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Community institutions in water governance for sustainable livelihoods

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Abstract: *Successful community institutions in the global South, which are contributing to livelihoods' improvement while conserving water and other natural resources, can sustainably build the resilience that policy makers at different tiers are seeking. This article assesses different models of community institutions in Nepal in governing water resources from various lenses, based on Ostrom's and others' design principles, including bricolage. Illustrated by three empirical cases, it analyses key features of community institutions in integrated water governance, their contributions to health, nutrition, food security, and environmental conservation, and ways for empowering these institutions as viable and sustainable solutions to address various livelihood challenges. However, inequalities along gender, caste, and ethnicity lines persist. We argue that the recently established local governments under the federal system in Nepal provide new opportunities for gender and social inclusion.*

Keywords: community institutions, water, federalism, gender, livelihood, Nepal

WATER, FORESTS, AND OTHER NATURAL resources in the global South have traditionally been managed by local communities through community-based institutions and this trend continues. In South India, ancient community institutions such as the *Kudimaramathu* harvest rainfall and runoff in tanks for later use. *Subak* systems for paddy irrigation in Bali, Indonesia since the 9th century are managed by temple communities. All across the Himalayas, from Swat Valley of Pakistan to India, Nepal, and Bhutan, communities have harnessed thousands of streams that enable sustained agricultural production and other water uses. Formal or informal Water Users' Associations (WUAs) represent the community organization at local level. Similar examples of local, community-based water governance are found in Yemen, Philippines, Sri Lanka, Japan, Laos,

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Vietnam (Kajisa, 2019), Latin America (Boelens, 2008), and Africa (van Koppen et al., 2007).

In rural Nepal, community institutions for water, irrigation, and forest resources management also have a long tradition (Riccardi, 1977; Pradhan, 1989; Ostrom et al., 2011). These community institutions are dynamic, responding to changing needs or aspirations and new technical opportunities. There are over 16,000 units of farmer-managed irrigation systems and several thousands of Forest User Groups (FUGs) in Nepal. Such dynamism is also reflected in the rapid expansion of farmer-led irrigation development across the globe (Giordano et al., 2012). Water governance brings life to rural communities who use water for drinking and other domestic uses, livestock, aquaculture, fisheries, forestry, cropping, crafts, enterprises, and cultural uses. However, gender and social inequities persist in Nepal and elsewhere.

Externally initiated development interventions encounter these local, context-specific, and socially embedded institutions (Merrey and Cook, 2012). This encounter produces a prominent gap between external institutional designs and reality, for example, in donor- and state-initiated water supplies for domestic uses (Cleaver, 2002, 2012). Local community institutions are also to interact with Nepal's Constitution, 2015 and new local governments under federalism. One centralized governing regulation of these community organizations would be detrimental for the operation of the community institutions (Merrey and Cook, 2012). Instead, facilitated institutional bricolage capabilities may integrate both aspects (Haapala et al., 2016; Whaley et al., 2021). However, in this encounter, local elites may capture the new spaces. On the other hand, targeted efforts to reach women and the marginalized may redress inequities. The Constitution and federalism aim at such redress. This article further examines community institutions and this encounter.

Methodology and structure

The article starts with a conceptualization of community institutions for natural resources management (NRM) in general, based on literature by Ostrom and others in the next section. This will be followed by its application to community water institutions and gender and social dimensions. We selected three diverse empirical studies from Nepal to test the robustness of local community institutions for integrated water management. The cases, which focus on forest management, irrigation, and multiple water use systems (MUS), especially highlight how local water management is linked to the management of land and forest resources and delivers a wide range of livelihood benefits. Holistic, community-led support processes by state and non-state actors that move beyond specialist administrative and research silos can mobilize these strengths of community institutions in polycentric governance. The case studies also point out exclusion and inequity challenges that persist in the community-led NRM institutions and ways to address these through policy and capacity building of the newly established local governments. The conclusion synthesizes the lessons offered by the evidence presented.

Conceptualizing community institutions

Community institutions, common property, livelihoods, and polycentric governance

Community-based water institutions are shaped by general attributes of community institutions. The term 'institution' in the development literature is referred to in multiple, often confusing ways, implying 1) specific organization in a particular country, such as the Department of Irrigation, 2) human relationships in a society, such as family structure (institution of the family), and 3) rules that individuals use which shape specific relationships with others (Ostrom, 1992: 19). This article follows Ostrom who used the term 'institution' in the third sense and defined it as 'a set of locally-constructed norms to organize societal activities that produce outcomes affecting each individual in the society and potentially others' (Ostrom, 1990: 19). These combined narratives imply that *community institutions are self-organized social entities that take care of local people's needs and are governed by the rules/norms evolved over a period of time*.

