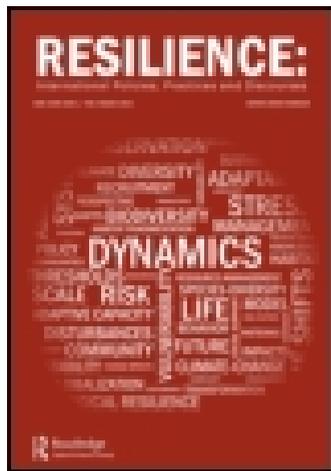


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Conceptualising resilience in Norwegian Sámi reindeer pastoralism

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Resilience thinking has growing purchase in the context of Arctic policy, resource management and indigenous politics. The present text outlines and compares two conflicting versions of the resilience concept, both currently at work in the field of contemporary Norwegian Sámi reindeer pastoralism. First, while ecological resilience originally emerged as a challenge to mainstream equilibrium ecology in the 1970s, we identify and discuss here a strand of current research that links ‘resilience’ to the ability of reindeer populations – and ecosystems – to maintain themselves in a steady state. At the same time, another strand of resilience research – developed in large part with (and by) indigenous pastoralists – uses the term to conceptualise the pastoral ecology as a dynamic and unstable system, threatened by factors such as progressive pasture loss, competing land-use forms and the ongoing pressure to ‘modernise’ production. Contrasting these two versions of the resilience concept, we explore some of its potential implications and uses in the context of resistance against dominant political agendas.

Keywords: resilience; pastoralism; reindeer; equilibrium

Introduction

Resilience thinking has growing purchase in the context of current Arctic policy, resource management and indigenous politics. Our aim in the following is to outline and contrast two versions of the resilience concept, both of which are currently at work in the fields of indigenous Sámi reindeer pastoralism, research and governance in Norway. First, while the resilience literature in ecology originally emerged as a challenge to the mainstream equilibrium paradigm in the 1970s and 1980s (Folke, 2006), ongoing debates about reindeer management in Norway are currently seeing the concept redeployed within a broadly equilibrium-based framework. The general argument here is that reindeer pastoralism is not ‘sustainable’ in its current form; the version of this argument that we focus on in more detail maintains that this lack of sustainability is due to a loss of ‘resilience’ from overstocking. Large reindeer populations and low carcass weights serve as indicators of this lost resilience – understood as a property that describes, primarily, the capacity of individual animals to cope with adverse winter conditions and predation. Inflated competition over resources leads to increased losses, which produce high variability in the reindeer population, introducing unpredictability and irregular revenues that endanger the livelihood of herders. Resilience, in this framing, becomes linked to the (assumed) ability of the pastoral system to maintain itself in a steady state, as measured through quantitative indicators such as population size and individual weight: an interpretation of the concept that disregards the inherent variability and unpredictability of

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Arctic pastoral systems and which is, in turn, closely linked to long-standing government objectives of stabilising the reindeer population, regularising production and ensuring predictability over time (Bjørklund, 1999, 2004; Paine, 1992, 1994, 2004), through the use of ‘equilibrium-based management tools’ (O’Brien, Hayward, & Ferkes, 2009, p. 8).

In contrast to this, we also outline some ways in which researchers – including indigenous scholars and pastoralists – are using the resilience concept to highlight elements of reindeer-pastoral practice that have ensured its continuity over time, in extreme and often unpredictable environments. ‘Resilience’ is used here to describe issues such as flexible organisation, control over space, sophisticated technical terminology and mechanisms for intergenerational transmission, in an attempt to formally capture the ability of reindeer pastoralism to accommodate, survive and adapt, presently and historically, to a wide and heterogeneous range of ‘shocks’ – including unpredictable climatic and environmental change, but also social and political shocks, such as new regulatory frameworks, changing border regimes, state intervention and shifting economic conditions. In this understanding, resilience encompasses factors such as the ability of herders to flexibly manage (and modify) the size and structure of their own herds, calibrating populations against a shifting, inherently variable resource base determined by complex and frequently unpredictable environmental factors.

On the one hand, then, we suggest that the concept of resilience is being (re)deployed within the frame of a long-standing, strongly equilibrium-based management ideology, sustained for decades by powerful interests at the Norwegian science-policy nexus (Beach, 2004). On the other hand, another strand of research is developing resilience terminology as a way to advance understandings of the pastoral ecology as a complex and dynamic system, threatened by factors that tend to remain invisible within dominant government discourse and scientific narratives: factors such as loss of pastures to competing forms of land-use – including extractive industries, energy and infrastructure developments, expanding tourism and a growing population of protected carnivores – and the ongoing pressure from state agricultural and environmental authorities to de-stock, as a step towards ‘modernising’ production. Contrasting these two versions of resilience and situating them more generally within the political and historical landscape of reindeer governance in Norway, we examine the potential of ‘resilience’ as tool for critique and resistance to dominant political agendas.

Background

The notion of ‘ecological resilience’ was first coined by Crawford Holling in an influential 1973 paper, ‘Resilience and Stability in Ecological Systems’ (Holling, 1973). Holling here used the term resilience to distinguish between two ways of conceptualising ecological systems, with radically distinct, mutually incompatible implications for the management and conservation of natural resources. One of these, the ‘stability view’ – which he later termed ‘engineering resilience’ (Holling, 1986) – he identified as an inheritance from classical physics and Newtonian mechanics, insofar as it focused on ‘equilibrium, the maintenance of a predictable world, and the harvesting of nature’s excess production with as little fluctuation as possible’ (Holling, 1973, p. 21). This version of resilience applied to systems that tended towards a stable, unchanging state, and that underwent little variation – making prediction and long-term projections possible, precisely insofar as the system and its behaviour could be reliably predicted. Not all systems behaved in this manner however, and certainly not on a continuous basis. A system that was subject to extreme stress or variability – that is, a system which is ‘profoundly affected by changes

external to it, and continually confronted by the unexpected' (Holling, 1973, p. 1) – demanded a shift of analytical attention, from *constancy* to *persistence*: from an understanding of repeating patterns and predictable behaviour, to an analysis of how integrity is preserved and the system continues to resemble itself despite dramatic shocks, perturbation and change. The notion of 'ecological resilience' aims to capture precisely this quality of persistence in systems that operate under highly variable or 'non-equilibrium' conditions: systems that are 'characterised by historical dependency, complex dynamics, inherent uncertainty, multiple scales and multiple equilibria' (Holling, 2001, p. 390).

To Holling and many subsequent adopters, the concept marked a radical break with productivist models of resource management, which were based on assumptions concerning the 'natural' equilibrium, stability and persistence of ecological systems (Holling, 1973, p. 21; see also Folke, 2006). Equilibrium theory predicted that natural systems would return to a stable baseline, their so-called climax state, following a disturbance or perturbation. Holling argued that such behaviour was far from universal and that it must certainly not be assumed in advance as a basis for resource management decisions. Given a system with low stability, operating far from (or without) equilibrium, 'the effective and responsible effort to provide a maximum sustained yield ... might paradoxically increase the chance for extinctions' (Holling, 1973, p. 2) – say, by altering deterministic conditions in such a way as to increase the susceptibility of the system to 'dramatic change and loss of structural integrity', triggered by 'chance or rare event[s]' (Holling, 1973, p. 21). Managing a resilient but highly variable system thus entailed 'the need to keep options open, the need to view events in a regional rather than a local context, and the need to emphasise heterogeneity'; in other words, such systems demanded, 'not the presumption of sufficient knowledge, but the recognition of ... ignorance; not the assumption that future events are expected, but that they will be unexpected' (Holling, 1973, p. 21).

