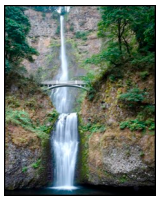
Journal of Environmental Psychology 66 (2019) 101365

Contents lists available at ScienceDirect

Journal of Environmental Psychology

journal homepage: www.elsevier.com/locate/jep



"We will change whether we want it or not": Soil erosion in Maasai land as a social dilemma and a challenge to community resilience

Anna Rabinovich[a,*], Claire Kelly[b], Geoff Wilson[b], Mona Nasseri[c], Issakwisa Ngondya[d], Aloyce Patrick[d], William H. Blake[b], Kelvin Mtei[d], Linus Munishi[d], Patrick Ndakidemi[d]

[a] Psychology, University of Exeter, UK
[b] School of Geography, Earth and Environmental Sciences, University of Plymouth, UK
[c] Faculty of Ecological Design Thinking, Schumacher College, UK
[d] Nelson Mandela African Institution of Science and Technology, Arusha, Tanzania

ARTICLE INFO

Handling editor: Leila Scannell

Keywords:
Soil erosion
Land use practice
Community resilience
Commons dilemma
Community cohesion
Cultural identity

ABSTRACT

Soil erosion is a major environmental challenge that undermines economic development in many regions of the world. While much previous work explored physical processes behind this problem, less attention has been paid to social, cultural, and psychological parameters that make a significant impact on soil erosion through the land use practices that they support. The present paper addresses this gap by conducting a qualitative exploration of agro-pastoralist stakeholders' experiences of soil erosion in northern Tanzania, using the community resilience framework and the social dilemmas approach as theoretical lenses. Interview data suggests that the factors that make communities vulnerable to soil erosion challenges include the centrality of cattle keeping practice to pastoralists' cultural identity, lack of social cohesion, lack of alternative livelihood opportunities, and weak governance structures. We argue that the ways towards resolving the dilemma lie in addressing relevant cultural norms, building cohesive and open communities, and strengthening local governance.

Soil erosion is defined as a displacement or wearing away of soil's upper layers, leading to a reduction of its productivity. It is a critical global problem that affects many areas across the world: A recent report by the UN Food and Agriculture Organization suggests that one third of the Earth's land is strongly degraded, estimating the economic cost of this degradation at 17% of the global GDP (UNCCD, 2017). Soil erosion undermines food security and successful economic development, especially in the regions that strongly depend on healthy soils for agricultural production. While much research effort has been invested into exploring the geophysical and geographical factors behind soil erosion (Blaikie & Brookfield, 1987; Ionita, Fullen, Zgłobicki, & Poesen, 2015; Valentin, Poesen, & Li, 2005; Wilson & Juntti, 2005), less attention has been paid to social, psychological, and cultural processes related to this issue (cf. Blake et al., 2018; Wynants et al., 2019). In the present paper, we aim to start addressing this gap by conducting a multi-disciplinary, qualitative exploration of stakeholder perceptions and experiences of soil erosion in the Monduli district of northern Tanzania and interpreting these in the context of associated socio-psychological and cultural factors. In doing this, we use two theoretical lenses adopted from different disciplines: The social dilemmas approach and the community resilience framework.

1. The community resilience framework

Community resilience relates to the local or community scale and encompasses the human and non-human resources and capacities within a community to take collective action to deal with problems and determine future development trajectories (Magis, 2010). Community resilience research considers system characteristics and processes through which human agency identifies and shapes collective futures (Wilson, 2012). In particular, this approach focuses on the importance of path dependencies (ways in which current choices are constrained by past circumstances) and lock-ins (sets of circumstances that make certain developmental pathways impossible to implement) to understand

* Corresponding author. Psychology, University of Exeter, Perry Road, Exeter, EX4 4QG, UK.
E-mail addresses: a.rabinovich@exeter.ac.uk (A. Rabinovich), claire.kelly@plymouth.ac.uk (C. Kelly), geoff.wilson@plymouth.ac.uk (G. Wilson), mona.nasseri@schumachercollege.org.uk (M. Nasseri), ngondyai@nm-aist.ac.tz (I. Ngondya), patrickaloyce@gmail.com (A. Patrick), william.blake@plymouth.ac.uk (W.H. Blake), kelvin.mtei@nm-aist.ac.tz (K. Mtei), linus.munishi@nm-aist.ac.tz (L. Munishi), patrick.ndakidemi@nm-aist.ac.tz (P. Ndakidemi).

https://doi.org/10.1016/j.jenvp.2019.101365
Received 21 March 2019; Received in revised form 11 September 2019; Accepted 25 October 2019
Available online 31 October 2019

Fig. 1. Conceptual framework for analysing community resilience. (Source: Kelly et al., 2015, 12).

how the resilience of communities is affected by environmental, economic, or social challenges. Resilience is usually seen as a normative concept, i.e., a goal that stakeholders can strive to achieve (Wilson, 2017). With this in mind, in this paper we will refer to notions of 'strong', 'moderate' and 'weak' resilience, with strong resilience corresponding to the survival of a community as a cohesive unit able to withstand future shocks and disturbances.

To assess resilience at community level, we will use the conceptual framework developed by Emery and Flora (2006) and Kelly et al. (2015) which suggests that social, cultural, natural, economic and political/governance-related domains need to be taken into account to understand how resilient a community is (Fig. 1). Many authors have emphasised the importance of understanding the complex interplay between various domains for assessing community resilience (e.g. Buikstra et al., 2010; Emery & Flora, 2006; Wilson, 2012), suggesting that community resilience will be strongest where there is a balance between domains and they are equally well developed. As Fig. 1 suggests, there are close interlinkages between the five domains and they broadly have equal 'weighting' – therefore, weakening one domain (e.g., weakening the social and cultural domains through outmigration) can also affect other domains (e.g., by reducing the availability of social capital for collective action). Building on Resilience Alliance (2007), Wilson (2012), and Kelly et al. (2015), in this article we will analyse evidence of community resilience and vulnerability to soil erosion across the five domains in Fig. 1.

The community resilience model provides a useful framework for describing and evaluating parameters related to stakeholders' ability to overcome the impacts of soil erosion. At the same time, it represents a generic approach applicable to multiple impacts challenging community resilience and, as such, does not offer a tailored theoretical framework for the specific situation that the communities we study are facing (i.e., a need for collective cooperation around a shared natural resource). The social dilemmas approach was developed specifically to understand (and change) collective behaviour and individual choices associated with management of shared resources. It offers a complementary way of analysing human behaviour factors associated with soil erosion, as well as providing evidence for parameters that can contribute to problem resolution – and, as a result, increase community resilience.

2. The social dilemmas approach

The social dilemmas approach is a way of describing and theorizing situations where actors face trade-offs between individual and collective benefits. It is applicable to multiple real-life contexts and is widely used in psychology, economics, and other disciplines (for reviews, see Messick & Brewer, 1983; Van Lange, Balliet, Parks, & van Vugt, 2014). Several types of dilemmas are described in the literature, but one that is most relevant to the problem of soil erosion in the context of agro-pastoralism is the "commons dilemma" (or "tragedy of the commons", Hardin, 1968) – in fact, an example most frequently used to illustrate unsuccessful resolution of this type of dilemma describes a (hypothetical) community where cattle grazing decisions lead to pasture and land deterioration. The "commons dilemma" is characterised by a situation where individuals have unrestricted access to a shared resource (e.g., communal land) and have a choice to contribute towards (protection of) this resource or not (e.g., reduce number of cattle grazed or not). Contributions are always costly and do not affect immediate individual pay-offs from using the resource (e.g., it is costly to reduce cattle numbers) – therefore, an incentive not to contribute is very strong. However, if most community members choose not to contribute towards resource protection, this leads to resource depletion and collapse (Dawes, 1980). In other words, choices based on maximizing individual benefit are detrimental for the shared resource and the community as a whole.

