GEF-6 PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project
TYPE OF TRUST FUND:GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title:	Implementation of the SAP of the Dinaric Karst Aquifer System: improving groundwater governance and sustainability of related ecosystems.		
Country(ies):	Albania, Bosnia & Herzegovina, Croatia, Montenegro[1]	GEF Project ID:[2]	9919
GEF Agency(ies):	UNDP (select) (select)	GEF Agency Project ID:	5776
Other Executing Partner(s):	UNESCO International Hydrological Programme	Submission Date:	1 September 2017 2 October 2017
GEF Focal Area(s):	International Waters	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities ☐ IAP-Commodities ☐ IAP-Food Security ☐	Corporate Program: SGP ☐	
Name of parent program:	NA	Agency Fee ($)	488,775

A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES[3]

Objectives/Programs (Focal Areas, Integrated Approach Pilot, Corporate Programs)	**Trust Fund**	**(in $)**	
		GEF Project Financing	**Co-financing**
IW-1 Program 1	GEFTF	2,000,000	5,000,000
IW-2 Program 3	GEFTF	2,400,000	8,000,000
IW-2 Program4	GEFTF	745,000	1,850,000
Total Project Cost		**5,145,000**	**14,850,000**

B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: Implement agreed priority actions to strengthen multi-country cooperation and national and regional groundwater governance frameworks and institutional capacity for the sustainable management of the Dinaric Karst Aquifer System and its ecological resources.

Project Components	**Financing Type[4]**	**Project Outcomes**	**Project Outputs**	**Trust Fund**	**(in $)**	
					GEF Project Financing	**Co-financing**
Component 1: Facilitating Multi-country cooperation (SAP Action 3)	TA	Outcome 1: Institutionalization of periodic multi-country expert consultations and information exchanges, and creation and strengthening of bilateral/multilateral conflict resolution mechanisms, provide the transboundary cooperation framework crucial for the sustainable utilization of shared karst waters, and for the protection of the Dinaric Karst ecosystems.	1.1. Joint multi-disciplinary thematic expert groups established by project countries, with the participation of Croatia. 1.2 Draft multilateral agreement on the establishment of Consultation and Information Exchange Body (CIE) and its	GEFTF	700,000	2,800,000

[1] Croatia, a EU member and therefore not eligible for GEF funding, will fully participate to all project activities with its own funds. Efforts will be made during the PPG to engage Italy, Slovenia and Greece as co-financiers and observers to main project activities as a way to foster their sustained cooperation and leadership in strengthening cooperation in the managment of this shared resource.

[2] Project ID number will be assigned by GEFSEC and to be entered by Agency in subsequent document submissions.

[3] When completing Table A, refer to the excerpts on GEF 6 Results Frameworks for GETF, LDCF and SCCF and CBIT guidelines.

[4] Financing type can be either investment or technical assistance.

			permanent Secretariat prepared for governments approval. 1.3 Bilateral Agreements and Bodies: Options for the strengthening of existing ones, and establishment of new ones, to address the management of areas of transboundary influence (Transboundary Aquifers of the TDA) formulated for decision by governments. 1.4 Stakeholder involvement plan formulated and implemented, including special focus on gender issues and women empowerment.			
Component 2: Institutional strengthening for improved groundwater governance (SAP Actions 2 and 3)	TA	Outcome 2: Adoption of sound national[5] groundwater governance principles and frameworks, including emphasis on sanitary protection zones, harmonized across the Dinaric Karst Aquifer System, facilitated through the application of the methodology developed by the Groundwater Governance GEF project.	2.1 Groundwater governance diagnostics in all project countries, and assessment of gaps and opportunities. 2.2 National policy, legal and institutional reforms, harmonized across countries, defined and submitted to countries for adoption. 2.3 Training courses on: Hydro diplomacy; Conjunctive surface and groundwater management; Gender analysis and mainstreaming; Land use policy and practice in karst terrains.	GEF TF	1,000,000	4,000,000
Component 3: Monitoring karst waters and dependent ecosystems (SAP Action 1)	TA	Outcome 3 Modern multi-purpose monitoring of karst groundwater enables responsible entities at the local and at the regional level to effectively manage the shared karstic waters and dependent ecosystems.	3.1 Monitoring network design: design of DIKTAS-wide groundwater multi-purpose monitoring harmonized across the countries.	GEF TF	1,300,000	3,000,000

[5] In the case of Bosnia and Herzegovina the term "national" relates to the subnational entities as well.

		Outcome 4 Agreement on real-time harmonized data sharing enables effective transboundary cooperation.	3.2 Monitoring network design tested on the ground and two full-scale demonstration monitoring networks implemented in two selected areas of transboundary and environmental concern. 4.1 Joint data sharing mechanism: joint design and implementation of a real-time data sharing mechanism and harmonization of different national classification standards.			
Component 4: Focus on areas of transboundary influence and of special concern (SAP Action 2)	TA	Outcome 5: Definition of national and/or binational Action Programmes and of DIKTAS wide guidelines for reversing degradation trends in highly vulnerable areas accelerates remedial actions	5.1 Action Programmes for all 6 areas of transboundary influence identified in the TDA (Table 1) prepared and submitted for adoption at governmental level. 5.2 Preparation of the DIKTAS Rulebook on sanitary protection zones and setbacks, and for domestic and solid waste disposal.	GEFTF	1,400,000	3,000,000
Component 5: Awareness Raising and Gender mainstreaming (SAP Action 3)	TA	Outcome 6: Increased awareness among stakeholders, dissemination of project's achievements and lessons learned, and strengthened gender equality and women empowerment, facilitate adoption of good practices and policies.	6.1 Awareness raising events and dissemination products. 6.2 Gender analysis of the water sector in all project countries. 6.3 IW LEARN activities: Sharing experiences within the GEF IW portfolio by producing 4 experience notes and securing participation in regional conferences, twinning programs, and IWCs (1 % of the GEF grant).	GEFTF	500,000	1,200,000
			Subtotal		4,900,000	14,000,000

Project Management Cost (PMC)[6]	GEFTF	245,000	850,000
Total Project Cost		5,145,000	14,850,000

For multi-trust fund projects, provide the total amount of PMC in Table B, and indicate the split of PMC among the different trust funds here: ( )

C. INDICATIVE SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE, IF AVAILABLE

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount ($)
GEF Agency	UNDP	In kind/grants	350,000
Recipient Governments	Albania, Bosnia & Herzegovina, Montenegro	In-kind	7,500,000
Donor Agency	UNESCO	In-kind/grants	4,500,000
Others	Government of Croatia	In-kind	2,500,000
Total Co-financing			14 850,000

D. INDICATIVE TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES), FOCAL AREA AND THE PROGRAMMING OF FUNDS a)

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	(in $)		
					GEF Project Financing (a)	Agency Fee (b)b)	Total (c)=a+b
UNDP	GEFTF	Regional	International Waters	NA	5,145,000	488,775	5,633,775
Total GEF Resources					**5,145,000**	**488,775**	**5,633,775**

a) Refer to the Fee Policy for GEF Partner Agencies.

E. PROJECT PREPARATION GRANT (PPG)[7]

Is Project Preparation Grant requested? Yes ☒ No ☐ If no, skip item E.

PPG AMOUNT REQUESTED BY AGENCY(IES), TRUST FUND, COUNTRY(IES) AND THE PROGRAMMING OF FUNDS

Project Preparation Grant amount requested: $150,000				PPG Agency Fee: 14,250			
GEF Agency	Trust Fund	Country/ Regional/Global	Focal Area	Programming of Funds	(in $)		
					PPG (a)	Agency Fee[8] (b)	Total c = a + b
UNDO	GEFTF	Regional	International Waters	NA	150,000	14,250	164,250
Total PPG Amount					**150,000**	**14,250**	**164,250**

[6] For GEF Project Financing up to $2 million, PMC could be up to10% of the subtotal; above $2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

[7] PPG requested amount is determined by the size of the GEF Project Financing (PF) as follows: Up to $50k for PF up to$2m (for MSP); up to $100k for PF up to $3m; $150k for PF up to $6m; $200k for PF up to $10m; and $300k for PF above $10m. On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

[8] PPG fee percentage follows the percentage of the Agency fee over the GEF Project Financing amount requested.

F. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS[9]

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society	Improved management of landscapes and seascapes covering 300 million hectares	*Hectares*
2. Sustainable land management in production systems (agriculture, rangelands, and forest landscapes)	120 million hectares under sustainable land management	*Hectares*
3. Promotion of collective management of transboundary water systems and implementation of the full range of policy, legal, and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services	Water-food-ecosystems security and conjunctive management of surface and groundwater in at least 10 freshwater basins;	*1 Number of freshwater basins*
	20% of globally over-exploited fisheries (by volume) moved to more sustainable levels	*Percent of fisheries, by volume*
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO_{2e} mitigated (include both direct and indirect)	*metric tons*
5. Increase in phase-out, disposal and reduction of releases of POPs, ODS, mercury and other chemicals of global concern	Disposal of 80,000 tons of POPs (PCB, obsolete pesticides)	*metric tons*
	Reduction of 1000 tons of Mercury	*metric tons*
	Phase-out of 303.44 tons of ODP (HCFC)	*ODP tons*
6. Enhance capacity of countries to implement MEAs (multilateral environmental agreements) and mainstream into national and sub-national policy, planning financial and legal frameworks	Development and sectoral planning frameworks integrate measurable targets drawn from the MEAs in at least 10 countries	*Number of Countries:*
	Functional environmental information systems are established to support decision-making in at least 10 countries	*Number of Countries:*

[9] Provide those indicator values in this table to the extent applicable to your proposed project. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the *GEF-6 Programming Directions*, will be aggregated and reported during mid-term and at the conclusion of the replenishment period. There is no need to complete this table for climate adaptation projects financed solely through LDCF, SCCF or CBIT.

PART II: PROJECT JUSTIFICATION

1. *Project Description.* Briefly describe: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area[10] strategies, with a brief description of expected outcomes and components of the project, 4) incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, CBIT and co-financing; 5) global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF); and 6) innovation, sustainability and potential for scaling up.