We visualize community institutions related to managing natural common property resources (CPR) as originating in, and evolving through, community's own initiatives, efforts, and leadership, rather than being imposed by external agencies. There are examples of community-initiated institutions seeking external support in the form of technical knowledge or financial resources (Cleaver, 2002). However, the initiatives and decisions would be made by the members of the community. In community institutions, transparent leadership, which is key for success (Hutchings et al., 2015), emerges from among the members. Leaders take up the responsibility to bring people together and organize activities for the better utilization of their resources. Most community members extend support to such leaders because they understand that their shared roles lead to sustainable livelihood benefits. Leadership has more of a voluntary nature and creates social and institutional capital. Leaders are a symbol of change and technical and managerial innovation in the community (Martiskainen, 2016). Such leadership is vital to catalyse the required collective action over time, ensuring that members comply with their well-defined obligations for operation and maintenance of the system and contribute cash or labour, and ensure that conflicts are solved.

However, communities are heterogeneous entities with diverse interests, needs, and abilities to exercise their power over rule-making in NRM. The decision-making process tends to prevent some groups (e.g. women, poor, and marginalized) from having a voice (Zwarteveen and Meinzen-Dick, 2001; Khadka et al., 2014; Shrestha et al., 2020). An interplay of power relations based on caste, ethnicity, and gender within a community institution influences access to water and natural resources and decision-making (Panta and Resurrección, 2014; Gautam et al., 2018). Nevertheless, as for self-organized community institutions in general, the fundamental feature of CPR is whether and how they can promote and maintain basic sustainable livelihoods. In terms of the five assets for sustainable livelihoods (physical, natural, financial, human, social) (DFID, 1999), community institutions mobilize social, human, and financial capitals to (re-)construct the technical capitals that enable

the community to transform its physical land, water, and forest capitals into multi-faceted livelihood benefits. We concur with Chambers and Conway (1991: 6), who consider a sustainable livelihood as one that 'can cope with and recover from shocks/stresses and maintain/enhance its current and future capability and assets without undermining the natural resources base'. In order to sustain, institutions must embody the capacity to adapt to the changing terrain while retaining their relevance and effective management. Then, this raises the question of whether and how the community institutions for managing natural resources, including water, can cope with and recover from shocks, for example, an earthquake, and strengthen capability and assets for now and the future.

Ostrom (1994) recounts 'robust' institutions that have existed and successfully managed CPR for hundreds of years. This success is attributed to the autonomy of the users to create their own rules and attain freedom to revise them over time. After analysing diverse models of CPR management across various settings, Ostrom (1990) proposed the following set of eight design principles to characterize institutional attributes required for governing CPR sustainably and equitably.

1. Clearly defined boundaries of the resource and member right holders.
2. Proportional benefits and costs; everyone gives and gets in a fair manner adapted to local conditions.
3. Collective choice arrangements; individuals affected by a decision are part of the decision-making.
4. Monitoring by, and accountable to members.
5. Graduated sanctions of rule-violations, first gentle with a capacity to escalate as necessary.
6. Conflict resolution mechanisms that are local, low-cost, quick, and recognized as fair.
7. Recognition of members' rights to organize, without being challenged by state/outsiders.
8. Nested enterprise, in which appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers (polycentric).

Ostrom's design principles represent a milestone in determining the key factors that contribute to making a community institution 'robust', particularly for governing CPR. Subsequent studies and emerging theories by other scholars have largely confirmed their efficacy and endorsed the applicability of principles while suggesting additional ones (Cox et al., 2010; Cleaver 2002, 2012; Haapala et al., 2016).

The last design principle, polycentric governance, implies many overlapping areas of authority and responsibility as opposed to a monolithic order of organization (Ostrom, 2005; Carlisle and Gruby, 2019). These centres exist from community groups up to national government. The term 'nested' institutions recognizes that there are no dictatorial entities, neither at community level nor at politically constructed higher levels. As proposed later in critical institutionalism, the processes at stake both within a centre and at the interface between centres can be

analysed as 'bricolage' (Cleaver, 2012; Merrey and Cook, 2012). Bricolage 'consists of the adaptive processes by which people imbue configurations of rules, traditions, norms, and relationships with meaning and authority. In so doing they modify old arrangements and invent new ones, but innovations are always linked authoritatively to acceptable ways of doing things' (Cleaver, 2012: 34).

At the interface between communities and external agencies, polycentric governance can nurture and sustain the self-governing capabilities of the community. Here, external actors can allow the community organizations to be innovative and develop more gender-inclusive and equitable membership and leadership within the community. However, top-down blueprints based on social engineering to 'craft' such institutions by external agencies promoting new infrastructure or other innovations can even erode existing social capital. Instead, in a spirit of facilitated bricolage (Haapala et al., 2016), social capital can become more inclusive and strengthen self-governing CPR management capabilities. These broad, general features also apply to water governance.

