EVALUATING DISASTER GOVERNANCE NETWORKS USING BIG DATA:

A CASE STUDY OF THE 2015 NEPAL EARTHQUAKE RESPONSE NETWORKS USING THE GLOBAL DATA ON EVENTS, LOCATION AND TONE

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ABSTRACT

Effective interorganizational communication and cooperation are key elements of successful disaster response. Scholars advise measuring interorganizational networks through multiple sources of data. Typically, human-coded event data from content analysis of news and published reports is used. This approach usually requires much time and resources. Alternatively, the Global Data on Events, Location and Tone (GDELT) database contains graph data that is coded from contents of global and national media reports using advanced algorithms. Because GDELT database contains a massive-scale network of interconnected events, organizations, locations, and topics, it provides an additional source of data to evaluate whether disaster governance networks have actually operated according to their designed policies and plans. With this goal in mind, this paper analyzes the performance of the 2015 Nepal Earthquake response networks to see whether they worked as planned by policymakers and public managers. Governmental and NGO reports are coded to map the *planned network* and the GDELT knowledge graph data is used to map the *actual network*. Measures of density, centrality, and cohesiveness are used from the literature on disaster response networks to make the comparisons. Findings indicate that there were several problems in the network-in-action whereby national level public organizations had significant coordination problems with local and province level organizations in Nepal. Moreover, due to tensions with UN agencies and donors leading up to and after the 2015 earthquakes, cooperation of the national ministries with international organizations suffered in the network-in-action, which was not foreseen by the network-in-plan.

Keywords: disaster relief, network analysis, big data, Nepal, humanitarian assistance

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INTRODUCTION

Effective interorganizational communication and cooperation are key elements of successful disaster response (White 1999; Sylves 2008). This paper uses big data constructed from media reports to evaluate the effectiveness of a natural disaster response network. In so doing, the paper aims at improving collective understanding of enabling and constraining factors that drive cooperation between national government agencies and international governmental and non-governmental organizations responding to complex emergencies in developing country settings – a critical question raised by scholars like Comfort (1990) and Natsios (1995). Concurrently, the paper evaluates the strengths and weakness of a particular big data source - Global Data on Events, Location and Tone database – in conducting a social network analysis of interorganizational cooperation in the 2015 Nepal Earthquake response in relation to contextual knowledge about the case obtained from desk research, fieldwork and elite interviews.

Scholars often measure interorganizational networks through multiple sources of data. Typically, human-coded event data from content analysis of news and published reports is used (e.g., Comfort and Kapucu 2006; Lia and Hsu 2018). This approach usually requires much time and resources. Alternatively, the Global Data on Events, Location and Tone (GDELT) database contains graph data that is coded from contents of global and national media reports using automated algorithms. Because GDELT database contains a massive-scale network of interconnected events, organizations, locations, and themes (topics), it provides an additional source of data to evaluate whether disaster governance networks have actually operated according to their designed policies and plans.

More specifically, this paper analyzes the performance of the 2015 Nepal Earthquake response networks to see whether they worked as planned by policymakers and public managers. Governmental and NGO reports are coded to map the *network-in-plan* and the GDELT knowledge graph data is used to map the *network-in-action*. Measures of density, centrality, and cohesiveness are used from the literature on disaster response networks to make the comparisons.

Findings of the paper indicate that there were several problems in the disaster response network whereby national level public organizations had significant coordination problems with local and province level organizations in Nepal. Moreover, due to tensions with UN agencies and donors leading up to and after the 2015 earthquakes, cooperation of the national ministries with international organizations suffered.

The next section of the paper discusses the context of Nepal with respect to disaster impact, policies and planning as well as the political landscape struck by the earthquakes.

CONTEXT

Disaster Impact

On April 25th, 2015 an earthquake of 7.8 magnitude and in about two weeks, on May 12th, an after-shock of magnitude 7.3 struck Nepal. The two earthquakes killed 8,891 and injured 22,300 people in Nepal.[2] The earthquakes fully or partially destroyed over 756,000 buildings, leaving 3.5 million people (over one tenth of Nepal's population) homeless. In addition, 400 health facilities, 9,000 classrooms, 2,900 cultural and religious heritage sites, and 1,711 other structures were destroyed or damaged. The earthquakes are considered the worst since the Great Nepal-Bihar earthquake of 1934.[3] The earthquakes affected 31 of Nepal's 74 districts, where almost half of the country's 30 million population resides. Especially 14 districts were affected severely. The earthquake damage was assessed at USD 10 billion, equivalent to half the GDP of the country.

Nepal is a mountainous country that has both harsh winter climate as well as tropical monsoon season. In addition to seismic risk, there are multiple other natural hazards in Nepal. During April 14th and October 18th of 2015, in addition to 70 incidents of earthquakes (including aftershocks), there were 14 floods and 56 landslides that caused 128 deaths and damaged hundreds of houses.[4] Nepal is one of the poorest countries in the world and the poorest in South Asia. 70% of Nepal's population is rural and many engage in seasonal labor in cities and abroad.

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[2] United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA). Flash appeal for response to the Nepal earthquake. Available from: http://reliefweb.int/sites/reliefweb.int/files/resources/nepal_flash_appeal.pdf [last accessed April–July 2015].
United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA). Nepal: earthquake humanitarian snapshot. Available from: http://reliefweb.int/report/nepal/nepal-earthquakehumanitarian-snapshot–14-may–2015 [last accessed 14 May 2015].
United Nations Office for the Coordination of Humanitarian Affairs
(UNOCHA). Nepal: earthquake 2015 situation report No. 16. Available from: http://reliefweb.int/report/nepal/nepal-earthquake–2015-situation-report-no16–18-may–2015 [last accessed 18 May 2015].

[3] United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA). Flash appeal for response to the Nepal earthquake. Available from: http://reliefweb.int/sites/reliefweb.int/files/resources/nepal_flash_appeal.pdf [last accessed April–July 2015].
GON 2015. SDG report. http://www.np.undp.org/content/dam/nepal/docs/reports/SDG%20final%20report-nepal.pdf
Sheppard, Phillip S., and Michel D. Landry. "Lessons from the 2015 earthquake (s) in Nepal: implication for rehabilitation." *Disability and rehabilitation* (2015): 1-4.

[4] http://neoc.gov.np/uploads/news/file/Bulletin%202072_20151018010401.pdf

The earthquakes greatly and disproportionately affected the poor because the poor are more likely to live in disaster-prone areas such as flood plains and seismic fault zones and are less likely to recover from disasters without public assistance.[5]

Women and excluded social groups (like low caste Dalits, Tamangs, and Janajatis) are severely affected from the earthquakes as they live in houses that do not withstand seismic shocks and their conditions are not impacted by public policies designed to address risk reduction and disaster mitigation.[6] For instance 34% of the 8,891 people who are killed in the earthquakes belong to Tamang people – indigenous, low-caste ethnic group. 63% of the 607,212 houses that were destroyed or damaged also belong to the same marginalized group, as they tend to live in unsafe mud and stone houses on the slopes that are vulnerable to landslides and quakes.[7]

Such strong social and economic inequalities in Nepal impact local and international organizations. International agencies attempt to redress such inequalities by improving education, health, and living conditions of marginalized groups. Such international projects can be impeded or channeled away by socially and economically advantageous groups. The government of Nepal might also want to regulate such projects in order to maintain control over the population.

Disaster Policy

Nepal's Natural Calamity Relief Act of 1982 mandates the Ministry of Home Affairs (MoHA) as the lead disaster management agency and the Minister to chair the Central Natural Disaster Relief Committee (CNDRC), which is the highest-level decision-making body for disaster management in Nepal. The Minister of Home Affairs activates the National Emergency Operations Center (NEOC) and manages coordination with other ministries, the Nepal Army, the Nepal Red Cross Society (NRCS), private and non-governmental organizations, and international relief agencies. Upon recommendation of the CNDRC, the Council of Ministers may declare national emergency in catastrophic events, in which case the Prime Minister would chair the National Council for Disaster Management.

