1 Introduction

Transboundary resources: delineating the challenges

For the thousands of Muslim worshippers who gathered in mosques across the Middle East one Friday morning, as the second millennium was drawing to an end, only God could end the misery caused by the worst drought experienced in their lifetimes. Thousands of Jewish worshippers joined them the following morning, fervently reciting the daily prayer for rain. Indeed, as these prayers suggested, the occurrence of drought was a matter beyond human control. Yet the praying, which the political leaders ceremoniously attended, furthered the wrong perception of water shortage as a problem of dwindling supplies. It deemphasized the governments' responsibility for the inability to manage responsibly the conflicting demands for water and to reduce waste. Indeed, much of the plight of the worshippers was a result of human conflict and government failure to correct inefficiencies in water management systems and to prevent environmental degradation.

Dating back three millennia, the Middle East has been a region where impressive instances of efficient small-scale demand-management systems have thrived. Villagers have managed to design and implement collective mechanisms for the shared management of small springs, aquifers, and floods. Thanks to these ancient systems, many of these villages survive to this very day. One would have hoped that the emergence of the modern state in the Middle East towards the end of the second millennium would have produced similar successful arrangements on a regional or even national scale. But the governments in the Middle East have failed to do so and, instead, have caused much dissipation and ruin of natural resources. The picture is similar in other parts of the world: efficient small-scale water management institutions

have been replaced by larger, inefficient, and often corrupt systems with consequential loss and even human suffering.

The same Middle Eastern leaders who joined the dramatic prayer for rain have also failed to ameliorate the dismal situation through negotiations with one another on resolving the regional water and environmental disputes. A comprehensive plan that could have reduced waste and increased water availability eluded them. Since gaining independence, the states in the Middle East have been engaged in conflict with one another, often with saber-rattling that led, on one occasion, in 1967, to all-out war. Needless to say, these conflicts have contributed to the plight the worshippers now plead to God to end.

When I first set out to explore the roots of the inefficiencies of the modern state and the causes of regional conflict in the management of transboundary natural resources, I was struck by the efficiency and sustainability of the ancient local systems. Why, I wondered, did villagers in ancient communities succeed where modern states fail? Are there systemic failures in the Westphalian state system that hinder efficient management of domestic and international resources? Can these systemic failures be corrected through institutions and norms? This book is the outcome of that endeavor to understand this perplexity. The most immediate goal of the book is to address the challenge of management of transboundary resources, namely natural resources shared by more than one state, in an efficient, sustainable, and equitable way. The book explores the reasons for inefficiency and non-sustainability, examines different responses that have been suggested, and proposes norms and institutions that could create more effective incentives for states to cooperate. On a more general level, this book provides a new outlook on the state as a locus of political decision making in the emerging global environment. It suggests that the principle of state sovereignty that allocates power to governments empowers some domestic interest groups at the expense of others. The difference in the aptitudes of the domestic groups to influence the ways the state manages its public resources often leads to inefficient and inequitable outcomes. The book argues that domestic and international norms and institutions can and should rectify this imbalance.

The focus of this book is on management of transboundary resources (also called "international common pool resources"). These are transboundary natural resources to which only a number of states have access. Such resources could be fresh water, clean air, fisheries in shared rivers and lakes, hydrocarbon and mineral deposits, forests and

rainforests, nature reserves, and endangered species of flora and fauna. What characterizes these resources is their partial accessibility. Only a limited number of states enjoy access to the given resource. While their own access is unlimited, states can limit the access of other states. This opportunity to limit the access of others gives rise to the theoretical possibility that efficient and equitable collective action among the co-owners of the transboundary resource can emerge. I explore this theoretical possibility and suggest legal and institutional principles that could assist in accomplishing that possibility.

The rest of this introductory chapter is devoted to a more thorough clarification of the book's agenda and goals. It proceeds from the village level to the international level, identifying the main promises and pitfalls of collective use of common pool resources.

The endogenous evolution of cooperation in small-scale common pool resources

The collective effort to ensure an adequate supply of water was the bond that gave birth to many societies. Communities in arid and semi-arid areas had to coordinate activities to procure sufficient water to feed their families and cattle and to irrigate their fields. In other areas, where water was abundant, cooperation was necessary to prevent flooding. This endogenous cooperation resulted in efficient utilization of the communal resources. The design of sophisticated engineering projects could not have been sustained without equally sophisticated social, political, and legal designs. No well would be dug unless its water could be protected under a clearly defined set of rules of either individual or collective ownership. When the procurement of water required efforts beyond the capabilities of a single peasant, systems of common decision-making and monitoring were set up to collectively procure and apportion the shared resource.

