
Review of *The Lower Damodar River, India: Understanding the Human Role in Changing Fluvial Environment* by Kumkum Bhattacharyya

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Growing population, higher demand for food and consequent agricultural irrigation, rising standard of living, increasing industrial activity, and expanding energy generation are putting greater pressure on our water resources, including rivers and aquifers. To satisfy these demands, most major rivers in the world have been exploited or are being exploited for their water. The exploitation of rivers has accomplished, at least partially, the intended objectives, but the environmental and ecological cost has been huge. This is nowhere more evident than in India. In recent years, human impact on the riverine systems and socioeconomic environment has become a matter of great concern. This book follows a journey rich in human interference of the kind that is seldom seen or even heard of and is a kind of a wake-up call for greater understanding and better management of riverine resources.

The book is comprised of eight chapters and eight appendixes. Chapter 1 presents the purpose and perspectives of the book. Tracing the origins and development of major civilizations along rivers, the author argues that rivers had to be trained for the socioeconomic benefit of the society, entailing a twofold struggle. On one hand, there was a need to protect people from flood hazards; on the other hand, a safe water supply for domestic use and agricultural irrigation had to be ensured. This struggle led to the development of hydrotechnical installations for river training. The chapter is well written and provides many historical insights into river regulation programs and policies and the application of geology, geomorphology, engineering, and the societal considerations needed for the development of these programs.

Chapter 2 introduces the region of Damodar River, a tributary of the Ganges. Beginning with a short description of the geography of the Damodar River, also known as the Deonad Nadi in its upstream sector, it discusses the physiographic factors and elaborates on the factors for choosing this river for study. The chapter goes on to discuss the landscape, geomorphic environment, culture, social space, land use, human ecology, and refugees. The chapter concludes with a statement of the objectives of the book, research paradigm, geomorphological and human environmental issues, models and methods, techniques and tools, and the organization of the book. This is

a well-written chapter and provides a wealth of information that is highly useful to those engaged in river training works.

Like other rivers in India, China, and other countries, the Damodar River is notorious for its calamitous floods. For protecting property and people from these floods, heavy embankments were employed in the lower reaches for reducing flood hazard in the Rarh plain. With the establishment of the Damodar Valley Corporation (DVC) in 1948, sophisticated engineering structures were constructed for river regulation and control. The result has been the rise of the riverbed, expansion of cross sections, the opening of a number of spill channels, and changes in the soil composition in the adjacent riparian tract. Considering these issues, Chapter 3 reviews the state and community-level effort in flood and water resources management and impacts of embankments, with particular focus on the hydrogeomorphic consequences of lateral control structures.

Chapter 4 presents a hydrogeomorphic perspective of the consequences of control structures on the Damodar River, including reservoirs. Rivers are known to respond to anthropogenic activities through morphological and hydrological adjustments in the channel. More particularly, dams alter the flow regime, channel characteristics, and sediment supply of the river, and this same has happened to the Damodar River. This chapter discusses at length the hydrological impacts of dams, the changes in the flood behavior of the lower reaches, and changes in river morphology. The discussion is rich in empirical evidence and highly qualitative.

The colonization of the lower Damodar River bed has been occurring since 1947 and is the subject of Chapter 5. Beginning with a history of colonization and the reasons behind colonization by refugees from Bangladesh, the chapter details the phases of colonization. This is one of the shorter chapters but presents those aspects that are often not considered in the water resources and engineering literature. The text is lucid and informative.

The colonizing refugees use alluvial bars in the bed of Damodar River as a resource base. The riverbed landscape metamorphoses as a result of the interaction between the riverbed and its occupiers. Dealing with the controlled Lower Damodar River from a social perspective, Chapter 6 discusses the influence of culture, social pace, perceived environment, land ownership rights, and political forces on the functional relationships between the riverine environment and riparian community. The subject matter of this chapter is instructive and has a wealth of information.

The controlled lower Damodar River can be perceived as a product of twin processes—hydrogeomorphic and anthropogenic land utilization—operating simultaneously. Forms, processes, and materials in the controlled reaches are not entirely natural these days, because the refugees have been playing a significant role in altering the geomorphology of the river through land use and colonization. Chapter 7 reviews a range of aspects associated with the ramifications of the interaction between the human and riverine systems. On the whole, the chapter is well written and sheds new light on the impact of humans on the river.

The last chapter outlines thought for better human-environment interactions and planning approaches for future management of river resources. It argues that river regimes should be treated as economic assets, for economic and human developments are inextricably connected to the ecologically sound riverine environment. It makes a strong case for employing a mix of structural and nonstructural measures that acknowledge and incorporate local cultural attitudes, experience, and knowledge.

The book is appended with eight appendixes. Appendix A is a list of reference maps; Appendix B is on hydrological observations; Appendix C tabulates monthly and average annual streamflow of the Lower Damodar River at Rhondia; Appendix D tabulates streamflow at the Damodar Bridge Site; Appendix E tabulates inflow into Durgapur Barrage and canal consumption; Appendix F lists peak flow at Raniganj and at Rhondia during predam and postdam periods; Appendix G tabulates combined moderation by Maithon and Panchet Dams; and Appendix H presents a model questionnaire for perception survey.

The material presented in this book is based on the author's seven years of extensive research and is supported by an extensive literature review. The book will be a good addition to the library of engineers, policy makers, geographers, geomorphologists, environmentalists, and ecologists who are concerned with river training and control. The end-of-chapter references provided are extensive. The author should be complimented for preparing a well-written treatise on a most interesting topic—the role humans play in changing the fluvial environment.