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Proposals for the Protection of Water Resources in the Prespa Lake Basin, Greece

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Abstract

The present paper focuses on the region of Prespa in northwestern Greece, a disadvantaged mountainous region, whose natural environment is protected by numerous international treaties (Ramsar, Natura 2000) and which depends heavily on its surface water resources for most of its socio-economical activities. The study area's primary surface water bodies are the trans-border lakes Small and Great Prespa, which, over the years, have witnessed a decline in both the quality and the quantity of their waters. Therefore, the paper's main objectives are to investigate the pressures that the water resources are under and to propose ways to counteract the current negative quantity and quality trends. The research methods employed in the present research include: review of relevant literature and the implementation of a set of methodological tools, namely SWOT Analysis, Stakeholder Analysis and the Logical Framework Approach (LFA). The literature review showed that activities of the primary sector are responsible for the largest percentage of water use in the study area, agriculture being the top consumer of water. Therefore, the paper discusses new irrigation-related technologies, aimed at achieving higher water efficiency and lower levels of agrochemical pollution of the aquifer. The implementation of the methodological tools results in an overall schematization of the factors that can affect water resources in the study area and in probable policy making axes. The research concludes, among others, that the region can exploit several developmental and financial programs in order to achieve the goals of enhancing water quality and quantity and achieving sustainable economic development.

Key words

Irrigation, Prespa lakes, Water resources

1. INTRODUCTION

The protection of the environment and the establishment of a global framework of sustainable development has been a permanent topic in the sector of policy making in recent decades. Indeed, both the continuation of life in general, and the vast majority of modern human activities heavily depend on the condition and availability of natural resources.

Water is one of those natural resources because of its importance both for the continuation of life and for many activities of economic nature, i.e. industry, agriculture, tourism etc.. The importance of water resources is further highlighted in small remote regions where agriculture is usually the main economic activity and the primary source of income.

The Greek part of the Prespa region, which is the focal point of the present paper, belongs to the type of regions described above. It is located in northwestern Greece, on the borders between Greece, Albania and the Former Yugoslav Republic of Macedonia (F.Y.R.O.M.) and gets its name from the two trans-border lakes that are found in it, namely Lakes Small and Great Prespa. Great Prespa Lake is divided between the F.Y.R.O.M., Albania and Greece, whereas lake Small Prespa is divided between Greece and Albania.

It is calculated that 65% of the active population is occupied in the primary sector, the main economic activities - in order of population occupied in them - being: agriculture, stock raising, fishing and forestry. An interesting fact is that about 58% of the crops in the study area are bean cultivations, so that beans can be characterized as a monoculture for the study region [9]. During the last years, activities of the tertiary sector, such as tourism and commerce have also witnessed a development, accounting for the occupation of 23% of the population [10].

The study area also has a unique environmental and ecological value mainly due to its rich biodiversity centered around the Prespa Lakes. Specifically, in the region one can find circa 1500 plant species, 60 mammal species, 33 species of reptiles and amphibians, 23 species of fish – of which 9 are endemic – and 273 bird species, among which the most populous colony of the globally rare Dalmatian pelican in the world [14]. It is calculated that the region of Prespa gathers over 50% of the bird, amphibian and mammal species that can be found overall in Greece [4].

The study area's aforementioned ecological value is reflected on the legal protection regime that exists in the area. As far as national legislation is concerned, the Prespa National Forest was declared in the Greek part of Prespa in 1974 and was extended and renamed to Prespa National Park in 2009, covering 32,700 hectares. As for international legislation, two areas within the Prespa basin, Lake Small Prespa or Micro Prespa and Mount Varnous, have been designated as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) under Directives 92/43/EC ("Habitats/NATURA Directive") and 79/409/EEC ("Wild Birds Directive") respectively. According to these designations they have been included within the NATURA 2000 network sites, under the codes GR1340001 (Lake Small Prespa) and GR1340003 (Mount Varnous) [6].

Lake Micro Prespa is also one of the 10 sites in Greece designated under the Ramsar Convention on Wetlands, an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources, as a contribution towards achieving sustainable development throughout the world [6].

