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A Post-Area Studies Approach to the Study of Hill Irrigation across the Alai – Pamir – Karakoram

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Joe Hill

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Abstract

Due to the geo-political history of the mountainous region stretching from the Alai in the south of Kyrgyzstan to the north-western Himalaya of India, language barriers, and also perhaps the nature of traditional area studies, little if any comparative work has been undertaken to examine historical and contemporary similarities and differences in farmer-managed gravity-flow canal irrigation across the former divide between Tsarist Russia/USSR and British India/Pakistan. A large number of studies have been undertaken in Nepal, north-western India, and northern Pakistan, however very few studies exist or are readily accessible for understanding the dynamics of hill irrigation in the Tajik Pamir, southern Kyrgyzstan's Alai, and adjoining mountain ranges. Irrigation-related research in the former Soviet republics is largely concerned with lower elevation systems which have been organised into Water User Associations under reforms carried out by national governments since independence in 1991, under the aegis and direction of international organisations. This paper seeks to explore what is known about hill irrigation in the territories of the latter countries, and to conduct a preliminary analysis of some of the more obvious similarities and contrasts between the contexts within which hill irrigation is practised across several valleys of the above-defined mountainous region.

The value of such a comparative study may lie in its testing of the applicability of a "post-area studies approach", for hill irrigation is decentralised having little cross-border effects, but yet is deeply affected by the state form, and by socio-cultural values and forms of organisation. The paper covers the ecological conditions and the historical socio-political contexts of selected valleys where hill irrigation is practised, and for which studies and literature exist. It then highlights where research is needed for an understanding of contemporary processes underway in the selected valleys, in particular to gauge the effect high levels of out-migration have upon irrigation systems and practices, and to learn about how state and non-state actors engage with local communities, and vice versa, how local communities of water users mobilise themselves and resources to maintain and improve their irrigation systems. How both migration and intervention interact with inequalities in access to and control over irrigation water and related resources is of central concern.

1. Introduction

Irrigated agriculture is central to the livelihoods and subsistence of the communities residing in the valleys of the Alai-Pamir-Karakoram-Himalaya mountain ranges and foothills. Two types of gravity-flow irrigation are extant: hill irrigation systems¹, typically comprising small canals built and managed by farmers along steep slopes serving small command areas; and systems with larger command areas located in foothills, mostly constructed by the state and maintained nowadays with international assistance and the participation of water-users. While there is no dearth of literature on such canal irrigation for the valleys and foothills of the Himalaya and Karakorum mountain ranges, studies are sparse for the mountain ranges and valleys of Tajikistan and Kyrgyzstan. This relates to the history of this vast mountainous region: in 1893 and then 1895 borders were created by British India and Tsarist Russia, creating the Wakhan Corridor of north-eastern Afghanistan (Kreutzmann, 2005: 11). Thereafter, until the collapse of the Soviet Union in 1991, the region was divided in two, its people and their irrigated farming practices subjected to vastly different forms of state rule and thus agrarian conditions. For reasons relating to geo-political history, language barriers, and the nature of traditional area studies, few hill irrigation studies undertaken in the former USSR are readily accessible, or even exist; and little if any comparative work has been undertaken to examine historical and contemporary similarities and differences in hill irrigation across the afore-stated divide.

2. Traditional area studies and the Alai-Pamir-Karakorum-Himalaya

Taking a post-area studies approach to the study of hill irrigation across the Alai-Pamir-Karakorum-Himalaya, this research is premised on the understanding that the conventional geographical regions and areas into which the world was divided post-Second World War and during the Cold War were to some extent politically inspired (Prewitt, 2002). Regional or area studies, e.g. South Asian studies, use geographical metaphors to legitimate the production of specific geographically-structured and disciplinary-based knowledge (Van Schendel, 2002: 650). In recent years traditional area studies' approaches have been critiqued for a variety of reasons; for their US- and Euro-centricity in their conceptualisation of projects and research agendas, i.e. failing to study other societies on their own terms, and imposing upon them their own agendas; for their outdated concern for a world that no longer exists, due to globalisation processes and resultant increased flows of people, goods and ideas; for their statist nature and tendency to overlook borderlands and privilege heartlands; and for their arbitrariness, an obvious example being Afghanistan variously included in and omitted from traditional South

¹ Vincent states that the term 'hill irrigation' can be used in two ways, as a general term for irrigation in hill and mountain regions, or specifically for systems crossing sloping terrain (1995: vi). In this research 'hill irrigation' is used to mean gravity-flow canal irrigation, often referred to as offtake systems or diversion systems, developed to utilise river flow or tap melt-water from glaciers or snow-fields directly (ibid.: 36).

Asian, Central Asian and Western Asian (Middle Eastern) studies, to name but a few (Prewitt, 2002; Szanton, 2004; Van Schendel, 2002).

The mountainous region stretching from the Alai to the Himalaya could in many ways qualify as a physical academic space², for its populace have language affinities, religious and cultural commonalities, and share similar ecological conditions and livelihoods. However the region has not been worked into a site of theoretical-knowledge production; in other words it has failed to qualify as a symbolic academic space, for several reasons (Van Schendel, 2002: 649-650). Firstly, it straddled the communist and capitalist spheres of interest during the Cold War period. Two decades on from the collapse of the Soviet Union the effects of this partition continue to be felt; for example, in academic circles Tajikistan continues to be considered a member of the 'Central Asian' states, regardless of its affinities to neighbouring geographical regions such as parts of Afghanistan and Pakistan, or to Iran. Secondly, the mountainous region did not cover states considered important, or as heartlands, by world powers. Some of the region's parts are or have been politically marginal regions within states, and thus scholars wishing to undertake research have faced restricted access or physical danger, thus reducing research efforts. Finally, and not in part due to the above reasons, the mountainous region has received insufficient scholarly clout. Thus the region has not been considered a symbolic academic space, nor has it qualified as an institutional academic space.³

This current research aims to investigate contemporary and historic hill irrigation practices across the mountainous region stretching from the Alai in the south of Kyrgyzstan to the Himalayas of north-western India. Taking a post-area studies approach to this research entails an analysis that takes the local populace's concerns into account, while also attempting to disregard the traditional area studies categories of 'South Asia' and 'Central Asia'. Though the vastly differing histories of these two traditional areas cannot be negated – and they are not, for the historical context is described below – one can attempt to look upon contemporary hill irrigation practices through a post-area studies lens, to explore how water users manage irrigation systems given their shared experiences of, for example, collective ownership of irrigation canals, high levels of out-migration, and exposure to non-government agencies and state entities intervening in irrigation matters, in the present-day often under the influence of international funding agencies and discourses.

² Van Schendel identifies three principal ways of understanding an academic area: as a place (physical space), as a site of knowledge production (symbolic space), and as a career machine (institutional space) (2002: 649).

³ A clear example of the way areas bi- or trifurcate such regions as the Alai-Pamir-Karakorum-Himalaya can be seen on the Ooska News website, see <http://www.ooskanews.com/> (accessed February 2012). The geographical focus of this research falls into two of the four regions constructed by the news agency – Eastern Europe and former Soviet Union, and Southern and Eastern Asia.

3. Hill irrigation studies undertaken in the former Soviet Union

Initial plans to compare and contrast pre-existing studies of hill irrigation across the Alai-Pamir-Karakorum-Himalaya are under re-consideration due to a lack of material generated in, or easily accessible from, the former Soviet republics of Tajikistan and Kyrgyzstan⁴. In his 1994 review of small-scale surface irrigation in Asia, Ambler includes among the areas worthy of note Yemen, northern Pakistan, northern India, much of Nepal and Bhutan, northern Thailand, parts of Burma and China, the Korean peninsula, Japan and large parts of Indonesia and the Philippines; but neglects to mention Tajikistan or Kyrgyzstan (Ambler, 1994: 268). Vincent's 1995 book *Hill irrigation* includes a bibliography of 588 texts, not one of which includes a case study from Tajikistan or Kyrgyzstan: at least 77 of the cases are from the Nepalese Himalaya, 24 from the north-western Indian Himalaya, and 23 from the northern Pakistan Karakorum, and a great many more are from Bhutan, Thailand and Indonesia, Iran, Iraq, Yemen and Baluchistan, and from African countries and Latin American Andean countries (Vincent, 1995). Admittedly these studies were undertaken shortly after the 1991 independence of the former Soviet republics; but from the review of studies undertaken thus far in this research, it would seem likely that were such a review to be undertaken in the present-day, there would still be no cases proffered from the Pamir or Alai and adjoining mountain ranges. Kreutzmann's 2000 edited volume *Sharing water* contains one historical chapter on irrigation north of the Hindu Kush; however Fourniau's contribution only alludes to hill irrigation in several paragraphs and mainly concentrates on lower elevation irrigation (Fourniau, 2000; Kreutzmann, 2000a). Studies of (hill) irrigation aside, an article mapper on the Mountain Research and Development website⁵ showing the location of articles published by the journal between 1991 and 2008, provides a telling testament to the research deficit (i.e. readily available to an international audience) in the former Soviet republics.

Yet hill irrigation is very much practised in the high and low mountain valleys of the Pamir and Alai ranges. For the Pamir some good quality material exists. Bliss's historical ethnography of Tajikistan's Gorno-Badakhshan includes reference to and some important insights into hill irrigation, although he claims, "Practically nothing is known about the traditional organisation of irrigation, the building and upkeep of the canals, as well as the water laws" (2006: 129). Bossenbroek (2011) in 2010 undertook her Masters' thesis research on canal irrigation in two villages in the Pamir, focussing on land and water rights through a gender lens. A study by Wood et al. (2009) provides some general information on hill irrigation along the Tajik side of the Pyandsh valley, the study concentrating on a GIS mapping tool to address contemporary water scarcity. Mukhiddinov (1975) focuses on land management and hill irrigation in the

⁴ Research in Tajikistan and Kyrgyzstan will help determine what other literature exists. Certain works are identified but yet to be consulted, e.g. Bregel (1995), Mukhabatov (1999), Badenkov (1988, 1996).

⁵ See <http://www.mrd-journal.org/map/> (accessed February 2012) and note the density of studies undertaken in the Himalaya and Karakorum, and by contrast the absence of studies conducted across Tajikistan and Kyrgyzstan's mountain ranges.

Pamir in his doctoral research, the fieldwork for which was undertaken in 1969. His study provides some interesting historical insights, from the 19th century to the early 20th century, for hill irrigation and agriculture in Wakhan and Ishkashim, i.e. the right bank of the Pyandsh. Mukhiddinov's study's existence suggests further material may be available from the Soviet period, though in-country research will be necessary to unearth it. No other major or minor studies have as yet been identified for hill irrigation in the Alai or Pamir mountains⁶.

One reason for this ostensible absence of studies of hill irrigation might be the preoccupation of researchers with lower elevation irrigation serving larger proportions of the respective countries' populations, and with irrigation systems that have been subjected to relatively recent state-led reforms. Sehring (2009: 70), citing other authors, states that by 2004 59% of Kyrgyzstan's irrigated land was managed by 353 water user associations, and that by 2005 an estimated 20% of Tajikistan's irrigated land was managed by about 100 water user associations. These water user associations were established for the most part by international donor agencies within the mandate of agricultural development projects (ibid.). In her 2006 paper on the politics of irrigation reform in Tajikistan, Sehring presents a case study from Aini Rayon (district) located in the Zerafshan valley. The Director of the district water management department (RVKh) in interview stated to her that of a total 2500 ha arable farmland in the district, 960 ha is irrigated by pumping irrigation, and 1540 ha of land is served by canal irrigation from mountain sources: "Many villages have self-managed canals that divert water directly from a source or small mountain river into the village and onto the fields. The RVKh is not involved in the water management here and the users therefore also do not have to pay ISF [irrigation service fee]" (Sehring, 2006: 18). Thus Sehring's work indicates the presence of farmer-managed hill irrigation in Tajikistan; however it does not explore it further.

In the south of Kyrgyzstan a report submitted to the Aga Khan Foundation's Mountain Societies Development Support Programme (MSDSP), as a component of a climate change adaptation project, leaves the impression that hill irrigation is extant in the upper reaches of Kara Kulja district. For high elevation (1700-2500 m) villages in the Tar valley, it is stated that, "There is also diversity between these villages. For example, Oi Tal has almost no cultivated land and few hayfields while Kyzyl Zhar has significant cultivated land and hayfields" (Ashley and Ershova, 2011: 26). Kyzyl Zhar Aiyl Okmotu⁷ is stated to be at 2200m elevation, and to receive around 570-907 mm rainfall annually (ibid.: 12, 14). Though this report contains no mention of hill irrigation systems, the head of Kyzyl Zhar's Aiyl Okmotu, when interviewed, confirmed that canals do exist in these mountain villages; mainly for the production of fodder rather than of food grains (April 2012, at Kara Kulja MSDSP office)⁸. That such systems receive undue scholarly

⁶ If a reader knows of any such study, please contact the author at jhill[@]uni-bonn.de

⁷ Kara Kulja district contains 12 Aiyl Okmotu, which are the lowest administrative unit of the Kyrgyz government. In Kara Kulja district, each Aiyl Okmotu comprises between two and seven villages (Aiyl), and contains between 2405 and 23737 inhabitants (Kara Kulja District Statistics Office, January 2012).

⁸ Field research is being undertaken in Kyzyl Zhar in the Tar valley in May 2012. Hill irrigation systems irrigate homestead lands – where potato, vegetables and fodder are grown – and some farmland, where mainly fodder is nowadays grown. Wheat was grown in the recent past; but nowadays the majority of households purchase flour.

attention is perhaps understandable if one considers that even locally-based irrigation practitioners are unsure of their existence: during an exploratory field visit to Kyrgyzstan in November 2011, a seasoned irrigation engineer working for MSDSP in Kara Kulja could not say whether or not irrigation systems existed in the upper reaches of the Tar valley. A researcher from the International Water Management Institute, Tashkent, who has worked in and around Osh with the 'Integrated Water Resources Management in the Ferghana Valley' project, was of the view that no studies of hill irrigation systems have been undertaken in southern Kyrgyzstan's mountain valleys (pers. comm. September 2011). Another reason for a lack of scholarly attention appears to be an assumption that Kyrgyz pastoralists do not irrigate their fodder crops. From these and other insights it can be concluded that many hill irrigation systems exist across Tajikistan and Kyrgyzstan⁹, but that few if any studies of these systems have been conducted or are readily accessible.