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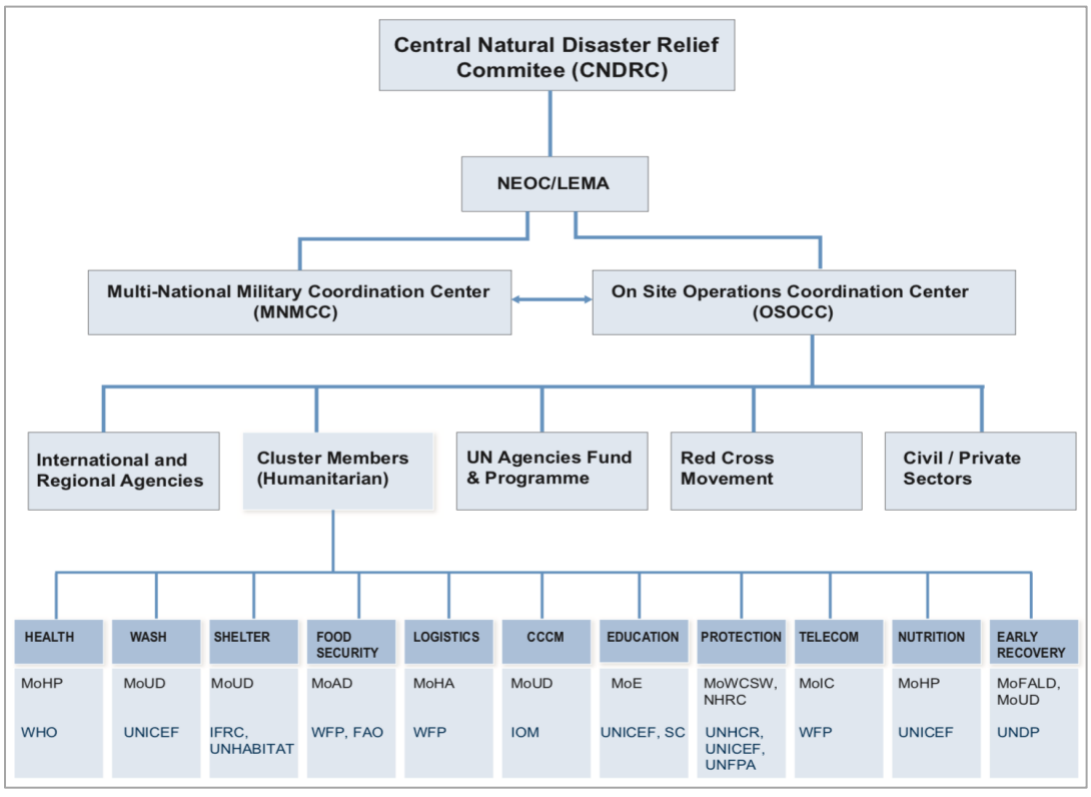
[5] Dani S. The poorest are the hardest hit in rural Nepal. The World Bank blog – end poverty in South Asia. Available from: http://blogs.worldbank.org/endpovertyinsouthasia/poorest-are-hardest-hitrural-nepal [last accessed 5 May 2015].
GON 2015. SDG report. http://www.np.undp.org/content/dam/nepal/docs/reports/SDG%20final%20report-nepal.pdf
[6] http://flagship4.nrrc.org.np/sites/default/files/documents/Nepal%20Disaster%20Report%202013.pdf
[7] http://www.nepalitimes.com/blogs/thebrief/2015/07/05/the-tamang-epicentre/

The Nepal Army runs the Multi-National Military Coordination Center (MNMCC) to coordinate disaster relief activities with the aiding foreign military agencies. The MNMCC reports to the NEOC. The NEOC runs the On-Site Operation Coordination Center (OSOCC), which is designed to cooperate with the MNMCC to achieve civilian-military cooperation. Other ministries in the Government of Nepal also partner with the United Nations and other international organizations to plan and prepare for natural disasters such as floods, avalanches, landslides, and earthquakes. The government adopted the UN cluster system in which a ministry from the Government of Nepal leads each cluster and a UN agency or an international agency supports the lead ministry as a co-lead/partner agency. The clusters also receive strategic advice from the Humanitarian Country Team (HCT) that is led by the UN Resident/Humanitarian Coordinator and composed of the UN agencies, International Organization for Migration, Red Cross and INGOs. from the Figure 1 below depicts Nepal's national policy framework for disaster management.

Figure 1. National Disaster Response Framework of Nepal in 2015.



Source: ReliefWeb (2015).

The Local Self-Governance Act of 1999 mandates the District Development Committees (DDCs), municipalities, and Village Development Committees (VDCs) to respond to disasters by creating Disaster Relief Committees and Emergency Operation Centers at district and local levels. In 2009, the Government of Nepal adopted the National Strategy for Disaster Risk Management, which provides a roadmap for making Nepal a disaster resilient country.

Since the 1988 earthquake, when about 1,000 people were killed, 6,553 injured, and about 65,000 buildings damaged in eastern and central regions of Nepal, the government of Nepal has initiated several risk reduction and capacity building projects with the assistance of international organizations.[8] In 1993 the Government of Nepal partnered with the United Nations Development Program (UNDP), the World Bank (WB), and the Asian Development Bank (ADB) to develop a building code that includes modern principles of earthquake resistance. The Nepal government authorized the new building code with the Building Act of 1998. In 2003, the government made it mandatory for all national, district and local government buildings to comply with the code. International aid organizations are also heavily involved in Nepal to assist the country with a variety of programs such as education, health, climate change, fight against poverty, and so on. Under this umbrella, there have also been programs to make schools, hospitals, and other public buildings earthquake resistant.

International non-governmental organizations that have been operating in Nepal for quite some time coordinate their activities within the Association of International NGOs (AIN), which is led by Save the Children in Nepal. Within AIN, there is a group of INGOs that have projects related to disaster risk and management. In addition, there is also a body called Disaster Risk Consortium that coordinates activities of public, private, NGO and international organizations in Nepal that have projects related to disaster risk reduction.

Political Context

Natural disasters such as the 2015 earthquakes in Nepal are shocks that provide and excellent test of governance effectiveness (Schneider 1990). Nepal experienced that shock as it was going through a painful but protracted political transition that had reduced effectiveness and capacity of governance institutions in Nepal. Following democratic movements in early 1990s, the Kingdom of Nepal had transitioned to a constitutional monarchy whereby Prime Minister elected by majority political parties in the parliament governed the country. However, the

[8] http://www.lebret-irfed.org/spip.php?article787

instability of transition further dragged Nepal into a civil war from 1996 through 2006. In 2006, all sides to the conflict signed the Comprehensive Peace Agreement (CPA) and in 2007, the Interim Constitution of Nepal declared the country as a democratic federal state and the Constituent Assembly (CA) in 2008 abolished the monarchy and declared Nepal as a secular republic (Schneiderman et al. 2016).

The CPA provisions stated that rebel soldiers of the Communist Part of Nepal (CPN) – Maoist incorporated in the Nepal Army, victims of war crimes compensated, and the CA draft a constitution within two years of its first session after elections. While the first provision was completed after long but painful integration of soldiers, the second and third provisions were taking too long to complete due to 139 different political parties jockeying for power and influence. From 2008 to 2015, because the political leaders were unable to come to an agreement and adopt a new constitution, Nepal faced heighted instability and was governed by seven different prime ministers and governing coalitions. Daily functions of government such as service provision and public infrastructure projects suffered severely as the instability in government precluded it from even spending its budget. The 2015 earthquakes produced the necessary catalyst and within 44 days after the earthquakes major political leaders of Nepal agreed on 16 contentious issues that had been delaying the constitution adoption (ICG 2016).

Because of economic tolls of political transition over the previous two decades, Nepal had grown dependent on foreign grants and loans from the World Bank, Asian Development Banks, European Union aid agencies, US Agency for International Development, and United Nations agencies such as UN World Food Program, UN Development Program, UN World Health Organization, UN Children's Fund, UN Food and Agriculture Organization, and so on. Such dependence on foreign aid and loans gave foreign actors much power to shape the process of state reform in Nepal. Moreover, because Nepal depends on India with respect to national security and economic transit, India has had enormous influence on determining who governs Nepal. Geopolitical and economic dependence play an important role as either enabling or constraining factors in disaster relief operations (Kelman 2006).

In such a political landscape, the powerful earthquakes of 2015 altered the contours of politics in Nepal both domestically and internationally. The necessity of stable governance for post-disaster rebuilding and the international spotlight allow the major political actors to power through with and adopt a new constitution on September 20th, 2015.

THEORETICAL FRAMEWORK

Effective management of response to large-scale natural disasters like the 2015 Nepal earthquakes is contingent upon a complex set of interdependent factors (Comfort 1999). The most important factors are the extent to which risk reduction activities are effectively implemented prior to the disaster. However, risk reduction depends on the level of economic development, distribution of resources across social groups, and governance capacity of a given country and takes years if not decades to undertake (Cutter et al. 2008).

The next set of factors can be grouped under the rubric of preparedness and include coherent policy and management framework for joint planning, communication, and collaboration among diverse sets of organizations that have varying levels of financial, human, and organizational resources (Perry and Lindell 2003). Policy and planning documents such as national frameworks for disaster management need to be actively implemented during simulations and exercise in order for the organizations to effectively prepare for large-scale earthquakes. However, even the most prepared disaster relief networks can fail because of the unexpected nature of high-risk disaster that often create high uncertainty in a dynamic environment (Comfort and Kapucu 2006). Therefore, such response networks are truly tested only when the actual disaster happens.

Once the disaster strikes, the first goal of the response network is to restore normalcy as quickly as possible while minimizing loss of life and property and preventing secondary consequences of a disaster such as public health catastrophes, social upheaval, political disorder, and economic collapse. Attaining these objectives is often a tall order because disaster response networks quickly overwhelmed by the scale of the disaster and needs of the affected populations. A surge in the number of response actors that results from appealing to international organizations for support can create serious communication and coordination issues even when a coherent policy and management framework is in place prior to the disaster (Nolte and Boenigk 2011). In resource-poor countries, it becomes especially important to communicate and coordinate better as many organizations operate with minimal financial, human, and organizational capacity (Saban 2015).

