Environmental degradation in the Aral Sea basin has been a touchstone for increasing public awareness of environmental issues. The Aral crisis has been touted as a ‘quiet Chernobyl’ and as one of the worst human-made environmental catastrophes of the twentieth century. Just a few decades ago, it was the fourth-largest inland body of water in the world. Today, it has fallen to sixth place... and it continues to shrink.

This multidisciplinary book is the first to comprehensively describe the slow onset of low grade but incremental changes (i.e., creeping environmental change) which affected the region. Over a dozen researchers explore every facet of this environmental disaster: changes in landscape, water level and salinity, river flow changes, fish population dynamics, desertification, public health, and political decision-making. The demise of the sea cannot be blamed on natural factors. Its sorry state is clearly the result of decisions made to irrigate the fertile but dry sands of Central Asian deserts for the sake of cotton production. This involved a hidden cost to the inhabitants of the region which far outweighed the benefits derived. In addition to the sharp reduction in the size of the sea and in the quality of its water, environmental degradation has had a drastic negative effect on human health in the region. The book is an attempt to ‘set the record straight’ on how decision-makers allowed small incremental changes to grow into an environmental and societal nightmare.

This book presents a set of case studies on a region of worldwide environmental interest, and outlines many lessons to be learned for other areas undergoing detrimental creeping environmental change. It therefore provides an important multidisciplinary example of how to approach such environmental disasters for students and researchers of environmental studies, global change, political science and history.

one of the worst human-made environmental catastrophes of the twentieth century
Creeping Environmental Problems and Sustainable Development in the Aral Sea Basin

Edited by

MICHAEL H. GLANTZ
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This book has proven to be a labor of love. It began in 1994 with support from the United Nations Environment Programme (UNEP) Water Unit’s director, Walter Rast. The idea was to document the incremental changes that have taken place in the Aral Sea basin in the past several decades. As is now well known, the Aral Sea has dropped in level about 17 meters in the short time span of three-and-a-half decades, and has dropped in volume by two-thirds. The Aral Sea’s commercial fishing industry has collapsed. And as a result of chemical fertilizers and pesticides in the runoff from the fields to the rivers and the sea, human health in the region surrounding the Aral coastline (called the Priaralye) has been greatly affected.

The approach taken was to identify researchers who have spent years, if not decades, monitoring some aspects of environmental change in the Aral Sea basin. It therefore involved researchers from a variety of disciplines and countries who dedicated, and continue to dedicate, their professional lives to improving our understanding of environmental changes at the regional level. The environmental aspects presented include the following: landscape changes, changes in sea water quality and quantity, desertification processes, regional climate change, changes in the deltas, human health, political ideological changes related to the environment, streamflow variations, fisheries, and environmental impacts of the Karakum Canal.

The framework suggested as a guideline to these researchers in the preparation of their assessments was to enable them to view the changes that they were to write about as creeping environmental problems (or CEP). CEP are long-term, low-grade, incremental but cumulative environmental problems. Each researcher was asked to try to identify with hindsight predetermined thresholds of change. The thresholds included the following: awareness of a change in the environment (not necessarily seen as a problem but only as a change); awareness that the change had become an environmental problem; awareness that the problem had become a crisis; awareness of the need to act to address the CEP; and actions actually taken to address the crisis. Each author recorded the progression of change through the thresholds in his/her own way, as no rigid outline was imposed. The idea was to get the researcher’s perceptions of change in the particular location in the Aral basin and with the particular environmental factor on which he or she had focused. Several authors put their findings with regard to thresholds in the form of charts. Others chose to discuss these threshold changes in their text.

Elisabeth Vostokova discussed Aral basin landscape changes that she
had witnessed over a period of more than thirty years. Landscape refers to large areas containing different types of ecosystems and vegetation (plant) communities. At first, her observations were on the ground and, later as satellite imagery became available, she continued her monitoring of changes from space imagery as well.

VITALYI BORTNIK is an authority on the status of the Aral Sea’s water quantity and quality. His work has been instrumental in monitoring the changes in the Aral Sea level, surface area, water volume, and salinity levels of the sea. His assessment suggests that as obvious as the human impacts of water diversions from the region’s two major rivers may be, there is also an impact of the natural variability of the regional climate on Aral Sea level.

Arid lands are known to be quite fragile and therefore vulnerable to the activities of human settlements. The Aral Sea is sandwiched between two major deserts, the Karakum and the Kyzylkum. As the sea dries up, the newly exposed seabed becomes vulnerable to wind erosion. Plants will not grow on this salt-laden soil. As there is nothing to stop the soils from blowing away, the region becomes a source of salt and dust storms. The water that is diverted from the rivers, the Amudarya and the Syrdarya, is used for irrigation of desert sands, primarily for the production of cotton and, to a lesser extent, rice. As the water runs off from the fields, carrying with it chemical fertilizers and pesticides, it is later reapplied to fields further downstream. The soils become increasingly saline and eventually crop yields and total production drop, and the land has to be abandoned. These are some of the desertification problems discussed by ASOMITDIN RAFIKOV in his chapter.

