

## Loughborough University Institutional Repository

---

# *Tacit networks, crucial care: Informal networks and disaster response in Nepal's 2015 Gorkha earthquake*

This item was submitted to Loughborough University's Institutional Repository by the/an author.

**Citation:** CARRERO, R. ... et al, 2018. Tacit networks, crucial care: Informal networks and disaster response in Nepal's 2015 Gorkha earthquake. *Urban Studies*, 56 (3), pp.561-577.

### **Additional Information:**

- This paper was published in the journal *Urban Studies* and the definitive published version is available at <https://doi.org/10.1177/0042098018810606>.

**Metadata Record:** <https://dspace.lboro.ac.uk/2134/36524>

**Version:** Accepted for publication

**Publisher:** SAGE Publications © Urban Studies Journal Limited

**Rights:** This work is made available according to the conditions of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) licence. Full details of this licence are available at: <https://creativecommons.org/licenses/by-nc-nd/4.0/>

Please cite the published version.

## Tacit networks, crucial care: informal networks and disaster response in Nepal's 2015 Gorkha earthquake.

Carrero, R., Acuto, M., Tzachor, A., Subedi, N., Campbell, B., To, L.S.

### Abstract

It is often reiterated that a better understanding of local networks and needs is key to risk reduction. Nevertheless, the crucial role of informal social networks and actors in the catering for human needs in disaster circumstances remains largely under-explored. If we have to rethink the “work” that informality does for our understanding of urban areas (McFarlane, 2010), its contribution to resilience (Pelling, 2003), and take it seriously in the ‘full spectrum of risk’ in urban and peri-urban centers (Satterthwaite and Bartlett, 2017), better and more balanced methods and are needed. This paper attends to this gap. Examining the mechanisms of aid provision in the aftermath of 2015 Gorkha Earthquake in Nepal, it details an experimental set of quantitative research methods to explore the role of informal social networks in the provision of critical human needs in natural disasters. Relying on a sample of 160 households across 4 districts and 16 villages in the built environment affected by the Gorkha earthquake, the paper reveals that, overall, a wide disparity exists in the comparative importance of organizations in the provision of aid and resources. Much crucial after-disaster care is catered for a mix of relatives, temples, friends, neighbors and local clubs. It highlights the importance of informal networks in understanding, and theorizing, governance (of disaster and of the ‘urban’ more in general), and calls for greater attention to its role. It is time, it argues, to revalue informal disaster governance networks as a crucial, not tacit, component of disaster response.

**Keywords:** Community, disasters, governance, informality, method, networks, urban informality

## Introduction

The connection between disasters and cities might be one of the most pivotal challenges of our time. Most of the major international frameworks, like the United Nations Sustainable Development Goals, now acknowledge that a better understanding of the mechanisms to reduce risk in cities is urgently needed given current demographic urban trends (Satterthwaite and Dodman 2013). This is further heightened by the increasing exposure to natural and technological hazards and the projected climate change impacts on urban areas (Dickson 2012). Within this context major international organisations and academia have increasingly paid attention to the social dimension in urban risk reduction. A clear proof of this is that the *Sendai Framework*, the main international voluntary agreement for Disaster and Risk Reduction (DRR), is intentionally explicit about the role of social factors in building resilience (Walhstrom 2017). In the last years terms such as ‘social resilience’, ‘community-based DRR’ and ‘people-centred approaches’ have become common in crisis management forums, with urban studies of disaster flagging their centrality in disaster response (Campanella 2006). Seen this emphasis on society, the nexus of built environment and natural hazards, then, becomes an apt context where to investigate formal-informal dynamics, and vice versa urban informality emerges as a central reality for risk reduction. Informal responses to crises in cities can even come to dominate disaster relief and recovery, offering in several cases “collective security mechanisms” beyond the formal sector (Pelling 2013). Yet the value of mapping informal networks and actors in catering for human needs in disasters remains largely under-explored (UNISDR 2015) albeit social capital has been largely understood as the ‘main engine’ (Fussell 2010) of long-term recovery. Here we seek to offer an empirically-driven starting point that can attend to the importance of informal relations and recognise them more systematically across a variety of urban settings. We argue for informal networks to be better appreciated as key element in the governance of disaster, and offer evidence as to their tacit but crucial positioning.

The idea we propose is that after disasters, formal networks of institutions with formal procedures provide affected communities with resources that only partially meet disrupted human needs. Informal networks of actors emerge comparatively quickly to cater for the un-met needs. To explore these mechanisms this research led an empirical investigation in Nepal in the aftermath of the 2015 Gorkha earthquake. Paying particular attention to the urban dimension of this study allows us, as discussed below, to begin addressing questions of urban resilience, but also open up a conversation on the ‘neighborhood’ dynamics that underpin the tacit networks of DRR shaping much disaster response in cities. The framing of the paper is purposefully explicit in methodology, data collection and discussion to offer a systematic view of

1  
2  
3 both research results and research framing. This allows an open insight into what we would argue is a  
4 replicable method to trace 'tacit' (i.e. informal) DRR networks. Results of the research include a statistical  
5 analysis of distribution of needs covered by different organizations in the recovery phase, a social network  
6 analysis offering a view of the importance (weight and centrality) of specific formal and informal actors in  
7 the overnance of aid, and a detailed cluster analysis of shelter provision to highlight relevant aid providers.  
8  
9  
10 If we have to "rethink informality" as a critical "bricolage" of social relations contributing to resilience as  
11 McFarlane (2010) or Pelling (2003) suggested, taking it seriously in the "full spectrum of risk" in urban,  
12 sub-urban and peri-urban centers (Satterthwaite and Bartlett 2017), our paper aims to demonstrate that  
13 more nuanced, systematic and balanced methods and are urgently needed.  
14  
15  
16  
17  
18  
19  
20  
21  
22

### 23 **Networking needs, mapping informality**

24  
25  
26 Disasters disrupt the provision of, or access to resources necessary to meet physiological requirements,  
27 such as water, food, shelter, clothing, medicines, whilst inflicting physiological injuries and psychological  
28 traumas. The concept of *human needs*, is as a prism through which these impacts of disasters can be  
29 observed and studied (e.g. Yawson 2015). For the purposes of this research, 'human needs' are defined  
30 as a set of physiological and psychological requirements, or otherwise put materialistic and  
31 nonmaterialistic needs, that complement each other. With a holistic understanding of "human needs",  
32 this research focuses on the provision and the providers of resources and aid, across the different disaster  
33 phases. To study and improve the catering for human needs in post-disaster circumstances a degree of  
34 analytical granularity is required: *who provides what resources to whom at what time and where*, in the  
35 aftermath of a natural disaster? These are central questions for anyone who wishes to appreciate the  
36 governance, not just government, of disaster. This starting point allows us to highlight informal networks  
37 as tangible instantiation of the operations of social capital in disaster response, and the importance of  
38 informality as a central element of the governance of crisis beyond the formalized channels of  
39 government. As we demonstrate below, informal actors and connections are in fact crucial elements of  
40 governance of DRR: not a secondary dimension but actually what distinguishes the governance from  
41 government of DRR.<sup>1</sup>  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51

