Carpathian Journal of Earth and Environmental Sciences, November 2013, Vol. 8, No. 4, p. 115 - 124

CONDITIONS AND OPPORTUNITIES OF ENVIRONMENT MANAGEMENT OF A PROBLEMATIC LAKE: POSSIBLE CONTROL OVER THE CHANGE OF THE NATURAL CONDITION OF THE ILI-BALKHASH BASIN

Saltanat YERZHANOVA & Zsolt HUSZTI
L.N. Gumilov Eurasian National University, KAZ-100008 Astana, Mirzoyan 2, salta_27@mail.ru;
University of Pécs, Illyés Gyula Faculty, H – 7100 Szekszárd, Rákóczi út 1; husztizs@mail.ru

Abstract: The main issue of the paper is a region which is problematic both from the ecological and the environmental management perspectives: the Ili-Balkhash Basin in Kazakhstan. This area today is in a very bad condition, but this situation is reversible with the making of the necessary measures. In addition to a theoretical approach, the paper explores all of the reasons and factors that may determine the future scenarios for the region; also, by finding adequate similarities and correlations it tries to give answers that are adequate in terms of environmental sustainability, along with a concrete logic for intervention: measures derived from using the tools of modelling, seeking the answer to each question.

Key words: Lake Balkhash, water, water resources, ecological problem, water management

1. FOUNDATIONS OF THE SCIENTIFIC APPROACHES TO THE JOINT IMPLEMENTATION OF PRESENT ENERGETICS AND ECOLOGICAL SAFETY

As it is well-known, the number of the human population on planet Earth has now reached 7 billion and the issue of the survival of the civilisation of the planet has become a more and more sharply debated issue amongst the scientific, political and economic circles. There are serious reasons and other issues in the background, related to the ever more intensive anthropogeneous factors putting stress on the biosphere. Human kind is endangered by real threats: the exhaustion of mineral resources, the decrease of the biodiversity of the Earth, and the consequences of climate change – they all may all lead to disastrous outcomes, while the speed of economic development cannot keep pace with satisfying the increasing material needs and demands. To sum it up, the need for the harmonisation of the operations of mankind and nature seems to be more and more inescapable.

One of the first one to draw attention to this new situation was a Russian scientist, Vladimir Vernadsky (1863–1945) (Gumilevskiy, 1961) who published his theory on the "noosphere" (as he labelled the sphere of the global conscience) as early as the dawn of the 20th century: creating a theory on the reasonable operation of society. Vernadsky pointed out that sooner or later the time would come when a reasonable, conscious action had to be implemented to ensure the further conflict-free existence of human kind as a part of the biosphere (Vernadsky, 1986).

The issue of the noosphere was later dealt with by Pierre Teilhard de Chardin (1881–1955) (Gumilevskiy, 1961). His theory was that Cosmos is characterised by an effort to develop further and get higher, the climax of which is the Omega Point. He pointed out that the connections between politics, economics and philosophies of the different groups of humans were intensifying, due to urbanisation, technical development and communication methods.

The theory of Vernadsky was further developed by Nikita Moiseyev (1917–2000) (Gumilevskiy, 1961), who was the first to work out the theory of the single possible way for the development of human kind, called "Coevolution or the unity of man and biosphere". According to his theory of coevolution, living beings do not develop independently from their environment, but in the

algorithm of Moiseyev it had a different meaning: as humans must learn to restrict their egoistic efforts and their actions they must refrain from extremist initiatives and their consequences (Moiseyev, 1983).

It is a bizarre historical curiosity that it was in what was the homeland of the theoretical founder of the noosphere and coevolution where geographical nihilism was prevalent in practice– what is more, it also occurred at just the same historical time. Geographical nihilism is a theory of the geographical sciences which says that humanity can practically totally neglect the factors of nature during their transforming activity. Steps inspired by this attitude have included the diversion of rivers, conquering territory from the sea, the creation of the irrigation canal systems in the deserts, the conversion of former fallow lands into agricultural plough lands, deforestation, the establishment of research bases in space and the conquest of the depths of the sea and the geographical poles – these are all measures that are realisable but whose economic value is questionable.

