

A descriptive analysis of the emergency response to the 2013 flood incident in Suffolk, UK

- A study in theory and practice

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Abstract

Over the past decade, flooding has been a great issue for several countries in Europe. With the movement of people and assets to flood prone areas, consequences due to flooding are increasing. Coping with this problem requires an effective response to flood risks. Therefore, this work has aimed to describe the emergency response to the 2013 flood incident in Suffolk, UK. This, in order to provide valuable input to the ongoing research project on flood risk management in Sweden called SUrF – Sustainable Urban Flood Management. The researchers have achieved this aim by describing both the actual-, as well as the intended emergency response. Here, the actual response refers to how the response went in practice, whilst, the intended response refers to the response as described in response plans. The actual response was described using interviews with participating actors and by performing a Social Network Analysis. Further, the intended response was described by analysis of existing response plans and by interviews with emergency planners in Suffolk. This have resulted in a thorough description of the response with, for instance Social Network Graphs showing the flow of communication amongst actors that were active in the response. Comparisons between the actual and the intended response showed that patterns of the structural framework described in response plans were also present in the social network graphs presenting the actual response. However, results showed that inconsistencies were present as well. Finally, it is the belief of the authors that this study enables for further comparison and analysis to be made.

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Summary

Flooding is an increasing problem for several countries in Europe. During the past years, economic damages have increased and there is little evidence suggesting that this trend will stop. It can be argued that the increased consequences of flooding are due to urbanisation. Naturally, there are numerous protection values in an urban area, making the potential for loss enormous. Additionally, some state that climate change is a factor enlarging the risk of flooding. This leaves a higher demand in managing the occurrence and consequences of flooding.

Historically, flood risk management has been focusing on preparedness and prevention measures since these measures have shown to be more cost effective compared to response and recovery measures. However, with an increasing risk for flooding, society cannot afford to leave measures of response and recovery behind. There is a need for effective solutions as well as cooperation among involved stakeholders in flood prone areas.

In order to find more effective organisational models for flood management, it is important to understand the present models. Therefore, the aim of this master thesis is to perform a descriptive analysis of the actual, respectively, the intended emergency response to the 2013 flood incident in Suffolk, UK. The master thesis is conducted as part of an ongoing research project in Sweden called Sustainable Urban Flood Management, or SUrF. The authors of this master thesis hope to provide input to this research project, as well as to others that can benefit from this study.

The methods found appropriate for the purpose of this work were a social network analysis and interviews with important stakeholders in the emergency response. For the social network analysis, data was acquired by using a web questionnaire, which was spread to participating actors using a snowball sampling approach. The social network analysis resulted in social network graphs, showing the flow of communication amongst actors in the response. This combined with interviews and incident reports could describe the actual response in a way the authors found valid. The intended response was described using interviews with emergency planners as well as by looking at response plans and practices on flood and emergency response in Suffolk.

Finally, it is the opinion of the researchers that they managed to describe the response in a way that enables further comparison and analysis to be made. However, the results shown in this report are outcomes of the researchers' choices of research methods as well as the respondents' subjective and biased views. On the other hand, biases are inevitable and does not imply that learning points cannot be drawn.

When comparing the intended and the actual response, the researchers found some consistencies. For instance, patterns of the structural framework that existed in response plans could also be seen in the social network graphs presenting the actual response. Not surprisingly, there were also inconsistencies. As a respondent humorously explained: "No battle plan survives first contact with the enemy or as in this case, No Flood Plan survives first contact with flood water".

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1 Introduction

The introduction will begin with a short background, covering the subject as well as to why it is a relevant subject of study. Furthermore, there will be a short description on the research project SURF, followed by a specification of the purpose of this master thesis. Finally, the thesis outline of this work will be described.

1.1 Background

Over the past decade, flooding have been a great issue for several countries in Europe. As flooding may cause consequences such as the loss of life and/or protection values, it definitely is a hazard that needs to be taken into consideration. Interestingly, loss of life due to flooding has decreased during the past years, whilst economic damages have increased drastically. These phenomena especially concern Scandinavia, Eastern Europe, Austria, and the UK (Lugeri et al, 2013).

Unfortunately, there is nothing suggesting that this trend of increasing problems due to flooding will tail away. On the other hand, according to a report by IPCC (2012), Europe is exposed to an enhanced risk of increased and heavier precipitation. This means Europe is exposed to an enlarged risk of flash floods. The report further estimates an increasing risk of coastal flooding due to anthropogenic climate changes.

The report by Barredo (2009) emphasises that it is societal changes that have caused the great losses in these flood incidents. Barredo further states that these societal changes are results of a socio-economic shift. The shift, he is referring to, is the gradual shift of assets and population from rural to urban areas. Naturally, when disasters strike urban areas with a lot of protection values, the potential for loss is enormous. Aspects that are threatened by flooding are, for example: infrastructure, schools, health care services, housing, population (especially the vulnerable part of it), et cetera. Further, the article stresses the uncertainty of the evidence that underlies the increasing damages of floods induced by anthropogenic climate changes.

