

AN INTEGRATED TRANSBOUNDARY WATER EDUCATION, TRAINING AND TECHNOLOGY TRANSFER PROJECT BETWEEN GREECE AND BULGARIA

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ABSTRACT

Water management involves many scientists as well as politicians that work together trying to simulate the hydrologic balance and to schedule ambitious water management plans. However, first and foremost, wise water management practices require people participation, otherwise the water management plan will fail no matter how much money and time will be invested. Guided by the above, the Department of Forestry and Natural Environment Management (Greece) and the Department of Geography-Ecology and Natural History (Bulgaria) prepared a proposal, which was approved and financed by the European Union Initiative INTERREG-III/GREECE-BULGARIA concerning the integrated management of transboundary waters, the education of the students and the technology exchange and transfer between the institutions. In particular, the cooperation between the two institutions had the following results. Firstly, the initial diligent bilingual research was followed by the creation of guidelines regarding the sustainable water resources management. Secondly, a bilingual multimedia application was created based on the above-mentioned guidelines including a small duration video, brochures and leaflets were designed according to these guidelines. Thirdly, students had the opportunity to be informed by experts about the sustainable water resources management during the realization of short exchange visits between the two countries and program results were analytically presented in two galas. Finally, a web portal and a permanent forum is under development aiming not only to the demonstration of all the material that was created and designed during this program but also to the display of the best sustainable water management practices.

Key words: Water education, Water training, Water management practices, Drama, Smolyan,

1. INTRODUCTION

Water resources always were and still are the necessary condition for the existence of life and the development of any kind of activity. During the second half of the 20th century, a rapid increase of the human population is observed, which is accompanied by a corresponding increase of water demand. As a result of this, there is an urgent need for a sustainable water resources management. Water management involves many scientists (hydrologists, engineers, economists) as well as politicians that work together trying to simulate the hydrologic balance and to schedule ambitious water management plans. However, first and foremost, wise water management practices require people participation, otherwise the water management plan will fail no matter how much money and time will be invested. Guided by the above, the Department of Forestry and Natural Environment Management in the Technological Educational Institute of Kavala (Greece) and the Department of Geography-Ecology and Natural History (Bulgaria) prepared a proposal, which was approved and financed by the European Union Initiative INTERREG-III/GREECE-BULGARIA concerning the integrated management of transboundary waters, the education of the students and the technology exchange and transfer between the institutions.

In particular, the cooperation between the two institutions in the framework of the Community Initiative INTERREG-III had the result of the creation of an integrated transboundary program for the education, training and sensitization regarding the protection and conservation of the water resources. The integrated water training and education program comprises four sub-projects: The first sub-project concerns the drawing up of detailed guides on the rational water resources

management dealing with subjects like fertilization, irrigation, flood protection etc., new suggested plant species for cultivation, planning of courses covering the needs of the Primary and Secondary Education and the drafting of thorough and detailed proposals for the rational utilization of the water resources. The second sub-project regards the creation - based on the guidelines material - of a bilingual multimedia application for the rational management in which a small duration video will be embodied. Moreover, special bilingual leaflets based on these guidelines will be designed and addressed to children of preschool age. Finally, leaflets will be drawn up and addressed to all citizens demonstrating proper water resources management practices. The third sub-project comprises the creation of a web portal demonstrating this program, the formation of a permanent forum providing the visitors with the possibility to address questions regarding the rational water resources management and the organization of eight meetings. The last sub-project consists of visits and stay of Secondary Education schools to Bulgaria including their information by experts on problems regarding the rational water resources management and vice versa. Additionally, Greek Schools will also visit the regions of the Greek dominion where the major problems appear.

