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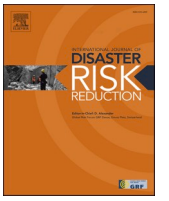

Translocal responses to natural hazards: Insights from Indonesian support-lending migrant communities in Germany and the Netherlands

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ABSTRACT

Translocal social networks connect people across different places and enable the flow of financial resources, knowledge, skills, and practices. This translocal social capital is expected by scholars to be beneficial for the adaptive capacity of communities affected by natural hazards and environmental change. While existing hazard studies show the positive influence of translocal social capital for affected communities, it remains unclear what forms of support are available through translocal social capital, and how translocal social capital is activated, utilized, and translated over spatial and socio-cultural distances to improve adaptive responses of households and communities. To address this question, we examine the characteristics and determinants of translocal support provided by Indonesian migrant communities in Germany and other EU countries to family members affected by natural hazards in Indonesia. We apply a mixed-methods approach, combining the results of qualitative interviews and a quantitative online survey. Our results show that translocal social capital can materialize in much more diverse ways than previously assumed, including emotional/mental support, financial/material support, mobilizing social networks for practical support, sharing knowledge and skills, discussing adaptation/response strategies, as well as local support through being on-site. Further, we find that the identified forms of support are shaped by a variety of individual and situational factors of the support-lending migrants including socio-economic situation, migration history, experiences with and knowledge about natural hazards, embeddedness in a (trans)local network, and perceived agency. Our study highlights the multifaceted nature of translocal support, emphasizing the importance of understanding both provider and recipient perspectives in harnessing these networks.

1. Introduction

For many local communities in the Global South, their ability to cope with and adapt to environmental change and natural hazards is closely related to their social capital, which is accessed through their social networks [1,2]. Social capital can fulfill a variety of functions in times of crisis such as providing moral and material support, resources, or information, ultimately shaping the adaptive capacity of local communities [3]. As climate change and sea level rise are expected to exacerbate the risk and impact of natural hazards globally, social capital will likely grow in importance, particularly for communities that have limited financial and human

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capital or are constrained by limited government resources and interventions [4,5].

In a globalized world, social capital is increasingly becoming more translocal, meaning that it is organized across local, regional, and national boundaries [6–8]. In this regard, migration is considered the most influential practice in establishing translocal ties as family ties between migrants and their non-migrant families in their place of origin represent the most cohesive and reliable translocal ties [9–14]. The resulting translocal social capital enables households and local communities to access resources, knowledge, and opportunities that are not available locally [4,15].

The flow of people, financial remittances, knowledge, skills, and practices between places in translocally connected social networks can have a significant effect on resilience and climate change adaptation of households and communities [13]. This vital role of translocal social capital for community resilience is especially highlighted in the event of major disasters when local ties reach the limits of their support capacity [10,16,17].

The prevalent conceptual understanding of translocal and migrant support is usually limited to the transfer of financial resources, knowledge, skills, and practices (e.g. Ref. [18,19,20]) and often does not consider other potential forms of translocal support such as psychosocial and moral support [21], or labor [13]. Much of the literature on translocal social capital in hazard and climate change adaptation research has looked at whether the presence of translocal social capital improves adaptive responses or the overall adaptive capacity and resilience of affected households and communities [4,14,16]. In other words, while translocal social capital is regarded as a valuable resource for households and communities affected by natural hazards and environmental change, knowledge about the formation and implementation of translocal support remains limited.

Furthermore, most research in this context is focused on the receiving end – households and communities that are affected by natural hazards (e.g. Ref. [21,22]). While acknowledging that translocal support will be influenced by the needs of the receiving end, we argue that major determinants of translocal support lie in individual characteristics on the support-lending side of translocal social networks (see Ref. [23,24]). Ultimately, there is little knowledge about those who actually lend translocal support and what factors may contribute to or inhibit them to provide it. To address these research gaps, the following two research questions are at the center of our analysis.

1. What forms of translocal support emerge in the context of responding to natural hazards?
2. What factors determine the use of different forms of translocal support and how do they shape translocal responses and adaptation measures?

To address our research questions, we examine the characteristics and determinants of translocal support migrants provide to their non-migrant family members affected by natural hazards.

We focus on Indonesian migrant communities in Germany and other EU countries as an empirical case. Indonesian migrants in the EU are mostly high-skilled workers [25]. Given their available financial and human capital, we expect a greater potential for a vaster range of translocal support from these individuals (see Ref. [26]). Following this approach, we aim to identify the various forms of translocal support that can emerge when responding to natural hazards and examine the factors that determine and shape the activation of different forms of translocal support. In doing so, we broaden our understanding of how individual characteristics on the support-lending side influence translocal social capital, ultimately shedding light on the crucial role it plays in community adaptation.

2. Conceptual background

Social capital refers to the resources embedded within social networks, which facilitate cooperation and collective action among individuals and communities [27]. Social capital is seen as an important resource in countries of the Global South because it can compensate for deficiencies in financial or human capital [13]. As a result, social capital enables vulnerable communities to manage natural hazards effectively, though it may not always be sufficient for long-term development and resilience [28]. Social capital comprises three interrelated forms: bonding, bridging, and linking [1,17,29–31]. Bonding social capital refers to close-knit relationships and strong ties within homogeneous groups, such as families, close friends, or members of the same cultural or religious communities. This form of social capital fosters trust, reciprocity, and emotional support among its members. In contrast, bridging social capital involves the formation of connections and networks between more diverse and heterogeneous groups, promoting the exchange of ideas, resources, and opportunities across social boundaries. Finally, linking social capital connects individuals and groups to institutions, enabling access to resources and decision-making processes to shape their social, economic, and political environments.

