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SUSTAINABLE USE AND PROTECTION OF GROUNDWATER RESOURCES – TRANSBOUNDARY WATER MANAGEMENT – BELARUS, POLAND, UKRAINE

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"To promote peaceful co-operation and develop synergies between different uses of water at all levels, whenever possible, within and, in the case of boundary and transboundary water resources, between states concerned, through sustainable river basin management or other appropriate approaches"

Ministerial Declaration of The Hague (2000)

Abstract. In 2006 Science for Peace and Security NATO Pilot Study project "Sustainable Use and protection of Groundwater Resources – Transboundary Water Management" has been launch. This project focuses on development of international co-operation on implementation of water quality assessment and water quality monitoring and assessment as important issues in relation to sustainable land management. It is also a scientific platform for experts from Belarus, Poland and Ukraine as well as from other countries for exchange ideas about water management with special emphasis on groundwater and its protection. The project initiates trilateral cooperation on monitoring, contamination migration and water management issues. The main interest of the project focused on the Bug River Basin, which is divided into three riparian countries Belarus, Poland and Ukraine as well as is an eastern border basin of European Union.

Key words: transboundary basin, water management, international cooperation, the Bug River Basin.

INTRODUCTION

In different circumstances each water resources, either surface water, groundwater or weather is treated as a separate phenomenon. Unfortunately, this approach can not cover and effectively manage the associated natural cycle in which the individual elements are complementary and mutually reinforcing. The situation is even more complex in transboundary areas where the natural water cycle is intertwined with the landscape, social, cultural and even political systems.

The history of interest in water resources management issues occurring in border areas is relatively new and dates back several decades. Among the factors determining the demand for recognition of this theme are: globalization, development of civil society and the increasing competition between different sectors of the economy to win the dwindling natural resources. Undoubtedly, the changing political and social situation in the world in recent times and increasingly open societies in the neighborhood are yet another factors affecting the interest in transboundary waters, which by definition do not know artificial boundaries or barriers.

Water occurring in areas separated by conventional administrative boundaries can also be a reason of conflicts with a very different medium. It is important to realize that in the world there are 268 major rivers flowing through more than one state. And some of them, such as the Danube, are shared between several countries. Record of events occurring in the areas of transnational waters (Wolf *et al*., 2003) indicates the superiority of cooperation in relation to con-

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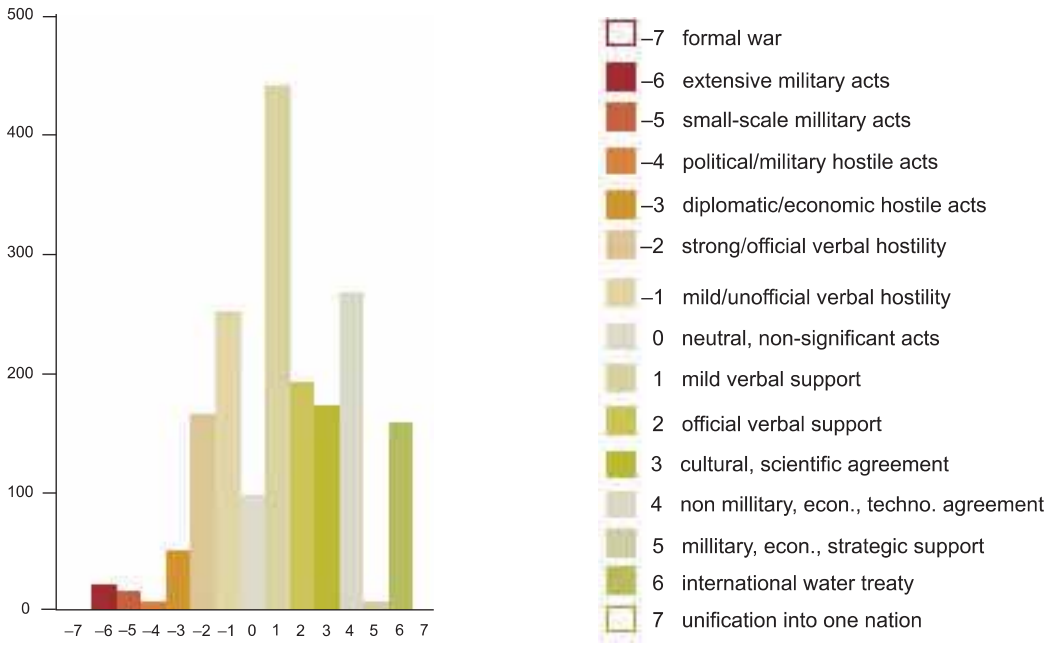

Fig. 1. Records of events associated with transboundary waters (after Wolf *et al.*, 2003)

flicts (Fig. 1), but the seeds of potential conflict can be very diverse. Simply recall the disputes carried out in Turkey, Iran and Syria on the Tigris–Euphrates basin, India and Bangladesh on the Ganges and the most famous, with the military actions in the background, in the Jordan Valley.