Community water management institutions

Since time immemorial and across the world, community institutions have enabled the harvesting and storing of precipitation, springs, surface water bodies, streams, and groundwater to adapt to seasonal variability or droughts. Water from multiple sources is stored and led to homes, fields, grazing areas, fishing ponds, and elsewhere to accommodate agriculture-based livelihoods. Individuals or groups of community members or an entire community organized into a WUA invest in infrastructure and 'create hydraulic property rights' to the waters stored and conveyed. Rights are confirmed by contributing to maintenance (Coward, 1986). Customarily, water, land, and forest products are perceived as community property. Normative frameworks in farmer-managed irrigation schemes, for example, are agreed by the irrigators and supported by customary law, protecting the community water rights. These norms regulate equitable water distribution based on proportionate shares; minimize the occurrence of conflict; and mobilize human resources for irrigation maintenance as an obligation of irrigators that confirms their entitlements (Pradhan, 1989). When top-down government projects seek to assist these schemes, they risk ignoring these water sharing arrangements. For example, in order to divert water from a stream by gravity into the irrigation scheme, farmers construct a headwork weir, which needs to be recurrently repaired. Although head-enders may be in an advantageous position to access irrigation water, they often depend on labour contributions of the tail-enders. Under such conditions, water distribution and benefit – sharing among head-enders and tail-enders is still equitable. However, when external agencies impose the construction of a concrete river diversion headwork, no labour contributions of the tail-enders for headwork repair are required any more. Tail-enders have to engage in more complex, asymmetric negotiations with the head-enders for their due share of water (Ostrom and Gardner, 1993).

External water supply projects for domestic uses often introduce new infrastructure, assuming that newly created 'water committees' will take charge of

operation and maintenance (Chowns, 2015). However, instead, complex institutional bricolage processes emerge in this encounter (Cleaver and Toner, 2006; Whaley et al., 2019). Both in Nepal and elsewhere in the rural South, the functionality of water supply schemes is often low. Hutchings et al. (2015), in analysing 174 relatively successful community-managed systems across the South, identified the importance of post-construction, external financial support, and technical and managerial advice, besides strong leadership and transparency. The affordability of maintenance and repair of hand pumps appeared the main technical condition in Africa (Whaley et al., 2019). In navigating these complex, diverse interfaces between communities and support agencies, institutional bricolage processes and avoidance of parallel project-specific structures are best facilitated by providing locally legitimate, inspiring spaces to local agencies for continued learning, adaptation, and innovations. This should address unequal distribution of power and responsibilities defined by gender and social status in water decision-making (Haapala et al., 2016), as discussed next.

Gender and socially inclusive community water management institutions in the federal system

There have been significant changes in the socio-economic and political systems of Nepal over the past three decades. Gender roles in managing and provisioning water and natural resources for rural livelihoods are changing (Gartaula et al., 2010; Sunam et al., 2021). Large numbers of men migrate from Nepal to other countries in search of jobs and education. More women are taking up roles in local irrigation groups (Meinzen-Dick et al., 2021).

Furthermore, the restructuring from the unitary state to the federal system in Nepal redefined power relationships in water and natural resources governance at centre, provincial, and local levels (Khadka et al., 2021). Federalism has created new opportunities for gender and socially inclusive NRM decision-making and planning in local governments (Khadka et al., 2021). The Constitution of Nepal 2015 ensures improved representation of women and underrepresented groups in all state bodies. The federal system prescribes at least one-third women's representation in federal and provincial assemblies, and 40 per cent of lawmakers in each local government. This is definitely a significant political change. This representation is a significant change in the governance system of Nepal (Uehara, 2019). However, there is a need for enabling women and marginalized to meaningfully engage in decision-making and leadership functions (Khadka et al., n.d.).

Local governments have some power and responsibilities in development, public services, and NRM. Local governments can facilitate equitable and sustainable NRM and empower women and marginalized groups in locally managed natural resources systems. However, understanding, capacity, and/or willingness to implement gender and socially inclusive water governance are limited (White and Haapala, 2018). A concerted effort is required to advance the agency of women and men elected representatives in inclusive planning and decision-making approaches (Khadka et al., 2021; van Koppen et al., 2022).

Water and rural livelihoods in decentralized integrated development

To highlight the aforementioned conceptualizations of robust community-initiated institutions for integrated water governance, we have selected three diverse empirical studies, on the basis of the authors' intimate experiences working with these community-initiated institutions. The cases show, in particular, how community CPR institutions manage their land, water, and other resources in an integrated manner enabling multi-faceted livelihood benefits and resilience to shocks. More holistic, bottom-up, and community-led processes can build on communities' integrated resource management (Clement et al., 2019).

