Trip Report

Colorado–Amudarya Rivers Project
5–17 October 1991

"The Aral Sea Will Live!": billboard at the Muynak Airport near the Aral Sea

Prepared by: Michael H. Glantz
American Project Coordinator

Igor S. Zonn
Russian Project Coordinator

Environmental and Societal Impacts Group
National Center for Atmospheric Research
PO Box 3000, Boulder, CO 80307
PROJECT PARTICIPANTS

Michael H. Glantz  
Head, Environmental and Societal Impacts Group, National Center for Atmospheric Research, Boulder, Colorado, USA

Valeri Neronov  
Deputy Chairman, USSR Committee for the UNESCO/MAB Program, Moscow, Russia

Nicolai Orlovsky  
Deputy Director, Institute of Deserts, Turkmen Academy of Sciences, Ashkhabad, Turkmenistan

Thomas Potter  
Director, NWS Western Region, NOAA, Salt Lake City, Utah, USA

Steven L. Rhodes  
Environmental and Societal Impacts Group, National Center For Atmospheric Research, Boulder, Colorado, USA

Moses Sarkisov  
Director of Project–Research Institute "Turkmengiprovodhaz," Ashkhabad, Turkmenistan

James Wescoat  
Department of Geography, University of Colorado, Boulder, Colorado, USA

Igor S. Zonn  
Desert Development Expert, Head of Foreign Relation Office, VO Sojuzvodproject, Moscow, Russia
TRIP REPORT: Colorado/Amudarya Rivers Project (CARP)
5-17 October 1991

Project Coordinators: Igor Zonn and Michael Glantz
Project participants: United States (Michael Glantz, Thomas Potter, Steven Rhodes, James Wescoat) and the USSR/TSSR (Igor Zonn, Nicolai Orlovsky, Moses Sarkisov).

This activity falls under the US-USSR bilateral agreement, Area V, The Protection of Nature and the Organization of Reserves. The project is a joint comparative assessment of the problems and prospects of water resources use and development in the basins of the Colorado River and the Amudarya River/Aral Sea. This will be a multidisciplinary effort during which integration and synthesis of the research findings will be an overriding objective. In May and June 1991 the Soviet group visited the various management centers for the Colorado River system in order to familiarize themselves with different aspects of the system. This recent field trip to Central Asia was organized to familiarize the American participants with the Amudarya River system and its engineering and management aspects, following a pattern similar to the structure of the Soviets' field trip through the Colorado River Basin.

Thus, the U.S. participants' tour of the Amudarya and the Karakum Canal emphasized both the physical as well as the institutional dimensions of the "management" structure governing the utilization and protection of the water resources in this river basin. The following pages describe the itinerary of the U.S. team's tour, as well as the physical structures and government institutions response for water planning and development in the Amudarya Basin that were visited by the U.S. team. The last page of this report is a revised workplan for Phase II of the CARP project.

We arrived in Moscow on October 5 at Sheremetyevo Airport. We were met by Dr. Igor Zonn, the Colorado-Amudarya Project (CARP) co-director. We spent the next two nights at the dormitory of the Institute of Higher Education (ul. Pereyaslovskaya, 50).

We left for Domodedovo Airport on Monday morning, the 7th. However, there was a strike of passengers at the airport (they had been at the airport for several days awaiting flights without food and water). We stayed in the overcrowded waiting room for 15 hours until our Aeroflot flight finally left at midnight for Ashkhabad.

We arrived in Ashkhabad at 8 am on October 8 and were greeted by Dr. Nicolai Orlovsky, Deputy Director of the Desert Institute of the Turkmen Academy of Sciences, Turkmenistan. We were accompanied by Zonn and Orlovsky throughout the entire journey with additional experts joining us for different segments of the field trip. Our program in Ashkhabad was shortened by the one day we lost waiting for our flight at the airport in Moscow. We visited the Turkmengiprovdokhaz (Turkmea Project Institute of Water Hydraulic Structures; Moses Sarkisov, Director of this institute is a member of the CARP project team. Sarkisov was absent during our visit because he had to accompany the President of Turkmenistan, Mr. Nyasov, on
a governmental mission to Iran). Our visit preceded by about 10 days a Turkmen referendum for independence.

We discussed problems of irrigation and drainage in Turkmenistan related to the Amudarya, Murgab and Tedjen Rivers and the Karakum Canal. The Canal draws its water from the Amudarya, none of which is returned to the river. There were brief presentations by Institute scientists and a lively discussion followed.

We then visited a collective farm (named Socialism) about 25 km from the city. The lands of this farm are irrigated by canal water. This farm has shifted its attention to water saving technologies, such as drip irrigation for vineyards and sprinkler irrigation using the center pivot system for grain production and sprinkler irrigation for linear watering of alfalfa fields. We also observed herds of sheep brought in to graze the residual following the cutting of the alfalfa crops, before it was plowed under for nitrogen fertilizer. We had discussions with the chairman of this collective farm, who provided us with site-specific economic and agricultural data. We discussed problems facing this collective, such as those associated with irrigation water usage.

