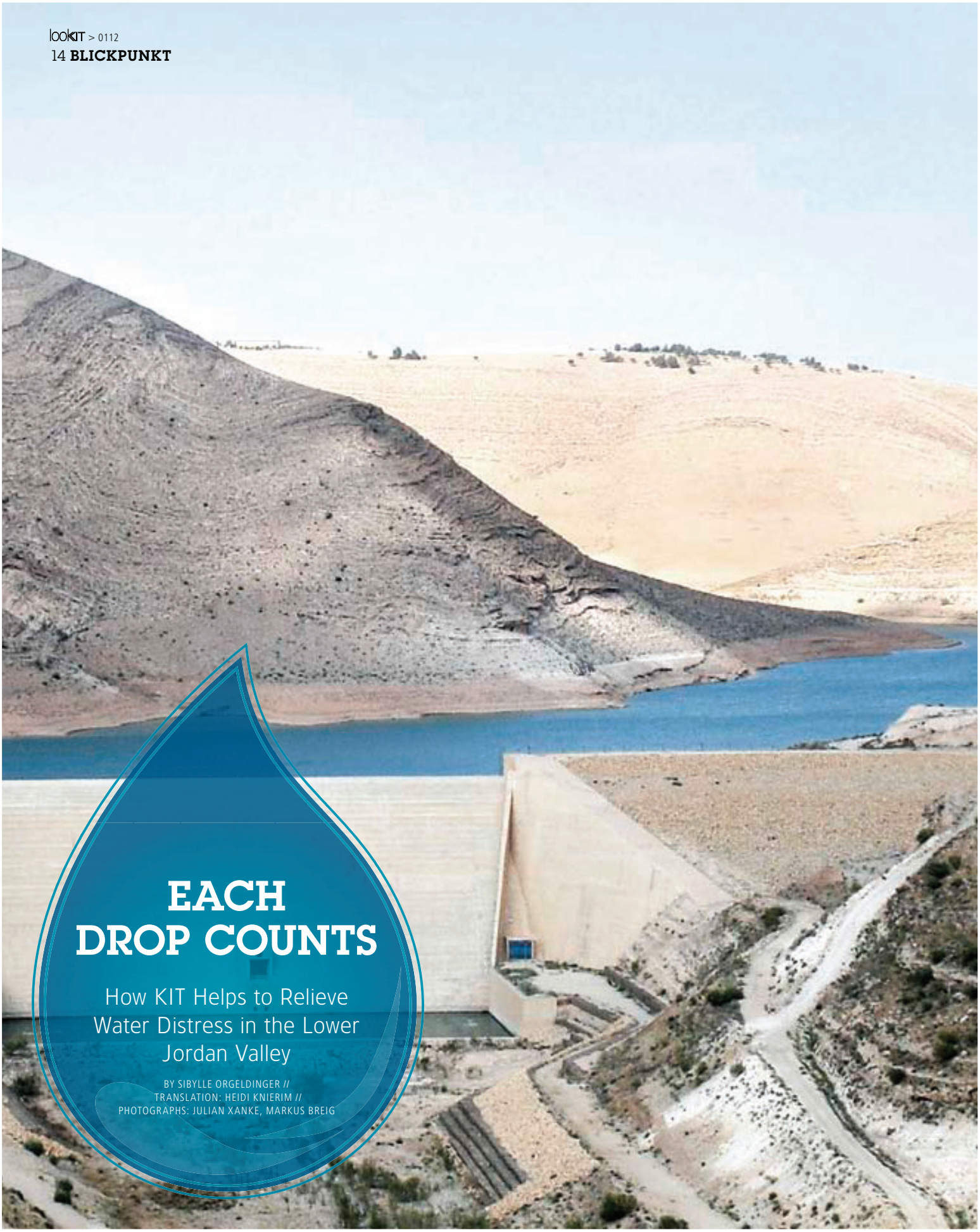

EACH DROP COUNTS

How KIT Helps to Relieve Water Distress in the Lower Jordan Valley

BY SIBYLLE ORGELDINGER //
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PHOTOGRAPHS: JULIAN XANKE, MARKUS BREIG

In der Klimakammer des Instituts für Angewandte Geowissenschaften beobachten die Forscher, wie Schadstoffe sich im Wasser ausbreiten

