Transboundary Lakes in the Balkan Area, Monitoring and Management in Accordance with the EC Water Framework Directive

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Abstract

On the Balkans thirteen river basins are transboundary, i.e. shared between two or more countries. This illustrates the high relevance of developing appropriate management tools and policy strategies tailored to address transboundary water resource issues in this region. The DRIMON Project (www.drimon.net) seeks to improve the framework for integrated land and water resource management in transboundary catchments, with particular emphasis on erosion and sedimentation, pollution control measures and related transboundary problems, in line with the EC Water Framework Directive (WFD). The main objective is to contribute towards an improved knowledge base and dialogue between stakeholders for the transboundary management of water resources in the Balkan area through the integration of natural and social sciences.

This paper presents the results of the first half of the project (entire project period, 2006-2009), with particular emphasise on transboundary water management needs for improved frameworks. Lake and river monitoring results from the Prespa and Skadar/Shkodra basins are presented and seen in conjunction with experiences in the basin of Lake Vansjø in Norway. Stakeholders analyses in the two case basins will provide insights into the main problems and ways to overcome them through improved participation and knowledge sharing.

Key words: *Nutrient budgets, Dose-response relationships, Monitoring, Transboundary management of water resources, Stakeholder analyses.*

Introduction

With the EC Water Framework Directive (WFD) (EC 2000), integrated water resources management has become high on the agenda in most European countries. For the first time, European countries have a common framework for water management, which is not least useful in cases where two or more countries share the water resources. The Balkan countries have some of the highest proportion of transboundary catchments in Europe, with 13 international river basins, which illustrates the high relevance of developing appropriate management tools and policy strategies in this region (e.g. Faloutsos et al., 2006). Approximately 90% of the area of the South Eastern European countries falls within transboundary river basins, and the regional dependency on transboundary water resources is on average 66 percent (GWP, 2006).

This situation becomes more challenging since many countries in the Balkan region are in transition, both politically and economically, as a result of the political instabilities in the past. Consequently, several sectors are in rapid development, including agriculture and tourism, with subsequent impacts on the water resources situation.

This paper presents the preliminary results of a research project on two transboundary Balkan lakes and their catchment areas. The project, abbreviated DRIMON, is being carried out jointly by researchers in Albania, Macedonia, Montenegro, and Norway since June 2006. The main objective of

DRIMON is to contribute towards an increased knowledge base for improved water resources management, in line with the EC Water Framework Directive. Through the study of lakes Prespa and Shkodra/Skadar, twinned with the on-going research in a Norwegian lake, the project integrates natural and social sciences on the one hand, and research and management issues on the other.

Background and rationale

Three lakes, five countries, and numerous environmental and management challenges
Two Balkan and one Norwegian lakes and their catchment areas are used as case studies (Figure 1):

- Lake Prespa, shared between Albania, Macedonia and Greece;
- Lake Skadar/Shkodra, shared between Albania and Montenegro;
- Lake Vansjø in Southern Norway

The Lake Vansjø basin is included for comparison purposes, as it is a pilot basin for the implementation of the WFD in Norway, and is presently one of the most extensively studied lake basins in Norway.

The three lakes are quite different in many respects, both in terms of physiography, size, and hydrology, as well as in terms of main pollutant sources and stakeholder interests (cf. Table 1). On the other hand, there are also similarities, not least the fact that the management of the lakes requires reliable monitoring data, co-operation between different stakeholders, and environmentally-sound management practices.

Lake Prespa consists of two basins, the Macro and Micro Prespa; but only the Macro Prespa is included in the project. The largest tributary is the River Golema, entering the lake from the Macedonian side. A rather unusual hydrological feature of the Prespa is that there is no main outlet stream, as underground streams and groundwater moves from the Prespa to Lake Ohrid. Lake Prespa is rich in biodiversity, and supports a wide range of flora and fauna. The entire area is of international importance according to the Ramsar Convention.