52  
53 In the academic literature, social networks are seen as key to maintain norms and reciprocity. They  
54 enhance trust and cooperation benefiting their links with access to assistance and resources. They create  
55  
56

1  
2  
3 a shared identity, establish solidarity and allow faster, cheaper flows of information and materials  
4  
5 (Granovetter 1982; Putnam 2000; OECD 2001). This is well paralleled in urban research where the study  
6  
7 of social networks has received moderate but constant attention. This is especially true when it comes to  
8  
9 discussing the fabric of socio-economic relations in the built environment (Gordon and McCann 2000),  
10  
11 but also more recently to chart the ways urban dwellers relate to the size, shape and 'nature' of cities  
12  
13 (Batty 2008). Formal social networks involve membership in an institution or an organization (institutions  
14  
15 by their very nature are formal). These membership-organizations will adhere to a specific, well-defined,  
16  
17 social purpose. In contrast, informal social networks consist of unofficial, non-institutional ties between  
18  
19 individuals that stem from personal relations; ordinary socializing in an individual's living environment or  
20  
21 in working and voluntary environments, neighbor-to-neighbor or peer-to-peer, respectively. These  
22  
23 relations will occur outside the context of formal organizations (Tierney 2004). As past research  
24  
25 demonstrated, social cohesion and networks strongly influence post-disaster mortality rates (Aldrich and  
26  
27 Sawada, 2015), and community social networks give access to critical resources in natural disaster  
28  
29 circumstances, for instance financial resources, physical aid and child care, essential information,  
30  
31 materials and emotional support (Haines et al. 1996; Elliott et al. 2010; Aldrich and Meyer, 2014).

32  
33 Applying these distinctions between networks and mechanisms of aid delivery is a first step to achieve a  
34  
35 higher degree of analytical granularity in DRR research. Evidently, formal social networks are active in  
36  
37 some DRR phases, for some time, catering for some requirement, whereas informal social networks play  
38  
39 a pivotal role in complementing the provision of necessities. In other words, informal social networks of  
40  
41 actors and organizations fill-in the void in the delivery of information and commodities left by  
42  
43 international organizations, and in some instances, they do this to a significant extent (Tierney, 2014). This  
44  
45 was for instance documented by Fussell during Hurricane Katrina: "it was natural for them [disaster-  
46  
47 affected individuals] ... to turn to their social networks for advice and assistance... after the disaster  
48  
49 unfolded, these same (informal) networks were used to exchange information, emotional support, shelter  
50  
51 and in-kind assistance" (151: 2012). From a research and policy perspectives, it is beneficial to explore and  
52  
53 analyze the mechanisms of informal social networks as these webs are perhaps better positioned among  
54  
55 communities to deal with impending or recurring natural disasters, and to offer immediate assistance  
56  
57 (Aldrich and Meyer, 2014).

58  
59 As Daly et al. (2017) argued, compelling arguments "have been made that decentralizing disaster  
60  
governance is especially necessary in urban environments" as this allows us to account for "the complex  
social, political and economic dynamics common in cities, the multitude of overlapping stakeholders

1  
2  
3 involved, and the potential lack of alignment between disaster-affected areas and political/administrative  
4 boundaries". However, as they noted with particular reference to the Gorkha earthquake in question  
5 here, national disaster management plans emerging from the UN's Hyogo and Sendai DRR frameworks  
6 have promoted the decentralization of disaster governance (Bisri and Beniya 2016), but are not "followed  
7 up with practical steps to empower local stakeholders and facilitate decentralization – and are readily  
8 dismissed in the face of a real emergency" (Daly et al. 2017). A more systematic and data-driven look at  
9 the value of informal social networks in DRR, we would argue, can evidence that in a broader sense  
10 disaster response should be more effectively engaged with local and informal processes and, in fact, might  
11 already be decentralised in practice.  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22

## 23 **Data and Methods**

24  
25  
26 The information presented and analysed in this research is primary data collected in the field. It was  
27 gathered through semi-structured interviews of households' representatives (Black, 1999). The sample  
28 comprises 160 households across different communities in areas affected by the Gorkha earthquake. The  
29 data collected was cleaned, coded, processed and analysed in-desk using descriptive statistical analysis  
30 and social network analysis techniques. Further details on the methods are provided on the next  
31 paragraphs.  
32  
33  
34  
35  
36

### 37 **The 2015 Gorkha earthquake**

38  
39 The 2015 Gorkha earthquake was the most severe natural disaster to strike Nepal since the 1934 Bihar  
40 earthquake. The tremor was of a 7.8Mw magnitude and a maximum of 9 (IX) on the Mercalli Intensity  
41 scale. The hypocenter of the earthquake was at a depth of approximately 8 kilometers and its epicenter  
42 was east of Gorkha District, some 77 kilometers from Kathmandu, at Barpak in Gorkha, giving the quake  
43 its name (USAID, 2015). A first earthquake struck on April 25, 2015 at 11:56 am Nepal Standard Time.  
44  
45 Smaller earthquakes followed throughout the country at intervals of 20 minutes, with an aftershock at a  
46 magnitude of 6.7 on 26 April and an aftershock at a magnitude of 7.3 on 12 May, both causing second-  
47 order damage such as landslides, avalanches and infrastructure breakdowns (Dey, 2015). In terms of  
48 economic losses, the US Geological Survey initially estimated economic losses from this quake at 9% to  
49 50% of GDP, with an estimate of 35% (Dey, 2015). In the course of the event, 8,786 people were killed,  
50  
51  
52  
53  
54