The first story of successful cooperation is reported in the biblical tale of the meeting between Jacob and Rachel. A heavy stone covered the collective well that served the herds of all the villagers. Removing the stone required the joint effort of all the shepherds, but Jacob, in a show of extraordinary strength, managed to remove the stone single-handedly while trying to impress Rachel.[1] The heavy stone was a simple device that enabled collective monitoring of the timing and quantity of use, as

[1] Genesis 29:1–11.

well as assignment of responsibility for accidental pollution. The Middle East is replete with many similar examples, all based on the idea of a community-owned resource. One such example, which still functions, was developed in the ninth or eighth century BC. It involves a communal spring or system of springs. The villagers dug tunnels deep into the rock to drain the saturated aquifer more efficiently and increase the flow of these springs.[2] They based the complicated digging and maintenance of the spring flow tunnels and the distribution of the water thus obtained on the idea of the spring as a shared resource. A similar arrangement, which also emerged without the backing of a central government, developed through local customs in the ancient Persian kingdoms. Since the eighth century BC, farmers have irrigated their fields by groundwater flowing from *qanawat* (tunnels dug into the underground water table below riverbeds), which sometimes reached a length of more than fifty kilometers.[3] There is ample evidence that *qanawat* were satisfactorily operated, sometimes supplying over one hundred users.

Collective action required investment not only in infrastructure, but also in collective decision-making processes and enforcement mechanisms. In some communities, these functions depended heavily on family ties. The villagers in the Judean Hills in Palestine, for example, relied heavily on the structure of the *hammulah*, the extended family. Only a small number of *hammulahs* resided in each village, and water would rotate between the *hammulahs* on a weekly basis. At night, the spring water filled a publicly owned pool. Then, during the daytime, the water that had accumulated in the pool would be redirected to the fields, each day supplying water to the members of one *hammulah*. An elder of the *hammulah* would be in charge of the actual diversion. Zvi Ron described in detail the water system in Battir, an Arab village in the West Bank in the vicinity of Jerusalem, which, in 1967, still relied on the ancient spring flow allocation system.[4] Eight *hammulahs* lived in Battir,

[2] On the spring flow tunnels, see Zvi Y. D. Ron, "Qantas and Spring Flow Tunnels in the Holy Land" in Peter Beaumont, Michael Bonnie, and Keith McLachlan (eds.), *Qantas, Kariz and Khattara: Traditional Water Systems in the Middle East and North Africa* (London, Middle East & North African Studies Press, 1989), pp. 211–36. In some places, the tunnels reached a length of 50 to 100 meters and, in one place, even 225 meters (see at p. 224). See also "The Utilization of Springs for Irrigated Agriculture in the Judea Mountains," in Avshalom Shmueli, David Grossman and Rehav'am Ze'evi (eds.), *Judea and Samaria* (2 vols., Jerusalem, Canaan Publishing House, 1977, in Hebrew), vol. I, pp. 230–50.

[3] A. K. S. Lambton, "Qanat," 4 *Encyclopedia of Islam*, 529–31; Peter Beaumont, "The Qanat: A Means of Water Provision from Groundwater Sources" in Beaumont, Bonnie, and McLachlan, *Quantas*, note 2, pp. 13–31, at p. 23.

[4] Zvi Y. D. Ron, "Development and Management of Irrigation Systems in Mountain Regions of the Holy Land" (1985) 10 Trans. Inst. Br. Geogr. NS 149–69; Zvi Ron,

and hence, each *hammulah* would get water for its families every eighth day. An elder of the *hammulah* was in charge of distribution among the families of the *hammulah* and among the family members within each family. With a wooden stick that was notched with as many notches as there were water recipients, he would measure the decreasing water level in the pool and order the opening and closing of the pool gates. Throughout the day, several women from the same *hammulah* would sit near the pool, talking casually, but also watching the elder at work. Similar arrangements for collective processes of allocation of quantities and for monitoring actual withdrawals enabled indigenous populations in North America and in the Philippines to adjust to the sometimes harsh environment.[5]

Distribution in cycles provided a built-in response to fluctuations in water supply; when the source dwindled, everyone received less. Thus, maintenance of the spring and the nearby storage pool, as well as of the horizontal extension of the spring flow tunnels into the rock to capture more water, was in everyone's interest. This shared interest, backed by the reliable allocation system and enforced by the myriad of ties between and within families unrelated to water use,[6] enabled the development of long tunnels that extended well into the rock, well below the surface.