For all the reasons described above, it is obvious that the natural environment of the region of Prespa is considered highly valuable. Furthermore, it is obvious that the area's water resources are important both for environmental and for economic and developmental reasons. Therefore, the present paper focuses on investigating the pressures that the study area's water resources are under, on assessing whether corrective plans should be implemented and if so, what those corrective plans should be.

2. MATERIALS AND METHODS

The methods and techniques used in the present research are: the review of the relevant literature and the implementation of methodological tools.

The review of the relevant literature is a standard method used to record the current knowledge and theoretical and methodological contributions on a certain topic. As such, it is not described further in the present paper, as its characteristics can be accessed fairly easily on various sources.

The methodological tools employed in the research are described below.

2.1. SWOT Analysis

SWOT Analysis is a standard tool used in various types of cases and consists in the recording of the Strenghts and Weaknesses of an idea or project, in other words, its internal environment, as well as the Opportunities and Threats that can affect its course or development, which, in turn, constitute its external environment. The initial letters of the words Strengths, Weaknesses, Opportunities and Threats make up the name of the method.

After the recording of the various characteristics of the issue under question as described above, Strengths can be combined with Opportunities in order to neutralize Weaknesses and prevent the manifestation of Threats.

In the present paper, the SWOT Analysis was implemented on the study area aiming to form proposals for the protection of water resources.

2.2. The Stakeholder Analysis

The Stakeholder analysis consists in the identification of the implicated parts in a project, proposal or situation, of their interests and their needs in relation with the project under question, as well as the implications-pressures that they cause or that can be caused to them by the implementation of the aforementioned project, proposal or situation [3].

In issues regarding water resources management, the Stakeholder analysis has to include all users of the water resources of the region under question who exercise pressure on said water resources and who would be affected by potential proposals for the improvement in the management of the water potential.

2.3. The Logical Framework Approach

The Logical Framework Approach (LFA) is a method developed by USAID at the end of the 60s and at 1990 by a Norwegian working group supported by Samset & Stokkeland. It is promoted by the OECD and the Directorate General for Development of the Committee of the European Communities [12].

It is a detailed tool, which consists of a series of phases and analyses, designed to cover the stages of planning, implementation and management of projects, management plans and other actions.

Its main component is the Logical Framework Matrix or Logframe Matrix, which summarizes the key elements of a project plan as well as how the main goals of the plan will be achieved. In the present research, it is implemented in order to analyze the strategy axes that are proposed for the improvement of the water resources management as well as for the achievement of sustainable economic development in the study area.

3. RESULTS AND DISCUSSION

3.1. Literature Review on the Pressures on Water Resources

3.1.1. Definition and distinction of pressures

In the framework of the present research, pressures on the water resources of the study region were identified following the definitions and categorization of pressures on the aquatic environment, as defined in the European Union Water Framework Directive, or Directive 2000/60/EC.

According to the latter, pressures on water resources are distinguished, on the basis of the spatial dimension of the activity that causes them, in point pressures and non-point (diffuse) pressures, each one related to various pollution sources [2].

Furthermore, pressures on water resources are distinguished between surface water bodies and groundwater bodies, on the basis of the recipient of the pressure and between pollution pressures, quantitative pressures (abstractions) and other pressures, on the basis of the type of the pressure [9].

3.1.2. Pollution Pressures

1) Point pressure sources:

- Urban waste

The collection of urban waste in all Regional Districts of the Municipality of Prespa is carried out through a sewage network, except for the community of Psarades, where the waste management is done in individual systems, which are examined later on in the part that concerns non-point pressures [9].

In the basin of the Prespa lakes, there are no settlements with more than 2000 inhabitants and therefore, the construction of an Urban Waste Treatment Plant is not required, according to Directive 91/271/EEC. However, in the study area there are two Urban Waste Treatment Plants, which use the method of Constructed Wetlands but are currently under reparation works [9].

- Overflows from rainwater pipes

Due to the lack of sufficient data for the assessment of the overflows from rainwater pipes as a point pressure, according to the provisions of Guidance document No21: Guidance for Reporting under the Water Framework Directive, they are elaborated together with diffuse runoff from urban areas later on.

