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# Examining the role of the diaspora in addressing the interconnections between human health and environmental change: The case of northern Senegalese communities

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ABSTRACT

Diaspora communities are a growing source of external assistance and resources to meet unmet needs and to strengthen existing health systems in their home countries. Although a growing number of articles have been published in this realm, very few have looked at diaspora communities' role and the place translocal communities give to health (care) in the various remittance dynamics, whilst including power relationships and environmental change. This article examines the motivations and practices through which Senegalese diasporas engage with the health system in their origin country and what barriers they face in their interventions. The results of the migration-environment-health nexus are critically discussed with a political ecology approach. We found that households and villages with a critical number of members abroad, and with strong political and/or international networks, are better off and less exposed to health risks in the face of adverse extreme climate impacts.

## 1. Introduction

This article explores the role of the diaspora in addressing the interconnections between human health and environmental change, with a specific focus on northern Senegalese communities. Environmental change, including climate change, deforestation, and desertification, has substantial implications for human health, particularly in vulnerable communities (McMichael, 2023). The northern region of Senegal, characterized by a fragile ecosystem and high reliance on natural resources, is particularly susceptible to the impacts of environmental change (WHO, 2019; Sultan, 2020). The diaspora, comprising individuals who have migrated from the region to other countries, maintain strong social and economic ties with their places of origin. Leveraging these connections, the diaspora can play a crucial role in addressing the challenges posed by environmental change and its impact on human health (Gemenne and Blocher, 2017; Grechi and Agustoni, 2019; Scheerens et al., 2021). This article explores the various ways in which the diaspora can contribute, including knowledge transfer, financial support, and political advocacy.

While the importance of diaspora engagement in development efforts is recognized, there is a gap in understanding the role of diaspora networks in improving healthcare access and facilities within Sahelian villages, particularly in the face of climate change impacts (Crate, 2011; Grechi and Agustoni, 2019). In this regard, this explorative study aims to add to the growing field on translocal, and transnational perspectives on health and environmental mobilities (Tacoli, 2009; Crate, 2011; Frehywot et al., 2019; Poppe et al., 2016; Kramer and Zent, 2019). Migration can lead to positive outcomes for individuals or households, yet it can positively or negatively impact the adaptive capacity of the communities they leave behind. Limited systematic research exists on the multi-scalar effects of adaptive migration on migrants and non-migrants (Schade et al., 2016), particularly concerning health. Surveys conducted in Low-and Middle-income Countries (LMICs) reveal that a notable portion of remittances is allocated to healthcare needs (Plaza, 2012; Randazzo and Piracha, 2019), and diaspora contributions to emergency humanitarian responses are well-documented (Nagarajan et al., 2015).

Nevertheless, diaspora involvement in healthcare extends beyond direct individual payments and disaster aid. Our study builds upon these insights, associating these contributions with remittances dedicated to

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enhancing local health infrastructure and medical resources at departure points. Poppe et al. (2016) interviewed 27 sub-Saharan African health workers in Belgium and Australia, highlighting that institutional crises and favorable European living conditions discourage their return due to concerns about health infrastructure, education, and security in their source countries. Recent research identifies 89 medical diaspora organizations across four high-income nations, focusing on health service provision and training in origin countries, professional networking, and aiding healthcare for displaced individuals in host countries. While some activities address short-term humanitarian needs, others have longer-term health system priorities. This study also uncovers 68 LMICs that have established diaspora offices to coordinate and manage diaspora contributions (Frehywot et al., 2019). These findings underscore the increasing interest among both diaspora groups and policymakers in harnessing and optimizing diaspora resources. Furthermore, this study examines the motivations and activities through which Senegalese diaspora communities engage with the health system in their origin country, as well as the barriers they encounter in their interventions. Ultimately, this research contributes to a deeper understanding of the lifestyle and health management practices of northern Senegalese communities in the context of extreme climatic disruption.

The next section delineates the conceptual and methodological framework applied in this investigation. Following this, the results section is structured into three primary components: The first section encompasses an exploration of the interrelationship between climate change and health outcomes, delving into health perceptions. The second one comprehensively evaluates the diaspora's role and expectations by the community members on delivering health infrastructures, encompassing aspects such as food production, water safety, water quality, and management. The third section scrutinizes the influence of diaspora engagement on collective adaptation via pivotal translocal practices—namely knowledge transfer, financial backing, healthcare investments, and political advocacy.

## 2. Conceptual and methodological frameworks

### 2.1. Conceptual framework

To understand the context and significance of diaspora engagement, it is essential to conceptualize diaspora communities as populations from a specific territorial, national, or ethnic origin living abroad, maintaining ties and exchanges with both their origin and destination countries (SSWA & IOM, 2011). Migration is often seen as a response to extreme climate impacts, serving as a means for adversely impacted communities to enhance adaptive capacities and resilience (Black et al., 2011; Gemenne and Blocher, 2017). However, the motivations for migration can also include access to better healthcare services and other welfare opportunities (Black et al., 2011; Van Praag et al., 2021a; 2021b; Ou-Salah et al., 2022; 2023a; 2023b; Timmerman et al., 2014). Recognizing the potential of diaspora communities, major development agencies, bilateral aid organizations, and NGOs have increasingly sought to harness diaspora development potential for economic growth (USAID, 2017). The contributions of diaspora communities take various forms, such as remittances, charitable donations, skill transfers, and policy advising (Heleniak and Canagarajah, 2011). These contributions could include both financial remittances but also consist of "social remittances" or "intangible" remittances, (Levitt and Jaworsky, 2007; Pinkow-Läpple and Möllers, 2022), that include "the knowledge, practices and normative structures migrants acquire at the migration destination and transfer to their migration origin" (Pinkow-Läpple and Möllers, 2022).

