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Mismanagement of Irrigation Water and Landslips in Yourjogh, Pakistan

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Risks and hazards associated with climate change and geological factors, especially in the world's youngest mountains, are inevitable and may have been exacerbated in recent decades. However reports about increased landslips and landslides in some areas are being presented as examples to argue that most natural hazards in mountain areas are due to climate change. Based on a field study in the Yourjogh area of Chitral District in Pakistan, we argue that this discourse is based on generalized conclusions that do not hold in all cases and for all types of disasters. Our study challenges the climate change discourse as disregarding the political dimension of water management that also contributes to landslides and landslips in Pakistan's mountainous regions. The climate change discourse has taken the politics out of external-donor-led development interventions that replaced traditional irrigation management practices and institutions with an arrangement in which external development agencies and the state control crucial economic and social processes that shape the distribution of water. This not only depoliticizes disasters and their effects but also leads to further mismanagement of abundantly available irrigation water, contributing to the frequent occurrence of landslips in our study area. We conclude that attributing hazards only to climatic or geological factors leaves little room to promote locally appropriate solutions for locally created hazards.

Keywords: *Water governance; local irrigation management; external intervention; hazards; mountains; Chitral; Pakistan.*

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Introduction

Many recent studies of hydrometeorological hazards and resource degradation explain them as caused by extreme climatic events and climate variability and change (Bouwer 2011; Gentle and Marasent 2012; Huggel et al 2012). Others attribute landslides and landslips to geological activity (Jones 1992; Soldati et al 2004; Dixon and Brook 2007). These views have been embraced in Pakistan as leading explanations of hazards such as landslides and landslips and as the rationale for policies to mitigate risks associated with these hazards (GoP 2007, 2012, 2015). Recent studies of the mountainous region of Pakistan suggest that natural hazards, including landslides and landslips, are increasing (GoP 2007; Hope 2010; Rasul et al 2012; Ali et al 2014). Media accounts have reported that increased landslides and landslips in the settled areas have caused damage to both irrigated land and housing (Express Tribune 2011; Nation 2013; Pamir Times 2015).

A number of policy documents and studies in Pakistan attribute these hazards principally to geological processes (PMD 2007; GoP 2010; Riaz 2011; FOCUS 2012) and climate change (GoP 2012, 2015; Rasul et al 2012). Climate change is believed to have resulted in increased summer monsoon rains in a region that is otherwise classified as a mountainous desert, receiving only 100 to 400 mm annual precipitation (Hussain and Hanif 2013; Hanif and Ali 2014; Hanif et al 2015), mainly in the form of snow (GoKP 2015a). The argument that climate change and geological activity are responsible for landslips has emerged as predominant and influential. For example, a recent hazard, vulnerability, and risk assessment for another village in Chitral, called Parsan, near Yourjogh (FOCUS 2012), reported that the risk of landslides was very high and that a large number of buildings were at risk; the assessment related this situation to a higher moisture content in the soil coming from a lake above the village. The study found that the land mass on which Parsan village is built consists of highly weathered metamorphic and igneous material, which can retain large quantities of

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water, making it less stable and resulting in landslips. The report suggested that if drainage could be improved, less water would seep into the settled area.

The national policy documents of the country also recognize that landslides are a major hazard in mountainous regions; they attribute them to gravity and describe them as induced by rock mass, water content, and some human activities, such as deforestation and blasting (GoP 2007, GoP 2010). Such policy analysis heavily underplays the effect of anthropogenic activities resulting in disaster risks. We do not deny the importance of natural (climatic and geological) processes in explaining landslips and landslides. Rather, we approach these as the outcome of the interplay between and mutual transformation of social and natural processes (Swyngedouw 1999; Baldwin and Stanley 2013; Perramond 2013; Joy et al 2014). For example, water is a product of natural processes and at the same time a common-pool resource that is managed and subjected to rules and regulations, varyingly understood as institutions and institutional arrangements or governance structures (Ostrom 1990; Acheson 2011). Institutions are not static; they emerge and are continuously reworked by locally accepted and shared norms for regulating the distribution and use of water and affected by shifts in power relations among village water users. In this article, we draw on water governance literature to discuss the role and impact of shifting the regime of water resource governance from traditional institutions to the new systems emerging from infrastructure development to increase water availability. This has received very little attention in the climate change literature and in policy debates, particularly in Pakistan.

The term "water governance" denotes the range of political, social, economic, and administrative systems that develop and manage water resources and distribute water for productive use, including irrigation, at different levels of society (Rogers and Hall 2003: 7). The water governance literature has shifted from an emphasis on governance as an ideal but normative concept of technically good governance to a perspective that addresses water problems (eg lack of access, unequal distribution, and lack of political participation) from a water justice perspective (Perramond 2013; Joy et al 2014; Zwarteveen and Boelens 2014). This shift in analysis is legitimate,as water-related problems cannot be solved simply by introducing new institutions and modern management systems that supposedly reflect good governance. This is very significant for our case.