Nevertheless, it is probably impossible to precisely anticipate the consequences of future climate change. Where and when incidents might occur are possibly even more difficult to foresee. However, it is certain that flood risks have been, and will continue to be, a concern for various parts of the world, also for Europe. Greater risk for flooding in Europe leaves, hence, a higher demand in managing the occurrence and consequences of flooding.

Historically, flood risk management has been characterised by preparedness and prevention measures. These types of measures have shown to be more cost effective and therefore more economic against response and recovery measures. However, flooding in urban areas stresses improvement of all aspects in flood risk management: anticipation, prevention, response, and recovery. The potential of a flood damaging critical societal functions in an urban area is too high to leave improvement of response- and recovery measures behind.

A successful response to the incident of a flood could drastically decrease losses of health and economical values (WMO/GWP, 2008). Also, a functioning response might improve robustness against future incidents.

Furthermore, it is important to understand that as the number of people and assets increases in flood prone areas, the need for effective solutions and cooperation between involved stakeholders increases as well. In an emergency response, cooperation between involved stakeholders is stressed, causing several challenges in managing collaboration successfully. According to Dynes (1970) a disaster could create new or altered organisational structures in organisations. At the same time, Kreps (1984) means that construction of social networks is rather improvised than planned. These improvised social networks may contradict to the ones in the intended emergency plan, and therefore, interfere with it.

Finally, the emergence of social networks is a rather complex matter, making it even harder to distinguish the factors that characterises how and when emergency response networks will emerge within them. However, it is probable that social networks play an important role in the success of the response to a certain disaster. In this report, a social network approach will be performed on the actors active in the emergency response to the 2013 flood incident in Suffolk, UK. Further, the researchers will perform interviews with important actors in the emergency response, in order to get an idea of their opinion of the response. The purpose for this work is to describe the actual and the intended emergency response to the 2013 tidal surge. Are there any differences between the two? What are the opinions of the actors, active in the response?

1.2 Sustainable Urban Flood Management, SUrF

This master thesis-project is conducted as part of an ongoing Swedish research project. The name of this project is Sustainable Urban Flood Management (SUrF). SUrF is an ongoing research project centred on the following areas/municipalities in Sweden: Malmö, Helsingborg, Göteborg, and Høje å river basin (Lomma, Lund, Staffanstorps). These places are all vulnerable to coastal-and/or pluvial flooding and are the objects of research. The ultimate aim of the research study is to: “produce results which will be of high relevance and value to organisations and individuals working with sustainable urban flood management” (p.6). To achieve this aim, SUrF have described 6 detailed objectives and 2 action oriented objectives.

One of the two action oriented objectives is to “*find effective organisational models for flood management*”. The method to be used, in order for this specific objective to be achieved, is to perform an international study of organisational models. Countries that are of special interest, for this study are: United Kingdom, Germany, Netherlands, and United States. Once the case studies are done, the results will be compared with case studies performed in Sweden. Further, the concept of efficiency in flood management will be analysed and indicators for the concept will be suggested. Hence, the efficiency of the management in Sweden, respectively in some international case study areas can be evaluated.

1.3 Research Objectives and Questions

The overall aim of this master thesis is to provide valuable input the above specified objective: “*to find effective organisational models for flood management*”. This will be done by performing a case study on the organisational model for flood management in the UK. More specifically, the authors of this work have chosen to look at the emergency response to the past flood incident, namely, the 2013 tidal surge in Suffolk. The objective of this work is to perform a descriptive analysis of the actual, respectively, the intended emergency response to this flood incident. The intended response here refers to the response, according to present plans and policies among the stakeholders in the response. In order to fulfil this objective, the strive is to answer the three below research questions:

- How did the actual emergency response to the 2013 Tidal surge incident in Suffolk proceed?
- How should the emergency response to this incident be organised according to existing plans and policies among stakeholders?
- In comparison between the two, what are the differences, and why might they exist?

1.4 Thesis outline

The report begins with an Introduction in Chapter 1, covering a short Background of this work, along with the specified Research Questions and Objectives. Chapter 2 follows with a Theoretical Framework, describing the main terms and theory used in the report. Thereafter, the report includes Study context in Chapter 3. Then follows the Methods (Chapter 4), where research designs and methods used will be described and discussed. Naturally, data obtained by these methods will then be described in the Results-section (Chapter 5), followed by an analysis and discussion of results in the Discussion (Chapter 6). Finally, a conclusion can be drawn in the Conclusions-section (Chapter 7). References and appendices can be found in Chapter 8, respectively, 9.

2 Theoretical framework

In the following section, the authors will provide a theoretical framework containing the theory necessary to understand the meaning of, and differences between, the concepts used in this report. This will hopefully enable a higher grade of understanding when reading the report.

2.1 Emergency, crisis, and disaster

When describing a negative event, words such as emergency, crisis, and disaster are often used. Sometimes, all three concepts are used when referring to the same situation. However, scientifically, the words have different meanings and could therefore be misused. It is thus of great importance to clarify the meaning of each concept. This may enable an understanding of the terms and a possibility to distinguish the differences. In further reading the concepts are defined and discussed.

