Title

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Journal

Journal of Irrigation and Drainage Engineering, 143(4)

ISSN

0733-9437

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Publication Date

2017-04-01

DOI

10.1061/(asce)ir.1943-4774.0001151

Peer reviewed

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DOI: 10.1061/(ASCE)IR.1943-4774.0001151

Introduction

Water resources problems involve technical and engineering issues in which nature's deterministic and random phenomena must be accounted for. Yet, there is another dimension to water-resources management, namely, human behavior. Substantial tribute is paid to natural water resources phenomena, whereas the human and social dimensions have received much less attention comparatively. This is so in spite of the substantial feedback between the natural and the human dimensions concerning water resources management. Consider, for instance, a town in which a dam is considered for construction within its vicinity. Construction may seem an appropriate choice based on hydrologic conditions, yet, the project most likely will not be realized if the town's residents do not support this project. The concerned community, in this case, has at its disposal several means, such as withholding manpower and economic and political support needed to build the dam, thus obstructing its construction. This type of situation is not uncommon; it highlights the multidimensional decision nature that typically surrounds the undertaking of significant water resources problems.

Water resources projects and their operation typically involve managers and stakeholders who may have conflicting interests and viewpoints about a project's function and management Those diverging interests can be explained in some cases with game theory (Madani 2010). Some complex situations concerning water resources projects can be modeled with conflict-resolution theory (Wolf 2002). Such approaches attempt to explain stakeholders' behaviors and actions, and what to expect of the interactions among them.

Yet, understanding the stakeholders' behaviors is only partly sufficient to reach consensus on water resources projects. Parties who find their interests at risk want to intervene to influence decision making. Allowing stakeholders' participation in decision making is synonymous to proper management in which each interested party is meaningfully involved in the decision-making process. The very least management should do is to create a welcoming environment for all the stakeholders to voice their concerns. Such an environment improves the decision-making process and facilitates anticipating the behavior of different parties should a dispute arise. Imagine a conflict of interest situation in which one side of the debate is not allowed to make his or her argument and state his or her preferences. Suppressing participation in this manner silences stakeholders in the decision-making process. This makes the prediction of outcomes inaccurate and sometimes in contradiction with reality. The suppression of the open participation of stakeholders is the main reason why many attempts for conflict resolution are unsuccessful because they fail to capture and consider all parties' interests.

Water resources project are prototypical concerning conflicts of interests between those who propose engineering works and the societies who are in direct or indirect interaction with the impacted water resources. Because of these conflicts and possibly diverging objectives, it is appropriate to consider societal priorities in the decision-making process. This consideration is recommendable for local-scale water projects and for international sharing of water resources involving common resources among countries.

The previous paragraphs will not make the impression that this manuscript's purpose is to advocate amending water regulations, laws, and operational procedures but rather to propose means for achieving positive changes and explain how these changes can be achieved.

Unionism

The idea central to unionism is the idea that the voices that come together can make a change and is applicable to the resolution of conflicts arising from planned water resources management. A trade union or labor union is an organization of workers that advocates goals shared by its members. Those goals, nowadays, comprise achieving safe and dignified work conditions, adequate pay, securing bargaining rights, and pursuing advocacy interests.

Origin of Unionism during the Industrial Revolution

Early in the 19th century, labor unrest developed in England from where it spread to other parts of industrialized countries to protest long work hours and inhumane work conditions in factories. The organization and resolute rebellion by industrial workers gained strength and initiated a series of events that changed working conditions forever.

Workers engaged in collective bargaining with employers. They demanded better working conditions and higher wages. If negotiations did not achieve their goals, unionized workers would strike, bringing production to a standstill. Workers with special skills strengthened the negotiating power of their unions given that their replacement was difficult or impossible in the short term because of the special talents required in some industrial jobs. However, there were limits as to how far the wage demands of striking workers could go. Those limits were set by the cost of finding

replacement workers who could maintain production at profitable levels.

