

The Aral Sea Disaster and Health Crisis

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I. Introduction

The physical geography of Central Asia is not so favorable for economic activities but the development of technologies, techniques, equipments, machines, irrigation canals with man- power make this region lively for socio- economic developments especially from the beginnings of 1960s when Soviet government involvement was in full fledge in Central Asian countries. But the blind use of agricultural lands, mines and water resources degraded the environment. The socio- economic consequences of the regional environmental change that may be significant include food security, health problems, lack of job opportunities, regional stability and spoiling of agricultural and industrial sectors. The result of overuse of irrigation for the production of 'white gold' in between 1970s to 1980s resulted the drying of Aral Sea and the people who survived around the Aral Sea Basin forced to migrate from there due to huge socio- economic problems and degradation in the environmental conditions. Soviet Central Asia remained one of the poorest regions of the USSR until the break-up of the Union. These republics lagged behind the others in all social and economic indicators. The shortcomings of the Soviet policy of rapid economic integration were visible by the 1970s and a number of problems including environmental problems were assuming critical proportions (Patnaik, 1995). The situations became worst after the disintegration of Soviet Union in 1991 due to the lack of managements and resources. Central Asia is faced with a range of serious environmental challenges, where climate change and climate variability will add to the current problem complex. Climate variability is not a new phenomenon in Central Asia but climate change will add to existing and recurrent economic, social and ecological stresses, risks and uncertainties. With climate change follows environmental change which is manifested in changing resource abundance or scarcities of natural resources and ecosystem services (Nilsson and Ingevall, May 2009). Key environmental challenges include climate change and climate variability, radioactive emissions, widespread pollution, desertification, loss or degradation of ecosystem, salinization, floods, droughts and large-scale natural resource depletion of land, water, forests, minerals and energy resources. Climate change adds to existing economic, social and environmental challenges. Central Asia's environmental problems are not isolated phenomena but are linked in multiple ways with other development themes across the region. Attaining development objectives such as sustained and pro-poor growth, public health, broad-based employment, devolution and strengthening of people's rights in the region as well as sub-regionally presupposes sustainable use of the region's natural capital, reduced levels of pollution and equitable management of shared natural resources including trans-boundary water resources, drainage areas and forest ecosystems (EEU, University of Gothenburg, 2009). Local environmental issues may have broader geographical implications: failing to sustainably manage natural resources in one country raises the risk of negative repercussions in neighboring countries in the sub-region and occasionally in large parts of the continent. This applies to the quest for water, resources, and agricultural lands and may lead to conflicts. Water stress is likely to increase food insecurity, and have major impacts on poverty and health issues. It is also expected that many areas of Central Asia will face increased numbers of natural and man- made disasters such as floods, earthquakes, landslides, soil erosion, chemical and radioactive pollution, epidemic, famine, deforestation, overgrazing, oil spills, seismic activities, mud and landslides, desertification, salinity and droughts. It is recognized that all of the impacts above, as well as an increase in the range of vector-borne diseases, could have significant negative impacts on human health.

Hypotheses-

The proposal research study seeks to prove the following hypotheses

- The environmental change in Aral Sea Basin is due to legacy of Soviet developmental practices such as extensive irrigation, overexploitation of natural resources, over use of pesticides and nuclear wastages.
- Exploitation of Aral Sea Basin directly affected on public health and leading to health crisis.

II. Research Methodology

The proposed study would undertake a historical and analytical perspective. The study will be based on both Primary and secondary sources. Primary sources would include various government / official documents relating to bilateral and multi-lateral treaties, draft of the laws and speeches of the leader. Besides, the secondary

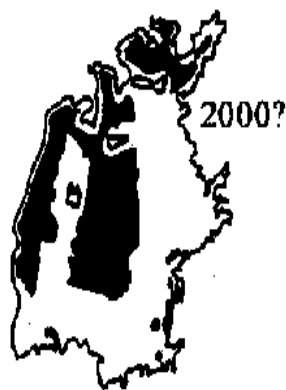
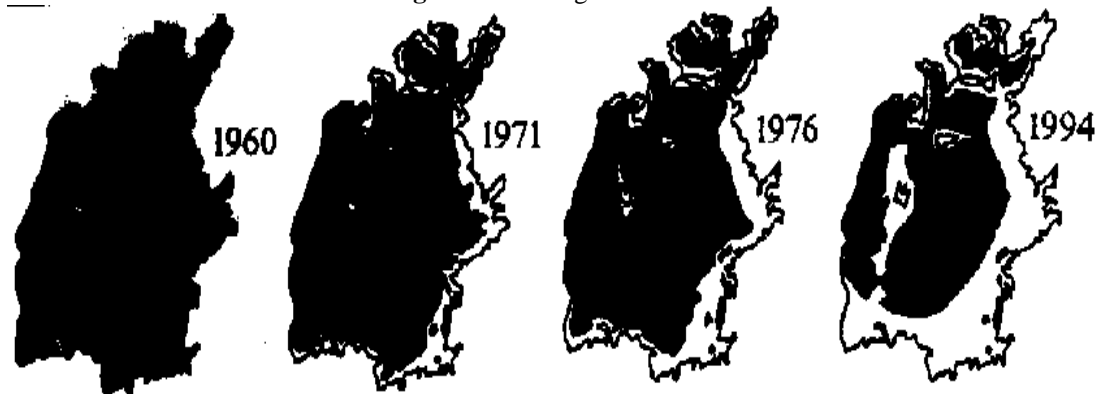
sources shall, comprise books and article from academic journals. Articles which are published in various popular newspapers and journals will also be consulted.