- Industry

There is no remarkable industrial unit operating in the study area.

• Stabled livestock

Stock raising is an important traditional economic activity in the study region. However, only the breeding of swine can be included in the category of activities that cause point pressure because swine raising units, due to the nature of these animals, require special constructions in a designated space, excluding the possibility of free farming [9].

• Fishfarming

No fisheries are found in the study area.

• Landfill sites

Solid waste in the Municipality of Prespa and the regional district of Kristallopigi is gathered and transferred to the Waste Transshipment Stations of the neighboring cities of Florina Kastoria and from there they are transshipped to the regional landfill of Kozani. In any case, there is no pressure caused by landfill sites in the study area [9].

• Extractive activity

The operation of quarries or other extractive activities is not permitted within the Prespa National Park, hence there is no pressure caused by extractive activities [9].

2) Non-point pressure sources

• Urban runoff and overflows from rainwater pipes

Rainwater is the runoff that goes through built areas and often carries a large variety of pollutants, in quantities that can negatively influence the environment, the surface water recipients but also the underground aquifers. Due to the lack of data on the management of the overflows of rainwater in the settlements of the study area, the assessment of the pressure under question is considered related primarily to the surface area and the use of its built areas [9].

According to the relevant literature, a percentage of urban coverage lower than 3% advocates for an urban runoff and rainwater pipe overflow pressure of low intensity. Urban areas in the study region cover an area of 1.66 km^2, which correspond to about 0.5% of the total surface area of the study region. In conclusion, it can be estimated that the pressure on the surface water bodies of the study area which is caused by urban runoff and overflows from rainwater pipes is of low intensity [9].

• Transportation networks

The road network within the study area is mostly provincial, forestal or rural and the regional network has small length and a low daily traffic load. Therefore, runoff from the road network is not a significant pressure on the quality of the surface water resources [9].

• Urban liquid waste not treated by a Waste Treatment Plant

The disposal of waste in individual sewage systems is considered a non point pollution. In the study area, this practice is in use only in the Regional district of Psarades of the Municipality of Prespa, which has a population of 83 inhabitants [9]. The estimation of the pollutant loads that end up in Lake Great Prespa are shown on table 3.

• Outflows from agricultural activity

Pollutant loads which come from agricultural activities include nitrogen loads, phosphorus loads and pesticide residues. A percentage of the outflowing loads corresponds to the runoff, which burdens the surface waters and a part of them leaches towards deeper ground layers and may burden the waters of the aquifer. The measure of the pollutant load that ends up in the aquatic system depends on its type, on its quantity, on the way and the time of application, on the position and the morphology of the land parcel, on the presence and density of a drainage system and on a large number of ground-related factors [9].

• Livestock raising

The sector of livestock raising, except for swine breeding, is included in the activities causing non point pollution on the basis of several criteria concerning the nature of this activity. The basic pollutants produced by livestock are: organic load, nitrogen and phosphorus. According to the relevant literature, the percentage of the produced load that is a runoff to the aquatic systems is 15% for nitrogen and 3% for phosphorus. Furthermore, deep leaching is considered to account for 17% of the nitrogen runoff and for 1% of the phosphorus runoff [9].

• Spaces of uncontrolled waste disposal

Uncontrolled waste disposal is a practice which has been abandoned in the study region, hence there is no pollutant load produced by sites of uncontrolled waste disposal [9].

• Outflow from other land uses

According to Guidance Document 3 for the Directive 2000/60/EU, "Analysis of pressures and impacts", the primary land uses that are calculated as pressures are urban, forest, herbaceous and bushy areas and agricultural uses. The pressures caused by these uses can be quantified in Total Nitrogen (TN) and Total Phosphorus (TP) [9].

3.1.3. Quantitative Pressures (Abstractions)

Quantitative pressures in the study area's water resources are reported herein according to the main use which they stem from.

1) Abstractions for irrigation

According to the relevant literature, the total abstractions for irrigation are estimated at around 5.9 hm3 /year, of which 5.02 hm^3 /year are abstracted from surface waters – most of them from Lake Small Prespa- and 0.32 hm^3 /year are abstracted from ground waters [9].

