



Marginality, Climate and Resources in Pastoral Rangelands: Oman and Mongolia

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On the Ground

- Oman and Mongolia feature different political systems and physical landscapes yet represent similar challenges encountered across global pastoral societies.
- Extractive industries disrupt pastoral drylands through reorienting government policy, environmental change, altered water supply, and infrastructure factors that challenge livelihood viability.
- The impact of climate variability on rangeland livelihoods is now exacerbated by policy and development decisions.
- Herder livelihoods at different income and development levels are dependent on government policy and risk mitigation strategies to maintain customary practices.
- The combination of multiple external forces stress rural viability and contribute to out-migration from herding systems.

Keywords: pastoralism, rangelands, climate, resources, Oman, Mongolia.

Rangelands 38(3):145–151

doi: 10.1016/j.rala.2016.03.001

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For millennia, nomadic pastoralism has been a sustainable livelihood because of herders' ability to manage risk in marginal landscapes.¹ Today's mobile pastoralism is being seriously impacted by new environmental and social forces, exemplified by climate change, government policy, and resource extraction, which restrict movement and customary livelihoods.² As pastoral risk magnifies, understanding of how climate trends, evolving herding practices, and national planning strategies affect the viability of pastoral systems across the globe becomes vital.^{3,4} Two nations where pastoralism is prominent, Oman and Mongolia, reflect the modern challenges to mobile

livelihoods.⁵ In both countries, governments encourage settlement or provide limited support for customary lifestyles whilst favoring extractive industries for tax revenue. As climate, policy, and extraction affect pasture quality, water resources, and the rural landscape, these forces contribute to loss of livelihoods and herder displacement. Yet the knowledge, adaptability, and resilience of pastoral livelihoods suggest their enduring value in an era of environmental and socio-economic change.^{6,7} Our article explores these contemporary dynamics in the two traditional pastoral societies.

Pastoralism is prevalent in dryland regions where domesticated animals efficiently convert limited ecological productivity into sustenance for people. Climate variability significantly impacts livestock raising and human well-being in rangelands where mobile herding provides effective management of environmental risk.⁴ Furthermore, shifts in governance and the reorganization of pastoralism due to socio-economic pressures are often confronted with mining and large-scale resource extraction that competes for, and reconfigures, the land that pastoralists inhabit.⁸ This dynamic has the effect of changing land use, re-directing government policy, and altering herder access to pasture and water while potentially degrading the landscape and removing pastoral peoples' customary tenure rights.⁷ The immediacy of climate change and development policy is evidenced by how the resulting metamorphosis disorders pastoral communities' herding practices and traditions. As the ability to make a living from animals is affected by drought, extreme cold, storms, degradation, and reduced vegetation, access for livestock herding may become unviable.⁹ The result is out-migration first from traditional homelands, then to towns, and finally abandonment of herding as a livelihood to search for jobs in cities.

Pastoral environments have long been home to subsistence herders in marginal arid and semi-arid landscapes. Today 200 million people, predominantly in Africa, the Middle East, and Asia, use herding to create lives based on extensive land use and mobility.¹⁰ Great changes in environmental and socio-economic conditions are prevalent across pastoral societies as states seek to balance divergent risks, interests,

and objectives. Herders' struggles with climate change, environmental variability, and livelihood transitions are exemplified in diverse nations such as Iran, China, and Kyrgyzstan, through Kenya, South Sudan, Mali, and Senegal to Peru and Bolivia.⁴ Warming trends, extreme weather events, and greater volatility typify changing climates across pastoral regions. Balancing the fundamentals of herding with changes in climate and development is a great social and political challenge. Further, pastoralism is commonly perceived as a marginal, backward livelihood, leading governments to stress settlement and integration through policy, services, and control measures.¹¹ As pastoralism, climate, and development become part of an unsettled present, we examine the trajectories, challenges, and possibilities in Oman and Mongolia, two societies where pastoralism was once the dominant livelihood. The countries represent two divergent transition arcs. Oman is a sultanate where nation-building and oil-fueled development has transformed Omani society over the last four decades. During this time pastoralism has remained a subsistence economy while its significance has declined. Since 1991, Mongolia has embraced a market economy and parliamentary democracy. Today a vibrant civil society coexists with high (36%) poverty levels. In the vast steppe environment more than 30% of the population remains dependent on herding (Fig. 1).

