

Effective Governance for Groundwater Management

An Investigation of Indian and American Governance
Approaches

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ABSTRACT

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Groundwater is a common-pool resource (CPR) that is extremely susceptible to overexploitation because of its difficulty of exclusion and high subtractibility of use. As groundwater is susceptible to overexploitation, it is also susceptible to the ‘tragedy of the commons’ (TOTC). In the tragedy of the commons, Garrett Hardin proposed private-property rights or state control as governance mechanisms capable of sustaining resources. In view of that, this paper seeks to answer: what CPR governance approach(es) are more effective in the management of groundwater? The CPR governance approaches examined in this paper are: self-governing institutions through the commons, privatization governance, and state-led governance. Governance examples from India and America are investigated to shed light on this question. In answering the question, the examples demonstrate that – no one single governance approach stands out from the rest. Firstly, a commons governance approach on resource management is minimal when private-property rights exist, where landowners frequently extract unlimited volumes of groundwater. On the other hand, state-led governance has the potential to be more effective at addressing groundwater problems. Yet, many examples of “too late” state-led governance are evident or in some cases the initiatives lack the inclusion of local communities and stakeholders. As such, this paper reasserts the position that Hardin’s proposed solutions for the TOTC are not full proof, and argues that commons are not effective at managing groundwater in the face of external drivers. Overall, I conclude that a multi-level form of governance is a promising approach for effective groundwater management.

TABLE OF CONTENTS

INTRODUCTION.....	1
Prominent Governance Approaches for CPRs	3
Self-Governing Institutions through the Commons.....	3
Privatization Governance.....	3
State-Led Governance.....	4
Indian and American Governance Approaches	5
INDIA	5
<i>Self-Governing Institutions through the Commons</i>	5
<i>Privatization Governance</i>	6
<i>State-Led Governance</i>	7
AMERICA	8
<i>Self-Governing Institutions through the Commons</i>	8
<i>Privatization Governance</i>	9
<i>State-Led Governance</i>	10
<i>When Hardin’s Governance Preferences Turn Sour</i>	11
CONCLUSION.....	12
BIBLIOGRAPHY	14

INTRODUCTION

Groundwater is a common-pool resource that is extremely susceptible to overexploitation because of its difficulty of exclusion and high subtractibility of use. A common-pool resource (CPR) is a resource system in which control of access and exclusion of potential beneficiaries is difficult and costly (principle of excludability), and the exploitation by one beneficiary impacts what is available for others (principle of subtractibility) (Acheson, Berkes, Feeny, & McCay, 1990; Anderies & Janssen, 2013; Armas, et al., 2013; Ostrom, 1990; Ostrom, 2010; Theesfeld, 2007). The principle of excludability is evident in groundwater because it is a resource with hydro-geological boundaries that are difficult to define (Acheson, et al., 1990; Krishnan, Kulkarni, & Shankar, n.d.; Theesfeld, 2007), considering it is concealed underground. The principle of subtractibility is present as groundwater usage is challenging to govern and monitor (Somma, 1994), especially as a resource that is transboundary – between properties, state and even national jurisdictions.

Early estimates in the 1990s claim that of the 2.5% of global freshwater available, groundwater accounts for 30.1%. The remaining freshwater comes from surface water (1.2%), such as lakes, and a larger majority of freshwater comes from glaciers and ice caps (68.7%) (Shiklomanov, 1993). The latter of which has decreased due to global warming and the extensive melting of glaciers and ice caps experienced in recent history. In light of that, groundwater is a crucial global freshwater resource.

