ENVIRONMENTAL EFFECTS OFSALINITY IN THE KARUN-DEZ BASIN, IRAN

Mehran Afkhami

Head of Environment Dept, Ahwaz Islamic Azad University,
Farhang Shahr, Ahwaz, Iran
E-mail: afkhami67@hotmail.com

ABSTRACT

The Karun-Dez Basin is the largest river basin in Iran (approximately 62,718 km^2). Situated in the southwest of Iran it is formed by the confluence of two major rivers, the Karun and Dez. Annual discharge of these rivers is 21,693 m^3/year. The river system provides the principal source of potable and industrial water in the region. The Karun/Dez basin has experienced a major salinity problem in recent years. Near the outlet of the catchment at the City of Khoramshahr, average salinity in 1970 was 1,388 micromhos/cm and in 2001 average salinity was 3,607 micromhos/cm. At the headwaters of the basin, at Dez dam, the average salinity in 2001 was 533 micromhos/cm. This increase in salinity has rendered the river unsuitable for potable use for much of the year, irrespective of general environmental effects. Use of water for irrigation has not only reduced dilution flows but also causes adjacent ground water levels to raise bringing salt to the surface and increasing salt discharge to the river. The impact of irrigation exacerbated by (naturally) saline tributaries and the reduction in flow from the high rates of diversion for irrigation, urban and industrial water supply. Salinity impacts on the surrounding environment of Karun-Dez Basin in a number of ways. One of these impacts is that the reproductive cycle for important fauna has become upset because low salinity water is not available at critical times. In addition more salt-intolerant species have been removed. Where trees have died the physical structure of the ecosystem has changed and the habitat for a range of flora and fauna has disappeared. There are impacts on local endemic species and threats to Ramsar listed wetlands such as the Shadegan wetland, which abuts the Karun River. Formerly wide-spread species are in many cases now restricted to a few localities, and entire ecosystems now have very limited extent.

Key words: Karun-Dez Basin, river, Salinity, Environmental effects, Iran

INTRODUCTION

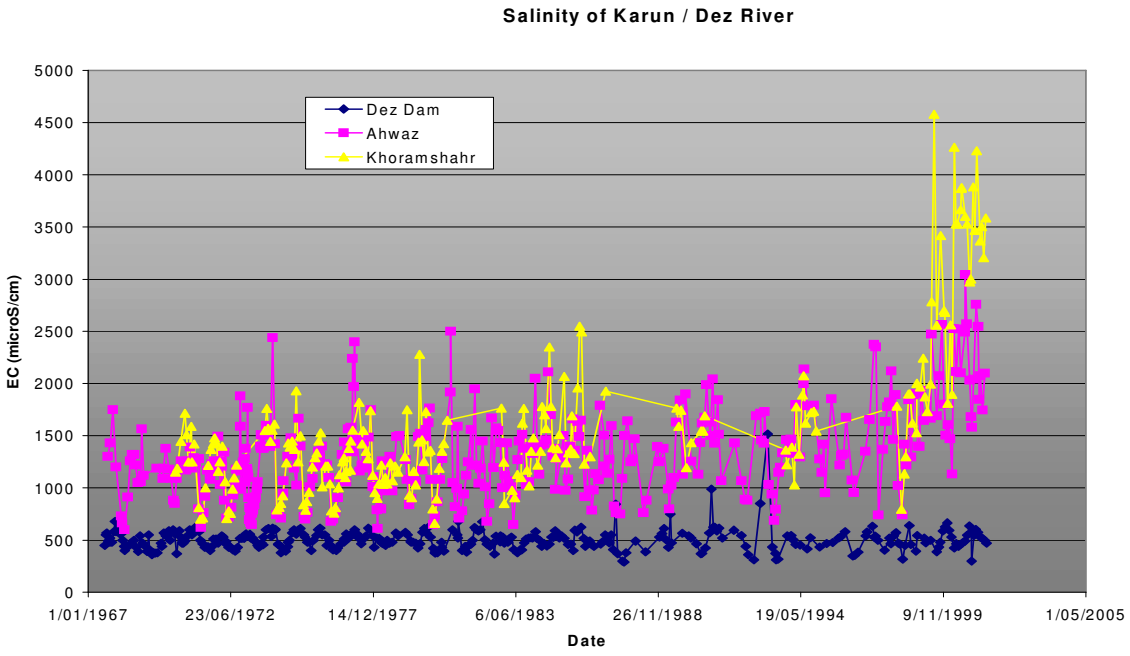
The Karun-Dez basin is the largest river basin in Iran (approximately 62,718 km^2) which situated in the south west of Iran. Karun River originates from Zagros mountain ranges and passing through khuzestan plain, reaches the Persian Gulf. Several cities lie along its path, of them the most important is Ahwaz city, the capital of Khuzestan province. As the main source of water specially drinking water,

the Karun-dez basin salinity is very important for its marginal cities namely; Shushtar, Ahwaz, Abadan, Dezful and Khorram Shahr. The increasing trend of the Karun-Dez salinity results from different factors including: agricultural, domestic and industrial wastewater, high extraction, and saline properties of soils and drought (Afkhami 2002).

