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ORIGINAL ARTICLE

Changing drought vulnerabilities of marginalized resource-dependent groups: a long-term perspective of Israel's Negev Bedouin

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Abstract

Marginalized resource-dependent groups (MRDGs) are highly vulnerable to the impacts of climate change and weather extremes. However, research on MRDGs tends to analyze their vulnerability in a specific point in time, thereby neglecting the examination of changes that evolve over time spans that are similar to those on which climatic changes occur. This study adopts a long-term perspective, examining changes in the vulnerability of the marginalized and traditionally agro-pastoralist Bedouin residing in the semi-arid and drought-prone northern Negev region. Utilizing multiple data sources, the study compares the vulnerability of the Bedouin during two severe droughts separated by a 40-year period—the 1957–63 drought and the 1998–2000 drought. The changes in the impacts of the droughts on the Bedouin are identified and analyzed, as well as the main factors explaining these changes. The results indicate that the vulnerability of the Bedouin to droughts has declined considerably, largely due to integration in Israel's market economy and improved access to water infrastructure. Large-scale economic transformations and changes in settlement and water supply patterns explain much of the reduction in vulnerability. However, the Bedouin have remained marginalized and are vulnerable to fluctuations in market conditions. Thus, while we find that the vulnerability of even the most vulnerable groups can decline over time, we also observe that their vulnerability may change its form from "climate vulnerability" to more general social vulnerability.

Keywords Climate change · Vulnerability · Marginalization · Resource dependency · Drought · Bedouin

Introduction

Climate change is expected to increase the frequency and intensity of climate extremes (IPCC 2014). Commonly characterized by poverty and limited access to services and infrastructure, marginalized groups are among the most vulnerable to such extremes. Some of these groups are also highly dependent on climate-sensitive resources. This dependency adds another dimension of vulnerability to the adverse impacts of climatic shocks on such groups (Berrang-Ford et al. 2012). Marginalization and resource dependency underpin the vulnerability of various populations worldwide, including, but not limited to, indigenous communities, tribal people, and certain ethnic minorities (e.g., Adhikari 2013; Bizikova et al. 2015; Ford et al. 2010a, b; Raleigh 2010).

Of the projected climate change impacts, the intensification of droughts in many of the arid and semi-arid regions constitutes a particularly acute risk to the marginalized resource-dependent groups (MRDGs) residing in those areas, threatening some of the most fundamental elements of their well-being, including water security and drought-sensitive livelihood sources such as agriculture and pastoralism (Taenzler et al. 2008). These risks are further magnified by the "dryland syndrome," implying an especially high baseline level of biophysical and social vulnerabilities and low economic productivity stemming from drylands' marginal resources (Reynolds et al. 2007).

Although MRDGs will be increasingly affected by climatic disruptions, such groups have received only scant attention in academic and policy discourses on climate change (Belfer

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et al. 2017; Bose 2017). While research on vulnerability and adaptation of MRDGs has increased over the last several years, it still faces several main challenges. Particularly, with the exception of only a few cases (e.g., Ford et al. 2013), most studies focus on the current vulnerabilities of MRDGs, paying little or no attention to the long-term processes that shaped these vulnerabilities. This lacuna, evident in vulnerability research in general, is substantial as many climate change impacts, as well as socio-economic factors affecting vulnerability and adaptive capacity, develop over decades (Jurgilevich et al. 2017). But evidence on the mechanisms underlying the persistent vulnerability of MRDGs remains limited and fragmented, leading to calls for further research on such long-term processes (Bose 2017; Ford et al. 2016).

This study seeks to contribute to the understanding of MRDGs vulnerability by adopting a long-term perspective. To this end, we examine how the vulnerability of the Bedouin population residing in Israel's semi-arid and drought-prone northern Negev region has changed over a 40-year period. The Bedouin are a marginalized population that traditionally subsisted on pastoralism and dry-farming and have suffered substantial impacts during a severe drought that afflicted the northern Negev between 1957 and 1963 (Tubi and Feitelson 2016). However, changes in the vulnerability of the Bedouin to droughts have not been studied.

Based on information obtained from archival records, statistical sources, and a review of scholarly and gray literature, the impacts sustained by the Bedouin during the 1957–63 drought are compared to the impacts caused by the 1998–2000 drought—the next severe multi-year drought that afflicted the research area. The main changes in Bedouin vulnerability, namely the propensity of this society to experience adverse drought impacts due to resource dependency and marginalization, are then identified and analyzed from a broad perspective, including changes induced by macro-economic processes and access to political entitlements. We find that while the 1957–63 drought has led to severe impacts on the Bedouin, the 1998–2000 resulted in much lower impacts, indicating that the vulnerability of this society has declined considerably. These changes occurred despite an overall drying trend attributed to climate change (Shohami et al. 2011) and an increase in population from 18,000 to 110,000 (Ben-Gurion University of the Negev 1999), potentially increasing the pressure on climate-sensitive resources.

This article proceeds as follows. In the next section, the factors affecting the vulnerability of MRDGs are reviewed. We then present the physical and social settings of this study. After elaborating the methodology, the results are presented and several main lessons on the evolution of MRDGs vulnerability pathways are discussed. The last section draws several conclusions regarding long-term changes in the vulnerability of MRDGs.

