

Farmer-managed irrigation systems in Baltistan and Kargil

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Abstract

Irrigation is an essential part of agricultural production in the valleys of Baltistan and Ladakh, as there is insufficient rainfall. In such farmer-managed irrigation systems, water-users' tasks include maintenance and operation of infrastructure, mobilisation and administration of resources, and building alliances with government and non-government agencies. Interventions by government and non-government agencies alter water-users' institutional arrangements, while studies highlight that such interventions should build on, rather than erode, existing arrangements. This paper presents case studies from two villages: Thurgu in Baltistan and Karchay Khar in Ladakh's Kargil. It first provides an overview of the current irrigation systems in these villages. It then compares water rights and customs recorded in the land revenue settlement re-assessments of the early 1910s, with current practices to highlight change and continuity over the past 100 years. It also presents an overview of irrigation development interventions in both villages, highlighting the agencies involved and their approaches. While these interventions do not directly interfere with irrigation institutions, they do have an indirect impact. It identifies areas for further research, including funds allocation systems and the impact of interventions on various social groups.

Irrigation water in the valleys of the Karakoram and trans-Himalayan regions is supplied by gravity-flow offtake systems developed to utilise river flow (river valley offtake systems), melt water from glaciers or snow fields, or spring water (slope offtake systems). Storage works (*zing*) are sometimes used to store water through the night for use the next day. Offtake systems are the commonest form of irrigation in mountain areas, characterised by their ability to deliver regular irrigation across a cropping season. An irrigation system includes the physical infrastructure (the water extraction technology, conveyance

channels, control and distribution technologies) and the social infrastructure, i.e. the rules and procedures that ensure the operation of technology and water delivery (Vincent 1995). Ambler (1989, in Vincent 1995: 36) proposes that ease or difficulty of conveyance, and adequacy or scarcity of water supply at key times in the cropping season, are useful factors to explain the necessity of different water management activities, presence of particular functionaries and use of certain technologies.

In farmer-managed irrigation systems, water-users carry out multiple tasks including establishment and enforcement of regulations (rules), distribution of water, operation of the hydraulic works, maintenance of infrastructure, mobilisation and administration of resources, and alliance-building and networking (Beccar et al 2002: 14). The rules, a combination of individual and collective rights and obligations, form the normative foundation for the collective management of irrigation systems. Beccar et al (2002: 3) define water-rights as “authorized demands to use (part of) a flow of water, including certain privileges, restrictions, obligations and sanctions accompanying this authorization.” Individual rights are derived from collective rights and duties vary with every irrigation system. They can depend not only on the fulfillment of obligations in the irrigation system but also on the performance of other collective tasks established by the community (Boelens, 1998: 87). Rights and obligations developed during the construction, use and maintenance of irrigation systems can be termed ‘hydraulic tenure’ arrangements. Hydraulic tenure implies that the normative and organisational arrangements for irrigation reflect the underlying property grid formed during initial construction (Coward 1986). So rights are the product of investments made during system construction and reproduced during maintenance activities. As a result, interventions—that reduce or modify maintenance obligations, for instance—by government and non-government agencies invariably alter water-users’ institutional arrangements. It is thus argued that external interventions can only succeed if they build on existing arrangements (Coward 1990, Vincent 1995).

This paper presents the findings of research conducted in 2013 in Baltistan and Ladakh. It focuses on historical and contemporary irrigation practices and interventions by government and non-government agencies. Little, if any, research has been conducted on both sides of the ‘Line of Control’ that divides India and Pakistan in this region (Figure 1). Besides geopolitics, Demenge et al (2013) note that the Ladakh region is the meeting point of two separate scholarly traditions—one focussed on the eastern Himalayas/Tibetan plateau and the Tibetan-Buddhist cultural sphere, while the other concentrates on the western Himalayas/Karakoram and Indo-Islamic world. As a result of these

divides, the development experiences of agencies on both sides have rarely been compared. While Baltistan and Kargil share similar socio-cultural and ecological characteristics, their political and administrative developments have taken different trajectories since 1947.

Brief history of the study region

From 1834 onwards, General Zorawar Singh led several expeditions against local chieftains in Baltistan and Ladakh. By 1840, the region was under the effective control of Raja Gulab Singh, who in 1946 assumed the title of Maharaja of Jammu and Kashmir (Datta 1984: 30-58). By 1899, Baltistan, Ladakh and Gilgit Wazarat were merged to form a single ‘frontier district’ and in 1901 the district of Ladakh was established, incorporating Skardu, Kargil and Leh *tehsils* under the administration of a *Wazir-i-Wazarat* (governor) (Sheikh 2010: 166, Lawrence 2002 [1909]: 100-105, Dani 1989: 320)¹. Kargil *tehsil* was known as Purig prior to the twentieth century².

