DIKTAS

PROJECT

Implementation of the Strategic Action Plan of the Dinaric Karst Aquifer System:
Improving groundwatergovernance and sustainability of related ecosystems

(DIKTAS - SAP)

UNDP · gef · United Nations Educational, Scientific and Cultural Organization · International Hydrological Programme

1. Dinaric Karst Region

Protection and sustainable use of the Dinaric Karst Transboundary Aquifer System (DIKTAS) is a regional project aimed at improving the management of karst groundwaters in the Dinaric Karst shared by Albania, Bosnia & Herzegovina, Croatia and Montenegro. The project is the first ever attempt to globally introduce integrated management principles in a transboundary karst freshwater aquifer system of such magnitude. The project performed a TDA in 2011 – 2014, which resulted in the adaption of a Strategic Action Program (SAP) by the countries. It is currently preparing the implementation of Strategic Actions over a 5-year period with the aim of improving regional groundwater governance and sustainability of related ecosystems.

2. Frameworks

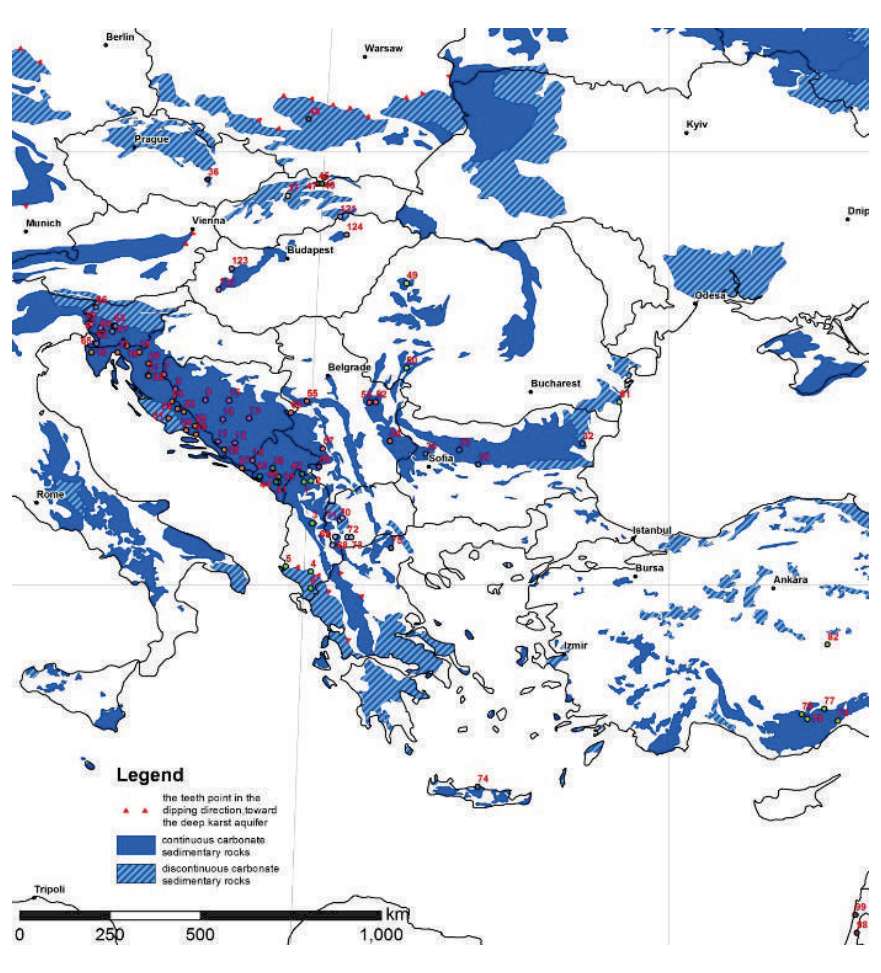
All four countries have a wide experience in international cooperation for the protection and sustainable use of transboundary waters. There are on-going efforts for transposition of the fundamental principles, objectives and measures from the EU Water Framework Directive, WFD (2000/60/EC) and the Groundwater Directive, GWD (2006/118/EC) in national legislations.

