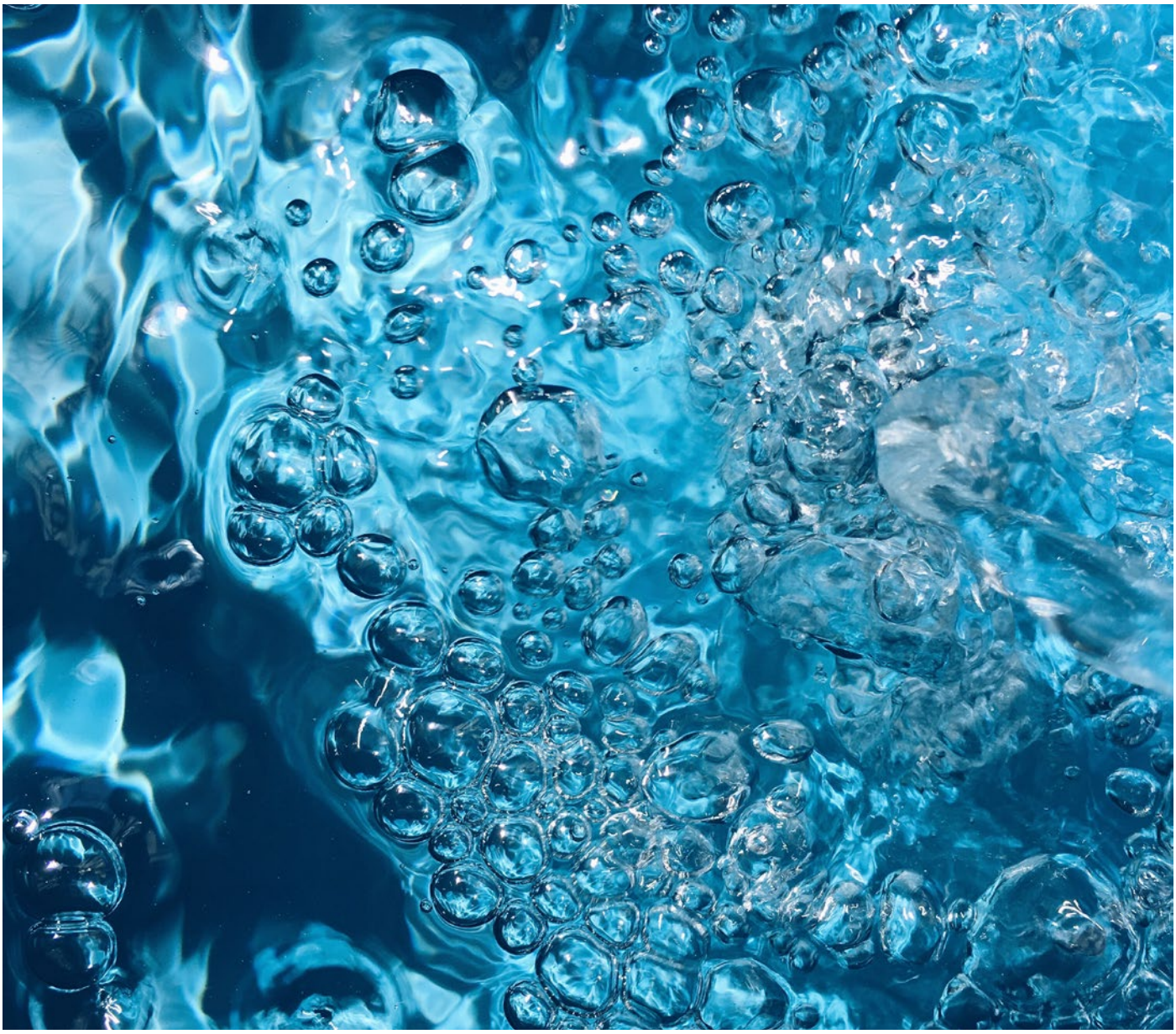
Founded in 1899, **NABU** (**Nature And Biodiversity Conservation Union**) is one of the oldest and largest environmental associations in Germany. The association encompasses about 960,000 members and sponsors. NABU's most important tasks are the preservation of habitat and biodiversity, the sustainability of agriculture, forestry and water management, and last but not least, climate protection. The communication of nature experiences and the promotion of natural history knowledge are among NABU's central concerns. About 70,000 volunteers play an active role in practical nature conservation work, with great success: this is something that is unique to NABU. These active NABU members look after more than 110,000 hectares of valuable protected reserves in Germany. NABU also has volunteer groups working on an international level to conserve nature and combat poverty in Africa, Eurasia, and the Caucasus. This work is supported by professionals at our regional offices and at our national headquarters in Berlin, who take care of public relations, project development and management, and political lobbying. NABU is part of BirdLife International.