Crisis of the Aral Sea Basin-

The Aral Sea is one of the largest inland water reservoirs in the world which extends between Kazakhstan in the north and Uzbekistan in the south. The Aral Sea is continuously shrinking since the 1960s after the diversion of rivers by the Soviet irrigational projects. The shrinking of the Aral Sea is one of the worst anthropogenic world’s environmental disasters. In the early 1960s, the decision of Soviet government to divert the two most important rivers of Central Asia called the Syr Darya in the north and Amu Darya in the south of Aral Sea for irrigation purposes especially for white gold or cotton. For this purpose, construction of irrigational canals in full fledge but most of the canals were weak, poor constructed and lots of leakages so that maximum water went to waste. By 1960, instead of water going to Sea maximum water used for irrigation due to diversion of water caused the shrinking of Sea. In 1970s, the Aral Sea level fell at an average of 45- 55 centimeters per year and by 80s it continued to fell down about 85 centimeters each year. Increasing demand of water caused the overexploitation of water and land. From last 55 years, rate of water usage for irrigation nearly doubled and the surface area of Sea shrank about 90% and as a result in 1987, Aral Sea split into North Aral Sea and South Aral Sea (fig: 2.1).

Today, the South Aral Sea is vanishing in faster rate due to high evaporation and hot desert climate as compare to North Aral Sea because of the construction of dam which helpful for the existence of the Aral Sea. The Aralkum desert is the best example of the shrinking of South Aral Sea. The Kizilkum and Karakum deserts which surrounded the Sea are huge sources of transformation of air masses which entered the Aral Sea region and affect the climate of this area. As per the data, 90% of water of this region used for agricultural purposes, 4% used for public utilities, 2% for industries, 1.8% for fishery and rest for other requirements (Sergey, 2008). This anthropogenic disaster is the result of the political economy of the Soviet legacy. Some of the economic policies and weak

Fig: 2.1 Shrinking of Aral Sea



YEAR	AVERAGE LEVEL (m)	AVERAGE AREA (km ²)	AVERAGE VOLUME (km ³)	AVERAGE SALINITY (‰)
1960	53.4	66,900	1090	10
1971	51.1	60,200	925	11
1976	48.3	55,700	763	14
1994		31,938	298	
large sea	36.8	28,856	273	>35
small sea	40.8	3,082	25	-25
2000		25,217	212	
large sea	33.4	21,776	186	>60
small sea	41.6	3,441	26	-20

