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On the politics and the possibilities of participatory mapping and GIS: using spatial technologies to study common property and land use change among pastoralists in Central Tibet

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This article critically and reflexively examines the process of applying participatory mapping and Geographic Information Systems (GIS) to investigate land use change and common property among pastoralists in Central Tibet. It explores the tensions inherent to participatory mapping in contemporary China and asks if participatory methods of recording and asserting territoriality are a plausible subaltern intervention for Tibetans living under Chinese political rule. In development and research circles, participatory mapping has been discussed and, slowly, tested in the field as a tool for 'empowerment'. Yet the political currency of literature on participatory (or 'counter') mapping has been developed predominantly in contexts where there is a dialogue, however asymmetric, between state and indigenous groups, and where these cartographic interventions can identify and delineate political boundaries in ways that may allow local or indigenous groups some measure of autonomy. This article extends critical geography on participatory mapping and spatial technologies such as GIS by reflecting on their relevance to Central Tibet, which has had a significantly different political history than the locales where indigenous cartographies have been previously deployed. For pastoralists living in the Tibet Autonomous Region of China, politically charged dynamics with respect to autonomy and the writ of boundary making preclude any possibility that participatory mapping can 'empower' participants or give them greater authority in government negotiations: the scope for political contestation in Tibet is narrow and highly circumscribed. Even though participatory mapping is of limited utility as a tool for mobilization in the Tibetan context, the case study offers possibilities for the uses of participatory mapping and computer-driven spatial methodologies to blend information about land use and common property under different regimes of governance.

Keywords: cartography • China • common property • epistemology • Geographic Information Systems (GIS) • land use • participatory mapping • pastoralists • politics • Tibet

Introduction

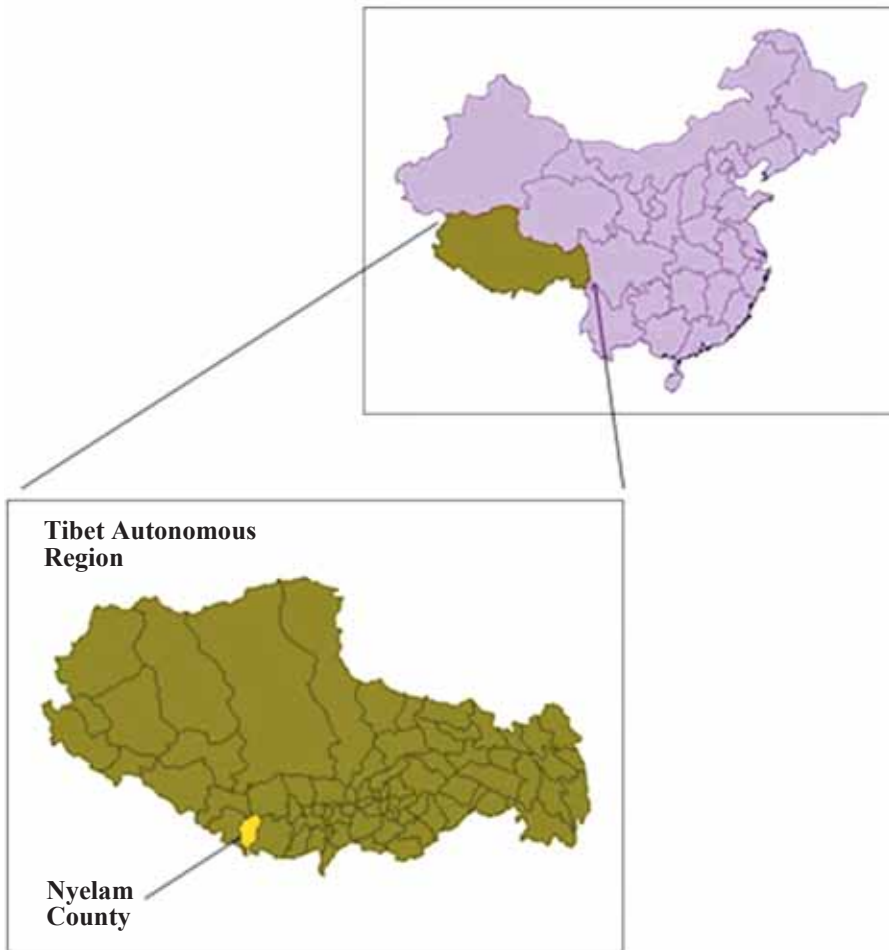
Much of the impetus for and literature on participatory mapping comes from former European colonies like Australia, New Zealand, Mexico, and Belize as well as First Nations groups in the USA and Canada. As a result, the process and rhetoric of participatory (or 'counter') mapping

has been predominantly developed in contexts where there is a dialogue, however asymmetric, between states and subjects (or between development organizations and beneficiaries), and where these cartographic interventions can identify and delineate political boundaries in ways that may allow local or indigenous groups some measure of autonomy. In this article, I show how the case of Tibet presents particular challenges to using participatory mapping even though current government rhetoric in China emphasizes the importance of grassroots development and of decentralizing governance. Whether these stated policies can, in fact, be extended – through techniques such as participatory mapping – to the efforts of small-scale producers to gain a more equal footing in natural resource management and development planning is a contested issue. Rather, I argue that participatory mapping is of limited political utility in a place like Tibet because mapmaking is not enfranchised and cannot be scaled up, for instance, to settle legal battles over land tenure and resource rights through the regulatory offices of the state. Even as this article emphasizes the limitations of participatory mapping for asserting political agency, it argues that the process of participatory mapping and the application of spatial tools such as Geographic Information Systems (GIS) can bridge landscape epistemes and illuminate the dynamics of land use in novel and syncretic ways.

Study site, data, and methods

The Porong region of Central Tibet (Nyelam County, Tibet Autonomous Region [TAR], PRC) is situated just north of the China-Nepal border, as displayed in Figures 1 and 2, approximately 700 kilometers west of Lhasa (the capital of the TAR). Porong is located in the buffer zone of Chomolongma (Mt Everest) Conservation Area and Mt Shishapangma, the world's 14th highest peak (8013 meters), lies within the boundaries of this high-altitude nomad region. The study site is part of a watershed that drains into Peiku Tso Lake and is bounded by the Himalayas to the south and lesser ranges to the north. Porong is the largest livestock production area in Nyelam County: rangelands there support over 50,000 animals.¹ Porong's nine administrative villages have some 380 households with a total population of just over 2000 people. Empirically this is a little studied region, in part due to the difficulty of securing research access.

The text used in this case study – hereafter denoted as the 'Porong Boundary Text' (T. *Pal byang pa'i sa tho dge*) – was recorded in 1884 and delineated one administrative unit (T. *tsbo*) within Central Tibet.² The Porong Boundary Text lists the principal settlement names, toponyms, and boundaries of common property pastures belonging to the lord and subjects of the Porong principality (see Figure 3).³ The historical boundary survey that spurred this mapping effort was smuggled out of Tibet in the early 1960s, carried by pack animals and on foot over the Himalaya by members of Porong's erstwhile elite, gone into exile in Nepal. This act made available a kind of document that is rare to find inside Tibet at this juncture.⁴ As such, the Porong Boundary Text represents a previously untapped resource in studies of Tibetan pastoralists. Because the period since this 19th century survey was recorded has seen huge transitions in Tibet's governance – from feudalism to socialism through to today's hybrid of state capitalism – the Porong Boundary Text provides exceptional access to understanding land use and governance patterns in this pastoral region.



The study site (Porong) is located in Nyelam County, Shigatse Prefecture, Tibet Autonomous Region, People's Republic of China

FIGURE 1 Location of Study Site within the People's Republic of China.