In contrast to social capital grounded in one specific location or neighborhood, translocal social capital transcends geographic boundaries, connecting individuals and communities across different locations, regions, or countries [4]. Translocality originally emerged as a conceptual framework to describe grounded or rooted transnationalism and forms of local-local connections and relations [9,32]. Because the concept is interested in practices that are shaped by their immediate environments, it also concerns the actual practices of people from below [33]. Studying translocal social capital has become increasingly relevant due to globalization, advancements in communication technologies, and growing migration flows. While local social capital primarily focuses on the immediate environment and shared values, translocal social capital allows for intercultural exchange, international perspectives, and broader resource access [6–8].

Translocal social capital and migration are intricately linked, as the mobility of individuals and communities across borders drives the development of these expansive networks and relationships [11,14]. In fact, migration is considered the most influential practice in establishing translocal ties [9,11,12]. When people migrate, they often maintain connections with their country of origin while simultaneously forging new relationships in their host communities [34]. Family ties usually represent the most cohesive and reliable

translocal ties, highlighting the importance of translocal bonding social capital for fostering social resilience [10,13,35]. These connections also benefit their home communities, as the flow of knowledge, remittances, and cultural exchange can foster economic development and social progress [18]. Additionally, migrants often experience different political, economic, and social contexts compared to the affected households at home, which enables them to offer similar benefits as bridging and linking social ties might [14]. In this regard, it is crucial to recognize that translocal social networks and social capital usually develop independently of exposure to natural hazards. Instead, existing networks are often created due to processes like migration, maintained through close relationships, and then activated in emergencies [36]. In other words, translocal social networks are typically established as general livelihood support strategies, independent of hazard exposures.

Translocal support – the flow of financial resources, knowledge, skills, and practices facilitated by translocal social capital – has significant implications for communities' adaptive capacity (see Fig. 1). Translocally connected households and communities can access resources and opportunities not available locally, which is especially relevant when local resources are depleted or overburdened [10]. Translocal social capital is positively associated with responding to natural hazards and with long-term adaptation strategies and innovation [4,16,37]. Thus, disaster-affected households can significantly benefit from the support of migrants through various means, as translocal connections establish channels for assistance that supplement local and governmental relief efforts.

We argue that individual translocal support from migrants plays a significant yet often overlooked role in disaster relief, complementing collective efforts and providing unique benefits to affected households. The existing literature predominantly focuses on the role of diaspora and collective efforts in disaster relief (e.g. Ref. [32,38–40]), often overlooking individual relief channels [23]. Migrants usually maintain strong connections with their non-migrant family members, providing aid while remaining geographically distant and physically unaffected by the same disaster [10]. Moreover, disasters tend to amplify migrants' engagement with their country of origin [32], drawing increased attention from their host countries to the disasters happening in their homeland [34]. Platte [34] states that this is especially relevant for events happening far away from potential donors or disasters that are so small scale that they may go unnoticed in the global news stream.

Drawing from migration and development studies, translocal support from migrants is typically conceptualized as financial and social (or non-financial) remittances. Financial remittances involve migrants sending money to their families and communities in their countries of origin, which can offer relief for immediate needs like food, shelter, and medical care, as well as contribute to long-term recovery efforts such as rebuilding homes and restoring livelihoods [18,19]. In contrast, social remittances refer to the sharing of knowledge, skills, and practices between migrants and their home communities [20,41]. This type of remittance can enhance adaptive

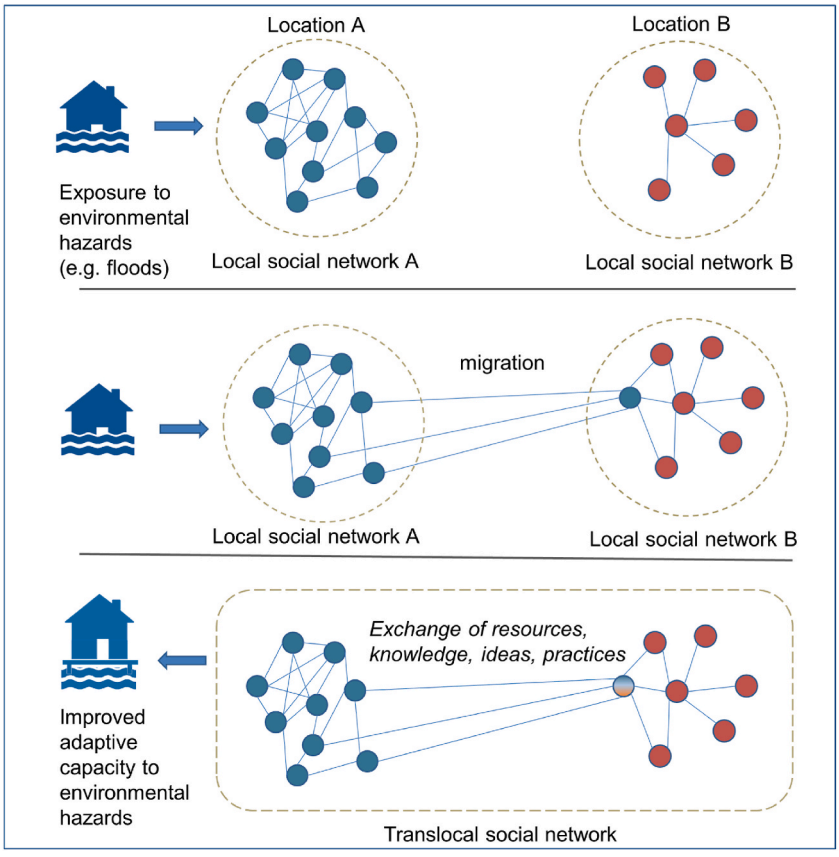

Fig. 1. Translocalization of social networks through migration and its impact on adaptive capacity to natural hazards (own illustration).

capacity and climate resilience, especially among at-risk households, by fostering the transfer of innovative ideas, risk reduction strategies, and environmental management techniques [42]. Financial remittances have received widespread attention in the literature due to their accessibility and measurability, while the potentially more important effects of social remittances have only recently received more attention (see Ref. [19]).