Evaluating the effectiveness of disaster response networks based on only inputs and outputs such as number lives saved during search and rescue activities and the quantity of food and shelter provided in early phases of relief does not provide a sufficient evaluation of the

effectiveness of the disaster response network. The reason is there will always be losses in human life and unsatisfied human needs in large-scale disasters. In addition, the number of responders deployed, the number of equipment used, the amount of food and shelter provided may still lead to a failed disaster response. Moreover, it is hard to judge how many lives could have been saved if a given amount of additional inputs was procured and deployed. Therefore, it is important to focus on how available resources were provided to affected populations with minimal failures in communication and coordination.

A more viable approach to the evaluation of disaster response networks then is analysis of the extent to which organizational actors were prepared to communicate and coordinate their actions prior to the disaster and of the extent to which they actually were able to do in the face of a disaster (Comfort and Kapucu 2006). Comparison of the network-in-plan with the network-in-action can provide crucial insights for identifying and learning lessons (Birkland 2006), especially when done with careful consideration of domestic context as well as benchmark cases from the country's past or other comparable, contemporary cases from similar countries. Such an analysis of network effectiveness is important for critical outcomes such as community capacity (Provan and Kenis 2008) and organizational resilience (Lai and Hsu 2018) that public policy and administration scholars study. It is also important for practitioners and policy makers because network properties and structures shape the rules of engagement in complex, dynamic environments such as mass-scale earthquake relief (Byman et al. 2000).

METHODOLOGY

The paper uses a mixed methods approach to evaluate the network effectiveness of disaster response within three months of Nepal's April 2015 earthquake. Academic, new media, and government and non-governmental reports were used to understand the Nepali context and its disaster preparedness and policy framework. Big data from media reports was used to extract interorganizational disaster response network, while other academic and policy reports, as well as observations from fieldwork and expert interviews were used to cross-reference the findings from social network analysis of the graph data extracted from the big data source.

The remainder of this section of the paper describes the database and methods used to retrieve, extract, and prepare the knowledge graph data for analysis. The section will also point out limitations of the database.

Database Description[9]

The GDELT Global Knowledge Graph (GKG) database catalogues world events and their latent dimensions, geographic characteristics, and network structures, providing an automated collection of content analysis data for network analysis and media contextualization. The GKG algorithm captures a massive-scale network that connect all events, their thematic and geographic contexts, what actors are involved in them, and how the world is feeling about them every single day as of April 1, 2013. The GKG database provides a wealth of information about organizations that are being discussed in the global news and social media as having active roles in the governance system and networks of Nepal from April 1, 2013 to the present day.

The GKG database includes two data streams. The first one is the daily Counts data, which includes records of numbers that are used in news reports to count objects such as the number of protesters, the number of people killed, the number of displaced persons, etc. This allows tracking daily the number of people killed or affected, for instance in natural disasters, accidents, or epidemics, in the world. The second data stream captures the daily Graph data that contains a massive-scale network of inter-connected events, counts, actors (persons and organizations), locations (countries and states/provinces), themes (topics), tones (emotions), and sources (URLs).

Each GKG record is a unique pairing of a set of names (events, counts, actors, locations, themes, and tones) and a set of news articles in which the set of names appears. Every morning the GDELT GKG engine processes each news article from the day before and groups the articles that contain the same sets of names. The output format of the Graph file is essentially a list, which contains unique sets of names along with the articles in which they appear each day separated by several delimiters. The same sets of names have the same identifiers and thus de-duplicated based on their name set ID. The date of a GKG record indicates the date in which the unique sets of names are discussed in news media articles. Even though the sets of names that co-occur or appear together in the same sets of articles, no straightforward relatedness is implied or suggested; however, the relationships that emerge in multiple co-occurring sets can be inferred to exhibit properties of semantic or structural relatedness. In other words, the GDELT GKG database is based on co-occurrences of names, not on any kind of deeper structural understanding of their individual or organizational relatedness.

[9] This section is based on documentation available at https://www.gdeltproject.org/data.html#documentation.

The list of entities or organizations and locations in the GKG database are compiled using an algorithm developed by Leetaru (2012) and are delimited by semicolons. The list of organizations includes corporations, international governmental and nongovernmental organizations, and any other local organizations like local councils and fairs. The algorithm is highly adaptive and currently set up to err on the side of inclusion when the level of confidence about a match is relatively lower with the purpose of making sure that a maximum number of smaller organizations operating around the globe that are of interest to many GKG users are captured. (I overcome this issue by developing an exclusion list to reduce irrelevant entities and redundancies. See the Data Retrieval section below for the discussion of the exclusion list).

A GKG theme indicates discussions around a topic. There are 2,609 themes in the GKG database as of October 2017. These themes include governance, constitutions, political and administrative reforms, riots and protests, blockades, natural disasters, manmade disasters, earthquakes, varieties of crises related themes. All themes were created using sophisticated lexicological dictionaries and algorithms. The master file for the themes can be accessed from the GDELT website.[10]

This paper uses the version 1.0 of the GDELT GKG database because GDELT analytics services for data retrieval for version 2.0 are not yet available. The main difference between versions 1 and 2 is in that the former includes data only from English language news sources while the latter translates 65 languages on the fly while collecting data.

Data Retrieval

Network data was retrieved from the GDELT GKG database using the tools provided by the GDELT Analysis Services – cloud-based tools and services that allow exploring, retrieving, and visualizing data from the GDELT databases free of charge. Among these tools, the GKG Network Visualizer was used to export graph data in .GEXF (v.1.2) format for advanced analysis using the free, open-source software suite Gephi.[11]

The use of this tool does not require knowledge of programming or data retrieval languages such as Structural Query Language (SQL).[12] However, it requires one to understand the database and how the information is collected, processed, and stored to facilitate meaningful

[10] The master file of GDELT GKG themes are available at http://data.gdeltproject.org/documentation/GKG-MASTER-THEMELIST.TXT
[11] The tool is available at http://analysis.gdeltproject.org/module-gkg-network.html
[12] Users with such skills can utilize the Google BigQuery tools to query data from the GDELT databases.

and advanced analysis. The tool allows the user to specify values along certain parameters such as date range, type of actors, location, themes, and threshold levels for inclusion and the system queries the entire database and provides matching results via e-mail. The parameters use Boolean logics for inclusion and exclusion.

The date ranges for data retrieval were chosen according to the research design. Specifically, I analyze the governance network of organizations responding to the 2015 earthquakes in Nepal for the first three months after the April 25th earthquake. The location parameter was chosen as Nepal. For retrieving data for the 2015 earthquakes in Nepal, the NATURAL_DISASTER_EARTHQUAKE theme was used.

Threshold levels for inclusion of nodes and edges can be specified. As mentioned above, low cutoff points would create massive networks of thousands of actors with tens of thousands of edges. This project sets the node cutoff point at 10 and the edge cutoff point at 5. In other words, for a node to appear in the data, it (i.e. the set of names) must be mentioned at least 10 times in news articles and for ties among nodes to appear in the data the nodes must have co-occurred at least 5 times in the news. These cutoff points were determined after attempting various cutoff points, and values of 10 and 5 allow retrieval of manageable graph data that can be analyzed in Gephi. Using threshold values based on the number of times each sets of names appear allows one to identify the key actors and study the broader trends in their relational structure over a period of time.

The resulting graph data is still cluttered; so, I developed an exclusion list for data retrieval that would increase the relevance and accuracy of network data that I use in this analysis. The exclusion list consists of

- news organizations such as CNN, Reuters, New York Times, Boston Globe, Times Magazine, and so on;
- internet company names such as Google, Microsoft, Apple, Apple App;
- social media names such as Facebook, Pinterest, LinkedIn, Google Plus, Flickr;
- air travel company names such as British Air, Indian Air, United Airlines, Nepal Airlines, and so on;
- airport names such as JFK airport, Dubai International Airport, and so on;

- and stock market names such as NASDAQ, Dow Jones, and New York Stock Exchange, Nepal Stock Exchange, Singapore Stock Exchange, Hong Kong Stock Exchange, and so on.

The exclusion list removes entities that are not important for the purposes of analysis in this paper. The resulting graph data file contains undirected network without any isolates and can be imported into Gephi for extracting, analyzing, and visualizing inter-organizational networks.

Network Extraction and Data Preparation

In working with big data and networks, it is important to extract the relevant parts of the network from a large-scale graph data that is computationally, analytically and visually challenging to make sense of. Therefore, after retrieving the undirected graph data from the GKG database and importing it into Gephi software, several steps were taken to extract networks before further analysis can be conducted. The first step included going over the list of nodes and ensuring no additional irrelevant organizations such as news organizations, social media outlets, or airlines appear in the node list.

Second, the data was exported to Microsoft Excel and several procedures were conducted in to further prepare the data for analysis. Duplicate nodes and edges were removed carefully without affecting the network structure. Jurisdictions and sectors of organizations were coded based on common knowledge and internet search when necessary. Acronyms were created for each organization so that visualizations are easier to interpret.

Finally, the prepared data was re-imported to Gephi for computing network statistics and visualization. As will be discussed further in the next section, the *giant component* algorithm was used before computing the betweenness and closeness centrality scores. The algorithm removes extraneous pairs or cliques of organizations such as firms linked via the stock markets that are irrelevant to the discussions around actors of the governance network.