Texts are written under certain material conditions and are embedded within cultural and political systems. Texts have served a variety of purposes in Tibetan culture, none more prominent than the propagation of scripture. Among Tibetans, religious texts themselves are considered sacred objects – for the teachings they contain and as physical manifestations of transcendent wisdom. But texts have also served managerial and coercive purposes in Tibet: specifically, the Porong Boundary Text was recorded by the feudal principality in order to delineate taxable entities, define common property pasture units, and settle land claims. In these ways, the Porong

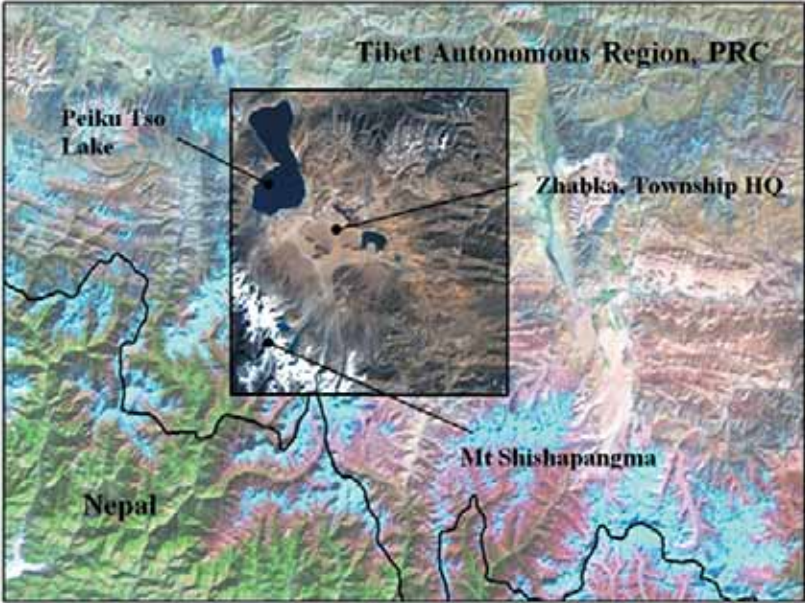


FIGURE 2 Satellite View of Study Area.



This boundary survey text was recorded by Porong's feudal ruler in 1884. Settlements are written in red ink, followed by a detailed listing of the boundaries of common property pastures belonging to that settlement.

FIGURE 3 The Porong Boundary Text.

Boundary Text legitimates a political hierarchy and formalizes extractive relations between the Porong lord and his subjects. Therefore, a note of caution must be added to advise against too 'easy' a reading of this historical survey: there is always some dichotomy between written policy and embodied practice in the observance of, or resistance to, rules.⁵

Were the boundaries recorded in this document known and observed by herders in their day-to-day and seasonal movements? Government records such as this text may have represented 'ideal' and officially sanctioned interpretations of territory. For the purposes of this case study, however, I assumed that the social stress of not heeding customary norms, and the penalties brought against offenders who did not comply with the boundaries listed in this text, was incentive enough for herders to follow boundaries and respect these regulations. Breaking such rules in such a marginal environment would risk fraying social relations and exposing one's household to a loss of support within the community. This mapping project thus relied on the assumption that the boundaries as mapped were geographically plausible; wherever possible, evidence was triangulated with data from field surveys, interviews, hand-drawn maps, and remote sensing images.

In the text, pastures are delineated by physical landmarks like ridges and rivers as well as by built architectural elements such as corrals and cairns. Translation and decoding of the text enabled me to catalogue hundreds of toponyms and boundary markers. In the field, the Porong Boundary Text was used to identify and locate toponyms, corrals, and resource use points, which were geo-referenced along with landscape features using a Global Positioning Systems (GPS) unit. Interviews and participatory mapping with Porong herders were deployed to track down and illustrate historical and contemporary pasture boundaries, which were eventually digitized using Geographic Information Systems (GIS) software. The cumulative result of these efforts was a gazetteer of the Porong region that contained over 1400 place names, of which more than 500 points were geo-referenced (latitude/longitude/elevation). These geo-referenced features were supplemented with hand-drawn, participatory maps made by local herders. Next, I reconstruct the physical and social settings in which participatory maps were produced in Porong.⁶

Participatory mapping has a broad range of applications including: collecting spatial data; recording linguistic terms, subsistence techniques, and other cultural information; and delineating social spaces and land management units.⁷ Participatory mapping techniques are also commonly used in planning and monitoring development interventions.⁸ In pastoral areas, development planners have used participatory mapping to plot herd movements, chart land use, and depict the resources and services that are available to different groups.⁹ Yet, participatory mapping in pastoral areas has proven to be problematic because of the highly dynamic and non-equilibrium nature of rangeland resources: the distribution of resource-use sites and their productivity typically vary greatly from year to year and within years. Moreover, multiple and flexible rights may apply to the same area and pastoral groups may make seasonal use of different areas in different years.¹⁰

In Porong, participatory mapping techniques were deployed with individuals and in groups to depict toponyms, pasture boundaries, built elements, and landscape features. These cartographic exercises were typically collaborative efforts, with several different people wielding colored pens and markers. At the beginning of each mapmaking project, participants were asked to draw prominent features of the landscape and to locate livestock corrals. Beyond that, the mapping process was left deliberately open. The most common elements that collaborators drew were ridges and mountains, rivers and bodies of water, and grasslands, together with architectural features such as corrals and settlements. In carrying out these participatory mapping exercises,

the objective was to capture a landscape-scale picture of the Porong pastoral production system in terms of time and space, according to Tibetan cultural idioms and conceptions of land use. The resultant maps sometimes covered only small areas immediately adjacent to a village and other times reached the outer bounds of the entire township. The maps created by Porong's herders were windows onto local production techniques, the presence/absence of key seasonal resources, and a means of depicting the relationship between administrative units and common property boundaries. With this brief review of the study site and methods applied, the next section outlines some key political and epistemological critiques of spatial technologies and their particular relevance to Tibet.

Critiques of participatory mapping and GIS

The first set of objections to the validity and applicability of participatory mapping and GIS for research and development planning is *political*. Namely, tools like participatory mapping and spatial technologies like GIS are criticized as inherently political and likely to reinforce or re-create the status quo of power relations.¹¹ These political objections stand in marked contrast to the position of participatory mapping proponents, who argue that it creates hopeful prospects for increasing the visibility of marginalized groups and thereby diminishing power asymmetries.¹² Advocates posit that participatory maps are a form of communication, an effective medium for breaking down entrenched power structures and fostering civil society.¹³ Through the use of participatory mapping and technologies like GIS, community members can, ostensibly, strengthen the legitimacy of their customary claims on natural resources by engaging the state with the techniques and tools used for official mapmaking.¹⁴ According to this perspective, maps can be used as a credible and graphic base from which to launch political campaigns.

Accompanying the rise of participatory rhetoric in development agendas, mapping has been proffered as a logical extension of 'capacity building' in communities.¹⁵ In turn, NGO activists have enthusiastically adopted participatory mapping as a tool for indigenous groups that are documenting land claims and contesting rights to ancestral resources.¹⁶ Counter mapping can include efforts to protect indigenous land rights, demarcate and protect 'traditional' territories, manage community lands, protect biodiversity, raise awareness about conflict and mediate resolutions, empower communities, and promote cultural diversity.¹⁷ Scholars and activists have also argued for the merit of participatory approaches in enhancing democratic values, regardless of the specific outcomes.¹⁸

Even as participation has been presented as an irrefutable 'good' in development rhetoric, this premise has been questioned and some critics have taken to calling participation 'the new tyranny'.¹⁹ The same suite of critiques leveled at 'participatory development' can be directed towards participatory mapping, too.²⁰ For example, depending on the social context in which they are produced, participatory maps may (intentionally or not) produce homogeneity by eliminating the ways in which different stakeholders see a landscape or resources differently; just as likely is the observed phenomenon that development interventions like participatory mapping are viewed as irrelevant to the supposed beneficiaries.²¹ The implementation of participatory strategies in development interventions is, moreover, shaped by the power relationships between the state and community actors as well as among members of a group. Just as in the 'participatory' appraisals

commonly facilitated by development planners, mapping can be subject to elite capture, in which dominant members of a community dictate the terms and tenor of the cartographic process.