Generalities on karst:

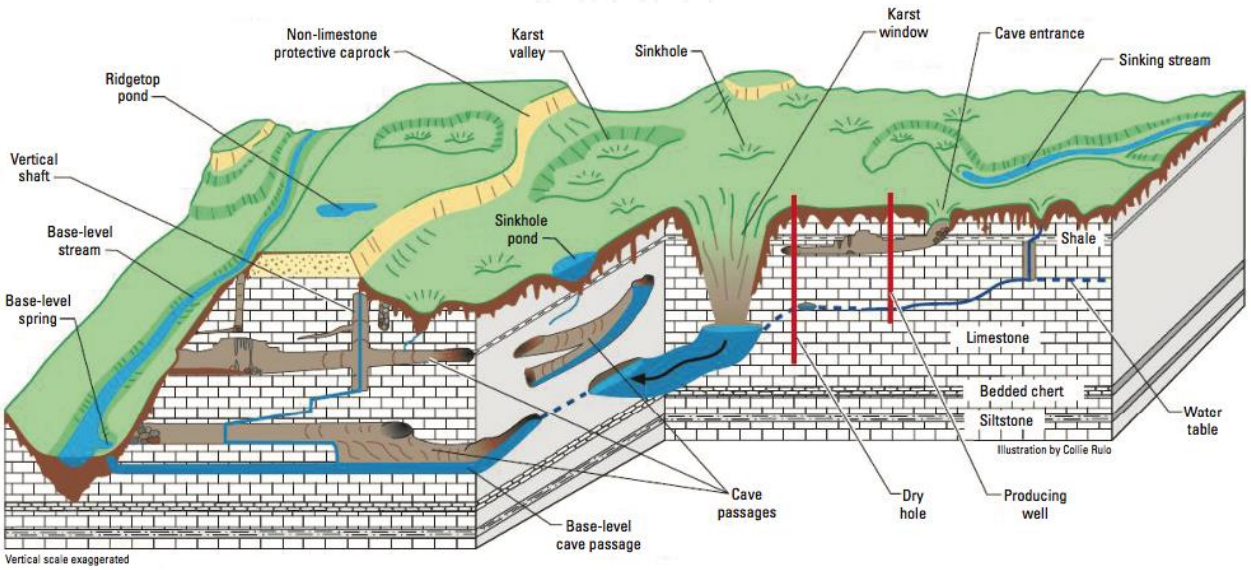

Fig. 1 – Physiographic and hydrologic features of karst terrains

In karst terrains, water is the main agent of landscape change; the role of mechanical erosion processes is much less significant. Karst landscapes form in areas with carbonate (limestone, dolomite) bedrock. Over time, the bedrock is subjected to slow dissolution processes caused by a particular combination of temperature, chemistry and soil acidity. This process typically results in the formation of visible surface and subsurface features, including sinkholes (dolines), caves, sinking (or disappearing) streams, caves, and karst springs. The hydrologic characteristics associated with the presence of karst also are distinctive and generally include: (1) internal drainage of surface runoff through sinkholes; (2) underground diversion or partial subsurface piracy of surface streams (that is sinking streams and losing streams); (3) temporary storage of ground water within a shallow, perched epikarst zone; (4) rapid, turbulent flow through subsurface pipe-like or channel-like dissolution conduits; and (5) discharge of subsurface water from conduits by way of one or more large perennial springs (fig. 1).

A karst aquifer can be conceptualized as an open hydrologic system having a variety of surface and subsurface input and output flows, and boundaries defined by the catchment limits and geometry of conduits. The hydrogeologic characteristics of karst aquifers are largely controlled by the structure and organization of the conduits, the development of which generally acts to short-circuit surface drainage by providing alternative subsurface flow paths that have lower hydraulic gradients and resistance.

The Dinaric Karst System

[10] For biodiversity projects, in addition to explaining the project's consistency with the biodiversity focal area strategy, objectives and programs, please also describe which Aichi Target(s) the project will directly contribute to achieving.

The Dinaric karst system represents a geologically heterogeneous, south European orogenic belt of the Alpine mountain chain and is considered as the classic karst region worldwide. In fact, the term “karst” was born in the area, and this is where the foundation of karst hydrogeology was set by establishing that carbonate rock dissolution was the key karstic process that created most types of dolines, the diagnostic karst landforms. The term “karst” is now applied to modern and paleo dissolution phenomena worldwide. Some local terms were accepted, and are still used, in international karst terminology (e.g. ponor, doline, uvala, and polje).

The main orientation of the Dinaric system is NW-SE, parallel to the Adriatic Sea. It is a long mountainous structure with numerous intermountain depressions including large karst poljes and valleys created by perennial or sinking streams. Most authors agree that the Carso area around Trieste-Monfalcone in Italy is the western boundary of the Dinarides; the question remains which parts of the Pindos and Hellenides in Albania and Greece respectively, belong to the system. Although most professionals believe that only the Albanian Alps in the NW part of Albania belong to the Dinaric system, the members of the Hydrogeology Working Group (HGWG) of the DIKTAS project have agreed to extend the project boundary to the Vjosa River in Albania as the southern limit of the study area.

The total surface area of the Dinaric system within the project countries is estimated at 110,500 km2 as follows: 27,500 km2 in Croatia, 45,400 km2 in Bosnia and Herzegovina, 13,350 km2 in Montenegro (the entire territory of the country belongs to the DIKTAS), and 24,250 km2 in Albania. About 60% of the project area belongs to the Adriatic Sea basin, while 40% is in the Black Sea catchment (Figure 2).

The DIKTAS region, in particular Eastern Herzegovina and Western Montenegro, is an area characterized by rainfall among the highest in Europe. Since the region is one of the most karstified in the world, surface flows are very rare. The thickness of soluble carbonate sediments is more than 3000m, and the average depth of karstification ranges from 250 a to 350m, and locally, along faults, even deeper. The most active karst conduits are directly above the base of karstification. Average underground flow velocity varies within a wide range from 0.002 to 55.2 cm/s. Groundwater residence time is very short and fluctuations of the water table are very fast and with high amplitude: in some cases, the water table has risen 90m in only 10 hours.

Three out of the four project countries (with the exception of Albania) together with Slovenia, Serbia and FYR of Macedonia were parts of the former Yugoslavia between 1918 and 1991. During this period many common activities in the water sector, water management and infrastructure construction projects took place in the country. Extensive and complex hydrogeological investigations throughout the Dinaric karst region in the former Yugoslavia were undertaken as part of large infrastructure projects including the construction of large and medium dams, development of well-fields for water supply, and control and regulation of karst aquifers with drainage galleries and other engineering works. Examples are the “Hydrosystem Trebisnjica” in Herzegovina, and Gornja Zeta in Montenegro, with plugging of underground flows, artificial drainage of poljes, and the intra-basin transfer of water. These modifications of water regime had various impacts. They include hydrogeological, hydrological, ecological and social changes. In some instances, the impact has been positive and predictable (flood reduction, irrigation, water supply improvement, power production, etc.). However, some impacts have been negative and sometimes unpredictable: important cultural/historical monuments, natural resort areas and arable land were inundated; the survival of endemic species is endangered; the regime and quality of some aquifers and springs has been changed, etc. Therefore, keeping the balance between necessity for regional development and preservation of complex karst environment and resources is the key issue for the region.

The results of hydrogeological investigations, including those conducted within the context of the DIKTAS project, represent an important contribution to international hydrogeological science. Evidence of significant interest by the hydrogeology community in Dinaric karst is the book ‘Hydrogeology of the Dinaric Karst’ published by the International Association of Hydrogeologists as Volume 4 of the book series ‘International Contribution to Hydrogeology’.
Due to its historical importance in the development of karst science, including its exemplary karst development with numerous geo-heritage sites, and abundant groundwater resources, an initiative has recently been taken to include the entire Dinaric region in UNESCO's list of World Heritage Sites.

1) THE GLOBAL ENVIRONMENTAL AND/OR ADAPTATION PROBLEMS, ROOT CAUSES AND BARRIERS THAT NEED TO BE ADDRESSED:

The Transboundary Diagnostic Analysis (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, but with a number of serious potential threats. The main threat to the overall groundwater quality in the DIKTAS region is solid waste and wastewater disposal. There are hundreds of unregulated landfills and illegal dumping sites in the four project countries. The number of wastewater treatment plants is insufficient, with about half of the population not connected to this service. For the vulnerable karst environment of the Dinaric region, which has a very limited auto-purification capacity, this is the most serious current as well as potential future problem. To a lesser degree, karst groundwater resources in the region are also contaminated by agricultural and industrial activities.

Currently no common legal framework and no common criteria exist for a) the delineation of water source sanitary protection zones, and b) setting cost-efficient measures for groundwater protection in the Dinaric Karst region. This was identified as the main issue of concern in section of the DIKTAS with centralized public water supply systems: Trebišnjica, Neretva, Cetina and Una.

There is a significant concern of some stakeholders about hydropower production in the region, especially in Bosnia & Herzegovina, including the impacts of hydropower infrastructure in the transboundary areas of Trebišnjica and Bilećko Lake. With the disintegration of Yugoslavia, this issue has obtained transboundary dimensions and has become very prominent. This holds for both already operational and planned infrastructural projects. The concern is not only environmental but also economic and political. The complexity of the karst environment, especially in terms of predictions, further complicates the resolution of the identified concerns. This also confirms that the definition of water resources development strategies in the Dinaric karst area based on sound governance principles is a key requirement for regional socio-economic development.

A major added value of the TDA can be seen in the collection and harmonization of a large amount of data and information relevant for the assessment and management of karst groundwater resources in the region. This gathered information was not always complete and in some cases, there were still significant information gaps. Nevertheless, the DIKTAS TDA was the first thorough regional groundwater analysis that covered Albania, Montenegro, Bosnia and Herzegovina and Croatia. The analysis included hydrogeological characterization, as well as social, economic, legal and regulatory aspects of the groundwater resources management in the region. Outputs of the TDA, including GIS materials such as thematic maps and databases and quantitative hydrogeologic analyses, form the basis for developing groundwater resources management models at both regional and local scales.