While strong family ties are conducive to reducing the costs of monitoring and enforcement, peasants in other regions have demonstrated that collective action can emerge despite the lack of such ties. Indeed, as Robert Wade has documented, fruitful cooperation emerged in some water-scarce villages in southern India, despite strict caste differences between the villagers and looser social ties.[7] Such cooperation developed

"Battir – The Village and the System of Irrigated Terraces" (1968) 10 *Teva va-Arets* 112, 121 (in Hebrew).

[5] For the irrigation systems of the Pueblo Indians in New Mexico, see Jose A. Rivera, "Irrigation Communities of the Upper Rio Grande Bioregion: Sustainable Use in the Global Context" (1996) 36 Nat. Res. J. 491, 497 (describing the "acequia associations," consisting of three elected ditch commissioners and the irrigators themselves, governed by rules based on custom and tradition); Robert Y. Siy, Jr., *Community Resource Management: Lessons from the Zanjera* (Quezon City, Philippines, University of the Philippines Press, 1982) (describing the irrigation system in rural parts of the Philippines).

[6] On multidimensional relations as reinforcing cooperation, see Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (New York, Cambridge University Press, 1990), p. 207; Russell Hardin, *Collective Action* (Baltimore, MD, Johns Hopkins University Press, 1982), pp. 31–3.

[7] Robert Wade, *Village Republics: Economic Conditions for Collective Action in South India* (Cambridge, Cambridge University Press, 1988); Robert Wade, "The Management of Common Property Resources: Collective Action as an Alternative to Privatisation or State Regulation" (1987) 11 Cambridge J. of Econ. 95.

due to the relative scarcity of the resource and the fact that the peasants held a diversified portfolio of fields: some near the water source, some further below, in the flatter area. The villagers described by Wade managed to form a council that coordinated the efforts to obtain more water for the village, monitored the allocation of this water, collected taxes to finance its actions, and fined violators. Violations occurred, and there were even suspicions that some farmers were using their position on the council to obtain unfair special benefits for themselves or their relatives. But all these concerns were addressed in public, on the local accountant's open veranda. Even more than fines did, the cost to reputation provided a reasonably effective sanction against violations. The council remained in operation for as long as it could ensure net gains to farmers from collective action.

But there were significant limits to these indigenous forms of cooperation. Both in the Judean Hills and in the southern Indian uplands, significant losses were caused by inter-village failure to cooperate. Sometimes the reason was the asymmetric upstream-downstream relationship between villages. At other times, due to sporadic seasonal flows, there was no incentive for setting up and maintaining mechanisms in anticipation for their occurrence. Here again, the Bible is a source of early evidence of conflict resulting from competition over water. The first biblical stories of conflicts in Canaan relate not to contested land, but to competition over access to water.[8] Lack of coordination often resulted not only in conflict, but also in inefficient and unsustainable use.[9]

Nevertheless, some communities managed to overcome even this collective failure. At times, religion proved a potent tool to iron out inter-village competition. Clifford Geertz describes this phenomenon, which survives to this day in parts of Indonesia.[10] In the Island of Bali, each

[8] Genesis 26:15–22 (the Philistines covered the wells dug by Abraham and Isaac in an attempt to chase Isaac away from the area).

[9] For examples of inter-village strife in ancient Palestine, see Ali Hasan Dawod Anbar, "Socio-Economic Aspects of the East Ghor Canal Project" (Ph.D. thesis, University of Southampton, 1983), pp. 91–3; for examples of inter-village conflicts in India, see Robert Wade, *Village Republics*, note 7. This is the typical scenario of the tragedy of the water commons and arises, for example, in areas along the Mediterranean coast, where the opportunity of many individuals to dig wells led to numerous shallow wells and a lowering of the water table which, in turn, rendered many wells dry and increased the salinity of the coastal aquifer.

[10] Clifford Geertz, "Organization of the Balinese Subak" in E. Walter Coward, Jr. (ed.), *Irrigation and Agricultural Development in Asia: Perspectives from the Social Sciences* (Ithaca, NY, Cornell University Press, 1980), pp. 70–90.