2) Abstractions for water supply

According to the same source, abstractions for the area's water supply are estimated at around 0.37 hm^3 /year, of which 0.24 hm^3 /year are abstracted from surface waters and 0.13 hm^3 /year from ground waters [9].

3) Abstractions for livestock breeding

On the same logic, abstractions for livestock are estimated at around 0.2 hm^3 /year and are abstracted from ground waters [9].

From the data presented above, it becomes obvious that irrigation is the largest consumer of water in the study area and also that the largest quantity of water is abstracted from surface waters, and from the Lake Small Prespa specifically.

3.1.4. Other pressures

The types of "other pressures" defined by the Directive 2000/60/EC are:

• flow regulations – hydromorphological alterations

• artificial recharge of aquifers

• desalination

• sand extractions

For the study region, the relevant literature records that none of the types of pressures mentioned above have an impact on the water resources of the study area [9].

3.1.5. Status of water resources

According to the literature, Directive 2000/60/EC characterizes the ecological and chemical status of surface water resources and quantitative and qualitative status of ground water resources.

For the study area, all groundwater systems are given a Good quantitative and qualitative status [9].

The area's fluvial water bodies are characterized by a "Good" chemical status, whereas their ecological status is unknown [9].

As for the lacustrine water bodies, Lake Great Prespa's ecological condition is characterized as "Moderate" and Lake Small Prespa's as "Poor". However, the most remarkable fact is that the chemical status of both Lakes is characterized as "Bad" [9].

3.2. Implementation of methodological tools

3.2.1. The SWOT Analysis

In order to form proposals for the protection of the water resources in the study area, a SWOT analysis was performed with the aim to record the strengths, weaknesses, opportunities and threats that are present in the region of Prespa. They are recorded as follows:

1) Strengths

• Existence of rare biodiversity, protected by the Ramsar Convention

• Area with a remarkable natural environment, included in the Natura 2000 network

• Existence of a large number of studies for the area, that have been executed in the framework of developmental programs and programs of trans-border cooperation (Interreg, Life 2014-2020, Horizon, OEMN etc.)

• Presence of environmental organizations in the area

• Existence of the monoculture of beans, characterised as product of Protected Geographical Indication (PGI)

• Existence of organic farming, mainly of Prespa beans

• Progress of the study for the installation of a drip-irrigation network in the study area

2) Weaknesses

• Old existing irrigation network, causing remarkable water losses and low irrigation water efficiency

• Drawdown of Great Prespa Lake, primarily from the 80s onward

• Lack of a common Management Plan for the Prespa Basin in transnational level between the countries which share the Prespa Lakes

3) Opportunities

• Application of Directive 2000/60/EU via the publication of the Management Plan for the river basins of the River basin District of Western Macedonia and that of the Special Management Plan of the basin of Prespa.

• New Common Agricultural Policy for the period 2014-2020, including financial aids like: coupled payments for Natura 2000 areas, for bean cultivation, for disadvantaged/mountainous regions, for organic farming etc.

• New national Rural Development plan for the period 2014-2020

• Increase in eco-tourism and agro-tourism

• Possibility of certification of agricultural products

4) Threats

• Non-global confrontation of problems in a trans-boundary river basin level because of the lack of a common Management Plan

• Quantitative and qualitative degradation of the water resources caused by human activities

• Difficult economic period

• Intense weather phenomena – climatic change

• Possible proposals for the protection of water resources can arise from the combination of points from the above recorded SWOT analysis, so that strengths can attract opportunities to prevent the manifestation of threats.

As it was mentioned beforehand, specifically in section 2.1, the points of the SWOT analysis that can be combined on the basis of the previous reasoning can be summarized as following:

For starters, the rich faunal and floral biodiversity of the study area – which is under numerous protection regimes – and the intense presence of a virgin natural environment are elements that can create opportunities for the growth of tourism, especially environmental tourism, agro-tourism etc.

Secondly, the presence of the bean monoculture creates opportunities for the certification of this product and the creation of a stronger "brand-name" for the area.

Also, organic farming can spread further with the financial aids for organic farming provided by the new Common Agricultural Policy.

