



SAP

Strategic Action Program



DITAS

Protection and Sustainable Use of the Dinaric Karst
Transboundary Aquifer System



This document is prepared by the DIKTAS Project Team members in the framework of the DIKTAS project (<http://diktas.iwlearn.org>).

DIKTAS (Protection and Sustainable Use of the Dinaric Karst Transboundary Aquifer System) project is a regional project aimed at improving the management of karst groundwaters in the Dinaric Karst in South-Eastern Europe.

DIKTAS is a full-size Global Environment Facility (GEF) regional project, implemented by United Nations Development Programme (UNDP) and executed by United Nations Educational, Scientific, and Cultural Organization (UNESCO).



THE STRATEGIC ACTION PROGRAMME FOR PROTECTION AND SUSTAINABLE USE OF THE DINARIC KARST TRANSBOUNDARY AQUIFER SYSTEM (DIKTAS)

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Abbreviations

CIE	Consultation and Information Exchange body
DIKTAS	Protection and Sustainable Use of the Dinaric Karst Aquifer System project
EU	European Union
GWDE	Groundwater Dependent Ecosystem
GEF	Global Environment Facility
GWP-Med	Global Water Partnership Mediterranean
IAH	the International Association of Hydrogeologists
IGRAC	International Groundwater Resource Assessment Centre
ISARM	Internationally Shared Aquifer Resources Management
IW LEARN	International Waters Learning Exchange and Resources Network
IWRM	Integrated Water Resources Management
NIC	National Inter-ministerial Committee
PCU	Project Coordination Unit
SAP	Strategic Action Programme
TBA	Transboundary Aquifer
TDA	Transboundary Diagnostic Analysis
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO-IHP	UNESCO's International Hydrological Programme
WFD	Water Framework Directive (WFD)

Summary

This document contains the main elements of a Strategic Action Programme (SAP) prepared to improve management of karst groundwaters and ensure protection of vulnerable groundwater-dependent ecosystems in the Dinaric region in South-East Europe. The document is produced in the framework of the DIKTAS project (<http://diktas.iwlearn.org>) based on the main project findings. The document will be *(is)* submitted to aquifer states in the Dinaric region for their consideration. If *(Once)* adopted, the proposed actions will be elaborated in a project proposal and submitted to GEF and similar institutions with request for a funding.

Below, a short introduction of the DIKTAS project is provided firstly, followed by an overview of main findings of Transboundary Diagnostic Analysis (TDA); TDA was the main DIKTAS project activity and the main source of information required to formulate the SAP - Strategic Action Programme. The strategic actions are the core of this proposal; they are presented in the context of long-term water resources objectives. The document is rounded off specifying a required commitment to the proposed programme as well as expected benefits from its implementation.

DIKTAS project

The project “Protection and Sustainable Use of the Dinaric Karst Transboundary Aquifer System” (DIKTAS) is a regional project implemented with the purpose of improving management of karst groundwaters in the Dinaric karst region shared by several countries of South-East Europe. It is the first global example of introducing the principles of integrated management of transboundary karst aquifers of this magnitude.

The project’s preparatory phase started in 2007, and the project was implemented in the period 2010 – 2015. The project was initiated by Albania, Bosnia and Herzegovina, Croatia and Montenegro, and was supported by other countries in the Dinaric region (Italy, Slovenia and Serbia), as well as by international organizations such as the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the International Association of Hydrogeologists (IAH), the International Groundwater Resources Assessment Centre (IGRAC) and the Global Water Partnership – Mediterranean (GWP-MED). DIKTAS is a regional project of the Global Environment Facility (GEF), it was implemented by the United Nations Development Programme (UNDP) and executed by the UNESCO-IHP. The overall project budget amounted to \$ 5.3 million, of which \$ 2.2 million was a GEF grant, while the remaining amount was in-kind contribution of the participating countries and organisations.

DIKTAS was a challenging but successful project which also delivered many lessons learned for future activities. The project activities:

- improved knowledge on karst groundwaters in the Dinaric region (by collecting, structuring, harmonising and interpreting data and information through the TDA implementation);

- strengthened the cooperation in the region (through the Project Team, the National Inter-ministerial committees, the Steering Committee);
- increased the capacity and awareness (through the Karst School, stakeholder workshops, conferences, publications, etc.).

The project outcomes have paved the way for further and more extensive cooperation in the region. They also revealed the problems and concerns that should be tackled with priority. The main issues identified through Transboundary Diagnostic Analysis (TDA) are summarised in the following paragraph, whereas the SAP objectives and actions to be taken are addressed subsequently in this document.

Transboundary Diagnostic Analysis

During the Transboundary Diagnostic Analysis (TDA), groundwater resources (both in terms of quantity and quality) were reviewed in the entire DIKTAS project region, and analysed in detail in the transboundary aquifer areas. In that process numerous data gaps were identified, resulting primarily from the fact that certain areas haven't been investigated enough, lack of adequate monitoring and integrated databases, as well as inadequate inter-state exchange of available data.