Land revenue settlements (called “regular settlements”) were completed in 1901 for a period of ten years by R.T. Clarke. Skardu’s re-assessment began in 1911 and was overseen by Thakar Singh, whose ‘Assessment Report of the Skardo Tahsil of the Ladakh District’ was published in 1913 (Singh 1913a). In Kargil, the re-assessment started in 1910 and is documented in four (untitled) volumes containing village data, currently stored in the Muhafiz Khana (archives/preservation office), Kargil (Singh 1910b)³. These settlements, following Baker (2003: 27), had the primary purpose of determining the nature of property rights in an area, identifying rights holders and establishing revenue rates and payment schedules⁴. Irrigation rights in each hamlet was also detailed in these revenue

¹ Gilgit *tehsil* was not included in Ladakh district.

² See Grist (1998: 13-19) for a discussion on the history of Purig.

³ The ‘Assessment Report of the Kargil Tehsil’, by Thakar Singh, dated August 1912, has yet to be located. It is not available at the British Library in London, the National Archives in Delhi, the Leh Archives (where staff said that all records related to Kargil were shifted to Kargil after bifurcation) or the Archives office, Kargil. A ‘Note on the Assessment Report’ was located in the Jammu Archives (MoJK 1912).

⁴ Ostensibly the settlements were “an exercise in elucidating and recording a region’s customs and laws relating to land rights, cultivation, and the distribution of agricultural surpluses”, however they “were heavily influenced by prevailing European social theories concerning private property, investment and productivity, anthropological theories about social evolution, and the successes and failures of prior settlements in other parts of India, all cloaked in the guise of debates about what constituted “local custom” (Baker 2003: 27).

records, compiled and maintained by a local government official called *patwari* (tax collector). The village record of rights (*Misl Haqiyat*) contain a section called the *Riwaj-i-Aabpashi* (irrigation customs), which indicates the *kuhls* (irrigation channels) in which a village has irrigation rights, and the nature of those rights (Coward 1990: 81)⁵. The *Riwaj-i-Aabpashi* for the study villages were obtained from the respective districts (Singh 1910a, Singh 1913c).



Figure 1: Map of Baltistan and Ladakh showing key places and research villages

At the time of independence from British rule, Jammu and Kashmir was effectively excluded from the partition agreement, leading Pakistan and India to fight a war over it (Grist 1998, 2008)⁶. As a result of this war, Ladakh Wazarat

⁵ The property and irrigation rights recorded during the settlements in Kangra district (present-day Himachal Pradesh), which became part of the administrative system for enforcement and adjudication, continued to influence irrigation up until the 1980s (Coward 1990: 87).

⁶ There have been further conflicts in 1965, 1971 and 1999—the latter known as the Kargil War.

and its people were divided by the Line of Control (Bouzas 2012). Thus, it takes a week to travel between Kargil and Skardu via Islamabad, Lahore, Amritsar and Srinagar, even though the distance between the two is only about 200 km (Figure 1). Today the name ‘Baltistan’ is used for the area under Pakistani control, including the districts of Skardu and Ghanche. Balti-speaking communities still live in Leh and Kargil districts, which are under Indian control (Magnusson 2011: 34, Magnusson 2006). In Kargil district’s Suru valley, the population speaks Purigi, a Tibetan-dialect related to Ladakhi and Balti. Purigi-speakers can be found across Kargil district and Baltistan. Like Balti, Purigi is nowadays written in the Urdu script.⁷

According to van Beek (1999: 442), Ladakh has been reduced to a state of dependence that “ironically, is partly attributable to government policies aimed at replicating nationalist projects of development in this rather different region [than the mainland], for example through the promotion of tourism, cash cropping, and modern education, and the concurrent undermining of local livelihoods by the provision of heavily subsidised agricultural inputs and rations of ‘essential commodities.’ The growth of waged employment and cash incomes in general is tied mostly to government jobs and the armed services, and through these agencies’ procurement of local agricultural produce...” On the Pakistani side of the Line of Control, this list would include the Aga Khan Rural Support Programme (AKRSP) upon which, until recently, the “current welfare structure in Baltistan relies heavily” (Magnusson 2006: 198). In Zangskar, which falls in Kargil district, Mankelov (2005) shows that attempts to improve irrigation systems have been largely ineffectual, while at the same time traditional institutions are being undermined by a growing dependency on the government for funds, materials and labour. Others studies on irrigation in Ladakh and Baltistan have focussed on other aspects and rarely commented on the sustainability of contemporary irrigation interventions (see Labbal 2000, Schmid 2000, Schmidt 2004)⁸.