In addition, these systems and institutions are designed by drawing on objective expertise from engineering and natural sciences that "positively distinguishes water professionalism from indigenous, layman's or traditional beliefs and knowledge. … Much water expertise, then, effectively works to provide scientific justification for far-reaching water redistribution and reallocations, making them appear natural, inevitable, and as scientifically and technologically rational" (Joy et al 2014: 960).

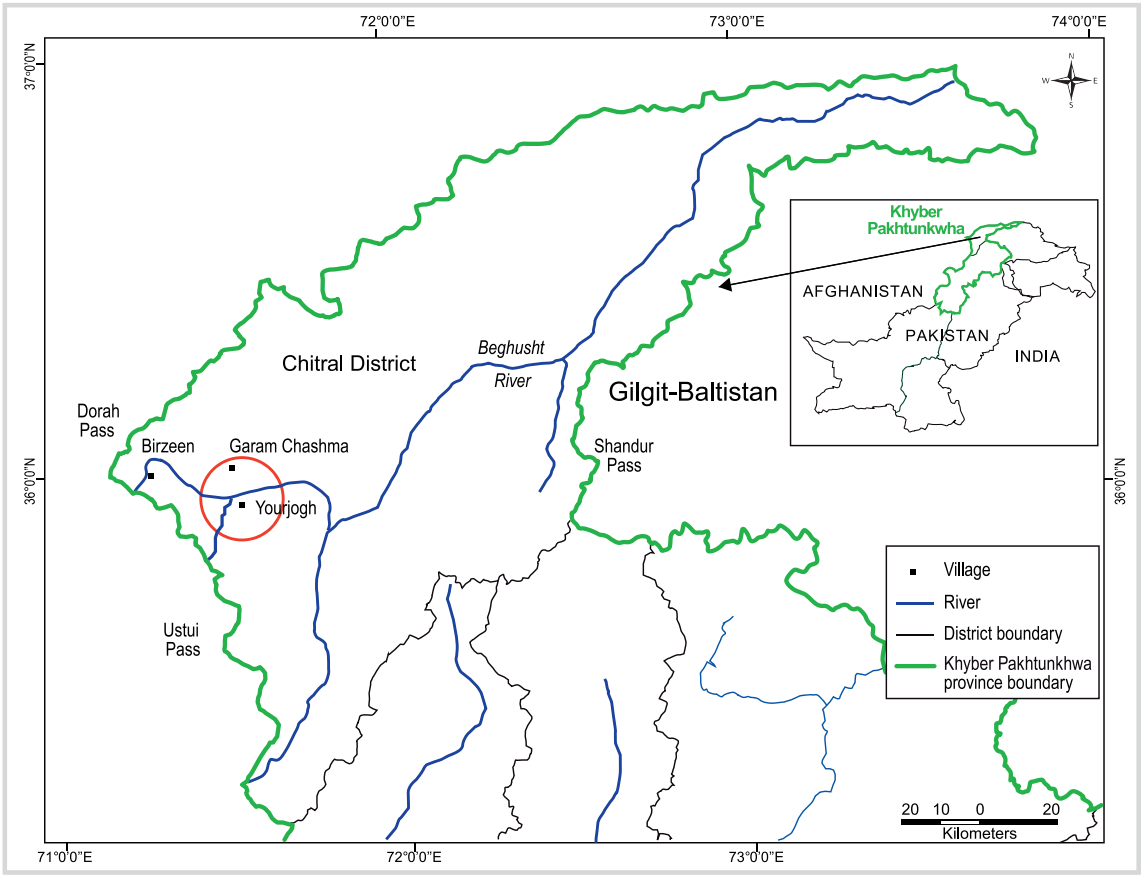
Li (2007) captured the problematic influence of external knowledge and development policy with the notion of "rendering technical," describing an approach that frames water problems and natural hazards as confined, knowable, and controllable. According to this approach, problems become solvable once the right expertise is called upon (Scott 1998). Li (2007) also argued that rendering [only] technical also implies rendering nonpolitical and treating a problem as noncontested (Zwarteveen and Boelens 2014). Issues of equal or unequal distribution, sociopolitical struggles to participate in water-related decisions, and whose knowledge and reality counts in decision-making (Chambers 1997) are isolated from the technical domain. A number of analyses (Ferguson 1990; Mosse 2005; Joy et al 2014) have described this process as depoliticizing—shifting attention away from local dynamics to focus solely on natural factors.

Beniston et al (2011) emphasized the importance of incorporating social factors into the analysis of water-related issues. They suggested that there is a direct link between water-related hazards and water governance in the case of the Swiss Alps. While physical and natural processes in the Alps govern the flow of the Rhône from its source (the Rhône Glacier) to Lake Geneva, water-related policies and negotiations need to be sufficiently robust to cope with rapid changes in water availability and competition for the use of water in times of scarcity or abundance. Biggs et al (2013), focusing on Nepal, argued that despite adequate water supply, the country may still experience severe water insecurity if effective water governance and equitable access are not prioritized.

