

## Northern Aral Sea Has Survived, Eastern – Has Died, Western Aral Sea Can Be Saved

Yusup Rysbekov

Scientific-Information Centre of Interstate Coordination Water Commission  
of Central Asia, Tashkent, Republic of Uzbekistan

**Abstract:** As it is well known, the Aral Sea region was quoted as one of the most staggering disasters of the 20<sup>th</sup> century. In the beginning of 1960s Aral Sea had water area more than 66000 km<sup>2</sup>, in 1985-1986 Aral Sea was divided into Large Aral Sea (LAS) and Northern Aral Sea (NAS), later the LAS was divided into Eastern Aral Sea (EAS) and Western Aral Sea (WAS). In 2007 a total area of three Aral Seas makes less than 20000 km<sup>2</sup>, including EAS - less than 11 000 km<sup>2</sup>, WAS - 5000 km<sup>2</sup>, NAS - about 3300 km<sup>2</sup>. According to last data (2009), the shallow EAS has dried up. Now, as a result of realization of the appropriate measures by Government of Kazakhstan, only NAS has real chances for survival. At the same time, now opinion on impossibility of save of one more Aral Sea has firmly become in public consciousness, some experts name of terms of final disappearance of LAS – 15-20 years. At the same time, impartial analysis shows that there are real chances for survival of WAS (Kazakhstan, Uzbekistan). Idea consists in opportunity of save of WAS by way of creation of artificial dynamical (flowing) ecosystem "WAS - Amu Darya River delta" and construction a line of hydraulic engineering structures, which will connect River delta and WAS. Idea has by compound parts a connection of western part of NAS with WAS, construction of channel "NAS-WAS" and dam, which will separate WAS from EAS. Dynamical ecosystem "WAS - Delta" will include a line of wetlands (Sudochie Lake - Ramsar Site, Akushpa, etc.). Now these wetlands are unstable, as they receive water not always in enough volume. The EAS' saving will allow to stop process of desertification of an extensive zone known under name Southern Prearalie (Turkmenistan, Uzbekistan) and also western part of drying up zone of the former Aral Sea (Kazakhstan, Uzbekistan). Now a desertification covers more than 4 millions ha in coastal zone of the former Aral Sea.

**Key words:** Aral Catastrophe • Ecological Stability • Combating Desertification

### INTRODUCTION

Intensive irrigation development in Amu Darya and Syr Darya Rivers' Basins (RBs) in 1970-1980s have caused sharp decrease of Aral Sea level and hope for water reception from outside (from Siberia' rivers) was not justified.

In 1911-1960 average multiyear river flow of the Aral Sea Basin was equaled about 117 km<sup>3</sup>/year, including Amudarya RB - 80 km<sup>3</sup> and Syrdarya RB - 37 km<sup>3</sup>. During this period the Aral Sea received on average about 56 km<sup>3</sup>/year of river water, including 42 km<sup>3</sup> - from the Amu Darya River and 14 km<sup>3</sup> - from the Syr Darya River. In the subsequent periods a sharp decrease of inflow to the Aral Sea was observed. So, in 1961-1970 inflow to the Sea was reduced on average to 30.0 km<sup>3</sup>/year, 1971-1980 - 16.7 km<sup>3</sup>, 1981-1990 - 3.45 km<sup>3</sup>,

1991-1999 - 7.55 km<sup>3</sup>/year. In 1980-2001 per separate years Amu Darya and Syr Darya Rivers' flow did not reach the Aral Sea. As a consequence, a Sea level has decreased from 53 m (beginning of 1960s) up to 41 m (1985-1986) and 30 m (2001).

Thereof, since 1960 the Aral Sea coastal line has receded on 130 km. In 1980s the Aral Sea was divided on Large and Northern (Small) Aral Seas (LAS and NAS). Later the LAS was divided on 2 parts - Western and East Aral Seas (WAS and EAS). According to the expert analysis, more than 70 % of present Aral Sea level lowering are caused by the anthropogenic impact and rest of these changes are implication of climatic factors (natural aridity). Formation of vast saline desert with area more than 4 Mio ha is major consequence of the Sea shrinkage that has complicated social-political and ecological situation in this region.