Climate and Pastoralism

Changing climates have a significant influence on pastoralists who pursue environmentally dependent livelihoods.¹² In harsh hot and cold landscapes the ability to obtain adequate fodder to fatten animals is the endemic challenge. Shifts in weather patterns, seasonality of precipitation, moisture for plant forage growth, and recharge of

Table 1. Selected social indicators and data related to Oman and Mongolia¹⁷

Indicator	Oman	Mongolia
Herders, %	7	>30
Population (million)	3	2.9
GDP (PPP) p/c	23,133	3,673
Government	Autocratic	Democratic
Arable land, ha p/c	0.04	0.16
Malnutrition rate	8.6	5.8
Food, % income	30	38.6
Food import, % total	70	30
Mean precipitation, mm	139	204
Mean temperature, -C	28	0
Animal type	Goat, camel, sheep	Sheep, goat, horse, camel, cattle

p/c indicates per capita. Sources: CIA Factbook 2013, related sources.

sub-surface water sources are vital to herding viability.³ As pastoral sustainability is jeopardized, food provision, jobs, social stability, and even state security become concerns as reflected in recent protests in Oman¹³ and Mongolia¹⁴ (Table 1). In Oman a 0.6°C annual temperature increase and a

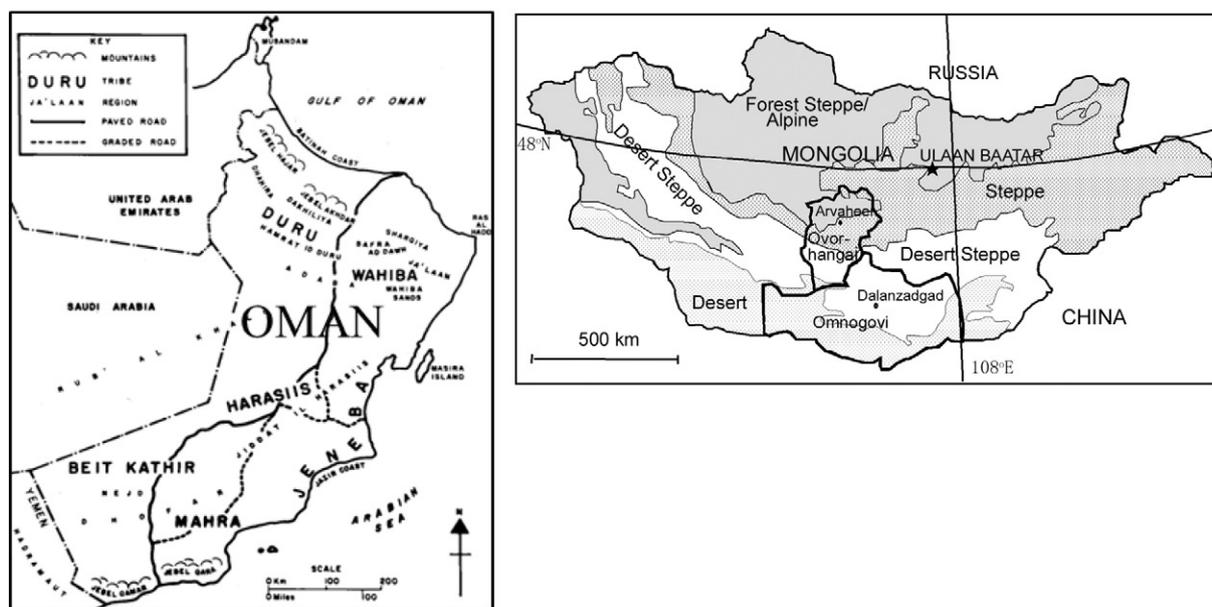


Figure 1. Oman (left) with main pastoral tribes (312,000 km², avg. temperature 28°C). Mongolia (above) main mining areas (1.56 million km², avg. temperature 0°C).



Figure 2. Omani herder; government-issued tent home.