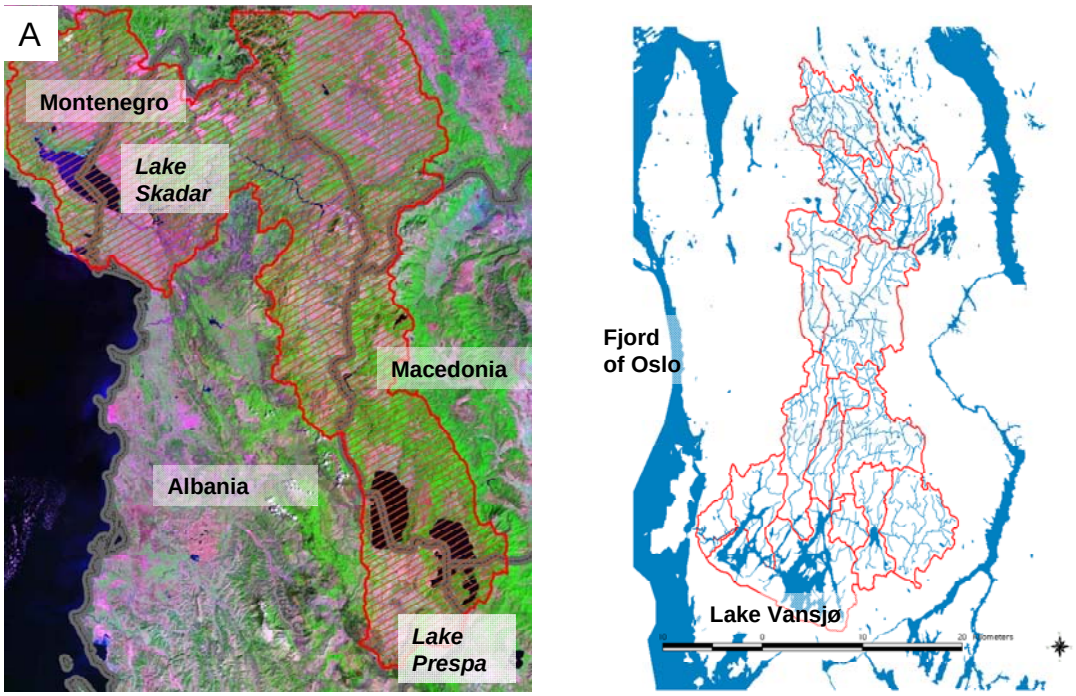

Figure1. A (left): Map of lakes Prespa and Skadar/Shkodra within the Drim/Drini drainage system; and B (right) map of the drainage basin of lake Vansjø south-eastern Norway.

Lake Shkodra/Skadar is shared between Montenegro and Albania. The most important tributary is the Moraca River, which contributes to 62 percent of the lake's water. In addition, several groundwater springs both in and near the lake complicates the hydrology and therefore the water balance calculations of this lake. Unlike Prespa, Lake Shkodra/Skadar has a defined outlet in the Bojana/Buna River, which runs from the eastern shore of Lake Shkodra/Skadar to the Adriatic Sea. The lake is rich in biodiversity, and hosts amongst others more than 270 bird species, many of which are endangered. The lake has therefore been a Ramsar site since 1995.

Lake Vansjø in Eastern Norway is the third study area of this project. This lake and the processes in its catchment area have been extensively studied during the last decade. In addition to limnological and hydrological studies, the socio-economic and political processes related to the activities in the catchment area are of interest, even though the lake is not transboundary. The main tributary is River Hobøl, which is draining agricultural areas, small villages and scattered dwellings. It is one of the richest lakes in Norway in terms of fish diversity, and also hosts a large number of bird species. In recent years, the blooming of toxic blue green algae during the summer has caused severe environmental problems in the lake.

Table 1. Information on the three lakes of the DRIMON Project.

LAKE BASIN	PRESPA	SKADAR/SHKODRA	VANSJØ
Countries	Macedonia, Albania, Greece	Albania and Montenegro	Norway
Lake area	274 km^2	353-500[1] km^2	36 km^2
Lake max depth	52 meter	60 meter	41 meter
Lake height	853 m asl	5 m asl	25 m asl
Lake morphology	Two basins	One basin	Two basins
Main tributary	River Golema	River Moraca	River Hobøl
Main outlet	Groundwater outlet (carst) to Lake Ohrid	Buna/Bojana River	Moss River
Main pollutant pressures	Agriculture, sewage, urban areas	Agriculture, sewage, increasing tourism, industry, urban areas	Agriculture, sewage from scattered dwellings
Main stakeholder issues	Farming, fishery, biodiversity, sewage recipient, tourism	Tourism, fishery, farming, sewage recipient, biodiversity	Farming, drinking water, tourism/leisure activities, sewage recipient
Main managerial agreements	Prespa Park, signed 2000 by Albania, Macedonia and Greece	MoU 2003 between Albania and Montenegro	Vansjø Project, with participation of 8 municipalities. Started in 1999, ongoing.

The challenge of IWRM in transboundary waters in the Balkan region

The current challenge over water sharing has often been described as a *crisis of governance (*Rogers and Hall 2002). As such, the 2001 International Conference on Freshwater in Bonn did for example stress that 'the essential key is stronger, better performing governance arrangements'. A series of processes or declarations have paved the way for dialogue at the international level in the Balkans, including the two phases of the Petersberg Processes (1998); the Athens declaration process (2003), the Rudesheim follow-up process (2004), the Berlin Roundtable (2005) and the Roundtable Conference in Ohrid (2006). The latter was jointly organised by GWP-Med and the Lake Ohrid Watershed Committee, established by Albania and Macedonia, and is primarily supported by *GEF IW:LEARN.* This conference identified three issues that could be crucial for the establishment of transboundary water resources management frameworks:

- The development of legal instruments agreeable to all countries sharing common water resources;
- recognition of an extended timeframe for addressing institutional issues; and

[1] The considerable variation of water levels in Lake Shkodra/Skadar is caused by hydrological conditions. When the Drim/Drini system is flooding, outflow from the lake is sometimes impeded, and water may also enter the lake from the River Buna.

- adoption of arrangements for funding of transboundary management bodies.