Several individuals and regions rely on groundwater for their consumption and sanitary needs (Armas, et al., 2013), including rural and urban populations (Ravindranath & Sharma, 2008). Groundwater is also essential for industrial and agricultural purposes (Armas, et al., 2013; Ravindranath & Sharma, 2008). Conversely, it is one of the most extracted natural resources. The extreme rate in which groundwater-taking occurs impacts the resources' water flow patterns and water volumes (Armas, et al., 2013; Somma, 1994), and outpaces the ability of the system to replenish itself. When groundwater is overdrafted, the result is desertification of the surface environment, thus threatening global food production. Likewise, overdrafting of coastal aquifers can introduce salt water and presents a contamination threat (Thompson, 2000). A rise in global temperatures along with climate change induced extreme weather events, such as drought, further impact groundwater usage and vitality (Brown, Langridge, & Rudestam, 2015). Thus, groundwater as a CPR presents both equity of use challenges and environmental issues (Somma, 1994), and accordingly needs appropriate governance systems in place for its management.

As groundwater is susceptible to overexploitation, it is also susceptible to the 'tragedy of the commons' (TOTC) (Armas, et al., 2013), a theory popularized by ecologist and philosopher Garrett Hardin in 1968. The TOTC denotes that exploitation or environmental degradation of a shared subtractable resource is inevitable due to selfish behaviour by all of its beneficiaries (Armas, et al., 2013; Hardin, 1968; Theesfeld, 2007). For that reason, Hardin

proposed private-property rights or state control to prevent the TOTC (Acheson, et al., 1990). Yet, Hardin is criticized for having mistaken commons for unrestricted open-access property rights in the TOTC (Acheson, et al., 1990; Theesfeld, 2007). Plentiful commons' scholarship demonstrates the contrary to Hardin's position on commons, and concludes how often tragedies are avoided through a commons governance approach. This includes scholarship by prominent commons scholar, Elinor Ostrom (Armas, et al., 2013; Thompson, 2000). Despite this scholarship, collective action through a commons governance approach has received pessimism from those who accept the theory (Theesfeld, 2007).

This paper adds to existing commons' scholarship, identifying if commons do avoid tragedies in the context of groundwater. This paper also contributes to the understanding on how other CPR governance approaches in the management of natural resources work. In view of that, this paper seeks to answer: what CPR governance approach(es) are more effective in the management of groundwater? Governance examples from India and America will be investigated to shed light on this question. Those governance approaches deemed 'more effective' are those that have shown more success in improving a groundwater system's situation over other approaches. The purpose of the question is not to give a concrete answer,¹ but to critically examine how governance approaches differ and distinguish what makes others more effective than others. The CPR governance approaches examined in this paper are: self-governing institutions through the commons, privatization governance, and state-led governance. The Indian and American examples will demonstrate the challenges and successes of each type of governance approach, and can help policy-makers decide which method is most appropriate in their situation, what best practices are, and what can be improved on.

¹ This is especially important considering that other case studies around the world will demonstrate different results due to contextual differences in the resource being governed or how governance approaches are developed.

Prominent Governance Approaches for CPRs

This section provides a background on some of the more prominent governance approaches for CPRs: self-governing institutions through the commons, privatization governance and state-led governance.

Self-Governing Institutions through the Commons

Contrary to Hardin's view on the TOTC, many local communities have successfully and sustainably managed CPRs through social cohesion and collective action, developing an informal self-governing institution through the commons (sometimes recognized formally by the government). The term "commons" is not limited to describing shared natural resources, like groundwater, but is often used to describe as well, the type of self-governance institutions illustrated here that manage CPRs (Fournier, 2013). Successful commons generally function by allocating rules and regulating use among beneficiaries, they utilize monitoring, and administer sanctions for violators (Acheson, et al., 1990; Brown, et al., 2015; Fournier, 2013; Theesfeld, 2007; Thompson, 2000). Self-governance (through the commons) can be government mandated, or naturally self-organized by a community, as will be apparent in subsequent sections. Modern American commons-type approaches to groundwater governance are sometimes known as 'water user associations' or 'aquifer management organizations', and other similar titles (Acheson, et al., 1990; Theesfeld, 2007).

Because local beneficiaries are typically those most directly-impacted by resource degradation (sometimes triggered from poor state regulation and neo-liberal policies) (Fournier, 2013), the commons enable bottom-up governance that includes more effectively stakeholders and communities. For that reason, self-governance institutions through the commons are "increasingly at the forefront of political demand amongst anti-capitalist movements" according to Fournier (2013, p. 434).