Since this introduction, the concept of resilience has undergone extensive shifts, translations and lateral movements – to the point where today, we may find the language of resilience applied as easily to urban planning and climate change adaptation as to developmental child psychology or the therapeutic rehabilitation of military personnel (although not all these formulations trace directly back to Holling). An initial point of confusion here, reflected in much of the literature that follows Holling, is that the term can describe distinct, even contradictory properties, associated with different kinds of system – or with different understandings of the same system. This opens the concept up to multiple and contradictory applications, an ambiguity which in turn has allowed resilience to function as an intuitive 'boundary concept' (Brand & Jax, 2007) – enabling the ubiquity that some refer to as 'resilience creep' (Walkate, McGarry, & Mythen, 2013) – but only at the cost of lost precision, and of unclear policy implications (Davoudi, 2012). As Lance Gunderson observes (2000, p. 425), 'multiple meanings of resilience can lead to very different sets of policies and actions'. This conceptual pliability is a double-edged sword – enabling resilience to function, potentially, within diametrically opposed political agendas, with oppositional effects.

In the light of this, recent criticism of resilience terminology has been intense, sustained and wide-ranging. Critics have pointed to issues such as its convergence with neo-liberal economic doctrines (Joseph, 2013; Watts, 2011; Welsh, 2013), its socially conservative effects as an ecological concept applied to human systems (MacKinnon & Derickson, 2013) and its convenient availability for the political projects of militarism or the nuclear security state (Duffield, 2011). For the purposes of the present paper, we focus on two principal lines of critique. The first is that resilience thinking may *depoliticise*

uncertainty (Evans & Reid, 2013), reframing the objectives of governance (Zebrowski, 2013) and enabling a movement by which agents traditionally responsible for ensuring security can relinquish traditional obligations – and ‘the subject or agent of security ... shifts from the state to society and to the individuals constitutive of it’ (Chandler, 2013, p. 210). In this view, resilience discourse enables bodies such as the state to rewrite the social contract, abandoning traditional responsibilities in areas such as security or well-being and shifting them elsewhere: reframing the objective of governance as facilitating the formation of autonomous, self-organising and independent entities, in an ‘abdication of responsibility by the collective and [its relocation] to the individual’ (Welsh, 2013, p. 8). In the process, the notion of resilience also makes available a vocabulary that first ‘depoliticise[s] and naturalise[s] a world of uncertainty’, then renders it ‘knowable in the common vocabulary of capital’ (Welsh, 2013, p. 8) – opening the world to new forms of exploitation and privatisation, as the ‘calculative metric for a brave new world of turbulent capitalism’ (Watts, 2011, p. 88). In its more missionary manifestations, critics argue, the ‘gospel of resilience’ presents global capitalism with a promise of survival, through its apparent transformation into novel forms – ethical, sustainable, wise, resilient (Hornborg, 2009; Nadasdy, 2007).

The second line of critique concerns how the notion of resilience enables *slippages*, between scales, domains, objects, disciplines and contexts: collapsing distinction, foreclosing significant difference and subsuming disjunctions within a smooth, overarching ‘ontology of “the system”’ (Welsh, 2013, pp. 1, 4 and 5) – generating the world as a total structure of nested systems that reaches its apex at the planetary scale, in terms such as ‘Earth System resilience’ (Folke et al., 2010). If the theoretical ambitions of resilience generate it as a universal frame of analysis (e.g. as a form of ‘complex systems theory’ that parses ecological and financial turbulence in the same language, see Walker & Cooper, 2011), then its blunt or uncritical application – perhaps particularly to ‘systems’ that include human elements (Cote & Nightingale, 2012; Davidson, 2010; Rival, 2009) – incurs the risk of reductionism: of glossing or obscuring issues, processes and phenomena that fall outside the purview of its ‘ontological commitments’ (Joseph, 2013). Hyphenated portmanteaus such as ‘social-ecological’ go some way towards rendering this problematic explicit, but they nevertheless still encode a holistic ambition to render all phenomena as intelligible within a single, all-encompassing, ‘deceptively simple’ framework (Dong et al., 2011). Analytical holism may be salutary, of course, drawing out the interconnectedness of otherwise distinct domains, but handled carelessly it also incurs the risk of simplification and gloss, of doing conceptual violence to the specificity of its objects.

One response to the linked violence of these two issues – a partial response, but nonetheless important – is to focus on *specification*, in an effort to recollect continuously the question of ‘resilience of what, to what, for what purpose, and for whom?’ (Beymer-Farris, Bassett, & Bryceson, 2012; see also Carpenter, Walker, Anderies, & Abel, 2001). Responding to this, the following two sections outline two different formulations of the resilience concept, locally active in the same context; following that, the argument opens up some lines of comparison between the two and returns, in closing, to issues regarding specification and resilience politics more generally.

Resilience and equilibrium

For a long time, indigenous reindeer pastoralism in the northern territories of Norway has been an administrative thorn in the side of the state. Over time, the nature of the ‘reindeer

problem' has shifted – but shifting rationales notwithstanding, the drive to reduce reindeer populations in the region has remained a long-standing policy objective. As far back as the middle of the nineteenth century, in the first few decades of Norwegian independence, historical sources document a concern on the part of administrations and official bodies with the supposed excess of reindeer on the tundra (Strøm-Bull, Oskal, & Sara, 2001). Presently, the Norwegian state is pushing forward a large-scale programme to reduce reindeer populations to a 'sustainable' level, administered by the Ministry of Agriculture and Food (*Landbruks- og Matdepartementet*, henceforth LMD). The dominant framework that underpins this programme can be fairly straightforwardly summarised. Large populations and high densities generate low individual weights, which lead to higher losses, which reduce predictability and create increased economic vulnerability for herders. The reindeer population must therefore be *reduced*, so as to increase the weight of individual animals and improve their ability to resist predation and hunger, and it must also be *stabilised*, so as to limit the exposure of herders to uncertainty and the economic effects of variable meat production. A key assumption guiding intervention here is that the reindeer population *should* be stable and largely invariant over time: fluctuations in population size or density are attributed to human modifications of the pastoral ecosystem, largely to do with excessive herd sizes produced by excessive individual accumulation. The principal aim of policy then becomes returning the 'system' to a stable, steady state – its 'natural' condition – in which the reindeer will be heavier and therefore also more capable of protecting themselves from predators and surviving difficult weather (Reinert, 2014b). To illustrate how these broad trends articulate with the concept of 'resilience' – or rather, how resilience is re-articulated relative to them – we focus on a recent article, co-authored by a team of government-sponsored natural scientists¹: the article makes substantive but not unproblematic use of the term.

