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**SUSTAINABLE WATER RESOURCES MANAGEMENT  
IN UZBEKISTAN: TRANSBOUNDARY ISSUES****Abror N. Gadaev, Anvar Juraev, Gulmira Boboeva***Samarkand State Architectural and Civil Engineering Institute,  
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*Uzbekistan and other Central Asian countries including Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan and Afghanistan are struggling to come to terms with an ecological disaster affecting the Aral Sea. The crisis has been brought about by the mismanagement of water resources from the Aral's main tributaries, the Amudarya and the Sirdarya rivers. The primary source of quality drinking water in Uzbekistan and Central Asia is ground water, which accounts for between 85 an 90 % of the general water budget. Agricultural irrigation systems have caused high pollutions levels in the region's (unevenly distributed) surface waters. Historically water flow the Aral Sea was 56 km<sup>3</sup> per year, which decreased to 47 km<sup>3</sup> between 1966 and 1970. Water flow plummeted to 2 km<sup>3</sup> between 1981 and 1983, and now stands at less than 1,8 km<sup>3</sup>. A key question is how to balance social and economic development with natural resource protection. Central Asian Republics utilize the same watersheds and share many water management issues in common. It is clear that the region's existing multination and regional water management and environmental protection project are insufficient by themselves to meet the scale of the problem. Further multinational agreements and joint-state/joint-agency programs will undoubtedly be required.*

The Central Asian region has been designated in recent years as an ecological and social disaster zone because of Aral Sea situation. Although water resources are not a new issue, this problem can be traced back to the beginning of civilization for a number of reasons. The beginning of irrigated agriculture in the region dates back to the 6th-7th centuries B.C. This time period coincides with a flourishing of the most ancient civilization where irrigation was a major decisive factor of historical and socio-economic development. Today the Aral Sea and surrounding territories are world-known for ecological disasters attributed mainly to anthropogenesis factors. In recent years, Uzbekistan's control under multiple regimes and governments has made it difficult for central Asia to unite. The growth in water consumption is connected to cultivation of new irrigated territories, where mainly cotton and rice are grown. That issue combined with the increase in the population and employment in agriculture, the flow of water to the sea from the two major river systems -the Amu

Darya and Syr Darya - completely stopped. By the beginning of the 20th century, 7-8 million people lived in the region. Irrigated lands made up about 3.5 million hectares and had irrigation networks of different levels. It was the foundation of society's economic base. At present the population of the region has increased 7 times, exceeding 50 million people. In response to the increase in population, irrigated lands have doubled (7.5-7.9 million hectares). In the climate of the Aral Sea region, 60 cubic km per year would be needed to keep the surface. Area of the Aral Sea at approximately 60 000 square km. The water has stopped completely. From 1930 to 1960 there has been a sharp increase in water usage from 25 km<sup>3</sup> to 103 km<sup>3</sup> a year. The quantitative facts alone show the high usage rates for improper reasons coupled with less potable water for health incentives. The improper use of the water taken from the Aral Sea has led to many consequences that the interstate commission is trying to resolve. Unfortunately since the departure of the USSR, central Asian economies have not been strong enough to rehabilitate the productivity of the territory. Large and ominous hardships fall onto the responsibility of the government. Socially these include protecting the population from adverse impacts of desertification, creating new workplaces and job markets and trying to improve the economic and social conditions by introducing new water efficient technology. Ecologically, each country must implement new plans for the restoration of flora and fauna diversity and the prevention of any further degradation of the Aral Sea.

In particular, improving irrigation efficiency, water supply development, waste water treatment and watershed management are critical needs throughout Uzbekistan and Central Asia. An ecological disaster was set in motion in this region beginning in the 1950s, when water was diverted from the two rivers that flow into the Aral Sea. An additional problem is the regular failure of the region's groundwater systems during the summer (when the demand sharply increases), so that the population is left to consume poor quality surface water. In jeopardy is the health of the region's entire population. Infectious intestinal diseases, often caused by the contaminated drinking water, are a primary challenge facing water specialists is to balance the competing demands of sending more water to the Aral Sea and simultaneously meeting the water supply and quality needs of a developing economy and growing population. The proposed program delivers advanced operational training via activities which develop self-initiative and problem solving skills to prepare students and industry professionals for meeting these needs.

It is to be hoped that the next generation of Uzbek and Central Asian political leaders and citizens will enter into their respective roles with greater awareness of the water resource management challenges faced by their countries and the region, having learned about these issues in the universities.

What is the **conclusion**: Improving the situation in the region is possible by increasing water resources management efficiency with the main focus on ground waters. This option is more realistic by ground waters purification and demineralization because the quality doesn't meet official water standards. The second option involves the implementation of more modern irrigation techniques. A big reason for the over use of water is the mismanagement of current irrigation systems. 7.9 million hectares are being taken from the lakes drainage basin, 92 % of that water is being used for agriculture. Although modern technology would be a positive, financial resources tend to hold this project back. In addition because of this, the training of people would be difficult to provide. Researchers estimate that complete renovation of irrigation systems on 6 million hectares could save about 12 cubic kilometers a year but would cost about 16 billion in US dollars. Although water is conserved, the funding is far beyond state and international funding. The third option is reusing traded water. This would also include additional resources because all participating countries would need to develop several wastewater treatment plants. Most rural populations do not have access to safe water; water treatment plants would indefinitely aid many citizens. The third option is water reusing technologies. This would help with water supply and irrigation. Although all options would have their unique consequences, by far the best action would be to exercise water conservation in arid to semiarid regions. Improper irrigation practices are becoming more prevalent, harming the people that are in need of clean water resources. The first plan of prevention would be to take away certain government monopolies on items such as cotton, gold, oil and silk. Although there have been improvements made such as the creation of the Water Users Association in 2003, there are still disagreements on the water policy. These agreements between farmers and the government only perpetuate the issue of water resources.

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## **WATER-RELATED ENVIRONMENTAL ISSUES IN CENTRAL ASIA**

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*This article addresses the need for a sustainable water resource management in the Central Asian region with a hot, dry and continental climate. This research and its results meet sustainable development's goals and also specifically the potential to solve or softening consequences of the Aral Sea ecological disaster. The urgency of this concern is felt most deeply in areas lacking potable water, most notably the larger Aral Sea region. During the long summer (from May until October) water consumption increases sharply and water sources cannot meet the demand. Intensive water use and sharply increasing of the water demand misbalances water flow in the main rivers as Syr Darya and Amu Darya which feed the Aral Sea. The primary challenge facing water supply and sustainability specialists in Central Asia and specifically in Uzbekistan is to balance competing water supply demand and water sources preservation in the region. Among these demands is the urgency of halting further depletion of water in the Aral Sea, and, ideally, to augment the water in that basin. But there is also the need to develop high quality water delivery systems for human and industrial use. And, of course, there is the question of what water can be left for the agricultural sector of the dry and hot temperature region to irrigate its crops or just sustainable water resources management. This study will address water-related issues in the Central Asian Republics with special emphasis on the Republic of Tajikistan. The authors analyse a current situation and describe the factors that contribute to these issues and will provide recommendations for alleviating the*