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K.S. Valdiya

Prehistoric River Saraswati, Western India

Geological Appraisal and Social Aspects



 Springer

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Series editor

Satish C. Tripathi, Lucknow, India

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Series Editor Foreword

Rivers are sites for origin and diversity of human civilisations and any change in their course/source of water has a great impact on cultural development. Many a great civilisation has vanished in history due to the changes in the river systems. Integrated study of river system is an important domain for earth scientists, and lost rivers remain a subject of debate and contention. The existence of lost prehistoric River Saraswati, one of the sacred rivers of India along which great Harappan Civilization developed, is also a topic of debate within the scientific community. Geoscientific studies have been carried out extensively by different workers on various aspects. Professor K.S. Valdiya, a noted teacher, scholar and scientist, is associated with the geological studies of River Saraswati since long and has also drawn excellent scientific conclusions from ancient Indian literature and archaeological studies. Thus, this monograph, apart from its scientific value, has removed the dividing line between geology and archaeology. It also suggests that even some ruined cultural site may pose a question to geologists and may initiate geological studies to understand natural reasons/disasters, if any, associated with the destruction. It is because that the book is expected to be very useful and interesting for both earth scientists and archaeologists.

Satish C. Tripathi

Preface

Students of geology have long been reading graphic descriptions of the “lost” River Saraswatī in Edwin Pascoe’s *A Manual of Geology of India and Burma*, Volume One, published in 1950 by the Geological Survey of India. The article I wrote in the popular Indian magazine *Dharmayug* in 1968 on the robbing of the River Saraswatī water by the Gangā evoked widespread interest and curiosity. In 1979, 11 years later, in well-researched papers Bimal Ghose and associates at Central Arid Zone Research Institute, Jodhpur followed by Yashpal et al. (1980) of Space Application Centre, Ahmadabad (Indian Space Research Organization) charting the course of the river on the basis of satellite imagery provided a strong scientific support to the postulation that once a great river flowed through the now Haryānā and the desolate and dreary land of the Thār Desert. My 1998 article in a science journal *Resonance* generated keen interest in the community of scientists. Among them was Prof. Roddam Narasimha, FRS, who invited me to give a talk at the National Institute of Advanced Studies to a large gathering of scholars and laymen and suggested that I write a book on the Saraswatī. In the audience was the late Prof. Satish Dhawan, former Chairman of Indian Space Research Organization (ISRO) and ex-Director of Indian Institute of Science. He persuasively urged me to write a booklet on the Saraswatī and made the ISRO to subsidize its publication in 2002.

The book was *not* a best seller, but within a few years not a single copy was left in the publisher’s stock. I continued to get requests to spare my own copies— even from those who wanted to make a film or a documentary on the river that nourished for over three thousand years the vibrant Harappan Civilization. I do not know what happened after I sent my little book to seven or eight film persons.

In recent years, one or the other of the quite many scientists has come out with the comprehensive studies on geomorphological, sedimentological, geochronological, hydrological and remote-sensing aspects of the Saraswatī River. A majority of earth scientists have come to the conclusion that it was a large river that had abundant discharge and brought voluminous quantity of sediments from the Himālayan province. And there are quite a few who deduced that the Saraswatī was a monsoonal rain-fed river originating in the Outer Siwālik and its foothills. Studying in great detail the pattern of human settlements of the Harappan

Civilization located on the banks of an extraordinarily wide, sand-filled nearly waterless water course known as Ghagghar in Haryānā, Hākrā in Cholistān and Nārā in Sindh, the archaeologists harboured no doubt on this water course being the legendary Saraswatī full of life and bounty.

I felt the urge to write again on the geological aspects of the river that was the lifeline of the people of the progressive and vibrant society that chose to cling to the bank of this river for thousands of years, and lived a buoyant life full of appreciation for arts, crafts, commerce, agriculture and nature. Enormous evidence that archaeologists have gathered points to the Harappan Civilization being nourished by the life-sustaining Saraswatī.

