



**EVALUATING THE PROBLEMS AND  
OPPORTUNITIES OF EMERGENCY  
COMMUNICATION NETWORKS THROUGH  
COMPLEX ADAPTIVE SYSTEMS (CAS) THEORY IN  
İZMİR**

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Thesis for the Master's Program in Marketing Communication and Public Relations

Graduate School  
İzmir University of Economics  
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2023

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## ETHICAL DECLARATION

I hereby declare that I am the sole author of this thesis and that I have conducted my work in accordance with academic rules and ethical behaviour at every stage from the planning of the thesis to its defence. I confirm that I have cited all ideas, information and findings that are not specific to my study, as required by the code of ethical behaviour, and that all statements not cited are my own.

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Date:

# ABSTRACT

## EVALUATING THE PROBLEMS AND OPPORTUNITIES OF EMERGENCY COMMUNICATION NETWORKS THROUGH COMPLEX ADAPTIVE SYSTEMS (CAS) THEORY IN IZMIR

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Master's Program in Marketing Communication and Public Relations

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This thesis aims to reveal the main coordination problems and opportunities perceived by the stakeholders regarding natural disasters (specifically earthquakes) and emergencies within disaster communication networks in İzmir. Within this framework, the expectations and insights of disaster stakeholders from different institutions (public, private and NGOs) on disaster communication will be compared. Research data will be evaluated within the scope of Complex Adaptive Systems (CAS) theory and disaster management. Semantic network analysis was deemed appropriate as a method for the study. As the main output of the study, the data obtained are tabulated and the networks obtained are compared according to the organisation types. Thus, the study will go beyond the disaster communication and coordination problems between stakeholders in the literature. Finally, it is aimed to obtain original value with the data based on semantic network analysis of the identified communication problems and

opportunities. The first phase of the thesis is based on the process of collecting and compiling data from secondary sources and creating a research plan. The second stage includes conducting semi-structured interviews with the determined stakeholders, coding the data and modelling the findings.

Keywords: Emergency communication, CAS theory, Stakeholder, Semantic Network Analysis



## ÖZET

### İZMİR'DE ACİL DURUM İLETİŞİMİ AĞLARINDAKİ PROBLEM VE FIRSATLARIN KARMAŞIK UYARLANABİLİR SİSTEMLER (KUS) TEORİSİ ÜZERİNDEN DEĞERLENDİRİLMESİ

Güneri, Furkan

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Danışman: Doç. Dr. Selin Türkel

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Bu proje, İzmir’de doğal afet (spesifik olarak deprem) ve acil durumlara ilişkin paydaşların, afet iletişim ağları içerisinde algıladıkları temel koordinasyon problemleri ve fırsatlarını açığa çıkarmayı amaçlamaktadır. Çalışmanın odağı olan afet iletişimi konusuna yönelik farklı kurumlardan (kamu, özel ve STK) afet paydaşlarının beklentileri ve içgörülerini karşılaştırılacaktır. Araştırma verileri Karmaşık Uyarlanabilir Sistemler (KUS) teorisi ve afet yönetimi kapsamında değerlendirilecektir. Proje için semantik ağ analizi yöntem olarak uygun görülmüştür. Çalışmanın ana çıktısı olarak, elde edilen veriler tablolaştırılacak, ve elde edilen ağlar organizasyon tiplerine göre karşılaştırılacaktır. Böylelikle, literatürde yer alan paydaşlar arası afet iletişimi ve koordinasyon problemlerinin ötesine geçilecektir. Son olarak, saptanan iletişim problemleri ve fırsatlarının anlamsal ağ analizi ve afet paydaşlarından merkezi aktörlerin sosyal ağ analizine dayalı verilerle özgün değer elde

edilmek amaçlanmaktadır. Tez çalışmasının ilk aşaması ikincil kaynaklardan elde edilen verilerin toplanıp derlenmesi ve araştırma planının oluşturulması sürecine dayanmaktadır. İkinci aşama ise belirlenen paydaşlar ile yapılandırılmış görüşmeler gerçekleştirilmesi, verilerin kodlanması ve bulguların haritalandırılması süreçlerini kapsamaktadır.

Anahtar Kelimeler: Afet iletişimi, KUS teorisi, Paydaş, Ağ Analizi



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## **LIST OF ABBREVIATIONS**

AFAD: Disaster and Emergency Management Presidency

CAS: Complex Adaptive Systems

NGO: Non-Governmental Organisation

SNA: Semantic Network Analysis

USA: United States of America



# CHAPTER 1: INTRODUCTION

## *1.1. Introduction to Basic Framework*

The usage, widespread use and speed of development in communication tools in the world has never been as high as it is today. People can access information almost simultaneously. This speed of development affects organisations as much as it affects individuals. Organisations, just like people, learn as they access information quickly and adapt themselves to change.

Disaster is a phenomenon with devastating effects. The effort to minimise this damage has created the concept of modern disaster management. In this context, organisations come together within the scope of cooperation and handle the disaster process within an integrated cycle as before, during and after. Thus, a dialogue environment open to information exchange allowing synthesis of different disciplines, expertise and perspectives is formed. Ideas, information or experiences entering into the disaster communication system are evaluated. Some of them may not create a great impact within the system; however, sometimes seemingly insignificant inputs can create a strong impact that will reshape the system in an instant. Therefore, at this point, it is important that the communication system is as inclusive as possible. At this point, one of the most important discussions in the literature about the disaster communication system is related to the ideal system structure. Rather than the traditional, hierarchical command-control structure of the system, the idea of a more flexible, power-sharing and democratic structure is intensely discussed. Thus, it is suggested that the information flow process within the system will be more flexible, efficient and rapid.

The concept of adaptability has an important place in complexity theory. High adaptive capacity in disasters is very critical in terms of minimising the risks of disaster, which is an unpredictable phenomenon and can occur in various places, times and sizes. The complex adaptive systems approach comes from the science of complexity and focuses on the responses to change in the face of the vitality of the system. The system will either resist or adapt to innovations and changes. Indeed, with the capacity to change, complex systems are capable of enduring (Holden 2005; Rickles, Hawe, and Shiell, 2007). How the stakeholders in the disaster communication system in Izmir act in these processes has been tried to be understood through the problems they address. Because at this point, it was thought that the existing problems

would reveal the expectations of change in the system. The effort to understand these problems was made both in the context of disaster communication and in the context of problems related to cooperation depending on the type of organisation (public, private, non-governmental organisation).

### ***1.2. Importance of the Study***

Disaster (specifically earthquake) communication has been examined in the literature from various perspectives such as communication infrastructure (Becker, 2013), inadequate communication and cooperation (Chen et al., 2020; Zhang et al., 2016; Girgin, 2011), disaster education (Yong et al., 2017; Mutarrak and Pothisiri, 2013), and interpersonal communication in the context of disaster preparedness (Sim et al., 2018; Adams et al., 2017). In addition, although there are studies focusing on specific stakeholders in disaster communication (Yılmaz and Akbulut, 2021; Chen et al., 2020), there are insufficient studies on the communication, coordination and cooperation of stakeholders from different sectors directly related to the disaster (Chen et al., 2020). Although CAS theory has been used to conceptually explain disaster resilience (Coetzee et al., 2016), researchers have not yet used the theory to support an empirical study (Sadeghi et al., 2020). There is no empirical study that addresses the problems and opportunities involved in the dynamic communication and interaction process between stakeholders in the context of the Complex Adaptive Systems (CAS) approach. Therefore, the current thesis directly addresses this gap. Unlike other similar studies, this study helps to reveal the behind-the-scenes of inter-stakeholder expectation conflicts, i.e. stakeholder insights, in a participatory state-centred stakeholder pool. In addition, this study combines the stakeholder theory, which is predominantly adopted by profit-oriented enterprises, with the collaborative governance approach in the context of disaster communication. In other words, instead of using this understanding for the production of material gain, it aims to focus on the rapid production of information within dynamic communication networks and thus to bring an innovation by expanding the concept. There have been studies on stakeholder communication and collaboration in disaster management. However, despite its importance, there is no study that fully evaluates and visualises the semantic analysis of problems and opportunities in collaborative disaster communication. This research study makes a relevant contribution to this gap.



### ***1.3. Research Questions and Aim of the Study***

The study is carried out to provide answers to the following research questions (RQ):

**RQ 1:** With which concepts do stakeholders identify disaster communication?

**RQ 2:** What are the expectations of stakeholders from an effective cooperation in disaster communication? How are the semantic contents of these expectations defined?

**RQ 3:** How do the expectations towards idealised disaster communication differentiated between stakeholders from various types of organisations (public, private and non-governmental)?

**RQ 4:** According to the stakeholders, who is the most essential stakeholder in disaster communication? How is the relationship between these stakeholders and the primary stakeholder defined?

The relationships and connections between various units are examined by semantic network analysis, which also creates a semantic map for each network. The aim of this study is to identify the main communication problems and opportunities by revealing the expectations of the stakeholders regarding natural disasters and emergencies in Izmir for cooperation in disaster communication. Thus, this study reveals the limitations and variable factors perceived by the disaster stakeholders in Izmir in the context of communication and cooperation processes for a possible disaster, and current solution suggestions for improving these processes. Therefore, it is considered that this study will serve as a guide for the units with relevant authority and expertise.

### ***1.4. Structure of the Thesis***

This thesis consists of 5 main chapters. The first part is the introduction, which is the current part, and contains information about the general outline of the study, its importance, its purpose and what it is trying to find out. The second part is based on the literature review. In this part, the concept of disaster, stakeholder approach in emergency communication and complex adaptive systems approach are included. The third part includes explanations about the methodology of the study. This section includes information about semantic network analyses, the relationship between semantic network analysis and complex adaptive systems, research sample, data

collection and coding process and finally the analysis process. The fourth part includes the analyses and findings of the study. In the last part, the conclusion of the study, limitations and insights for future studies are included.



## CHAPTER 2: CONCEPTUAL AND THEORETICAL FRAMEWORK

### 2.1. Disaster

Although there is no universally accepted definition of disaster by all disciplines (Shaluf et al., 2003), in general terms, disaster is defined as a natural, technological or human-induced event that causes physical, economic and social losses for people; stops or interrupts the activities of human communities in their normal lives and affects people (Erkal and Değerliyurt, 2009).

*“When disasters are evaluated according to their sources; earthquakes, floods, hurricanes, storms, volcano eruptions, spontaneous forest fires etc. are considered as natural disasters. Nuclear accidents, industrial accidents, aircraft accidents, mining accidents, pipeline explosions, etc. are considered as technological and man-made disasters. Finally, terrorist attacks, wars and revolutions are classified as conflict-induced disasters.” (Akyel, 2005, p.17).*

While disasters directly affect people or communities, structures and the environment, they can also bring indirect effects due to the loss of life and property and other major damages they cause. As a direct impact, such disaster events affect human life with loss of life, injury or disability, etc., cause destruction in infrastructure services, destroy agricultural areas and animals in environmental terms, and damage cultural structures. Indirectly, disasters can affect sectors such as health, education, transport and tourism, leading to unemployment, migration and disruption of basic services in the long run.

In order to minimise the risk of disasters, firstly hazard status of the disaster area should be known and appropriate hazard management and risk management should be applied in areas with potential to affect the living spaces of people. Depending on all disaster hazards, the practices to be carried out in pre, during and post-disaster processes should be known by all public and private organisations and their responsibilities (Akduman, 2021) should be fulfilled within the framework of cooperation. Police, fire departments, public health, civil defence and other

organizations have to react not only efficiently and individually, but also in a coordinated manner (Meissner et al., 2002). This creates the need for coordination within and between organisations at different levels of hierarchy (Auf der Heide, 1989).

*“Communities that have strong working relationships on a daily basis generally function better in emergency situations because of increased trust. Building trust among public, private, and non-profit organizations can best be done prior to emergency situations”* (Kapucu, 2006, p. 210).

The mentioned coordination, cooperation and confidence building can be explained by the phenomenon of disaster management, which has a wide coverage in the literature.

### **2.1.1. Disaster Management**

*“Disaster management refers to a multifaceted, multidisciplinary and multi-actor management process that requires the use of resources and opportunities in line with the strategic objectives and priorities determined by all institutions and organisations of the society in order to plan, direct, coordinate, support and effectively implement the measures to be taken and activities to be carried out at all stages before, during and after the disaster”* (Özmen, Gerdan ve Ergünay, 2015, p.40).

Disaster management is a process which has certain principles and fundamentals but may vary according to the type, magnitude of impact and phases of the event. Chaotic situations that can be experienced especially in disasters that cause large-scale destruction require high cooperation and coordination (Yavuz, 2011). In this context, it is seen that disaster management is commonly used as Comprehensive Disaster Management in the sources (Çilingir, 2018). The perspectives and analyses on the concept of disaster management have been further deepened in time and the concept of "modern disaster management" has been discussed in the literature.

*"In modern disaster management concept, pre-disaster protection activities such as reduction of losses and damages, preparation, prediction and early warning, understanding disasters are accepted as "Risk Management"; post-disaster activities such as impact analysis, intervention, improvement and reconstruction are accepted as "Crisis Management" (Erkal and Değerliyurt, 2009, p.151).*

The experiences gained through the historical process have brought about the awareness that the damage and risk that may be caused by disasters can be reduced in advance; and this situation is accepted as a progress in the efforts related to disaster management (Kadıoğlu and Özdamar, 2008). The risk management-based understanding which requires the realisation of systematic and comprehensive studies (Carter, 2008), brought about by this awareness, allows the *integrated disaster management* (Kadıoğlu, 2017, p.56-57) process to be seen as a chain of phases repeating as a cycle in the form of mitigation, preparedness, response and recovery, and the success of the previous phase affects the success of the activities in the next phase (Özmen, Gerdan and Ergünay, 2015). In this context, an effective disaster management can be seen as studies covering all processes before, during and after the disaster (Demirci and Karakuyu, 2004).



Figure 1. Disaster Management Cycle (Sawalha, 2020, p.3)

As stated by Comfort (2005), the main function of any government is to protect its citizens from all kinds of harms and disaster is one of the most comprehensive of these harms. According to Carter (2008), in disaster management, national disaster management policy needs to be clearly defined at all levels, from national government to local government or community level, in order to cope with the threat of disaster. In this context, some factors should be taken into consideration in order to define an effective national disaster management policy:

- *” defining accurately the disaster threat;*
- *identifying the effects which are likely to be caused by the threat;*
- *assessing the resources available to deal with the threat;*
- *organisational arrangements which are required to prepare for, respond to, and recover from disaster events;*
- *defining how a national disaster management policy interlocks with other aspects of national policy, especially those concerned with national development and protection of the environment;*
- *any other specific national factors which may be applicable”* (Carter, 2008, p.26- 28).

Disaster management models differ from country to country in terms of their position in management and hierarchy, their organisational structure and the way they function (Yavuz, 2011, p.367). In the US context, the interconnected cascade of failures approach is important in emergency and disaster management systems, where a cascade of problems in management that starts at the local level can affect the state and federal levels as the scale of the hazard and threat increases (Gerber, 2007). In order to get rid of the complex structure of the disaster management system, Turkey has taken a system similar to the disaster management in the USA as a role model (Karaaslan, 2015).

*"In 2009, the Disaster and Emergency Management Presidency (AFAD), which is similar to the Federal Emergency Management Agency (FEMA) in institutional terms, was established and a new approach in disaster management was introduced in Turkey by putting into force the Regulation on Disaster and Emergency Response Services on 26.08.2013" (Şahin and Üçgül, 2019, p.59).*

In this US disaster management approach, which is based on coordination between the public and private sectors, the commitment and capacity of local level actors subject to an effective policy in the disaster area varies (Burby and May, 1997). Therefore, it is emphasised that the possibility of a coordination failure that may occur anywhere in such dense and interdependent systems may gradually create an obstacle for the functioning of the system (Gerber, 2007).

### ***2.1.2. Disaster Management in Turkey***

*"Due to its geological, meteorological and topographical structure, Turkey is frequently exposed to natural disasters such as earthquakes, landslides, floods, rock falls and avalanches" (Can and Saka, 2022, p.115).*

Turkey experienced problems in disaster management and cooperation during the Marmara earthquakes in 1999 (Ünlü et al., 2010; Hermansson, 2016) and experienced a rapid change in disaster management after the 1999 earthquakes (Yavuz, 2011). Moreover, the contribution of NGOs to the 1999 earthquake response efforts was significant (Hermansson, 2016) and this played an important role in strengthening the legitimacy of NGOs (Jalali, 2002). After 1999, Turkey, which has been orientated towards administrative arrangements and changes on the axis of the World Bank (Yavuz, 2011), has established a hybrid network structuring under the leadership of the Disaster and Emergency Management Presidency (AFAD) in 2009 in the last stage of this orientation (Hermansson, 2016). Disaster and Emergency Management Authority (AFAD) is the leading disaster agency in Turkey responsible for the prevention of disasters and minimisation of damage, coordination of post-disaster

response and cooperation between relevant government agencies (İnal Onal, Tekeli-Yeşil and Okay, 2022), In the post-2009 period in Turkey, the fact that this hybrid structure had a more centralised network revealed that it was less efficient for cooperation among disaster stakeholders (Hermansson, 2016). In more recent literature, Hermansson (2019) examines centralisation and decentralisation initiatives in Turkey's disaster management system and argues that following the 1999 earthquake, Turkey attempted to centralise; became legally and de facto decentralised in 2004, 2005 and 2009 with reforms encouraged by international aid agencies; and finally returned to centralisation after two earthquakes in 2011. She adds (2019) that it is not surprising and new for the state to switch back to a policy of centralisation following decentralisation initiatives. Turkey's centralised and hierarchical disaster management system, which has a long history of disasters, has been widely criticised for its lack of effective coordination and cooperation (Ganapati, 2008; Kapucu, 2012) and for its exclusion of local and NGO actors (Balamir, 2013). Indeed, inter-agency coordination is key for effective and multi-participatory disaster management (Liu, Xu and John, 2021). It should be noted that the effective coordination of organisations with different capacities and sizes depends on their access to timely and relevant information, their ability to exchange, internalise and adapt that information (Comfort and Kapucu, 2006). Erkal and Değerliyurt (2009), in their study comparing the disaster management systems of some countries in the world, underline that Turkey has not yet reached the level of developed countries in disaster planning in 2009 and the main reason underlying this is that not enough lessons have been learnt from the negative experiences of past social disasters. In this regard, Şahin (2019) points out the deficiencies in the pre-disaster risk reduction (mitigation and preparedness) process of integrated disaster management in Turkey and emphasises that disaster management in Turkey is mostly implemented as post-disaster crisis management (response and recovery) (p.181). Hermansson (2016), on the other hand, concludes that the main deficiency in this regard is the lack of trust, balance of power, actor autonomy and independence, focusing on the problems in cooperation between stakeholders. Accordingly, she adds the argument that state actors in Turkey are generally not used to inter-institutional cooperation (Hermansson, 2016).



### ***2.1.3. Emergency Communication in Disaster Management***

Communication is a central foundation of disaster coping efforts, as communication facilitates such disaster coping behaviours (Spialek and Houston, 2018). In other words, the damage and limitations in communication services during and after a disaster make an effective emergency communication network an essential function for disaster management (Wang et al., 2016).

Tundjungsari and Yugaswara (2015, p.6) has defined emergency management as:

*“a cooperative process that involves various stakeholders (i.e. different kinds of agents, including governmental and non-governmental agencies and corps, communities, volunteers and citizens) and requires the active and coordinated participation of its stakeholders”* (as they cited from, Carver and Turoff, 2007; Aedo et al., 2010).

As mentioned earlier, a natural disaster is an unpredictable and often sudden situation or event that exceeds local capacity, requires external assistance at national or international level, and causes major damage, destruction and human suffering (Guha-Sapir, Hoyois, Wallemacq, and Below, 2017). Even today, there is not much control capacity over natural disasters, but it is possible to limit their impact (Zibulewsky, 2001). Therefore, in order to control these effects, effective and stable communication is vital in the disaster management process (Kishorbhai and Vasantbhai, 2017; Chau et al., 2015). However, disaster communication is a complex phenomenon in itself as a system that involves unpredictable, non-linear and context-dependent responses (Coetzee et al., 2016).

In the context of disaster management;

*“communication is not limited to how people understand each other, but also how information, facts as well as policies, expectations, rumours, emotions, failures and all other human experiences are transferred between organisations”* (Kapucu, Arslan ve Demiröz, 2010, p.454).

In another study, emergency communication in the context of disaster is expressed as Ha (2016) emphasises that sending, receiving, understanding, and reacting to essential disaster information across all stakeholders is a complex process that occurs on during disaster management.

