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Giving Water Its Place: Artificial Glaciers and the Politics of Place in a High-Altitude Himalayan Village

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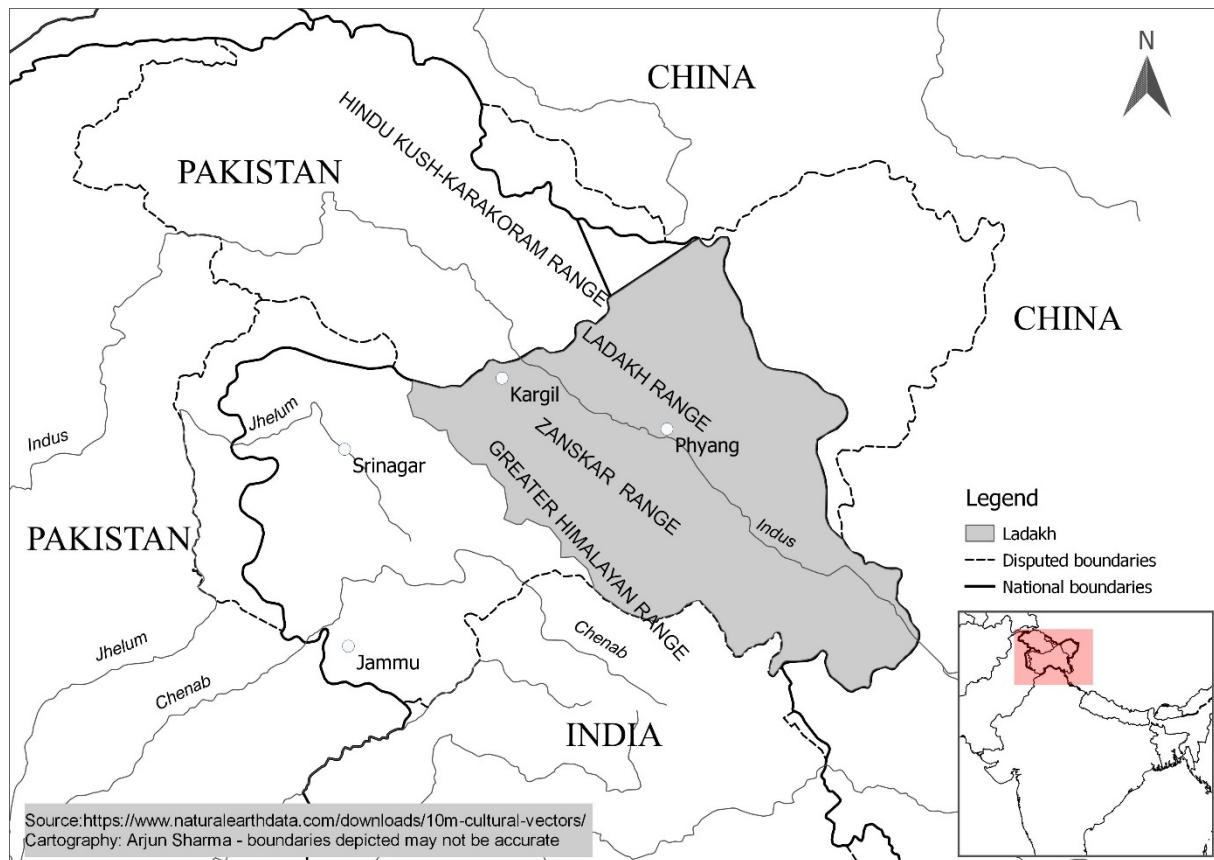
ABSTRACT: Jeff Malpas' concept of place as a bounded, open, and emergent structure is used in this article to understand the reasons for the differences in villagers' responses to 'artificial glaciers', or 'Ice stupas', built in two different places in the Himalayan village of Phyang, in Ladakh. Using archival material, geographic information system tools and ethnographic research, this study reveals how Phyang as a village is constituted by interacting ecological-technical, socio-symbolic, and bureaucratic-legal boundaries. It is observed that technologies such as land revenue records, and cadastral maps, introduced in previous processes of imperialist state formation, continue to inform water politics in this Himalayan region. It is further demonstrated how this politics is framed within the village of Phyang, but also shifts its boundaries to create the physical, discursive, and symbolic space necessary for projects like the Ice stupa to emerge. By examining the conflict through the lens of place, it is possible to identify the competing discursive frames employed by different stakeholders to legitimise their own projects for developing the arid area (or *Thang*) where the contested Ice stupa is located. Such an analysis allows critical water scholarship to understand both how places allow hydrosocial relationships to emerge, and how competing representations of place portray these relationships. Understanding the role of place in the constitution of hydrosocial relationships allows for a more nuanced appraisal of the challenges and opportunities inherent in negotiating development interventions aimed at mitigating the effects of climate change. It is also recommended that scholars studying primarily the institutional dimensions of community-managed resource regimes consider the impact on these institutions of technological artefacts such as the high density polyethylene (HDPE) pipes used to construct the Ice stupas.

KEYWORDS: Artificial glaciers, place, irrigation, water politics, Ladakh

INTRODUCTION

Ladakh is an arid, high elevation borderland located adjacent to the northernmost Himalayan Union Territory (UT) of Jammu and Kashmir, in India. As with any desert, water has been the key to survival for the picturesque villages and the rare birds and animals that nestle amongst its many valleys. In most Ladakhi villages, simple earthwork irrigation channels are used to tap meltwater streams emanating from glaciers located amid the formidable 5000-metre-plus mountain ranges that tower above the villages. Water availability is thus a matter of both volume and timing. If there is less precipitation in the winter and summer, or if the ice does not melt at the beginning of the single agricultural season (around May), most crops would fail. Over the past decade, among the scientific community and the Ladakhi public, there has been a growing concern about the impact on water availability of climate change-induced glacier recession (Bhutiyan et al., 2009; Behera and Vaswan, 2014; Ziegler et al., 2016; Chudley et al., 2017).

Figure 1. Overview map of Ladakh.



Source: Author's map.

The village of Phyang is located 16 kilometres from Leh, which is the district headquarters and Ladakh's biggest urban centre. In Phyang, a Ladakhi social reformer named Sonam Wangchuk has teamed up with a respected Buddhist Rinpoche¹ from the village's monastery to build three vertically oriented 'artificial glaciers', or 'Ice stupas'.² These 'glaciers' (which are, in reality, ice reservoirs) are formed by transporting unfrozen water down from higher elevations through water pipes and then forcing it through 'sprinklers' (narrow vertical pipes with tiny holes). In winter, when night-time temperatures drop below freezing, the water flowing out of the sprinklers freezes into a vertical tower of ice. Because of warmer temperatures at lower elevations, these artificial glaciers melt faster than their high elevation counterparts, thus giving farmers more control over water at the beginning of the spring agricultural season ("Sonam Wangchuk: Ice Towers in the Desert", 2016). One such Ice stupa is located on the main stream bed at the upper end of the village of Phyang; this stream has for centuries been used to irrigate the fields of Phyang and the village of Phey, located downstream. The other two Ice stupas are located in an arid area called the Thang,

¹ In Tibetan Buddhism, Rinpoche refers to reincarnated spiritual guides. The Rinpoche of the Phyang Monastery is His Holiness Drikung Kyabgon Chetsang, who is also head of the Drikung Kagyu lineage. He is the counterpart of the Dalai and Panchen Lamas, who are the leaders of the Gelugpa lineage. In 2015, Chetsang Rinpoche was elected Mountain Partnership Goodwill Ambassador as part of a programme sponsored by the United Nations Food and Agricultural Organization. (See www.fao.org/mountain-partnership/our-work/advocacy/mp-goodwill-ambassadors/his-holiness-the-drikung-kyabgoen-chetsang/en/ accessed on 19 November 2018).

² Stupas are structures associated with Buddhist beliefs and practices. In Ladakh, they are referred to as *chorten*.

which lies outside the conventional watershed³ of the Phyang village. The Ice stupas in Phyang's Thang (Figure 2) were first constructed in 2015, whereas the one in the stream bed was created in the winter of 2017. The Thang Ice stupas were promoted as part of a desert reclamation project to irrigate a small plot of poplars and fruit trees located next to them. Through clever messaging and the use of social media, the Ice stupas have been globally marketed as an innovative 'local' response to climate change; the international media has likewise responded with glowing headlines: The *New York Post* announced that *Artificial Glaciers Saved This Remote Village from a Water Crisis* (Tousignant, 2017); National Geographic cheered *The 'Ice stupas' That Could Water the Himalaya* (Strochlic, 2017); even the venerable British periodical, *The Guardian*, joined the fanfare, suggesting that "an ingenious idea to build artificial glaciers at lower elevations using pipes, gravity and night temperatures could transform an arid landscape into an oasis" (Safi, 2018).

Figure 2. Thang Ice stupas in March 2017. Notice the tree plantation in the foreground.



Source: Author's photograph.

