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Historical Analysis and Water Resources Development - Foreword

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Foreword

Few natural resources professionals are unaware of the growing importance of interdisciplinary cooperation. Managing the global environment poses complex problems that transcend the rigid boundaries of academic disciplines. The very term "sustainable development," popularized in the Brundtland Commission report *Our Common Future,* indicates a need for husbanding our resources while providing for long-term economic growth.[1] Social and environmental issues have been joined.

Happily for historians, they have never separated the issues, for the fundamental historical process includes the changing relationship between the individual and the environment. It is a process that envelops both space and time. It touches the present and extends into the future. Historical analysis of the ways in which the human and natural worlds have adapted to one another holds lessons about human and environmental capabilities and constraints. It also suggests why and how the "global village" faces substantial environmental and economic crises.

This present issue focuses on water resources development. In one sense, water resources planners have always relied on history. Engineers use historical data about precipitation, streamflow, and other hydrological features when planning water projects. Their choice of construction material and location for one project may be influenced by experience with similar projects elsewhere. Even the drafting of codes and standards is largely the result of historical experience.

Yet, when planners depart from their own experience or from statistical data, they tend to be more circumspect in their application of history. What lessons do the overbuilt bridges of the nineteenth century, with their overlaying truss configurations, have for the present? What can we learn from dam failures, such as the St. Francis and Teton dams? A partial answer to both questions is that inadequate visual imagination can result in poor, uneconomical design and, far worse, in loss of life and property. In the first case, seeing a bridge as a unified system involving compression and tension members eventually led to a more economical configuration. In the second case, an appreciation of the many unfortunate combinations of factors inherent in each dam design might have led to more adequate

1. World Commission on Environment and Development, Our Common Future (1987). *See* Brundtland, *Global Change and Our Common Future,* 31 Environment 17 (1989).

defenses.[2] Avoiding techniques that resulted in failures or using those that are the equal of more expensive recent innovations can reduce risk and increase savings.

An example of the use of history to recover a largely overlooked engineering design is provided by Donald C. Jackson. His article in this issue shows that the American engineering community rejected John Eastwood's multiple arch dam design on the grounds that the design was not visually appealing and did not correspond with the mathematical models then in vogue. The article not only tells us about the psychological importance of the visual appearance of a dam, but also says something about the professional habits or "technological momentum" that limits the application of new approaches.[3]

The importance of cultural bias and professional ideology in molding project plans is an idea that many engineers and planners reject or, at best, accept with substantial reservations. Again, history helps. So does literature. One might recall Alice and the White King:

> "I see nobody on the road," said Alice
> "I only wish *I* had such eyes," the King remarked in a fretful tone. "To be able to see Nobody! And at that distance too!"[4]

In other words, not knowing about bias and ideology is not proof that they do not exist. One may not have looked hard enough. For example, when transportation engineers designed highway systems in the post-World War II period, they assumed that women's place would remain at home. However, the number of working women dramatically increased and contributed to the commuter traffic that quickly made newly constructed urban roads obsolete.[5]

In their articles, Mary Ellen Wolfe and Gail E. H. Evans show how Canada and the United States developed shared water resources in different ways that reflected each country's culture and politics. Indeed, the development of Niagara Falls, according to Evans, actually stimulated contrasting political developments in each country, while Wolfe argues that cultural predispositions effectively undermined attempts to resolve

2. J. Morley, The Importance of Being Historical: Civil Engineers and Their History (1990) (unpublished paper). I am grateful to Ms. Morley, the former Historical Coordinator for the American Society of Civil Engineers, for sharing this paper with me and for many stimulating discussions about the subject. *See* R. Jansen, Dams and Public Safety 171–83, 191–213 (1980).

3. Hughes, *Technological Momentum in History: Hydrogenation in Germany, 1898–1933*, 44 Past & Present 106–32 (1966) (on the idea of "technological momentum"). *Force of Habit*, 109 Engineering News Record 658 (1932) (this editorial noted that "Force of Habit" was an obstacle to innovation).