Despite this nihilism, the former Soviet Union was the place of the implementation of several nature-conversion plans: in some areas for example desert climate irrigated agriculture was introduced – the results of which can be seen in the present condition of Lake Aral – and experimental agricultural holdings were created alongside the construction of a large number of hydroelectric power plants. Moscow was connected to five seas by canal systems etc.

Meanwhile, in the "West" the Club of Rome became one of the dominant organisations that have been engaged with the global exchange of information on different issues of international politics. In general, the aim of the Club was to foster the sense of joint care and responsibility for the future of humanity. The organisation first grabbed international attention in 1972 with its study called "The Limits to Growth" (Meadows, 1974). This was the first attempt to predict the further development of the world, using an analytical methodology. Since 1972 a total of 33 studies have been approved by the Club, dealing with different aspects of future development. In 1977 the Hungarian scientist Ervin László led the group making the draft called "Goals for Mankind" (László, 1977) focussing on what the responsibilities of governments, communities, and businessmen should be in the 1970s and 1980s.

Vernadsky's theory on the noosphere was finally defined as one of the foundations of sustainable development at the growth conference of the UN held in Rio de Janeiro in 1992 (Samson & Pitt, 1999).

Irrespective of the widespread popularity of the theory of coevolution, the energy issues and the ecological disasters have been increasingly seen to go hand in hand in recent years: human kind is confronted by the need to recognise the mutual interdependence of society and nature, and the requirement to place emphasis on the cooperation between the two. Although these phenomena require the exploration of the basic tendencies and the elaboration of global strategies and scenarios, theoretically they also allow us to come to a solution of the dilemma of the increased demand for energy and the safe overcoming of the ecological threats.

This as a risk is present in modern post-industrial society but also gives human kind a chance to create a noosphere civilisation based on the partnership of different nations and cultures. The efficient use of natural and energy resources was thus specified as one of the biggest challenges of human kind of the 21st century by the head of the Kazakh state, Nursultan Nazarbayev when he spoke to the general assembly of the United Nations on 25th of September 2007. He said that a global energo-ecological strategy for the 21st century had to be worked out. The main point in it is that the further development of mankind must be adapted to the evolution of the biosphere, in order to safeguard a direction suitable for all individuals (Mutanov, 2011). In the President's opinion – who had written his doctoral dissertation on the assessment of resources – basic principles must be worked out for the guarantee of the sustainability of natural resources: the intensity of their use must not exceed the pace of their regeneration, and the speed of the use of non-renewable resources must not exceed the speed of the use of renewable resources replacing them, meanwhile, the emission of pollutants must not exceed the assimilation capacity of the ecosphere (Nazarbayev, 2011). This initiative and the scientifically founded recommendations aiming at the social and economic problems of mankind and the immediate solution to the energo-ecological safety had a very favourable political reception. The major objective of global energo-ecology is on the basis of the mutual cooperation of nations and civilisations and in the deployment and development of the available energy and other resources, by the middle of the 21st century, is to find a way of meeting the needs of all nations, which must be satisfied at a rational level. The objective and tasks of the strategy, the principles and periods of implementation are in the vested interests of not only countries, groups of countries and of the planet for their development but are also the

responsibilities of solidarity for the states in the field of the solutions applied and the obligations accepted. In conclusion, the present state of sustainable development is actually the logical further development of Vernadsky's and Moiseyev's theory of collective thought built on moral grounds.

2. MAIN FEATURES OF THE BALHAS REGION

The tasks related to energy safety these days include the more efficient use of the known sources of energy, and also the search for new, possibly renewable, sources of energy and their potential uses. Besides the spread of alternative energy sources such as solar energy, wind, geothermal energy, sea currents and biomass, the issue of the extended use of nuclear energy is becoming a topical issue, but new perspectives may also be found in the use of hydro-energy. In our age, the traditional sources of energy are no longer suitable for the unlimited satisfaction of human needs without negative impacts. This makes Kazakhstan too search for innovative ways to develop, in the economic processes the issue of the already mentioned ecological safety is becoming an important issue, which makes it an absolute must to find solutions to the emerging problems. During the economic utilisation of the natural factors we must make sure that the threshold values concerning the quality elements of the environment – like air quality, surface and subsoil waters, and also soil – are not exceeded and the requirements of environmental, health and ecological safety are met.