⁷ The Purigpa and the Balti are two of eight recognised ethnic groups given Scheduled Tribe status in Ladakh. According to Census data of 1986-1987, the Purigpa made up 69 percent of Kargil district’s population, and the Balti just 3 percent (van Beek 1997: 35).

⁸ Labbal (2000) details village-level irrigation management arrangements in Ladakh, showing that while landholding and social status are unequal, access to irrigation water is equitable; Schmid (2000) provides an account of a minority group’s unsuccessful legal attempts to gain access to water in Hunza, and Schmidt’s detailed work provides a superb overview of the institutions for natural resource management, including irrigation, in the Shigar valley.

Methods

Qualitative field research was undertaken from mid-April to early July in 2013. Following visits to several valleys in each district, villages were independently and purposively selected for intensive study. The selection was made keeping in mind the altitude, population size, and agricultural characteristics of villages identified in 2012 for research in Tajikistan's Pamir and Kyrgyzstan's Alai (Hill 2013), as well as previous research conducted in Shigar (Schmidt 2008) and Suru (Grist 2008). Thurgu is located in Tisar Union Council, in the Basha valley, upper Shigar valley, to the north of Skardu town (Figure 1). Karchay Khar⁹ is located in Sankoo Development Block¹⁰, which is south of Kargil town and midway up the Suru valley in Barsoo valley. Fieldwork was undertaken for about three weeks in Tisar Union Council, and three weeks in Karchay Khar Gram Panchayat¹¹. Assistants were hired locally and the research relied heavily on my mediocre command of Hindi and Urdu. Transect walks across villages and along channels, participatory mapping of irrigation systems and farmland, interviews, observation and other group participatory methods (e.g. ranking of seed varieties, timeline of the village and region's history, mapping of mobilities) were utilised. Local government officials, elected politicians and councillors, and NGO staff were interviewed, while hoteliers in Skardu, Shigar and Kargil provided key logistical support.

Thurgu village, Shigar valley, Baltistan

Thurgu village is located on the left bank of the Basha river, just across from Chutron, which is famous for its hot spring baths (Azhar-Hewitt 1998) and just a few kilometres upstream from where the Basha and Braldu valleys open out to form Shigar valley. A hundred years ago, at the time of Skardu's settlement officer Thakar Singh (1913a: 5-8) classified the *tehsil's* 199 villages (termed 'estates') into four classes according to climate, crops and fruits production. Singh placed Thurgu village in the third class category: where agriculture is more

⁹ The villagers requested that I write Karchay Khar, although their village name is officially written as Kartse Khar. For example, 'Karchay Khar' is written on the village's middle school's signboard.

¹⁰ In early 2014, it has been announced that Barsoo will itself become a Development Block.

¹¹ Union councils are the Pakistani equivalent to gram panchayats. Tisar Union Council comprises six revenue villages, whereas Karchay Khar Gram Panchayat contains only Karchay Khar revenue village. By Indian standards, gram panchayats in Kargil are unusually small. See Hill (2014: 24-25) for further information on union councils in Shigar valley/Baltistan.

difficult, fruit is poor and consumed at home, the estate is not easily accessible. Thurgu remains difficult to access: after a four-hour journey in a shared vehicle from Skardu to Chutron, four to five small bridges—often no more than logs fastened together with cloth and supported by rocks—must be crossed when travelling from Chutron to Thurgu on foot. The alternative route is via a road up the Basha’s left bank, whose construction began in 1998 (funded by AKRSP, later widened by the government); however very few vehicles use this road. The revenue village includes Thurgu, with about 85 households, and the hamlet Zing Zing, located about 1 km away with 8 households (see Photo 1). In 1913, Thurgu revenue village was recorded as having 52 hectares of land, with 28 hectares under cultivation (Singh 1913b). In 2013, the *patwari* was unable or unwilling to provide the latest data for Thurgu village’s irrigated area¹².



Photo 1: Thurgu (to the left) and Zing Zing (right), with the Basha River in the foreground

Thurgu’s irrigation systems

Thurgu Revenue Village has a complicated network of irrigation channels, which the locals refer to as *hrkong* (generally larger) or *hrka* (smaller). Figure 2 shows a map created with the help of villagers, images from Google Earth and transect

¹² For Niesolo Revenue Village, also in Tisar Union Council, the figures were available: the cultivated/irrigated area for had increased by 41% over the one hundred year period.