2.1.1 What is an emergency?

The definition of the term emergency will in this report follow the definition of the term in the Civil Contingency Act 2004 in UK. In the Civil Contingencies Act 2004, an emergency is defined as:

1. An event or situation that threatens serious damage to human welfare in a place in the United Kingdom
2. An event or situation that threatens serious damage to the environment of a place in the United Kingdom
3. War or terrorism that threatens serious damage to the security of the United Kingdom

Damage to human welfare refers to loss of human life, human illness or injury, homelessness, damage to property, disruptions of a supply of money, food, water, energy or fuel. In addition, it could be disruption of communication systems and facilities for transportation.

Furthermore, an event or a situation that threatens serious damage to the environment refers to contamination of land, water or air with biological, chemical or radioactive matter. It could also be disruption or destruction of plant- or animal life.

2.1.2 What is a crisis?

In previous research, the concept of crisis is defined in several different ways. Darling (1994) argues that a crisis can be determined by a number of different variables and is therefore both unique and highly contextual to the current situation. According to McMullan (1997) there are no universally accepted definition. However, the author states that a situation will develop into a crisis if the following three elements are current:

1. A triggered event that either causes or has the potential of causing a significant change
2. An incapability to manage and cope with the triggered situation
3. A change so substantial that it threatens the survival for an organisation, government or a country

Shaluf et al (2003) argue that the term crisis often relates to something negative rather than positive. For instance, in the book authored by Rake (2008) it is written that the consequences of a crisis often result in a question between life and death. Other scientists also stress that a crisis calls for a need to act and take decisions under time pressure (Boin, 2005) (Rosenthal, 2001).

Olsson et al (2000) consider a crisis to be a negative change where there is a need to take decisions quickly. The authors further define a crisis as an event where there is a large degree of uncertainty present. In summary, a crisis is defined as a situation where decisions encounter the following three conditions:

- Basic values are threatened
- Limited time available
- Considerable degree of uncertainty

2.1.3 What is a disaster?

The concept of disaster is similar to the concept of crisis (Shaluf et al, 2001). A disaster could be expressed as a crisis with a bad ending (Boin, 2005). Dombrosky (1998) defines disaster as “an agent too fast, severe and, overwhelming in relation to the capacities available” (p. 23).

2.2 Emergency, crisis and disaster management

Clearly, there are differences between the definitions of the concepts emergency, crisis and disaster. However, according to Rake (2008), there are more similarities than there are differences when comparing the concepts. All three concepts are more or less used to describe an unexpected event that threatens life, properties or the environment. The differences are greater once the consequences of each concept are analysed but less when it comes to managing the emergencies, crisis and disasters. For instance, Rake (2008) uses the four phases: mitigation, preparedness, response and recovery when defining crisis management. Coppola (2011) also uses the four-phase approach. However, he uses the term disaster management for this approach.

Despite the fact that these concepts are different in terms of consequences, the disaster management model will be appropriate when explaining and understanding the phases in emergency and crisis management as well. Also, it is found appropriate in order to understand the different phases in the flood management in Suffolk 2013.

2.2.1 Disaster management

According to Coppola (2011) the modern disaster management originates from different countries Civil Defence Acts, developed in the mid-20th. The term disaster management was further developed during the World conference on Natural Disaster Reduction in Yokohama in Japan, where members of the UN signed an agreement to improve their disaster management. The agreement regarded 10 principles.

Today, the traditional disaster management uses the “disaster cycle”, a conceptual model to explain and address a disaster (Twigg, 2015). The disaster cycle could be seen in figure 1 and uses the phases mitigation, preparedness, response and recovery (Alexander, 2002a).

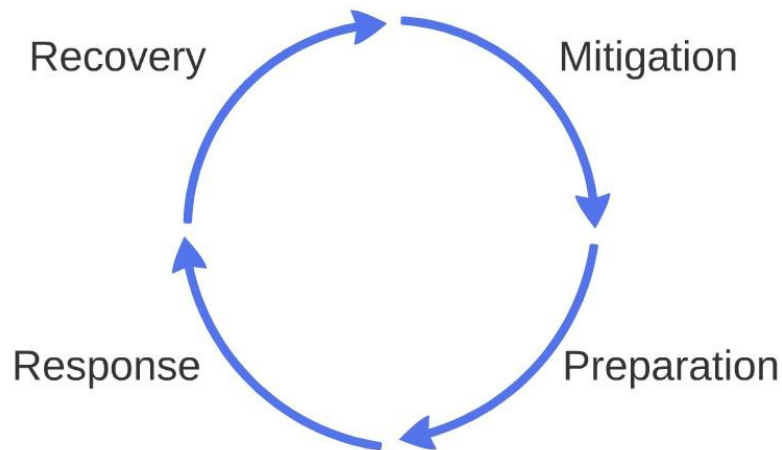


Figure 1. The disaster cycle. Adapted from Alexander (2002b)

Coppola’s disaster management approach

All phases are in the following text explained, using Coppola’s (2011) description of the modern disaster management. The four phases are mitigation, preparedness, response and recovery.