While the TDA has produced a fair assessment of groundwater resources in the region it also revealed limitations of knowledge on their actual state and trends in terms of quality and quantity. The main obstacle for this was a lack of monitoring data at both regional and local scales, such as in the vicinity of solid waste and wastewater disposal (treatment) sites, mines, intensive agriculture areas, and industrial facilities handling and generating hazardous materials. Therefore, an urgent message 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 TDA's comprehensive regional analysis was followed by an analysis of the main issues of transboundary concern. The latter were found to be concentrated in several sections of the DIKTAS, which were defined as of "transboundary influence" (or "transboundary aquifers" part of the larger DIKTAS), that is areas located all along the shared borders of the project countries where transboundary impacts on water quantity / quality, and /or on dependent ecosystem health are being felt. These aquifer areas of transboundary influence most of them named after the related rivers are: Una, Cetina, Kupa, Beretva, Trebišnjica, Bilećko Lake, and Cemi/Cijevna.

2) THE BASELINE SCENARIO:

<u>Socio-economic and environmental aspects:</u>

Out of the four DIKTAS countries, Croatia has the largest population with 4.29 M inhabitants followed by Bosnia and Herzegovina (3.8 M), Albania (2.8 M) and Montenegro (0,62 M). The population density is the highest in Albania (98.5/km2) and lowest in Montenegro (50/km2). The population growth rate is low or negative for all four countries. Across the region, there is a trend of migration from remote, rural areas towards urban areas and industrialized zones. Small settlements are extremely dispersed, and a number of settlements in rural areas are already abandoned. This trend becomes visible in the TBA areas, most of which are rural. Due to tourism, population numbers may vary considerably across the year, with peaks in the summer season (especially along the Adriatic coast).

Hydropower plays a central role for energy production in all DIKTAS countries. Amounting to more than 90% of its energy production, Albania relies almost entirely on hydropower. With more than 2,000 MW, Croatia has the highest hydro-power installed capacity among the countries, while its share of hydropower to total energy production is the lowest among the DIKTAS countries (31%). About 2/3 of total existing hydro power facilities are located in the DIKTAS karst area, therefore hydro power generation from DIKTAS karst system plays significant role in countries' economies.

The GDP percentage of the agriculture sector in the participating countries varies from 8% to 18%. The percentage of countries' agricultural area ranges from 24 to 47%. In Albania, the percentage of agricultural area is lower than in other countries, yet the agricultural sector in Albania has the highest contribution to GDP (more than 18%) compared with the other DIKTAS countries. Agricultural activities and the economic importance of agriculture is decreasing at the regional level. Agricultural sector is directed mainly to production of corn, maize and wheat in the continental parts, and grape, vegetables and fruits in southern parts of the DIKTAS region.

Major industries are iron works, aluminum, mining, and pharmaceutical industries, shipyards and the food-processing industry. During the transitional period (post 1990), the majority of the industries have rapidly decreased with limited success of recovering afterwards and with noticeable decrease in the role of heavy industry in the economies of all four countries. Heavy pollution in the form of PCBs, PAH, heavy metals, acids, fluoride, chlorine, lead, zinc, iron, copper and other metals have been registered from historical pollution hot-spots. Nowadays, economy of the countries has shifted from industrial and agricultural towards services oriented economies. Economic Indicators are showing constant improvement in the countries' economies that exert increasing pressures on the karst environment.

Across the region, the tourism sector is expanding and provides an important source of income (revenues range between 250 and 7000M Euro per year and share 2-15% of countries' GDP). In all four countries trends show significant and continual development of touristic sector. This is linked to the use of numerous natural resources and additional pressures on the environment. In Croatia, Albania and Montenegro tourism is seasonal (along the Adriatic coast) and the countries work towards diversification of touristic offer and activation of tourist destinations in mountains and rural countryside. Increased tourism development increases pressures on water utilization and protection.

The total estimated amount of generated solid communal waste is in: Albania is 400 000 t/year, B&H 1 400 000 t/year, Montenegro 280 000 t/year and in Croatia is 1.30,0000 t/year with different stage of development of waste management systems (for example, there is no system for the safe management of hazardous waste in Albania and Montenegro). Historic industrial sites are one of the main sources of pollution in the region. The main method of waste disposal is in unlined landfills which are present in an insufficient number, although it should be noted that new landfills are being constructed by EU standards.

Sewage systems are not at the desirable level and service coverage rate is much lower in rural than in urban areas. Wastewater (in rural and some urban areas) is discharged in improvised permeable septic pits, smaller adjacent surface streams or depressions polluting these streams with organic content, leading to pollution of the whole hydrological system and endangering drinking water sources. Therefore, waste and wastewater pollution has been identified as major threats to the protection of the Dinaric Karst Aquifer System.
None of the countries in the DIKTAS project have complete and operational network for systematic monitoring of groundwater quality. Consequently, a detailed assessment of the overall quality of the groundwater in the project region is not feasible. However, based on the available information, the quality of karst groundwater in the region can be rated as generally good, and most of the time in line with the standards for drinking water quality without any pre-treatment needed. Problems concerning chemical parameters of karst groundwater are very rare, and the main problems are

turbidity (typically caused by the rapid infiltration of precipitation) and microbial contamination. Contamination with pathogens is mostly related to human activities, including inappropriate disposal of wastes and wastewater. Another issue of concern is proper establishment and enforcement of the source protection zones around springs and wells utilized for public water supply. All countries have necessary legislation in place but proper implementation is frequently missing which jeopardizes a generally good quality of groundwater at the source.

Monitoring network of surface water quality is developed on different scales in the DIKTAS region. Croatia has a systematic network of monitoring stations that measure surface water quality at more than 400 locations, while Montenegro has a network with more than 60 monitoring stations in place. Although different national classification of water quality exists, the surface water quality in the Project region can generally be described as good to average (according to the EU WFD) in most cases. Quality of surface waters deteriorates immediately downstream of larger settlements and industrial pollution sites where it does not meet European Union standards. Major treats for the quality of surface (and ground) water are identified as very high percentage of untreated waste disposal and wastewater discharge (frequently directly to the recipient) as well as a large number of untreated/unsecured industrial pollution hotspots, mainly from the heavy industries (closed or partly in function) left from/after transition period to open economy principles in the 1990's. All DIKTAS countries are considered to have abundant groundwater resources at their disposal. However, during the summer period water shortages may occur, particularly in tourist areas along the Adriatic coast. Quantities of water use for different sectors correspond well with the level of economic development; still, most water in the region is used for drinking water supply. Main source for drinking water supply is groundwater basins, contributing as much as 90% to the water supply (in Montenegro and Bosnia and Herzegovina 90%, in Albania 70%). Large quantities of water are also used for production of electrical power. Most water supply systems in urban areas are regularly monitored for quality, while rural water supply systems may not be subject to any system of quality control. Percentage of total population connected to the public supply system varies from 48% (Entity of Republic of Srpska in Bosnia and Herzegovina) to 80% (in Croatia), with significant discrepancies between rural and urban areas. Water quantities used for industry and irrigation are significant, but those numbers rapidly decreased since 1990s. Floods are frequent in the project region due to the natural conditions, regime of the dams, and shortage of funds for flood protection.

The region is abundant with pristine nature areas, which are often vulnerable and under threat. Yet, none of the countries recognized the vulnerability, complexity, and importance of integrated protection of karst environment through national policies. The percentage of protected surface to the total area of the Country varies from 0,5-12,4% but none of the protected areas (or categories) in any country is solely related to the Groundwater Dependent Ecosystems (GDEs). Croatia has reported 29 sites that may be potential GDE, while info for rest of the Countries is missing and GDEs in those countries need to be investigated and properly acknowledged. Natural wetlands are dispersed over the region and are considered to be areas of high ecological value. Thirteen of them are Ramsar sites and are severely threatened by water use (such as for hydropower) and land-based sources of pollution and drainage. There are a number of caves in DIKTAS region, but most of them are not commercially utilized or known to the wider public. Higher institutional attention (identification and management) of sensitive karst morphological features is strongly needed as they represent unique (eco) systems of geological and biological importance and valuable parts of groundwater depended ecosystems (Figures 1 and 2).

In conclusion, the Dinaric karst is providing essential and extremely valuable ecosystem services and supports development of the countries' economies (drinking-water supply, tourism, hydro power production). At the same time, it is threatened by the ongoing activities including industrial pollution hot-spots, waste and wastewater disposal, and unsustainable water use and management.

Climate

The Balkan countries experience a range of climates out of proportion to the size of their geographic area. Albania has a Mediterranean climate with mild, wet winters and hot, dry summers, as does the southern part of Montenegro and the coastal and lowland areas of Bosnia and Herzegovina. The climate in the remaining areas of Bosnia and Herzegovina ranges from temperate continental to alpine. Most of Croatia has a moderately warm, rainy climate. The far north of

Montenegro has a continental climate, and the central and northern parts have some characteristics of mountain climate, but with Mediterranean Sea influences on temperature and precipitation.

The Balkans are getting warmer and are projected to continue on this warming trend generally in proportion to the expected increase in global temperatures. Similarly, the region is receiving less precipitation and is projected to experience further decreases, although precipitation patterns will continue to vary according to terrain, elevation and proximity to the sea. The effect of warmer temperatures on evaporation, together with the decline in precipitation is attributable to changes in the frequency of low intensity rain days and to a significant increase in the incidence of dry days. Precipitation in Bosnia & Herzegovina has increased in some areas, and decreased in others. Montenegro has been experiencing more frequent extreme heats since 1998, but annual precipitation has remained fairly constant with some fluctuations around the norm, and some analysts detect a slight downward trend.

Rising temperatures and disruptions in the precipitation regime are the most significant exposures for the region. All the countries in the West Balkans face more frequent and more intense droughts and floods, and the four countries with coastal areas – Albania, Bosnia and Herzegovina, Croatia and Montenegro – also face potential hazards associated with a rising sea level. Exposure to these hazards will play out in public health and biodiversity and in key economic sectors – water resources, agriculture, forestry, energy and tourism.