Many times in the past a series of research regarding the issue of environmental education on level of national strategy have been implemented Kostova (1989), Martin *et al.* (1993), Smyth (1996), (Bekalo and Bangay, 2003). Furthermore, many investigations are concerned with the case studies program of environmental education that take place in the region of a country Strokes (1992), Barbosa *et al.* (2003), (Kazimieras and Stasiskiene, 2006), Hillman (2006). Thus, it is actually the first time that such an integrated transboundary program for the education, training and sensitization regarding the protection and conservation of the inter-sharing water resources is implemented between two countries that have too many economical and social differences and in the past have been even involved in war.

2. OBJECTIVES

The objectives that are fulfilled form the implementation of the above water education program are the following:

- the protection and the improvement of the state of the transboundary water resources,
- the rapprochement of the people of the two countries, the amelioration of their relationships and the mutual understanding
- the amelioration of the life quality of the habitants by resolving the long-lasting problem regarding the shortage of adequate quantity of potable water. The expected result of the proposed program combined with the administrative measures that will be adopted by the two governments, will be the restoration of the water resources back to their initial state during a period of ten years
- the goal of good quality and proper quantity of water according to the water framework directive will gradually be achieved
- the added value of this program is that the citizens of today and tomorrow in both sides of the borders to become conscious and aware of the conservation and rational management of the water resources, to learn how to protect them and to inherit them to the future generations in an improved state or at least in the state that they had inherited them.

3. RESULTS

The main activities of the proposed project are the drafting of detailed guides on the rational water resources management, the introduction of new suggested plant species for cultivation, the planning of courses on the rational water resources management, the bilingual multimedia application for the rational management, the bilingual leaflets that will be addressed to children of preschool age as well as to all citizens, the creation of a web portal, the formation of a permanent forum, the meetings in both countries and the short exchange program regarding the visits and stay

of students between the two countries. In a rather short period of two years, a number of activities will take place, some of which will be held repeatedly (meetings) in order to sensitize the local community. The results of the project will be constantly demonstrated in the web portal that will be created and which will function even after the ending of the project, thus offering the know how, good practices, updated informative videos and interfacing between authorities, citizens, stakeholders, and experts in the water resources management.

3.1 Subproject 1: Pilot action of rational water resources management

Work Package 1: Syntax of Guidelines

Experts on issues of water resources from the two Academic Institutions after sedulous research prepared analytical guidelines on a line of subjects which concerns the wise management of water resources. In particular, the guidelines were written in three languages (Greek, Bulgarian, and English) regarding:

- the measures which will be supposed and can be taken by the citizen so as to be protected from the floods that constitute the meteorological phenomenon which causes the biggest destructions during 20th century.

- the most optimal way of irrigation of cultivations so as the losses are minimized but also the available quantities of water can be exploited more wisely. Even if due to the overpumping by the drillings there is a continuously fall of level of underground water-aquifer and during the summer months the available quantities of water are minimized, the quantities of water do not suffice for the needs of cultures. As a result, the farmers do not know which method they should follow in order to irrigate the cultures, which time of day is the best for the irrigation of cultivations, or which are the needs of their cultures so as to minimize the losses due to evapotranspiration and they start to exploit smaller quantities of water that however cover the needs of cultures.

- the quantity of fertilizers and pesticides that should be applied depending on the culture, the season of time and the conditions of humidity that must be prevailed. The farmers are to a great extent responsible for the pollution phenomena of underground water aquifer by the use of fertilizers, pesticides and the phenomena of eutrophication as well. The ignorance of requirements of cultures concerning fertilizers and pesticides of which season time they should be applied has as result to lead these to the underground aquifer horizon. However, taking into consideration the rational method of fertilization, the way and quantities of pesticides that they should use, they spend much less money for the purchase of fertilizers and pesticides. What is more, the available quantities of water are exploited much more effectively and the pollution of water is radically decreased.

- the management of water in the households so that the consumption of water is decreased. The syntax of this guideline is of great importance because significant quantities of water are wasted by each household overloading the familial planning and the availability of water resources.