Forest collectives for water access and livelihoods

Eklepakha villagers, consisting of 452 households in Dolakha district, the Central Hill region of Nepal, have practised a forest collective as an integrated land-forest-water CPR management regime since the 1980s. They started to conserve 183 hectares of government-owned degraded forest by forming a Forest User Group (FUG) after an open – access forest system led to accelerated degradation of forests and the community started to experience a shortage of firewood, timber, fodder, and leaf-litter – the key sources of rural livelihoods. The Government of Nepal legalized Eklepakha FUG after enacting forest legislation in the early 1990s to manage forests under community rules and regulations (Yates, 2011). The initiative for FUG formation was taken by the members of the group so that they can both conserve forest and share benefits of forest products among the member households.

The group has its own rules and regulations ('constitution') to manage and improve forest productivity, conserve water sources, protect landslide-prone areas, harvest forest resources, and share the benefits among the members. Members meet once a year for the general assembly to review and approve annual programmes related to forest management, including water source conservation, community development, and operating, administrative, and financial activities. The assembly also has the power to select the committee every three years and to decide and enforce penalties for violation of the community rules. The group has an eleven-member executive committee, with four women, that guides planning and implementation of forest and water resources management activities. The committee meets monthly to implement and oversee the decisions made by the general assembly.

Each member household contributes labour for tree planting in the barren patches in their forests, including around water sources. They are slowly replacing the pine forest planted earlier with broadleaved trees. They fenced seven water sources for their protection and constructed a separate water pond for animals in their grazing area. The group earns around US$3,300–4,100 annually from selling timber/non-timber forest products and from fines, 30 per cent of which is spent on community development activities, such as the water supply, or schools. FUGs preserve, manage, and distribute forest resources to their members as needed. During the 2015 earthquake, for example, the local FUG in Dolakha provided

timber to build or rehabilitate homes of the members, helping single women and people with disability in particular.

Although the FUG operates according to its rules and forest operation plan, not all users are actively involved in decision-making. The influence of women, poor, and marginalized groups in planning and decision-making of forest and water resources management activities is negligible. Yet, the FUG has the community's trust and undertakes collective activities for mutual benefits. The sustainable livelihood impacts generated include the conservation/restoration of springs; piped water supply for multiple uses; construction of toilet facilities; and making forest products available to those who are in need. The water supply facilities have reduced the incidence of water-borne disease, saved the time of women and girls in providing water for domestic uses, and enabled homestead irrigation.

Community institutions bringing life to an irrigation system

The earthquake of April 2015 caused heavy damage in the Dhap village in Sindhupalchowk district and rendered people homeless. Disaster brought not only physical damage but also social and psychological uncertainty among the earthquake-affected people. Irrigation channels of the village irrigation system were destroyed. As a temporary measure, tents, clothes, and food were distributed by government and non-governmental organizations as a gesture of humanity. This short-term support was appreciated; however, two unanswered questions were: *How can long-term food security be ensured? How can the village and community infrastructures be rebuilt*?

April is when farmers need to prepare for monsoon paddy cultivation in the villages of Nepal. Unfortunately, the village irrigation systems were damaged by the earthquake. Looking at the five assets for sustainable livelihoods, because of the damage to physical infrastructure (irrigation channel), natural resources like the water supply were disturbed in the farm lands. This affected villagers' livelihoods, and as a result, financial capital for further activities was reduced. However, human capital (except a few deaths) and social capital were not greatly affected. The community spirit was still intact. For timely cultivation of paddy, farmers were willing to rebuild the village irrigation systems by themselves provided some external financial resources were made available to them.

For many years the community had its own community institutions, which included women, for irrigation management. External funds from an NGO for repair of the village irrigation system after the earthquake were made available to the farmers' WUA. Accountability and transparency were strictly maintained throughout the repair work. Local leadership, technology, materials, and skills were used and managed from within the community. In a short period of time, they repaired the channel and brought irrigation water to the farmers' fields. They found an acceptable arrangement for the equitable distribution of paddy seed donated by an external agency. Finally, farmers could cultivate the paddy fields and harvest paddy which provided food security and enhanced confidence among the villagers. However, the farmers at the tail end did not

benefit from the irrigation rehabilitation because their farms are located in a landslide-prone area.