Mitigation

The mitigation phase is the phase where efforts to reduce risks are taken, for example, by reducing the risk for a hazardous event to occur. There are several actions for risk reduction. It could be actions that either reduce the likelihood for an event to occur or actions to reduce the consequences of a future event.

Preparedness

Coppola separates the preparedness phase into two groups, where the preparedness of the government is one and the preparedness of the individuals and businesses the other.

Preparedness of the government group is characterised by emergency planning, for instance the agencies that have responsibilities to act in the event of an emergency. Normally, all agencies with responsibilities have to perform co-operative training for emergency situations.

For the individuals and businesses in the second group, preparedness consists of actions that are strengthening the public’s ability to cope with an emergency. Actions that increase the awareness

of emergencies are important. Also, educating people on how to cope with an emergency could improve how individuals act in an emergency.

Response

The next phase and the major concern for this study is the response phase. In the response phase, efforts taken in order to reduce the impact of an emergency are important for saving lives and other protection values. The phase can be divided into the pre-emergency phase, the emergency-phase, and the post-response.

The pre-emergency phase starts once the hazardous event is recognised. Warning the public and evacuating people at risk are important actions. In addition, allocating resources in order to equip responders is necessary. Finally, last minute actions can strengthen responders' or the public's ability to cope with the emergency.

During the emergency phase the duration could vary depending on what type of hazardous event it is. For a flood, the duration can vary with several days and the impact of the event can vary as well. Responders in the emergency are in this phase coping with casualties, saving life and properties to the extent that the outside circumstances provide.

Once the effects from the hazard have ceased, the final phase in the response follows. The response moves from dealing with the effects from the hazard into dealing with the needs of affected individuals.

Recovery

Finally, the last phase is the recovery phase. During this phase, the strive is to recover from the disturbances the event have created. An event could bring both short- and long-term consequences and actions in the recovery phase should follow to the same extent.

2.3 Social Network Analysis

Social network analysis can be used in order to understand various kinds of networks, focusing on the structure of relations between social entities (Butts, 2008). In this section, the social network approach will be described as well as of why it is found useful in the context of this work.

2.3.1 Social networks

In the article written by Butts (2008) it is described how the social network approach is used in numerous fields of social research. Butts describes a social network as a set of entities which each have relations. Entities are the subjects of study and can, for example, be organisations, persons, texts et cetera. With some constraints, such as the requirement that the relationships are defined on pairs of entities, the social relations can be presented in graphs. Such graphs will contain the two elements: entities, and the ties between them. The network is bounded by the set of entities it involves. A miss-specified boundary that excludes or includes entities that are

important or not important, can make an analysis of the social network deficient. Dependent on the network type, boundaries can be more or less easy to specify on beforehand.

Wasserman and Faust (1994) states that in those applications where network boundary is unknown, there are certain sampling techniques that can be used. An example of such a technique is *snowball sampling* (Goodman, 1961; Erickson, 1979).

2.3.2 Snowball sampling

The snowball sampling method begins with defining an initial set of individuals to begin the study with. These individuals are then asked to name the actors with whom they have/had some kind of relation. The people named in the second wave, are to be interviewed in the same way. The extent to which this process is continued can be varied by the researcher depending on the purpose of the research. (Erickson, 1979)

Snow, Hutcheson and Prather (1981) used snowball sampling to identify residential clusters of minorities (Hispanics) dispersed in Atlanta Georgia. The authors mean that snowball sampling was the most favourable method to use given the size and geographical distribution of the population. The method saves time since no screening of the entire population needs to be done and resources can be used for valid interviewing of the initial individuals (key informers). These key informants were asked to recommend further individuals to continue the sampling and so on. The referrals by respondents provided chains and these chains were documented in order to control the snowball process.

The arguments that Snow et al. (1981) present for using the snowball sampling method in their research, is found valid arguments for using the method in this work as well. The emergency response during a great flood involves a complex network of different individuals (Suffolk Resilience Forum, 2015). A complete network can easily contain hundreds of involved agents, and every one of these agents can have connections to several other agents (Uhr & Johansson, 2007). Striving to define a definite boundary of such a large network is found both difficult and time-consuming. Since the time-span for this work is limited it is found profitable to start with an initial set of key individuals and then extend this set using the snowball approach.

2.3.3 Problems related to the method

There are certain problems identified when using the snowball sampling method. Erickson (1979) discusses how threatening relational questions can lead to lower response rates or biases, especially if the respondent understands that the person he/she names may be interviewed in turn. Another problem that is mentioned in the literature is ‘masking’ – when respondents are willing to contribute but cannot do so adequately because they are asked to give a fixed number of actors and might have more, or less relations than this number. This may lead to that the respondent not answering at all, or a bias depending on how the respondent choose to add and drop names. These problems, Erickson means, lead to chaining processes – that respondents have choice in and/or affects the way the chain is constructed.