walks across the village. It shows one main stream (Urdu: *nalla*) called Lungma, which is fed by several springs, and from which at least eight irrigation channels (*hrkong*) are sourced. The topmost *hrkong* supplies water every four days to the hamlet Zing Zing (Maloni *hrkong* can be seen cutting across the mountainside in Photo 1). A smaller *hrkong* with its headwork also at the top of Lungma, known as Aga Khan pi *hrkong*, was created in 1996 by an AKRSP project. The village's most important irrigation channel is called Ghora Bloq pi *hrkong*. Every year, in the month of May, a group comprising one male representative from each household (regardless of their landholding size in the command area) trek up the mountainside, to camp for a night at a place known as Ghora Bloq (*bloq* is Balti for 'alpine pasture' (Schmidt 2004: 326)), situated at an altitude of 3,800m above mean sea level. The next day, working downwards towards the village, the group repair the channel, and 'bring water to the village'. Ghora Bloq pi *hrkong* irrigates all the farmland up to Lungma. Just before the *hrkong* reaches Lungma, it joins and supplies water to a *hrkong* called Hrkong Lungma, which in turn supplies water to Dukhzakhsi *hrka* and Skillma *hrka*. Besides the springs that feed Lungma, the village of Thurgu has an additional 10-15 springs (*chasma*, or in Balti *chumik*) that feed into larger *hrkong* or form the source of *hrka*. In addition to water received from Maloni *hrkong*, the hamlet Zing Zing relies on the limited water of several springs located in its main *nalla* (seen above Zing Zing in Photo 1), which is why it has four *zing* (storage reservoirs).

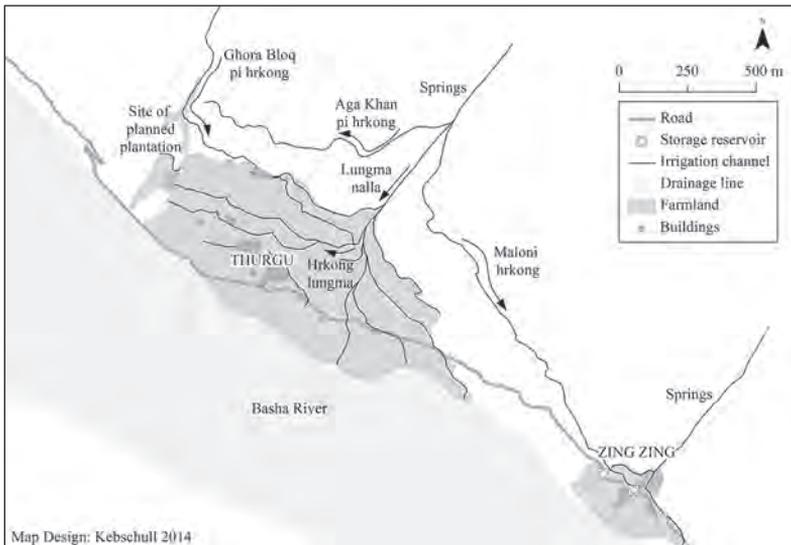


Figure 2: Map of Thurgu showing features mentioned in text

Irrigation rules over the past 100 years

A comparison of the irrigation customs recorded in the 1913 village record of rights with the present-day practices points to continuity and change. For instance, the penalty for not participating in the annual repair of Ghora Bloq pi hrkong was, and still is, one kg of *deshi* ghee per household. The 1913 record states that the supervisor or *hrkongpa* (also *hrkongstrunpa*) is selected annually by the villagers. In 2013, the *hrkongpa* was a 67-year-old man, who was performing the task for the second consecutive year. He said he was remunerated with 3 kg of barley or wheat by each household at the end of the season, totalling to about 240 kg grain (~80 households made the payment in 2012). This is the same rate per household recorded 100 years ago. However, it stated that the duty lasted 40 days, whereas in 2012 the *hrkongpa* worked for three months (the channel's importance and use has likely increased as the village has grown in size). For non-attendance at the annual cleaning of other *hrkong* or *hrka*, the penalty is recorded as one *seer* (kg) of wheat or barley per day of absence. Nowadays the penalty for non-attendance is disputed. *Tsharma* (elders) from Niesolo village said that several years ago such penalties were abandoned to maintain peace in the village. In Thurgu, some villagers claimed such penalties had been dropped, whereas others stated that the size of a fine depends on the wealth of a household, for example, Pakistani Rupees (PKR) 30 for a wealthier household and 1 kg barley grain for a poor household.