Disaster communication has been studied in the literature in the context of technical sciences, mainly in seismology (Auza et al., 2018; Masi et al., 2014) engineering (Hossain, Ray, and Lota 2020; Kirsch et al., 2010), health (Myers et al., 2018; Subedi et al., 2018), telecommunications (Ali et al., 2015; Zlatanova, Oosterom, and Verbree, 2006), technology (Khan, Gupta, and Gupta, 2020; Wu, Xia, Liu, and Wu, 2005), and even big data (Freeman et al., 2018); social sciences, mainly geography (Zabini et al., 2021), sociology (Yong, Lemyre, Pinsent, and Krewski, 2017), psychology (Peers et al., 2021), interpersonal communication (Sim, Hung, Su, and Cui, 2018), pre-disaster education (Khan, Rana, Nawaz, and Waheed, 2020; Mirzaei et al., 2019) and public relations in the context of crisis management (Giri and Wats, 2019; Brynielsson et al., 2017). In other words, it has been analysed from a very broad perspective.

Effective use of communication tools, which are increasing their importance and diversity today, has a critical importance in the disaster communication process (Kapucu, Arslan, and Demiroz, 2010). Therefore, in order for decision-makers and those in charge of emergency response and rescue operations to successfully communicate before, during, and after a disaster; it is crucial to protect the means of communication (Haraguchi, 2020). At the same time, it is important that actors with information know who needs information and how to access it (Auf der Heide, 1989). In this context, crisis communication plays a major role in response and recovery processes, especially in the post-disaster phase (Fokaefs and Sapountzaki, 2021). Emergency communication is defined as a *special temporary communication mechanism* and refers to the means and methods of communication necessary to guarantee rescue, emergency assistance and communication in this process (Ran, 2011, p 44). Drawing attention to the barriers to emergency response communication, Girard (2016) emphasises that technical methods are important in communication, but it is also necessary to understand how communication takes place in a disaster environment. At this point, Kishorbhai and Vasantbhai (2017) mentioned that emergency communication basically includes two types of communication systems:

*pre-disaster communication*, which refers to *disaster warning*, and *post-disaster communication*, which includes *rescue and evacuation* (p. 840).

In the literature, in the context of emergency communication in earthquakes, it is argued that the maintenance, strengthening or renewal of emergency communication systems is the responsibility of the state (Haraguchi, 2020; Chen et al., 2020; Ghanjal, Bahadori, and Ravangard, 2019; Haraoka et al., 2013). In emergency management operations, the government should provide incentives and information to strengthen coordination and trust in cross-sectoral cooperation (Kapucu, 2005).

With a similar approach:

*“Public authorities have a mandate to serve the public interest and to secure the safety of citizens by managing crises effectively”* (Palttala et al., 2012, p 3).

Within this context, there are main response organisations that are legally responsible for preparing for and managing a crisis, but today, as the crisis situations created by disasters are increasingly complex, the simultaneous involvement of many organisations is needed (Palttala et al., 2012). According to Mileti and Sørensen (1990), from a social science perspective, emergency communication should be seen as public advice and warnings that occur as a result of long communication chains between different organisations. Accordingly, the emergency communication chain in question should be evaluated with 4 uncertainty criteria: (1) which local organisations and persons to notify of a hazard, (2) the ability to identify a hazard, (3) insufficient technical communication capacity, and (4) conflicting information shared by organisations from different sectors to relevant authorities (Mileti and Sørensen, 1990).

Similarly, Chen et al. (2008) draws attention to the complex nature of the coordination problem in the process of emergency communication in disasters, starting from factors such as multi-authority and massive personal involvement between organisations; conflict of interest and increased demand for timely information. On the problem of increasing demand for timely information, Seemann, Onur and Clotuiers-Fisher (2011) point out that the source of poor communication is often the over-reliance of experts

on scientific jargon and the inability to convey knowledge in plain language. Similarly, Auf der Heide (1989) emphasises the use of mutually understood terminology by actors in the process of information exchange in the context of emergency communication. Another problem is related to the routine organisational structure of emergency communication networks. According to Kapucu (2006), bureaucratic systems have a functional and routine structure in simple information exchange processes. However, in emergency situations, bureaucratic and formalised networks may become non-functional as information is often complex and the limits imposed by the routine structures developed before the emergency may prevent the sharing of information from other sectors. In other words, as disasters affect the continuity of routine operations, public and non-profit organisations try to re-adapt by establishing new strategies and norms (Drabek and McEntire, 2002). In this way, actors acquire situational awareness with the information from the environment (Wukich and Steinberg, 2013). For example, Abbas and Norris (2018) asked disaster managers and disaster health practitioners about the main mechanisms to improve situation awareness in disaster communication and received mainly “*effective information exchange*” and “*sharing timely information*” (p.4) responses. As can be seen, the problems in disaster communication mainly refer to the dynamics of timely information exchange, communication and coordination between organisations (Auf der Heide, 1989). Indeed, it is argued that the concepts of communication and cooperation are positively related to coordination in the emergency context (Drabek and McEntire, 2002).

#### ***2.1.4. Crisis Management and Crisis Communication in Disaster Management***

*“Disasters are complex and challenging situations in which people often expect governments to solve problems swiftly and effectively. Managing catastrophic disasters is fundamentally different than addressing routine emergencies”* (Kapucu and Demiroz, 2017, p 25).

Implementing a solution to a real issue, such as a natural disaster, accident, or human-made catastrophe, is known as crisis management (Lovari and Bowen, 2020). In everyday life, despite emergencies such as traffic accidents and fires that require the

response of the same organisations every day, large-scale disasters and crises include coordination efforts between public institutions and many different organisations (Seba et al., 2019). The terms crisis and disaster are not synonymous; disaster refers to a more comprehensive process that calls for cooperation between actors. However, crisis communication may be occasionally necessary for disaster response organizations when taking action (Coombs, 2010). Strategies for controlling and shaping how the public perceives an event are included in the public relations notion of crisis management (Palttala et al., 2012). In terms of its function crisis management is to clarify a particular crisis event, determine its potential effects and consequences, and give those affected with precise mitigation information (Reynolds and Seeger, 2005). Therefore, the importance of crisis management and dialogue in disaster communication should not be ignored by organisations (Liu, Xu and Tsai, 2020).

*“From a social perspective, crisis communication refers to all individual and institutional actors, who participate in crisis communication and interact in the context of a crisis” (Saez, Chávez and Núñez, 2014, p 2).*

Crisis communication covers communication between stakeholders in crisis management processes. In this context, the reliable performance of information functions is important in ensuring coordination among the broad stakeholder groups involved in crisis response (Comfort and Kapucu, 2006). Although the concepts of risk communication and crisis communication are similar, they should not be utilized interchangeably for a variety of reasons, because: (a) all phases of the disaster communication cycle are covered by risk communication; (b) while a variety of information and facts concerning the disaster are covered in crisis communication, forecasts and recommendations are also included; (c) decisions based on insufficient information are made in crisis communication in a shorter amount of time, irrevocably, and with unforeseen consequences (Fokaefs and Sapountzaki, 2021). In crisis communication, uncertainty is a crucial element (Seeger, 2006), because the concept of uncertainty, although it has negative connotations of insecurity and confusion, encourages the search for information (Chowdhury, Gibb and Landoni, 2014).

Moreover, the actual choices of disaster authorities can influence the developing crisis in both directions - mitigation or exacerbation (Comfort et al., 2001).

Public organisations are the leading organisations in crisis management for disaster communication (Coombs, 2018). As public authorities have a mandate to serve the public interest and ensure the safety of citizens, they also manage crises effectively. Response organizations, in this regard, relate to governmental entities and rescue groups authorized by law to plan for and handle catastrophes. Disaster response organisations deal with disaster management within the framework of their authority. However, day by day, crisis circumstances are becoming more and more complex (Palttala et al., 2012). It therefore requires the involvement of many organisations at national, regional and local level, simultaneously involved in the management of the crisis. (Palttala et al., 2012). Through immediate information seeking, exchange, and feedback mechanisms that foster inter-organisational learning, a stakeholder community's ability to mobilize to mitigate a crisis can be improved (Comfort, 2007). The open and collaborative nature of disaster management, open to multi-sectoral stakeholder participation, makes it an ideal context for research networks (McGuire and Silvia, 2010).

*“Disasters may induce organisational learning. New knowledge, understanding, and insights, for example, often arise as a consequence of crisis”* (Kapucu, 2008, p 246).

Crisis communication basically aims to reduce the uncertainty of the situation, to resolve it by responding to the event and to take lessons from the process as a result (Ulmer et al., 2007) however, contrary to individual communication, organisational communication involves complicated variables and structures. Due to the hierarchical structure of organisations (Schultz and Seeger, 1991), organisations can often react strategically in crisis situations by sharing, distributing or avoiding responsibility (Seeger, Sellnow and Ulmer, 1998). It should also be recognised that stakeholder groups are not homogenous and may therefore consist of sub-groups with different priorities, interests, expectations and objectives (Fassin, 2008). In parallel, organisations need to communicate with their environment in order to meet

stakeholder needs and expectations and ultimately to create system stability. Thus, in times of crisis, organizational aims are different from those of individuals. (Seeger, Sellnow and Ulmer, 1998).

According to the definition often quoted in the literature, public relations is defined as:

*“the management function that establishes and maintains mutually beneficial relationships between an organization and the publics on whom its success or failure depends”* (Cutlip, Center and Broom, 1994, p 6).

In order to explain how organizations should engage with their stakeholders, including the media, the crisis management literature utilizes the term public relations (Seeger, Sellnow, and Ulmer, 1998). To meet the communication expectations of diverse stakeholders at various stages of the crisis is crucial, which goes hand in hand with the public relations discipline (Ndlela, 2019). While public relations is commonly understood as a publicity and promotion function for organisations, its value in relationships and stakeholder engagement deliver sustained and mutually beneficial outcomes (Granville, Mehta and Pike, 2016, p.74).

*“The complexity of present-day crises calls for communication strategies, which match the expectations of different stakeholder groups in the various types and phases of a crisis”* (Palttala et al., 2012, p.11).

## ***2.2. Stakeholder Approach to Emergency Communication***

*“There is a tendency to think of organization not as systems, but rather as components operating independently of each other. But often there are sets or systems of inter-related specialized, organizations which are designed to perform particular disaster-related tasks”* (Quarantelli, 1988, p.378).

Kapucu (2013) draws attention to the importance of collaborative governance among stakeholders in the pre- and post-disaster process.

*Cross-sector collaboration defined as the linking or sharing of information, resources, activities, and capabilities by organizations in two or more sectors to achieve jointly an outcome that could not be achieved by organizations in one sector separately”. (Bryson, Crosby, and Stone, 2006, p.44).*

This form of governance is defined as a form of management in which both public and private organisations are involved in collective and consensus-based decision-making processes under the leadership of the state or a state-affiliated institution (Ansell and Gash 2007; Emerson et al., 2012; Kapucu 2012).

*“Disaster management requires efforts from all levels of government; however, government’s capacity and resources are usually inadequate for handling major disasters, and collaboration with private and non-profit organizations becomes vital” (Kapucu and Demiroz, 2017, p.26).*

In this context, Chen et al. (2020) emphasise that the participation of state-owned enterprises in collaborative governance is considered insufficient, but argue that these enterprises have great potential in emergency management due to their advanced coordination systems and resources. On the other hand, observers and practitioners with a decentralised collaborative perspective draw attention to the importance of local actors in disaster management cooperation (Miller and Douglass, 2015). In short, the benefit of addressing emergency communication at the organisational level is that it provides the opportunity to examine a wide range of stakeholders with different perspectives and expertise (Aldunce et al., 2016). For instance, the following table provides a suggestion of what a coordinated response to a disaster might look like (see Figure 2):



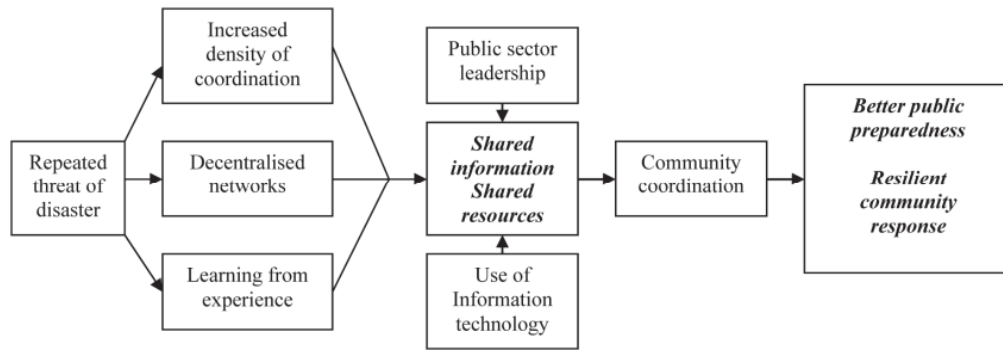


Figure 2. Coordinated community response to a disaster (Kapucu, 2008, p.248)

Cooperation between national, local and non-governmental organisations is complicated by the incompatibility of organisational frameworks in terms of national and regional spheres of influence. Communication specialists are urged by Wood and Gray (1991) to view these complicated circumstances as possibilities rather than challenges for creating a collaborative atmosphere. In other words, this should not be perceived as a threat to conflicting views or the efforts of public organisations, but rather as an advantage of joint capacity building (Aldunce et al., 2016). According to Nguyen, Imamura, and Iuchi (2017), collaborative planning is a process in which a variety of stakeholders are involved and actors work to overcome obstacles in order to achieve shared objectives. This situation underlines the importance of disaster planning and communication especially in the pre-disaster process (Kearns et al., 2014). Accordingly, the social communication networks and organizational structure of response stakeholders are included in the multidisciplinary approach to emergency response communication. (Shen and Shaw, 2004)

*“Developing mutually beneficial communication relationships with stakeholders”* (Xu and Li, 2012, p.373) has an important place in disaster communication and management within the scope of disaster preparedness.

*“The area of disaster governance is not only limited to the governmental setup but also includes all the stakeholders from local to global level”* (Topno, 2018, p.129).

In the aftermath of a disaster, it is important to manage the preparedness or plan determined in advance, taking into account multi-stakeholder participation and their communication. Considering the highly dynamic context in which field workers are expected to be good at manual or electronic communication in the aftermath of a disaster, the main challenge is to ensure and maintain fast, clear and effective communication (Meduri, 2016). When all pre- and post-disaster processes are considered, it is not sufficient to ensure only stakeholder participation. In order to ensure effective and valid participation in disaster risk management, it is necessary to distribute responsibilities and roles to stakeholders in a balanced manner and to create spaces where stakeholders can negotiate among each other (Aldunce et al., 2016).

The stakeholder approach examines how individuals and groups affect an organization and how managers act in response to these individuals and groups (Ulmer, 2001). Freeman (2015, p.1) defined stakeholder theory as *“a set of propositions suggesting that organisational managers have obligations to certain stakeholder groups”*. Rowley (1997) bases his method for understanding how central actors respond to stakeholders on an analysis of the multiple and complex set of relationships between stakeholders. Following this, complex and interconnected interactions between stakeholders are based on the structure of social networks and the nature of pre-existing patterns of relationships (Muzzi and Kautz, 2004; Rowley, 1997). Studying these structures and interactions enables one to identify the primary cause of networked systems failure and foresee probable conflicts amongst collaborating stakeholders (McAdam, 2005; Heikkila et al., 2004; Clemons et al., 1995). In this context, Nowell and Steelman (2015), in their study examining the relations between emergency stakeholders in the specific case of forest fire disaster management, argue that the strong social ties, common relations and familiarity of stakeholders in the pre-disaster process enable more frequent communication and interaction between network actors. Additionally, the demand for integration within the system is increased by the expansion of the problems that are experienced within it as a result of the

expansion of the actors involved in the disaster management response system (Comfort and Kapucu, 2006). Referring to the participatory governance and cooperation paradigm of the European Union (EU), Bruns and Gee (2009) conclude that the state can end hierarchical intervention and facilitate planning processes by collaborating with stakeholders in a participatory manner. Furthermore, Chen et al. (2020) point out that despite their poor participation in collaborative governance; businesses, particularly state-owned ones, have a lot of potential in emergency management due to their developed coordination systems and resources. In the context of involving other stakeholders in cooperation, it is argued that there should be a close relationship and interaction between different sectors of emergency management (Pourhosseini et al., 2015). Another point about sectoral cooperation in emergencies is that *alienation* between different sectors needs to be overcome in order to improve communication networks (Chen et al., 2020, p.1). In this context, Morsing and Schultz (2006) propose a stakeholder engagement strategy that adopts a collaborative and transparent approach to communication between stakeholders and points to two-way symmetrical communication. This strategy may be an effective way forward as a relational model of corporate social responsibility (CSR) developed by EU member states, rather than the market-based model adopted by US governments (Harper Ho, 2012).

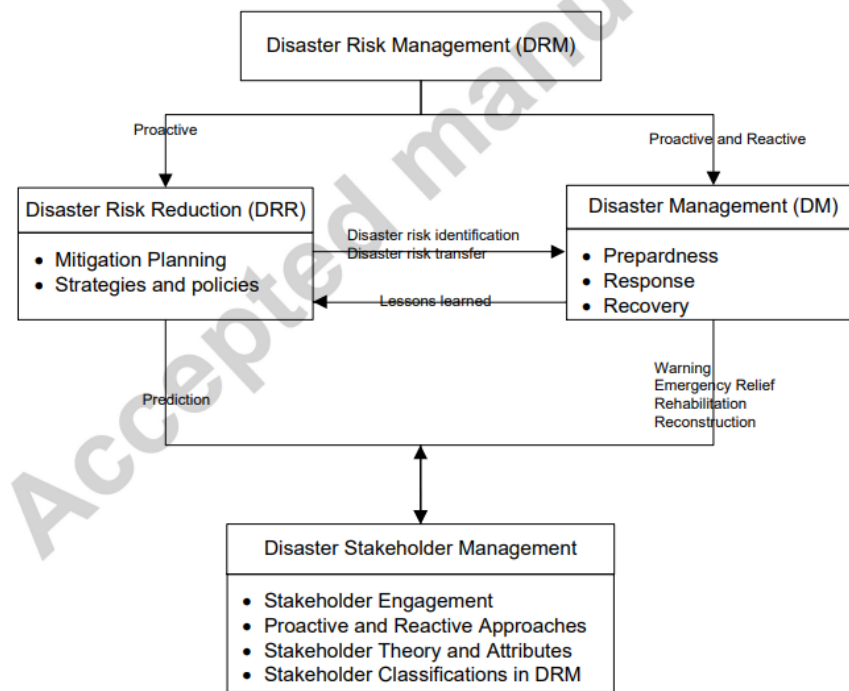
*“community engagement promotes equal decision-making through two-way knowledge exchange among stakeholders, and combined with policy support, can promote the development of community networks and the integration with public forces, thus enhancing community resilience”* (Song, Zhang and Dolan, 2020, p.2).