1  
2  
3 more than 20,000 injured, more than 2.8 million people left homeless or needed humanitarian assistance  
4  
5 in urban and rural Nepal, where villages close to the epicenter and many buildings in in the Kathmandu  
6  
7 Valley collapsed. This essay therefore presents an image of an ‘urban’ challenge that needs to be read in  
8  
9 the context of a broader peri-urban and rural reality which has equally been affected by the earthquake.  
10  
11 As we discuss below, reading urban informality across this variety of urban settings is key to highlight both  
12  
13 commonalities and differences across diverse forms (social as much as physical) of the built environment.  
14  
15 A consortium of formal institutions including the International Red Cross, the World Bank, USAID’s  
16  
17 Disaster Assistance Response Team (DART), International Organization for Migration (IOM), UN World  
18  
19 Food Program (WFP), UN Population Fund (UNFPA), the Adventist Development and Relief Agency (CARE),  
20  
21 the Family Planning Association of Nepal, Medair, Mercy Corps and Plan International, among others,  
22  
23 provided relief commodities and support shelter and water, sanitation, and hygiene (WASH) interventions  
24  
25 for earthquake affected populations. According to USAID (2015), since June 10, the Logistics Cluster, a  
26  
27 coordinating body for humanitarian logistics activities, engaged with 94 organizations to coordinate  
28  
29 deliveries of more than 5,600 metric tons of items to earthquake affected populations. In this context of  
30  
31 devastation, as with other disasters affecting countries with rapid rates of urbanisation, the ‘informal’  
32  
33 nature of settlements has been often flagged as central to the impact of the earthquake. In fact, 2013  
34  
35 World Bank research was already pointing at these as critical resiliency factors, highlighting in a report on  
36  
37 Nepal’s urban growth that “unplanned urban development” in the Kathmandu Valley had “led to rapid  
38  
39 and uncontrolled sprawl; irregular, substandard, and inaccessible housing development; loss of open  
40  
41 space, and decreased livability” whilst also “increas(ing) vulnerability to disasters, making Kathmandu one  
42  
43 of the most earthquake-vulnerable cities in the world” (Muzzini and Aparicio 2013).<sup>2</sup> Urban informality,  
44  
45 as well represented across much DRR literature, was pointed at again in 2015 as the source of instability.  
46  
47 Yet what if this characteristic of urban sprawl is also, if not quite the contrary, the tacit fabric providing  
48  
49 much of the crucial care in the disaster recovery phases? Whilst there have been efforts to map the  
50  
51 response and resource flows through formal networks (for example, Basu, et al, 2017), the role of informal  
52  
53 social networks received less attention and thus offers little evidence to answer this query in positive or  
54  
55 negative – something we attempted to redress by mapping informal networks. The challenge we pose  
56  
57 here to this reading is that, in practice, informality and informal urbanism might in reality not just be a  
58  
59 factor of risk but rather a driver of response and recovery and a central element in the governance of  
60  
61 crisis.

Figure 1: Fieldwork sites and the Gorkha earthquake

### Data acquisition and analysis

Four districts, heavily affected by the earthquake, were included in our fieldwork: Gorkha, Sindhupalchowk, Rasuwa and Kathmandu. Within these four districts, and after consulting with the local partners, sixteen Village Development Committees (VDC) were selected to ensure the representation of different energy situations, including in rural and urban areas.<sup>3</sup> In each VDC, ten households were selected to represent a broad range of socio-economic situations within the village. One person was interviewed in each household, achieving a sample size of 160 participants. Efforts were made to achieve gender balance, having a composition of 42 % of male and 58% female respondents. The fieldwork was conducted by a gender-mixed team of six local Nepali surveyors for 3 weeks, between June 16 and July 5, 2016. The survey was conducted using DataWinners on mobile phones, and then exported to a statistical software. Individual semi-structured interviews were conducted with each household representative in Nepali. Respondents were able to name as many organisations or individuals as they chose, either formal (e.g. government) or informal (e.g. neighbours). The questions were carefully discussed with the local team of surveyors, as well with other collaborators with DRR experience in the study sites prior to the fieldwork to minimise potential biases or favouring answers towards specific institutions or groups. All the interviews were conducted in Nepali during the fieldwork, and responses were later translated to English for analysis.

The data acquired in the field was used for two different types of analysis: i) the distribution of needs, using descriptive statistics methods, and ii) analysis of Informal Social Networks, based on social network analysis (SNA) techniques.

- i) *Distribution of needs analysis.* Field data was coded and classified according to Maslow's typology of needs (Maslow 1970), based on a pyramidal understanding of human needs, including physiological, safety, and love and belonging needs.<sup>4</sup> Given its universality and versatility, this framework has been used to different degrees in DRR and emergency management literatures, in both technical and academic works (e.g. Joseph and Linley 2005; Da Silva et al. 2012). Maslow's typology was used to code and classify the data, which was then analysed by classical descriptive statistical analysis in the computer environment R.



1  
2  
3 ii) *Informal Social Network Analysis*. Field data was also used for a second complementary  
4 analysis, an informal Social Network Analysis, based on classic SNA techniques. SNA consists  
5 in analysing patterns of distribution of relational ties and drawing inferences about their  
6 networked nature. To perform the SNA, the field data was coded in a relational database  
7 where households, needs and needs providers were linked, and then exported to a SNA  
8 modelling environment. The SNA allowed to visualize the full network activated after the  
9 earthquake, as well to analyse the network architecture and its clusters.  
10  
11  
12  
13  
14  
15  
16  
17

## 18 Preliminary results

### 19 Distribution of needs

20  
21 Results of the statistical analysis of the distribution of needs are shown in Table 1, where the graph lines  
22 represent the ten needs, the x axis represents the organisation or entity covering that need, and the y axis  
23 represents the percentage of the need covered by that specific organisation. This demonstrates the  
24 importance of international NGOs (INGOs) during the earthquake immediate response. INGOs were the  
25 main provider (50% of cases) of water and medicines, and a significant provider (30% of cases) of food,  
26 shelter, clothes and sleeping materials. The second most important player were local NGOs, which  
27 provided substantial support in the distribution of clothes, sleeping materials, medicines, food and  
28 shelter. In contrast, the government had a limited role among surveyed communities in the response  
29 phase, and was only a critical player in the provision of money (89% of cases). Together, relatives,  
30 neighbours and friends were either the second or the third most relevant players in the provision for most  
31 human needs. Comparatively, relatives (who participated in the provision of 90% of needs) and  
32 neighbours (70% of needs) appear to have played a bigger role in the VDC surveyed than friends (50%).  
33 Local clubs and private corporations played a varied role, between 1% to 15%, in the provision of five and  
34 seven needs respectively. Local clubs were a relevant distributor of sleeping materials (15%) while private  
35 corporation delivered mainly cooking devices (14%). Temple authorities and Guthi (traditional patriarchal  
36 kinship organisations) assumed varied positions, from 0.4% to 10%, with Guthi concentrating on the  
37 provision of clothes. Self-help groups and school authorities played a minor role, with a maximum of  
38 2.37% of needs provision focusing on shelter.  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55

Table 1: Needs and needs providers

Overall, results display a variety in the relative importance of organizations and networks, formal and informal, in the delivery of information, materials and aid. The analysis underscores the fact that there is not a single predominant organization in the social web of needs provision. In the vast majority of cases, relief was provided by a combination of agents and institutions, with the exception of the central government as the primary distributor of money in the disaster response phase. Informality emerges here as key in the governance of crisis response. As the data clearly shows, it is essential to acknowledge both formalised disaster relief mechanisms as much as 'unofficial' channels for support to human needs and for attending to the crucial care required in these moments of disruption. From this viewpoint it seems blatant to us, and in line with much of the literature on social capital in DRM, that both formal *and* informal networks are to be considered as integral to the determinants of who, to paraphrase Lasswell's famous definition of politics, gets "what, when and how" (Lasswell 1936). If McFarlane and Waibel (2012) already pointed out how informality in its own right has effectively occupied a "peripheral" position in urban studies needing more 'spotlight' positioning, our data offers additional evidence to this assertion. As we argue more extensively in the conclusion echoing recent scholarly and practitioner literature on the Gorkha earthquake (Twigg et al. 2017), the importance of self-recovery and informal ties hold a key role in the whole edifice of disaster response and recovery. The key here is in the mix, and hence in acknowledging informality as central component that allows us to speak of governance, not just of *government*, of crisis.