The core argument of the article in question (Hausner et al., 2011) is that the 'continued degradation' of the northern pastoral ecosystem is a historical consequence of 'development intervention' and 'big push policies' that have created an 'Economic Security Trap (EST)' for herders (Hausner et al., 2011, p. 1). Financial support and state guarantees, in the form of disaster relief and compensation for losses to protected predators, have prevented effective action on the part of pastoralists to reduce their own susceptibility to environmental risks – thus transferring liability for these risks to the benefactor, in this case the state, and increasing the dependence of pastoralists on external economic support. The vulnerability of herders to 'environmental risks' is understood as a function of excessive herd accumulation, which has led to the 'degradation' of pastoral resources (Hausner et al., 2011, p. 9) – and, in turn, thinner and weaker animals, through increased competition for resources. As heavier animals are (supposedly) less susceptible both to predation and to adverse winter conditions, reduced weights will entail greater losses for pastoralists and a less predictable meat output or productivity for the industry as a whole – as herds of thin animals produce less meat, and herders recoup periodic losses by reducing their out-take from the herd, allowing it to recover.

In short, then, the argument is that misguided policies have removed existing checks on herd accumulation, leading to excessive herd sizes – and consequent losses, possibly collapse – while simultaneously shifting the burden of increased losses (caused by herd sizes) to the state. Excessive herd sizes are thus an anthropogenic problem, one that erodes the 'ecosystem resilience' (Hausner et al., 2011, p. 2) of the pastoral system. 'Ecosystem resilience' itself is not separately defined in the paper, but 'resilience' in general is understood as the ability of a system to cope with 'disturbances' (Hausner et al., 2011, p. 4), such as extreme weather events, as well as the ability of *producers* to cope with

‘recurrent disturbances and provide production opportunities over time’ (Hausner et al., 2011, p. 1). The article treats this quality of the system as measurable in terms of two ‘surrogates’: the size of the reindeer population and the weight of individual reindeer carcasses. The move is justified by reference to other publications by the group, which document a relationship between ‘reindeer numbers, condition, pastures, and losses associated with environmental risk’, as well as other publications on ecosystem ‘degradation’ (Hausner et al., 2011, p. 1). Population size as an indicator of resilience is not developed significantly in the article. Carcass mass, on the other hand, is described as a direct indicator for the availability of pasture resources, and also as an indicator of ‘ecological resilience’, insofar as low weights increase the susceptibility of reindeer to predation and adverse environmental conditions. In an unexplained move, the authors take the increased likelihood of reindeer losses as an indication that the pastoral ecosystem itself has a ‘lower ability to cope with disturbances’ (Hausner et al., 2011, p. 4) – that is to say, that fluctuations in reindeer mortality reflect the ‘resilience’ of the pastoral ecosystem as totality. The ‘livelihood resilience’ of pastoralists is also linked directly – and reduced – to weight: defined in terms of exposure to environmental risks, specifically the risk of reindeer losses, as well as their ability ‘to cope with and recover from such events’ (Hausner et al., 2011, p. 3).

As this short (reductive) overview indicates, the argument is set up as a series of naturalised reductions. The resilience of individual reindeer is reduced to physical condition, and physical condition is further reduced to weight: a heavy reindeer is in good condition, and therefore ‘resilient’, whereas a lighter reindeer is not. Condition determines survival, and weight thus becomes a universal predictor for survival: ‘reduced weight increases susceptibility to losses’ (Hausner et al., 2011, p. 4) – and high weight, conversely, lowers it. Because weight determines survival, a heavy reindeer is ‘resilient’ and a lighter reindeer is not. Along similar lines, the ‘ecological resilience’ of the pastoral ecosystem is reduced to the resilience of individual reindeer – which has already been reduced to the issue of weight – and the problem of ensuring ‘livelihood resilience’ for pastoralism is reduced to minimising the loss of reindeer, by maximising their weight. Carcass mass stands in for condition, which stands in for individual resilience. Individual resilience stands in for both ‘ecological’ or ‘ecosystem’ resilience, *and* for the ‘livelihood resilience’ of pastoralists. Effectively, in this line of argument, carcass mass comes to stand in for resilience *at all levels of the system*. With this, ‘resilience’ is transformed into a directly observable quantity, inherent in bodies: measurable, comparable, subject to disarmingly simple manipulation – increase weight, solve the problem of resilience. It might not be remiss to see in this a kind of reverse holism: a chain of conceptual reductions by which the totality of a complex, multi-dimensional system comes to be, not just *represented* by one of its elements, but identical with – and reduced to – that element.

This reductive notion of resilience is situated, in turn, within an equally reductive, simplified environment. In line with administrative conceptualisations of pastoral space as a simplified, largely undifferentiated expanse (e.g. Reinert, 2008, 2014b; Benjaminsen, Reinert, Sara, & Sjaastad, *in press*), the environments of herding are imagined here as basically stable, predictable and recurrent – a ‘barnyard space’, as herders sometimes mockingly refer to it, within which ‘disturbances’ occur in the form of a limited set of discrete, occasional and already-known events or potentialities: predation, and adverse weather. The imagined ‘optimal’ or climax state of this system is defined by a stable, largely unvarying population of heavy reindeer, whose high weight renders them resistant to all the known (and predictable) risks they are exposed to within the system. This ‘optimal state’ *exists*, as a potentiality – or even a default state – of the system, but human

activity has forced the system to deviate from it. Efforts must therefore concentrate on returning the system to this state, as quickly as possible. Importantly, as the authors state, this ‘optimal state’ of the system is also given *in productivist terms*, as the configuration in which the system offers up its maximal economic yield. The notion of resilience is thus put to work within the coordinates of a steady-state, equilibrium ontology – and the single ‘optimal state’ of that steady-state system is given as the point of maximum sustainable yield.

Painting a portrait of an industry eating itself, the article reproduces fairly straightforwardly the terms of the dominant overstocking narrative. The main threat against pastoralism appears as its own failure to self-regulate, amplified by misguided policies. Within the optic of this argument, other threats generally disappear: the issue of pastoral mobility and its relevance to ‘resilience’ does appear, for example, but the scarcity of pasture grounds is almost immediately reformulated as a result of government policies having *increased recruitment* to pastoralism, thus filling ‘vacant pastures’ (Hausner et al., 2011, pp. 11 and 12) and reducing the space available to individual pastoralists. The issue of space, and rather of resilience as a spatial problem, is thus reduced to the matter of excessive population densities, caused by misguided government action – only this time, the excessive population is human. Threats to pastoralism from external factors – such as climate change, the progressive loss of territories to external interests or new (and invasive) forms of land use – are neither discussed anywhere in the article itself, nor do they figure in the policy recommendations or media interventions by scientists associated with the group. In this as in other matters, the article falls safely within persistent broader patterns established over decades by ‘outsider’ representations of – and interventions into – the management of indigenous pastoralism in Norway: specifically, with regard to the exclusion and silencing of indigenous pastoralists themselves, and their rendering as problematic ‘objects’ of policy to be ‘solved’ by non-indigenous experts (Bjørklund, 1999; Bjørklund & Brantenberg, 1981; Eidheim, 1999; Paine, 1994; Reinert, 2012a; Benjaminsen, Reinert, Sara, & Sjaastad, *in press*).

Alternative framings

As we discussed earlier, concepts of resilience are also being mobilised in other ways in current pastoral research, sometimes to explicitly destabilise the assumptions of the dominant government framework. These alternative framings give the concept purchase on issues such as social organisation, institutional flexibility, herd structures, preservation of (and control over) rangelands, language and terminology, transmission and development of traditional knowledge, and its integration into the knowledge-base of policy and decision-making. Interestingly, these accounts also tend to encompass a much broader understanding of the reindeer themselves and the role they play in ensuring the resilience of pastoralism. This work of (re)coding resilience is ongoing, and draws in large part (but not exclusively) on approaches and frameworks developed by the Stockholm Resilience Centre (Biggs et al., 2012).