These and a range of other studies clearly suggest that understanding water-related hazards and finding solutions for the problems associated with the supply and redistribution of water require an interdisciplinary approach. Insights from both social and technical or engineering sciences are necessary to unravel the complexities related to how the social dimensions of water shape the natural flow of water and vice versa. This article argues for a combination of various disciplinary insights, as our analysis is set in a context where relatively independent geological processes of change take place that coincide with attempts of development agencies and the state to improve the existing water supply. It is the locally specific interplay of institutions and resource management systems on the one hand, and natural geological processes on the other, that together explain why landslides and landslips occur. Such an analysis may also identify ways to respond more adequately to these hazards.

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FIGURE 1 Location of Yourjogh in Chitral District, Pakistan. (Map by Muhammad Abbas Qazi)



Study area

Yourjogh is located in Garam Chashma Valley in Chitral District, Khyber-Pakhtunkhwa Province, Pakistan (Figure 1). Chitral is the largest and northernmost district of the province, with a latitude of 35.213° N to 36.908° N and longitude 71.199° E to 73.885° E. Chitral's water resources include vast glaciers, natural springs, streams, and rivers; it covers 14,850 km^2, of which 4% is forest, 2% cultivable wasteland (uncultivated common property land), and about 3% cultivated land; the remaining area consists of mountains and barren lands with sparse vegetation. The population of Chitral is 414,000. Temperatures range from –4°C to 25°C; average annual precipitation is 451 mm, mainly in the form of snow (GoKP 2015b).

Yourjogh is a cluster of 4 hamlets with 158 households: Sanik Bala (62 households), Sanik Payeen (24 households), Gholaki (21 households), and Yourjogh proper (51 households). Another 21 households living in neighboring villages own land in Yourjogh. Residents speak the Khowar language. The households are members of the Gobor Area Development Organization, an umbrella organization representing village organizations (VOs) and women's organizations (WOs, also village-based). Sanik Bala has 1 VO and 2 WOs, Sanik Payeen 1 VO and 2 WOs, Gholaki 1 of each, and Yourjogh proper 2 of each.

The inhabitants of Yourjogh and nearby villages practice a largely subsistence economy with agricultural crops and livestock as the main livelihood sources. Data collected for this study indicated that total cultivated land in Yourjogh is 41.35 ha, with an average landholding of 0.23 ha/household. The short growing season allows only 1 crop per year. Crops include wheat, potato, maize, and a number of vegetables, all cultivated with irrigation. Livestock include cows, sheep, and goats; poultry farming for domestic consumption is also common. The literacy rate among the youth (6 to 25 years) is above 90%. Health facilities are scarce. Wood is the main source of energy, obtained from a nearby, substantially degraded natural forest (Fischer et al 2010). Electricity from a small local hydropower station is the secondary source of energy.

Methodology

This study was inspired by comments from Yourjogh residents during an earlier study on hazards and

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vulnerabilities (Ali et al 2014), in which they reported a mysterious increase in landslips. To further investigate this, we used participatory rural appraisal techniques (Chambers 1997) to collect data from Yourjogh. We visited several landslip sites. Owners of 10 houses and cattle sheds damaged by landslips were interviewed, and these properties and their neighborhoods were inspected in detail. Four focus group discussions were held, 1 in each village, with a total of 32 villagers (12 women and 20 men, most age 36 years or older). We conducted key informant interviews with 5 villagers (including 1 woman), 3 members of the Gobor Area Development Organization, 2 members of development agencies, 1 expert in geology and water from the University of Peshawar, and 1 expert from Water Management Department of the Agricultural University Peshawar.

We conducted transect walks of the entire village and of the full length of the 3 irrigation channels in Yourjogh and found water running down the channels without a clear origin at several points. We therefore measured the water discharge between the head and tail of the channel to estimate en route water losses. Soil samples from agricultural fields on slopes were taken and analyzed to ascertain soil type, structure, and water retention capacity. We reviewed published and unpublished literature on hazards, especially landslips, in Chitral and the mountainous neighboring Gilgit-Baltistan region.

Irrigation management in Chitral District

Irrigation has expanded over the past 30 years in Chitral. With donor support for efforts to bring more land under irrigation, Chitral's residents have revived, widened, and extended existing irrigation channels. Nadeem et al (2013) distinguished between indigenous and modern irrigation systems in Chitral. This study suggests that the modern system of water governance is a modified version of the indigenous system. Nadeem et al also suggest that "the modern system of governance exists alongside the indigenous system and is based on indigenous knowledge and the traditional water distribution system" (p 6). From this discussion it is clear that there are 2 systems of water governance, the traditional and the modern. However, we prefer to refer to so-called "modern irrigation management" as neotraditional, since it is grafted onto a traditional system of water distribution, which is briefly described in the following text.