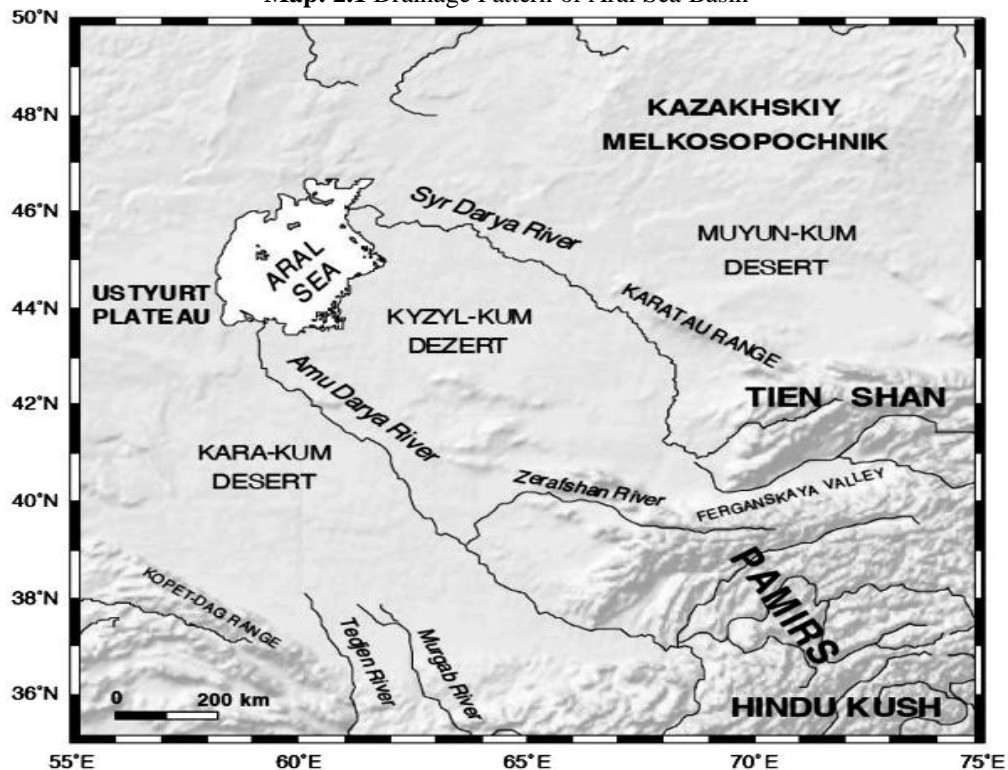
Philip Micklin: 1995

Source: Micklin, P. P. (1998).

Management during the Soviet Era is considered to be crucial reasons of the Aral Sea Basin crisis. The forced cultivation of cotton, unmanaged irrigation, the inefficient management of collectives (Kolkhozy) and state farms (Sovkhozy), introduction of glasnost of Gorbachev, Virgin Land Policy at the time of Khrushchev were some of the main causes of the water diversification, salinization, desertification and contamination of water which effectively changed the environment of the Aral Sea Region. Apart from that, privatization of industrial sector leads to new technologies, new experiments and over use of natural resources which are damaging the environment and adding to this, there is neither effective efforts nor capital to invest in cleaner technologies. Lack of sewage systems, population pressure, weak policies regarding the investments in social infrastructure in rural areas especially contribute to more declination of water quality. One of the steps taken by the government in 1950s was the construction of the Kara Kum canal which caused diversion of water into westward and limited water reached to the Aral Sea (Map: 2.1).

The Zarafshan River which also the important contributor of water to the Aral Sea Basin is largely consumed in the Bukhara and Samarkand regions. Due to irrigation, most of water not even reached in many parts especially in the Syr and Amu Darya deltas. The fishing ports like Aralsk (in the delta of the Syr Darya of Kazakhstan) and Maynak (in the delta of the Amu Darya in Karakalpakstan) have almost perished. Some desert depressions like Arnasay (Uzbekistan) and Sarykamysh (Turkmenistan) with large quantities of fertilizers residue, pesticides and salts discharged into the Aral Sea Rivers. Mono-cultivation, lack of crop rotation leads to water logging in some parts of the basin which resulted in soil erosion particularly in the downstream areas of the rivers. By the 1985, after the period when water diversion peaked, 68% and 89% of all irrigated land of Dzhizak and Syr Darya oblasts of the Syr Darya basin was salinized for the Amu Darya basin; the levels were 60% in Karakalpakstan, 75% in Khorezm and 90% in Navoi in western Uzbekistan. It was found that in the Amu Darya basin especially 84 million tons of salt got discharged annually into the river. These salts got transported with water which is used to irrigate the fields (Spoor, 2000). The surface and underground water highly contaminated because of over use of pesticides and fertilizers for the production of Cotton and rice.

Map: 2.1 Drainage Pattern of Aral Sea Basin



Source: WMO, 2005

Wind erosion and sand storms in the basin of Aral Sea, particularly Kzyl Orda and Karakalpakstan are leading to reduction of fertility of land and soil degradation. Extreme hot temperature and drought in the nearby area of this basin make the environment inhospitable. One of the sectors apart from agriculture, the fishery sector is highly affected because of the changing freshwater ecosystem into saltier ecosystem. Lack of drainage system, over salinization, contamination with poisonous residues of fertilizers and pesticides flushed back into the rivers. The fauna and flora of the river ecosystem have been affected or destroyed so that fishes are not growing properly. Some died, some become poisonous and some are not able to breathe due to polluted water.

Industries, mines and factories which are around the main cities (Kokand, Samarkand, Tashkent, Osh, Bukhara and others) of the Aral Sea Basin, caused the discharge of their poisonous residues into the rivers and played an important role in disturbing the local environment and difficult to survive.