Previous work on commons dilemmas has identified a number of factors that increase the likelihood of cooperative choices (i.e., choices that maximise collective, rather than individual, benefit) and ensure protection and stability of shared resources. While it is not possible to review all of these here (the following sources provide examples of comprehensive reviews: Messick & Brewer, 1983; Parks, Joireman, & Van Lange, 2013; Van Lange et al., 2014), several socio-psychological factors that are most relevant to the present context can be identified. Specifically, we chose to focus on group identification, group norms, and effective communication as the three socio-psychological parameters that have been frequently identified as drivers of cooperative solutions and are open to modification from within a group (thereby offering realistic opportunities for community-led change). We provide a brief review of the relevant evidence below.

Group identification refers to a psychological sense of connectedness with, and belonging to, a group (e.g., community, Levine & Hogg, 2009). According to social identity and self-categorization theories (Tajfel & Turner, 1986; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987), this connectedness develops as a result of incorporating group membership as an aspect of one's self-concept. Previous research demonstrates that contributions to shared resources increase when there is a strong sense of group belonging. For example, Wit and Kerr (2002) demonstrated that group identification (experimentally boosted within a lab environment) increased concern for collective interest and contributions to a shared resource. Similarly, Rabinovich and Morton (2011) showed that individuals who were given an opportunity to experience a sense of connection with a meaningful group were more willing to protect a natural resource the group shared (see also Heath, Rabinovich, & Barreto, 2017). The role of group identification in motivating collective environmental action (that can be seen as a response to a large-scale commons dilemma) has received substantial support (e.g., Bamberg, Rees, & Seebauer, 2015). According to the social identity model of collective action, group identification drives cooperative action by increasing collective efficacy and emotional dissatisfaction with the situation that the group finds itself in (Van Zomeren, Postmes, & Spears, 2008).

Another factor that drives contributions to shared resources is cooperative group norms. Self-categorization theory suggests that individuals who identify with their group internalize group norms and

values and adopt these as guiding principles for individual choices (Turner et al., 1987). Biel and Thogersen (2007) provided a comprehensive overview suggesting that activation of relevant social norms contributes to cooperation in social dilemmas related to environmental resources, and Bicchieri (2002) demonstrated that group norm development is a crucial process linking collective discussion of a dilemma with cooperative choices. Earlier experimental work in laboratory contexts shows that developing cooperative consensus and internalizing corresponding group norms is fundamental for motivating decisions that prioritize collective (rather than individual) outcomes (Kerr, Garst, Lewandowski, & Harris, 1997; Orbell, van de Kragt, & Dawes, 1988). Similar results were obtained in field settings, where relevant group norms were demonstrated to motivate engagement with sustainable agricultural practice among Australian farmers (Fielding et al., 2008) and decrease overconsumption of energy in the US (Goldstein, Cialdini, & Griskevicius, 2008). There is also an interplay between group norms and identification, such that the impact of norms is stronger when the level of group identification is high (Wildschut, Insko, & Gaertner, 2002).

Finally, there is evidence that effective communication within a group promotes successful management of shared resources (see Sally, 1995, for a meta-analysis; Meleady, Hopthrow, & Crisp, 2013, for a review). For example, Bouas and Komorita (1996) demonstrated that giving groups an opportunity to discuss a dilemma they are facing before making individual choices decreases the likelihood of shared resource depletion. Other research showed that such discussion effects are due to explicit promise-making (Orbell et al., 1988), and subsequent internalization of the commitment to cooperate (Kerr et al., 1997). Meleady et al. (2013) suggest that the discussion effect on cooperation takes place through a series of stages, including group identification strengthening, demonstration of cooperation benefits, and consensus development and internalization – in other words, discussion facilitates the two processes described above (identification and norms). There is also evidence that group discussion with like-minded individuals facilitates collective action for environmental sustainability (e.g., Thomas, McGarty, & Mavor, 2009).

While psychological research on commons dilemmas is extensive and clearly identifies parameters responsible for cooperation around shared resources, much of it takes place in a laboratory context (but see Van Vugt & Samuelson, 1999; Van Vugt, Van Lange, Meertens, & Joireman, 1996), and focuses on one predictor of cooperative choices at a time. It is crucial to extend this approach to field contexts, where both groups and dilemmas in question are established, and choices have vital consequences for individuals and communities – indeed, this is what reviews regularly call for (e.g., Kopelman, Weber, & Messick, 2002; van Lange, Joireman, Parks, & van Dijk, 2013). It is also important to explore the relevance of existing principles in non-Western contexts, where applying them could have dramatic effects on communities' welfare and resilience. The present paper proposes such an extension by applying the commons dilemma framework to analysing stakeholder experiences related to soil erosion in northern Tanzania. Identifying factors associated with willingness to cooperate around shared resources may open up opportunities for enhancing resilience of communities affected by soil erosion, thereby linking the two theoretical frameworks we use through their practical application.

3. Present research

The present study is an initial step in developing an understanding of some of the social, psychological, and cultural parameters related to soil erosion in northern Tanzania. Given the paucity of social science research on the topic, we started by conducting a qualitative investigation of stakeholders' accounts of the soil erosion problem, current land use practices, and perceived barriers and opportunities for adopting alternative practices, as well as social, cultural, and governance context framing these. The first part of the analysis used the community resilience framework to assess stakeholder resilience to soil erosion in their area. The second part used the commons dilemma

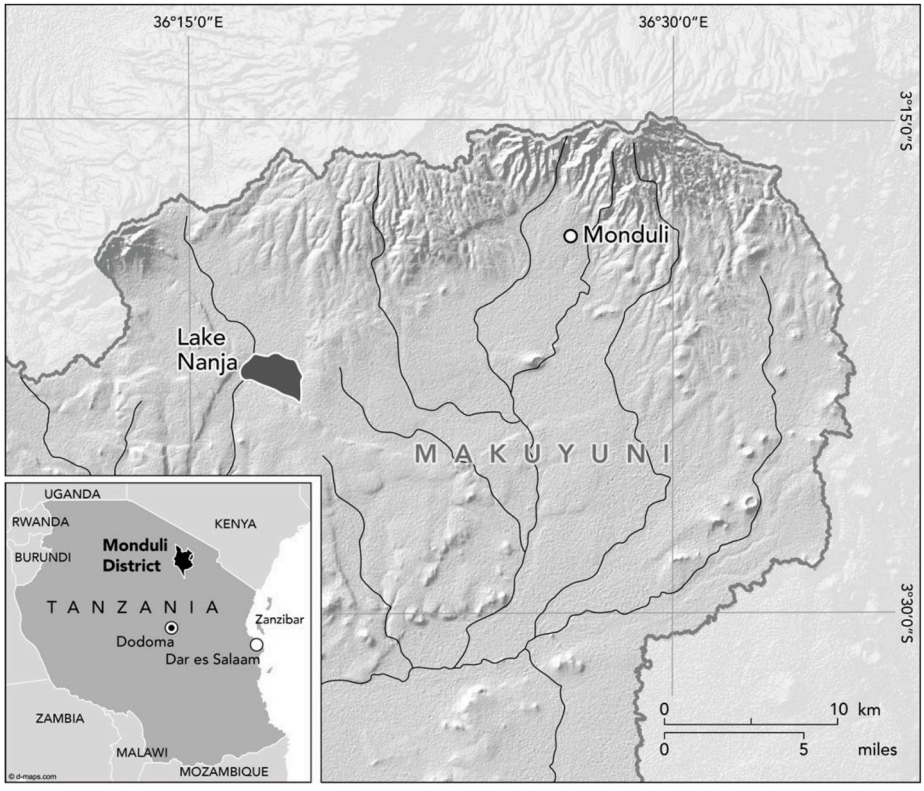


Fig. 2. Monduli district in northern Tanzania.

framework to explore parameters associated with stakeholders' willingness to cooperate and take collective action in the wake of threats to the shared resource. We aimed to addressed the following research questions: What are participants' experiences of soil erosion on their land? How is this problem reflected within different community resilience domains? and What processes may hinder or facilitate cooperation around this problem?