October 9: In the early morning we packed the van for our trek to Mary across the southern edge of the Karakum Desert. We were told we were the first Americans to be allowed to travel by car along this road, which had been off-limits because it parallels the Iranian and Afghan borders, coming to within 1 km of Iranian border control. We observed the physical setting of the region of interest and discussed the problems and prospects for the development of rangelands through tree planting and the use of plowing for preparation of the land for seeding pasture. We had the opportunity to see first hand the old system of irrigation, called “qanat” in Iran and “kariz” in Turkmenistan.

We also visited the Tedjen and Khauskhan reservoirs. We saw how the local water managers coped with last summer’s (1991) extreme flash floods. Flood levels were exceptionally high; elderly people in the region could not recall having seen such levels. We saw the rapidly constructed siphons used to bleed water from the reservoir so that it would not top the structure and flood the surrounding villages. (It took them 10 days to install the siphons.) We saw the engineering structures designed to allow the Tedjen River to pass under the concrete Karakum Canal. We were shown problems associated with cotton production, which is the main crop in the region: salinization, drainage water collection, and the silting up of the reservoirs. At the time of our visit the reservoir was empty as all remaining water had been used for irrigating the fields. We visited one local private farmer, at whose home we had lunch. This particular farmer produces many different fruits and vegetables, including lemons in a greenhouse-like structure, and he keeps some livestock and poultry.

We arrived in the evening in the city of Mary, the ancient location of Merv. Mary is the administrative center of the Mary Oblast and is the center of a major oasis, irrigated in ancient times by waters from the Murgab River. It became much more developed and populated after the construction of the Karakum Canal.
October 10: We visited hydraulic structures such as the Jar Canal and the Gindukush Reservoir. The latter dam was constructed between 1895 and 1905 and was the first dam constructed in the region under the regime of Tsar Nicolas II. The location was chosen by the Russian Tsar for the development of cotton production. We visited the small hydropower plant associated with this dam. The plant has been working since 1915 and was in perfect condition. The equipment was constructed in Hungary in 1915. We held discussions with the engineering staff at this site. As for the Jar Canal, it too was allowed to cross below the Karakum Canal. We visited various stretches of the Karakum Canal. We also had the chance to visit the ruins of the important ancient site of Merv.

October 11: We left Mary by bi-plane on a two-hour flight that followed the course of the Karakum Canal. We saw some areas where the desert land had been reclaimed, using canal water, to produce cotton along the canal’s banks. We could also see how this canal had impacted the surrounding lands. The seepage of canal water into the groundwater supply caused the water table to rise, flooding large tracts of land in the area with highly saline water. We could easily spot the white saline areas where the standing water had evaporated. Some of these depressions, now filled with standing water, had been part of ancient river systems. This was pointed out to us as an example of a failure to take into consideration the local geological conditions when the canal was constructed in the 1950s.

We then flew over the headwaters of the Amudarya River where we observed the dam and diversion structures for the Karakum Canal from the air. We circled over the headwater structures several times and then went on to overfly the Zeid Reservoir, designed to capture Amudarya River water in order to regulate the river flow, canal supplies, and canal sedimentation. We were accompanied by Vladimir Torgashov, chief engineer of the Headwater Project for the Amudarya/Zeid reservoir project.

We landed at Kerki where we visited some of the hydraulic structures associated with the future operation of reservoir waters for water intake and release. We also saw the main drain for drainage water. We lunched here and were then taken to the helicopter for our flight to Chardjhou.

On our helicopter flight we again followed the course of the river, viewing the large tracts of land put into cotton cultivation. We saw the effects of the naturally occurring rapid change of direction of the flow of the Amudarya (such a quick change in Russian is called day'gish). This can be a very rapid change on the order of hours, and its effects can be catastrophic.

The high level of importance of river water to human activities along the river banks (e.g., for cultivation and human settlement) is evident. We also sighted several ruins of important ancient cities that survived in the old days by use of Amudarya waters.

October 12: On Saturday we went to Bukhara by car. Because the pontoon bridge at Chardjhou had been destroyed by floods earlier in the year, we had to take the ferry. The ferry got caught on a sandbar and required help from other boats, making for a two-hour-long
crossing. We then traveled by car 120 km along the Amu-Bukhara Canal and crossed the Karakul Canal (a branch of the Amu-Bukhara Canal). The return to Chardjhou was beset by the same problems of trying to cross the river by ferry. Competition for a space for the car on the last ferry of the day was very high, and several conflicts broke out. Those who failed to get on this ferry ride would have to wait until the following day, but we were fortunate enough to board (after some struggle) the last ferry.

October 13: We flew by helicopter from Chardjhou to the Tuyamuyun Reservoir on the Amudarya River. Our flight lasted two hours, following the river course. We were able to look at the irrigation zones along both banks of the river and to see the terminal drainage lakes for the different local irrigation systems. These were located in depressions in the desert. We flew over the city of Gazli, the biggest natural gas producing region in all of Middle Asia. Near Gazli our flight transected the Tuyamuyun Reservoir and we could see the hydraulic structures for water intake to this irrigation system. We lunched in one of the canal maintenance department buildings, after which we went by car past the ancient city of Hazarasp on the way to Tashauz.