### Informal Social Network Analysis

Figure 2 describes the social network that was activated during the response to Gorkha earthquake. Nodes represent entities (e.g. household, NGOs, schools) and edges represent any kind of connection established between entities (e.g. any of the human needs identified). The central nodes correspond to "human needs providers" (i.e. organisations and institutions) while the exterior nodes at the circumference represent "needs receptors" (i.e. the surveyed households). Identified human needs' providers included relatives, friends, neighbours, school authorities, Guthi, temples, local NGOs, local clubs and associations, INGOs, government agencies, private corporations, self-help groups and "others". Figure 2 also shows how formal and informal organisations interact among them and also with the surveyed households, producing a rich network of relations formed by over 700 connections distributed among 150 nodes. In addition, the

1  
2  
3 analysis of the connections of this network confirms 100% of the households relied on the informal side  
4 of the network, that is, not not formally mandated disaster respondents, including friends, relatives,  
5 neighbours, self-help groups (SHG), schools, Guthi, health workers, as well as local NGOs, local clubs and  
6 private parties. All the households depended to some degree on these informal connections, at a  
7  
8  
9  
10 minimum, for one of the analysed needs.  
11  
12  
13  
14  
15

16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
Figure 2: Social network activated to respond to the Gorkha earthquake

The detailed analysis of the case of shelter provision allows us to understand better internal organization and properties of this network. On the one hand, its network architecture (Figure 3) shows a difference on the location of institutional and non-institutional disaster response actors. Institutional respondents, such as government and INGOs, are more centrally located, indicating a wide reach across the surveyed communities. In contrast, non-institutional actors (with the exception of local NGOs) appear in the periphery of the network, indicating a partial and asymmetrical reach to the surveyed households. That is, these actors provided shelter only to a specific part of the network. Within these peripheral actors, some appear more nested (e.g. local NGOs, friends, relatives, neighbours and Guthi), reaching more communities, while others appear in more isolated locations, with a smaller reach radius (e.g. temples, schools and self-help groups).

Further analysis of the significance in terms of weight and centrality of the actors (Figure 4) depicts INGOs as a more relevant player than government for shelter distribution among the studied population. The most condensed area of figure 4 shows the bulk of the households received shelter from either INGOs or a combination of INGOs with another actor. These 'tandems' (INGOs + Government, INGOs + Local NGOs, and INGOs + friend/family/neighbour) reach 30% of the population. A total of 19.29% of households accessed shelter solely via INGOs, while only 3.5% received this resource exclusively from the government.<sup>5</sup> In addition, most of the households attended by the government, had also access to shelter via INGOs, indicating some overlapping or redundancy between these two systems. An isolated fraction of households (3.5%) depended exclusively on friends, relatives and neighbours for shelter acquisition. While another secluded fraction (6.14%) relied on the combination of local NGOs and Local Clubs.

1  
2  
3  
4  
5  
6 Figure 3: Network activated for the shelter provision: network architecture  
7  
8

9 Figure 4: Network activated for the shelter provision: actors' significance  
10  
11  
12  
13

14 This offers some important pointers as to the 'urban' quality of informality. Beyond the recurring rhetoric  
15 of an urban/rural divide (e.g. Cutter et al. 2010), the case of shelter shows communities located in urban  
16 centres behave somewhat similarly that the communities located in peri-urban and rural areas. Zooming  
17 in the 'urban' elements of the network, Figure 5 shows that in these urban communities we see equivalent  
18 patterns to the ones presented in peri-urban and rural settings. INGOs appear again as the most central  
19 actor, followed by local NGOs and government. This offers an interesting connecting thread between  
20 urban, peri-urban and rural (or at least village) informalities which might call for more evidence-based  
21 considerations about their interplay. For instance, Roy (2005: 149) convincingly argued that in many parts  
22 of the world, and South especially, "the site of new informality is the rural/urban interface" but concluded  
23 that this is to be couched in a metropolitan expansion logic driven by "informal urban-ization". Perhaps,  
24 within the cross-urban/rural logics of present debates on the planetary urbanisation of peri-urban spaces  
25 (Brenner 2016) our evidence asks us to better appreciate the shared qualities of informality between  
26 different qualities of the 'urban'. In our case, we found social bonds were similarly important in urban,  
27 semi-urban and rural communities, indicating that perhaps, the strength of the social fabric does not  
28 necessarily relate to the built infrastructure or rural or urban character, but primarily to a blend of the  
29 intrinsic historical, cultural, socio-economic and political aspects of the community.<sup>6</sup> This is however not  
30 to reject the importance of *urban* informality as a dimension of social relations. Remarkably, in the urban  
31 case, the percentage of households depending exclusively on family, friends and neighbours for shelter is  
32 higher, making up to 6%. Private parties also seem to play a more relevant role at the urban level, reaching  
33 6% of households. On the other hand, the number of households depending exclusively on INGOs is much  
34 lower at 4.1%. The tandems local NGO/Local Clubs and INGO/family/friend/relative seem to work as well  
35 at the urban scale, covering 12.5% and 16.6% of households respectively. This is possibly preliminary  
36 evidence as to some heightened socio-material complexity inherent in the 'urban' if not perhaps even  
37 some higher degrees of informality characterising DRR (and governance more in general) in the built  
38 environment. Here, in line with recent developments in the humanitarian and relief sector, it becomes  
39 evident that academia and practice need a much better grasp on the urban dimension of disasters and  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56

1  
2  
3 their implications for aid (Sanderson et al. 2016). Yet, from our viewpoint, this cannot be divorced from  
4 appreciation informal forms of urbanism (and more broadly informal dimensions of disaster governance)  
5 as central to the dynamics of crisis response and, likely, recovery.<sup>7</sup>  
6  
7  
8  
9

10  
11  
12 Figure 5: Zooming in the case of shelter provision: network behaviour in urban areas  
13