It was identified that there is currently no coordinated legislative framework and no coordinated criteria to define the boundaries of water source protection zones, and no coordinated criteria to establish cost-effective measures to protect groundwater in the Dinaric karst. This is the main reason for concern with regard to the protection of resources in the transboundary aquifers (TBAs) from which groundwater is abstracted for public water supply (the TBAs of the Trebišnjica, Neretva, Cetina and Una Rivers).

Additional problems are the insufficient involvement of stakeholders in the processes of planning and managing groundwater resources, the insufficiently analysed and appreciated characteristics of karst groundwater-dependent ecosystems, and the insufficient public awareness about the importance and specifics of the karst.

The final results of the project suggest that the current approach to managing this resource, without a coordinated joint approach to solving problems and appreciation of karst specifics, can negatively affect the future economic development of all the participating countries. This refers primarily to public water supply (in the majority of the countries groundwater accounts for more than 90 % of drinking water supply), development of tourism, development of agriculture (groundwater is at present used to a very small extent in irrigation systems), production of hydropower, and development of rural regions, particularly in the context of consequences of expected climate variations.

Vision and the Long Term Objectives

Based on the outcomes of the TDA and other DIKTAS project activities, a concept SAP document was prepared by the DIKTAS Project Team and subsequently discussed by the National-inter-ministerial Committees (NICs) of the project countries and the project Steering Committee. The discussion resulted in a decision to produce a short version (i.e. this document) of this extensive (70 pages)

concept, addressing only the information relevant for decision-making at the country level, namely the problems (TDA outcomes), the context (vision and long-term objectives) and the proposed solutions (strategic actions). The main TDA outcomes are presented in the previous paragraph.

The proposed regional vision is: “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 are suggested:

- Provide sufficient groundwater quantities in dry periods, particularly for the drinking water supply and maintenance of environmental flow;
- Maintain and improve (where needed) the quality of groundwater in the Dinaric region;
- Ensure protection of groundwater-dependent ecosystems, their specific characteristics and ecosystem services for the future;
- Support equitable allocation of groundwater resources;
- Raise awareness and build capacities related to karst water and their dependent ecosystems.

Having in mind that achievement of these objectives requires a long time period and considerable financial resources, the proposed SAP focuses on three Strategic Actions, to be implemented within the next 5 to 10 years. The proposed Strategic Actions (described below) are 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. The strategic Action 1 (on groundwater quantity and quality monitoring) is considered as a major climate measure, dealing concretely with issue of water shortage in dry periods and sustainable environmental flow. Accordingly, this action includes testing/implementation to provide a proof of concept (i.e. developed methodologies) and encourage future replication in the region and elsewhere.

Strategic Actions

STRATEGIC ACTION 1:

Joint design and testing of a regional groundwater quantity and quality monitoring network and associated data exchange and analysis protocols.

MAIN STEPS: Development of methodology and preparation of guidelines for the monitoring of groundwater quantity and quality within the transboundary aquifers identified in the SAP, including:

- Estimation of renewable groundwater resources in the entire transboundary aquifer area, focusing on dominant groundwater flow directions, as well as aquifer share per aquifer state;
- Develop technical criteria required for monitoring of (equitable) use of renewable groundwater resources;
- Define methodology to determine maximum groundwater withdrawal in relation to sustaining the environmental flow;
- Define criteria to design and establish a monitoring network;
- Define the optimum monitoring scope and methodology;
- Define the minimum structure of data within national databases;

- Define a data exchange protocol (type and method);
- Define the optimal and minimally acceptable groundwater sampling frequency in relation to different hydrological periods;
- Define groundwater quality standards in relation to drinking water standards and quality standards for groundwater-dependent ecosystems;
- Harmonization of criteria and development of methodology to assess the quality of groundwater in transboundary aquifers in the Dinaric region;
- Analyse the groundwater status assessment methodology applied in the part of the Dinaric karst within the authority of the Sava River Basin Commission;
- Develop and test groundwater quantity monitoring of a transboundary aquifer (proposed site: Cijevna-Cemi). All essential new infrastructure at the selected site for the development and testing of monitoring need to be financed.
- Develop and test groundwater quality monitoring methodology for a transboundary aquifer (proposed site: Cetina/Una). All essential new infrastructure at the selected site for the development and testing of monitoring need to be financed.

RESULT: Upon completion of the above presented steps, a unique 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 programme implementation.

A groundwater quality and quantity monitoring network for the selected transboundary aquifer will be established.

A groundwater quality monitoring network for the selected transboundary aquifer will be established

STRATEGIC ACTION 2: Harmonization of criteria for (content and extend) of sanitary protection zones.