The inhabitants of Phyang and Phey – the intended beneficiaries of the Ice stupas – remained unimpressed. In March 2017, an angry delegation of villagers from Phey approached the Phyang Monastery, on whose land the Ice stupa desert reclamation project was located. The villagers claimed that their customary and legal rights were being violated by the drawing of water from the main stream for the Ice stupas, in the winter, and particularly, the unsanctioned use of special water pipes, in the

³ In this article, 'watershed' is used in a strictly physical sense to indicate a catchment area where water from different sources is likely to collect and the outlet through which it is likely to drain, given the topography of the valley.

summer, to irrigate the poplar plantation in the Thang. At the same time, by putting pressure on local bureaucrats the Phey villagers managed to get a government order prohibiting the construction of artificial glaciers in the area.⁴ During the winter of that same year (2017), a second Ice stupa was built next to the main stream bed, upstream from the village of Phey. This project has not been contested and has been even cautiously accepted.

Why is it that Ice stupas that are located at different locations in the same village are received so differently by their intended beneficiaries?

While anthropologists are calling for greater engagement with the relationship between water and place (Gagné and Rasmussen, 2016), sociologists and critical geographers working within the broad domain of political ecology have been ambivalent towards the importance of place in water politics. This ambivalence is primarily due to a lack of conceptual clarity about the difference between place and local/national/regional/watershed geographic scales. Secondly, when critical water scholars do refer to place, they portray it as the outcome of unfolding hydrosocial relationships, rather than as an active agent, which allows these relationships to become coherent. Specifically, they do not consider the way in which place is a dynamic and historically conditioned entity, which emerges from the interaction between material, phenomenological, symbolic, *and* social boundaries expressed in, among others, every day practices of governing water resources.

The following sections will first review the way in which place is currently used in political ecology literature concerned with mapping hydrosocial relations. There will be a brief introduction of Jeff Malpas's (2012) definition of place as a bounded yet open entity where new practices and politics constantly emerge and make room for engagement with broader historical processes.

If places are inherently bounded, then how are these boundaries created, maintained, and changed over time? How are water politics and practices implicated in these processes? These questions are addressed by examining how ecological, social, and bureaucratic-legal boundaries have historically interacted with water practices; they are then examined as they particularly affect the relationship between Phyang and the Thang – the site of the presently contested Ice stupa desert reclamation project. The high-density water pipes used to make the Ice stupa, which can carry water over longer distances than the existing irrigation infrastructure, have the potential to reshape the physical and institutional boundaries of the villages of Phyang and Phey. The responses to the Ice stupa project are based on how these boundaries are perceived by their intended beneficiaries (the villagers) in the different places where the Ice stupas are currently being constructed. In the subsequent and final sections, this article reflects on how processes of state formation, capitalist expansion, and global sustainable development discourses create competing representations of the relationship between water and place. While the monastery and the developers of the Ice stupas want to use the arid land (the Thang) on which the stupas are built to showcase their commitment to global sustainable development discourses, the villagers of Phyang want to use it for commercial and residential purposes. At the same time, water users based downstream of Phyang and the village of Phey – where water is scarcer than in upstream areas – see the Thang-based Ice stupas as taking water away from their cultivated, ancestral lands and threatening the integrity of customary water governance institutions. Thus, by illustrating the importance of place as a dynamic and open, yet bounded entity, where different flows of water, discourses, technologies, etc. converge *and* emerge, it is hoped that it will merit greater consideration in future studies about the politics of water.

The evidence presented here is the result of seven months of fieldwork conducted between 2016 and 2018, primarily in the village of Phyang. Thirty-eight unstructured interviews were conducted with villagers from Phyang and Phey, local government officials, monks from the Phyang Monastery and the

⁴ As per a memorandum of understanding dated 24 March 2017 that was signed by the Phey villagers and the Phyang Monastery, it was agreed that "the Ice stupa Project [in the Phyang Thang] will be discontinued from next year (2018) onwards" (Parentheses in original). This understanding was ratified by the Deputy Commissioner (DC) of Leh on 16 February 2018 (Parvaiz, 2018).

Ice stupa project staff. Additionally, four oral histories in the Ladakhi language were filmed and translated into English. The interviews and oral histories were supplemented by participating in and observing village activities, especially those related to water. The valley's watershed and Phyang's irrigation network were mapped using a combination of high-resolution satellite imagery and a detailed ground survey using Global Positioning System (GPS) devices. Watershed boundaries were calculated using procedures and algorithms available in ArcGIS geographic information system software.⁵ To recreate the historical development of the village of Phyang from 1842 onwards, primary and secondary sources were consulted including reports by British India land revenue officials, travelogues and biographies, as well as the original land revenue registers, cadastral maps, and official communications available at the district archives in Leh, and the National Archives of India, in New Delhi.

WATER AND PLACE: A BRIEF CRITIQUE OF CURRENT APPROACHES

The problem of differentiating place from scale in water studies

Water is an essential part of the activities and everyday rhythms that give meaning to human existence, whether it involves taking a ritual dip in a sacred river, a shower before work, constructing a hydroelectric dam, or even wandering a desert in search of it. All these activities happen in particular places, which is why water and place are inextricably linked (Gagné and Rasmussen, 2016). Similarly, water originates in certain places and flows through them, in the meantime being stored, redirected or acted upon within places. Understanding, controlling, and representing these flows in and between places constitutes the core of water politics. Consequently, because of the fluidity of water the issues surrounding it usually cannot be limited to a particular place. Policymakers and scholars dealing with the sociology and politics of water governance approach this problem in two ways: they either use a predefined geographical scale such as local, national, regional, watershed or river-basin boundaries to frame the myriad socio-ecological relationships associated with water flows, or they use alternative spatial concepts like networks, waterscapes, or hydrosocial territories, which attempt to transcend geographical scales. Both approaches simplify the relationship between place and water.

Watersheds, river-basins or catchments designate an "area of land that drains all the streams and rainfall to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel" (USGS, n.d.). According to Molle (2009), with the advent of large-scale, state-driven hydrological projects – such as the American Tennessee Valley Authority, which was created in 1933 – and the subsequent adoption of this model in many developing countries, watersheds became the tool favoured by engineers and bureaucrats for integrating hydroelectric production, irrigation, and flood control. By the 1990s, the use of hydrological boundaries was extended beyond technical water management geared solely towards economic development, and began to encompass social and environmental issues under the ambit of Integrated Water Resource Management (IWRM) (Cohen, 2011). While IWRM has become a popular policy framework (ibid), it neglects and misrepresents place. First, like other forms of modern cartographic practices, IWRM's use of watershed boundaries reduces place to a mere location in a two-dimensional mathematical space defined by latitude and longitude. Such a representation obscures the meaning that places hold for those who live within and travel between them, and overlooks the sociopolitical relationships that shape, and are shaped by, place. Second, IWRM does not fully consider the possible disconnect between actual conditions and the hydrological boundaries defined by planners. It has been argued that hydrological boundaries that are used to designate watersheds over a large geographical area do not always account for the smaller watersheds, ecological zones, and groundwater flows which may stretch across the boundaries of multiple watersheds (Omernik and Bailey, 1997; Winter

⁵ The watershed analysis was done using the Spatial Analyst tool in ArcMap software, using the SRTM (Shuttle Radar Topography Mission) 1 Arc-second Digital Elevation Model (DEM) clipped to the study area coordinates. Spatial analysis was supported by field surveys during which *yuras* (irrigation channels) and *yu-go* (headworks) were mapped using a Garmin 62s GPS device.

et al., 2003). Hence, the biophysical boundaries of places may differ from the watershed boundaries defined by planners.

Critical water scholars, especially those working within a political ecology paradigm, have expressed similar critiques of IWRM and watersheds. Their issue, however, is not with the concept of place used in IWRM, but with its depoliticised understanding of scale (see, for example, Delaney and Leitner, 1997; Brown and Purcell, 2005). Within political ecology approaches, concepts such as waterscapes, hydrosocial cycles, or hydrosocial territories⁶ are used to demonstrate the "ways in which flows of water, power and capital converge to produce uneven socio-ecological arrangements over space and time, the particular characteristics of which reflect the power relations that shaped their production" (Budds and Hinojosa, 2012: 124).

These hybrid "flows of water, power and capital" create the perception of a 'natural' local, national or watershed scale (Swyngedouw, 1999, 2004) and also occur across these scales. At the same time, scholars espousing this relational hydrosocial view either do not clarify how place is different from other scales (for example, are locality and place the same thing?), or tend to portray places as merely the *outcome* of hydrosocial processes rather than active agents constituting them.⁷

The Ice stupa is a classic example of a trans-scalar hydrosocial artefact. In the case of Phyang, it embodies a network of water, technologies, discourses, knowledges, and actors that transcend the local scale. Critically analysing these relationships using the waterscape or hydrosocial cycle/territory approaches, however, is not sufficient to explain why Ice stupas are contested in one place within the village and not in another. To the villagers contesting this project, the places where these stupas stand have a significance that cannot be reduced to a single geographic, economic, environmental, political, phenomenological or social constructivist explanation. This problem calls for an approach which helps to understand how historical processes and trans-place relationships impact place and water, as well as how the unique, though dynamic, aspects of a place allow these very processes and relationships to manifest in artefacts like the Ice stupas.