Using a transborder social fields (Glick-Schiller, 2011) and translocal political ecology approach (Sakdapolrak et al., 2016), the study encompasses international migrants (in Belgium), internal migrants (in Dakar), and key development stakeholders. Transborder social fields refer to the interconnected social and cultural spaces that emerge as a result of cross-border or transnational movements of people and the connections between individuals or communities in different countries. The translocal political ecology approach further builds on this idea and uses a theoretical lens to study environmental issues and resource management across multiple geographical scales, emphasizing the interconnectedness of local and global factors. The advantage of this approach is that it recognizes that environmental issues should be considered within the complex interplay of local, national, and global dynamics, including power relations in the analyses.

Besides health (care), the environmental and political dimensions related to migration are central to the analysis, including power relations in the analysis for adaptation and translocal social resilience. Following Keck and Sakdapolrak (2013), translocal social resilience allows social actors to move across national boundaries to facilitate coping with adversities, incorporate past experiences and knowledge into future actions, partially by the development of institutions that safeguard individual welfare (Keck and Sakdapolrak, 2013). In this study, we apply a translocal approach by looking at translocal communities that are social groups or networks that span multiple localities or geographic areas. Translocal communities often emerge because of migration, globalization, or the use of communication technologies that enable people to maintain connections across distances (Sakdapolrak et al., 2016; Glick Schiller, 2011). In casu, the communities are characterized by a sense of collective identity and shared practices, despite their members being physically dispersed. Hence, we studied eighteen "multi-sited Senegalese villages", which are networks established through migration and spread over several national, continental and international areas, involving several generations of individuals sharing the same area of origin, in this case a rural site (Dia, 2013). Hence, by using a translocal political ecology approach to study human health and environmental change we aim to lay bare the advantages, pitfalls and structural inequalities translocal communities at play in the studied villages (Fig. 1).

### 2.2. Data collection and sample characteristics

The ethnographic research approach was conducted by the first author and provided empirical evidence about health and migration in the Sahelian context of a changing climate, more particularly, in the northern Senegalese Mid-valley or *Fuuta-Tooro* region, as it is affected by climate change. The fieldwork aimed to capture social perceptions of environmental change, its impact on health, and community-based adaptation strategies involving international migrants and was part of a larger research project, that used a translocal approach in which Senegalese migrants in Belgium were also included. This research focused on multi-sited village communities as case studies that illustrate how environmental and climatic changes influence migration, health, as well as associated power, vulnerabilities and resilience. The villages (i.e., Soubalo, Garly, Vordé, Thiemping, Thially, Odobere, Mboumba, Doumga Lao, Dabia Odeji, Orefonde, Nouma, Tourguénol) were selected based on five criteria: 1) climate vulnerability and geographical location; 2) presence of international/return migrant networks to Belgium;

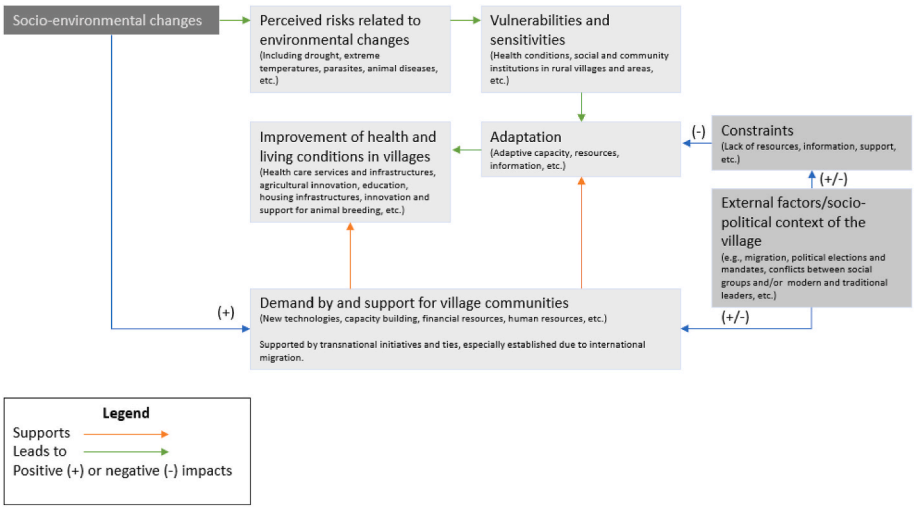


**Fig. 1.** Main rationales underlying the methodological framework for surveys in rural villages in Senegal (inspired by Abid et al., 2016).