Transforming water committees into multi-functional utilities

When communities design infrastructure, this is multi-purpose. Public water supply systems are in reality used for productive purposes as well, even though they are designed for domestic uses only (GC et al., 2019). Recognizing these local practices, International Development Enterprises (iDE-Nepal) started to encourage and plan for multi-purpose infrastructure. In 2004, iDE helped to build a multiple-use water system (MUS) for improved access to water for domestic use and irrigation of vegetables in Annapurna-6, Lumle, Kaski. A MUS committee was formed by water users to oversee its operation and management. In 2005, the users also formed a Marketing and Planning Committee (MPC) to support and coordinate the marketing of vegetables produced by the users. The neighbouring communities who witnessed these developments became interested in MUS and contacted the NGO's staff. Seven other MUS were developed in neighbouring localities after seeing the benefit of the first MUS programme. iDE-Nepal played a catalyst role in securing financial support from the government line-agencies. Subsequently, MUS users organized themselves into production groups and received production and marketing training. These eight MUS groups consist of about 213 households (958 people) in the Lumle community.

Members contributed mostly in – kind during the construction, and later they contributed operation and maintenance fees. iDE provided initial financial support and technical advice. Each MUS is managed by a MUS committee comprising nine–ten office-bearers with at least one woman in the leadership role. Members of the water committee are elected by voice-vote and govern their MUS by collective decisions. The users have formed one advisory committee from among themselves to guide these individual groups. The MPC became a common group for all eight MUS systems. When vegetable production increased, the MPCs created a collection centre in the locality in 2010 and engaged in bulk sale in the market, which was supported by iDE, local government, and other local partners. We found that women played an important role both in water provision and management and agricultural production in the community. They participated in trainings, meetings, and discussions, from which they derived more self-confidence in water management and improved production. Women in the village also gained confidence from dealing with people from outside their village. Moreover, male out-migration created a new opportunity for family members to redefine their roles in both households and the community. Project planners (iDE and its partners) also facilitated women's involvement in the entire process of planning and implementation of MUS activities. As a result, women's involvement in water management and decision-making processes has been effective and well established, regardless of their caste and ethnicity.

These developments transformed the role of the MUS committees from a focus on water into multi-functional committees. They received technical, agriculture, and other services from the local government. The coordinated effort of these

institutions enabled the MUS committees to mobilize further support and assistance from outside agencies, to settle disputes among the water users, and to undertake other production and marketing-related activities within their community. In collaboration with iDE, they learned to use micro-irrigation technology and low-tech greenhouses in conjunction with MUS and this became a good model for improving water resource planning, saving water, increasing agricultural returns, and improving livelihoods. As a result, volumes of production became sufficiently large to make vegetable collection centres profitable and sustainable. The committees could plan their production volumes together with the collection centre officials from their section and production area and engage with them to ensure the vegetable prices are fair and consistent with the district markets. These self-evolved roles and norms emerged and developed over the years in response to improvements in water-based production activities and livelihoods, continuous improvements in knowledge and capacity of MUS committees, and the collaborative efforts of the groups. Such local practices and emerged norms and strategies not only sustained in the community but are gradually expanding in other areas as well.

Conclusions

Community-initiated institutions have demonstrated their role in water governance for sustainable livelihood across many countries in the global South since long. They create opportunities for collective action and mutual help. They mobilize and manage resources on a self-directed and self-sustaining basis. Community institutions not only promote creativity and innovations as demonstrated in the case studies presented earlier, but also make water a community property, ensuring water rights among the members. These community institutions are local context-specific, socially embedded, dynamic, and responding to changing needs, aspirations, or opportunities.

When development interventions encounter such institutions in polycentric governance, there can be prominent gaps between institutional design and reality (Cleaver, 2002). However, in community-led processes, external support agencies and private service providers can mobilize communities' social and institutional capitals while assisting communities with financial and technical assets in nested enterprises. The effort of institutional development for the water and forest systems in this article demonstrated how sound institutional design can facilitate local bricolage capabilities for sustainable operation of local institutions (Haapala et al., 2016; GC, 2020). Yet feminist studies of forest and water collectives note that poor and historically excluded social groups lack water access from community-managed water supply due to financial and social constraints (Shrestha et al., 2020)

The three case studies on the role of community-led institutions in water governance for sustainable livelihoods in Nepal confirm earlier research that has demonstrated effective roles of community institutions in natural resources management. These include a polycentric approach, promoting social capital for collective action for mutual benefit, and robust institutional features. In addition, bottom-up innovation of technology is vital for promoting users' ownership and

adaptive capacity. Their interactions and relationships with external actors helping as catalysts also evolve along with the changes in socio-economic and environmental contexts in which they operate. Integrated support enables institutions to expand their scope of activities and to adopt multiple functions to serve the range of water-related needs of the community.