While interventions such as participatory mapping are formally ‘participatory,’ the actual functioning of land management is affected by other factors, such as the economic and political interests of the actors involved and the history of people–state relationships. The involvement of ‘local people’ in development does not, in and of itself, make it an apolitical process: power relations between various actors can also intervene. For instance, scholars have asked whether, in their meeting with regulatory systems – including mapping systems – the indigenous epistemologies of landscape are altered in such a way as to make and enforce certain assumptions about personhood and ‘custom’.²² Elizabeth Povinelli’s work on Aboriginal land claims in Australia helps us think about the way state power engages minority nationality subjects and points to potential pitfalls in assuming that efforts like participatory mapping can get to ‘authentic’ land claims.²³ In Australia, the 1993 federal Native Title Act requires that Aboriginal people demonstrate an unbroken line of adherence to traditional law in order to qualify for native title to land. Seen in this light, the practice of participatory mapping could – under the guise of liberalism and multiculturalism – serve to extend subtle but real hegemonies with respect to group identity.

Spatial technologies can separate the producers of spatial knowledge from the product (maps, written information, etc.). Thus, the creation of participatory maps may undermine indigenous peoples as the original owners of geographic knowledge since spatial technology is all but sure to be alien to them, and because they cannot control the uses of the maps as records or artifacts once they are in the hands of outsiders.²⁴ As such, participatory maps can be counterproductive to a community if the production of maps is controlled by outsiders or political interests that influence how the data is used to characterize resource use and land tenure. One advantage of written culture is that everyone has access to information once it becomes public domain. However, the disadvantage is that once the information circulates, the original owner or author of the information cannot control how the information will be used. For marginalized communities, this set of realities can be used against their authentic interests.

As we have seen, there is ambivalence around GIS as a tool for ‘empowerment’ of subaltern populations and as a technology of surveillance that may augment the efforts by states and non-governmental organizations to make society more legible, not to mention more taxable.²⁵ Led by theorists of space and landscape, we have come to understand that spatial technologies are not wielded in a vacuum.²⁶ The postmodern turn in cartography has wrested the discipline away from empiricist interpretations of maps as objective representations of a real geography toward more critical assessments of maps as technologies of power.²⁷ In this vein, scholars from diverse disciplines have considered the relationship between mapping and the practices of colonialism since maps have typically served empires as early and rudimentary expressions of codified law.²⁸ Maps, together with auditing techniques like inventory record keeping, have been central to the project of state making.²⁹ As Johnson (this volume) argues, maps are an attempt to represent an order that allows for uncomplicated control over land, people, and resources by state systems. That activities of survey, marking, naming, and mapping make space ‘legible’ for state-sponsored efforts to settle and control populations, particularly mobile groups, has been well documented in the literature.³⁰ In this sense, the Porong Boundary Text can be seen as contemporaneous with state technologies of power as there is an organic connection between the act of mapping and surveillance.³¹

The second set of objections to participatory mapping and spatial technologies like GIS are *epistemological* and concern whether or not 'indigenous knowledge' can be integrated into western cartographic representations. Robert Rundstrom writes:

... the Western or European-derived system for gathering and using geographical information is in numerous ways incompatible with corresponding systems developed by indigenous peoples ... GIS technology, when applied cross-culturally, is essentially a tool for epistemological assimilation, and as such, is the newest link in a long chain of attempts by Western societies to subsume or destroy indigenous cultures.³²

According to this critical view, it is problematic to assume that knowledge about resource use can be encoded verbally and reduced to words or figures.³³ One's knowledge of the environment lies not in the ideas in our heads but in the world that our predecessors reveal to us. Practical knowledge about survival and livelihood skills like herding, trade, and animal husbandry are absorbed in the doing, watching, and living a particular way of life.³⁴ Demonstrated more often than articulated, knowledge of pastoral production and land management is usually conceptualized less as a set of ideas than embodied skills and enacted practices. Following this line, it would not be possible – without possibility of substantial error – to simply transform information relating to resource management out of its cultural context and treat it as an independent technical fact or measure.

Epistemologically speaking, then, is it possible to extract knowledge from the pastoral production setting using spatial technologies? If pastoralists' knowledge is locally specific, is it generalizable for incorporation into standardized development praxis? By attempting to map the Porong region, was I trying to codify or quantify an inventory of stable principles or measures that cannot simply be entered, sorted, and manipulated in a computer? Other questions follow, of course: Are the worldviews represented by Cartesian cartography and Tibetan notions of landscapes commensurable? Can the participatory maps I collected in Tibet be plausibly converted to Cartesian units? Can GIS help us model complex, culturally embedded production strategies, and help us decipher how these interlock with processes of negotiation and accommodation to state structures?

By committing to a GIS-centered approach, not only was I teaching myself how to use a technical piece of software, I was also embracing a mode of thinking. I was, in a sense, adopting the epistemology of a group of programmers and designers who had conceived the software. The logic of digital forms of communication is expressed in programming codes (e.g., ARC/GIS, Java, HTML, etc.), which are bound by the conventions of the languages and the concepts that underlie the expression of content through programming code. In the coding that underlies GIS software, there are events (digital objects such as points, lines, and polygons) and 'gateways' of spatial logic. These logical programming structures, which enable digital storage, analysis, and layering of spatial information, emerged from a decidedly non-Tibetan context built upon a framework that fundamentally assumes, for example, that everything can be reduced to a binary opposition (e.g., yes/no, true/false) to open or close certain gateways for analysis. The point, simply, is that some forms of knowledge (much less experience) cannot be adequately represented in such a framework of binary oppositions. Of course, any conversion of cultural information from one context to another risks loss of information, of subtlety, of depth of meaning. With these critiques in mind, I turn now to a description of the politics and process of participatory mapping in China's Tibet.

The politics and process of participatory mapping

The balance of power between central control and local discretion has vacillated in a pendular manner since the PRC's formation in 1949. It is commonly argued in Chinese studies literature that bottom-up institutional changes generated by the rural sector drove the economic reforms that the state adopted in the post-Mao era, leading to plural rather than hegemonic state-society interactions. The 'peasant-power' school of thought characterizes China's decollectivization as a decentralized, bottom-up process in which peasants asserted themselves over the state, eventually overturning the verdict on collectivization. But do these contentions hold true in the Tibet Autonomous Region, where a restive minority nationality population has consistently posed a perceived threat to the state's narrative of unity and progress?

Tibet remains a region of sensitive ethnic politics in which state incorporation is an ongoing process.³⁵ Though it lies at the margins of the Chinese state, Tibet is strategically important and its economy is significantly subsidized by the state; the pace of construction of the recently completed railroad from Golmud to Lhasa, despite local reservations, is but one example. Even more, in matters having to do with identity politics or religion, the Party-state has demonstrated that it is more than willing to exercise punitive and decisive control in the TAR. Political and economic change in Tibet will, arguably, continue to be more tightly controlled than in other parts of mainland China. Participatory mapping initiatives are thus bound to risk state censure in Tibet: the PRC keeps its cartographic prerogatives close at hand, particularly in regions populated by minority nationalities. Even if participatory mapping could be integrated into standard development praxis in Tibet, for what purposes could it be used? While advocates of these techniques claim that participatory mapping and spatial technologies like GIS can be used to identify so-called 'problems' in development planning, how would that relate to catalyzing participatory solutions, which would entail a different power structure and set of priorities than currently exist in this 'autonomous' region?

Unlike the case of Mayangma in Nicaragua and the Maya in Belize (Bryan and Wainwright, this issue), it is not politically possible in PRC to consider the idea that participatory mapping can empower Tibetans to engage in 'countermapping' initiatives. Maps such as the ones produced by Porong herders are not permitted to be linked to legal claims in China; as such, they will not result in publicized maps or legal precedents recognizing indigenous land rights over/outside of those claims recognized by the Party-state. Situations in which indigenous groups have strengthened their claims to land and other resources using the political platform of political mapping have occurred in the context of increased local activism as a reaction to disenchantment with the state.³⁶ As was manifestly seen in the state's response to protests by Tibetans in March and April 2008, there is no space for such local activism and campaigns for cultural and economic enfranchisement in China.