Defining place

While acknowledging its multiple facets, most approaches to place in human geography concentrate on a particular dimension of it. So, for instance, John Agnew (2011: 23) defines place according to three dimensions. First, he defines it as a location, or site, which is connected to other sites through the movement between them of things, ideas and people. Agnew's second dimension of place is as a series of 'settings' where social life happens. His third dimension concerns the meaning people give to places, or the "sense of place or identification with a place as a unique community, landscape, and moral order". In practice, as Cresswell (2004) demonstrates, scholars of place tend to concentrate on one or other of Agnew's dimensions using either a descriptive, social constructivist, or phenomenological approach. While each of these perspectives has yielded interesting insights, the challenge remains as to how to study place in its totality as something that is omnipresent and has meaning for people, but is at the same time a tangible, material entity which is bounded but not closed or static.

Jeff Malpas' work (2012, 2017, 2018) tackles this challenge by offering a comprehensive understanding of place as an entity that is bounded, open, and emergent. Each of these three elements is necessary and is related to the others. A detailed explanation of the philosophical arguments

⁶ For studies using the waterscape concept, refer to Swyngedouw, 1999; Loftus and Lumsden, 2008; Budds and Hinojosa, 2012; Perreault et al., 2012; for hydrosocial cycles, see Boelens, 2014; for hydrosocial territories see Boelens et al., 2016.

⁷ For instance, in the definition by Budds and Hinojosa (2012: 124) quoted above, it is unclear as to which place(s) in 'space and time' the flows (of water, power, etc.) converge in or emerge from. Moreover, while such flows may produce 'uneven' landscapes, how are they influenced in return by the characteristics and histories of the landscape/places that they already traverse?

underlying Malpas's approach to place is beyond the scope of this study, however the following summary provides an overview of how his concepts are used here.

Boundedness

Typically, a boundary is understood as that which excludes or encloses. Some geographers understand boundaries in a negative sense that interprets physical borders as geographically reinforcing a community's imagination of its exclusivity.⁸ Yet, as Castree (2004) argues, efforts to protect bounded places – such as the sacred sites from which native American groups have been historically displaced – have also led to the formation of trans-local alliances between these groups which have produced new discourses and identities that are not exclusively circumscribed by their bounded ancestral places. In a positive sense, boundaries can be described as roughly analogous to 'skin': a semi-permeable membrane which shields organs from the elements but also needs the internal organs to function effectively in order to remain healthy. The skin physically differentiates one individual from another, allowing for a separate identity as well as for interaction. Importantly, the skin is not a static boundary, it changes as the body changes. Over time its history is inscribed on it in the form of scars and marks. Boundaries are also about movement; they are about crossing into and between places, and the inevitable connections that are formed in the course of the movement of people, things, and ideas. Following from this, instead of treating the village of Phyang as a self-contained, static place, it is explored as a set of historically conditioned yet dynamic ecological-technical, socio-symbolic, and legal-political boundaries, *which both enable, and are transformed by hydrosocial flows*.

Openness

Each of Phyang's mutually reinforcing boundaries creates an opening, or space.⁹ For example, the topography and unique climate of Ladakh shape the hydrology of the Phyang valley, which creates not only technical challenges for water distribution but also physical spaces for experimenting with novel technologies like Ice stupas. However, technological innovations also impact sociomaterial and legal - political boundaries, so they must be negotiated within the institutional and discursive spaces that are opened up by them.

Emergence

Such interactions – as, for instance, between technological innovation, water governance institutions, historically conditioned social relationships, and discourses evolving around issues like sustainable development – create frictions that either modify, reinforce or create new boundaries. As people, ideas, and things move between and within places, new meanings, practices, and representations of places also emerge and test existing boundaries. Emerging boundaries, combined with the different ways of representing the relationships that appear within them, create new places. Phyang can thus be seen as constituting multiple, nested places.

In this way, place is an ongoing dialogue between boundedness, openness, and emergence. Using this framework, the following sections will examine the empirical evidence to trace the changing relationship between water and place in Phyang, and how this impacts the legitimacy of the Ice stupa project.

⁸ Refer to the critiques by Malpas (2012), Jones (2009), and Castree (2004) regarding the conceptualisation of boundaries in the discussions of place by critical geographers like Ash Amin and Deborah Massey.

⁹ Malpas (2012) defines space as an opening created within the boundaries of place (*topos*), or as bounded openness (*chora*); this is contrasted with the definition of space as an infinite extension (*kenon*) which became a dominant paradigm during the enlightenment because of the theories of Newton, Leibniz, and Descartes (Casey, 1997). The view of space as *kenon* is criticised by Malpas because it reduces place to a mere mathematical location in an abstract space (in the case of Newton and Descartes) or as a set of positions of related monads (in the case of Leibniz).

THE ECOLOGICAL BOUNDARIES OF PHYANG AND TECHNOLOGIES OF HUMAN ADAPTATION

The villages of Phyang and Phey are located in a valley that lies perpendicular to the spine of the Ladakh Range. This mountain range runs east from the confluence of the Indus and Shyok Rivers in the Pakistani province of Baltistan, to the disputed Sino-Indian border. The Ladakh Range was originally a volcanic arc which was formed prior to the collision of the Indian and Eurasian continental plates 50 million years ago (Searle, 2013). The Indian plate subducted roughly where the valley is now traversed by the Indus River, sandwiching the Ladakh Range between the formidable Karakoram Range to the north and the Greater Himalayan Range to the south. As the collision between the two continents continued to push the mountains of the Ladakh Range ever higher 430,000 years ago, large glaciers began forming along the slopes of the range (Owen et al., 2006). These glaciers continued to surge and recede, grinding down the granite to form a U-shaped valley, the bottom and sides of the U tracing the mountains that form the physical border of what is today the village of Phyang. Phey is located at the south end of the valley where it opens to the Indus River. At the northern edge of Phyang, the remnants of the once-mighty glaciers perch on mountaintops at an elevation of more than 5000 metres. In the spring, meltwater from the five remaining glaciers converges above Phyang village at an elevation of 4800 metres, where it forms a stream which gradually descends until it drains into the Indus at 3180 metres. The valley's inhabitants have for centuries directed water from this stream to field terraces using an intricate web of irrigation channels. Historically, (and in some cases even today, as discussed later in this paper), in this arid, oxygen-starved landscape with its minimal rainfall (115 mm/year) and annual temperatures that range from – 14 to +28 degrees Celsius (ibid), irrigation-based agriculture combined with livestock rearing has formed the core of subsistence strategies.

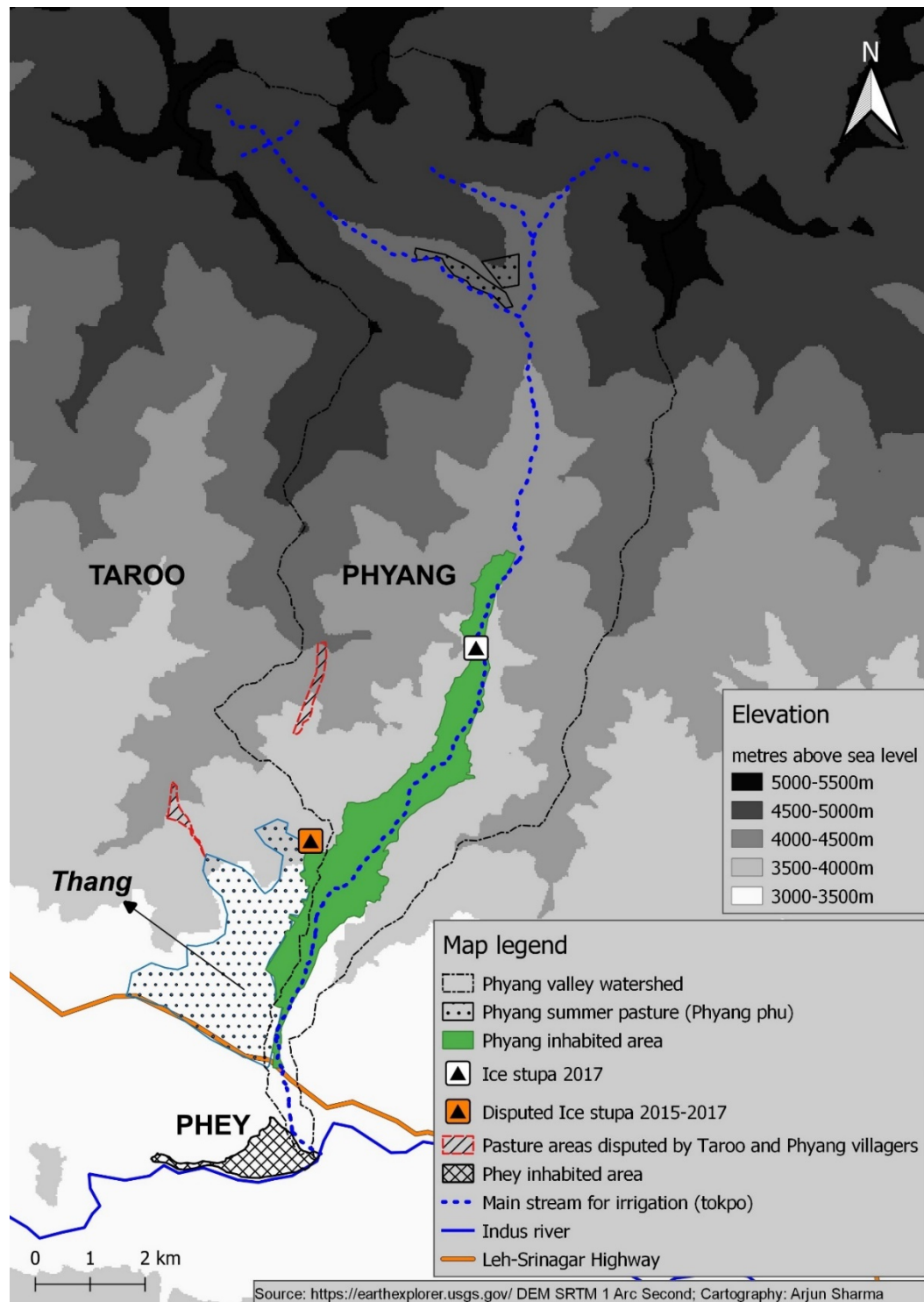
In Ladakh, these subsistence strategies depend on the availability of water and on the utilisation of the different microecologies created by variations in elevation. Some crops, such as wheat, cannot be grown above an elevation of about 3800 metres, whereas some varieties of barley cannot withstand the heat of lower elevations. Since there is a single agricultural season in most of Ladakh (April to August), grains are supplemented with meat during the winter. Dung produced by livestock constitutes a crucial fertiliser for agriculture, and livestock is thus reared for this purpose as well as for nutrition and as a source of wool for clothing. Around mid-May, once the cereal crops start sprouting, livestock is driven to the high-elevation pastures on the northern ridge of the village and on the slopes of the mountains bordering its western flank. Grazing grounds at upper elevations are called *phu* in Ladakh. At its northern end, the Phyang *phu*, as the name suggests, is claimed by the villagers of Phyang as commons. The pastures located on the western flank of the village, however, have in the past been the subject of frequent disputes between the Phyang and adjacent Taroo villagers (Figure 3).