4. Conceptualising hill irrigation

By contrast to that of the Pamir and Alai, a substantial literature developed mostly since the 1990s, exists on hill irrigation in the Himalaya and Karakorum mountain ranges. Many of these studies provide, from differing standpoints, rich and detailed accounts of contemporary and historic hill irrigation practices in specific villages or valleys. For example, chapters in edited volumes such as Kreutzmann's *Sharing water* (2000a), and Dittmann's *Mountain societies in transition* (2000), and studies from Nepal published by the International Irrigation Management Institute (IIMI, now renamed IWMI), e.g. Martin and Yoder (1988) and Pradhan (1989). Some of these studies go further to develop substantive theorisations about irrigation practices, for example, Baker's work on the kuhl irrigation canals of Kangra valley, Himachal Pradesh (Baker, 1997, 2003, 2005), or Kreutzmann's work on mountain irrigation in Hunza and the surrounding valleys of Gilgit-Baltistan (Kreutzmann, 1988, 1999, 2011b). Along with studies undertaken in other mountainous regions, research on Himalayan and Karakorum hill irrigation contributed to studies such as Vincent's *Hill irrigation* (1995), which conceptualises irrigation in such a way that the theory holds worldwide. Vincent's colleagues at Wageningen University, such as Boelens, Zwarteveen and associates have greatly contributed to the theorisation of smaller-scale irrigation systems, much of their empirical work undertaken in the Andes (Boelens, 2008; Boelens and Davila, 1998; Boelens and Hoogendam, 2002; Roth et al., 2005).

Different interest groups use different criteria to characterise mountain regions, for example natural scientists have an interest in environmental conditions, defining them in terms of altitude, topography and vegetation, or using terms like fragility and vulnerability; social scientists have studied cultural adaptations and continuities in institutions, technologies and

⁹ Through the National Centre of Competence in Research (NCCR) North-South a number of scholars undertook research in the Sokuluk River Basin, Chui Valley, in northern Kyrgyzstan and in the catchment of the Tien Shan range (e.g. Eriksson 2006; Lindberg 2007). Lindberg's research undertaken for her diploma thesis investigates access to water from several types of irrigation system, including farmer-managed (hill) irrigation systems.

livelihood strategies; and scholars of rural development processes have developed models of mountain livelihood systems and policy options for external assistance (Vincent 1995: 4-14). On social scientists, Vincent notes that rarely have attempts been made to formally define mountain areas or mountain societies' characteristics, but rather more general hypotheses have been applied to explain conditions in fieldwork locations. When comparisons of conditions across mountain areas have been made, this is usually undertaken in a spirit of enquiry rather than by assuming similarities (ibid.: 5). To some extent this insight holds nearly twenty years on for hill irrigation: Vincent's *Hill irrigation* remains the only prominent comparative work identified that investigates hill irrigation *across* mountain areas.

Irrigation's purpose is to supply water for crop growth, providing a variety of needs such as essential carbohydrates, fruits and vegetables, herbs and shrubs for food and cash. However in mountain agriculture, irrigation also supplies water for trees for use as food, wood, fodder and cash, as well as for fodder crops for animals.¹⁰ Besides supplementing crop water requirements, irrigation protects against frost and low temperatures, and assists early planting in relation to climatic conditions (ibid.: 15-31). An irrigation system is defined as "the entire body of works involved in the practice of irrigation – the water extraction technology, conveyance canals, control structures and local distribution technology. The term encompasses both the physical infrastructure of works and also the social infrastructure of rules and procedures that ensures the operation of technology and the delivery of water" (ibid.: 34).

Vincent delineates eight basic types of hill irrigation system, based on their water source and mobilisation technology¹¹. Of concern to this research are offtake systems, probably the commonest form of irrigation system in mountain areas, often referred to by authors as diversion systems, but distinguished from spate systems¹² by their abstraction of flows over sustained periods of time, and their ability to deliver regular irrigation across a cropping season. Offtake systems mostly use river flows, though some tap melt-water from glaciers or snow-fields directly, and others tap permanent springs. Maintenance demands tend to be lower in systems utilising melt-waters and springs as compared with those with headworks in rivers with more extreme flow regimes (ibid.: 36). A four-fold typology developed by Ambler (1989; in Vincent 1995: 36) pits ease/difficulty of conveyance (primarily a function of the distance between offtake and command area, and the terrain the water must cross) against adequacy/scarcity of water supply at key times of the cropping season or year. These two factors, conveyance and water supply, are useful for explaining the necessity of different water management activities, presence of functionaries, and use of certain technologies.

¹⁰ 'Combined mountain agriculture' is a term coined to describe the livelihoods of populations residing in mountain systems in which irrigated agriculture is part of a mixed farming strategy, alongside animal husbandry (cf. Ehlers and Kreuzmann 2000).

¹¹ These eight are offtake systems, underground canal systems, spate systems, collection systems, storage systems, lift systems, combination systems, and wetland systems (Vincent 1995: 35-45).

¹² Spate systems make use of occasional floods in ephemeral streams, so they only operate intermittently through the year; they are particularly common in foothill sites with arid climates (Vincent 1995: 40).

An irrigation system is a complex set-up to control water. Kreutzmann's (2000c: 17) develops a schematic showing relevant interrelationships in water management/irrigation systems in high mountain regions (see figure 1). The endogenous realm, comprising four boxes, is much the same as the conceptualisation of Beccar et al., wherein they claim four inter-relating elements combine to make irrigation systems work: a) *physical elements* – the water source, flows of water and places where it is applied, and the infrastructure/technology to catch, conduct and distribute it, b) *agro-productive elements* – soils, crops, technology, capital, labour force, and the capacities/knowledge of the art of irrigation, c) *organisational elements* – the human organisation to govern, operate and sustain the system, and d) *normative elements* – the rules, rights and obligations related with access to water and other necessary resources (Beccar et al., 2002: 2-3).

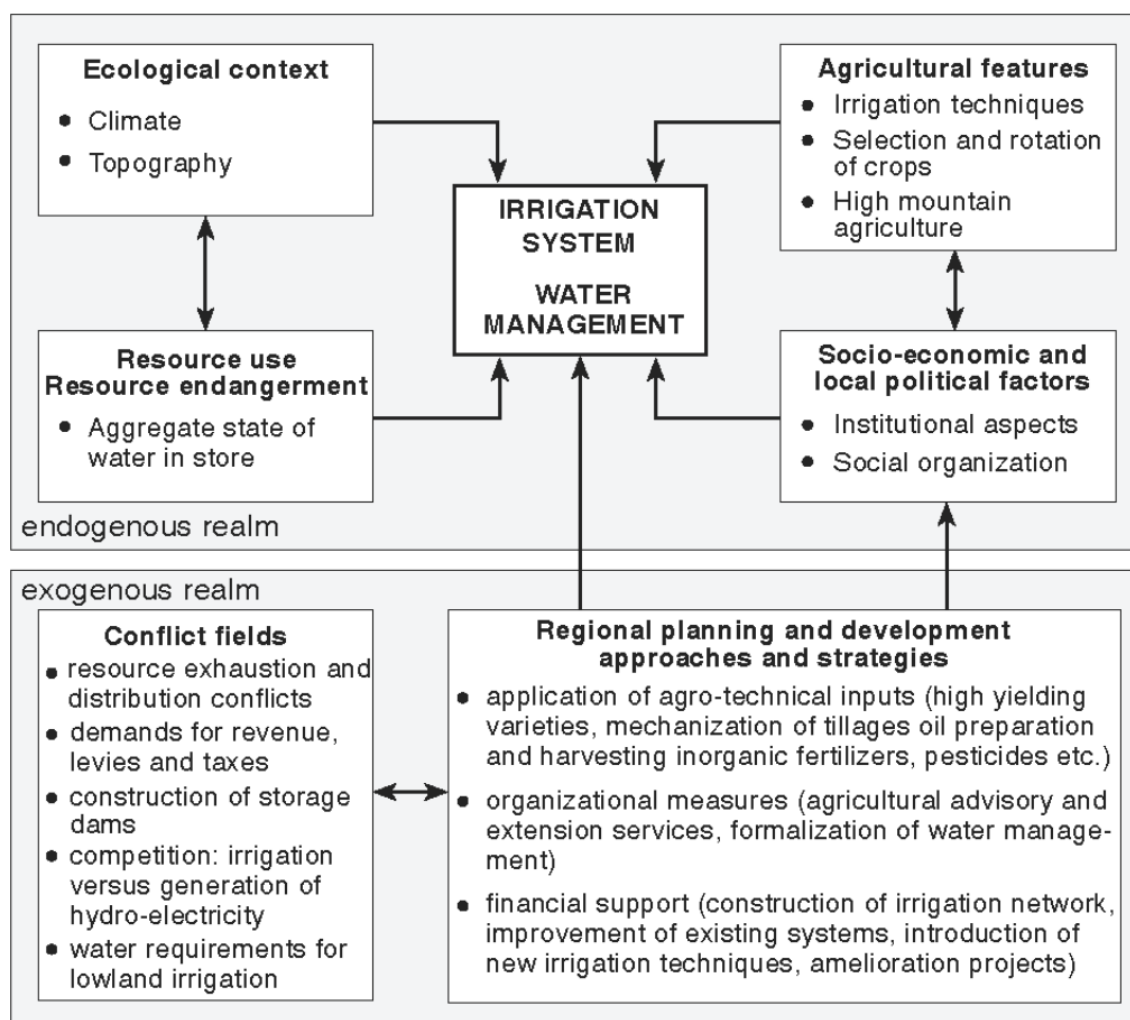


Figure 1: Schematic diagram of relevant interrelationships in the field of water management in high mountain regions. Source: Kreutzmann 2000: 17.

The contextual circumstances that enable or restrain the conduct of irrigation practices, as theorised by Mollinga (2003: 24), are a) *the agro-ecological system and technical infrastructure*, including climate, weather, vegetation, soil, topography, technologies other than the irrigation system itself, b) *the agrarian structure*, including markets for labour, land, technology, credit, inputs and outputs, and social relations such as class, gender, ethnicity, religion, caste and kinship at various social levels, i.e. household, village/community, and societal, and c) *the state and institutions of civil society*, such as government line agencies, the legal system, policy making institutions, development NGOs, social movements, education and training institutes, international donor and lending agencies, local government institutions. These contextual circumstances are both endogenous and exogenous to mountain irrigated agriculture, as captured in Kreuzmann's schematic (figure 1). Such circumstances must also be considered within their regional context, taking into account cultural concepts of territory, as emphasised by Baker (2005) in his study of kuhl irrigation canals in Kangra valley.

Irrigation management can be described as the arrangements for coordinating the multiple activities necessary to supply water for crop growth. Vincent (1995: 92 onwards) shows how three conceptual models have been influential in explaining the structure of irrigation management arrangements, namely irrigation management activities (Uphoff et al., 1991), property rights and hydraulic tenure (Coward, 1986a, b, 1990), and governance in irrigation systems (e.g. Ostrom, 1990, 1992). Uphoff et al. provide a useful and comprehensive description of irrigation activities, distinguishing three types, relating to water (acquisition and allocation, distribution and drainage), infrastructure (design and construction, operation and maintenance) and human organisation (communication and decision-making, and resource mobilisation and conflict resolution) (Uphoff et al., 1991: 54). Coward's *hydraulic tenure* model provides the insight that the organisational arrangements of many irrigation systems is a reflection of the underlying property grid, formed during initial construction. Water rights from this view are seen to relate to investments in the construction, and be reproduced in the maintenance of systems. Local irrigation institutions control the rights to procure, direct and gain benefits from the landesque capital of the developed infrastructure and the water sources it mobilises (Vincent, 1995: 94). Vincent notes that while all three models have contributed enormously to understanding irrigation management, they have also attracted general criticism for not explicitly incorporating the *objective* of institutions formed (e.g. collective security, not just increased agricultural output), and for the assumptions they make about water users and rule makers (e.g. assuming consensus of interest in crafting rules, unlikely in areas where there has been major colonisation and land reform) (Vincent, 1995: 95-96). Vincent's insight suggests that the perspectives and priorities of local water-users are important to take into account.

Therefore, rather than using Uphoff et al.'s (1991) conceptualisation of irrigation activities, which is more suited for outsider practitioners, it is useful to consider the following list of irrigation tasks, which stem from the users' viewpoint (adapted from Beccar et al., 2002: 14): a) *tasks of internal organisation*: e.g. definition of objectives, collective decision-making, activities

co-ordination and planning, monitoring of implementation, conflict resolution, ensuring members' participation, b) *tasks of regulation and authorisation*: formulation, discussion, authorisation, dissemination and acceptance of constitutional rules, as water rights, including procedures, obligations and penalties, c) *tasks of operational water management*: implementing water rights through scheduling, distribution and surveillance of irrigation sessions, operation of hydraulic works, control over infrastructure maintenance, d) *tasks of (re)constructing infrastructure*: design and construction, repair and modification of hydraulic works and the irrigation distribution network, e) *tasks of mobilising and administering resources*: both members' and outside institutions' resources, e.g. economic capital, material resources, labour, agricultural resources, information including technical assistance. It is also useful to move away from conceptualising organisation for the fulfilment of tasks in terms of collective action, a perspective that can be seen to mask social difference (Agrawal and Gibson, 1999; Boelens et al., 2005; Mehta et al., 1999). Nuijten (2003: 11) suggests that to understand the logic of organising practices in specific socio-political and cultural contexts, we should not define organising in terms of collective action, because the objective is not to isolate organising actions, strategies and performances. Rather it is preferable to consider that people follow fragmented organising strategies, working with one set of actors and another, developing strategies and changing them in the course of action (ibid.).