21% decrease in precipitation from 1990–2008 has intensified water scarcity and increased evapotranspiration in the pastoral interior. This has reduced ecological productivity essential to the animals upon which herders depend; concurrently the country has experienced catastrophic storm episodes (\$5 billion in losses in 2007, 2010). Restriction on movement and water access as a result of extractive industry infrastructure limits herder ability to maximize ecological knowledge and requires the purchase of fodder and water delivery for livestock survival. Mongolia has experienced a 2°C warming trend since 1940, recurrent drought, changes in precipitation, seasonality, and reduced water sources.¹⁵ Severe temperature (to -50°C) contributed to 2010's extreme winter event (*dzud*), the nation's 'worst-ever' disaster,¹⁵ that killed 25% of the country's livestock as 3% of herders lost their livelihood.^{9,16} The resultant rural poverty and out-migration to cities manifests the detrimental impact of a changing climate.

Today pastoralists in Oman make up between 7–10% of the national population.¹⁸ In the north in the valleys of the Hajar mountain range and the Jebal Akhdar, and in the interior foothills, are *shawawi* goat breeders, many of whom have been encouraged by the authorities to farm small gardens. In the south are the Dhofari transhumant herders who specialize in cattle and, to a lesser extent, camel and goat. In the rest of the central region of Oman—the al-Wusta governorate—are goat and camel breeding pastoralists including the Harasiis tribe living on the Jiddat il-Harasiis (Fig. 2).¹⁸ Livelihood strategies amongst Central Omani pastoralists have adapted to the rapid political and economic changes of the past half-century. The establishment and building of the nation-state centralized power and fostered greater security among the tribes. For the Harasiis and other tribes of the interior, oil operations introduced waged employment and motor vehicles, both of which have acted as key catalysts for change in these pastoral societies. Waged employment amongst the Harasiis has also gone from close to zero prior to 1954 to at least 1 person per household in 1982,

1.6 persons in 2001, and 2 in 2010.¹⁹ On average, 57% of household income is derived from paid employment and the remainder from livestock sales. Thus, pastoralism in this region has remained subsistence; it has not moved towards a market economy.

Key to understanding the pastoral migratory system of Omani herders is knowledge of the temporal and spatial variability in rainfall, which can be dramatic in hyper-arid deserts such as central Oman.²⁰ Years go by with rainfall in one region and not in a neighboring one. With little and highly variable rainfall, large areas are needed to support a relatively small herding population. It is inevitable then that most areas will be seldom used because of local drought. As in Mongolia, what might seem as an un-used site by a non-pastoralist is nevertheless an important part of the overall pastoral economy and land tenure systems. The oil extractive industry in Oman operates largely in these same hyper-arid deserts resulting in serious challenges to the resilience of pastoralism and creating substantial vulnerability among these social groups.¹⁷

In Mongolia herders' local knowledge, mobility, changes in livestock composition, and seasonal grazing convert limited ecological resources into a productive living.¹² Today 30–40% of the population depends on herding goods—livestock, cashmere, dairy, and related products—for their livelihoods (Fig. 3). In Mongolia migration greater than 100 km is possible; more common are 3–5 moves per year within a 20–50 km radius, whilst poor households may move infrequently.⁶ Once a subsistence occupation, herding is now an economic endeavor where decision-making considers costs, potential income, the price of cashmere and livestock, micro-loans, and children's education.²¹ Perceptions are shaped by the harsh climate (+40°C to -40°C average range), the opportunity that mining offers (markets, jobs), modernization (phones, vehicles, education), sedentarization, and future aspirations.⁶ Policies to encourage copper, coal, and gold mining often disadvantage pastoralists, result in



Figure 3. Mongolian herder; ger (tent) home.

reduced pasture access, quality, rights, and diminishes empowerment.²² The ongoing struggle to craft equitable mining laws, benefit the population, and preserve both social custom and new resource streams has proved elusive.⁸

While in Mongolia pastoral production, rather than wage labor, remains the major source of income in rural communities, in Oman income-generating opportunities remain a key priority to both the migratory and settled populations. The economic focus of the vast majority of families in the region is their livestock. The greater part of cash income now comes from paid employment rather than animal sales but the vast majority of that income is channeled in support of their livestock.¹⁹ In Mongolia conflict with mining focuses on pastoral concerns; in Oman the long legacy of industry employment discrimination against herders has bred cynicism about extractive operations and their expressions of future intentions.¹⁹ⁱ These factors increase vulnerability to climate dynamics and the resulting social change.