- the management of household litter so that the pollution of water resources is minimised. The thoughtless deposition of litter, their not sorting out in categories and the ignorance of the method by which they must be exploited have as result the reduction of water resources and nature in general.

- the Management of waste from industries. The syntax of a guideline which concerns the way with which the industries must exploit their waste in order to minimise the aggravation of water resources is one of the most fundamental guideline of the program.

- the Proposals on import of new cultures with fewer requirements adapted to the soil-climatic conditions so as to ensure the income of the farmers. After thorough research plants were proposed for cultivation that require small quantities of water, are adapted to the requirements of each region and are adjusted to the income of farmers as well.

- 3000 brochures written in three different languages were distributed in the study areas that include the main rules of rational water management. In particular, detailed subjects are illustrated such as the hydrological cycle, the role of forest and vegetation in stream discharge etc. Furthermore, these brochures comprise a series of simple guidelines of daily practices of water saving in a level of household (use of water for personal cleanliness, as a detergent medium) but also in a wider scale (road wash etc).

Work Package 2: Lessons planning

Both in Greece and Bulgaria environmental education courses take place at schools. However, these courses do not point out the wise management, the protection and maintenance of water resources. In the context of proper education of tomorrow's citizens of two countries a range of special courses focused in the water resources were organised which will be incorporated in the course of environmental education.

Work Package 3: Recognition of major water resources problems of Drama prefecture and syntax of thorough proposals for the rational exploitation of water resources.

After the study of major problems that concern the research region regarding the water resources and the finding of main teams of pressure, thorough proposals were developed for the more rational exploitation of water resources of prefecture. (Places of creation of dams, installation of small hydroelectric work, enrichment of underground water aquifer with the help of drillings, exploitation of wintry flows, small earth dams).

3.2 Subproject 2: Development of applications and brochures

This subproject includes the production of bilingual multimedia application with incorporated video as well as the production of various forms that display the way of rational management of water resources and are addressed to all the citizens but also the creation of special brochures for children of preschool age and first degree education as well. According to the above, this sub-project can be classified into three work packages:

Work Package 1: Development of multimedia application

Based on the results of subproject 1, a trilingual (Greek, English and Bulgarian) multimedia application was created which includes the guidelines. Also it is incorporated with a short duration video that displays by means of picture and sound the way with which the rational management of water resources can be achieved. The application was distributed to the residents of at both sides' borders. Moreover, 5000 multimedia DVDs were distributed, through them students and citizens as well by using them are able to learn the function of torrent streams, the mechanism of flood development and are leaded by simple guidelines and techniques so as to deal with possible risks aiming at the protection of their life and their property as well.

Work Package 2: Creation of brochures

For the needs of this sub-project, four differently special bilingual booklets were designed based on the material of sub-project 1, which are enriched with pictures, sketches, cartoons and explanations in order to be addressed to children of preschool age as well as first degree education. Also taking into consideration the material of guidelines, four bilingual booklets were designed for all the citizens; these booklets demonstrate the best practices of water resources management and methods of rational management of water resources as well. Also, 6000 brochures were distributed which involves with best practices at matters of rational water management and water savings.

Additionally, a manual guide with measures for the protection of life and property from flood risk was designed.

3.3 Subproject 3: Publicity - Sensitization activities

This sub-project concerns the creation of trilingual web portal, the development of a network database, the elaboration of a permanent forum as well as the organisation of four meetings in each country in time interval of two years with attendance of experts, NGO, institutions that aims at the sensitization of citizens and at their briefing on the rational management of water resources.

Work Package 1: Creation of trilingual web portal

Through the web portal the following services are provided:

- collaboration between institutions of Greece and Bulgaria through exchange of opinions, publications, inquiring results, etc aiming at the appointment of methods for the rational exploitation of water resources
- dissemination of project results
- exchange of Know-how, from the scientific community and the researchers to the citizens
- possibility of creation and active mission of complex digital “publications of” this material website to particular categories of users that select it through a form of mass electronic post or alternative channels of communication (newsletter).