Further, Abrahamsson, Hassel and Tehler (2010) bring up issues related to gathering information for analysing an emergency response network. Often the information is gathered through interviews with people who participated in the emergency response, and this can cause biases. People are, for example, subject to several cognitive biases. One example of such is the hindsight bias, meaning that people might revise their perception of the event (Fischhoff, 1975). However, Norris (2007) argues that all kinds of research, whether it is quantitative or as in this case – qualitative, is a human activity and thus subject to the same errors as any other human activity. Norris further states that different kinds of research are prone to different kinds of biases but that none are immune. Therefore, he argues the importance of the researcher being committed and concentrated in order to understand the object or domain of inquiry. Further, the research requires a capacity to accept and use criticism as well as being self-critical.

In addition, Health (1998) announces problems related to people feeling guilty about their involvement in the emergency response, and thus may choose what information to give, or not to give. Same goes for staff and management of organisations, who might want to protect their organization. Another issue brought up is time distortion during the events of crises. This is often due to the intensity of the incident, which makes the days feel longer than they really are.

It is hard to perform snowball sampling ideally, with no chaining processes or cognitive biases. However, this either not the goal. The crucial thing lies in the researchers being open minded, transparent and alert to sources of error when analysing the results.

3 The context of the study

In the following section, the context of the study will be described. There will be an explanation to why it is interesting to look at the county of Suffolk in the context of flooding studies. Also, the section will contain a summation of the Suffolk Emergency Response Plan as well as the different actors that should act in a flood response.

3.1 Suffolk and Flooding



Figure 2 Map of the county of Suffolk. (Suffolk Tourist Guide, 2016)

Suffolk is a county situated on the east coast of England and has Ipswich as the county town. Other important towns in Suffolk include Lowestoft, Bury St Edmunds, Newmarket and Felixstowe. The latter has, for example, one of the largest container ports in Europe. Suffolk shares borders with Norfolk in the north, Cambridgeshire to the west and Essex to the south. To the east lies the North Sea.

The county of Suffolk has landscape with green and blue environment creating cultivatable lands. However, the county is vulnerable to risks such as coastal and pluvial flooding. This, due to its flat landscape and geographic coastal location, with high occurrence of precipitation.

Consequently, the county has suffered from several flood incidents. In January, 1953, the North Sea flood struck the Netherlands, Belgium, England and Scotland. It was a combination of high tide and severe windstorm that caused the storm tide. In England, 307 people died where some 50 of them in Suffolk. Additionally, over 24 000 properties flooded. 60 years later, in December 2013, yet another disaster struck the Eastern coast of England.

3.1.1 The 2013 Flood incident

The storm that hit the east coast of England on the 5th and 6th of December 2013, resulted in the most severe tidal surge since 1953. In some places, the recorded sea levels were higher than during the destructive flood in 1953.

In total, 33 Severe Flood warnings and 73 Flood Warnings were issued by EA to protect areas where there were either risks for loss of life and/or flooding of properties. These warnings triggered public and different services to put their flood plans in to place. In addition to these warnings, over 22 000 recipients (in homes and businesses) were sent multiple flood warning messages during the course of the event.

Unfortunately, over 500 homes and businesses flooded distributed all across the east coast counties of Norfolk, Suffolk and Essex. Nonetheless, many protection values remained protected by technical and non-technical flood protection. The fact that over 14 000 people were evacuated, naturally, contributed to the fact that there were no fatalities recorded due to the incident.

In Suffolk, the city that became most affected by the surge was Lowestoft, where many properties were flooded and both bridges were closed. Other affected places were Snape and Waldringfield, which both suffered significantly from the flooding. Also, several estuaries flooded severely which resulted in them being damaged.

3.2 Suffolk Emergency Response Plans

In this chapter, a short description of the Suffolk Generic response plan is presented. The aim is to provide background information and explain why the plan has been implemented. In addition, the actors in the response plan are presented. Prior to the description of the Generic response plan, the legislation that founds the plan will be described. The legislation is called the Civil Contingencies act (2004) and legislates all response plans in UK, which makes it a highly relevant document in this study.

3.2.1 The civil contingencies act 2004

The Civil Contingencies Act 2004 legislates the framework for all emergencies in the UK. The act consists of two parts, Local arrangements for civil protection and Emergency powers. The first part defines an emergency and what type of duties the different agencies have on a local level. The second part is a framework that the government can use for the most serious emergencies, with additional emergency powers. In the context of this study, focus will lie on the arrangements on a local level and therefore, only part 1 will be described.

The Civil Contingencies act 2004 legislates duties to both category 1- and category 2 responders. Category 1 responders are representatives from Local authorities, Emergency services, National Health Services, Environment Agency and Secretary of state. Category 2 responders are representatives from different utilities, the transport sector and the Health and Safety Executive.

One of the major obligations the category 1 responders have is to set up emergency plans. The plans should aim to prevent and reduce the consequences of an emergency. In order to achieve effective emergency management, the Act highlights the importance of cooperation. One approach improving just that, is training. The Act also implies that category 1 responders have to exercise for civil contingencies. Another approach is the multi-agency approach, which is used in the SFR Generic response plan. There are further duties described in the Act, however they will not be presented in the context of this study.