While financial and social remittances from migrants serve as valuable conceptual foundations for understanding how translocal social capital can manifest, research gaps remain concerning the diverse ways individual migrants engage in such support and the factors influencing their involvement in disaster response and adaptation efforts. Specifically, remittances carry the notion of continuous processes and dynamics within translocal networks. However, as illustrated by other scholars (e.g., Ref. [21,39,43]), we argue that translocal social capital can manifest in diverse forms of support, especially when activated as a response to external threats and shocks such as natural hazards. For example, Pacoma and Delda [21] highlight the significant role of psychosocial support for household resilience in the aftermath of Typhoon Haiyan in the Philippines.

Finally, to advance research on translocal social capital and responses to natural hazards it is crucial to identify and analyze the characteristics and determinants of translocal support. The factors shaping migrants' translocal engagement and the activation of translocal support within social networks are still poorly understood. Both financial and social remittances are influenced by a range of factors, including personal, social, economic, spatial, political, and cultural aspects (see Ref. [24]). For instance, Dalgas [23] argues that the extent of individual relief provided by migrants likely depends on their wealth and the nature of their translocal social networks. Social remittances, in particular, are seen as highly contextual [19].

3. Indonesian migrant communities in Germany and other EU countries

Indonesia is one of the most disaster-prone countries in the world, displaying a wide range of natural hazards across large areas of the country such as earthquakes, tsunamis, volcanic eruptions, flooding, or land subsidence. The impact of climate change and sea level rise are expected to exacerbate the risk and impact of some of these natural hazards in Indonesia in the future [44,45].

We focus on the context of translocal connectedness between support-providing migrants and individuals who are directly affected by natural hazards in Indonesia which makes this case relevant for examining the characteristics and determinants of translocal responses to natural hazards. Germany harbors one of the largest Indonesian migrant communities in the European Union [25]. Other important countries of Indonesian immigration in Europe are the Netherlands, Belgium, and France. There are currently around 22 000 Indonesians living or working in Germany. Indonesian-German migration is characterized by labor and educational migration. These mostly high-skilled and educated migrants come from diverse regional and social backgrounds and maintain strong connections with other Indonesian migrants in Europe and their families and communities in Indonesia (ibid.).

4. Methodology

To comprehensively answer our research questions, we employed a two-part mixed methods research design. This approach involved semi-structured qualitative online interviews and a quantitative standardized online survey. We used qualitative interview data to inform the design of a subsequent standardized quantitative survey. By doing so, we ensured that our research process enabled both in-depth information gathering and rigorous data analysis to increase the overall validity and generalizability of our results. We chose to conduct this research online due to the mobility and accessibility constraints caused by the Covid-19 pandemic during the data collection period, which took place from November 2020 to February 2022.

4.1. Qualitative interviews: data collection and analysis

As a first step, we conducted qualitative semi-standardized interviews with Indonesian migrants living in Germany and the Netherlands. For practical reasons, we used a respondent-driven sampling technique, where interview partners would refer to other potential respondents. To reduce the bias caused by this approach, we purposefully selected respondents by aiming at a high rate of heterogeneity among the interviewees concerning their demographic and socio-economic characteristics including age, gender, occupation, place of residence and origin, as well as their time spent outside of Indonesia.

The interviews followed a semi-structured approach with the use of interview guidelines. The guidelines covered questions on (1) demographic and socio-economic status; (2) migration history/background and motivation; (3) social networks of migrants in place of origin and destination; and (4) experiences with natural hazards.

In total, 39 interviews have been conducted with Indonesians living in Germany and the Netherlands. The interviews were conducted from November 2020 to March 2021. The interviews have been conducted in English or German according to the preference of the interviewees. The interviews have been audio recorded and transcribed afterward. The average interview duration was 60 min.

The interview data was analyzed using qualitative content analysis in MaxQDA (see Ref. [46]).

The findings of the qualitative data analysis serve as the basis for the development of the subsequent quantitative standardized online survey. We identified six forms of translocal support that are common in our sample: (1) emotional/mental support, (2) financial/material support, (3) mobilizing social networks for practical support, (4) sharing knowledge and skills, (5) discussing adaptation/response strategies, as well as (6) local support through being on-site.

4.2. Quantitative online survey: data collection and analysis

We conducted a quantitative standardized online survey to validate the findings from the interviews by developing more representative data about Indonesian migrants living in Germany, the Netherlands and other EU countries. To ensure the reliability of the survey items, we translated the questionnaire into Bahasa Indonesia and conducted a pre-test. Data collection ran from July 2021 until February 2022 using LimeSurvey. The data was imported and analyzed using Stata 16.1.