### **2.2.1. Stakeholders of Emergency Communication in Disasters**

The impact of disasters on society and the environment is lessened by effective planning for disaster risk reduction and active stakeholder involvement in this planning process (Horney et al., 2016). Mojtahedi and Oo (2017) classified the stakeholders of the disaster management process into 2 categories as stakeholders with proactive and reactive approaches. In this context, it is thought to be useful for policy makers in allocating resources and ensuring balance according to the power, legitimacy and

urgency of stakeholder groups in different types of disasters (Mojtahedi and Oo, 2017). They (2017) presented the following table in their study on disaster risk management and stakeholder management:

Table 1. The relationship between disaster risk management and stakeholder management (Mojtahedi and Oo, 2017, p.5)



Supporting the increasing importance of stakeholder management in disaster operations, Fontainha et al. (2017) drew attention to the increasing participation of the private sector in recent years, with the state and then NGOs as the main actors (Kapucu, 2006; Stewart et al., 2009; Caruson and MacManus, 2011; Jain, 2015). Disaster stakeholders from different sectors can be grouped as follows in the context of the Public-Private-People Relationship, or 3PR, model (Fontainha et al., 2017):

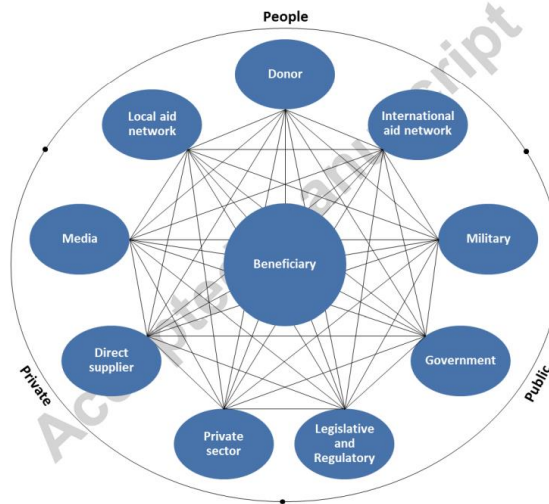


Figure 3. 3PR Stakeholder Model for Disaster and Humanitarian Operations (Source: Fontainha et al., 2017, p. 33)

It is important to plan what the state, non-governmental organisations and other disaster-related stakeholders will do in pre-disaster and post-disaster processes in order to mitigate or prevent disaster risk. While risk management mostly covers pre-disaster stages, crisis management process concentrates on the post-disaster process (Topno, 2018). The figure below (see Figure 4.) clearly shows the stages of the stages in the disaster cycle in risk management and crisis management:

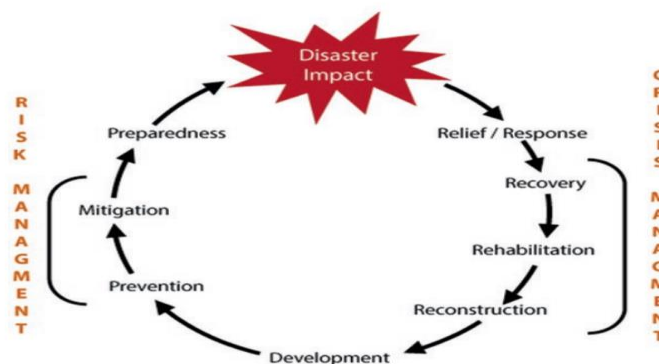


Figure 4. Risk and Crisis Management Stages in Disaster Management Cycle (Source: Topno, 2018, p. 132)

According to the results from the literature; actors such as the state, emergency communication centres, local authorities or local communities are key stakeholders in building disaster related emergency communication and disaster resilience. In addition, there are stakeholder studies for specific areas such as tourism and health for disaster situations in the literature.

Chan et al. (2020) offers some recommendations for key communication stakeholders on tourism:

*“share accurate information; notify across the stakeholders about the situation; offer prompt assistance to foreigners; give suggestions to locals; follow governmental advice; translate information to foreigners; collect and disseminate information about damage; establish information-sharing platforms and communication channels; post and update information online; report and disseminate updated statistics; improve information management”* (p.9).

Similarly, Granville, Metha and Pike (2016) concluded that stakeholder engagement in the tourism sector will have a positive impact on disaster management when implemented correctly. On the other side, emergency communication has also an important place in health. For example, King et al. (2016) in their study with 68 healthcare professionals from evacuation hospitals on Hurricane Sandy concluded that respondents identified communication (43%) as the key barrier to effective evacuation. On the other hand, Lestari et al. (2020) emphasise the importance of education and simulation studies, especially in the pre-disaster phase, for effective communication and coordination between stakeholders in disaster communication.

In emergency communication related to disaster management, some difficulties may also arise due to multi-stakeholder participation. Le Roux and Niekerk (2019), in their study on the challenges related to the roles of stakeholders in the disaster communication process, argued that the critical role of disaster management teams, such as the timely dissemination of information on rescue and relief efforts during a

disaster, is not recognised in disaster policies and systems. This situation causes a negative impact on disaster management efforts and stakeholder relations (Le Roux and Niekerk, 2019). Presenting a stakeholder engagement model as a solution to the challenges of disaster management in South Africa, Ngqwala et al. (2017) argue that stakeholder engagement of NGOs, especially those carrying out disaster operations, is a facilitator for various disaster management activities. A stakeholder network generates value through complex dynamic exchanges between companies, partners, society, citizens, and other stakeholders (Räikkönen et al., 2017, p.5). Therefore, a common stakeholder value can be achieved in the disaster communication system with the participation of actors with different value systems.

### ***2.3. Complex Adaptive Systems Theory***

#### ***2.3.1. Complexity Science***

Einstein's "quantum mechanics" proposes that systems are living systems that may alter and affect each other, in contrast to Newtonian theories that presume the cosmos functions like a "machine" in an ordered manner (Chadwick, 2010; Burns, 2001). However, in contrast to the machine metaphor, complexity science considers organisations as dynamic and living systems (Capra, 2004). Similar to quantum mechanics, complexity theory first appeared in the physical sciences (Kauffman, 1995; Lewin, 1992; Nicolis and Prigogine, 1989; Prigogine and Stenger, 1984; Waldrop, 1992). Nevertheless, researchers contend that complexity theory can be useful in understanding how social systems work (Hwang, 1996; Kauffman, 1995; Kiel, 1991; Wheatley, 1992).

*Complexity science is not a single theory nor interchangeable with a single theory such as the Chaos Theory; it is a worldview or paradigm that encompasses numerous interdisciplinary theories and frameworks. Complexity science is viewed as the study of multilevel complex adaptive systems (CASs) (Benham-Hutchins and Clancy, 2010, p.353).*

The complexity science benefit from social sciences because it gives us a way to value both abstract and concrete outcomes, gives us conceptual tools to pay attention to the feedback and learning that go into reaching consensus, and explains how innovations

and second and third order effects work. This understanding thus contributes to long-term consensus building that helps communities and organisations move to higher levels of performance and creativity in an ever-changing world (Innes and Booher, 1999).

*“Complexity theory involves the study of many actors and their interactions. Complex adaptive systems exhibit coherence and persistence in the face of change and dependence on extensive interaction”* (Holland, 1995; Kapucu, 2009, p.3).

Complexity science in this context refers to a multidisciplinary post-positive field that was created to examine dynamic systems in the natural and physical world (Fuller and Moran, 2001).

Furthermore, looking at an organisation through the lens of complexity science rather than the traditional case study lens brings a different perspective. While case studies evaluate decision points as key events to reveal the nature of the organisation, complexity science suggests focusing on the meaning-making features that reveal the nature of the organisation (Weick, 1995). In other words, complexity science proposes to see the phenomenon under investigation as a process rather than an event (Anderson, Crabtree, Steele and McDaniel Jr., 2005).

### ***2.3.2. Complexity Science and Complex Adaptive Systems (CAS)***

*Constant change* (p.14), which is one of the most important phenomena of the information age, is a concept that contains problems if resisted and opportunities if adapted (Kayral, 2016). However, this change is not consistent:

*“Change may occur rapidly or slowly; it may accumulate linearly or nonlinearly; it may be constant or have bursts of punctuated equilibrium; it may be resisted or encouraged; it may take little or many resources; it may have a profound or no effect on system outcomes”* (Dooley, 1997, p.89).

The importance of change in complex adaptive systems theory derives from the fact that systems, just like living organisms, are in constant interaction with other systems



and show open system characteristics (Kayral, 2016). The term complex adaptive system (CAS) is derived from complexity science and is most commonly applied to living systems (Wycisk et al., 2008).

Gell-Mann (2002, p.17) states at that point:

*“On Earth, all complex adaptive systems seem to have some connection with life”.*

Similarly, the CAS concept, which evolved from complexity theory, brings a dynamic systems approach to both human and non-human agent groups (Urry, 2003). In order to make sense of the dynamic interaction and communication processes between the units in the system, a CAS lens is needed (Nugus et al., 2010).

Complex adaptive systems (CAS) are,

*“an entity composed of many different parts that are interconnected in a way that gives the whole capabilities that the parts don’t have on their own”* (Letiche, 2008, p.127).

The evaluation of Complex Adaptive Systems (CAS) within complexity science is based on the premise that systems are living, interacting, robust structures composed of subsystems (Samur and Intepeler, 2016), because complex systems survive through their ability to adapt to change (Holden 2005; Rickles, Hawe, and Shiell, 2007). Today, the machine metaphor does not accurately describe the social world because it portrays systems as predictable and prone to losing the energy applied to them over time, whereas the consensus process, as a complex system, is unique, unpredictable, and prone to building rather than losing energy through dynamic interactions between stakeholders and context (Innes and Boohar, 1999). Therefore, social interactions keep the system alive. In the specific context of this research topic, the unpredictable social and economic impacts of disasters reveal the importance of the self-organising nature of the disaster system, which is essential for effective and collaborative disaster governance (Song, Zhang and Dolan, 2020).

### ***2.3.3. Complex Adaptive Systems (CAS) and Social Sciences***

Complex Adaptive Systems (CAS) is a variant of classical systems theory that arose in the natural sciences of ecology and biology, with the goal of explaining nonlinear adaptation at micro and macro scales in the natural environment (Hartvigsen et al., 1998; Holden, 2005; Ahmed et al., 2005; Levin, 1998). The complex adaptive system perspective enables us to appreciate the differences between simple and complex actions, equilibrium and chaos, scarcity and richness (Page and Miller, 2009). Railsback (2001) adds that the essence of CAS analysis is an attempt to show how simple interactions between individual elements at the micro level lead to complex behaviour at the macro level. Yet, for all its potential in explaining complexity in system behaviour, the social sciences have been slow to adopt CAS as a possible way of analysing human behaviour and larger social systems (Innes and Booher, 1999; Holden, 2005).

*“Due to the slow uptake by the social sciences most of the definitions defining CAS have been within the natural sciences, but the basic principles can be extrapolated to social settings in general and the understanding of disaster resilience specifically” (Coetzee, Van Niekerk ve Raju, 2016, p.203).*

Lansing (2003) compares the understanding from the social sciences that complex global patterns with new features arise from local interactions with concepts such as emergent behaviour introduced by the CAS perspective, arguing that it can contribute significantly to our understanding of how micro-level decision-making can positively or negatively influence a wider social dynamic. Hartvigsen et al. (1998) emphasize the potential of CAS in social science, arguing that it allows us to analyze and explain social dynamics from the standpoint of society as a diversified set of interacting individuals rather than as a heterogeneous set of individuals. The advantage of studying society in this manner is that it provides us with more realistic impressions of behavior at the population and community levels (Railsback, 2001; Hartvigsen et al., 1998). Mutual causality exists because the phenomenon of interaction occurs both in the form of the system's effect on the unit and the unit's effect on the system (Ellis and Herbert, 2010). The following table (see table 2.) shows the main characteristics of Complex Adaptive Systems (CAS):

Table 2. CAS Elements and Management Principles (Source: Ellis and Herbert, 2010, p.34)

Core CAS elements	Features	Management principles
Multiple agents with schemata	Informal, collaborative networks of individuals that partner and contribute to solution making Connectivity and interdependence between agents Degrees of connectivity	Respect democratic principles that lead to mutual adjustment; jointly steer courses of action
Self-organising networks	Holistic patterns formed through human interactions Causation Feedback	Adjust the fitness landscape: offer incentives, and longer term rewards by setting priorities. Apply simple design principles because they turn into rules; ensure that lines of communication flow across network, so authority and legitimacy become vested in the process as a whole, not on the perspective of one
Coevolution	Innovative pathways of governance emerge – a variety of what is known as ‘emergent behaviour’ in CAS	Appreciate and monitor the implications of feedback, non-linear and mutual causation
System adaptation	Networks represent additions to hierarchies	Respect individuals and their organisations that exist in an ecosystem – avoid major change

Considering the normative aspect of social theory and its mission to guide policy makers towards ideal development (Loye and Eisler, 1987), complex adaptive systems encompass such aims as developing communication patterns and revealing the dynamics necessary to make organisations and governments more responsive and effective (Eidelson, 1997).

#### ***2.3.4. Levels of Complex Adaptive Systems***

In their research on the concept of leadership in the process of inter-organisational interaction and cooperation in CASs, Comfort and Resodihardjo (2013) distinguished three types of levels: *micro level* (within organisations), *meso level* (between organisations in a single region or country) and *macro level* (international, national, regional and local organisations) (Comfort and Resodihardjo, 2013, p.2-3). In a similar approach, Özmen, Smith and Yilmaz (2013) point to three types of levels at which science can be utilised, framing them as micro-level interactions between individuals, meso-level interactions between communities and macro-level interactions between ecosystems. It should be added that the nodes in the figure below are open to be interpreted as cooperation, depending on the purpose of the model developer (Özmen,

Smith and Yilmaz, 2013). The figure below illustrates the levels of interaction (see Figure 5.):

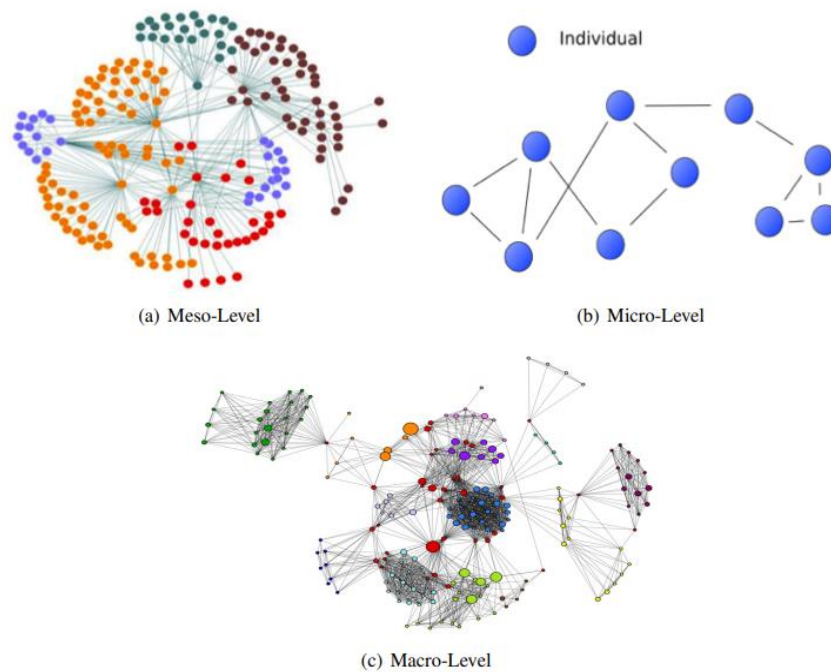


Figure 5. Network Visualizations of Micro-level, Meso-level, and Macro-level Science Studies (Özmen, Smith and Yilmaz, 2013, p.414)

From this point of view, it is possible to understand that the focus of this thesis is inter-organisational interactions in disaster communication, that is, CASs are at an intermediate level. Similar to the above classification, complex adaptive systems are classified by Burger et al. (2021) as follows:

*“(1)the physical system, consisting of geological, biological, meteorological, ecological, and human-built systems; (2) the social system, consisting of formal and informal socio-cultural structures and collective behaviour such as organizations and governments; and (3) the individual system, consisting of the actor and its cognition” (pp.2).*

In the light of the aforementioned classification, the social system category formed by formal and informal organisational structures can be related to the focus of the thesis study because formal and informal institutions are involved in disaster management and related emergency communication.

In this context, Comfort and Resodihardjo (2013) stated that:

*“...interactions among organizations require different skills in communication to a range of actors and synthesis of diverse interests and goals” (p. 2).*

As a similar approach, Kapucu (2009) underlines that formal or informal relationships developed to achieve common goals in complex environments require cooperation between different types and levels of organisations. A specific school of communication that can be formed by the synthesis of the individual differences of the actors involved in the disaster system is expressed as follows:

*“...it assumes communication ecologies include networks of micro- (e.g., family, neighbours) and meso-level (e.g., local media, community organizations) communication resources” (Spialek and Houston, 2018, p.2).*

Communication infrastructure theory (Ball-Rokeach, Kim, and Matei, 2001) assumes that communication ecologies include communication resources at various levels, such as micro-level (e.g. citizens, family, neighbours) and meso-level (e.g. organizations, local media). Micro- and mid-level resources are included in such ecologies. Interpersonal connections, such as peer citizens or disaster-affected community members, provide information or other resources for disaster managing and recovery at the micro level; information from news media, local emergency management, and other community-based organizations are available at the meso-level (Spialek, Houston, and Worley, 2019). For example, Nugus et al. (2010) examined emergency departments in hospitals from a CAS perspective and stated that emergency departments consist of micro, meso and macro interactions. In this context, Spialek,

Houston and Worley (2019) draw attention to the importance of the different interests, goals and skills of multiple actors in their study, in which they try to understand the information exchange from news media, local emergency management and other community-based organisations. As a result, it is critical to synthesize all of these distinctions (Comfort and Resodihardjo, 2013).

*“...beyond examining disaster communication from individual agencies, even less research focuses on inter-organisational disaster communication—that is, the communication directed at and received from peer disaster management agencies” (Liu, Xu ve John, 2021, p.916).*

Therefore, the process of information exchange between organisations may point to a gap in the literature that needs to be filled. Despite the possibility that the communication channels that will function operationally in the emergency process may cause problems depending on the severity of the crisis, Kapucu (2006) emphasized the importance of actors who can link organizations with the external environment, known as boundary spanners, in the emergency and crisis management process.

*Disaster management literature has recognized the critical role of “boundary spanners,” the type of organizations that can promote the flow of information exchange beyond the established networks and “act as conveners between various sectors” (Liu, Xu and John, 2021, p.916; St. John and Yusuf, 2019, p.154)*

Many local actors (particularly municipalities), for example, have potentially transferrable knowledge about the region in which they operate, although sometimes lacking technical capacity (Hermansson, 2019). Indeed, as disasters are local in character, they are essentially the responsibility of the affected area's low-level organization (Nguyen, Imamura, and Iuchi, 2017). Prioritization of communication is within the system in the context of complex adaptive systems (Keshavarz et al., 2010).

The information flow from outside the system network takes precedence over the communication request from the organizations with priority and responsibility for the disaster.

With a similar approach, Fokaefs and Sapuntzaki (2021, p.7) stated that:

*“In emergency periods, the local and regional coordination centres have the upper hand regarding emergency management decisions and accordingly communicate appropriate actions, such as evacuation orders and declaration of emergency”.*

Empirical research indicates that cross-sectoral networking and collaborative actions between emergency management organizations can aid in the timely transmission of information and, thus, strengthen the adaptive capacity of the disaster response system (Anthony et al., 2014). The literature has long highlighted the need for organizations to adapt to environmental factors in order to survive (Cyert and March, 1963; Luecke, 2003; Lockamy, 2014; Sadeghi et al., 2020), emphasizing that certain enterprises are capable and successful, while others are inept and fail.

#### ***2.4. Emergency Communication as a Complex Adaptive System***

During a disaster, the processes of communication, information seeking, and feedback impact the activities of actors attempting to self-organize within the system (Comfort, 1999). Therefore, disasters are complicated processes that entail ever-changing and dynamic social relations (Kapucu, 2009). Furthermore, because it recognizes the influence of both environmental limitations and the behaviour of other stakeholders, complexity science suits itself to social network research (Benham-Hutchins and Clancy, 2010). A social network is a group of actors, entities, or agents who may have relationships with one another. The idea of social network emphasizes the fact that each actor/group within the network has ties to others (Miao and Xi, 2007, p.448). It should also be noted that *networks and collective behaviour are probably the most current research fronts of complex systems science* (Sayama, 2015, p.8).

Whereas Complex Adaptive Systems (CAS):

*“has been a research effort attempting to find common characteristics and formal distinctions among complex systems arising in diverse domains (such as biology, social systems, ecology and technology) that might lead to a better understanding of how complexity occurs, whether it follows any general scientific laws of nature, and how it might be related to simplicity”* (Miao ve Xi, 2007, p.448).

According to this viewpoint, CAS is defined by panarchy (an inclusive, multilateral system in which all parties can meaningfully participate in something) or the ability to be dynamically influenced or adapt to changes that occur within or outside the system (Gunderson and Holling, 2002; Folke et al., 2004). In their study on emergency communication as a complex adaptive system, Chen et al. (2020) determined that emergency communication networks are systems that evolve and adapt over time. Therefore, the linkages between system actors (Miao and Xi, 2007); the information exchange between organisations operationalised as subsystems at the sectoral level in this study; and how each subsystem adapts its local behaviour to these information exchange and cooperation processes (Clymer, 1999) are examined in the context of the disaster communication system.

In this context, considering that:

*“...in order to maximize disaster management potential, government agencies need to create the space for disaster management plans to be informed by local knowledge and expertise”* (Nguyen, Imamura and Iuchi, 2017, p.131);

In disaster management, it will be more likely to observe the behaviour of sub-systems, that is, local units.



At the heart of this endeavour lies the approach that, “*the study of the behaviour of large communities of simple, interacting units with the potential to evolve over time*” (Eren, 2018, p.724) introduced by complexity theories.