For example, with severe and frequent local and regional droughts, pastoralists require access over wide areas to sustain a herd or to minimize purchased hand-feed. Several pastoral watering sites and wadis (ephemeral watercourse) are important links in a fragile customary land tenure system and also the locations of oil extractive industry, becoming a source of conflict. To describe these areas as ‘terra nullius’, as is often the case by the resource extractors, is to miss out on this larger picture of pastoral realities in the deserts of the world.

Indeed, in both pastoral regions climate exhibits high variability that makes prediction and management difficult, pasture resources insecure, and hazard events severe. The environmental marginality of deserts exposes herding liveli-

hoods to weather disruptions—previously mitigated by customary practices—that may now be constrained by climate, restriction, or various forms of control (e.g., government, exclusion zones, infrastructure) in rural spaces. The Intergovernmental Panel on Climate Change²³ projects increasing temperatures, change in precipitation, and impacts on livestock in Oman whilst in Mongolia increased aridity, permafrost melt, and health impacts of heat and drought are forecast. In both countries, as across pastoral societies, climate change increases uncertainty for livelihoods based on ecological and weather parameters.

Resource Extraction

Resource extraction has taken different paths in these two countries. Oil is the engine of Oman that has supported a rapid development, infrastructure, and expansion of government bureaucracy and influence around the country.¹⁹ In the 1970s Oman first developed the oil resources that have transformed the country from an isolated sultanate into a medium-income nation (Table 2). The aging Sultan faces little domestic oversight, in part because 85% of Omanis work for the government.²⁴ As Oman’s oil is difficult to extract, exploitation has been done by multinational corporations in cooperation with the state’s Petroleum Development of Oman. This has created a controlled, intensive, large-scale effort with resultant infrastructure based on maximizing economic (tax) benefit rather than consideration for local residents. The approach is exemplified by British Petroleum’s 2013 \$16 billion gas development deal in the country’s pastoral area, a project that will further disturb herding livelihoods in the shared area.

In two decades Mongolia has transitioned from communism to capitalism with vast untapped mineral reserves

ⁱ Also see www.nomadsinoman.com/films/a-conversation-with-hamad-bin-haraiz.

Table 2. Selected resource extraction indicators and data related to Oman and Mongolia²⁴

Indicator	Oman	Mongolia
Extraction, % gov revenue	86	90
Leases, % land	n/a	43
Government stake, %	6070%	3450%
Major investors	Petroleum Dev. Oman	Rio Tinto (UK)
	Shell (UK/NL)	Chalco (China)
	Occidental (US)	Russia
	Total (Fr) PTPP (Thai)	Canada
	Partex (Ptgl)	
Resources	Oil, gas	Gold, copper, coal, silver, uranium, rare earths, oil, etc.
Regulatory conditions	Strong	Weak

Sources: CIA Factbook 2013, related sources.

(\$1.3 trillion), mineral licenses covering 46% of the country, and 90% of its tax revenue derived from mining (Table 2). Called ‘the next Qatar’, this treasure trove enthuses politicians and investors as the country sits on China’s doorstep, which provides a ready and well-funded buyer. The flagship project is Rio Tinto’s \$10 billion Oyu Tolgoi project, claimed to be the world’s largest copper and gold mine. Several Chinese, Russian, and Mongolian companies also have large mining operations with opaque contracts and poor environmental records. Extensive fencing, water piped >100 km, 1000s of trucks a day driving on dirt tracks to the Chinese border, uncontrolled development, and heavy equipment to dig and process minerals reconfigures the countryside.²¹ Until recently artisanal ‘ninja’ miners, purported to number 100,000, predominated, engaging in transient, low-skilled, and small scale operations. Each approach digs up the earth, manipulates water sources, scars landscapes, and changes social perceptions and interaction. Little oversight exists; income disparity makes corruption rife whilst the fragile desert ecosystem is quickly damaged. Mining is the focal point of policy, development, and protest as issues of weak governance, perceived unequal benefit, dubious contracts, and capital vs. countryside interests dominate debate and divide the nation.^{8,14}