**Corresponding Author:** Yusup Rysbekov, Scientific-Information Centre of Interstate Coordination Water Commission of Central Asia, Tashkent, Republic of Uzbekistan

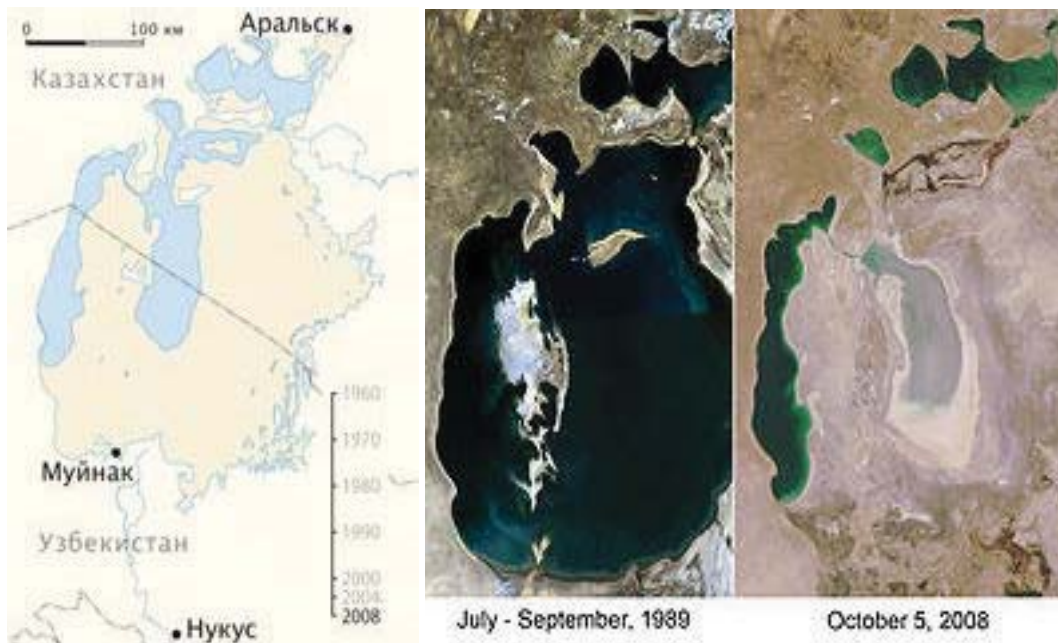


Fig. 1: Dynamics of change of the Aral Sea's coastal line. (Source: [4])



Fig. 2: Aral Sea: August, 2009 (Eastern Aral Sea has disappeared). (Source: [4])

By estimations, damage from wetlands' degradation makes more than 144 Mio \$ per year. Last years many recommendations for Amu Darya and Syr Darya River Delta wetlands' restoration and management on preservation of NAS, WAS and EAS and their coastal zones are prepared.

Now, after realization of a line of necessary measures by Government of Kazakhstan (Kokaral dam was constructed, which has separated NAS from LAS and blocked water receipt to the EAS), experts estimate a management of NAS and Syr Darya River Delta as relatively satisfactory.

At the same time, considerably more difficult situation develops in the Amu Darya River Delta and concerning preservation of WAS and/or EAS.

**Amu Darya River Delta Developing Situation:** Considered zone enters into sub-region known under name "Southern Prearalie" (Turkmenistan, Uzbekistan), most part of which is located in Kara-kalpak Autonomy and Khorezm province (Uzbekistan). Till start of 1960s the Aral Sea was ranked as the 4<sup>th</sup> lake over the world after the Caspian, the Great Lakes (North America) and Victoria (Africa). In the beginning of 1960s the Aral Sea had area more than 64000 km<sup>2</sup> (on other data - 68000 km<sup>2</sup>).

Till 2008 area of 3 Seas together (NAS, WAS and EAS) were estimated less than 20000 km<sup>2</sup> (NAS - more than 3000, WAS - about 5000, EAS - 10800 km<sup>2</sup>) with its gulfs [1-3] According to last data, in 2009 EAS has dried up. A picture of the Aral Sea reduction and its division and disappearances of EAS are given in Figures 1 and 2.

In result, a strong degradation of the Amu Darya and Syr Darya River Deltas' wetlands was observed: water reduction, water mineralization' increase, etc [5-8], etc). Lakes' area in the Amu Darya Delta varied from 120 km<sup>2</sup> (1997, wet year) up to 26.0 km<sup>2</sup> (2000, dry year), in the Syr Darya Delta - from 450 km<sup>2</sup> (1982) up to 262 km<sup>2</sup> (2000). It is necessary to notice that Amu Darya River Delta receives water not always in quantities, sufficient for its sustainable existence. So, in 2004, 2005 there was rather a lot of water and situation in the Amu Darya Delta was estimated as relatively satisfactory. However, in 2006 situation has become difficult in connection with sharp reduction of river flow to the River Delta. For last decades a management of coastal zone of the Aral Sea was strongly complicated, especially - in the Amu Darya Delta. Here the former ecosystems are destroyed, many lakes have dried up, salt desert was formed on place of dried up bogs and area between Delta and Coastal zone of WAS and EAS, flora and fauna were sharply reduced, local climate has changed. In these conditions a search acceptable ways for Delta restoration and steady management of zone from delta up to the Sea are represented especially important.