Irrigation development interventions in Thurgu

Irrigation interventions in Baltistan are undertaken by the Public Works Department (PWD), or funded through the Local Government and Rural Development (LG&RD) department, or the AKRSP. From 2003 to 2011, 122 projects were funded under the 'National Programme for Improvement of Watercourses' in Skardu district. Three of these 122 projects were completed in Tisar Union Council (UC), two in Chutron village, one in Tisar village, and none in the UC's other four villages¹³. It was not possible to verify the actual results of these interventions during field research. Until recently union councils had at their disposal funds provided by the LG&RD, however according to Tisar UC's ex-Chairman (2002-2007), the Government of Pakistan ended this system in 2009, when power was vested in the Deputy Commissioner (Skardu), Assistant Commissioner (Shigar) and *Tehsildar* (Shigar). Locals hope that

¹³ The amount spent on each projects was about PKR 260,000 (roughly Indian Rupees (INR) 180,000). A (labour equivalent) contribution of PKR 100,000 from villagers is listed for each of the projects.

Gilgit-Baltistan's upcoming local elections, scheduled for 2014, will return power to councillors. Regardless of who is in charge of spending, funding to union councils has continued. For June 2012-2013, the LG&RD allocated PKR 540,000¹⁴ to Tisar UC, to be spent on 15 projects: a community centre, repair of four irrigation channels, a road, eight protective bunds (against river erosion), and a water tank. Each of the irrigation channels will receive PKR 40,000¹⁵. Interviews with councillors in Tisar UC revealed that such allocations have been the norm over the past 10 years. As there are six villages in the UC with eight or so irrigation channels per village, funding comes infrequently to irrigation channels, especially in peripheral villages like Thurgu.

The AKRSP officially began work in Baltistan in 1986, and by 1990 village organisations (VOs) had been created in all of Shigar subdivision's 57 villages (Clemens 2000). Irrigation projects (construction and repair of channels) formed a major part of AKRSP's Productive Physical Infrastructure (PPI) programme. Fazlur-Rahman (2007: 338-339) analyses the PPI projects completed by VOs up to 2000, and finds that 85% of the 802 projects initiated in Baltistan were completed by 2000. About 54% of these projects were for irrigation (including 388 feeder channel/pipe irrigation, 30 storage reservoir, and 14 lift irrigation projects), and 26% for other water-related projects (i.e. 89 protective works, 78 boundary walls, 9 micro-hydel schemes and 33 water supply/delivery). Since 2000-2005, however, AKRSP has scaled back its agricultural support operations. Nevertheless under an Italian and Pakistani government funded programme named Social Economic Environment Development (SEED), four irrigation channel repair projects have targeted Tisar UC: two completed in Hamasil and Thurgu, and two (in Tisar revenue village) ongoing in spring 2013.

AKRSP have funded a total of four projects in Thurgu Revenue Village: in 1996 construction of a new irrigation channel and the repair of a *zing* in Zing Zing, from 1998 the construction of a link road, and in 2012 the repair of Thurgu's main irrigation system Ghora Bloq pi hrkong (under SEED)¹⁶. Field research revealed that the 1996 project (a channel created above Thurgu to irrigate a plantation) failed as villagers stopped maintaining it after a few years. The 2012 project renovated 3,500 feet of channel and included the construction of a 250

¹⁴ Roughly equal to INR 304,000, or EUR 4,200. According to xe.com, exchange rate was PKR/INR 0.56266 and PKR/EUR 0.00777 on 30.12.2012.

¹⁵ Roughly equal to INR 22,500.

¹⁶ AKRSP/SEED channelled PKR 666,288 (about INR 375,000) into this project, with PKR 222,058 listed as the community's (labour equivalent) contribution.

feet RCC tunnel. One of the village's two religious leaders (both sheikhs, each of whom leads a political party-based faction in the village) oversaw the project. He made the project application to AKRSP in 2012, after his party came to power in 2009 after 15 years in opposition. Only those male villagers supporting this sheikh participated in the paid renovation work to the irrigation channel; the remainder boycotted the work. By 2013 the renovation work appeared to have been completed to a high standard.

Karchay Khar village, Suru valley, Kargil

Karchay Khar village is located midway up the Suru valley, in a side valley known as Barsoo valley¹⁷. Connectivity to Kargil has improved significantly in recent years, with bus services from Barsoo valley to Kargil four times a day. Karchay Khar Revenue Village (and also a gram panchayat) comprises three hamlets/villages: Stiankung (25 households), Karchay Khar (~67 households), and Stakbourik (28 households). Karchay Khar hamlet is itself divided into four *mohalla*: three in the main village, the fourth (Richen) located below an area of farmland called Dambisthang (seen at the top-left of Photo 2). During Kargil's re-assessment in 1910, the *tehsil's* revenue villages were divided into four classes (as were the villages of Skardu *tehsil*). Karchay Khar Revenue Village was placed in the third class category (Singh 1910b)¹⁸. In 1910, the revenue village is recorded as having 144 hectares of land, including 47 hectares of cultivated land, while in 1901 the data shows 132 hectares of land of which 57 was cultivated (Singh 1910b). Karchay Khar has a rich history and many features: as one descends towards the village from the main road, down a steep and winding road that ends at a newly constructed bridge (seen in Photo 2), one passes a recently installed diesel generator, a seven-metre tall sculpture of the Buddha believed to date back to the seventh or eighth century CE (Abbasi 2012), a tourist bungalow (under construction in 2013) and a newly built primary school. There is also a fenced-off park that includes the tomb of Rygyal Khatoon¹⁹. The *khar* in the