In total, 265 respondents have completed the online survey. All first- or second-generation migrants from Indonesia with their place of residence inside the European Union were eligible to participate in the survey. After implementing the survey online, we disseminated the questionnaire through online channels such as mailing lists or social media of Indonesian migrant communities or organizations such as student associations, Indonesian embassies, social, cultural, and religious communities as well as other organizations related to Indonesian migrants. In total, more than 250 groups, communities, and organizations have been contacted and asked to share the survey among their members. About 79 % of survey respondents have their residence in Germany, about 10 % in the Netherlands and the remaining 11 % in other EU countries (France, Belgium, Italy, Hungary, and Romania).

We find that our quantitative sample is biased, mainly due to the large share of Indonesian students (55 %; see Table 1). The effect of this can be seen in the comparatively short length of stay and the high level of education of the participants in the sample. This is a systematic selection bias which is a result of the sampling method that relied on the distribution of the online survey through social media. These include a large share of Indonesian Student Associations. On top of that, we can expect that (younger) students are more active on social media which increases the likelihood of reaching this part of the total population. While our results appear to be robust when controlling for this existing bias, we acknowledge that the generalizability of our results to other migrant populations or contexts might be limited.

5. Results: Identifying translocal support forms

To answer our first research question on what forms of translocal support can emerge in the context of responding to natural hazards, we use a qualitative content analysis of our interview data. Our findings reveal six distinct types of translocal support employed by Indonesian migrants whose families in Indonesia are affected by natural hazards (see Table 2). Subsequently, we supplement these qualitative findings with a descriptive overview of the quantitative results concerning the different support types in our survey sample (see Fig. 3).

To find out more about the prevalence of translocal support forms identified in the interview data, we asked survey respondents which natural hazards have negatively affected their families in Indonesia over the past 10 years. About half (49 %; N = 130) of the respondents selected at least one hazard that affected their family negatively in the past 10 years (see Fig. 2).

The first form of support identified from our interview sample was *emotional or mental* support. This type of support ranges from simple expressions of goodwill following a negative event, extending to comprehensive mental and psychological support provided to loved ones over extended periods. Despite the common perception of natural hazards as a standard aspect of life in Indonesia, many interviewees emphasized the importance of mutual support, presence, and affection. They highlighted these factors as crucial elements in helping from afar. A large majority (91 %) of our survey respondents indicated that they offered such support. This finding underscores the widespread and accessible nature of emotional support which is facilitated by affordable and user-friendly communication technology, such as the internet and social media. These tools enable instantaneous communication, making them particularly valuable for providing emotional support. However, this support form faces some limitations such as time differences between Europe and Indonesia, connection problems, and limited technological proficiency, especially for elderly family members residing in Indonesia. When providing emotional support, bonding social capital is clearly visible in the close-knit family relationships and

Table 1
Comparison of sample data with general data on Indonesian migrants living in Germany.

	Sample	Indonesians in Germany (2020)[a]
Total Number	265	21 650
Place of residence:		
Germany	78.7 %	N/A
The Netherlands	10.3 %	N/A
Other EU countries[b]	11.0 %	N/A
Gender Ratio	62.0 % female/38.0 % male	57.6 % female/42.4 % male
Avg. age in years	30.8 (Median = 28)	34.5
Avg. length of stay (in years)	4.5 (Median = 2.3)	10.9
% married	54.9 %	36.3 %
Born in Germany	1.9 %	3.4 %
Tertiary education	81.2 %	~45 %
(self-)employed	33.5 %	37.8 %
Share of students	54.9 %	~26 %
Religion	56.77 % Islam/34.21 % Christian	~40 % Islam/less than 60 % Christian[c]

[a] Data obtained from Bundesagentur für Arbeit [54]; Statistisches Bundesamt [55], Rabl [25,56] |
[b] France, Belgium, Italy, Austria, Hungary, Romania, Lithuania |
[c] estimate - no accurate data available (see Ref. [25]).

Table 2
Summary of interview responses and exemplary quotations concerning translocal support forms.

Type of translocal support	# of participants who mentioned (n = 39)	Exemplary quotations
Emotional support	9	"Emotionally, [me and my family in Indonesia] always support each other and share almost everything." (032) "I feel the need to support my family there. Yeah, mental support by being there, even though virtually." (039)
Financial support	22	"We tried to give some financial help to our family members affected by flood, for instance." (033) "As a part of society, we collect money and help people with food, with clothes and with medications." (034)
Use own social contacts in Indonesia to organize practical help for affected family	5	"For example, there was a student. The parent of a student cannot contact his son or his daughter. So, we communicated in our group to find out what happened with the son or this daughter. And you know, we also help when there is an accident or something else." (007) "The most important that we organized is how to coordinate with other family members who are not affected by the flood to give some safe place and supporting, you know, supporting materials they need during that situation until they get normal again, they get their normal life again." (033)
Travel to family to support directly on site	6	"The last time I went to Indonesia and we kind of cleaned up." (024) "And then I went to [Indonesia] and I brought many things, multiple medical stuff." (037)
Share knowledge and skills	12	"For example, we have organized events or workshops about tsunamis or disasters. We then do a seminar and invite experts and they then give information about this disaster. We have also had disaster management as a topic, for example how to prepare. If something happens, what should we do?" (015) "And then something that we can adopt or we can do the same thing in our country or practice in agriculture. Because you know every time I got a lecture, it's like, whoa, this is interesting. Like, I suddenly want to jump to my farm field and then just discuss it with my father, you know?" (027)
Discuss adaptation/response options	11	"They think of making some anticipation steps with their neighbors. Like make a cleaning from the sanitary, something like that. And they organize trash better, but they did not know what the causes of the big flood this year is. So, they tried the very best they could to anticipate the flooding maybe in this rainy season." (033) "I always tell them to think about safety route, for example, if something happens. Think about emergency packages, think about having enough batteries or supplier batteries at home, so, then I am able to contact them" (039)