The study was conducted in the Monduli district of northern Tanzania, part of the East African Rift System (see Fig. 2). The area suffers from significant soil erosion problems – a recent study demonstrated that over the last two decades, soil aggregate stability and infiltration capacity have been significantly reduced, which has led to sheet wash erosion and pronounced gully development (Blake et al., 2018). Maasai pastoralists constitute a large proportion of the area's population, and it is these communities that suffer most from soil erosion issues. While changing weather patterns may be a major factor contributing to this, land use practices also exacerbate the problem. The present study focuses on barriers and opportunities for changing these from the communities' perspective, while grounding the analysis in a wider set of parameters contributing to community resilience or vulnerability.

4. Method

4.1. Participants and procedure

A qualitative approach was used, with semi-structured interviews as the method of data collection. Seventeen respondents from the Monduli district took part in the study (13 male, 4 female). Most participants were Maasai pastoralists and farmers (n = 14), the remaining interviewees were representatives of farmer organisations or local government officials advising Maasai communities on agricultural practices. Interviews were conducted in participants' home villages. For cultural reasons, responsibility for inviting community participants was devolved to local village leaders. They were asked to approach community members engaged in pastoralist or agri-pastoralist activities and invite them to participate on a voluntary basis, aiming for a gender balance wherever possible. Informed consent was sought from participants. After each interview was completed, participants were given the opportunity to ask questions and were provided with an information sheet.

Most interviews (twelve) were conducted by a member of the UK research team, with translation and cultural assistance from a member of the Tanzanian team, following guidance by Weiss (1994). The remaining five interviews were conducted by the Tanzanian team who were trained in interview techniques during the first stage of the data collection. Each interview lasted between 30 and 100 min. Interviews were audio-recorded and transcribed verbatim (in Swahili), using basic transcription (i.e., capturing all verbal, but not paraverbal information). The transcripts were subsequently translated into English. The interview schedule focussed on the following main topics: Community livelihoods, land use practices, soil erosion, community life, and cultural identity.

4.2. Data analysis

We employed a thematic analysis approach (Braun & Clarke, 2006) for data analysis. We chose to conduct theoretical thematic analysis, where the coding process was primarily driven by the two theoretical frameworks used (community resilience and social dilemmas frameworks). This choice was made in order to give the analysis a specific focus and to provide a more detailed account of themes related to resilience and socio-psychological processes involved in the shared resource management, in the context of soil erosion. At the same time, we aimed to maintain a degree of flexibility, with some codes (and, subsequently, themes) being driven by our perception that they are central to participants' experience and essential for framing the focal issue. We used realist approach to the data, assuming that participants' use of language reflects their experiences and perceptions. This choice of epistemological approach was made with the aim of exploring processes framing the problem of soil erosion, based on the assumption that participants' accounts provide some access to such processes. In line with this approach, we coded for semantic themes, identified within the explicit meanings articulated by the participants.

The analytic process started with a careful reading of the complete dataset, followed by initial coding of data excerpts. We then sorted these codes into initial themes, and reviewed these using criteria of internal homogeneity and external heterogeneity (cf. Patton, 1990, see Table 1 for the final set of themes). Both processes of coding and theme identification were guided by the chosen theoretical frameworks. The dataset was re-read at this stage to make sure that the identified themes describe it well. Finally, we identified how the final themes fitted together to provide an overall account of the data. Below we present an overview of the main themes, structuring it according to the resilience domains (shown in Fig. 1). This is followed by a reflection on the links between the themes and a construction of an overall account (Fig. 4). Excerpts from the interviews are referenced throughout by a letter showing participant gender and transcript number.

Table 1
List of themes.

Theme	Sub-themes	Description
Problem awareness	Concerns about the future; Livelihood threat; Accessibility/mobility threat	Participants talk about signs of soil erosion and implications that it has for them
Solutions	Adaptation; Mitigation; Ineffectiveness	Participants talk about solutions they have tried and evaluate these
Transitions	Climate change (droughts, unpredictable rain season onset); Population growth; Uptake of crop growing; Limits on migration (pressure on existing tracking routes); Adoption of private land ownership (responsibility for private land)	Participants talk about environmental and social changes they have noticed or experienced, in the context of soil erosion
Cattle as economic asset	Liquidity; Drought as threat; Lack of alternative skills; Lack of access to/ unreliability of alternative markets	Participants talk about and justify the role of cattle in their livelihoods
Cultural norms linked to cattle-keeping	Cattle as a core element of Maasai identity; Cattle as status symbol; Cattle keeping as a lower-risk practice; Changing norms	Participants talk about the social meanings of cattle and perceived normative prescriptions linked to cattle-keeping
Limits of community cohesion	Support available; Support available in extreme cases/when requested; Gendered support; Lack of support for problems on others' land; Lack of discussion and motivation to cooperate	Participants discuss availability of cooperation and communication processes within their communities
Pathways to normative and practice change	Experience (drought); Intergenerational transfer (children to parents); Champions/knowledge exchange; Inescapable change	Participants talk about sources of information and inspiration for current and future land management practice change
Local governance weakness	Collective decision-making; Local power misuse; Lack of open discussion; Non-confrontational norms as a barrier to challenging misuse	Participants discuss difficulties associated with management of communal natural resources

5. Results and discussion

5.1. Natural and economic domains: problem awareness and alternative livelihoods in the context of environmental and socio-economic change

As noted above, the extent of the soil erosion problem in the Monduli district is significant. Participants demonstrated a high level of awareness of this issue. Many of them expressed strong concern about soil erosion and the implications that it has for their livelihoods and their children's future: "*We are now worried that our children won't have a place to farm and graze their cattle*" (F5). When asked about signs of erosion, participants mentioned gullies forming and increasing in size, but also soil loss on their farms, and accumulation of sediment in water reservoirs. Participants spoke about a range of solutions that they practice, directed both at adaptation to existing erosion (e.g., filling gullies with branches or manure) and mitigation of future damage (e.g., building barriers on farmland, using contour cultivation, hole planting, chemical weeding). At the same time, none of these solutions was perceived as sufficiently effective: "*As a community we don't have any technique or knowledge … to solve the soil erosion problem*" (F5). Overall, despite high awareness of the soil erosion issues, community resilience in the natural domain can be characterised as weak.

As is typical in Maasai communities, pastoralists in the Monduli district placed great emphasis on cattle as a valuable economic and socio-cultural resource (cf. Warren, 1995). Participants talked about cattle as a 'liquid asset', which can be used as a buffer when needed during times of environmental or economic disturbances. Some interviewees stressed that other sources of sources of livelihood (i.e., crop farming) are unsuitable for this purpose and used this lack of immediate liquidity as an argument against alternative sources of livelihood: "*I don't think that [shifting to farming] will happen because we use cattle as an alternative to farming for getting money whenever there is an emergency. In such situations you cannot wait until you sell crops because crops take a long time. So most people sell cattle and after they harvest they sell crops to replace the cattle …*" (M8). Other barriers to economic diversification are lack of alternative skills, as stated by some participants: "*Many of us know nothing about other business than cattle keeping …"* (M7) and unavailability of dependable markets, as well as delays in payments from (commercial) buyers. For example, one participant (M17) commented on a failed initiative to tap into the global flower trade: "*The price for dry flowers remained unchanged for over three years, which meant that some farmers have stopped growing those flowers. They also don't give you money on time, it can take up to three months to get all your money."*

From a community resilience perspective, the economic domain is characterised by pronounced lock-ins and path dependencies. While some participants expressed a willingness to embrace wider market possibilities (e.g., production of dry flowers mentioned above), a combination of geographical and socio-economic constraints has hampered the development of a more multifunctional economic base. Given that the main economic asset (cattle) is under significant threat from changing environmental conditions, the economic resilience of Maasai communities in the Monduli district can, therefore, also be described as weak.