In addition, the perspective of the installation of a new drip-irrigation network for the crops of the study area is an opportunity to solve the problems caused by the existing irrigation network and to avoid the threat of the qualitative and quantitative degradation of the water resources.

Finally, the lack of a common trans-border-level Management Plan for the basin of Prespes is a weakness of the study area, which can allow for the manifestation of the threat of a non global confrontation of environmental problems. However, there is a variety of developmental trans-border programs that have taken place and are in progress, which can help prevent the threat under question.

3.2.2. The Stakeholder Analysis

The second methodological tool that was used in the process of forming proposals for the protection of the water resources in the study region is the Stakeholder analysis. A brief description of this analysis can be found on sub-section 2.2. of the present paper. The Stakeholder Analysis as it was implemented for the issue under question is presented on table 1, further down.

3.2.3. The Logical Framework Approach

The last methodological tool that was used in the process of forming proposals for the protection of the water resources in the study region is the Logical Framework Approach. A brief description of this method can be found on sub-section 2.3. of the present paper.

The Logframe matrix for the issue at hand is shown in table 2.

Table 1. Stakeholder Analysis for the region of the Prespa Lake basin

Stakeholder	**Interests**	**Needs**	**Implications/Pressures they can cause**	**Implications/Pressures they may suffer**
Farmers	The water resources' good quality is important for the good quality of the crops produced	Water of certain quantity and good quality - Efficient irrigation network	Degradation of water resources' quality due to agrochemicals	Loss of income due to water losses from irrigation network
Livestock breeders	The water resources' good quality is important for the health of the stock	Water of certain quantity and good quality	Degradation of water resources' quality due to livestock waste	Negative implications on health of their stock due to pollution of water resources
Fishers	The water resources' good quality and quantity are important for	Good quality and, if possible, ceasing of the drawdown in	Imbalance in the lakes' ecosystems due to overfishing	Reduction of fish population due to pollution and drawdown of lake waters

	the reproduction and health of the fish	lake waters		
Residents	The water resources' quality affects their health via drinking water – The less polluted the water is, the lower the treatment costs will be	Potable water of good quality	Degradation of the lakes' waters due to littering – Over consumption of potable water	Negative effect on their health due to pollution of the aquifer
Tourists	The better the state that the Lakes' environment is in, the	Potable water of good quality – Good state of the	Degradation of the lakes' waters due to littering - Wasting of potable water	Negative effect on their health due to pollution of the aquifer – Negative impression by the state of the
Stakeholder	**Interests**	**Needs**	**Implications/Pressures they can cause**	**Implications/Pressures they may suffer**
	more they feel satisfied with their destination choice - The water resources' quality affects their health via drinking water	natural environment		destination they chose
Touristic facility owners	The better the state that the Lakes' environment is in, the more satisfied their customers will be	Potable water of good quality – Good state of the natural environment	Overuse of water supplies	Loss of customers due to unattractive state of the natural environment

Table 2. Logical Framework Matrix for the study area

Overall Goal: The protection of water resources in the study area and the achievement of sustainable development

Description	Indexes	Means of Verification	Assumptions and risks
1. Improvement of qualitative state of the water resources	Pollution Indexes - Characterization of qualitative status of aquatic systems	Measurements – Monitoring of physicochemical parameters and of special pollutants in the river basin	Active commitment of the three neighbouring countries in the control and monitoring of the quality of waters – Implementation of national and community legislation – Implementation of Directive 2000/60/EU – Implementation of river basin management plan – Low increase of population
Description	**Indexes**	**Means of Verification**	**Assumptions and risks**
1.1 Actions for the concentration of hazardous pollutants in the water bodies	Concentrations of hazardous pollutants and physicochemical variables, according to directives – Characterization of the water bodies' ecological and chemical situation	Field measurements	Approval of necessary funds – Implementation of the appropriate regulations
1.2 Establishment – reinforcement of monitoring mechanisms	Staffing of municipal, regional and national authorities	Reports by said authorities – Posting of work position notices	Approval of necessary funds – Active commitment by authorities
2. Quantitative improvement of water resources	Water Exploitation Index (WEI) – Basin water balance – Levels of the basins water bodies	Measurement of abstractions per use of water – Measurement of rainfall/precipitation	Implementation of Directive 2000/60/EU - Implementation of river basin management plan - Active commitment of the three neighbouring countries in the control and monitoring of the quantity of waters - Low increase of population – Installation of drip irrigation network in the Greek part of the