In the context of elevation-based transhumant subsistence strategies, the Thang area where the disputed Ice stupa is based is a unique space. From a productive perspective, this arid land lies outside the watershed of the Phyang valley (Figure 3), and thus is difficult to cultivate using traditional gravity-dependent irrigation techniques. Similarly, its sparse vegetation is insufficient for grazing livestock in the summer months. In the course of fieldwork for this research project, Phyang village elders indicated that the Thang had been considered to be a part of the village in the past, but they were unable to explain its previous identity from either an economic or a socio-symbolic point of view (this is discussed in more detail in the subsequent section). Part of the issue with the Thang was that while its western boundaries could be demarcated by the mountains on its edges, there were no natural landmarks to mark its southern limit, which extends to the banks of the Indus where the village of Phey is currently situated. In fact, only when the paved Leh-Srinagar Highway was built (between 1962 and 1974) did Phyang and Phey villagers begin to recognise the southern boundary of the Phyang Thang as being that highway.

The liminality of the Thang is also conveyed by the word used to describe it. In Ladakhi, 'Thang' is used interchangeably to mean either 'land' or 'desert'. Koshal (2001: 42) mentions varieties of Thang that include *pe thang* (sandy desert), *shak thang* (full of pebbles) or *thang skam* (a dry desert with no

vegetation). In Phyang, one neighbourhood is named Thang Ol, *ol* being the alfalfa grass that grows plentifully in this area and which is often used as winter fodder. 'Phyang Thang' simply expresses the village's sovereignty over the area.

Figure 3. Overview map of Phyang showing the elevation of summer pasture areas and the Thang.



Source: Author's map

BETWEEN MATERIALITY AND PRAXIS: WATER PRACTICES AND SOCIO-SYMBOLIC BOUNDARIES

Ecological constraints in Ladakh that are imposed by climate and geological processes have resulted in particular subsistence strategies. Agropastoral and water management practices in Phyang are organised according to different zones of elevation, which in turn create liminal spaces such as the Thang. While the Thang was nominally considered a part of the village space, it remained peripheral to its material survival because of its aridity and its location outside the watershed. However, viewing Thang's marginality purely as a response to environmental factors would be reductive. Water management practices in Ladakh are not only integral to survival, but are part of broader symbolic, social, and political domains that link community to place.

In Phyang, decisions regarding the distribution, maintenance and management of irrigation infrastructure are taken by the *yul pa* (village community). Unlike the English language, which separates the words community, place and geographical space according to different scales such as the village, region, province, state and nation, the Ladakhi word *yul*, according to Ravina Aggarwal (2004: 61), is "both an imagined community and a social reality, an abstract category and a contextual reference point for various locales". *Yul* may be used to refer to the village where one's house is situated, to the Indian nation (*rgya gar yul*), to one's birthplace (*shyes yul*), or to one's ancestry (*pha yul*).

In this regard, participation in both ritual activities and the upkeep of irrigation infrastructure are obligations (*thal*) that must be honoured by every household in the village as part of their membership in the *yul*. In March, at the beginning of the agricultural season, a retinue of monks from the Phyang Monastery trek to the top of the village where the main stream begins. Here they offer prayers to the Phyang village's main *lha tho* – a being associated with the sky. The location for prayers to *lha tho* – at the confluence of glacial streams – is considered important for ensuring a steady supply of water from the glaciers. This is especially critical between April and June when cereal crops must be watered at precise times and when water is frequently scarce because of a lack of snow melt. In addition to the sky spirits (*lha*), there are numerous underground spirits (*lhu*). These reside at four large springs which primarily provide the village's drinking water, but are sometimes also the source of water for irrigation. The springs in Phyang are located in catchment areas (Figure 6) covered with wetland grass (*spang*), hence they also serve occasionally as common pastures. Pollution and private encroachment of these sites are considered taboo. In the middle of the agricultural season, the Buddhist community of Phyang organises the *bums khor* ceremony during which the monks circumambulate the village purifying the space and offering special prayers at each spring's *lhu brang* (the structures housing the *lhu*) (Figure 5). Shia and Sunni Muslims, who comprise one-third of Phyang's population, also sponsor special prayers during periods of water scarcity. At the beginning of the agricultural season, each of the 355 households in the village, regardless of religious affiliation, must contribute labour or cash towards the upkeep of the irrigation channels. The cultivated and inhabited area of Phyang is currently divided into nine *mohallas* (neighbourhoods), each of which organises the maintenance of its own irrigation channels and water distribution (Figure 4).

In Ladakh, irrigation structures are constructed simply, using local materials. Irrigation channels (*yura*) consist of earthwork trenches that are stabilised by lining them with alfalfa grass or stones; old clothes and rocks are used to block outlets. Over the past two decades, national and state governments have been subsidising the cost of upgrading sluice gates to concrete and metal; however, these are prone to greater wear and tear due to extreme temperature variations and poor quality of construction (Mankelow, 2003). In line with Labbal's (2000) study of the irrigation system in the nearby Sabu village, we find that the irrigation system in Phyang is a historical "rhizome" (Deleuze and Guattari, 1988). As such, it has not been consciously designed nor is it efficient from an engineering perspective. Even so, it is transparent (easy to monitor where and to whom the water goes), flexible (easily repaired and readily adjusted to changing circumstances), and decentralised or, in Netting's (1974) view "anarchic" (the materials and knowledge required for its functioning cannot be easily monopolised by a single party or

interest group). In August 2010, there was a cloudburst in Phyang which washed away large parts of the village and damaged the headworks of all twenty-two of Phyang's major irrigation channels. Despite this major setback, villagers were able to repair most of the headworks with minimal external support and had the system largely up and running by the following year.

Figure 4. In Phyang, the maintenance of irrigation channels and water distribution is organised at the neighbourhood level.