In a case study of the 2013 inter-rim Arctic Resilience Report, based on ongoing research with herders in northern Norway and the Kautokeino area, Mathiesen et al. (2013) define pastoralism as a skilled, practical ‘understanding of rapid change’, coupled with the knowledge, training and equipment necessary to respond appropriately to such changes. Personal or individual aspects of resilience are situated within and depend on social forms and structures, such as collaborative working groups and the *siida* kinship unit (Sara, 2011) – which provide labour and financial support, ensuring skill transmission,

development and entrainment. The resilience of pastoralism here is not isolated in individuals or in reified ecological processes, but depends also on collective factors and structures developed over time. The characteristic flexibility of Sámi institutions – for example, the manner in which herds might be combined or separated according to variable conditions, or individual herders might move from one working group to another as required – constitute them as adaptive, relative to rapidly changing and unpredictable material environments. Resilience here also involves dimensions of human learning, entrainment and pedagogy – including particularly the transmission and development of complex technical language (Eira et al., 2013; Magga, 2006), but also less formalised aspects of experience and memory: herds, herders and *siidas* that have experienced and recovered from shocks or extreme events may, for example, be better equipped to deal with similar events in the future (Mathiesen et al., 2013). Sustaining these factors depends on processes of knowledge development and dissemination, training, education and intergenerational transmission – brought together under the heading of ‘traditional knowledge’, and its relationship to other forms of knowledge. Building resilience on this basis involves combining multiple forms of knowledge – and particularly, the integration of both traditional expertise and scientific knowledge practices into formal governance structures (Maynard et al., 2011; Pape & Löffler, 2012; Turi & Keskitalo, 2014).

The question of ‘livelihood resilience’ here also extends beyond human factors: consider, for example, the problem of herd structure. The productivist herd advocated by biologists and the reindeer herding administration (Reinert, 2006, 2014b) maximises pastoral meat output by maintaining a high and continuous production of calves, minimises the number of males in the herd in favour of ‘productive’ females and eliminates ‘non-productive’ animals such as castrates. Against this, indigenous critics, in particular, have advocated for more complex, differentiated herd structures, based for example on traditional principles of herd composition and aesthetic ideals such as the ‘beautiful herd’ [*cappa eallu*], composed of a wide range of different reindeer types, sizes, ages and morphologies (Oskal, 2000). An important line of argument here is that structurally diverse herds – diversified, that is, with respect to factors such as age, sex, build, size, colour, traits and temperament – embody high levels of phenotypical and genetic diversity. This serves to diversify resistances and vulnerabilities, reducing the overall exposure of the herd itself to singular threats – a common risk management strategy, familiar from other contexts, that contrasts sharply with the well-documented vulnerability of mono-crop agriculture to single-vector threats and pathogens (Scott, 1998). At the same time, diversified herd structures are also about more than the genetic resilience of individuals. ‘Non-productive’ individuals such as castrated bulls or ‘surplus’ males play significant roles within the herd, affecting its ability to negotiate and survive in the complex, shifting environments of the tundra. Castrated bulls, for example, tend to be calmer than fertile animals. This makes them easier to manage, and they also exert a calming influence on the rest of the herd. As they retain their strength after the rutting season, unlike the exhausted reproductive males, castrates can also help with fighting off predators or breaking through ice and snow-cover, aiding the access of other reindeer in the herd to locked-away pasture resources. Maintaining castrates in the herd thus helps ensure its ability to survive predation and winter conditions – the two principal types of ‘adverse events’ identified earlier as problems of resilience.

This alternative conceptualisation of the herd – as a complex, heterogeneous entity in continuous engagement with its environment – reflects a more general point, which we might gloss as the ‘more-than-human’ dimension of pastoral resilience. Pastoral practice depends on a range of human factors, but it also depends – in no small part – on the

intelligence and adaptive capacity of the reindeer themselves (Oskal, Magga, & Sara, 2003). As we saw earlier, Hausner et al. (2011) define the resilience of individual reindeer through weight, as a metric of their physical condition and thus their ability to survive. More generally, this reflects a near-exclusive emphasis, in government interventions as in media discourse, on weight as a primary metric and indicator not just of survival, but of ‘responsible’ herding (Reinert, 2014b). Pastoral understandings of reindeer expand significantly on this, drawing out other aspects of their ‘behaviour and physiology’ (Mathiesen et al., 2013) that help ensure their survival – including, for example, their ability to learn from predator attacks and their independent ability to find forage within complex and ever-shifting environments. Unlike industrial production systems based on the management of captive animals in human-controlled environments (Reinert, 2008), reindeer pastoralism rests almost entirely on a complex, ongoing interplay or negotiation between reindeer and humans: human control is rarely complete, but conceptualised rather in an ongoing exchange with the self-determined behaviour and preferences of the reindeer.

An important guiding concept here is *luohtu*, which relates to the freedom of animals in a state of nature and the manner in which reindeer – as free beings – will revert to such a state when necessary: when finding pastures, for example, or when recovering from illness (Norwegian Ministry of Agriculture and Food [LMD], 2002; Oskal et al., 2003). Reindeer are agents and active participants in the pastoral adaptation, and in ensuring their own survival: they are emphatically *not* quasi-automatic biological machines that convert pasture resources into meat. The move within productivist logic that transforms the reindeer from semi-autonomous agents into quasi-automata fully dependent on human control needs to be made visible (Reinert, 2012b, 2014a). The ability of reindeer to survive their environments is not reducible to weight, or for that matter to any numerical variable: rather, it emerges as an aggregation of factors that may include individual intelligence, learning, physical traits and capacities, herd structure and composition, skill transmission *within the herd*, the range of available terrain types and so on. From a pastoral perspective at least, the resilience of Arctic pastoralism is effectively unthinkable without taking this more-than-human element – the active participation of the reindeer themselves – into account.

More generally, another useful concept here is *jahkodat*, a northern Sámi term that describes the pasture conditions of a given year as a combination of specific and non-recurrent factors, with cumulative effects (Helander, 1999; Sara, 1999, 2001; Benjaminsen, Reinert, Sara, et al., *in press*). Precipitation, temperatures, the structure of the snow cover and predator pressure: conditions on the tundra are complex and variable; factors combine and recombine in unpredictable patterns. Management decisions thus need to be continuously oriented towards the specific conditions obtaining at present, their relationship to prior conditions and the manner in which they may – or may not – affect subsequent events. This understanding of environmental time offers little guarantee of the future; what little guarantee there can be depends, acutely, on correct understanding and interpretation of present conditions. Assumptions concerning pasture conditions next year are almost impossible. This idea – of the non-recurrent specificity of pasture conditions, or rather of the unpredictable irregularity of time itself as a concatenation of variable and interdependent conditions – is captured succinctly in traditional herder maxims such as ‘one year is not the brother of the next’ [*jahki ii leat jagi viellja*] (Tyler et al., 2007). *Jahkodat* thinking thus takes into account the complex interdependence of space, climate, environments and time, as a continuous play of variable factors interacting in unpredictable ways – and with any form of predictive certainty decreasing over time.