The current discursive emphasis on 'local participation' in Tibet belies the dominant role of the state in development processes. Indeed, throughout the feudal and communist eras, the state has rarely been excluded or absent from the stream of decisions concerning land use and resource access rights. Further, it is important to note that legal and cartographic strategies have been part and parcel of the process by which the socialist state sought to transform the Tibetan theocratic polity. Since its 'liberation' of Tibet, the Chinese state has imposed hegemonic categories of territory, property, and identity constitutive of a colonial geography.³⁷ In other words, the

optimistic view that counter-mapping can be a tool for resistance used by the marginalized may equally invite unwelcome supervision by making traditional property relations and resource sharing arrangements more explicit and thereby possibly triggering or redoubling the coercive and extractive agencies of the state.

In the participatory mapping exercises I undertook in Porong, the process of generating and controlling information certainly brought to the fore power dynamics that were prompted, in large part, by economics. During fieldwork, I paid for a government-assigned co-researcher from the Tibet Academy of Social Sciences as well as field assistants in Porong. In a real sense, then, I initiated and controlled the production of knowledge: it was my research agenda that prompted these participatory mapping exercises rather than any spontaneous initiative on the part of my collaborators. Still, the realization of these mapping exercises brought out a host of reactions and interactions over which I did not necessarily have (nor desire) any control. Because I was asking about previous political and social orders, I was not surprised that my study of the Porong Boundary Text generated keen interest both on the part of government agents and residents of this area. One Chinese planner in a government department was indignant when he learned that I was making maps of Tibet, digitizing boundaries, and assigning tenure. By creating maps and comparing the differing effects of political organization on land management, I was, necessarily, asking questions about the contested transformations that have occurred in Tibet during the 20th century.

Throughout this case study, then, it became clear that mapping engendered politics and that there was no *a priori real* of mapping that was outside of the political.³⁸ For instance, when I described my research intentions in Tibet to Porong informants who had relocated to Kathmandu, they insisted that I go about my mapping very carefully. They impressed upon me the fact that there were still open claims over pasture boundaries, which remained a source of dispute between Porong and its neighbors. They felt an accurate historical map would be important in making a more effective argument before government entities. Though they had chosen to permanently relocate from Porong, they still earnestly sought to provide a basis for recapturing use of their homeland's traditional pastures, which had been lost to neighboring communities as a result of administrative boundary reshufflings and territorial consolidations. Gathering GPS points and mapping boundaries in this nomadic region, therefore, certainly had political ramifications – even to Porong citizens not currently residing in Porong proper.

Indeed, grassland boundaries and access to resources such as water and salt licks are a real and present concern for Porong's pastoralists. For example, during fieldwork, I photographed and translated a set of documents that recorded the judgments of the Nyelam County government concerning conflicts over grassland resources. These documents recorded the attempts by government representatives to resolve longstanding and sometimes-violent feuds over land rights – an issue of serious concern to a government bent on maintaining a complaisant population. The boundary agreement in question (recorded in 2003 and excerpted below) summarizes the conflict over grasslands claimed by Bertse Village (Porong) and two neighboring villages, Koryak and Ngora (Yarleb Township). Villagers from these townships had been fighting over the rights to use pastures along their shared boundary. In this case, tensions flared and erupted into open conflicts when herding groups began to assert their competing claims on these grasslands. In a previous ruling, the government had decided that grazing should be banned in the contested

pastures. None of the villagers accepted this proposed settlement. Instead, the third and final settlement validated customary usage rights, as indicated below.

Each year, Bertse Village has to pass through Khon-man grassland enroute to their winter and summer pastures. Use the same road as you used before. Koryak and Ngora villagers [Yarleb Township] are granted the rights to still graze 1000 goats and sheep in Porong Township. This has been decided. Also, use the grasslands as before ... Keep following this traditional custom.

In order to maintain good relationships and provide benefits to both sides, the county re-opened the area. In the end, the agreement mediated by the government assigned the boundaries of the contested pastures according to traditional landmarks such as ridges, passes, cairns, and livestock corrals, just as the local administration had done in the 1884 Porong Boundary Text.

From documents like these, we can surmise several important aspects of the current status of land rights – and, therefore, the likely limitations of counter mapping initiatives – in Tibet’s pastoral areas. First, the local state remains closely involved in even the smallest claims and County- and township-level agents are intimately involved in the mediation of grassland conflicts. In the end, rather than arbitrating new boundary lines, through the redrawing or mapping of borders, the local state judiciary relied instead on precedents, which retain elements of deliberate ambiguity or ‘fuzziness’.³⁹ This judgment reveals some resistance among Porong’s herders to government grazing regulations and, arguably, some latent potential for counter mapping initiatives. Yet, given the contested nature of pasture boundaries, participatory mapping efforts initiated to resolve conflicts between local communities in places like Tibet could, in fact, result in increased conflict between and within villages. With Roth (this issue), my findings suggest that as long as boundaries remain fluid and flexible, defined only in individuals’ mental images and historical memory of the landscape, conflicts between competing interests can be ameliorated; once boundaries are mapped, conflicting images of reality cannot be overlooked any longer and must be addressed.⁴⁰ Following this discussion of the contested nature of delineating grassland resources in Porong, an exploration of Tibetan notions of territory and practices of mapmaking is in order.

Tibetan notions of territory and practices of mapmaking

The following example illustrates how pastoralists in Porong bolster community identification with given territories through religious rituals.⁴¹ Reading a text from the village of Labug (T. *La bug*) in Porong Township, I employ textual analysis to underscore Gerald Creed’s suggestion that, ‘Rituals are explicit statements on the local nature of collectivity.’⁴² The text in question narrates a rite performed annually for the autochthonous deity (T. *yl lha*) of Labug.⁴³ In Tibetan-speaking areas, place gods have long functioned to ensure the security of territory and the abundance of its resources.⁴⁴ In conversations with the lineage holders of this text, it emerged that a major concern of this ritual is to ensure the security of Labug Village’s land area. The text invokes and praises this village deity and describes how, over the course of one year, the god circumnavigates the boundaries of the village. Depending on the time of year, the text depicts the lord riding a horse of changing hues, cloaked in clothes of different colors and wielding ritual instruments and weapons of various kinds (swords, arrows, daggers, etc.). In each season, the deity takes up

residence in a new dwelling located in one of the cardinal directions; not coincidentally, these seasonal residences mark the boundaries of the village. Excerpts provide a sense of the text:

In the spring, you [the god] stay on top of *na ring* mountain. Your name is *trak tsen nyem bo thog kar je*. You wear a red cloak and red turban. You are riding a red horse with a white face...

In the summer months, you reside on *mar ti dzong* mountain. Your name is *lha tsen nyem bo tho kar je*. You wear a white cloak and white turban. You are riding a holy, off-white horse...

We have already prepared meat, blood, effigies, barley beer, and tea for offerings. Please come here and partake. Please protect me and my community. (*Labug yul lha* text, lines 11–19)

With this annual circuit, the deity of Labug defines the village's mundane territory and the resources belonging to its villagers. Later in the text, the protector deity is requested to protect the community's resources from outside intruders:

Punish them with pollution. Give them skin diseases. Give them blisters so they die quickly. Use the invisible lasso to tie them. Shoot the arrow into his heart. Kill him. Drink his blood, eat his flesh. Give disease to his family members and animals and his land. Don't delay for months and days. Please do everything I've told you. (*Labug yul lha* text, lines 19–27)

In this way, the supplicant asks the deity to protect the villagers and to wreak violence upon those who threaten the community. Such an entreaty certainly sets a boundary in space. In this light, we see continuity between human and supernatural conflicts over the rightful use of limited resources that are part and parcel of the social and economic fabric that constitute land management in this marginal environment.