The Aral Sea water table continues to lower and has caused two major environmental problems:

- Danger to Barsa-Kelmes natural reserve.
- Formation of a huge salt desert in the area between the island of Vozrozhdenie and the eastern coast and the area surrounding the Aral Sea.

In short, destruction of the traditional water management and lack of crop rotation system during the early Soviet period in Central Asia, followed by the 'cotton at all price' policy of Moscow from the 1960s onwards, seriously endangered the environmental sustainability of the Aral Sea Basin. The exclusive focus on 'white gold', cotton as it is known in Central Asia, under a socialist mode of production has turned into a 'tragic experiment' (Rumer, 1989) because it ignored the environmental long- term impact of inadequate resource management.

Health Crisis-

There are profound impacts on socio- economic and human health due to environmental change in Central Asia. In Central Asia, as in many other areas, water- or- its lack- is a prominent cause of human suffering (GWP, 2008). Health is one of the important indicators of life quality. In concern of environmental change; life expectancy, children mortality rate, maternity mortality rate and female fertility are some of the highest indicators. Unsustainable use of water has affected the hydrology, ecology and general environment in the region, with expanding knock on effects on industry, agriculture and society. Contamination of water from irrigation effluent is widespread and detrimental to human health (UNEP, 2005). The destruction of Aral Sea caused severe stress and large number of victims forced to leave the region because social services and support systems including health care were disrupted (Small et al., 2001). Rapid economic crisis, political instability, droughts, agricultural and industrial pollution, floods, sand storms, land degradation and civil war in 1990s contributed to epidemic typhus, malaria, dysentery, diarrhea, tuberculosis, respiratory illness, meningitis, typhoid and other vector- borne and infectious diseases including deteriorating public health infrastructure, sewage- polluted ditches, lack of sanitation, cisterns, hygiene problems. The terror of malaria has quite relevant in southern Tajikistan, Kazakhstan during the past decade. The estimated case of malaria in Tajikistan was about 400,000 (WHO, 2008). In 2002 and 2004, the epidemic of malaria caught large sections of Kyrgyzstan. Non- environmental factors like political instability in Central Asia during 1991- 97 and its consequences like displacement of people, economic decline, increasement in health problems, land use changes, poverty, water stress and lack of nutritious foods caused the huge decline in health sector. Uneven precipitations, melting of ice, high insolation and climate change in recent pasts were enhancing the floods. Flood invites many diseases like malaria, typhoid and diarrhea which mostly mound in mountainous regions of Central Asian states. Groundwater pollution by the dissolution of heavy metals, salts, agricultural chemical waste and other elements attack the nervous system, immune system, digestive system, heart, blood and thyroid. Groundwater pollution is more found in agriculturally active regions of Uzbekistan, Kazakhstan and Turkmenistan. The sewage and sanitation problem invites the water- borne diseases especially in rural areas. Water- borne diseases includes hepatitis A, kidney rupture and typhoid. Drinking water is the key factor for health issues because most of the diseases happen due to dirty water. Kyrgyzstan, Tajikistan and Kazakhstan's fundamental problem is drinking water because of unfavorable physical conditions. The inhabitants of these areas are mostly dependent on pipeline water supply but the biggest problems are poor maintenance of pipelines, old and rusty pipes. Natural disasters like landslides, mudslides, rock falls and seismic activities make hindrances in supply of water. The rural inhabitants are bound to drink dirty water because of the limited resources and lack of money. Kyrgyzstan's 40% population has no access to water supply. 25% of total population of Kazakhstan has negligible access to water, 16.5% population dependent on open reservoirs and 3.2% of total population use water which has no guaranteed (UNDP, 2007). The life expectancy rate of Kazakhstan people is less than of their neighboring countries. Karakalpakstan and Muynak (Uzbekistan) is facing chronic health problems because of the environmental disasters. Some critical issues like drought, impure drinking water, sand storms, high temperature, salinization of potable water, polluted air quality, presence of agricultural chemical and wastes in the food chain. Anemia, respiratory problems, cancer, hypertension, kidney diseases, heart problems and itching are common in these regions which are one of the common factors for unemployment and migration. Some important general health concerns of Karakalpakstan are as follows: (a) terror of infectious diseases (diarrheal diseases, respiratory and tuberculosis), (b) nutrient deficiencies, (c) poor access of drinking water, (d) respiratory infections, (e) high infant mortality, (f) salinized and mineralized water, (g) urinary tract, pulmonary, immune and kidney disease. The above diseases also found in other environmentally degraded regions of

Central Asia. The Semipalatinsk Nuclear Testing Site (SNTS) of Kazakhstan is the best example of anthropogenic disaster which degrades the environment in such a way that people are bound to displace from there because of the health problems. This nuclear site was active between 1949 and 1989 but the effect also prevalent today. Our research team at the Research Institute for Radiation Biology and Medicine, Hiroshima University started questionnaire survey near the SNTS in 2002. The result of the survey is shown in the table (Table: 3.6). From the table it is clear that most of people were suffering from Arthralgia, arthritis, lower back pain, blood pressure, eye diseases and heart problem. Apart from that there are some other health problems such as gastrointestinal problem, diarrhea, hair loss, nightmare, birth defects, cancer, irradiation, depression, headaches, mucositis, appetite

Table: 3.6: Given symptoms were faced by the respondents of Semipalatinsk.