Key Takeaways

Germany is losing more water than it restores —and climate change as well as changing land use patterns are accelerating the gap. Nature-based solutions that rethink retention and regenerate land can rebuild resilience. Here's what it takes.

1 Restoring natural storage and recharge capacity is important for long-term stability; efficiency measures alone cannot close Germany's growing water storage deficit.

2 Recognizing which parts of the water cycle we can directly control, the priority is to reduce runoff by managing the surface and topsoil layers in the context of our land use.

3 Vegetation cover and regenerative land use increase infiltration, reduce runoff, and reactivate the small water cycles that cool landscapes and rebuild the water balance.

4 The cost of inaction amounts to at least €20-25 billion annually or cumulatively €500-625 billion by 2050. A significant portion of these costs can be reduced through decisive investments, that fundamentally strengthen Germany's water availability.

5 Regenerative Agriculture, Forest Management, and Dynamic Drainage can add roughly 7–7.5 billion m^3 of water annually, closing the storage gap more effectively and cost efficiently than technical measures.

Have you ever thought about the amount of water available to us? Water seems abundant: it covers about two-thirds of the Earth's surface, and we tend to assume there is always enough of it. But only 2.5% of the planet's water is freshwater—and less than 1% of that is directly available for human use. What looks plentiful from afar is, in reality, a very limited resource that sustains all societies, economies, and ecosystems.

"The entire share of usable freshwater available to all people on Earth would form a sphere small enough to fit over Luxembourg."

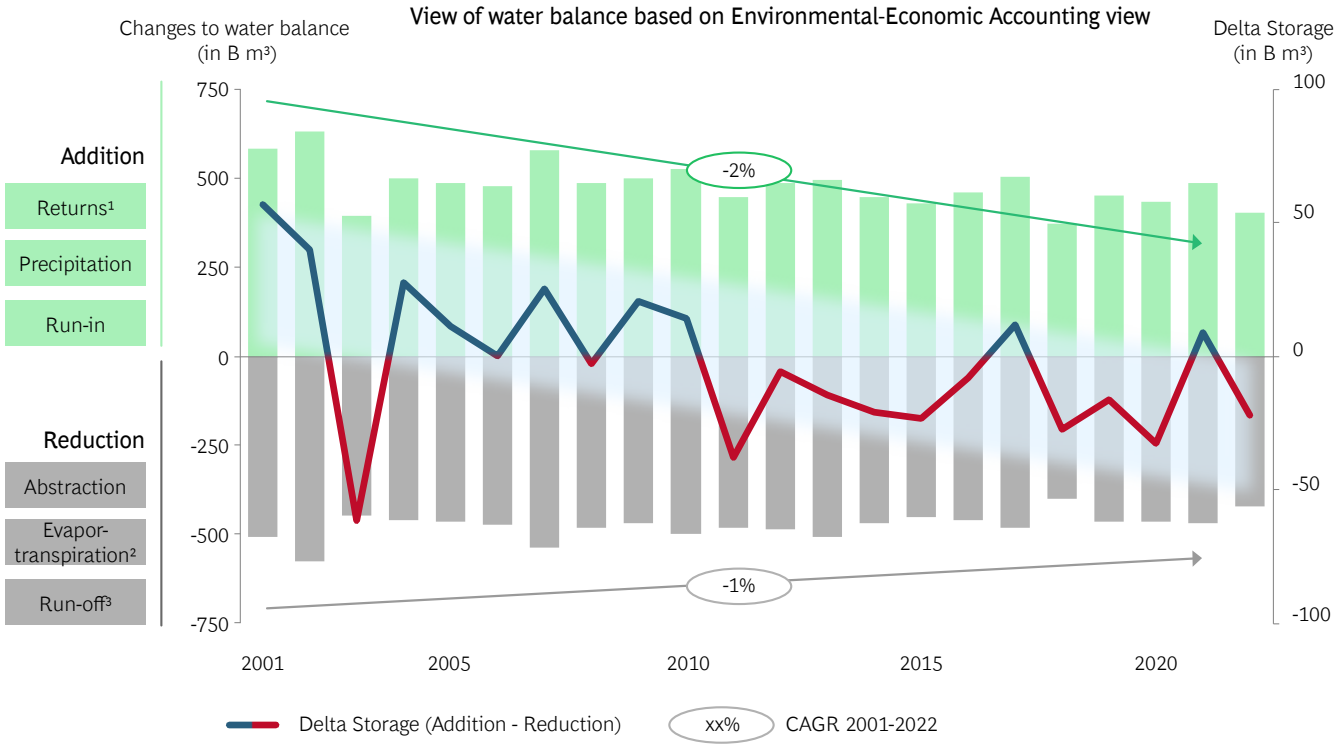
Our research shows just how misleading the perception of abundance can be. Even in countries long considered water-rich, such as Germany, natural water storage has declined over the past two decades—roughly by the volume of Lake Constance. Shifting rainfall, depleted soils and forests, and rising runoff are weakening the small water cycles that once kept landscapes cool, moist, and resilient. As a result, droughts and local water shortages are becoming more common, and the economic cost of inaction could reach at least €20–25 billion annually by mid-century.