Further, the case studies show how water, forests, and land management and conservation are intertwined and how support agencies can holistically build on communities' integrated governance for multiple livelihood benefits. This overcomes the tendency of state and non-state support agencies and academia to operate in silos and specialisms, separating water management from forestry or land management; domestic uses from irrigation and from livestock drinking; water infrastructure from energy provision; irrigation from the other inputs and the markets needed for food security and income; and resource development from conservation. Instead of expecting communities to merely conserve forests, the creation of FUGs empowered the communities to rejuvenate the source and implement their local priorities. Also, MUS ensures the priority for domestic uses for the family's health. This alleviates especially women's and girls' chores. Moreover, many households also use these supplies for irrigation of crops and vegetables at homesteads and adjacent lands, and for livestock. Improved market-oriented agriculture generates more income. Multi-purpose infrastructure and agricultural training and market development simultaneously improve nutrition, food security, and income in virtual circles out of poverty (GC et al., 2019).

Nonetheless, the case studies also present realities that water and forest collectives are not homogeneous in terms of members and the degree of social power relations. Power relations among members based on their socio-economic and gender backgrounds also influence the inclusion and exclusion of members and norms for managing and using natural resources. Although the collectives function as per their shared objective and rules for water and forest resources conservation and use, members with high social capital and status influence institutional practices and policies on governing common resources and its benefit–sharing mechanism. This is not in favour of women, the poor, and marginalized groups. The community institution's relationships with the state and non-state actors indeed are critical to enable the former to make their norms and leadership equitable and inclusive of those who have limited voices (Nightingale, 2019; Goodrich et al., 2019; Clement et al., 2019). This challenge can be addressed by strengthening the leadership capacities of women and members of marginalized groups in FUGs and WUAs, and by capacitating the new local governments on equitable and gender-responsive water planning and decision-making under the federal system of Nepal (Khadka et al., 2021; van Koppen et al., 2022).

References

Boelens, R. (2008) *The Rules of the Game and the Game of the Rules: Normalization and Resistance in Andean Water Control*, unpublished PhD thesis, Wageningen University, Wageningen, Netherlands. <https://edepot.wur.nl/16320>

Carlisle, K. and Gruby, R. (2019) 'Polycentric system of governance: a theoretical model for the commons', *Policy Studies Journal* 47(4): 927–52. <https://doi.org/10.1111/psj.12212>

Chambers, R. and Conway, G. (1991) *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century*, IDS Discussion Paper 296, London: IDS. <https://www.ids.ac.uk/publications/sustainable-rural-livelihoods-practical-concepts-for-the-21st-century/>

Chowns, E. (2015) 'Is community management an efficient and effective model of public service delivery? Lessons from rural water supply sector in Malawi', *Public Administration and Development* 35: 263–76. <https://doi.org/10.1002/pad.1737>

Cleaver, F. (2002) 'Reinventing institutions: bricolage and social embeddedness of natural resources management', *The European Journal of Development Research* 14(2): 11–30. <https://doi.org/10.1080/714000425>

Cleaver, F. (2012) *Development through Bricolage: Rethinking Institutions for Natural Resources Management*, London and New York: Routledge. <https://doi.org/10.4324/9781315094915>

Cleaver, F. and Toner, A. (2006) 'The evolution of community water governance in Uchira, Tanzania: the implication of equality of access, sustainability and effectiveness', *Natural Resource Forum* 30: 207–18. <https://doi.org/10.1111/j.1477-8947.2006.00115.x>

Clement, F., Pradhan, P. and van Koppen, B. (2019) 'Understanding the non-institutionalisation of a socio-technical innovation: the case of multiple-use water systems (MUS) in Nepal', *Water International* 44(4): 408–26. <https://doi.org/10.1080/02508060.2019.1600336>

Coward, W.E. Jr. 1986. State and locality in Asian irrigation development: The property factor. In: Nobe, K.C. and Sampath, R.K. (eds.) *Irrigation management in developing countries: Current issues and approaches:* Proceedings of an Invited Seminar Series sponsored by the International School for Agricultural and Resource Development (ISARD). Boulder, USA and London, UK: Westview Press. (Studies in Water and Policy Management. No. 8). <https:doi.org/10.4324/9780429038457>

Cox, M., Arnold, G. and Villamayor-Tomas, S. (2010) 'A review of design principles for community-based natural resource management', *Ecology and Society* 15(4): 38. <https://doi.org/10.5751/ES-03704-150438>

Department for International Development (DFID) (1999) *Sustainable Livelihoods Guidance Sheets*, DFID, London. <https://www.ennonline.net/dfidsustainableliving>

Gartaula, H.N., Niehof, A. and Visser, L. (2010) 'Feminisation of agriculture as an effect of male out-migration: unexpected outcomes from Jhapa District, Eastern Nepal', *International Journal of Interdisciplinary Social Sciences: Annual Review* 5(2): 565–78. <https://doi.org/10.18848/1833-1882/CGP/v05i02/51588>