3) history of migration; 4) number of inhabitants; 5) ethnic composition of the village. Based on these indicators, 12 Haalpulaar (Fulani-speaking) villages were selected. There is a large diversity included in terms of geographical location, resulting in a large variety of means of survival, ranging from fishing, the development of small commercial activities, market-oriented gardening to larger scale agricultural activities. The size of the villages, in terms of number of inhabitants, ranged from 300 inhabitants (where mainly pastoralists lived) to 3000 and up to 8000 inhabitants. The type of migration trends varied across villages, going from villages with established traditions of migration to Belgium to villages that only experience recent migration, with less people that have migrated. Finally, the ethnic composition of the Haalpulaar villages also ranged from homogeneous in terms of ethnic sub-groups specialized in mainly one traditional activity (e.g., Cubalbe fishers in Soubalo) to more socially heterogeneous villages. Apart from the research conducted in twelve Haalpulaar villages, interviews were conducted with mobile Haalpulaar populations in Dakar, including individuals engaged in internal, transit, and permanent migration.

Participants were selected based on a) whether they had migrant networks (in- and outside the country), and b) whether they had personal migratory experiences. Selection followed a snowball procedure, starting from people with migrant networks in Belgium or Dakar, and local key persons in the communities, to recruit also people with no networks nor personal migration experiences. In addition to these interviews, 43 in-person interviews were conducted with 23 modern healthcare staff, including nurses (3 F/10 M), 5 telephone interviews with nurses (0 F/5 M) medical family physicists (0 F/2 M), 2 private healthworkers (0 F/3 M); 11 traditional healthcare providers (0 F/11 M); and 9 local authorities (0 F/9 M) (see Table 1). The sample consisted of diverse participants in terms of age, gender, occupation/livelihood, social status, and personal migration history. Finally, the findings were triangulated with empirical data collected by the second author, in Senegal in Kanel, Dembankané, Ouro Sidy, Bokiladji, Ganguel Maka, Tata Batchili, which focused more in-depth on health impacts and health professionals and providing healthcare services in the Matam region.

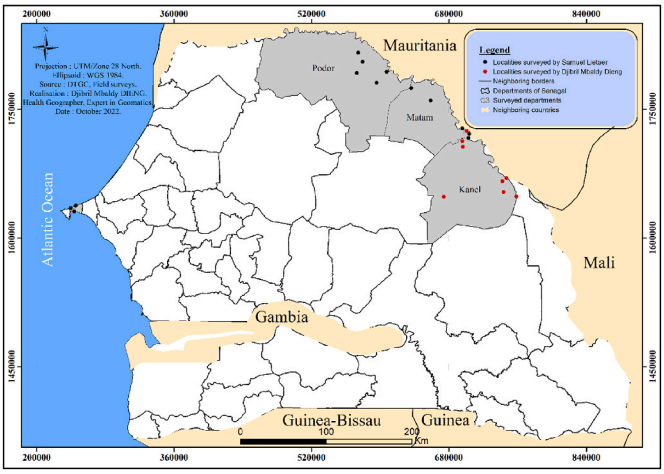


**Fig. 2.** Surveyed fieldwork villages.

The interviews, conducted between 2018 and 2020, followed a topic guide that covered socioeconomic background characteristics, factors affecting living conditions and livelihoods, migration history, experiences, aspirations, and specific environmental changes and their impacts on participants' livelihoods. All interviews were conducted with informed consent, and participants were assured of confidentiality. The interviews were transcribed and translated from French and Fulani to English (Fig. 2).

**Table 1**
Sample characteristics.

| Country of fieldwork | Participants living in Senegal | | | Additional questionnaires, including open questions) to support the data in Senegal | Additional interviews with Senegalese migrants living in Belgium |
|---|---|---|---|---|---|
| Location | Fuuta-Tooro | Dakar | Key Stakeholders in the Fuuta-Toro region | Kanel, Dembankané, Ouro Sidy, Bokiladji, Ganguel Maka, Tata Batchili | Brussels, Antwerp, Charleroi, Tournai, Liège |
| Total number of persons interviewed | 256 | 94 | 43[11] | 259 | 62 |
| Gender: Female/male | 62/194 | 41/53 | 3/40 | 20/239 | 16/46 |

### 2.3. Data analysis

The data were analyzed using thematic analysis, focusing on the similarities and differences in the topics addressed during the fieldwork related to the migration-environment-health nexus. Using a qualitative thematic content analysis allowed us to identify key themes and patterns within the data (Braun and Clarke, 2012). The main themes identified were: 'Food production: fishery and agriculture', 'Water quality, shortage and management', 'diaspora and return migration', 'change in agriculture', 'agriculture and migration', 'importance of remittances', 'Policies and situation on health and food security safety', 'health outcomes', 'health risks', 'colonialism', 'inequalities', "Living' livelihoods (nutritious food) affected by environmental change', 'social expectations for diaspora engagement', 'social infrastructures', 'challenges'. Building further on initial analyses of the first two authors, the third author further analyzed the data systematically based on these themes, further triangulating data and researchers.

## 3. Results

In the next sections, we will delve deeper into specific aspects that are seen to link climate change to health outcomes, and consequently, discuss how the diaspora and its transnational networks influencing power relationships are perceived to play a role.

### 3.1. Climate impacts and health perceptions

Our results show that Haalpulaar diaspora communities in Senegal play a significant role in addressing the migration-climate-health nexus. Climate change is considered to have led to various health impacts affecting these communities, including the increased prevalence of climate-sensitive infectious diseases like asthma and skin infections caused by deteriorating sanitation due to climate-related damage to water and sanitation infrastructure. Moreover, climate-related food insecurity and weather-related injuries further exacerbate health challenges. The impact of global warming is widely acknowledged by community members, although their understanding of greenhouse gas mechanisms and broader climate change processes remains limited. Nevertheless, they highlight the adverse effects of environmental disasters such as sand winds, heatwaves, and droughts on physical activities, leading to environmentally induced physiological and psychological illnesses and occasional antisocial behaviors. Conversely, there appear to be strong social expectations and demands from village communities towards 'their' diaspora members to address these issues. To grasp the analyses fully, it is crucial to outline the context and the available social and health infrastructures in the studied villages.