Over those users/exploiters of the environment that are responsible for the emission of pollutants into the air, a continuous ecological control must be in place so that they do not exceed the emission thresholds of pollutants of the air, water during their industrial processes (Ecological Codex of Republic of Kazakhstan, 2007).

The most serious ecological problems of Kazakhstan today can be seen in the region along the Lake Balkhash, and the lake itself. The Lake Balkhash can be found southeast of Karaganda; its altitude above sea level is 342 metres, covering 18,200 km^2. The extents of the lake are as follows: it is east-west dimension is 614 kilometres, its width is 74 kilometres, its average depth is 6 metres, while its deepest point reaches 26 metres. The first written notices of Lake Balkhash are by Rubruk and Karpina (Karagandy, 2008). The catchment area of the Lake Balkhash includes the total territory of Almaty county, a part of Karaganda County (its southern part), the county of East Kazakhstan (the southwestern part) and the north-eastern part of Jambyl County. The catchment area of the lake plays an important part in the sustainable development of Kazakhstan and in the life of the country's population. The catchment area is home to 4 million people (which is approximately one-quarter of the total population of the county) and this area concentrates 22% of the waters of the country and 42% of the sources of hydro-energy. The Lake Balkhash is a special wetland area with a great ecological significance; it is an important factor for the climate, nature protection, fishing, and social and medical biological issues alike. In addition, it has a huge importance in the preservation and improvement of the ecological state, in every natural system, as the Lake Balkhash is the largest of the Central Asian lakes into which important big rivers run, originating from the Zaylinski and the Zhongar Alatau One of the largest rivers is the Ili River, supplying 80% of the water of all rivers into the lake. The total of the surface water stock in the basin is 28.85km^3/annum, from which 22.87 km^3/year comes from the catchment area of the Ili River and a total of 5.36 km^3/year from the western tributaries of the catchment area. The total of the annual water supply of the Balkhash Basin is 17.4 km^3, a significant part of which comes from the People's Republic of China.

Table 1.
Main features of Lake Balkhash

Average area	16,400 km^2	Elevation	340 m a. s. l.
Length	600 km	Area of drainage basin	413,000 km^2
Width	9-19 km (east); 74 km (west)	Annual amount of precipitation	131 mm/year
Average depth	5,8 m	Number of islands	43

Source by: Zektser & Lorne, 2000

3. LAKE BALATON – A LAKE VERY SIMILAR TO LAKE BALKHASH IN ITS RECENT DEVELOPMENT

If we turn our attention to Hungary, it is worth comparing Lake Balkhash to a Hungarian lake, the Lake Balaton, because of its situation. Lake Balaton, the biggest freshwater lake in Central Europe, is an extremely important destination for tourism in Hungary. The number of touristic arrivals at Hungary exceeds the population of the country by almost four times, it is one of the highest of such figures in the world, and a major part of this tourism flow is oriented to the Lake Balaton, as the second most popular destination following Budapest, the

capital city of Hungary (Illés, 1981). Besides its many sights of interests, natural and other values the Lake Balaton is known as one of the most researched lakes of the world, from which a large number of studies have been published. Lake Balaton – length: 75 kilometres, width: from 1.5 to 14 kilometres, surface area: 594 km^2 – is very shallow, like the Lake Balkhash: its average depth is only 3 metres, while it is 11 metres deep in its deepest point.

The condition of the lake started to decline in the 1960s – partly due to the infeasible developments – and the ecological state of the lake got worse and worse, as did its performance in the tourism industry. In the 1980s the stress on the lake coming from over-exploitation started to ease, the pace of building along the shore areas slowed down, the industrial facilities were either liquidated or they went bankrupt on their own after the regime change (Buday-Sántha, 2007). Now the lake with its water is not enough in itself as an attraction to tourists, and so developments have spread into a broader and broader hinterland of the Lake Balaton. Another similarity to Lake Balkhash is that it is in the area of three administrative units, which may also be a source of problems (Bujdosó, 2005).