drainage basin has its own *subak*, or irrigation society. The *subak* is "in fact very much more: an agricultural planning unit, an autonomous legal corporation, and a religious community. Aside from house gardening, virtually everything having to do with cultivation lies within its purview."[11] It operates under a system that today could be described as subsidiarity, relegating decision making and activities as much as possible to the village level.[12] The bond between potentially rival villages has been the shared religion. "The begetter of order in this otherwise rather particulate social field is the temple system . . . The temple system provides both a simplified model of Balinese social structure and a schoolroom in which kinds of attitudes and values necessary to sustain it are inculcated and celebrated."[13] One of the three great temples, the Great Council Temple, holds an annual ceremony, which is the climax of lengthy preparations of representatives of the surrounding *subaks*. As Geertz observed, "the integrative force of this continual collective effort, as it moves from one social context to another, is the linchpin of the entire system."[14] This common belief system sustains an explicit local customary law that is enforced through negotiations.[15]

Often the policies of the emerging regimes in the developing world, supported by Western scientists irreverent to "native" and "primitive" cultures and practices, shattered those ancient systems. The modern systems, however, have proved less efficient. Contemporary scientists and disillusioned governments have now discovered that this and similar religious rites in Benin, Bolivia, and Cambodia may be more efficient than modern command and control systems run by short-sighted central bureaucracy, and strive to reconstruct them wherever this is still possible.[16] Since attempts to introduce modern strains of rice and fertilizers brought only environmental disaster, the Indonesian government has recently been trying to convince farmers to revert to the ancient Balinese "rice cult" noted so precisely by Geertz.[17]

[11] Geertz, "Organization of the Balinese Subak," p. 79.
[12] *Ibid.*: "Theories of 'hydraulic despotism' to the contrary notwithstanding, water control in Bali was an overwhelmingly local and intensely democratic matter." The *subak* encompasses all owners of rice fields irrigated by a single dam. Organization is based on a one-person one-vote system for electing the *subak* head and other officials who perform allocation, monitoring, and maintenance works (at pp. 80–1).
[13] *Ibid.*, at p. 81. [14] *Ibid.*, at p. 88. [15] *Ibid.*, at p. 81.
[16] Jane Ellen Stevens, "Science and Religion; Cultural Practices and Ecology" (1994) 44(2) *Bioscience* 60.
[17] *Ibid.*

The inefficiency and inequity of national command and control institutions

The temptation to ignore the limits of the local common pool resource and adopt an "economy-of-scale" approach is not a twentieth-century invention. Along with the successful small-scale efforts, the allure of water management on a grand scale was evident already in the ancient empires of Sumer and Assyria. Outsiders to the common resources collaborated with those who hoped to increase revenues from them by placing the smaller resources under an all-encompassing joint management. This required the replacement of the delicate mechanisms that had ensured individual incentives to cooperate with imposed rules and sanctions to compel cooperation. Such efforts gave birth to despotism and produced inefficient and unsustainable regimes. Disrespect for nature has been a major cause for the demise of such despotic empires.

This is the legacy of the ancient empires of Sumer and Assyria in Mesopotamia, described by Karl Wittfogel.[18] According to his account, in all great ancient civilizations, such as Sumer and Assyria in Mesopotamia, Pharaonic Egypt, the Inca Empire in Peru, ancient China, and India, taming the large rivers was the catalyst for their evolution. Wittfogel linked what he termed the "Oriental despotism" of these societies to their internal efforts to promote their economic growth through the use of more water to irrigate more fields. He therefore called them "hydraulic societies." Harnessing the mighty rivers for large-scale irrigation in fertile but otherwise dry lands necessitated the construction of lengthy irrigation canals and sophisticated flood-control devices and, hence, required a submissive and cheap workforce. Authoritarian bureaucracies emerged to control this workforce, to cajole and discipline it. Despotic structures of governance were required only because the many workers recruited for the arduous task of digging and maintaining irrigation canals and other protective works gained very little from their efforts. The ruling elite had to design a strong bureaucratic apparatus and sophisticated methods of governance to control people and, thus, to ensure maximal water use.[19] Laws had to be promulgated to provide the authority for the bureaucratic activity and for disciplinary measures. Hammurabi's Code, for example, prescribes

[18] Karl A. Wittfogel, *Oriental Despotism: A Comparative Study of Total Power* (New Haven, CT, Yale University Press, 1957).
[19] Wittfogel, *Oriental Despotism*, p. 109.

penalties for neglecting the maintenance of irrigation ditches in Mesopotamia.[20] As Wittfogel explains:

> Having access to sufficient arable land and irrigation water, the hydraulic pioneer society tends to establish statelike forms of public control. Now economic budgeting becomes one-sided and planning bold. New projects are undertaken on an increasingly large scale, and if necessary without concessions to the commoners. The men whom the government mobilized for corvee[21] service may see no reason for a further expansion of the hydraulic system; but the directing group, confident of further advantage, goes ahead nevertheless. Intelligently carried-out, the new enterprises may involve a relatively small additional expense, but they may yield a conspicuously swelling return. Such an encouraging discrepancy obviously provides a great stimulus for further governmental action.[22]