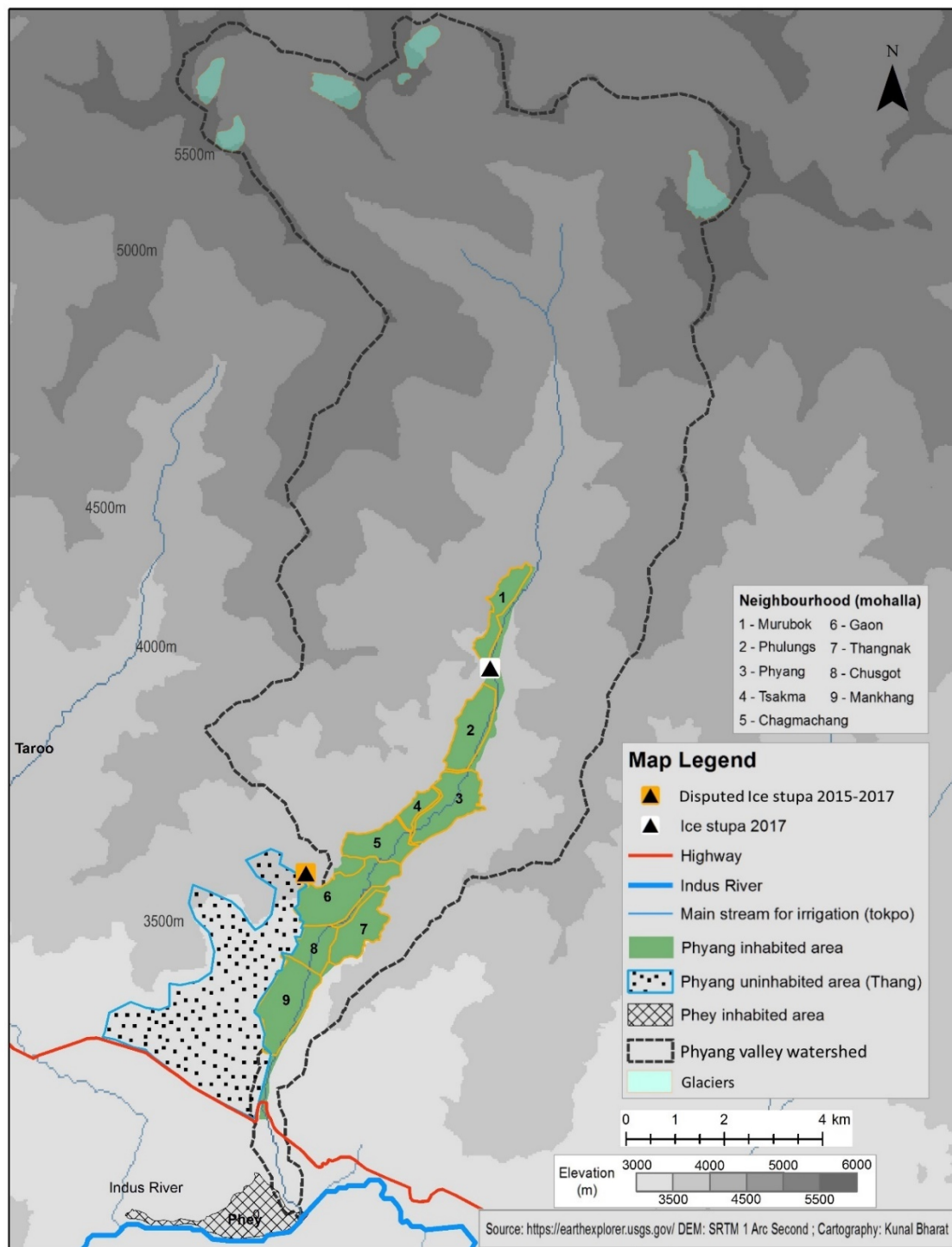


Figure 5. Monks from the Phyang Monastery perform rituals at the lhu brang (the structures housing the lhu, or spirits) at the main spring in Phyang during the annual *bums khor* ceremony. The wetland grass covering the catchment is called *spang*, and areas such as these are also used as common pasture.

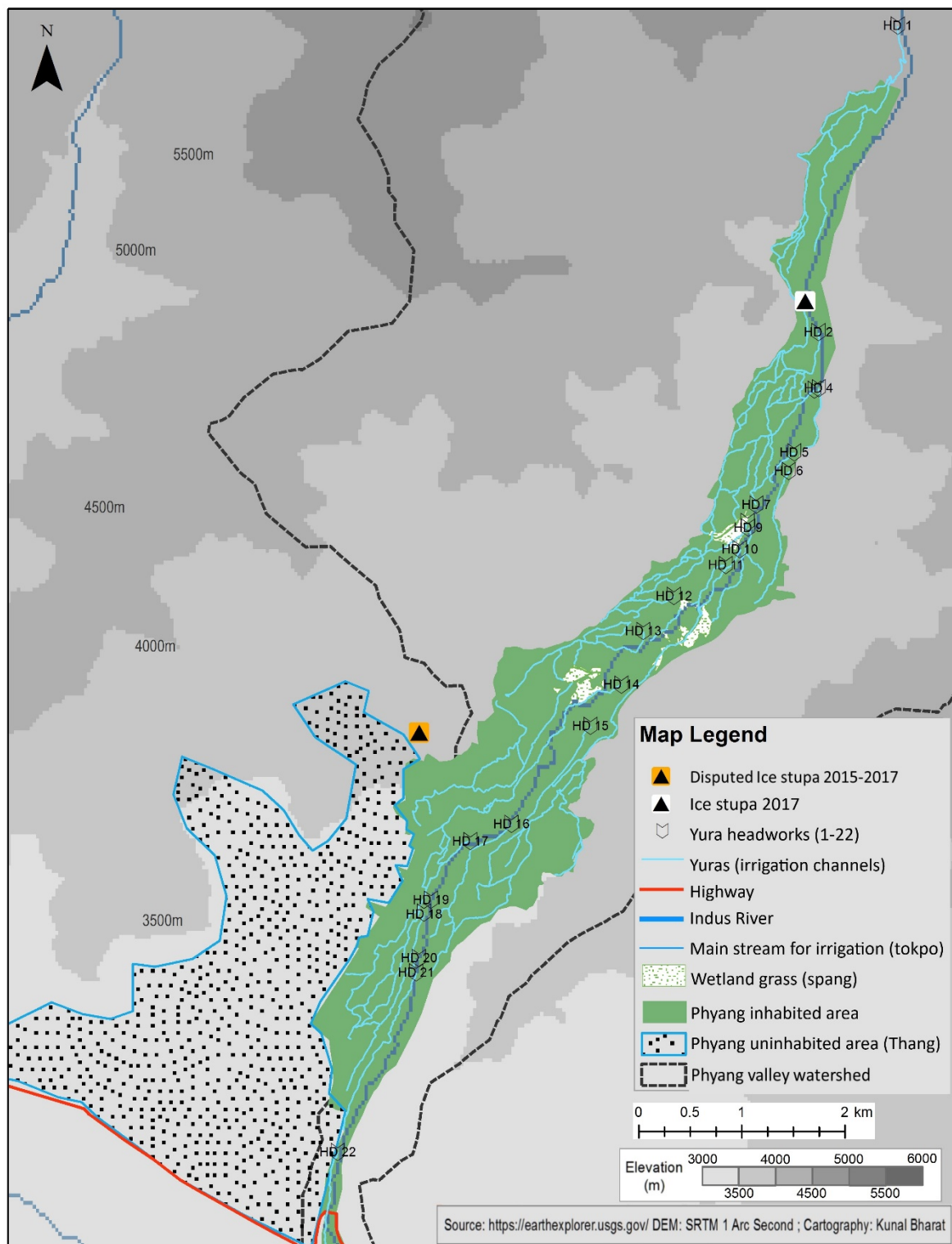


Source: Author's photo.

Irrigation structures in Ladakhi villages also inscribe historically developed power relations into the landscape (Gutschow and Gutschow, 2003; Wacker, 2007). According to custom, the fields that fall within the Phyang mohalla (see Figure 4) are watered first, as the fields in this area are at the wheat-growing elevation (between 3800 and 3500 metres). At this elevation, wheat must be planted early (usually by mid-April) as it takes a longer time to mature than wheat grown below 3500 metres and longer than does barley grown above 3800 metres. Another reason for the priority in irrigation that is given to the Phyang mohalla is its status as the ancestral land of Phyang's most influential Buddhist families. Similarly, during periods of water shortage lands belonging to the monastery and to certain other high status families may be given priority in the water distribution schedule.

The importance of power relations in the distribution of water is also evident from the fact that the smaller village of Phey, located downstream, is only allowed to block the headworks of the channels up till the boundary of the Phyang mohalla (see Figure 6 above), which is considered to be the original settlement. According to custom, the Phey villagers may only redirect water from the main Phyang stream (*tokpo*) after the summer solstice on June 21, or once all the fields of the village have been adequately watered. As a sign of respect, the Phey villagers also make offerings to the Phyang Monastery before they start taking water.

Figure 6. Main irrigation channels (*yuras*) of Phyang; They are allowed to block only headworks 14 to 22 to divert water for irrigation.



In summary, this section illustrates how the network of irrigation channels in Phyang interacts with ecological, social and religio-symbolic boundaries. Irrigation structures not only channel water, they also materially inscribe historically contingent social relations into the landscape. Viewed through this lens, the everyday practices of maintaining, creating and supervising irrigation, as well as contesting claims to water and land, are necessary not only for biological reproduction in Ladakh; they are also symbolic practices that tie individuals to households and households to the *yul*, which (as explained above) refers to both the mode of belonging in place and the place of belonging. The following section shall zoom out of the Phyang valley to consider how the historical processes of state formation create new "technologies of governance" (Foucault, 2007), and how such technologies engender new understandings of boundaries.