Explicitly concerned with state and non-state (NGO) development interventions in irrigation, Vincent (1995: 96-99) develops a schematic model for the study of local water institutions. Local irrigation institutions have a number of characteristic properties, including a) the *form* of water rights (usufruct and ownership, ascribed or acquired), b) the *constitutional principle* of group association and collective rights (affinity via clan or community, or based upon individual investment contributions), c) the *tenure principles and reinforcing action* that legitimise group action (e.g. under hydraulic tenure, costs and actions may be allocated more freely in affinity-based than individual investment groups; interventions that create conferred tenure from the state leave uncertainty over rights and responsibilities, etc), d) the *administrative structure* used for governance and management (specific irrigation entities, more broad based community roles, embedded in a general civil administration), and e) the *objectives* of irrigation development (collective food security, colonisation of land and claiming of land and water rights, individual gain from increased output). These various institutional forms and their range of characteristics cannot in any way be considered static: a spectrum of sets of rights coexists in irrigation systems, for different groups of water users, and for different conditions of water availability; and these arrangements change over time, even independently of each other.

State-led or donor-driven external interventions often seek to amend these rights, for example, a) through introduction of volumetric shares, b) by making rights conditional to registration and fee payment, c) by considering irrigators as beneficiaries of state assistance or as clients of services or users of public services, or d) by attempting to increase output and improve water efficiency, without considering water-users' existing preferences for water allocation, which may support groups, or take into consideration horticulture and livestock needs (ibid.: 98).

Vincent's schematic connects 'local irrigation institutions' with 'external interventions', labelling the result 'modified institutions'. Besides specific interventions that target individual irrigation systems, the effects of more general, longer term processes of agrarian change must be considered for their influence upon irrigation institutions¹³. Modern (and 'pre-modern') states have invested in irrigation as a broad national development tool, while hill irrigation systems in mountainous regions incorporated within larger states have often been subjected to laws and regulations that were developed for lowland, larger scale irrigation systems; as was the case in Himachal Pradesh in the 1960s and 1970s, as shown by Manzardo (2000: 207). Vincent (1995: 123) highlights how distinctions have been made between interventions having *development objectives* (focussed more purely on economic transformation) and those having *reformist objectives* (related to the emergence of the nation-state and state agencies to direct social change); and between the processes of transformation, i.e. between *monetarist*-type agricultural reform policies (e.g. credit services, new technologies etc) and *structuralist* policies of agrarian reform (which promote new agrarian conditions).

Irrigation is however almost always modelled as a somewhat static phenomenon, because of the way its infrastructure is spatially fixed. This is problematic in the contemporary era for several reasons. People are increasingly on the move, either to pursue migratory, nonfarm employment, or to urbanise for want of better working and educational opportunities. Migrants' remittances ultimately lead to changes in cropping patterns; for example, in wheat flour being purchased. Migration also leads to reconfigurations in local demographics and value systems, which can impact upon the fulfilment of irrigation maintenance obligations and undermine the recognition of local authoritative figures, such as village elders. In line with this movement of people is that of ideas: ideas in the water sector are nowadays rapidly disseminated to far flung places, irrespective of their appropriateness, i.e. regardless of whether or not they succeeded elsewhere¹⁴. The sociospatial turn in social theory somehow captures this increasing complexity, suggesting the need not to privilege only a singular dimension of sociospatial processes, for example scale as is often the case in irrigation studies, but to take into simultaneous consideration the mutually constitutive and relationally intertwined dimensions of territories, places, scales and networks (Jessop et al., 2008), or of scale, place, networks, positionality and mobility (Leitner et al., 2008). Incorporating this sociospatial theoretical turn is a necessary challenge for this research of hill irrigation systems across valleys having such widely varying contexts. In the next section several of the case studies chosen for this research are introduced.

¹³ The term development encompasses several meanings, including that of 'an historical process of social change in which societies are transformed over long periods', and 'as consisting of deliberate efforts aimed at improvement on part of various agencies, including governments, all kinds of organisations, and social movements' (Thomas 2000: 777).

¹⁴ For example, Sehring (2006, 2007) discusses how irrigation reforms, introducing the concepts and institutions of Water Users Associations (WUAs) and Irrigation Service Fees (ISFs), in Tajikistan and Kyrgyzstan have largely failed, and have even increased inequalities. Experiences from neighbouring regions seem not to have been taken into account: for example Manzardo (2000), writing in 2000, claims that experiences in participatory management in the Himalayas in the 1980s and 1990s have shown that the formation of water user groups is not sufficient to ensure sustainable farmer participation in irrigation management.

5. Ecological and livelihood contexts of hill irrigation

The ecological and cultural environment varies dramatically across the vast region comprising the Alai, Pamir, Karakorum and Himalaya mountain ranges. Figure 2 shows graphically the region in question, and highlights several valleys across the region where research will likely be conducted, and/or for which studies already exist that will likely be drawn upon. The work of Kreutzmann (1999), Sidky (1996), Allan (1990), Khan and Hunzai (2000), Schmid (2000), and Dani and Siddiqi (1986) for hill irrigation in the Hunza valley will not be discussed further in this paper, neither will that of Gutschow (1998; 2003), Labbal (2000), Vohra (2000), and Nuesser, Schmidt, and Dame (2012), amongst others, for hill irrigation in Ladakh's Zangskar and Indus valleys. The only site or mountainous area for which no hill irrigation literature has been identified, thus far, is that of the Alai mountains in the south of Kyrgyzstan (i.e. Batken and Osh provinces). Some ecological attributes of Kara Kulja district, inhabited by Kyrgyz, have already been detailed (section 3); however little if anything appears to have been written about hill irrigation in the south of Kyrgyzstan.



Figure 2: Map showing the mountain area stretching across the Alai, Pamir, Karakorum, to the north-western Himalaya. Source: Kreutzmann (2011a). The yellow circles are added by the present author to indicate the location of, from the top, a) Tar valley in the Alai, in Osh province, Kyrgyzstan, b) Gund and Shokhdara valleys in the Pamir, in Gorno-Badakhshan province, Tajikistan, c) Hunza valley and d) Shigar valley, in the Karakorum, in Gilgit-Baltistan, Pakistan, e) the Indus and Zangskar valleys, between the Karakorum and Himalaya, Central Ladakh, in Jammu and Kashmir state, India, and f) Kangra valley, in the foothills of the Himalaya, in Himachal Pradesh state, India.

The remainder of this section focuses on three valleys – Neugal valley (in Kangra valley), Shigar valley, and Gund and Shokhdara valleys – for which sufficient information exists to make a comparative analysis. Below I introduce the ecological and livelihood contexts of hill irrigation systems found in the Neugal valley, Shigar valley, and Gund and Shokhdara valleys, respectively. Common to all three sites, communities of water-users over decades, even centuries, have invested into land and irrigation improvements to increase the productivity and profitability of land, the objective of such landesque capital development having been collective food security and the colonisation of land in mountain valleys that would otherwise be uninhabitable. Though nonfarm migratory livelihoods continue to be pursued extensively (see also section 7), remittances are such that without cultivation of grains, vegetables, fruits and fodder, the survival of farming households and the persistence, more the very existence, of rural communities would be untenable.

Table 1: Some comparative information for the three selected sites where hill irrigation is practised

Name of valley	Neugal valley, in Kangra valley	Shigar valley	Gund and Shokhdara valleys
District	Kangra district	Skardu district	Shugnan and Roshtkala districts
State/Province	Himachal Pradesh	Gilgit-Baltistan	Gorno-Badakhshan
Country	India	Pakistan	Tajikistan
Authors drawn upon	Baker (1997, 2003, 2005), Coward (1990)	Schmidt (2004, 2008, 2009), Polzer and Schmidt (2000), Dieckhoff and Wegner (2008)	Bossenbroek (2011), Bliss (2006, 2010), Mukhiddinov (1975), Herbers (2001)
Mountain range	Dhauladhar, Himalaya	Central Karakorum	Pamir
River name	Neugal	Shigar, and upstream, Braldu and Basha	Gund and Shokhdara
Elevation of irrigation systems (m)	800-1600	2300 – 3050	2400 – 3000
Local name for canal	<i>Kuhl</i>	<i>Hrkong, Hrka</i>	<i>Aryk, Wedh</i>
Precipitation (mm)	1800 (1000-2700)	<150 in valley bottoms	250-300
Number of crop seasons	Two, starting Apr-Jun and Oct-Nov	Two below 2600 m, one above 2600m. Starting Mar-Apr and Jul for second crop	One, starting Mar-Apr
Dominant cropping system (not including vegetables, fruit trees, and fodder crops)	Paddy-wheat, also maize-wheat	Wheat or barley. When two crops, barley-buckwheat or barley-millet	Barley, wheat, legumes
Socio-cultural attributes of populace	Hindu religion (high and lower castes): Rajputs, Brahmins, Rathis, Thakurs, Girths	Balti ethnic group, Balti-speaking, mostly Shia (twelve Shia), some Nurbakhshi, and less than 5% Sunni	'Tajik Pamiris', Shugni-speaking, majority Shia (Ismaili), some Sunni
Population of valley and/or district	69,000 + in Neugal basin, in 2001 (Baker 2005: 58)	45,000 + in Shigar valley/district, in 1998 (Schmidt 2004: 319)	62,000 + in the two districts/valleys, in 1997 (Bliss 2006: 46)

Hill irrigation in the lower Himalaya: Neugal basin, Kangra valley, Himachal Pradesh, India

The Neugal basin in Kangra valley is located in Himachal Pradesh, a relatively small, largely mountainous state located in north-western India, its population representing well under 1% of India's total population. Although about 90% of its population reside in rural areas, the state is currently ahead of others in terms of most indicators of human development due to supportive government policies that have invested in infrastructure and the social sector. Per capita social expenditures roughly double those of the all-states average for India: much of the economy remains dependent on public spending, financed borrowing, and central government assistance. 26% of the state's population live below the official Indian poverty line (ADB, 2010: 4). However such figures may be misleading: according to Saravanan's (2010: 654) primary survey in one research village in neighbouring Kullu valley, in 2004 51% of households were below the poverty line, compared with official figures of 26% of households. The central government favours Himachal Pradesh due to its abundant water resources, hydropower potential, and popularity for international tourism. The state has a significant area under glaciers, and is drained by nine river systems, the largest of which include the Satluj, Beas, Chenab, Yamuna, and Ravi, their catchment areas accounting for over 90% of the state's area (ADB, 2010: 9-12).

The reported cultivated area of the state is 580,000 ha, about 10% of the total land area (ibid.: 26). The predominantly rural population is primarily dependent on agriculture: agriculture accounts for 70% of employment in the state but generates only 22% of the state's GDP (ibid.: 5). Cropping patterns are closely linked to elevation, and double cropping without irrigation is possible only where there is adequate non-monsoonal rainfall; however the winter crop is vulnerable to rainfall irregularities. There are three marked seasons: the summer (April to June), the rainy season (July to September), and the winter (October to March). Average yields are comparable with other hill states of India, and fertiliser use is half of the national average. Many farms are located on steep slopes that do not lend themselves to mechanisation. In the past decade a major shift to vegetables and horticulture has reportedly occurred, primarily in areas with irrigation. Viability of subsistence agriculture is becoming increasingly critical, due to progressive fragmentation of holdings through inheritance, labour shortages caused by nonfarm employment, the relative expense of hired labour from other states, and high cost of inputs. Although animal husbandry is also pursued by most households for subsistence purposes and to generate cash income, subsistence agriculture remains inadequate to fulfil the total livelihood requirement of households. Thus nonfarm government and private sector employment is increasingly sought by many, often in urban centres outside of the state (ADB, 2010: 26-29).

Kangra valley lies in the north-central portion of Kangra district, in western Himachal Pradesh, and is one of the most intensively irrigated areas of the state (Coward, 1990: 78). Lying in the hill country to the north of the Punjab plains, the valley is comprised of alluvial fans which spread southwards from the base of the Dhaula Dhar mountain range, with each fan bisected longitudinally by a stream or river originating in the Dhaula Dhar. These streams flow across

the valley and eventually join the Beas river, which flows through the Sivalik hills (Baker, 2005: 6). Baker describes how this topography provides the ecological conditions suitable for some of the most extensive gravity-flow irrigation networks in the Himalaya. Dense networks of irrigation channels, known as *kuhls*, are embedded lattice-like on the valley's sloping, broad irrigable plains. Each *kuhl* consists of a diversion structure, one or more channels ranging in length from 1 to 40 km, numerous tertiary channels, and many named distribution points. The *Riwaj-i-Abpashi* (book of irrigation customs), compiled in 1918, listed 715 *kuhls* irrigating multiple villages, and 2,500 *kuhls* irrigating single villages in the Kangra valley. Before post-independence electrification and widespread availability of piped water to many villages, *kuhls* provided water for irrigation, domestic purposes, as well as hydropower for milling grain and turning potters' wheels. In the present day, *kuhls* continue to constitute the primary source of irrigation water, irrigating approximately 30,000 ha in the valley as of 2002; approximately 95% of the net irrigated area (Baker, 1997: 200; 2005: 7).

The 39 *kuhls* which divert water from the Neugal river, located in central Kangra valley, irrigate about 5,000 ha distributed across more than 240 hamlets within the 8,500 ha Neugal basin. Precipitation varies considerably; annual rainfall between 1968 and 1991 averaged 2,700 mm at the base of Dhaula Dhar, and just 1,000 mm at some 30 km to the south-west (Baker, 1997: 201). Two water deficit periods occur annually, from April to June and from October to November, which correspond with the sowing seasons for *kharif* (summer) and *rabi* (winter) crops. These constitute the periods of peak dependence on *kuhl* irrigation water, and indicate a high dependence on *kuhl* water. Paddy-wheat and maize-wheat are the two most prominent cropping systems, accounting for 90% of total cropped area (ibid.: 201). During his field research, Baker found no households that sold either grains or pulses¹⁵. This Baker attributes to small landholdings, the high cost of production which cannot compete on the market with green revolution grains produced in Punjab and sold in provision stores, the superior attributes of locally grown grain over store-bought ones, and the marginal profitability of agriculture more generally (Baker, 2005: 60-66). Presently the canals and the institutions that sustain them are facing unparalleled challenges due to the recent transformation of a primarily agrarian economy into one in which migratory employment is increasingly important. The scale of nonfarm employment is historically unprecedented, and has dramatically changed the reliance of household dependence on irrigated agriculture. Yet subsistence agriculture remains important, because nonfarm employment is not accessible to all (ibid.).