For the category 2 responders, duties are current if their sector or work is affected. In that case they have a duty to share and co-operate with category 1 and 2 responders.

3.2.2 Suffolk Generic Response Plan

With regard to the Civil Contingency Act 2004, the County of Suffolk has established their framework for the response plan. The plan is named the SRF Generic Response Plan, where SRF stands for Suffolk Resilience Forum. The framework follows the Emergency response and recovery guidance in UK, developed by the cabinet office. Experience from past incidents and training exercises have been utilized in the development of the plan.

The plan is currently used for major incidents and was activated in the event of the 2013 flood in Suffolk. A major incident is, according to the Suffolk Constabulary & Joint Emergency Planning Unit (2014), defined as an emergency that leaves a demand for special arrangements by the emergency services, the NHS or the local authority. The special arrangement the emergency is required for is either one of the following:

1. A rescue, treatment and transportation of a large number of casualties
2. The involvement either directly or indirectly of a large number of people
3. The handling of a large number of enquires likely to be generated both from the public and the news media, usually addressed to the police
4. The need for the large scale combined resources of two or more emergency services
5. The mobilisation and organisation of the emergency services and local authorities to cater for the threat of death, serious injury or homelessness to a large number of people

3.2.3 Actors

In the Suffolk generic response plan, the different responsibilities and roles among involved actors are presented. Here, a short description of the actors is described.

Environment agency

The Environment Agency is a non-departmental public body, responsible for protecting and improving the environment in England (Environment Agency, 2016). The Agency is sponsored by the Department for Environment, Food & Rural Affairs, DEFRA. In terms of flooding, the Agency have responsibilities to manage and assess flood risks from main rivers, the sea, reservoirs and estuaries. In the emergency response the Environmental Agency participate on the

strategic and the operational level of coordination. Another responsibility, is to issue flood warnings (Suffolk Resilience Forum, 2015).

Suffolk Constabulary

The Suffolk Constabulary's main responsibilities are to hold the residents in Suffolk safe, secure and informed (Suffolk Constabulary, 2016). In a flood emergency response, they are obligated to chair both the strategic and tactical level of coordination (Suffolk Resilience Forum, 2015). In addition, they also coordinate evacuations, traffic management procedures and other actions at the scene.

Suffolk Local Authorities

The county of Suffolk is divided into 7 district councils. These are: Babergh District Council, Forest Heath District Council, Ipswich Borough Council, Mid Suffolk District Council, St Edmundsbury Borough Council, Suffolk Coastal District Council and Waveney District Council. In addition, the Suffolk County Council is considered a local authority. The local authorities have several responsibilities in the flood management response. One of their main task to Co-ordinate the local authority response (Suffolk Resilience Forum, 2015). Further duties are to provide transport for evacuees to rest centres and make sure all necessities for running the rest centres are achieved.

In the 2013 flood event, the different local authorities were more or less affected by the flood. Obviously, this meant that some local authorities were obligated and had to respond more than others. The local authorities in Suffolk that had to respond and therefore participated to the highest extent in the response were: Suffolk County Council, Waveney District Council, Suffolk Coastal District Council.

Suffolk Fire & Rescue Service

The roles of Suffolk Fire & Rescue Services are to prevent and protect the residents in Suffolk from fire (Suffolk County Council, 2016). In addition, they provide the residents with emergency response services. Their work aims to: decrease the death and injuries from fires and traffic accidents, maintain low levels of fire related crimes, ensure businesses are aware of their fire protection responsibilities and make sure that people feel safe in their homes. In Suffolk there are 35 fire stations in service. In terms of flooding, the service provides emergency services and is responsible for the immediate response. Actions in the immediate response can be, for instance, to rescue people from any kind of incident, to assist other blue light services and to coordinate operations with other agencies.

East of England Ambulance Service Trust

East of England Ambulance Service Trust, is one out of 11 Ambulance National Health Service trusts in England (East of England Ambulance service, 2016). In a flood emergency response, they have the obligation to provide health care service. (Suffolk Resilience Forum, 2015)

Public Health England

Public Health England, is an executive agency sponsored by the Department of Health in England. The primary aim is to “improve the nation’s health and wellbeing, and reduce health inequalities” (Public Health England, 2016).

Nation Health Service

The Nation Health Service set the standards and directives for the health service in England (NHS England, 2016). In an emergency response one aim is to provide advice to the Strategic Coordination Group (Suffolk Resilience Forum, 2015).

Met Office

The met office is UK’s national weather service (Met Office, 2016). In an emergency response, they activate the Met office Emergency Support Service, updating responding services about the weather forecast (Suffolk Resilience Forum, 2015). In addition, they provide guidance and support to involved actors in the emergency response.