The vulnerability of marginalized resource-dependent groups to climate variability and extremes

In the climate change literature vulnerability is viewed as "a measure of the susceptibility to harm" (Ford et al. 2013, p. 1195). It is the degree to which a system is prone to and is unable to cope with adverse climate change effects (IPCC 2014). Contextual approaches, emphasizing the context-specific nature of vulnerability, conceptualize it as a function of exposure to climatic variations, sensitivity to the variations, and capacity to cope with, adapt to or recover from, the adverse impacts induced by these variations. The emphasis of contextual approaches on sensitivity and adaptive capacity stresses the importance of cultural, economic, and socio-political variables in determining the nature and degree of vulnerability (Füssel and Klein 2006). Marginalization and resource dependency constitute, and are affected by, such variables.

The dependency of MRDGs on climate-sensitive resources affects mainly their livelihood vulnerability. Dependency on natural resources can increase vulnerability because their quality and availability may be adversely affected by climatic fluctuations (Block and Webb 2001). Consequently, resource-dependent households and communities can experience substantial negative effects of extreme climatic events on critical components of well-being, including income instability, deteriorated nutritional status, and ill-health (Nkem et al. 2013).

MRDGs are also particularly prone to the adverse impacts of non-climatic stressors, such as commercial exploitation of the resources MRDGs depend on and large-scale land acquisitions by transnational companies, which might reduce the resource base available to MRDGs (Nkem et al. 2013). The establishment of conservation areas, from which marginalized groups are often excluded, may lead to similar results (Berrang-Ford et al. 2012). These constraints may limit MRDGs livelihood options, forcing them to inhabit peripheral areas and, over the long-term, degrade natural resources (Collins 2009). Such areas tend to be characterized also by inadequate access to infrastructure and services. These undermine the capacity of MRDGs to cope with and recover from the impacts of climate extremes (Reynolds et al. 2007).

Linked more closely with social processes, marginalization is referred to as "the best known explanation for the production of risk" (Collins 2009, p. 590). Broadly, marginalized populations are those that possess an inferior status as compared to more dominant groups. Often, the identity of such groups differs from that of the more dominant groups based on their different ethnicity, culture, language, or livelihood base (Raleigh 2010). Studies that examine the effect of marginalization on vulnerability highlight the limited access of marginalized groups to resources and assets needed to adapt and the lack of entitlements to use these resources (Collins 2009). Some of the key resources

marginalized populations commonly lack access to extend beyond material means, to aspects such as political representation and governance. Thus, marginalized groups remain vulnerable because they have a limited ability to influence the decisions that shape the range of adaptation options available to them (Eriksen and Lind 2009).

The interaction of resource dependency with marginalization implies that MRDGs are likely to experience high levels of exposure and sensitivity to climatic shocks coupled with a limited coping capacity, resulting in them being among the most vulnerable to climate change. However, we do not suggest that MRDGs are "helpless victims" of climate change, but rather that such groups are more susceptible to the adverse impacts of climatic shocks than most other social groups. Moreover, the vulnerability of MRDGs may change substantially over time.

Several approaches conceptualize long-term changes in vulnerability and the factors underlying these changes, including the "pathways," "vulnerability dynamics," and "dynamic landscapes" approaches (Jurgilevich et al. 2017). These approaches emphasize that vulnerability is shaped by the interaction between slow-moving and fast-moving variables as well as between endogenous and exogenous stressors operating on different scales (Ford et al. 2013). Explanatory variables include factors which are often in flux, such as environmental conditions, resource availability, institutional structures, settlement patterns, technology and economy (Dilling et al. 2015; Duvat et al. 2017). Thus, vulnerability is inherently dynamic because it is tied to constantly shifting social landscapes. Moreover, climatic fluctuations are viewed as merely one stressor within a complex set of stressors and goals (Dilling et al. 2015; Jurgilevich et al. 2017).

Many factors affect changes in the vulnerability of MRDGs over the long-term. These include economic, social, political, and cultural variables (Ford et al. 2010a, b; Raleigh 2010). A full review of these factors is, however, beyond the scope of this paper. From a drought and climate change perspective, some of the most pertinent variables are those that affect the extent of dependency on resources. Therefore, the extent to which the livelihoods of MRDGs diversify towards non-climate sensitive activities (Goulden et al. 2013) is of particular importance for the purpose of this paper. However, livelihood diversification is not necessarily a positive process. Diversification that does not involve a fundamental shift in the economic basis of MRDGs can result in temporary or partial vulnerability reduction, or even a worsening of vulnerability. For example, farming-based market integration can increase opportunities to diversify crops, thereby reducing vulnerability to some extent. Conversely, it can exacerbate vulnerability by increasing the cultivation of cash crops, which may be ecologically unsuitable (Adger 2000). More broadly, diversification of livelihoods within (rather than beyond) climate-sensitive activities is likely to be exhausted at a certain stage due to a finite productivity of the natural resources on which such diversification is based (Adhikari 2013).

Marginalization may also change over long time spans, although significant shifts in power relations are uncommon. A more likely path are changes that occur through the activities of development agencies and Civil Society Organizations (CSOs). Such agencies and CSOs may represent the needs and aspirations of MRDGs in the institutional sphere, thereby potentially improving their access to political and economic resources (Eriksen and Lind 2009). They may also assist livelihood diversification through economic or educational and employment programs (Piya et al. 2013).

Climate extremes form an additional factor which may affect MRDGs vulnerability over long time spans. In drylands, drought-induced livestock mortality is particularly problematic as livestock forms the economic and entitlements base of pastoral societies (Sen 1981). High livestock mortality rates may create highly negative trajectories, deepening the poverty of MRDGs and in extreme cases leading to malnutrition, which may have long-term health impacts (Sen 1981). In the case of a severe drought, extensive livestock mortality may occur over a relatively short time span, implying that pastoralists are left with limited means to cope with the negative impacts in-situ, forcing some of them (mostly men) to out-migrate (Tubi and Feitelson 2016). However, severe impacts may also encourage livelihood diversification and integration in the wage labor market, thereby potentially reducing vulnerability to climate change in the long term (Block and Webb 2001).