¹⁷ The valley is also known as Kartse valley (Abbasi 2012) or Phoolungma valley (Pulumba Chu is the name given to the tributary of the Suru River in the Gazetteer of Kashmir and Ladak in 1890 (1974)).

¹⁸ This is a little unclear. The Archives office (Muhafiz Khana), Kargil has four untitled books that contain the details of just 118 revenue villages. One book contains the details of 32 villages in the first class, one contains the details of 16 villages in the fourth class, and two books contain the details of 70 villages in the third class. The book containing the details of the villages of the second class appears to be missing.

¹⁹ Over 400 years ago, according to Francke (1999 [1907]: 92-93), the "Duke" of Khapulu, Ali Mir, married his daughter Rygyal Khatoon, to the Ladakhi (Buddhist) ruler Jamyang Namgyal.

village's name refers to the fort that was located on the huge rock towering above the main village.



Photo 2: Karchay Khar village on the left bank of the Barsoo River

Karchay Khar's irrigation systems

Karchay Khar's network of irrigation channels is more complex than the one in Thurgu. Irrigation channels are referred to as *yurba* (Purigi language) by villagers (larger irrigation channels are called *mayur*); however they are also referred to as *hrkong* or *hrka*. A map (Figure 3) created with villagers and adjusted following numerous transect walks through the village shows 16 *yurba* (however there are more). Several *yurba* are shared between villages, for example Braqjon *yurba* (at the top of Figure 3) that begins in Stiankung also irrigates land owned by a few of Karchay Khar's households. Another shared irrigation system is Thasgam *mayur*, which is a river valley offtake system that originates in Stiankung's territory, irrigates farmlands owned by Stiankung and Karchay Khar's households, but mainly serves the downstream Thasgam village. Karchay Khar itself has several important *yurba*. The oldest *yurba*²⁰ are likely to be those sourcing their water from Chogo Lungma, the village's largest and

²⁰ The maps that accompany the 1910 Jamabandi show Kharzong *yurba* and Richen *yurba*.

wettest *nalla*; these include Kharzong *yurba*, Richen *yurba* and Chakdochan *yurba* that serve the village's most productive fields. Other smaller *yurba* were probably developed at later periods, to serve areas of land known as *broq*²¹. On these lands, more often than not grass and lucerne (alfalfa) is grown. Bro Lungma (Dandikhor) *yurba* and Dambisthang *yurba*, the village's two longest *yurba*, were both built by villagers in the post-1947 period, without government support. Both source their water from Bro Lungma *nalla*. The Dambisthang *yurba* is designed to draw water from Barsoo river and does so when Bro Lungma dries up each year in June-July (see Figure 3).

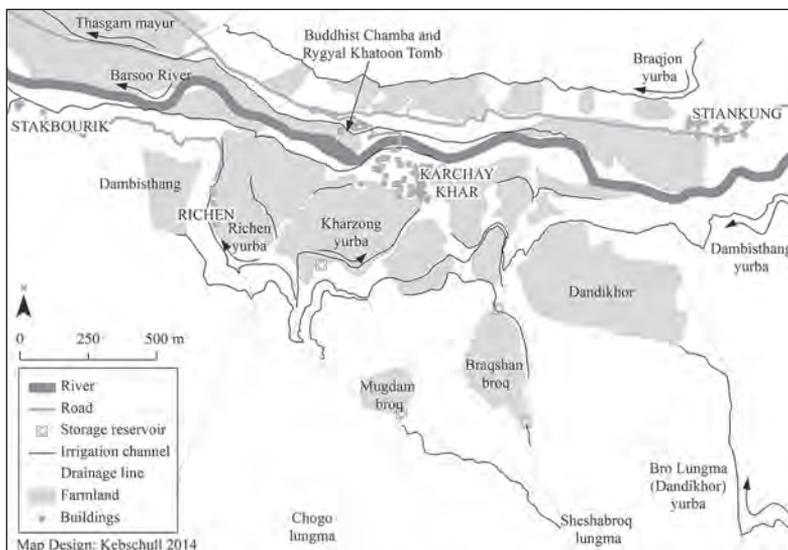


Figure 3: Map of Karchay Khar showing features mentioned in text

²¹ In Balti *bloq* is used (Schmidt 2004), whereas in Purigi *broq* is used. *Bloq* or *broq* can be non-irrigated pasture land or irrigated land (termed *ol*) reserved for the production of fodder. A slight differentiation can be found in the pronunciation of many key Balti and Purigi words, for example, wheat is *tro* and *cro* and buckwheat is *blo* and *bro*.