Typically, beneficiary rights developed in commons are neither exclusive nor transferable (Acheson, et al., 1990), except this differs in the context of groundwater where private-property rights exist. In such case, rights can be both exclusive to those who can afford land over groundwater and transferred to new property owners.

Privatization Governance

In traditional private-property rights, landowners own both the land surface and what is below (Anantha, Pathak, Suhas, & Sudi, n.d.; Theesfeld, 2007). Under privatization or private-property rights, governance of the CPRs are at the discretion of the landowner (includes individuals and corporations). In theory, this type of 'privatization governance' that I coin herein is supposed to accomplish superior resource management because landowners are able to

exclude beneficiaries (Acheson, et al., 1990; Fournier, 2013), therefore preventing selfishly driven exploitation that apparently happens in Hardin's vision of the TOTC (Thompson, 2000). Likewise, landowners are hypothetically more inclined to be sustainable with their CPR, or else bare the full cost of misuse (Acheson, et al., 1990; Thompson, 2000). However, this is not always the case. As put best by Thompson (2000), private-property rights can "reinforce a sense of entitlement to an unlimited harvest" and also "focus resource users on their individual interests rather than on total societal well being" (p. 257). This moral ideology underlies what Hardin thought would occur in commons, although clear in the aforementioned example is also applicable under privatization (Thompson, 2000). Moreover, long-term management, especially for CPRs like groundwater, is not always an incentive for landowners (Beckh, 2013), because of the perception that the government can provide water alternatives if the water-table is lowered (Thompson, 2000), or well off landowners can easily purchase other land on groundwater. Furthermore, negative consequences associated with poor unsustainable practices take time to show symptoms (Beckh, 2013); therefore, poor unsustainable practices may persist for several years, becoming a norm in the meantime.

Private-property rights, when they are recognized by the government, are sometimes a manner in which governments have used to regulate and govern CPRs (Theesfeld, 2007). Yet, it varies on the legal doctrine in which the property rights are recognized. For example, governments that recognize the principle of 'absolute ownership' have no claim to regulate groundwater use of landowners in the jurisdiction the principle applies. As such, the privatization governance and state-led governance have been split into different categories herein, but overlap between the two governance approaches will be evident in the later examples of this paper.

State-Led Governance

State-led governance, where state refers to federal, provincial/state or municipal level government, can enforce the regulation of CPRs that in theory are in the public interest (Thompson, 2000). More generally, it is often an expectation by the public that the government control groundwater (Beckh, 2013). However, in practice, state-led governance does not guarantee sustainability, especially in developing countries where governance is poorly developed and inadequate to enforce regulations (Acheson, et al., 1990). One of the largest problems with government regulation is the perceived loss of rights by landowners (Thompson, 2000), thereby generating opposition and poor endorsement by some landowners who may lobby for less stringent regulations, and have the financial capabilities to do so.

Indian and American Governance Approaches

India and America make fine models for the investigation of effective groundwater governance approaches. Both countries also have quite comparable groundwater settings. In both countries: groundwater depletion is a known problem; irrigation plays an important role in agriculture; comparable semiarid conditions are experienced by some of their states (Western American States more comparable to Indian states); the governments are democratic with similar governance and legal structures (Frasier, Nagaraj, & Sampath, 1999); along with other similarities that will become apparent in this section. The two countries present differences as well. These include: differing spread of appropriators (higher in India); technological differences (Frasier, et al., 1999); differing proportion of landowners; corruption; etc.

INDIA

India is one of the largest users of groundwater. Groundwater is particularly important in rural India, acting as a main source of drinking water with an estimated 95% of rural India relying on groundwater for consumption. Groundwater is also used intensively for irrigation (Krishnan, et al., n.d.), as well as livestock consumption and industrial needs (Devi, 1993). Approximately 20 million wells exist in India (Fujita & Nagaraj, 2009).² Not surprisingly then, roughly 60% of India's population has a high degree of groundwater vulnerability (Cullet, 2012; Krishnan, et al., n.d.). India's agricultural boom, due in part to improved water-taking technology, and the green revolution, have exacerbated the exploitation of groundwater in the country (Prahadacher, 1990; Narayanan & Singh, 2011). In sum, groundwater governance is crucial in India.