			basin
2.1 Promotion of the installation of irrigation systems	Implementation studies – Inclusion of actions in financial programs	On the spot research/autopsy – Implementation studies	Approval of necessary funds
2.2. Pricing actions	Review – Modification of legislation	Publication of law review	Prioritization of the present issue by appropriate authorities
3. Achievement of conditions of economic development	Inhabitants' income pro capita – Increase of population – Increase in work positions	Population census – Regional reports on economy and occupation	Confrontation of difficult economic situation – Diffusion of agricultural products within the basin area – Turn towards alternative tourism – Touristic growth
Description	**Indexes**	**Means of Verification**	**Assumptions and risks**
3.1 Actions for the reinforcement of agriculture	Quantities of produce – Producers' income	Records by agricultural cooperatives - Regional reports on agricultural production	Prioritization of the present issue by appropriate authorities - Confrontation of difficult economic situation – Use of the new CAP
3.2 Actions for the reinforcement of commerce	Quantities of purchased/sold products - Income	Records by the appropriate authorities - Regional reports on commerce	Prioritization of the present issue by appropriate authorities - Confrontation of difficult economic situation – Use of the new CAP
3.3 Actions for the reinforcement of tourism	Arrivals/Visits by tourists	Records by the Hotel owners' Association of Florina	Prioritization of the present issue by appropriate authorities – Promotional campaigns

3.3. Discussion

As it has been pointed out beforehand, irrigation is the primary consumer of water in the study area. Furthermore, as demonstrated by the results of the implementation of the LFA in the area, the installation of irrigation-related systems is one of the actions proposed towards achieving the goal of the quantitative improvement of the water resources. Therefore, the present research proposes a set of irrigation-related systems that can assist in the achievement of the aforementioned goal.

1) Installation of a drip irrigation network

The advantages of drip irrigation are widely known. For the study area, the function of a drip irrigation system is expected to lead to the irrigation of a more extended area with the same amount of water. Furthermore, it is

expected to lead to a considerable reduction in the washout of the terrains and a consequent need to use less fertilizer. This, in combination with the more effective application of water in the root region of the plants will result in less diffuse development of parasitic weeds and consequently, to the use of inferior quantities of herbicides. The lower cost that the producers will have to incur and the expected higher productivity are expected to lead to a better living standard. Finally, the lower expected use of fertilizers and herbicides is expected to lead in the reduction of the concentration of hazardous substances in the aquifer, as these substances end up in the aquifer or the lakes either through the ground or via surface runoff.

2) Reuse of treated wastewater in irrigation

The use of treated wastewater for irrigation is a popular practice in many countries, especially arid and semiarid ones [13]. Many studies have tested its effects on fruit yield and quality [8], [7], [14] and it has also been tested in combination with drip-irrigation systems and Waste Treatments Plants using the method of Constructed Wastelands, a method which is being used in the Waste Treatment Plants of the study area [1].

3) Automated Water-intake Device for Irrigation

The following system focuses on the economical use of water resources. With the aid of an electronic card, a farmer can purchase water quantity units. Subsequently, he/she has the ability to pump the quantity of water he wishes to apply to his parcel. After the quantity has been applied, the pump is automatically switched off, thus avoiding potential waste of water and higher water costs for the farmer. After the end of the irrigation session, the appropriate amount of water quantity units is subtracted from the quantity that the farmer has paid for beforehand.

4) Precision agriculture

Precision agriculture is a new agricultural practice, which utilizes specific information, defined in space and time, to assess the right amount of water or fertilizer needed in a specific area of the crop's surface [5]. In that way, it takes potential variabilities within the same parcel into account.

Precision agriculture utilizes technologies, such as productivity maps, GPS systems, laboratory analyses, GIS and systems of variated application (of fertilizer or water), in order to accurately apply the correct quantities of substances to a particular area of the parcel, depending on the needs of the area under question.