Climate and agriculture. The vulnerability of the region to climate change effects on water resources is high. As the disruptions in water resources ripple through the West Balkans, the negative effects will multiply. In particular, agriculture may see diminished production and periodic catastrophic losses, and hydropower may become less reliable. The socio-economic consequences are likely to be profound, and the countries of the are highly vulnerable to climate change. Agriculture has a significant role in the West Balkans' sensitivity to climate change. Almost half of the land in the region is used for agriculture – 19 per cent in pastures and 29 per cent in arable land and permanent crops. Estimates of agricultural employment vary, as do survey definitions, but between 18 per cent and 58 per cent of the working population is engaged in agriculture, and the sector is an important employer in the region, maybe the most important employer. Agriculture, on average, contributes 17 per cent to West Balkans' GDP. Croatia's 6.0 per cent agricultural share of GDP, the lowest in the region, is still significantly higher than the EU average of 1.6 per cent.

Forest fires.

Higher temperatures combined with more frequent and intense droughts increase the risk of forest fires, and the West Balkans are already experiencing more fires over larger areas – more than 38,000 fires that burned more than 450,000 hectares between 1988 and 2004 in Albania, Croatia, the former Yugoslav Republic of Macedonia, Montenegro and Serbia. No reliable data are available to estimate the economic losses, but the environmental damage includes loss of habitat, soil erosion and greenhouse gas emissions.

Floods. The region's exposure to more frequent and intense floods has implications for the economies of the countries and for the environment, to say nothing of the human suffering. Flooding in 2010 in Albania, Bosnia and Herzegovina, Croatia and Montenegro forced 20,000 people from their homes, and caused US$ 450 million in damage.

Mine tailings. The mining legacy in the West Balkans raises the specter of a flood resulting in an environmental catastrophe, possibly one with international implications. Mine tailings – the waste material remaining after metal and mineral extraction – contain complex compounds and residual chemicals used in the extraction process, and are held indefinitely in tailings management facilities. The volume and contamination level of waste in these facilities can be high, and maintaining reliable storage and management of the tailings is a challenge under any circumstances.

Unfortunately, many tailings management facilities in the West Balkans are abandoned, neglected or orphaned. Without routine monitoring and maintenance these facilities deteriorate and become vulnerable to failure and the consequent release of toxic contamination. The main exposure pathways for such releases are rivers, and the combination of river flooding and tailings management facility failure poses a major threat in the region. Such an event within a country would be bad enough, but when the river crosses international borders and the event involves more than one country, dealing with the event becomes more complicated.

Transboundary implications. Although all of the West Balkan countries have fresh water resources sufficient to meet the needs of sustainable development, climate change is expected to disrupt water regimes. As the requirements for drinking water grow, and the demands for hydropower production increase, the water resources of the region may come under pressure from users with conflicting interests. New international boundaries add yet another element of complexity.

Twenty years ago, the Balkans had six international river basins. Now, as a result of the new international borders, they have thirteen, as well as four transboundary lake basins. In terms of exposure and sensitivity, water resources in the Balkans are particularly vulnerable to climate change, and what happens in the water sector will influence what happens in agriculture and energy, two other highly vulnerable sectors.

The implications for the development of adaptation strategies are enormous. The water resources problem is more regional than national in scale, and effective adaptation in the region cannot occur on a strict country-by-country basis. This means that the Balkan countries must work together on regional adaptive strategies, and that their capacity to cooperate on mutual problems is a major element in their overall adaptive capacity.

Legal and Institutional Frameworks

In all four countries (Croatia, Bosnia and Herzegovina, Montenegro, and Albania) water issues are covered by different ministries and institutions at the different administrative levels. However, coordination and clear division of responsibilities among the institutions at different levels have not been properly defined and the level of law enforcement is not sufficient in all countries. Although all four countries have designated responsible institutions for implementation of EU water acquis there is a need for capacity building and education of personnel in those institutions, on issues like characterization of water bodies, establishment of reference conditions, analysis of human impacts, application of the 'combined approach' principle and development of river basin management plans and programs and measures.

Regarding the legal aspects, current regulations have many gaps and ambiguities linked to groundwater monitoring, due to unclear criteria related to the use of appropriate indicators/parameters of groundwater status, choice of measurement points and the frequency of monitoring. There is a lack of consideration of groundwater dependent ecosystems and the areas (water bodies) intended for the abstraction of drinking water (drinking water protected areas, DWPA) are not properly defined in national legislation. No clearly defined relationship exists between groundwater bodies, which are intended for the abstraction of drinking water, and sanitary protection zones which are defined to ensure protection measures within drinking water protected areas.

The concept of management and water protection in respective countries is determined by the national strategic documents. Croatia, Albania and B&H (both entities of B&H) have adopted Water Management Strategies. Albanian Water Strategy dates from 2004, and a new Strategy is under preparation. Montenegro has the Water Basis Document that dates from 2001, and a new Water Basis should be prepared and adopted. Although all these documents set out the vision, mission, goals and tasks of state policies in water management, including groundwater management, they differ in the level of harmonization with the requirements set in the WFD and the GWD. Besides, these water policy documents are only partly harmonized with other sectoral strategies. It is evident that sectoral policy documents, such as e.g. energy development strategies, the strategies of industrial development, territorial development strategies, etc. imply the existence and consumption of water as a resource. On the one hand, these sectoral strategies are not harmonized with each other, and on the other hand they rarely estimate real demand for water and water pollution potential of sectoral activities, which may threaten the implementation of the water protection measures both on the national and on regional (transboundary) levels.

In all four countries, 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. Although the "polluter pays" principle and the principle of "recovery of the costs" are promoted in national legislative documents, the principle of cost recovery is not fully transposed either in national regulations or in water management practices, with regards to implementation of the environmental and resource costs in water pricing policies. There is no legal or policy document in any of these countries which adequately defines and prescribes the

integration of environmental and resource costs into development of pricing policies. It should be noted that the main shortcoming of the legislative framework in all countries is an underdeveloped system of by-laws and insufficient implementation of present legislation due to lack of human resources and financial means for fulfilling legal and policy requirements. Due to the lack of clear development strategies, programs and plans on water management issues, the Dinaric Karst region cannot be considered as an example of successful implementation of the "user pays", "polluter pays" and "cost recovery" principles. National financial resources are not sufficiently developed to cope with the accumulated problems and due to its small budget, local communities, in principle, have to rely upon the assistance of the state and international donors.

All four countries have a wide experience in international cooperation for the protection and sustainable use of transboundary waters. The countries are part of multilateral framework conventions, and have bilateral and multilateral agreements at the ministerial level among themselves, covering transboundary water issues. Albania, Bosnia & Herzegovina and Croatia are parties to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UN Economic Commission for Europe, 1992) and to the Protocol on Water and Health (1999), adopted under this Convention. Countries are signatories to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) adopted in 1976. As regards multilateral agreements, Bosnia and Herzegovina, Croatia and Montenegro are parties to the Convention on Co-operation for the Protection and Sustainable Use of the River Danube (Danube River Protection Convention) (1994). Also, Montenegro ratified the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UN Economic Commission for Europe, 1992). Furthermore, Bosnia and Herzegovina and Croatia are also parties to the Framework agreement on the Sava River Basin (signed in 2002, in force in 2004), which was the basis for establishment of the International Sava River Basin Commission (ISRBC) in 2005, aiming to transboundary cooperation for sustainable development of the region. The International Sava River Basin Commission and Montenegro signed a Memorandum of Understanding in Belgrade in December 2013. Project countries have bilateral agreements on water management issues, related to transboundary water bodies, such as the agreement between Albania and Montenegro (signed on 14 December 2010), which covers the Basin of Shkodra Lake, Drini and Buna rivers, and related to the water streams at the border, such as agreement between Croatia and Bosnia and Herzegovina[11].

A 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. Adaptation and mitigation mechanisms and establishment of adequate supervision system(s) under these processes should be reflected in national legislations and transboundary agreements. The goal is to reduce the uncertainty in predictions of groundwater quality and quantity status determination and to enhance the conceptual understanding of the (karst) aquifer system and its interactions with receptors, terrestrial and aquatic ecosystems.

Stakeholder Analysis

The analysis of stakeholders carried out during the TDA process identified different actors that could influence/affect or be influenced/affected by the Project, as well as the management of the karst aquifers in the Dinaric karst region. Representatives of a wide spectrum of stakeholder groups participated in the activities which led to the stakeholder analysis, including water management-related ministries, regional authorities and research institutions, groups associated with tourism, NGOs working with nature and ecosystems, and the private sector, industries and hydropower. In general, there has been a good representation of stakeholder groups except the ones in the tourist sector and in agriculture and animal husbandry, the latter being under-represented and consequently not identified in the analysis. The water management-related institutions - perceived by the stakeholders as the most influential actors in the field of karst aquifers management - were those best represented. The industrial sector has been identified as one of the main sectors in terms of

[11] B&H bilateral agreement on water managment was signed in 1996. Two additional agreements between BiH and Croatia have been signed and they regulate: joint financing, operation and maitenance of the regional waste water system Neum-Komarn-Mljetski kanal; rights and obligations of the usage of water supply systems crossing the border.

pressures exerted on the resource and along with the private sector. Hydropower in particular is regarded as one of the most important economic activities in the region and the second most important user in terms of exerting pressure on groundwater. It is perceived to cause significant impacts on the quantity and quality of the resource. Sustainable tourism is regarded as the foremost proposed development option for the area with the agriculture development coming second; the identified groups in the above sectors have been less engaged in karst aquifer-related actions so far.

Some of the perceived transboundary issues, such as pollution, are common in all four project countries. Unsustainable and insufficient wastewater and solid waste management –especially inadequate landfills – are recognized as the most important pressure in this regard. Pollution from industry and agriculture is also indicated as significant. It was clearly shown that there is a need for more information and education in water resources management as well as more research and scientific knowledge exchange among stakeholders. Lack of cooperation among stakeholders, institutions and initiatives at all levels is noted. Inadequate implementation and enforcement of legislation is believed to be an issue. The harmonization of national legislations among neighboring countries and the completion of the transposition of the EU Directives are thought to be of importance.

Major issues of transboundary concern

Major issues of concerns were identified for the most significant areas of aquifer transboundary influence shared by the DIKTAS project countries, named after the related rivers/surface water bodies: Una, Cetina, Neretva, Trebišnjica, Bilećko Lake and Cemi/Cijevna.