The threats discussed above relating to the natural and economic domains are overlaid by higher spatial level demographic, social, and economic transitions that have been taking place in the recent decades. The first of these is the partial shift from cattle-keeping to mixed livelihoods (supplementing cattle-keeping with small-scale crop farming). The lack of pasture land (due to erosion and population growth) and changes in weather patterns were mentioned as the main reasons for this shift: "*Our parents have been dealing mainly with livestock keeping, (but) due to … shortage of rain and shortage of pastures we decided to shift to agriculture*" (M8). While this transition is a sign of vulnerability to changing environmental factors, it also demonstrates capacity for adaptation. This observation is consistent with previous research on pastoralist capacity for adaptation (e.g., Campbell, 1999; Huho, Ngaira, & Ogindo, 2011; Opiyo, Wasonga, Nyangito, Schilling, & Munang, 2015; Wangui, 2018), and contributes to extensive empirical evidence on adaptability to changing environmental conditions noted in other pastoralist communities in different regions of the world. The shift to mixed livelihoods may, however, itself indirectly increase pressure on communal land and affect social cohesion within communities, as we will see below.

The second shift is related to migration patterns. Previously, Maasai families led a nomadic life-style, following the rains with their cattle. However, most families now remain in permanent homesteads, and only young men and boys, whose responsibility it is to tend cattle, move to new pastures and then return back: "*Nowadays we don't migrate with the whole family as before, when we used to abandon an area and never come back*" (M6). This is explained both by an increased importance of crop farming, and by the disruption of traditional migration patterns due to commercial and governmental uses of land: *"… you can only move this much and not more … because in the middle where we used to track there is military land, and after that there is an investor, we cannot cross his land"* (M11). One important implication of this shift to a more settled life-style is that cattle herds pass along the same route much more often, thus increasing the pressure on the soil. The experience described by participants here is consistent with wider trends of land appropriation across pastoralist territories that, cumulatively, undermine the sustainability of traditional pastoralist systems (e.g., Abbink et al., 2014; Bluwstein et al., 2018).

Finally, the shifts to a more settled life-style and crop farming have contributed to another important transition within Maasai communities: The shift from communal to private land ownership: "*Traditionally we owned land as a communal property not as an individual property, but farming and being immobile forced us to own land as individuals.… If [families] don't move they will step on each other's toes … so we [decided] … each one should take care of their own land!*" (M11). The shift to private land ownership is described here as a way of avoiding conflict within communities – again, demonstrating capacity for adaptation. At the same time, private ownership of agricultural land shifts each household's responsibility away from communally owned pastures. This change in land ownership could undermine community cohesion (e.g., Desmarais, Qualman, Magnan, & Wiebe, 2015), weakening willingness to invest efforts in protecting shared pastures from erosion.

Overall, the above analysis suggests that there are several transition processes taking place in Maasai communities that may undermine environmental resilience by a) exacerbating pressure on land and b) undermining motivation to invest in communal land protection. From the perspective of the social dilemmas approach, this describes a typical setup for a commons dilemma, where a shared resource faces significant environmental threats and, once destroyed, is not renewable. At the same time, economic pressures create a strong reliance on this resource among local stakeholders and, together with the lack of livelihood diversification, push for a more intensive resource exploitation. As previous research suggests, there are parameters that can prevent over-exploitation in these circumstances, such as group identification, cooperative norms, and effective communication. Below we consider evidence for the presence of these parameters within the communities in focus, while locating them within relevant resilience domains.

5.2. Social domain: community identification, support, and gender

Participants' reflections on the amount of connectedness and support within their communities offer a mixed picture. Some participants mentioned examples of mutual support (e.g., sharing equipment, running lending banks): "… *in this community we do have good cooperation, for example one who doesn't have an ox-plough can get help from the one who has … Women in this community strongly* support *each other, for example, during weeding season women would help each other from one plot to another until they weed all the plots.*" (F1). At the same time, some

interviewees suggested that this support was available in times of crisis (such as death in a household or severe drought), but outside of these situations they were mostly 'on their own'. Participants mentioned that if they asked neighbours for help, in most cases it would be given, but it would not necessarily be freely offered otherwise.

The lack of strong connectedness seems to have direct implications for communities' ability to respond to soil erosion issues. For example, one participant spoke about community members' unwillingness to cooperate if the problem did not occur on their own land: "… [other villagers] *can only willingly come to help fix a problem in my area if that gully is used by their cattle … So it has to be a problem that affects them, too*" (M7). When asked directly whether erosion on shared land was considered a problem later during the interview, the participant gave a negative response: "Interviewer*: If this problem [gully formation] occurs on communal land and not your land, do you consider it to be a problem?* Interviewee*: No, it's not a problem! I will just tell my children not to take cattle into those areas as they are dangerous …"* (M7). These excerpts suggest that the strength of group identification within the communities in focus was not always sufficient to enhance priority of shared community issues and support cooperation around resolving the problem of degrading shared land.

In places, weak community identification was associated with lack of open communication about soil erosion issues and a lack of availability of community-wide forums for negotiating solutions. For example, one participant mentioned there was little willingness within his community to engage in collective discussion of these issues: "*… there was no time that we sat together as a community to look at what can be done about soil erosion …"* (M3). A similar situation was described by an interviewee from a different community, who stressed the priority of privately owned land for each household and the difficulty in mobilizing collective action: "*Village meetings are there, but we don't meet for discussing land issues. Everyone has to be responsible for their land … There are people who try to mobilize others to [address soil erosion], but response is very low, as people don't show up.*" (F10). At the same time, some interviewees demonstrated an advanced understanding of the link between group cooperation and their community's ability to resolve the dilemma: "*Cooperation among community members should be strengthened … For example, if we had cooperation then we would find right grasses to plant and … trees that when planted could prevent soil erosion …. All this could have mitigated soil erosion if only we had cooperation among ourselves.*" (M3).

There was also a gendered aspect to participants' reflections on connectedness and social support within their communities: Some interviewees mentioned strong support between women of the same community (see above), while others discussed the negative impact of the Maasai patriarchal system: "*… the challenge is that [when a woman] harvests, the household head takes the whole produce to the market and leaves the spouse with nothing. Based on our culture, it's difficult for a woman to ask the household head where the produce was taken. Women toil but men benefit from women's hard work.*" (M1). It seems, therefore, that group identification and social support in many communities are split along gender lines: Connectedness within gender groups (especially among women) may be very high, but this does not necessarily lead to the whole community being bound together.

Overall, analysis from a community resilience perspective suggests that the social domain is partly characterised by negative lock-ins and path dependencies related to weak social support in some communities, and gendered power distribution across all of them. This latter finding is in line with the existing research on gendered risk distribution and vulnerability in pastoralist communities (e.g., Goldman, Davis, & Little, 2016; Talle, 1988) and calls on gender mainstreaming in international development more generally (e.g., Benería, Berik, & Floro, 2015; Parpart, 2014). At the same time, some evidence of cooperation within communities (and especially within gender groups) was also evident. Based on this evidence, the social domain can be characterised as moderately resilient.

Analysing the above evidence from a commons dilemma perspective, it can be concluded that community identification is often insufficiently strong for group members to recognize the degradation of the communal land as a priority that needs addressing. This conclusion is linked to an earlier observation that the transition to private land ownership shifted households' sense of responsibility away from communal land. Weak identification with fellow villagers and lack of open communication about the issue may represent a barrier to cooperation needed to address the soil erosion problem. These findings are consistent with the existing research on the role of group identification in cooperation in social dilemmas (e.g., Rabinovich & Morton, 2011; Wit & Kerr, 2002) and in collective environmental action (e.g., Bamberg et al., 2015), demonstrating that this parameter is likely to play an important role in the context of communal land management.