England's rulers initially denied industrial workers unionizing rights, a fact recounted by Friedrich Engels (1845) in his manifesto titled "The Condition of the Working Class in England" where he wrote of the unions' struggles against the ruling class as "a long series of defeats of the working-men, interrupted by a few isolated victories" in Victorian England. Eventually, unions became commonplace in England and other countries, and by 1886, several unions formed a national labor association named the American Federation of Labor (AFL) in the United States. A series of strikes won AFL members more suitable working conditions. In 1955 the AFL merged with its longtime rival, the Congress of Industrial Organizations (CIO), giving rise to one of the most influential labor organizations in the United States.

The struggle by workers unions has not ended; it has simply morphed in modern times, despite the United Nations' (UN) proclamation of workers' right of peaceful assembly and association (Chelghoum et al. 2016). The right of workers to form unions and defend their legitimate work conditions represents an accepted foundation of modern democracy (Olowu 2006). The following sections present a few examples of how unions could improve water resources management.

Legal and Institutional Framework

Most water resources problems are influenced by legal covenants, rather than simply by hydrological and engineering concerns. The legal framework affecting water resources management can and does have an impact on the feasibility of a project. One example is the delineation of wellhead protection areas, whereupon hydrological science assists legislators in understanding the nature of effective protection of groundwater resources and in enacting sound laws regarding this matter.

As a second example, consider the proposed construction of a dam. The feasibly of the project must be scrutinized from hydrological and engineering viewpoints. The proposed dam must have a suitable location, and its construction requires suitable funding. In the case of small dams, funding usually comes from local communities and organizations. In exchange for their support, the sponsors demand rights on the stored water. In other words, they expect the reservoir to be operated in the way that benefits them. Fisheries management, on one hand, may request the release of reservoir water during the spawning seasons (Mower and Miranda 2013). Recreational users, on the other hand, may require high reservoir levels times to maximize the aesthetic amusement during the spawning season, which would curtail reservoir releases to support fisheries.

A common approach to managing reservoir releases relies on establishing seasonal targets for water levels. These predefined rules, i.e., rule curves (RCs), guide reservoir operation for any given conditions. Rule curves attempt to balance optimally and harmoniously various reservoir functions, such as flood control, hydroelectric power generation, water supply, navigation, preservation of fisheries and wildlife habitat, and recreation (Mower and Miranda 2013). In the United States, the establishment of RCs for federally owned reservoirs rests with the Bureau of Reclamation and the US Army Corps of Engineers. The operation of reservoirs is not narrowly discretionary or subjective but rather is tightly constrained by the RCs that reflect contractual agreements with entities that pay for the construction and operation of the project in exchange for receiving benefits from reservoir water management (Mower and Miranda 2013).

Over time, the objectives of reservoir operation may change, reflecting shifting societal priorities. These changes in societal objectives have prompted the modification of the operation of reservoir systems and in some cases, even their dismantling in parts of the United States and elsewhere. Cases in point are the lawsuits regarding water allocation involving Lake Lanier and John H. Kerr Lake, Lake Heron, other reservoirs on the Rio Grande River in the American Southwest, main-stem reservoirs in the Missouri River in the Midwest (Mower and Miranda 2013), and the planned demolition of dams along the Klamath river in the state of Oregon.

The general perception in the United States about amending RCs is that authorization must be obtained from the U.S. Congress to do so. This perception may or may not be accurate, depending on the magnitude of the change requested. Yet, it is probably correct that the benefits of changing RCs can be brought up to the attention of and consideration by the U.S. Congress in light of changing circumstances. This requires lobbying efforts and finding sponsors for new bills, a process which is quite technical and requires financial support and skillful political maneuvering. In such situations, forming unified constituencies guided by a common goal increases the chance of steering the process of change in the desired direction. Unions can be part of such unified constituencies, requesting changes to reservoir operations. Consider, as an example, a region whose economy depends on fisheries. If the RC of the upstream dam does not meet the needs of fishermen, they could organize and threaten to strike until their demands are met. Their chances of success are improved by the centrality of their activity to the regional economy, which may persuade decision makers to concede to the requested changes.