Self-Governing Institutions through the Commons

Commons, with their advantages illustrated earlier, are important in India for groundwater governance. A localized response and management of groundwater has the increased potential to account for the reality of groundwater in varying regions throughout the country, including differing water supply needs (Devi, 1993), and groundwater characteristics (Anantha, et al., n.d.) than top-down state-led governance approaches. Two successful examples of groundwater commons in India come from Kothapally, Andhra Pradesh, and Gokulpura-Govardhanpura, Rajasthan.

Kothapally is a small village of less than 300 families and is made up primary of small farmholders and landless labourers, as well as a large livestock population. Acknowledging the

² This number may not reflect the reality of the number of working wells. India has a considerably high probability of well failure, as high as 40-50% in some regions (Chaitra, et al., 2011). This means some wells are created but do not function or are unused.

amount of groundwater used for irrigation and consumption, the village developed informal rules after consulting with stakeholders in the year 2000 to conserve groundwater. They began to “restore groundwater by conserving surface water to recharge wells” and enacted a lifting water ban on check wells (harvesting structures) to ensure water was available for irrigation during the offseason. By establishing a committee, they were able to continuously govern their groundwater. As a result, groundwater recharge showed improvement, and an approximate increase in recharge of 24%. Although small in effort, the village was able to manage their groundwater sustainably using the commons approach to governance in this case (Anantha, et al., n.d.).

Gokulpura-Goverdhanpura is another village located in a drought prone area of the state. Together, farmers contributed equal shares of the cost of a holding tank to save excess water during the rainy season. Accordingly, the level of irrigation from groundwater has decreased and groundwater recharge of downstream wells has increased. By improving the state of groundwater, the village benefited from agricultural expansion possibilities as well (Anantha, et al., n.d.).

These two examples demonstrate how villages utilized collective action and self-governance to take care of their CPR. However, not all commons in India are as successful (Krishnan, et al., n.d.). This correlates with Narayanan & Singh’s (2011) statement that “water as a ‘commons’ exists more in theory than in reality” in India (p. 1). The scale of groundwater exploitation, groundwater boundaries, and external drivers all influence how effective governance at any level can be (Krishnan, et al., n.d.).

Privatization Governance

The Indian Easement Act of 1882 gave landowners absolute ownership over their land, including groundwater underneath it (Chaitra, et al., 2011; Narayanan & Singh, 2011). Not everything about private-property in the context of groundwater is “bad”. In some instances, self-governance around groundwater occurs when private-property owners, such as non-governmental organizations (NGOs) or temples, permit communities to use or create wells for community use. In these instances, private-property is used as a mechanism for commons, giving rights to a whole community rather than an individual property owner (Devi, 1993). Nonetheless, private groundwater extraction is vastly larger than community or public well extraction (Devi, 1993). Even if self-governance proves to be an optimal approach to manage groundwater, it does not account for the fact that many more landowners with enhanced technology and financial advantage are taking excessive (and unequal) shares of groundwater (Devi, 1993), hence impacting local communities’ access to safe drinking water and irrigation for small to medium sized farms. Here the challenge of groundwater subtractibility is evident (Narayanan & Singh, 2011). In this regard, groundwater governance in India is essentially controlled by landowners (Krishnan, et al., n.d.), hence the term ‘privatization governance’ comes into play.