The analysis has shown that transboundary aquifers have some unique major issues of concern and some that are shared. Specifically, TBAs Una, Trebišnjica, and Bilećko Lake share the issues of absence of a comprehensive groundwater monitoring program, including a necessary bilateral agreement and lack of a database on point and non-point sources of surface water and groundwater contamination (landfills, septic tanks, quarries, wastewater discharges and others). The lack of defined sanitary zones and uncontrolled collection and treatment of sewage water that is usually discharged into the ground are mainly issues for the TBAs Cemi/Cijevna and Cetina. The absence of harmonized criteria for delineation of the sanitary protection zones and of legal framework for establishment and law enforcement in sanitary protection zones affects the Una, Trebišnjica, Neretva and Cetina TBAs. The lack of harmonization of regulatory framework on groundwater protection including a legal mechanism for establishment and law enforcement in sanitary protection zones of karst springs used for public water supply is an important issue for the Una, Trebišnjica, Neretva and Cetina aquifers. Tourism initiated by the existence of national parks can trigger significant economic development and additional water abstraction that needs to be planned for; this is a major issue for both the Una and Trebišnjica TBAs. Specific major issues of transboundary concern are provided in Table 1.

Table 1. Major issues of transboundary concern

Major issue of concern	Basin
Possible microbiological contamination of karst springs in the Bihać region (B&H) due to lack of wastewater treatment (mostly from Croatia); Possible contamination of karst springs in the Bihać region (B&H) by spills of PCBs from destroyed military installations including Željava Airport in the very state border area and Udbina which is located in Croatia; Absence of reliable data on groundwater consumption in rural areas without a centralized water supply; Existence of big cities close to TBA can project pressures on the TBAs environmentally due to extensive economic demands.	Una
Lack of water users' analysis; Sanitary outflow from rural settlements is mostly unregulated (usually septic tanks that allow discharge in the ground); Construction of a hydro-power plant in the upper part of the Trebišnjica catchment is considered as an issue of concern by some stakeholders because of the possible change of water regime	Trebisnjica

downstream.	
Possible contamination of the Prud spring by nitrates, pesticides and phosphates as a result of agriculture activities in the Ljubuško Polje; Possible of contamination of the Prud spring due to the inadequate wastewater collection and treatment system of the town of Ljubuški; Possible contamination of the Neretva delta area due to the extensive use (or use of illegal types) of pesticides and fertilizers.	Neretva
Poor implementation of protection measures of drinking water in B&H; good implementation in Croatia; Possible water pollution at the springs in Croatia due to inadequate wastewater collection and treatment systems of settlements in B&H; Probable negative consequences on water quality due to the plans for developing large open pit coal mines in Duvanjsko and Livanjsko Poljes; Unregulated and/or unplanned economic activities based on the absence or abundance of water in the area.	Cetina
A concern from Montenegro is that although a part of Bilećko Lake's catchment area is in Montenegrin territory, Montenegro doesn't share benefits from the hydropower generated by using water from Bilećko Lake. Water from Bilećko Lake is used for water supply of the Herceg Novi municipality. The concern of Montenegro is that Montenegro pays a high price to the communal company of Konavle in Croatia for transfer of water to Herceg Novi.	Bilecko Lake
Lack of a sewage system in almost all the settlements in the TDA zone; A high degree of vulnerability of the karst aquifers because of the lack of vegetative cover and forests; Water exploitation and discharge without permits or control by the authorities; Lack of an appropriate drinking water system (water pipelines are local and amortized).	Cemi/Cijevna

The Strategic Action Program

Based on the outcomes of the TDA and other DIKTAS project activities, a Strategic Action Program was discussed and agreed upon by the National-inter-ministerial Committees (NICs) of the project countries and by the project Steering Committee, and finally endorsed by the countries (see attached letters of endorsement). The SAP was 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:

- 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.

The discussion among the countries resulted in a decision to produce a short document focused on key actions needed to enable the coordinated and cooperative actions by the countries aiming at achieving the above long-term objectives.

The SAP hence focuses on three Strategic Actions, to be implemented within a limited time span of 5 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 consider as a major climate adaptation measure, dealing concretely with issue of water shortage in dry periods and sustainable environmental flow. Accordingly, this action includes testing/implementation to encourage future replication in the region and elsewhere.

Table 2. SAP Priority Actions

Priority Action		Expected Results
1	Joint design and testing of a regional groundwater quantity and quality monitoring network and associated data exchange and analysis protocols	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.
2	Harmonization of criteria for (content and extend) of sanitary protection zones.	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.
3	Application and promotion of joint principles of sustainable management and equitable use of transboundary Dinaric karst aquifers.	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.

3) THE PROPOSED ALTERNATIVE SCENARIO

A SHARED GLOBAL VISION FOR GROUNDWATER GOVERNANCE (GEF, FAO, UNESCO, IAH and the WORLD BANK)

This is a vision of a world in 2030 in which countries have taken appropriate and effective action to govern their groundwater in order to reach globally shared goals of social and economic development and avoid irreversible degradation of groundwater resources and their aquifer systems. There is more freshwater stored underground than anywhere else on the planet. Although not all of this groundwater is readily accessible, groundwater has become a critical element for living for many settlements, cultures and economies as a prime source of water and also as a factor in environmental health and climate change adaptation. For all too long now, groundwater has too often been 'abandoned to chance' — despite the growing resource utilization and dependence. Therefore, a Shared Global Vision for Groundwater Governance has been generated through a worldwide process of consultation with groundwater professionals, users and managers. The

Vision is an urgent call for systematic action, recognizing that the 'price of doing nothing' will be especially high, in terms of lost freshwater reserves at a time when groundwater storage is critical for sustaining water security and adapting to climate variability. The Vision aims that by 2030:

1 there are appropriate and implemented legal, regulatory and institutional frameworks for groundwater that establish public guardianship and collective responsibility, permanent engagement of stakeholders and beneficial integration with other sectors, including other uses of the subsurface space and its resources
2 all major aquifer systems are properly assessed, and the resulting information and knowledge are available and shared, making use of up-to-date information and communication techniques
3 groundwater management plans are prepared and implemented for the priority aquifers
4 groundwater management agencies, locally, nationally and internationally, are resourced and their key tasks of capacity building, resource and quality monitoring, and promoting demand management and supply-side measures are secured
5 incentive frameworks and investment programs foster sustainable, efficient groundwater use and adequate groundwater resources protection.

The proposed project draws inspiration from the results of the GEF project "Groundwater Governance", and intends to implement the main steps recommended in the "Global Framework for Action" for setting the basis of sound groundwater governance. This approach and vision perfectly adhere to the conclusions reached by the countries sharing the DIKTAS that are enshrined in the Strategic Action Program for the DIKTAS prepared by the countries and recently endorsed at ministerial level.

What follows is a summary description of the proposed project Objective, Components, Outcomes, Outputs and a preliminary assessment of the possible activities.

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.

Component 1. Facilitating Multi-country cooperation

Outcome 1:
Institutionalization of frequent multi-country expert consultations and information exchanges, and creation and strengthening of bilateral/multilateral conflict resolution mechanisms provide the transboundary cooperation framework crucial for the sustainable utilization of shared karst waters, and for the protection of the Dinaric Karst ecosystems. (SAP Action 3)

Outputs:

1.1. Joint multi-disciplinary thematic groups established by project countries, with the participation of Croatia and the support of Project agencies. These Joint Expert Groups will lead project activities on issues related to groundwater governance and monitoring, conjunctive management of surface and groundwater, land use, agricultural practices, waste management, climate resilience, energy production, and protection of karst ecosystems services. They will participate and/or provide advice to all project activities, in particular to the harmonization of national sectorial strategies (Output 2.2).

1.2 Draft multilateral agreement on the establishment of Consultation and Information Exchange Body (CIE) and its permanent Secretariat prepared for governments approval 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 DIKTAS 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 for eventual adoption at a high level in all project

participating countries. National Interministerial Committees were active during the foundational phase (TDA-SAP), and were instrumental to the definition of the SAP. These bodies will be re-established in countries with the participation of high ranking members across the ministries (agriculture, mining, energy, finance, planning and water, but also other ministries as relevant and if they have a mandate within wastewater/solid waste pollution issues), and together with the Joint Expert Groups will participate to the establishment of the CIE and its Permanent Secretariat, and to the definition of their tasks and regulations.

1.3 Bilateral Agreements and Bodies. Options for the creation of bilateral agreements and management bodies to address the issues of concern in areas/basins of transboundary influence (Transboundary Aquifers of the TDA, see Table 1), and/or the strengthening of existing ones, will be formulated for decision by governments.

1.3 Stakeholder involvement plan formulated and implemented, including special focus on gender issues and women empowerment.

Through the joint work for the conduct of the transboundary diagnostic analysis and the formulation of the strategic action program, the four participating countries have reached a level of mutual trust and shared understanding of the DIKTAS and of the sections of the aquifer system more prone to transboundary impacts sufficient to enable them to commit to a multi-country cooperation mechanism for the improved management of the shared groundwater resource. Any such mechanism at the level of the whole aquifer is lacking at present in the region, while bilateral agreements of limited scope involve transboundary sections of the DIKTAS. A consultative and information exchange (CIE) body of the four countries would consolidate the countries' systematic commitment to cooperative management, and provide a concrete response to the call of the science community of the region that identified as key priority "... to gain a better mutual understanding of the peculiar properties and functions of the Dinaric Karst Aquifer System, and to adopt policies for its joint management, based on a regional consultative and management mechanism". The CIE shall be open to other countries sharing the aquifer system upon their request and approval from the CIE Permanent Secretariat.

Cooperation is required by the provisions of the EU Water Framework Directive (WFD), which the four countries are in the process of implementing in their national legislations, by the UN ECE Water Convention (1992) which the DIKTAS countries have ratified, and by the UN General Assembly Resolution A/RES/63/124, which represents the only international text related specifically to transboundary aquifers.

Component 2. Institutional strengthening for improved groundwater governance (SAP Actions 2 and 3)

Legal framework will target societal goals of sustainable and efficient development and use and equitable sharing of benefits, the full compliance with the WFD, and the harmonization with other relevant sectors. It will be based on four basic provisions: Groundwater brought into the public domain; Licensing of water-well construction and groundwater extraction; Control of 'point-source' pollution of groundwater; Requirement for transparency and sharing of data collected by all groundwater users, private and public.