The ultimate aim of this endeavour is to contribute to the improvement of the performance of the disaster management system. The theory of Complex Adaptive Systems is considered appropriate for this improvement purpose, because considering organisations from this theoretical perspective shifts the focus of management activities away from command, control and planning thinking and offers the opportunity to assess the ability of system actors to make sense, learn and improvise (McDaniel Jr., 2007). Moreover, as Kayral (2016) states that the conventional view of management, leadership, and doing business in the manner of command and control is being replaced in today's digital age by the understanding of developing connections and collaborations. In parallel, the emergency management literature has recognized that the dynamic, complex environment seen during emergencies necessitates a different strategy than the typical hierarchical command and control structure, which assumes constant operational conditions during a crisis (Comfort, 1994, 2007). It has also been proposed that comprehending complexity science within the social sciences results in long-term consensus building, assisting communities and organizations in moving to greater levels of effectiveness and creativity in an ever-changing world (Innes and Booher, 1999).

*“Going outside the formal lines of communication and authority is usually frowned upon in rigid hierarchies”* (Krebs, 2007, p.2).

Complex Adaptive Systems Theory (CAS), which constitutes the main theoretical framework of the study, points to the process shaped by emergency response systems, information sharing and organisational structure (Comfort, 1994). This understanding offers some hints for better explanation such as non-linearity, aggregation, emergent behaviour, feedback loops, self-adaptation, and context-based responses that can help us understand disaster resilience (Coetzee et al., 2016). It should be added that for feedback to be effective, the system needs to be guided by a shared vision (Dooley, 1997).

The following 5 criteria have been put forward to explain the functioning of CASs within the scope of disaster resilience (Coetzee, Van Niekerk and Raju, 2016, p. 204 - 205) a concept related to *managing change* (Sadeghi et al., 2020) in disasters.

(1)*Non-linearity*: It argues that inputs in the system may not be proportional to outputs. In this context, it is stated that small and seemingly insignificant variables in the system may have great effects, whereas large inputs may not have any effect on changing the system. Therefore, the non-linear, dynamic nature of the system makes the contribution of actors inside and outside the disaster system variable.

(2)*Aggregation*: This characteristic refers to the process by which actors in systems come together with other actors with similar interests, practices and needs to form subgroups or hierarchical organisations. These sub-groups, which have a lively and dynamic structure, are open to multiple interactions with other sub-groups. Therefore, aggregation is a characteristic that is compatible with the previously mentioned concepts of stakeholder engagement and multiple cooperation in the disaster context.

(3)*Emergent behaviour*: Although this characteristic is not in parallel with the characteristics of the wider system, it points out how micro-level interactions between individual actors occur. Micro-level interactions between disaster units have the potential to mobilise the main goals and decision-making mechanisms of the system.

(4)*Feedback loops and adaptation*: Since these loops have a characteristic of encouraging learning and adaptation within the system, they prevent the system from being destroyed. As mentioned before, feedback has a critical role in the continuity of the system. For example, Aldunce et al. (2016) emphasised the importance of taking into account the views and information exchange of various stakeholders in the emergency system in terms of developing the knowledge pool, creating meaning and supporting learning.

(5)*Context-based responses*: It is suggested that a complex system cannot be isolated from context and history and that dynamic interactions within the system can affect and even change the context. At this point, contextual factors

such as disaster type, location and time will also affect the interactions between actors.

Past literature on emergencies has predominantly focussed on linear processes, which is a highly simplistic way of describing the dynamic nature of emergencies (Nugus et al., 2010). Therefore, the non-linear perspective of CAS may be considered more useful in explaining emergencies. In addition, there are basically two types of CASs in the literature (Chen et al., 2020). The first is based on the effort to explain social phenomena from a socioecological perspective, which can be used in sociological research (Espinosa and Porter, 2011). This can be seen as a CAS approach that integrates ecological and social systems. The 5 universal CAS characteristics identified by Coetzee et al. (2016) mentioned above can be explained by this approach (Chen et al., 2020). The second implementation approach focuses on the management of CAS in emergency management (Chen et al., 2020), and instead of the traditional hierarchy and command and control structure, interpretation, learning and improvisation activities become the main tasks (McDaniel Jr, 2007). Therefore, the definitions of communication, control, and coordination should be operationalized in a crisis management framework (Comfort, 2007).

*“Embedded in a range of hierarchical levels with different spatial and temporal scales, the particular elements are shaped by a mutual yet non-deterministic co-evolutionary dialogue”* (Rammel, Stagl and Wilfing, 2007, p. 17).

Self-adaptation is a phenomena that occurs in crisis scenarios and explains the changes that occur in complex systems (Kendra, 2000). In this situation, self-adaptation is motivated by the common aims of organizations in the disaster communication process (Chen et al., 2020). When an organization is faced with an urgent duty or function for which it is not prepared, a self-organization phenomenon is likely to develop. Cooperation among organizations enables work adaptation, particularly in areas not governed by a detailed plan (Chen et al., 2020). The figure below (see Figure 6.) illustrates the logical framework of the theory of complex adaptive systems:

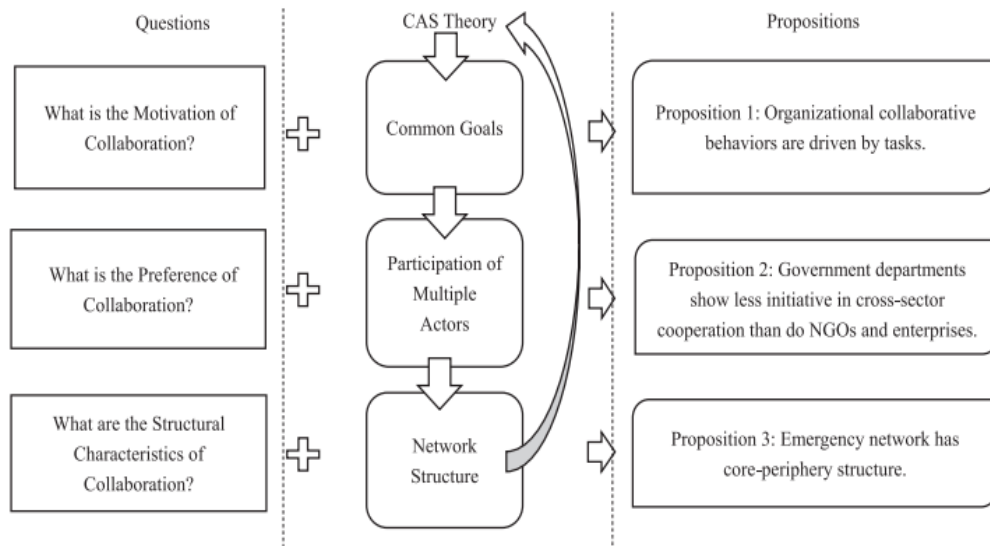


Figure 6. Logical Framework (Chen et al., 2020, p. 3)

This logical framework for CAS in the study of Chen et al. (2020) assumes that participants in cross-sectoral cooperation have common goals. Collaborative networks are informational communities produced by human or non-human entities based on cross-sectoral collaborations (Kapucu, 2005). The size of collaborative networks is proportional to the number of nodes, and as the networks' size increases, so does the complexity of its relationships (Kapucu, 2005). These networks, which are made up of non-linear, interactive agents, may be made up of several interconnected and cooperating subsystems (Auyang, 1998; Morin, 2001; Shi et al., 2021). In this case, the interconnection of CAS actors indicates that any actor's conduct can affect all other participants in the system (Yoder-Bontrager, 2014). Comfort and Kapucu (2006) argue that a system of interacting institutions will more accurately adapt to internal and external threats than uncoordinated and independent actors. Furthermore, the interconnectedness perspective is critical to the design of organizations in complex systems. Although there has been substantial theoretical progress on this topic, there have been relatively few research studies on the extent to which long-standing dependency between organizations may impact organizational cohesion in dynamic situations (Kapucu, 2005).

Networks formed through collaboration in emergency situations enable high-status actors to transfer legitimacy to lower-status actors (Podolny and Page, 1998). This enhances the network's resilience in the face of a crisis situation, as new actors entering

the network as part of a broad intervention acquire strength and access to information and resources improves (Tierney and Trainor, 2004). When faced with changing, new conditions in the context of disaster, resilience reveals the importance of adaptive capacity and indicates that the greater the diversity in the system, the greater the resilience of the system in the face of disruption (Hufschmidt, 2011; Coetzee et al., 2016). At this point, it is critical to maintain diversity and develop stakeholder participation through openness and shared contextual understanding (Rammel, Stagl, and Wilfing, 2007). In the context of Turkey, AFAD (2018), a key stakeholder in disaster management, emphasises resilience in the integrated disaster management system:

*“The Disaster and Emergency Management Presidency (AFAD) is a resilient and dynamic institution that ensures cooperation between all institutions and organisations of the country in order to plan, direct, support, coordinate and effectively implement the activities required for the prevention of disasters and mitigation of their damages, response to disasters and rapid completion of post-disaster recovery activities” (p.28).*

Systems theory has provided application areas for organizations to establish effective communication strategies, and communication is now viewed as a vital aspect that activates subsystems to ensure the overall system's continuity (Lai and Huili Lin, 2017). Furthermore, communication in the setting of CAS allows for the flow of information via internal and external feedback, serving as an adaptable to change and development of organizations (Lai and Huili Lin, 2017). However, it should be recognized at this point that the gap between the observed state of the system's actors and the desired state is significant. The actor's preparedness for change is affected positively or adversely by the existing status of this difference (Dooley, 1997). All types of communication and information flows that may occur between the actors in the disaster and coordination process which are direct, indirect, nonverbal, verbal, written, observation of cues; are a building block for complex adaptive systems because they have a great importance on the adaptation and harmony of the system actors (Comfort, 1994). In their experimental investigation on CAS dyadic

interactions, Hubler and Pines (1993) emphasized that even if the system agents do not have direct communication with each other, the agents might positively or negatively affect each other's prediction abilities. According to Çorbacıoğlu and Kapucu (2006), CASs are built on positive feedback and make decisions according on the feedback they receive from their environment. Therefore, the data gathered through feedback is assessed and analysed; negative data is eliminated while positive data is kept. The complex adaptive system must continue to work as efficiently as possible through the communication channels through which information and feedback flow into and out of the system's internal and external environment (Comfort and Sungu, 2001). It can be challenging for actors to learn and adapt in complex situations, especially when there may be random and incomplete information flows that cause quick and frequent systemic changes (Brower et al., 2009). Nevertheless, it is the process of evaluation and self-adaptation based on the information received that transforms the complex adaptive system into a collaborative activity. Nevertheless, learning occurs as a result of this process, which results in new decisions, and the system develops (Yoder-Bontrager, 2014). In conclusion, in times of crisis, representatives from many organizations gather together to create trust-based networks that are interconnected and able to offer solutions or support organizational-specific objectives and tasks (Currao, 2009). In other words, collaborative networks are essential for gaining access to the required knowledge within a system, and they also provide awareness and adaptive management when new knowledge is produced and the environment changes (Khan et al., 2018).

*“Trust is essential for facilitating effective problem solving because it encourages the exchange of relevant information and determines whether members are willing to allow others to influence decisions and actions”*  
(Mistral, 1996, p. 12).

To sum up, Complex Adaptive Systems can be defined as follows in the context of organizations engaged in disaster communication: In disaster communication processes, CAS is a network of actors that interacts nonlinearly, self-regulates and

connects in this way, evolving continuously in response to changing circumstances (Sayama, 2015).

Finally, Turkey is experiencing a wide range of disasters as a result of numerous factors, including Turkey's geographic, geological, and topographical position, the problem of global warming, the growing population, issues with natural resources, and issues with energy. As a result, disaster management is now more important than ever. Important steps have been performed in our nation in this regard, particularly since 2009; plans and policies are being formulated (Karaman, 2018). For instance, the establishment of AFAD, the creation of provincial-scale strategic action plans and the Turkey Disaster Response Plan (TAMP), and the inclusion of disaster management as a topic in the 11th Development Plan are the leading ones of these measures. These efforts were not limited to the scope of a strategic plan; they also included the implementation of applications with the aid of a technological infrastructure. The most notable attempt in this regard is the Disaster Management and Decision Support System (AYDES), which is designated as the information infrastructure of the Turkey Disaster Response Plan (TAMP). AYDES is a web-based online application with a geographic information system which has decision-support functions that attempts to effectively manage available resources in disasters and emergencies. As it is mentioned in AFAD's official website (*for more details, see AFET Yönetim ve Karar Destek Sistemi Projesi (AYDES), in the references*) that the system's Incident Command System component makes it possible for several service groups, including field response, information/planning, logistics, and finance to collaborate. Thus, the aforementioned groups can communicate via methods like instant messaging and email.

Nonetheless, effective communication in this process is considered to be one of the most significant success criterion to disaster management, according to the literature (Ali et al., 2015; Kapucu and Demiroz, 2017; Xue et al., 2022). On the other hand, the integrated disaster management strategy outlined in the Disaster Management in Turkey and Natural Disaster Statistics Report (AFAD, 2018) places a special emphasis on the coordination and interaction between stakeholders, further emphasizing the need of disaster communication.

## **CHAPTER 3: METHODOLOGY**

### ***3.1. Introduction***

Semantic network analysis was utilized in the context of this study to examine the various dimensions of disaster communication in terms of different type of organisations which are public institution, private organisation, and non-governmental organisation (NGO). The relation of the theoretical framework with the methodology used is included in this chapter. Semi-structured interviews were conducted based on the questions obtained from the theory of complex adaptive systems. Afterwards, semantic network analysis was applied to the data obtained. Additionally, a description of the analysis's software, Pajek, as well as thorough details on data collection and sampling are presented.

### ***3.2. Semantic Network Analysis and Social Network Analysis***

According to Hao and Othman (2021), semantic meaning is defined as the semantic characteristics of the thing, circumstance, or action being communicated. Semantic meaning can also be called the conceptual meaning or referential meaning of words (Wan and Fan, 2019). In this context, the meaning of a word depends on the beliefs, attitudes and behaviours (Lieberman and Olmedo, 2008) that an individual acquires and learns. According to Doerfel (1998) semantic network analysis in an organisational context has become a method for examining the homogeneity or diversity of subgroups based on members' interpretations of organisational issues (rather than networks representing who communicates with whom). Semantic network analysis is the use of network analytic techniques on paired associations based on shared meaning as opposed to paired associations of behavioural or perceived communication links (Doerfel, 1998, p.16). In other words, semantic network analysis focuses on the structure of a system based on shared meaning, consisting of situations where the uses of concepts overlap with each other, rather than the links between communication partners, which is the focus of traditional network methods (Doerfel and Barnett, 1999). It analyses the relationships between words and shared meanings between participants by enabling them to speak naturally (Podnar et al., 2012). Therefore, this technique allows the placement of words in semantic space, facilitating the understanding of each text, making comparisons between texts and evaluating the larger whole (Fitzgerald and Doerfel, 2004). According to Kang et al. (2017), semantic



networks are structured as a network of interrelated words in written text and even nodes representing interrelated concepts. Accordingly, rather than analysing the frequency of particular words, semantic networks enable the extraction of important concepts by recognizing developing concept clusters. Social network analysis investigates patterns of relationships between nodes. Many researchers view social networks as the exchange of messages between individuals or organisations (Shumate and Contractor, 2013). According to their interests and behaviours, social network actors can form various partnerships (Molla et al., 2014). Therefore, the relationships that stakeholders involved in disaster communication develop with each other may also differ. In the process of examining these relationships, social network analysis will be useful to the study as a *set of powerful techniques to identify social roles, important groups and hidden organizational structures* (Artman et al., 2011, p. 7).

### **3.3. Complex Adaptive Systems and Semantic Network Analysis**

The procedures for risk and disaster management that are corrective and prospective are based on different theoretical perspectives (Spinozzi ve Mazzanti, 2019). Complex Adaptive Systems (CAS) theory integrates the concept of *emergence* with adaptability and evolution (Pinto, 2012, p. 5). Focusing on the importance of the ability to use the flow of information in the organisational framework in the face of change and competition across space and time, this understanding has changed the paradigms used to model organisational development. In the context of disaster management, Complex Adaptive Systems (CAS) is seen as an appropriate theory in the effort to understand the (emergent) behaviour of system actors in cooperation processes through their interactions with each other, because it offers a flexible and robust perspective as a result of the reaction to and interaction with the environment (Yıldız et al., 2016). In this direction, since semantic network analysis provides the flexibility to identify themes after the clusters are displayed (DeLuca, 2013) and actors in the social network can develop different relationships with each other according to their interests and activities (Molla et al., 2014); it is thought that social and semantic network analysis methods will enable the evaluation of the problems and opportunities that stakeholders from different organisations, which are operationalised as subsystems in the context of the CAS approach, will indicate from different perspectives. At this point, the key to effectiveness is use of past experience to generate plausible new rules for situations as yet poorly understood (Holland, 2002, p. 33).

In the processes of information flow between news media, emergency management in the local context and other community-based organisations (Spialek et al., 2019); it is thought that semantic analysis will be effective in finding out what the shared meaning is between stakeholders in the context of communication and cooperation in disaster management. In addition, in the endeavour to minimise the need for intervention efforts addressed by modern disaster management, the importance of strategic diversity and non-uniformity of structural relations for variable situations in disaster management is intended to be revealed. Through social network analysis, it is aimed to make comparisons between the stakeholder relationships situations indicated on an organisational basis and to reveal the structural relationship forms that differ in perception. Accordingly, within the scope of Complex Adaptive Systems (CAS) theory, disaster communication is considered as a complex adaptive system in this research study. Thus, it was aimed to consider disaster communication as a system that includes unpredictable, non-linear and context-based responses (Coetzee et al., 2016) and to focus on the processes of adaptation and cooperation between system actors.

#### **3.4. Sampling**

As the research population, stakeholders who took part in the 2020 Aegean Sea earthquake in İzmir, which took place in recent history, were determined as stakeholders. Since it would be difficult to access the research universe, other stakeholders with experience about this disaster were reached through snowball sampling with the suggestions of the participants in the interviewed organisations. In this context, the research unit is the *senior and middle level managers* (Gökçe and Şahin, p. 138) in organisations.

Within the scope of the research, semi-structured interviews were conducted with senior and middle level managers in the organisations to be interviewed. The basis for conducting interviews with senior managers is the use of a phenomenological design. Phenomenology is a research method that utilises the experiences of individuals to obtain information about the phenomenon and aims to reveal the experiences, perceptions and meanings attributed to a phenomenon by individuals (Kocabıyık, 2016, p. 55-56). Since senior managers play an active role in the process of communicating with internal and external stakeholders in the private sector, public institutions and non-governmental organisations (Onat, 2018), it was aimed to

understand the relationship experiences of institutions/organisations with other disaster stakeholders based on the responses of management levels.

### ***3.5. Process of Data Collection and Coding***

The semi-structured interviews were conducted between June, 2022 and September 2022. In this research process, semi-structured interviews were conducted to collect data on disaster communication from stakeholders working in different sectors. The interview questions were formulated based on specific studies addressing the characteristics of complex adaptive systems in a disaster context (Yoder-Bontrager, 2014; Coetzee et al., 2016; Chen et al., 2020). The questions were mainly focussed on experiences. Since the answers were taken together with the reasons, more associations and insights were tried to be obtained.

The interviews were audio-recorded with the permission of the participants in order to be transcribed later. After the transcription process was completed, the answers related to the questions were coded and tabulated. To evaluate components through network analysis, it is crucial to code them. The statements of participants regarding disaster communication were coded after the data gathering process was finished. The data obtained were processed in the next stage by matching the synonyms and arranging the total data accordingly in order to make them ready for Pajek analysis. Since each question will form a different network, this tabulation and synonymising process was applied separately for each question. Basically, the coding system is based on the following rules:

- If the values were expressed in sentences or paragraphs, they were shortened to the minimum possible.
- The values did not merge into one another.
- Unrelated values are not included in the coding.
- Long-expressed answers are shortened without distorting their essence and without distorting their relationship with the subject. They are turned into phrases.

After the coding process was completed, the answers of the participants were linked to each other independently of organisations and individuals. The connection was made by moving from the first to the second value, the second to the third value, and

finally the first to the third value. After connections were established, the data preparation process was complete.

### ***3.6. Implementation and Planning of Semantic Network Analysis***

Pajek is used to carry out the analysis of the semantic network. The software Pajek, which is available for free and non-commercial usage, allows for the analysis and visualization of massive networks.

The analysis process was carried out differently for 7 different questions. Therefore, 7 networks were analysed in total. The networks in question are basic, one-mode, and directed. It is important to identify the basic indicators of semantic network analysis in order to better explain the methodology. Node or vertex are the tiniest unit in the network. A node can represent any statement, organisation or person in the network. With connections established by semantic relations, concepts and instances are represented as nodes (Ma and Chen, 2008). In this research, each core value represents a vertex. Vertices are given numerical identifiers. "Line" symbolises the link between two nodes. The endpoints of two nodes form lines. Lines are divided into directional and non-directional. Directional ones are called arc and non-directional ones are called edge. In semantic network analysis, a graph is formed by a series of nodes and a series of lines between them. Graphs that are directed have at least one arc. A "network" is a graph having nodes, lines, and different dimensions.