### 14 15 16 17 **Tacit networks: acknowledging informality in governance** 18

19  
20 The case of the 2015 Gorkha earthquake shows empirical evidence on the importance of tacit networks  
21 in covering almost any need in emergency relief, reaffirming that it is critical to start incorporating these  
22 networks into DRR policies (Islama and Walkerdenb 2017).<sup>8</sup> More generally it paints a picture that  
23 disproves strict lines between a formal reality and the ‘formal other’ of urban informality. The relationship  
24 between the two in constructing networks of disaster governance (if not urban governance more in  
25 general) calls for a scholarship that is centred on informality not as a static reality but as dialogue with a  
26 variety of “grey spaces” (Yiftachel 2009) that constitute urban governance. This illustrates a multifaceted  
27 dynamic between formal and informal defining the governance of crisis relief and response, and thus to  
28 the importance not only of appreciating different kinds of urban informality but also their interdependent  
29 nature and the continuities between different kinds of urban spaces from the metropolitan core to the  
30 peri-urban periphery, if not to the village. Here we have sought to question the predominantly negative  
31 view of ‘informal settlements’: clearly the “neighbourhood” dynamics (e.g. Tomba, 2014; Daly et al. 2017)  
32 of most of the settlement observed speak not just to their fragility but also to their resilience in the wake  
33 of disaster. These relationships are illustrating how less apparent socio-economic bonds weave a tight  
34 fabric of urban governance beyond the formality of the built environment, and how these networks  
35 present us with a rich realm for more investigation of DRR in cities, and urban informality more in general.  
36  
37 From the results obtained in this research, it seems informal networks might have similar features and be  
38 of equally great importance for disaster response in urban, semi-urban and more peripheral built  
39 environment areas. Equally, it points at the persistence of tacit community-based networks within urban  
40 settings. If the case of shelter acquisition has for instance illustrated how relatives, friends and neighbours  
41 were especially important to some, otherwise, isolated households, in the observed urban areas this  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56

1  
2  
3 phenomenon was even more noticeable. In addition, the same associations of actors, including tandems  
4  
5 of institutional and not institutional actors, appear with the same arithmetic in both peripheral and urban  
6  
7 settings. The differences between these contexts, such as a higher importance of private sector or the  
8  
9 absence of Guthi presence in some urban cases, also seems to reflect some of the particularities of the  
10  
11 respective urban, peri-urban and village social fabric from pre-disasters times. Interestingly, as we noted,  
12  
13 there appears to be some 'urban' quality to informality and an urbanisation of disaster response that  
14  
15 cannot go unnoticed (e.g. Archer and Dodman 2017). The networks emerging around the provision of  
16  
17 shelter can highlight the importance of providing a temporary 'urban' (i.e. agglomerated social spaces and  
18  
19 networked services to tender to needs) in disaster contexts where cities and peri-urban settings, but also  
20  
21 villages, stop functioning. Equally they also highlight the centrality of non-governmental actors in building,  
22  
23 providing for and maintaining these temporary urbanities, and once again the critical care role of informal  
24  
25 networks in upholding them. However, perhaps as a reminder to the possible "methodological city-ism"  
26  
27 (Angelo and Wachsmuth 2015) and general urban bias embedded in some of the informal urbanism  
28  
29 literature, we also find some degree of commonality across urban, peri-urban and rural settings when it  
30  
31 comes to the shape and dynamics of informal social networks.

32  
33 Overall, our experience with Nepal pushes the horizon of experimentation of the analysis of informality  
34  
35 towards greater efforts to engender replicable methods to convey, and potentially compare, the  
36  
37 complexity of governance in crisis, as much as urban, contexts. The intricacy of the urban environment  
38  
39 emerges here in the relation between informal social networks and the broader context of governance  
40  
41 they remain embedded into. In this sense acknowledging the work that informality does in disaster relief  
42  
43 efforts in the built environment becomes perhaps key to appreciate the different registers of authority  
44  
45 and politics that shape cities and their surroundings. Paying greater and more systematic attention to the  
46  
47 informal dimensions of governance is, as Magnusson (2011) puts it, a key ingredient to better "see like a  
48  
49 city" when speaking of the ways in which people organize in the built environment – whether in crisis or  
50  
51 not.

52  
53 In turn, appreciating more systematically the informal dynamics underpinning disaster response by  
54  
55 gathering tangible data can support greater interdisciplinary integration towards a more 'common  
56  
57 operative research language' (Quarantelli, 1982: 3) and against the limits of disciplinary jargon which still  
58  
59 inhibits communication between researchers (Petak et al., 2008; Gall et al., 2015). This practice-oriented  
60  
61 and explicitly methodological approach responds to growing calls to "open up" current "epistemologies  
62  
63 of the urban" (Barnett and Parnell 2016). Yet this does not have an academic application only, but also an

1  
2  
3 explicit normative role in better acknowledging and including local response mechanisms on their own  
4 terms within the broader edifice of DRR. This means moving from top-down view of disaster response,  
5 and understanding the durability rather than negative impact, of informality (Daly et al. 2017; Kaika 2017).  
6 It also highlights how informal social networks affect not only the material landscape of response and  
7 recovery, but also the information ecosystem upon which people make decisions about their reaction to  
8 crisis. As already noted by Twigg et al. (2017) on the case of the Gorkha earthquake, families and  
9 communities recovering from disasters set priorities and take decisions based on the knowledge they  
10 have, their needs, and their means. This implies that disaster-affected people should be able to make  
11 choices on the basis of “good advice” and having a well-informed opportunity of setting of priorities  
12 remaining with their family or community (Twigg et al. 2017; Crawford et al., 2016). In this spirit we have  
13 attempted here to open up a more explicit methodological and evidence-based dialogue between DRR  
14 and urban studies, conscious that the ultimate purpose of this effort needs to be tied and engaged with  
15 that ‘field’ of practice, and tacit networks, we encountered in our study.  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27

## 28 Acknowledgments

29 Research for this grant has been funded under the UK Engineering and Physical Research Council (EPSRC)  
30 research grant “Vaccinating the Nexus” (EP/N005961/1). The authors would like to thank the Department  
31 of Science, Technology, Engineering and Public Policy at University College London (UCL STEaPP) for  
32 additional funding, and the support of the ‘Enhancing community resilience using renewable energy in  
33 Nepal’ (also UCL STEaPP funded) project, also including Prof Yacob Mulugetta at UCL, in enabling the  
34 fieldwork for this study. Authors would like to express their earnest gratitude for Nepali surveyors team  
35 and collaborators, and the interviewees for participating in the study.  
36  
37  
38  
39  
40  
41  
42  
43

## 44 References

- 45 Aldrich, D.P. (2010). Fixing recovery, social capital in post-crisis resilience. *Journal of Homeland Security*,  
46 No. 6, pp. 1-10.  
47  
48 Aldrich, D.P. and Sawada, Y. (2015). The physical and social determinants of mortality in the 3.11 tsunami,  
49 *Social Science and Medicine*, 124(1), pp. 66-75.  
50  
51 Aldrich, D.P. and Meyer, M.A. (2014). Social Capital and Community Resilience, *American Behavioral*  
52 *Scientist*, 59(2,) pp. 254–269.  
53  
54  
55

