A Systematic Study of Zerbar Lake Restoration

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The beautiful lake of Zerbar, located near Marivan City at the west of Iran, is a freshwater lake with an area of 20 km2 and average depth of 5 meters. The lake is created by regional tectonic activities and is mainly fed with natural spring water from bottom. During the past three decades, regional development has caused much disturbance to the natural environment of the lake and its watershed. Rescuing the lake is crucial to the sustainability of the whole region.

The study of Zerbar Restoration was performed with the aim to restore its health indicators. Variety of human activities in the watershed, as well as the multidisciplinary nature of lake restoration studies, made it necessary to develop a systematic approach to conduct the study.

In Step I of restoration studies, satellite images were investigated to identify the historical changes of watershed during the past 30 years. Meanwhile, documents since 50 years ago were studied. Results indicate that farmland and graze land areas have been relatively constant during the past 50 years. Also, the area of lake, its riparian canes and floating plants have not changed much. In fact, the only significant land use change observed was the significant spread of Marivan City that has stretched toward the lake. The main physical variation to the lake has been elevating the southern edge of the lake by a constructing a landfill dam which was done to control the lake's overflow discharge for irrigation of downstream farmland development.

Step II consists of studies performed by disciplines of water resources, hydrogeology, water quality, wetland and watershed ecology, agriculture, animal farming and fishery. Study results indicate that eutrophication (TSL>100), mainly caused by sewage from Marivan City and the surrounding rural areas has been the main reason for lake ecosystem degradation. DPSIR framework, as a novel approach in lake restoration, was applied to synthesize the study results of different disciplines in a systematic manner.

In step III, stakeholder engagement was investigated through constitution analysis. Meetings were held to communicate lake damages obtained and classified through DPSIR Framework to the stakeholders. Then, stakeholder participation in different actions was achieved through additional meetings.

Finally in Step IV, crucial restoration actions were identified: residents to manage rural and urban sewage and waste disposal through local governance, to plan and perform complementary study of lake water treatment (physical, chemical and biochemical methods), to plan and perform bottom sediment refinement, restoring the lake's natural hydrodynamic condition by adjusting the outlet level, local communities to help prevent landuse change from agriculture to villas, triggering the watershed master plan study to enable watershed monitoring, investigating water quality and discharge of bottom springs to better understand the lake's hydrological cycle, and finally, local residents to protect riparian vegetation.