Hill irrigation in the high valleys of the Karakorum: Shigar valley, Gilgit-Baltistan, Pakistan

Pakistan is a predominantly mountainous country, its highlands and plateaux covering approximately 60% of its total land area: the northern, north-eastern and western parts of the country are covered by the Himalaya, Karakorum and Hindu Kush ranges, and except for a few locations, the entire region is sparsely populated (Fazlur-Rahman, 2007: 331-332). The

¹⁵ Baker's field research took place in 1990-1993, with return visits in 1997 and 2002. The main thrust of his historical work is to explain the persistence of *kuhl* regimes, which he defines as the institutional rather than physical component of irrigation systems, in the face of rising levels of nonfarm employment.

inhabitants of the mountainous regions live in villages located in numerous valleys, ranging from five to more than 150 km in length, and despite their ethno-linguistic and religious heterogeneity, show a degree of homogeneity in their utilisation of natural resources for their livelihood security and subsistence sustenance (ibid.: 333-334); the main economic activity is irrigated agriculture and animal husbandry (combined mountain agriculture). Historically, the food situation in these regions has always been precarious, for after paying their revenue to the state, the remaining agricultural produce was never sufficient for most households to fulfil their needs throughout the year, resulting in recurring famine situations during the late spring and early summer periods of the year. The nutritional situation was greatly improved in the late 1970s following reconfigurations in the political set-up and abolishment of the old revenue system, and later subsidised foodstuff in the market improved food availability. Nonfarm daily wage employment is accessible locally to some, while a majority of households send migrants to join the labour markets of the plains areas as seasonal wage earners; and from the 1980s the phenomenon of international migration began to occur. These sources are however insufficient to fulfil entire domestic needs, and consequently irrigated subsistence agriculture for production of staple crops and fodder retains its importance (Fazlur-Rahman, 2007: 334; Schmidt, 2008: 251).

The Shigar valley is located in the central Karakorum, just north of the capital of the historically and linguistically defined region of Baltistan, Skardu¹⁶ (Schmidt, 2004: 317). Shigar as a political unit comprises three valleys, those of the Basha and Braldu rivers, and that of the Shigar river into which the former two flow; the Shigar river then discharges into the Indus at Skardu. Shigar's settlements (which number over 50) are located only in the river valleys, on alluvial fans, gentle slopes, or terraces above the rivers, at altitudes of between 2,300 m (Marapi, in Shigar proper) and 3,050 m (Askole village, on the Braldu) (Schmidt, 2004). The Karakorum mountain valleys resemble deserts with arid and semi-arid conditions: while the areas at high altitudes (the peaks reach altitudes of 8000 m) contain large glaciers and snowfields, and are the origins of torrential rivers leaving the mountain and feeding the Indus basin; the valleys are arid due to the location of Karakorum in the 'monsoon-shadow' of the West Himalaya. Valley bottoms receive annual precipitation of less than 150 mm, and evaporation far exceeds rainfall (Schmidt, 2009: 20-21). Practising combined mountain agriculture in such arid to semi-arid conditions has been possible, therefore, only by the development by the local populace of landesque capital in the form of irrigation canals, known as *hrkong* or *hrka*, and arable farmland. As undertaken by the British in Kangra valley, detailed above, a *Riwaj-i-Abpashi* (book of irrigation customs) was compiled during the 1901 and 1911 land revenue settlements in Shigar, providing testament to the old agedness of the Karakorum's canal systems.

The canal systems source melt water from glaciers and snowfields, which is diverted from side valley streams via head works, and using gravity, is brought to fields by systems of main, side and sub-canals. The fields are then irrigated by overflowing (flood irrigation), or by furrow

¹⁶ Gilgit-Baltistan, formerly known as the Northern Areas, shares a common border with Afghanistan in the north, China in the north-east, Kashmir in the south, and Chitral district of Pakistan in the west.

irrigation (Schmidt, 2009: 22-23)¹⁷. Some irrigation systems have large catchment areas, while others have relatively small ones: the largest catchment area in the valley is that of Shigar Proper, which covers 20,900 ha (Dieckhoff and Wegner, 2008: 46). The command area served by irrigation canals in Shigar valley is nowhere stated in the reviewed literature. Because of the runoff's origins as melt water, water availability varies significantly over the year according to temperature, and consequently maximum runoff is reached in the summer when the need for irrigation water is highest (ibid.). Where water supply is limited, water reservoirs are constructed to store water overnight. The irrigated lands comprise arable fields, orchards and meadows: wheat, barley, buckwheat and pulses are the main crops grown, while apricots are the most popular tree fruit. The vegetation period in the areas below 2,600 m allows for cultivation of two crops per season when barley is sown first, while in higher elevated areas only one crop per year can reach maturity. Buckwheat and millet are usually sown as a second crop, with millet harvested before reaching maturity used as fodder (Schmidt, 2009: 22-23).

Hill irrigation in the Pamir: Gund and Shokhdara valleys, Gorno-Badakhshan, Tajikistan

The Tajik Pamir, occupying almost the whole eastern half of Tajikistan, are almost exactly contiguous with that of one of the country's four provinces, the Autonomous Province of Gorno-Badakhshan (GBAO)¹⁸ (Herbers, 2001: 368). Although making up 44.9% of the country's territory, GBAO accommodates only 3.5% of its population: according to 2006 Tajikistan government data, just 218,400 of the nation's 6.27 million people live there (State Statistical Committee of Tajikistan, in Lerman and Sedik, 2008: 13, Table 2.2)¹⁹. In 2004 the overall poverty rate was highest in Gorno-Badakhshan province, at a level of 84%, as compared to the other three provinces and the capital Dushanbe; the average poverty rate of the entire country was 64% (Bliss, 2010: 6)²⁰. Extreme poverty apparently decreased most noticeably in Gorno-Badakhshan over a four year period (1999 to 2003), primarily due to the high rate of foreign aid (ibid.: 5-6). The sparsely populated, mountainous province falls into two parts: a western section, characterised by deeply incised valleys and separated from one another by formidable mountain ranges, and an eastern section which comprises a high plateau with an altitude ranging between 2,700 and 4,000 m (Herbers, 2001: 368). The boundary between east and west forms the limit of permanent settlement and grain cultivation, and also divides different ethnic groups: while the eastern Pamir (Murghab district) are inhabited overwhelmingly by Kyrgyz pastoralists, the western Pamir are populated by a range of Tajik linguistic groups, the dominant religion being Ismaili (ibid.). Gorno-Badakhshan presently comprises seven districts in total: from south to north-west, Ishkashim, Roshtkala, Shugnan, Rushan (incorporating

¹⁷ Schmidt undertook fieldwork in 1996-1998. His work focuses upon the historical development of land and water tenure systems for combined mountain agriculture. Further research took place in Shigar in 2008 by a study team from the Freie Universitaet Berlin, who returned to Shigar proper to undertake multiple studies.

¹⁸ Herbers (2001) refers to the GBAO as Gornyi-Badakhshan, Bliss (2010) as Gorno-Badakhshan, and Bossenbroek (2011) as Gorno Badakhshan. I use Bliss' spellings throughout this paper.

¹⁹ Bliss gives a total population of about 209,000, according to 1998 data (Bliss 2006: 46).

²⁰ This data is sourced from the World Bank 2004 'Tajikistan Poverty Assessment Update' main report, Dushanbe. Bliss (2010: 5-6) discusses the varying measures of poverty used in assessments, and the state of the Tajik economy in general.

Bartang), Vanch (or Wandsh), and Darvas (previously within Vanch), with Murgab district to the east (Bliss 2006: 37-44; Herbers 2001: 368-370). The provincial capital Khorog, located a 16 hour drive away from Dushanbe, is positioned at the confluence of the Gund, Shokhdara and Pyandsh rivers, and also connected to Afghan Badakhshan by a recently constructed bridge.

In the western Pamir, arable land accounts for approximately 24,000 ha, or as little as 0.4% of the GBAO's total area. This arable land and areas of settlement are located for the most part on alluvial fans and river banks (Breu and Hurni, 2003: 33). Given the minimal annual precipitation, which is about 250 mm in normal years and up to 300 mm in wet years, and the temperature regime, which varies from -8 degrees Celsius in December to 22.5 degrees Celsius in August (Bliss, 2006: 27), the vegetation period is limited to 200-230 days annually, and irrigation is necessary to achieve good yields. However labour inputs are high and the potential for mechanisation low (Breu and Hurni, 2003: 8). Due to its limited land resources, the Soviet division of labour allotted to the Pamir mainly the tasks of stock rearing and fodder production: in 1965 76.3% of the cultivable area produced foodstuffs and 23.7% fodder; however by 1987 69.8% was used for fodder and only 25.4% for foodstuff, meaning that only 10-20% of the GBAO region's required foodstuff could be met locally (Herbers, 2001: 371). Following Tajikistan's independence from the Soviet Union in 1991, a highly subsidised local economy that was dependent on external resources was forced to turn to subsistence farming (Breu and Hurni, 2003: 8). The de-collectivisation of land and livestock resulted in a form of agriculture being practised that corresponds with that of neighbouring mountainous regions, such as Gilgit-Baltistan, i.e. combined mountain agriculture. Herbers' claims the farmers of GBAO were (prior to 2001) novices as compared to their peers in Gilgit-Baltistan, because they had no experience in independent farm management and decision-making (Herbers 2001: 375).

The inhabitants of Gorno-Badakhshan have dug and maintained canals, known locally as *aryk* or *wedh*, for hundreds of years under extremely arduous conditions to irrigate fields, gardens and orchards²¹. The details of several such canals are presented in Bossenbroek (2011)²². The village of Spienz, 20 km upstream the Gund river from Khorog, has 40 ha of arable land and is irrigated by three main canals, originating from two mountain streams. Each of the three canals, ranging from 2-8 km in length, supplies water to another village before supplying Spienz, and were built by local landowners long before the Soviet period. The village of Shokhirizm, 80 km upstream the Shokhdara valley from Khorog, has 75 ha of arable land, though only 50 ha can be cultivated due to limited water availability. Shokhirizm's land is irrigated by two parallel canals of about 18 and 20 km length, and shares one of its water sources with one upstream village which has 15 ha irrigated land. Shokhirizm's arable land is divided into four sections, three of which are supplied by one of the irrigation canals. The main, secondary and tertiary canals are principally made of stone and earth, and by furrow irrigation and surface flooding they irrigate fodder crops, wheat, barley and potatoes, and fruit trees.

²¹ Raunig (1982: 128), quoted in Bliss (2006: 125), states that archaeological data from Pyandsh shows that irrigation of wheat and barley can be attested for as early as 1550 to 1200 BC.

²² Bossenbroek's thesis specifically focuses on land and water rights through a property and gender lens.

Irrigation usually begins from April and water flows continuously until July or August, according to winter precipitation. Migratory livelihoods are pursued by 35% of households in each of the two villages (according to government statistics, however the actual figure is likely much higher), thus irrigated farming is indispensable for household sustenance (Bossenbroek, 2011).

This section has served to demonstrate the similarities in ecological context in three of six sites selected for this research. Although ecological differences are most stark between that of the low elevation Neugal basin in Kangra valley, and that of the two high elevation sites in the Karakorum and Pamir, it is clear for all three sites that climatic constraints towards agriculture are overcome by gravity-flow hill irrigation, and that subsistence crop production provides an important contribution to household livelihoods, albeit an insufficient one supplemented by nonfarm migratory employment. In development terms, hill irrigation remains central to community well-being and to the social reproduction of communities and of their localities. The historic and contemporary socio-political context of hill irrigation is now discussed.

6. Socio-political and historical contexts of hill irrigation

The structure of property rights and entitlements in the present day is the result of continued interaction between communities of water-users and the state over long periods of time. As shown in this section, all three selected sites have experienced differing periods and intensities of state expansion and contraction, which have greatly impacted upon property rights over and entitlements to land and water resources. For example, in the British colonial period land revenue settlements and the recording of irrigation customs were undertaken in Kangra valley and Shigar valley in the late 19th century and early 20th century, privatising land at the household level into small holdings and largely defining hydraulic tenure arrangements up to the present day²³. On the other hand, in Gund and Shokhdara valleys in the Pamir (and also the Tar valley in the Alai), the Soviet Union completely rearranged land tenure patterns and the agrarian structure, socialising irrigated agriculture. Only after the Tajik civil war, from 1996-98, has land been 'privatised' and redistributed at the individual (then reverting to the household) level into small holdings²⁴. Thus hydraulic tenure arrangements in the Pamir (and Alai) have faced dramatic upheavals and reconfigurations throughout the 20th century, continuing to the present day. As Baker points out, "State support, whether for common, private, or public forms of property regimes, invariably reinforces a specific array of power relations at the local level, thus helping to forge specific types of communities" (2005: 97). The reformist objectives of

²³ It is necessary to point out that Hunza valley, which neighbours Shigar valley, was not subjected to such land revenue settlements. Sidky provides an extended overview of the Hunza valley's history (1996). According to Kreutzmann and Schmidt (pers. comm. April 2012) Shigar is an exception in the Karakorum, because it was a part of Jammu and Kashmir at the time. Most of the valleys of the Karakorum are non-settlement areas, having had no cadastral survey executed. By studying both Hunza and Shigar valleys, I hope to gain an insight into the differential impact of these early land settlements on contemporary water management.

²⁴ Although land was redistributed to individuals in the Alai and Pamir, local people understand land to be owned by households not individuals. In the Alai, official land deeds are recorded at the household level in a red book.

states, including 'structural' policy mechanisms such as the assessment and collection of taxes on land, influences the structure of village communities and the distribution of resource rights and access within them, while simultaneously contributing to the project of state-making (ibid.).

Besides reformist objectives, in recent decade's development objectives more focussed on economic development have become prevalent, through the use of what Vincent (1995: 123) calls 'monetarist-type agricultural reform policies'. Development interventions, pursued by state entities or by non-governmental organisations and donors in league with state agencies, primarily aim to support users through credit provision, introduction of new technologies, and so forth. Development projects often intervene primarily in the technical and organisational fields. Organisations such as the Aga Khan Rural Support Programme (AKRSP) in Gilgit-Baltistan have given preference to the expertise and requirements of local communities in selecting their support projects (Kreutzmann, 1999: 114). However the distinction between reformist and development objectives, or structuralist and monetarist-type agricultural reform policies, has increasingly become blurred due to globalisation processes. For example, the international water discourse has impacted upon recent state-led agrarian reforms in the Kyrgyz Alai and the Tajik Pamir, and to some extent in the Indian Himalaya.