Timely adoption of legal instruments agreed by all parties and their implementation is necessary, and in order to implement these instruments, the partners should develop an institutional framework. The legal framework should recognise the existing rights of water users and should be easy to implement.

For the two Balkan lakes in the DRIMON Project, two international agreements are important:

- The Declaration of Lake Prespa as a trilateral protected park, signed by the Prime Ministers of Albania, Greece and Macedonia in 2000, while an agreement for the management of the lake and its basin is underway;
- A Memorandum of Understanding signed between Albania and Montenegro in 2003, which also provides for the management of Lake Shkoder.

In practical terms, these processes and declarations have led to the organisation of a series of capacity building workshops for senior officials, decision makers and experts, and through the facilitation of an internet-based information network establishing a community of practice on transboundary water resources management with a particular focus on South Eastern Europe. It is important to keep the interaction between agencies within and across the borders active, and to provide a permanent platform for negotiations, dialogue and agreements. In practice, such processes require adequate funding and resources that may come from external sources or generated within the system in the form of environmental taxes, payments from private industries which pollute, and/or voluntary contributions.

The EC Water Framework Directive (WFD) is another process that is expected to have a significant impact on the transitional waters of the Balkan region. With EU member states bordering the Balkan area, several of the transboundary water bodies are now partly within the EU, with governments facing the requirements of this Directive. Furthermore, the Balkan states are at a stage where EU membership is being discussed. One advantage with the WFD is that it exerts a strong external pressure to implement improvements in water management processes, with defined goals and a set of fixed deadlines. The main goal of the WFD is to ensure good ecological, chemical and hydromorphological status in all water bodies. This is a rather strict goal, which requires that all rivers and lakes within the commission countries can only have relatively small deviations from undisturbed conditions. The main tool for achieving good ecological status within the WFD is the development of River Basin Management Plans (RBMP). These are to be prepared at regional management levels with extensive involvement from both the local management and stakeholders, and should include a plan for abatement measures. For transboundary watersheds, the establishment of an international stakeholder panel providing opportunities for various stakeholders to meet and discuss the challenges may be recommended, in order to provide important inputs to the RBMP process.

Lake Vansjø, although not a transboundary water body, has interesting experiences to offer to the other cases. It has been a long-term process to create trust and integration between the different sectors (agriculture, sewage, drinking water supply, leisure & boating) and the different municipalities. Altogether eight municipalities run and finance the Vansjø Project, which since the start in 1999 has been led by the same project leader. The project's board is led in turn by one of the mayors of the eight municipalities. One major advantage with this project has been the willingness to ensure a sufficient knowledge-base of the natural processes. Through political pressure the project has ensured funding from national authorities for several scientific investigations, as well as a continuous monitoring program to record tributary loads and lake response. This knowledge base has assisted the Vansjø Project in selecting the most appropriate abatement measures, in order to combat the severe environmental pollution in the catchment area.

Two selected sectors: Agriculture and tourism

The catchment areas of all three lakes have extensive agricultural activities. Use of fertilizers and subsequent runoff of nutrients from fields therefore threatens the ecology of the water bodies in all three case studies. In addition to runoff from fields, the disposal of unused and rotting fruits and vegetables is not uncommon, especially in years with low market demands. Another issue is pesticides, which not only poses a problem in the runoff from fields, but also if the spraying equipment is cleaned in the rivers or lakes. Through such activities, harmful substances can enter directly into the aquatic ecosystems. Insecticides cleaned out in this manner may for example cause instant fish death in the downstream recipients. The abatement measures in such cases are first of all increased

information and stakeholder dialogues, linked with compensations where applicable and possible, whereas any “scape goat policy” is usually counteractive and should be avoided. In Norway, a number of measures to abate negative impacts from agriculture on the aquatic ecosystem are presently being evaluated, and the results should be of use for the Balkan area as well. However, some types of pressures are less common in Norway than in Balkan, as for example irrigation of agricultural fields. The consequences of irrigation are particularly alarming in the Prespa region, where the water levels of the lake have been lowered during the last decades (e.g., Löffler et al. 1998; Catsadorakis and Malakou 1997), thus also increasing the risk for eutrophication.

The other main sector that will be highlighted in this project is tourism. In the two Balkan cases, the Lake Skadar/Shkodra is presently the one where tourism is expected to develop most rapidly. Lake Prespa is also developing in this manner, but the development is expected to proceed more slowly. In Lake Vansjø in Norway, the local population is using the lake for swimming and boating, but the harmful algae blooms the latter years have seriously affected this interest, and has lead to a massive political pressure to “clean up” the lake.