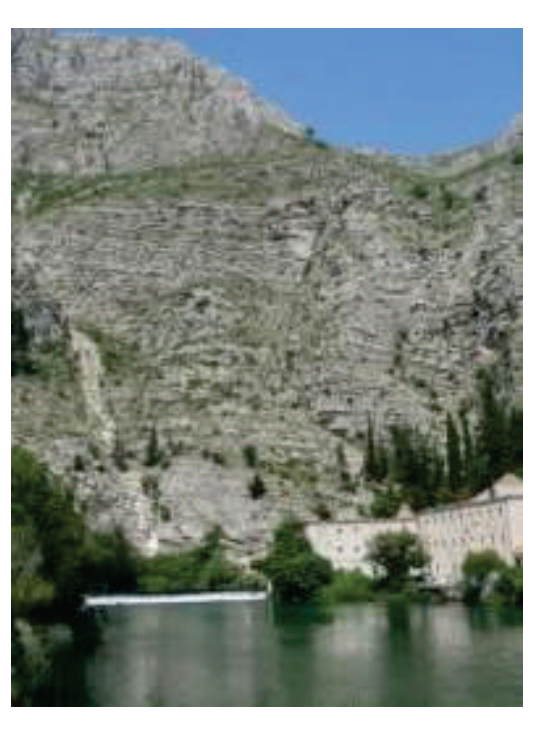
The concept of management and water protection in the project countries is determined by national strategic documents. Croatia, Albania and Bosnia & Herzegovina (both entities of B&H) have adopted Water Management Strategies. Albanian Water Strategy dates from 2004, Montenegro has the Water Master Plan that dates from 2001.

Regarding the legal aspects, current regulations have many gaps and ambiguities linked to groundwater monitoring and sanitary protection zones definition.

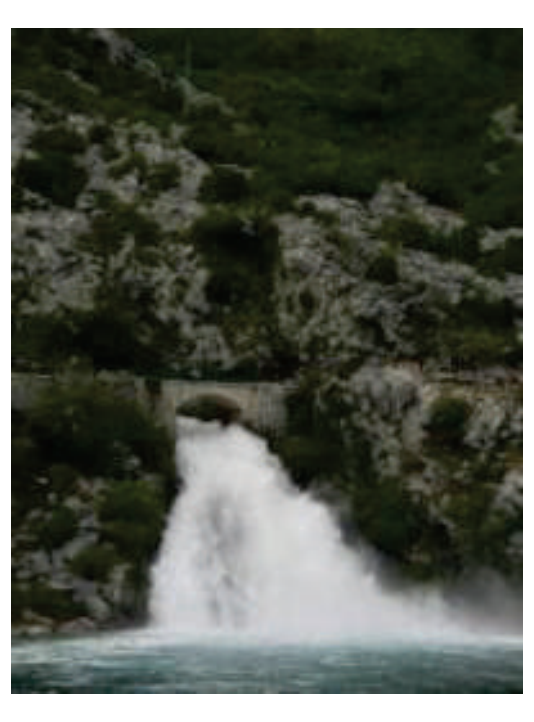
The Dinaric system (Dinarides) is a long, NW-SE oriented orogenic belt in SE Europe, parallel to the Adriatic Sea. Its NW fringe is the Crasso area around Trieste in Italy, covering all six countries of ex-Yugoslavia, while the SW part extends into Albania.
The Dinaric system is a "classical karst" region. The term karst was born here, as well as karstology - a new scientific discipline at the end of the 19 Century.
The region characterized by numerous intermountain depressions, large karst poljes, caves, deep canyons and valleys created by perennial and sinking streams.

Dinaric karst - The densest concentration of the large springs in the World





Ombla supplying water to the city of Dubrovnik with 95% of catchment in neighbour country of Bosnia & Herzegovina



Sopot spring in Montenegro. Its maximal discharge is >150 m^3/s, but almost drying in the summer

3. Identified Issues

The Dinaric karst system provides essential and extremely valuable ecosystem services and supports development of the countries' economies (drinking-water supply, tourism, hydro power production).

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.

Another key challenge of the water governance in the region is adaptation to climate change impacts and mitigation of changes in land use on transboundary groundwater resources.

4. TDA

A Transboundary Diagnostic Analysis (TDA) to identify the priority environmental concerns regarding transboundary waters and the causes to the problems arising from policies in the different economic sectors, was conducted in the period 2011-2013. The TDA showed that the state of groundwater in the DIKTAS project region is generally good in terms of both quantity and quality with a few exceptions and with several serious potential threats, mainly coming from:
-Solid waste and wastewater disposal;
-Agricultural and industrial activities;
-Absence of a common legal framework and common criteria for
    a) the delineation of water source sanitary protection zones, and
    b) setting cost-efficient measures for groundwater protection.