Traditional irrigation hinges on an institution called the *gram,* referring to an informal association of a certain number of households with a common interest. Decisions pertaining to common interests, such as distribution of land and water, are made by the *gram* by consensus. The *gram* also supervises annual cleaning of water channels at the start of the growing season by all beneficiaries, and subsequently repairs and cleans them on a rotational basis. According to Nadeem et al (2013), there are 3 systems of irrigation in Chiral: the *rongogh* (free use when water is abundant, with users at the head of the channel generally going first and the rest following them in order), the *sorogh* (use on a rotational basis, according to predefined usufruct rights, when there is a shortage), and the *chatogh* (the allotment of small, fixed amounts of water, determined by the state, to families that traditionally host official guests).

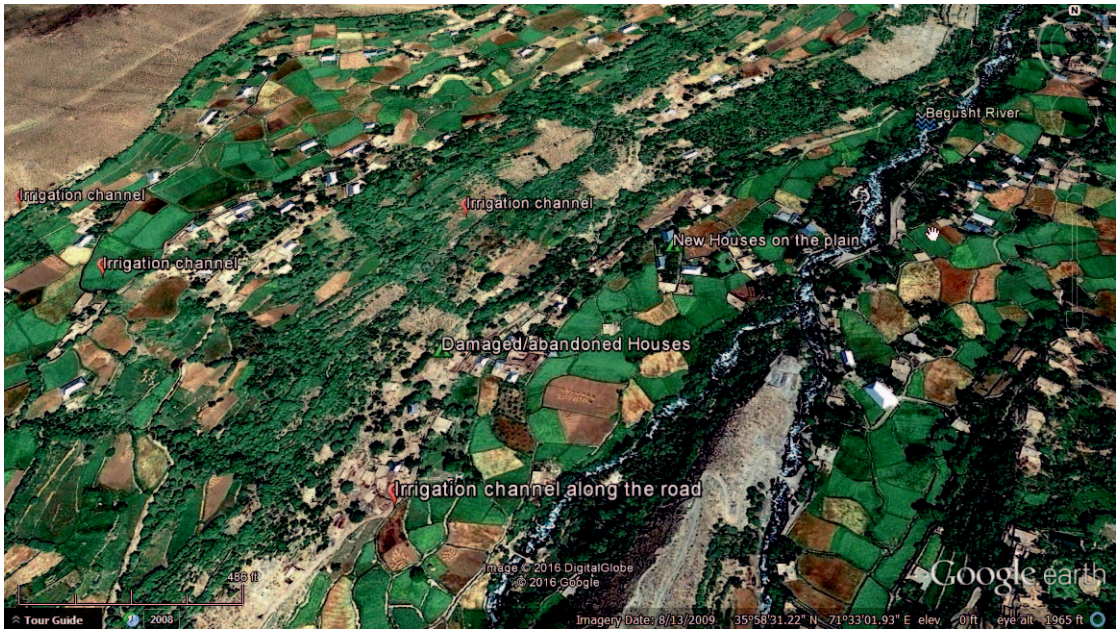
A new irrigation channel was constructed in Yourjogh in 1993, and existing channels were widened. This expansion occurred together with a shift in irrigation governance institutions, as a result of which more water became available for irrigation. Since water is abundant now as a result of new and expanded channels, the *sorogh* is not practiced systematically, and households may irrigate their fields whenever they choose. The beneficiaries appoint a caretaker to ensure equal distribution of water among users and to maintain the channels, as was the case in *gram*. However, since water is abundant for irrigation at any time, the caretaker only has a symbolic role in equal distribution of water. The caretaker is paid in cash or kind.

The neotraditional institutions that replaced the *gram* evolved with assistance from external development agencies in the 1980s. At that time, the Aga Khan Rural Support Programme supported the formation of VOs and WOs and, later, cluster organizations called local support organizations (LSOs). The Gobor Area Development Organization, for instance, is an LSO in Gobor, 1 of the 8 clusters in the Garam Chashma Valley. Yourjogh is one of the villages in Gobor cluster. As elsewhere in Chitral, these organizations have taken a more prominent role than *gram* in the development of villages and valleys. Most of the assistance from external agencies was used for infrastructure development, such as restoring old channels and building new ones. As part of the agreements between the external agencies and the communities receiving assistance from them, the VOs, WOs, and LSOs play a vital role in the construction and maintenance of the irrigation channels.

Although implementing water governance is not a direct mandate of VOs and WOs, they have assumed the role of proxies for traditional village-level water governance institutions, replacing the *gram* and caretakers because they suddenly have access to ample resources provided by external development agencies, as opposed to the voluntary functions of the *gram*. The LSOs support the villages in seeking external support for major repairs, extension, and widening of irrigation channels. The Aga Khan Rural Support Programme has so far invested about US$1.3 million, through the VOs/WOs and LSOs, in the construction of 154 new irrigation channels and the widening and repair of 226 channels in Chitral, including financial and technical support for 7 projects in Yourjogh since 1991. The Chitral Integrated Areas Development

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FIGURE 2 A Google Earth image of village Yourjogh. (Figure by Muhammad Abbas Qazi)



Project has also supported the improvement of irrigation channels. Helvetas Swiss Intercooperation Pakistan, supported by the Swiss Agency for Development and Cooperation, has also provided technical and financial assistance for improving old channels in Yourjogh and has organized a water users' association to manage these channels. While all these development initiatives have been implemented with the best of intensions, the hazard of landslips continues to rise in Yourjogh, for several reasons discussed in the following section.