Data Limitations

There are some limitations related to automated data collection by the GDELT GKG algorithms. The algorithms produce false positives in detecting locations and organizations. One hopes such false positives do not matter much for this research because the focus on key actors and the broader trends will reduce the use of false positives, which tend to be outliers. However, as is known well in the field of social network analysis, measurement error and missing data have consequences for inference,

In addition, while the GKG engine de-duplicates the sets of names on a daily basis, de-duplication does not happen when the sets of names occur in different days. When that happens, it is possible the same sets of names occurred again or was simply reported again in a different day. Therefore, it is possible that some nodes and edges are redundant. This issue is partially addressed when the node and edge thresholds are used in data retrieval and when parallel edges were merged using the summation method on edge weights in importing data into GEPHI. This limitation was addressed by manually de-duplicating the nodes, and then the edges in the network.

In addition to the problems associated with entity and theme extraction, the method of observing governance networks through the media has its own limitations. Typically, whether human-coded or computer-coded, when data about governance actors and their transactions are observed through media reports, the data is biased toward the most central actors, whether positive or negative (Yi and Scholz 2016).

ANALYSIS AND FINDINGS

This section starts with a summary of network statistics for the 2015 earthquake response networks in Nepal. It then discusses which types of organizations have played influential roles in the actual disaster response network compared to their respective roles, or lack thereof, in the policy documents of the Government of Nepal. Finally, key organizations and their roles are discussed to provide a detailed analysis of their pivotal role in the network.

Network Statistics

Once interorganizational network data is extracted and preprocessed as described in the previous section, it results in a network of 273 organizations and 853 undirected ties and 12 connected components (Table 1). On average, each organization has about 6.2 ties. The *diameter* of the network is 6. This means that the farthest two organizations in the network with respect to geodesic distance are connected to each other through six other organizations. Geodesic distance is the shortest path between two organizations.[13] Mean geodesic distance, which is also called *average path length*, is about 3. In other words, on average organizations in the network are situated three steps or "degrees of separation" away from one another (Wasserman and Faust

[13] A pair of connected nodes have a geodesic distance of 1. For a network of diameter k, the two most distant nodes of the network are connected to each other via k-1 number of nodes.

1994). This is a relatively closely connected network. Usually, spread of ideas, propagation of behavior, and transmission of diseases are effective up to three degrees of separation.

The *density* of the network is 0.023. Network density measures how complete the network is. In other words, a complete network has all possible ties among its nodes and a density of 1. It is calculated by summing the number of ties and dividing it by the total number of all possible ties (Wasserman and Faust 1994). While the network has only 2.3 percent of all possible ties, it is moderately dense for an interorganizational disaster response network.

Network modularity measures modular decomposition of a network into a number of sub-networks or communities. The greater the modularity score of a network, the more sophisticated is its community structure and better compartmentalization of its communities that have a real-world importance.[14] The disaster response network has a moderate network modularity score of about 0.6. The algorithm detected 19 subnetworks, including five largest ones.

Average clustering coefficient measures the extent to which a network is clustered, i.e. the degree to which nodes are situated in clusters or neighborhoods of higher connectivity (Latapy 2008). Networks that are highly clustered but have lower average path length exhibit "small world" properties such as faster diffusion of ideas and behavior (Milgram 1967; Watts and Strogatz 1998). While the average path length of the disaster response network is not low, the average clustering coefficient is moderate at 0.7.

Table 1. Network Statistics

Number of Nodes	273
Number of Edges	853
Average Degree	6.249
Network Diameter	6
Network Density	0.023
Modularity	0.574
Connected Components	12
Average Clustering Coefficient	0.703
Average Path Length	2.934

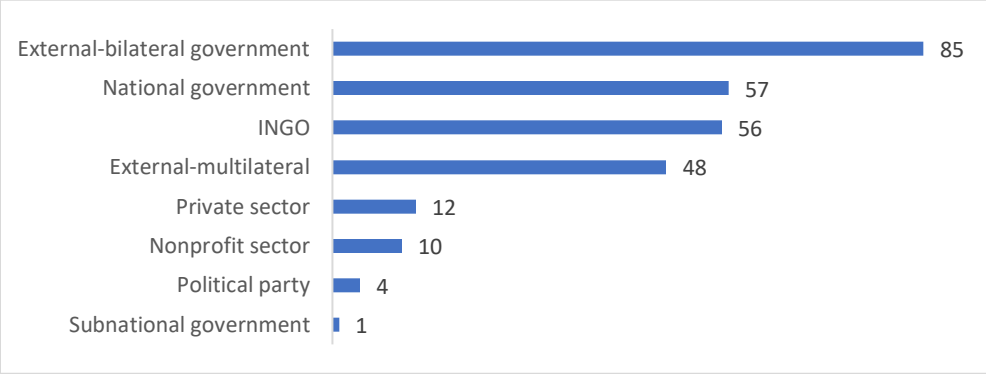
Note: See Appendix A for charts showing distribution of the centrality measures.

[14] The algorithm used for community detection was developed by Blondel and colleagues (2008) with random decomposition for higher accuracy while also accounting for edge weights. The resolution algorithm for community detection was developed by Lambiotte and colleagues (2009).

Frequency Distribution by Organization Type

With respect to frequency distribution, as shown in Figure 2, external bilateral organizations make up the largest number of organizations in the network, namely 85. National government agencies and INGOs are the second and third most common organizations in the network, respectively. Subnational government agencies and political parties have the lowest presence in the network. Despite their small number, three of the four political parties represented in the network are the largest four parties and have near-ubiquitous presence across all sectors and jurisdictions in Nepal. While it is possible that Nepalese private firms and NGOs are underrepresented in English-language media outlets, the data speak to the fact that international organizations (bilateral, multilateral, and non-governmental) overshadow Nepalese governmental and non-governmental organizations in the disaster response network due to Nepal's dependence on foreign assistance and surge capacity of international actors.

Figure 2. Frequency distribution of organizations across organization type (N=273, E=853)

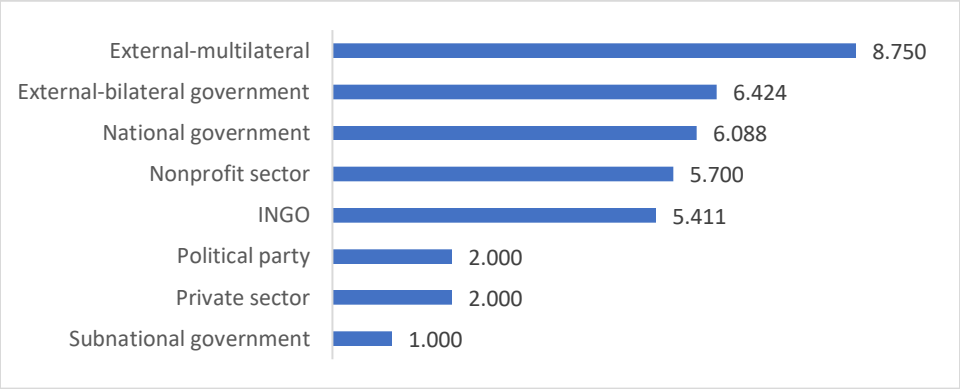


Network Centrality by Organization Type

Degree Centrality measures the extent of a node's connectivity in the network – the number of ties a node has, normalized by the total number of ties in the network (Freeman 1978). Degree centrality is the most basic measure of influence in a network. When degree centrality measures are averaged and broken out across organization types, multilateral and bilateral governmental agencies are the top two types of organizations, reducing national government agencies of Nepal to the third place. Still, national government agencies are more connected than domestic and international NGOs. It is interesting to observe that domestic NGOs have higher degree centrality scores than international ones (Figure 3), despite the fact that the role of

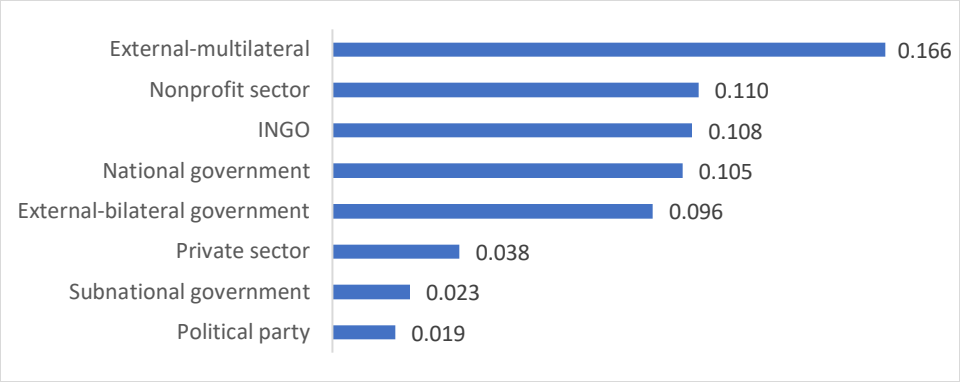
domestic NGOs are not clearly formulated in the Nepal's National Disaster Response Framework. This is consistent with the findings of Bisri and Beniya (2016). This is likely the case because domestic NGOs have depended on international NGOs and multilateral donors for funding; however, after the earthquakes they also received large amounts of funds from local and Non-Resident Nepalis (diaspora living or working abroad) as well as from foreign individual philanthropists who developed ties with them while on a touristic journey in Nepal.