The challenges of privatization governance are evident in the legal battle between a small village called Plachimada in Perumatty Gram Panchayat, and the multi-national company of Coca Cola. When Coca Cola Company opened a plant in the village in the year 2000, the water table quickly drained, groundwater was in shortage and concerns over contamination arose. The company faced much resistance from the village and as a result the plant's license was not renewed in 2003 by the state. Consequently, the matter appeared in High Court twice. The most recent ruling sided with Coca Cola Company. The ruling reasserted that landowners have rights over their groundwater, reinforcing that groundwater was a private resource, therefore limiting the rights of the villagers dependent on the same (shared but not recognized shared) groundwater resource. The case is to be heard at the Supreme Court, with the state fortunately in favour of the villagers' rights (Narayanan & Singh, 2011). Another example of the failure to sustain CPRs in privatization governance comes from the Upper Guadiana Basin, where uncontrolled withdrawals by property owners, like farmers, has lowered the water table (Lipponen & Van der Gun, 2010). In sum, private-property laws have led to much of the exploitation of groundwater in India.

State-Led Governance

At the federal level in India, there is no legislative control over water management, including groundwater management and ownership (Anantha, et al., n.d.), but there is the 1970 Model Bill for Groundwater Control and Regulation ('Model Bill') that was developed for adoption by Indian states.³ The Model Bill seeks to apply a commons rule of law, shifting away from the country's 1882 Easement Act that gave landowners the rule over their land (Cullet, 2012). Some Indian states have developed or are developing Groundwater Acts to varying degrees, based off of the Model Bill (Krishnan, et al., n.d.). In 2011, some 11 states and union territories enacted legislation around the Model Bill, and 18 others were in the process. The remaining states of Nagaland, Sikkim, Tripura, Arunachal Pradesh, Manipur and Punjab were less supportive of the legislation (Narayanan & Singh, 2011).

The Model Bill contains provisions that allow for the development of groundwater authorities. These authorities are authorized to establish permit systems for the expansion of sink wells for instance and authorize these authorities to create areas of concern such as overdraft areas (Narayanan & Singh, 2011). One of the biggest criticisms for the Model Bill is the lack of provisions directing representation of all stakeholders (Frasier, et al., 1999; Narayanan & Singh, 2011). This impacts adopted Model Bills' abilities to develop or replicate a commons-type governance framework.

While the Model Bill is a fine initiative by the federal government, some of the actions of other governmental departments clash with the objective of the bill. This includes the National Bank for Agricultural and Rural Development (NBARD). The NBARD's aim is to support groundwater well development through refinancing (Frasier, et al., 1999). Although the NBARD enhances India's technical expertise in groundwater monitoring, maintenance and evaluation

³ The Model Bill was postponed in 1970s and revalidated in 1992. It has had many revisions since.

(Frasier, et al., 1999), by providing financing for new wells, it intensifies India's already high volumes of groundwater wells. Even with parameters in place to restrict new well development in stressed groundwater zones or to mitigate groundwater pressures through well-separation requirements, it has not improved India's groundwater exploitation (Anantha, et al., n.d.; Lipponen & Van der Gun, 2010). Similarly, energy subsidies throughout the country has promoted and made well pumping more affordable and attractive, multiplying well development. According to Lipponen & Van der Gun (2010), north western states such as Haryana, Punjab, Rajasthan and Gujarat, and southern states such as Andhra Pradesh, Karnataka and Tamil Nadu have experienced rising groundwater exploitation because of subsidized energy. Additionally, illegal well development still exists, and is difficult to monitor and capture (Lipponen & Van der Gun, 2010).

All in all, the Model Bill, although adopted by many Indian states, has not had clear effectiveness (Fujita & Nagaraj, 2009; Narayanan & Singh, 2011). This is clear as India still has a significant groundwater exploitation problem. Anantha, et al. (n.d.) depict some main reasons for the lack of success in groundwater legislation by governments: (1) those that are created apply to vast regions with varying groundwater characteristics; (2) legislation does not reflect local problems or interests of communities thus generating opposition; (3) a consistent monitoring mechanism for all the millions of wells in India is near impossible, some of which are inaccessible or illegal (see also Narayanan & Singh, 2011); (4) there is both a real and perceived threat of mobilization against legislation by farmers. Moreover, because of absolute ownership private-property rights, it appears that groundwater legislation in India is limited to regulating *where* new wells can be located, and not regulating the *extent* that groundwater throughout the country can be taken.