Irrigation rules over the past 100 years

Like Thurgu, irrigation water rights in Karchay Khar are attached to the water source (i.e. the *nalla*) and not the particular channel (i.e. the *yurba*). For example, Karchay Khar's oldest channels (Kharzong *yurba*, Richen *yurba*) source their water from Chogo Lungma (*nalla*). In the 1910 records, it is stated that in the first half of the agricultural year, when there is plentiful water supply, there are no water allocation rules. However, when the *nalla*'s water flow decreases a system of water distribution (*chures*, or *bari*) is implemented: 24 households share the stream's water over a 12-day cycle; two households per day. The household names were recorded in 1910 and this same system continues to be followed in 2013, though it has been adjusted informally to reflect demographic changes, land sales etc. There is also a *chures* for Sheshabroq Lungma, recorded in 1910 and followed in 2013. This *nalla* supplies water via small *yurba* to at least eight *broq* and two areas of *khet* (seen in Figure 3). About 60-70 years ago a huge landslide/landslip in Stiankung's main *nalla* shifted the course of Barsoo river, destroying hectares of agricultural land on both sides of the river (i.e. Karchay Khar and Stiankung). Several of Karchay Khar's families, with the help of other villagers, were subsequently able to develop a new *broq* (Mugdram *broq*) above the village because they were still entitled to their share of water from Sheshabroq Lungma.

Construction of the 7 km-long Dambisthang *yurba* began in 1951 and is said to have taken 18 years to complete, with little to no government support. The *yurba* was created by 36 households who also developed farmland at Dambisthang, which is said to have formally been a polo ground. The *yurba*'s system of water distribution (*chures*) reflects the contribution of labour during construction: there is a 12-day cycle, with three households having a share each day. Each year a watchman (*chustrunpa*) is selected to manage the *yurba*, for which he is remunerated 20 kg of wheat per household. In the 1970s, religious leaders are reported by Rizvi to be involved in village-level adjudication over irrigation systems (Rizvi, 1993). Similarly, in Karchay Khar, religious leaders are said to have been called upon to make and enforce rules pertaining to irrigation. In 2000, a meeting was held in Richen *mohalla*, above which Dambisthang *yurba* carries water to irrigate land at Dambisthang. It was decided that should the *yurba*'s water cause damage to the property of any of Richen's seven households, the costs will be borne by the irrigators. A document was created to this effect, and signed by all the *yurba*'s users.

After a 100 year gap, a second land settlement has begun in Kargil district, which promises to be a long drawn-out process. The *tehsil* office in Sankoo was established in 2007 with 36 villages under its jurisdiction. By summer 2013,

the settlement operations for Sankoo's five smaller villages were complete. The *tehsildar* estimated it would take 31 years to complete the settlement of the remaining villages.

Irrigation development interventions in Karchay Khar

Irrigation development interventions in the Suru valley are largely executed (or overseen) by the Public Works Department (PWD) and the Development Block. The Ladakh Autonomous Hill Development Council, Kargil²² or LAHDC, K annually creates and approves the district plan, which is funded by the J&K state. The formation of the LAHDC, K is said to have been a success, because funds are now reaching the entire population, including the smallest/remotest of hamlets. In 2011, INR 20 million²³, to be spent over a period of 10 years, was sanctioned by LAHDC, K for the improvement of Dambisthang pi yurba. According to the junior engineer in charge of this project, in the first year INR 2.5 million was spent on concrete lining and support treatment at the headwork, in 2012 about INR 0.55 million was spent on support work in three places between the headwork and village, and in 2013, a culvert was being constructed and repair work at Chogo Lungma was planned for the autumn.