Basic results of carried out researches and offered ways of Sea's saving: Analysis of results of previous projects, including some projects developed in the Soviet period - in 1980s [9, 1, 2, 10, 3]; etc.) shows that the uniform opinion on ways of WAS' and EAS' saving did not exist. Any of proposed projects did not give the concrete answer to question on steady management of Amu Darya Delta and its wetlands. According to appropriate analysis ([1]; etc.) and other scientific sources, the offered ways for preservation of water ecosystems in coastal zone of the Aral Sea are reduced to the following basic variants (other variants do not leave for frameworks resulted below): # 1. Reduction of total area of the Aral Sea (there are variants);

- Reduction of area of the Aral Sea, but with NAS' liquidation;
- Separation of the NAS and WAS;
- Separation of NAS and WAS, at reduction of WAS' area;
- Preservation of the NAS and WAS, at separating of the EAS;
- Preservation of reduced LAS and NAS;
- Preservation of reduced LAS, but the NAS is salty reservoir;
- Preservation of reduced EAS, but the WAS and NAS are salty reservoirs;

- Preservation of reduced WAS and NAS, but the EAS is salty reservoir;
- The WAS exists, the EAS is completely separated;
- The EAS exists, the WAS is completely separated;
- The EAS and WAS continue to exist without human intervention.

Variant # 13 Water of the Amu Darya is directed to the WAS.

Now it is obvious that many variants have lost an actuality owing to preservation of the NAS and to disappearance of EAS. As a whole, variant # 13 remains acceptable for consideration and it is most expedient, attractive and possible to realization and this variant should be accepted for a basis for preservation of WAS. But this idea, which was offered by Academy of Sciences of Uzbekistan, is not considered by authors of the Report under the Project INTAS ([1,3]; etc.) as correct. At the same time, in developing situation it is necessary to recognize and to prove a decision on saving of WAS and it is possible only at connection of the Amu Darya Delta with WAS and creation of uniform "Delta-Sea" ecosystem [11,12].

Otherwise, water ecosystems of the Delta will be unstable and will change their parameters depending on river flow receipt.

Proposed idea consists in substantiation of the WAS preservation and sustainable management by artificial created ecosystem "Delta-Sea", which will include also a number of wetlands and lakes in the Amu Darya River Delta. For this purpose it is necessary to change approaches to management of the WAS Coastal zone and Amu Darya River Delta zones.

According to carried out scientific and experimental researches, there are 2 hypothetical routes of artificial channel's construction to the WAS, namely:

- Through Sudochie Lake - Southern channel,
- Through zone of Rybachie and Muynak Lakes - Northern channel.

Analysis shows that a Southern channel's construction is preferable from the point of view of technical practicability, smaller expenses of financial assets and future efficiency for nature protection in this area. Channel from Amu Darya Delta will be constructed on the route, which includes Sudochie Lake, whence water will flows in the WAS itself. Sudochie Lake is the object of the Ramsar Convention that is very important moment also.

It is supposed to determine for creation of flowing ecosystem "Delta - WAS":

- Minimal river flow, which necessary for functioning of new ecosystem. These water volumes should not be used for other needs (irrigation, etc);
- Optimum parity of water and land areas in future Delta (optimum areas of wetlands and lakes). Accordingly, it will be necessary to refuse from some wetlands (Akushpa, Tayly, etc), which have few chances for survival and parameters of which do not promote sustainable management by them (small area and depth, high water mineralization, etc.);
- Optimum water level in WAS, on which it is necessary to save it. It can be determined after calculation and establishment of necessary water limits for new artificial ecosystem. For base of this water limits it is possible to accept volumes of collector-drainage waters, which earlier are dumped (without benefit) in EAS and sanitary water releases to Amu Darya delta,
- Volumes of lost biodiversity' restoration (fish, muskrat, bird, etc. and vegetative communities) and economic activity in the Amu Darya Delta and WAS;
- Volumes of artificial wood landings (area, kinds of vegetation etc.) in adjacent to system "Delta-Sea" areas. These measures will allow to lower negative pressure on new ecosystem and will promote common improvement of zone,
- Necessary measures on maintenance of ecological stability in the Amu Darya Delta and other measures on maintenance of stability of ecosystem "Amu Darya Delta - WAS". As a rule, it is operational measures;