Stakeholder analysis revealed a pressing need for transparent, public sharing of knowledge, information and scientific data on the many unique characteristics of karst aquifers in the DIKTAS region. A strong message resulting from the TDA is a request for improvement of the groundwater monitoring network throughout the region and the need to intensify capacity building in the public sector.

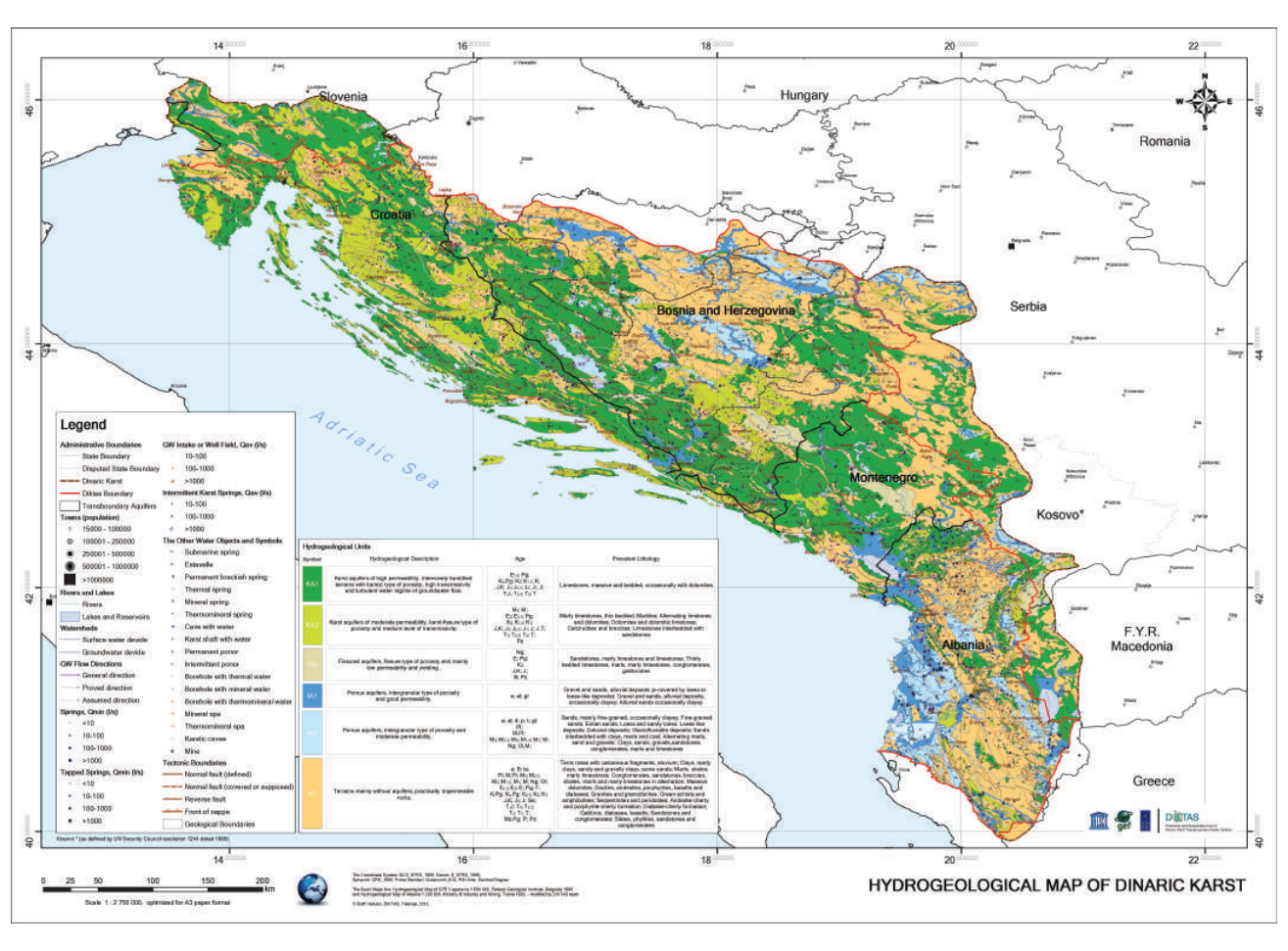
The largest karst waters utilization project in last 50 years is also completed in the Dinaric karst. The intake on sublacustrian karstic spring "Bolje sestre" located at the edge of Skadar Lake is now supplying entire Montenegrian Coast and very much supported national economy by enabling expansion of the tourism.