The effects of climatic fluctuations on the natural environment are also important determinants of MRDG vulnerability because they affect the availability and diversity of natural resources and thus the range of adjustments available within the boundaries of ecological systems (Adhikari 2013). In arid and semi-arid environments, such boundaries are highly restrictive (Reynolds et al. 2007).

Beyond the effect of the exogenous factors noted above, the endogenous social-cultural attributes of MRDGs are also critical determinants of their vulnerability and adaptive capacity. Such attributes may include, among other factors, the ability to operate collectively, improvise, and learn. These are a function of factors such as education and the social structure of the community (Washington-Ottombre and Pijanowski 2012). A significant body of literature highlights the adaptability of MRDGs, emphasizing the ability of such groups to draw on local institutions and collective memory and develop new adaptations to rapidly changing social and environmental conditions (e.g., Ford et al. 2009; Piya et al. 2013).

The case study

Rainfall variability and droughts in the northern Negev

The northern Negev is a semi-arid region lying between the humid Mediterranean zone to the north and the Negev Desert

to the south. Precipitation is concentrated between December and March and averages between 100 mm at the southeastern part of the region to 400 mm at its northwestern margins. However, rainfall in the northern Negev is highly variable, with a coefficient of variation ranging between 30 and 40% (Degen 2007). While rainfall variability is naturally high, evidence suggests that climate change is leading to a decline in mean precipitation (Shohami et al. 2011).

Droughts in the northern Negev are frequent and commonly occur in multi-year cycles. Two of the most severe events that affected the region in the last 90 years include the 1957–63 drought and the 1998–2000 drought. These droughts are clearly visible in Fig. 1, showing a time series of annual precipitation values measured at the City of Be'er-Sheva (roughly the south-central part of the region). In the winters of 1958–59 and 1960–61, when precipitation levels were relatively high, most rainfall occurred after the period needed to ensure the growth of crops and pastures (Ministry of Agriculture 1959a, 1961).

The Negev Bedouin: a brief historical overview

Nomadic to semi-nomadic Bedouin tribes have resided in the Negev for centuries. The economy of the Bedouin was based on the grazing of goats, sheep and camels, undertaken along traditional migration routes (Degen 2007). During rainier years, patchy dry-farming of wheat and barley provided a secondary source of subsistence (Levin et al. 2010). Such land-use practices, deeply rooted in culture and way of life, reflect the strategies developed by the Bedouin to cope with the extreme physical environment and the uncertainty induced by droughts (Marx 1974).

Following the 1948 war and the establishment of the State of Israel, only 11,000 Bedouin remained in the Negev. Those became Israeli citizens, but were relocated to two military administered areas covering approximately 10% of the territory they previously utilized (Shmueli and Khamaisi 2011). In the 1960s, the state initiated a long-term effort to relocate the Bedouin to state-planned towns. To this end, seven towns were established between the mid-1960s and the late 1980s. Over the years, this urbanization policy produced two distinct spaces of Bedouin settlement (Degen 2007). One space comprises the planned towns. The other space comprises dozens of villages, most of which are viewed by the Israeli authorities as illegal and do not benefit from the same level of facilities and services that are offered in the planned towns (Shmueli and Khamaisi 2011). In 2015, roughly 70% of the 222,400 Negev Bedouin resided in the state-built towns and in several villages that were recognized by the state, while the remaining 30% lived in the unrecognized settlements (Israel Central Bureau of Statistics 2015). While livestock production can be found in both planned towns and villages (whether recognized or not), almost all the families whose income is largely based on livestock are to be found in the largely unrecognized hamlets (Degen 2007). The locations of the Bedouin settlements, their adjacent Jewish settlements, and the previously confined zones are shown in Fig. 2.

Research method

We conduct a case study where we utilize primary (mainly archival) and secondary sources, as well as statistics wherever they are available, to analyze shifts in Bedouin vulnerability to droughts. To examine these shifts, the study compares the vulnerability of the Bedouin during the 1957–63 drought to their vulnerability 40 years later, during the 1998–2000 drought. However, references to changes in vulnerability are also made in relation to the less severe 2007–09 drought, visible in Fig. 1, which coincides with the latest data on the Bedouin. The study area, where the Negev Bedouin population resides, is delineated in Fig. 2.

The analysis focused on two central elements. First, the degree of resource dependency and marginalization in both droughts was identified, as well as the impacts the Bedouin suffered during these periods. To capture the degree of political marginalization, we focused on the official representation of Bedouin interests in the political-institutional sphere. Our main marginalization indicator is the percentage of the Bedouin population that is represented at the local-municipal level. However, to obtain a more complete view of marginalization/integration, we also examined the establishment of state institutions dedicated to the representation of Bedouin interests and the functions filled by these institutions. The degree of resource dependency is operationalized as the percentage of the Bedouin population that relies on agro-pastoralism relative to the share of this society that relies on climate-insensitive livelihood sources. Such livelihood sources are largely wage labor.

To identify the droughts' impacts on the Bedouin, we analyzed changes in resource-dependent entitlements, which in our case include mainly livestock mortality, effects on water supply, the adaptations undertaken by the Bedouin—migration northward in the case of the Negev Bedouin[1]—and the need for relief assistance.