Transboundary water management goes far beyond the aspects of nature and is a challenge for politicians, planners and scientists, as in decision-making and managing process various political and administrative systems are involved. Therefore, arrangements between various institutions of neighboring countries are necessary. Poland is pursuing such action within the European Union with the Czech Republic, Lithuania and Germany (for example: International Commission for the Protection of the Oder River against Pollution), where tasks are defined in order to integrate water management.

Over the past few decades, the growing importance of groundwater in supplying the population with drinking water is clearly visible. Although the amount of resources used has slightly increased since the year 1980 (it remains at 1,500 hm^3) (GUS, 2009), due to the drastic reduction of surface water usage, the percentage ratio between these resources has changed considerably. In the early 1980s, more or less the same amount of water from surface and groundwater sources was used, with even a slight predominance of the former. Currently, these relations have changed dramatically and almost 70% of water is obtained from groundwater resources.

WATER FRAMEWORK DIRECTIVE OPENS BORDERS

Awareness of the existence of transboundary water resources and problems with their management and protection have existed for many years. However, there had been no legal mechanisms which would allow to make significant actions. It was not until the establishment in 2000 of the Water Framework Directive (Directive 2000/60/EC) by the European Commission. It provides a basis for action in the areas of river basins shared between two or more countries. Records of the WFD have been transposed into national law of Poland (Water Act: Prawo Wodne, 2001). The next step was the adoption of the Directive on groundwater protection (Directive 2006/118/EC). These acts allowed to take integrated action in areas of river basins. The examples of cooperation are numerous committees established to manage the international river drainage basins. International teams of experts working in various committees are intended to develop and agree on the national principles of cooperation in the basin, using the best practices. Of course, the main tasks of the committee's work are focused on surface water, but more and more weight is also applied to groundwater resources.

LEGAL BASIS – INTERNATIONAL ACTS IN THE TRANSBOUNDARY BUG RIVER BASIN

EU Directives greatly facilitated the cooperation between EU countries in terms of water issues, but their jurisdiction does not extend beyond the associated countries. Activities in the transnational areas outside the EU, on both surface water and groundwater, require international arrangements. Poland is a signatory to several international agreements and conventions (Guidelines..., 2000; Kazimierski, Gidziński, 2009) whose purpose is to organize and harmonize the activities of cross-border areas. Of course, there are different aims and objectives of each instrument, where international conventions are intended to define the long-term orientations, and the bilateral agreements include more specific actions taken by each country's border regions.

Poland is an EU Member State, Ukraine is adapting its legislation to the laws of the European Union, while Belarus is in economy transformation process from the FSU. All three countries are parties to the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Water Convention) and under this Convention have undertaken substantial activities on their shared transboundary water resources. The three countries are also parties to the Convention on Biodiversity (CBD) and the UN Framework Convention on Climate Change (UNFCCC), and are also committed to sustainable environmental development within their border regions.

Cooperation in the field of protection and use of bordering waters between Belarus, Poland and Ukraine was regulated basing on the following documents:

- The Agreement on the Environmental Protection Co-operation between the Ministry of the Environmental Protection, Natural Resources and Forestry of the Republic of Poland and the State Committee for Ecology of Belarus Republic dated 22.05.1992;
- The Agreement between the Polish and Ukrainian governments on the Environmental Protection Co-operation, signed in Warsaw, 24.01.1994;
- The Agreement between the Polish and Ukrainian governments on Water Management Co-operation on Transboundary Waters, signed in Kiev, 10.10.1996;
- The Agreement between the Belarusian and Ukrainian governments on the Co-operation on Environmental Protection, signed 16.12.1994;
- The Agreement between the Belarusian and Ukrainian Governments on the Joint Use and Protection of Transboundary Waters, signed in Kiev, 16.10.2001.