- 1  
2  
3 Angelo, H., & Wachsmuth, D. (2015). Urbanizing urban political ecology: A critique of methodological  
4 cityism. *International Journal of Urban and Regional Research*, 39(1), 16-27.  
5  
6 Archer, D. and D. Dodman (2017) The Urbanization of Humanitarian Crises. *Environment & Urbanization*  
7 29(2), pp.339-348.  
8  
9 Barnett, C., & Parnell, S. (2016). Ideas, implementation and indicators: epistemologies of the post-2015  
10 urban agenda. *Environment and Urbanization*, 28(1), 87-98.  
11  
12 Basu, M., Ghosh, S., Jana, A., Bandyopadhyay, S. and Singh, R. (2017). Resource mapping during a natural  
13 disaster: A case study on the 2015 Nepal earthquake, *International Journal of Disaster Risk Reduction*  
14 , 24(1), pp. 24–31.  
15  
16 Batty, M. (2008). The size, scale, and shape of cities, *Science*, 319 (5864), 769-771.  
17  
18 Bevir, M. (2012). *Governance: A very short introduction*. Oxford, UK: Oxford University Press  
19  
20 Bisri, M.B.F., and Beniya, S., (2016) Analyzing the National Disaster Response Framework and Inter-  
21 Organizational Network of the 2015 Nepal/Gorkha Earthquake, *Procedia Engineering*, 159(1), pp. 19–  
22 26  
23  
24  
25  
26 Black, T.R. (1999). “Identifying populations and samples”, In: *Doing Quantitative Research in the Social*  
27 *Sciences: An Integrated Approach to Research Design*, Measurement and Statistics, Sage, London.  
28  
29  
30 Brenner, N. (2016). The Hinterland Urbanised?. *Architectural Design*, 86(4), 118-127.  
31  
32 Campanella, T. J. (2006). Urban resilience and the recovery of New Orleans. *Journal of the American*  
33 *Planning Association*, 72(2), pp. 141-146.  
34  
35 Cutter, S. L., Burton, C. G., & Emrich, C. T. (2010). Disaster resilience indicators for benchmarking baseline  
36 conditions. *Journal of Homeland Security and Emergency Management*, 7(1).  
37  
38 Da Silva, J., Kernaghan, S., and Luque, A. (2012). A systems approach to meeting the challenges of urban  
39 climate change, *International Journal of Urban Sustainable Development*, 4(2) pp. 125-145.  
40  
41  
42 Daly, P., Ninglekhu, S., Hollenbach, P., Dwyne Barenstein, J., and D. Nguyen (2017) Situating local  
43 stakeholders within national disaster governance structures: rebuilding urban neighbourhoods  
44 following the 2015 Nepal earthquake. *Environment & Urbanization* 29(2), pp.403-424  
45  
46  
47 Dey, S. (2015). A Devastating Disaster: A Case Study of Nepal Earthquake and Its Impact on Human Beings,  
48 *IOSR Journal of Humanities And Social Science (IOSR-JHSS)*, 20(7) pp. 28-34.  
49  
50 Dickson, E. (2012). *Urban risk assessments: understanding disaster and climate risk in cities*. World Bank,  
51 Washington DC.  
52  
53  
54 Dimmer, C. (2014). Evolving place governance innovations and pluralising reconstruction practices in post-  
55 disaster Japan. *Planning Theory and Practice*, 15(2), 260-265.



- 1  
2  
3 Elliott, J., Haney, T. and Sams-Abiodun, P. (2010). Limits to social capital: Comparing network assistance  
4 in two New Orleans neighbors devastated by Hurricane Katrina. *Sociological Quarterly*, No. 51, pp. 624-  
5 648.  
6  
7  
8 Fussell, E. (2012). "Help from family, friends, and strangers during hurricane Katrina: finding the limits of  
9 social networks", in *Displaced: Life in the Katrina Diaspora*, Weber, L., Peek, L. 2012, Austin: University  
10 of Texas Press.  
11  
12 Gordon, I. R., & McCann, P. (2000). Industrial clusters: complexes, agglomeration and/or social networks?.  
13 *Urban studies*, 37(3), pp. 513-532.  
14  
15  
16 Granovetter, M. (1982). "The Strength of Weak Ties: A Network Theory Revisited", in *Social Structure and*  
17 *Network Analysis*, P.V. Marsden, N. Lin (eds.), Sage, Beverly Hills, CA, pp. 105-30  
18  
19 Haines, V.A., Hurlbert, J.S., and Beggs, J.J. (1996). Exploring the determinants of support provision:  
20 Provider characteristics, personal networks, community contexts, and support following life events.  
21 *Journal of Health and Social Behavior*, 37(3), pp. 252-264.  
22  
23  
24 Halpern, D. (2004). *Social Capital*, Polity Press, London.  
25  
26 Islama, R., and Walkerdenb, G., (2017). Social networks and challenges in government disaster policies: A  
27 case study from Bangladesh, *International Journal of Disaster Risk Reduction*, Vol. 22, pp.325–334.  
28  
29 Jones, S., Oven, K.J., and Wisner, B., (2016). A comparison of the governance landscape of earthquake risk  
30 reduction in Nepal and the Indian State of Bihar, *International Journal of Disaster Risk Reduction*, 15(1)  
31 pp. 29–42.  
32  
33  
34 Joseph, S. and Linley, P.A. (2005). Positive Adjustment to Threatening Events: An Organismal Valuing  
35 Theory of Growth Through Adversity, *Review of General Psychology*, 9(4), pp. 262-280.  
36  
37 Kaika, M. (2017) 'Don't call me resilient again!': the New Urban Agenda as immunology. *Environment &*  
38 *Urbanization* 29(1), pp.89-102.  
39  
40  
41 Lasswell, H. (1936) *Politics: Who Gets What, When and How*, New York: Whittlesey House  
42  
43 Maslow, A.H. (1970), *Motivation and personality*, New York, NY: Harper and Row.  
44  
45 McFarlane, C. and Waibel, M. eds. (2012). *Urban informalities: reflections on the formal and informal*.  
46 Farnham: Ashgate.  
47  
48 Mercer, J., Kelman, I., Taranis, L., and Suchet-Pearson, S. (2010). Framework for integrating indigenous  
49 and scientific knowledge for disaster risk reduction, *Disasters*, 34(1), pp. 214-239.  
50  
51  
52 Muzzini, E. and Aparicio, G. (2013). *Urban Growth and Spatial Transition in Nepal*. Washington D.C.: The  
53 World Bank Group.  
54