Source: In-depth interviews. November 2020 to March 2021

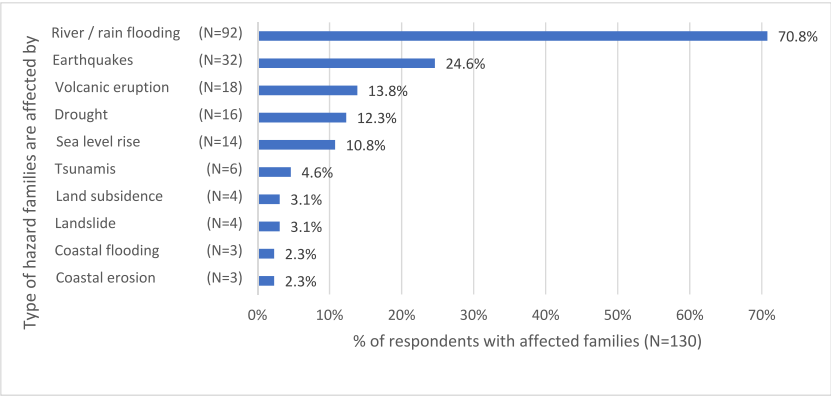

Fig. 2. Distribution of different natural hazards affecting family members of respondents in Indonesia (N = 130).

friendships that sustain mutual care and understanding.

The second support form we found was financial support. Financial support is largely undertaken in the form of regular or event-specific remittances or donations. This support form was the most commonly mentioned among the interviewees and also more than half (59 %) of survey respondents will provide financial support to family members in cases of emergency. Again, internet technology and cheap transaction costs make this support form relatively easy to implement. Many interviewees would send regular financial remittances which are not related to specific events. A large part of the interviewees mentioned that it was part of their cultural norm to support their family, especially their parents, financially. However, several younger interview partners, who were university students, mentioned that they were rather recipients of financial support from their families in Indonesia. As they stated, their families would not

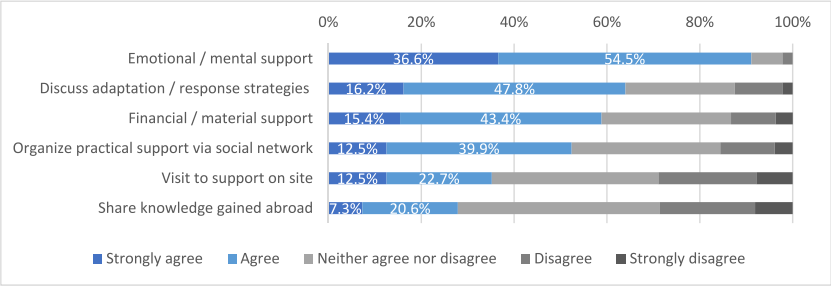

Fig. 3. Distribution of answers on whether translocal support forms are used (n = 136). Only includes respondents who have family members that are affected by natural hazards.

accept any financial support while they were still in training, especially when the impact of a hazard is relatively minor. This finding is confirmed by our statistical results, where students are significantly less likely to provide financial support (45 %) compared to non-students (73 %). Apart from traditional remittances and direct money transfers from individual to individual, some interviewees mentioned that they would activate their social networks in their place of residence and of origin to collect larger sums of money and funnel it to their family when more severe events were taking place. Here, bonding social capital appears in the strong family ties that drive routine or emergency remittances. However, aspects of bridging social capital are also apparent when migrants mobilize aid from other migrants or local associations.

The third support form entails using one's social network to *organize practical* support in Indonesia. Interviewees mentioned that they would inform friends and family in Indonesia when relatives were affected by adverse events. These contacts would then be asked to bring food, materials, or help repairing and cleaning any damage. Some interviewees mentioned that they met other Indonesians abroad who could either provide local contacts in Indonesia to help family members in need or serve as a connection to relief groups or communities. Just over half (52 %) of survey respondents would utilize their social network to this end. The mobilization of the migrants' social capital to provide practical support to their family members via proxy demonstrates the diverse ways in which translocal support can materialize. While this type of network mobilization relies on bonding social capital when family members or close friends are the primary "first responders", the results show that migrants frequently tap into their bridging social capital when turning to diaspora circles or acquaintances to locate additional helpers, share contacts, or pool resources.

The fourth support form we found was *visiting to* support *on-site*. Oftentimes, interviewees would give this type of support only when they were planning to visit affected family members anyways, as travel from Europe to Indonesia was not always possible due to work or family-related responsibilities in their place of residence. Accordingly, just over a third (35 %) of survey respondents indicated providing this type of support. On-site visits typically reflect strong bonding ties, because they require significant personal effort and commitment toward close family or friends.

The fifth support form involves *sharing hazard-related knowledge or skills* that were gained abroad. This knowledge was in most cases gained through education, professional training, or practical skills. Relevant fields of education mentioned included medicine, civil engineering, geology, environmental sciences, business, and law. Several interviewees received professional training in disaster mitigation, climate change and environmental protection, or water management. Practical skills included first aid skills, waste management, communication and research of information, disaster monitoring and early warning systems, as well as general disaster preparedness skills. Especially interviewees who worked or studied at a university mentioned that Indonesian student groups regularly organized workshops on disaster mitigation and preparedness. However, it also was mentioned often that while migrants learned more about natural hazards or how to respond to them, a crucial problem was how to translate this knowledge into the Indonesian context or simply convince family members to adopt new response strategies. This is also reflected in the results of the survey, where only about a quarter (28 %) of respondents indicated transferring hazard-related knowledge to support affected family members (see Fig. 3).