#### 3.1.1. Link between climate change and health outcomes

Climate change has direct and indirect impacts on health outcomes beyond the scope of food production, nutrition, and water issues. Participants have reported respiratory issues, including increased incidences of flu, asthma, and colds, attributed to air pollution from dust caused by drought periods. Heatwaves and sandstorms also have adverse effects on concentration, teaching processes, and students' performance in schools. The lack of awareness about tree planting and the importance of environmental conservation further exacerbates the health risks associated with climate change. These health impacts are influenced by socio-economic and political factors, including weak health policies, insufficient health infrastructure, and social inequalities.

### 3.2. Health infrastructures in northern Senegal

Although progress has been made in the past two decades, the basic social infrastructure (schools, health posts, mosques, etc.) is still considered inadequate in terms of quantity and quality, according to most of the villagers interviewed. Therefore, there is room for improvement in these infrastructures, particularly considering the impacts of environmental changes. The healthcare facilities are often perceived as unsuitable for the needs of the village and surrounding areas, both due to a lack of staff, medicines, and appropriate medical equipment and due to deficiencies in building infrastructure. The interviews demonstrate that climate impacts permeate all aspects of people's lives and how people put efforts in dealing with these consequences within their capabilities – which often go beyond health infrastructures and touch upon general infrastructures. Villagers frequently mention the absence of green areas, ventilation, and shade, as well as the use of 'warming' concrete and zinc in building structures, including school roofs, which are ill-suited to the local climatic conditions. Respondents propose various improvements, such as enhancing ventilation, changing roofing materials, and repositioning classrooms to mitigate the effects of wind, dust, and excessive heat. High temperatures are a particular concern, and the installation of air conditioning is seen as a means of coping with heat-related challenges. Interviewees mentioned that there were a lot of deaths in relation to the heat, especially old people and children.

When being asked about strategies to deal with the insufficient infrastructures, many participants bring to the fore the lack of political engagement with their region. This often means that villagers turn to diaspora members to search for solutions. Also, diaspora members themselves, who are often more mobile and therefore often contrast different contexts with each other, tend to search for solutions, based on their own experiences. For instance, diaspora members mentioned that air conditioning could provide relief especially for elderly, and therefore could reduce the need for mobility to urban areas like Dakar in search for better living conditions. As a village chief explained: "*As people get money from abroad, they install air conditioning everywhere for their old people*" (Thieming, February 2019). In addition to the lack of social infrastructure, diaspora members were valued, not only for health-related gains but also for improved intergenerational solidarity and social cohesion. The contribution of diaspora members to improving living standards through investments in air conditioning is significant. If it is not possible to install air conditioning, families bring elderly relatives to Dakar for temporary shelter during periods of extreme heat, reducing the risk of heat-related deaths, but also as it fosters social cohesion. This way, family members gather in the cooled rooms for companionship and shared meals. While asking about the role of the diaspora in reducing health-related risks of excessive heat and climate impacts, the fieldwork showed that while the diaspora plays a crucial role in introducing such improvements, the impact on local populations without diaspora members is more limited. Though, most villages can provide temporary housing options in Dakar for village members in need through the Hometown Association (HTA) or through informal kinship solidarity (for specific hospital care, for example).

#### 3.2.1. Food production and safety

Climate change significantly affects food production in various sectors, including fishery, cattle, and agriculture. Participants have reported the inability to sow crops in certain years and the preference for crops that require fewer resources such as machines, diesel, and insecticides. For instance, in agriculture, an interviewee added that what tired him are insects and cockroaches that attack corn or sorghum, when no insecticidal products were used. Participants have reported the inability to sow crops in certain years and the preference for crops that require fewer resources such as machines, diesel, and insecticides. Also, fishers encountered difficulties for sustaining their livelihoods. As a 60-year-old fisher from Dabia Odedji explained:

> "Yes, much changed. Before, 30 years ago, it was enough to put your feet in the water with nets. We could not even take it all. It was the abundance of fish. Today you spread your nets for 2 days without having anything. We often prefer to go buy some than go fishing. We get tired for no reason. In times of flood waters, we continue to fish,

but it's just enough for a meal or dinner. Before, we could sell the surplus."

The decreasing food production due to climate change was clearly felt, eventually impacting living standards, investments, and health outcomes. This is especially the case as many of these climate impacts are not accompanied by adapted agricultural policies and/or water management. These challenges, combined with decreasing revenues, poverty, and the need for insecticides, contribute to health risks and affect agricultural practices. Nonetheless, health risks are not always perceived as such, as a young farmer stated in Soubalo (February 2020): "*If you put on a mask when spraying, I don't see any other problems for our health*". And if perceived as such, many of these perceived challenges and health risks are related to broader investments and structural challenges and even conflicts – in which diaspora members also take up a position. In most cases, the financial support sent by diaspora members at the individual/household level contributes to '*eat the dry season*' (Warner and Afifi, 2014). Remittances enhance nutritional intake by enabling households to purchase healthier and often more expensive food items, such as citrus fruits. The purchasing power of households, which enables greater diversification for healthier diets, frequently grows with the increase in the number of out-migrants and becomes increasingly evident over time as remittances are received.