- 1  
2  
3 OECD (2001). *The Well-Being of Nations: The Role of Human and Social Capital*, OECD, Paris. Putnam, R.  
4  
5 (1993). *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton, N.J.: Princeton University  
6  
7 Press.  
8 Putnam, R. (2000). *Bowling Alone: The Collapse and Revival of American Community*, Simon and Schuster,  
9  
10 New York.  
11 Putnam, R. (2002). *Democracies in Flux: The Evolution of Social Capital in Contemporary Society*, Oxford  
12  
13 University Press.  
14 Roy, A. (2005). Urban informality: toward an epistemology of planning. *Journal of the american planning*  
15  
16 *association*, 71(2), pp.147-158.  
17 Satterthwaite, D., & Dodman, D. (2013). Towards resilience and transformation for cities within a finite  
18  
19 planet. *Environment and Urbanization*, 25(2), pp.291-298.  
20 Sanderson, D., Kayden, J. S., & Leis, J. (Eds.). (2016). *Urban disaster resilience: New dimensions from*  
21  
22 *international practice in the built environment*. Routledge, London.  
23 Tierney, K. (2014). *The Social Roots of Risk: Producing Disasters, Promoting Resilience*, Stanford University  
24  
25 Press, CA.  
26 Tomba, L. (2014). *The government next door: Neighborhood politics in urban China*. Cornell University  
27  
28 Press.  
29 Twigg, J., E. Lovell, H. Schofield, L. Miranda Morel, B. Flinn, S. Sargeant, A. Finlayson, T. Dijkstra, V.  
30  
31 Stephenson, A. Albuerne, T. Rossetto and D. D'Ayala (2017) *Self-recovery from Disasters*. ODI Working  
32  
33 Paper 523. Overseas Development Institute, London.  
34  
35 USAID (2015). Nepal Earthquake, June 12, 2015, available at: [https://www.usaid.gov/nepal-](https://www.usaid.gov/nepal-earthquake/fy15/fs20)  
36  
37 [earthquake/fy15/fs20](https://www.usaid.gov/nepal-earthquake/fy15/fs20) accessed on 9 August 2017.  
38  
39 Usamah, M., Handmer, J., Mitchell, D., and Ahmedb, I., 2014. Can the vulnerable be resilient? Co-existence  
40  
41 of vulnerability and disaster resilience: Informal settlements in the Philippines. *International Journal*  
42  
43 *of Disaster Risk Reduction* 10(1), pp. 178–189  
44 Vera, F., & Mehrotra, R. (2017). Ephemeral urbanism: looking at extreme temporalities. In Haas, T. &  
45  
46 Westlund, H., eds. *In The Post-Urban World*. London: Routledge, pp. 62-73.  
47 Yiftachel, O. (2009) Critical theory and 'gray space': mobilization of the colonized. *City* 13(2/3), pp.246–  
48  
49 63.  
50 Wahlstrom, M. (2017). Social work and the Sendai Framework for Disaster Risk Reduction, *European*  
51  
52 *Journal of Social Work*, 20 (3) pp. 333-336.  
53  
54

1  
2  
3 Yawson, D.O, Adu, M.O., Armah, F.A., Kusi, J., Ansah, I.G., and Chiroro C. (2015). A needs-based approach  
4 for exploring vulnerability and response to disaster risk in rural communities in low income countries,  
5 *Australasian Journal of Disaster and Trauma Studies*, Volume 19, Special Issue.  
6  
7  
8  
9

---

10  
11 <sup>1</sup> Here we rely on an understanding of ‘governance’ as the broader context of governing disaster response as  
12 carried out through both formal and informal power relations (e.g. as in Bevir 2012).

13 <sup>2</sup> This is a common equation between informality and risk that is well echoed in the rest of this special issue  
14 and certainly embedded in DRR well before 2013

15 <sup>3</sup> From 1990 until 2017 (hence at the time of this research) Village Development Committees were the lower  
16 administrative part of Nepal’s Ministry of Federal Affairs and Local Development, akin to municipal  
17 authorities and divided internally in wards.

18 <sup>4</sup> Applying Maslow’s framework, participants answers were classified into eleven needs: (1) *Physiological*  
19 *needs*: food, water, medicines, clothes and sleeping materials; (2) *Safety needs*: rescue, money, shelter, and  
20 guidance; and (3) *Love and Belonging needs*: emotional support. These ten needs categories group all the  
21 individual needs pointed by the 160 surveyed households in the immediate response to Gorkha earthquake  
22 (e.g. rice or blankets would be classified as food and sleeping material respectively).

23 <sup>5</sup> We recognise the complexity of shelter provision in relation to other forms of aid: this is addressed more  
24 extensively in the conclusion – for a useful discussion of the urban implications of this type of aid see amongst  
25 other Flinn (2013).

26 <sup>6</sup> Our results also resonate with the work of Usamah et al. (2014) who revealed that the strength of social  
27 relationships helped to reduce the vulnerability of the communities in informal settlements in the Philippines,  
28 whether they were close to infrastructure or remotely located.

29 <sup>7</sup> We recognise social capital is also fundamental for the ‘recovery’ phase, as soundly exposed by Dimmer  
30 (2014) in his exploration of the local communities in Japan.

31 <sup>8</sup> Islama and Walkerdenb (2017) emphasized that while organisations linking social networks are emphasized  
32 in policies, households’ bonding networks, bridging networks, and their local linking relationships are largely  
33 ignored.  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

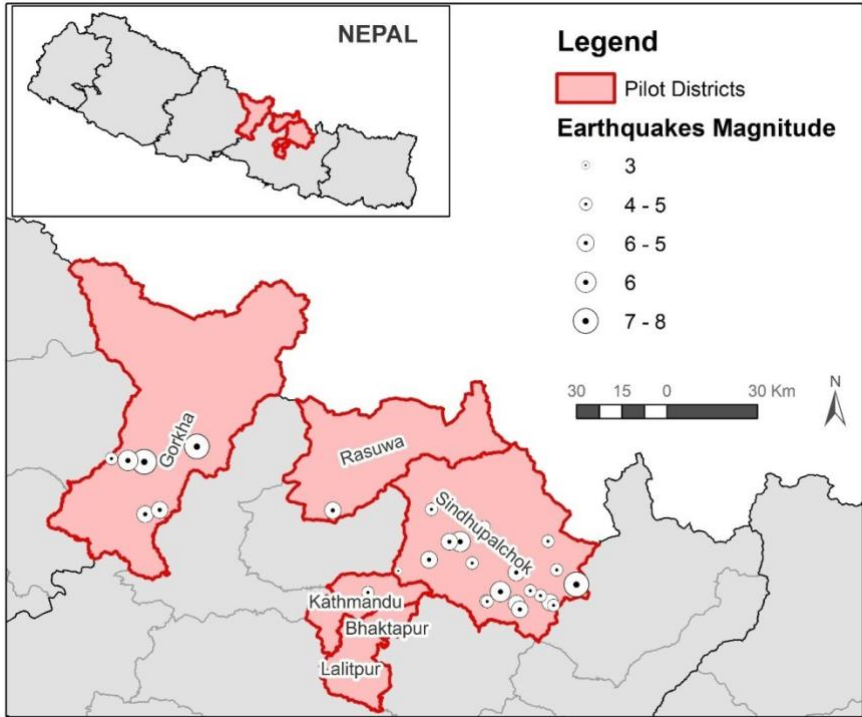


Figure 1: Fieldwork sites and the Gorkha earthquake  
161x209mm (220 x 220 DPI)