Local mountain cults in Tibet are also closely tied to discrete units of territory, exclusive notions of descent, and social boundaries. Through their yearly recitation of this text, Labug's lineage householder priests (*T. snags pa*) ordinate a geography that is at once both sacred and political yet has physical correlates. In Maurice Bloch's words, 'God, in this sense, is the external, unchangeable parameters of one's life, including the topography, which affects people in ways beyond explanation.'⁴⁵ In chanting this text, the names of certain places are given a sacred character – the *nomina* become *numina*.⁴⁶ This clerical activity generates a visionary architecture of landscape and imposes meaning on the natural environment; rituals and other forms of religious representation ensure that naturally embodied architecture is regularly redefined.⁴⁷ In the present case, the native deity is called upon to defend territory and the ritual specialists define, through their chanting, boundaries that are both physical and metaphysical.⁴⁸

The Labug Village text illustrates some salient points about sacred and mundane geography and neatly illustrates the convergence of ritual life and daily praxis. First, the text lists points in the local landscape that delineate the territorial boundaries of Labug village; second, the text serves as a sacral legitimation of those boundaries; third, the text legitimates intra-communal violence – seen here in the rather graphic language used to call down the supernatural punishment that should be inflicted on the 'outsider' – if necessary to protect these boundaries. However, the text sublimates, through ritual, the real-world violence that is immanent and, I argue, necessary to the defense of common property. Likewise, the ritual reinforces group solidarity by conveying a strong sense of 'insiders' and 'outsiders'.⁴⁹ The Labug text creates a geography that is, empirically, not just political or sacred, but both. The text projects a territorially based identity in which

conflict is elemental to the workings of property and to maintaining cohesion within the social and political units that regulate resource use. In the Tibetan context, the intertwining of religion with landscape values renders false the separation between nature and culture, on the one hand, and between the material and symbolic domains of human activity, on the other. Yet the material domain is routinely assumed to be the basis of 'rational' management within the dominant capitalist political-economy paradigm of today's China.⁵⁰ As it is, community identity and resource use boundaries are established, in part, through religious rituals such as these.⁵¹ In Tibetan culture, community is not an abstract concatenation of social categories: it has a definite terrestrial location.⁵²

Boundaries in the context of Tibetan pastoralism are certainly more complex and more expansive than the territorial lines bounded by the realm of a place deity such as the one in the Labug Village text. For instance, different Tibetans may worship the same mountain differently and the boundaries of each group may overlap. Literally and metaphorically, Tibetans cross borders and zones of jurisdiction constantly, with and without animals. As such, notions of territory are not limited to the realms in which a community's local place god lives. It is important to note that the Tibetans with whom I discussed these rituals did not literally believe that their place deities would make a stand with them to defend borders in the event of outsiders' incurring upon their resources. Even as they believe in the existence and integral role of these place deities in their moral universe, they also readily acknowledge that other mechanisms – such as the Porong Boundary Text, vigilant monitoring, and government judicial settlements – are needed to maintain and defend boundaries.

Beyond rituals like the Labug boundary text, how is space and spatiality experienced and produced by nomads? The nomadic sense of land is acute. In their daily herding of animals, the shepherd comes to know his landscape intimately. The location of mountains, passes, ravines, good stands of grass, caves, rivers, springs, swamps, fords, and the qualities of the soil, among other landscape features, are closely observed and recited. This is not an academic interest in tallying toponyms but a practical concern with finding stray livestock, taking the shortest route to campsites, and securing the safest passage for trade ventures. Time and again, I have observed among the Tibetan pastoralists with whom I have worked an acute spatial sense. While in some cultural contexts western cartographic concepts like the cardinal directions are exotic, orienting to north, south, east, and west is a long-established geographical principle in the Tibetan-speaking world. Within this cultural context, then, can we link the Tibetan sense of space to our own cartographic episteme? Proceeding from the foregoing discussion of Tibetan notions of landscape and territory, I now argue that, in Tibetan pastoral areas, despite certain reservations, landscape epistemes can indeed be bridged. In order to make the argument that landscape epistemes can be bridged, it behooves us to understand the ways that Tibetans have cartographically depicted landscapes.

Tibetans have used a variety of mapping systems for navigating their 'world-space' (T. *zhang khams*), which is both psychological and physical. Toni Huber writes:

... most Tibetans have relied heavily on oral and written textual maps or guides to navigate and interpret particular landscapes. These forms are much more intensive and immediate ways of relating to landscapes and places, as they can simultaneously invoke history, myth, cosmology, theories of substance, place, and person, social relations besides just geography and topography.⁵³

Yet maps in the way westerners think of them – as portable graphic representations of the physical landscape – have only a short history in Tibet and do not represent the ‘typical’ use of mapping in a Cartesian sense (i.e., based on mathematical principles).

Still, stylized painted maps have a long tradition in Tibet: most often they were used to represent other possible world-systems or Buddha-fields, cosmograms, and paradisiacal landscapes of alternative realities.⁵⁴ In both secular and religious traditions of painting in Tibet, artists often rendered spatial relations in their depictions of landscapes. For example, paintings of the life stories of saints are often depicted in complex landscapes as a way of situating these holy men’s travels and deeds. In virtually all cases, such artworks are not maps that Tibetans could use to negotiate their own physical countryside. There are a few 19th and 20th century examples of maps (T. *sa bkra*), literally ‘variegated countryside,’ but even these cartographic exercises in representing landscapes retained a unique Tibetan system of projection and spatial reference.⁵⁵ It is interesting to note that visualization exercises are germane to Tibetan culture and consciousness, particularly in relation to religious practices: many meditation exercises in Tibetan Buddhism entail imagining complex three-dimensional buildings and landscapes.⁵⁶ Beyond visualization exercises and landscape renderings, how Tibetans conceive of territory and property has important implications for how they might approach a participatory mapping exercise in which they were asked to draw boundaries related to land use.

During mapping sessions, herders readily drew passable maps, or, given points of reference, pinpointed topographical features when shown satellite images of their home turf. In these interventions, herders in Porong proved to be adept at reading and drawing maps. Furthermore, they had no problem marking unequivocal boundaries between common property units. The present case challenges Thom’s (current volume) assertion of the fallacies inhering the cartographic practice of representing indigenous territories as discrete, bounded units; in comparison with the ethnographic maps of the Coast Salish, Tibetans have represented territories *both* as discretely bounded, continuous regions and as nested, with overlapping tenures and use rights. For instance, Tibetan social practices of affective kin/business partnerships (T. *gnas tshang*) and reciprocal resource sharing arrangements make boundaries permeable even as documents like the Porong Boundary Text recorded fixed borders. Yet, in the case of Tibetan pastoral areas, extant records indicate a long history of continuous efforts to delineate borders. As such, claims that ‘indigenous people do not have boundaries’ overlook the very real boundaries that crisscross nomad territories throughout Central Asia. Unlike the Coast Salish in Canada, in the Tibetan pastoral context, property-owning groups are composed of household-based producers linked by definite territories, rather than ‘borderless kin networks.’ In a sense there may be no significant divergence between the Salish and Tibetan cultural uses of maps as a measuring or drawing device – what is being mapped may simply be social in one context and physical in the other.