Landslips in Yourjogh and their causes

Yourjogh is built on a slope and the plain at its foot (Figure 2). According to key informants, landslips in Yourjogh were first noticed in 1986–1987. Out of 51 households in Yourjogh, around 30 were directly affected by landslips, including 14 households that moved to the foot of the slope next to Begusht River. These 14 households and others reported losing cultivated land; however, specific data were not collected on this specific aspect. We visited damaged houses and witnessed springs oozing out in the kitchens, living rooms, and washrooms. We also visited completely deformed and abandoned houses inundated by seepage water. Deep crevasses were observed all around on Yourjogh's cultivated slopes as well as on road and footpaths.

Highly permeable soil

Farooq (2002: 2) concluded that the material above the bedrock in Yourjogh is igneous in origin and noncohesive, with relatively high permeability and low shear strength. The water that percolates through this permeable layer eventually meets relatively less permeable material below in impervious bedrock. As a result, soil gets saturated and pore pressure starts developing due to less permeable material acting as a drainage barrier and causing heavy material to subside above the bedrock. Farooq also found that there is significant seepage of water from irrigation channels into the porous surface material and that irrigation channels are the major sources of water penetration. Similar findings have been reported by Riaz (2011) in the village of Daa'een in Ghizar District, adjacent to Chitral. Riaz found that the irrigated areas of the village started subsiding in 2007 and noted an unlined irrigation channel built in 2007 leaking a lot of water into the ground as part of the problem.

Slope unsuited for farming

The Yourjogh slope inclines at more than 45° and is not suited for cultivation or house building without proper terracing, as practiced in Yourjogh and elsewhere in Chitral. Soil samples taken for this study from 2 wheat fields on the Yourjogh slope consisted of 46.4% silt, 48% sand, and 5.6% clay, with hardly any organic material, a type of soil with extremely low water-holding capacity. Combined with its shallow profile, this makes it unsuitable for cultivation (Anderson 1998). The development challenges for Yourjogh include the small size of most farmers' landholdings (on average 0.23 ha) and the lack of alternatives to cultivation, even on land that is unfit for this purpose. We observed poor growth of crops and grasses, few trees on the slopes, and insufficiently controlled irrigation, causing harm to land and property

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located downstream. However, some farmers who participated in the study believed that these slopes will eventually stabilize with the growth of grasses and trees and will be developed into agricultural terraces.

The chairman of the Gobor Area Development Organization, now 55 years old, recalled that when he was 18, the slope was completely barren and without irrigation. With increasing population, the demand for cultivable land also increased. As a result, the steep slope is now cultivated with poorly managed potato and wheat terraces, grasses, and trees, and is heavily irrigated. His statement is in line with the findings of Dekens (2007) for Chitral that population growth has forced people to settle in more hazard-prone areas and has increased their vulnerability. Dekens (2007) also reported that better access to water through construction of new irrigation channels supported by external development agencies had reduced people's vulnerability to natural hazards. This may be true in some areas, but these interventions have created other kinds of vulnerabilities, as discussed in this article.

Abundance of water

Unlike in many villages in Chitral, where the villagers have constructed and maintained long irrigation channels in difficult mountainous terrain, sufficient irrigation water is available in Yourjogh from the nearby Begusht River. Cultivated land in Yourjogh is irrigated by 3 channels: Sanik Bala (which is divided into 2 subchannels), Sanik Payeen, and Yourjogh, widened and expended with the assistance of external support to increase water supply. As a result, the *sorogh* water distribution system (strict rotation) has been replaced by *rongogh* (free availability). The channels are jointly managed by the community. Major cleaning of the channels is done once a year by the irrigators, and minor repairs are made when needed. Our rough estimate is that these channels, combined, carry approximately 0.42 m^3 of water per second (Sanik Bala 0.34 m^3, Sanik Payeen 0.05 m^3, and Yourjogh channel around 0.03 m^3). For this study, we estimated a water loss of about 50% over the length of these poorly managed irrigation channels, or around 0.21 m^3 of water is lost per second. Data on how much water is needed for irrigating various crops on the 41.35 ha of land cultivated in Yourjogh were not available for this study. However, the farmers reported that irrigation water is abundant, and they irrigate their fields when needed without any restrictions. It is common to observe water flushing down the slope. The top soil layer is coarse loam, which slips down as the flushing water passes down the steep slope. The flushing water washes away fine soil particles, making the remaining soil even more coarse and porous. The inevitable result is subsidence, as has been reported by Farooq (2002) and confirmed by our own observations in the area described earlier.

