

16 LANDSCAPE RESTORATION WITH REGARD TO THE WATER LEVEL DROP OF LAKE DOIRANI

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INTRODUCTION

Landscape restoration is a complicated process that evolves many entities. The situation becomes more complex when transboundary water management is concerned, especially where there are substantial socioeconomic differences, conflicts in land uses and cultural dissimilarities.

Lake Doirani is located in the borderline between Greece and Former Yugoslavian Republic of Macedonia (F.Y.R.O.M.). Over-pumping for irrigation purposes on the Greek side of the lake has caused a dramatic drop in the water level, affecting the surrounding landscape and the quality of the water of the lake. Landscape deterioration in the area of Lake Doirani has affected both countries in different ways. This is due to the differences concerning the distribution of the watershed between the two countries, the differences in land uses, as well as differences in certain socioeconomic characteristics.

The impacts of landscape degradation are more direct in F.Y.R.O.M, as landscape deterioration greatly affects mass tourism in the area. On the Greek side of the lake, intensive agriculture does not seem to be affected by the water level drop, since the water used for irrigation purposes is pumped from the groundwater. However, the externalities imposed by the excessing pumping of the groundwater could generate severe negative environmental as well as socioeconomic impacts and might prevent any attempt for future area development.

Market failures due to the public nature of the natural resource, the absence of well defined property rights, policy intervention failures, along with the lack of local participation in the decision making process, constitute critical components of the water management regime in the area. In fact, the case of the lake Doirani represents a strong paradigm of the complexity of land restoration problems, where any solution, apart from technical considerations, should take into account the human factor.

ECOLOGICAL AND SOCIOECONOMIC CONTEXT OF THE AREA

Lake Doirani, located in the Greek - F.Y.R.O.M. borderline, has lost almost $\frac{3}{4}$ of its water amount in the last 15 years. More specifically, the water volume of the lake has been reduced from 265 m³ in 1985, to 69 m³ in 2000 (Barouti 2000; Nikolaidis *et al.*, 2002), resulting in a drop of the mean water level from 5.8 m to 2.0 m, and the

restriction of the surface of the lake from 39.5 km² to 23 km². The water level drop of the lake has resulted in a large-scale territory appearance and major landscape deterioration. As far as the water quality is concerned, there are strong indications that there is a loss in biodiversity namely aquatic vegetation and wild fauna, as well as the deterioration of certain chemical characteristics of the water (E.K.B.Y., 2002).

Despite the fact that there is not a widely approved and/or scientifically proven explanation for the real causes of the water level drop, there is strong evidence that the problem is greatly related to the reduction in the ground water due to overpumping for irrigation purposes in the Greek side of the lake (Barouti, 2000).

The watershed of the Lake Doirani covers a total area of 273.5 km². Greece possesses 70.4% of the watershed and 36.8% of the total surface of the lake, while F.Y.R.O.M. 29.6% and 63.2% respectively. As regards land use, Greece possesses 73.5% of flat areas and 75.7% of cultivated land.

The population in the area of F.Y.R.O.M. is almost 4000, located mainly close to the lake, while in Greece the population of 5000 is scattered at a relatively long distance around the lake.

Economic activity in the area close to the lake is quite different between the two countries. In F.Y.R.O.M., apart from the extensive primary production, there is an important manufacturing activity, as well as important domestic tourist development. In fact, the Lake Doirani is the main tourist resort in the country. On the contrary, economic activity on the Greek side of the lake is dominated by intensive agriculture, with the absence of any activity in the secondary sector and a potential for the development of small-scale tourism activities.

Given the geomorphologic characteristics of the area, the distribution of the watershed between the two countries and the land uses, it becomes obvious that Greece plays a key role in terms both of use and management of water resources.

LANDSCAPE DETERIORATION AND LOCAL ECONOMY

The main cause of landscape deterioration in the wider area of Lake Doirani is the surface water level drop. This deterioration has affected both countries in different ways.

In F.Y.R.O.M. the development of tourism is greatly affected by the water level drop and the resulting deterioration of the landscape. That is because mass tourism is heavily dependent both on use values of the wetland, such as recreation activities, and on non-use values, such as aesthetic values of the wetland. It should also be mentioned that domestic tourism constitutes an important source of income for the local population. It could be said that as far as F.Y.R.O.M. is concerned, the impact of the landscape deterioration is rather direct and obvious. Moreover, the lack of any other coastal areas in F.Y.R.O.M., makes the lake an important destination for tourism and recreation, the deterioration of which greatly affects the local and the national economy.