The analysis' second element focused on the examination of the main factors that contributed to the changes in resource dependency and marginalization. In line with the methodology applied in studies examining long-term changes in vulnerability (e.g., Duvat et al. 2017; Murgida et al. 2014), the analysis focused on capturing the main processes that influenced the changes in marginalization and resource dependency, the

[1] Such migration may lead to conflicts with farmers in the Mediterranean zone (Tubi and Feitelson 2016). Hence, the incidents of such conflicts are also noted.

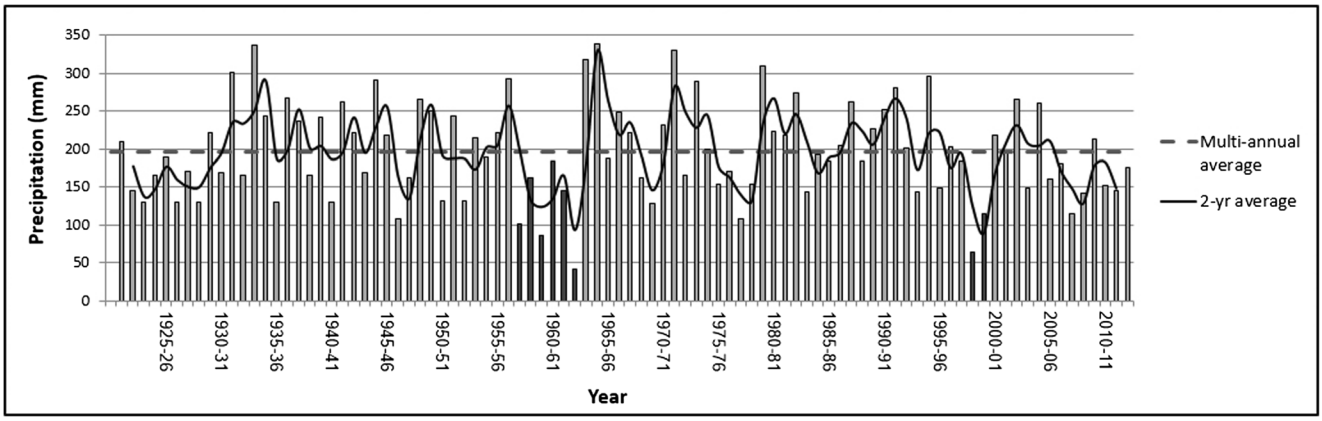

Fig. 1 Annual precipitation (September through May) in Be'er-Sheva, 1921–2012. Precipitation values during the 1957–63 and 1998–2000 droughts are bolded. Source: own calculation based on data obtained from the Israel Meteorological Service (2015)

direction of their influence, its magnitude, and, where possible, the interrelations between different effects. This included the analysis of processes that are internal to the Bedouin society (e.g., considerations affecting livelihood diversification decisions), institutional actions that affected the degree of Bedouin marginalization (e.g., the establishment of Bedouin municipalities), and changes in the regional- and national-level economic environment the Bedouin are embedded in (e.g., national-level economic transformations and their effect on employment opportunities).

Data were derived from multiple sources, including primary (archival) and secondary sources, a systematic literature review and statistical sources, wherever they were available. The archival and statistical sources were used largely to depict the state of resource dependency and marginalization and the associated droughts' impacts (the first element of our

