

Human-Environment-Society Interactions: Dam Projects as a Case Example

Numerous examples point to the complexity of human-environment-society interactions. This complexity is particularly apparent in the case of large engineering projects. Despite this evidence, however, the planning and development of engineering projects typically give little attention to tools that promote environmental protection and sustainability, such as the principles of European environmental law.

In general, engineering approaches are not interdisciplinary or “transdisciplinary” (that is, combining interscientific and local community knowledge, as explained by Kelsey, 2003; Reed, Dougill, & Taylor, 2007; and Rist & Dahdouh-Guebas, 2006). But such approaches are necessary in order to arrive at holistic solutions.

About This Article

This article describes some issues relating to human-environment-society interactions within the context of decision making on engineering projects. The discussion notes some sustainability factors that should be considered when planning

Improving the decision-making and development process

a project, emphasizing the role that a transdisciplinary approach can play.

The article focuses in particular on dam engineering, since dam projects provide a valuable example of the issues that can arise during the decision-making process.

The Impact of Dam Projects

Numerous dams built around the world have imposed high environmental and social costs. Among the impacts created by dams are ecosystem disturbance (see Anderson, Freeman, & Pringle, 2006; Merritt & Wohl, 2006; Petts, 1980; World Commission on Dams, 2000) and population displacement (see Siebert, 2001; World Commission on Dams, 2000).

The Need for Public Participation

In order to minimize negative impacts and successfully achieve the objectives of dam projects, it is imperative to incorporate public par-

Herlander Mata-Lima



ticipation into all stages of the decision-making process. According to the United Nations Environment Programme (1999), “Public participation is basically concerned with involving, informing, and consulting the public in planning, management, and other decision-making activities which can be considered part of the political process. It is that part of the process which provides opportunities and encouragement for the public to express their views.”

For the public participation process to be effective, all stakeholders—including project owners, government agencies, and members of the local community—must work together. In addition,

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all stakeholders must be provided with equal access to information and opportunities for participation.

Several authors have offered frameworks for ensuring public participation in the decision-making

process (see, e.g., Doelle & Sinclair, 2006; Giordano, Passarella, Uricchio, & Vurro, 2007; Mata-Lima, 2006; Rutherford & Campbell, 2004).

In particular, it is clear that participation by members of the local community who are not “scientific experts” can provide insight into social, ethical, and political values that cannot be obtained solely through scientific approaches (Middendorf & Busch, 1997). Such participation helps create a more robust factual base and reduces uncertainty (Olsson, Folke, & Berkes, 2004; Stringer et al., 2006).

Ethics in Engineering: How Can It Be Enhanced?

Engineering has been defined as a realm that simultaneously integrates science, technology, and art. In today’s world, however, decision mak-

ing on engineering projects requires even more elements. In particular, sustainable development requires the integration of aspects related to ethics and society (see Becker, 1997; Turner, 1993).

Nash (1989) has noted that ethical issues are recognized as being at the center of human-environment interactions. At the same time, human-environment interactions constitute the reference point for progress in Western society.

Establishing Ethical Principles

A number of professional associations have established ethical principles. For example, the American Psychological Association recognizes six principles that should govern the activities of psychologists (American Psychological Association, 1992):

- competence,
- integrity,
- professional and scientific responsibility,
- respect for the rights and dignity of people,
- concern for the welfare of others, and
- social responsibility.

These principles are also pertinent to engineering activities. This is especially true in the case of areas such as hydraulics engineering that have a significant impact on the planet. Such projects inevitably involve issues relating to the environment, society, and human well-being.

The principles listed above are relevant with respect to both individual and collective rights. These ethical principles also correspond to the concerns noted in European environmental law—especially the precautionary principle, the emphasis on prevention of harm and promotion of public participation, and the focus on integration.

Moving Toward a Transdisciplinary Approach

It is no longer possible to doubt the impact that cultural, religious, ethnic, and social-eco-

conomic factors can have on engineering. We know that, in many situations, these factors play a key role in determining the success of engineering projects (see, e.g., Giordano et al., 2007; Rist & Dahdouh-Guebas, 2006).

Full consideration of all these elements requires a strong commitment to the environment and sustainable development. This in turn implies that environmental, social, and economic dimensions will be included in project planning and assessment (Lee, 2006).

Some authors argue that including such factors requires an “interdisciplinary” approach (see Moore, 1920, and Tetzlaff et al., 2007). In fact, however, the effort must actually be “transdisciplinary,” since it should integrate stakeholder participation and knowledge (Mata-Lima, 2007; Rist & Dahdouh-Guebas, 2006).

Sustainable Development Principles

Sustainable development relies on an integrated approach to human and environmental factors (see Morse, 2006; Stringer et al., 2006; United Nations Environment Programme, 1999), giving special attention to the precautionary principle and proactive measures that can prevent “nonconformity” and unexpected consequences.