This is not the case for Greece, where the water level drop seems to have no negative effects on the intensive agricultural production, which constitutes the dominant economic activity, since the water used for irrigation purposes is not pumped from the surface water of the lake but from the groundwater.

Nevertheless, the conclusion that the impacts of the water level drop seem to affect mainly F.Y.R.O.M., does not hold to be true. In fact, it is obvious that any problem concerning transboundary water management affects both parties, since no boundaries exist for any natural resource. Moreover, strictly economically speaking, the structure of the economy in F.Y.R.O.M. appears to be much more balanced between the three production sectors, therefore less dependent on deficiencies appearing in each one of them. Moreover, agriculture is practiced extensively, which in turn means that it would be less dependent on irrigation schemes. Finally, the water level drop of the lake has resulted in a not so obvious territory appearance in the area of F.Y.R.O.M., due to the geomorphology of the area.

On the contrary, on the Greek side, intensive agricultural schemes demand large water quantities. Apparently, any reduction in the groundwater level affects the whole system, whereas the water level drop of the lake and the resulting large scale territory appearance restricts any attempt for the development of alternative small scale tourism, which could be an important source of complementary income for the local people. Moreover, it should be noted that the irrigation and cultivation schemes being practiced in the area are already questionable. As a consequence, the implementation of any integrated approach concerning water resource management would encompass restrictions in agricultural production, both in terms of irrigation systems and cultivation products.

Furthermore, in the case of Greece, the protection of the landscape of the lake for the potential of an alternative tourist development is more important, since Lake Doirani has to compete with several coastal areas at a close distance, as well as other more important wetlands (Lake Kerkini). So the prerequisite for the development of any kind of tourism in the area should be the restoration of the wider landscape of the lake.

From what was stated above, it becomes obvious that the externalities imposed by the overpumping of the groundwater will generate severe environmental impact, such as the loss of aesthetic qualities, resulting from the deterioration of the landscape, the deterioration of the water quality and the extinction of species. Moreover, negative social and economic impacts are apparent. The water level drop of the lake might affect the income of the fishermen in the area and reduce the chances for the creation of new jobs and business opportunities such as tourist development. On a social level, the impacts would include dramatic changes in the structure of the community.

ENVIRONMENTAL AND SOCIOECONOMIC CAUSES OF THE LANDSCAPE DETERIORATION

Landscape deterioration in the area of Lake Doirani reflects the impacts of market and intervention failures, concerning the management of natural resources. Market failures are the result of the public nature of many environmental goods and services, along with the absence of well-defined property rights. Intervention failures include weaknesses in the institutional and legal framework.

There is a large range of types of property rights, often decided by the intrinsic nature of the resource, and by cultural and social determinants. These range from open access to common property, state property and private property (Adger and Luttrell, 2000).

For private goods or resources, the conditions of their utilization are fairly clear. This means that those who have the property right on the resource can use it or convert it or partly/totally shell the rights of its use. Moreover, the owner of the resource can prohibit others from having any rights on the specific good.

On the other hand, certain goods or resources are used by a wider group of persons and they cannot be divided and supplied in small parts. This applies to many environmental goods such as water and air. Those goods or resources are characterized as common property resources (*res communes*). Common property is usually within defined boundaries and ruled through a group of individuals or organizations that enforce control over access and use (Baland and Platteau, 1996).

In cases where there is no international legal framework for specific property rights for certain goods, then we refer to open access resources (*res nullius*), even though those goods tend to be “governed”, with varying degree of success, through customary law or through bi-lateral or multilateral agreements between governments (Adger and Luttrell, 2000). To what extent a specific good or a natural resource could be considered privately or publicly owned depends on how easily this can be divided in parts or could be used as public or private good and on the ability of the state to control the resource use (Kottis, 1994).

Groundwater in the wider area of the lake could be considered a common property resource, since it is used by a group of people (mostly farmers), licensed by the State and regional authorities. Since anyone who is licensed can use as much quantity of water as he wants, there is no motivation for the wise use of the resource. Moreover, as irrigation takes place at a long distance from the lakeshore, farmers are either unaware or just careless of the negative externalities (reduction of the water of the lake) that they cause at the expense of all other existing or potential users of the water of the lake, since no compensation is demanded.