Uncontrolled irrigation

We observed that in some areas, irrigation of grasslands and trees proceeded unattended. Respondents said that the farmers who live outside Yourjogh open irrigation outlets and leave for home, returning to turn off the water supply only when they estimate that the crop has received enough water, sometimes allowing it to flow unattended for 24 hours at a time. This practice has resulted in increased water seepage, gullies, and landslips. We observed seepage inside a number of houses (Figure 3), as well as in cattle sheds and along the road below the Sanik Payeen channel. Respondents said that seepage water below that channel diminishes significantly when the channel is dry. The owner of a new house just below the Yourjogh channel has lined the channel to stop water seeping into his house. The owner shared that lining the channel has reduced moisture in the house.

The landslip problem was aggravated as more land was brought under cultivation over the lpast 2 decades, increasing the need for irrigation. Most of the expansion of housing and cultivated land has been on the slope—in the case of housing, partly because it was considered at less risk of flooding. Once considered safe by the residents for building houses, this area has become dangerous due to landslips exacerbated by poor water management by the occupants.

Deteriorating water governance and related hazards

Participation, accountability, transparency, and responsiveness are crucial for achieving good governance (Rogers and Hall 2003; Joy et al 2014). The purpose of establishing VOs and WOs was to ensure greater community participation in decision-making (Wood et al 2006). We found these institutions have also taken over the role of traditional water governance institutions in Chitral, including in Yourjogh. Development led by VOs and WOs has allowed increased availability of irrigation water. Over the past 30 years, the traditional water governance institutions have diminished, and VOs and WOs have focused on securing more infrastructure. This has come at the cost of the overall water governance system. The *sorogh* water distribution system that handled water issues during times of scarcity, has now changed to *rongogh*, which hinges on the free availability of an ample supply of water. VOs and WOs are now responsible for the distribution of water in Chitral District. However, these newly introduced institutions have not been able to put an effective, efficient irrigation water governance system in place. The case of Yourjogh suggests that this has led to mismanagement of water and emergence of environmental problems.

Interviewees attributed the environmental problems to 2 factors, geological instability and the way water and

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FIGURE 3 (A) Seepage inside a house located below an irrigation channel; (B) cracks in a house as a result of heavy seepage. (Photo A by Jawad Ali; photo B by Muhammad Asad Salim)



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its distribution are handled. Some interviewees blamed the mismanagement of irrigation water and lack of communal action on landowners who live outside Yourjogh. They said that these landowners could not be convinced to stop misusing water, despite the presence of a water authority in the village such as a VO or LSO. Our discussion in Yourjogh, however, suggests that landowners living outside are not the only ones mismanaging irrigation water. We noted that local farmers also apply excess irrigation water. Despite losses to land, crops, and houses, the community has not been able to take restorative actions—even actions that do not require much financial investment, such as self-organized controlled irrigation. They also say that they have been unable to maintain the channels by themselves due to high expenses and are waiting for more external support to line their channels and repair wear and tear.

The foregoing discussion hints at the interrelationship between landslips as an outcome of geological factors and processes on the one hand, and the way water is being handled and distributed on the other; this is contrary to arguments in the literature, which only focus on geological factors and climate change for all forms of hazards. It is evident that where the newly introduced institutions were successful in achieving infrastructure development (eg irrigation channels), they have a hard time ensuring that the rules regarding proper use of water in Yourjogh are indeed applied. The argument that natural hazards like landslips are the outcomes of natural processes further disempower these institutions from implementing good water governance practices and establishing routines that ensure a fair and proper distribution of water. It also encourages and reinforces dependency among communities, which continue to rely on external agencies for solutions (eg improved irrigation channels). As argued by Dekens (2007: 67), "Increasing dependence on external help, ability to blame and hold the government responsible for disaster" has become a trend in Chitral.

Conclusions

While geological factors conducive to landslips exist in Yourjogh, the main cause of the landslips is the deterioration of the water governance system, leading to negligent overuse of water, which is readily available. The creation of new local institutions went hand in hand with a development vision of increased irrigation of agricultural lands. However, the outcome of the change in water governance institutions was mismanagement of irrigation channels, which has increased the risk of landslips in Yourjogh. The area was already prone to landslips due to its geology—a porous upper soil mass resting on impermeable volcanic bedrock. The expansion of irrigation with assistance from donors, coupled with mismanagement of an abundant supply of water, exacerbated the situation by saturating the soil. Free-flowing, excessive irrigation water in a porous soil environment resulted in widespread subsidence below the irrigation channels.

The generalized discourse that geological activity and climate change increase landslips does not hold for Yourjogh. Such arguments undermine communities' sense of responsibility for improving their own water management. The continued dependency of communities who turn to external development and humanitarian agencies for assistance to solve their problems negatively affects their ability to take initiatives and solve their problems with their own ways and means. The newly established local institutions are trying to manage the new irrigation structures; however, water mismanagement has become a chronic factor leading to landslips. Instead of taking measures to improve water governance, the communities tend to depend on experts to investigate the causes of landslips that are perceived as mysterious phenomena due to natural factors. The depoliticizing effect of this discourse is of concern. It takes the politics out of external agencies and state-led development interventions that have reorganized irrigation management from a system based on consensus about water distribution to one in which the focus of the neotraditional institutions is mainly on harnessing external support to expand irrigation infrastructure. Efficient water management is not the main focus of these institutions. This has led to mismanagement of abundantly available irrigation water, contributing to the occurrence of landslips in Yourjogh. Increased availability of irrigation water has decreased some vulnerabilities while increasing or creating others.