Figure 3. Mean degree centrality distribution of organizations across organization type (N=273, E=853)



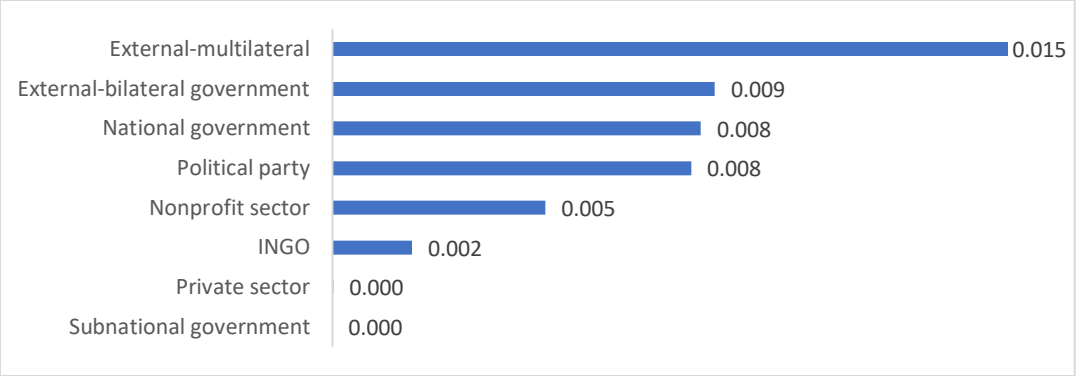
However, when *Eigenvector Centrality* measures – a more refined measure of influence that takes into account connectivity of the nodes that a node is connected to – are used, both domestic and international NGOs have higher mean scores than the national government agencies of Nepal and external bilateral organizations (Figure 4). These findings attest to the fact that 1) frequency does not explain everything as relations and interdependencies are important in disaster response; and 2) external multilateral organizations, Nepalese NGOs and international NGOs in Nepal had been working on disaster risk reduction and preparedness issues as the national government of Nepal was busy dealing with political transition and international bilateral organizations have not had as long presence and as great influence in Nepal as multilateral agencies and NGOs have.

Figure 4. Mean eigenvector centrality distribution of organizations across organization type (N=273, E=853)



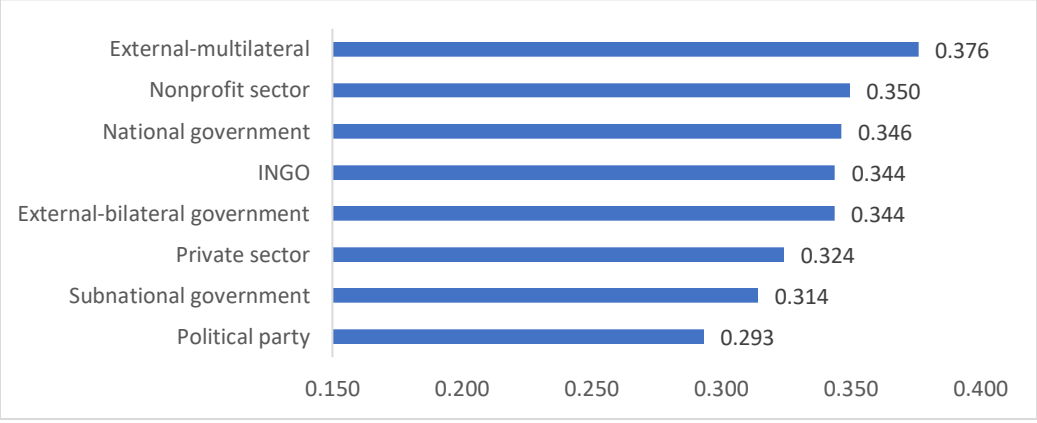
Betweenness Centrality measures the importance of each node in terms of its brokerage role in the network. In other words, it measures the normalized frequency with which each node provides a shortest-path connection between other nodes in the network (Freeman 1977). The greater the betweenness centrality of a score, the more important its brokerage role is in the network, as calculated using the method developed by Brandes (2001). With respect to this measure of influence, external multilateral organizations are in a dominant position of the network, surpassing all other actors by a large difference. It is because of the dominance of the United Nations as well as actors such as Asian Development Bank and the World Bank. Even though local and international NGOs have higher eigenvector scores, likely because of their close ties with multilateral organizations, the national government agencies of Nepal surpassed them with respect to their betweenness centrality scores. Political parties also have relatively higher influence because of their engagement with multilateral organizations and brokerage of ties between international and domestic actors. In contrast, the private sector and subnational organizations had negligible brokering power in the disaster relief network (Figure 5).

Figure 5. Mean betweenness centrality distribution of organizations in the largest connected component of the network across organization type (N=248, E=828)



Closeness Centrality measures the mean of the shortest geodesic distance from a given node to all other nodes in the network normalized by the total number of nodes in the network (Bavelas 1950). The greater the closeness centrality score of an organization is, the closer the organization's geodesic distance is to all other organizations in the network. It appears external multilateral agencies are closest to all other organizations in the network than any other type of organization. Overall, it seems all organizations in the network are situated in the network such that they all have more or less even closeness to others in the network with the exception of political parties, which have lower closeness centrality scores (Figure 6).

Figure 6. Mean closeness centrality distribution of organizations in the largest connected component of the network across organization type (N=248, E=828)



Most and Least Central Organizations

Multilateral Actors. Among external multilateral actors, denoted with dark blue nodes in Figure 7, the United Nations agencies in general had the highest degree centrality score with the

World Food Program having the highest in particular. This is likely because of the importance of the presence of WFP in Nepal with long existing anti-poverty programs and logistical capabilities that allow the organization to access even the remotest mountainous villages. EU agencies in general had the second highest degree centrality score followed by the World Bank, the World Health Organization, International Federation of Red Cross and Red Crescent Societies (IFRC), Asian Development Bank, and the International Committee of the Red Cross (ICRC).

In contrast, the UN Population Fund and the UN Office for the Coordination of the Humanitarian Affairs (UNOCHA) were among external multilateral organizations with the lowest degree centrality scores. The latter is probably the case because the United Nations have had a strong presence in Nepal for decades and the head of the UN Country Team – UN Resident Coordinator (RC) – also took over the role of Humanitarian Coordinator (HC) obviating the need for UNOCHA to send one. The office of RC in the UN headquarter/compound in Patan, Lalitpur played an important role in coordinating relief operation of all international humanitarian actors (Datta et al. 2018).

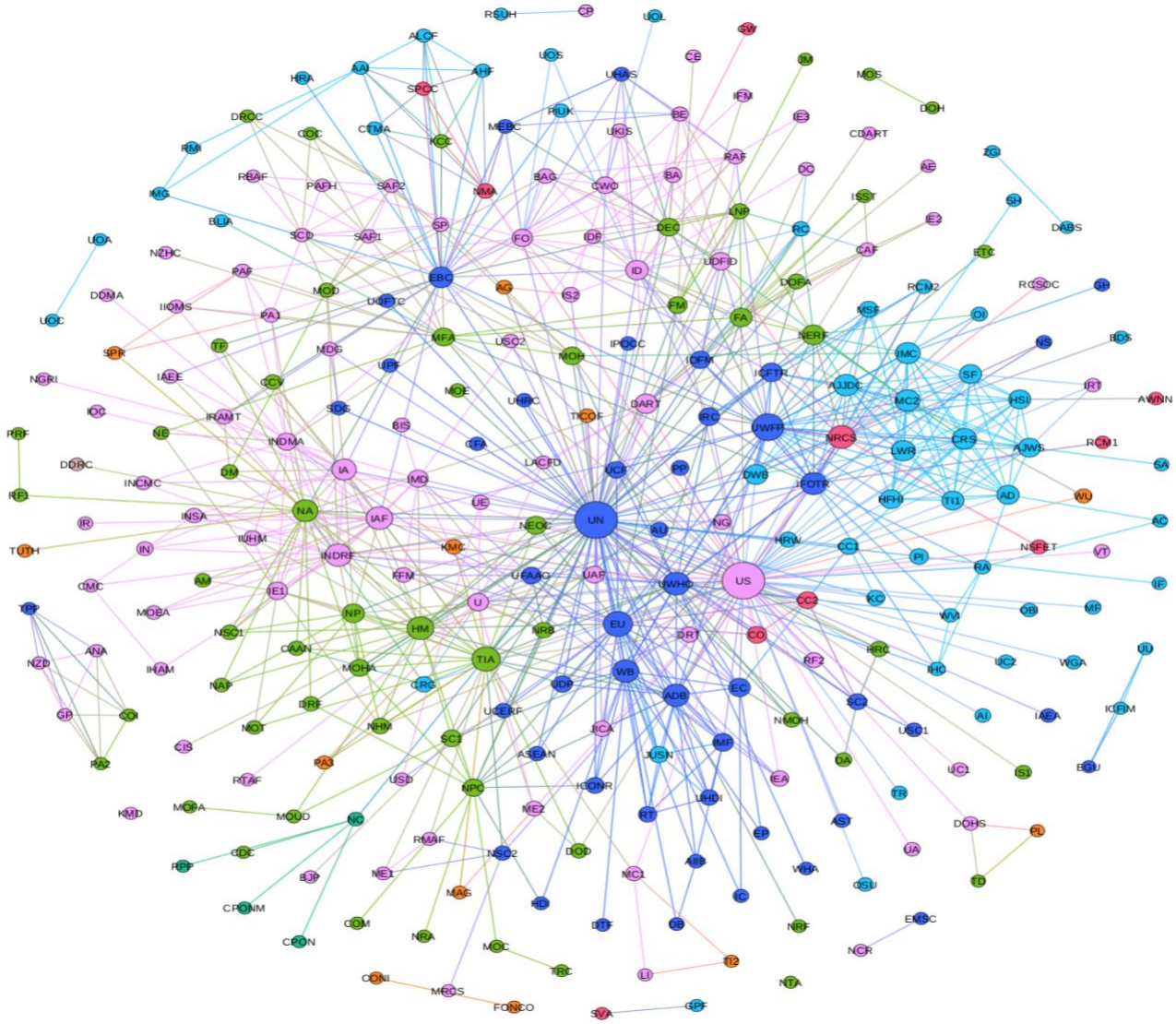
The same set of actors are dominant in the disaster relief network with respect to alternative measures of centrality: eigenvector, betweenness and closeness. The International Organization for Migration (IOM) joins the list of top actors according to the latter measures. With respect to least central actors, surprisingly the UN Humanitarian Air Service joins the list.