The socio-political context of hill irrigation in the Neugal basin, Kangra valley, Himachal Pradesh

Through the three marked historical periods in Kangra Valley, precolonial, colonial and post-colonial, irrigation canal (*kuhl*) systems and institutions have been the site through which state-making projects have been pursued (Baker, 2005). Precolonial ruling lineages sponsored construction of *kuhls* as a type of political patronage, colonial administrators perfected private property rights believing this would promote agrarian investment, and oversaw the codification of irrigation customs through the compilation of the *Riwaj-i-Abpashi*, and, for example, contemporary district commissioners sanction grants to repair flood-destroyed *kuhls*. The constraints of ecological and landscape form in the valley have disallowed the construction of large-scale canal systems by state intervention, and severely curtailed opportunities for private investment in tube-well technologies more recently. Thus state-making via irrigation has been expressed through engagement with the technology and institutions associated with *kuhl* irrigation, and in an analogous fashion, private agricultural investment urges have been compelled to express themselves through the financing of *kuhl* construction and renovation (Baker, 2005: 200). In this section changes to property rights and entitlements through Kangra's history are outlined, and an attempt is made to gauge the impact of this on hydraulic tenure principles in hill irrigation.

During the precolonial period the control and exchange of land was one of the most important currencies used to consolidate, strengthen and maintain political power. At the assumption of British control of Kangra district, in 1846, around one-quarter of the district had been given by precolonial rulers as political *jagirs* (rights to collect taxes), religious grants, and other miscellaneous grants to individuals (Barnes 1855: 31-33, in Baker, 2005: 105). In addition to

giving grants of land, the rulers sponsored the construction of *kuhl* irrigation systems in order to extend, solidify and sanctify their domains of authority. Baker's research identifies that the construction of 19 of the longest and largest *kuhl* irrigation systems in Kangra were sponsored by the valley's precolonial rulers during the late 17th, 18th and early 19th centuries. These systems are such that they would not have been built without state support, for the labour mobilisation required would have exceeded local capacities, especially in those systems which convey water to less productive lands (Baker 2005: 107-111). State sponsorship of *kuhls*, much like land grants and patronage of temples, was a means by which a ruler could strengthen sovereign control over a region and legitimate his rule. In addition to symbolic benefits, material ones were reaped from such investment: tax assessed on irrigation land was significantly higher (one-half of gross product) than that assessed on non-irrigated land (from one-quarter to one-half, depending on land productivity). Other taxes included those collected for the army, at times of war, for transportation of grain to the state granary, and for writing revenue receipts (Baker, 2005: 111-112).

Immediately after the forcible annexation of Kangra from the Sikhs, the British initiated a first regular land settlement in 1849 (Baker 2005: 117). The process called 'settlement' comprised an assessment of revenue to be collected, and the creation of a record of rights, its purpose to generate income from tax on land and other forms of property (Coward, 1990). Barnes was guided in his assessment by the rent rolls of the prior Sikh government; however he reduced rates on non-irrigated areas and removed many other taxes (Baker 2005: 117-118). The settlement was "heavily influenced by prevailing European social theories about private property, its ownership and productivity, and investment in it, by anthropological theories about social evolution, and by the successes and failures of prior settlements in other regions of India" (Baker, 2005: 16). Thus methods of payment of tax were reversed from the 'ancient and time-honoured custom' of paying in kind, to payment in cash (Barnes 1855: 52, in Baker 2005: 119). Resources became valued not for their political currency but for their utilitarian potential to yield revenue. According to principles of ancestry that had previously held no bearing on agricultural work, the agricultural community was divided into two groups, cultivators and tenants. Cultivators descending from village founders were newly classified as landowners (proprietary rights holders), whereas the remaining cultivators were classified either as hereditary tenants (if they had cultivated their land for 12 or more years) or tenants at-will. Prior to the settlement cultivating households had held allotments of land, appended to which were proportional rights in the uncultivated commons. Shares in the commons included usufructuary rights in grazing and wood collection, and the right to break up and cultivate a household's share (Baker 2005: 118). The settlement meant that such shares (rights) in the village commons "passed into oblivion" (Smith 1996: 32, in Baker 2005: 118); thus "non-landowning" families or lineages were disenfranchised from legitimate use of uncultivated areas. Authority over expansion of agriculture into uncultivated areas, such as forest, shifted from ruler to "landholders", who as a co-proprietary class now had ownership rights in the commons (see also Baker, 2003: 30). New forms of property rights, a 20-year fixed assessment for tax, and increasing grain prices, all provided the incentives for the expansion of agriculture:

the cultivated area in Neugal basin increased 8%, from 6,522 to 7,028 ha, between 1851 and 1892 (Baker, 2005: 58).

Consistent with their desire for progress, and to control and regulate the expansion of irrigated agriculture in order to generate greater revenue, British colonial administrators first compiled the *Riwaj-i-Abpashi* (book of irrigation customs) during the 1874 settlement (Baker, 2003: 26). This allowed the British to exercise control over the construction of new *kuhls*, and to resolve disputes over irrigation rights. Codification of irrigation customs reflected the mid-19th century emphasis on using custom as the basis for determining land rights. Recognising that a village-level record of irrigation rights would not capture the full picture for larger *kuhls*, a watershed-scale record of irrigation rights for Palampur and Kangra *tahsils* (fiscal/administrative tier of the state) was prepared, describing some 715 multi-village *kuhls*, and over 2,000 single-village *kuhls*. The document also contained a glossary of specialised irrigation terms, a section on the customary rules governing construction of new *kuhls*, and maps. Public meetings were held to record the custom and practices relating to each *kuhl*, and it is likely that dominant factions or groups presented a picture of rights in certain *kuhls* that favoured their interest, or to solidify claims (Baker, 2005: 126-127). Using case studies from the various records of specific *kuhls*, Baker concludes that the extraction and classification of local irrigation knowledge and rights that the *Riwaj-i-Abpashi* entailed a) shifted power relations among local groups (generally in favour of already dominant groups), b) undermined the authority of water masters (*kohlis*), c) shifted the terms and arena of water disputes from local, oral, and civil, to general, written and state-centred, and d) expanded the presence of the state at the local level (Baker, 2003). Expansion of irrigated agriculture, construction of new *kuhls* (41 were constructed between 1850 and 1916), and court decisions over irrigation matters, soon made the original *Riwaj-i-Abpashi* outdated, which led to its revision in the third revised settlement from 1913 to 1919 (Baker, 2005: 128).

Through its administrative set-up, the colonial state's interaction with water-using communities has had several implications on water management (Baker 2005). The emergence of the district court and the creation of the *Riwaj-i-Abpashi*, helped to create a new arena within which contested social claims to water could be negotiated. The courts operated according to a different logic to that which had previously existed in the valley, and once the skills and organisation were developed, local groups came to use this arena to advance claims against rival claimants, including even state entities. The Revenue Department and the district court system also resolved conflicts over *kuhl* water during periods of scarcity (Baker, 2005: 131-132), and the colonial government provided the resources to reconstruct *kuhls* following natural disasters, such as the devastating earthquake that struck Kangra Valley in April 1905 (ibid.: 3). By the time of the third revised settlement the colonial government indirectly promoted the construction of new *kuhls* through a "protective lease" provision: application of higher rates of tax assessment on newly irrigated lands were postponed until the foregone revenue payments were equivalent to the cost of the *kuhl's* construction (Middleton 1919, in Baker 2005: 132). Baker concludes that the above state-making processes also contributed to

'community-making', by modifying relations among social groups and between them and state entities: many such 'community-making modifications' related to property rights, devolution of authority to the local community, codification of custom, and classification of social groups (Baker, 2005).

Of the 39 *kuhls* in Neugal basin investigated by Baker, nine *kuhls'* regimes had 'collapsed' in the late 1960s and early 1970s, and have since been managed by the Irrigation and Public Health Department (IPHD). The *panchayats* (elected councils) for the irrigated areas under these *kuhls* negotiated with the IPHD for it to assume responsibility for *kuhl* management under the Himachal Pradesh Minor Canals Act²⁵. The state government's management of these nine *kuhls* is essentially a direct and total subsidy, for it is yet to collect any tax from command area water-users (Baker, 1997, 2005). Besides the IPHD, government agencies or officers that may be involved in authorising funds to *kuhl* regimes include the block development officer, the sub-district magistrate, and the Public Works Department. Baker considers the IPHD's direct involvement in managing the nine *kuhls*, and the indirect involvement of other state agencies and departments for the occasional upkeep of other committee-managed *kuhls*, instrumental to the continued viability of *kuhls*. The reasons the state has retained interest are both ideological, grounded in an ideology of the developmentalist, socialist welfare state, and instrumental: departments such as the IPHD compete with other departments for power and budget outlays, and the civil administration and locally elected political leaders are motivated by the expectation of political support in return for provision of subsidies and grants for *kuhl* maintenance (Baker, 2005: 153-154).

The Himachal Pradesh government of the 21st century's development priorities are highlighted in its 11th Five-Year-Plan (2007-12). The state seeks to increase the productivity and economic value of its natural assets: as agriculture accounts for 70% of employment (95% of female employment) but generates less than 22% of the state's GDP, the state is promoting both a shift to higher return vegetable crops, and to move workers out of subsistence agriculture to either modern agriculture or the nonfarm sector (ADB, 2010: 5). The influence of the international water discourse can be seen in the state's Water Policy of 2005: it proposes a) a participatory approach for policy implementation, b) integrated water resources planning based on hydrological units, c) 'multipurpose' and 'multidisciplinary' approaches to management, d) efficiency in water utilisation, e) financial and physical sustainability through collection of operation and management costs from consumers, and f) a paradigm shift from expansion towards improved performance of existing schemes (ibid.: 25). The Asian Development Bank reports five years on, in 2010, that little of the policy has been put into practice. Therefore the ADB recommends, due to "the very special needs of the state and climate change" (2010: 25), Integrated Water Resources Management (IWRM) be established, and 'climate change adaptation' be mainstreamed. The ADB document provides numerous

²⁵ This act authorises the Himachal Pradesh IPHD to "assume the control and/or management of any canal [*kuhl*] if the owner(s) of the canal consents thereto", though this authority can return to the owners upon their request any time (Baker 2005: 242, footnote 10).

contradictions in its references to poverty and land holdings, limited attention devoted to *kuhls*, and seemingly impossible claims regarding the area of irrigation created by the state (ibid.: 29). This example illustrates the presence of international agencies and ideologies in contemporary Himachal Pradesh.

The socio-political context of hill irrigation in Shigar valley, Gilgit-Baltistan

Pakistan's Gilgit-Baltistan has an unconventional political history, which problematises periodisation into the categories of precolonial, colonial and post-colonial. Taking colonial relations to accommodate not only British domination but also the kinds of domination perceived locally as 'foreign', Sökefeld (2005) shows how the Northern Areas, then known as the Gilgit Agency, were until 1947 subjected to British rule and/or simultaneous domination by Britain and Jammu and Kashmir over differing periods. Two weeks before Pakistan's independence on August 15, 1947, the British left Gilgit under the control of Kashmir. On November 1, 1947 the people of Gilgit started a freedom struggle against the maharaja of Kashmir, their aim to merge the Gilgit Agency with the newly born Muslim state of Pakistan. This succeeded on November 16, 1947 with the establishment of a Pakistani administration; however according to Sökefeld writing in 2005, till the mid-2000s certain oppositional groups perceived the Pakistani administration as some kind of a 'new colonial system', not least because the Northern Areas were not legally a part of the country, and its inhabitants had no right to vote (2005: 940). Thus Gilgit and its surrounding environs can be seen to have been subjected to three different powers in the last 150 years: Jammu and Kashmir, the British Empire, and Pakistan (ibid.: 940). The August 2009 'Gilgit-Baltistan Empowerment and Self Governance Order' takes Gilgit-Baltistan further towards 'internal autonomy', bringing in at par with Pakistan's other provinces, but not quite giving it full provincial status (Hussain, 2009: 6).

Although Shigar valley in Gilgit-Baltistan differs greatly from Kangra valley in respect to its social and ecological characteristics, the two sites share similar agrarian histories in the sense that both experienced rule by local rajas prior to the entrance of the British, and both experienced British-designed land revenue settlements which led to somewhat similar tenure arrangements being put into place. Shigar valley was until the middle of the 19th century ruled by local autocratic sovereigns, known as *cho*, whose authority was grounded around a system of land revenues and dues (Schmidt, 2008: 252). All land was defined as the property of the ruling *cho*, who allowed local farmers to cultivate it in exchange for services, and revenues to be paid in kind (ibid.). Land was sometimes gifted to soldiers or persons enjoying the favour of the *cho*, who thus became land proprietors, though the *cho* could take back this land at will (Hashmatullah Khan, 1987: 136, in Schmidt, 2008: 252). In 1841 the Dogras conquered Baltistan, which included Shigar, and in 1846 the British signed the treaty of Amritsar, under which Baltistan became part of the Princely State of Jammu and Kashmir. For several decades Shigar's *cho* retained his right to collect revenues and to organize administration, though his authority was gradually undermined. By the late 19th century the Jammu and Kashmir administration collected land revenues. In summary, under the *cho*, local farmers were de facto landowners with inheritable property rights, while under the *maharaja*, land possessors

became tenants-at-will; though in practice it is difficult to establish how and if this affected actual control over agricultural land (Schmidt, 2008: 252-253). Polzer and Schmidt found no reliable information about the construction of irrigation canals in Shigar, and what role if any the local ruler played in their construction. They doubt that any single ruler was responsible for the planning, building and maintaining of all the irrigation systems in the valley, and find it probable that specific village communities themselves established the systems, possibly mobilised by industrious or charismatic men of the locality (Polzer and Schmidt, 2000: 203)²⁶.