In some cases, diaspora members invest in community investments, but their efforts are not always fully supported. For instance, farmers in the region face challenges with altered flood recessions. This is perceived by many to be due to the construction of hydro dams up – and downstream and climate change. This hinders motivation and willingness for local agricultural investments, which are often supported by diaspora members (mostly at household or family-level, and sometimes at broader community-level). Furthermore, climate change also leads to a reduction in useable land, resulting in conflicts between farmers and pastoralists seeking land for their livestock. In response to these challenges, some individuals resort to buying extra food supplies and selling part of their animal stock to sustain themselves, a practice that has been ongoing for many years. In addition to food production and safety, a second issue was raised by impacted participants, namely water quality, and the management of this scarce resource.

#### 3.2.2. Water quality, shortage, and management

Water-related issues pose significant health challenges in the region, including concerns about water quality, water scarcity, and inadequate water management. The intrusion of saline seawater, referred to as 'the salty tongue,' poses a threat to water security and impacts drinking water sources and agricultural activities. This intrusion, along with a lack of resources to invest in well-digging and excessive costs of drinking water, affects water availability for purposes beyond consumption and hygiene. As illustrated by a participant living in Thially, the ways several villages deal with waste, drilling and water management matters a lot for own survival and investments in agriculture:

> "The drinking water bill is too high to exploit the entire surface of the garden. Sometimes drilling can cut. The Thially village well is abandoned, due to waste from the drilling. While it supplied the whole village and even neighboring village. These wells have been neglected since the drilling, but people regret it. Here, they have a central well and a dispensary well. The central well was also used for the gardens and to water the cattle and drinking water. Experts say the water quality is good. Just deepen it and then put solar pumps."

He continues by stating that a lot of villagers use drinking water for agriculture. Other issues arise, for instance when growing rice, which requires a lot of water and costs to deal with associated risks, including fence protection against the animals/livestock that come to drink and eat the rice.

Importantly, when dealing with water management, participants stress that it is needed to consider the distribution of limited (water) resources. Choices made herein are political in nature, as shown by the accounts of the villagers and diaspora members: inadequate water management systems - often due to unequal treatment and kin favors - have negative consequences for food production, and the scarcity of water affects the livelihoods of farmers and herders. When discussing these issues with community leaders, they also add that insufficient access to clean water can also lead to the introduction of infectious diseases through contaminated food and vectors. Furthermore, as many school officials mentioned, the shortage of water affects sanitation facilities, such as the lack of toilets in schools, impacting students' health and well-being.

### 3.3. Diaspora engagement impacting collective adaptation and health resilience

The engagement of diaspora and migrant networks in addressing matters related to health is, apart from the physical infrastructure and the prevailing socio-economic conditions, significantly influenced by the prevailing political climate. The lack of confidence in political leaders and reservations about the actions taken by the government contribute to a more pessimistic outlook regarding prospective reforms and assistance. The involvement of government officials is seen as counterproductive by many diaspora members and local inhabitants, prompting migrant interviewees to express a preference for direct interaction with targeted farmers, circumventing these intermediary figures. The dearth of capable politicians and the perception that individuals possessing pertinent skills are disinclined to participate in politics further augment the prevailing distrust in political circles.

Local inhabitants articulate their dissatisfaction with unmet commitments and insufficient State support, exemplified by instances such as the provision of electricity without the concomitant construction of paved roads, or the non-delivery of promised ambulance services. The evident absence of faith in political efficacy is unmistakable among the villagers, as illustrated by a farmer's recollection of village electrification in Garly, a village with relatively less diaspora members and no politically engaged (return) migrants: "*While the electric poles have been installed, we are still devoid of electricity. These words and assurances come from politicians … and we remain in anticipation, we are always waiting.*" These disillusioning experiences construct the perception of the State's ineptitude in furnishing adequate assistance. Consequently, most villages center their expectations on migrants within their communities. Nevertheless, the community engagement endeavors of the latter often exhibit complex associations with local, regional, and national political domains. Except for these villages without historically strong migration networks and engaged members, like Garly.

Numerous interviewees underscore the scarcity of proficient politicians, noting that the role of a "mayor" should not be devoid of relevant experience. The experience of international migration, when channeled through the Hometown Association (HTA), is regarded by many migrant and non-migrant respondents as a significant asset that can empower individuals to assume impactful political roles, thereby augmenting community resilience. Nonetheless, the role of the diaspora in addressing climate impacts and health infrastructure varies significantly depending on the presence or absence of networks. Networks play a vital role in mobilizing resources and addressing community needs. However, investments and expenses from the diaspora are not evenly distributed across sectors, with education and health often prioritized over agriculture. The importance of diaspora contributions is underscored by a typical phrase that several villagers pronounced: "*In all villages, there are problems with the governments. We are all equal, but certain are more equal than others.*" This reflects the recognition that diaspora support can lead to unequal outcomes and benefits across communities.

#### 3.3.1. Major translocal practices contributing to increased adaptive capacity

Within the domain of migrant networks, three primary translocal

practices were identified, which were observed to bolster adaptive capacity. These practices encompass knowledge transfer, financial support, and engagement in political advocacy.