Bilateral Actors. Among external bilateral actors colored in pink in Figure 7, international development agencies, especially the US Agency for International Development (USAID) and the UK Department for International Development (DfID) have played the most central role in the disaster relief network. Disaster Assistance Response Teams (DARTs) within the USAID have been a useful instrument of assistance within Nepal's disaster relief network. Similarly, the Indian National Disaster Response Force, the Indian Air Force, the Indian Army, the National Disaster Management Authority of India, and the Embassy of India also appear in the top list with respect to degree centrality measures. The next set of actors are Singapore security forces including their air force, army, civil defense units, and police. Israeli and Pakistani military forces also played active role in the search and rescue operations, consistent with the findings of Thapa (2016).

In contrast, the US Army, Chinese international search and rescue teams, the Red Cross Society of China, Indian Railways and the Indian Oil Corporation were on the list of actors with the lowest degree centrality measures in the disaster response networks. Despite the US Army's low degree centrality score, the US Marine Corps and the US Air Force have much higher scores especially because one of the U.S. Marine Corps helicopters crashed in a remote mountainous region of Nepal while on a disaster relief mission. The Chinese Red Cross and search and rescue teams are highly praised by the Nepali leaders and external scholars alike who point out that while keeping silence and not networking/coordinating with other actors, Chinese disaster relief agency provided effective rescue and shelter provision (Wolbers et al. 2016).

Considering alternative measures of centrality, the same set of actors are influential in the disaster response networks. The Japan International Cooperation Agency (JICA) joins the list of influential actors with respect to eigenvector centrality; however, JICA has a very low betweenness centrality score. Malaysian Red Crescent Society also took part in the disaster relief network; however, it is among bilateral actors with lowest eigenvector, betweenness, and closeness centrality scores.

Figure 7. A visualization of Interorganizational Disaster Response Network in Nepal within First Three Months Following the April 25 Great Gurkha Earthquake by Organization Type



Note: The software Gephi version 0.9.2 software was used to visualize the network extracted from the GDELT Global Knowledge Graph database.

National Actors. Among national government agencies of Nepal color coded in green in Figure 7, the Tribhuvan International Airport, the Nepal Army, Ministry of Home Affairs, the Ministry of Foreign Affairs, the Nepal Earthquake Relief Fund, the Central Natural Disaster Relief Committee, the National Planning Commission, and the Nepal Police appear on the list of most central actors, respectively, in terms of degree centrality measure. Interestingly, the National Disaster Response Framework of Nepal does not discuss the role of the Ministry of Foreign Affairs and the National Planning Commission, even though they have played important roles. Moreover, the Armed Police Force of Nepal does not appear in the top 10 list of highly connected agencies, even though it is part of the Ministry of Home Affairs and took active role in

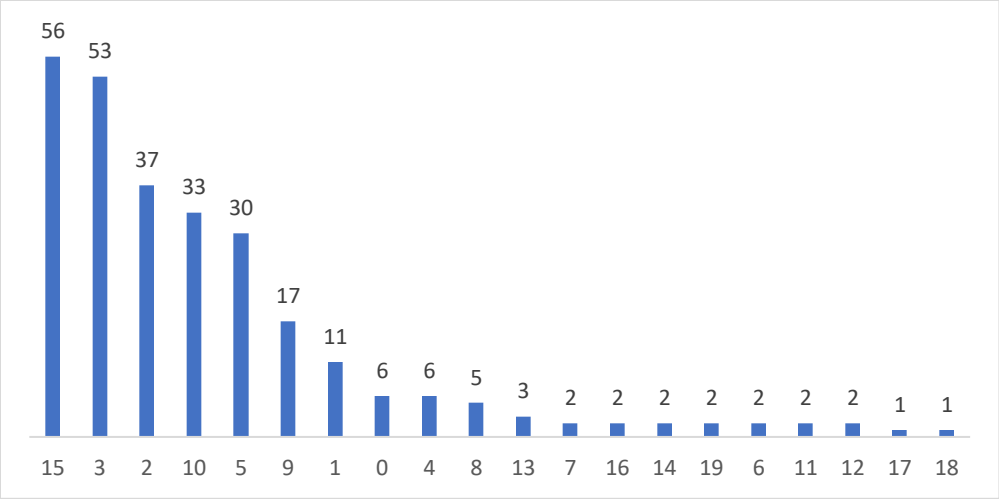
disaster response. The Ministry of Education and the Nepal Telecommunications Authority appear to have the least number of ties among national government agencies.

As for subnational government agencies, lack of their presence in the relief network could be explained by two factors. First, Comfort and Joshi (2017), coding the disaster relief network using Kathmandu Post news articles, report that about 14 percent of the actors in the network were district government agencies. Given this information, the network identified by GDELT in this study underreports the number of subnational actors. However, even in Comfort and Joshi (2017) report only about 2 percent actors from local (subdistrict) government. This leads to the second explanation, namely either local government actors were not represented in the Kathmandu Post articles either or, as Manandhar and colleagues (2017) argued, lack of elected local government officials precluded the local institutions from playing an effective role in the disaster response. Even in some localities where response capacity did exist, lack of effective communication with district and national organizations delayed effective response and recovery (Regmi 2016; Manandhar et al. 2017). Both explanations found support from qualitative expert interviews I conducted in earthquake affected districts such as Kathmandu, Lalitpur, Bakhtapur, Sindhupalchok, and Dulikhel in March 2016 and April 2018.

Subnetworks in the Network

As discussed above, the modularity algorithm detected 19 subnetworks within the disaster response network based on their structure. Subnetworks 15, 3, 2, 10, and 5 are the main communities detected by the algorithm, accounting for 77% of the organizations within the disaster response network. Figure 8 shows distribution of the number organizations across modularity class.