5.3. Cultural domain: social norms, cultural identity content, and pathways to change

Some interviewees highlighted that Maasai cultural identity is closely associated with traditional extensive (transhumance) pastoralism and livestock rearing. Cattle were described as a central component of Maasai collective identity content (i.e., a sense of what it means to be a member of this cultural group). For example, one interviewee said: "*… it is impossible to abandon cattle-keeping and still be called a Maasai! If you do that you are not a Maasai!*" (M6), suggesting that it is impossible to retain one's cultural identity while shifting to a different type of livelihood. In addition, the size of herd appears to be a significant marker of a male Maasai person's status. One participant described the historical link between status and herd size in the following way: "*If I hear that someone has 1000 cattle I must struggle to have 5000! We are competing to have more cattle than anybody else.*" (M6). These excerpts point towards a strong embeddedness of the practice of large herd keeping within the interviewees' collective identity, and the centrality of this practice for maintaining status within the cultural group, in line with existing accounts of Maasai culture (e.g., Fratkin & Mearns, 2003; McPeak, Doss, & Little, 2011).

The above evidence suggests that there are strong social norms within the participant communities encouraging ownership of large cattle herds and legitimizing such ownership as a status symbol. In addition, there seem to exist norms linking livestock rearing (as opposed to crop farming) with adaptability and low risk. Here is how one participant described views of his friend who opposed crop farming as a high risk activity: "*One of my friends who has a lot of cows … once told me:"I cannot imagine you guys can put seed in the ground and look up! … What do you believe in? I have my cows - if it's dry here I move to greener pastures, if it's dry there I move to another greener pasture! You roll up your farms and go to where it's raining!*" (M11). This excerpt demonstrates that traditional pastoralism is perceived as a normative low risk activity that ensures adaptability to environmental pressures, while recent shifts to crop farming are represented as unreasonably risky. This view is in line with the existing work on ambiguity and risk aversion within African pastoralist societies (Bryan, 2013; Liebenehm & Waibel, 2014), and suggests that risk perceptions may lag behind the ongoing environmental change – for example, an increased risk of losing cattle during droughts may not be recognized. Consequently, enhancing resilience may require adjusting risk perceptions associated with traditional and alternative livelihoods – a suggestion that may be of relevance to different types of societies undergoing environmental or social change.

There is some evidence that such an adjustment is happening for some participants. For example, some interviewees talked about their recent experience of drought, and the fact that this has changed how they think about cattle keeping: "*If you advise us to reduce the number of livestock we will listen, because we normally lose many cattle during dry season*" (M6). This experience seemed a stronger driver for change for some respondents than the soil erosion itself: "Interviewer*: … might you think about reducing your livestock numbers because of soil erosion?*

Interviewee: *No, but I will do it because of drought." (M7)*. In resilience terms, this highlights that respondents may be more willing to adjust to fast-onset shocks such as droughts, but less willing (or able) to adjust to slow-onset disturbances such as soil erosion. This observation is consistent with the suggestion that different adaptation pathways may be activated for coping with fast and slow onset hazards and, consequently, societies may demonstrate different resilience levels with respect to each of these (Cutter et al., 2008; Handmer & Dovers, 2009).

Another pathway to change is offered by children's school education, and the influence they exert through this on their parents: "*Children told us that keeping a big number of cattle isn't wealthy because at some point a big number will die due to drought and diseases*" (F1). Norms about sustainable ways of crop farming (e.g., hole planting, terracing) also seem to be changing through intra-community observation of successful practice: "*People have started joining [a conservation agriculture group] this year after witnessing that I am practising it, so they joined the group in order to be taught …" (M3)*. Overall, many interviewees demonstrated significant openness to change and willingness to learn. Some of them described an acute sense that a move away from traditional lifestyle is inevitable: "*What I believe in [is that] we should always be ready for any change, although we have been pastoralists for millions of years … we will change whether we want it or not! … and if we don't want to change, our circumstances, the environment will make us change …. We are trying as much as possible to stick to our guns but no way! We will eventually change!*" (M11).

Overall, from the community resilience perspective, the cultural domain can be described as moderately resilient, as lock-ins related to cultural norms exist side by side with openness to adaptation and change. From the social dilemmas perspective, the data suggest that existing group norms related to cattle keeping, and perceptions of risks associated with traditional and new lifestyles, may stand in the way of resolving the commons dilemma of soil erosion. This is exacerbated by the strong embeddedness of cattle keeping within Maasai cultural identity content. At the same time, there is evidence of normative change taking place through peer influence, learning through experience, and inter-generational transfer of knowledge, opening up opportunities for addressing the dilemma.

5.4. Political/governance domain: local governance and norms of decision-making

The data suggest that collective decision-making plays an important role in community functioning, although decision-making forums are not always used to discuss soil erosion issues. At the same time, some interviewees pointed towards distinct difficulties in the domain of community governance. For example, a participant (M11) talked about "devolution of power" (i.e., the transfer of powers and responsibilities from higher-level government structures to the community level), and the consequences this has for over-exploitation of natural resources (e.g., forest grazing and clearance – a practice that has detrimental consequences for soil erosion): "*… there is what they call a 'community approach to conservation'. They nominate members of the community here, for example [they] say "you are the committee for forest conservation", and I have livestock. I have to take my livestock into the forest as I have power. I'm the member of the committee … Who will come and ask me why I'm doing this? This situation is like asking a hyena to become a judge of a goat.*" This excerpt suggests that the power allocated to local committees may sometimes be misused.

Possible reasons for this misuse may include the factors discussed above – in particular, insufficiently strong community identification (leading to prioritization of individual or household needs over those of the community), cultural norms that attach high value to cattle, and lack of access to alternative livelihoods. Another reason for community-level governance failing becomes apparent when the same interviewee describes how disagreements around resource management are dealt with: "*There are a lot of people who don't agree with what is taking place now [encroachment on the forest]. … But they say 'ok it's not our concern'. … The best way to be in a community is don't interfere when you are not supposed to! … You will be safe and happy in the community …*" (M11). The interviewee suggests that while some members of the community may support shared resource protection and practice change, they do not attempt to influence others, preferring to avoid conflict. Preserving agreement and 'harmony' within a community seems to be one of the key norms that is prioritized above natural resource protection.

The above analysis suggests that local governance of natural resources is associated with a number of problems and can be described as weak. While formal opportunities for managing resources locally exist, these seem to be undermined by the avoidance of open disagreement and discussion, and the misuse of local committee positions to pursue individual interests. From the commons dilemma perspective, it can be concluded that these weaknesses in local governance are likely to be rooted in prioritising individual interests over community ones and the social norms that encourage avoidance of disagreement and confrontation. This observation is consistent with the existing models of communication effect in cooperation, which suggest that an open dialogue around a dilemma, including the stage where conflicting views are discussed, is crucial for a successful resolution (e.g., Meleady et al., 2013).