FROM YUL TO THE REVENUE VILLAGE: EVOLUTION OF BUREAUCRATIC – LEGAL BOUNDARIES IN THE IMPERIAL ERA

When legitimising their claims to property or water-sharing arrangements, contemporary Ladakhis often use the word *bandobast*. For instance, "our family owns this land since the *bandobast*", or "according to the *bandobast*, our [village, household, field, neighbourhood] gets water first". *Bandobast*, in this context, is an Urdu (not a Ladakhi) word meaning 'an arrangement'. The particular arrangement that is being referred to here concerns the land settlement process that was undertaken in the early 20th century by the Hindu Dogra suzerains of Ladakh, under direction of the agents of the imperial British Indian state. The continued use of the word *bandobast* in daily parlance reflects the continuity between imperial and post-imperial technologies of governance and the relevance of these technologies for strategies aimed at establishing or contesting claims over land and water resources in present-day Ladakh.

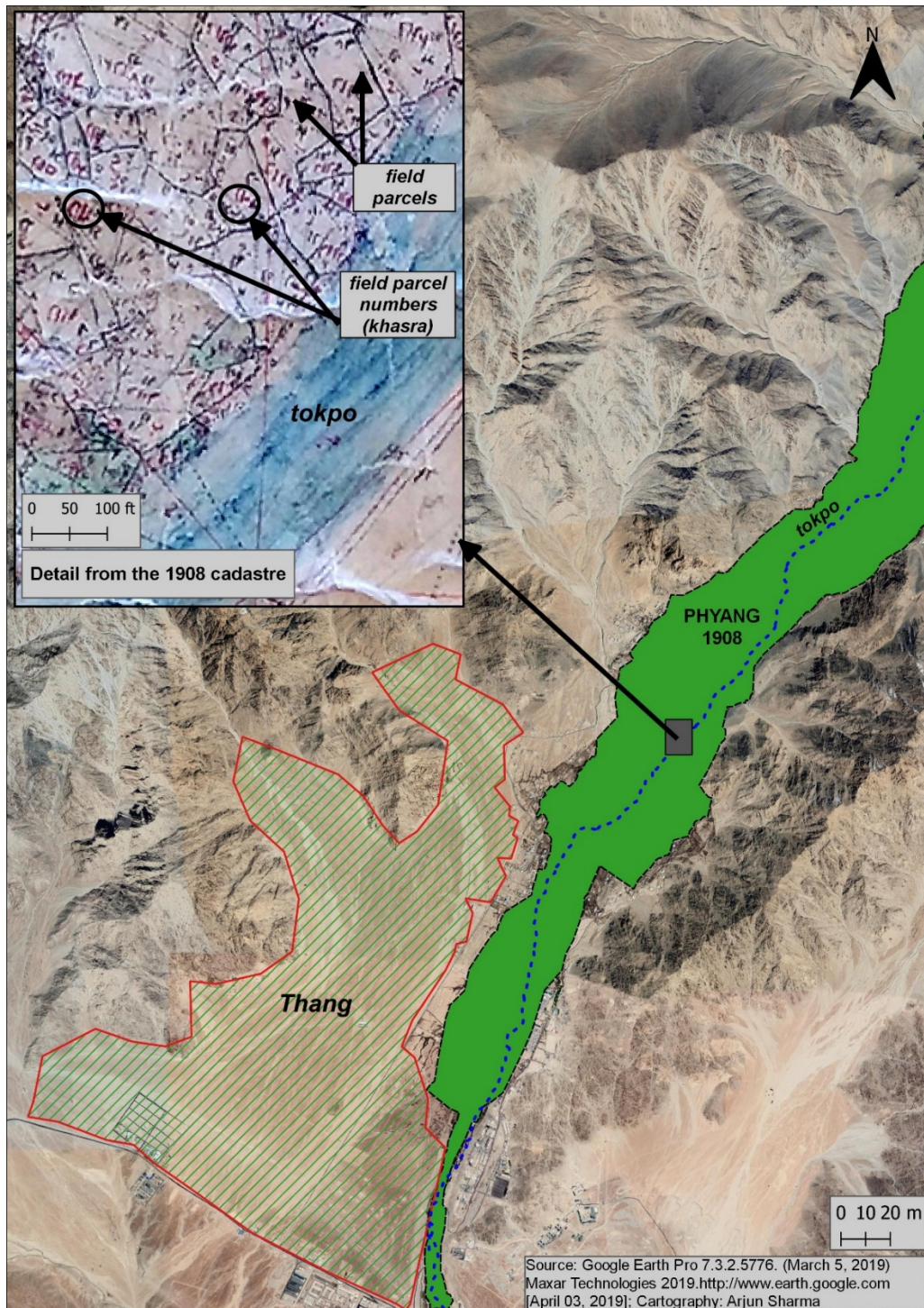
By 1842, the previously independent kingdom of Ladakh came under the control of the Hindu Dogra king, Gulab Singh. In 1846, the British ceded the present Indian state of Jammu and Kashmir, along with Gilgit-Baltistan (now part of Pakistan), to the Dogra chieftain (Bray, 2005). The Dogra state of Jammu and Kashmir thus became one of the largest and geostrategically most important princely states in British Imperial India. Until 1895, the Dogras were accorded a fair degree of autonomy over their internal affairs. Eventually, a number of factors – including widespread corruption, famine and paranoia about the Russian threat to their northwestern borders – compelled the British to increase their control over the administration of the state (Rai, 2004).

One of the first steps taken by the British-Dogra settlement officers was reform of the property rights and land revenue administration of the state. In Ladakh, as elsewhere in northern India, the revenue village became the primary administrative unit. Ensuring control over these village communities, and their stability, became imperative for British administrators, especially as Jammu and Kashmir was an important border state. The technologies through which this process was realised at the village level included cadastral maps for fixing the physical space of the village, and the construction of village genealogies and customs, which together embedded the individual within a bureaucratically conceived place (Gilmartin, 1994, 2003; Smith, 1996).

The cadastral maps of Phyang from the 1908 settlement (which are still used today) were drawn using the trigonometric plane table surveying method. Each map is drawn on a scale of approximately 1 inch to 220 feet; the surface of the map is divided by a chain of triangles used to geometrically demarcate the space. By comparing these cadastral maps to satellite images (Figure 7), it is evident that the legal - administrative boundaries of the village were primarily defined on the basis of economic utility. The utilitarian focus on productivity is also evidenced by the map legend and the instructions to settlement officers, which go to great lengths to classify 'waste' (uncultivated) land (Douie, 1974; Gilmartin, 2003). This general category of waste includes land designated as 'old and new fallow', 'common land' and 'village springs' (which are also wetlands used for grazing livestock). Summer pastures, such as the *phu* to the north of the village and the *Thang* to the south, were not included within the village's boundaries

because of an administrative strategy by which cultivated land and potentially productive 'culturable waste' were separated from unproductive land.

Figure 7. Map showing the georeferenced boundary of Phyang from the 1908 cadastral map.



Source: Author. Notice that the Thang is excluded from the village boundary. Inset map shows the details from a section of the original cadastre.

The cadastral maps also number the irrigation channels in Phyang. In a separate register called the *Riwaz-I-Abpashi* (Irrigation Customs), each channel is referenced according to its corresponding number on the map along with all the field parcels it irrigates. The *Riwaz-I-Abpashi* also codifies the practices governing irrigation management within and between the villages of Phyang and Phey. Despite the aura of authority and precision that the British administrators liked to project, the codification of Phyang's irrigation customs reveals the extent to which such decisions were based on arbitrary choices made by land settlement officers who were highly dependent on the information provided by local informants. While in other Ladakhi villages officials made detailed records of inter- and intra-village arrangements, in the case of the Phyang and Phey villages they documented only that Phey receives water after Phyang's fields have been irrigated. However, according to present custom it is understood that Phey can take water after June 21 or after Phyang's fields have been irrigated. The official records also fail to mention that the villagers of Phey are only allowed to block the headworks of Phyang's main channels up to a specific point. These differences between practice and codification have led to much confusion and frustration when addressing conflicts; they have also, paradoxically, created room for interpretation, which at times works in the favour of the strategically disadvantaged village of Phey.

While it is safe to assume that Phyang villagers had some control over information and that they took advantage of this at the time of the settlement, they were unaware of the logic according to which their customary water arrangements and administrative boundaries were represented. Land settlement documents are written in an archaic, bureaucratic form of Urdu which can only be read by a handful of land revenue officials today; during fieldwork, it was noticed that often even they had difficulty interpreting these documents. In Lefebvre's (1991) terms, imperial-era land settlement records exemplify an abstract conception of space predicated on an objective (Cartesian) epistemology which, owing to these documents' continued use, still frames the relationship between the Indian state and its Ladakhi citizens.

While the geometric boundaries of the 1908 cadastral map simplify the complex interplay between the boundaries constituted by environmental, material, and symbolic practices, they cannot be ignored because they continue to form the basis on which land division, citizenship, and water disputes are adjudicated in Ladakh. Bureaucratic boundary-making practices have created a dual identity and dual set of boundaries for Phyang, as a yul, and as a revenue village. The interplay between these two boundaries makes space for new political configurations and modes of contestation to emerge. More importantly for this discussion, the next section will explore how the omission of the Thang from official classification has led to the emergence of specific types of claims and disputes in this area, which inform both Phyang and Phey villagers' response to the artificial glacier project.