A year, as a unit of time, is not fungible and a herder must, as far as possible, expect – and prepare for – the unexpected. To know such an environment, to survive in it and thrive over generations requires, as Holling put it, a ‘science of surprise’ (Holling, 1986).

Within these ‘surprising’ environments, ‘shocks’ or ‘disturbances’ may include extreme winters, pasture lands left inaccessible by ice, or disease outbreaks in the herd – but also events in the human world: border closures; new regulations and incentive systems; or ‘forced reductions’, such as the one currently unfolding. Resilience to such anthropogenic disturbances demands (and fosters) many of the same adaptive skills, knowledges and institutions that equip herders (and their herds) to manage their continuously variable and unpredictable environments, with flexibility as a particularly vital aspect: the ability of herders to self-organise, to manage labour within their working collective, to move pastures as required, to use diverse ecological niches, to adjust the size and composition of their herds (Magga, Corell, Mathiesen, & Oskal, 2011, pp. 37, 60; Reinert, Mathiesen, & Reinert, 2010). Access to and control over rangelands is a vital element of this flexibility, insofar as it determines the range of options available when herders – and their herds – confront unviable conditions on a given pasture (Reinert et al., 2009). Resilience – understood here as the ability of herds and herders to survive in the Arctic environment – is thus very much a spatial problem, linked to territorial control, pasture losses and increasing encroachment (Brännlund & Axelsson, 2011).

Taken together, these elements build up to a broad, multi-dimensional concept of resilience, oriented towards – and rooted in – pastoral environments that are understood as fluid, shifting and unpredictable. This version of resilience functions through continuous adaptation and inter-reaction between a range of interdependent and highly variable factors: none of which are easily reducible to numerical quantities, or, in fact, easily reducible to a single indicator, nor is one factor reducible to another. Rather, these factors emerge as significant contextually, in a kind of additive or enumerative logic that demands continuous attention to their specificity, and to the differentiation of the various discrete resiliences in play. The resilience of pastoralism is neither reducible to nor interchangeable with the resilience of reindeer, of vegetation cover, of individual herders or families, of herds, or of the pastoral ecosystem itself as totality. The resilience of each of these elements must be considered on its own, *as well as* by the manner in which it modifies or forms part of resiliences operating elsewhere in the ‘system’.

Comparisons

The two versions of resilience we have outlined here are situated within – and entail – highly differentiated understandings of space, time and practice, of relations and environments, of landscapes and the kinds of being that inhabit them. These differences are perhaps most clearly manifest in their respective understanding of time, their orientation towards the future and the prescriptive action they dictate in the present. Embedded in the dominant, equilibrium-oriented framework that informs government interventions, ‘resilience’ is articulated as a matter of managing a highly circumscribed set of known disturbances – that is predation and adverse weather – anticipated as occurring within an already-known space, understood to be stable and predictable. The impact of these disturbances can be anticipated, calculated and minimised, through the application of prescriptions developed within the existing, quantitative analytic that underpins governmental understanding of pastoral space. These prescriptions can appear startlingly simple: at times at least, it seems as if every problem can be resolved by increasing the

weight of reindeer (Reinert, 2014b). The understanding of pastoralism and of the herd that underwrites this approach is biometrical, biophysical and – more often than not – extremely reductive. It is defined not just by metrics, but – more specifically – by metrics that are available to it in advance: it anticipates the future by means of what has already happened. It is also committed, in advance, to an ontology of discrete events occurring in a stable environment, temporarily disturbing the regular functioning of the ‘system’ and dislodging it from its optimal or climax parameters. The challenge, following ‘disturbance’, is to restore the system to its pre-disturbance functioning.

This equilibrium-oriented approach has a number of implications:

- Pastoral space can be bracketed as stable, invariant, homogeneous and largely featureless. Space – and implicitly, the future – are *fully known*, at least insofar as they are relevant to policy. Environments behave predictably; if disturbed, they ‘misbehave’ in predictable ways. Reliable projections are possible, linear growth can be extrapolated.
- There is such a thing as an ‘optimal herd size’, and an optimal herd structure; these can be calculated as a fixed optimum, in a largely context-independent manner.
- High weights can be rendered as a ‘magic bullet’ that will improve survival, reduce losses and enhance profits across all contexts, in all settings: a simple, all-purpose solution.

Within the ‘alternative’ literature we outlined, on the other hand, the notion of resilience functions within a distinct understanding of space: as uncertain, provisional, in more or less continuous flux, governed by environmental variables that oscillate with cumulative and interdependent effects. The ‘system’ is in precarious assemblage, continuously subject to unexpected, possibly unprecedented recombinations. Put simply, this version of resilience does away with the notion of a ‘climax’ state, of a system ‘disturbed’ by irruptive events and returning continuously to its stable baseline. Instead, it offers an account of so-called ‘disturbance’ not just as continuous, but as intrinsic: something very much akin to what Holling describes as a non-equilibrium system. Projections within such a system are necessarily contingent, and the unknown is managed through continuous adjustment to emergent situations. Resilience, like pastoral practice itself, must therefore be understood in open-ended, improvisational and experimental terms: identified, effectively, with any factor that enables pastoralists to manage, and survive, the continuous and unpredictable recombinations thrown up by an inherently variable environment. From this perspective, the notion of pastoral space as a stable or equilibrium space is a fiction – and compliance with government measures serves, over time, to adapt pastoral practice to the requirements of a fictional space.

Different perspectives, then, which are based not just on different presuppositions regarding what kind of ‘system’ pastoralism is, but also on distinct epistemological approaches. We might call one *reductive*, the other *aggregative*. The relationship between the two could be phrased in terms of complexity and simplification, or in terms of the analytical reducibility of elements within the pastoral ‘system’: the question of how far an analytic of surrogation can extend, of what things can stand in for other things and how far the chain of substitutions can extend, before it begins to do material violence – a violence tallied, for example, in the number of herders forced to leave the trade based on productivist calculations of ‘sustainability’, or in the reindeer felled by predators but classified as lost to hunger (and thus ‘mismanagement’) because at ‘optimal’ weight they would not have succumbed to predation (Reinert, 2014b; Sara, Sjaastad, Benjaminsen, & Reinert, *in press*). In part, this question concerns the ontology of ‘systems’, how they are to

be conceptualised and – importantly – by whom, and based on whose accounts? Is the ‘pastoral system’ closed or open-ended? Are the basic parameters given or unknown? Are they predictable or defined, in some basic way, by the unexpected, by their capacity to surprise? In part, of course, this also concerns the relationship between (certain) scientific epistemologies and the logic of state power, quantification and legibility (Li, 2007; Scott, 1998).

Between them, the two versions of resilience generate contradictory accounts of the current government programme to reduce the reindeer population: the programme is *either* an attempt to stabilise and restore to normal functioning a system brought into disequilibrium by earlier, misdirected policies, *or* a misguided attempt to manage a complex ‘social-ecological’ system, based on mistaken simplifications and disregard for existing forms of expertise, with potentially destructive effects for the system and its inhabitants – both insofar as interventions based on steady-state assumptions artificially restrict adaptive flexibility, with adverse effects for reindeer and herders alike (Reinert et al., 2010), *and* insofar as they misrepresent the ecological basis for pastoralism, thus opening for encroachment from competing interests such as mining (Johnsen, 2014). In the first version, the resilience of the system will be increased, supposedly, because reduced population densities will reduce resource competition and increase individual weight, and – as we have seen – individual weight indexes ‘resilience’ at all levels of the system. In the second version, the outcome is harder to define – because ‘resilience’ is both multiple and irreducible to single indicators – but the overall resilience of pastoralism as a livelihood will almost certainly be *reduced*, in no small part because normative government interventions into herd sizes impair the ability of herders to responsively regulate their own practice.