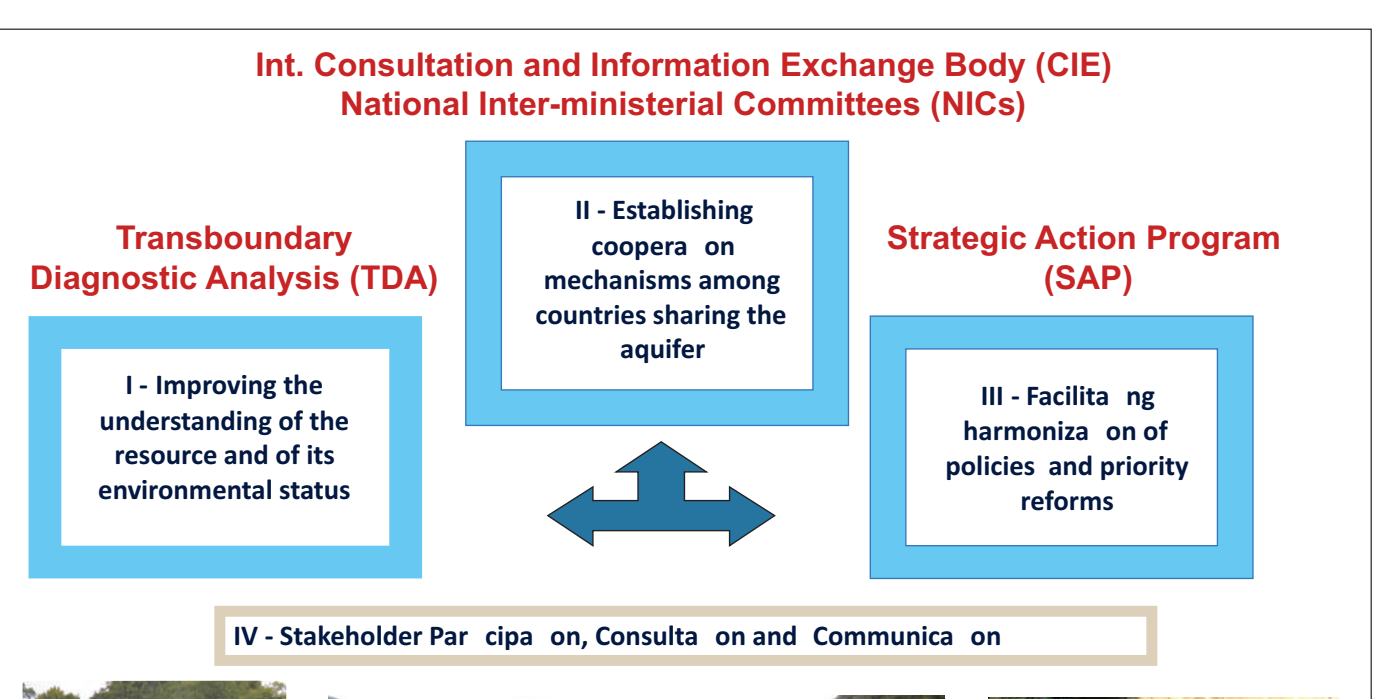
For the Phase I of DIKTAS the four Working Groups were established:

- ***WG1** - hydrogeological characterization*
- ***WG2** - environmental and socio-economical assessment*
- ***WG3** - assessment of legal and institutional frameworks and policies*
- ***WG4** - stakeholder analysis*

WG 1 completed first thorough regional groundwater analysis that covers Albania, Montenegro, Bosnia and Herzegovina and Croatia.

The main results are created GIS Digital Hydrogeological Map and Database.





Int. Consultation and Information Exchange Body (CIE)
National Inter-ministerial Committees (NICs)

Transboundary Diagnostic Analysis (TDA)

II - Establishing cooperation mechanisms among countries sharing the aquifer

Strategic Action Program (SAP)

I - Improving the understanding of the resource and of its environmental status

III - Facilitating harmonization of policies and priority reforms

IV - Stakeholder Participation, Consultation and Communication

5. SAP & Planned Actions

A Strategic Action Program (SAP) was agreed upon by the National-inter-ministerial Committees (NICs) of the project countries and by the project Steering Committee, and recently endorsed by the countries. The SAP is based on the agreed upon regional vision "to achieve joint sustainable and equitable use and protection of Dinaric karst aquifer system".