Although a traditional irrigation system may not resonate well with the new situation, a more extensively developed infrastructure and more water, the new institutions have also not been able to find local, affordable, place-based solutions to locally generated hazards. This study challenges the predominant climate-change discourse and argues for an interdisciplinary approach that focuses on the interplay between social and natural factors and processes. Although it focuses on a specific region in Pakistan, its theme—deteriorating water governance resulting in increased hazards—is a larger one. Our analysis and findings are not limited to Chitral District only. They may prove to be relevant to other mountainous areas in Pakistan where fragile geological conditions and vulnerabilities of humans prevail. This is particularly the case of those mountainous areas where irrigated farming is practiced, irrigation structures are built on fragile terrain and managed communally, and effective water governance systems are needed to avoid damage and mitigate hazards to villages situated below irrigation channels.

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REFERENCES

Acheson J. 2011. Ostrom for anthropologists. *International Journal of the Commons* 5(2):319–339.

Ali J, Nizami A, Ara R, Salim MA. 2014. *Hydro-meteorological Hazards, Vulnerabilities and Coping Strategies in Garam Chashma Chitral, Pakistan*. Islamabad, Pakistan: Intercooperation Pakistan.

Anderson J. 1998. Influence of soil texture and organic matter content on bulk density, air content, compression index and crop yield in field and laboratory compression experiments. *Soil & Tillage Research* 49:159–170.

Baldwin A, Stanley A. 2013. Risky natures, natures of risk. *Geoforum* 45(2):2–5.

Beniston M, Stoffel M, Hill M. 2011. Impacts of climatic change on water and natural hazards in the Alps: Can current water governance cope with future challenges? Examples from the European "ACQWA" project. *Environmental Science & Policy* 14(7):734–743.

Biggs EM, Duncan JMA, Atkinson PM, Dash J. 2013. Plenty of water, not enough strategy. How inadequate accessibility, poor governance and a volatile government can tip the balance against ensuring water security: The case of Nepal. *Environmental Science and Policy* 33:388–394.

Bouwer LM. 2011. Have disaster losses increased due to anthropogenic climate change? *Bulletin of the American Meteorological Society* 92(1):39–46.

Chambers R. 1997. *Whose Reality Counts? Putting the First Last*. London, United Kingdom: Intermediate Technology Publications.

Dekens J. 2007. *Herders of Chitral: The Lost Messengers? Local Knowledge on Disaster Preparedness in Chitral District, Pakistan*. Kathmandu, Nepal: International Centre for Integrated Mountain Development.

Dixon N, Brook E. 2007. Impact of predicted climate change on landslide reactivation: Case study of Mam Tor, UK in Landslides. *Journal of the International Consortium on Landslides* 4(2):137–147.

Express Tribune. 2011. Pakistan now more vulnerable to climate change. *The Express Tribune* October 10–16, 2011. http://tribune.com.pk/story/270655/pakistan-now-more-vulnerable-to-climate-change/; accessed on 10 September 2016.

Farooq S. 2002. *Reconnaissance visit of Yourjogh village landslide October 2002*. Chitral, Pakistan: FOCUS (Focus Humanitarian Assistance).

Ferguson J. 1990. *The Anti-politics Machine: "Development," Depoliticization, and Bureaucratic Power in Lesotho*. Cambridge, United Kingdom: Cambridge University Press.

Fischer KM, Khan MH, Gandapur AK, Rao AL, Zarif RM, Marwat H. 2010. *Study on Timber Harvesting Ban in NWFP, Pakistan*. Islamabad, Pakistan: Intercooperation Pakistan.

FOCUS [Focus Humanitarian Assistance]. 2012. *Hazard, Vulnerability and Risk Assessment (HVRA) Report for Parsan Village*. Islamabad, Pakistan: FOCUS.

Gentle P, Marasent TN. 2012. Climate change, poverty and livelihoods: Adaptation practices by rural mountain communities in Nepal. *Environmental Science and Policy* 21:24–34.

GoKP [Government of Khyber Pakhtunkhwa]. 2015a. *Climate: North Region (Chitral)*. City: Government of Khyber Pakhtunkhwa. http://www.khyberpakhtunkhwa.gov.pk/aboutus/Climate.php; accessed on 4 January 2016.

GoKP [Government of Khyber Pakhtunkhwa]. 2015b. *District Profile*. *Planning and Development Department, Government of Khyber Pakhtunkhwa*. http://www.chitral.financekpp.gov.pk/index.php/home/district-profile; accessed on 4 January 2016.

GoP [Government of Pakistan]. 2007. *National Disaster Risk Management Framework Pakistan. National Disaster Management Authority*. Islamabad, Pakistan: GoP.

GoP [Government of Pakistan]. 2010. *National Disaster Response Plan*. National Disaster Management Authority. Islamabad, Pakistan: GoP.