Capacity building of national government officials and technical staff will be an important part of this Component. It will be developed through a number of formal training courses, and enhanced through the creation of National Execution Units that will carry out project activities at the national level under the oversight of the Executing Agency and in collaboration with the Joint Expert Groups. These Units will be funded by the participating countries as part of their counterpart co-financing to the project.

Outcome 2:
Adoption of sound groundwater governance principles and frameworks, including emphasis on sanitary protection zones, harmonized across the Dinaric Karst Aquifer System, facilitated through the application of the methodology developed by the Groundwater Governance GEF project.

Outputs:

2.1 Groundwater governance diagnostic analysis in all project countries, including a stocktaking of the governance situation — actors, legal framework, policies and plans, adherence to the EU WFD and GWD, available knowledge, enforcement capacity — and an assessment of gaps and opportunities.

2.2 National policy, legal and institutional reforms defined and harmonized across countries on laws and regulations regarding groundwater with focus on sanitary protection zones. Proposed policies and reforms will be submitted to Governments for adoption. Legal framework will target societal goals of sustainable and efficient development and use and equitable sharing of benefits, the full compliance with the WFD, and the harmonization with other relevant sectors. It will be based on four basic provisions: Groundwater brought into the public domain; Licensing of water-well construction and groundwater extraction; control of 'point-source' pollution of groundwater; Requirement for transparency and sharing of data collected by all groundwater users, private and public.

2.3 Training courses on: hydro diplomacy; international water law, legal instruments and soft laws; groundwater governance (based on the guidelines produced by the GEF/FAO Groundwater Governance project); gender analysis and sex disaggregated data collection; land use policy and practice in karst terrains; enforcement of sanitary protection zones around springs and other karst features and ecosystems.

Activities will include amongst others:

- Harmonize protection measures in sanitary protection zones required by the current legislation of individual countries;
- Analyze 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;
- Analyze 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 with ensure full transposition of Water Framework Directive (WFD) into national legislation in the field of drinking water protection in karst areas;

Component 3. Monitoring karst waters and dependent ecosystems (SAP Action 1)

Since none of the countries has a complete and operational network for systematic monitoring of groundwater quality/quantity the TDA calls for the improvement of the groundwater monitoring network throughout the region. The project will facilitate this investment by the countries by producing an agreed upon design of the network and its protocols, implementing on the ground demonstration networks and a joint data sharing mechanism across the countries.

Outcome 3:
Modern multi-purpose monitoring of karst groundwater enables responsible entities at the local and at the regional level to effectively manage the shared karstic waters and dependent ecosystems.

Monitoring protocols will be designed considering optimum spatial and temporal sampling/monitoring points distribution and will be based on (i) updated reconstructions of the regional and local hydrogeology, (ii) the identification of groundwater dependent freshwater ecosystems and waterbodies, and of coastal ecosystems, (iii) the mapping of water uses for domestic, agricultural, industrial (including energy production) purposes, and (iv)

an inventory of groundwater wells, discharge points of wastewater and pollution hot spots; (v) known areas of diffuse contamination
Outputs:

3.1 Design of DIKTAS-wide groundwater multi-purpose Monitoring network harmonized across the countries. Monitoring will be related to quantity and quality in line with recommended standards of the EU Water Framework Directive. The network will provide (i) periodic information on the regional background, and (ii) greater detail in space and time in vulnerable areas of concern and of transboundary influence indicated in the TDA. The design of the monitoring network will also consider a Stakeholders' involvement analysis in order to ensure equipment safety, data assimilation and long term operational success of the network.

3.2 Monitoring network design tested on the ground and two full-scale demonstration monitoring networks, and related infrastructure, implemented in two selected areas of transboundary and environmental concern.

- In order to get information of background long term water budget trends, which will help analysis future effects of climatic variations in the region, one ad hoc monitoring station will be installed in selected sites in each project country.
- Full scale demonstration networks, including sensors and transmission equipment. will be installed in two selected areas of transboundary influence, and/or protection zones, tentatively in the transboundary basins/aquifers Cetina-Una (B&H – Croatia) and extended Cijevna-Cemi catchment area (Montenegro-Albania) as set in the SAP, and based on an assessment of the water supply potential in the two karst basins[12]. Training on the implementation of the networks, maintenance, data collection and processing will be provided to relevant national agencies.

Outcome 4:
Agreement on real-time harmonized data sharing enables effective transboundary cooperation.

Output:

4.1 Joint data sharing mechanism: joint design and implementation of a real-time data sharing mechanism and harmonization of different national classification standards of water quality, following EU guidelines. If possible, the sharing mechanism will use a GIS-based and real-time online database. The sharing of agreed upon monitoring data will feed periodically into the Consultation and Information Exchange body under the responsibility of its Permanent Secretariat, and be reflected into the relevant Multilateral Agreement dealing amongst others with the long term sustainability of the data sharing mechanism, including financing, updating and maitemnance.

Activities will include amongst others:

- Definition of criteria and objectives for the design and establishment of a monitoring network;
- Identification of most suitable and effective locations for the emplacement of groundwater monitoring stations, using whenever possible existing wells and considering long term monitoring equipment safety and maintenance;
- the definition of monitoring parameters, and selection of automatic equipment for sampling and data transmission; methodologies for manual monitoring (sampling methodologies, methodologies for needed laboratory analyses, frequency of sampling); parameters for which information will be exchanged between countries sharing the aquifer (including frequency, units to be used etc.) etc.

[12] A technical study of the potentials of GW sources for water supplying in extended Cijevna-Cemi catchment area (Montenegro-Albania) will be developed.

- the training of entities that will be involved and responsible for monitoring involving stakeholders, e.g. local schools, in the data gathering and stations maintenance;
- Design of groundwater quality and quantity indicators, intended to facilitate data assimilation by authorities and long-term evolution of overall aquifer status;

Component 4. Focus on areas of transboundary influence and of special concern

Outcome 5 :
Definition of national and/or binational Action Programmes, and of DIKTAS wide guidelines for reversing degradation trends in highly vulnerable areas accelerates remedial actions (SAP Actions 1,2 and 3)

Outputs:

5.1 Action Programmes for all 6 areas of transboundary influence identified in the TDA, addressing:

- the establishment of a common groundwater monitoring program;
- the adoption of harmonized criteria for the delineation of sanitary protection zones and setbacks (springs, sinkholes and other karstic features, wells);
- definition and adoption of harmonized policies and practices for storm-water and wastewater management, and for domestic and solid waste disposal;
- establishment of special protected areas for most valuable karstic features and related biodiversity.

The Action Programs will be submitted for adoption at governmental level.

5.2 The DIKTAS Rulebook and guidelines on sanitary protection zones and setbacks, and for domestic and solid waste disposal, defining the boundaries of sanitary protection zones and the associated protection measures;

Component 5.
Awareness Raising and Gender Mainstreaming (SAP Action 3)

Outcome 6:
Increased awareness among stakeholders, dissemination of project's achievements and lessons learned, and strengthened gender equality and women empowerment facilitate adoption of good practices and policies. (SAP Action 3)

Outputs:

6.1 Awareness raising events and dissemination products, aimed at:

- 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 the 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;
- Disseminating experience and lessons lerned notes at various educational levels, from academia to primary schools

6.2 Gender analysis conducted in project countries water sector. Gender analysis offers information to understand women's and men's access to and control over water resources that can be used to address disparities, challenge systemic inequalities (most often faced by women), and build efficient and equitable solutions.

6.3 IW LEARN activities: Sharing experiences within the GEF IW portfolio by producing 4 experience notes and securing participation in regional conferences, twinning programs, and IWCs. 1 % of the GEF grant will be devoted LEARN activities.

4) INCEMENTAL COST REASONING

The incremental reasoning at the basis of this project is quite simple. In fact, the project aims at adding the multi-country, regional dimension needed to reform and harmonize present national policies and physical plans, and address the transboundary implications of the shared nature of the resource. This regional dimension will involve and bring about the shared recognition of the system boundaries (in line with the ecosystem approach), the establishment of multi-country mechanisms for cooperation, and the enhancement of regional awareness and stakeholder involvement, all of which is incremental with respect to the "baseline" represented by the fragmented, single-country approach to groundwater exploitation presently adopted by the countries sharing the Dinaric Karst Aquifer System. Without the facilitation of the GEF, the countries would continue to implement fragmented and poorly coordinated management, monitoring and exploitation policies that would not take into systematic consideration the challenges existing in areas of transboundary influence, thereby exacerbating conflicts among users, threatening water security and the integrity of groundwater dependent ecosystems and coastal environments.

5) GLOBAL ENVIRONMENTAL BENEFITS

The global benefits that the project aims to produce fall into two categories:

(i) Enhanced cooperation in the management of the transboundary groundwater resources; (ii) Improved sustainable use of the services provided by the DIKTAS also in view of climate variability and change.

The project will also represent a globally relevant demonstration of the important role of groundwater in coping with increased climate variability and change, balancing water uses, and improving overall sustainability and cooperation in complex transboundary contexts.

In order to maximize the ability of the project to produce global benefits, its design includes specific elements that will emphasize the national benefits that integration of groundwater in water management policies and practices, and increased transboundary cooperation in water management will bring about. In particular:

Outcomes 2, the adoption of sound national groundwater governance principles and the establishment of new national policies, harmonized across the region, on sanitary setbacks and zoning and of other measures for the protection of karst waters and ecosystem;

Outcome 3, leading to the multi-country agreement on regionally harmonized, modern, multi-purpose national monitoring networks of karts waters.

6) INNOVATION, SUSTAINABILITY AND POTENTIAL FOR SCALING UP

The project being proposed 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:

i) It is the first time, not just for the region, but also at the global level, that countries sharing a major karst aquifer system cooperate in the adoption of common groundwater governance principles and agree on the harmonization of monitoring protocols;
ii) The project will foster a Multilateral Agreement on the establishment of a Consultation and Information Exchange body, including permament technical support from the "multi-disciplinary thematic expert groups" established by the project, and the long term sustainability of the infromation exchange mechanism.
iii) The project design adopts a blend of mutually reinforcing national and regional actions that will enhance sustainability and the likelihood of scaling up;
iv) 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.
v) This project represents the first attempt to implement on the ground the recommendations emerging from the recently completed project: "Groundwater Governance: A Framework for Action" (GEF /FAO / UNESCO / IAH / WB).