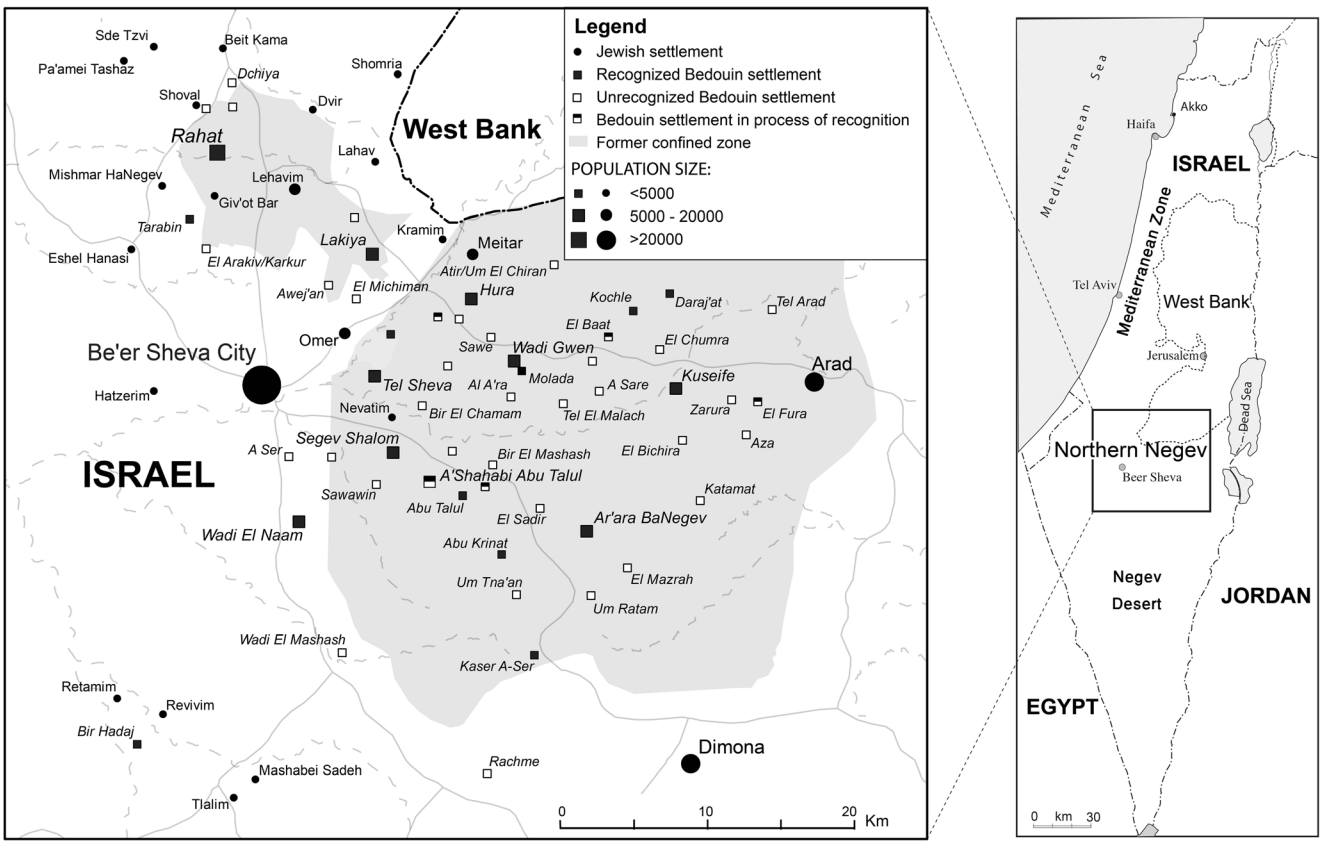

Fig. 2 Bedouin settlements in the northern Negev, 2014. Source: data on the Bedouin settlements courtesy of "Bimkom" Non-Governmental Organization

analysis). Reports issued by the Ministry of Agriculture, the main agency responsible for addressing the 1957–63 drought, formed the primary source of information for this period. These reports, summarized in an extensive work in the Israel State Archives, include detailed descriptions of the drought's impacts and associated relief activities by both the Ministry of Agriculture and the Bedouin herders and sheiks.[2] Statistical reports, utilized to identify the state of resource dependency and marginalization, were used critically. As reports issued by most government agencies exclude the unrecognized villages, data regarding these villages were derived mainly from non-state sources that focus on the Bedouin. These comprise the Negev Bedouin statistical yearbook, published by Ben-Gurion University in 1999, 2004, and 2011, and the socio-economic surveys of Palestinians in Israel, published by the Arab National Society for Health Research and Services ("The Galilee Society") in 2004, 2007, and 2010.

We conducted a systematic review of the academic and gray literature on the Bedouin to analyze the main factors that influenced the identified shifts in resource dependency and marginalization (the second element of the analysis). This methodology, based on Duvat et al. (2017), involved the review of peer-reviewed books and articles as well as reports published by government agencies and CSOs. The findings derived from this extensive review were triangulated (Ford et al. 2013) to identify the most important factors underlying the changes and the manner in which they shaped those shifts. This method was deemed most appropriate for the examination of changes in vulnerability spanning a 40-year period. However, we acknowledge that studying inter-decadal changes in vulnerability may imply that some information on the factors driving such changes might be missed.

Shifts in the vulnerability of the Negev Bedouin: a 40-year perspective

Changes in drought impacts

Between 1957 and 1963, the Bedouin were severely affected by the drought that afflicted the northern Negev. Wheat and barley crops failed repeatedly, basic water needs were not always met, and pastures were extremely limited. In the few fields where crops did not fail entirely, yields were very low, providing almost no grains and very little pasture (Kibbutz Shoval 1958; Ministry of Agriculture 1959a, 1960). The combination of these conditions resulted in widespread livestock mortality. Already in the first year of the drought (1957–58) livestock numbers fell by 40%, from 130,000 to 78,000, dropping further to 70,000 by 1961 (Israel Central Bureau of Statistics 1964; Ministry of Agriculture 1959a). Moreover, much of the remaining livestock could not be sold due to significant weight loss (Ministry of Agriculture 1961). These impacts were exacerbated by the Bedouins' marginalization—unlike the Jewish settlements in the region, the Bedouin were not connected to the newly built Yarkon-Negev conduit which delivered water to the northern Negev from the center of Israel. This combination severely restricted the Bedouins' adaptation options, implying that many families were unable to meet basic nutritional needs. Even isolated cases of malnutrition have been reported (Ministry of Health 1960).

To mitigate the adverse effects, Bedouin herders were allowed to migrate with their herds, mainly to the Mediterranean region which was less severely affected by the drought. As a result, conflicts with Jewish farmers, some of which were violent, ensued over access to fields/pastures and livestock-induced crop damages (Ministry of Agriculture 1958; Negev Military Governor 1963).

In response to the drought's impacts, the Israeli institutions, particularly the Ministry of Agriculture, undertook an extensive relief operation. Assistance included the provision of water and food and the generation of public works projects (Tubi and Feitelson 2016). Measures were also taken to supply water, feed, and pastures for Bedouin livestock, including the planting of pastures and the allocation of nature reserves for grazing. Fields cultivated by Jewish farmers, where crops failed or stubble remained, were also allocated for grazing (Ministry of Agriculture 1959b, 1960).

Forty years later, despite the deterioration of Israel's water resources (Gvirtzman 2002)[3] and the increase in Bedouin population from less than 20,000 in 1957–63 to about 105,000 in 1998–2000 and 170,000 in 2007–09, there is very limited evidence of substantial drought impacts. None of the data sources we reviewed provides any indication of severe effects on livestock or livelihood, out-migration of Bedouin from the Negev, substantive institutional relief responses, drought-related conflicts between Bedouin and Jews, or a sense of "crisis" occurring during the 1998–2000 drought or the 2007–09 period.