Managing water proactively is thus important both from an ecological as well as from an economic perspective - depending on coordinated action across sectors. In our study, we explore the drivers behind Germany's emerging water shortages and outline the solutions that can expand water availability, rebuild resilience, and ultimately turn the tide.

Germany's biggest challenge is water quantity, and it comes at a cost

Germany faces water challenges across quantity, quality, and accessibility, yet the most urgent and consequential is water quantity. While wastewater discharge and intensive agricultural and industrial practices continue to degrade water quality—and aging infrastructure makes accessibility increasingly uneven—the clearest sign of systemic stress is the steady decline in water availability. Land use and land use changes, including a declining number of near-nature forests, soil sealing, and unsustainable land management practices have disrupted the small water cycles that once kept landscapes cool, moist, and fertile, turning water scarcity into a systemic land- and ecosystem challenge. At the same time, less predictable rainfall, drier summers, more frequent droughts and floods, groundwater depletion, higher evapotranspiration, rising agricultural water demand, and increasing runoff further intensify pressure on natural water availability. Together, these drivers have caused Germany to lose around 60 billion m³ of stored water over the past two decades—about the volume of Lake Constance—as landscapes absorb and retain less rainfall than before. (See Figure 1.)

Figure 1: Germany's biggest challenge is quantity: water storage is steadily depleting



1. Includes returns to domestic water resources (surface water, groundwater, soil water)

2. Excludes transpiration of soil water by agriculturally cultivated crops, as this is already accounted for under abstraction from the environment

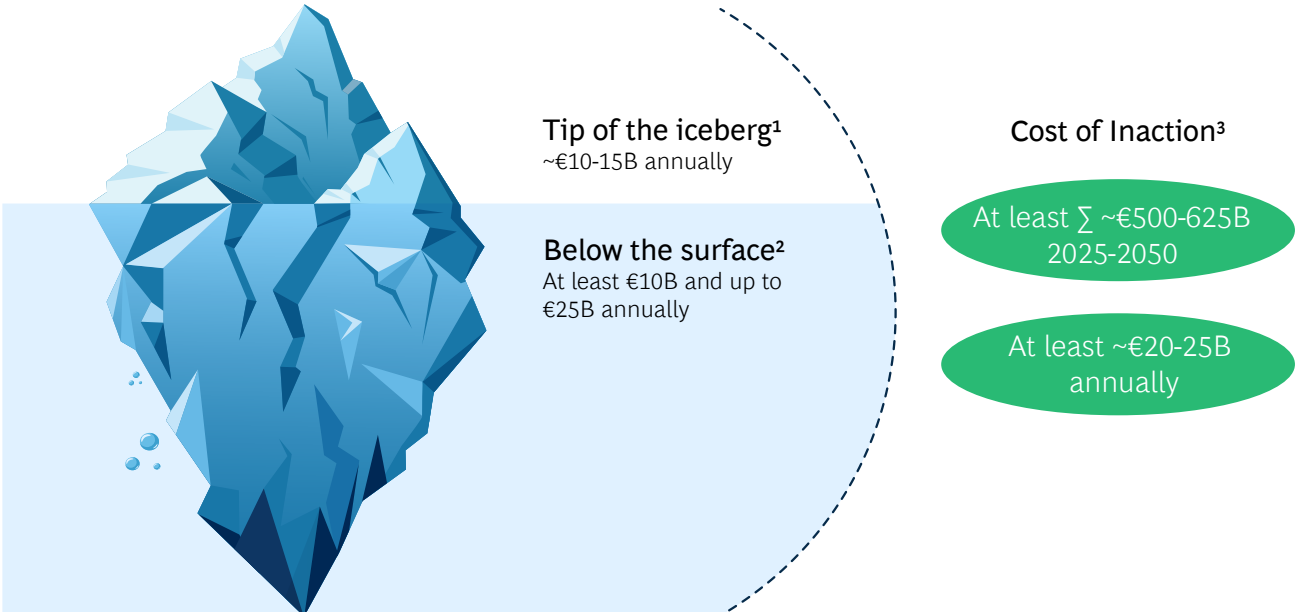
3. Includes runoff abroad and into the sea