Over-pumping of the groundwater for irrigation purposes reflects the overexploitation of a common property natural resource, which additionally can be characterized as an exhaustible natural resource (Tietenberg, 1997).

The farmers utilizing the groundwater seem to be engaged in a social trap. Social trap is any situation in which the short-run local reinforcements guiding individual behavior are inconsistent with the long-run global best interest of the individual and the society

(Cross and Guyer, 1980). Usually, where individuals enjoy open unregulated access to resource in common property, privately rational behavior can lead to overexploitation of the resource to the detriment of the long-run interests of everyone. In these and all similar cases, individuals may be said to be trapped by institutional, informational or temporal conditions, resulting into making socially sub-optimal decisions (Costanza and Perrings, 1990).

Until now, state institutions have been weak concerning the use of common property resources. The above applies to the Lake Doirani, where the existing legal framework is limited to the restriction of the approval of new licenses for water pumping. This policy cannot solve the problem of the overexploitation of the groundwater. On the contrary, it promotes the existing scheme, which has already been proved detrimental to the natural resource.

Wetlands in general have suffered external cost damage, due to hydrological perturbation or pollution generated by agricultural activities located outside the wetland boundaries. Wetland conservation value has public good characteristics (non-exclusion and non-rivalry in consumption) across individuals now, and across individuals now and in the future. It is likely that the market will under-supply conservation benefits in the presence of such “publicness” (Pearce and Turner, 1990). Thus, many human activities result in external effects that may have an adverse effect on sites elsewhere, but for which, due to lack of enforceable rights, no compensation is paid to those affected (Turner *et al.*, 2000).

Many wetlands and essential functions, such as their ability to provide water, have been treated as public goods and exposed to open access pressures, with a lack of property rights, allowing unrestricted depletion of the resource. According to Tisdell (1993), common or open access to natural resources can lead to their excessive exploitation and in some cases to their disappearance, and when there is common access to a resource (when it is common property), there is no incentive to conserve it. This is the case of Lake Doirani, where agriculture activities in the wider area result in negative externalities for which no compensation is paid to the users of the lake (fishermen or recreationists).

Apart from the market failures due to the public nature of several wetland goods and services and the absence of well-defined property rights, there is also a policy intervention failure. Despite the fact that a set of regulations, agreements and Conventions has been developed concerning the protection of wetlands, their degradation still continues. There is a lack of information and understanding among politicians and users of the wetlands in general, of the multitude of values that may be associated with wetlands. This is partly related to the complexity and “invisibility” of spatial relationships among groundwater, surface water and wetland vegetation (Turner *et al.*, 2000).

LOCAL INVOLVEMENT IN THE WATER MANAGEMENT PRACTICES

Intensive agriculture is the main economic activity in the Greek area of the lake. This means that the specific misuse of the water for irrigation purposes conflicts with any other potential uses, such as tourism development, or fishing. Moreover, the continuing underground water reduction, along with the surface water drop of the lake, constitute crucial environmental problems, since no one can predict where the limits of the system lie. The problem lies in the fact that market processes do not indicate whether a system is approaching the limits of system resilience. The continuation of the present practice might cause severe environmental, economic and social perturbations in the area.

The local users of the Lake Doirani, who are bearing the external costs of the overpumping, do not seem to protest or react to the irrigation practices. This can be partly explained by the fact that, due to the lack of any other competitive uses in the area, local people do not seem to recognize the long-term impacts of the existing management practices.

Mass tourism is only developed in F.Y.R.O.M. and, due to the existence of the boundaries, it is not able to affect the management of natural resources in the area of Greece. This could be done through specific projects of integrated management of the watershed and/or the implementation of the existing, but in fact inactive, international and transboundary conventions and agreements.

Moreover, in the case of Lake Doirani, those who are affected by the external cost of over-pumping might probably be unaware of the environmental, economic or social cost that is imposed on them. Had they been informed, through institutions or public participation in the decision-making process, they then would have been able to react to the landscape degradation.

Another reason for the absence of any local reaction is the lack of information concerning functions, values and development opportunities of Lake Doirani in general. That in turn is connected with a weak institutional and policy framework along with a complete lack of local participation in the decision-making processes.