ALEXANDER ZOLOTOKRYLIN presents data in support of the view that the climate in the region of the Aral Sea basins has changed over the past several decades. While some of those changes are natural in origin (e.g., climate varies on a variety of time scales from months to millennia), other climate changes may have been induced by the shrinkage of the sea. It is generally suggested that the winters have become colder and the summers hotter in the past few decades. In other words, the regional climate has become more continental.

NINA NOVIKOVA has spent much of her professional life working in the delta of the Amudarya. She provides the reader with detailed description of vegetative changes over time in the deltaic area. She discusses the impact of reduced river flow into the delta and the loss of lakes and a degradation in the types of vegetation in the area as a result of increasing desiccation in the delta and its surrounding area.

One of the major concerns of groups around the world is the poor health status of much of the population of the Priaralye. LEONID ELPINER notes that the degradation of health in the region had been registered for some decades, but it was not officially permitted to be discussed or presented to the public. Only with glasnost and perestroika in the USSR in the mid-1980s were such data allowed to see the light of day, so to speak. Elpiner shows through statistics the poor state of health of inhabitants closest to the sea, compared
with those in Uzbekistan or in the former Soviet Union as a whole. He lists numerous diseases and other health problems plaguing people in the Dashowuz part of Turkmenistan, the Kyzył-Orda region in Kazakhstan and in Karakalpakstan, an autonomous political unit in Uzbekistan.

Igor Zonn traces the political context in which creeping environmental changes in Central Asian states have taken place. He begins with Lenin’s plans to transform nature in Central Asia and follow up with Stalin’s grandiose schemes to make Central Asia the source of ‘white gold’ – cotton – for the textile factories and military activities in Russia and for export to foreign markets. This chapter answers some of the questions people often raise when learning of the demise of the Aral Sea: how could such an environmental catastrophe occur in such a short period of time?

K.V. Tsytsenko and V.V. Sumarokova focused their research on the two major rivers feeding the Aral Sea, the Amudarya and the Syrdarya. They discuss interannual variability in river flow, as well as interdecadal changes and what those variations have meant for the condition of the sea. They discussed changes in the quantity and quality of river water, as these rivers were recipients of return flow and contaminated water runoff from the fields. The rivers are the lifeline of the sea, and they are the lifeline of the irrigated activities along their courses.

One of the first and most visible physical and socioeconomic impacts of the contamination of sea water was on the sea’s fish population and its commercial fishery. Illya Zholdasova has studied fish populations in the Aral Sea and its deltas for several decades. She has observed considerable change in both fish spawning habitats and in the fish populations themselves. She provides fairly detailed accounts of the fate of Aral fish populations that were endemic to the sea, as well as those that have been introduced. Most popular articles on the Aral region note that the fishery had failed by the late 1970s, and that fish had to be imported from the Pacific Ocean and the Baltic Sea for processing in Muynak (Karakalpakstan) factories in order to provide employment to a large part of the local population (on the order of tens of thousands of fish industry workers).

Nikolai Orlovsky, former Deputy Director of the Institute of Deserts of the Turkmen Academy of Sciences, reports on the environmental impacts of the Karakum Canal. This constructed canal is the longest in the world, registering a length of about 1400 km. It draws a considerable portion of water from the Amudarya. The canal passes by several oases in Turkmenistan (around which major population centers have developed). Aside from the adverse environmental impacts associated with this unlined canal cut out of barren desert sands, the Karakum Canal is an apparent irritant to other Central Asian Republics, as it deprives the Aral Sea of about 15 km³ each year; it deprives the Uzbek Republic from using that volume of water further downstream for watering its own fertile but dry desert sands; and it takes the water out of the Aral basin and puts it into the Caspian basin.
ANATOLY KRUTOV supplies an overview to the environmental problems in one of the key Central Asia Republics implicated in the Aral crisis: Uzbekistan. He discusses the plethora of environmental problems, as well as the numerous legislative attempts to address those problems, mostly failed attempts. He notes that the recent increase in flow in the rivers and into the sea may be only a temporary respite from the environmental catastrophe that awaits the sea, in the absence of effective governmental responses to the identified creeping environmental problems.