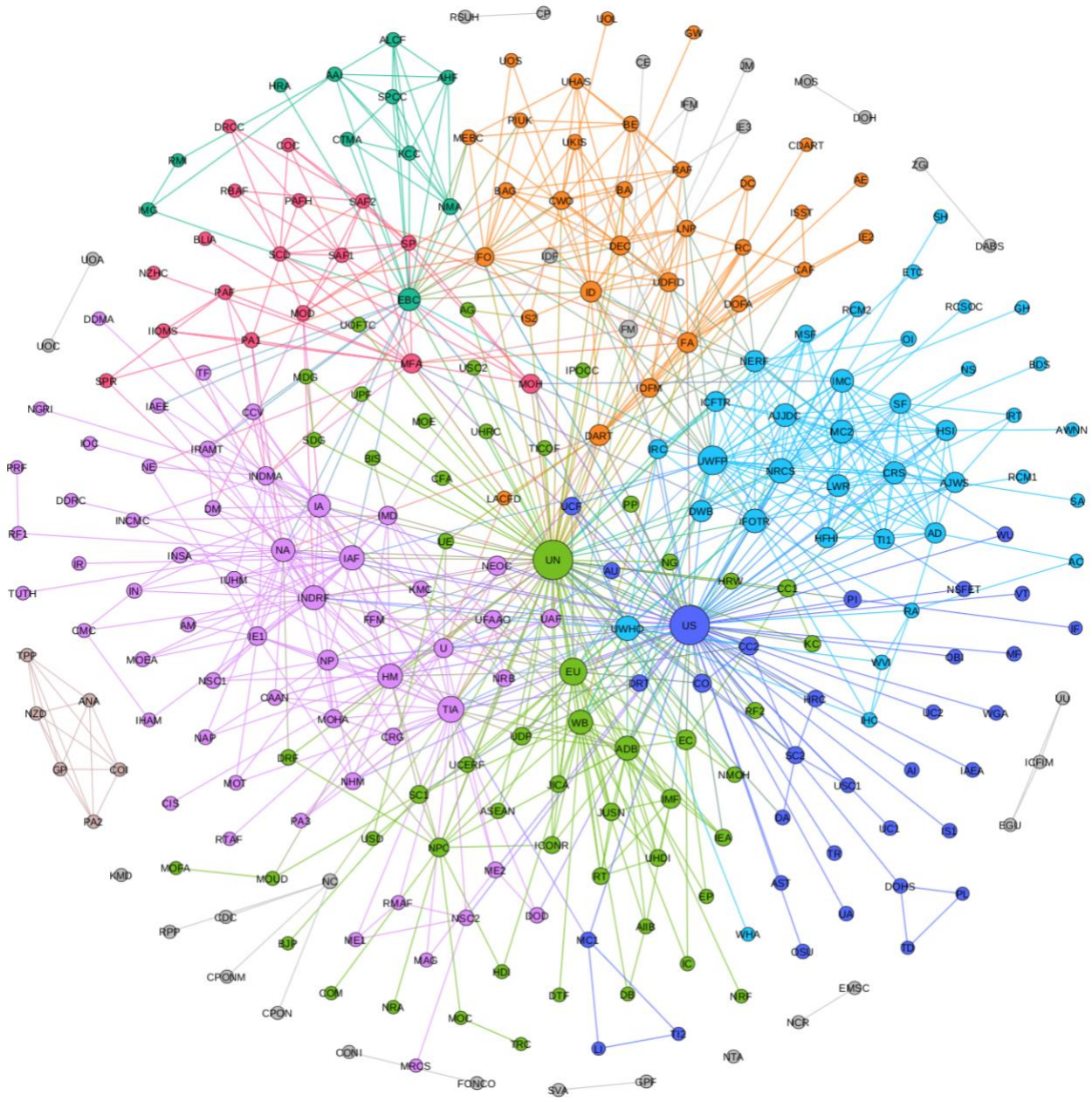
Figure 8. Frequency distribution of organizations across modularity class (N=273, E=853)



An interesting observation from the visualization of subnetwork modularity classes in the disaster networks in Figure 9 is that while multilateral agencies, Western bilateral agencies, and INGOs appear if different subnetworks of the disaster response network, the national government agencies of Nepal and Indian government agencies are coupled together within the same subnetwork. This finding speaks to the fact that Indian government and security actors dominated the response scene and the media elaborately discussed many issues including some controversial issues related to portrayal of Nepal in Indian media and the strong reaction by the Nepali public that triggered anti-India sentiments.[15]

Figure 9. A visualization of Interorganizational Disaster Response Network in Nepal within First Three Months Following the April 25 Great Gurkha Earthquake by Modularity Class

[15] https://www.bbc.com/news/world-asia-india-32579561



Note: The software Gephi version 0.9.2 software was used to visualize the network extracted from the GDELT Global Knowledge Graph database.

CONCLUSIONS

The main findings of this paper show that the disaster response network following the massive 2015 earthquakes in Nepal was dominated international multilateral and bilateral governmental institutions as measured by centrality scores. Perceived loss of control in the disaster response network to Indian actors as well as the UN actors led government officials and

political party leaders in Nepal to attempt to regain control of the disaster governance network. Within a month of the earthquakes, the government of Nepal ended the emergency phase of the response and re-imposed import duties to all the incoming goods at the customs. Moreover, the government required financial donations go through the Prime Minister's Disaster Relief Fund or Nepal's central bank. Political party leaders attempted to reignite nationalism, anti-India sentiment, and self-sufficiency narrative to regain control of the situation. This is consistent with the findings of Wolbers and colleagues (2016) who show that anti-dependency narrative was used by political officials to regain control of the resources flows in the humanitarian response network.

While complex response activities in highly uncertain and dynamic environments of catastrophic events suggest that no one actor is truly in control of the entire network (Comfort and Joshi 2017) and thus shared management of response activities would be a more effective approach, lack of coordination and duplication of efforts among bilateral international governmental and non-governmental actors, as reported by experts in Nepal, can lower the effectiveness of networked response activities. Moreover, Manandhar and colleagues (2017) argue that there were overlapping mandates by the Nepal Army, Nepal Police, and the Nepal Armed Police Force and lack of clear line of authority as the lead agency – the Ministry of Home Affairs – could not command its peer ministries.

The analysis of the graph data extracted from the GDELT database is certainly useful in understanding the effectiveness of disaster response activities in Nepal. However, a rich understanding of the context from other studies, surveys, and interviews are necessary in order to make sense of the findings from analysis of the big data collected by GDELT. However, one main limitation of the data extracted from GDELT was the fact that actors of lower centrality were not represented well in the network. The version two of the GDELT Global Knowledge Graph database will be explored in future research as it includes Nepali language news and social media as well. However, the latter could make accurate entity extraction more difficult, and it will require more manual intervention in data preparation to reduce duplication of nodes and edges.[16] More algorithms are being developed using which entity names can be cross-checked with databases of existing organizations.

[16] This is a typical problem with automated extraction of entities from text data (Pfeffer and Carley 2012).

In future research, scholars are encouraged to compare the GDELT graph data with human coded network data from news articles, financial statements of donation exchanges among organizations, and extraction of networks from web hyperlinks. More formal methods of comparison such as Quadratic Assignment Procedure (QAP) and Exponential Random Graphs (ERGs) would allow one to check if macro and micro level network structures across different measures of the network provide similar results (e.g., Lai and Hsu 2018).

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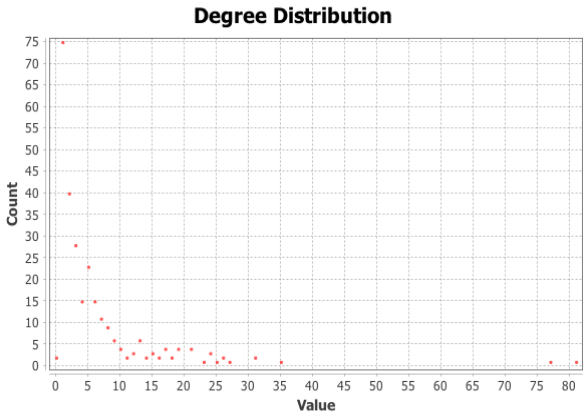
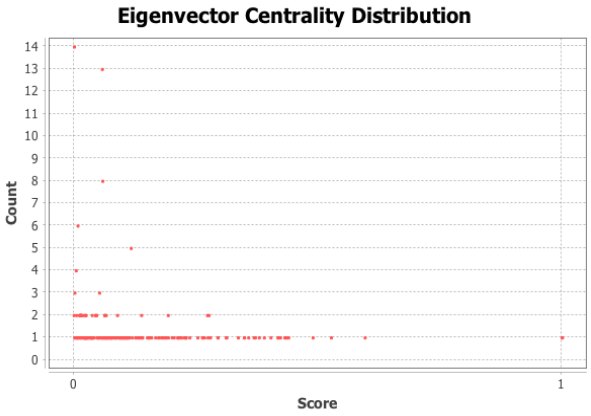
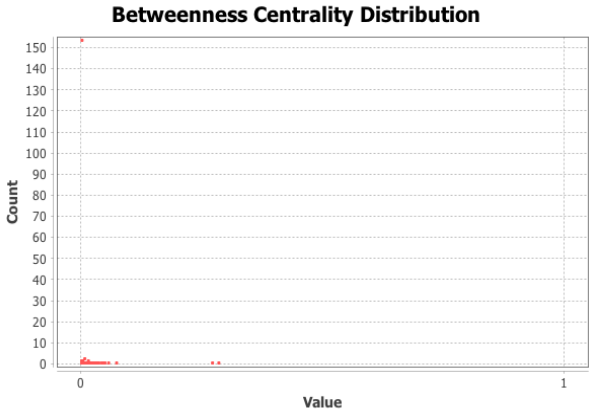
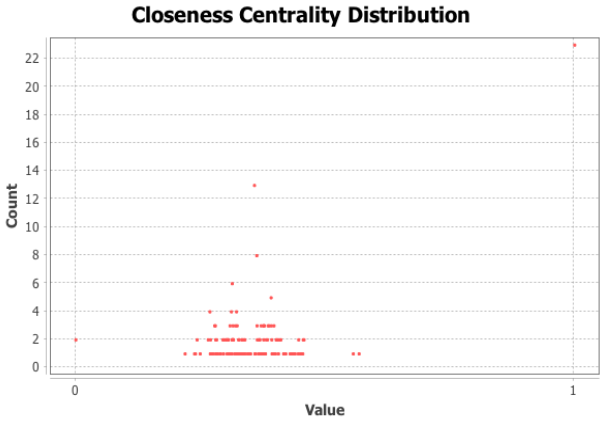
APPENDIX A. DISTRIBUTION OF NETWORK STATISTICS