Land revenue settlements were undertaken by the Jammu and Kashmir administration with British assistance in 1901 and in 1911, following an administrative reorganization in 1899-1901 that led Shigar to fall within a newly established Skardo Tahsil under the Wazarat of Ladakh. The settlement included maps made on cloth, the definition of occupancy and property rights for land, pastoral rights for each village, a revenue assessment based on land cultivation and average yields, and reorganization of administration (Schmidt, 2008: 253). Water rights (*Riwaji-Abpashi*) and other customs (*wajib-ul-arz*) were documented (Schmidt, 2004: 321). Schmidt (2008: 253-256) shows how the settlement had four effects: a) it reorganized administration, such that Shigar formed a so-called *girdawar halqa*, comprising ten revenue circles each headed by a revenue officer – normally Kashmiri, and fifty-seven revenue villages each headed by a village tax collector – a local Balti person. b) Occupancy and property rights were defined. Although the ruler of Jammu and Kashmir declared all land his own, local villagers were given three types of occupancy rights, namely right of possession (as long as dues paid), tenant-at-will (utilisation right dependent on will of land proprietor), and occupancy tenant (right of possession protected, inheritable)²⁷. Additionally Shigar's former *cho* was given rights as a *jagirdar* (having the right to collect tax) allowing him to keep his landed property. c) Land classification and soil categorisation was undertaken for revenue assessment in the settled areas, which included villages and their irrigated surroundings. Land was divided into private property, i.e. cultivable land including kitchen gardens, grassland and arable land, and communal property, i.e. non-cultivable land such as canals, paths and rocks. d) Land revenues were fixed for 14 years, according to the differentiation in land class, and had to be paid in cash, with additional payments to be made in kind, namely wheat and barley. Schmidt concludes that as a result of the land settlement, state income increased; yet for tax-payers the pressure to pay taxes was very high. Tax exemptions were not approved for the poorest, and a significant number of farmers had to sell part of their land or livestock as a result. In addition, different forms of unpaid and forced labour existed. This resulted in many young Baltis emigrating from the region to avoid hardship (Schmidt, 2008: 256).

In 1947 Baltistan came under Pakistani administration, traditional links to Ladakh and the valley of Kashmir were cut, and new roads were constructed linking Baltistan with the rest of

²⁶ By contrast, in the nearby Hunza valley rulers were almost certainly responsible for the development of large irrigation canals. See Kreuzmann (1988; 2000) and Sidky (1996).

²⁷ This classification is identical to that undertaken in Kangra: in Kangra households were classified as either cultivators with proprietary rights, at-will tenants, or hereditary tenants; compared with Shigar's classification of *Haq-i-asami* (proprietary rights), tenant-at-will, and occupancy tenants with inheritable protected rights.

Pakistan. Baltistan became an Agency with Skardu as its capital (Schmidt, 2008: 256). In 1961 basic democracies were introduced to what were then called the Northern Areas, with Union Councils established at the local level, under District Councils (Polzer and Schmidt, 2000)²⁸. The revenue system introduced by the British persisted up until reforms under Bhutto, in 1972-1974, which abolished all land tax collection. Administrative reforms left the revenue circle officer in place, to continue to record land transactions, however the village tax collector post was abandoned. In 1933 proprietary or private ownership rights had been granted to most land users (to individuals or households, normally household heads) in the settled areas of villages, i.e. all irrigated lands (arable fields, gardens and meadows) (Schmidt, 2004: 323). Thus, due to the 1933 and 1972-74 reforms, land possessors (but not tenants) became real land proprietors.

To the present-day the regulations and customs for water use and maintenance of canal systems in Shigar valley are based on both written (*Riwaj-i-Abpashi*) and oral arrangements. The 1972-1974 reforms instigated by Bhutto did not alter the *Riwaj-i-Abpashi* fixed during the 1901 and 1911 land settlements. Dieckhoff and Wegner (2008) studied Shigar Proper's irrigation system and regime ten years on from Schmidt's field research. Their investigation found that the *Riwaj-i-Abpashi* documents are kept in the local administrative (*tahsil*) office, and describe for each village the main canals, the distribution ratio, rotation system, and responsibilities for maintenance. However the record is rarely consulted, according to Dieckhoff and Wegner (2008: 49), due to the document's illegibility and ancient Urdu script that hardly anyone can read²⁹. Local authorities such as elders and *patwaris* (land record officers) have passed on the knowledge orally, and the *Riwaj-i-Abpashi* is only consulted with the local *tahsildar* (tax collector), by village elders and by members of the Union Councils in cases of dispute. The water rights have apparently remained fairly unchanged, and are still effective these days (Dieckhoff and Wegner, 2008: 49); perhaps due to Shigar Proper's water supply being sufficient, and the irrigation system 'stable' (ibid.: 45).

By the late 1990s, no government institution was involved in the maintenance and organisation of irrigation systems in Shigar valley (Schmidt, 2004: 322). Ten years later, Dieckhoff and Wegner found that government financial support was being extended; but not by implementing any projects. Compared with the irrigation canals of Kangra valley, Shigar Proper's irrigation system can be usefully equated with several canals coming off the one river; nine main canals divert water from the glacial stream. Dieckhoff and Wegner (2008: 53) found that local government financial support had been extended to reinforce canal walls and canal heads with wired stone walls, and sections of canals have been cemented for erosion resistance. Changes to the organisational structure of canal regimes were noticed for financial

²⁸ Polzer and Schmidt provide a fascinating account of how power was redistributed in Shigar valley following the establishment of Union and District Councils, with Shigar's former *cho*'s descendents seeking seats in the councils, and not being expropriated of their lands even in the Bhutto reforms (2000: 198-207).

²⁹ The authors also cite a low literacy rate as impeding the reading of the document. They quote IUCN Karachi, which gives a figure of 16.4% literacy rate (IUCN 2007, in Dieckhoff and Wegner 2008: 49). However Benz et al. (2008: 120-121) state that the IUCN has a restrictive definition of literacy, and so use the AKRSP definition, in which a person is considered literate if they have graduated primary school (etc.), which brings the literacy rate of Shigar close to 51%, only slightly lower than Pakistan's average of 54%.

matters. Penalties for farmers (for breaking rules) are claimed in cash, not in kind as in the past. The budget allocated for irrigation by the local government has risen noticeably, due to the stated reasons of increases in prices and needs. The government allocates annual contributions to the local government, and Union Councils receive a lump sum for diverse community issues, such as education, health and irrigation, which is then redistributed according to local needs and priorities. Due to this local government funding, wage work has risen, and much of the work which was previously done by the community is nowadays partly performed by contractors who are paid by the local body. It is noted that the national government and NGOs, namely Aga Khan Rural Support Programme (AKRSP), nowadays play supportive roles in irrigation management: the government funds local government (Union and District Councils, *tahsildars* and village elders), while NGOs finance the implementation of projects by water-users; however the local government pay local contractors to do the work, while the AKRSP allows water users to oversee work directly (Dieckhoff and Wegner, 2008). Thus the government and NGOs, namely AKRSP, support water management; however the way funds are channelled are entirely different.

The Aga Khan Rural Support Programme was established in 1982 as an expansion of the Aga Khan foundation's network of welfare programmes serving the Ismaili community³⁰. AKRSP is non-communal, serving the entire population, also a major precondition for financial support from international donor organisations (Clemens, 2000: 3-4)³¹. AKRSP's activities started in Gilgit in 1983, and officially expanded to Chitral and Baltistan (including Shigar) in 1986 (ibid.: 4). The programme's main objective is to 'support the commercialisation of previously subsistence villages' (World Bank, 1987: xii in Clemens, 2000: 4) by increasing agricultural productivity and surplus marketing. The central focus is direct integration of the village population into decision-making, planning and implementation processes via formation of village organisations (VOs), and entrustment of project maintenance/management on completion. Thus filling the institutional vacuum left after the 1970s abolition of feudal rulers (Clemens, 2000: 5; Fazlur-Rahman, 2007: 335). By the sixth regional programme year, in 1990, 156.1% of Shigar subdivision's 57 villages were covered by village organisations (i.e. half of villages had two VOs), and 58.3% of all households in Shigar (4,759 in the 1981 census) were 'covered by' VOs, with each VO have an average size of 31.2 (Clemens, 2000: 9)³².

The Productive Physical Infrastructure Programme (PPI) is AKRSP's major programme, and irrigation projects – the construction and repair of irrigation canals in particular – are the major part of this programme. In 1990, in addition to irrigation canal projects which comprised about one-third of all projects, non-canal irrigation projects such as pipe and lift irrigation projects were decided upon in Skardu and Shigar basins; and in Shigar – and with increasing distance

³⁰ Further research on AKRSP is identified but not yet consulted, e.g. Khan and Khan (1992), World Bank (1996), and Wood, Malik and Sagheer (2006).

³¹ Aga Khan Development Network initially funded the work, and later GTZ, CIDA, DFID started financing the projects. The Pakistan government also provides some funds (Fazlur-Rahman, 2007: 334-335).

³² Clemens sources AKRSP reports and Government of Pakistan data to provide these statistics. Recent data needs to be sought to make this meaningful; the data is provided here to give the extent of AKRSP's coverage.

from the urban centre of Skardu – there was a high share of flood control PPIs and boundary wall construction (2000: 19-21). The programme in Baltistan was done according to the local administration, which meant that the programme's expansion was slow through the 1980s, initially centred at the Indus and Shigar rivers (Clemens, 2000). Fazlur-Rahman (2007: 338-339) analyses the PPI projects completed by VOs up to 2000, for three regions/programmes (i.e. Baltistan, Chitral and Gilgit), and finds that of 802 projects initiated in Baltistan, 85% were completed by 2000. Of 802 projects, 54% were for 'irrigation' (including 388 'feeder channel/pipe irrigation', 30 'storage reservoir', and 14 'lift irrigation'), 26% for 'other' (i.e. 89 'protective works', 78 'boundary walls', 9 'micro-hydel schemes' and 33 'water supply/delivery'), with the remaining 20% of projects covering 'transport', i.e. roads (143 projects), and community centres, bathrooms and sanitation (14 projects). Fazlur-Rahman is critical of the local government system that has been functioning since 2001, because of tussles between members of national and provincial assemblies and district representatives. Rural elites have availed a majority of benefits. He complains that most rural development programmes are initiated by the Local Bodies and Rural Development Department (LB&RD), but the development approach has been sector-based, with different line agencies looking after their own projects without sufficient coordination. In this respect, the development strategy of AKRSP has been highly successful, and can be seen to represent sustainable rural development (Fazlur-Rahman, 2007: 332-333). However the AKRSP approach is not without criticism (cf. Clemens, 2000: 2; Settle, 2011).

The socio-political context of hill irrigation in Gund and Shokhdara valleys, Gorno-Badakhshan

Though sharing similar agro-ecological and religious characteristics, the political and agrarian histories of Gorno-Badakhshan and Gilgit-Baltistan could hardly differ more. One way to periodise history in Gorno-Badakhshan is according to transformations in property rights, i.e. a feudalist period from the 16th to early 20th century, a period of collectivisation of agriculture under the Soviet Union from the 1930s until 1990s, and finally the post-1991 period marked by the independence of Tajikistan, civil war, and the redistribution and privatisation of agricultural land (Bossenbroek, 2011). This section attempts to sketch out the changes to property rights and entitlements over this period, with an attempt made to gauge the impact these changes have had on principles of hydraulic tenure in gravity-flow irrigation systems. The material on irrigation is limited; nevertheless discussion of changes in administrative structure and of the objectives of the state towards agricultural production is pursued. Reference is made to Shugnan and Roshtkala districts, or Gund and Shokhdara valleys, because it is in these districts/valleys where field research is planned.

During the 'Great Game' the Pamir Boundary Commission of 1895 definitively set the borders between British India and Tsarist Russia, in the process creating the Wakhan Corridor as a buffer zone between the two empires³³. Local rulers were unsatisfied with this outcome,

³³ The southern border of the Wakhan Corridor was established in 1893 when the Durand Line was drawn. Russian and British officers negotiated the northern border, with assistance by Afghan officials (Kreutzmann, 2005: 11).

because it spatially partitioned regional semi-autonomous principalities like Badakhshan, Darvas, Wakhan, Shugnan and Rushan (Kreutzmann, 2005: 11). In the middle of the 19th century, the parts of Darvas on the right side of the Pyandsh river were a permanent part of the Emirate of Bukhara (which is today part of present-day Uzbekistan). Shugnan, then ruled by a Shah, included Rushan (governed by relatives of Shugnan's *shah*), the Bartang valley, Shokhdara valley (ruled by an autochthonous family), as well as the Gund valley and the plains and side-valleys of the Pyandsh on both sides of the Gund estuary (Bliss 2006: 66). On the Afghan invasion of the right bank of the Pyandsh in 1883, Shugnan's local rulers had turned to the Emir of Bukhara and the Russian Governor-General of Turkestan simultaneously for help. The inhabitants of Shugnan and Rushan suffered greatly during the Afghan invasion between 1883 and 1895, as large parts of the land were laid waste; for example, the population of Rushan was reduced by a half (Becker, 1968: 215, in Bliss, 2006: 73). Bliss also notes that the Shugnan were equally ruthless when at war (2006: 66). After the Pamir Agreement the Afghans withdrew, after some hesitation, but not the Russians. Thus in 1895 the Russians gained territory formally belonging to Bukhara namely Rushan and Shugnan; while Bukhara had to give up parts of Darvas on the left side of the Pyandsh to Afghanistan.

Between 1893 and the dissolution of Bukhara from 1921 to 1924, Russia and Bukhara held joint sovereignty over much of the Pamir. However for Shugnan, Bliss (2006: 73) states that a Russian military administration was transferred to Khorog in 1897-98, even while the civil administration remained under Bukhara's jurisdiction till 1924. The Russians likely created a few major routes to and from Khorog in the period prior to the First World War, while the Bukhara civil administration did little more than institute, around 1900, a cursory census providing a basis for taxation (*ibid.*: 73-74). To Bliss, the special status of high mountain valley agriculture was taken into account during this census, because a farmer's wealth was measured by the weight of crop not the size of landholding (Holzwarth, 1990: 151, in Bliss, 2006: 74). Up until the end of the Great Game in 1917 and the emergence of the Soviet Union, there is no account of resistance by the people of the Pamir to the Russian occupation, but there is mention of unrest among the populace who complained to the Russians about the way the Bukharan regime behaved (Luknizki, 1954: 220 in Bliss, 2006: 74). The Russian occupation of the Pamir led to a definitive reduction in taxes (Bliss, 2006: 147). After 1905 only half the previous land tax, one-third of the livestock tax, and just 5% of the former harvest tax were collected (Holzwarth, 1990: 159-160 in Bliss, 2006: 147). Informal contributions in labour, goods or services continued however, for example, the building of canals or upkeep of village guest house, or the building of roads and bridges for the district. There are mixed accounts of social stratification in the Pamir during the 19th century. By 1917 6% of households were considered well-off, 27% as middle-class and 67% as poor, 60% of the latter owning less than 1 ha of land and almost no livestock (Kreutzmann, 1996: 171 in Bliss, 2006: 150). A detailed but mixed account of Pamiri society for the pre-Soviet period, covering social stratification, poverty

The resultant Wakhan Corridor forms a link between Afghanistan and China, and separates Tajikistan from Pakistan. It is roughly 300 km long and 15-75 km wide (*ibid.*).

and slavery is provided by Bliss, who concludes that society was strongly differentiated (2006: 147-151).

