

DⁱK^{arst}TAS

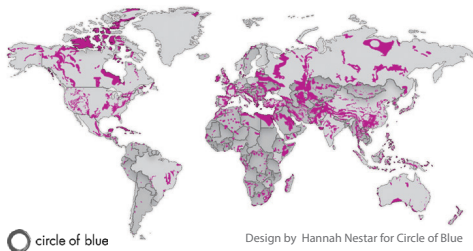
Protection and Sustainable Use of the
DINARIC KARST AQUIFER SYSTEM



the context

► What is Karst?

Karst is a special type of geologic environment that is formed by dissolution and corrosion of soluble rocks, such as limestone and dolomite. Karst hydrogeology is characterized by high fracture controlled permeability, almost total absence of surface water, high infiltration rates and rapid underground flows of groundwater.



Karst aquifers are widespread globally, from Central America to East Asia and the Mediterranean Region, with more than 25% of the world's population obtaining its water resources from these aquifers.

► Where is the project area located?

The project focuses on one of the world's largest karst aquifer systems, located in the Dinaric mountain range, which spreads from Friuli (NE Italy) through Slovenia, Croatia, Bosnia & Herzegovina, and Montenegro to Albania. Karst formations connected with the Dinaric chain outcrop also in Serbia, FYR Macedonia, and possibly NW Greece.





► Which are the key characteristics of the project area?

The DIKTAS project area contains some of the world's largest and most prolific karst aquifers, several of which are shared among two or more countries, with several first magnitude karstic springs and caves spread throughout the region.

The dominant flow of the huge groundwater resources contained in the karst aquifer system is towards the Adriatic Sea; the eastern extension of the karstic chain drains to the Sava river basin. The gradient is steep, over 1%, broken in a stepwise fashion by a series of karstic depressions descending from well over 1,000 m of altitude, down to 100-200 m above sea level, creating a very favorable environment for hydropower generation. Groundwater eventually enters the coastal area through few rivers (Neretva, Cetina, Trebisnjica, and others) and more importantly through strong submarine groundwater flows that characterize the coastal areas of Istria and Dalmatia in Croatia. The total amount of groundwater entering the coastal environment is not known, but certainly it is very large: it is estimated that karstic groundwater is the largest source of freshwater entering the Adriatic Sea.

► What is important for the economy, the environment and the communities in the DIKTAS project area?

Agriculture, industry, electricity production and tourism along the Adriatic coast are important economic sectors depending on karstic water. Moreover, karst aquifer management is a significant tool against flooding, a frequent case in the region, among others due to climate conditions.

The project area hosts a pristine natural environment and uniquely variable landscapes. The karst waters support rich biodiversity with many endemic karst underground species. In Croatia alone, karst ecosystems host 3,500 flora, 12 amphibian and 36 reptile species, along with 200 species of endemic birds, 79 of mammals and 64 species of freshwater fish.

Drinking water supply heavily depends on groundwater, from up to 70% in Albania to 90% in Montenegro and Bosnia & Herzegovina. Capital cities Podgorica, Sarajevo and Tirana use karst groundwater.

► What threatens the Dinaric Karst Aquifer System?

The unsustainable use of the karst water resources threatens the Dinaric Karst Aquifer System and the services it provides. Due to high permeability and limited self-purification, the system is highly vulnerable to pollution from inappropriate disposal of solid waste, untreated wastewater, agricultural and industrial activities.



the project

► The identity

The DIKTAS Project (2010 - 2015) is a collaborative effort to facilitate the equitable, sustainable management of the Dinaric Karst Aquifer System's transboundary water resources, and protect the unique dependent ecosystems from natural and man-made hazards including climate change. It was initiated by the aquifer-sharing states, Albania, Bosnia & Herzegovina, Croatia, and Montenegro, with the support of the Global Environment Facility (GEF). It is funded by GEF with substantial co-financing by the participating countries and other partners.

The DIKTAS project improved knowledge of karst aquifers in the area and coordination among countries, agencies and other stakeholders. Being the first major project globally to address transboundary karst aquifers, it has been used as an opportunity for introducing new, integrated management principles in shared karst aquifers of such magnitude. It managed to attract the international community's attention on the widespread, yet vulnerable and poorly understood karst aquifers.

► The partners

DIKTAS is a GEF regional project, implemented by the United Nations Development Programme (UNDP) and executed by the International Hydrological Programme of the UN Educational, Scientific and Cultural Organization (UNESCO IHP). The core DIKTAS project partners are the Dinaric Region's four fund-recipient countries: Albania, Bosnia & Herzegovina, Croatia and Montenegro. Non-fund recipient countries participating in the project are Italy, Slovenia, Greece, and France.