Gautam, M.S., Georgeou, N., Phillips, M., Pyakurel, U., Wali, N. and Clayton, E. (2018) *Women and WASH in Nepal: Key Issues and Challenges*, Humanitarian and Development Research Initiative, Western Sydney University. <https://doi.org/10.26183/5bc6a2e8c089c>

GC, R.K., Ranganathan, S. and Hall, R.P. (2019) 'Does rural water system design matter? A study of productive use of water in rural Nepal', *Water* 11: 1978. <https://doi.org/10.3390/w11101978>

GC, R.K. (2020) *Exploring the Potential of Multiple Use Water Services for Smallholder Farmers in the Western Middle Hills of Nepal*, PhD dissertation, Virginia Polytechnic Institute and University Center, USA. <https://vtechworks.lib.vt.edu/bitstream/handle/10919/101753/G.C._RK_D_2021.pdf>

Giordano, M., de Fraiture, C., Weight, E. and van der Bliek, J. (Eds.) (2012). *Water for wealth and food security: Supporting farmer-driven investments in agricultural water management*. Synthesis report of the AgWater Solutions Project. Colombo, Sri Lanka: International Water Management Institute (IWMI). <https://doi.org/10.5337/2012.207>

Goodrich, C.G., Prakash, A. and Udas, P.B. (2019) 'Gendered vulnerability and adaptation in Hindu-Kush Himalayas: research insights', *Environmental Development* 31: 1–8. <https://doi.org/10.1016/J.ENVDEV.2019.01.001>

Haapala, J., Rartanen, S-L., White, P., Keskinen, M. and Voris, O. (2016) 'Facilitating bricolage through more organic institutional design? The case of water users association in rural Nepal', *The International Journal of the Commons* 10(2): 1172–201. <https://doi.org/10.18352/IJC.688>

Hutchings, P., Chan, M.Y., Cuadrado, L., Ezbakhe, F., Mesa, B., Tamekawa, C. and Franceys, R. (2015) 'A systematic review of success factors in the community management of rural water supplies over the past 30 years', *Water Policy* 17(5): 963–83. <https://doi.org/10.2166/WP.2015.128>

Kajisa, K. (2019) 'Role of community and government in irrigation management in emerging states: lessons from Japan, China and India', in K. Otsuka and K. Sugihara (eds), *Paths to Emerging States in Asia and Africa*, Emerging States and International Policy Studies, Singapore: Springer: 273–292. <https://doi.org/10.1007/978-981-13-3131-2_12>

Khadka, M., Joshi, D., Uprety, L., Shrestha, G. and Suhardiman, D. Manuscript n.d. Gender and Socially Inclusive WASH in Nepal: Moving Beyond 'Engineering Fixes'.

Khadka, M., Karki, S., Karky, B., Kotru, R. and Darjee, K. (2014) 'Gender equality challenges to the REDD+ Initiative in Nepal', *Journal of Mountain Research and Development* 34(3): 197–207. <https://doi.org/10.1659/MRD-JOURNAL-D-13-00081.1>

Khadka, M. Uprety, L., Shrestha, G., Minh, T.T., Nepal, S., Raut, M. Dhungana S., Shahrin, S., Krupnik, T.J. and Schmitter, P. (2021) *Understanding Barriers and Opportunities for Scaling Sustainable and Inclusive Farmer-led Irrigation Development in Nepal*, The Cereal Systems Initiative for South Asia (CSISA), Kathmandu, Nepal. <https://repository.cimmyt.org/xmlui/handle/10883/21683?show=full>

Martiskainen, M. (2016) 'The role of community leadership in the development of grassroot innovations', *Environmental Innovations and Societal Transition* 22: 78–9. <https://doi.org/10.1016/j.eist.2016.05.002>

Meinzen-Dick, R., Pradhan, P. and Zhang, W. (2021) *Migration and Gender Dynamics of Irrigation Governance in Nepal*, IFPRI Discussion Paper No. 02061, International Food Policy Research Institute, Washington, DC. <https://cgspace.cgiar.org/handle/10568/117110>

Merrey, D.J. and Cook, S. (2012) 'Fostering institutional creativity at multiple levels: towards facilitated institutional bricolage', *Water Alternatives* 5(1): 1–19. <https://www.water-alternatives.org/index.php/volume5/v5issue1/154-a5-1-1/file>

Nightingale, A.J. (2019) 'Commoning for inclusion? Political communities, commons, exclusion, property and socio-natural becomings', *International Journal of the Commons* 13(1): 16–35. <https://doi.org/10.18352/ijc.927>

Ostrom, E. (1990) *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge, Cambridge University Press. <https://digitalrepository.unm.edu/nrj/vol32/iss2/6>

Ostrom, E. (1992) *Crafting Institutions: Self-Governing Irrigation Systems*, San Francisco: Institute of Contemporary Studies. <https://doi.org/10.1002/RRR.3450080314>

Ostrom, E. (1994) *Neither Market nor State: Governance of Common Pool Resources in the 21 Century*, IFPRI, Washington, DC.