Consider then the two principal lines of critique that we outlined at the outset: the risk of reductionism, and the problem of how resilience might reorganise political responsibilities. The first problem is evidenced fairly clearly – proximately by the argument we examined, and in a more diffuse form across much of current Norwegian reindeer policy and governance. As others have observed before us, the knowledge base of state policy on pastoralism (in Norway as elsewhere) tends to be premised upon reductive simplifications, from one term to a component that stands in for it (Beach, 1981, 2004; Bjørklund, 1999, 2004; Paine, 1992, 1994, 2004; Reinert, 2008). These simplifications may be elegant, easy to represent and methodologically convenient – but when they translate into action, and the drive to generate simplified accounts begins to reorganise reality in its own image, this starts creating highly problematic interferences with the actual practice of pastoralism. Reducing resilience to biophysical metrics serves to isolate certain causal mechanisms, but only at the expense of rendering invisible – and collapsing – all factors which are not directly reducible to the metrics that render them visible. Models of resilience rooted in pastoral practice, on the other hand, maintain resilience as an aggregate property arising in the interaction between mutually irreducible factors – knowledge, skills, equipment, the reindeer themselves, social organisation, available rangelands, herd structure and so on.

The other line of critique against ‘resilience thinking’ is that it shifts and reconstructs existing responsibilities, naturalising uncertainty and absolving actors such as the state of important historical obligations. Relative to this, Norwegian pastoralism presents an interesting case: the advent of close state regulation is a fairly recent event, still within living memory. Critical discourses – including the alternative formulation of resilience we outlined earlier – mobilise notions such as resilience as counters to heavily centralised, top-down micromanagement as exercised through the Department of Agriculture and

Food; the goal here might, in a sense, be described precisely as *disinvesting* the state of responsibilities it has, in historical terms, recently assumed. The problem of resilience here is thus *not* that the term inherently devolves and abrogates responsibility – rather, the issue is how notions such as resilience may be used to point out (and counteract) particular modalities of state control, surveillance and intervention that interfere with the operation of existing pastoral adaptations to the Arctic environment. Disinvestment and the controlled devolution of state responsibilities may function here less as adverse effects, more as tactical objectives.

The difference between the resiliences under discussion here is in part a matter of conceptualising and locating uncertainty – and of defining the uncertainties that are *significant* in any given situation. From one perspective, state intervention has removed the uncertainties that surrounded herd accumulation, by providing a ‘safety net’ that shields pastoralists from the risks – and economic effects – of their own excessive accumulation. This suspension is artificial, and needs to be removed in order for the system to restore itself to equilibrium. In the process, however, other (and vital) forms of uncertainty are erased. From the other perspective, state management premised on equilibrium denies the radical environmental uncertainties around which pastoral adaptation itself is organised. As these uncertainties determine practice in vital ways, they need to be acknowledged and integrated into governance. Both versions of resilience, in a sense, entail projects of restoration or recuperation: one, the restoration of a naturally functioning equilibrium system, brought into disarray by misguided interventions; the other, the restoration – and preservation – of a human-reindeer ‘social-ecological’ assemblage capable of functioning, and remaining similar to itself, across the continuous and unpredictable oscillations of a non-equilibrium system.

Both positions (on the concept of resilience) imply reorientations, or redefinitions, of the state-pastoralist relation – but the distinctions are important. At its limit, the argument from equilibrium aims to scale back the state, by removing safety nets and allowing the ‘system’ to operate in its natural state. The state has interfered with the ‘natural’ functioning of the system, disrupting its equilibrium: this position dovetails neatly with neo-liberal critiques of the state interfering with the ‘natural’ operation of a market. The ‘other’ strand of resilience thinking, on the other hand, also points towards scaling back the state – not so as to dispose entirely of its involvement, however, but so as to eliminate certain modalities of control that deny the vital uncertainties of pastoral practice, and so as to develop instead modes of support that acknowledge the environmental conditions under which pastoralists operate, and the expertise pastoralists have developed to cope with these. In a sense, the two versions of resilience bring into view different forms of uncertainty as the appropriate focus of governance: in the first case, the risks associated with accumulation, which must not be suspended by safety nets; in the second, the uncertainties inherent to pastoral practice, which must be acknowledged in policy. The question is *which* uncertainties are to be made salient, to what effect, and for whose benefit.

Concluding thoughts

Both in Norway (Bjørklund, 2004; Reinert, 2008) and elsewhere in Scandinavia (Beach, 1981; Forbes et al., 2006), the management of reindeer pastoralism has often been described in terms of ‘development’, ‘modernisation’ or ‘rationalisation’. Accidentally or otherwise, such descriptions double as critique: capturing the manner in which administrative conduct and decisions at the science-policy interface have

reproduced – and continue to reproduce – patterns of epistemic arrogance that have characterised Western interventions elsewhere in the so-called ‘developing world’. In a context given by the near-certainty of rapid, extreme, historically unprecedented near-future environmental change – with disproportionate adverse effects projected for the Arctic – this problem of epistemic arrogance extends, potentially, well beyond the immediate parameters we have described here. Presently, the ‘overstocking crisis’ is by far the most dominant narrative framing for reindeer herding in Norway. Within the parameters that this narrative establishes, other threats – such as climate change, loss of rangelands, habitat fragmentation, pollution and pressure from the industrial extraction of minerals and hydrocarbons – tend to disappear (Benjaminsen, Reinert, Sara, et al., *in press*). Almost invariably, attempts by herders and others to address these other threats – through securing adequate control over rangelands, preserving traditional knowledge and ensuring adaptive flexibility – run up against the massive pervasiveness of this crisis formulation, and the pressing urgency it generates: the imperative to reduce reindeer populations, stabilising them at an ‘optimal level’. This predominance of overstocking narratives is a complex issue, with entangled causes and durable effects (Benjaminsen, Eira, & Sara, *in press*) – but as we have indicated here, it functions, in no small part, through reductive assumptions concerning the nature of pastoral space, pastoral practice and pastoral environments.

For herders, altering dominant definitions of the situation demands that they contest and rethink a range of basic assumptions about space, practice and time – assumptions that are deployed, and naturalised, at the intersection between state-funded science and the state optics of governance. As we have argued here, a substantive share of these assumptions revolve around the ascription of certainty or predictability to aspects of the pastoral environment. In this sense, the case of Norwegian pastoralism presents an interesting converse to critics of resilience who contend that ‘environmental uncertainty is a fabrication’ (Duffield, 2011, p. 758) – insofar as here, at least from the perspective of the ‘alternative’ resilience discourse we outlined, it is the idea of environmental *certainty* that figures as a fabrication. As a supplement to critical discourses on resilience and the governance of uncertainty, the case thus highlights not only the need to disentangle the multiple concepts of resilience that may be at work in a given situation, but also the importance of specifying the historical backdrop in which they operate. There are situations – such as the one we have discussed here – where assumptions concerning security, stability, certainty and predictability need to be analysed, not simply as beneficial goods eroded in a neo-liberal restructuring of reality, but rather also as contingent effects of power and historical violence.