The GEF is an independent financial organization uniting 183 countries with international institutions, civil society organizations and private sector. Since 1991, it has provided countries with funds to support activities related to biodiversity, climate change, international waters, land degradation, chemicals and waste, in the context of development projects and programs. <http://www.thegef.org/>

The UNDP is active in 170 countries and territories, helping them to develop policies, leadership skills, partnering abilities, institutional capabilities, and build resilience in order to sustain development results. <http://www.eurasia.undp.org/>

UNESCO contributes to the building of peace, the eradication of poverty, and sustainable development and intercultural dialogue through education, the sciences, culture, communication and information. UNESCO IHP devoted to water research and water resources management, focuses on policy advice, education and capacity building for sustainable development. <http://www.unesco.org/new/en/natural-sciences/environment/water/ihp/>



► The structure

The partner countries have been guiding the project implementation through the Steering Committee. The Project Coordination Unit based in Trebinje, Bosnia & Herzegovina, has been responsible for day-to-day implementation. The DIKTAS Project Team is composed of national and international experts in hydrogeology, environment, social sciences and policies. National experts make up four National Execution Units -one in each of the partner countries- led by the National Focal Points. The Regional Consultation and Information Exchange Body facilitates the dialogue between the National Inter-Ministerial Committees composed of partner countries' high level representatives involved in water resources and land use planning, in order to advance project management and consultation structures. The Science Advisory Panel, comprised of selected scientists from within and outside the region, has held meetings upon request of the Project Coordination Unit to provide advice to other bodies.

► The process

The DIKTAS Project followed a methodology common to GEF projects, based on conducting a Transboundary Diagnostic Analysis (TDA) and preparing a Strategic Action Programme (SAP).

The TDA, a substantial scientific and technical assessment, was used to enhance the understanding of the groundwater resources' environmental status, in order to identify, quantify, and set priorities for the transboundary environmental concerns, as well as identify their root causes as means to specify practices and locations from which environmental degradation derives.

Building upon the TDA factual basis, a Strategic Action Programme embodying specific policy, legal, institutional or investment actions will be nationally adopted within a harmonized multi-country context. Actions included in the SAP will address the top priority transboundary concerns to restore or protect the transboundary water resources and ecosystems. Adopted and implemented by partner countries at the highest government level, the SAP aims to provide a regional vision for the sustainable management of the Dinaric Karst Aquifer System and propose the means to achieve this.

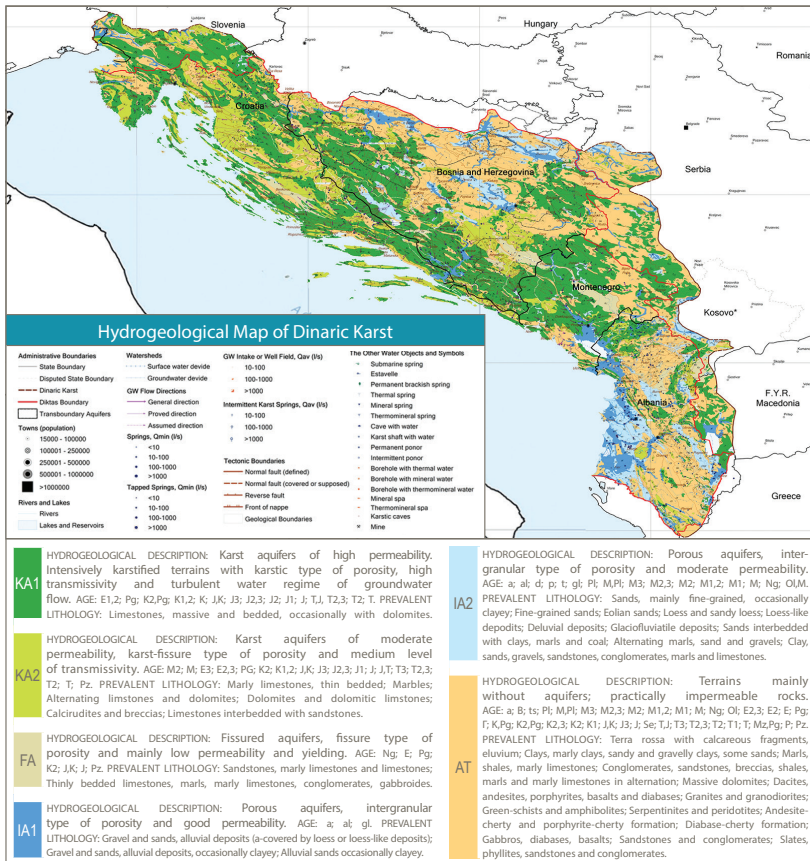




the results

► Scientific knowledge for the Dinaric Karst Aquifer System was enhanced and harmonized.

A large amount of data and information was collected through the TDA to analyze and assess the Karst groundwater management status and framework. This process focused on the hydrogeological characterization, the environmental and socio-economic assessment, the assessment of legal and institutional frameworks and policies, and the stakeholder analysis. The TDA covered Albania, Montenegro, Bosnia & Herzegovina and Croatia, assessing and harmonizing hydrogeological data, as well as data on natural and anthropogenic conditions. The knowledge produced can be used by partner countries to take informed decisions about the karst aquifer management. Experts updated the existing GIS databases for all partner countries with the features included in the DIKTAS hydrogeological map.