The importance of irrigation in pre-Soviet Gorno-Badakhshan is revealed by Olufsen, head of Danish Pamir expeditions in 1896-97 and 1898-99, and whose 1904 book covers the right bank of the Pyandsh (Olufsen, 1904). Olufsen writes, "All cultivation is attained by irrigation, as in other parts of central Asia. Outside of the irrigated area there is no considerable vegetation to be found except, of course, along the banks of the rivers." (ibid.: 110) "The water is conveyed [to cultivated field and gardens] by means of a few channels which are seldom more than two feet deep and the same in breadth, cut from the upper course of the rivers on the mountain slopes down to the kislaks [villages], whence minor channels ("wado") lead the water to every landed proprietor, who again, by means of innumerable little channels, lead the water out over the fields and gardens" (Olufsen, 1904: 114). "It is one of the most difficult of undertakings to keep the channels in order; often they must be led several kilometres in zig-zag or in numberless windings down the slopes. Often it is impossible to make them in the hard rock and they have to be constructed of stones and clay along the mountain sides, and in snow melting time the earthslips and avalanches destroy the whole work so that in spring they have to be constructed anew" (Olufsen, 1904: 114-115). Given the detailed account by Bliss of the traditional political system in the Pamir in the 19th century, it seems unlikely the rulers played any role in the construction of these canals. For example, at the end of the 19th century, the whole of Shughnan's dominion comprised only 1,500-2,000 households with no more than 250 armed men (covering an immense area) (Holzwarth, 1980: 203 in Bliss, 2006: 143). Bliss deduces that local rulers had humble resources, probably with no more than 12-24 armed men in peacetime (2006: 143). In his discussion on canal (*aryk*) construction in Ishkashim and Wakhan, Mukhiddinov (1975: 19-20) does not mention the role any ruler played. He states that there are many ancient canals which have existed for hundreds of years; even the old generation cannot say by whom they were built. Construction of the more recent canals, built in the late 19th and early 20th centuries, was organised by village leaders with the help of experts and the labour of all the village community.

The Russian occupation of Turkestan changed the earlier Islamic legal foundation to land ownership substantially, with Articles 119 and 120 in the statute of the Russian military government providing that all land should belong to the state and that the farmers would only be allowed its use. In 1922 Russian land law in Turkestan was confirmed by the Soviets, with the basic buying and selling of land prohibited, and land to be distributed to all people over 16 who were explicitly promised the right to use land and water (Bliss, 2006: 123-124). The planned land reform was hampered till 1925 by the Basmachi uprising in the Ferghana valley (ibid.: 124, see also Abashin et al., 2011). If land reform occurred in Gorno-Badakhshan before collectivisation, which took place between 1933 and 1937, then it could only have affected a few areas for there were few farmers with excess land. Thus in the early Soviet period not land distribution but the possibility of using land relatively free of taxes is cited in reports as the great achievement of the early Soviet period (Bliss, 2006: 124). The Emirate of Bukhara was

abolished de jure in 1924, after which the Pamir regions were added to the Autonomous Socialist Soviet Republic of Tajikistan – separated from Uzbekistan in 1929 – first as ‘Special Pamir Oblast’, then later as ‘Gorno-Badakhshan’ (‘Mountain-Badakhshan’) (Kreutzmann, 1996: 118 in Bliss, 2006: 76).

In the 1930s under Stalin private land ownership was abolished and agriculture collectivised, first as Kolkhozes and Sovkhozes (Herbers 2001). Kolkhozes were collective enterprises, such that apart from the land itself, the capital and productive assets belonged to the workers, with the income of the workers depending on the profit generated. Sovkhozes were state enterprises, with all land and other property belonging to the state, and the workers state employees having fixed salaries independent of the Sovkhoz’s profitability. Kolkhoz workers’ earnings were only a third of Sovkhoz’s workers’, therefore wage reform programmes were undertaken in 1966, and by the second half of the 1970s, loss-making Kolkhozes were merged into Sovkhozes. By 1987 all of the 49 Kolkhozes that had existed in Gorno-Badakhshan in 1975 had been transformed into 28 Sovkhozes (State committee on statistics of the Republic of Tajikistan 1987, in Herbers, 2001: 371)³⁴. For example, around Khorog the four former Kolkhozes of Shugnan, Sokhcharv, Darmorakht and Porshinev, were merged into one Sovkhoz (Bossenbroek 2011: 46). Herbers calculates that the 28 Sovkhozes had an average size of 607 ha, and an average total number of workers of 563 (ibid.: 381). She gives the example of ‘Sovkhoz International’ in Bartang, which in 1987 comprised a total area of 10,947 ha, though only 315 ha comprised arable, i.e. irrigable, land. Herbers presents data on the privatisation and restructuring of agriculture in Bartang valley, which contained 11 Kolkhozes till 1976. These merged into four Sovkhozes after 1976, divided into 12 Sovkhozes in 1992, transformed into 12 Kolkhozes in 1996, before they were privatised, resulting in 38 villages with private farms, and one Goskhoz (a state-run livestock enterprise). One important point to keep in mind is that the division of land after 1996 was carried out village by village, thus it was not the land of each Kolkhoz that was divided amongst all its members, but rather each village’s land that was divided amongst its inhabitants (ibid.: 373). This point is substantiated in Bossenbroek’s recent study of two villages (2011). By 1999, around 80% of Gorno-Badakhshan’s cultivable land had been privatised (Herbers, 2001: 375).

Collectivisation impacted upon the management of hill irrigation systems because farmers were made to specialise in one, often narrow, kind of work. Bliss gives the example that whereas one farmer became a tractor driver, another became responsible for irrigation, a third became a cowherd, and the sons and daughters of farmers became mechanics, economists, vets, soil experts or hydraulic engineers in the Sovkhozes once they completed their training. The result was that once land became privatised, only the older men who had themselves once been farmers many years before, were capable of running a farm properly (Bliss, 2006: 250). Although agriculture had become mechanised, irrigation based as it was on gravity-flow canal

³⁴ Farmers had retained formal ownership of their land up until this nationalisation of land and livestock in the 1970s, although they were forced to collectivise agriculturally productive land and to work and use infrastructure communally. Farmers were left only with their gardens (Bliss 2006: 250).

systems had remained labour intensive (ibid.). Through the Soviet period, from 1926 to 1987, the total area of cultivated land increased from around 4,500 ha to 18,000 ha in Gorno-Badakhshan, however the best land was already being cultivated by traditional agriculture, and so given population increases, agriculture never improved beyond subsistence level (ibid.: 252). During the economic crisis that precipitated at the time of the civil war in 1992-93, many irrigation canals were not looked after properly, with the result that some main canals became blocked by landslip and cultivation of entire tracts of irrigated land was halted (ibid.: 285).

The Pamir Relief and Development Programme (PRDP) was set up in 1992 under the aegis of the Aga Khan Foundation. During the civil war in 1993, Bliss estimates that the government in Dushanbe allocated to Gorno-Badakhshan just 10% of the food it required, and in 1994, just less than 25% (2006: 297). From 1993 PRDP began supplying food aid to the province's populace, simultaneously setting up an agricultural development programme. By 1995 PRDP was rehabilitating canals. Around 1997 PRDP extended its mandate west of Gorno-Badakhshan and renamed itself Mountain Society Development Support Programme (MSDSP). By 2002 production of food in the province had reached a record level of 80% as compared to just 20% in 1994-95; even though in 1997 experts believed only 40% would be possible (Bliss, 2006: 297). Bliss provides an account of the multiple tasks undertaken by MSDSP, including: its humanitarian assistance programme; its agricultural reform programme (ARP), in which it actively worked to a) put decision-making in the hands of farmers, b) support the dilution of the Sovkhoz system, c) rationalise land allocations by village community groups (in 1996-98), and d) increase yields through use of better technologies; besides other economic, welfare, and communal development activities (ibid.: 297-329). A land reclamation component of PRDP planned in 1994-95 to build 32 new irrigation canals with a total length of 220 km up to 2000. In 1996 almost 110 km of new canals were constructed, and about 100 km of existing, damaged canals were repaired under a food-for-work programme. In 1997 325 ha additional land was provided for by canals, and over 600 ha in 1998. There were mixed results (ibid.: 313-314). Bliss concludes from his observations in 1995-98, and 2003, that most farmers in Gorno-Badakhshan had insufficient knowledge of irrigation systems despite the long-standing tradition of irrigation in the Pamir. An estimated 50-70% of water is wasted from many canals because of their setting, or damage to them, while Bliss also claims that farmers do not even possess the basic skills to extract water from a canal to irrigate fields. He recommends that more support for irrigation systems is necessary (ibid.: 316). Overall, the writings of Bliss, who worked alongside MSDSP in the Pamir for over a decade, leaves the impression that Soviet collectivisation had a detrimental impact upon hill irrigation system management.

This section has demonstrated the contrasting historic and contemporary socio-political contexts within which hill irrigation has evolved and is practised in three sites across the Himalaya, Karakorum and Pamir. While these three sites do not adequately display the variation found across the whole mountainous region of interest, they serve to illustrate the difficulties of making a comparison across 'traditional areas', for it is obvious that there are certain similarities between the history of the Kangra valley and Shigar valley, whose lands

were settled by or under the influence of the British Empire over a hundred years ago, with fairly limited changes having taken place since, as compared to that of Gorno-Badakhshan's valleys which have had a tumultuous history of land reform and re-organisation of local roles, due to their experiences under the Soviet Union and in the period since Tajikistan's independence. However there is also great variation in the socio-political context of hill irrigation between neighbouring valleys falling within a territory, as the case of Hunza and Shigar makes clear. Within a valley variation in management arrangements are found between irrigation systems too. For example, Schmidt (2008: 323) details the differing types of arrangements that exist in Shigar valley, dependent upon water surpluses or shortages, and upon the hydraulic tenure arrangement, i.e. water rights per household, per clan, per village, according to the length of the canal and its history. This section has also made clear that different actors are at work in the three selected sites, with very different types of state and non-state interactions at play in the field of irrigated agricultural development. In the next stage of this research additional valleys will be included within the sample, for example, Hunza valley in the Karakorum and Tar valley in the Alai, and water management at the canal level within valleys will be investigated. The role of the private sector, if applicable, also needs attention. The paper now discusses where research is needed for an understanding of contemporary processes underway in the selected valleys.

7. Impact of nonfarm employment and development interventions

The above discussion has highlighted the ecological and livelihood contexts, historical socio-political contexts, and contemporary development contexts within which hill irrigation in the lower Himalaya, high Karakorum, and high Pamir is located. The studies mostly draw upon more macro- and meso-level analyses of ongoing processes, such that they do not for the most part offer detailed case studies of individual irrigation systems, providing a view on what irrigators themselves have to say about ongoing water management-related events. The task of empirical work will be to investigate local views surrounding the contemporary processes underway in hill irrigation, namely those of a) how increasing levels of out-migration, or nonfarm employment are impacting upon irrigation canal management, b) how farmers are mobilising themselves, or being mobilised by the state and non-state (NGO or private sector) actors involved in irrigation development initiatives, to access resources to improve or maintain their irrigation canal systems, and c) how inequalities in access to and control over water, land and other agro-resources, are manifesting.

Research in the Kangra valley by Coward (1990) and Baker (2005) offer many insights for this ongoing research. Coward concludes that the irrigation rights documented in the British era provide much of the 'social glue' required for the operation and sustenance of hill irrigation systems: while climatic, topographic and agronomic conditions provide the context for the careful division of water, the rules (as listed in the *Riwaj-i-Abpashi*) structure the broad relationships between the various groups and individuals with a claim to water (1990: 83).

Coward also shows how maintenance tasks are and were never equally distributed among water-users within a canal: the general rule in Palampur's *Riwaj-i-Abpashi* is that the 'last' village to receive water is responsible for maintenance and repair of the main canal; the irony being that the group receiving the poorest irrigation services has the heaviest burden for maintenance and operation (ibid.: 84). Generally speaking, in Shigar valley and in the Gund and Shokhdara valleys, all households have to provide a male labourer for main canal maintenance work, regardless of their size of land holding (Bossenbroek, 2011: 81; Schmidt, 2004: 325). What is uncertain and needs clarification, is a) whether or not the high mountain valleys share more equal divisions of maintenance tasks and water distribution, as compared to lower elevation valleys, b) the reasons for this, be it related to religious-cultural attributes stressing equality, the harsher environment necessitating cooperation, or other factors. It is also necessary to further study c) the effects the Soviet value system of equality for all, had upon hill irrigation systems, d) whether or not such introduced values have been retained, e) the different outcomes in the present-day according to whether or not irrigation rights and customs were documented in the past by governments (thus providing a 'social glue' in Coward's sense), and f) different outcomes according to whether or not oral irrigation rights and customs have faced massive upheavals – such as through the collectivisation processes of the Soviets – or remained stable.

Contrary to more simplistic associations made between formality in organisational structure and resource mobilisation requirements (e.g. Martin and Yoder, 1988), Baker (2005) suggests that temporal as well as spatial factors are at play. His historically grounded research examines both the impact of nonfarm employment on canal regime management strategies, as well as mobilisation by water-users to access state resources in response to the changing context within which irrigation is practised, namely changing values and work patterns, the powerful discourse of development and modernity, and more broader social changes such as declining importance of village-level structures and authority, or of caste. To Baker, while the codification of water rights (in the *Riwaj-i-Abpashi*) played a role in the undermining of traditional water masters and the increasing involvement of the state in canal management, the stresses to irrigation institutions/regimes arising from increasing nonfarm employment are likely the principal source of variations in management outcomes in individual canals (1997: 200). Increasing levels of nonfarm employment has affected Kangra's canal institutions in four principal ways: a) decreasing participation in *kuhl* maintenance work parties, b) increasing inequality between head and tail end farmers in terms of water consumption and maintenance contributions, c) a decline in the authority of water masters, and d) a change in crop patterns (Baker, 1997: 202-204; 2005: 136-154). Such indicators will be investigated for other valleys.