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Note

1. The team consists primarily of biologists based at the Norwegian Institute for Nature Research (NINA) in Tromsø and at the University of Tromsø. Individually and as a whole, publications from the team emphatically support the idea of an ‘excessive’ reindeer population as the singular root cause of current problems in the industry; this view aligns strongly both with current political rhetoric and with long-standing government objectives. We discuss the work of this group in more detail elsewhere (Reinert, 2014b; Benjaminsen, Eira, et al., *in press*; Benjaminsen, Reinert, Sara, et al., *in press*).

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References

- Beach, H. (1981). *Reindeer herd management in transition*. Uppsala: Acta Universitatis Upsaliensis.
- Beach, H. (2004). The long walk VI: An interview with Robert Paine. *Nomadic Peoples*, 8, 7–16.
- Benjaminsen, T. A., Eira, I. M. G., & Sara, M. N. (Eds.). (in press). *Samisk reindrift, norske myter* [Sámi Herding, Norwegian Myths]. Trondheim: Fagbokforlaget.
- Benjaminsen, T. A., Reinert, H., Sara, M. N., & Sjaastad, E. (in press). Misreading the Arctic landscape: A political ecology of reindeer, carrying capacities and ‘overstocking’ in Finnmark, Norway. *Norwegian Journal of Geography*.
- Beymer-Farris, B., Bassett, T., & Bryceson, I. (2012). Promises and pitfalls of adaptive management in resilience thinking: The lens of political ecology. In T. Plieninger & C. Bieling (Eds.), *Resilience and the cultural landscape* (pp. 283–299). Cambridge: Cambridge University Press.
- Biggs, R., Schlüter, M., Biggs, D., Bohensky, E., Burnsilver, S., Cundill, G., ... West, P. (2012). Toward principles for enhancing the resilience of ecosystem services. *Annual Review of Environment and Resources*, 37, 421–448.
- Bjørklund, I. (1999). *Norsk ressursforvaltning og samiske rettighetsforhold* [Norwegian Resource Management and the Sámi Legal Situation]. Oslo: Ad Notam Gyldendal.
- Bjørklund, I. (2004). Saami pastoral society in northern Norway: The national integration of an indigenous management system. In D. Anderson & M. Nuttall (Eds.), *Cultivating Arctic landscapes* (pp. 124–135). Oxford: Berghahn.
- Bjørklund, I., & Brantenberg, T. (1981). *Samisk Reindrift – Norske Inngrep* [Sámi Herding, Norwegian Interventions]. Tromsø: Universitetsforlaget.
- Brand, F., & Jax, K. (2007). Focusing the meaning(s) of resilience: Resilience as a descriptive concept and a boundary object. *Ecology and Society*, 12, Article 23.
- Brännlund, I., & Axelsson, P. (2011). Reindeer management during the colonization of Sámi lands. *Global Environmental Change*, 21, 1095–1105.
- Carpenter, S., Walker, B., Anderies, M., & Abel, N. (2001). From metaphor to measurement: Resilience of what to what? *Ecosystems*, 4, 765–781.
- Chandler, D. (2013). Resilience and the autotelic subject: Toward a critique of the societalization of security. *International Political Sociology*, 7, 210–226.
- Cote, M., & Nightingale, A. (2012). Resilience thinking meets social theory. *Progress in Human Geography*, 36, 475–489.
- Davidson, D. (2010). The applicability of the concept of resilience to social systems: Some sources of optimism and nagging doubts. *Society and Natural Resources*, 23, 1135–1149.
- Davoudi, S. (2012). Resilience: A bridging concept or a dead end? *Planning Theory & Practice*, 13, 299–307.
- Dong, S., Wen, L., Liu, S., Zhang, X., Lassoie, J., Yi, S., ... Li, Y. (2011). Vulnerability of worldwide pastoralism to global changes and interdisciplinary strategies for sustainable pastoralism. *Ecology and Society*, 16, Article 10.

- Duffield, M. (2011). Total war as environmental terror: Linking liberalism, resilience and the bunker. *South Atlantic Quarterly*, 110, 757–769.
- Eidheim, H. (1999). *Samer og Nordmenn* [Sámi People and Norwegians]. Oslo: Cappelen Akademisk.
- Eira, I. M., Jaedicke, C., Magga, O. H., Maynard, N., Vikhamar-Schiler, D., & Mathiesen, S. (2013). Traditional Sámi snow terminology and physical snow classification: Two ways of knowing. *Cold Regions Science and Technology*, 85, 117–130.
- Evans, B., & Reid, J. (2013). Dangerously exposed: The life and death of the resilient subject. *Resilience*, 1, 83–98.
- Folke, C. (2006). Resilience – The emergence of a perspective for socio-ecological systems analyses. *Global Environmental Change*, 16, 253–267.
- Folke, C., Carpenter, S., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: Integrating resilience, adaptability and transformability. *Ecology and Society*, 15, Article 20.
- Forbes, B., Bölter, M., Müller-Wille, L., Hukkinen, J., Müller, F., Gunslay, N., & Konstantinov, Y. (Eds.). (2006). *Reindeer management in northernmost Europe*. London: Springer.
- Gunderson, L. (2000). Ecological resilience – In theory and application. *Annual Review of Ecological Systems*, 31, 425–439.
- Hausner, V., Fauchald, P., Tveraa, T., Pedersen, E., Jernsletten, J.-L., Ulvevadet, B., ... Bråthen, K. (2011). The ghost of development past. *Ecology and Society*, 16, Article 4.
- Helander, E. (1999). Sámi subsistence activities – Spatial aspects and structuration. *Acta Borealia*, 16, 7–25.
- Holling, C. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, 4, 1–23.
- Holling, C. (1986). Resilience of ecosystems: Local surprise and global change. In W. Clark & R. E. Munn (Eds.), *Sustainable development of the biosphere* (pp. 292–317). Cambridge: Cambridge University Press.
- Holling, C. (2001). Understanding the complexity of economic, ecological and social systems. *Ecosystems*, 4, 390–405.
- Hornborg, A. (2009). Zero-sum world: Challenges in conceptualising environmental load displacement and ecologically unequal exchange in the world-system. *International Journal of Sociology*, 50, 237–262.
- Johnsen, K. I. (2014). The paradox of reindeer pasture management in Finnmark, Norway. Online feature. *Strategic Environmental Impact Assessment of Development of the Arctic*. Retrieved October 1 from <http://www.arcticinfo.eu/en/features/112-the-paradox-of-reindeer-pasture-management-in-finnmark-norway>
- Joseph, J. (2013). Resilience as embedded neoliberalism. *Resilience*, 1, 38–52.
- Li, T. (2007). *The will to improve*. Durham: Duke University Press.
- MacKinnon, D., & Derickson, K. (2013). From resilience to resourcefulness. *Progress in Human Geography*, 37, 253–270.
- Magga, O. H. (2006). Diversity in Saami terminology for reindeer, snow and ice. *International Social Science Journal*, 58, 25–34.
- Magga, O. H., Mathiesen, S., Corell, R., & Oskal, A. (Eds.). (2011). *Reindeer herding, traditional knowledge, adaptation to climate change and loss of grazing land*. Alta: Arctic Council.
- Mathiesen, S., Alfthan, B., Corell, R., Eira, R., Eira, I. M., Degteva, A., ... Turi, J. M. (2013). Strategies to enhance the resilience of Sámi reindeer husbandry to rapid changes in the Arctic. In *Arctic council: Arctic resilience interim report* (pp. 109–112). Stockholm: Stockholm Environment Institute and Stockholm Resilience Centre.
- Maynard, N., Oskal, A., Turi, J. M., Mathiesen, S., Eira, I. M., Yurchak, B., ... Gebelein, J. (2011). Impact of Arctic climate and land use change on reindeer pastoralism: Indigenous knowledge and remote sensing. In G. Gutman & A. Reissell (Eds.), *Eurasian Arctic land cover and land use in a changing climate* (pp. 177–205). London: Springer.
- Norwegian Ministry of Agriculture and Food. (2002). *Proposition to the storting No. 12 (2002–2003) animal welfare and animal husbandry*. Retrieved October 1, 2014, from http://www.regjeringen.no/upload/kilde/lmd/bro/2002/0003/ddd/pdfv/246168-parliamentary_report_number_12_on_animal_husbandry_and_animal_welfare_recovered.pdf