Small sums are also allocated to various irrigation channels by MPs, MLAs, MLCs and councillors from their Constituency Development Funds, which are sanctioned by the Deputy Commissioner. The Gram Panchayat (GP) can decide and allocate small sums through its Community Development Fund, which are sanctioned by the Block Development Officer (BDO). The block also administers the centrally-funded National Rural Employment Guarantee Scheme (NREGS). Under NREGS, in 2011 Kharzong yurba, Richen yurba and Chakdochan yurba were repaired, and in 2012 and 2013, INR 160,000 was spent to improve channels and a bridlepath at Dandikhor (*ol*). When a section of Dambisthang pi yurba, close to where it crosses Chogo Lungma, collapsed in June 2013, the councillor visited the site and assisted the villagers to procure the necessary materials (wire mesh and piping) for its repair. The *sarpanch* (head of the GP) travelled with the councillor to Kargil where they met the Assistant Development Commissioner and Project Director of the District Rural Development Agency. The *sarpanch* collected ten 20-foot plastic pipes, the cost of which would come from flood management funds, and brought them back to the village. The

²² LAHDC, K was formed in 2003 and comprises locally-elected councillors and bureaucrats.

²³ Roughly equal to PKR 10,400,000, or EUR 310,000. According to xe.com, exchange rate was INR/PKR 1.92537 and INR/EUR 0.01543 on 02.07.2011.

sarpanch said they would receive the wire mesh when the BDO returned from Srinagar. Without using these materials however, on the fourth and fifth days after its collapse, the villagers repaired the section of *yurba* with remarkable skill and cooperation.

Discussion

Regardless of non-farm employment earnings, remittances and subsidies, the use and maintenance of irrigation systems remain crucial for villagers' subsistence needs and for the viability of their settlements. In both Baltistan and Kargil, some of the needs of government departments and the military are supported by these irrigation systems too (e.g. production and supply of fodder to the Department of Sheep Husbandry in Suru Valley²⁴). The literature suggests that external interventions only succeed when they build on existing social or institutional arrangements (e.g. Coward 1990). Mankelov (2005) shows that in Zangskar many irrigation interventions have been ineffectual and have undermined traditional institutions by increasing dependency on government schemes for funds, materials and labour. It is clear that support should be given to villagers; but it is also evident that it is not desirable that such support undermine local institutions.

Positively, this research shows that agencies do not appear to directly interfere with the traditional roles and responsibilities assigned to irrigation system functionaries, or with local rules of water distribution. Interventions appear to have reduced the number of days villagers spend on repairing channels and improving water supply. Since the 2011 repair work on Dambisthang *yurba*, its water users only have to spend 5-15 days per year cleaning and repairing the channel as compared to 15-30 days in the past. A junior engineer explained that if set correctly, concrete lining can have a lifespan of 50-75 years. Although there are allegations of misappropriation of funds, this project has not yet affected the channel's management. The repair of Ghora Bloq pi hrkong, likewise, appears to improve water supply. However this project was incoherent in at least three ways: it was funded by a non-government agency that claims to work in a participatory manner, though villagers seemed to regard it as a contractor-led project; the villagers link the project funding with the support of a political party due to which half the households did not participate in it; and thirdly, villagers

²⁴ Historically too: in 1917 Thakar Singh proposed several irrigation interventions as a way to increase crop and grass production, to reduce the cost of maintaining troops in Gilgit region (Singh 1917).

did not provide voluntary labour even though the NGO's project book claims they did. These issues are only problematic in as far as practice differs from discourse. What counts, however, is whether the project supports or interferes with local institutions. For the cases discussed in this paper, only time will tell. In both Thurgu and Karchay Khar, and indeed in Shigar and Suru valleys, irrigation system management is very much intertwined with local-level politics (which include political and religious groups). In Karchay Khar and the Suru valley, irrigation projects are explicitly contractor-led, while a good chunk of the overall funding is tied to political party affiliations. However, the LAHDC, K model appears to allow locally-elected councillors to play a significant role in planning. This potentially adds a degree of transparency to decision-making at the district level by allowing local priorities to be voiced. In Thurgu and the Shigar valley, by contrast, there appears to be less transparency in decision-making; especially since 2009 when power was returned to bureaucrats. Almost half of Thurgu's households chose not to participate in the 2012 AKRSP project due to their political party affiliation. In this case, it could be argued that the AKRSP project may exacerbate social divisions within the village. Yet it would be unfair to blame the AKRSP: one could equally blame the introduction of the democratic, multi-party political system to the valleys of Ladakh/Kargil and Baltistan for the creation of political factions in villages.

There are several questions that need to be researched further. How are funds allocated to irrigation systems within districts, UCs/GPs, and revenue villages? Do interventions improve access to water for all including the poorest, or do they improve some people's access at the expense of others? For example, over the past two decades a majority of irrigation projects in Tisar Union Council have been implemented in the two politically dominant villages (of Chutron and Tisar). This paper shows that the rules and rights recorded a hundred years ago continue to influence the management of irrigation systems, though with some modification. One further topic for research, therefore, would be to examine how water rights and customs are being documented and recorded in Kargil district's ongoing land settlement operations.

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