The Balaton is a very important attraction in Hungary, but far from being the only one. (Duda-Gromada et al., 2010.) The development of the tourism sector is over its quantitative development phase now; it is more and more quality improvements that determine development. The sustainability of the Lake is guaranteed by a special act made especially for the Lake, and also the recognition that the socio-economic "counter-developments", "decreased developments" and qualitative developments together are the appropriate ecological-touristic developments.

4. TOPICAL INTERNAL AND EXTERNAL ENVIRONMENTAL PROBLEMS OF THE ILI-BALKHASH REGION

Caused by the exploitative measures of the 1970s, the Lake Balkhash suffered a catastrophic decrease in the water level. This was due in the first place to the miscalculated water management developments like the construction of the hydroelectric power plant at Kapchagay, the extended amelioration works and the spread of extensive irrigated farming. The lake behind the dam of the hydroelectric plant, however, has not even become a major recreational area, although international examples show that such lakes can have a significant touristic potential (Bujdosó & Radics 2007).

Simultaneously to these ill thought out water management activities leading to horrible consequences, another major problem appeared: environmental pollution that mostly affected surface waters. Rivers contained agricultural, industrial and communal waste. In addition, the air in the city of Almaty (in its former Russian name Alma-Ata) was heavily polluted, as were the surface and subsoil waters of the capital city. This is by far the most contaminated place in Kazakhstan, along the Ili River – which carries the daily pollution of one and half million people without any purification – which is the largest environmental danger to the Lake Balkhash. Industrial plants, petroleum storage facilities, more than 300 petrol filling stations, urban transportation and the networks of public utilities also threaten the environment with oil substances, nitrates and other chemical materials.

Environmental organisations estimate that one-third of the lands on the planet are on the brink of desertification. One of the countries in the most dramatic situation is the neighbouring China where one-quarter of the land was originally desert, and their size is increasing year after year. In addition, in the last 30 years the growth of demand for water has reached 1% annually, which has a significant implication for safety and also affects the growth of gross domestic product of the country. The scarcity of water and the issue of environmental pollution have become very serious problems in China. Seventy per cent of the available water resources must not be used only for industrial purposes.

Regular droughts make the – already serious enough – environmental problems of the industrial and agricultural areas even more worrying. In China alone, 50 million people have no access to enough water each year. Even if we do not address the lack of drinking water, the enormous lack of agricultural and industrial water still remains.

Being aware of these problems of water, the People's Republic of China has launched large-scale water management investments at the Ili River and the Black Irtis River, concerning several countries (the rivers originate in China, then flow across Kazakhstan to run into the Russian Ob River). As the initial step, an annul amount of 1 km^3 of water is being taken out of the Black Irtis River, which is 10% of the average annual water output (9.6 km^3) measured at the border. The second step is the construction of the Black Irtis–Karamay Canal that requires a further 0.45 km^3 of water, which is necessary for the utilisation of the new crude oil and natural gas fields in China's Hsinchiang–Uyghur Autonomous Territory (HUAT) region. In the long run then, the total water required may be up to 2.5-4.0

km^3. In addition to providing water for the crude oil wells of Karamay, in the vicinity of Urumchi (the centre of HUAT), water will be used for the foundation of an enormous new chemical plant. This Chinese chemical industry was to blame for the ecological disaster of the Amur River in Russia in 2005, through the Sungari River, one of the Chinese tributaries of the Amur River.

The official standpoint of the Beijing leadership is to consider the HUAT issue as the socio-economic development of a lagging region of China, isolated from other parts of the world. It is, unfortunately, also a political issue for the central power of China, as thereby they want to improve the political situation of the province that has showed separatist efforts for decades – one of the signs of which is the birth of the World Uyghur Congress aiming at the foundation of a sovereign and independent Uyghur state under the name East Turkestan (Amnesty International, 2011). For this purpose, in the HUAT territory there are extremely rapid agricultural developments (forestation, cotton and grasses), and the size of cultivated areas will be increased from 4 to 6 million hectares by 2015. Of course the only way of securing the water demand of these developments is to drain some of the water from the rivers flowing towards Kazakhstan before they reach the border. Such drainage of the water in China from the Ili River, which provides 80% of water running into the Lake Balkhash, will lead to an ecological disaster in Kazakhstan.

The situation is really dangerous because the two rivers concerned provide half of the total surface water supply of Kazakhstan. What makes the situation even worse is the fact that China sees an opportunity for such drainage on 30 rivers originating in the mountains of China and flowing towards Kazakhstan.