Finally, the sixth support form involves *discussing and developing adaptation and response options* with affected family members. This support form is closely related to knowledge sharing but is still employed even though migrants might not have gained any relevant knowledge or skills abroad. Moreover, this support form is characterized by a more organizational character, focused on the implementation of solutions and improvements indicating that the migrants are not just providing immediate support but are also concerned with longer-term adaptation of their family members. Compared to knowledge support, discussing improvements is much more common in the survey sample with almost two-thirds (64 %) using it. However, the interviewees stressed the notion that discussing new strategies was mostly done when an improvement could be anticipated. As such, the use of this support form appeared to be highly dependent on the interviewees' perceived ability to improve the adaptive strategies of affected family members.

In sum, returning to our first research question on what forms of translocal support can emerge in the context of responding to natural hazards, we identified six distinct forms of support. Each of these support forms represents a different way in which migrants can contribute to their family's well-being and response to natural hazards. Although most of the support forms identified revolve around the bonding ties between migrants and their immediate families, our results show that migrants would often utilize their personal bridging and sometimes linking social capital to amplify their support. Further, by analyzing the diverse ways in which translocal support can be provided, we illustrate the factors that influence the type and extent of support offered. For example, one recurring theme is the role of technology in facilitating these support forms. Another important theme is the influence of cultural norms

and roles on the type and extent of support provided. Moreover, several barriers to providing support emerged from the interviews, including spatial distance, work or family-related responsibilities in the migrants' place of residence, the challenge of translating knowledge gained abroad to the Indonesian context and convincing family members to adopt new response strategies.

6. Results: Determinants of translocal support forms

To answer our second research question on what factors determine the use of different forms of translocal support and how they shape translocal responses we derived relevant individual and situational characteristics of the support-lending migrants from our interview and survey data, which can be grouped into (1) demographic and socio-economic situation, (2) migration history, (3) experiences with and knowledge about natural hazards, (4) embeddedness in a (trans)local network, and (5) self-perceived agency. In the following, we briefly discuss the results of the qualitative content analysis for each support form.

6.1. Financial support

From our interviews, three main themes emerged as particularly influential in shaping whether and how Indonesian migrants provide financial support to their families in Indonesia: financial independence, socio-cultural expectations, and perceived agency and control.

In many cases, interviewees mentioned the importance of having sufficient income or savings to send money home. Student status, in particular, played a crucial role. Students are often unable to provide monetary assistance because they lack a stable income and, in many instances, depend on financial support from their families in Indonesia. Moreover, cultural norms sometimes exempt students from the expectation to send money.

Concerning socio-cultural expectations, several interviewees described how some families deliberately avoid asking for money – especially from students – because of deeply held beliefs about parental responsibility and the desire not to burden younger family members. This interplay between requests for assistance and cultural norms around reciprocity underscores the complexity of decisions to send financial support.

The final theme is revolving around the perceived agency of migrants. Migrants who believe in their ability to improve their family's living situation in Indonesia appear to be more likely to provide financial support. The interview results also showed that highly motivated respondents were often well-connected and had extensive social networks, enabling them to mobilize support more easily.

6.2. Practical support via social network

Our findings underscore the substantial role of social networks and the mobilization of social capital in enabling Indonesian migrants to arrange practical support for their families in response to natural hazards. Several key factors emerged from our study, highlighting how knowledge, social connections, and influence facilitate network-centered responses.

Respondents who gained knowledge abroad about responding to environmental change emphasized that their cross-cultural experiences and international education help them make more informed decisions when activating their social networks in Indonesia. Many interviewees mentioned how this knowledge can be leveraged to identify resources and provide targeted, practical aid.

Furthermore, individuals who are actively involved in humanitarian organizations reported that these platforms not only offer useful knowledge and resources for practical support but also strengthen social ties and amplify the influence of individual actions. This "multiplier effect" was repeatedly observed in discussions, with interviewees explaining how organizational networks help to streamline the flow of information and resources between migrants and families in Indonesia.

6.3. Visit to support on site

The decision to provide on-site support is complex and not straightforward from the results. Interviewees mentioned different situational and individual factors such as personal motivations, tightness of relationships, flexibility in schedule, available financial capital, accessibility of the affected area, severity of the hazard, and type of impact – all of which influence their ability to provide on-site support. These nuances highlight the complexity of on-the-ground assistance and why it varies greatly among different individuals.

However, one prominent theme emerged from the interviews: gender roles and related socio-cultural expectations. Women often shoulder a larger share of family responsibilities – such as childcare – in their place of residence, making short-notice visits to Indonesia more difficult. Additionally, on-site support often entails manual labor, which is commonly perceived as a male responsibility in many Indonesian cultural contexts.

6.4. Share knowledge on how to deal with natural hazards gained abroad

The qualitative data suggest that acquiring knowledge about managing natural hazards during time abroad is a crucial driver for knowledge transfer. Interviewees explained that family members in Indonesia often view skills obtained abroad as more credible, establishing migrants who possess specialist knowledge as "knowledge brokers". These individuals can encourage the adoption of new practices and techniques, thus serving as catalysts for innovation and preparedness in household and community-level hazard management. This pattern underscores the importance of providing relevant learning opportunities for migrants, which forms a key

element of successful knowledge transfer. It also indicates that migrants are generally receptive and willing to share the knowledge they possess.

Moreover, many participants stressed the importance of discussing hazard-related issues with relatives back home. Such conversations create a context in which migrants can share ideas and strategies, helping to adapt and translate knowledge from one local context to another. This finding highlights the social dimension of knowledge exchange, where regular communication fosters receptivity and a willingness to try new solutions.