The invocation of rivers Gangā, Yamunā, Sindhu, Saraswatī, Godāvarī, Narmadā and Kāverī in all ceremonies of the people of the largest segment of the Indian society indicates the exalted position the rivers occupy in our scheme of things. The *Rigved* verse 1:3:12, extolling the Saraswatī as a purifier endowed with riches and treasures of intellect and enlightenment demonstrates how great the Saraswatī River was to the people in the Vedic times. The accounts given in the ancient Indian literature, such as *Rāmāyan*, *Purāns* and *Mahābhārat*, cannot be rubbished and ignored, for they do contain grains of truths, the kernels of revealing facts. Keeping in mind the perspective of the geology, evolutionary history of the Indian subcontinent and the geomorphological layout of NW India, if one reads the texts of the *Purāns* and the epics, it would be clear that the geographical descriptions of mountains, rivers and landforms in the works of noted ancient writers Vālmiki and Krishna Dwaipāyan ‘Vyās’ are quite accurate in descriptions. Undoubtedly, descriptions and narratives are heavily enmeshed in verbose language, are replete with metaphors, and are embellished with allegories. Shorn of these superfluities, the *shlokās* (verses) do provide material of historical value. One can find geological reality lying hidden in the narratives if the texts are read without metaphors and superfluous phrases. The reality that emerges from the narratives in the *Purāns* and the epic *Mahābhārat* is that there was a great river which started drying up during the *Purān* times and was practically waterless by the time the *Mahābhārat* was written by Krishna Dwaipāyan ‘Vyās’ sometime after 3500 years Before Present.

In writing on the legendary Saraswatī—it may be emphatically stated—I was not swayed by my Purānic sympathies. Rather, I viewed the scenario within the framework of geological parameters and rigorously evaluated all inferences and surmises on the anvil of the principles of geodynamics. Presented in this book is the geological history of river that is now represented by an extraordinarily wide and waterless channel snaking through the vast floodplain in northwestern Haryānā and adjoining Rājasthān, by the considerably thick and extensive riverine deposits containing material of Himālayan parentage, and testified by the thousands of years old freshwater lying concealed in underground reservoirs in the heart of sandy Thār Desert, by the dense clusters of ruins of human settlements on the banks of the dry water courses, and by the occurrence of an ancient seaport opposite the remnants of a delta in what is today a salt-encrusted marshy flat of the Rann of Kachchh, the seaport speaking eloquently of navigable river that discharged into the Arabian Sea.

It was the river that vanished as a consequence of tectonic upheaval in the foothills of the Himālaya.

I wish to emphasize that this is not a scholarly treatise, nor a comprehensive analysis. It is just a geologist's interpretation of the mass of facts of varied kind, presented with a modest objective of providing a few credible examples that testify to the existence of a Himālayan-born river that in the prehistoric time was the lifeline of the people who had settlements in the land between the well-watered floodplains of the Sindhu and the Gangā River systems.

Despite a section of historians dismissing it as a figment of the imagination, as a fantasy, I believe that the Saraswatī was not a fantasy. It was a reality. This modest work endeavours to portray that reality in the land with many layers of history.

Bengaluru, India

K.S. Valdiya

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Professor Kanchan Pande at the Indian Institute of Technology, Mumbai, not only spurred me to write this book but also helped me in many ways, including the redrafting of diagrams and critically reviewing the manuscript. Dr. Satish C. Tripathi, at the Society of Earth Scientists, Lucknow encouraged me to write without loss of time and offered to publish under his society's banner.

I am profoundly grateful to Dr. Ravindra S. Bisht, formerly Joint Director-General of the Archaeological Survey of India (New Delhi), Dr. Amal Kar, formerly Principal Scientist and Head of Natural Resources and Environment Division, Central Arid Zone Research Institute (Jodhpur), Dr. Anil Kumar Gupta, formerly Senior Scientist at the Regional Remote Sensing Centre (Jodhpur) of Indian Space Research Organization, Dr. B.K. Bhadra Scientist/Engineer S.F. at Regional Remote Sensing Centre (ISRO), and Prof. Jyotiranjan S. Ray at Physical Research Laboratory (Ahmadabad) for rigorously reviewing the manuscript and giving very valuable suggestions for improvement.

Dr. Ravindra S. Bisht spared many photographs on the Harappan Civilization. The photographs of the Himālayan terrain were taken by Shree Anup Sah and Shree Niraj Pant. I am extremely grateful to them. I thank Ms. Sapna Shinde for drawing the line illustration and Dr. Jaishri Sanwal for helping in many ways.

K.S. Valdiya

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Chapter 1

Mighty Tempestuous River

Land Without Rivers

A look at the map of the Indo-Gangetic Plains would make it quite obvious that a vast expanse of the land between the Yamunā and Satluj rivers is a parched realm of sandy plain bereft of the bounty of rivers (Fig. 1.1). In this riverless land the annual rainfall is no more than 15–50 cm. Compounding the problem of pervasive aridity, droughts visit the region at an interval of 2–5 years. While the central, eastern and the western sectors of the Indo-Gangetic Plains are watered profusely round the year by multitude of Himālayan rivers, the great expanse of the land encompassing Haryānā, the northern and western parts of Rājasthān, and the adjoining region of Pākistān is a riverless country (Fig. 1.2).