5.5. Community resilience overview

Overall, the community resilience assessment has revealed a mixed picture (see Fig. 3), where none of the domains could be characterised as strongly resilient. The social domain emerged as moderately resilient in line with cognate studies that discuss social capital in Maasai and other livestock herding communities (e.g. Fratkin & Mearns, 2003; McPeak et al., 2011; Silver, 2009) but with some variability in the strength of social connectedness and support noted across communities. The cultural domain also emerged as moderately resilient, largely due to strong lock-ins associated with male-focused cultural importance of cattle ownership as a status symbol. Echoing existing studies on Maasai culture, it seems culturally inconceivable for some participants to give up their cattle herds for alternative livelihood means (Fratkin & Mearns, 2003; Galvin, 2009). The most problematic domains, however, are the economic, governance, and environmental ones. The weakness of the economic domain is linked to negative lock-ins associated with a strong dependence on livestock grazing and lack of sustainable economic alternatives for more multifunctional rural livelihoods (cf. Wilson, 2012), while the local governance domain could be a potential stumbling block

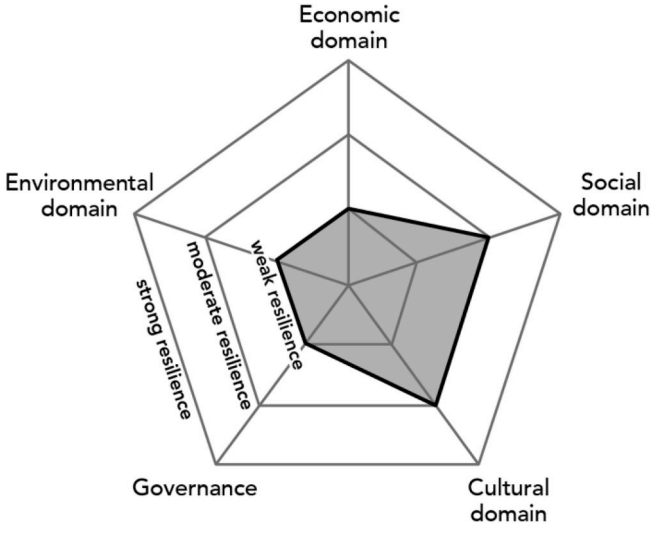


Fig. 3. Community resilience assessment summary.

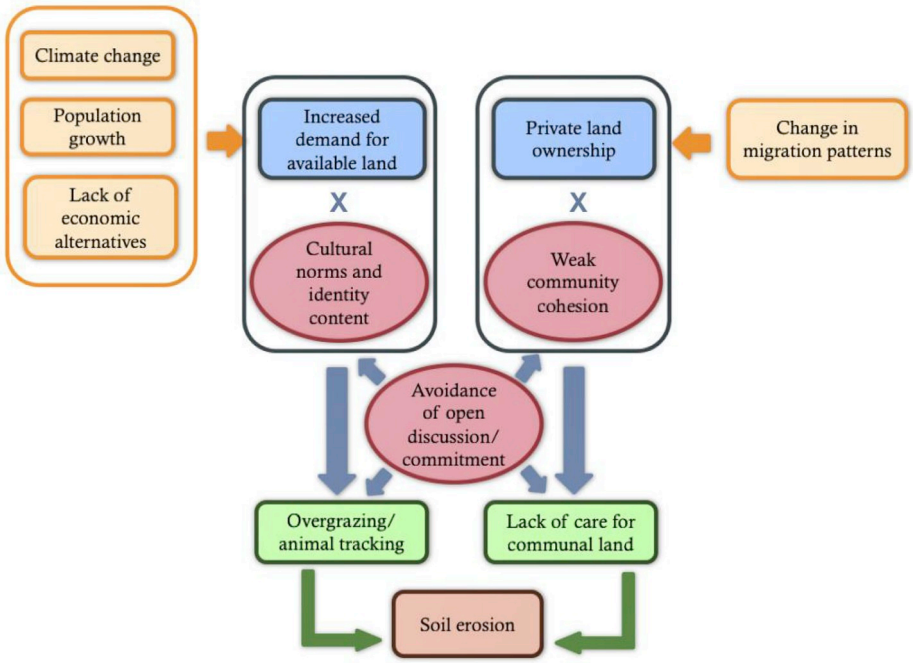


Fig. 4. Processes contributing to the social dilemma of soil erosion.

for successful implementation of policies and regulations alleviating soil erosion.

From a theoretical perspective the above analysis highlighted the utility of the five-domain resilience framework (Kelly et al., 2015) for understanding community vulnerability to environmental challenges, demonstrating that this model provides a rich and systematic structure for understanding resilience pathways and transitions in small-scale communities. The analysis has also supported the role of negative dependencies and lock-ins in driving overall resilience trajectories, demonstrating close interactions between resilience domains. For example, cultural importance of cattle (cultural domain) combined with the lack of economic alternatives (economic domain) exemplified lock-ins that increased vulnerability in the natural domain (by increasing the pressure on land). This finding is consistent with critical analyses by Davidson (2010) and Wilson (2012) who suggest that community resilience is based on a well-developed balance between various domains, rather than the isolated strength of one or two of them. In practical terms, this suggests that resilience-enhancing interventions should aim to develop capacity across a number of domains in parallel, focussing on path dependencies and lock-ins that bridge across these.

5.6. Soil erosion as a social dilemma: key processes

From the social dilemmas perspective, soil erosion on Maasai land represents a typical example of the commons dilemma. Pressures of climate change, population growth, and changing migration patterns have increased pressure on grazing land, while changing patterns of land ownership may undermine willingness to protect the land that remains communally shared. Given the lack of economic alternatives, community members are motivated to maximise grazing without bearing conservation costs. Key factors linked to communities' inability to tackle the crisis include: a) weak social connectedness in some communities, leading to lack of engagement with the problem when it occurs on communal land and prioritization of individual needs, b) lack of open discussion at community level, c) strong social norms encouraging ownership of large herds and positioning traditional cattle keeping as a route to resilience and adaptability, and d) avoidance of open disagreement with other community members (allowing those who misuse shared resources to remain unchallenged). This analysis is visually represented in Fig. 4. The factors above are exacerbated by the fact that cattle keeping constitutes a key element of Maasai cultural identity content and, consequently, the discourse of change represents a significant social identity threat (cf. Branscombe, Ellemers, Spears, & Doosje, 1999). At the same time, there is evidence of normative (and possibly identity) change taking place, through the pathways of peer influence, direct experience, and inter-generational transfer of education.

Overall, the above analysis is broadly consistent with previous work that discusses group identification (e.g., Wit & Kerr, 2002), social norms (e.g., Bamberg et al., 2015), and discussion opportunities (Meleady et al., 2013) as some of the central social psychological predictors of cooperation around shared resources. Our analysis suggests that these factors bear relevance to groups' ability and willingness to cooperate beyond experimental laboratory contexts, and may play a significant role in real world environments where ability to solve shared resource dilemmas has crucial implications for communities' livelihoods. The finding that avoidance of confrontation undermines protection of the shared resource may seem inconsistent with the claim that group identification and cohesion are essential for cooperation. In the present study, prioritising cohesion led community members to leave encroachment on the shared resource unchallenged, even when such behaviour was inconsistent with their personal norms. This represents an important nuance in the role of group identification in solving social dilemmas – contrary to previous work, this role may not always be positive, especially when it prevents an open discussion of the issue. It is worth noting that existing models (often based on laboratory research) assume that group identification is developed in the process of discussing a dilemma (e.g., Meleady et al., 2013). The present study demonstrates how pre-existing community links and the value attached to them may represent a barrier for such discussions – a finding that may have implications for other contexts where groups facing social dilemmas are established and strongly interdependent (from fishing villages to deprived urban neighbourhoods).

5.7. Practical implications

Despite the explorative nature of the present research, it suggests a number of promising directions for addressing Maasai communities'

willingness and ability to protect their land from further degradation. One crucial parameter is the centrality of livestock keeping to Maasai cultural identity. To make livelihood diversification conceivable, this possibility needs to be presented in such a way that it does not constitute a threat to cultural identity. One way of achieving this could be framing cattle keeping and nomadic lifestyle as practices that were making Maasai people resilient to harsh environmental conditions in the past, and presenting this *adaptability and resilience* (rather than the livestock keeping itself) as defining features of Maasai culture. Coupled with a clear understanding of changing environmental and social conditions (that undermine traditional ways of maintaining resilience), such re-framing could make adoption of alternative livelihoods more acceptable, since this would be consistent with maintaining adaptability as a key component of collective identity. Future research could explore this possibility further, focussing on context-appropriate approaches to re-framing identity content and producing corresponding normative change. The principle of identity content re-framing could also prove relevant in a number of other contexts, including intergroup conflict (cf. Livingstone & Haslam, 2008).