6.5. Discuss adaptation and response options

Personal involvement, knowledge, and perceived agency emerged as central themes when migrants discussed and planned adaptation or response strategies with family members. Many interviewees who had personal experiences with hazards described a deeper awareness of associated risks, which motivated them to actively engage in conversations about improving preparedness and resilience. Those who had gained specific knowledge abroad also felt more confident in suggesting specific response strategies.

However, interviewees who had spent longer periods abroad sometimes mentioned feeling more detached from family routines and local contexts, leading to reduced engagement in adaptation discussions. Physical and emotional distance appeared to diminish their sense of relevance to on-the-ground decisions. Meanwhile, interviewees who stated to be more motivated and well-connected a strong sense of personal influence – or having influential ties – often appeared to take a more proactive stance.

In sum, by addressing our second research question regarding the determinants of various forms of translocal support and their influence on shaping translocal responses, our findings demonstrate that support is not a linear flow of resources and knowledge but a complex process contingent on multiple factors. Specifically, three overarching themes emerge: (1) socio-economic status and socio-cultural norms, (2) hazard-related knowledge exchange, and (3) social influence and personal involvement. The socio-economic situation of migrants, combined with socio-cultural norms and expectations, affects the ability and willingness to provide and accept various types of support, illustrating the complex dynamics of activating social capital in translocal networks. Knowledge, especially informed by personal hazard experiences and specialized education, empowers migrants to become key "knowledge brokers," encouraging both direct provision of information and critical discussions about hazard preparedness. Finally, the role of social influence and personal involvement is notable. Bridging and linking ties (for example, through humanitarian organizations or family leadership) and a strong sense of personal agency help migrants channel their resources and amplify the potential impact of their support. Together, these insights highlight how demographic background, migration history, and embeddedness in (trans)local networks all interact to shape translocal support practices.

7. Discussion

In this study, we examined the characteristics and determinants of support manifesting in translocal social networks in the context of responding to natural hazards. Our findings demonstrate that support generated from translocal social capital is a multifaceted phenomenon that can manifest in a variety of ways and is shaped by individual characteristics of support-lending migrants, as well as socio-cultural and relational dynamics within social networks.

The case of Indonesian migrants in Germany and other EU countries presents a valuable case for understanding the dynamics of translocal responses to natural hazards. Indonesia is characterized by a multitude of natural hazards and is highly prone to be adversely affected by the effects of climate change and sea level rise. The studied Indonesian migrant communities in our case consist largely of high-skilled workers and students, appear well-organized and display a high degree of emotional attachment and the desire to contribute to the positive development of their place of origin (see Ref. [47,48]).

While earlier research has described the pronounced role of financial and knowledge support in advancing responses to natural hazards (see Ref. [13]), this conceptualization falls short in describing and explaining other support forms that do not fit well into these two broad categories. Drawing from migration and development studies (e.g. Ref. [19,20,26,43,49]), we find fruitful links to the concepts of financial and social remittances as more diverse manifestations of translocal social capital. These concepts, however, also do not fully grasp the processes and dynamics taking place when migrants provide support to hazard-affected non-migrant family members.

Our results show that translocal social capital and the resulting translocal support is a much more diverse phenomenon than previously acknowledged, substantiating Su's (2020) argument that translocal bonding ties to migrants can offer similar benefits as bridging and linking social ties. First, our data reveals that migrants are able to leverage their social networks in their place of residence and place of origin to organize practical support for their families. Second, discussing adaptation options emerges from our study as an independent sub-form of knowledge transfer that is more focused on organization and implementation independent of accessible knowledge for innovation. Interestingly, discussing hazard responses and adaptation strategies is more common than one-sided hazard-related knowledge transfer. Nonetheless, knowledge support from migrants is highly valued by non-migrant family members. Third, visits to provide practical support demonstrate that translocal social capital can also be a source of more localized forms of support, indicating that local and translocal support are not mutually exclusive categories. Finally, our results demonstrate the widespread use of emotional or mental support, underlining the importance of psychosocial factors when dealing with natural hazards and other challenging events (see Ref. [21]).

This diversity of translocal support also illustrates its additional contribution beyond local support networks. First, migrants can often tap into broader professional and institutional networks to bring specialized expertise (e.g., hazard management skills, access to funding sources, or linkages with international NGOs) that may not otherwise be accessible. Second, the international exposure of

migrants enriches local strategies with alternative ideas and innovations, which can complement or enhance existing practices. Finally, by bridging multiple social fields, translocal networks have the potential to mobilize wider support (e.g., fundraising campaigns) that exceed what local actors are typically able to organize. In this manner, translocal social capital multiplies the adaptive capacity of hazard-affected communities, rather than merely duplicating local efforts.

Translocal support is often taking place on a semi-collective level, blurring the lines between the prevalent dualistic understanding of individual or collective support from migrants (i.e. direct support between migrants and non-migrant family members and contribution to community/diaspora activities such as donations, respectively). In the context of financial remittances, Galstyan and Ambrosini [49] describe this phenomenon as "collective remittances from below" and "semi-collective remittances". Our findings confirm this and extend this conceptualization to other forms of translocal support. For instance, when looking at the support from the broader social networks of migrants, it is evident that the networks in their new residences enhance mutual support within migrant communities, demonstrating how support is embedded in broader social and geographical contexts.