Semantic network means the keyword network because it analyses the network based on keywords (Hu et al., 2020, p.3). The semantic relationships between words are referred to as a semantic network (Park et al., 2020). Semantic network analysis, in particular, aids in the demonstration of issues, stakeholders, and attributions such as causes, effects, and solutions that are mutually related in public relations and crisis communication study (Schultz et al., 2012).

## CHAPTER 4: FINDINGS AND ANALYSES

### *4.1. Introduction*

In this section, the findings and analyses related to the research are mentioned. These networks are seven analysis dimensions of social network analysis were used. These analyses dimensions are input degree, output degree, input closeness, output closeness, betweenness, valued core, and articulation points. Seven different networks are analysed within the framework of disaster communication. These networks are respectively the role of communication, communication with other institutions, organisation with strong communication skills, problems in emergency communication, problems in cooperation with public institutions, problems in cooperation with non-governmental organisations and problems in cooperation with private sector. This chapter shows the densest parts in the analysis measurements. It should also be noted that none of the 7 networks have clique values. In this section, findings related to the role of communication network are presented. However, all measurement results related to the analyses of other networks are included in the Appendix A.

### *4.2. Semantic Network Analysis Metrics of Communication's Role in Disaster Management*

The research study analyses communication in disaster management through 7 network categories in total. These 7 categories are the role of communication, importance of communication with other institutions, ideal institution with strong communication skills, perceived problems in disaster communication, problems identified in cooperation with public institutions, problems identified in cooperation with non-governmental organisations and problems identified in cooperation with private sector. Social network analysis results for each category are presented in this chapter

Table 3. Semantic Network Analysis Metrics of the Role of Communication

	<i>The Role of Communication Network</i>
Number of nodes	154
Number of lines	860

Table 3. (Continued)

Number of lines that have value 1	857
Number of lines that have value more than 1	3
Density of network	0.04
Average degree	11.17

Table 4. Semantic Network Analysis Metrics of Communication with Other Organisations

	Network of <i>Communication with Other Organisations</i>
Number of nodes	79
Number of lines	201
Number of lines that have value 1	194
Number of lines that have value more than 1	7
Density of network	0.03
Average degree	5.09

Table 5. Semantic Network Analysis Metrics of Network of Organisation with Strong Communication Skills

	Network of <i>Organisation with Strong Communication Skills</i>
Number of nodes	105
Number of lines	532
Number of lines that have value 1	524
Number of lines that have value more than 1	8
Density of network	0.05
Average degree	10.13

Table 6. Semantic Network Analysis Metrics of Network of Problems in Emergency Communication

	Network of <i>Problems</i>
Number of nodes	248
Number of lines	2264
Number of lines that have value 1	2232
Number of lines that have value more than 1	32
Density of network	0.04
Average degree	18.26

Table 7. Semantic Network Analysis Metrics of Network of Problems in Cooperation with a Public Institution

	Problems in Cooperation with a Public Institution
Number of nodes	63
Number of lines	166
Number of lines that have value 1	158
Number of lines that have value more than 1	8
Density of network	0.04
Average degree	5.27

Table 8. Semantic Network Analysis Metrics of Network of Problems in Cooperation with NGOs

	Problems in Cooperation with NGOs
Number of nodes	34
Number of lines	71
Density of network	0.06
Average degree	4.18

Table 9. Semantic Network Analysis Metrics of Network of Problems in Cooperation with Private Sector

	Problems in Cooperation with Private Sector
Number of nodes	37
Number of lines	57
Density of network	0.04
Average degree	3.08

Table 3. shows the main results of the semantic network analysis. In the role of communication network, there are 154 nodes in total and these nodes form 860 lines. 857 of the 860 lines have a value of 1 and only 3 of them are more than 1. In addition, tables 4.2 to 4.7 show the basic data of other networks related to semantic network analysis.

*“Density is used to measure the completeness of the relations in a network, also called connectedness. Measured as the ratio of total links to possible links,*

*density can identify networks as being sparse (relatively disconnected) or dense (relatively well connected)” (Rosen, Miaglikh and Suthers, 2011, p. 135).*

A density value of 0.04 is not a dense network value. It means that only 4 percent of all possible routed lines can be used. However, networks with low density are favourable for the research in terms of the richness of the free associative responses given by the participants. Average degree indicates the average number of connections in the network. The average value of about 11 indicates that the role of communication connects one another about 11 times.

### **4.3. Valued Core Analysis**

Valued core analysis deals with elements that are connected by a certain number of lines. The analysis is based on multiplicity and shows the minimum value of the lines. Table 10 shows the lowest and highest value core values in the role of communication network.

Table 10. Valued Core Values of the Role of Communication

	The Role of Communication Network
Dimension	154
The lowest value	1
The highest value	2

The analysis of valued core values in the role of communication network shows that the lowest value is 1 and the highest value is 2. This means that the values of the role of communication are connected to one to another by a minimum 1 line and maximum 2 lines. Table 11. shows the frequency distribution of valued core values along with the role of communication.



Table 11. Frequency Distribution of Cluster Values (The Role of Communication Network)

Cluster	Freq	Freq%	CumFreq	CumFreq%	Representative
1	148	96.1039	148	96.1039	most basic
2	6	38.961	154	100.0000	the mukhtar's role as an intermediary in communication with senior administrations
Sum	154	100.0000			

Table 11. demonstrates that 148 of 154 values are connected with value 1 and only 6 are tied to value 2. As value 1 and 148 of the 154 values are connected, there is not a visible structure between them. Figure 7 shows the network between elements with value more than 2. There are no values of clique and articulation points in the communication role network.

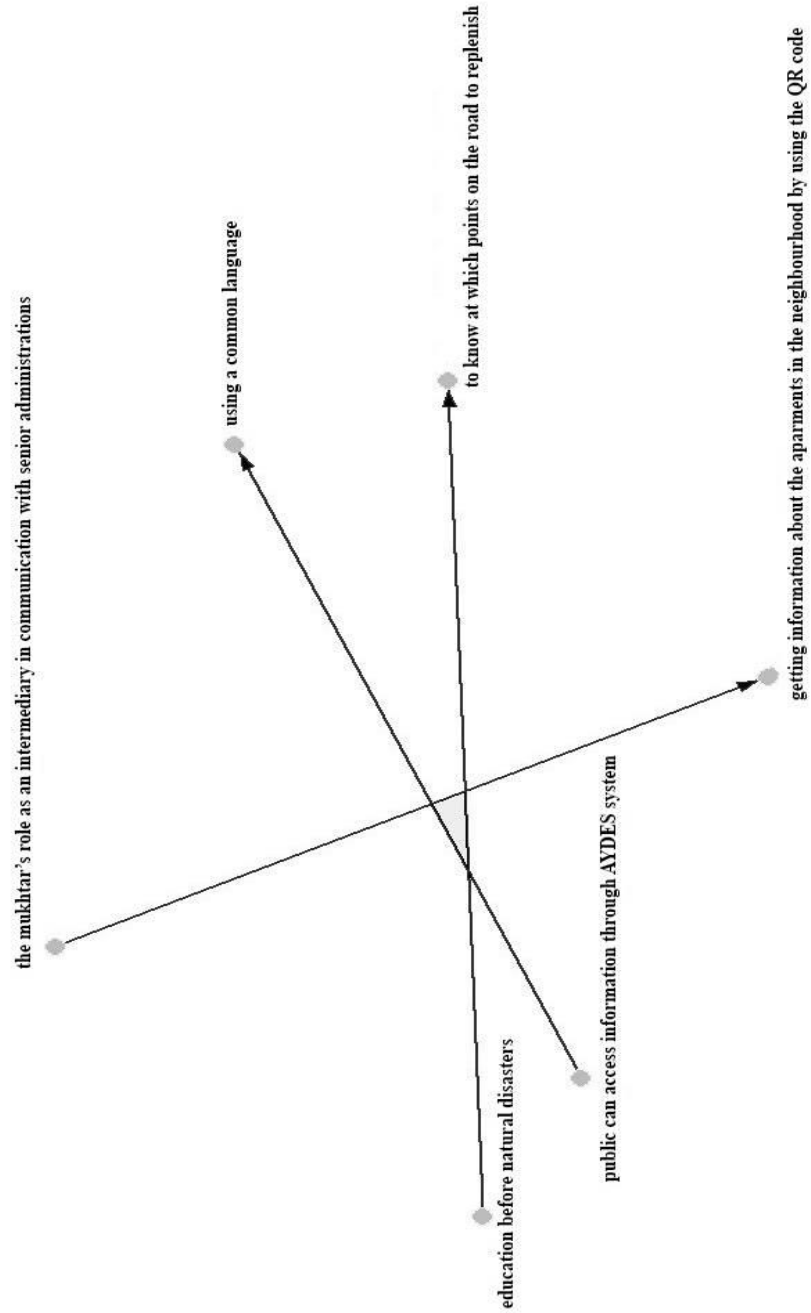


Figure 7. Network between Values Connected with More than Value 2 in Role of Communication Network

#### 4.4. Input Degree Analysis

Input degree is one of the centrality dimensions which is the measure of centrality. Based on its connections, centrality represents the social strength of a vertex. Centrality also comprises the measurements for betweenness, closeness and degree. The number of linkages connecting two nodes is known as degree centrality. Input and

output degrees exist in directed networks. The number of directed lines received depends on the input degree. Understanding how an elements of disaster management in the context of communication influences and also is influenced by others is significant. When networks in this study are directed, the direction of the lines is significant in that metric. Because the amount of directed lines that a node sends and receives varies in directed networks, input degree and output degree must be measured. Additionally, if a value of communication elements have numerous central linkages, it becomes more central. The input degree indicates how popular a node is. The input degree values of the role of communication network is shown in Table 12. This Table 12 shows the 12 elements with the highest input degree values in the communication role network.

Table 12. Input Degrees in Role of Communication Network

Rank	Vertex	Value	ID
1	154	1.00	listening to data
2	139	0.94	following technological developments idealises communication
3	138	0.89	communication is the heart of the disaster management
4	153	0.83	using a common language
5	137	0.83	to know at which points on the road to replenish
6	152	0.78	getting information about the apartments in the neighbourhood by using the QR code
7	136	0.78	keeping the communication channel open
8	135	0.78	the necessity for organisations to get to know each other better
9	134	0.72	making earthquake preparation plan before disaster
10	133	0.72	making the right intervention and the right plan thanks to communication
11	132	0.72	information sharing
12	131	0.72	establishing network

In the role of communication network, “listening to data” is the most input receiving value with 1. Hence, it is the most popular value in the role of communication network. Communication roles in disaster management that were not as significant in earlier dimension include “making earthquake preparation plan before disaster”, “making the right intervention and the right plan thanks to communication”, “information sharing”

and “establishing network”. Therefore, it may be stated that these values do not keep the network together since there are not many connections with other nodes. Nonetheless, they are still significant values because of ties they receive.

#### 4.5. Output Degree Analysis

As input degree, output degree is a metric for degree centrality. It is the total number of directed lines sent by a node. Output degree differs from input degree because it demonstrates extroverted nature of a communication’s role value. The highest 12 values for output degree in the role of communication network is presented in Table 13.

Table 13. Output Degrees in Role of Communication Network

Rank	Vertex	Value	ID
1	15	1.00	ensuring uninterrupted communication
2	30	0.94	correct transfer of information
3	43	0.89	access to communities experiencing life-threatening situations
4	7	0.83	being able to reach the right points to communicate
5	56	0.83	communication is not a part of the work, it is the work itself
6	13	0.83	being in a common communication channel
7	28	0.78	AYDES system, a communication infrastructure developed by AFAD
8	22	0.78	to be in constant communication
9	68	0.78	education
10	41	0.72	getting stakeholders to know each other through meetings or platforms etc.
11	80	0.72	drill
12	35	0.72	taking a course

“Ensuring uninterrupted communication” is the most significant the role of communication value with value of 1. “Correct transfer of information” (0.94) and “access to communities experiencing life-threatening situations” (0.89) are also remarkable with its value of output degree. At the their earlier ranks in the table of the communication’s role, the phrases of “being able to reach the right points to communicate”, “communication is not a part of the work, it is the work itself” and

“being in a common communication channel”. They do not receive many directed lines but instead send them.

#### 4.6. Input Closeness Analysis

In centrality measures, closeness refers calculating the total of a node's shortest routes to every other node in the network (Freeman, 2002). In comparison to nodes with longer linkages, those with shorter paths have higher proximity centrality and are therefore considered to be more significant elements in network (Raad and Chbeir, 2014). Due of the directedness of the network, some directions may be unavailable; hence, closeness specifies the shortest paths. Similar to degree centrality, closeness centrality denotes a node's accessibility. Table 14. demonstrates the top 12 input closeness degrees of the role of communication network.

Table 14. Input Closeness in Role of Communication Network

Rank	Vertex	Value	ID
1	154	1.00	listening to data
2	139	0.95	following technological developments idealises communication
3	138	0.89	communication is the heart of the disaster management
4	153	0.84	using a common language
5	137	0.84	to know at which points on the road to replenish
6	152	0.79	getting information about the apartments in the neighbourhood by using the QR code
7	136	0.79	keeping the communication channel open
8	135	0.79	the necessity for organisations to get to know each other better
9	134	0.74	making earthquake preparation plan before disaster
10	133	0.74	making the right intervention and the right plan thanks to communication
11	132	0.74	information sharing
12	131	0.74	establishing network

Similar to input degree values, “listening to data” is remarkable as the most central value. The phrase of “following technological developments idealises communication” has the next highest value (0.95). Therefore, these two communication roles have an important place in the network, since they have shorter routes to other nodes.

#### 4.7. Output Closeness Analysis

The distance between an output line and other output lines is measured by output closeness centrality. The network's structure is significantly impacted by this distance. On Table 15 the network's most significant output closeness centrality degrees are displayed.

Table 15. Output Closeness in Role of Communication Network

Rank	Vertex	Value	ID
1	15	1.00	ensuring uninterrupted communication
2	30	0.95	correct transfer of information
3	43	0.89	access to communities experiencing life-threatening situations
4	7	0.84	being able to reach the right points to communicate
5	56	0.84	communication is not a part of the work, it is the work itself
6	13	0.84	being in a common communication channel
7	28	0.79	AYDES system, a communication infrastructure developed by AFAD
8	22	0.79	to be in constant communication
9	68	0.79	education
10	41	0.74	getting stakeholders to know each other through meetings or platforms etc.
11	80	0.74	drill
12	35	0.74	taking a course

Similar to output degree, "ensuring uninterrupted communication" has the highest value in the role of communication network. On the other hand, "getting stakeholders to know each other through meetings or platforms etc.", "drill" and "taking a course" have a greater output distance from the other nodes, although there is not much difference among all output closeness values.

#### 4.8. Betweenness

Betweenness centrality is used to quantify one node's mediation function in a network (Zhang and Luo, 2017). If one node is the only one through which other nodes must communicate, connect, transfer, or complete a transaction, then this node should be significant and most likely have a high betweenness centrality (Freeman, 1977). Table 16 presents the betweenness degrees for the network of communication roles.

Table 16. The Highest Betweenness Degrees in Role of Communication Network

Rank	Vertex	Value	ID
1	125	1.00	teaching knowledge
2	121	1.00	family communication before disaster
3	114	1.00	the mukhtar's role as an intermediary in communication with senior administrations
4	106	1.00	communicating with the neighbourhood
5	96	1.00	informing stakeholders by setting up a whatsapp line
6	131	1.00	establishing network
7	128	1.00	the mukhtar conveys the information to the neighbourhood

It is seen that the betweenness values of 7 statements presented in the role of communication network are high. This indicates that communication roles such as "teaching knowledge", "family communication before disaster" or "establishing network", which are seen in the table, have a high task of information transmission and connection between two nodes. Moreover, the only dimension that emphasises all of them except "the mukhtar's role as an intermediary in communication with senior administrations" is betweenness.

It should also be noted that no data were obtained as a result of click and articulation points analyses in the network of communication roles.

#### ***4.9. Total Findings of 6 Dimensions***

Based on 6 different dimensions, the role of communication network is assessed. Only the top 10 values were included in the tables of the input degree, output degree, input closeness, output closeness. Betweenness analyses has presented only 7 highest values. Additionally the first 2 results are shown using the valued core dimension, allowing for a meaningful separation according to the number of clusters that are created. Because semantic social network studies make sense of dense structures. Some of the communication roles were repeated more than once, while others were repeated only once or not at all. A communication role becomes increasingly obvious in a network as the number of repeats increases. Table 17 shows the repetition number of communication roles.

Table 17. Summary of Semantic Network Analysis Findings regarding the Role of Communication

<b>Role of Communication</b>	<b>Number of Repetitions</b>	<b>Cohesion and Centrality Dimensions</b>
establishing network	3	Input degree, Input closeness, Betweenness
the mukhtar's role as an intermediary in communication with senior administrations	2	Betweenness and Valued core
listening to data	2	Input degree, Input closeness
ensuring uninterrupted communication	2	Output degree, Output closeness
following technological developments idealises communication	2	Input degree, Input closeness
correct transfer of information	2	Output degree, Output closeness
communication is the heart of disaster management	2	Input degree, Input closeness
access to communities experiencing life-threatening situations	2	Output degree, Output closeness
using a common language	2	Input degree, Input closeness
being able to reach the right points to communicate	2	Output degree, Output closeness
to know at which points on the road to replenish	2	Input degree, Input closeness
communication is not a part of the work, it is the work itself	2	Output degree, Output closeness
getting information about the apartments in the neighbourhood by using the QR code	2	Input degree, Input closeness
being in a common communication channel	2	Output degree, Output closeness
keeping the communication channel open	2	Input degree, Input closeness
AYDES system, a communication infrastructure developed by AFAD	2	Output degree, Output closeness
the necessity for organisations to get to know each other better	2	Input degree, Input closeness
to be in constant communication	2	Output degree, Output closeness
making earthquake preparation plan before disaster	2	Input degree, Input closeness
education	2	Output degree, Output closeness



Table 17. (Continued)

making the right intervention and the right plan thanks to communication	2	Input degree, Input closeness
getting stakeholders to know each other through meetings or platforms etc.	2	Output degree, Output closeness
information sharing	2	Input degree, Input closeness
drill	2	Output degree, Output closeness
taking a course	2	Output degree, Output closeness
teaching knowledge	1	Betweenness
family communication before disaster	1	Betweenness
communicating with the neighbourhood	1	Betweenness
informing stakeholders by setting up a whatsapp line	1	Betweenness
the mukhtar conveys the information to the neighbourhood	1	Betweenness
most basic	1	Valued core

In the table of the role of communications with highest values, 31 of 154 communication role values have been included at least once. There is no repeated communication role in every dimension. The role of “establishing network” has the highest repetition value with 3 times. This indicates the importance of networking in communication roles. Moreover, most of the roles were repeated 2 times. Another remarkable point is that the majority of the communication roles repeated 1 time appear to be in the betweenness degree. In addition, the roles with input degree values were repeated in input closeness and those with output degree values were repeated in output closeness.

Table 18. Summary of Semantic Network Analysis Findings regarding the Communication with Other Organisations

<b>Communication with Other Organisations</b>	<b>Number of Repetitions</b>	<b>Cohesion and Centrality Dimensions</b>
being a multidisciplinary field	4	Input degree, Input closeness, Output degree and Output closeness
the necessity of cooperation	2	Betweenness and Articulation Points

Table 18. (Continued)

ensuring that organisations are able to procure the necessary supplies	2	Input degree, Input closeness
ensuring the correct intervention and determination of the correct course of action	2	Output degree, Output closeness
reaching wider stakeholders through corporate communication	2	Input degree, Input closeness
ensuring the coordination	2	Output degree, Output closeness
pre-disaster communication facilitates communication during the disaster	2	Input degree, Input closeness
ensuring the awareness of the situation	2	Output degree, Output closeness
giving importance to organisational knowledge and experience	2	Input degree, Input closeness
being able to coordinate teams	2	Output degree, Output closeness
providing education with a common synergy	2	Input degree, Input closeness
being able to evaluate how long the danger in the disaster field will last	2	Output degree, Output closeness
being a necessity	2	Input degree, Input closeness
disaster is a common issue for all stakeholders in the city	2	Output degree, Output closeness
being in the field allows keeping the communication channel open with other organisations	2	Input degree, Input closeness
ability to act in an organised manner	2	Output degree, Output closeness
ensuring the communication of team leaders with each other	2	Input degree, Input closeness
ensuring that assistance is provided	2	Output degree, Output closeness
keeping communication alive	2	Input degree, Input closeness
being able to help neighbouring provinces	2	Output degree, Output closeness
enabling stakeholders to recognise each other	2	Input degree, Input closeness
being a multi-stakeholder field	2	Output degree, Output closeness
being a multifaceted issue	2	Input degree, Input closeness
preventing chaos and anarchy	2	Output degree, Output closeness

knowing the authorised and technical organisations	2	Input degree, Input closeness
providing a quick reaction	2	Output degree, Output closeness
cooperation offers an open environment for two-way communication	2	Input degree, Input closeness
the disaster is a matter above many things	2	Output degree, Output closeness

In the network values related to the importance of communication with other organisations, "being a multidisciplinary field" ranks first with 4 repetitions. This draws attention to the fact that communication with other institutions is a field that requires discipline. In this network, just like the communication roles, it is seen that there are 2 repetitions in this network. On the other hand, since "the necessity of cooperation" repeats the values of betweenness and articulation points, it assumes a key role for the network.