2. Stakeholders. *Will project design include the participation of relevant stakeholders from* civil society organizations *(yes ☒ /no☐) and* indigenous peoples *(yes ☒ /no☐)? If yes, identify key stakeholders and briefly describe how they will be engaged in project preparation*

In addition to the national and local government agencies responsible for water resources management of the 4 participating countries (Ministries of Environment, Ministries of Agriculture, Rural Development and Water Administration, Ministries of Energy and Industry, National Environmental Agencies and Water Secretariats, etc.) the key stakeholders in this project will be the academic and research institutions, concerned CSPs and NGOs at national and local levels, and international cooperation partners.

3. Gender Equality and Women's Empowerment. Are issues on gender equality and women's empowerment taken into account? (yes ☐ /no☐). If yes, briefly describe how it will be mainstreamed into project preparation (e.g. gender analysis), taking into account the differences, needs, roles and priorities of women and men.

Gender mainstreaming has been the primary methodology for integrating a gender approach into environment and development efforts. It is defined by the UN Economic and Social Council (ECOSOC) as: "...the process of assessing the implications for women and men of any planned action, including legislation, policies or programs, in any area and at all levels. It is a strategy for making the concerns and experiences of women as well as of men an integral part of the design, implementation, monitoring and evaluation of policies and programs in all political, economic and societal spheres, so that women and men benefit equally, and inequality is not perpetuated. The ultimate goal of mainstreaming is to achieve gender equality."

UNDP is committed to supporting capacity development of its national partners to adopt approaches that advance women's rights and take account of the full range of their contributions to development, as a foundation for SDG achievement. The commitment of UNDP on gender issues is covered in its gender equality strategy of 2008- 2011. Under this strategy, the GEF is identified as a key partner in the development and harmonization of supportive policy and legislative frameworks and institutional capacity building which is at the heart of the GEF's international waters portfolio approach for the improved management of transboundary waters. Involving both women and men in integrated water resources initiatives is likely to increase project effectiveness and efficiency. Participation by both women and men improves project performance and improves the likelihood of sustainability. In other words, a project is more likely to achieve what planners hope it will achieve if women and men (both rich and poor and representing different sectors) are active participants and decision makers.

In the project area, in a changing environment towards EU accession the role of women is being enhanced. There is a tradition of active participation of women in the economy as a result of the existence of socialist regimes in the project countries till the early 90's.

On gender issues, the project will adopt a two-pronged approach:

1) Mainstreaming gender in project execution - Balanced gender participation in project execution activities will be ensured, including in working groups, the project management unit, text drafting teams etc. Gender consideration will be mainstreamed in all documents produced by the project, and particular attention will be paid to gender in monitoring and reporting activities. The project will work to ensure a balanced participation among men and women in the overall stakeholder involvement strategy and in consultation workshops, and will support both women's and men's contributions individually, rather than assuming that both groups will benefit equally from gender-neutral development interventions.

2) Integration of the gender perspective into water policies - The development and harmonization of supportive policy and legislative frameworks and institutional capacity building aimed at ensuring that the gender perspective is successfully incorporated into national and international water governance, policy, and activities, will be a major objective of the project. This will be promoted by conducting Gender Analysis of the water sector in project countries, including:

- Identifying gaps in equality and developing strategies and policies to close those gaps; considering gender issues in the mapping and analysis of water resource use;
- Promoting women's participation in awareness raising training activities;
- Supporting for educational activities, on topics such as the environment, energy, and decision-making in general;
- Involving women's organizations: while the responsibility for implementing a gender approach does not rest solely with women's organizations, they are natural vehicles for promoting gender equality at the local as well as the national level.

The Gender Mainstreaming Strategy for the project including the above activities will be drafted as part of the Public Participation and Stakeholders Involvement Plan and submitted to the countries for approval.

4 Risks. Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable).

The only major risk that may prevent the full success of the project is the lack of sustained political support for this cooperative effort in the countries and states sharing the aquifer. The project proponents, fully aware of this challenge, have enhanced domestic benefits to be derived from the project, and focused specific project activities to the strengthening of this commitment through improved awareness, exchanges and consultations, and strengthening of capacity. It is also expected that Croatia, the non GEF recipient country participating to the project and EU member, will exercise leadership and help improve conditions for cooperation. Finally, the EU admission political objective of some of the countries will also help in moving the project successfully forward.

Given the nature of the project, oriented at setting the basis and the tools for harmonized governance of karst waters and ecosystems, Climate Change will not have any impact on the project likelihood of success. Climate change and increased climatic fluctuations will have on the other hand to be taken into full consideration as part of the technical components of the project, from the design of the monitoring networks, and the governance diagnostic analysis.

Risk	Level	Mitigation
Lack of sustained political support	low	The project design foresees activities that will strengthen country commitment through improved science and understanding, exchanges and consultations, awareness campaigns and capacity building

5. Coordination. Outline the coordination with other relevant GEF-financed and other initiatives.

The project, based on the more comprehensive and shared understanding of the freshwater resources of the whole Dinaric Karst region, will jump start the implementation of the priority actions agreed as part of the SAP, essentially related to the introduction of sound groundwater governance and management tools at the domestic level, and harmonized regionally. This in turn is expected to link with, and enhance the effectiveness of a number of complementary ongoing and planned initiatives (GEF and non-GEF) by providing the so far lacking overall policy and governance frameworks and tools.

Among the major related ongoing activities, it is worth mention:

1. GEF/UNDP project *"Enabling Transboundary Cooperation and Integrated Water Resources Management in the Extended Drin River Basin*" (Albania, Kosovo, Macedonia, Montenegro) aimed at harmonizing the so far fragmented approach to the management of this highly transboundary basin, which includes large karstic water resources.

2. GEF/WB project "*West Balkans Drina River Basin Management*" (Bosnia & Herzegovina, Montenegro, Serbia). The main objective is the preparation of the basin management plans for Drina and Seman transboundary rivers, and of the National Water Strategies and the national water cadaster.

3. GIZ, "*Climate change adaptation in the Western Balkans*". Regional project (Albania, Macedonia, Serbia, Kosovo, Montenegro). Project is focused on climate change and water issues.

4. WB, "*Study of the establishment of the protection zones of the Klokot source interrupted by the interstate border*" (Bosnia & Herzegovina, Croatia). In preparation.

5. UNEP/EBRD "Mediterranean Sea Programme (**MedProgramme**): Enhancing Environmental Security. Council approved, child projects in preparation.

6. Consistency with National Priorities. Is the project consistent with the National strategies and plans or reports and assessements under relevant conventions? (yes ☐ /no☐). If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

The Strategic Action Program for the DIKTAS aquifer is in line with the national priority objectives, strategies and plans of the project countries related the protection (quality, quantity), monitoring and sustainable use if water resources and especially groundwater. It also reflects the guidance of the EU Water Framework Directive and of the Groundwater Directive. The proposed SAP implementation project adheres to the EU guidance and national priorities, and represents a step forward in their implementation.

Freshwater related Global Treaties and Action Programs

The project by dealing with the DIKTAS waterbody in a holistic manner, ensures a collective response to relevant agreements, whether bilateral, multilateral, regional or truly global. In particular it supports compliance with, and implementation of the provisions of all major global treaties and soft laws related to freshwater and dependent ecosystems, and the coastal environment:

- 1992 UNECE Water Convention
- 1997 UN Convention on the non-navigational uses of international watercourses
- UNGA Resolution on the Law of Transboundary Aquifers
- GPA – Global Program of Action on land based sources of marine pollution
- Ramsar Convention on Wetlands

- Barcelona convention

Sustainable Development Goals

The Sustainable Development Goals and Targets, recently approved by the UN General Assembly in September 2015, represent an overarching framework providing guidance and common objectives to all, from individuals to countries and international organizations. The proposed project will provide major support to the achievement in the project countries of a number of targets, related Goals 6 on freshwater, 13 on climate change adaptation, 12 on sustainable consumption and production patterns, and 5 on gender equality.

SDGs	Project's Components			
	1 Facilitating Multi-country cooperation	2 Institutional strengthening for improved groundwater governance	3 Focus on areas of transboundary influence and of special concern	4 Awareness Raising and Gender mainstreaming
	Targets			
5. Achieve gender equality and empower all women and girls				5.5
6. Ensure availability and sustainable management of water and sanitation for all	6.5	6.3, 6.4, 6.6	6.5	
12. Ensure sustainable consumption and production patterns		12.2	12.2	
13. Take urgent action to combat climate change and its impacts	13.3	13.1	13.1	13.1
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss				15.1

Target 5.5: ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life

Target 6.3: by 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and increasing recycling and safe reuse by x% globally

Target 6.4: by 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity

Target 6.5: by 2030 implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

Target 6.6: by 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

Target 6.a: by 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation related activities and programs, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

Target 12.2: by 2030 achieve sustainable management and efficient use of natural resources

Target 13.1: strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries

Target 13.2: integrate climate change measures into national policies, strategies, and planning

Target13.3: improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning

Target 15.1: by 2020 ensure conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wet- lands, mountains and drylands, in line with obligations under international agreements

7. Knowledge Management. Outline the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

The project is intended to demonstrate the application of IWRM principles and Groundwater Governance frameworks in a karst environment. Integrated aquifer management to be efficiently applied in practice needs both knowledge and practical tools, which the project will strive to enhance. Well-planned structured stakeholder consultation processes in order to facilitate aquifer monitoring, governance and management, will be part of the knowledge management effort together with the participatory design of the monitoring protocols and data processing. The project will facilitate direct exchanges on best practices and enhance capacity and expertise among relevant national entities through collecting and disseminating the shared knowledge for the common benefit of all, enhancing national and local capacity in groundwater knowledge management, and applying lessons learned throughout the region and beyond, via IW LEARN services.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT[13] OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):
(Please attach the Operational Focal Point endorsement letter(s) with this template. For SGP, use this SGP OFP endorsement letter).