4. CONCLUSIONS

In conclusion, the present paper focuses on the region of the Prespa basin, in northwestern Greece, a tri-state trans-border region with valuable ecosystems and virgin natural environment, which is protected by national and international environmental treaties and legislation. Lakes Small and Great Prespa are the center of this region and take part in most of its socio-economic activities.

According to the literature review that was conducted during the present research, it was found that the quality and quantity of the water resources of the study region have both witnessed a decline. Therefore, the paper analyzed the various kinds of pressure that the water resources are under and subsequently applied a set of methodological tools in order to schematize the study area's environment and to discover ways that the current negative quality and quantity trends can be reversed.

The SWOT Analysis recorded the basic characteristics of the study area and combined them with one another in order to discover ways to create opportunities for economic development and protection of the water resources. The Stakeholder Analysis recorded all the users of water resources in the area along with their interests and needs from using water and the pressures-impacts they can cause or that can be caused to them. Finally, the Logical Framework Approach set the improvement of the qualitative and quantitative state of the water resources in the study area as the main strategy axes and subsequently described actions through which they can be achieved. It can be concluded that with the use of financial aid provided by the new Common Agricultural Policy as well as by programs of developmental nature (Horizon 2020, Interreg etc.), the study region can implement the actions proposed by the present paper towards the goal of protecting the water resources, like the installation of new irrigation-related systems.

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REFERENCES

[1]. Cirelli, G.L. et al., (2012). Treated municipal wastewater reuse in vegetable production. *Agricultural Water Management*, vol. 104, pp. 163– 170.
[2]. Directive 2000/60/EC of the European parliament and of the council of 23 October 2000 establishing a framework for Community action in the field of water policy [2000] OJ L327/1
[3]. European Training Foundation (1996). *Tempus Tacis Project Management handbook* [Online]. Office for Official Publications of the European Communities, Luxembourg. Retrieved 29 April 2015. Available: http://eacea.ec.europa.eu/tempus/doc/tacishandbook_en.pdf
[4]. JunEx. Biodiversity and habitat types [Online]. Retrieved 27 April, 2015. Available: http://www.junex.gr
[5]. Karydas, C., Silleos, N., Silleos, G. A new precision farming technique, for use on a wheat crop under Mediterranean agronomic conditions. *6th Balkan Conference on Operational Research*, 22-25 May 2002, Thessaloniki, Greece.
[6]. Koutseri, I. (2012). Saving fish biodiversity in the Prespa basin. LIFE09 INF/GR/319 project. Society for the Protection of Prespa
[7]. Manas, P. et al. (2002). Aptitud agronomica del aguaresidual depurada procedente de la E.D.A.R. de Albacete. *Invest. Agr.: Prod. Prot.Veg*, vol. 17 (1).
[8]. Mavrogianopoulos, G. and Kyritsis, S. (1995). Use of municipal wastewater for biomass production. Project report of Agricultural University of Athens.
[9]. Ministry of the Environment and Climatic Change (2014). Special Management Plan for the Sub-basin of Prespa of the River basin of Prespa (GR01) of the River basin District of Western Macedonia (GR09). Annex to the "Management Plan for the River basins of the River basin District of Western Macedonia"
[10]. Municipality of Prespes. Economy – The secondary sector [Online]. Retrieved 20 April, 2015. Available: http://www.prespes.gr
[11]. Municipality of Prespes. Economy - The tertiary sector – Current situation of services [Online]. Retrieved 1 May, 2015. Available: http://www.prespes.gr
[12]. Norwegian Agency for Development Cooperation (NORAD) (1999). The Logical Framework Approach (LFA). Handbook for objectives-oriented planning.
[13]. Pedrero, F. et al. (2010). Use of treated municipal wastewater in irrigated agriculture – Review of some practices in Spain and Greece. *Agricultural Water Management*. vol. 97. pp. 1233-1241.
[14]. Pedrero, F. and Alarcon, J.J. (2009). Effects of treated wastewater irrigation on lemon trees. *Desalination*, vol. 246, pp. 631–639.
[15]. Society for the protection of Prespa. Habitats and endangered species. Retrieved 30 April, 2015. Web site: http://www.spp.gr