Source: Destatis, BCG & NABU analysis

This long-term decline reflects a structural imbalance in Germany's hydrology: Germany is losing more water than its systems can naturally restore. If unaddressed, the consequences will be far-reaching. Visible costs—from more severe drought impacts, flood damage, and water-quality incidents that form self-reinforcing feedback loops—already amount to billions each year. Yet the chronic, less visible costs are even more significant: declining groundwater reserves, weakened small water cycles, shifting climatic and hydrological patterns, and growing competition between users quietly deepen water stress and accumulate substantial societal and economic burdens over time.

Taken together, these visible and hidden pressures result in a cost of inaction of at least €20–25 billion annually, or cumulatively at least €500–625 billion by 2050. Quantity is therefore not just the biggest challenge—it is the defining determinant of Germany's long-term water security. (See Figure 2.)

Figure 2: Water-related events could cause annual losses of at least ~ €20-25B or cumulatively ~ €500-625B by 2050, if no action is taken



1. Based on BCG & NABU meta-analysis

2. Extrapolation of Brandenburg estimates to all of Germany in a more optimistic and more extreme scenario, based on the following assumptions: a) Inter-sectoral spillover factor applied to Brandenburg's aggregated Cost of Inaction to avoid overestimation, b) Brandenburg's 2050 water stress (optimistic scenario) is ~ 4× higher than the German average, hence only 25% of Brandenburg's Cost of Inaction considered, c) Adjustment of Brandenburg's Cost of Inaction for per capita and areal factors, and d) Accounting for overlaps with the "tip of the iceberg" cost estimates

3. Combined estimate adding "tip of the iceberg" estimate with an optimistic "below the surface" estimate, while recognizing that the latter could increase when applying more extreme assumptions and when including overlaps with "tip of the iceberg" cost estimates

Note: Values shown on this slide are rounded and provided as ranges

Source: BCG & NABU analysis

Controlling the controllables: managing water runoff via surface cover

While many parts of the water cycle—such as large-scale weather patterns or deep groundwater flows—lie beyond our influence, the surface and topsoil layers are fully controllable. They are shaped directly by land use, cover, and management, immediately determining what happens when rainfall meets the ground: whether water infiltrates, evaporates, or runs off. Because these layers govern both retention and recharge, they represent the largest actionable part of Germany's water balance—and therefore the strongest lever to counter declining water storage. (See Figure 3.)

Figure 3: While deep waterflows and precipitation are hard to change, surface and topsoil offer management opportunities

Ecosystem layer	Degree of controllability[1]
Atmosphere	We **cannot control the atmosphere locally**; we can **influence** its **composition & behavior** via our collective global actions
Clouds	**Cloud formation can be influenced indirectly** via landcover or experimentally via cloud seeding (high costs, ethical & political concerns)
Water body	**Marginally controllable** via the amount of water extracted for use across different sectors (e.g., households, industry)
Surface	**We can control the surface** via our coverage choices and thus influence all ecosystem layers
Topsoil	**Our land use and management choices influence the topsoil structure** and thus how much water can infiltrate
Parent material/bedrock	We **cannot control** or change the composition or structure of parent material/bedrock easily
Aquifer	We **cannot control** groundwater deposits easily - we are able to extract & pollute them, but replenishment is difficult

Degree of controllability: Low High

1. Refers to the degree of local controllability — for example, the atmosphere can only be influenced globally, whereas cloud formation can be influenced locally

Source: BCG & NABU analysis

When surfaces are permeable and biologically active, far more rainfall infiltrates instead of being lost as rapid runoff. Healthy soils draw water deeper into the ground, supporting groundwater and even deep-aquifer recharge. In forests, mixed and deciduous stands intercept less rainfall, especially during winter, than dense coniferous canopies, allowing more precipitation to reach the soil where it can soak in rather than evaporate or drain away. These mechanisms directly strengthen long-term water availability.