AMERICA

Groundwater use in America is growing, accounts for approximately 25% of American water needs, and is exceedingly used more frequently than surface water in over six states. Additionally, the rate of groundwater withdrawals in America is roughly one quarter more than the national recharge rate (Thompson, 2000). Like in the case of India, groundwater governance in America is a necessity.

Self-Governing Institutions through the Commons

Self-governance of groundwater in America is evident through water use associations that often rely on education to generate local conservation efforts (Somma, 1994). States such as Nebraska, Kansas and Colorado grant authority of local districts or associations for groundwater management (Heikkila, 2001; Somma, 1994). Those local districts that fair better are generally those not restricted by financial limitations (Stephenson, 1996). But self-governance through the traditional commons is less visible in America. Nonetheless, it can be replicated and authorized by local jurisdictions, legislation and courts.

Americanized commons are apparent in Southern California. Southern California has decentralized groundwater governance, relying mostly on local groundwater management institutions for governance (Heikkila, 2001; Theesfeld, 2007). However, ownership of groundwater by landowners still exists under the correlative rights doctrine (Hampton, 1989). As such, two different things occur in Southern California: landowners continue to utilize groundwater at any rate they please, or acknowledgement of resource depletion brings beneficiaries together to develop self-governing systems, similar to commons, that support sustainable resource use (Brown, et al., 2015). The former will be demonstrated in an example shortly.

Privatization Governance

Like in India, the doctrine of absolute ownership exists in America (Gardner, Moore, & Walker, 1997), but varies by state.⁴ In American states that apply the ‘reasonable use’ doctrine, the idea that landowners have rights over what is under their land surface apply, except states can enact caps to enforce what constitutes as reasonable use. Other legal doctrines of property rights include ‘correlative rights’ and ‘prior appropriation’. The former imposes stock quotas based on landowner’s share of land over an aquifer to enforce reasonable use in the context of other beneficiaries of the resource (Brown, et al., 2015; Gardner, et al., 1997). States such as Nebraska and Oklahoma apply the correlative rights doctrine. The latter, prior appropriation, differs by setting annual limits based on a landowner’s average use of water, diverging from the correlative rights that focus on the size of land. This doctrine includes several states such as Colorado, Idaho, Kansas, Montana, and much more (Gardner, et al., 1997).

Texas is one of few states in America still applying the absolute ownership doctrine (Gardner, et al., 1997), and its groundwater situation reflects that. With no licensing or permits for well drilling, nor well-spacing requirements, (Somma, 1994), groundwater management essentially becomes privatization governance. Consider too the implications in the context that 95% of land in Texas is privately owned (Kreuter & Wagner, 2004). The Texas portion of the Ogallala aquifer for example, at the current pace of extraction, is anticipated to be completely depleted within the 21st century. By 1990, the aquifer dropped nearly 25% from early 20th century levels. The Ogallala aquifer is America’s biggest, spanning seven states, irrigating 20% of American fields (Thompson, 2000). It then comes to no surprise that Texas, particularly West Texas, is considered an example of the TOTC (Somma, 1994), although this is clearly not a commons governance situation, and thus demonstrates that Hardin’s push for privatization does not reduce selfish exploitation of CPRs. In response to the Ogallala’s aquifer situation, the state has attempted, in the past, to promote regional agencies, highlighting the benefits of local responses to resource management. However, agencies and local collective action have failed to organize (Somma, 1994). It is debatable whether local governance at the extent of groundwater depletion in Texas would even make any meaningful impact and whether instead more stringent regulations by the state, with stakeholder consultation, would be more effective.

⁴ Whereas in India absolute ownership is applicable throughout the country because of the Indian Easement Act.

State-Led Governance

State-led governance of groundwater in America has historically taken place “too late”, which may be due in part to poor monitoring or time-lag for visible groundwater negative effects, and therefore state-led governance remains relatively ineffective (Thompson, 2000). When governance is enacted, it is mostly categorized by permits that specify maximum annual use in conjunction with monitoring to fine and shut-off excessive use (Gardner, et al., 1997; Somma, 1994).