Table 19. Summary of Semantic Network Analysis Findings regarding the Organisation with Strong Communication Skills

<b>Organisation with Strong Communication Skills</b>	<b>Number of Repetitions</b>	<b>Cohesion and Centrality Dimensions</b>
competent	4	Input degree, Input closeness, Betweenness and Articulation Points
willing	4	Input degree, Input closeness, Betweenness and Articulation Points
able to mobilise other stakeholders	3	Input degree, Input closeness and Betweenness
active	3	Output degree, Output closeness and Betweenness
communicates easily	2	Input degree, Input closeness
able to work as a team	2	Input degree, Input closeness
training other teams	2	Input degree, Input closeness
sharing	2	Output degree, Output closeness
returning to stakeholders in need	2	Output degree, Output closeness
who has a good dialogue with the citizen	2	Output degree, Output closeness
who can turn a negative environment into a positive one	2	Output degree, Output closeness

Table 19. (Continued)

doing social welfare	2	Output degree, Output closeness
delivering needs to the right place	2	Output degree, Output closeness
intensively working	2	Output degree, Output closeness
able to communicate quickly	2	Output degree, Output closeness
who make good explanations	2	Output degree, Output closeness
able to reach any stakeholder	2	Betweenness and Articulation Points
centralised	2	Betweenness and Articulation Points
able to touch the citizen	2	Betweenness and Articulation Points
volunteer	2	Betweenness and Articulation Points
interested	1	Input degree
able to use communication tools well	1	Input degree
respectful of human beings	1	Input degree
with the ability to turn into action	1	Input degree
environmentally conscious	1	Input degree
meritocratic	1	Input degree
who admits his mistakes and shortcomings	1	Output degree
who is open to communication	1	Input closeness
able to quickly translate information into action	1	Input closeness
able to communicate directly	1	Input closeness
experienced	1	Input closeness
with technical equipment and facilities	1	Betweenness
dynamic	1	Betweenness
senior authorised	1	Betweenness

There is no repeated adjective in each dimension. However, the adjectives "competent" and "willing" are at the forefront with 4 repetitions for an organisation with strong communication skills. These are followed by the adjectives "active" and "mobilising

other stakeholders" with 3 repetitions. Out of 105 adjectives in the network, 34 of them are repeated at least once.

Table 20. Summary of Semantic Network Analysis Findings regarding the Problems in Emergency Communication

<b>Problems in Emergency Communication</b>	<b>Number of Repetitions</b>	<b>Cohesion and Centrality Dimensions</b>
necessity for the media to confirm information about the disaster	4	Input degree, Input closeness, Betweenness and Articulation Points
lack of attention to earthquake experts	4	Input degree, Input closeness, Betweenness and Articulation Points
necessity for service operators to strengthen their service quality and infrastructure	4	Output degree, Output closeness, Betweenness and Articulation Points
having to push some organisations to communicate	4	Output degree, Output closeness, Betweenness and Articulation Points
weakening of social communication in the virtual environment	3	Input degree, Input closeness and Betweenness
necessity of coordinated communication	2	Input degree, Input closeness
financial inadequacies cause communication to go through a single channel	2	Input degree, Input closeness
after 17 August, organisations, citizens and the state became incapacitated	2	Output degree, Output closeness
necessity to increase the value given to science in Turkish society	2	Input degree, Input closeness
the fact that material and technological possibilities will be insufficient in the event of a major natural disaster	2	Output degree, Output closeness
necessity of unification of air, land and sea communications	2	Input degree, Input closeness
telephone communication was incorrect during the disaster	2	Output degree, Output closeness

Table 20. (Continued)

GSM operators cut off communication at the slightest inconvenience	2	Input degree, Input closeness
lack of merit	2	Betweenness and Articulation Points
lack of awareness	2	Betweenness and Articulation Points
professional chambers looking at disaster with the dimension of criticising the government	1	Input degree
the state does not attach sufficient importance to the disaster in terms of supervision	1	Input degree
the central government acting with the mentality of 'let me do everything'	1	Output degree
organisations not being aware of each other	1	Output degree
failure to implement IRAP (Provincial Disaster Risk Plan)	1	Output degree
shortcomings in the drill	1	Output degree
lack of professional knowledge	1	Output degree
hegemony of Istanbul Technical University and Middle East Technical University	1	Input closeness
society's inability to use the means of communication well	1	Input closeness
necessity of increasing the number of satellite phones	1	Input closeness
not using the walkie-talkie too much	1	Output closeness
organisations tend to fulfil only their own tasks	1	Output closeness
occupation of GSM operators after disasters	1	Output closeness
coming to forefront of personal wishes in organisation	1	Output closeness
necessity of disaster awareness in society	1	Output closeness
problems with the realisation of the plans	1	Betweenness

Table 20. (Continued)

necessity of establishing a separate communication channel among search and rescue teams	1	Betweenness
lack of a disaster management model suitable for the country conditions	1	Valued core
not being able to fully master the work	1	Valued core
language problems in communication with foreign stakeholders	1	Valued core
the voluntary system has not been transformed into a law	1	Valued core
Turkey National Disaster Response Plan (TAMP) has not been adapted to the conditions of the country	1	Valued core
communication with other institutions is carried out mostly through individuals	1	Valued core
the fact that the private insurance system in the voluntary structure of civil society organisations is not established in Turkey	1	Valued core
civilian human pile-up on the rubble	1	Valued core
search for valuables in disaster wreckage	1	Valued core
incoming information not reaching the right units	1	Valued core

When the network regarding the problems in emergency communication is analysed, 4 problems with 4 repetitions are remarkable. Of the 248 problems in the network, 42 were repeated at least 1 time. The most repeated problems are “necessity for the media to confirm information about the disaster”, “lack of attention to earthquake experts”, “necessity for service operators to strengthen their service quality and infrastructure” and “having to push some organisations to communicate”.

Table 21. Summary of Semantic Network Analysis Findings regarding the Problems in Cooperation with a Public Institution

<b>Problems in Cooperation with a Public Institution</b>	<b>Number of Repetitions</b>	<b>Cohesion and Centrality Dimensions</b>
bureaucracy	5	Input degree, Input closeness, Output degree, Output closeness and Betweenness
non-cooperation	4	Input degree, Input closeness, Output degree and Betweenness
to pass over certain major works	4	Input degree, Input closeness, Output degree and Betweenness
confusion between the concepts of state and government in the last 10 years	3	Input degree, Output closeness and Betweenness
desire to stand out	3	Input degree, Output degree and Betweenness
lack of self-confidence of the people in charge	3	Output degree, Output closeness and Betweenness
political considerations	2	Input degree and Betweenness
the bifurcation in the centre caused by the political climate	2	Input degree and Betweenness
organisational chauvinism	2	Input degree, Input closeness
trusting the foreign person more	2	Input degree, Input closeness
dependence on Ankara	2	Input degree, Input closeness
not wanting to share power and authority	2	Output degree, Output closeness
political reasons	2	Input degree, Input closeness
not being able to ask for things by direct communication	2	Output degree, Output closeness
the metropolitan municipality's closing down some things as wasteful	2	Input degree, Input closeness
keeping accurate information about the disaster as a state secret	2	Output degree, Output closeness



Table 21. (Continued)

inexperience in communication with public institutions	2	Output degree and Betweenness
problematic permission processes	2	Output degree, Output closeness
they are worried that they have done something wrong somewhere	2	Output closeness and Betweenness
public institutions perceive criticism as an insult	1	Input degree
overspending of resources	1	Input degree
not to take action without criticising	1	Output degree
being closed to the new	1	Output degree
thinking that I'm the only one responsible	1	Input closeness
municipalities failing to fulfil their responsibilities	1	Input closeness
legal deficiency	1	Output closeness
not keeping up with the age	1	Output closeness

The most prominent statement in the problems related to cooperation with public institutions is “bureaucracy” with 5 repetitions. This is followed by “non-cooperation” and “to pass over certain major works” with 4 repetitions. There is no recurring problem in each dimension and 27 of the 63 problem statements in the network repeat at least 1 time.

Table 22. Summary of Semantic Network Analysis Findings regarding the Problems in Cooperation with NGOs

<b>Problems in Cooperation with NGOs</b>	<b>Number of Repetitions</b>	<b>Cohesion and Centrality Dimensions</b>
AKUT's tendency to work separately for a period	4	Input degree, Input closeness, Output degree and Output closeness
acting independently	4	Input degree, Input closeness, Betweenness and Articulation points
desire for self-assertion	4	Input degree, Input closeness, Output degree and Output closeness

Table 22. (Continued)

political action	4	Input degree, Input closeness, Output degree and Output closeness
economic difficulties	4	Input degree, Input closeness, Betweenness and Articulation points
desire to stand out	4	Output degree, Output closeness, Betweenness and Articulation points
there should not be any difficulties	4	Output degree, Output closeness, Betweenness and Articulation points
lack of a board of directors	3	Input degree, Input closeness and Output degree
avoidance of cooperation	2	Input degree, Input closeness
the mentality that let the state help me and I'll work	2	Input degree, Input closeness
competence status	2	Input degree, Input closeness
desire to be at the forefront	2	Input degree, Input closeness
not all non-governmental organisations are sufficient	2	Output degree, Output closeness
Identity problem	2	Output degree, Output closeness
AKUT sees itself above the official organisation	2	Output degree, Output closeness
desire to be a hero	2	Output degree, Output closeness
political stuff	2	Output degree and Betweenness
not showing enough sensitivity to events	2	Output degree, Output closeness
organisational chauvinism	1	Output degree
personalisation of relationships	1	Output degree
some NGOs being closed in their inner world	1	Output degree
trying to do other's work by exceeding authorisation	1	Output degree
insufficient financial means	1	Output degree
being a barrier against NGOs	1	Input closeness

In this relatively small network, which includes statements on problems in cooperation with NGOs, 24 out of 34 problem statements are repeated at least once. There is no statement repeating all 7 dimensions in the network. The maximum number of repetitions is 4 and there are 7 important problem statements with 4 repetitions. These statements are “AKUT's tendency to work separately for a period”, “acting independently”, “desire for self-assertion”, “political action”, “economic difficulties”, “desire to stand out” and “there should not be any difficulties”. It should also be noted that the statement "there should not be any difficulties" indicates that the participants do not see any problems in cooperation with non-governmental organisations.

Table 23. Summary of Semantic Network Analysis Findings regarding the Problems in Cooperation with Private Sector

<b>Problems in Cooperation with Private Sector</b>	<b>Number of Repetitions</b>	<b>Cohesion and Centrality Dimensions</b>
loss of work	6	Input degree, Input closeness, Output degree, Output closeness, Betweenness and Articulation points
not experiencing any difficulties	4	Output degree, Output closeness, Betweenness and Articulation points
having variable structures	3	Input degree, Input closeness and Output degree
they do not have a very important role in the disaster	3	Input degree, Output degree, Output closeness
emotional approach of the private sector	2	Input degree, Input closeness
taking part in more one-to-one communication	2	Input degree, Input closeness
see it as an expense	2	Input degree, Input closeness
loss of revenue	2	Input degree, Input closeness
it is related to the internal functioning of the company	2	Input degree, Input closeness
the fact that media organisations are in competition with each other	2	Input degree, Input closeness

Table 23. (Continued)

seeing the disaster issue as an unnecessary expense	2	Input degree, Input closeness
loss of money	2	Input degree, Input closeness
not taking part in pre-disaster processes	2	Input degree, Input closeness
workers' trade union rights	2	Output degree, Output closeness
waste of time	2	Output degree, Output closeness
the fact that he is not very involved in disaster affairs	2	Output degree, Output closeness
the perspective of the mainstream media that sees itself above everything else	2	Output degree, Output closeness
some of them have disaster equipment only for show	2	Output degree, Output closeness
seeing the issue of disasters as unimportant	1	Input degree
having very limited methods such as staying in good condition, labour service procurement	1	Input degree
the private sector should provide accurate information flow	1	Input degree
the media is in complete chaos	1	Input degree
the lack of a sufficient private sector with social awareness in our country	1	Input degree
the private sector is not very receptive to cooperation	1	Output degree
the mainstream media's dismissive view of local media	1	Output degree
in the private sector, this issue is not on their agenda at all	1	Output degree
inability to cooperate directly	1	Output degree
collecting and distributing information for money	1	Input closeness

In the network of problems related to cooperation with the private sector, "loss of work" ranks first with 6 repetitions. It is repeated in all dimensions except valued core. In the network of problems related to cooperation with the private sector, "loss of work" ranks first with 6 repetitions. It is repeated in all dimensions except valued core. This ranking is followed by the statement "not experiencing any difficulties". This statement indicates that there are no problems in cooperation with the private sector. In addition, the statements "having variable structures" and "they do not have a very important role in the disaster" are important for the network with 3 repetitions. In this network, 28 of 37 problem statements are repeated at least 1 time.



## CHAPTER 5: DISCUSSION

Significant findings emerged from examinations of disaster communication based on 7 different networks. Based on the study questions, the findings are discussed. As previously said, the study intends to respond to several basic questions:

- With which concepts do stakeholders identify disaster communication?
- What are the expectations of stakeholders from an effective cooperation in disaster communication? How are the semantic contents of these expectations defined?
- Is there a difference between stakeholder expectations from types of organisations (public, private and non-governmental)?
- According to the stakeholders, who is the most essential stakeholder in disaster communication? How is the relationship between these stakeholders and the primary stakeholder defined?

The questions are addressed in line with the thesis's theoretical framework and literature review (see Chapter 2). To answer the first question, it is necessary to look at networks of communication roles and the role of communication with other organisations (see table 17. and 18.). Because these two networks contain critical expectations and definitions for disaster communication. There is 1 most prominent statement in both networks. The expressions “establishing network” with 3 repetitions in the role of communication network and “being a multidisciplinary field” with 4 repetitions in the importance of communication with other organisations network are remarkable.

Table 17. shows that networking is the main role of communication. At this point, it can be clearly stated that it is important to have a connection between stakeholders. Because as mentioned in the literature; a social network is a collection of actors, things, or agents that could interact with one another. Therefore, it seems that interaction and relationship building will be achieved through communication within the system. Moreover, given that networks and collective behaviour are the research interest of complex systems science (Sayama, 2015), the importance of stakeholders' perception of communication as a network seems to be in line with the theoretical framework of the study. On the other hand, the shared meaning of the importance of communication with other organisations as a "multidisciplinary field" can be related to concepts such

as *cooperation, multi-stakeholder participation* and *stakeholder engagement*, which are pointed out in the literature. Because different disciplines within the system will bring different areas of expertise, different perspectives, knowledge and skills. Comfort and Resodihardjo (2013) also pointed to this issue:

*“...interactions among organisations require different skills in communication to a range of actors and synthesis of diverse interests and goals”* (p. 2).

In the second and third questions, the answer to the expectations for effective cooperation and expectations for certain organisation type is sought. The stakeholders' expectations in this regard were sought to be understood through the factors that hinder cooperation according to the type of organisation. Therefore, clues for the answer to this question are given in Tables 21, 22, and 23. Because these tables reveal the conditions that make it difficult to cooperate with a public institution, a non-governmental organisation and a private sector organisation respectively. In the network of problems related to cooperation with the public institution, the barrier of “bureaucracy” ranks first with 5 repetitions. This is followed by “non-cooperation” and “to pass over certain major works”. “Bureaucracy” represents a systemic obstacle. In other words, it draws attention to the slowness in the functioning of the system. Therefore, this slowness makes cooperation difficult. “Non-cooperation” seems to be an attitude adopted in line with a decision taken by public institutions on their own initiative. Therefore, at this point, it is noticeable that the type of organisation has an effect on cooperation. On the other hand, “to pass over certain major works” appears to be an obstacle observed according to personal experiences or, again, the type of organisation. This shows that public organisations have a tendency to avoid responsibility or not fulfil it properly. Considering the statement in the literature that “disaster communication is a state responsibility” (Haraguchi, 2020; Chen et al., 2020; Ghanjal, Bahadori, and Ravangard, 2019; Haraoka et al., 2013) this situation points to a problematic situation for disaster communication. Furthermore, hierarchical structure can also be considered to be effective on co-operation. Because, due to the hierarchical structure of organisations (Schultz and Seeger, 1991), they can often react strategically in crisis situations by sharing, distributing or avoiding responsibility

(Seeger, Sellnow and Ulmer, 1998). In summary, based on all these obstacles, stakeholder expectations for public institutions can be expressed as acting faster and more willingly in cooperation processes.

In the network of barriers to cooperation with non-governmental organisations, table 22. shows that AKUT's tendency to work separately for a period, acting independently, desire for self-assertion, political action, economic difficulties, desire to stand out are at the forefront with 4 repeats. When these statements are analysed, especially “AKUT's tendency to work separately” and “acting independently” indicate the tendency of NGOs to work independently. This is a negative situation for cooperation because it may result in directly being closed to cooperation. According to Quarantelli (1988,) organizations are frequently viewed as collections of isolated components rather than as integrated systems. However, there are frequently systems or groups of interconnected, specialized organizations that are created to carry out certain disaster-related duties. Thus, interdependence between stakeholders is essential. In the remaining statements, “desire for self-assertion” and “desire to stand out” are striking. Because these expressions indicate a selfish attitude, they contradict a sharing climate of cooperation. On the other hand, when these four statements are evaluated in total, it can be considered that a tendency to stand out is at the forefront in all of them. Economic difficulties indicates that the lack of institutional resources is significant for NGOs, while "political action" indicates that the organisation can survive through political ideology without cooperation with certain groups or stakeholders. This, in turn, implies a lack of the comprehensive value of cooperation and creates a problematic environment for disaster communication. To summarise, stakeholder expectations for non-governmental organisations may be that they should predominantly have a collective rather than an individual approach in organisational manner.

Finally, the most prominent obstacle to cooperation with the private sector is "loss of work". Therefore, it is observed that the private sector does not favour cooperation mostly due to financial concerns. Stakeholder expectations can also be interpreted as that the private sector should put financial concerns in the background in disaster communication. In response to second research question, stakeholder expectations were revealed. Since third question tries to understand whether there is a difference



in expectations according to the type of organisation, it is possible to say that the type of organisation changes expectations in response to this question.

In the network of organisations with strong communication skills in Table 19, the adjectives “competent” and “willing” are in the foreground in the definition of the ideal organisation, which is described as having strong communication skills. At this point, Nguyen et al. (2017) suggest that public institutions should create space for informing actors with knowledge and expertise. In fact, it is noticeable that the stakeholders are idealised as an organisation that is extremely open to action with its knowledge and competence. Because the other two adjectives that stand out with 3 repetitions in the repetition table are “active” and “able to mobilise other stakeholders”. In the context of cooperation, all these attributions imply that idealised cooperation requires expertise and willingness. Competence is identified as “*areas of disaster governance in which different actors are involved*” (Melo Zurita et al., 2015, p. 387). Therefore, when discussing the concept of competence, a cooperative environment where stakeholders from different fields come together is important. On the other hand, regarding the factors hindering the willingness of organisations to cooperate, four main obstacles were identified: competence, mutual distrust, lack of transparency and insufficient assistance capacity (Schulz and Blecken, 2010).