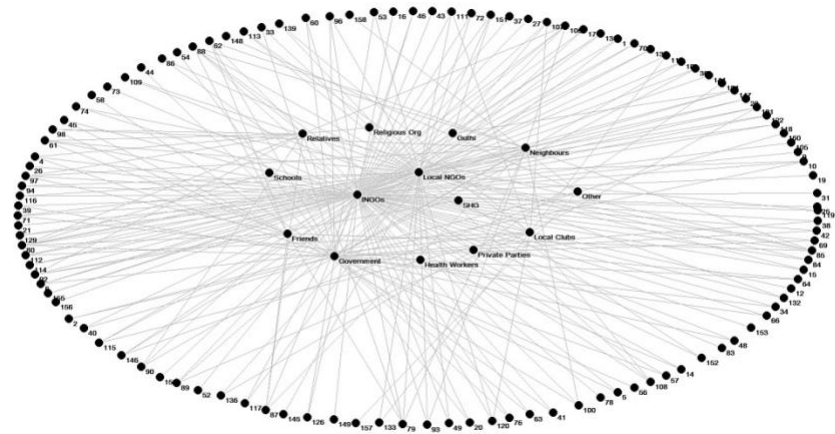


Figure 2: Social network activated to respond to the Gorkha earthquake

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

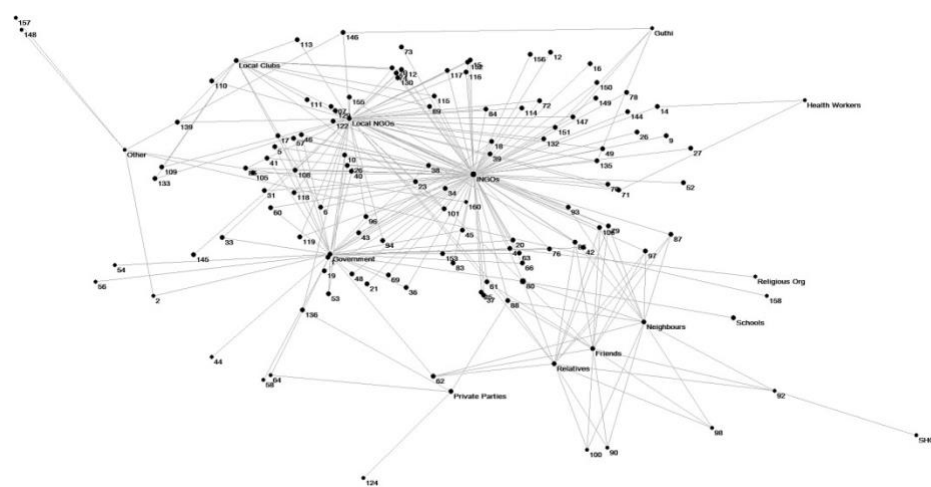


Figure 3: Network activated for the shelter provision: network architecture

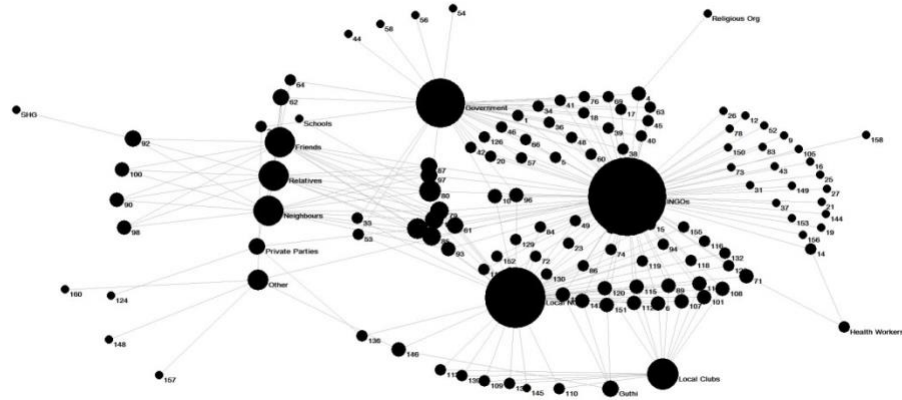


Figure 4: Network activated for the shelter provision: actors' significance

506x259mm (96 x 96 DPI)

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

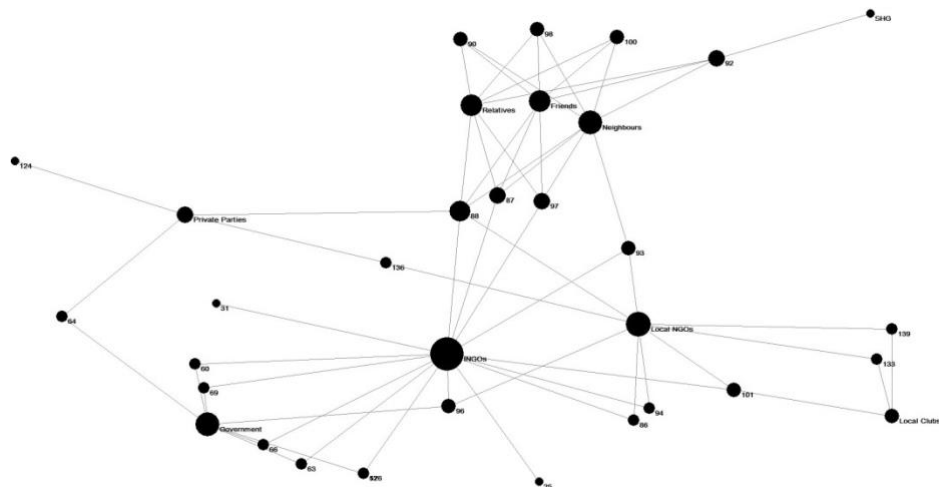


Figure 5: Zooming in the case of shelter provision: network behaviour in urban areas

508x259mm (96 x 96 DPI)



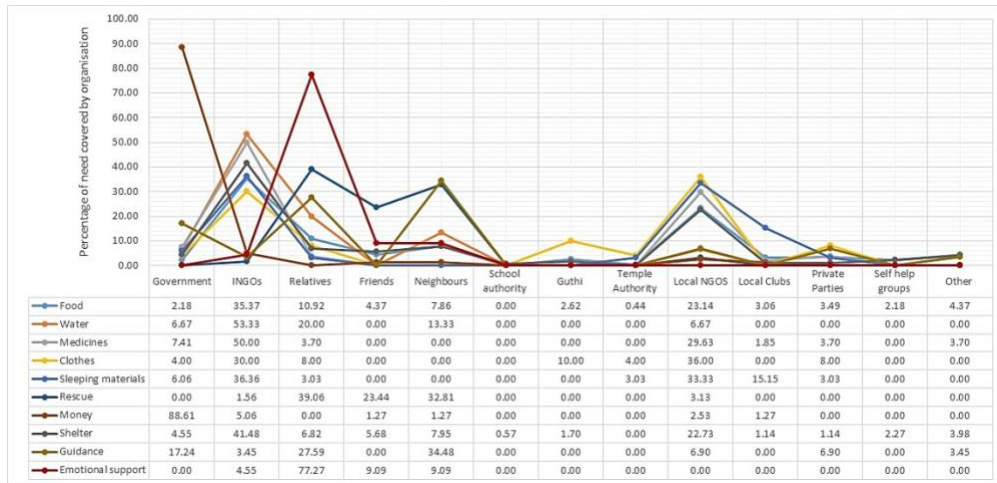


Table 1: Needs and needs providers