- Nadasdy, P. (2007). Adaptive co-management and the gospel of resilience. In D. Armitage, F. Berkes, & N. Doubleday (Eds.), *Adaptive co-management* (pp. 208–227). Toronto: University of British Columbia Press.
- O'Brien, K., Hayward, B., & Fikret, B. (2009). Rethinking social contracts: Building resilience in a changing climate. *Ecology and Society, 14*, Article 12.
- Oskal, N. (2000). On nature and reindeer luck. *Rangifer, 20*, 175–180.
- Oskal, N., Magga, O. H., & Sara, M. N. (2003). *Dyrevelferd i Samisk Kultur* [Animal Welfare in Sámi Culture], Report to LMD, published with Samisk Høgskole. Retrieved October 1, 2014, from http://www.regjeringen.no/upload/kilde/ld/rap/2001/0017/ddd/pdfv/151133-utredning_dyrevelferd_samisk.pdf
- Paine, R. (1992). Social construction of the tragedy of the commons and Saami reindeer pastoralism. *Acta Borealia, 9*, 3–20.
- Paine, R. (1994). *Herds of the Tundra*. Washington, DC: Smithsonian Institution Press.
- Paine, R. (2004). Saami reindeer pastoralism: Quo Vadis? *Ethnos, 69*, 23–42.
- Pape, R., & Löffler, J. (2012). Climate change, land use conflicts, predation and ecological degradation as challenges for reindeer husbandry in northern Europe: What do we really know after half a century of research? *Ambio, 41*, 421–434.
- Reinert, E. (2006). The economics of reindeer herding: Saami entrepreneurship between cyclical sustainability and the powers of state and oligopolies. *British Food Journal, 108*, 522–540.
- Reinert, E., Aslaksen, I., Eira, I. M., Mathiesen, S., Reinert, H., & Turi, E. I. (2009). Adapting to climate change in reindeer herding – The nation-state as problem and solution. In W. N. Adger, I. Lorenzoni, & K. O'Brien (Eds.), *Adapting to climate change* (pp. 417–432). Cambridge: Cambridge University Press.
- Reinert, H. (2008). *The corral and the slaughterhouse* (PhD dissertation). University of Cambridge. Retrieved October 1, 2014, from <https://www.repository.cam.ac.uk/handle/1810/214796>
- Reinert, H. (2012a). Knives for the slaughter. *Acta Borealia, 29*, 35–55.
- Reinert, H. (2012b). The disposable surplus – Notes on waste, reindeer and biopolitics. *Laboratorium, 4*, 67–83.
- Reinert, H. (2014a). Entanglements – Intimacy and nonhuman ethics. *Society & Animals, 22*, 42–56.
- Reinert, H. (2014b). Weight, density and space in the Norwegian reindeer crisis – Notes towards a critique. *Valuation Studies, 2*, 153–183.
- Reinert, H., Mathiesen, S., & Reinert, E. (2010). Climate change and pastoral flexibility. In Gorm Winther (Ed.), *Political economy of northern regional development* (Vol. 1, pp. 189–204). Copenhagen: Nordic Council of Ministers.
- Rival, L. (2009). The resilience of indigenous intelligence. In K. Hastrup (Ed.), *The question of resilience* (pp. 293–313). Copenhagen: The Royal Danish Academy of Sciences and Letters.
- Sara, M. N. (1999). *Praktisk reinbeitebruk – Tradisjonelle kunnskaper* [Practical Pasture Use – Traditional Knowledge], *Rangifer* (Report No. 3: 93-102). Retrieved October 1, 2014, from <http://septentrio.uit.no/index.php/rangifer/article/viewFile/1602/1505>
- Sara, M. N. (2001). *Reinen – Et Gode fra Vinden* [Reindeer—A Gift from the Wind]. Karasjok: Davvi Girji.
- Sara, M. N. (2011). Land usage and Siida autonomy. *Arctic Review of Law and Politics, 3*, 138–158.
- Sara, M. N., Sjaastad, E., Benjaminsen, T. A., & Reinert, H. (in press). Rein og rovvilt: statlig styring og reindriftsfaglig kunnskap [Reindeer and Predators: State management and pastoral knowledge]. In T. A. Benjaminsen, I. M. G. Eira, & M. N. Sara (Eds.), *Samisk reindrift, norske myter* [Sámi Herding, Norwegian Myths]. Trondheim: Fagbokforlaget.
- Scott, J. (1998). *Seeing like a State*. Yale, CT: Yale University Press.
- Strøm-Bull, K., Oskal, N., & Sara, M. N. (2001). *Reindriften i Finnmark – Rettshistorie 1852–1960* [Reindeer Herding in Finnmark—Legal History 1852–1960]. Oslo: Cappelen.
- Turi, E. I., & Keskitalo, E. C. H. (2014). Governing reindeer husbandry in western Finnmark: Barriers for incorporating traditional knowledge in local-level policy implementation. *Polar Geography, 37*, 234–251.
- Tyler, N., Turi, J. M., Sundset, M. A., Bull, K. S., Sara, M. N., Reinert, E., ... Corell, R. W. (2007). Saami reindeer herding under climate change: Applying a generalized framework for vulnerability studies to a sub-Arctic social-ecological system. *Global Environmental Change, 17*, 191–206.
- Walkate, S., McGarry, R., & Mythen, G. (2013). Searching for resilience: A conceptual excavation. *Armed Forces and Society*, doi:10.1177/0095327X12465419

- Walker, J., & Cooper, M. (2011). Genealogies of resilience. *Security Dialogue*, 42, 143–160.
- Watts, M. (2011). On confluences and divergences. *Dialogues in Human Geography*, 1, 84–89.
- Welsh, M. (2013). Resilience and responsibility: Governing uncertainty in a complex world. *The Geographical Journal*, doi:[10.1111/geoj.12012](https://doi.org/10.1111/geoj.12012)
- Zebrowski, C. (2013). The nature of resilience. Resilience: International policies, practices and discourses. *Resilience*, doi:[10.1080/21693293.2013.804672](https://doi.org/10.1080/21693293.2013.804672)