To assist in attaining the vision for the Dinaric karst aquifer system, five water resources and environmental long-term objectives were defined:

1.Provide sufficient groundwater quantities in dry periods, particularly for the drinking water supply and maintenance of environmental flow;

2.Maintain and improve (where needed) the quality of groundwater in the Dinaric region;

3.Ensure protection of groundwater-dependent ecosystems, their specific characteristics and ecosystem services for the future;

4.Support equitable allocation of groundwater resources;

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

The SAP focuses on three Strategic Actions considered to be of highest contribution to the long-term objectives and to the Water Framework Directive (WFD) requirements, taking into account specifics of the Dinaric karst.

Priority Action 1: Joint design and testing of a regional groundwater quantity and quality monitoring network and associated data exchange and analysis protocols.
Expected Results: A common methodology to establish groundwater quantity and quality monitoring network in the entire Dinaric karst region will be adopted and a monitoring programme will be prepared for all the identified transboundary aquifers, including the optimal/minimal monitoring density and frequency, and an estimate of costs and time required for the program implementation.

Priority Action 2: Harmonization of criteria for (content and extend) of sanitary protection zones.
Expected Results: Bilateral / multilateral agreements on the preparation of the joint Rulebook and guidelines for its implementation agreed and signed. The DIKTAS-level Rulebook prepared, agreed and adopted.

Priority Action 3: Application and promotion of joint principles of sustainable management and equitable use of transboundary Dinaric karst aquifers.
Expected Results: A multilateral agreement on the establishment and functioning of the Consultation and Information Exchange Body (CIE) and its Permanent Secretariat prepared. Coordinated measures to protect karst GWDEs prepared. Awareness of the public, local population and target groups raised.

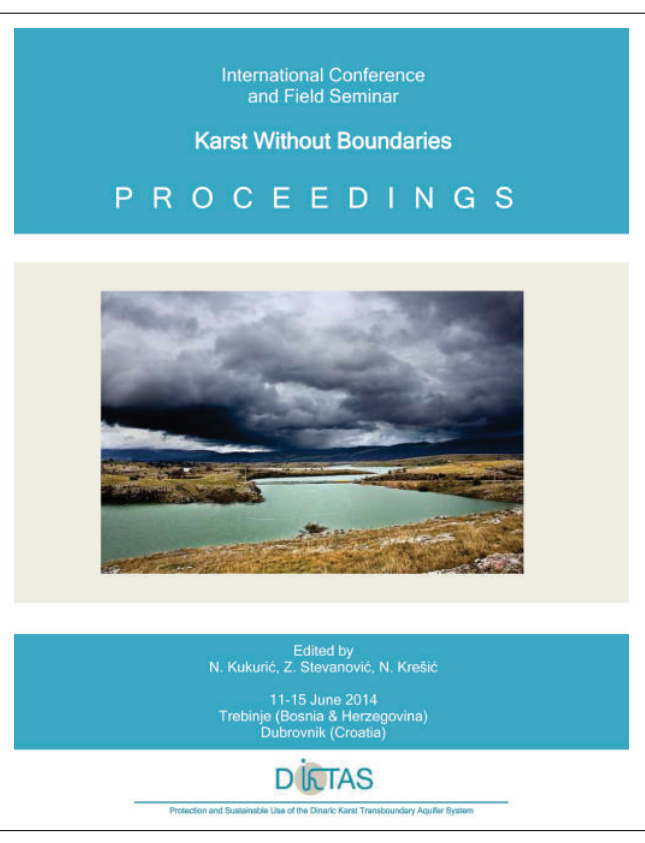
Test area:	Una
Sharing between the countries:	1. Croatia 2. Bosnia and Herzegovina
Data for Country 1	Croatia
GEOGRAPHY AND HYDROGEOLOGY	
Total surface area of TBA in two countries (km^2)	
Surface area of TBA catchment in Country 1. (km^2)	
Surface area of karst in TBA of Country 1. (km^2)	
Surface area of non-karst in TBA in Country 1. (km^2)	
Adjacent zone in Country 1. (km^2), water dependants on TBA (hereafter ZoI)	
The main river catchment (1) and sub-catchments of the tributaries (2,3...) in Country 1. (km^2)	1. name (km^2) (..., ..., ...) 2. (km^2) (..., ..., ...) 3. (km^2)
Main springs (T, NT) and their max/av/min discharges in Country 1	1. name (T) (0.8/0.25/0.055) B 2. (NT) (0.45/0.15/0.03) C
Public water supply wells/well fields and their max/av/min pumping capacites in Country 1	1. name /location (0.8/0.2/0.055) C 2.
Rainfall gauging stations in Country 1 including ca. 10 km outside the area (av. annual sum in mm) and total average sum	1. name (822 mm) 2. (750 mm) Σ: (810mm) equivalent to ... x 10^6 m^3 / an.
Summary max/av/min flows of all streams (runoff) entering study area of Country 1	1. (250/55/5.5) B