Of the 39 canal institutions (or regimes) investigated by Baker in the Neugal basin in Kangra valley, just ten persist relatively unchanged, informally managed without a water master (*kohli*). These ten regimes are characterised by a high reliance on irrigation water and by low social differentiation among irrigators. The nine regimes that 'collapsed' and whose canals' management were taken over by the Irrigation and Public Health Department (section 6) are

characterised by low reliance and high social differentiation; besides being large physical systems. Of the twenty regimes that have modified their operational rules and governance structures in response to increasing nonfarm employment, fourteen have formed committees. Twelve of these fourteen committees were modelled upon two earlier committees, registered and supported by the Department of Cooperative Societies. These fourteen committees were formed for three reasons: a) to increase the *kohli's* legitimacy (13 of 14), b) to facilitate acquisition of government funds for repair works (9 of 14), and c) to defend against external threats (2 of 14). The varied outcomes for the *kuhl* regimes relates to their social and ecological context, and also the processes of negotiation that have taken place between various state and local level actors. Although this present research does not have the scope to repeat the macro-level analysis Baker performed for the Neugal basin across all its selected sites (e.g. from Shigar valley to the Tar valley in the Alai), Baker's work provides a useful guide to some topics for empirical work. Given the omnipresence of the Aga Khan Foundation's MSDSP and AKRSP across the mountainous regions in focus (apart from the Himalaya), it is necessary to examine how communities of water-users have a) mobilised themselves or b) been mobilised to access and utilise funds and resources, and c) how such processes have altered water usage and management practices at the individual user and canal level³⁵.

In contrast to the decline over time in local-level authority in Kangra valley (cf. Baker 2005), administrative changes in Shigar valley due to Bhutto's reforms led to the institution of village elders/headmen (*tsharma*) being revived; although not without problems (Schmidt, 2008: 257). *Tsharma* settle disputes, fix days for canal cleaning and repair, nominate canal watchmen (*chhustrung* and *chhulsoq*), among their other duties. They took over most of the work previously undertaken by the village tax collector, including calling for communal work or dividing property on the death of somebody. The institution of *tsharma* exists alongside that of the constituted councils, and there is competition between these two institutions: *tsharma's* are not elected, but come from respected families, whereas councillors are political representatives (Polzer and Schmidt, 2000). Dieckhoff and Wegner's (2008) research highlights how villagers consider the involvement of local Union Councils detrimental to irrigation management: government funded irrigation improvement work performed by contractors is perceived to lead to a slight decrease in the attendance rate of villagers during maintenance work. These examples highlight that state interventions, be they directly or indirectly related to water, impact upon the local organisation of irrigation management.

Entirely different experiences with local-level authority are found in Gund and Shokhdara valleys, and across Gorno-Badakhshan. For example, Bossenbroek (2011: 63-69) shows how two very different routes were taken to land redistribution in her two selected research villages in 1997-98. In one village, in Gund valley, a commission was formed that consisted of the

³⁵ Intervention processes are never one way processes, because water-users are themselves active participants in the processes. Both Baker (2005) and Coward (1990) show how in the contemporary period, irrigation communities in the Kangra valley, Himachal Pradesh, are able to resist the Indian state's attempts to intervene in irrigation using colonial records of irrigation customs (*Riwaj-i-Abpashi*), which are recognised as 'water rights' by the district courts. The district courts were themselves established in the colonial period.

former Sovkhoz director and its units' heads, as well as local government representatives, who decided to follow the President's decree, which meant that former workers of the Sovkhoz received extra parcels of land as compared to non-workers. This resulted in some favouritism, with relatives of the director reportedly receiving better parcels of land. By contrast in the other village, in Shokhdara valley, the newly elected headman (*rais*) together with the village's farmers association undertook land redistribution. At first the *rais* wanted to redistribute land according to how it had been distributed prior to the Soviet era, because the *rais*' family had been wealthy landowners, and had even overseen construction of the canals serving the village. The villagers declined this proposition, and later land was divided equally: each and every household member received 6 *hessa* (0.06 ha) of land, regardless of their status, i.e. long-term resident, recent immigrant displaced by the civil war, elder, child, or residing abroad. This example from just two villages in Gorno-Badakhshan clearly illustrates how one cannot generalise for this province; that empirical work is needed to verify ongoing processes³⁶. The case study also contains a valuable insight: at least some families that were economically and politically dominant at the village-level in the pre-Soviet era managed to weather the entire Soviet period, to emerge with their status intact. The implications of this for irrigation management need empirical investigation.

The review of literature conducted thus far leaves an unsatisfactory understanding of the impact high levels of nonfarm employment has upon hill irrigation system management. Historical literature reviews from Kangra and Shigar valleys serve to highlight how migratory, nonfarm employment is not a new phenomenon. In 1874 a settlement officer in Kangra valley noted that generational subdivision of land had already reached "its lowest point" and that if the people had relied solely on their land for their livelihood, many would be starved (Lyll 1874, in Baker 2005: 56). Thus nonfarm income was playing a significant role in supporting the subsistence agriculture economy of Kangra valley even in the mid to late 19th century. Schmidt (2008: 256) notes that the land settlement reforms of the British in 1901 and 1911 led to many young Baltis out-migrating to avoid hardship. He also explains how population growth, a lack of financial resources, and physical constraints upon new land colonisation, mean that labour migration to big cities in Pakistan and to the Gulf states has become an essential strategy for households, although their primary pillar remains agriculture and animal husbandry (Schmidt, 2008: 251).

Baker's (2005) work is the only research identified that explicitly tackles the impact of nonfarm employment upon irrigation. However his analysis generalises at the level of the irrigation system or 'regime', without detailed exploration of the effects at the farmer- and canal-level (the common trade-off between a macro- and micro-analysis). Aside from this, the migration literature is largely disconnected from that of the irrigation literature. Many studies on migration have been published for Kyrgyzstan (e.g. Abazov, 1999; Becker and Paltsev, 2004;

³⁶ For example, regardless of the seemingly equitable redistribution process in the latter village, data collected from the newly formed Water User Association shows that in the present-day irrigated land holdings are quite unequal, with the largest land holder having 2.27 ha and the smallest having just 0.39 ha (own data, May, 2012).

Isabaeva, 2011; Rohner, 2007; Schmidt and Sagynbekova, 2008), for Kyrgyzstan and Tajikistan (e.g. Marat, 2009), and for the mountainous regions of Tajikistan, Kyrgyzstan, Afghanistan and Pakistan (e.g. Olimova, 2005). Schmidt and Sagynbekova (2008: 122) state it remains difficult to discern whether labour migration weakens or strengthens sending communities; and observe that migration tends to strengthen individual households but lead to a shortage of labour for agricultural work. Halpern (2011: 10), in a study for MSDSP in the Pamir, notes frequent mention by MSDSP staff and local leaders of the difficulty of finding able-bodied workers for digging canals. Halpern finds there is a reduction in the value placed on the local economy by households with migrants, resulting in less interest or motivation for working on irrigation projects. For Shigar, Dieckhoff and Wegner (2008: 54) claim that increasing levels of nonfarm employment reduce participation in canal maintenance work, with absenteeism often justified by villagers due to their lack of time availability due to other work obligations. Research from across Tajikistan, Pakistan and Kyrgyzstan's mountainous regions, by Olimova and Olimov (2007: 106-107), reiterates these messages, claiming that without investment being made into capital-intensive methods, women and children end up becoming more intensively employed in the agricultural sector, impeding agricultural modernisation and development. The material available for gaining a detailed understanding of the irrigation migration nexus is insufficient; and empirical work is required to comprehend this better.

Empirical research in the upcoming year will attempt to more clearly establish how nonfarm employment impacts upon hill irrigation management tasks, and how water-users mobilise themselves to access resources from the state and from non-state actors, and vice versa, how non-state actors such as MSDSP or AKRSP, or other non-government organisations, private actors, and the state interact with water-users and hill irrigation systems.

8. Conclusion

Irrigated agriculture by canal irrigation remains central to the livelihoods and subsistence of people residing in the Alai-Pamir-Karakorum-Himalaya mountain ranges and foothills, though current levels of out-migration have seemingly reached unprecedented levels. Unlike for the Karakorum and Himalaya, studies are sparse for the canal irrigation systems of the mountain ranges and valleys of Tajikistan and Kyrgyzstan. This relates to the partitioning of the region into British and Soviet spheres of interest in the late 19th and early 20th century, to post-Second World War developments including the Cold War division of the world's nations, and to academic specialisation via the delineation of areas into conventional categories. It also relates to the young age of independent Kyrgyzstan and Tajikistan; two decades has passed since the collapse of the Soviet Union. In this period there have been many changes in the agrarian sector, but given the small size of the countries' populations, the little academic attention that has been given to agriculture has largely focussed on the more productive regions within their territories.

This paper has attempted to take a post-area studies approach to the study of hill irrigation across the Alai-Pamir-Karakorum-Himalaya, by disregarding the area studies categories of 'Central Asia' and 'South Asia', and examining ecological, livelihood, and socio-political and development contexts of hill irrigation in select valleys of the Pamir, Karakorum and Himalaya. It is clear for all three sites that climatic constraints towards agriculture are overcome by gravity-flow irrigation, and that subsistence crop production provides an important contribution to household livelihoods, albeit an insufficient one supplemented by nonfarm migratory employment. The historic and contemporary socio-political contexts within which hill irrigation has evolved and is practised differ in many respects, yet also share some similarities. While the three sites selected for this paper do not adequately display the variation found across the whole mountainous region of interest, they serve to illustrate the difficulties of making a comparison across 'traditional areas', for when taking into account agrarian structure, it is obvious that there are certain similarities between Kangra valley and Shigar valley, formerly under the influence of the British, as compared to that of Gorno-Badakhshan's valleys, previously within the Soviet sphere of interest. The incorporation of additional valleys in the planned research will serve to highlight the difficulties that are also encountered if and when one compares within 'traditional areas'.

Finally, the paper has discussed why research is needed to investigate local views surrounding the contemporary processes underway in hill irrigation: How are increasing levels of nonfarm employment (out-migration) impacting upon hill irrigation canal management? How are farmers mobilising themselves or being mobilised by the state and non-state actors involved in hill irrigation development initiatives, to access resources to improve or maintain their irrigation canal systems? How are inequalities at the individual, household, community, and village levels, in access to water and control over hill irrigation systems manifesting? Empirical research will seek to address these questions. Allowing water-users to proffer their perspectives on what are the important contemporary issues in need of detailed study will be an important component in achieving this goal.

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Information on the competence network *Crossroads Asia*

The competence network *Crossroads Asia* derives its name from the geographical area extending from eastern Iran to western China and from the Aral Sea to northern India. The scholars collaborating in the competence network pursue a novel, 'post-area studies' approach, making thematic figurations and mobility the overarching perspectives of their research in *Crossroads Asia*. The concept of figuration implies that changes, minor or major, within one element of a constellation always affect the constellation as a whole; the network will test the value of this concept for understanding the complex structures framed by the cultural, political and socio-economic contexts in *Crossroads Asia*. Mobility is the other key concept for studying *Crossroads Asia*, which has always been a space of entangled interaction and communication, with human beings, ideas and commodities on the move across and beyond cultural, social and political borders. Figurations and mobility thus form the analytical frame of all three main thematic foci of our research: conflict, migration, and development.

- Five sub-projects in the working group **"Conflict"** will focus upon specific localized conflict-figurations and their relation to structural changes, from the interplay of global politics, the erosion of statehood, and globalization effects from above and below, to local struggles for autonomy, urban-rural dynamics and phenomena of diaspora. To gain a deeper understanding of the rationales and dynamics of conflict in *Crossroads Asia*, the sub-projects aim to analyze the logics of the genesis and transformation of conflictual figurations, and to investigate autochthonous conceptions of, and modes of dealing with conflicts. Particular attention will be given to the interdependence of conflict(s) and mobility.
- Six sub-projects in the working group **"Migration"** aim to map out trans-local figurations (networks and flows) within *Crossroads Asia* as well as figurations extending into both neighboring and distant areas (Arabian Peninsula, Russia, Europe, Australia, America). The main research question addresses how basic organizational and functional networks are structured, and how these structures affect what is on the move (people, commodities, ideas etc.). Conceptualizing empirical methods for mapping mobility and complex connectivities in trans-local spaces is a genuine desideratum. The aim of the working group is to refine the method of qualitative network analysis, which includes flows as well as their structures of operation, and to map mobility and explain mobility patterns.
- In the **"Development"**-working group four sub-projects are focusing on the effects of spatial movements (flows) and interwoven networks at the micro level with regard to processes of long-term social change, and with a special focus on locally perceived livelihood opportunities and their potential for implementation. The four sub-projects focus on two fundamental aspects: first, on structural changes in processes of transformation of patterns of allocation and distribution of resources, which are contested both at the household level and between individual and government agents; secondly, on forms of social mobility, which may create new opportunities, but may also cause the persistence of social inequality.

The competence network understands itself as a mediator between the academic study of *Crossroads Asia* and efforts to meet the high demand for information on this area in politics and the public. Findings of the project will feed back into academic teaching, research outside the limits of the competence network, and public relations efforts. Further information on *Crossroads Asia* is available at www.crossroads-asia.de.

Publications in the Crossroads Asia Working Paper Series

- Marsden, Magnus (2011): Mobile Life on the Frontiers of Crossroads Asia. In: Crossroads Asia Working Paper Series, No. 1.
- Schetter, Conrad (2012): Translocal Lives. Patterns of Migration in Afghanistan. In: Crossroads Asia Working Paper Series, No. 2.
- Hill, Joe (2012): A Post-Area Studies Approach to the Study of Hill Irrigation across the Alai – Pamir – Karakoram – Himalaya. In: Crossroads Asia Working Paper Series, No. 3

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- Working Group Development (2012): Development at the Crossroads. Development Research on Crossroads Asia – a conceptual approach. In: Crossroads Asia Concept Papers Series, No. 3.