Some states are more restrictive over their groundwater governance than others. For instance, in response for years of excessive groundwater use that had led to overdrafting, the state of Arizona developed the Arizona Groundwater Management Act in 1980 (Somma, 1994; Thompson, 2000), replacing the reasonable use doctrine with correlative rights (Gardner, et al., 1997). A critique of this governance approach, although considered one of the more stringent in America, is that it gave 45 years (from 1980 to 2025) for Arizona to reduce withdrawals rates to recharge rates (Thompson, 2000). It can be expected within the time span that water demands may have increased with population growth, as well as technological advances. In this example, state-led governance was not very timely in groundwater management.

In a more positive example, state-led governance can institute local governance, forming an American commons approach, as is apparent in the state of Nebraska. Although Nebraska applies the correlative rights doctrine, it also enables the establishment of a local district to help manage the Ogallala region’s groundwater through the Upper Republican Nature Resource District (Stephenson, 1996). The district is comprised of locally elected directors, and full-time staff, and has the authority to govern groundwater use and access. The district works with the state’s Department of Water Resources to create groundwater control areas (Stephenson, 1996). Accordingly, it is a multi-level governance institution. The effectiveness of this governance approach to some is a positive solution for governing the region’s groundwater resources, to others it is nothing more than a “club of irrigators” that maintain the status quo (Stephenson, 1996, p. 762). Because directors have largely been made up of farmers, they have generally supported private-property rights which are not entirely supportive of sustainable groundwater management. It has also influenced the direction of the groundwater management mechanisms. For instance, instead of establishing limits on access which the district is authorized to do so, the district predominantly enforces well-spacing requirements. This mechanism appears fairer in the eyes of the district for those farmers that have not contributed to the depletion problem. Additionally, science and technological improvements remain high on the agenda for directors as mechanisms for dealing with the region’s groundwater usage.

Despite the bias agenda of local governance institutions, because these institutions act on the local level, they are typically endorsed by local farmers (irrigators) and generate more support and trust than what a full scaled top-down governance approach would have entailed (Stephenson, 1996; Thompson, 2000). In general, the Nebraska Nature Resource District has had some success and has altered to some extent the rate of groundwater withdrawals through

expanding what constitutes as critical areas with strict groundwater requirements, expanding well-spacing requirements, and instituting monitoring and enforcement (Stephenson, 1996).

When Hardin's Governance Preferences Turn Sour

The San Luis Valley in the American state of Colorado presents an interesting case of collective action in groundwater management arising from resistance to state-led governance. However, in this case, local collective action did not mirror a commons approach, but instead it became what Hardin was worried about: selfish exploitation by local beneficiaries.

In the 1950s, the valley had experienced their most severe drought yet. The drought was felt largely by the farmers who lost productivity and even farms (approximately one third of farms in the decade). In response, farmers did opposite of what villagers did in the Indian commons example. Instead of working together to conserve water (in holding tanks for instance), the more "affordable" short-term option was for individual farmers to build new wells deep into the aquifer to compensate for the reduced surface water levels. Accordingly, the number of wells increased more than 3 times over. Like in India, affordable electricity further encouraged well development, because it led to more affordable well pumping. Of course, poor state-led governance of groundwater also perpetuated the increase in groundwater use. Access to groundwater proved optimal for farmers who were able to extend their growing season. New technology soon followed and increased water-taking capabilities (Andersson, Cody, Cox, & Smith, 2015).

In sum, the initial response to the drop in surface water due to the drought had led to a privatization governance 'solution' that entailed groundwater exploitation at a faster rate than recharge. Following such, the state responded by establishing the Rio Grande Water Conservation District to protect and enhance Colorado's Rio Grande River Basin (Andersson, et al., 2015; Rio Grande Water Conservation District, n.d.). The state also shifted the property rights to the prior appropriation doctrine through its Water Rights Administration and Determination Act in 1969 (Andersson, et al., 2015). This was generally perceived as a loss for landowners in their shared interests to withdrawal unlimited groundwater. They proceeded to sue the state in 1975. The court verdict protected existing wells from the act's regulations. As such, no effort at all was put in place to reduce groundwater exploitation, except for excluding rights for beneficiaries building new wells (Andersson, et al., 2015).