*3.3.1.1. Knowledge transfer.* Diaspora organizations engage in a diverse array of activities focused on the dissemination and transfer of knowledge. These activities encompass short-term mission trips, provisions of humanitarian and disaster aid, as well as the establishment of partnerships to facilitate the exchange of knowledge and skills. These proactive endeavours serve as conduits for the assimilation of innovative strategies aimed at addressing challenges pertaining to the environment and public health. The local populace acknowledges in most villages the pivotal role assumed by the diaspora in facilitating the diffusion of information and the exchange of exemplary methodologies in the health sector. The developmental trajectory of diaspora associations has undergone a gradual evolution, initially centred around repatriation and ceremonial aspects, subsequently diversifying to cater to an array of imperatives such as education, healthcare, and entrepreneurial pursuits.

Significantly, the diaspora has emerged as a dynamic participant in promising sectors such as agriculture and real estate, a manifestation of their dedication to investing in domains marked by growth potential. It is the intricate interplay and sharing of knowledge, as encapsulated within the concept of "intangible remittances" (Pinkow-Läpple and Möllers, 2022), that has yielded noteworthy instances thus far. Several villages have reaped benefits from migrant individuals who have forged partnerships leading to the installation of solar electric systems, specifically photovoltaic setups, catering to fundamental social infrastructure such as schools, health posts, and maternity wards. For instance, in the case of Thiemping, a Swiss technical team hailing from Ticino effectuated the replacement of an aging generator at a local health post. This transformational initiative not only obviated pollution concerns but also augmented power supply, thereby facilitating optimal conditions for the storage of critical medicines and vaccines. This endeavour was the outcome of a personal friendship nurtured between a migrant from the village and a Swiss medical practitioner.

*3.3.1.2. Financial support and healthcare investments.* Financial support from the diaspora plays a crucial role in funding sustainable development projects and improving healthcare infrastructure in northern Senegal. This support enables initiatives to address environmental degradation, enhance access to clean water and sanitation, and strengthen healthcare systems to better respond to emerging health risks. As shown above, diaspora members' financial contributions also contribute to the economic stability and resilience of the villages and their local communities (within their kin, or social subgroups), helping them cope with the challenges posed by climate change.

Simultaneously, akin to the prevailing trend in numerous sub-Saharan African nations, diaspora organizations and HTAs have directed their efforts towards prioritising healthcare requirements. A significant proportion of diaspora members who contribute to healthcare infrastructure investment concurrently pursue vocations within the medical domain in their host countries (Taslakian et al., 2022). These roles often encompass professions such as nursing and general practice, granting them access to pertinent medical resources. An illustrative instance can be found in the establishment of the secondary health center in Waoundé, where local diaspora collaboration, in conjunction with German cooperation, has led to the comprehensive construction and outfitting of the facility. It is notable that a considerable number of diaspora constituents participate in pooled funds to finance the construction of healthcare facilities. They also arrange for the transportation of hospital equipment from medical institutions in Belgium, which are in the process of upgrading their equipment. In addition to augmenting family remittances designated for healthcare, certain diaspora members have initiated initiatives aimed at alleviating the deficiency of adequately trained medical professionals.

In multiple villages, however, it has been observed that gender power struggles pose obstacles to these efforts. For instance, proficient female diaspora members who have acquired medical degrees in Belgium face challenges linked to "jealousy" - related to social status modifications - when offering training to male physicians in the villages (including family physicians and nurses). Several of these skilled diaspora members reported that, sometimes, these attitudes put them off to continue their work. Yet, as a middle-aged 42-year-old nurse living in Belgium for 22 years, argued:

> "What can we do to change this? This is about jealousy and traditional male mentalities. Many men cannot accept that skilled migrant women, especially when coming from lower castes, come back and tell them how to best do things. But, in the end, everyone is benefiting from us, so …" (Brussels, October 2019).

Yet, the commitment to invest in healthcare services is deemed a priority, a sentiment that resonates with the perspectives of many local inhabitants who consistently highlight the dearth of healthcare infrastructure and personnel needed to operationalise such facilities. A medical practitioner's statement encapsulates this sentiment (Doumga Lao, 2020):

> "Within the health centre, our inadequacy in terms of human resources is evident, particularly with respect to the equipped but non-functional - and very hot - operating theatre due to staffing constraints and unadapted infrastructures. Hence, the imperative of outfitting this service becomes essential to meet the people's healthcare requirements."

This quote underscores the necessity for diaspora investments to embrace a long-term perspective that encompasses the sustainability of these infrastructures, the provision of healthcare services, and the integration of strategies to address challenges stemming from the palpable ramifications and health hazards arising from the swiftly warming natural environment.

Despite these efforts, barriers to health access persist, particularly related to affordability. The cost of healthcare services poses a significant burden for populations whose livelihoods depend on agriculture and livestock, especially considering the differential impacts of climate change on income. Many rural dwellers face barriers that limit their ability to obtain timely and appropriate healthcare services. While health dispensaries have been established through collective funding by diaspora members, necessary and accessible healthcare services remain inadequate, particularly in smaller villages with fewer diaspora members abroad. Financial constraints prevent many households from paying for healthcare services or obtaining accepted health or dental insurance. Despite the Senegalese government's aspirations to establish comprehensive healthcare coverage via the Universal Health Coverage (CMU) initiative, bolstered by a concurrent diaspora support program, operational challenges such as issues related to revenue collection and overdue payments impede the full realization of its intended impact. Inadequate access to information about available services also hinders healthcare accessibility, as patients may seek care without awareness of specific services, leading to wasted time and money.