NAME	POSITION	MINISTRY	DATE *(MM/dd/yyyy)*
Prof. Dr. Mr. Pellumb Abeshi	**General Director of**	**MINISTRY OF**	**20-SEP-2017**

[13] For regional and/or global projects in which participating countries are identified, OFP endorsement letters from these countries are required even though there may not be a STAR allocation associated with the project.

	Environment. Ministry of Environment, Forest and Water Administration	**ENVIRONMENT, FOREST AND WATER ADMINISTRATION, ALBANIA**	
Assistant Professor, Mr. Senad Oprasic	**Head of Environment Protection Department**	**MINISTRY OF FOREIGN TRADE AND ECONOMICAL RELATION, BOSNIA AND HERZEGOVINA**	**28-SEP-2017**
Mr. Pavle Radulovic	**Political Focal Point Minister of Sustainable Development and Tourism**	**MINISTRY OF SUSTAINABLE DEVELOPMENT AND TOURISM, MONTENEGRO**	**29-SEP-2017**

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies[14] and procedures and meets the GEF criteria for project identification and preparation under GEF-6.

Agency Coordinator, Agency name	**Signature**	**Date** *(MM/dd/yyyy)*	**Project Contact Person**	**Telephone**	**Email**
Adriana Dinu, UNDP GEF Coordinator		1 Sept 2017	Vladimir Mamaev		vladimir.mamaev@undp.org

C. ADDITIONAL GEF PROJECT AGENCY CERTIFICATION (APPLICABLE ONLY TO NEWLY ACCREDITED GEF PROJECT AGENCIES)

For newly accredited GEF Project Agencies, please download and fill up the required **GEF Project Agency Certification of Ceiling Information Template** to be attached as an annex to the PIF.

[14] GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, SCCF and CBIT

ANNEX 1 – Outline of the envisaged groundwater monitoring design

A groundwater monitoring system is the combination of monitoring stations, monitoring devises, technical expertise, protocols, data management, visualization tools, stake holders, ruling bodies and action mechanisms (Figure 1). Following this comprehensive approach, the proposed monitoring strategy will be designed following the requirements described in the European Water Framework Directive, and agreed country requirements described in the DIKTAS TDA.

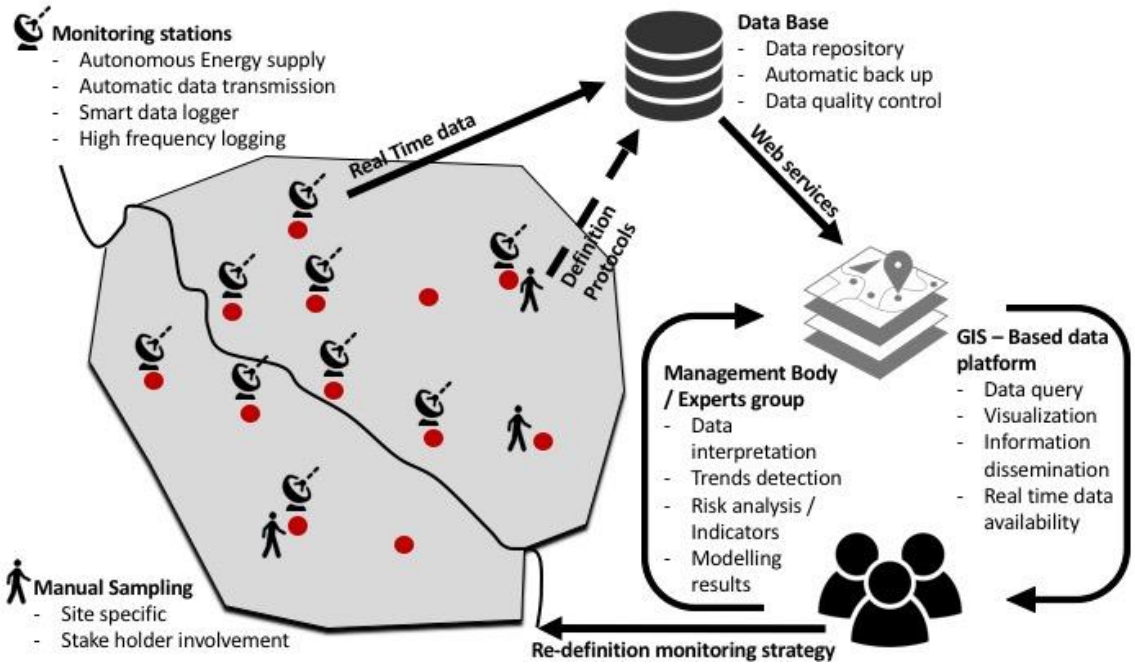

Figure 1. Conceptual design envisioned monitoring system

For the data acquisition, the project will rely on the combination of automatic monitoring and manual sampling. Both should cover operational and surveillance networks. The operational network will be focused in the areas with transboundary interest and/or at risk, whereas the surveillance network will try to capture long term trends, related to natural variations in groundwater bodies. Sampling frequencies and parameters will be decided upon revision of the existing information and proper conceptualization of each groundwater body. However, is expected that automatic stations will provide daily data, while manual sampling will provide monthly or annual information.

The extreme heterogeneity characteristic of karst aquifers is the main challenge when characterizing these systems. In order to capture the dichotomy between matrix and conduits behaviour, designing a monitoring system requires of the combination of strategies. For example, most commonly used pressure sensors will not hold groundwater table variation range between 10 and 100 m depth, common in karst systems. This dichotomy between rapid and slow reactions within the same groundwater body,

makes essential continuous monitoring of water levels, spring discharges and water quality[15] (Figure 2).

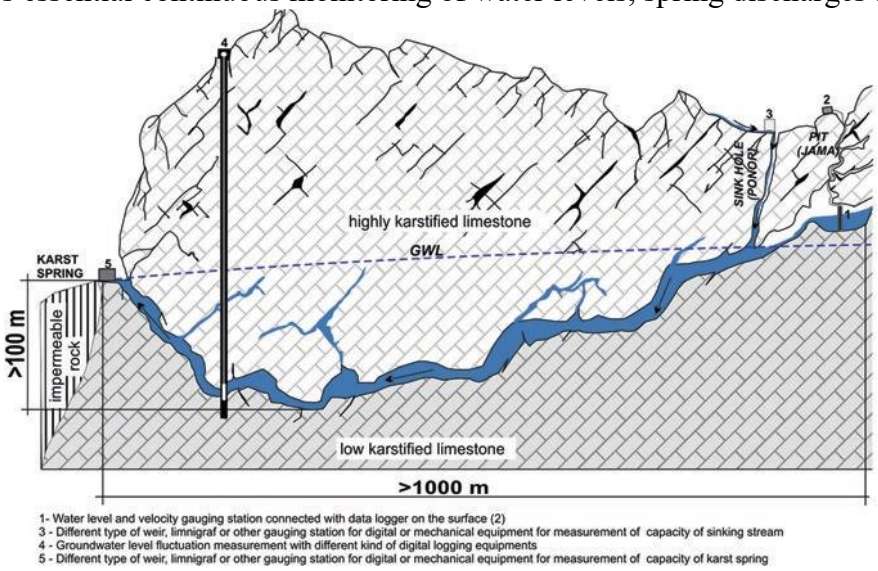

Figure 2. Schematic section of a karst system, including possible monitoring locations. (Source: Stevanovic, Z., et al. "Karst Aquifers Characterization and Engineering", Profesional Practice in Earth Sciences, Springer, 2015.)

Groundwater quality control is one of the most challenging tasks in karst aquifers. Rapid residence times allow contaminant to travel long distances through the aquifer system without being naturally attenuated. In previous phases of DIKTAS project, pollution due to nutrients, pesticides and poorly treated waste waters was identified as one the major problems that the region faces. Proper definition of protection measures and zones requires also understanding of the sources of pollution and residence times. In response to this specific requirements, the use of Microbial Source Tracking (MST) tools, in combination with traditional water isotopes, to discern sources of faecal pollution and nutrients[16] will be applied.

Automatic monitoring of minimum groundwater levels, temperature, electric conductivity, will provide a real time source of information. All these data will be fed automatically in a database, used as a repository from where other applications will draw information. The combination of this automatically updated data base and a GIS-based data platform will be the core of the data management strategy. Both should allow the management body and expert groups to have access to real time information, query data in time and space and visualise.

Groundwater related data interpretation and visualization is a challenge of concern in most water agencies around Europe. Specially the integration of hydrogeochemical data with groundwater levels and other types of information has inspired many efforts resulting in software and tools like

[15] N. Goldscheider (2015) Overview of Methods Applied in Karst Hydrogeology. Chapter 4. In Z. Stevanović (ed.), Karst Aquifers – Characterization and Engineering. Professional Practice in Earth

[16] A. Munne et al. (eds.), Experiences from Ground, Coastal and Transitional Water 1 Quality Monitoring: The EU Water Framework Directive Implementation in the Catalan River Basin District (Part II), Hdb Env Chem (2016)

AQUACHEM [17] , HyKA [18] or ChemPoint Professional Edition[19]. The Catalan Water Agency (Agencia Catalana del Agua – ACA), recently implemented a GIS-based tool for geochemical data analysis and integration which allowed to statistically analysed time series, plot data and create reports from monitoring series called QUIMET [20]. Similar approaches will be used to facilitate data assimilation by the experts group and management body.

One of the key output of the monitoring system, in line with EU WFD, will be the definition of trends which allows the identification of break points, positive or negative, based on which actions would be taken. Time series analysis and definition of thresholds will be one of the key elements in the data interpretation process.

Results from the interpretation phase will be centralized in the same database and accessed also though the Web-based GIS portal.

[17] Schlumberger (2014) AQUACHEM, Schlumberger Limited. http://www.swstechnology.com.

[18] KWR (2011) HyCA KWR Watercycle Research Institute (Holland). http://www.kwrwater.nl/ HyCA/.

[19] StartPoint (2015) StartPoint Software Inc., 2015. http://www.pointstar.com/ChemPoint/ default.aspx.

[20] Velasco V, Tubau I, Va zquez-Suñe E, Gogu R, Gaitanaru D, Alcaraz M, Serrano-Juan A, Fern andez-Garcia D, Garrido T, Fraile J, Sanchez-Vila X (2014) GIS-based hydrogeochemical analysis tools (QUIMET). Comput Geosci 70:164–180