The most significant evidence on adverse impacts pertains to the 1998–2000 drought. The loss of pastures caused by the drought induced the Ministry of Agriculture to provide financial compensations to registered Bedouin herd owners (Ra'anan et al. 2009). This constituted an exceptional measure as such compensations are not required by law. Despite the fact that there is evidence that much of the Bedouin livestock is not registered (Degen 2007) (and hence was not eligible to such aid) and in stark contrast to the 1957–63 drought, there

[2] Extensive archival work was conducted also in the Yad-Ya'ari Archives, documenting many of the Kibbutzim (Jewish agricultural settlements) in the northern Negev and their interactions with the Bedouin during the 1957–63 drought, and the Israel Military Archives which document the military administration of the Negev.

[3] Desalination in Israel began only in 2005 and did not exceed 10% of the national freshwater use until 2010 (Feitelson and Rosenthal 2012).

was no reported livestock mortality. Figure 3 presents the available estimates of Bedouin livestock numbers for the period of 1958 to 2006, published in various reports issued by the Ministry of Agriculture. As the estimates suggest, the size of Bedouin herds during the 1998–2000 drought, though similar to that in the beginning of the 1957–63 drought, has remained stable or even increased.[4]

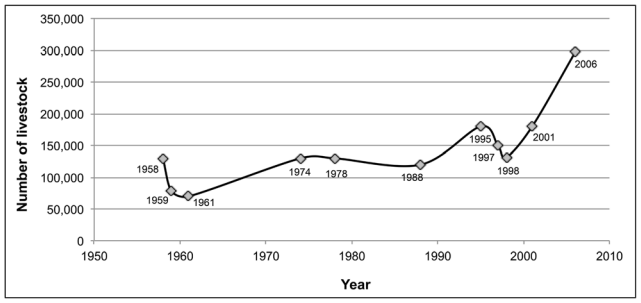

Fig. 3 Bedouin livestock numbers, 1958–2006

Changes in vulnerability and their driving forces

The decline in droughts' impacts on the Bedouin during the 40-year period is an outcome of changes in resource dependency and marginalization. Most importantly, resource dependency has declined dramatically. While marginalization has declined to a more limited extent, the improved political status of the Bedouin has been accompanied by the provision of water infrastructure. These changes have largely transformed droughts to a "non-issue" for the majority of Bedouin society. Still, the Bedouin residing in the unrecognized villages remain more vulnerable to droughts than those residing in the planned towns, as both their marginalization and reliance on herding are greater (Degen 2007).

The decreasing vulnerability of the Bedouin to droughts is related mainly to the changes in the economic structure of this society. Over the past several decades, the Bedouin economic base has largely shifted from livestock rearing and dry-framing to salaried employment in the Negev's regional market economy. Our indicator for the degree of resource dependency shows that only 3% were full-time agro-pastoralists in the early 2000s (The Galilee Society 2005),[5] compared to roughly 76% in the 1957–63 drought (Israel Central Bureau of Statistics 1964). About 84% of the Bedouin were wage employees, compared with 24% in 1957–63. Most of the Bedouin were employed in the services, industry, transportation and construction sectors. At the onset of the 2007–09 drought, the percentage of agro-pastoralists was estimated at 2.5% (The Galilee Society 2008).

The economic transformation of the Bedouin is the outcome of both push and pull factors. During the military administration era, the zones to which the Bedouin were confined provided insufficient resources for grazing and farming (Degen 2007), a problem that was worsened by the 1957–63 drought (Ministry of Agriculture 1960). Also, when the military rule was abolished, restrictions on land use and water continued to constrain grazing and farming (Degen et al. 2001). Such constraints have increased the reliance of livestock owners on feed supplements, reducing their vulnerability to weather variability but increasing their vulnerability to fluctuations in grain prices (Wachs and Tal 2009).

Perhaps the most influential process that contributed to the change in Bedouin livelihoods is the economic transformation of Israel since the 1960s. This was a period of accelerated industrialization and a rapid decline in the economic importance of agriculture (Maman and Rosenhek 2012). Between 1958 and 1970, national employment in agriculture (including pastoralism) dropped from 17.6 to 9.2%. When the military rule was abolished in 1966, the Bedouin began to enter the market economy in large numbers. The rapidly growing economy offered jobs in non-agricultural occupations, which provided higher incomes than those that could be obtained in the traditional pastoralist Bedouin economy (Marx 2000). This integration was enabled also by the improvement in Bedouin educational attainments, as well as wider cultural interactions with the more westernized Jewish society (Abu-Bader and Gottlieb 2009). By the 1998–2000 drought, national employment in agriculture declined to only 2.4%, dropping further to 1.6% by 2007 (Israel Central Bureau of Statistics 2008).

Agro-pastoralism, particularly herding, is maintained today as a primary source of income only by a small fraction of Bedouin households (Degen 2007). While these households own large herds of several hundred sheep and goats, most Bedouin who raise livestock keep only small flocks commonly comprising no more than 10–15 animals (Degen and El-Meccawi 2009). For such households, livestock constitutes an additional source of food and income and a buffer against the uncertainty associated with the increased dependency of the Bedouin on extra-tribal economic resources (Degen 2007). This economic diversification is particularly relevant for the segments of Bedouin society who lack formal education and training and thus occupy largely temporary and insecure jobs, many of which are open to competition with foreign workers (Abu-Bader and Gottlieb 2009). Accordingly, flocks are kept mainly in the unrecognized villages, whose integration in the country's formal economy is more limited than in the planned towns. Other reasons for keeping livestock include cultural motives linked with the preservation of social networks, social status, and family cohesion (Stavi et al. 2006).