► The main transboundary challenges and their root causes were identified.

An in-depth analysis of eight selected Transboundary Aquifers allowed the identification of the most important transboundary issues of concern along with their causes. A Root Cause Analysis was used to identify, and later, address the core of the problems; not just their “symptoms”.



The main findings of the TDA

The main challenges in groundwater management include cross-sectoral coordination, lack of implementation of IWRM principles in groundwater governance, as well as lack of public administration capacity and public participation in decision-making procedures. The inappropriate disposal of solid waste and wastewater was recognized as the most important threat to groundwater. Karst groundwater pollution is also owed to agricultural and industrial activities. Infrastructure for hydropower production, a significant part of energy production in all DIKTAS countries, has negative impacts. The lack of financial means, the unregulated market economy and the weak environmental values have an overall negative impact on the management of the karst water resources. Due to lack of monitoring at local and regional level there is limited assessment of the status quo and future trends with regards to karst groundwater quality and quantity.

► Discrepancies in laws and policies of partner countries were identified to enable collective action to address the identified issues.

The Project assisted partner countries to create the conditions to apply common principles and work towards an agreement on the implementation of common measures at transboundary level. A SWOT analysis was performed to map the strengths, weaknesses, opportunities and threats the karst management is currently faced with, by collecting information on the legal, institutional and policy setting in the region. Common approaches and principles as well as areas of concern shared among partner countries were identified, along with contradicting national strategies and gaps in national legislations that may have an adverse effect on decision making related to the water resources management framework.

► The widest possible consensus among stakeholders was secured and awareness was raised, to facilitate a behavioral change regarding karst management, as the basis for sustainable results.

The stakeholder engagement activities, based on the DIKTAS Stakeholders & Public Participation Strategy, succeeded to raise awareness among stakeholders about the value of the water resources and the need to manage these in a sustainable way. Moreover it facilitated the long-term commitment of aquifer sharing countries to sustaining the Project results through the strengthened sense of ownership by politicians, decision makers, users and other stakeholders.

A Stakeholder Analysis was used to identify the characteristics and understand the opinions and perceptions of the stakeholders regarding the management of the water resources. A number of stakeholder groups including water management competent ministries, regional authorities, research institutions, tourism organizations, NGOs working on nature and ecosystems, as well as private sector industries and hydropower units, were consulted for the preparation of the TDA and the SAP through focus group meetings, roundtables and internet based tools.



► **Coordinated action was initiated at both the national and transboundary levels.**

The National Inter-Ministerial Committees allowed the engagement and contribution of all related sectors in each partner country, for the identification of the priority issues and solutions under the five Water Resources and Ecosystem Quality Objectives included in the SAP. This ensured cross-sectoral work at national level, including the sectors of water resources, land use planning, forestry, finance and energy.

The Regional Consultation and Information Exchange Body, composed of partner countries' senior government officials is the first step to their systematic commitment to transboundary cooperation, as it forms the key technical-political interface of the Project discussing, commenting and approving the project outputs, such the TDA and the SAP. Regional management actions for reaching each objective include measures regarding policy and legislation, monitoring and data management, training and awareness-raising, as well as investments.



TDA approval and SAP endorsement process

National Inter-ministerial Committee
ALBANIA

National Inter-ministerial Committee
BOSNIA & HERZEGOVINA

National Inter-ministerial Committee
CROATIA

National Inter-ministerial Committee
MONTENEGRO

**REGIONAL
CONSULTATION
&
INFORMATION
EXCHANGE BODY**

Commitment to
Water Resources &
Ecosystem Quality Objectives,
Environmental Status Indicators
and their long-term monitoring



The five Water Resources & Ecosystem Quality Objectives identified by the SAP:

Ensure sufficient groundwater availability in dry periods, to support water supply and environmental flow.

Maintain and improve (where required) karst groundwater quality.

Ensure protection of Groundwater Dependent Ecosystems, specific features and their ecosystem services for the future.

Support equitable use of groundwater resources.

Raise awareness and build capacities related to karst water and dependent ecosystems management.

Suggested priority actions include:

The establishment of a common groundwater monitoring program followed by intense capacity building in the public sector.

The harmonization of criteria for the delineation of source protection zones, aimed at a harmonized policy/regulatory framework.

The establishment of a legal framework in transboundary sanitary protection zones.

► A Shared Vision for the management of the karst water resources is proposed:

To achieve joint sustainable and equitable use and protection of the Dinaric Karst Aquifer System.

This is the outcome of consultations among countries and stakeholders. Upon adoption of the SAP by the aquifer sharing countries, it will guide action in the years to come.







International Groundwater Resources Assessment Centre



Global Water Partnership
Mediterranean



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AUTHORITY

To find out more information about the DIKTAS Project and contact us,
please visit our website: <http://diktas.iwlearn.org>