Another dimension that needs to be addressed is enhancing community identification while opening up channels for discussion of soil erosion issues. Our analysis suggests that cooperation and agreement are highly valued in Maasai culture. These values can be harnessed to create opportunities for facilitated open discussion where differences in opinion are heard and accepted, rather than silenced. Such discussions may pave the way to building stronger group identification, that can then serve as a basis for developing cooperative solutions to the soil erosion challenge – for example, through enhancing a sense of collective efficacy and giving rise to the development of new norms and community self-monitoring systems.

The above steps, supporting the development of a socio-psychological basis for change (in the form of cultural identity content, community identification, and norms) need to be accompanied by work in three more directions: 1) support for education on processes and causes of soil erosion, 2) co-development of viable livelihood alternatives, and 3) support for strengthened local governance. The first of these steps should enable increased understanding of the link between certain land use practices and soil erosion, creating motivation for change; the second should make such change economically viable; while the third would co-design local institutions to support the transition. Achieving this is an ambitious task that requires a large-scale multi-disciplinary intervention programme. Recognition of the need for change demonstrated by the study communities provides ample evidence that such work could enable a real and sustained transformation.

Acknowledgments

The authors gratefully acknowledge funding from the Research Council UK Global Challenges Research Fund (GCRF) grant NE/P015603/1, UK Natural Environment Research Council grant NE/R009309/1, and British Academy grant KF1\100023. We are also grateful to Maarten Wynants, Prof. Neil Roberts, Prof. David Gilvear, Carey Marks, Francis Mkilema, Stacey Heath, and Vlad Zhischenko for their invaluable inputs into the wider project. The research team is indebted to the local village leaders and people at the study sites and Monduli District Council for their support.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2019.101365.

References

Abbink, G. J., Askew, K., et al. (2014). *Lands of the future. Transforming pastoral lands and livelihoods in Eastern Africa.* Halle/Saale: Max Planck Institute for Social Anthropology.

Bamberg, S., Rees, J., & Seebauer, S. (2015). Collective climate action: Determinants of participation intention in community-based pro-environmental initiatives. *Journal of Environmental Psychology, 43*, 155–165.

Benería, L., Berik, G., & Floro, M. (2015). *Gender, development and globalization: Economics as if all people mattered.* New York, NY: Routledge.

Bicchieri, C. (2002). Covenants Without Swords: Group Identity, Norms, and Communication in Social Dilemmas. *Rationality and Society, 14*, 192–228. https://doi.org/10.1177/1043463102014002003.

Biel, A., & Thøgersen, J. (2007). Activation of Social Norms in Social Dilemmas: A Review of the Evidence and Reflections on the Implications for Environmental Behaviour. *Journal of Economic Psychology, 28*, 93–112. http://dx.doi.org/10.1016/j.joep.2006.03.003.

Blaikie, P. M., & Brookfield, H. C. (1987). *Land degradation and society.* Methuen.

Blake, W. H., Rabinovich, A., Wynants, M., Kelly, C., Nasseri, M., Ngondya, I., et al. (2018). Soil erosion in East Africa: An interdisciplinary approach to realising pastoral land management change. *Environmental Research Letters, 13*, 124014. https://doi.org/10.1088/1748-9326/aaea8b.

Bluwstein, J., Lund, J. F., Askew, K., Stein, H., Noe, C., Odgaard, R., et al. (2018). Between dependence and deprivation: The interlocking nature of land alienation in Tanzania. *Journal of Agrarian Change, 18*, 806–830. https://doi.org/10.1111/joac.12271.

Bouas, K. S., & Komorita, S. S. (1996). Group discussion and co-operation in social dilemmas. *Personality and Social Psychology Bulletin, 22*, 1144–1150. https://doi.org/10.1177/01461672962211005.

Branscombe, N. R., Ellemers, N., Spears, R., & Doosje, B. (1999). The context and content of social identity threat. In N. Ellemers, R. Spears, & B. Doosje (Eds.). *Social identity: Context, commitment, content* (pp. 35–58). Oxford, England: Blackwell Science.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*, 77–101. https://doi.org/10.1191/1478088706qp063oa.

Bryan, G. (2013). *Ambiguity aversion decreases demand for partial insurance: Evidence from African farmers*LSE working paper Technical report.

Buikstra, E., Ross, H., King, C. A., Baker, P. G., Hegney, D., McLachlan, K., et al. (2010). The components of resilience: Perceptions of an Australian rural community. *Journal of Community Psychology, 38*, 975–991. https://doi.org/10.1002/jcop.20409.

Campbell, D. J. (1999). Response to drought among farmers and herders in southern kajiado district, Kenya: A comparison of 1972–1976 and 1994–1995. *Human Ecology, 27*, 377–416.

Cutter, S. L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., et al. (2008). A place-based model for understanding community resilience to natural disasters. *Global Environmental Change, 18*, 598–606.

Davidson, D. J. (2010). The applicability of the concept of resilience to social systems: Some sources of optimism and nagging doubts. *Society & Natural Resources, 23*, 1135–1149.

Dawes, R. M. (1980). Social dilemmas. *Annual Review of Psychology, 31*, 169–193. https://doi.org/10.1146/annurev.ps.31.020180.001125.

Desmarais, A., Qualman, D., Magnan, A., & Wiebe, N. (2015). Land grabbing and land concentration: Mapping changing patterns of farmland ownership in three rural municipalities in Saskatchewan, Canada. *Canadian Food Studies, 2*, 16–47. https://doi.org/10.15353/cfs-rcea.v2i1.52.

Emery, M., & Flora, C. (2006). Spiralling up: Mapping community transformation with community capital framework. *Community Development, 37*, 19–30. https://doi.org/10.1080/15575330609490152.

Fielding, K. S., Terry, D. J., Masser, B. M., & Hogg, M. A. (2008). Integrating social identity theory and the theory of planned behaviour to explain decisions to engage in sustainable agricultural practices. *British Journal of Social Psychology, 47*, 23–48. https://doi.org/10.1348/014466607X206792.

Fratkin, E., & Mearns, R. (2003). Sustainability and pastoral livelihoods: Lessons from East African Maasai and Mongolia. *Human Organization, 62*, 112–122. https://doi.org/10.17730/humo.62.2.am1qpp36eqgxh3h1.

Galvin, K. A. (2009). Transitions: Pastoralists living with change. *Annual Review of Anthropology, 38*, 185–198. https://doi.org/10.1146/annurev-anthro-091908-164442.

Goldman, M. J., Davis, A., & Little, J. (2016). Controlling land they call their own: Access and women's empowerment in Northern Tanzania. *Journal of Peasant Studies, 43*, 777–797.

Goldstein, N. J., Cialdini, R. B., & Griskevicius, V. (2008). A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. *Journal of Consumer Research, 35*, 472–482. https://doi.org/10.1086/586910.

Handmer, J., & Dovers, S. (2009). *A typology of resilience: Rethinking institutions for sustainable development, 9*, Organization and Environment482–511.

Hardin, G. (1968). The tragedy of the commons. *Science, 1262*, 1243–1248. https://doi.org/10.1126/science.162.3859.1243.

Heath, S., Rabinovich, A., & Barreto, M. (2017). Putting identity into the community: Exploring the social dynamics of urban regeneration. *European Journal of Social Psychology, 47*, 855–866. https://doi.org/10.1002/ejsp.2296.

Huho, J., Ngaira, J., & Ogindo, H. (2011). Living with drought: The case of the Maasai pastoralists of northern Kenya. *Educational Research, 2*, 2141–5161.

Ionita, I., Fullen, M. A., Zgłobicki, W., & Poesen, J. (2015). Gully erosion as a natural and human-induced hazard. *Natural Hazards, 79*, 1–5. https://doi.org/10.1007/s11069-015-1935-z.

Kelly, C., Ferrara, A., Wilson, G. A., Ripullone, F., Nolè, A., Harmer, N., et al. (2015). Community resilience and land degradation in forest and shrubland socio-ecological systems: Evidence from Gorgoglione, Basilicata, Italy. *Land Use Policy, 46*, 11–20. https://doi.org/10.1016/j.landusepol.2015.01.026.