6. Innovative Solutions

During the implementation of phase I of the DIKTAS GEF project several novelties have been introduced in the TDA procedure:

1. Establishment of criteria for **selecting prioritized Transboundary aquifers (TBA)** within Dinaric System for further analyses and monitoring.
    Importance of water reserves and interest for their effective utilization preferably in both countries involved;
    ·Representation of TBA which belong to External and Internal Dinarides, i.e. Adriatic and Black Sea catchments;
    ·Identified hazards for groundwater quality;
    ·Presence of specific issues of concern regarding water utilization and protection (end-users, pollutants, eco systems, and similar);
    ·Existence of data concerned precipitation, riverflows, springflows, water demands;
    ·Relevance for this and expected experience for similar TBA projects in karstic regions.
As result selected 8 TBAs comprise total surface area of 12,000 km^2, which is around 10% of the entire study area
2. **Hydrogeological map and Database** created by GIS tools
Including: Classification of aquifer systems, mapping of main springs and well fields, delineation of major groundwater bodies, assessment of groundwater flow directions.
3. **Groundwater resources assessment** by water budgeting
As a base for sustainable development, equitable share and monitoring of transboundary groundwater
4. **Environmental impact indicators**
The list contain 23 indicators divided in three groups: Pressures on Water Quantity, Pressures on Water Quality, and Pressures on Eco-Systems.
5. **Managing minimal flow by engineering interventions**
Assessed sources where such interventions are possible and feasible

The International Conference "Karst without Boundaries" to mark the end of project Phase I and present its results was held in June, 2014 in Trebinje B&H. 155 participants from 45 countries and five continents attended the conference. They appeal for "more intensive and organized survey of karst environments which are among main global sources of drinking water and habitats for numerous groundwater dependent ecosystems."