MAIN STEPS: Harmonization of criteria, development of joint methodology, preparation of the joint Rulebook and guidelines on defining the boundaries (i.e. extend) of sanitary protection zones and the associated measures to protect the sources used for public water supply within the transboundary aquifers identified in the SAP, including:

- Prepare joint criteria on the basis of the existing criteria used in each country of the Dinaric region;
- Harmonize protection measures in individual sanitary protection zones required by the current legislation of individual countries;
- Prepare a joint Rulebook and guidelines on defining the boundaries of sanitary protection zones and the associated protection measures;
- Analyse the possibility to apply new protection methodologies used in the other karst areas beyond this region, for the purpose of reducing the surface area of protection zones and applying more efficient protection measures;
- Prepare feasibility studies on the application of new protection methodologies including an analysis of improvements compared to the costs and time required for their implementation;

- Analysis of required amendments to the existing legislation in each country concerning each of the possible approaches to groundwater protection in karst;
- Define the methodology whose implementation will ensure full transposition of Water Framework Directive (WFD) into national legislation in the field of drinking water protection in karst areas;
- Strengths and possible weaknesses of the analysed protection solutions will be tested in the area of the Trebišnjica transboundary aquifer (proposal).

RESULT: 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.

STRATEGIC ACTION 3: Application and promotion of joint principles of sustainable management and equitable use of transboundary Dinaric karst aquifers.

MAIN STEPS: Defining the optimal mechanism for joint management of transboundary Dinaric karst aquifers; increasing public awareness and knowledge about integrated management of karst systems, including ecosystems, in line with principles of sustainable development and equitable use, including:

- Establishment of an expert group consisting of representatives of the countries participating in the DIKTAS Project. The expert group will be in charge of gathering experience about joint management models from other international commissions, identification of tasks for which a future Consultation and Information Exchange Body (CIE) would be responsible, definition of rules for the CIE operation and identification of the most cost-effective form for the CIE Permanent Secretariat. Based on the above elements, a Multilateral Agreement will be prepared in close cooperation with the National Inter-Ministerial Committees (NICs) in each country, which will then be submitted to and discussed at a high level in all project participating countries;
- Preparation of guidelines for identification, classification and characterization of groundwater-dependent ecosystems (GWDE) in karst areas;
- Development of a model and testing of guidelines for the classification and characterization of GWDEs based on the results of the established groundwater quantity and quality monitoring (Actions 1 and 2) on one of the transboundary aquifers within the Project;
- Preparation of guidelines to determine the environmental flow (*e-flow*) in karst areas, based on the results obtained through Actions 1, 2 and 3;
- Proposal for integration of jointly developed protection measures for karst GWDEs in the participating countries;
- Raising public awareness about the importance of karst water and their dependent ecosystems by promoting the importance of karst systems, the need for their protection, as well as project results and public presentations and discussions, and tailor-made educational programs for schools;
- Raising the awareness of local population and increasing their responsibility for sustainable management and protection of water resources;
- Improving specific knowledge among students and exchange of new information among scientists.

RESULT: 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.

Commitment and Expected Benefits

The aquifer states in the Dinaric region (*are expected to*) express their commitment to the DIKTAS Strategic Action Programme by adopting this document. Subsequently (*following the adoption*), the proposed SAP activities will be elaborated in the project proposal, in accordance with requirements of GEF and other possible funding institution(s) and in close cooperation with the aquifer states.

The expected benefit from execution of proposed SAP activities is manifold. These activities will substantially contribute to:

- Ensuring sufficient quantities of groundwater in dry periods in the areas of transboundary aquifers by improving bilateral cooperation among the neighbouring countries; this will be based on:
 - application of methodology to determine the maximum permitted abstraction quantities for renewable groundwater resources and
 - criteria for water allocation between the aquifer countries under the general principle of equitable use.
- Meeting the prerequisites for the development and improvement of integrated river basin management plans as required by the EU WFD, taking into account the specifics of the Dinaric karst. This implies:
 - Improvement and development of national monitoring of karst groundwater quantitative status and prepared monitoring programme for every individual transboundary aquifer, which is an obligation for every country in the process of implementing the EU WFD.
 - Development of coordinated methodology for establishment and implementation of national monitoring of karst groundwater chemical status, which is also an obligation for every country in the process of implementing the EU WFD.
 - Adoption and implementation of guidelines for the preparation of a register of GWDEs in the process of implementing the EU WFD.
- Development and implementation of coordinated legal mechanisms for integrated and sustainable management of Dinaric karst resources, including:
 - Adopted national-level decisions on amendments to the existing legislation about implementation of the Rulebook – agreed and adopted on the level of the DIKTAS Project – for determination of sanitary protection zones and accompanying protection measures;
 - Adopted Guidelines – prepared on the level of the DIKTAS Project – for improvement of national institutional and legal frameworks with the aim of achieving more efficient protection and management of GWDEs in the Dinaric karst.
- Raising awareness of the public and target groups about karst water and their dependent ecosystems and capacity building through dissemination of specific knowledge in these domains.