SALINITY SOURCES

Comparison of quality data of Karun-dez basin for a 30 year period indicates that generally, its salinity variation obeys the river discharge regarding different uses of water. For example, during the water year 1964-1970, the average discharge of the river has been 422 m^3/sec and its electrical conductivity has been 1112 umho/cm where as in water year 1969-1997, the corresponding amount EC has been 1657 umho/cm due to a discharge of 443 m^3/sec. The average monthly variation of the salinity in Ahwaz area ranges from a minimum of 927 to a maximum of 1567 umho/cm.

Graph 1 shows a summary of salinity of the Karun-Dez basin at different stations. Considering different studies and investigations on the water quality of the Karun-Dez basin, its main salinity sources can **be classified as four categories:**



1 – Natural saline waters and streams

This is related to geological composition of Karun-Dez basin formation, climate condition and regional physiography. A few number of saline streams (ab-e shur in native speaking) join Karun river along its path to the Persian gulf. The high salt content of these tributaries is Karun and Dez salinity.

2 – Industrial sources
There are a number of industrial plants and factories being established during the last two decades. The most important examples are ramin and zargan power plants, and Ahwaz sugar treatment factory.

3 – Municipal sources
Unfortunately, all of the domestic and urban sewerage systems ultimately intrude Karun River when passing through its marginal cities. This condition has a critical impact.

SALT MOBILIZATION

Although there were significant amounts of salt moving through land and rivers before intensive settlement, the quantity involved has been exacerbated under the land use changes that have occurred. Much of this mobilized salt has yet to reach the ground surface. On the other hand, not all of the salt that is mobilized actually gets exported out of the system through the rivers. Large-scale re-storage of salt occurs in the lower sections of valleys through diversions and entrapment, while sections with poor drainage retain much of the salt delivered to the surface from groundwater.

ENVIRONMENTAL IMPACTS

Salinity impacts on the environment in a number of ways; we distinguish between the riverine environment and the Terrestrial environment, and focus on what is known or can reasonably be predicted for loss of biodiversity. In particular the reproductive cycle can be upset if good quality water is not available at critical times. Apart from the direct impact of salinity on ecological processes (riverbanks, for example, are more susceptible to erosion), there are secondary impacts on ecological processes as the more salt-intolerant species are removed from the landscape. Where, for example, trees die the physical structure of the ecosystem changes and habitat for a range of flora and fauna disappears.

There are impacts on local endemic species and threats to Ramsar sites

The Karun-Dez Basin includes some wetlands, one of which (Shadegan Wetland) is internationally recognised under the Ramsar Convention. These threats can to some extent be quantified; it would, for example, be possible using Current data to project the impacts of rising aquifers on endangered Species. There are also less easily identified impacts that are exacerbated by the highly fragmented nature of the natural environment in the Karun-Dez Basin. Formerly widespread species are in many cases now restricted to a few localities, and entire ecosystems now have very

limited extent. Given that the biodiversity of these is at best only partially known, measuring impacts is very difficult.

CONCLUSIONS

Salt is a natural part of the Khuzestan landscape .The Karun-Dez Basin, over geological time, has been a natural salt trap. The clearing of native vegetation and its replacement with annual crops and pastures ,irrigated agriculture, and town gardens and lawns has unleashed a hydrological disequilibrium that brings this vast salt store to the land Surface and increases its seepage to river systems. The impact on streams and rivers is exacerbated by the reduction in flow resulting from the high Rates of diversion for irrigation, urban and industrial water supplies. In Summary There is a better capacity to predict future impacts of salinity on a Basin and catchment scale.

There is accumulated knowledge that points to the limits of current farming systems in most zones to control salinity even at the level of best practice .

There is a greater appreciation of economic and social impediments to the scale of land use change now advocated for dryland catchments.

There is a track record of policy initiatives, such as the Salinity and Drainage Strategy that are now under review.

The salt mobilization process across all the major river valleys is on a Very large scale. There is a future hazard for some rivers and those dependent on them as a source of water. Average river salinities will rise significantly, exceeding the critical thresholds for domestic and irrigation water supplies, and the riverine environment. The importance of variability of salinities over time and periodic exceedances of critical water thresholds, such as for irrigation water and ecosystem maintenance, is now better appreciated.

The Salt Loads study has identified land units with rising saline Groundwater, and the rate of rise. Yet, due to lack of monitoring data and surface contour data, the size and location of saline discharge areas cannot be reliably predicted. There is a priority for investment in better Estimation of cost impacts and the benefit/cost ratios of taking action.

REFERENCES

Afkhami, M., 2002, Karun River pollution and its effects on the groundwater quality around Ahvaz City, south west of Iran, Proc. 3rd International Conference on Water Resources and Environmental Research, Dresden University of Technology, Dresden, Germany.

Williamson D. R., et al., 1997, Salt Trends: Historic Trend in Salt Concentration and Saltload of Stream Flow in the Murray-Darling Drainage Division. Dryland Technical Report No 1. Murray-Darling Basin Commission, Canberra.

Chantelle, James, 2000, Scald site helps spread the word on salinity, Salt magazine, Australia.

Hui, Chi-chiu, 2000, Water quality: Its practical implications to sustainable development in the Pearl River delta, China, Global Nest Journal, Greece.