POLITICAL-ECONOMIC TRANSITIONS POST-1947 AND THEIR IMPACT ON VILLAGE BOUNDARIES

Presently, the political economy of Ladakh is driven by two related processes: security and tourism. As a region located next to the politically volatile UT of Jammu and Kashmir, surrounded by two hostile neighbours – China and Pakistan – the Indian government's impetus to develop this region has come from its desire to ensure its political stability, and the integrity of the nation's northern borders (Aggarwal and Bhan, 2009). The vast military apparatus has become a major source of income for Ladakhis as both employer and consumer. This is especially crucial in light of the complete cessation of the trade with Tibet and Central Asia that was the traditional mainstay of the Ladakhi economy till soon after Indian independence in 1949 (Rizvi, 2001). More importantly, the perceived need to sustain a military presence has led to the development of infrastructure such as roads, airports, and hydroelectric dams, which have encouraged the development of local markets, especially those catering to tourists.

While the military remains the backbone of the Ladakhi economy, since the 1970s tourism has emerged as an important source of livelihood and income (Michaud, 1996). The fundamental shift away from subsistence-based livelihoods is illustrated by the fact that in the 1961 census 99% of the

households in Phyang reported agriculture to be their main occupation, while in the most recent census (2011), this number has decreased to 25%, with the majority of employment being generated by the public and private sectors. Although agro-pastoral practices are still strongly linked to identity in some parts of Ladakh, their importance for subsistence is declining because of increased access to government-subsidised and imported food (Dame and Nüsser, 2011). As the focus of household investments in labour and resources becomes increasingly geared towards nonagrarian commercial activity, for villages like Phyang which are located close to the main highways, previously worthless nonarable land has become valuable. In conversations with villagers, comments such as the following are typical:

Before, if someone told us to capture land in areas like the Thang, where there is no water, we would laugh at them. But all these people who captured land in [uncultivable areas adjoining the district capital, Leh] are now rich. People in Phyang noticed this and now everyone is interested in first capturing the land and hoping that the government will provide the water (Interview with a Phyang resident, 26 June 2016).

The process of capturing land in the uncultivated Thang area began in the 1980s. Normally, anyone laying claim to uncultivated land lying within the village boundaries would be required to undergo a mutation process (U: *intaqal*) which is carried out annually in each village by land revenue officials. However, since the Thang itself was not included within the village boundary in the 1908 settlement, its legal status remained ambiguous, which consequently allowed land capture there to go unnoticed (or tolerated) by state authorities. Equally importantly, the distribution of land in the Thang was carried out by three *chokspas* (societies).¹⁰ Two *chokspas* represented the Buddhist population of Phyang, and one was created for distributing land among the Muslim population, particularly land in the Thang. The membership within the *chokspas* does not correspond with households' location within the present administrative boundaries of the nine mohallas in the inhabited parts of the village, according to which water is managed. Moreover, each *chokspa* has developed its own procedures for distributing land among its member households and is responsible for settling any disputes between them.

The distribution of land as determined by the three *chokspas* was legalised in 2014.¹¹ Following the legal recognition of property claims in the Thang, the government designated this land specifically for residential and institutional use. Technically, this makes the provision of water for residential consumption a responsibility of the government's public works department.

In short, the shift to perceiving land as a commodity rather than as a productive resource also influences Phyang villagers' attitudes towards the water governance arrangements in the still-uninhabited Thang. Since households in the Thang are tentatively organised according to *chokspas* and not according to the neighbourhoods they currently belong to, it remains to be seen how these two institutions will be reconciled in the future. In the meantime, the Ice stupa project is one attempt to use the space created by these new legal-institutional boundaries.

¹⁰ The three *chokspas* include *Serlam*, *Spesar* and Muslim. *Serlam* means ostracised. This *chokspa* historically consisted of households which allied themselves with the previous Ladakhi Rinpoche in a political struggle that took place within the Phyang Monastery in the 1970s and 1980s. It was at that point that the current Chetsang Rinpoche, who is Tibetan, came out of exile and, at the behest of some of its monks, took control of the monastery. Because this is a very personal and sensitive matter for the Phyang yul they do not discuss it openly; however, most villagers I spoke to stress that the differences between the *chokspas* have been resolved and that they now serve merely an administrative and ceremonial function.

¹¹ Order No. 539/Rev of 2014, 19 June 2014; signed by the Deputy Commissioner/CEO of the Ladakh Autonomous Hill Development Council (LAHDC).

A PLACE FOR INVESTMENT OR A MODEL OF SUSTAINABLE DEVELOPMENT? THE ICE STUPA AND ITS (DIS)CONTENTS

The cultivated part of Phyang is currently zoned as agricultural land, which both legally and customarily limits the modification of existing irrigation infrastructure in the area. The Thang, on the other hand, is zoned exclusively for residential and nonagricultural commercial, and for use by educational, non-profit and religious organisations. This implies that according to state law Phyang's irrigation network cannot be used to provide water to the Thang.¹² This leaves only two options for developing this area: either to provide water by lifting it from the Indus, which is a very expensive and resource-intensive proposition, or to exploit groundwater resources. The latter is especially problematic in the context of Ladakh's ecology and the current poor understanding of the nature and dynamics of groundwater hydrology in this region. Moreover, in the nearby city of Leh and in some adjoining villages, unregulated ground water extraction has depleted springs and is believed to be rapidly lowering the water table.

Mainly because of limited water access, the villagers of Phyang do not have a vision for the systematic development of the Thang beyond its potential value as residential and commercial real estate. However, other actors such as the Rinpoche of the Phyang Monastery and the social activist Sonam Wangchuk see it as an opportunity to create a template for sustainable development in Ladakh. Although coming from different backgrounds, both Mr. Wangchuk and the Rinpoche are media savvy and very adept at engaging with global sustainable development and climate change discourses; because of their national and global stature they also have extensive networks that allow them to mobilise financial and material support. Their partnership made strategic sense from the beginning: as Mr. Wangchuk is not from Phyang or Phey, and hence does not have access to land or water in these villages, he was able to benefit from the use of the monastery's land in the Thang and from the Rinpoche's reputation to realise the Ice stupa project; the Rinpoche, in return, could benefit from Mr. Wangchuk's expertise and networks to promote his own Go Green & Go Organic initiative (Drikung Kagyu, n.d.). According to Go Green & Go Organic's promotional material (*ibid*) this project endeavours to:

[deal] with global issues such as weather calamities, ecological imbalances, global warming and so forth, which are some of the biggest issues facing us in this highly developed modern world. So Go Green is intended globally, to take care of our world by planting trees for birds, animals, insects, and all living beings on this planet. Go Organic mainly focuses on growing and supplying organic vegetables for all.

During an interview with this author in August 2016, Mr. Wangchuk stated that the Ice stupas could accomplish either desert reclamation or could augment water in the main traditional irrigation channel. If the latter model had been selected and successfully implemented both Phyang and Phey would have had immediate access to water, but Mr Wangchuk chose the desert reclamation model and in doing so he chose a strategy which paid off. Since the Ice stupa artificial glacier was built in the desert and was portrayed as a climate change solution, it garnered enormous media attention for Mr. Wangchuk; it earned him personal accolades and resulted in significant financial investment for his university.¹³ Ironically, this attention also increased the scrutiny of the project by Phyang and Phey villagers.

Initially, out of respect for the Rinpoche, Phyang and Phey villagers had tolerated the construction of the Ice stupas in the Thang, a process that used special, weather resistant high-density polyethylene

¹² This is outlined in the *Jammu and Kashmir Water Resources (Regulation and Management) ACT 2010*, Chapter II, Article 3(1) and 3(2), and Chapter IV, Part II, Article 32(a); <http://jkswwra.nic.in/Acts%20&%20Rules/JKSWRRA%20Act,%202010.pdf> accessed on 7 August 2019

¹³ Mr. Wangchuk won a prize of 100,000 Swiss Francs (€88,400) from the Swiss watchmaker Rolex as part of their annual *Rolex Awards for Enterprise* (www.rolexawards.com/profiles/laureates/wangchuk_sonam/overview). He has also raised Rs71,297,949 (€888,786) on the Indian crowdfunding site *Milaap* (<https://milaap.org/fundraisers/hial>), and raised Rs50,00,000 (€62,402) on India's version of the television gameshow *Who Wants to Be a Millionaire* (Keshri, 2017) for the Himalayan Institute of Alternatives (HIAL) University, Ladakh (<https://hial.edu.in/>). (All of the above websites were accessed on 25 November 2018).

(HDPE) pipes to extract water from the main stream (*tokpo*) that fed the irrigation channels. It was an act that would normally have violated both customary and state regulations governing the modification of irrigation structures. However, Phey villagers began to actively oppose the project when they noticed that the Ice stupa engineers had doubled the diameter of the pipes without consulting them. They also noticed a similar pipe being laid from the current site of the Ice stupa (and its adjacent plantation) to the site – also in the Thang – where Mr. Wangchuk had requisitioned land for building his university. For the Phey villagers, this was not only a blatant violation of their water rights but also a threat to the peace between the two villages, where water has historically been a contentious issue.