Policy

In both countries, government policy frames herding viability through its construction of space, often as zones for resource extraction first, then as pastoral territory. Extractive industries are encouraged for national treasuries with little voice given to pastoral concerns.^{20,22} The power of extractive industries sees the rights of herders compromised in both autocratic and democratic regimes. The greater wealth of Oman enables more benefit for herders through water and forage supply, often necessitated by restricted access to traditional sources and pasture disruption by oil pipelines

and infrastructure. Yet the Harasiis exemplify a minority group that struggles for state support and the autonomy to continue pastoral ways. A stronger civil society in Mongolia allows for open discussion, yet there has been little resolution of mining, herding, and water conflicts. The 2004 Pasture Land Law and ongoing proposed revisions remain contentious as mining companies, herders, and local government compete with political elites over possession of land, privatization, access to pasture, and ultimately the viability of pastoral livelihoods. In both cases policy shapes practice. The difference is the government-extractive industry duopoly in Oman and the more chaotic uncertainty of land rights and control in Mongolia.

The unequal power of extractive industries vis a vis pastoralists is reflected in the herders’ limited national voice vs. companies’ ability to influence policy and on-the-ground realities. At the large scale, the intent and direction extractive industries’ Corporate Social Responsibility (CSR) programs have varied audiences and obligations. Rio Tinto donates to initiatives of their choice whilst Petroleum Development Oman benefits the state but significantly neglects training opportunities and job promises to herders. Implementation of high profile projects—schools, scholarships, ‘green’ agendas—do not signify that pastoral communities concerns are understood or that intended benefits are desired. Mobile populations are not well understood by settled communities, which are the basis of the extractive industries’ CSR practices. Pastoralists in Oman, Mongolia, and elsewhere are often invisible on the land, lack political gravitas, and are extraneous to mining operations and the political drive for extractive tax revenue (79% of tax in Oman, 32% in Mongolia).

Summary

Pastoralism is the balance of coaxing a living through effective use of marginal environments. Herders exemplify environmentally dependent livelihoods in their exposure to

weather, water, ecological productivity, and changing plant composition. Equally, pastoralists are subject to policies and programs often designed for settled and more economically integrated groups in society. Land tenure, access to water, infrastructure, physical or economic barriers to herd movements and taxation can restrict herding viability. When customary physical and social systems are affected by climate or governance, livestock raising can become untenable. Herders may become environmental or policy migrants, forced to move away from home territories, a process that often necessitates leaving pastoralism altogether. In the past this displacement might result in trans-border movement. Today fixed frontiers, fences, and politics restrict migration within nation states. This often channels herders to towns and cities, a process that requires significant livelihood adjustment as pastoral skills have limited value in urban settings.

Climate change becomes a threat-multiplier for pastoralists as weather dynamics impact water access, vegetation for grazing, food supply, income production, and contributes to landscape degradation; these processes affect the ability for rural residents and communities to make a living. This becomes part of a cycle that exacerbates risk; as herders are challenged by climate trends they have reduced resilience to adapt to external threats, particularly physical and financial challenges. In Oman this centers on drought, water access, and oil extraction; in Mongolia extreme cold and drought and mining-related degradation can instigate out-migration. In both countries climate disruption exacerbated by policy and economic forces (mining) can have devastating implications for pastoralists.

Oman and Mongolia present a range of the conundrums pastoral regions encounter when negotiating risk; hot and cold environments, development processes, autocracy vs. democracy, extraction of oil, gas and minerals, subsistence labor vs. economic enterprise, differing income levels, and social perceptions.^{6,7} Our research presents the first assessment of the pastoralist climate change-extractive industries nexus in these nations. In both countries pastoralism, representing a sense of strength and independence, is central to the national mythos. As small states in strategic geo-political regions, resolving internal paradoxes is key to progress and maintaining sovereignty. The experience of Oman and Mongolia can be instructive for pastoral and rural-based societies in our era of climate change. As both countries are impacted by climate-driven migration and livelihood transitions they encapsulate prevalent pastoral and extractive dynamics to serve as models, examples, or warnings across global pastoral landscapes.

Acknowledgements

The authors thank Maria Fernandez-Gimenez for encouraging their research ideas; workshop participation was supported by the Adapting Livestock Systems to Climate Change Feed the Future Innovation Lab, U.S. Agency for International Development. Authors also thank the 'Degradation in Gobi Region' project (Asia Research Center, Mongolia; Korean Foundation for Advanced Studies), the

John Fell Fund, Oxford and Dr Batbuyan of the Mongolian Institute of Geography for their support.

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