Large-scale engineering projects—such as those involving dams, highways, and tourism infrastructure—clearly must be integrated with plans for managing local watersheds and land-use patterns. In order to meet the requirements of sustainable development, however, they also must integrate social, economic, and environmental dimensions (see Lee, 2006; Mihelcic, Zimmerman, & Ramaswami, 2007; World Commission on Dams, 2000; World Commission on Environment and Development, 1987).

Despite a growing acceptance of sustainable development, there are still conflicts about what sustainability means and how development

should be conducted (see Daly, 1996; Tynkkynen, 2007).

Dam Projects: Are Environmental and Public Concerns Being Integrated?

Problems related to dam projects have been discussed at length in recent years. In 1997, the World Bank and the International Union for the Conservation of Nature sponsored a meeting to discuss dam-related issues and to propose measures for regulating dam construction and management.

This led to the creation of the World Commission on Dams. The commission published a report advocating that dam projects adhere to the “core values” of equity, sustainability, efficiency, public participation, and responsibility (World Commission on Dams, 2000).

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Benefits and Costs

Dams serve a range of utilitarian functions: They supply water, produce energy, help control floods, and offer opportunities for recreation. In addition, they often create employment opportunities and help promote regional development.

The World Commission on Dams (2000) has recognized that dams provide important benefits to human development. The commission also notes, however, that societies frequently pay a high price to create these benefits. Among the potential adverse impacts of dam projects are social problems (e.g., population displacement, loss of cultural identity, and inequality in the distribution of costs and benefits) and environmental issues, including ecosystem disturbance (see DesJardins, 2001; Martínez-Fernández & Es-

teve, 2005; Siebert, 2001; World Commission on Dams, 2000).

Dams have transformed—and sometimes destroyed—rivers throughout the world. Estimates suggest that from 40 to 80 million people have been displaced due to dam construction. In addition, dam projects often create a range of other social and economic impacts (World Commission on Dams, 2000).

Moreover, dams often fail to live up to their multifunctional promise and commonly do not allow for full financial recovery (see Central Water Commission, 1994; Indian Planning Commission, 2000).

Applying the principles of European environmental law would represent a useful step toward reforming the outmoded decision-making behavior that persists in many regions, including European countries themselves.

Generally, dam projects are located in remote rural regions. They typically seek to promote significant economic growth in these regions, including creation of local benefits such as increased employment and enhanced commercial and industrial opportunities.

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Unfortunately, however, experience has demonstrated that the regional advantages promised by dam projects do not materialize in most cases (see World Commission on Dams, 2000). In fact, in many instances, the jobs created by dam projects are filled by outside workers rather than by members of the local community and the projected economic growth does not occur. Instead, the changes caused by the dam project often lead to degradation of social and environmental conditions.

Promoting Sustainable Human Development

Dam projects should promote human development on the basis of economic, social, and environmental sustainability. This goal can be

achieved through the use of transdisciplinary studies, including a shared decision-making process that reduces uncertainty and minimizes project impacts.

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Gaps in Public Participation

A number of countries have approved and adopted the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the “Aarhus Convention”) (see United Nations Economic Commission for Europe, 1998). Many of these countries still have not fully implemented the practices outlined in the convention, however.

Rutherford and Campbell (2004) have noted a number of factors that contribute to unsatisfactory public participation results. In many cases, public participation is reduced to a simple one-way communication of information. Even when participation is more active, it typically does not take place during all phases of the dam project.

In general, the affected local population does not have equal access to information about the dam project or adequate opportunity to provide input during the decision-making process. As a result, in many developing countries, meaningful public participation can only be achieved when local opposition to a project gains media support.

It has been noted that in most developing countries (particularly in Asia, which has a high index of dam construction), there is no opportunity at all for public participation. For example, Siebert (2001) notes that a dam construction project on the Mekong River in Laos did not offer any chance for public participation since “ordi-

nary Laotians do not have a say. Their opinion is not asked in the political day-to-day life of the Communist-ruled state.”

Toward a Sustainable Process for Dam Project Development

In order to achieve a more equitable and sustainable process for dam project development, it is suggested that project developers incorporate the following elements:

- professional ethics,
- principles of European environmental law,
- a transdisciplinary approach that combines scientific interdisciplinarity with local community knowledge to arrive at a holistic solution for the issues under consideration, and
- a shared decision-making process that involves public participation during all project phases and that aims to design sustainable projects that incorporate adequate resource management.

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Herlander Mata-Lima, PhD, is an assistant professor in the Department of Mathematics and Engineering at the University of Madeira (Portugal). He is also a researcher for CERENA (Centre for Natural Resources and Environment) at the Technical University of Lisbon. Before joining the University of Madeira, Dr. Mata-Lima served as a consulting engineer in the private sector. He can be contacted at hlima@uma.pt.