No doubt, tourism has important economic, social and environmental implications, and at the same time, environmental quality is an important part of the consumer’s consumption decisions, especially in terms of eco-tourism. The linkages between tourism and environmental damage have been reviewed in a number of publications (Lindbergh and Johnson 1997; Davies and Cahill 2000; Hall 2000; Markandya 2000; OSPAR 2006). Uncontrolled conventional tourism can put enormous pressure on an area and lead to impacts such as soil erosion, increased pollution, discharges into recipient waters, natural habitat loss, increased pressure on endangered species and heightened vulnerability to forest fires. It often puts strain on water resources, and it can force local populations to compete for the use of critical resources. Markandya (2000) found that the number of tourists visiting a certain area correlates negatively with environmental degradation. High densities of tourists can lead to extreme pressures on wastewater treatment, waste disposal, and land based pollution. There is a major gap in literature on the relationship between tourism and the environment in the Eastern and South Eastern European region (Hall, 2000). However, there is no doubt that the environmental impacts may become serious around inland water bodies with increasing amounts of hotels, restaurants and domestic buildings, especially if the capacity of sewage treatment systems is not increased. The study areas reflect such a situation, and it is therefore necessary to address the challenges in tourism development if the water bodies are to be managed in a sustainable manner.

Methodology

Integrated approach

The main methodological approach of this project is the integration between natural and social sciences, not just in line with the EC WFD, but also in line with numerous principles set down during the last decades of increased awareness of water resources management challenges. These include e.g. the Dublin principles (1992); the Earth Summit in Rio de Janeiro, the Millennium Development Goals 2000 and the Johannesburg Conference (UN 2002). These and many more conferences have advocated that IWRM should go beyond the co-ordination of sectors and agencies, and include the carrying capacity of the natural environment and demand management (Koudstaal et al. 1992).

DRIMON addresses the integration of disciplinary knowledge towards improved water management in the study areas. Natural scientists focus on the different fundamental processes (physical and biogeochemical) in river basins and water systems, whereas social scientists have their starting point in the social and institutional issues governing water use and not the river basin *per see*. Both can potentially contribute to basic information for policy-making and policy development.

Harmonised monitoring of rivers and lakes

The requirements of the WFD for the monitoring of rivers and lakes are quite extensive, involving three types of surveillance activities and three groups of so-called quality elements (hydro-morphological; chemical; and biological). However, in Norway, most operational environmental goals to date are based on the chemical quality elements, with some exceptions. The chemical quality elements analysed most often in rivers and lakes affected by pollution from agriculture and/or sewage are nutrients, in particular phosphorus and nitrogen. In addition, chlorophyll a and easy-to-measure parameters such as the Secchi disc are used in lakes.

Within limited budgets, the DRIMON Project has therefore sought a compromise between the monitoring requirements of the WFD and the needs for investigating pollutant status in the lakes and catchment areas of the case studies. The most prominent factor of the WFD is that the environmental goal of Good Ecological Status has to be achieved for all water bodies. Work is underway in Europe to find a set of common classes for the status of each element for different water body types, but since this work is still not commonly agreed upon, and the preliminary results from the Mediterranean mainly concern reservoirs, the Norwegian status classes have so far been used in this study.

The DRIMON Project has during 2007 collected monthly samples from Prespa and Shkodra/Skadar lakes in altogether nine sampling stations, of which one pelagic station in each country in each lake, as well as five littoral stations. The main tributaries to each lake have also been sampled (River Moraca and River Crnojevica in Montenegro, and River Golema in Macedonia), as well as the main outlet of Shkodra, the Buna/Bojina River in Albania. Similarly, sampling has been going on the Lake Vansjø in Norway[2], with weekly samples at two pelagic stations in the lake, and bimonthly sampling in its tributaries. For all tributaries, the sampling programme includes additional sampling during floods. Parameters analysed include nutrients (total nitrogen, nitrate-N, ammonia-N, total phosphorus, orthophosphate, and silica), TOC, colour, suspended solids, pH, conductivity, and temperature; as well as oxygen levels, Secchi depths and Chlorophyll a in lakes. [3]

A harmonisation between the Balkan countries has been sought, wherein the basics of the sampling programme and selection of parameters have been similar for all countries. Basically this has been successful in that a set of samples have been collected from the rivers and lakes that may be compared and analysed. However, in this methodology chapter, it is our view that it is important to point at the constraints of such harmonised monitoring, which may include:

- Ensuring sampling by the same *method* may be impeded by different types of equipment, standards, and traditions across borders;
- Ensuring sampling on the same *dates* in one and the same water body but in two different countries can be a challenge as it requires communication on logistical arrangements, and also often requires sufficient funding.
- Agreements on a set of common parameters may be achieved, but different laboratories perform analyses for chemical parameters in different ways, based on different methods and different standards, and with different detection limits.

These challenges are definitely not restricted to monitoring in the Balkan region, as demonstrated by the monitoring of rivers discharging to the Atlantic Sea, related to the OSPAR Commission and the Riverine Inputs and Direct Discharges Programme (cf. Skarbøvik and Borgvang 2007). However, the work towards more harmonised procedures is important, as is laboratory intercomparison exercises throughout Europe, to ensure more reliable data results.

Stakeholder surveys and workshops

To address the transboundary management problems in the study areas, a number of methods to collect data and information are used in the DRIMON Project.