Our analysis revealed that the implementation of different support forms is heterogeneous and largely determined by individual characteristics of the support-lending side. While the specific determinants might be very context-specific, we identified five major groups of determinants which can be applied in a variety of specific contexts: (1) demographic and socio-economic situation, (2) migration history, (3) experiences with and knowledge about natural hazards, (4) embeddedness in (trans)local network, and (5) perceived agency. Specific relevant variables may be different from case to case, but indicator groups of determinants for translocal support are likely applicable to variable contexts, either socio-cultural or related to other (external) shocks affecting members of a (trans)local social network. The interplay of these factors revealed a pronounced role of personal involvement, self-perceived agency, as well as socio-cultural expectations shaping the use of different translocal support forms. Our findings are in line with a study from Su and Le Dé [24], who identified the migrant's occupation, intra-family dynamics, and cultural norms, among others, as relevant factors affecting the ability of households to turn their ties with migrants into financial remittances after disasters. Thus, overall, our results show that the rationales, motivations, drivers, and inhibitors of migrants in providing translocal support will influence the available social capital of affected households and communities.

Our study is in line with other literature showing that migration can serve as a diverse driver to build and maintain adaptive capacity to natural hazards. However, migration as a livelihood strategy is not typically pursued by the poorest members of society, as it necessitates a certain degree of education and financial assets [50–53]. This leads to challenges such as the exclusion of certain groups and the limited capacity for vulnerable groups to participate in translocal activities [22]. In fact, the capacity of the urban poor to organize translocally is a matter of debate, as developing and maintaining translocal networks may place an additional burden on already vulnerable groups (see Ref. [22]). Accordingly, the implementation of relationship-building beyond the local context is only beneficial to communities if it is relevant to their local needs. In other words, both human and financial capital play a crucial role in determining individuals' access to translocal social capital and their ability to engage in transnational activities.

While our study makes significant strides in understanding the nature and dynamics of translocal support in response to natural hazards, we acknowledge some limitations. The focus on Indonesian migrant communities in Germany and the Netherlands, though valuable, limits the scope and generalizability of our findings. Cultural, social, and economic factors that influence translocal support can vary greatly across different migrant communities and host countries. Similarly, our study is biased toward high-skilled workers and students, which may not represent all segments of the migrant population. However, this limitation does not undermine the depth and richness of the qualitative data generated.

In light of these insights, it would be beneficial for future research to extend this study to a broader range of migrant communities from different socio-economic backgrounds and in different geographical contexts. Exploring how these dynamics manifest in low-income or less-organized migrant groups could provide vital insights. Additionally, the potential disparity in access to translocal social capital revealed by our study underscores the need for further research into strategies for overcoming socio-economic barriers in developing and maintaining translocal networks. The exploration of how different types of hazards may trigger different support dynamics, even if our study found the type of hazard is not a determinant of support form, may be another potential avenue for future research to fully understand the versatility and applicability of translocal social capital. Finally, we underline with our research the notion that social capital can only be fully understood by looking at the entire social network involved, at the smallest level being those who provide support and those who receive it. Our research contributed to close research gaps on the support-lending side of translocal networks in hazard and development research. Future research on translocal social capital should strive to study both the support-lending and support-receiving side of social networks with a focus on bi-directional flows and potential interdependencies.

This study presents possible policy implications for harnessing translocal social capital effectively in response to natural hazards. Policymakers and practitioners should focus on fostering robust, adaptive (trans)local support networks in affected communities. Policy interventions should aim to reduce socio-economic barriers that may limit access to translocal social capital, acknowledging the role of human and financial capital in enabling migration and maintaining translocal support networks. This could include tailored programs for poverty reduction and education in affected communities, for example through scholarship programs. Further, our findings highlight the need to broaden the understanding of migrant support beyond financial contributions, recognizing the substantial potential of migrant communities as well as the beneficial impact of psychosocial support. Policymakers and practitioners should strive to facilitate these support forms, for instance by facilitating access to ICT infrastructure and devices.

8. Conclusions

In conclusion, our analysis sheds light on the intricate and interconnected nature of translocal support in the context of responding to natural hazards. This exploration lays the groundwork for a nuanced understanding of translocal support dynamics that intersect

natural, personal, social, and cultural domains.

The nuances of translocal support uncovered in our study demonstrate diverse migrant engagement in hazard responses, moving beyond the more established categories of financial support and knowledge transfer. Our findings shift attention towards the potential of harnessing social networks for practical assistance and support amplification, adaptation planning, and psychosocial assistance, thus broadening our understanding of the roles migrants play in their home communities resilience.

Our findings also challenge the prevalent dichotomy of individual versus collective support, with evidence suggesting that translocal support occurs semi-collectively, thus capturing a more complex and socially embedded reality. Recognizing this, we must re-evaluate our understanding of translocal social networks, acknowledging them as interconnected units of support rather than simply avenues for individual contributions.

While our findings highlight the potential of migration as a strategic tool in disaster response, it also uncovers existing challenges. Socio-economic disparities can restrict certain groups from participating in these translocal networks. It is a reminder that not all solutions are universally applicable and that context-specific barriers must be addressed to ensure equitable access to resources.

Lastly, we want to stress the importance of a comprehensive understanding of translocal networks, acknowledging both the provider's and receiver's perspectives. Such a holistic approach is critical to understand and to harness the resources embedded in (trans) local social networks. Ultimately, as we navigate towards a future increasingly marked by environmental and climate-related challenges, the effective leveraging of translocal social networks will be key to building and maintaining resilient communities.

CRediT authorship contribution statement

Konstantin Gisevius: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft. **Boris Braun:** Conceptualization, Funding acquisition, Project administration, Resources, Supervision, Writing – review & editing.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

The data that has been used is confidential.

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