International Affairs

Singapore is an island city-state located at the southern tip of the Malaysian peninsula in Asia. It shelters 4.4 million people. Singapore struggled with water stress for many years. The stress was caused by the lack of water storage for runoff, rather than by climatic conditions. In 1961, Singapore (then a self-governing English colony) signed a treaty to import water through from the state of Johor, Malaysia, via pipelines. Under the terms of the treaty, Singapore would pay a price for the imported Malaysian water of less than US$2.6 per cubic meter until 2061. In addition, Singapore would provide treated reused water to Malaysia for less than the cost of treating water.

In 1998, Singapore engaged Malaysia to renegotiate their water treaty. Singapore wanted an extended period of water importation from Malaysia (beyond 2061), whereas Malaysia wanted a higher price for its water export. The negotiations for a new treaty broke down over disagreements about the price of water to be paid by Singapore (Tortajada 2006).

These types of negotiations, treaties, and disagreements over water resource management are common in the international arena. One such type of negotiation has been undertaken by Hong Kong and China, whereby a council of legal experts and politicians started negotiations on behalf of the two parties. Naturally, the negotiators cannot represent everyone affected by any agreement on water resources, and thus, there will always be some who are not satisfied with the outcome of the negotiations. Evidently, if the negotiators change, so would the final agreement in all likelihood. In the Singaporean-Malaysian failed renegotiation, for instance, pipe manufacturers would have supported an extended contract. Singaporean water customers, on the other hand, preferred to seek water independence and self-sufficiency, which is the stance that ultimately prevailed. The previous examples signal that unions could play a crucial part in influencing negotiations over water

resources management. Unions could use their leverage and collective bargaining to steer negotiations towards their preferred outcomes. Normally, the most influential unions have the better chance to make an impact on the results, creating an environment in which each party can voice its concerns and defend its interests; however, this appears to be a preferable strategy for arriving at an acceptable agreement. This type of open dialogue and inclusive debate involves the public in the process of decision making and most likely would improve the trust between the governed and government officials.

Public Awareness

A common feature of water resources and environmental projects is that they are sometimes removed from public scrutiny. This may lead to regional, national, and even global disasters if not addressed timely and correctly.

Consider for instance, Lake Uremina, Iran, in which the advocacy of concerned environmentalists made an entire nation, and later the world, to take action to protect and save the perishing lake. Similar circumstances were observed years before in the Aral Sea under the governance of the now defunct Soviet Union, where water diversions and lack of environmental oversight led to the demise of most of the Aral Sea's aquatic life and to irrecoverable loss of storage (Micklin 1988). Fortunately, that was not the case for Lake Urmia, in which protests by interested environmentalists forced the congressmen from Azerbaijan province to introduce a bill named "Transferring Water to Revive Urmia Lake (Urmia Lake Restoration 2016)." This bill was aimed at preserving the lake's environment. Even though the bill did not pass at that time, it alerted the nation about the dire situation. Nowadays, preserving Lake Urmia has become one of Iran's top environmental priorities. These types of situations, empowering environmental unions to voice their concerns freely, might be instrumental in alerting the public about environmental degradation and the urgency of taking timely remedial actions.

Means of Improvement

The growth of unionism relies on increases in membership, effective training and education of union members, improving information sharing among members assisted by social media and networks, building alliances among unions and environmental advocacy groups, and improving their bargaining power (Olowu 2006).

Conclusion

Unions and unionism are underrated insofar as their potential involvement in water resource management is concerned. Most experts in water resources management fail to address this sector of society. Substantial attention is dedicated to the engineering aspects of water resources projects and management, yet less attention has been given to the potential role of unions in positively influencing the planning, operation, and management of water resources projects. This forum has touched on the need for developing a better understanding of the mechanisms through which these organizations could have a favorable impact on water resources planning and management. Issues, such as the institutional framework, international treaties, and public awareness, were identified as means by which unionism can exert a positive role in the water resources domain.

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