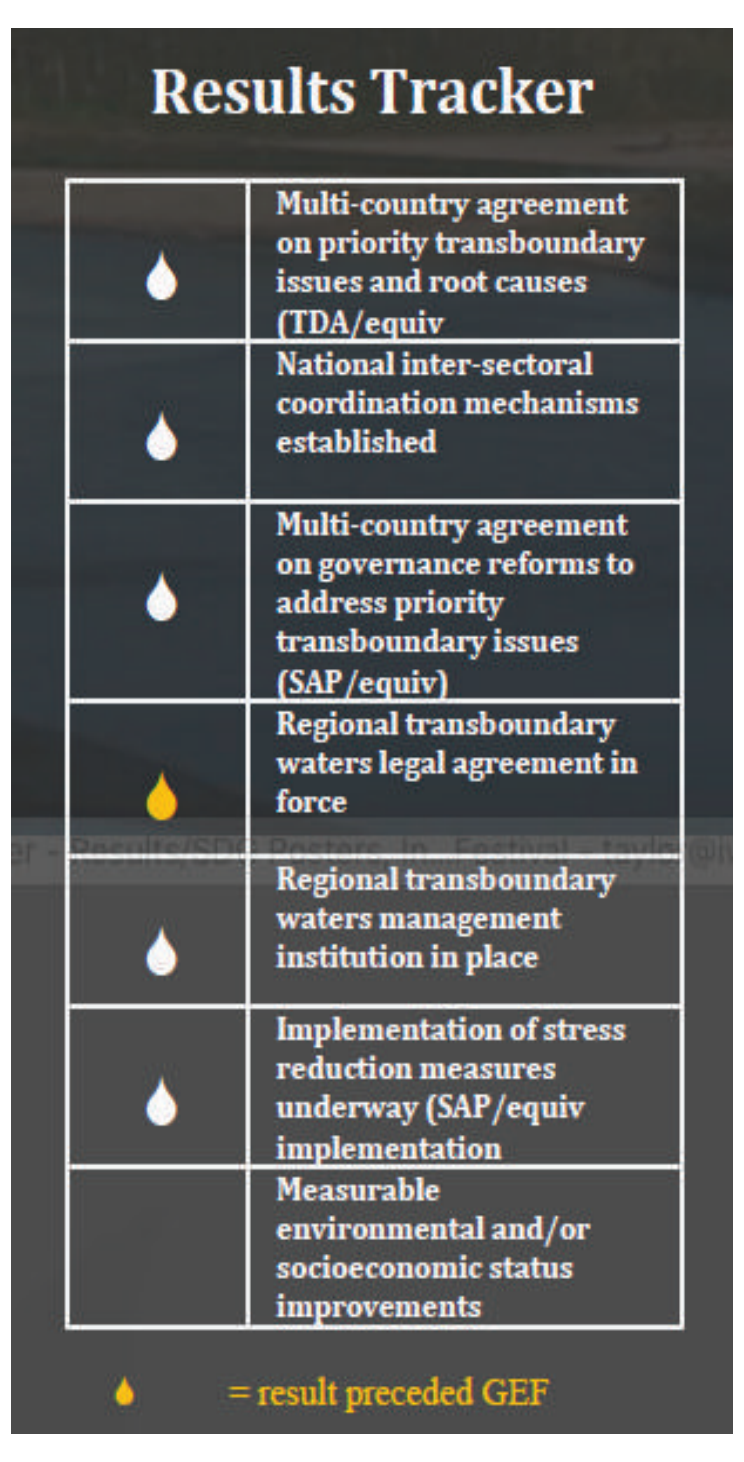
International Conference and Field Seminar
Karst Without Boundaries
PROCEEDINGS
Edited by
N. Kukurić, Z. Stevanović, N. Krešić
11-15 June 2014
Trebinje (Bosnia & Herzegovina)
Dubrovnik (Croatia)
DIKTAS

One the major project's achievements is the International Course Characterization and Engineering of Karst Aquifers started in June, 2014 and continued to be held in Trebinje, Bosnia & Herzegovina beyond the Phase I, in 2015, 2016, 2017, 2018...

United Nations Educational, Scientific and Cultural Organization · International Hydrological Programme · Karst Commission · CEKA

During the past five years and same number of courses around 100 participants from 22 countries were join the lectures and field seminars. They were lectured every year by 10 professors from different countries, half of them rotated every year.

7. GEF IW Process/Stress Reduction/Environmental and Socioeconomic Status Results Indicators



Results Tracker

💧	Multi-country agreement on priority transboundary issues and root causes (TDA/equiv
💧	National inter-sectoral coordination mechanisms established
💧	Multi-country agreement on governance reforms to address priority transboundary issues (SAP/equiv)
🟡	Regional transboundary waters legal agreement in force
💧	Regional transboundary waters management institution in place
💧	Implementation of stress reduction measures underway (SAP/equiv implementation
	Measurable environmental and/or socioeconomic status improvements