Interviews with key informants, questionnaire surveys and focus group meetings have already been initiated in the two lake basins. In total, 400 interviews were done during May-August 2007 in Lake Shkodra. The questionnaire was translated into local languages for better response. The respondents included, farmers, fishermen, people involved in the tourism industry and tourists. The purpose is to look at the impact of tourism (in Lake Shkodra) and agriculture (in Lake Prespa) on the lake water quality and examine to what extent the countries manage the transboundary waters jointly. Issues concerning expanding tourism industry as a means of employment, peoples perceptions towards the industry, deterioration in water quality due to pollution from hotels, restaurants and other sources that let the sewage into the lake untreated, legal and institutional mechanisms and their weakness in implementation, have been explored.

[2] The sampling in Lake Vansjø and its tributaries has been carried out by NIVA (Norwegian Institute for Water Research) and Bioforsk on commission for the Norwegian Vansjø Project.

[3] The DRIMON Project will also use GIS to map processes related to erosion in the catchment area, but this work is not yet ready for publication.

The stakeholder workshops to be held in 2008 will help to identify the interests/concerns of key individuals, groups and institutions that have a direct or indirect influence in the project. Attempts will be made to look at the social and political interactions of individuals, groups and institutions in the basins. The stakeholder analysis will be done to identify main stakeholder groups, their interests and problems or main issues. The analysis also helps in mapping institutions involved in water governance, both state and non-state institutions and organisations.

As part of the project, a literature survey was conducted to review the studies undertaken in the Balkans addressing the tourism impacts on the environment, the initiatives taken up to address the environmental impacts, and integrated management of transboundary water bodies. The literature report from the survey identifies the knowledge gaps and issues that require immediate attention in the DRIMON case basins.

Results

Water quality of the lakes and tributaries
One year of water sampling has been performed within the DRIMON Project, and the first analyses of the data are given here.

Secchi depth is a parameter that is readily measured in all areas of the world. It requires only simple equipment, yet gives valuable information on the clarity of the lake waters. High Secchi depths indicate clear water that allows sunlight to penetrate to greater depths. Low readings indicate turbid water which reduces the passage of sunlight. Readings were done at all pelagic sites. Figure 2 shows recordings of Secchi depths for all three lakes during the period April – September 2007. In the Montenegrin part of the Shkodra/Skadar, the depths are relatively high throughout the season, although a bit lower in April, possibly following snowmelt and subsequent high amounts of particles. Apart from April, Lake Prespa has throughout the summer generally less clear waters than the Shkodra/Skadar, both on the Albanian and Macedonian side, with values fluctuating around 2-3 meters in the summer period. In the period 2000-2003 average Secchi depths in Lake Prespa was measured to 2.8 – 4 meters, with a seeming decrease in the four year period (Petrova et al. 2006, Patceva et al. 2006). The 2007 data does, thus, seem to resemble the recordings around 2003. Lake Vansjø's eastern basin, which is the less polluted part of this lake, has the decidedly lowest visibility of the three lakes with Secchi depths varying between 1-1.4 meters. It must be noted that the sunlight is expected to penetrate less in the northern parts of Europe, but the visibility in Vansjø is low for Norwegian standards, which is partly due to suspended particles from eroded agricultural fields in the tributaries to the lakes, partly to algae production. This gives an environmental status of poor to very poor, according to the Norwegian classification system, which is also shown in the figure.

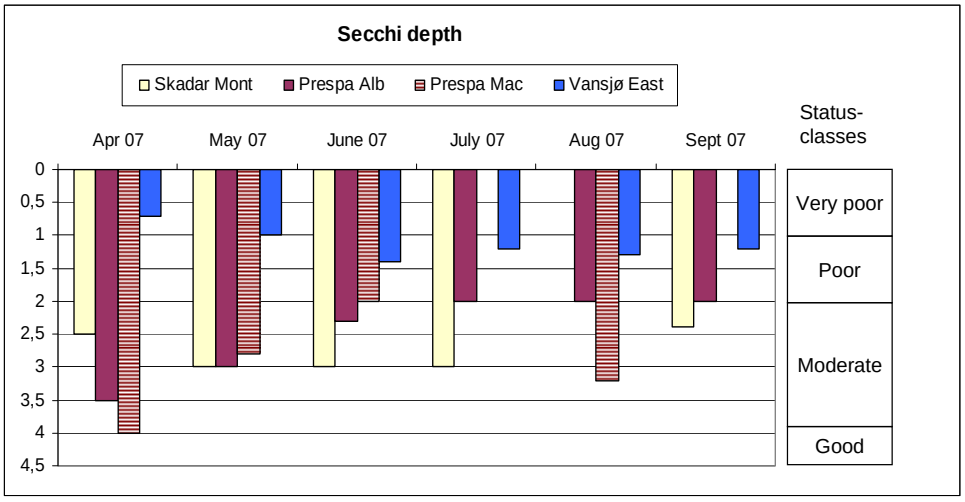

Figure 2. Secchi depths for all three lakes, in four countries. Norwegian status classes are shown to the right.

Another of the most commonly measured parameters in European lakes is Chlorophyll a. The concentrations of this parameter at three sites in Lake Skadar on the Montenegrin side, and in lake Vansjø's eastern basin, are shown in Figure 3. The values in Lake Skadar in April correspond to oligotrophic conditions, moving to mesotrophic conditions in the following months. The concentrations in Lake Vansjø show a marked increase during the two summer months of July and August, indicating increased algae growth and eutrophication. Lake Skadar shows a more stable development through the summer months, with values on average around 4 µg/l.