In comparison to wide-ranging economic changes, changes in marginalization have been limited. Under the military rule

[4] Official estimates for the 2007–09 drought are not readily available. However, we did not find any reports indicating livestock mortality or drought-induced livestock sales during this period.

[5] The estimate of wage employees (83.4%) pertains to the employment status, while the estimate of Bedouin employed in agriculture and pastoralism (3%) relates to the type of occupation. Thus, the estimates do not add up to a 100%.

of the Negev, the Bedouin were socially and physically isolated from the wider Israeli society. A considerable reduction in marginalization occurred due to the establishment of the Bedouin towns and the consequent formal-political representation at the local level. While constituting a highly controversial process linked with adverse social effects, this urbanization also had important implications for drought vulnerability, as this process led to the planning and provision of basic services and infrastructure—including water infrastructure. Between the 1957–63 drought and the 1998–2000 drought, the share of the population with direct access to piped water increased from almost nil to 60% (Ben-Gurion University of the Negev 1999), reaching 65% in 2007 (The Galilee Society 2008). Figure 4 shows the percentage of the Bedouin population residing in the planned towns for the period of 1979 to 2010.

Although the establishment of the planned towns somewhat improved Bedouin representation at the local-municipal level, marginalization remained high at the national level. Even when the military administration was abolished, the state continued to form specific institutions to govern the Bedouin. These operated in isolation from other governance structures and often held dual and contradictory responsibilities. The most prominent of these institutions has been the "Bedouin Advancement Authority," responsible for advancing the needs of the Bedouin as well as addressing their land dispute with the state (Swirski and Hasson 2006). Similarly, the establishment of the planned towns did not imply that the Bedouin immediately benefited from independent local governance. Rather, until 2000 five out of the seven Bedouin towns were managed by non-Bedouin appointed by the Ministry of the Interior and acting on its behalf (Abu-Saad and Lithwick 2000). The continued marginalization of the Bedouin is evident also in the high poverty rates prevalent in this society. Poverty stems mainly from the neglect of the Bedouin towns, including the limited provision of employment infrastructure in these towns (Abu-Bader and Gottlieb 2009) and the low level of the education system (Abu-Saad 1996).

Perhaps the most influential process that contributed to the greater attention accorded to the situation of the Bedouin is the increased activity of CSOs in the Negev. Between 1995 and 2010, the number of such organizations has increased from 18 to 209, with 29 of these organizations focusing on civil and social-political change (Ben-Gurion University of the Negev 2011). The most notable of these organizations is the Regional Council for the Unrecognized Villages (RCUV), established by the Bedouin in 1997 to fill the governance and welfare void in the unauthorized settlements.

Since their establishment, the RCUV and other organizations have utilized a range of political and legal tools, including public campaigns and appeals to the Israeli Supreme Court, to advance their objectives (Yiftachel 2009). These activities have had important implications for drought vulnerability. In particular, the activities of Bedouin CSOs have contributed to the Interior Ministry's formal recognition and consequent formal planning and provision of infrastructure (including water infrastructure) of 11 previously unrecognized villages. These villages are now organized in two regional councils. Although the formal recognition and granting of formal political status were gained in 2003, after the 1998–2000 drought, the provision of infrastructure has guaranteed water supply to those villages during the 2007–09 drought.

Discussion

This study examines long-term changes in the vulnerability of MRDGs to climatic disruptions. As the northern Negev case shows, the vulnerability of the Bedouin to droughts has declined dramatically over the 40-year period examined. Most importantly, while the Bedouin remained marginalized and economically disadvantaged, the context of vulnerability has shifted from climatic fluctuations to market conditions. This change can be attributed mainly to economic transformations, changes in water supply patterns and—to some extent—greater voice in political spheres. Such processes, as well as the overall reduction in Bedouin vulnerability despite the continued marginalization of this group, can be identified only through the adoption of a long-term perspective. Drawing on the case study, we shortly discuss several major lessons on the evolution of MRDGs vulnerability trajectories.

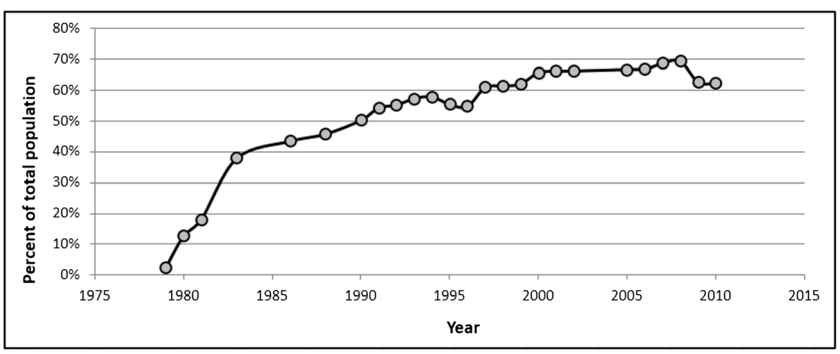

Fig. 4 Percentage of the Bedouin population residing in the planned towns, 1979–2010. Sources: Ben-Gurion University of the Negev (1999, 2004) and The Galilee Society (2011)