INTERNATIONAL PROJECTS ON THE TERRITORY OF THE BUG RIVER BASIN

In the past 20 years a series of international projects concerning protection and rational management of waters has been implemented on the territory of the Bug River Basin (Fig. 2). Most of them were focused on issues directly related with surface water resources. The most important ones include the following:

- The Bug River Pilot Project on monitoring and assessment of transboundary rivers established under the UNECE Water Convention (1998–2003).
- Promotion of sustainable development in cross-border cooperation between Poland and Ukraine financed with TACIS CBC ENACT (2002–2004).
- Water Management in the Bug and Latoritsa/Uh river basins, which was accomplished in the Ukrainian part of the basin within TACIS CBC Programme (2004–2006).
- Integrated Environmental Evaluation of Western Buh River Basin (Ukraine and Poland) – Phase I: Baseline Assessment and Analysis, financed with UNIDO (2008).
- Creation of the Polish–Belarusian–Ukrainian Water Policy in the Bug Basin – the Neighbourhood Programme Poland–Belarus–Ukraine INTERREG III A – TACIS CBC (2007–2009).

Fig. 2. Groundwater Bodies in transnational area between Belarus, Poland and Ukraine (Bug and San river basins)

SCIENCE FOR PEACE AND SECURITY NATO PILOT STUDY PROJECT

At the core of a project financed by the NATO SPS Committee faced the experience gained from work of The Working Group of the Hydro-meteorology and Hydro--geology Polish-Ukrainian Committee on the Co-operation in the Field of Bordering Waters. The "Agreement between the Government Republic of Poland and the Government of Ukraine on co-operation in the field of bordering water management" provides the principles for co-operation with respect to surface and groundwater quality and quantity aspects, monitoring, flood control and the principles of information exchange. On the basis of the mentioned agreement the Polish-Ukrainian Committee on the Co-operation in the Field of Bordering Waters is being formed. The following Polish-Ukrainian Working Groups operate under the Committee:

- the Working Group of the Bordering Waters Planning;
- the Working Group of the Bordering Waters Protection, against Pollution;
- the Working Group of the Flood Protection, River Regulation and Land Melioration;
- the Working Group of the Hydro-meteorology and Hydro-geology;
- the Working Group of the Accidental Pollution Control.

In August 2006, in cooperation with the Lubelskie voivodship authorities initial meeting was held in Lublin, with the aim of setting up a new transboundary project on the Bug River catchment area. Participants presented the main problems and issues associated with managing and protecting groundwater in the area which is under the jurisdiction of the three countries. Following discussion and agreement of representatives of Belarusian, Polish and Ukraine, a project "Sustainable Use and Protection of Groundwater Resources – Transboundary Water Management" was directed to NATO Science for Peace and Security (SPS) structures. Awarded funding enabled the organization to hold a series of meetings and exchange expert knowledge in the field of groundwater management and protection in the border area between the representatives of the three neighboring countries, as well as external experts. The project has so far held the following meetings (Nałęcz, 2007, 2008, 2009):

- August 2006 – initial meeting, Lublin (Poland);
- May 2007 – Transboundary Water Management in Bug Basin, Lvov (Ukraine);
- November 2007 – Groundwater Monitoring Systems, Minsk (Belarus);
- September 2008 – Technical Aspects of Groundwater Monitoring, Shack (Ukraine);
- April 2009 – Towards Future Cooperation, Jerusalem (Israel).

During five meetings organized in the three years of project lasting more than 40 experts from Austria, Belarus, Israel, Lithuania, Poland, Russia, Turkey and Ukraine took part. Most of them were associated with hydrogeology or geology, but also chemical and economic issues. Meetings allowed for the exchange of ideas related to water management and groundwater protection as a very important resource for the economy. Further issues comprised knowledge of riparian countries water management systems as well as other numerous examples. Presenting different systems of water management and discussion enable understanding of specifically local problems and are great means of building up common transboundary water strategy.

International cooperation in the field of groundwater across the Bug River Basin has never before been a coordinated action. The project "Sustainable Use and Protection of Groundwater Resources – Transboundary Water Management – Belarus, Poland, Ukraine" was designed to create an information platform for the exchange of information and knowledge between the institutions involved in the management of water resources as well as for individual researchers engaged in these issues. In the first phase the project attempted to gather as many people related to the issues discussed. Debates on the possible forms of transnational cooperation were conducted. The main objective of the action taken was the development of groundwater studies in the Bug River Basin, development of international cooperation on the implementation of transboundary water quality assessment. These tests are necessary because the Bug River catchment is a very good example of the relationship between surface ecosystem and groundwater supplying it. Another important element in this area is the high degree of surface water pollution caused by the lack of adequate wastewater treatment facilities. Although recent years have shown significant progress in this area (Raport..., 2008) and the expansion of the sewerage network is visible there still remains a problem relating to directing discharges of raw sewage into the receiving body of water. The report prepared under the UNIDO project also points the problems on the Ukrainian side, where discharges from the municipal sewage water treatment plants are responsible for the main contribution to the total mass of the river contamination, estimated to be significantly more than 50% (Dobrovolski *et al*., 2008). This situation shows how important is the aspect of identification of potential sources of contamination of the aquatic system. Abandonment of the study of contamination migration and lack of groundwater monitoring can degrade the water dependent ecosystems as well as cause future problems with drinking water supply.