Specifically, the villagers of Phey contend that even if the pipes used for the Ice stupas only draw 'wasted' water – water not used for irrigation in the winter – the plantation of the desert reclamation programme would need continuous watering after May or mid-June, which is when the meltwater stored from the artificial glaciers usually runs out. After that, the pipes used for constructing the stupas in the winter could be used to directly irrigate the tree plantation. Considering that the total cultivated area of Phyang is currently about 276 hectares (ha) and the total area of the Thang is about 615 ha, it would be reasonable to expect that, in an already water-stressed system, even a small increase in the proportion of area 'greened' using Ice stupas would put a lot of pressure on the availability of water for cultivating the fields of the lower-lying mohallas of Phyang and Phey, which receive their turn in May and June. Moreover, Phey villagers and some farmers from Phyang are sceptical about Mr. Wangchuk's claims that water is wasted in the winter. Although surface water is not used for irrigation in the winter, farmers in both villages claim that it recharges the underground springs which are used to provide drinking water to both villages. In the village of Phey, in addition to drinking water, springs also irrigate a significant proportion (roughly 51%) of the village's fields. During fieldwork between 2016 and 2018, I noticed that there was almost no water reaching the Indus. In fact, most of the water flowing into the Indus (and hence 'wasted') was observed towards the end of July and in August, which is after the irrigation of cereal crops in both villages is almost complete! In any case, the groundwater hydrology in this region is complex and the scientific understanding of the relationship between surface and groundwater is poor; therefore, the claim of Ice stupa proponents that water is wasted if not used for the artificial glaciers is not currently supported by scientific evidence.

Without recounting in detail the many protests that have occurred and the negotiations that have been undertaken amongst the villagers of Phyang and Phey, Mr. Wangchuk, land revenue officials and the Phyang Monastery since 2017, the net impact of this conflict has been to focus the villagers' attention and that of the broader Ladakhi public on the challenges and limitations inherent in reclaiming desert land using technologies like the Ice stupa artificial glaciers.¹⁴

During interviews, Phyang and Phey villagers unanimously stressed the importance of retaining autonomy over customary water distribution arrangements, which they believe are threatened every time people outside the yul become involved in inter-community disputes. While adjudicating the dispute over the Thang Ice stupas in February 2018, the senior civilian bureaucrat, the Deputy Commissioner of Ladakh, ordered the *tehsildar* (senior land revenue official) to consult the water arrangements codified in the 1908 bandobast documents; as discussed previously, the water arrangements between Phyang and Phey recorded in these documents are not consistent with present customary practices. When asked whether they would be interested in modifying the original settlement (bandobast) if it benefitted them in the long run, Phey villagers were sceptical. Most Phey villagers thought that, rather than settling future disputes, such an exercise would result in greater discord between Phyang and Phey. In this way, the everyday discourse of the villagers legitimises the status quo of water management institutions using the concepts of harmony and autonomy.

The judgement of the tehsildar of the Leh district appears to echo these sentiments:

¹⁴ Since 2017, more balanced and critical articles have appeared in the Ladakhi press debating the appropriateness of artificial glaciers as a solution for climate change-induced water scarcity. See, for example, Lundup (2017) and Parvaiz (2018).

The present [irrigation] system is working well (...). [T]he water distribution system is like a Greek democracy (as quoted by an expert) (...). [A]ny outside interference causing diversion of this system out of the traditional water sharing/distribution system will deteriorate the water scarcity [sic] and may spark dispute between two friendly villages¹⁵ (original wording and parentheses).

In the winter of 2017, a new Ice stupa was built in Phyang beside the bed of the main feeder stream shared by Phyang and Phey. Ostensibly, the goal of this artificial glacier was to augment water for irrigation rather than – as was the case with the Thang Ice stupas – reclaim deserts for new plantations. While not embracing it, neither have the Phyang and Phey communities opposed it. Phey villagers described the situation thus:

I don't think that it [the new Ice stupa in the stream bed] will solve water problems, but at least it is not taking water away from the village (...). [T]his is the land of our ancestors – it is registered in the Bandobast (...). Even people from our village who are building new houses outside this [currently cultivated] space do not and cannot take water from the [traditional] irrigation channels (Transcript from a discussion with the Phey village committee, 8 August 2018).

What can be gathered from such statements is that as long as projects like the Ice stupa do not violate customary water use practices that are tied to the identity and sacred places of the villages they are likely to be tolerated. More importantly though, the villagers' reservations reveal a deep tension in the relationship between the locations increasingly targeted for investment (such as Phyang Thang) and the existing sites of everyday life that are at the core of Ladakhi identity. The implications of this tension reverberate beyond these two villages.

DISCUSSION AND CONCLUSION

Using Jeff Malpas's definition of place as a bounded, open and emergent structure, this article deconstructs the responses of the residents of a Himalayan village to artificial glaciers called Ice stupas, situated in various places within their community. The article demonstrates that as 'place' the Phyang village is situated at the confluence of multiple boundaries: ecotechnological, socio-symbolic, and bureaucratic-legal. Within this bounded, yet open place, there is substantial scope for individual and collective agency in realising objectives; this manifests itself in the form of goal-oriented projects like the Ice stupas, which in turn connect an ensemble of technologies from across geographic scales, including water pipes, crowdfunding platforms, discourses, people, and knowledge systems. It is projects such as these that often challenge and reconfigure existing social, symbolic and ecological boundaries of places. As theorised by Malpas, this process creates a dynamic relationship between boundaries, the spaces they create, and emerging projects.

Intended to create tree plantations in reclaimed desert in the arid Thang area, the Ice stupa uses a water source that is considered to be shared by two villages. As such, it is contested because it transgresses the original watershed boundaries covered by the present customary irrigation governance regime. For the villagers of Phyang and Phey irrigation is not merely an economic activity, it is also closely tied to their symbolic membership in the village community (*yul*) and to the perceived identity of the village itself. In this context, the second Ice stupa, which is constructed in the bed of the main irrigation stream in the cultivated part of the Phyang village, is not considered controversial because it lies within the original watershed and does not threaten the arrangements that mutually define the two villages.

At the same time, the controversy surrounding the Thang Ice stupa also directs attention to the challenges that community-based irrigation practices face from new technologies like the HDPE water

¹⁵ Excerpt from Document No. 4259/OQ/2009, dated 27 March 2017, from the office of the tehsildar, Leh to the Deputy Commissioner, Leh district, entitled, *Enquiry and Report on the Dispute Between Phyang and Phey Village Regarding the Proposed Alternative University*.

pipes used for constructing the Ice stupas. While extending the limits of the physical watershed, purchase of these pipes requires access to substantial capital, specialised knowledge and new institutions; the introduction of these changes, in turn, entails a renegotiation of the relationships defined by the ecotechnological, socio-symbolic and bureaucratic-legal boundaries of the village. For scholars who focus primarily on the legal-institutional dimensions of water commons governance, this finding suggests the need to factor in the impacts of technological artefacts on community-managed water institutions.

Similarly, the Ice stupa controversy reveals the Thang as an emerging 'place' within the Phyang village; its ecological characteristics – its aridity and its location outside the watershed – are interpreted according to multiple, competing representations. Colonial technologies of governance such as cadastral maps, land revenue records, and the documentation of customary law created a static representation of Phyang as a 'revenue village' with a mathematically demarcated administrative boundary. In the process of simplifying the ecological and socio-symbolic boundaries of the village within a utilitarian framework, imperial administrators left the legal status of the Thang undefined. Due to rapidly changing socio-economic conditions in Ladakh, particularly since the 1970s, the Thang's legally ambiguous status became subject to the claims of different stakeholders including the Phyang villagers, the monastery, and the builders of the Ice stupas. In accordance with state laws on land zoning and watershed development, Phyang and Phey villagers see the Thang as a place for nonagricultural commercial real estate purposes, whereas the monastery and the promoters of the Ice stupas want to use this place to showcase their commitment to global sustainable development discourses by using the water from the Ice stupas to 'green' the desert. These competing projects engage their respective technological solutions and governance arrangements for the management of water, which must be contextualised within the evolving land use practices in the cultivated area of Phyang and the downstream village of Phey.

From the perspective of sustainable development policy and practice, these competing representations of Thang constitute different discursive 'frames' which, as Leach et al., (2010) suggest, entail various developmental pathways, each with its own specific set of political, sociotechnical and environmental choices and impacts. Methodologically, mapping the historical relationship between water and place as a bounded, open and emergent structure allows critical water scholarship to move beyond mere description of complex hydrosocial relationships and processes, and thus to better understand the boundary conditions and practices *within and between* places which allow such relationships to emerge. For actors interested in responding to challenges posed by climate change and socio-economic inequality, understanding the multiple – often incompatible – ways that stakeholders represent and problematise place provides a way to realistically appraise the appropriateness of sustainable development interventions.

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