The most fundamental changes over the 40-year period pertain to economic processes. Between the 1957–63 drought and the 1998–2000 drought, the Bedouin economy has shifted from pastoralism and dry-farming to wage labor (Degen 2007). This shift has reduced the dependency of the Bedouin on climate-sensitive resources, thereby diminishing their economic vulnerability to drought. However, although this change can be perceived as positive from a 'limited' climate vulnerability perspective, it increased the dependency of the Bedouin on income sources that are beyond their control as well as their exposure to competition for unskilled jobs within the wage labor market. In this sense, the reliance of some of the Bedouin on both traditional livelihood sources and the market economy constitutes a rational diversification strategy, balancing between their sensitivity to climatic fluctuations and institutional restrictions limiting agro-pastoralism, and their sensitivity to market conditions (Abu-Bader and Gottlieb 2009). A similar process occurred also within the segment of the Bedouin population who still raise livestock. The increased reliance of these Bedouin on feed has reduced their vulnerability to drought but increased their vulnerability to changes in feed prices (Wachs and Tal 2009).

The main factor that contributed to the transformation of the Bedouin economy has been the economic transformation of Israel from agriculture to industry during the 1960s, which shaped the macro-economic environment into which the Bedouin integrated. While this transformation was assisted by the widening educational opportunities to the Bedouin, the level of education limited them to manual occupations (Abu-Saad 1996). Thus, we find that the vulnerability of the Bedouin to droughts has declined largely as a result of exogenous processes which altered the wider social-economic landscape in which the Bedouin are embedded. However, our case study also shows that a fundamental shift of MRDGs towards non-climate sensitive livelihood sources might be contingent on the occurrence of larger-scale economic development. Such development may shift the entire economy towards sectors that are largely climate-insensitive, such as industry, and thus increase the availability of climate-insensitive livelihood sources. Such transformations are typical of emerging economies.

Although the Bedouin have remained largely marginalized socially and economically, there have been limited but important developments in the political dimension. The establishment of the planned towns has contributed to the formal political representation of the Bedouin at the local level, but, until recently, the independence of local governance in these towns was rather limited. Some of the most important changes in the marginalization of the Bedouin occurred as a result of CSOs activities. Particularly, the RCUV, established in response to the neglect of the unrecognized villages by the state, has utilized legal and political mobilization channels to advance its objectives (Yiftachel 2009). Most importantly, the actions of the RCUV have advanced the provision of infrastructure to the unrecognized villages, including water infrastructure. Such achievements illustrate the importance of organizations that are able to represent the interests of MRDGs in the institutional sphere. Moreover, as political marginalization is socially constructed and thus may not change significantly even over long time spans, the ability of CSOs to represent the interests and aspirations of MRDGs in the institutional sphere forms a critical element facilitating access to resources and political entitlements that may otherwise be unavailable to such groups.

The Bedouins' improved access to water can be largely attributed to their sedentarization and the consequent improved access to political and economic resources. While the establishment of the planned towns did not bring sufficient employment opportunities, it did mitigate the vulnerability of the Bedouin within these towns to drought, as these towns are connected to Israel's central water system. This system assures supply also during droughts, for domestic uses as well as for livestock. In this sense, the sedentarization processes and the associated changes in water supply patterns have significantly reduced the Bedouins' drought vulnerability.

In recent years, an additional change has contributed to the security of water supply—Israel's growing desalination capacity. This capacity assures water supply despite the drying up of the region (Feitelson and Rosenthal 2012). However, desalination reduces the vulnerability of the Bedouin that are connected to the state's central water system—those residing in the planned towns. The vulnerability of the more marginalized Bedouin residing in the unrecognized villages, which benefit from only limited connections to the central water system, is reduced only to the extent that they can obtain water from the central system.

Conclusions

This study examines long-term changes in the vulnerability of MRDGs, focusing on the case of the Bedouin residing in Israel's semi-arid northern Negev region. The results show that the vulnerability of this traditionally agro-pastoralist society to droughts has declined dramatically over the 40-year period examined. Thus, the vulnerability of even the most vulnerable groups can lessen over time. But the evolution of MRDG vulnerability pathways is complex. Different factors may affect MRDGs vulnerability, resulting in differences in both the speed and direction in which intersecting dimensions of vulnerability evolve over time.

Transitions between states of vulnerability were mediated through long-term intricate processes involving broad-scale social and economic transformations and changes in settlement patterns. As our case study shows, even over long time spans reduced vulnerability of MRDGs is more likely to result

from 'physical-occupational' changes than from changes in the social status of these groups. Accordingly, the vulnerability of such groups may change its form from 'climate vulnerability' to more general social vulnerability. This highlights the necessity to apply a long-term approach when analyzing changes in the vulnerability of MRDGs. Using such an approach enables the examination of the manner in which the vulnerabilities of MRDGs are modified or diffuse into the various spheres of their particular social and economic circumstances over time spans that are similar to those on which climatic changes occur.

As the northern Negev case shows, structural changes and integration in the market economy are critical to reduce the long-term vulnerability of MRDGs to climatic shocks. However, such changes occurred in Israel, a state that has transitioned into an industrial and then a post-industrial economy which has recently been accepted to the OECD. The question remains, therefore, to what extent such long-term changes in the vulnerability of MRDGs can occur in other settings, particularly in countries with more limited institutional and technological capacities.

The case study also shows that reducing the marginalization of MRDGs constitutes a major challenge. This highlights the importance of incorporating CSOs that represent the interests and aspirations of MRDGs in the political sphere. Such incorporation may lay the foundations for more inclusive policies, which may reduce the vulnerability of MRDGs while also improving the overall well-being of such groups.

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