Kerr, N. L., Garst, J., Lewandowski, D. A., & Harris, S. E. (1997). That still, small voice:

Commitment to cooperate as an internalized versus a social norm. *Personality and Social Psychology Bulletin, 23*, 1300–1311. https://doi.org/10.1177/01461672972312007.
Kopelman, S., Weber, J. M., & Messick, D. M. (2002). Factors influencing cooperation in commons dilemmas: A review of experimental psychological research. In E. Ostrom, T. Dietz, N. Dolšak, P. C. Stern, S. Stonich, & E. U. Weber (Eds.). *The drama of the commons*. (pp. 113–156). Washington, DC, US: National Academy Press.
van Lange, P. A. M., Joireman, J., Parks, C. D., & van Dijk, E. (2013). The psychology of social dilemmas: A review. *Organizational Behavior and Human Decision Processes, 120*, 125–141. https://doi.org/10.1016/j.obhdp.2012.11.003.
Levine, J. M., & Hogg, M. A. (2009). *Encyclopedia of group processes and intergroup relations.* Thousand Oaks, CA: Sage.
Liebenehm, S., & Waibel, H. (2014). Simultaneous estimation of risk and time preferences among small-scale cattle farmers in West Africa. *American Journal of Agricultural Economics, 96*, 1420–1438.
Livingstone, A., & Haslam, S. A. (2008). The importance of social identity content in a setting of chronic social conflict: Understanding intergroup relations in Northern Ireland. *British Journal of Social Psychology, 47*, 1–21. https://doi.org/10.1348/014466607X200419.
Magis, K. (2010). Community resilience: An indicator of social sustainability. *Society & Natural Resources, 23*, 401–416. https://doi.org/10.1080/08941920903305674.
McPeak, J. G., Doss, C., & Little, P. D. (2011). *Risk and social change in an African rural economy.* London: Routledge.
Meleady, R., Hopthrow, T., & Crisp, R. J. (2013). The group discussion effect: Integrative processes and suggestions for implementation. *Personality and Social Psychology Review, 17*, 56–71. https://doi.org/10.1177/1088868312456744.
Messick, D. M., & Brewer, M. B. (1983). Solving social dilemmas: A review. In L. Wheeler, & P. Shaver (Eds.). *Review of personality and social psychology*. Beverly Hills: Sage.
Opiyo, F., Wasonga, O., Nyangito, M., Schilling, J., & Munang, R. (2015). Drought adaptation and coping strategies among the Turkana pastoralists of Northern Kenya. *International Journal of Disaster Risk Science, 6*, 295–309.
Orbell, J., van de Kragt, A., & Dawes, R. (1988). Explaining discussion induced co-operation. *Journal of Personality and Social Psychology, 54*, 811–819. http://psycnet.apa.org/doi/10.1037/0022-3514.54.5.811.
Parks, C. D., Joireman, J., & Van Lange, P. A. M. (2013). Cooperation, trust, and antagonism: How public goods are promoted. *Psychological Science in the Public Interest, 14*, 119–165. https://doi.org/10.1177/1529100612474436.
Parpart, J. L. (2014). Exploring the transformative potential of gender mainstreaming in international development institutions. *Journal of International Development, 26*, 382–395.
Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.
Rabinovich, A., & Morton, T. A. (2011). Subgroup identities as a key to cooperation within large social groups. *British Journal of Social Psychology, 50*, 36–51. https://doi.org/10.1348/014466610X486356.
Resilience Alliance (2007). *Assessing resilience in social-ecological systems: A workbook for scientists.* Stockholm: Resilience Alliance.
Sally, D. (1995). Conservation and cooperation in social dilemmas: A meta-analysis of experiments from 1958–1992. *Rationality and Society, 7*, 58–92. https://doi.org/10.1177/1043463195007001004.
Silver, S. B. (2009). Pathways of continuity and change: Maasai livelihoods in amboseli, kajiado district, Kenya. In K. Homewood, P. Kristjanson, & P. C. Trench (Eds.). *Staying Maasai? Livelihoods, conservation and development in East African rangelands* (pp. 161–207). New York: Springer.
Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In S. Worchel, & W. G. Austin (Eds.). *Psychology of intergroup relations* (pp. 7–24). Chicago: Hall Publishers.
Talle, A. (1988). *Women at a loss: Changes in Maasai pastoralism and their effects on gender relations.* Stockholm: Dept. of Social Anthropology, University of Stockholm.
Thomas, E., McGarty, C., & Mavor, K. I. (2009). Aligning identities, emotions and beliefs to create commitment to sustainable social and political action. *Personality and Social Psychology Review, 13*, 194–218.
Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., & Wetherell, M. S. (1987). *Rediscovering the social group: A self-categorization theory*. Oxford and New York: Blackwell.
UNCCD (2017). *The global land outlook.* (Bonn, Germany).
Valentin, C., Poesen, J., & Li, Y. (2005). Gully erosion: Impacts, factors and control. *Catena, 63*, 132–153. https://doi.org/10.1016/j.catena.2005.06.001.
Van Lange, P., Balliet, D. P., Parks, C. D., & van Vugt, M. (2014). *Social dilemmas: Understanding human cooperation.* Oxford University Press.
Van Vugt, M., & Samuelson, C. D. (1999). The impact of personal metering in the management of a natural resource crisis: A social dilemma analysis. *Personality and Social Psychology Bulletin, 25*, 735–750. https://doi.org/10.1177/0146167299025006008.
Van Vugt, M., Van Lange, P. A. M., Meertens, R. M., & Joireman, J. A. (1996). How a structural solution to a real-world social dilemma failed: A field experiment on the first carpool lane in Europe. *Social Psychology Quarterly, 59*, 364–374. https://doi.org/10.2307/2787077.
Van Zomeren, M., Postmes, T., & Spears, R. (2008). Toward an integrative social identity model of collective action: A quantitative research synthesis of three socio-psychological perspectives. *Psychological Bulletin, 134*, 504–535.
Wangui, E. (2018). Adaptation to current and future climate in pastoral communities across Africa. *Oxford Research Encyclopedia of Climate Science*. https://doi.org/10.1093/acrefore/9780190228620.013.604.
Warren, A. (1995). Changing understandings of African pastoralism and the nature of environmental paradigms. *Transactions of the Institute of British Geographers, 20*, 193–203. https://doi.org/10.2307/622431.
Weiss, R. S. (1994). *Learning from strangers: The art and method of qualitative interview studies.* New York, NY, US: Free Press.
Wildschut, T., Insko, C. A., & Gaertner, L. (2002). Intragroup social influence and intergroup competition. *Journal of Personality and Social Psychology, 82*, 975–992. http://psycnet.apa.org/doi/10.1037/0022-3514.82.6.975.
Wilson, G. A. (2012). *Community resilience and environmental transitions.* London: Routledge.
Wilson, G. A. (2017). 'Constructive tensions' in resilience research: Critical reflections from a human geography perspective. *Geographical Journal, 184*, 89–99. https://doi.org/10.1111/geoj.12232.
Wilson, G. A., & Juntti, M. (Eds.). (2005). *Unravelling desertification: Policies and actor networks in Southern Europe*. Wageningen (NL): Wageningen Academic Publishers.
Wit, A. P., & Kerr, N. L. (2002). "Me versus just us versus us all" categorization and cooperation in nested social dilemmas. *Journal of Personality and Social Psychology, 83*, 616–637. http://psycnet.apa.org/doi/10.1037/0022-3514.83.3.616.
Wynants, M., Kelly, C., Mtei, K., Munishi, L., Patrick, A., Rabinovich, A., et al. (2019). Drivers of increased soil erosion in East Africa's agro-pastoral systems: Changing interactions between the social, economic and natural domains. *Regional Environmental Change,* 1–13.