We must be aware that neither Kazakhstan nor China has signed the UNO convention on the management of cross-border waters, aiming at the regulation of the issues concerning rivers and lakes situated in the administrative areas of several countries. Meanwhile, Kazakhstan – somewhat naïvely – believed that China would not confiscate those resources which are not the sole propriety of China.

5. POSSIBLE IMPROVEMENTS AND PRIORITIES OF THE ECOLOGICAL SITUATION OF THE ILI-BALKHASH REGION

Scientists are convinced that the Lake Balkhash can still be saved. If certain conditions are met, this unique area can even be a location of fishing and angling, energy, touristic and navigation improvements in the middle and long run. Let us see now which ways lead to the realistic and sustainable development (Németh & Dávid, 2007.) of the Ili-Balkhash Basin, a touristic destination of Kazakhstan.

Academician R. S. Karenov thinks that simple scientific recommendations can be made for the improvement of the ecological situation of the Ili-Balkhash Basin (Karenov, 2004.). These recommendations, however, either neither complete not exact in our opinion, and especially from practical development policy aspects they are in need of completion and revision. On the basis of this, the original five recommendations by Karenov were revised as follows:

5.1. Making China interested and/or exerting an international pressure on China

The most important point is to raise the interest of the People's Republic of China in the water system of the Lake Balkhash so that China wants to save and develop this region. Developments can be concentrated in natural, economic, touristic and human fields. It must be acknowledged that the management of the water resources and the division of water between the two countries – Kazakhstan and China – are issues just as important for the political decision-makers of both countries.

Connected to this, a joint water protection and water resources management plan must be worked out that does not jeopardise the interests of either party and can result in acceptable achievements for both parties in the long run.

In addition, of course, the exertion of international pressure as a problem solving tool may be applied if successful negotiations seem to be beyond hope, for if this is the case, then the existence of Kazakhstan is at stake.

5.2. A holistic view in resources management and administration

In the region, the natural, economic and social spheres must be treated as equals and held in balance. In addition, an organisation must be established that has a universal authority, as at the moment there is a distinctive lack of this as the basin and the lake is now divided administratively among three counties, operated by parallel organisations. This is significant among other things because this may lead to a different ecological view than the present one which is built on administrative borders (that nature does not respect).

Figure 1. Lake Balkhash on the border of three counties. Source: based on Google Earth

Within the post-Soviet market conditions, water management also requires a new, management oriented view; the administrative or sectoral-theoretical concept should be replaced by a "basin concept". Such a transition is already known in the practice of the world, it can be introduced in this case in this region, the complex, holistic management of the total of the basin (Fig. 1) would be possible for the protection of the waters, the flora and the fauna.

5.3. Creation of the legal background, emphasising the significance of the lake

In the near future an act must be made on the Ili-Balkhash Basin. This act must regulate all those aspects that determine the local possibilities of nature protection and water management.

There are methods available for this, also from the example of Lake Balaton which we used for comparison. The Parliament of the Republic of Hungary made a separate act on the Lake Balaton, the so-called Balaton Act, "with a view that in the territory of the Selected Holiday Region of the Lake Balaton the protection of the landscape, the natural and built environment serves, with the assertion of the principle of prevention, the protection of limited and hardly renewable environmental values which are also necessary for the qualitative development of tourism, representing a considerable economic potential – on the ways and rules of the more balanced territorial development of the region and on the guarantees of the enforcement of the regulations" (from the preamble of the Act – Act 2000). The Act creates, through the amendments of the spatial structure; the infrastructure network; and the definition of the order of the use of space, the technical and physical conditions necessary for the development of the conditions of holiday-making and tourism, and for the improvement of the quality of life and the working conditions of the inhabitants. The regulations of this Act are threefold: in certain issues it is permissive, in other cases it is strict, and the third option is differentiation.