As we have seen in the discussion of the Labug text and the Porong survey of 1884, Tibetans’ territories are relatively bounded and the vertices of historical boundaries were recorded in detail. But can these textual and cultural markers be located and assimilated into computer-driven cartography based on western cartographies? In order to integrate the diverse sources of information I had collected about land use in Porong, I needed, as an intermediate step, to correlate a satellite base map with hand drawn maps elicited while I was in the field. A first option I explored (and then abandoned, for reasons cited below) to integrate these hand-drawn maps with satellite images was to scan them and then transform them into geographically accurate

digital versions using GIS software.⁵⁷ GIS software can readily integrate two maps produced in the western cartographic tradition: given two mutually intelligible projections of earth's surface, geo-referencing can align the coordinates, topography, and locations quite easily. In effect, the computer overlays two landscapes and links the two layers of information to create one GIS layer. This process is sometimes called 'rubber sheeting' because it stretches and shrinks the scanned map image like a thin sheet of rubber being pulled to fit a particular form. Naturally, it would have been a great convenience to simply convert the hand-drawn illustrations I elicited in Porong by entering known coordinates and allowing the computer to render accurate maps. But in my case, the hand-drawn maps I had assembled could not be automatically transformed by mathematical algorithms and cartographic logic, since one must transform like with like. Ultimately, geo-referencing would have warped the maps illustrated by herders and thereby limited the data I had collected.⁵⁸

Drawing maps is not simply a matter of producing a technical drawing or rendering pre-selected elements in the landscape. The kinds of maps local informants produced were mental representations of their world and its spatial properties. The maps drawn by herders in Porong were distinctive and not accurate in the same way that cartographic maps are, with their constant scale and transferability between projections. The scale, distances, angles, and direction of the Tibetans' hand-drawn maps were not precise enough to create a 'meaningful' map in terms of real-world coordinates. The fact that locals' renderings of Porong's landscape were not drawn according to any set scale or projection systems made it impossible to migrate them easily into digital maps rendered by using standard cartographic projections (e.g., Universal Transverse Mercator system). Instead, I abandoned the idea that I could automate this process of translation between Porong herders' rendering of space and a digital map made according to western cartographic traditions. My own hand would have to intercede, literally.

Many of us like to pore over maps, trace the route of a road, or notice the patterns of rivers. Few of us, though, would want to recreate the whole map, contour-line-by-contour-line, river by river. Yet this is what I had to do in order to translate the hand-drawn, Tibetan maps into a language comprehensible to a computer so that they could enter the GIS environment and become part of the model and its analysis. To do so, I used the computer's mouse to trace points, lines, and polygons from the hand-drawn maps onto a digital base map created from a satellite image. This was, by turns, painstaking and meditative. It was also time consuming. In retrospect, this process was likely inevitable since the hand-drawn maps varied in scale, point of origin, and degree of conceptual information. However, what is obvious in hindsight with the design of research is not necessarily intuitive, but rather experiential. In terms of a working principle, then, I made the strategic and, I think, ethnographically responsible, decision to represent locally generated data in its own reference system, rather than trying to warp them into a fit – literally and figuratively.⁵⁹ The end result of this digitizing process was a considerably accurate conceptual representation of pasture boundaries over time.

In order to integrate these data, I triangulated field observations, GPS points, GPS points, and remote sensing images to deduce, judge, and, finally, draw boundary lines to create polygons that represented land use areas. By digitizing pasture boundaries, I became an explicit subject in this work, injecting my own landscape interpretations into the research. Though the mapping work was toilsome at this stage, this process of converting features on a paper map into data points on the computer had advantages for analysis. Doing so enabled me to consciously link

field data about land tenure, season, and period of use as I was digitizing features. This built-in attribute data (e.g., altitude, slope, aspect, etc.) thus allowed me to link characteristics like season of use to pasture areas. Digitizing is far more time-consuming than geo-referencing, but it adds tremendously to the amount of data available for use later. Having added more than 500 GPS points to the satellite image of Porong, it became apparent that I had plenty of markers to begin to discern patterns of land use over time. I also felt confident that I could draw accurate boundaries across this landscape. Once digitizing was completed, I could begin to analyze and model spatial patterns of tenure regimes and land use.

Despite deficiencies in both participatory mapping and GIS analysis, there were a number of compelling reasons to pursue an analysis of land use and property regimes within a computerized environment. GIS makes it possible to interpolate the relationships *between* points on the maps. Once these diverse data elements are merged in a GIS environment, they can also be disaggregated or combined to test for correlativity. In this way, GIS can be used as a tool both for synthesis (combining separate elements to form a coherent whole) and analysis (parsing out specific relationships between data). One of the most important assets of GIS as a data processing environment is that diverse attribute types (e.g., human and livestock census data, infrastructure elements, landscape features) collected at different scales (e.g., remote sensing from space, hand-drawn maps, and observations on the ground) can be compared because they are linked to points or areas that have real-world locations. United in a single frame of reference at a common geographical scale, the data can be stacked in layers to combine in novel, relational ways. These layers can then be displayed in maps and queried using spatial statistics.

Finally, we may ask, 'Would it be possible to do this research without GIS?' My answer would be: No. Like other computer applications, GIS makes it possible to process and query huge amounts of data. For instance, as an individual researcher, GIS allowed me to perform cartographic functions that not long ago would have involved employing a group of highly trained personnel working for many months with expensive equipment. GIS also enabled me to create base maps of the study site, which are not generally available: in the PRC, maps are still held closely as state secrets and researchers have little, if any, access even to simple topographic maps. Moreover, the scale of resolution on maps that are available in China is too coarse for meaningful analysis. Instead, I was able to produce the layers I needed using data available free via the Internet and to customize it for the analysis described here.

As seen in Figure 4, Porong's pasture boundaries in 1884 and 2004 formed rough-edged and irregular units welded together by historical circumstance, cultural synergies, and the politics of power, as well as by the uses and constraints of geography and ecology. The maps revealed significant structural continuities in the landscape architecture of pastoralism including the location of boundaries, livestock corrals, toponyms, and other human elements – despite the tumultuous policymaking and planning interventions of the past 50 years in China's Tibet.⁶⁰ These results validated the potential in participatory mapping to represent common property boundaries and resource use over time based on the integration of information from diverse sources such as field observations, remote sensing, textual analysis, and ethnographic interviews. This research lays out an approach for grappling with the challenge of reconciling indigenous experiences of dwelling in place (which includes landscape deities, sacred realms, and a plethora of toponyms) and territorial ideas that belong to the political milieu of land claims.



1884 (n=20)



2004 (n=12)

FIGURE 4 Porong's Management Units in 1884 and 2004.

Conclusions

Social critics argue that participatory mapping is an exercise of power, and that indigenous groups are disadvantaged in this equation, regardless of the intentions of development practitioners or researchers who introduce mapping into data collection.⁶¹ This case study has highlighted the central role that various government bodies have played in the creation and maintenance of common property boundaries and land use regimes in Tibetan areas. Given Tibet's current status within the Chinese state, it has been argued that participatory mapping applied for political purposes can only answer a normative set of questions that fits indigenous spaces into the configuration of the dominant body politic. This paradox cannot be resolved. However, in research applications, there is arguably more latitude within the techniques of participatory mapping to *render* spatial relations flexibly and holistically than in the politicized process of boundary *making*, which is highly circumscribed in the context of China's Tibet.

The research effort described here demonstrates that participatory mapping certainly entails power dynamics between individuals and also among bureaucracies and small-scale resource user groups. The social and political filters put in place – consciously or not – by technicians from the government or NGOs who try to facilitate participatory mapping inevitably lead to unintended consequences and diverted goals. Researchers, too, are part of a political process, particularly when they focus on spatial topics with political implications like land use and property boundaries. While we do not need to become politicians or diplomats, we must be sensitive to political and human realities, and to recognize how disciplinary epistemologies, divergent modes of inquiry, and different rules of evidence can facilitate or hinder the deployment of constructive policy and action.

Tools like GIS can provide a relatively low-cost means to represent land use and resource boundaries; moreover, participatory mapping techniques have the added advantages of being both low-tech and transportable. At the very least, as a technique to engage collaborators, participatory mapping does not require literacy: it demands, instead, the ability to relate to information in geographic terms, which, as we have seen, are a plausible common ground in the Tibetan nomad context. In this sense, participatory mapping may be considered a more democratic way to elicit local knowledge and facilitate discussion about land use and boundaries within communities. Moreover, in my experience, when you put an inexpensive and rugged GPS unit in the hand of a curious self-didact like my guides in the field, the synergistic aspects of participatory mapping are readily observed. In the field, herders led me through myriad historical puzzles, and I was more than happy to follow my companions' idiosyncratic leads to unanticipated insights and serendipitous data disclosures.