Finally, in the repetition table regarding the problems in emergency communication (Table 20.), “Necessity for the media to confirm information about the disaster”, “lack of attention to earthquake experts”, “necessity for service operators to strengthen their service quality and infrastructure” and “having to push some organisations to communicate” are remarkable with 4 repetitions. The statement “necessity for the media to confirm information about the disaster” draws attention to the need for accurate information to be conveyed by the media organs that have the role of conveying information. Therefore, the importance of informing the public opinion correctly is emphasised. The crisis management process including post-disaster activities (Erkan and Değerliyurt, 2009), which has already been discussed in the literature, is important in this regard. The characteristics of the media structure can be important factors in influencing the effectiveness of crisis communications because they play a significant role in framing organizations' responses to crises and as a result, they have an impact on how the public opinion perceives the crisis and the ability of organizations to resolve it (Romenti and Valentini, 2010). In other words, media

organisations have an indirect impact on the activities of other organisations. The other prominent problem is "lack of attention to earthquake experts". Here, the need for expertise in disaster communication stands out. This is in parallel with the attribution of "competent", which is prominent in the network of organisations with strong communication skills. The importance of collaboration between multiple stakeholders with different areas of expertise (Spialek, Houston and Worley, 2019) is also important for the functioning of CASs as the system will be open to interaction. One of the other main problems, which is "necessity for service operators to strengthen their service quality and infrastructure", covers the technical problems of communication (Ali et al., 2015; Zlatanova, Oosterom, and Verbree, 2006), which are highly discussed in emergency communication. In order for stakeholders in disaster communication to establish healthy communication, it is important to protect the means of communication (Haraguchi, 2020) throughout the *disaster management cycle* (see Figure 1.). Phrase of "having to push some organisations to communicate" is compatible with the expression "willing" which stands out in the network of organisations with strong communication skills. Willingness is an important stakeholder expectation and having to force some organisations to communicate in disaster communication points to the importance of organisations to be more active and willing in communication in Turkey's disaster management context. Considering the functioning of CASs, the ability of stakeholders to be affected by and adapt to changes occurring within and outside the system (Gunderson and Holling, 2002; Folke et al., 2004) will also be improved by being open to communication. These current problems and expectations arising from the interaction of system actors with each other actually provide important clues for the system to evolve by learning. Effective disaster communication plays a vital role for the realisation of these problems and expectations in the following processes.

## CHAPTER 6: CONCLUSION

Disasters have always taken place in human history and will continue its presence. They are unpredictable events but it is possible to control their impact with preparations and strong planning. At this point, cooperation and effective communication is key. Today, communication opportunities are increasing and becoming easier with the developing technology. Complex adaptive systems are set of interacted actors that adapt themselves to change by learning. Therefore, being able to reach experts, technical teams, academicians or decision makers from different disciplines in the global world and being able to adapt cooperation to the changing world is essential for minimizing risks of a serious issue such as disaster.

While today's communication is based on values and expectations, it also requires the fulfilment of certain responsibilities that fall on individuals. Organisations, just like human beings, have certain expectations, goals, responsibilities and experiences. Like people, they try to keep up with development by learning. However, not all organisations may have the same expectations and values. Therefore, it may be difficult to meet on a common ground in these situations. However, since the disaster context is an extraordinary situation, organisations need to act with a certain sense of responsibility. For this purpose, an effective communication and cooperation environment should be established within the scope of disaster preparedness. This study has tried to show the expectations of stakeholders from different sectors from disaster communication and cooperation and the problems they identified in these processes. The findings show that there are structural, financial or institutional obstacles such as "bureaucracy", "loss of work", "acting independently" in disaster communication. While public institutions see the disaster cooperation as an extra responsibility and tend to stay away from these processes, non-governmental organisations tend to act more independently and come to the forefront institutionally. The private sector, on the other hand, avoids taking part in cooperation due to concerns about financial loss or due to other cost losses such as time and labour losses. These findings provide clues about disaster communication in Turkey in the context of İzmir.

Since problems create expectations, it actually gives strong clues for the development of the disaster communication system in Turkey. In the complex adaptive systems approach, the system evolves by learning and the actors in the system, i.e. stakeholders,

are expected to come together by establishing networks and interactions as much as possible. In this way, actors will be aware of the changes arising from expectations, desires and problems in the system and will be able to adapt itself to the changes. For this purpose, it would be useful to consider disaster communication as a value and endeavour to build a dynamic, inclusive, cooperative, participatory and adaptable environment.

Consequently, considering all the findings on disaster communication and cooperation, it is possible to say that the organisational frameworks, needs and expectations differ in disaster communication in İzmir. However, the presence of heterogeneous actors and diversity in disaster communication as a complex adaptive system creates a favourable environment for a flexible, power-sharing and democratic environment. At this point, stakeholders are expected to be more active, competent and willing. Therefore, considering the potential of actors and the unpredictability of their impact on the system, İzmir disaster management should evolve into a more participatory and responsibility-sharing system.

### ***6.1. Limitations and Insights for Further Studies***

Seeking the social meaning of problems and opportunities in disaster communication only within the organisational framework can be seen as a limitation of this study. There may be differences in the perception of the social meaning of pros and cons of disaster communication by different stakeholders such as citizens, local communities, disaster victims, students, households. Investigation of these perceptions is recommended for future studies.

Another limitation of this study is that the research was conducted only in Izmir. In future studies, it would be useful to examine the social meaning of problems and opportunities in disaster communication, especially in a nationwide sample, and to conduct social network analyses of stakeholders. In addition, this study analyses the social meanings of problems and opportunities in disaster communication in the context of Turkey. Therefore, in future studies, it is thought that comparing the findings related to Turkey with the data obtained from different countries (especially earthquake countries) will bring different dimensions to the research subject. Moreover, there may be differences in the perception of the social meaning of pros and cons of disaster communication by different stakeholders such as citizens, local

communities, disaster victims, students, households. Thus, it is also recommended that different stakeholder groups should be included in the study and network analyses should be conducted.



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## APPENDICIES

### Lists of Findings Regarding All Other Networks in the Study

#### 1.1 Communication With Other Organisations – Input Degree

Rank	Vetex	Value	ID
1	79	1.00	ensuring that organisations are able to procure the necessary supplies
2	78	0.88	reaching wider stakeholders through corporate communication
3	65	0.88	pre-disaster communication facilitates communication during the disaster
4	62	0.75	giving importance to organisational knowledge and experience
5	77	0.75	providing education with a common synergy
6	76	0.75	being a necessity
7	64	0.75	being in the field allows keeping the communication channel open with other organisations
8	63	0.63	ensuring the communication of team leaders with each other
9	60	0.63	keeping communication alive
10	59	0.63	enabling stakeholders to recognise each other
11	58	0.63	being a multifaceted issue
12	75	0.63	being a multidisciplinary field
13	74	0.63	knowing the authorised and technical organisations
14	73	0.63	cooperation offers an open environment for two-way communication

#### 1.2 Communication With Other Organisations – Output Degree

Rank	Vertx	Value	ID
1	15	1.00	ensuring the correct intervention and determination of the correct course of action
2	29	1.00	ensuring the coordination
3	11	0.88	ensuring the awareness of the situation
4	25	0.75	being able to coordinate teams
5	50	0.75	being able to evaluate how long the danger in the disaster field will last
6	2	0.75	disaster is a common issue for all stakeholders in the city
7	8	0.75	ability to act in an organised manner
8	7	0.63	ensuring that assistance is provided



Appendix  
1.2.  
(Continued)

9	57	0.63	being able to help neighbouring provinces
10	13	0.63	being a multi-stakeholder field
11	5	0.63	being a multidisciplinary field
12	22	0.63	preventing chaos and anarchy
13	38	0.63	providing a quick reaction
14	17	0.63	the disaster is a matter above many things

### 1.3 Communication with Other Organisations – Input Closeness

Rank	Vertex	Value	ID
1	79	1.00	ensuring that organisations are able to procure the necessary supplies
2	78	0.89	reaching wider stakeholders through corporate communication
3	65	0.89	pre-disaster communication facilitates communication during the disaster
4	62	0.78	giving importance to organisational knowledge and experience
5	77	0.78	providing education with a common synergy
6	76	0.78	being a necessity
7	64	0.78	being in the field allows keeping the communication channel open with other organisations
8	63	0.73	ensuring the communication of team leaders with each other
9	60	0.67	keeping communication alive
10	59	0.67	enabling stakeholders to recognise each other
11	58	0.67	being a multifaceted issue
12	75	0.67	being a multidisciplinary field
13	74	0.67	knowing the authorised and technical organisations
14	73	0.67	cooperation offers an open environment for two-way communication

### 1.4 Communication with Other Organisations – Output Closeness

Rank	Vertex	Value	ID
1	15	1.00	ensuring the correct intervention and determination of the correct course of action
2	29	1.00	ensuring the coordination
3	11	0.89	ensuring the awareness of the situation
4	25	0.78	being able to coordinate teams
5	50	0.78	being able to evaluate how long the danger in the disaster field will last

Appendix

1.4.

(Continued)

6	2	0.78	disaster is a common issue for all stakeholders in the city
7	8	0.78	ability to act in an organised manner
8	7	0.67	ensuring that assistance is provided
9	57	0.67	being able to help neighbouring provinces
10	13	0.67	being a multi-stakeholder field
11	5	0.67	being a multidisciplinary field
12	22	0.67	preventing chaos and anarchy
13	38	0.67	providing a quick reaction
14	17	0.67	the disaster is a matter above many things

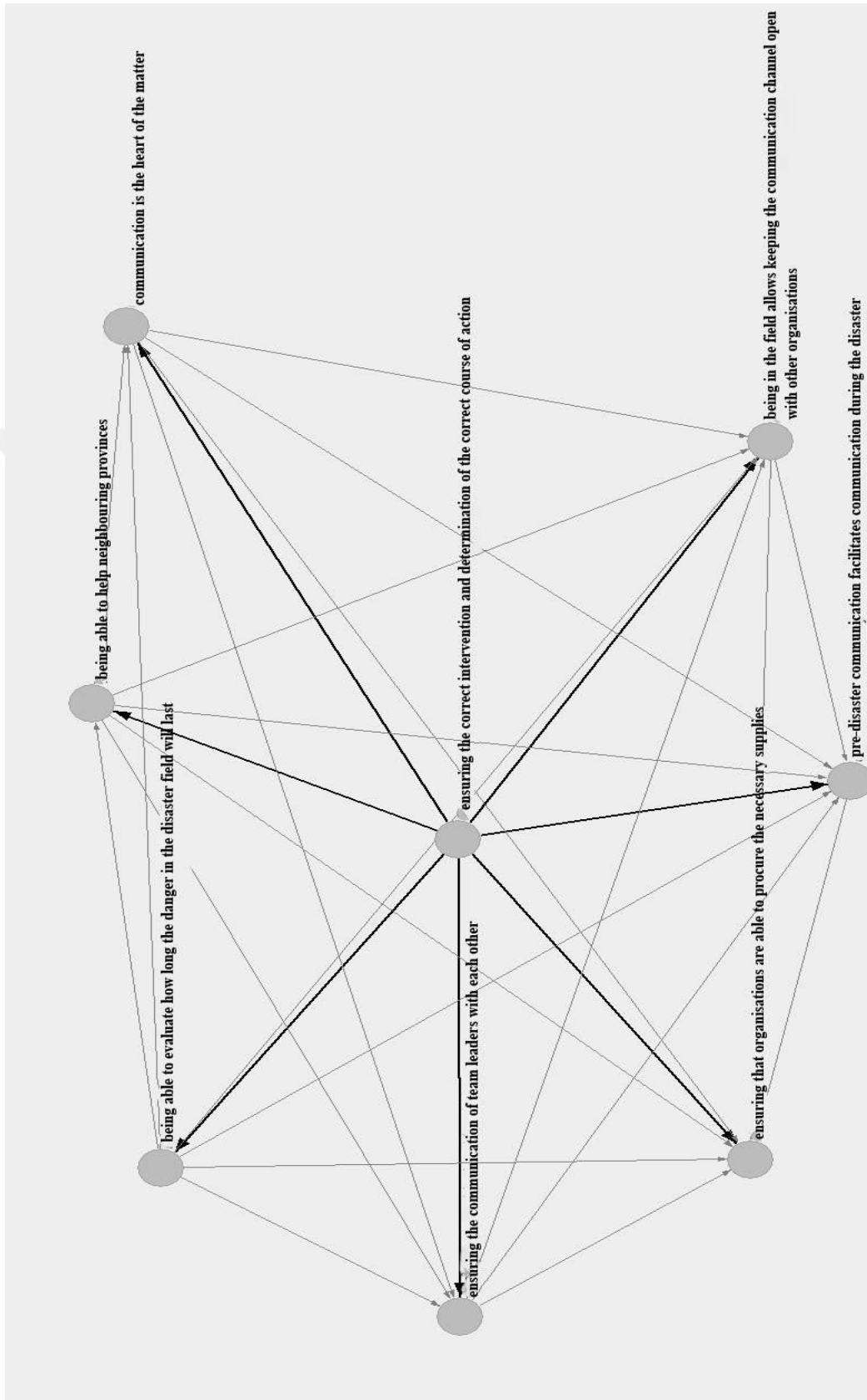
**1.5 Communication with Other Organisations – Betweenness**

Rank	Vertex	Value	ID
1	27	1.00	the necessity of cooperation

**1.6 Communication with Other Organisations – Articulation Points**

Rank	Vertex	Value	ID
1	27	2.00	the necessity of cooperation

## 1.7 Communication with Other Organisations – Network Between Values Connected with More Than Value 2



## 2.1 Organisation with Strong Communication Skills – Input Degree

Rank	Vertex	Value	ID
1	84	1.00	competent
2	59	0.73	able to mobilise other stakeholders
3	44	0.69	willing
4	105	0.65	communicates easily
5	93	0.54	interested
6	92	0.54	able to work as a team
7	91	0.50	able to use communication tools well
8	90	0.50	training other teams
9	89	0.46	respectful of human beings
10	88	0.46	with the ability to turn into action
11	87	0.42	environmentally conscious
12	86	0.42	meritocratic

## 2.2 Organisation with Strong Communication Skills – Output Degree

Rank	Vertex	Value	ID
1	11	1.00	sharing
2	8	1.00	active
3	24	0.94	returning to stakeholders in need
4	12	0.88	who has a good dialogue with the citizen
5	25	0.82	who can turn a negative environment into a positive one
6	47	0.82	doing social welfare
7	37	0.82	delivering needs to the right place
8	54	0.76	intensively working
9	62	0.71	able to communicate quickly
10	48	0.71	who admits his mistakes and shortcomings
11	38	0.71	who make good explanations

## 2.3 Organisation with Strong Communication Skills – Input Closeness

Rank	Vertex	Value	ID
1	84	1.00	competent
2	59	0.96	able to mobilise other stakeholders
3	105	0.94	communicates easily
4	44	0.88	willing
5	92	0.75	able to work as a team
6	103	0.74	who is open to communication
7	90	0.72	training other teams
8	77	0.71	able to quickly translate information into action
9	101	0.70	able to communicate directly
10	72	0.69	experienced

## 2.4 Organisation with Strong Communication Skills – Output Closeness

Rank	Vertex	Value	ID
1	8	1.00	active
2	11	0.95	sharing
3	24	0.91	returning to stakeholders in need
4	37	0.86	delivering needs to the right place
5	47	0.83	doing social welfare
6	12	0.81	who has a good dialogue with the citizen
7	54	0.80	intensively working
8	25	0.78	who can turn a negative environment into a positive one
9	62	0.76	able to communicate quickly
10	38	0.73	who make good explanations

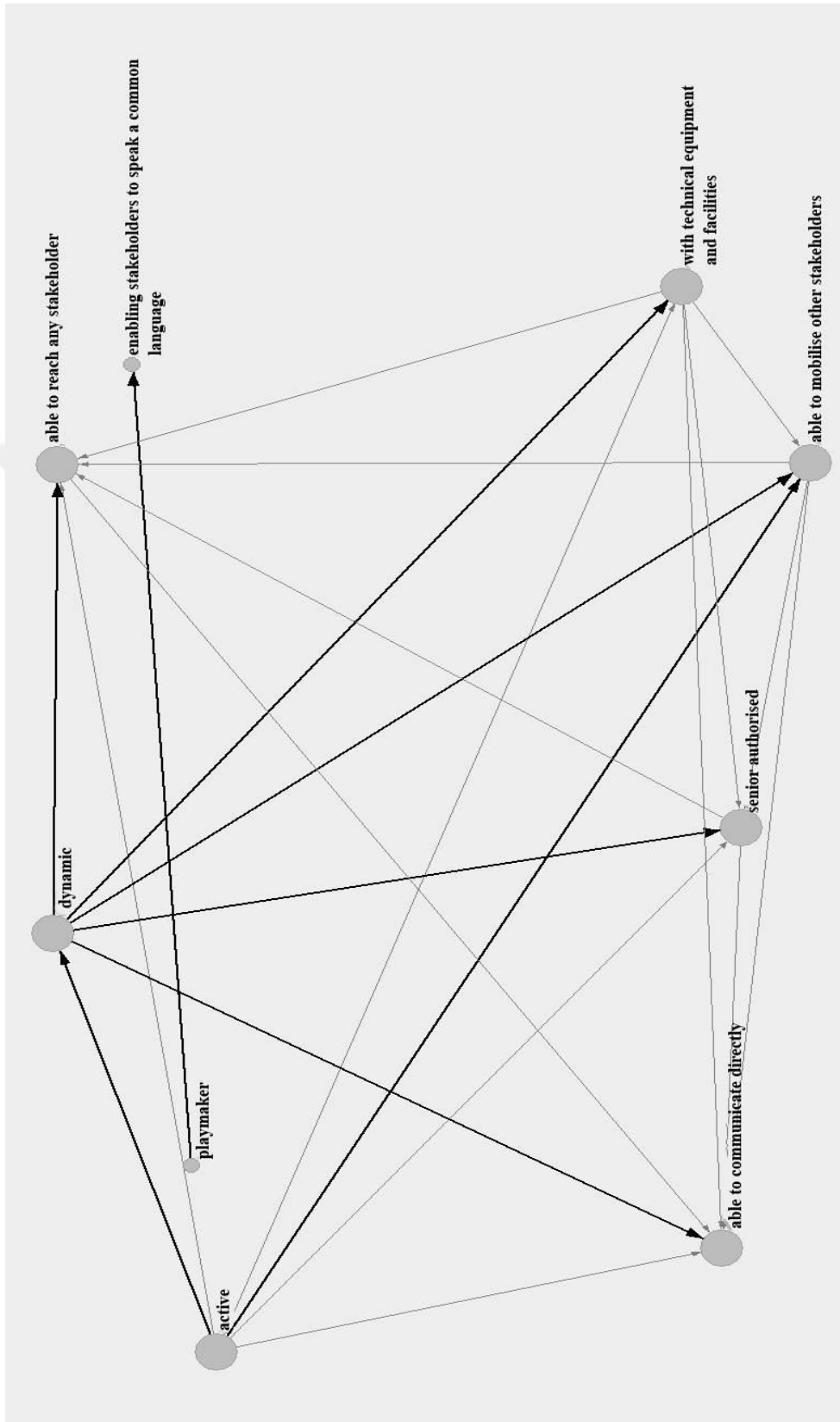
## 2.5 Organisation with Strong Communication Skills – Betweenness

Rank	Vertex	Value	ID
1	59	1.00	able to mobilise other stakeholders
2	22	0.98	able to reach any stakeholder
3	84	0.82	competent
4	52	0.29	centralised
5	44	0.19	willing
6	8	0.14	active
7	2	0.04	able to touch the citizen
8	17	0.03	volunteer
9	51	0.007	with technical equipment and facilities
10	21	0.007	dynamic
11	67	0.007	senior authorised

## 2.6 Organisation with Strong Communication Skills – Articulation Points

Rank	Vertex	Value	ID
1	52	2.00	centralised
2	2	2.00	able to touch the citizen
3	22	2.00	able to reach any stakeholder
4	44	2.00	willing
5	84	2.00	competent
6	17	2.00	volunteer

## 2.7 Organisation with Strong Communication Skills – Network Between Values Connected with More Than Value 2



### 3.1 Problems in Emergency Communication – Input Degree

Rank	Vertex	Value	ID
1	143	1.00	necessity for the media to confirm information about the disaster
2	248	0.92	necessity of coordinated communication
3	231	0.88	financial inadequacies cause communication to go through a single channel
4	247	0.81	necessity to increase the value given to science in Turkish society
5	246	0.81	necessity of unification of air, land and sea communications
6	245	0.81	professional chambers looking at disaster with the dimension of criticising the government
7	230	0.81	the state does not attach sufficient importance to the disaster in terms of supervision
8	229	0.81	GSM operators cut off communication at the slightest inconvenience
9	228	0.81	weakening of social communication in the virtual environment
10	134	0.81	lack of attention to earthquake experts