Regenerative Agriculture, Forest Management, and other nature-based practices unlock this potential at scale. They rebuild soil structure, increase vegetation cover, and enhance the landscape's natural hydraulic function. The result is a system that not only stores more water but releases it more slowly, buffers extreme weather, and reactivates the small water cycles—the process by which continental rainfall evaporates from land and vegetation, condenses in the atmosphere and is recycled back to local grounds as precipitation—that cool and stabilize local climates. By prioritizing the parts of the system we can control, Germany can meaningfully shift the trajectory of its water balance.

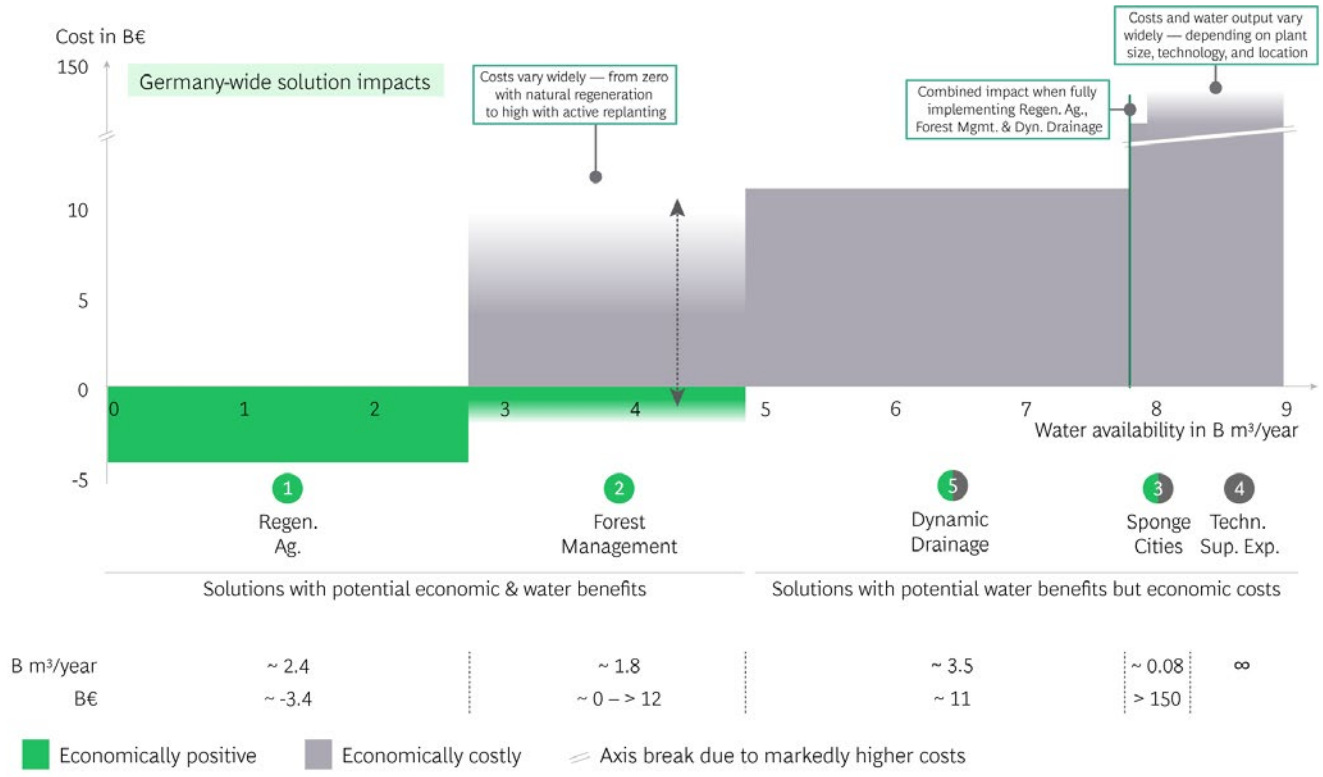
Nature-based water solutions offer the highest return

To understand how Germany can rebuild water resilience, we evaluated a broad set of nature-based, mixed, and technological solutions. Two complementary pathways emerge: Expansion and Optimization. Expansion increases the amount of water that landscapes can retain and make available through measures such as Regenerative Agricul-

ture, Forest Management, Dynamic Drainage (i.e., adaptive management of water at the landscape level to ensure reliable availability amid more unpredictable cycles of water excess and scarcity), Other Landscape-Level Methods, Sponge Cities, and Technical Supply Expansion (e.g., desalination or inter-basin transfer). Optimization focuses on using existing water more intelligently and more circularly—for example through Gray Water Reuse and Water Use Optimization across agriculture, industry, and households.