GoP [Government of Pakistan]. 2012. *National Climate Change policy*. Islamabad, Pakistan: Ministry of Climate Chance, GoP.

GoP [Government of Pakistan]. 2015. *National Forest Policy*. Islamabad, Pakistan: Ministry of Climate Chance, GoP.

Hanif M., Ali J. 2014. *Climate Scenarios 2011–2040: Districts Haripur, Swabi, Attock and Chakwal*, Pakistan. Islamabad, Pakistan: Intercooperation Pakistan.

Hanif M., Nizami A., Ali J. 2015. *Climate Scenarios 2011–2040: Bajour and Mohmand Agencies*. Islamabad, Pakistan: Intercooperation Pakistan.

Hope. 2010. *Disaster Vulnerability Assessment Report District Chitral, KP, Pakistan*. Chitral, Pakistan: Hope Pakistan.

Huggel C, Clague JJ, Korup O. 2012. Is climate change responsible for changing landslide activity in high mountains? *Earth Surface Processes and Landforms* 37(1):77–91.

Hussain SS, Hanif M. 2013. *Climate Change Scenarios and Possible Adaptation Measures. Districts Chitral and D.I. Khan*. Islamabad, Pakistan: Intercooperation Pakistan.

Jones DKC. 1992. Landslide hazard assessment in the context of development. *In:* McCall GJ, editor. *Geohazards: Natural and Man-made*. Association of Geoscientists for International Development Report Series. Dordrecht, Netherlands: Springer, pp 114–117.

Joy KJ, Kulkarni S, Roth D, Zwarteveen M. 2014. Re-politicising water governance: Exploring water re-allocations in terms of justice, *Local Environment* 19:9, 954-973. DOI: 10.1080/13549839.2013.870542.

Li TM. 2007. *The Will to Improve. Governmentality, Development and the Practice of Politics*. Durham, NC: Duke University Press.

Mosse D. 2005. *Cultivating Development: An Ethnography of Aid Policy and Practice*. London, United Kingdom: Pluto Press.

Nadeem S, Younis M, Ahmed F. 2013. *Policy and Institutions in Adaptation to Climate Change: Case Study on Responding to Water Stress in Chitral, Pakistan*. ICIMOD Working Paper 2013/2. Kathmandu, Nepal: International Centre for Integrated Mountain Development (ICIMOD).

Nation. 2013. Pakistan facing climate change risks. *The Nation* November 11, 2013. http://nation.com.pk/islamabad/11-Nov2013/pakistan-facing-climate-change-risks; accessed on 10 September 2016.

Ostrom E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, United Kingdom: Cambridge University Press.

Pamir Times 2015. Chitral and Humla – two new valley-blocking landslides in the high mountains of South Asia? http://blogs.agu.org/landslideblog/2015/03/04/chitral-and-humla-1/ ; accessed on 10 September 2016.

Perramond E. 2013. Water governance in New Mexico: Adjudication, law, and geography. *Geoforum* 45(1):83–93.

PMD [Pakistan Meteorology Department]. 2007. *Seismic Hazard Analysis and Zonation for Pakistan, Azad Jammu and Kashmir*. Islamabad, Pakistan: Pakistan Meteorology Department.

Rasul G, Mahmood A, Sadiq A, Khan SI. 2012. Vulnerability of the Indus Delta to climate change in Pakistan. *Pakistan Journal of Meteorology* 8(16):89–107.

Riaz M. 2011. *Report on the Land sliding at Daa'een (Dain) Village, Near Chitor Khand, District Ghizar, Gilgit–Baltistan*. Peshawar, Pakistan: National Centre for Excellence in Geology, University of Peshawar.

Rogers P, Hall AW. 2003. *Effective Water Governance*. TEC Background Papers No 7. Stockholm, Denmark: Global Water Partnership Secretariat; http://www.gwp.org/global/toolbox/publications/background%20papers/07%20effective%20water%20governance%20(2003)%20english.pdf; accessed on 4 January 2016.

Scott JC. 1998. *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven, CT: Yale University Press.

Soldati M, Corsini A, Pasuto A. 2004. Landslides and climate change in the Italian Dolomites since the late glacial. *CATENA* 55(2):141–161.

Swyngedouw E. 1999. Modernity and hybridity: Nature, regeneracionismo, and the production of the Spanish waterscape, 1890–1930. *Annals of the Association of American Geographers* 89(3):443–465.

Tagar HK, Bukhari BS, Qabtia M, Tagar AK, Pirzada I. 2016. Sustainable development Goals: economic empowerments of rural people through balanced land holdings (A Case of Sindh-Pakistan). *International Journal of Innovative Research & Development*. Vol 5 Issue 6: 436.

Wood G, Malik A, Sagheer S, editors. 2006. *Valleys in Transition: Twenty Years of AKRSP's Experience in Northern Pakistan*. Karachi, Pakistan: Oxford University Press.

Zwarteveen M, Boelens R. 2014. Defining, researching and struggling for water justice: Some conceptual building blocks for research and action. *Water International* 39(2):143–158.

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