Since such time, the valley has experienced other droughts and as a result a multi-level governance of sorts has emerged. But this example illustrates clearly the problem with privatization governance. Privatization governance can be a new means to generate a new form of commons, however shared interests may not be those most optimal for the sustainability of CPR. Further, state-led governance in this case was not able to amend the groundwater issue, instead it was fought with opposition and efforts to regulate groundwater were limited to new wells.

CONCLUSION

In Acheson, et al. (1990), it was concluded that private, state, and communal property are all potentially viable resource management options and I do not disagree. This paper has demonstrated how successes and challenges occur in all forms of government approaches as well. As Acheson, et al. (1990) state, the degree of management success relies on “complex interactions among the characteristics of the resource, the property-rights regime and other institutional arrangements, and the socio-economic environment” (p. 12). The examples within this paper demonstrate the exact same conclusion. The fact that this paper specifically examined the CPR of groundwater intensifies these complexities (the subtractibility and excludability problems of groundwater).

In answering the question, what CPR governance approach(es) are more effective in the management of groundwater, the examples in this paper demonstrate that – no one single governance approach stands out from the rest. Self-governing institutions through the commons were successful in the villages of Kothapally and Gokulpura-Govardhanpura India, but these successes are minimal when we consider that absolute ownership in India prevents many commons from establishing. For a groundwater problem as large scale as that in India and America, a commons approach does not appear effective when private-property rights exist. On the other hand, state-led governance has the potential to be more effective at addressing the extent of Indian and American groundwater problems. Yet, many examples of “too late” state-led governance are evident when state-led governance must be timely and responsive.

The Model Bill in India is a good start for state-led governance, but has to include local community and stakeholder consultation *and* participation. This is absolutely necessary to ensure regulations are localized to regional environmental conditions and groundwater characteristics. Local participation would generate greater endorsement of state-led governance and could work with the state to coordinate monitoring efforts as well. This has been done to some extent in American states like Southern California. But again, private-property rights and hence privatization governance can really influence the success of state and local-led governance. This was evident in the West Texas and San Luis Valley examples. Further, while landowners can donate or invite groups to develop mock-commons on their land, like NGOs or temples, private groundwater exploitation is too large of a problem to justify that privatization governance could be used in collaboration with local-led governance. Accordingly, states need to reevaluate private-property rights like absolute ownership.

States in general need to be much stricter in their regulations and efforts. The threat of mobilization from landowners should not deter the government from stringent groundwater-taking caps. Otherwise they risk groundwater overdrafting that has numerous environmental and social implications that are even harder to deal with and are more costly in the long run. This includes impacts to food production, and contamination of water sources. This is the same argument for climate change mitigation. By fighting climate change now, states avoid paying for the negative externalities in the future.

It is important to emphasize here that this paper has reasserted the position that Hardin's proposed solutions for the TOTC are not full proof. Privatization especially has proven to incentivize exploitation, more so than commons. In a sense, we saw in this paper how privatization and private-property rights end up acting a lot like open-access. So long as one owns land over groundwater, they may do to it as they please. And often, sustainability considerations are overshadowed by short-term profits.

With these considerations in mind, asking the question again, what CPR governance approach(es) are more effective in the management of groundwater, I conclude that a multi-level form of governance is most effective and promising. Take the Nebraska example, where the state works with local districts to manage groundwater. Of course, we need to be wary of the interests of elected officials for local districts. The governance approach, regardless of the level, needs to ensure a diverse set of interests are addressed – economic, social, *and* environmental perspectives, to avoid creating “clubs of irrigators”. For optimal success of a multi-level governance approach to groundwater management, Elinor Ostrom's institutional design principles should be considered.

To end, future research on the topic presented in this paper should investigate a market-based governance approach to groundwater management. A system like a water market is one such approach to investigate; perhaps providing a more effective governance approach than those explored in this paper.

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