Bringing together layers with GIS lends itself to complex environmental problems such as discerning patterns of land use over time. Before the advent of these tools, researchers typically simplified spatial relationships in their analyses and assumed that land use across regions had been homogeneous. They also assumed that different sites on a map were independent of each other. By contrast, GIS makes it possible to interpolate the relationships *between* points on the maps. Once these diverse data elements are merged in a GIS environment, they can also be disaggregated or combined to test for correlativity. The goal is to use GIS as a tool both for synthesis (combining separate elements to form a coherent whole) and analysis (parsing out specific relationships between data). One of the most important assets of GIS as a data processing environment is that

diverse attribute types (e.g., human and livestock census data, infrastructure elements, landscape features) collected at different scales (e.g., remote sensing from space, hand-drawn maps, and observations on the ground) can be compared because they are linked to points or areas that have real-world locations. United in a single frame of reference at a common geographical scale, the data can be stacked in layers to combine in novel, relational ways. These layers can then be displayed in maps and queried using spatial statistics.

In this project, participatory map making initiated many fruitful conversations about local landscapes. The act of drawing maps became a visual form of conversation that precipitated many ‘floodgate’ moments of information capture. In these ways, many choices that were made during this field research were initiated and controlled by my local collaborators. Aware of the critiques of participatory mapping, I contend that there *is* a leveling and democratizing effect that occurs when people sit down together to draw maps. Information is thus made visible and can be checked and corrected on the spot, whereas notes made by an interviewer cannot. In sum, even as participatory mapping will continue to have limited political applications in contexts like Tibet, the process of producing such maps can facilitate dialogue and, to some extent, limit subjectivity in the interpretation of landscapes. Informed by the political and epistemological critiques outlined here, this article concludes that researchers using tools like participatory mapping and spatial technologies like GIS can – and must – build on a foundation of cultural literacy as well as a historicized understanding of a given region’s political economy to realize their considerable potential for integrating diverse information and generating insights into the dynamic processes of land use and boundary making.

Bibliographic note

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Notes

- ¹ Nyelam County Animal Husbandry Bureau (Nyelam AHB), ‘Application for the construction of livestock shelters in Porong Xiang’ (Nyelam County, Tibet Autonomous Region, PRC, 28 November 2003).
- ² Tibetan terms are transliterated using the Wylie system, which renders Tibetan spelling using Roman characters. See T. Wylie, ‘A standard system of Tibetan transcription’, *Harvard journal of Asiatic studies* 2 (1959), pp. 261–7. Tibetan terms are identified between brackets and signified by ‘T.’
- ³ The Porong nomad estate belonged to the feudal lord (T. *rje dpon*) of this area. The Porong estate was situated within the district of Shekar (T. *Shel dkar*), which was administered by the province of Tsang, the seat of which was Shigatse (T. *Gzhis ka rtse*). Until China’s assimilation of Tibet, Porong was a semi-autonomous political entity sanctioned by the central government of Lhasa. Porong was associated with

a body of Buddhist texts and rituals derived especially from the Bodongpa school. See C. Ramble, 'The victory song of Porong', in K. Buffetrille and H. Diemberger, eds, *Territory and identity in Tibet and the Himalayas. Proceedings of the ninth seminar of the International Association of Tibetan Studies* (Leiden, Brill, 2002), pp. 59–84. The family of the Porong Jewön ruled the area for centuries and controlled a large number of nomad subjects who were bound hereditarily to this estate. See H. Diemberger, 'The people of Porong and concepts of territory', in Buffetrille and Diemberger, *Territory*, pp. 33–55. The Porong government was not a year-round, permanently stationed bureaucracy. Rather, the seasonal seat of this principality was located at a place called Drachen (T. *Sbra chen*), which means 'big tent'. The Jewön did, in fact, have a very large tent, which was the center of an annual summer festival during which the community's financial and political affairs were negotiated and settled.

- 4 Government records written prior to the 1950s are rare for three reasons: (1) village council and monastery texts were burned and destroyed during the Cultural Revolution; (2) the number of religious texts that were secreted out of Tibet is far greater than other kinds of writing, like government archives; and (3) pre-Communist documents pertaining to governance in Tibet have been systematically seized by the current government (and are presumably kept in archives in Lhasa and Beijing).
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- 8 A few examples of participatory mapping efforts in China illustrate the variety of uses to which these techniques can be put. For instance, participatory mapping was deployed by the World Bank to incorporate public input into the design of transportation in the city of Liaoning, with a particular emphasis on gender issues like safety and lighting. See C. Bennett, *Lighting up her way home: Using public participation techniques to improve urban transport project design in China* (Washington, World Bank, 2007). Likewise, the Fujian Province Forest Department used participatory mapping to incorporate stakeholder views on a management scheme for resources in Nan'an County. See Y. Tan and T. Chi, 'Web-based GIS services in participatory forest management in China', *Proceedings of the 2004 Geoscience and Remote Sensing Symposium, IGARSS & IEEE International* 7(20–24) (2004), pp. 4795–8. Participatory mapping also helped locate the places where pickpockets concentrated their activities in the southern city of Hangzhou: maps were posted on an internet site, which allowed users to view, navigate, and add information about different 'hotspots' in the city. See YouMeiTi, 'Participatory mapping of pickpockets in Hangzhou, China', URL http://www.youmeiti.com/information/participatory_mapping_of_pickp. Accessed 15 March 2006. This latter example is pertinent to the discussion of the ways in which these techniques can be used to increase state surveillance even as they allow the assertion of individual and group agency.
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- ¹⁶ See B. King, 'Towards a participatory global imaging system: evaluating case studies of participatory rural appraisal and GIS in the developing world', *Cartography and geographic information science* 29(1) (2002), pp. 43–52.
- ¹⁷ See P. Poole, 'Geomatics: who needs it?' *Cultural survival quarterly* 18(4) (1995), pp. 1–77.
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- ³⁷ For example, the spellings and pronunciations of Tibetan place names have been rendered in Mandarin and are, in many cases, changed beyond recognition from the original appellations. For a discussion of statemaking and cartography, see Edney, *Mapping*; M. Escobar, 'Exploration, cartography and the modernization of state power', *International social science journal* 49 (1997), pp. 55–75; Starling, 'Rethinking'.
- ³⁸ See S. Aitken and S. Michel, 'Who contrives the "real" in GIS? Geographic information, planning, and critical theory', *Cartography and geographic information systems* 22(1) (1995), pp. 17–29.
- ³⁹ See P. Ho, 'The clash over state and collective property: the making of the rangeland law', *The China quarterly* 161 (2000), pp. 227–50; E. Yeh, 'Property relations in Tibet since decollectivization and the question of "fuzziness"', *Conservation and society* 2(1) (2004), pp. 108–31; J. Sturgeon, T. Sikor, 'Introduction: postsocialist property in Asia and Europe – variations on "fuzziness"', *Conservation and society* 2(1) (2004), pp. 1–17.
- ⁴⁰ See Fox *et al.*, 'Mapping'.
- ⁴¹ See S. Atran, *In gods we trust: the evolutionary landscape of religion* (New York, Oxford University Press, 2002).
- ⁴² G. Creed, 'Constituted through conflict: images of community (and nation) in Bulgarian rural ritual', *American anthropologist* 106(1) (2004), p. 68.
- ⁴³ Samten Karmay describes Tibetan *yul lha* as local and regional territorial gods and goddesses whose worship predates the intensive introduction of Buddhism into Tibet. See S. Karmay, 'A comparative study of the *yul lha* cult in two areas and its cosmological aspects', in Samten Karmay, Y. Nagano, eds, *New horizons in Bon studies* (Osaka, National Museum of Ethnology, 2000), pp. 383–416. Territorial gods