Permissive allows for the spatial possibility of the development of settlements, in the fact that in the respective region residential and holiday functions are inseparable from each other and envisages opportunities for constructions as long as certain conditions are met. It is strict in the following issues: constructions are only permitted if the necessary infrastructure is already given, in the inner areas of settlements on or in the direct vicinity of the lake shore it is compulsory to fully build out public utility networks, the maximum size or constructible areas differ from the national regulations and in 30% of

the lake shore of the inner area, green areas must be established. The regulation is differentiated inasmuch as it makes a distinction between the settlements of the "selected holiday region" – within that, categories of direct lake shore and lake shore zone, with restrictions less and less rigorous parallel to the increase of distance form the lake shore – and it also pays attention to the outer areas of settlements where there is a chance to prevent or slow down non-desirable activities and processes.

The Hungarian Balaton Act and the Ecology Codex of Kazakhstan (approved in 2007) together can serve as an example for the complex management of lakes in a similar situation as Lake Balaton and the Lake Balkhash.

5.4. Information and gradual enlightenment of society

During the touristic activities in Kazakhstan, a form of behaviour must be promoted that respects nature, its operation and the way activities can be pursued so that they contribute to the long-term sustainability of a given area.

One of the tools for this is a complex marketing plan that makes society aware of the importance of the lake and the basin and also indicated potential threats. The messages of this marketing plan must be integrated into public information, school syllabi and even in diplomatic documents.

5.5. Conducting research and establishing monitoring

A good reason for the importance of research and an adaptable example is, besides the Lake Balkhash, the Balaton Limnological Institute. As early as 1894, a recommendation was made for the establishment of an institute similar to the Zoological Station of Naples, but because of financial problems it was only in 1925 when the Balaton Biological Station, as a part of the National Museum of Hungary, was temporarily opened in Révfülöp, led by Béla Hankó. The foundation stone of the Hungarian Biological Research Institution was laid on the 25th of August, 1926 in Tihany, and the institute was finally opened on the 5th of September, 1927. The institute became a part of the Hungarian Academy of Sciences (HAS) in 1951, under the name Biological Research Institution of the HAS. The deterioration of the quality of the water of the lake between 1960 and 1980 and the recognition of the importance of the research done for the protection of the water made the Academy transform the Institute in 1982, changing its name and competencies. The main task of the Balaton Limnological Institute of the HAS has been research on the Lake Balaton since then. Half of the research staff is engaged with the research on the Balaton, the others deal with comparative neurobiology.

There are several ways now for special measurements serving as the background of monitoring; their methodology is well known (see Puczkó & Rátz 2001, and Dávid, et al., 2012). These methods, the empowerment of the organs of science and the official authorities with clear competencies, the protection of the Lake Balkhash could be adequately established.

5.6. Environmental measures in water management

During the planning of the future hydrological establishments, and even in the case of industries delivering water management, the calculation of economic indices and impact analyses must be made in a broad circle of activities, which will lead to a much more effective use of capital and more rational water management. It is logical that this recognition will lead to the conversion of the hydro-electric power plant of Kapchagay (and the large amount of water dammed behind it) from electricity production to an operation of hydro-technical purposes, and the missing electricity must be produced from other, renewable sources of energy – e.g. by solar energy.
Also, we must not forget that water is in constant circulation, and so in the larger part of the cases pollution will have impacts on its own sources, and/or can only be treated by complicated and expensive processes.

5.7. Environment based developments

The Lake Balkhash of the future must be protected from harmful processes and activities that deteriorate the quality of water flowing into the lake and endanger its water supply. The recycling of waters can significantly decrease the amount or industrial water used, and consequently not only the financial demands of investments are decreased thereby but indirectly also the development costs of the water treatment systems. There is a great interest in the establishment of closed production systems related to the water recycling solutions (see at Tóth & Dávid, 2010).

First, the value of nature of the region must be assessed – with the involvement of experts having the adequate skills and knowledge – by which environmental factor as a potential can be calculated

(we deliberately avoid the use of the phrase “value”, as that usually narrowly refers to financial calculability) (Ecological Codex of Republic of Kazakhstan, 2007, p.141.).

The planning of closed circuit processes in production – and so the application best available technologies (BAT) – in itself can greatly promote the improvement of the environmental conditions of the lake.