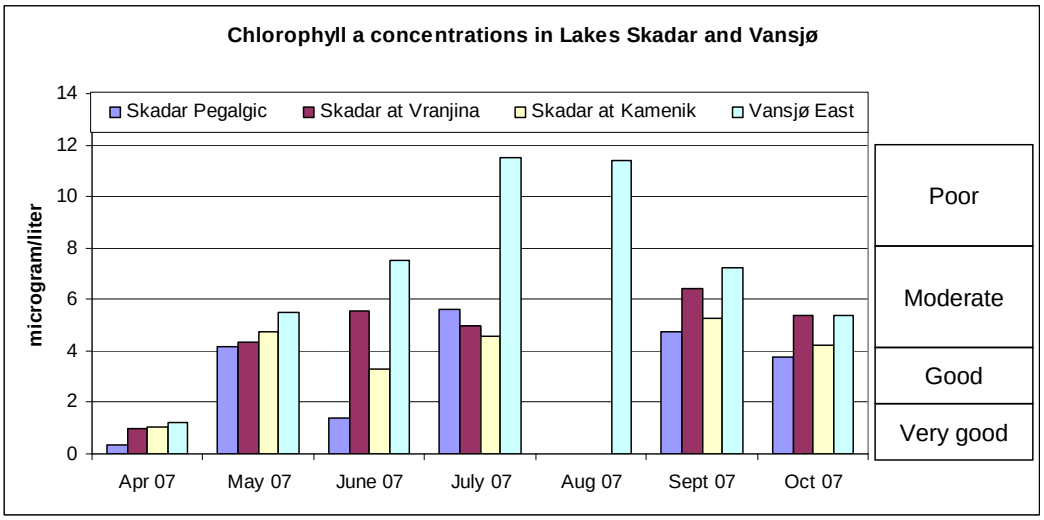

Figure 3. Chlorophyll a concentrations in three stations in Lake Skadar (Montenegrin side) and Lake Vansjø's eastern basin. Norwegian status classes are shown to the right.

In the summer of 2007, the Macro Prespa experienced an incidence of fish deaths along its shores, all fishes belonged to the genus *Calcaburnus belvica*, a Balkan sub-endemic species. This incidence has not yet been fully explained, but, as shown in Figure 4, the primary production in this lake is probably high, as the oxygen levels during the summer months are very low, going towards zero at the bottom. Similar oxygen depletions were observed in the Macedonian part of the lake. Combined with recordings of reduced temperature, this indicates stagnant, oxygen-free conditions at the bottom of the lake, with the risk of H_2S development.

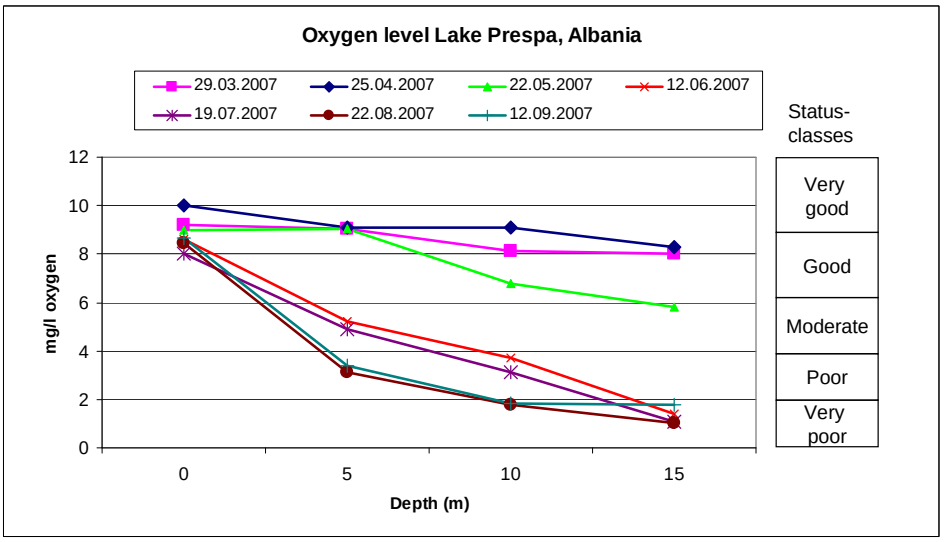

Figure 4. Oxygen level with time and depth in Lake Prespa, Albania. The total depth at the sampling station was 16,5 meters. Norwegian status classes are shown to the right.

Whereas total nitrogen and total phosphorus unfortunately are parameters that are less frequently analysed in laboratories in the Balkan region, all countries have analysed for NO_3-N. A comparison of nitrate concentrations has therefore been done for most of the stations, cf. Figure 5. A typical feature is the rather low variability of the levels in the Norwegian Lake Vansjø, especially in the eastern basin, as compared to the stations in the two Balkan lakes. In the month of June the western basin of Lake Vansjø has for the latter years been more or less devoid of nitrate, although less so in 2007 due to heavy rainfalls and flood episodes during the summer. In situations where the nitrate levels approach zero, this usually indicates that the algae are consuming all available nitrate. In Lake Vansjø, this usually represents the time when nitrate fixating algae (*Anabaena sp.*) begin to increase in numbers on the cost of *Microcystis Sp.*, which is usually abundant in number up till June. This is significant since the latter algae produce the toxin microcystin in this lake.