Utilities

A utility is a company that provides useful services to the public (McKeichnie,1978). It could either be telephone-, energy-, electricity- or water-company. For instance, the utilities can provide services and resources to the emergency response if it is required (Suffolk Resilience Forum, 2015). The extent of participation in the response depends on the circumstances of the incident. For example, if a flood affects the business of a company, it is likely to participate in the response. Participation is also likely to occur if the company possess vital resources that are useful in an emergency.

Maritime & Coastguard Agency

The Maritime and Coastguard Agency is sponsored by the department of Transport and save lives at the sea and on the coast of UK (Maritime & Coastguard Agency, 2016). It is an executive agency that provides support to emergency services during a flood incident (Suffolk Resilience Forum, 2015).

The Department for Communities and Local Government

The Department for Communities and Local Government is a ministerial department. Their job is to “create great places to live and work, and to give more power to local people to shape what happens in their area” (The Department for Communities and Local Government, 2016). In an emergency response, the Strategic Coordination Group uses liaison officers from the Department (Suffolk Resilience Forum, 2015).

4 Research methods and designs

At the beginning of the thesis process, research questions were formulated. Next, the researchers began a literature study while simultaneously considering which methods that could be used to answer the research questions. The methods found appropriate were: snowball sampling combined with interviews with important stakeholders in the emergency response. Further, data, found through these methods, was analysed and conclusions could be drawn. Hence, the final report could be written. In this section, the research methods and designs used in this work process will specifically be described. The overall process can be seen in figure 3 below.

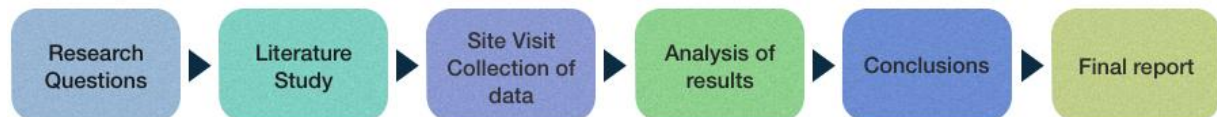


Figure 3. Simplified, overall work process for the master thesis project.

4.1 Literature study

A literature study was performed in order to find information on the subjects concerned. At the beginning of this work, usual search engines (such as google.com) were used. These were used in order to find recent flooded areas in England, which were possible areas of interest for the study. Thereafter, the researchers used the website gov.uk in order to find information about the governance of England as well as information about the different counties within the country. The hope was, thereafter, to find actors willing to provide information and allow for interviews to be performed. This was done through different county councils' websites, such as suffolk.gov.uk. Once this was done and main contacts were established, the researchers could continue on with the literature study to find out more about the emergency response management in the specific area - Suffolk. This, in order to find information on how the intended emergency response was supposed to function. Two useful sources of information, about the Flood Response in Suffolk, were Suffolk Constabulary & Joint Emergency Planning Unit (2014) and Suffolk Resilience Forum (2015).

Another primary method for finding literature was through searches in databases. The main data base used was Scopus, but other databases such as; Google Scholar and LubSearch were used as well. The searches in databases were performed in several different ways. For example, the search could be restricted to the title, abstract and keywords of the literature. This way of restricting the search was the most commonly used one in this work. However, restricting to searches in title was used when wanting more specific matches. Another way of restricting the search was through the use of "AND", when searching on several words, meaning the title/key-words/abstract must contain all the written search-words. When a search had been made, the found literature was sorted on "cited by", ranking the most cited articles at the beginning of the search list. Thereafter the researchers read the abstract of the articles whose title were appropriate for the purpose. Through the course of this work an approximate of 70 abstracts have been read. Articles, whose abstracts were found interesting and appropriate, were downloaded, read and used when writing this report. The number of such articles are approximately 30. An example of search words and number of hits, when searching through Scopus, can be found in table 1 below.

Having found key literature, yet another method for collection of literature was through cross-references. This means using existing literature to find other relevant articles/books in the references. This was found to be a useful method by the researchers. When an article appropriate for the cause is found, it usually contains several useful sources of information as references. One of the main “pearl-papers” used for this thesis was Uhr and Johansson (2007).

Table 1. An example of different searches and number of hits generated.

Keywords	Number of hits
Mapping AND actors AND Emergency AND response	<i>6</i>
Analysis AND emergency AND response AND Mapping AND Agents	<i>5</i>
social network analysis AND emergency AND response AND Mapping	<i>2</i>
social network analysis AND snowball AND actors	<i>8</i>
snowball AND emergency AND response	<i>19</i>
Title(emergency AND response AND analysis AND flood)	<i>1</i>

4.2 Field study

This section will regard the field study to Suffolk. The visit occurred during the 13th to 18th of March. It was done in order to get information on how the emergency response management in the area was intended to function during a flood incident. Information on this was acquired by face-to-face interviews with important stakeholders who were all active during the 2013 flood in Suffolk. Furthermore, the visit to Suffolk provided an opportunity for the authors of this master thesis to introduce themselves to the respondents and to explain the importance of the respondents' participation in the web-questionnaire.