Work Package 2: Development of multimedia network database

The work package 2 includes the planning and development of multimedia network database (text-picture-video) in which the electronic data are registered. Moreover, the possibility of import and update of data from the scientific personnel is provided. Data can be appeared per researcher and the possibilities of addition, treatment of users and definition of conditions of access in the database are available.

Work Package 3: Permanent forum

For the even better briefing of visitors' web portal, a permanent forum was manufactured where the possibility of submitting questions by the visitors is provided. While the questions are submitted, they are answered by the experts. All the questions submitted in forum during the past are easily accessible to the visitors' web portal while the possibility of search base of word keys is available too. The number of different Web-based learning projects is rapidly increasing at all levels of education in the developed countries (Houtsonen *et al.*, 2004).

Work Package 4: Meeting Organization

So as for the sensitization regarding the rational management of water resources to have the most positive effects, in two years time, it is expected that eight meetings will take place– (four in each country) with the participation of experts, NGO, institutions, teams of interests, citizens.

3.4 Subproject 4: Visits – Residence

This sub-project involves: visits and residence of schools between the two countries with simultaneous briefing by the experts concerning the problems of rational management of water resources, visits at regions that face the most significant problems and briefing regarding their problems, exchange of experts between the institutions of two countries so as to be effectively informed on issues of wise management of aquatic resources.

3.5 Basic difficulties

The different language and inadequate knowledge of English language bought up the need of

interpretation throughout the duration of the project and also constituted the basic difficulty on the implementation of the program. Due to this fact important problems concerning personal contact arise. Furthermore, between the students and teachers there were not existed the proper interactions and they didn't share the same concerns. As a result, teachers faced the entire project as an opportunity to broaden their horizons, while students considered the same project much more as an opportunity for tourism than a chance to enrich their knowledge. Furthermore, the applications and software which were developed by the Greek experts had major incompatibility problems when it was tried to be installed in the Bulgarian partner's personal computers, due to the antiquated technology of them.

The distance between the involved universities constituted another important problem as well. The two educational institutions are only 260Km away, yet the bad quality of the road network in combination with the intense relief and the winding road had as a result 6.5 hours to be required in order to cross this distance by a vehicle. As a result there was no frequent contact between the intertwined for a better materialization of the transboundary water education project. Finally, the substantial differences in the education systems between the two countries had as a result disagreements to be raised between the involved partners due to the different educational methods that are used in every country. An example of this consists that the University Geography, Ecology and Natural History of Smolyan, doesn't have any equivalent University in the Greek Educational System.

4. CONCLUSIONS

The present integrated program concerns the formation of an integrated transboundary program for the education, training and sensitization regarding the protection and conservation of the inter-sharing water resources between the Greece (Drama) and Bulgaria (Smolyan). In the past, many ambitious strategic projects of integrated watershed areas management have been elaborated aiming to the rational water resources management. The elaboration of such a project constitutes an obligation for Greece and Bulgaria as members of EU) according to the Water Framework Directive 2000/60. However, the international experience has shown that no matter how much time or money we can afford, the expected results will not prosper if, at first, we do not make sure that the citizens are properly informed, sensitized and trained so as to be aware of what should or should not do in order to contribute to the rational water resources management and conservation.

The multiple profits that are expected to result from the materialization of the present sub-project are: The improvement of quality of potable water, the increase of reserves in water, the protection the biodiversity and diversity of fauna and flora, the protection of protected areas members of Natura 2000, the protection of water resources, the most optimal exploitation of available quantities of water, the waste reduction of the households, the better waste management of the industries, the reduction of water consumption of the households, so much the pollution reduction of surface waters, as much as of underground water-bearings stratum, the quantities' reduction of fertilizers which are being used, the income increase of farmers through adoption of cultures that are more efficient and least water demanding and the improvement and protection of environment.

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