In the climate chamber of the Institute of Applied Geosciences, the team observes how pollutants spread in the water

In the Lower Jordan Valley between Lake Kinneret and the Dead Sea, arid climate dominates: Whereas annual precipitation amounts to only 50 to 150 mm, the potential annual evaporation is as high as 2600 mm. Water is extremely scarce. Large sections of the population in the lower Jordan Valley and the riparian areas of Israel, Jordan, and Palestinian territories make their living from agriculture. It is imperative for that region that additional freshwater sources be made accessible. "This can only be ensured through a concept integrating all available water resources, which means not only groundwater but also floodwater, desalinated brackish water, and treated sewage water," explains Nico Goldscheider, Professor of Hydrogeology at KIT's Institute of Applied Geosciences (AGW). Goldscheider's department is in charge of SMART, a project where researchers from Israel, Jordan, Palestine, and Germany work out a concept for Integrated Water Resources Management (IWRM) in the catchment area of the Lower Jordan Valley. At KIT, IWRM is an important topic with several successful projects.

SMART is not only characterized by international collaborations across political boundaries but also by a fruitful interdisciplinary cooperation between different institutions: Together with representatives from ministries, public authorities, industrial companies, and water distribution companies, engineers and natural scientists from universities and research institutions develop innovative solutions to sustainably increase water supply and water quality in the Lower Jordan Valley. The KIT participates and contributes through the Division of Hydrogeology at AGW, the Division for Water Chemistry at the Engler-Bunte Institute (EBI), the Sanitary Environmental Engineering Division at the Institute for Water and River Basin Management (IWG), and the Institute of Photogrammetry and Remote Sensing (IPF). Technologiezentrum Wasser (TZW) is another Karlsruhe institution taking part in SMART.

SMART stands for "Sustainable Management of Available Water Resources with Innovative Technologies." The project started in 2006 under the coordination of Heinz Hötzl, Professor of Hydrology at KIT. For his contributions in advancing SMART, Hötzl was awarded the Federal Cross of Merit, first class, in 2008. Today, Dr. Jochen Klinger from KIT's Chair of Hydrology acts as operative project coordinator. Within the current, second project stage, the researchers start implementing their findings in the Lower Jordan Valley by transferring valuable knowledge to the region's water users. In February, Nico Goldscheider and his team offered a two-day workshop on groundwater protection and tracing techniques at Al-Balqa University in Jordan; more than 40 persons participated.

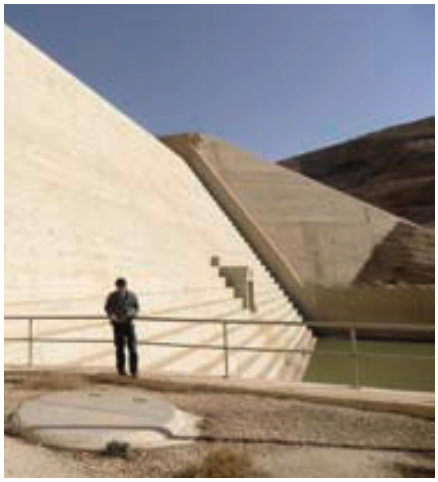
Within SMART, several graduate theses are being prepared for the Chair of Hydrogeology. Geoecologist Moritz Zemann, for example, investigates how the quality of groundwater in the Lower Jordan Valley can be assessed and protected. Sewage water, which is used for agricultural irrigation because of the extreme water shortage, seeps into the groundwater. In the AGW climate chamber, Zemann can observe at a temperature of 30 degrees Celsius and a relative air humidity of 40 percent how pollutants, such as drug residues, spread in water and accumulate. Zemann conducts sewage water containing different pollutants through columns representing different soil types.