The two littoral samples in Lake Prespa on the Macedonian side vary quite extensively, indicating discharges from the shore, and possibly high consumption by algae in July. The two stations in Lake Shkodra on the Albanian side show that nitrate levels are higher in the pelagic station than close to the shore, probably as a result of uptake of nutrients from plants and algae at the shoreline.

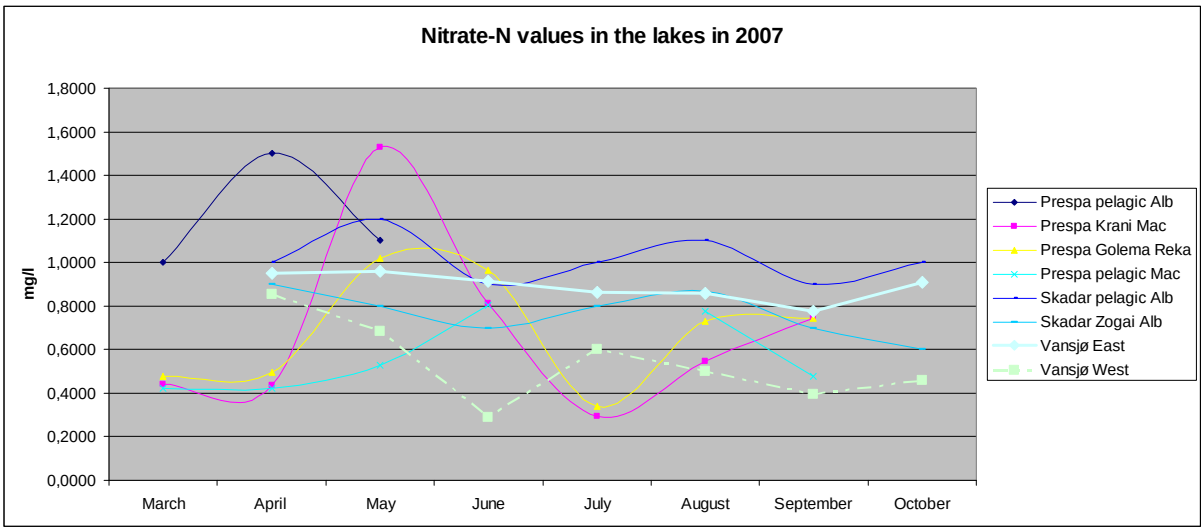

Figure 5. Variations in nitrate-N levels in the three lakes. The samples are collected from the following sites (from top to bottom in the legend): In lake Prespa: One sample from pelagic waters in Albania; two littoral samples (near Krani and the outlet of River Golema) and one pelagic in Macedonia. In Lake Shkodra/Skadar: One pelagic and one littoral sample near Zogai in Albania. In Lake Vansjø one pelagic sample from each basin.

Djuraskovic and Kojovic (2006) reported low nutrient concentrations in the Shkodra/Skadar Lake, but that levels were higher in the tributaries. The data from 2007 confirm this, as nitrate levels in River Moraca averaged 1.7 mg/l, with a maximum of 3.1 mg/l in November. Higher levels in the rivers are not surprising as the nutrients are not consumed by primary production at the same rate in running water as in lakes. Nitrate levels in the Golema River, entering Lake Prespa from the Macedonian side, varied more through the season, with values between 1 – 6.5 mg/l. The relatively high maximum values (6.5 mg/l) were found in late summer (August and September). The outflow of Shkodra Lake, the River Buna, had during the period April – August nitrate concentrations of about 1.3 mg/l, which are slightly higher than the pelagic values from the lake, indicating additional pollution at the outlet, which is situated close to the township of Schoder. Water discharge data will be used to calculate transport values in the rivers at a later stage of this project.

Tourism impacts: Socio-economic and institutional issues in the Shkodra/Skadar area

The preliminary results are based on meetings with selected stakeholders (Minister of Tourism, Montenegro; Lake Shkodra/Skadar National Park Authority; hotel owners, farmers etc). The results indicate that respondents were positive towards tourism expansion since it will provide new employment opportunities to local people, better prices for their agricultural products, fish and other

products, and inviting more investments into the region for development. The government agencies are keen to expand the tourism industry by opening the borders for foreign investors and relaxing legal systems to facilitate easy entry and operation. However, it is important that the government initiatives are well balanced to cope with the expected growth. Sudden development of this industry is likely to damage the environment if proper measures are not adopted to check environmental degradation.