Note: These measures were calculated using Gephi 0.9.2 software

APPENDIX B. LIST OF ORGANIZATION LABELS AND DESCRIPTIONS

Label	Description
AAI	Alpine Ascents International
AC	Adventist Church
AD	Adventist Development
ADB	Asian Development Bank
AE	Australian Embassy
AG	Advisory Group
AHF	American Himalayan Foundation
AI	Amnesty International
AIIB	Asian Infrastructure and Investment Bank
AJJDC	American Jewish Joint Distribution Committee
AJWS	American Jewish World Service
ALCF	Alex Lowe Charitable Foundation
AM	Affairs Ministry
ANA	Afghan National Army
ASEAN	Asian Association For Regional Cooperation
AST	Assistance Survey Team
AU	African Union
AWNN	Animal Welfare Network Of Nepal
BA	British Army
BAG	British Army Gurkhas
BDS	Blue Diamond Society
BE	British Embassy
BIS	Bureau Of Indian Standards
BJP	Bharatiya Janata Party
BLIA	Buddha Light International Association
CAAN	Civil Aviation Authority Of Nepal
CAF	Canadian Armed Forces
CC1	Catholic Church
CC2	Culture Centre
CCV	Communication Centre Vehicles
CDART	Canada Disaster Assistance Response Team
CDC	Constitution Drafting Committee
CE	Chinese Embassy
CFA	Commission For Asia
CIS	China International Search
CMC	Crisis Management Committee

CO	Cultural Organization
COC	Coordination Centre
COI	Commission Of Inquiry
COM	Council Of Ministers
CONI	Confederation Of Nepalese Industries
CP	Cheshire Police
CPON	Communist Party Of Nepal
CPONM	Communist Party Of Nepal Maoist
CRG	Contingency Response Group
CRS	Catholic Relief Services
CTMA	China Tibet Mountaineering Association
CWO	Commonwealth Office
DA	Development Agenda
DABS	Dar Al Ber Society
DART	Disaster Assistance Response Team
DB	Development Bank
DC	Development Canada
DDMA	Delhi Disaster Management Authority
DDRC	District Disaster Relief Committee
DEC	Disaster Emergency Committee
DM	Defense Ministry
DOD	Department Of Defense
DOFA	Department Of Foreign Affairs
DOH	Department Of Hydrology
DOHS	Department Of Homeland Security
DRCC	Disaster Relief Coordination Centre
DRF	Disaster Relief Fund
DRT	Disaster Response Team
DTF	Donor Trust Fund
DWB	Doctors Without Borders
EBC	Everest Base Camp
EC	European Commission
EGU	European Geosciences Union
EMSC	European Mediterranean Seismological Center
EP	European Parliament
ETC	Emergency Telecommunications Cluster
EU	European Union
FA	Foreign Affairs
FFM	French Foreign Ministry

FM	Foreign Ministry
FO	Foreign Office
FONCO	Federation Of Nepalese Chambers Of Commerce
GH	Global Health
GP	Green Party
GPF	Global Peace Foundation
GW	Gurkha Welfare
HDI	Human Development Index
HFHI	Habitat For Humanity International
HM	Home Ministry
HRA	Himalayan Rescue Association
HRC	Human Rights Council
HRW	Human Rights Watch
HSI	Humane Society International
IA	Indian Army
IAEA	International Atomic Energy Agency
IAEE	Indian Army Everest Expedition
IAF	Indian Air Force
IC	International Cooperation
ICFIM	International Centre For Integrated Mountain Development
ICFTR	International Committee For The Red Cross
ICONR	International Conference On Nepal Reconstruction
ID	International Development
IDF	Israel Defense Forces
IE1	Indian Embassy
IE2	Irish Embassy
IE3	Israel Embassy
IEA	Indian External Affairs
IF	Intrepid Foundation
IFM	Israel Foreign Ministry
IFOTR	International Federation Of The Red Cross
IHAM	India Home Affairs Ministry
IHC	International Humanitarian City
IIOMS	India Institute Of Medical Sciences
IMC	International Medical Corps
IMD	India Meteorological Department
IMF	International Monetary Fund
IMG	International Mountain Guides
IN	Indian Navy

INCMC	India National Crisis Management Committee
INDMA	India National Disaster Management Authority
INDRF	India National Disaster Response Force
INSA	India National Security Advisor
IOC	Indian Oil Corporation
IOFM	International Organization For Migration
IPOCC	Intergovernmental Panel On Climate Change
IR	Indian Railways
IRAMT	India Rapid Action Medical Team
IRC	International Red Cross
IRT	International Relief Teams
IS1	Immigration Services
IS2	International Search
ISST	Interdepartmental Strategic Support Team
IUHM	India Union Home Ministry
JICA	Japan International Cooperation Agency
JM	Justice Ministry
JUSN	Jubilee United States Network
KC	Korean Church
KCC	Khumbu Climbing Center
KMC	Kathmandu Medical College
KMD	Kolkata Meteorological Department
LACFD	Los Angeles County Fire Department
LI	Lexington Institute
LNP	Langtang National Park
LWR	Lutheran World Relief
MAG	Marine Aircraft Group
MC1	Marine Corps
MC2	Mercy Corps
MDG	Millennium Development Goals
ME1	Malaysian Embassy
ME2	Marine Expeditionary
MEBC	Mount Everest Base Camp
MF	MetLife Foundation
MFA	Ministry Of Foreign Affairs
MOC	Ministry Of Culture
MOD	Ministry Of Defence
MOE	Ministry Of Education
MOEA	Ministry Of External Affairs

MOFA	Ministry Of Federal Affairs
MOH	Ministry Of Health
MOHA	Ministry Of Home Affairs
MOS	Ministry Of Science
MOT	Ministry Of Tourism
MOUD	Ministry Of Urban Development
MRCS	Malaysian Red Crescent Society
MSF	Medecins Sans Frontieres
NA	Nepal Army
NAP	Nepal Armed Police
NC	Nepali Congress
NCR	National Capital Region
NE	Nepal Embassy
NEOC	National Emergency Operation Center
NERF	Nepal Earthquake Relief Fund
NG	National Guard
NGRI	National Geophysical Research Institute
NHM	Nepal Home Ministry
NMA	Nepal Mountaineering Association
NMOH	Nepal Ministry Of Health
NP	Nepal Police
NPC	National Planning Commission
NRA	National Reconstruction Authority
NRB	Nepal Rastra Bank
NRCS	Nepal Red Cross Society
NRF	National Reconstruction Fund
NS	National Societies
NSC1	National Seismological Centre
NSC2	National Security Council
NSFET	National Society For Earthquake Technology
NTA	Nepal Telecommunications Authority
NZD	New Zealand Defence
NZHC	New Zealand High Commission
OBI	Operation Blessing International
OI	Oxfam International
OSU	Oregon State University
PA1	Pakistan Army
PA2	Promotion Authority
PA3	Public Affairs

PAF	Pakistan Air Force
PAFH	Pakistan Army Field Hospital
PI	Plan International
PIUK	Plan International United Kingdom
PL	Propulsion Laboratory
PP	Pacific Partnership
PRF	PM Relief Fund
RA	Relief Agency
RAF	Royal Air Force
RBAF	Royal Brunei Armed Forces
RC	Response Centre
RCM1	Red Cross Movement
RCM2	Red Crescent Movement
RCSOC	Red Cross Society Of China
RF1	Relief Fund
RF2	Russian Federation
RMAF	Royal Malaysian Air Force
RMI	Rainier Mountaineering Inc
RPP	Rastriya Prajatantra Party
RSUH	Royal Stoke University Hospital
RT	Relief Trust
RTAF	Royal Thai Armed Forces
SA	Salvation Army
SAF1	Singapore Air Force
SAF2	Singapore Armed Forces
SC1	Supreme Court
SC2	Security Council
SCD	Singapore Civil Defence
SDG	Sustainable Development Goals
SF	Seva Foundation
SH	Scripps Health
SP	Singapore Police
SPCC	Sagarmatha Pollution Control Committee
SPR	Services Public Relations
SVA	Student Volunteer Army
TD	Technology Directorate
TF	Task Force
TI1	Teams International
TI2	Textron Inc

TIA	Tribhuvan International Airport
TICOF	Third International Conference On Financing For Development
TPP	Trans Pacific Partnership
TR	Team Rubicon
TRC	Tourism Recovery Committee
TUTH	Tribhuvan University Teaching Hospital
U	USAID
UA	US Army
UAF	US Air Force
UC1	US Congress
UC2	University Of California
UCERF	UN Central Emergency Response Fund
UCF	UN Children Fund
UDFID	UK Department For International Development
UDP	UN Development Program
UE	US Embassy
UFAAO	UN Food and Agriculture Organization
UHAS	UN Humanitarian Air Service
UHDI	UN Human Development Index
UHRC	UN Human Rights Council
UKIS	United Kingdom International Search
UN	United Nations
UOA	University Of Adelaide
UOC	University Of Cambridge
UOFTC	UN Office For The Coordination Of Humanitarian Affairs
UOL	University Of Leicester
UOS	University Of Sheffield
UPF	UN Population Fund
US	United States
USC1	UN Security Council
USC2	US Supreme Court
USD	US State Department
UU	Utrecht University
UWFP	UN World Food Program
UWHO	UN World Health Organization
VT	Virginia Task
WB	World Bank
WGA	Wise Giving Alliance
WHA	World Health Assembly

WU	Western Union
WVI	World Vision International
ZGI	Zayed Giving Initiative