🟡 = result preceded GEF

TDA Completed

National ISC mechanism established

SAP formulated; Priority actions defined

} Phase I

No Legal agreement/cooperation framework in place

No Regional management institutions (RMI) created

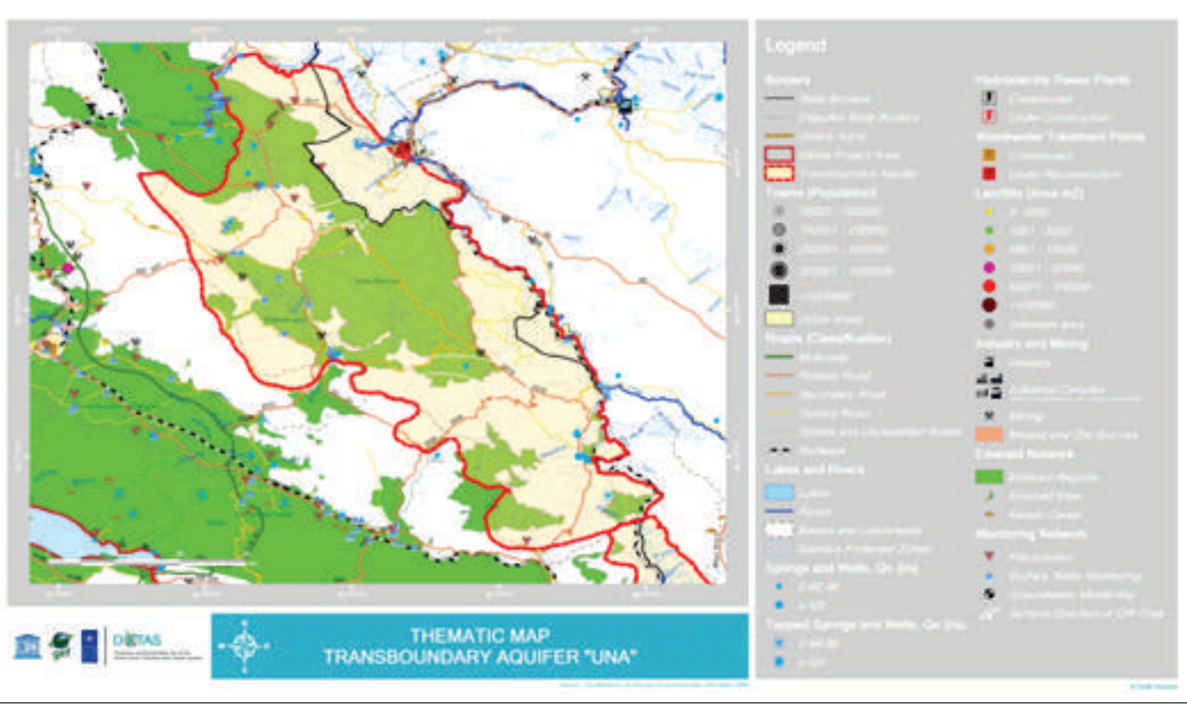
No Stress reduction measurements conducted, neither mechanisms in place to monitor/report change

Environmental impact indicators proposed in Phase I, but no mechanisms and project indicators in place to monitor the environmental status of the waterbody; Gender issues, stakeholder involvement and reforms of legislation evaluated and proposal for further improvement formulated for Phase II

} Phase II in pipeline

Groundwater Monitoring Network proposed at the two TBAs: one shared by Montenegro and Albania (Cijevna/Cemi), and one shared by Croatia and Bosnia & Herzegovina (Una)

GW Monitoring network



8. Next Project Phase: Implementing SAP

Period: 2019 - 2024
Scope: Regional
Countries: Albania, Bosnia and Herzegovina, Croatia and Montenegro
Partners: UNDP, UNESCO-IHP; Governments of Albania, Bosnia & Herzegovina, Croatia, Montenegro
GEFGrant: $5.1 million
Co-finance: $14.85 million

Project Objective: Catalyze effective multi-country cooperation for the sustainable management of the Dinaric Karst Aquifer System and its ecological resources by strengthening national and regional groundwater governance frameworks and institutional capacity.

Project Components:
Component 1. Facilitating Multi-country cooperation
Component 2. Institutional strengthening for improved groundwater governance (SAP Actions 2 and 3)
Component 3. Monitoring karst waters and dependent ecosystems (SAP Action 1)
Component 4. Focus on areas of transboundary influence and of special concern
Component 5. Awareness Raising and Gender Mainstreaming (SAP Action 3)

9. Project Innovative Solutions, Tools, Practices for Sustaining International Water Cooperation

The project 'Implementation of the SAP of the Dinaric Karst Aquifer System: Strategic Action Program presents several innovative features and design approaches which are expected to ensure sustainability beyond the project, and the replication at both national and regional levels:

1. Countries sharing a major karst aquifer system cooperate in the adoption of common groundwater governance principles and agree on the harmonization of monitoring protocols;
2. The project will foster a Multilateral Agreement on the establishment of a Consultation and Information Exchange body, including permanent technical support from the "multi-disciplinary thematic expert groups" and the long-term sustainability of the information exchange mechanism;
3. The project design adopts a blend of mutually reinforcing national and regional actions that will enhance sustainability and the likelihood of scaling up;
4. The involvement in all project activities of the Thematic Expert Groups, formed by national experts, will ensure country ownership and overall reinforced capacity in the countries.
5. This project represents the first attempt to implement the recommendations from the recently completed project: "Groundwater Governance: A Framework for Action" (GEF/FAO/UNESCO/IAH/WB).

DIKTAS Protection and sustainable use of the Dinaric Karst Transboundary Aquifer System

Links

www.diktas.iwlearn.org
https://groundwaterportal.net/project/diktas

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