Although the Ministries of Environment in both Albania and Montenegro have set standards for sustainable development, in reality, the large infrastructure development does not take into consideration the sustainable use of natural resources. Several ministries have jurisdiction over the lake, and their interests often conflict with one another. The Ministry of Agriculture and Food in Albania is interested in increasing the fishing activities in the lake, contrary to the interests of Ministry of Environment (National Park Authorities) who discourage fishing as part of lake conservation measures. Similarly, the Ministry of Tourism encourages construction of new hotels around the lake, which is not in line with the objectives of the Ministry of Environment. However, a joint Action Plan for the Shkodra/Skadar Lake has been developed through a GEF and World Bank funded initiative, and was finalised in April 2007. The Ministry of Tourism and Environment of Montenegro and the Ministry of Environment, Forests and Water Administration of Albania are behind this plan, which is yet to be implemented (APAWA and CETI 2007).

A number of new hotels and restaurants have been constructed close to Lake Shkodra/Skadar since the mid 90s. A majority of these do not have sewage treatment facilities and are therefore a serious threat to the lake water quality. The local municipalities support initiatives that are useful for the local communities and can influence the local development to a large extent. But their participation in the lake management is limited. During the field visits, it was observed that local municipalities were interested to play a more active role in the management. Such local participation is also in line with the requirements of the WFD.

Currently, there is a lack of a common forum that can monitor the development and management of Lake Shkodra/Skadar both within the countries (between various stakeholders) and across the borders. Although international agencies (REC), the GEF etc. are making efforts to improve participation and co-ordination, in reality the co-operation is limited to joint workshops and ministerial level meetings. Such initiatives are important to provide a way ahead for integrated management of the water bodies, but not adequate enough to stop indiscriminate use of lake waters. In Lake Prespa, the agreements for transboundary management are more formalised and have a legal binding. In Lake Shkodra/Skadar, such agreements are still in the discussion phase.

Discussions and Conclusions

This paper has focused on the challenges involved in the integrated management of transboundary lake catchments in the Balkans, and has also presented some preliminary data from the on-going DRIMON Project.

Based on the selected parameters analysed and presented here, the two Balkan lakes seem to be in an overall better ecological status than the Norwegian case study, but it must be noted that Lake Vansjø is one of the most polluted lakes in Norway. Of the two Balkan lakes, the Lake Prespa is probably the lake with the most imminent pollution problems, as seen from data showing oxygen depletion at the bottom waters during summer, combined with an incident of fish deaths in July. Eutrophication and pollution problems are also documented by, e.g., Matzinger et al. (2006) and Patceva et al. (2006). The agricultural activities in this region, combined with reduced water levels due to irrigation, are expected to intensify the situation if abatement measures are not implemented.

Lake Shkodra/Skadar is the lake in the best environmental condition of the three cases. Mijovic et al. (2006) have given a classification to the lake based on data from the period 2002-2004, confirming that the lake ecosystem is still ‘in good condition’ despite the small efforts to preserve it in the past. On the other hand, there may be worrisome environmental threats to Lake Shodra/Skadar resulting from the planned increased tourism in this area. Implementation of the newly prepared Action Plan, as well as development of River basin management plans in line with the WFD, should therefore be prioritised, in order to ensure that the expected changes in this and other sectors will be handled in a way that will not result in decreased ecological conditions in the lakes. This will, in the long term, also have positive effect on the tourism industry.

In Lake Vansjø, the pollution processes were allowed to continue for many years before appropriate action was taken. The political willingness to fund investigations and management processes in this lake was eventually triggered by the stakeholders' concern. With repeated episodes of harmful algae growth in a lake used for drinking water and recreation, the subsequent political pressure to intervene finally resulted in the establishment of the Vansjø Project. One very important result of this project is that it has demonstrated the need for reliable data in order to be able to take the appropriate measures to abate the pollution. This, again, demonstrates two important issues for the water resources management also in the Balkan region:

- The need for harmonised monitoring programmes;
- The need to prioritise the upgrading and maintenance of laboratories, also for a wider range of water quality analyses.

Appropriate monitoring programmes are needed in order to assess the environmental status of the lakes and rivers; in order to monitor trends in the environmental status; and in order to investigate whether or not implemented abatement measures have the expected effects. All this is important for water managers, but if the water quality data are not reliable, or if laboratories for lack of funds can not analyse important parameters, the monitoring efforts are unfortunately more or less futile.

Conducting integrated projects is always a challenge, and also reflects the difficulties involved in IWRM. A major challenge is to integrate perspectives from the natural and social sciences and to create conditions and methods to improve stakeholder participation. The DRIMON project addresses this integration of disciplinary knowledge in the study areas by the mapping of both drivers and pressures, in combination with monitoring of pollutant levels. Such interdisciplinary work also often requires that the researchers cannot delve deep into the processes and details of their specific subject, but rather must strive to make their data available and understandable for the other scientists, making new types of correlations with, for them, new types of data. The results of such exercises must, in turn, be presented in an understandable way to managers. The partners of the DRIMON Project have so far organized two workshops on the Balkan where researchers and water managers could meet (Ohrid 2005 and Kotor 2007). The project is also developing internet pages (www.drimon.net) where "bridging the gap" between managers and scientists is in focus, and is also planning to develop "policy briefs" with project results for managers in the study areas.

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