Furthermore, households with diaspora members are more capable of overcoming geographical and financial barriers to healthcare access compared to those without. They have the means to reach and afford services, including transportation to distant healthcare facilities. However, cultural health traditions also play a role, as some individuals, including diaspora members to a lesser extent though, choose traditional healers over modern medicine based on their beliefs about responsibility for illness. Some villagers argued that diaspora members who are living in Europe since more than a decade or so "get too disconnected with local realities". According to them, "these migrants lose sometimes the feel with the important role of traditional healers", and hence, "do not consider them enough" in their various translocal practices. For example, it is generally much less accepted by the diaspora to use sent

money from Belgium for purchasing such traditional healer services, or for collective support through the Hometown association for this paramedical branch.

In some instances, diaspora partnerships have facilitated the installation of solar electric systems for social infrastructure, such as schools and health posts. However, the dependence on external partners and development aid is evident. There is a lack of autonomous mastery of imported techniques and know-how, both by international migrants and beneficiary populations. For instance, the maintenance of equipment imported from foreign partners poses challenges in certain villages. This underscores the need to contextualise progress in food production and water management within the socio-economic and political conditions, while acknowledging that climate change has a significant impact on people's health beyond environmental changes alone.

*3.3.1.3. Political advocacy.* The diaspora can play a crucial role in advocating for policies and interventions that prioritize the intersection of human health and environmental change. By leveraging their networks, diaspora members can raise awareness, influence decision-making processes, and promote sustainable practices at both local and international levels. Their engagement in political advocacy can contribute to addressing the challenges posed by climate change and improving health outcomes in the region. When looking at the importance of the diaspora to deal with both climate impacts as with health infrastructure, huge differences are found between those (villages/individuals) with and without networks. Additionally, the expenses and investments of the diaspora do not seem to be equally shared across sectors. Education and health are priorities that are more put into practice, in contrast with agriculture. Despite strong State discourses in Senegal about the importance of agricultural investments by the diaspora, echoed by both villagers and most diaspora members, this for-profit activity remains more constrained within family circles than for collective village projects.

Common collective translocal practices, emanating from the diaspora, encompass political advocacy strategies, particularly evident in endeavors related to reforestation and waste management. These undertakings exhibit traits of direct engagement, voluntary participation, and deliberate and anticipatory planning. The reforestation initiatives are positioned to mitigate soil degradation and the encroachment of desertification. Nonetheless, their transformative impact remains constrained, as they do not bring about substantial alterations to prevailing models such as wood-based energy sources, upgraded stoves, or gas cookers. The overarching goal of curbing the decline in forest cover has yet to be fully realized, primarily due to the inherent challenges associated with sustaining tree growth, except within privately owned or well-protected regions. Waste management initiatives are influenced by migrants' calls for community-wide clean-up initiatives, colloquially referred to as "set-setal." These programs typically receive formal backing from the Commune and frequently collaborate with developmental partners identified through the diaspora's international connections.

## 4. Discussion and concluding remarks

The case of northern Senegalese communities serves as an illustrative example of how the diaspora can contribute to addressing the links between human health and environmental change (see also Grechi and Agustoni, 2019). This contribution adds to the growing field on translocal, and transnational perspectives on health and environmental mobilities (Tacoli, 2009; Crate, 2011; Frehywot et al., 2019; Plaza, 2012; Poppe et al., 2016; Kramer and Zent, 2019). The study contributes to this emerging field in mainly four ways. First, findings of this study highlight that our participants perceived insufficient health infrastructures in Northern Senegal, often turning to diaspora members and/or reflecting on (personal) mobilities or those of the most vulnerable ones (e.g., elderly) in times of increased health risks due to climatic factors (e.g., excessive heat). In line with earlier research in this region (Grechi and Agustoni, 2019), climate change was perceived to impact food production and safety, as well as water quality and shortage.

Second, this study demonstrates that the engagement of the diaspora in addressing the migration-climate-health nexus extends beyond financial support. It also encompasses the recognition of context-specific factors, including local knowledge, cultural values, and community priorities. Hence, this stresses the importance of "social/intangible" remittances for the adaptive capacity to deal with environmental change (Pinkow-Läpple and Möllers, 2022). By including the perspectives of both migrants (internal and international) and non-migrants (with and without migrant networks) in a region highly affected by climate change, but also with specific cultures of migration and migration dynamics related to (the adaptation to) climate change, our data demonstrates how international migrants have a significant influence on various social determinants of health risks, including health care access and quality, economic stability, education access and quality, and the built environment (Heleniak and Canagarajah, 2011; Grechi and Agustoni, 2019). It is important to note here that the diaspora cannot solve all these structural issues. Thus, concerning the potential use of intangible remittances to deal with climate-related risks, a match is needed between skills and resources (see also Van Praag, 2021). Hence, relying on diaspora members to deal with health infrastructures brings along a double burden on this group of migrants (Van Praag, 2023). Even more so when migrants' disconnectedness appears indeed to be a limiting factor to respond the villagers' request in their distinct views on livelihood and health resilience needs (Sakdapolrak et al., 2023).