October 14: We journeyed by auto to Khiva. En route we stopped and discussed cotton production problems and prospects for the region. In the evening we had dinner with the chairman of the Tashauz Oblast Environmental Protection Committee. There was a lively discussion about environmental problems in the region, especially those related to the quality and quantity of water and the status of the Aral Sea.

October 15: In the morning we went in a bi-plane from Tashauz to Muynak. En route we could see the changes in the landscape as we got closer to the Aral Sea coast. We flew over the shoreline of the southwestern part of the Aral Sea and could see the "dead zone" that has developed as the waters of the Sea receded. It was a spectacular sight to see the underlying sand dunes in the shallow part of the Sea about to become exposed as the Sea continues to shrink. We landed for a brief time in Muynak, once a thriving coastal port but now 40 km from the coast of the Aral Sea and took a brief walk around the streets near the airport.

We then flew in a southwesterly direction toward Lake Sarakamysh, passing along the spectacular Ust-Urt Plateau. After several hours of searching the horizon for a sighting of the lake, it finally appeared. We landed on a strip of desert hardpan in order to have a tea break in the desert, and to get away from the incessant vibration of the bi-plane. This lake was created as a terminal drainage lake for the then incoming drainage water (i.e., return flow) from the Amudarya-dependent irrigation system in Turkmenistan, in order to prevent saline, pesticide-laden return flow from reaching the Aral Sea. In essence the water that would have replenished one sea (the Aral Sea) was being diverted in order to create another one (Lake Sarakamysh) with contaminated water. Fish do live in this lake but a few years ago there was a government ban placed on eating them because of heavy contamination (heavy metals, herbicides, etc). In Uzbekistan, polluted irrigation water will be diverted to the Aral Sea once diversion works are completed in that republic.
October 16: We drove from Tashauz to Nukus in the morning. On the way we stopped at a collective farm where people were in the fields in the midst of harvesting the cotton crop. The heavy machinery was making a second pass across one section of the cotton fields, while in another part of the field teenage girls were picking by hand the cotton that the machines missed. We spent about an hour discussing various aspects of cotton production with one of the heads of the collective farm. This farm was selected at random in response to an American request to visit a cotton-producing collective farm.

We took a side trip to Kunya Urgench, a famous ancient city destroyed in 1221 by Ghengis Khan. Some of the buildings were in their earliest stages of reconstruction and development. It is a rich site for anthropologists and archaeologists.

In Nukus (in the Karakalpakstan Autonomous Republic, part of Uzbekistan) we visited the offices at "Aralvodstroii" (the USSR State Concern on Water Work Construction). We held discussions with the Chief of this organization, Malik Saresenov (he is also a USSR People's Deputy), who explained in detail some of the drainage plans for the region. After a visit to the Nukus museum for the Aral Basin, we had dinner with Sarsenov and then departed for the airport and Moscow.

We arrived in Moscow at 9 pm and prepared for our departure early the next morning (3 am) for our flight from Sheremetyevo (6:15 am) on the morning of October 17.

During the field trip, discussions were held among the U.S. and Soviet participants in order to determine the work plan for Phase II of the Colorado–Amudarya Rivers Project. The most recent draft of that plan is attached to this report. It is also a strong possibility that, depending on the success of this research project, a similar project will be established for the Syrdarya River system.
Proposed Workplan for Phase II of Colorado–Amudarya River Project (CARP)

Project Coordinators: M.H. Glantz (US), and I. Zonn (USSR)
Project Participants: M.H. Glantz, S. Rhodes, J. Wescoat, T. Potter and I. Zonn, N. Orlovsky, and M. Sarkisov
Objective: to compare these systems in order to identify similarities and differences, problems and prospects for sustainable development

- **Report on Colorado River System**
  - Historical development (identify key conditions, including legal and institutional factors)
  - Natural conditions
  - Demographics
  - Role of technology; demographics. Can sustainable development be realized?
  - Futurology (also collect and assess scenarios of climate change, e.g., Revelle/Waggoner, Dickinson, Kneese) (e.g., climate change, global change, Salton Sea, Mexicali Valley)

- **Report on the Amudarya River system**
  - Historical development (identifying key decisions)
  - Natural conditions
  - Demographics
  - Role of the impacts of technology; demographics. Can sustainable development be realized?
  - Futurology (e.g., climate change, global change, political change). Also collect and assess scenarios of climate change

- **Synthesis: workshop**
  - Lessons for managing river systems with international aspects
  - Convene workshop to identify problems and prospects for these systems

- **Output(s)**
  - Reports: Technical (100-200 manuscript pages, approximately 100-page book)
  - Executive Summary (English/Russian, etc.) for d-ms and NAUK, NAS
  - Peer-reviewed manuscripts for submission to journals
  - Popular booklet (photos, etc.)

- **Schedule**
  - Schedule for Phase II workplan was determined during visit of US team to Ashkhabad 6–17 October 1991
  - Tentative date for completion of draft report for Phase II of the CARP project is September 1992, at which time the draft report will be submitted to S. Kohl and V. Neronov for their comments.