There are problems related to the drastic decrease of the industrial performance and the increase of the recreational capacities in the Ili-Balkhash Basin. In this region a key issue of tourism development is the situation of transport infrastructure. The trunk railway lines connecting the southern and northern areas of Kazakhstan are in a desperate need of renovation. Their renewal can be followed by the revival of spa and medical tourism that basically do not hurt the ecological situation of the Lake Balkhash.

In the region, an important issue of environmental protection and environmental improvement is the designation of areas of water protection, realisable by the application of water protection works and systems, to which technological, forest amelioration, agro-technical and hydro-technical, health and other regulations and laws that exclude pollution, littering, the exhaustion of resources and also improve the state of the environment both in the lake and the rivers supplying water to it.

The soonest possible development of the necessary environmental infrastructure – canalisation, water treatment works – is indispensable, regulated by law, allowing some time for the actors for preparation.

These clearly suggest that we must not think in sheer in the terms of economics, a simple cost-benefit analysis is not enough for decision-making on the lake. The saving of the lake now requires a serious planning process and well considered actions.

5.8. Introduction of reasonable limitations

The Central Asian region does not receive a large number of tourists from the major countries of origin yet (Boniface & Cooper 2007). For this reason it would be reasonable to provide a kind of protection against the harmful effects of tourism, especially mass tourism (Rátz & Puczkó, 2000).

Developments must be carried out in a way that they do not cause environmental, social or economic harm. The recognition of this truth has taken a long time, too long time (Hall & Page, 2002). This is assisted by the rapidly developing modern technology. In addition, Kazakhstan cannot have touristic ambitions like Bhutan for example due to its location and size. On the other hand, with reasonable limitations, and avoiding mass tourism, the forms of environmentally friendly tourism (sustainable tourism, ecotourism, responsible tourism) that are already known and well established may promote the development of tourism in Kazakhstan without any major innovation.

6. A MODEL FOR THE IMPROVEMENT OF THE OF THE ECOLOGICAL STATE OF THE LAKE BALKHASH

Taking the necessary and possible measures into consideration, we can get to the elaboration of the model of the condition change that gives us a kind of concrete action plan for the promotion of the environmental condition change.

In order to do so, organising the above eight recommendations into an order, the following scenario may be applied for the solution of the ecological problems of the lake (Fig. 2). The output, i.e. the objective is the creation of a sustainably developable condition of the lake.

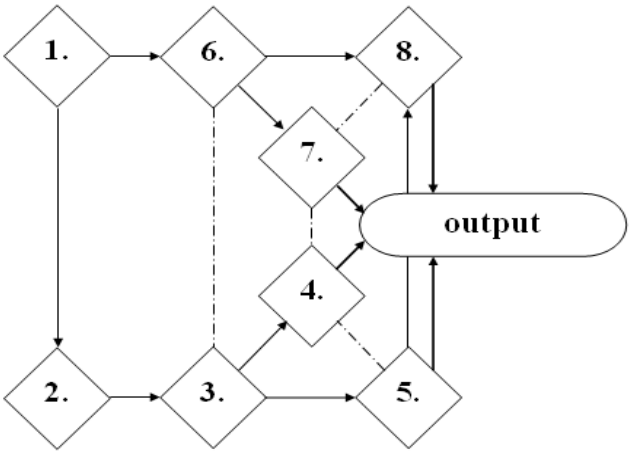

Figure 2. A model for the improvement of the ecological state of the Lake Balkhash. Source: by the authors.

Summarising all these we can conclude that the Lake Balkhash is in a very bad condition, but this situation is reversible with the making of the necessary measures.

7. CONCLUSIONS

The two lakes analysed in the paper, Lake Balkhash in Kazakhstan and Lake Balaton in Hungary are quite similar in several aspects (both are shallow, with hectically fluctuating water level, both are vulnerable ecologically), which makes their comparison feasible and the experiences of the Lake

Balaton concerning the solutions of some of the problems that Lake Balkhash is still facing, utilisable for the Republic of Kazakhstan in the management of the Lake Balkhash and the improvement of the environmental quality of the lake, making it thereby a popular destination of tourism and also a source of sustainable fishing and agricultural activities.

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Data sources: Statistical Agency of the Republic of Kazakhstan

Received at: 28. 01. 2013
Revised at: 24. 09. 2013
Accepted for publication at: 30. 09. 2013
Published online at: 09. 10. 2013