Offered idea consists as a component a connection of western part of NAS (Kazakhstan) with WAS (Kazakhstan, Uzbekistan) by means of construction of the artificial channel "NAS - WAS" that will allow:

- To supply a fluidity of water and to reduce of water mineralization of NAS on all to its length (now sea waters mix up badly, as a fresh river water runs into it of its eastern part, while water of western part of NAS has higher mineralization),
- Considerably to expand vital space and to supply more favorable conditions of duplication both residing of freshwater and sea fishes in NAS,
- To exclude dump of river fresh waters (from Syr Darya River) in former EAS, which can be used for filling of WAS and improvement of water quality in it.

## CONCLUSIONS

As it is shown above and it follows from simple logic, creation of uniform flowing ecosystem "Amu Darya Delta - Western Aral Sea" is possible. At the same time, this idea conflicts to the opinion, which has strongly become in public consciousness – it is impossible to save WAS. Restoration of WAS will give doubtless the positive social-political, socioeconomic and ecological effects. In particular, the economic benefit will be reflected in revival of fish and hunting craft and a greatest feedback should be from fish-cultivation.

Before dividing of the Aral Sea into the LAS and NAS water of Amu Darya and Syr Darya rivers flew to one Sea, with successful realization of the proposed project they will flow also in one Sea - WAS. But it is already a philosophy.

## REFERENCES

1. Nachtnebel, H., J. Schutter, V. Dukhovny, A. Sorokin, Y. Roschenko, R. Kadirova, A. Tuchin, P. Umarov, U. Uhalin, A. Beloglazov, E. Korshak, E. Temlyanceva, B. Tashmukhamedov, I. Mirabdullayev, O. Vasilyev, V. Kvon, V. Kuzin, A. Semchukov and V. Martyanov, 2006. Report on the Project INTAS - 0511 REBASOWS The rehabilitation of the ecosystem and bioproductivity of the Aral Sea under conditions of water scarcity. Scientific-Information Centre of Interstate Coordination Water Commission of Central Asia. Vienna - Tashkent, pp: 75.
2. Nachtnebel, H., V. Dukhovny, A. Sorokin, B. Tuchin, Tashmukhamedov and I. Mirabdullayev, 2007. The Aral Sea - Last, Present and Future. Scientific-Information Centre of Interstate Coordination Water Commission of Central Asia. Tashkent, pp: 26-37.
3. Shutter, J. and V. Dukhovny, 2006. Integrated Water Resources Management in the Aral Sea Basin with the Purpose of Filling of the Southern Prearalie's water surfaces. Scientific-Information Centre of ICWC of Central Asia. Tashkent, Uzbekistan, pp: 84.
4. [http://ru.wikipedia.org/wiki/ApaJbkoie\\_Mope](http://ru.wikipedia.org/wiki/ApaJbkoie_Mope).
5. Bortnik, V., V. Kuksa and A. Cycarin, 1999. Modern condition and possible future of the Aral Sea. News of Academy of Sciences of USSR. Geographical Series, 4: 62-68.
6. Ellis, W., 1990. A Soviet Sea Lies Dying. National Geographic (Feb. 1990), pp: 73-935.

7. Rasakov, R. and K. Kosnasarov, 1996. Dust and salt transfer from exposed bed of the Aral Sea and measures to decrease its environmental impact. NATO ASI series: The Aral Sea Basin Environment, Springer 12: 95-102.
8. Micklin, Ph., 2007. The Aral Sea Disaster. Annual Review of Earth and Planetary Sciences, 35(4): 47-72.
9. Greenberg, I., 2006. As a Sea Rises, So Do Hopes for Fish, Jobs and Riches. The New York Times. <http://www.nytimes.com/2006/04/06/world/asia/06aral.html>.
10. Shiklomanov, I., 1989. Influence of economic activity on river flow. Hydrometeoizdat, Leningrad, pp: 334.
11. Rysbekov, Yu., 2006. Substantiation of the necessity of creation artificial ecosystem "Amu Darya Delta - Western Aral Sea", Proceedings of the GISIG ITALY ECO-IMAGINE International Conference. Genoa, Italy, pp: 60-63.
12. Rysbekov, Yu. and B. Tillaiev, 2008. About problem of the Aral Sea and possible ways of its decision in thesis form or attempt of the concrete answer on eternal Russian question. Collection of the proceedings "Problems of the Aral sea and Priaralie" Scientific-Information Centre of Interstate Coordination Water Commission of Central Asia. Tashkent, Uzbekistan, pp: 26-37.