HEALTH PROBLEMS	RESPONDANTS
Arthralgia, lower back pain and arthritis	64.9% (393)
High blood pressure	46.2% (280)
Eye disease	22.6% (137)
Ear and nose disease	15.3% (93)
Heart disease	42.9% (260)
Anemia and blood related disease	5.4% (33)
Respiratory disease	13.7 % (83)
Diabetes	2.3% (14)
Liver disease	14.9% (90)
Bone fracture and bone related disease	2.5% (15)

Source: <http://jrr.jstage.jst.go.jp>

lack, fertility disorder and nuclear cataclysm which have led to the birth of maimed children. The infrastructural disorders in Central Asia are equally responsible of health issues because of the lack of hospitals, poor health- care waste management, poor sanitation, medicines, diagnostic equipments and poor sewages. It is important to note that the maximum health problems in Central Asia faced by women and children. The above discussion clearly shows the demerit of environmental change on human health. Proper infrastructure, management and awareness are the key solutions of this problem in Central Asia.

III. Conclusion

The major environmental problems in Aral Sea Basin owes from the Soviet period. Soviet Union was a self-dependent country which manifestly depended on its own resources. To fulfill the basic needs of Soviet population and for agricultural and industrial development, it became indispensable to annex the new areas in its territory. For that purpose, Soviet Union focused on Central Asian countries which were at that time under the control of Soviet Union. In order to satisfy its self-interest, Soviet Union commenced the new exploration of mines, oil and gas fields, establishment of industries, nuclear and military testing sites, construction of new irrigated canals, divergence of water resources and most importantly huge convergence of grasslands into agricultural fields, which were diluting the conducive environment of Central Asia. Additionally, some of the Soviet government policies like ‘Glasnost’ of Mikhail Gorbachev and ‘Virgin Land Policy’ of Nikita Khrushchev intent to robust their economy some extent exploited the resources of Central Asian states during Soviet period. Huge encroachment on environment similarly disturbed the local ecology of environmentally affected areas. Environmental problems grew up speedily after the disintegration of Soviet Union in 1991 because newly independent states had faced social, political and economic crises. The central control vanished and new boundaries and borders caused the division of natural resources. Division of resources created the situation of conflicts among the states because some states got abundant resources and some inadequate where the confrontation over the division of resources still persisting. Different crises and demographic pressure induced over exploitation of agricultural lands and water resources which resulted the biggest man- made disaster of the world in terms of drying of about 80% water of Aral Sea. The largest displacements of victims are one associated with the drying of the Aral Sea. The geographical topography of Central Asia is highly variable including deserts, mountains and grasslands. The backbone of Central Asian economy, which is agriculture, was struggling from the Soviet period because of the uneven and harsh agricultural fields with scanty of irrigated water and problems like desertification, salinization and land degradation. Drying of the Aral Sea, major rivers (Syr Darya, Amu Darya and Zarafshan) and fresh water lakes including Lake Balkhash creates the big problems in the field of agricultural activities. Water quality is unsuitable for human consumption and shortage of water made worse by the uneven distribution of water resource. Contamination and presence of toxic substances (mercury, pesticides, radioactive elements, fluorine and oil) in the rivers and underground water sources especially in Kazakhstan, Tajikistan and Uzbekistan were found to excessive which directly affect the human health. Water and vector borne diseases like malaria, plague, dysentery, diarrhea, tuberculosis, respiratory illness, meningitis, typhoid and heart problems which is the result of polluted water makes the

survival of people critical. The primary victims of environmental pollution are children, women and old persons. Increased Child mortality rate (75 children per 1000 newly born) and maternal death rate (about 120 women per 10,000 births) in the former Soviet Union period (EACH- FOR, 2008) shows the clear picture of the consequences of environmental pollution. Cancer, kidney, thyroid and liver diseases, asthma, hepatitis, parasites, paratyphoid and anemia are highly sophisticated diseases among women and children.

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(* indicates a primary Source)

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