Despite having no rivers, except for a few ephemeral streams, this parched domain contains evidence of living of primitive people of the Stone Ages. In this very land beginning around 5500 yr B.P., the Harappa Civilization blossomed 4600–3300 years ago (Kenoyer 1998; Rao 1999; Bhan 1972) (Fig. 1.2). And it was this part of India that witnessed epochal events and stirring developments of history, not only in the historical period but also in the Purān times more than 3500 years ago (Valdiya 2012). In spite of aridity, caravan after caravan of traders, invaders and conquerors traversed the land. Among the invaders were Alexander the Great (327 B.C.E), Mahmūd Ghazanavi (A.D. 997–1025), Mohammad Ghori and Ahmad Shāh Abdāli (A.D. 1760) who took the road across this riverless region experiencing the tyranny of aridity. But the famous traveller Ibn Batūtā (A.D. 1325–1354) saw greenery of sugarcane and paddy crops in the fluvial reaches of the Ghagghar. There were such bustling trading towns as Mārot, Fort Abbās, Sirsā, Bhadrā and Hānsi along the road that traversed the dry land.

Even more surprising is the fact that the desert tracts continue to support a burgeoning population in the present: the Thār is described as world's most crowded desert where the population between 1909 and 1971 grew at the rate of 158 %, compared to less than 132 % in the rest of the country in the same period

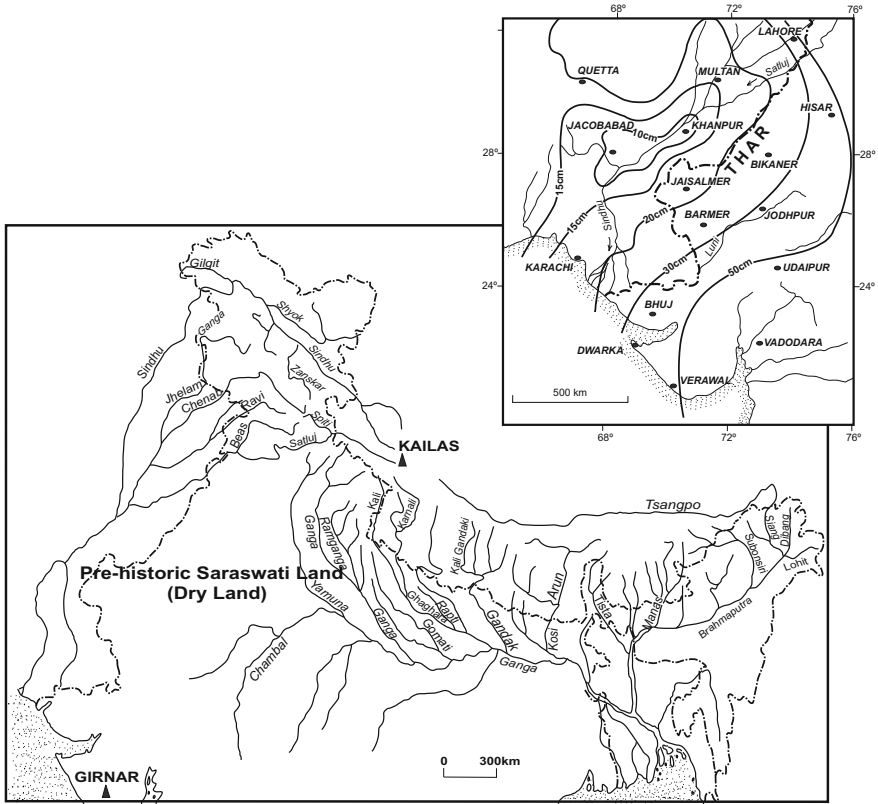


Fig. 1.1 While the central-eastern and the western sectors of the Indo-Gangetic Plains are profusely watered by Himālayan rivers, the vast expanse between the rivers Yamunā and Satluj is bereft of the bounty of perennial rivers. *Inset*; West of the Arāvāli Ranges and east of the Sindhu floodplain the vast swathe of semi-arid to arid land receives annual rainfall no more than 15–50 cm (Valdiya 2002)

(Gupta and Prakash 1975). In 2011 the human population density was 133 persons/km² (Kar 2014b). Even the livestock population grew rapidly from 72/ha in 1951–175/ha in 1971 (Chaudhary et al. 2011). While the livestock population was 25.52 million in 1951, it was recorded much higher at 49.14 million in 2003. And the livestock population density in 2011 was 115/km² (Kar 2014b). Obviously, the desert sediments are rich in nutrients—the materials that the flowing rivers bring from the mountains made of varied assemblages of rocks. Indeed the vast expanse of the land without rivers at present is covered by thick columns of sediments brought by past rivers and deposited in their channels and floodplains. On the top, it is mostly aeolian sands emplaced by the blowing winds of the desert.