4. L. Carroll, Through the Looking-Glass and What Alice Found There 117 (1987).

5. Morley, *supra* note 2.

disputes over the Milk River Basin. Todd Shallat directly examines the role of ideology in his article. His analysis of the evolution of federal water resources agencies concludes that "engineering science . . . had a political agenda, a bias that varied according to agency mission and clientele." The myth of objective, non-ideological engineering was a fiction that Congress exploited whenever engineering plans furthered congressional schemes.

All the authors hint at the ways in which politics and technology influence one another. The insight is gradually being tested in studies of water resources projects. Robert Kelley examined the impact of political ideology on the development of flood control plans for California's Sacramento Valley in his recent book, *Battling the Inland Sea.*[6] Taking another direction, I have hinted at some of the constraints hydraulic engineers placed on politicians in developing flood control plans for the Lower Mississippi Valley.[7] In my article in this issue, I trace the emergence of social science in water resources planning and argue that social science goals and methodologies have become less ambitious and more realistic—indeed, less ideological. At the same time, social scientists have significantly influenced federal water resources planning procedures. These developments affect the professional culture of the engineer and the ways in which we view the engineering process.

Through historical analysis, water resource professionals become aware of their professional values and how those values affect methodological approaches.[8] Such knowledge not only contributes to a sense of professional identity and responsibility but also highlights issues that have been matters of continuing relevance and concern. Studying the history of water projects also extends a person's knowledge beyond his or her own experience. For one thing, it likely will sensitize young engineers to the importance of nonengineering economic and political factors—the cultural context—in design decisions. It also can hone a planner's analytical judgment by suggesting the factors or combination of factors that need to be considered prior to making critical decisions.

Finally, historical analysis of completed projects will answer questions about the effectiveness of the planning process. How well did the planners anticipate the impacts of the project? Did the planning assumptions prove accurate? Was the available data interpreted correctly? Were there significant problems in interagency cooperation that resulted in unnecessary cost or marginal designs? And how do the projects actually

6. R. Kelley, Battling the Inland Sea: American Political Culture, Public Policy, & the Sacramento Valley, 1850–1986 (1989).

7. Reuss, *Andrew A. Humphreys and the Development of Hydraulic Engineering: Politics and Technology in the Army Corps of Engineers, 1850–1950*, 26 Tech. & Culture 1–33 (1985).

8. W. Bijker, T. Hughes & T. Pinch, The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology (1987).

influence the lives of the local residents? Answers to these questions should help improve both the planning and operation of water projects.[9]

In the last few years, both the Public Works Historical Society of the American Public Works Association and the Office of History, Headquarters, United States Army Corps of Engineers, have encouraged water resource professionals to utilize historical analysis. The response has been gratifying. The American Society of Civil Engineers and the American Water Resources Association have added sessions on history to their recent programs,[10] and many individual members of both organizations have indicated their interest in the subject. The authors in this issue of *Natural Resources Journal* advance the dialogue another step. Certainly, much remains to be done. In a decade when environmental issues clearly will be center-stage, it is essential that we understand how this country's water resources have developed and how historical analysis can contribute to wise natural resources development in the future.

9. M. Robinson & H. Rosen, *Post-Audits in Public Works: The Role of History,* in Post-Audits of Environmental Programs and Projects: Proceedings of a Session Sponsored by the Environmental Impact Analysis Research Council of the American Society of Civil Engineers in conjunction with the ASCE Convention, New Orleans, Louisiana, October 11, 1989 at 5–16 (C. Gunnerson ed. 1989). E. Armstrong & H. Rosen, Effective Emergency Response: The Salt Lake Valley Floods of 1983, 1984 & 1985 (1986) (for an example of a post-audit of an emergency flood control operation).

10. Sessions focusing on the value of history were included in the 16th and 17th Annual Conferences (1989 & 1990) of the Water Resources Planning and Management Division, American Society of Civil Engineers (ASCE); the 1989 annual conference of the ASCE (*supra* note 8); and at a joint conference of the American and Canadian Water Resources Associations in 1990.