The situation becomes more complicated in the case of transboundary waters, since their management requires cooperation based on an effective institutional framework. A number of potential weaknesses include lack of comprehensive legal framework, clear demarcation of responsibility between the different authorities, institutional and administrative competence, lack or unequal access to information and lack of funding. There is also the need for institutional adaptation to the new paradigm of integrated water management.

PROSPECTS FOR THE RESTORATION OF THE LANDSCAPE

In this article we propose that, while certain intervention policies aiming at the correction of farmer's irrational behavior are necessary, emphasis should be placed on the organization of the affected parties, so as to improve their negotiation status and pose indirect pressure on the users of the groundwater. In this case, what interests us

more is not the internalization of the external cost through intervention policies, but rather the orientation towards the enhancement of the interests of the actual or potential users of the lake.

Stakeholder analysis could be a powerful tool for the identification of the key actors, the assessment of their interests, and the analysis and understanding of the different functions of the system. Moreover, it could help policy-makers in the design and implementation of more efficient intervention policies. According to Grimble and Wellard (1997), stakeholder analysis is more relevant and critic in complex situations where there are compatibility problems between objectives and stakeholders, and particularly relevant to natural resource issues where they are characterized by cross-cutting systems and stakeholder interests, multiple uses and users of the resource, market failure (negative externalities, unclear property rights, no monetary values), subtractability and temporal trade-offs, multiple objectives and concerns, poverty and under-representation.

By identifying the key actors that are involved in or influence the functioning of the natural resource system, a division could be made between those who affect and those who are affected by certain decisions or actions, those who seem to be more important, and finally those who are more influential to the system. After the identification and the classification of the key actors, an analysis of the conflicts and the possible trade-offs would lead to a better understanding of the environmental and development problem and the promotion of the socially best policies. In our case, the promotion of policies that are oriented towards the enhancement of the interests of the parties affected by the misuse of the groundwater, along with a wider reform of the agricultural practices, would help the restoration of the landscape and the wise use of the lake.

The promotion of a multifunctional agricultural development, along with an integrated development of the wider rural area, with an emphasis on small-scale tourist development, could act as a catalyst, promoting the creation of new economic interests. Multifunctional agriculture development could involve: the promotion of tourist investments by the farmers, the diversification of agricultural production, the promotion of organic farming, the enhancement of fishing, as well as information, education and technical support to the farmers.

Until today, local economic interests on the Greek side have been solely related to intensive agriculture. The development of new economic activities and the promotion of innovative rural policies could diversify economic interests. New social groups would be required to play a role in the development of the area. This in turn should ease the application of several intervention policies.

Finally, along with the development of a multifunctional agriculture, an integrated plan for the management of the water resources of the area should be carried out, with emphasis on the transboundary character of the lake. In that context, bilateral cooperation is necessary at all levels.

CONCLUSIONS

Local economies on both sides of the lake differ not only in their structure at a local level, but at the level of their influence on the national economies of the two countries as well. The dominant economic activities in Lake Doirani are tourism in the area of F.Y.R.O.M. and intensive agriculture in Greece. Due to geomorphologic conditions and economic structures, Greece holds a key role in the management of the watershed of the lake.

Due to the transboundary character of the lake, common or conflicting interests cannot be easily expressed and cooperation on both sides is restricted due to institutional and policy weaknesses.

The dominance of intensive agriculture on the Greek side precludes any other potential for alternative development, such as small scale tourist development. The short-term economic interests of the farmers in the area do not leave room for any integrated management approaches or the implementation of landscape restoration projects.

Externalities imposed on the various users of the lake are not internalized to the private cost of the water pumping process, thus leaving the farmers indifferent about the environmental, economic and social impacts of their activity.

Weaknesses in the institutional framework, lack of a strong public participation in the decision-making process, combined with a lack of information, results in a misunderstanding of the full impacts of the environmental degradation of the wetland, preventing immediate reaction of the affected parties.

For the anticipation of market failures (negative externalities, unclear property rights, unpriced goods and services), intervention policies are required. Those include taxes, economic incentives, restrictions and administrative measures and are addressed to those who through their economic activities generate adverse effects to the natural resource.

For landscape restoration to be achieved, agricultural production should be performed on an equal basis to all other economic activities. The development of alternative activities in the area, along with an integrated management of the water resources, should be considered as a key factor for the protection and the restoration of the landscape in the wider area of Lake Doirani.

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