Third, given that diaspora members in the first place help their networks and communities, relying on transnational and translocal networks can create social disparities and tensions within communities (see also McLeman et al., 2016; Van Praag et al., 2021a). Inequalities exist across villages, families and households concerning the extent to which they benefit from translocal and transnational networks, which impacts their access to healthcare and financial support. As diaspora members modify and transform social, economic, and political factors, through their translocal practices, they transform and (re-)create disparities within and between the villages in the region. Diaspora organizations and HTAs prioritize addressing healthcare needs, and their significance is evident at the community and household levels. The diaspora has played a pivotal role in establishing school and health infrastructures, often through collaborations with NGOs (co-development) or decentralized cooperation (Dia, 2013). Nonetheless, such transnational practices are not only equivocally positive. First, return of diaspora members – even temporary, during holidays – to their communities of origin can also disrupt local social dynamics. Differences in lifestyles, values, and expectations can lead to tensions and conflicts within communities. Second, diaspora engagement can negatively impact health and safety in communities of origin. Notably, because the Senegalese diasporas' actions can send a signal to national and regional policymakers that the basic needs of these villages are already being taken care of. Yet, diaspora's capacity to address structural challenges, such as the emigration of health workforce and the lack of quality training and well-paid doctors, is limited (Majeed et al., 2017; Efendi et al., 2021).

Finally, despite the efforts of the diaspora, barriers to health access persist, particularly related to affordability. The cost of healthcare services poses a significant burden for populations whose livelihoods depend on agriculture and livestock, especially considering the differential impacts of climate change on income. Many rural dwellers face barriers that limit their ability to obtain timely and appropriate healthcare services. While health dispensaries have been established through collective funding by diaspora members, necessary and accessible healthcare services remain inadequate, particularly in smaller villages with fewer diaspora members abroad. Financial constraints prevent many households from paying for healthcare services or

obtaining accepted health or dental insurance. Despite the Senegalese government's aspirations to establish comprehensive healthcare coverage via the Universal Health Coverage (CMU) initiative, bolstered by a concurrent diaspora support program, operational challenges such as issues related to revenue collection and overdue payments impede the full realization of its intended impact. Inadequate access to information about available services also hinders healthcare accessibility, as patients may seek care without awareness of specific services, leading to wasted time and money.

Some limitations should be noted on this study, that could inspire future research. Despite the large sample used, the primary focus of the research was directed to explore connections between international migration, environmental change and transnational practices related to health (care), and less to health outcomes and management of health risks. Hence, future research is needed to fine-tune how international migration and diaspora influence health risk distribution in the context of extreme climate change impacts. More specifically, within this field of research, a clearer distinction should be made in specific health outcomes, ranging from mental health to infectious diseases, to indirect consequences of climate change on health (McMichael, 2023). A second limitation relates to the need to better assess the interconnectedness between climate change and health risks and outcomes more explicitly, considering factors such as professions, gender, age, and the influence and structure of migrant networks, both internal and international (Van Praag and Timmerman, 2019).

Some policy recommendations can be made based on our findings. First, when policy makers develop climate adaptation interventions, including those in the health sector, the intended beneficiaries should be involved, and these policies should be framed by their goals and priorities. Policymakers could do so using 1) systematic bottom-up approaches that ensure equitable distribution of resources and investments, 2) support translocal communities and their initiatives while promoting inclusivity and transparency (Taslakian et al., 2022). Second, to reduce vulnerability to climate change impacts and health risks (Brubaker et al., 2011), satellite technology can be employed as demonstrated in some indigenous communities of the global north. Third, increased focus on health risks and consequences are needed when developing policies focused on climate adaptation by strengthening disease surveillance, monitoring food and water quality, and implementing infrastructure projects. At the same time, when setting out health policies, more systematic attention needs to be given to climatic causes and risks. Finally, the intangible and financial remittances shared by diaspora networks are often valued and cherished, for instance, as it enhances community resilience. Nonetheless, attention should be paid to how diaspora activities reinforce power relations (Artur and Hilhorst, 2017; Rusca et al., 2015) and how diasporas can strengthen or create existing social/ethnic/gender inequalities (Black et al., 2011; McLeman et al., 2016; Van Praag et al., 2021a). In doing so, it is important to remember that, although diaspora members aspire to reverse the health-related migration, brain drain and improve healthcare training in peripheral regions, their efforts are often insufficient to address the scale of the problem. Increasing support for diaspora activities from government agencies and local partners is crucial, but caution must be exercised to prevent elite capture and manipulation of resources by diaspora members and local elites.

To conclude, diaspora engagement can bring both positive and negative consequences for the health and safety of communities in Africa. It is essential to critically assess the potential downsides while leveraging the positive aspects of diaspora engagement to create well-rounded and effective health and safety initiatives. This reflection underscores the importance of well-informed and culturally sensitive approaches in diaspora-led health projects to maximize benefits while mitigating the negative impacts. While an excessive focus on family remittances can shift focus and resources away from the development of local healthcare systems, the collaborative remittance system through the HTA and co-development initiatives involving diaspora associations (HTA) and national or international institutions (bilateral development cooperation or non-governmental cooperation) seems to have a positive impact on the Senegalese Mid-valley. This region, which has been neglected in political priorities for decades, is experiencing a noticeable difference. However, the diaspora members cannot structurally bear this burden alone. Yet, politically engaged diaspora members can pressure high-level Senegalese politicians to enhance health infrastructure and other development projects with positive health incidence.

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## Data availability

The data that has been used is confidential.

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