Transboundary co-operation requires extensive knowledge of the environment in the Bug River Basin. Another important issue is the integrated monitoring of both surface and ground waters. However, conducting measurements requires recognition of the hydrogeological conditions and determining the directions of flows in the transborder reservoirs. Therefore, one of the most important stages of the project was

the presentation of the local hydrogeological conditions. It was found that more detailed research is needed and the creation of hydrogeological models would also be fairly helpful.

In each riparian country the groundwater monitoring is conducted, however, during the project, it was found that the rules for the implementation of these works are different and this causes difficulties in comparing and interpreting the results. A similar situation is also the case for quality standards for surface waters (Dobrovolski *et al*., 2008). National groundwater monitoring systems of Belarus, Israel, Lithuania, Poland and Ukraine were presented. The creation of a unified monitoring system of the border area is a fundamental premise of the works within the project. The system requires a common research methodology. The framework and recommendations for such methodology have been developed (Kazimierski, 2010). In addition to theoretical considerations a practical action has been taken, where at a meeting of experts involved in the technical monitoring issues the study of benchmarking methodologies for water sampling and chemical analysis were conducted (Nałęcz, Gidziński, 2009). Results showed a number of differences that should be eased in the future works. The groundwater monitoring conducted in the border area between Poland and Lithuania can be an example of properly maintained one (Kazimierski, Gidziński, 2009).

As mentioned above, the project is data exchange platform. It also aspired to integrate various groups of experts working around the theme of environmental protection in the Bug River Basin. That is why among others a very interesting initiative of the INTERREG project – the preparation of the Polish-Ukrainian-Belarusian water policy in the Bug River Basin (Zań, Goś, 2010) – was presented in one of the meetings. The presentation of the project was an essential complement to the information about the structure of water resources management in the countries sharing the basin of the Bug River. Knowledge of this issue is crucial to the creation of the integrated transboundary water resources management system and methodologies to support these activities.

Currently undertaken transnational activities are very important and should be also a referential to the future. Study of the relationship between fluctuations in groundwater table caused by the current climate fluctuations and future trends of climate change should be the prelude to the designation of future water shortage areas.

Another important factor mentioned by the participants of the NATO project was the idea of creating a common knowledge base that would bring together the scattered materials and methodological studies of border regions. Also methods of developing effective information exchange between the countries involved in the project were discussed. These elements, as well as exchange of information collected by the united monitoring system will undoubtedly require appropriate infrastructure to enable efficient management of resources.

SUMMARY

Polish Geological Institute is working with partners from neighboring countries on coping with the threats of the environment and sustainable management of groundwater in the border areas, both within the framework of the bilateral border waters commissions and the International Commission for the Protection of the Odra River against Pollution (ICPO) and co-operation in organizing their own initiative.

Experience gained during the SPS NATO project suggests a number of important issues that require intensive research and organizational activities in the Bug River Basin. Undoubtedly, transnational areas, mentioned in the WFD, as sites to develop cooperation between the countries are practicing ground to perform a test of environmental management systems according to the principles of Best Available Practice. At the same time cooperation activities require compromises from all involved parties and benefit from partner's achievements to create a unified solution.

Actions taken during the project are the initial stage, allowing the exchange of information between partners to create integrated water resources management in the transboundary area of the Bug River Basin. Undoubtedly, in the future such role could serve the Vistula Commission, acting like ICPO).

It should be stressed that the work of the project requires a follow-up to prepare a set of tasks that should be done to implement the provisions of international agreements related to environmental protection and sustainable development. These tasks can be the beginning of a series of new projects funded by international organizations (UNIDO, NATO, the 7th Framework Programme, the Eastern Partnership, and others).

During the NATO project, among the most important issues that should be considered in future activities, the following were stated (Nałęcz, 2009):

- creating a knowledge base for potential technologies used in environmental research in different countries, human resources and institutions involved in the research process;
- identification of pollutants sources and their valorization;
- preparation of applications for international funding for the equipment of Belarusian, Polish and Ukrainian services of leading transboundary environmental monitoring into united, professional field equipment, as well as chemical laboratories in the high-end equipment allowing for a quick chemical analysis of water and ground samples;
- creation of a research network to conduct comparative works;
- the establishment of inter-state body managing transboundary water monitoring system with a single research methodology.

There is no doubt that groundwater research in transnational areas should be accompany with changes of surface and atmosphere water system. Gathered information, all together will be a basement for integrated transboundary water management system.

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