The doctoral thesis that is being prepared by Felix Grimmeisen deals with the protection of the Hazzir Spring that supplies drinking water to the 80,000 inhabitants of the Jordanian town of As Salt, which is located in its catchment area. Due to leaks in the sewage conduits, the water from the spring is polluted with high concentrations of nitrates and bacteria. The Hazzir Spring is part of a karst system and reacts quickly to precipitation. In times without precipitation, the spring shows discharge and pollutant content variations on some days of the week. This reflects the activities of the inhabitants. Ph.D. student Paulina Alfaro is developing a networked model of Wadi Shueib, a tributary valley of the Jordan Valley that begins near As Salt and reaches down to the Jordan Rift.

A numerical model of water storage, infiltration, and abstraction in the aquifer below the Wala Dam in Jordan is developed in a doctoral thesis by geologist Julian Xanke. The floodwater collected by the Wala Dam during winter percolates naturally

Am Wala-Damm wird ein Messgerät ausgelesen

Two researchers reading out data from a measurement device at Wala Dam



Geologe Julian Xanke schreibt seine Dissertation über Wasserspeicher

Geologist Julian Xanke writes his doctoral thesis about water storage systems

from the barrier lake through rock into the ground. In addition, groundwater is being enriched through injection wells that are connected to the barrier lake via a pipeline. The water thus stored in water-permeable rock formations is protected from evaporation and is available as drinking water to the capital of Amman. Problems are caused by sedimentation that reduces the storage capacity of the barrier lake and by the turbidity and microbial pollution of the groundwater during the rainy season. Xanke uses special devices to measure conductivity, temperature, water level, and turbidity and examines how these depend on phenomena such as precipitation or the overflowing of the lake. Xanke's model is intended to help develop measures and scenarios that contribute to improving utilization of the barrier lake.

Brackish-water desalination is an important option for supplying drinking water and water for agricultural use. Brackish groundwater or spring water contains less salt than seawater and, thus, requires less energy to desalinate. Besides, such water sources are found upcountry where they are actually needed. The EBI Division for Water Chemistry at KIT studies technologies for brackish water desalination. The Helmholtz Center for Environmental Research (UFZ) in Leipzig also participates in SMART. There, the researchers are developing a network of decentralized small-scale sewage treatment plants for improvement of the water quality in the Lower Jordan Valley. Göttingen University is another important German project partner. ■

Sauberes Wasser für das Jordantal

KIT koordiniert das Großprojekt SMART

Im unteren Jordantal zwischen dem See Genezareth und dem Toten Meer herrscht extreme Wasserknappheit. Die Region ist dringend darauf angewiesen, dass zusätzliche Süßwasserressourcen erschlossen werden. „Gelingen kann dies nur mit einem Konzept, das alle verfügbaren Wasservorkommen einbezieht: nicht nur das Grundwasser, sondern auch Flutwässer, entsalztes Brackwasser und aufbereitetes Abwasser", erklärt Nico Goldscheider, Professor für Hydrogeologie am Institut für Angewandte Geowissenschaften (AGW) des KIT.

Goldscheiders Lehrstuhl koordiniert federführend das vom Bundesforschungsministerium geförderte Projekt SMART, in dem israelische, jordanische, palästinensische und deutsche Forscher ein Konzept für ein sogenanntes Integriertes Wasserressourcen-Management (IWRM) im unteren Jordantal erarbeiten. SMART steht für „Sustainable Management of Available Water Resources with Innovative Technologies". Im Rahmen von SMART laufen am Lehrstuhl mehrere Dissertationen, unter anderem zum Schutz von Trinkwasserquellen und zur unterirdischen Wasserspeicherung in Grundwasserleitern.