The logic of these hydraulic societies was strikingly different than the logic of the common pool resources system. These societies were based on a vertical power-relationship between the bureaucratic elite and the peasants. The elite's constant drive for further taming of nature proved to be so unsustainable that it led to its demise. While one part of the tale of these societies is a tale of despotism, the other part is therefore a tale of unsustainability, which resulted in their demise. These hydraulic societies declined and ultimately disappeared, in large part due to the salinization of fields by the sediments in the water carried by the lengthy irrigation canals.[23]

While the ascendancy of the modern state was not based on control of water or other natural resources, controlling these resources did, however, provide opportunities to use the state's central powers, whether the legislature, the bureaucracy, or the judiciary, to interfere with local common pool management structures to provide benefits to larger segments of society beyond the closely knit, but often politically weak, communities. Hence, laws were promulgated to regulate use and resolve ensuing conflicts.[24] These laws allocated property rights in water – some

[20] Laws of Hammu-Rabi, No. 55, reprinted in G. R. Driver and John C. Miles (eds.) *The Babylonian Laws: Ancient Codes and Laws of the Near East* (2 vols., Oxford, Clarendon Press, 1952–5), vol. II, p. 31.

[21] Corvee labor is temporary but recurring forced labor. Corvee workers were recruited seasonally, usually before the flooding period. On this type of recruitment, see Wittfogel, *Oriental Despotism*, note 18, at pp. 47–8.

[22] *Ibid.*, at p. 109.

[23] Clive Ponting, *A Green History of the World* (London, Sinclair-Stevenson, 1991) at pp. 69–73.

[24] On the history of domestic water law see Ludwik A. Teclaff, *The River Basin in History and Law* (The Hague, Martinus Nijhoff, 1967); Dante A. Caponera, *Principles of Water Law and Administration: National and International* (Rotterdam and Brookfield, VT,

allowing individual ownership, others vesting ownership in the state – and authorized administrative agencies and judges to allocate rights and obligations.

The ascendancy of the modern state and its use of its central powers did not ensure optimal and sustainable use of its natural resources. Indeed, the story of Sumer and Assyria was often repeated by central governments set on providing food to their mushrooming populations and eager to stride towards development. Between 1950 and 1980 there was an almost threefold increase in the total area of irrigated global agriculture. This increase augmented agricultural output by between 50 and 60 percent, but at a dear price: many of the large-scale irrigation projects proved to be heavily subsidized and unsustainable economically (when comparing the rate of return to opportunity costs of capital).[25]

The opportunity to progress through interference with nature, so tempting for the Mesopotamian rulers, has proved attractive to many, if not most, governments in the developing world. During the second half of the twentieth century many of those governments embarked on water-related mega-projects, such as high dams or extensive irrigation systems.[26] The national command and control systems they set up for the management of those projects were fraught with all of the regular maladies of central management. Losses often occurred, allocations were often skewed, and deprivations were often the result of human action rather than nature's curse.

Sometimes losses resulted from a poor understanding of hydrology or of environmental processes. It is believed that poor understanding of the harsh effects of water sedimentation and of field salinization was responsible for the demise of the great empires of Assyria and Sumer. Similarly, the popularity of high dams in the crucial span of about half

A. A. Balkema, 1992). On the development of water law in the United States see Morton J. Horwitz, *The Transformation of American Law 1780–1860* (Cambridge, MA, Harvard University Press, 1977), pp. 34–53.

[25] Elinor Ostrom, *Crafting Institutions for Self-Governing Irrigation Systems* (San Francisco, ICS Press, 1992), pp. 1–7. See also *World Development Report 1992* (*Development and the Environment*, The World Bank), p. 100: about 73 percent of water withdrawals are allotted for irrigation and are heavily subsidized. In India, irrigation accounts for 93 percent of water consumption: Salman M. A. Salman, *The Legal Framework for Water Users' Associations: A Comparative Study* (Washington, DC, World Bank, 1997), pp. 1–2.

[26] See William M. Adams, *Wasting the Rain: Rivers, People and Planning in Africa* (London, Earthscan, 1992); Fred Pearce, *The Damned: Rivers, Dams, and the Coming World Water Crisis* (London, Bodley Head, 1992); Patrick McCully, *Silenced Rivers: The Ecology and Politics of Large Dams* (London and Atlantic Highlands, NJ, Zed Books, 1996).