- have a limited relevance outside their territory. Instead, participation in mountain divinity rituals implies integration into the community, thereby inheriting social and political obligations to maintain solidarity in the face of external aggression. See S. Karmay, 'The Tibetan cult of mountain deities and its political significance', in A.-M. Blondeau and E. Steinkellner, eds, *Reflections on the mountain: essays on the history and social meaning of the mountain cult in Tibet and the Himalaya* (Vienna, Verlag der Österreichischen Akademie der Wissenschaften, 1996), pp. 59–75; C. Ramble, 'Tibetan pride of place: or, why Nepal's Bhotiyas are not an ethnic group', in D. Gellner and J. Pfaff-Czarnecka, eds, *Nationalism and ethnicity in a Hindu kingdom* (Amsterdam, Harwood Academic, 1997), pp. 379–414. In contrast to the sacred mountains (T. *gnas ri*) that are the object of systematic religious worship (like circumambulation and meditation) in Tibetan areas, *yul lha* are more commonly the object of secular worship that seeks success in mundane activities. As such, the local mountain cult ritual tends to be focused on present life and this world. The annual purification ceremonies performed for *yul lha* are aimed at the reconstitution of the relationship between divinity, individual, and community and are closely associated with annual domestic production cycles, seasonal access to resources, human movements, etc. Such rituals are also recorded in other Central Asian pastoral society such as Mongolia. See C. Humphrey, 'Chiefly and shamanist landscapes in Mongolia', in E. Hirsh and M. O'Hanlon, eds, *The anthropology of landscape: perspectives on space and place* (Oxford, Oxford University Press, 1995), pp. 135–62.
- 44 See C. Ramble, 'Patterns of places', in Blondeau and Steinkellner, *Reflections*, pp. 141–52; C. Ramble, 'Gaining ground: representations of territory in Bon and Tibetan popular tradition', *Tibet journal* 20(1) (1995), pp. 83–124.
- 45 M. Bloch, 'People into places: Zafimaniry concepts of clarity', in Hirsh and O'Hanlon, *The anthropology of landscape*, p. 67.
- 46 See E. Evans-Pritchard, *The Nuer: a description of the modes of livelihood and political institutions of a Nilotic people* (Oxford, Oxford University Press, 1940).
- 47 See K. Dowman, *The power places of central Tibet: the pilgrim's guide* (London, Routledge and Kegan Paul, 1988); L. Epstein and P. Wenbin, 'Ganja and Murdo: the social construction of space at two Tibetan pilgrimage sites in eastern Tibet', *Tibet journal* 19(2) (1994), pp. 21–45; T. Huber, *The cult of pure crystal mountain. Popular pilgrimage and visionary landscape in southeast Tibet* (Oxford, Oxford University Press, 1999).
- 48 See M. Mills, 'The religion of locality: local area gods and the characterisation of Tibetan Buddhism', in Thierry Dodin, Heinz Räther, eds, *Recent research on Ladakh* 7 (Ulm, Universität Ulm, 1997), pp. 309–28; Mona Schrempf, 'Taming the earth, controlling the cosmos: transformation of space in Tibetan Buddhist and Bon-po ritual dance', in Huber, *Sacred*, pp. 198–224.
- 49 For example, the colloquial term for 'Buddhist' (T. *nang pa*) literally translates as 'insider.'
- 50 See D. Williams, *Beyond great walls: environment, identity, and development on the Chinese grasslands of Inner Mongolia* (Stanford, CA, Stanford University Press, 2002).
- 51 Territorial cults are of a very ancient origin in Tibet and were an important part of the imperial religious cults in pre-Buddhist and early Buddhist Tibet. See S. Karmay, 'Mountain cults and national identity in Tibet', in R. Barnett, S. Akiner, eds, *Resistance and reform in Tibet* (London, Hurst & Co., 1994), pp. 112–20.
- 52 See C. Ramble, *The navel of the demoness: Tibetan Buddhism and civil religion in highland Nepal* (New York, Oxford University Press, 2007).
- 53 Huber, *Cult of Pure Crystal Mountain*, p. 60.
- 54 See T. Wylie, 'The Tibetan tradition of geography', *Bulletin of Tibetology* 2(1) (1965), pp. 17–25; B. Aziz, 'Tibetan manuscript maps of Dingri valley', *Canadian cartographer* 20(1) (1975), pp. 28–38; T. Huber, 'A Tibetan map of *lho kha* in the south-eastern Himalayan borderlands of Tibet', *Imago mundi* 44 (1992), pp. 1–15; T. Huber, 'When what you see is not what you get: remarks on the traditional Tibetan presentation of sacred geography', in G. Smale, H. Gregor, E. Stutchry, eds, *Tantra and popular religion in*

Tibet (New Delhi, Aditya Prakashan, 1994), pp. 39–52; T. Huber, 'A guide to the *la-phyi* mandala: history, landscape and ritual in south-western Tibet', in A. Macdonald, ed., *Mandala and landscapes* (New Delhi: D.K. Printworld, 1997), pp. 233–86; D. Martin, 'Tibet at the center: a historical study of some Tibetan geographical conceptions based on two types of country-lists found in Bon histories', in Per Kvarne, ed., *Tibetan studies: proceedings of the 6th seminar of the International Association for Tibetan Studies (Fagernes 1992)* (Oslo, Institute for Comparative Research in Human Culture, 1994), pp. 517–32; C. Ramble, 'The politics of sacred space in Bon and Tibetan popular tradition', in T. Huber, ed., *Sacred spaces and powerful places in Tibetan culture: a collection of essays* (Dharamsala, India, Library of Tibetan Works and Archives, 1999).

⁵⁵ See Huber, *Cult of Pure Crystal Mountain*.

⁵⁶ See G. Tucci, *The theory and practice of the mandala* (New York, Samuel Weiser, 1970).

⁵⁷ GIS data is commonly obtained in this way. However, scanned maps do not necessarily contain information that links the area represented on the map with actual points on the Earth's surface. In order to use a scanned map in conjunction with other spatial data, it is necessary to align – or 'geo-reference,' in GIS parlance – that map to a known coordinate system. When geo-referencing a map, one defines how the scanned map is situated in real world coordinates. Geo-referencing requires selecting control points on the scanned map that aligns with actual geographical locations, either by assigning geographical coordinates to these control points, or by linking each point to its equivalent on a projected map (in this case, the base map I had derived from satellite images). Once the control points are in place, a GIS tool applies mathematical algorithms to warp the scanned map to fit the base map as nearly as possible.

⁵⁸ One interesting aspect of drawing a map is trying to correctly render scale – or the proportion of map elements proportionately sized in relation to one another. Scale may initially seem to be more universal. When we enter a space – whether a room or a landscape – most of us try to reckon the scale of it, compare it to our previous experiences, and relate the size of objects with ones we consider familiar. For example, we often ask how far things are or how much time it will take to travel to a specific place. But rendering the scale and relational features of a landscape on a piece of paper is no mean feat: it has been a perpetual challenge for painters who have tried and retired to depict spatial relations on two-dimensional canvases.

⁵⁹ Mapping the location of boundaries entailed several preliminary operations: paleographic transcription; orthographic and terminological interpretation; and toponym reconstruction. See F. Boas, *Geographical names of the Kwakiutl Indians* (New York, Columbia University Press, 1934); Basso, *Wisdom*. Then, through the process of digitizing, I created polygons representing pasture units. In this way, I recreated the outlines of past and present land administration. Some boundaries followed line of sight, others followed the various bends of rivers or the contours of ridges in the landscape. Digitizing in this way required locating – with acceptable precision – the features named in the boundary text and visually connecting them with the same features on the satellite image. While tracing lines on the computer, I toggled constantly between the Porong Boundary Text, the hand-drawn maps, satellite images, topographic maps, photo images, and, the Porong gazetteer that I had compiled.

⁶⁰ For an analysis of how boundary adjustments impacted access to pasture resources in Porong between 1884 and 2004, see K. Bauer, 'Common property and power: insights from a spatial analysis of historical and contemporary pasture boundaries among pastoralists in central Tibet', *Journal of political ecology* 13 (2006), pp. 24–47.

⁶¹ G. Rambaldi, D. Weiner, *Third international conference on public participation GIS: track on international perspectives* (Madison, University of Wisconsin, 2004).