### 3.2 Problems in Emergency Communication – Output Degree

Rank	Vertex	Value	ID
1	58	1.00	necessity for service operators to strengthen their service quality and infrastructure
2	15	0.78	after 17 August, organisations, citizens and the state became incapacitated
3	30	0.75	the fact that material and technological possibilities will be insufficient in the event of a major natural disaster
4	45	0.72	the central government acting with the mentality of 'let me do everything'
5	10	0.72	organisations not being aware of each other
6	1	0.69	failure to implement IRAP (Provincial Disaster Risk Plan)
7	60	0.69	shortcomings in the drill
8	14	0.69	telephone communication was incorrect during the disaster
9	25	0.69	lack of professional knowledge
10	42	0.69	having to push some organisations to communicate

### 3.3 Problems in Emergency Communication – Input Closeness

Rank	Vertex	Value	ID
1	143	1.00	necessity for the media to confirm information about the disaster
2	248	0.91	necessity of coordinated communication
3	231	0.88	financial inadequacies cause communication to go through a single channel
4	247	0.87	necessity to increase the value given to science in Turkish society
5	228	0.85	weakening of social communication in the virtual environment
6	134	0.84	lack of attention to earthquake experts
7	242	0.82	hegemony of Istanbul Technical University and Middle East Technical University
8	225	0.82	society's inability to use the means of communication well
9	246	0.81	necessity of unification of air, land and sea communications
10	237	0.81	necessity of increasing the number of satellite phones

### 3.4 Problems in Emergency Communication – Output Closeness

Rank	Vertex	Value	ID
1	58	1.00	necessity for service operators to strengthen their service quality and infrastructure
2	42	0.92	having to push some organisations to communicate
3	15	0.85	after 17 August, organisations, citizens and the state became incapacitated
4	13	0.85	not using the walkie-talkie too much
5	11	0.84	organisations tend to fulfil only their own tasks
6	28	0.82	occupation of GSM operators after disasters
7	30	0.82	the fact that material and technological possibilities will be insufficient in the event of a major natural disaster
8	14	0.81	telephone communication was incorrect during the disaster
9	26	0.81	coming to forefront of personal wishes in organisation
10	43	0.79	necessity of disaster awareness in society



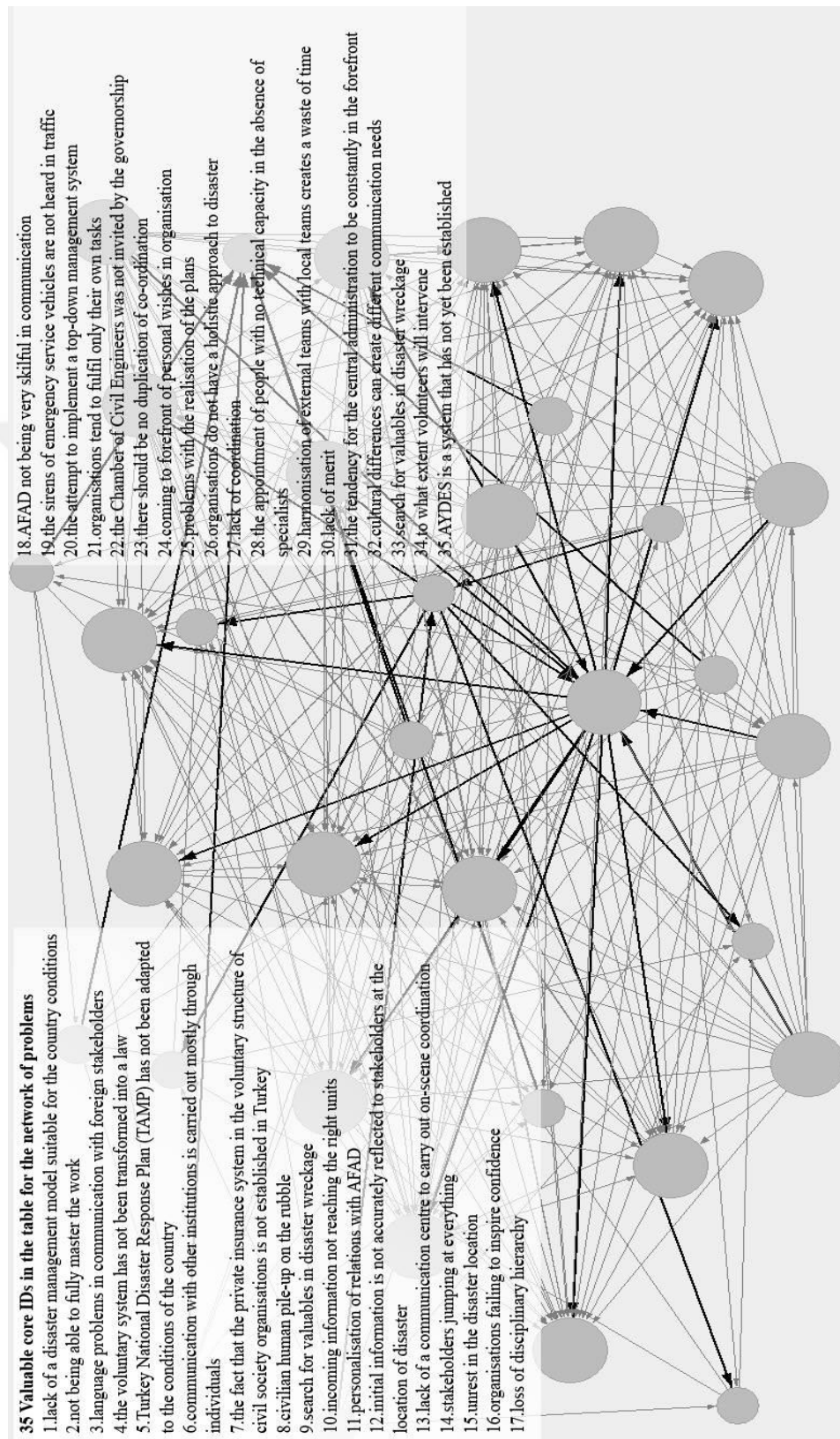
### 3.5 Problems in Emergency Communication – Betweenness

Rank	Vertex	Value	ID
1	42	1.00	having to push some organisations to communicate
2	134	0.84	lack of attention to earthquake experts
3	112	0.76	problems with the realisation of the plans
4	4	0.47	lack of merit
5	21	0.38	lack of awareness
6	143	0.34	necessity for the media to confirm information about the disaster
7	58	0.25	necessity for service operators to strengthen their service quality and infrastructure
8	229	0.002	GSM operators cut off communication at the slightest inconvenience
9	228	0.002	weakening of social communication in the virtual environment
10	102	0.001	necessity of establishing a separate communication channel among search and rescue teams

### 3.6 Problems in Emergency Communication – Articulation Points

Rank	Vertex	Value	ID
1	58	2.00	necessity for service operators to strengthen their service quality and infrastructure
2	21	2.00	lack of awareness
3	42	2.00	having to push some organisations to communicate
4	4	2.00	lack of merit
5	143	2.00	necessity for the media to confirm information about the disaster
6	134	2.00	lack of attention to earthquake experts

### 3.7 Problems in Emergency Communication – Network Between Values Connected with More Than Value 2 (Since the table is very complex, the IDs in the network are written on the table)



#### 4.1 Problems in Cooperation with a Public Institution– Input Degree

Rank	Vertex	Value	ID
1	1	1.00	non-cooperation
2	3	1.00	bureaucracy
3	51	0.88	public institutions perceive criticism as an insult
4	62	0.75	organisational chauvinism
5	61	0.75	trusting the foreign person more
6	50	0.75	confusion between the concepts of state and government in the last 10 years
7	49	0.75	dependence on Ankara
8	21	0.75	desire to stand out
9	41	0.75	to pass over certain major works
10	60	0.63	political reasons
11	59	0.63	the metropolitan municipality's closing down some things as wasteful
12	48	0.63	overspending of resources
13	47	0.63	the bifurcation in the centre caused by the political climate
14	33	0.63	political considerations

#### 4.2 Problems in Cooperation with a Public Institution– Output Degree

Rank	Vertex	Value	ID
1	3	1.00	bureaucracy
2	7	0.89	not wanting to share power and authority
3	21	0.89	desire to stand out
4	20	0.89	not being able to ask for things by direct communication
5	1	0.78	non-cooperation
6	30	0.67	keeping accurate information about the disaster as a state secret
7	9	0.67	not to take action without criticising
8	37	0.67	lack of self-confidence of the people in charge
9	27	0.56	being closed to the new
10	12	0.56	inexperience in communication with public institutions
11	2	0.56	problematic permission processes
12	41	0.56	to pass over certain major works

#### 4.3 Problems in Cooperation with a Public Institution– Input Closeness

Rank	Vertex	Value	ID
1	62	1.00	organisational chauvinism
2	49	0.96	dependence on Ankara
3	41	0.95	to pass over certain major works
4	46	0.85	thinking that I'm the only one responsible
5	59	0.80	the metropolitan municipality's closing down some things as wasteful
6	45	0.75	municipalities failing to fulfil their responsibilities
7	1	0.74	non-cooperation
8	61	0.72	trusting the foreign person more
9	3	0.69	bureaucracy
10	60	0.67	political reasons

#### 4.4 Problems in Cooperation with a Public Institution– Output Closeness

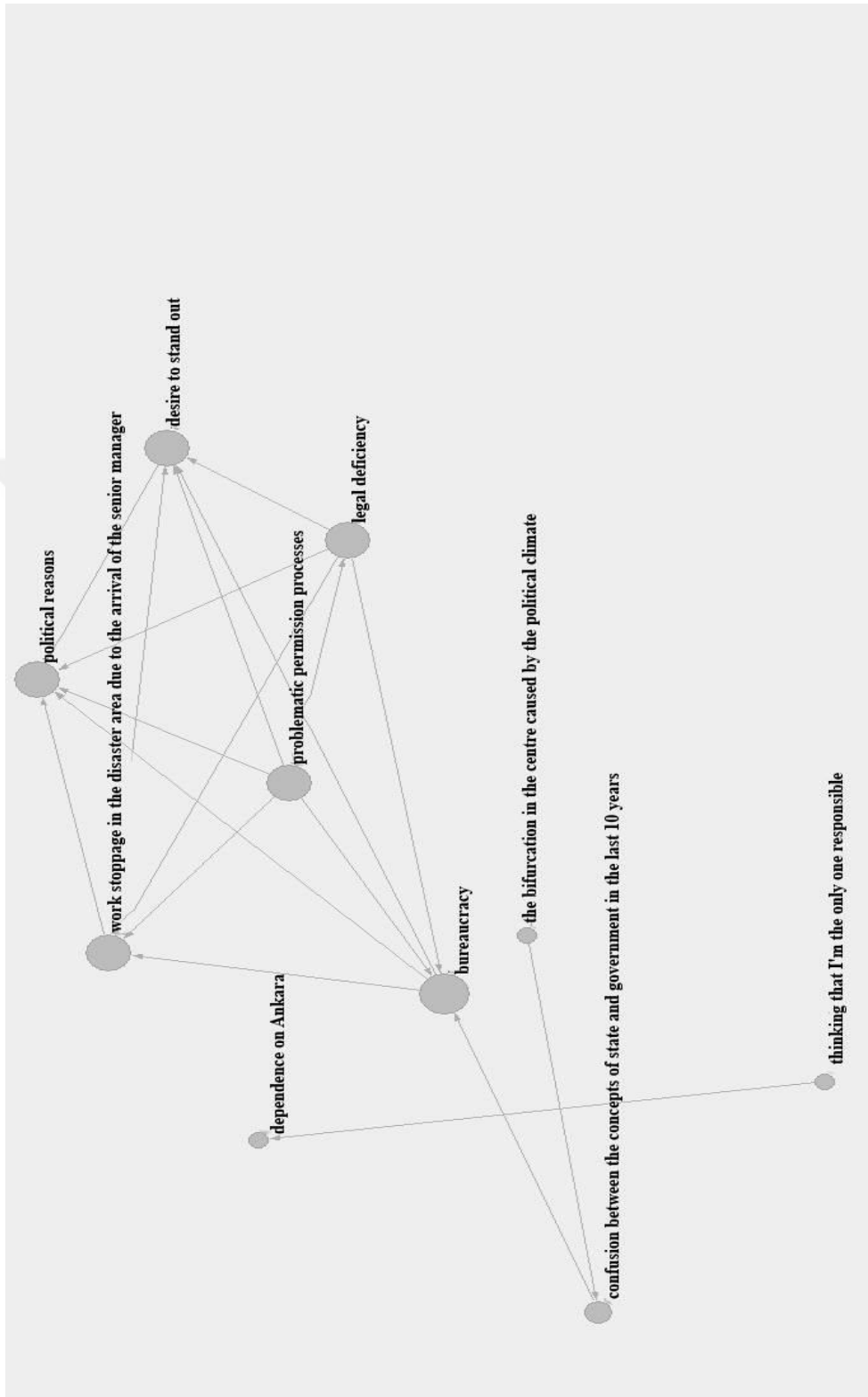
Rank	Vertex	Value	ID
1	7	1.00	not wanting to share power and authority
2	20	0.97	not being able to ask for things by direct communication
3	3	0.93	bureaucracy
4	37	0.88	lack of self-confidence of the people in charge
5	30	0.80	keeping accurate information about the disaster as a state secret
6	2	0.78	problematic permission processes
7	50	0.75	confusion between the concepts of state and government in the last 10 years
8	15	0.73	legal deficiency
9	43	0.67	they are worried that they have done something wrong somewhere
10	14	0.64	not keeping up with the age

#### 4.5 Problems in Cooperation with a Public Institution– Betweenness

Rank	Vertex	Value	ID
1	3	1.00	bureaucracy
2	1	0.70	non-cooperation
3	21	0.63	desire to stand out
4	41	0.35	to pass over certain major works
5	50	0.21	confusion between the concepts of state and government in the last 10 years
6	33	0.12	political considerations
7	12	0.10	inexperience in communication with public institutions
8	47	0.01	the bifurcation in the centre caused by the political climate
9	43	0.01	they are worried that they have done something wrong somewhere
10	37	0.01	lack of self-confidence of the people in charge

*There are no articulation points in “Problems in Cooperation with a Public Institution” network.*

#### 4.6 Problems in Cooperation with a Public Institution – Network Between Values Connected with More Than Value 2



### 5.1 Problems in Cooperation with NGOs – Input Degree

Rank	Vertex	Value	ID
1	34	1.00	avoidance of cooperation
2	25	0.88	the mentality that let the state help me and I'll work
3	24	0.75	lack of a board of directors
4	23	0.63	AKUT's tendency to work separately for a period
5	14	0.50	acting independently
6	22	0.50	desire for self-assertion
7	21	0.38	political action
8	16	0.38	economic difficulties
9	33	0.38	competence status
10	32	0.38	desire to be at the forefront

### 5.2 Problems in Cooperation with NGOs – Output Degree

Rank	Vertex	Value	ID
1	7	1.00	desire to stand out
2	8	0.80	not all non-governmental organisations are sufficient
3	20	0.60	identity problem
4	5	0.50	there should not be any difficulties
5	21	0.50	political action
6	22	0.40	desire for self-assertion
7	3	0.30	AKUT sees itself above the official organisation
8	23	0.30	AKUT's tendency to work separately for a period
9	4	0.30	desire to be a hero
10	1	0.20	organisational chauvinism
11	15	0.20	personalisation of relationships
12	13	0.20	some NGOs being closed in their inner world
13	12	0.20	trying to do other's work by exceeding authorisation
14	24	0.20	lack of a board of directors
15	11	0.20	political stuff
16	10	0.20	insufficient financial means
17	9	0.20	not showing enough sensitivity to events

### 5.3 Problems in Cooperation with NGOs – Input Closeness

Rank	Vertex	Value	ID
1	34	1.00	avoidance of cooperation
2	25	0.89	the mentality that let the state help me and I'll work
3	24	0.78	lack of a board of directors
4	23	0.67	AKUT's tendency to work separately for a period
5	14	0.56	acting independently
6	22	0.56	desire for self-assertion

Appendix  
5.3.  
(Continued)

7	30	0.47	being a barrier against NGOs
8	21	0.44	political action
9	16	0.44	economic difficulties
10	33	0.44	competence status
11	32	0.44	desire to be at the forefront

**5.4 Problems in Cooperation with NGOs – Output Closeness**

Rank	Vertex	Value	ID
1	7	1.00	desire to stand out
2	8	0.86	not all non-governmental organisations are sufficient
3	20	0.64	identity problem
4	5	0.55	there should not be any difficulties
5	21	0.55	political action
6	22	0.45	desire for self-assertion
7	9	0.42	not showing enough sensitivity to events
8	3	0.36	AKUT sees itself above the official organisation
9	23	0.36	AKUT's tendency to work separately for a period
10	4	0.36	desire to be a hero

**5.5 Problems in Cooperation with NGOs – Betweenness**

Rank	Vertex	Value	ID
1	5	1.00	there should not be any difficulties
2	7	0.75	desire to stand out
3	14	0.75	political action
4	11	0.50	political stuff
5	16	0.50	economic difficulties

**5.6 Problems in Cooperation with NGOs – Articulation Points**

Rank	Vertex	Value	ID
1	7	2.00	desire to stand out
2	14	2.00	acting independently
3	5	2.00	there should not be any difficulties
4	16	2.00	economic difficulties

*There is not Graph of Values Connected with More Than Value 2 in “Problems in Cooperation with NGOs” network.*



### 6.1 Problems in Cooperation with Private Sector – Input Degree

Rank	Vertex	Value	ID
1	37	1.00	emotional approach of the private sector
2	25	0.80	taking part in more one-to-one communication
3	36	0.80	see it as an expense
4	12	0.60	loss of work
5	24	0.60	loss of revenue
6	23	0.60	having variable structures
7	35	0.60	it is related to the internal functioning of the company
8	34	0.60	the fact that media organisations are in competition with each other
9	33	0.60	seeing the disaster issue as an unnecessary expense
10	31	0.40	seeing the issue of disasters as unimportant
11	30	0.40	having very limited methods such as staying in good condition, labour service procurement
12	22	0.40	they do not have a very important role in the disaster
13	21	0.40	the private sector should provide accurate information flow
14	20	0.40	the media is in complete chaos
15	19	0.40	loss of money
16	32	0.40	the lack of a sufficient private sector with social awareness in our country

### 6.2 Problems in Cooperation with Private Sector – Output Degree

Rank	Vertex	Value	ID
1	1	1.00	not experiencing any difficulties
2	15	0.44	not taking part in pre-disaster processes
3	12	0.44	loss of work
4	8	0.44	workers' trade union rights
5	3	0.33	waste of time
6	6	0.33	the fact that he is not very involved in disaster affairs
7	5	0.33	the perspective of the mainstream media that sees itself above everything else
8	22	0.33	they do not have a very important role in the disaster
9	16	0.33	some of them have disaster equipment only for show
10	14	0.22	the private sector is not very receptive to cooperation
11	13	0.22	the mainstream media's dismissive view of local media
12	23	0.22	having variable structures
13	9	0.22	in the private sector, this issue is not on their agenda at all
14	2	0.22	inability to cooperate directly

### 6.3 Problems in Cooperation with Private Sector – Input Closeness

Rank	Vertex	Value	ID
1	37	1.00	emotional approach of the private sector
2	25	0.83	taking part in more one-to-one communication
3	36	0.83	see it as an expense
4	33	0.71	seeing the disaster issue as an unnecessary expense
5	12	0.67	loss of work
6	24	0.67	loss of revenue
7	23	0.67	having variable structures
8	35	0.67	it is related to the internal functioning of the company
9	34	0.67	the fact that media organisations are in competition with each other
10	19	0.56	loss of money

### 6.4 Problems in Cooperation with Private Sector – Output Closeness

Rank	Vertex	Value	ID
1	1	1.00	not experiencing any difficulties
2	7	0.58	collecting and distributing information for money
3	8	0.53	workers' trade union rights
4	15	0.50	not taking part in pre-disaster processes
5	12	0.50	loss of work
6	3	0.43	waste of time
7	16	0.43	some of them have disaster equipment only for show
8	6	0.40	the fact that he is not very involved in disaster affairs
9	5	0.40	the perspective of the mainstream media that sees itself above everything else
10	22	0.40	they do not have a very important role in the disaster

### 6.5 Problems in Cooperation with Private Sector – Betweenness

Rank	Vertex	Value	ID
1	1	1.00	not experiencing any difficulties
2	12	0.67	loss of work

### 6.6 Problems in Cooperation with Private Sector – Articulation Points

Rank	Vertex	Value	ID
1	1	2.00	not experiencing any difficulties
2	12	2.00	loss of work

*There is not Graph of Values Connected with More Than Value 2 in “Problems in Cooperation with Private Sector” network.*