Our analysis shows that nature-based and mixed solutions—in particular Regenerative Agriculture, Forest Management, and Dynamic Drainage—have the highest combined impact, adding about 7–7.5 billion m³ of water annually—enough to close Germany's water-storage gap over time. (See Figure 4.). Their effectiveness comes from how they reshape land systems: Regenerative Agriculture rebuilds soil organic matter and strengthens the soil carbon sponge; Forest Management focuses on diversifying forests that reduce canopy interception, slow runoff, and promote deeper infiltration; and Dynamic Drainage retains water longer in agricultural soils, shifting landscapes from drainage to retention.

Figure 4: Germany could gain ~ 7.7B m³ water—exceeding 2022 public water extraction—via Regen. Ag., Dynamic Drainage and Forest Mgmt.



Note: Other Landscape-Level Methods are excluded from the visual, given their impact cannot be meaningfully represented via a single quantitative range. Water Use Optimization and Gray Water Reuse are not shown either, since the visual includes only measures that expand overall water availability — the two solutions improve efficiency, but do not add new water

Source: BCG & NABU analysis

Technological solutions such as desalination or reuse technologies can complement these measures, but they are typically more capital-intensive and less regenerative. Nature-based solutions, by contrast, deliver multiple benefits simultaneously—stabilizing microclimates, enhancing biodiversity, improving soil health, and reducing long-term infrastructure burdens. For Germany, these three interventions represent the most effective and scalable pathway to restore water availability nationwide.

Local measures to increase water resilience merit re-valuation and proper financing

However, achieving this transformation requires a fundamental shift in how water resilience is financed, governed, and valued. Unlike energy or infrastructure, water has rarely been treated as an attractive investment area: Costs occur locally, and benefits are diffuse and often only come with a significant time gap in the longer term. This creates a structural funding dilemma—those best positioned to restore water availability, such as farmers and forest owners, often lack incentives and access to capital, while those most dependent on reliable water supply, including industry and utilities, have limited abilities to invest in measures on privately owned land to increase water retention and storage. As a result, public funding instruments and private initiatives often operate in parallel rather than in a coordinated manner, limiting their effectiveness and preventing investments from being directed where water availability is influenced and water resilience is built. To overcome the current imbalance, two aspects are key: a clear understanding of where effective leverage lies and the ability to treat water as a strategic resource.

> "Reframing water as a shared system of interdependence—rather than an isolated input or private commodity—opens new pathways for action."

The local aspect of water management and resilience is a big advantage for taking action. While much of the climate debate is driven by global drivers such as GHG emissions and CO_2 content in the world's atmosphere—where impact depends on collective international action as individual influence is vastly limited—this study shows that water resilience can be built decisively through local action. How we manage landscapes, soil, and vegetation directly shapes small water cycles, determining infiltration, retention, groundwater recharge, and ultimately water availability. Much of what is needed is actionable now. The priority will be to act promptly to deliver tangible resilience and economic benefits.

Recognizing this leverage calls for changes to financial and policy mechanisms that reflect water's true economic and ecological value and focus efforts on what can be influenced directly. Redirecting existing infrastructure funds toward water resilience, harmonizing pricing and incentive systems, and aligning public support schemes with private investment can ensure that those who restore water availability and those who depend on it act in concert rather than in parallel. Building on this, innovative instruments—such as water or nature credits that reward measurable improvements in retention, recharge, and quality—can help share costs, pool capital and mobilize investment at a scale. Crucially, these mechanisms allow action and capital to flow to where water availability is shaped most directly: at the surface.

Ultimately, building a resilient water future requires a cross-sector implementation ecosystem. Public institutions play a key role in setting clear frameworks and financing structures; businesses can integrate water stewardship into operations; farmers and foresters are central to restoring the land's hydrological functions and small water cycles; and financial institutions can help channel capital into the natural and hybrid systems that underpin long-term stability. Only through this shared responsibility can water security become the foundation of Germany's climate adaptation, ecological renewal, and economic resilience.

This content was jointly developed by BCG and NABU.

For more information and access to the full version of the study please see: https://www.bcg.com/publications/2026/every-drop-counts-pathways-to-restore-germanys-water-balance

or scan the QR code:

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