The final chapter was prepared by NIKOLAII ALADIN. Aladin is well known in the former Soviet Union for his repeated field trips to the shores of the Small Aral Sea. He studied changes in fish populations, among other aquatic organisms in the Aral Sea and in the Small Aral for almost two decades. His studies have been labor-intensive and represent a considerable monitoring effort. He notes that the sea’s characteristics have varied throughout time, with evidence that the sea level had been much lower and the sea had even disappeared, only to return. He suggests that the sea has in fact been influenced by human activities for a few thousand years, that the recent level of human impacts is much greater and, therefore, much more damaging to aquatic ecosystems.

This set of studies is intended to provide a baseline assessment of some of the creeping environmental problems in the Aral Sea basin. When first proposed to some potential funding sources, the editor was advised that there was little interest in how the Aral Sea environmental crisis had developed and that the current interest was in preparing the Central Asian Republics for the future and in ‘saving the sea’. But UNEP supported the view that it was important to attempt to reconstruct the history of how the Aral crisis developed over time, in the hope that lessons could be learned on how to proceed into the future.

Environmental groups around the world have developed a strong interest in the Aral Sea, following the exposure to the world of the state of the sea’s degradation in the mid-1980s. A considerable amount of lip service had been paid to ‘saving the sea’ in the early 1990s. UNEP produced a diagnostic study of the problems of the Aral Sea, which served to spark renewed interest in the region. The World Bank then reluctantly got involved in the Aral region, drawing up numerous plans for multilateral cooperation to save the sea and to develop the economies of the Central Asian Republics.

As noted in some of the chapters in this volume, there have been some positive changes in the region, in terms of agricultural activities and water use. More water has been getting to the sea (a series of wet years in the early 1990s), and there was a reduced use of chemicals on the land because of the high cost of these agricultural inputs. However, there is some evidence that ‘saving the sea’ per se has been given a much lower priority than was the case in the early 1990s. While governments talk about it, it appears that little can or will be done about it by policy-makers in the region. However, one must wonder if the interest of the global community in the plight of Central Asian Republics
would remain high if the sea were allowed to disappear. The sea may be more important as a symbol of human misuse of the environment and as a symbol of how much damage humans can do in a short period of time in the absence of concern for the state of the environment. Saving the sea would not be just a symbolic act, however, but it may prove to be an action that serves to sustain interest in and support for the economic development fate of the Central Asian Republics.

Note on Russian names

It is important to note that an attempt was made to achieve consistency in the transliteration of Russian terms and location names. However, this proved to be an almost impossible task. Compounding the problem of transliteration is the fact that the spelling of locations in Central Asia has changed since the breakup of the Soviet Union in December 1991, as each of the newly independent republics sought to nationalize their country’s names. It is also important to alert the reader to the differences among references at the end of each chapter. They are not necessarily filled with the same level of completeness of reference information. This is partly the result of different styles of reference between the United States, the Soviet Union and the republics of the former Soviet Union. Nevertheless, the information provided in the references will enable the reader to locate the source of that information. I hope that this does not detract from the importance of the information provided by the contributors in their chapters.

Acknowledgments

This book has involved the dedicated work of several people whom I would like to acknowledge with my sincere appreciation. First and foremost, I must thank D. Jan Stewart for her tireless effort in producing numerous drafts of this manuscript. Sincere thanks also go to Jan Hopper, who worked diligently in making the first effort to input the entire manuscript into the computer. Justin Kitsutaka provided excellent graphic support for most of the figures in the book. Scientific coordination and support was supplied by Igor Zonn. It goes without saying that the manuscript and the logistics of organizing the contributors and the translation of their papers, as well as the endless queries to the authors in the former Soviet Union could not have been done without the friendship and dedication to this project of Igor Zonn. Nina Novikova was instrumental in identifying and seeking answers to problems generated by translation from Russian to English. We met on several occasions in Moscow (trips of opportunity) to iron out technical problems, including those introduced through translation and differences in the way scientific concepts are defined in different cultures.
I would also like to thank the contributors for their continued interest in this project and in their desire to assist in identifying thresholds of change for their specific creeping environmental change and problem. They have been and continue to be dedicated researchers and dedicated practitioners who hold onto the possibility that a concerned effort could ‘save the Aral Sea’ and the ecosystems and populations dependent upon it. They have more than a century of combined experience in the Aral region. This book provides them with a chance yet again to share their knowledge and expertise with the broad community of people interested in the future of the Aral Sea and its inhabitants.

Finally, not the least important is the support (moral and financial) that the Water Unit of the United Nations Environment Programme (Nairobi, Kenya) provided for the initiation of this project. Their moral support was a crucial factor in seeing this manuscript through to completion. GERHART SCHNEIDER, TAKAHIRO NAKAMURA, and WALTER RAST of the Water Unit provided a useful critique of a draft of the manuscript.

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