Ostrom, E. (2005) *Understanding Institutional Diversity*, Princeton University Press, Princeton, NJ.

Ostrom, E. and Gardner, R. (1993) 'Coping with asymmetries in the commons: self-governing irrigation systems can work', *Journal of Economic Perspectives* 7(4): 93–112. <https://www.aeaweb.org/articles?id=10.1257/jep.7.4.93>

Ostrom, E., Lam, W.F., Pradhan, P. and Shivakoti, G. (2011) *Improving Irrigation in Asia: Sustainable Performance of an Innovative Intervention in Nepal*, Cheltenham: Edward Elgar.

Panta, S. and Resurrección, B.P. (2014) 'Gender and caste relations amidst a changing political situation in Nepal: insights from a farmer-managed irrigation system', *Gender Technology and Development* 18: 219–47. <https://doi.org/10.1177/0971852414529482>

Pradhan, P. (1989) *Patterns of Irrigation Organization in Nepal, A Comparative Study of 21 Farmer Managed Irrigation Systems*, Colombo: International Irrigation Management Institute. <https://pdf.usaid.gov/pdf_docs/PNABF284.pdf>

Riccardi, T. (1977) 'The Royal Edicts of King Rama Shah of Gorkha', *Kailash, a Journal of Himalayan Studies* 5: 29–65.

Shrestha, A., Joshi, D. and Roth, D. (2020) 'The hydro-social dynamics of exclusion and water insecurity of Dalits in peri-urban Kathmandu Valley, Nepal: fluid yet unchanging', *Contemporary South Asia* 28: 320–35. <https://doi.org/10.1080/09584935.2020.1770200>

Sunam, R., Barney, K. and McCarthy, J.F. (2021) 'Transnational labour migration and livelihoods in rural Asia: tracing patterns of agrarian and forest change', *Geoforum* 118: 1–13. <https://doi.org/10.1016/j.geoforum.2020.11.004>

Uehara, A. (2019) 'Glass ceiling in the Himalayas: in Nepal, an uphill battle for gender parity' [online], SWI swissinfo.ch, 25 September, Kathmandu <https://www.swissinfo.ch/eng/politics/glass-ceiling-in-the-himalayas_in-nepal--an-uphill-battle-for-gender-parity/45254260> [accessed 18 July 2022].

van Koppen, B., Mark, G. and John, B. (2007) *Community-based Water Law and Water Resource Management Reform in Developing Countries*, Comprehensive Assessment of Water Management in Agriculture Series 5, CABI Publishers, Wallingford, UK. <https://doi.org/10.1079/9781845933265.0001>

van Koppen, B., Raut, M., Rajouria, A., Khadka, M., Pradhan, P., GC, R.K., Colavito, L., O'Hara, C., Rautanen, S.L., Nepal, P.R. and Shrestha, P.K. (2022) *Gender Equality and Social Inclusion in Community-led Multiple-Use Water Services in Nepal*, IWMI Working Paper 203, International Water Management Institute (IWMI), Colombo, Sri Lanka. <https://doi.org/10.5337/2022.200>

Whaley, L., MacAllister, D., Bonsor, H., Mwathunga, E., Banda, S., Katusiime, F., Tadesse, Y., Cleaver, F. and MacDonald, A. (2019) 'Evidence, ideology, and the policy of community management in Africa', *Environmental Research Letters* 14: 085013. <https://doi.org/10.1088/17748-9326/ab35be>

Whaley, L., Cleaver, F. and Mwathunga, E. (2021) 'Flesh and bones: working with the grain to improve community management of water', *World Development* 138: 105286. <https://doi.org/10.1016/j.worlddev.2020.105286>

White, P. and Haapala, J. (2018) 'Water security and social inclusion: local governance within the newly established rural municipalities in Nepal', *New Angle: Nepal Journal of Social Science and Public Policy* 5: 1–29. <https://doi.org/10.53037/na.v5i1.8>

Yates, J.S. (2011) 'Limits to adopting to water variability in rural Nepal: gaps in community governance', *Waterlines* 30(2): 106–21. <https://doi.org/10.3362/1756-3488.2011.013>

Zwarteveen, M. and Meinzen-Dick, R. (2001) 'Gender and property rights in the commons: examples of water rights in South Asia', *Agriculture and Human Values* 18: 11. <https://doi.org/10.1023/A:1007677317899>