4.2.1 Respondents

In order to perform the social network analysis, data was collected through a web-questionnaire where the respondents were primarily asked to name the contacts that they communicated with during the response. For a more detailed description of the web questionnaire, see section 4.3 below. For the analysis, an initial set of individuals had to be identified. The initial set were selected on the criteria that they had participated in the emergency response to the 2013 flood event in Suffolk.

However, identification of participators was found to be difficult. A few individuals were identified from the incident report 'Operational Fulstone' (2014). A list of these individuals was sent to our contact Neal Evans, Deputy Head of Emergency Planning at Suffolk County Council, who was also given the possibility to add additional names to the list. Five were representatives from Suffolk County Council, four were from the Suffolk Fire and Rescue Centre, three were from the Suffolk Constabulary, and two were from the Environment Agency. In addition, there were five respondents from Waveney District Council and one from the Suffolk Coastal District Council. The respondents had either a strategic, tactical or operational responsibility in the emergency response. The initial set of individuals were also the individuals that were interviewed.

4.2.2 Interviews

The interviews were performed during the site visit in the county of Suffolk the 14th -18th of Mars 2016. The aim with the interviews was to get the respondents qualitative interpretations and descriptions from the 2013 emergency flood response.

The structure of the interviews

The interviews were mainly performed face to face, between interviewers and respondents. However, one respondent was interviewed via telephone.

The interviews consisted of a set of planned questions. However, the open structure of the interviews allowed for follow up questions. If the interviewers did not understand the respondent, further questions were asked. The interviews were consciously planned to let the respondent be in focus and to give the respondent their point of view. Therefore, the interviewers strived to

guide the respondents to answer the planned questions. A majority of the questions were open, enabling the respondents to develop their answers.

The length of the interviews was planned to be around 30 minutes. In practice, the length of the interviews varied between 15 and 48 minutes.

Interview - questions

In total 7 interview questions was planned. In some interviews, following up questions were asked if the interviewee had a hard time answering the questions. Questions for the interview could be seen below in figure 4.

1. Were you active in emergency response phase 2013?
 - What time period?
 - What were your tasks and responsibilities?
2. What do you consider the Emergency response phase being?
3. How do you know the people that you had contact with during the emergency response in 2013?
4. In what ways have the ER changed from before the flood until now?
 - In plans?
 - In procedures?
5. What was learnt from the experiences in the 2013 flood event?
6. Do you consider the 2013 emergency response being successful?
7. Do you believe that the actual emergency response followed the emergency response plan?

Figure 4. Interview questions

Recorded interviews

The interviews were recorded with the respondents' informed consent. This facilitated the interview in several ways and made the interview similar to a conversation. First, it was easier to listen what the respondents said and to ask follow up questions. It also made it easier to maintain an eye contact between the interviewer and respondent. In addition, notes were not required, which also enabled the interviewers to focus on the respondents throughout the interview. Recording the interviews also resulted in a reduced risk of data loss and misinterpretation. After the site visit to England the interviews were transcribed and later analysed.

Secrecy

The person of contact during the visit to Ipswich, Neal Evans, is the only person in this report who will be mentioned by name. This he has given his full consent to. Even though, the other respondents gave their oral consent at the beginning of the interviews, the authors of this report

have chosen to leave their names out of the report. This because, giving this information was not considered to provide more value to the study, than it was found ethically viable. Therefore, with one exception, all respondents will be anonymous in this study.

4.3 Web-based questionnaire

Collection of data was needed in order to map the network relations according to the snowball approach. This was done using a web based questionnaire. Here, the web based survey will be discussed as of why it was used and what it included. The appearance of the web questionnaire can be seen in Appendices.

4.3.1 Why this method?

As stated above, a flood emergency response network often is large and complex. The number of individuals participating in the social network analysis was thus expected to be large. Therefore, it was foreseen that a huge amount of data was needed to be collected. For collecting this amount of data it was found best to use a web-based questionnaire. Still, using a web-based method for data collection could lead to problems in terms of; increased loss of data caused by technical problems, risk for technical bias, et cetera (Uhr & Johansson, 2007). On the other hand, dealing with large amounts of data without any technical tool could lead to problems as well, such as for example, the loss of data. Using a web-based method could also make the analysing of results easier and was found to be more time-effective. Therefore, it was found advantageous to use a web-based survey to collect the data. The web-based survey has been constructed using FluidSurveys online software. The web-link was sent out by mail to all the individuals in the initial sample, and then subsequently sent to the latter announced individuals.

4.3.2 Choice of relations in the web-based questionnaire

The chosen types of relationships to be investigated in the network were: contacts, importance and friendship. Here, these choices are discussed in terms of why they were relevant to incorporate in the web-based questionnaire.

Contacts

The respondents were first asked to name individuals that they had contact with during the emergency response. This was done in order to capture the complete network of relations in the response. One problem with this was that the perception of ‘contact’ may differ from respondent to respondent (Uhr & Johansson, 2007). Therefore, it was described in the questionnaire that in this context, ‘contacts’ incorporates all kinds of exchange of communication. Another problem with the wording of this question, was the use of the term “emergency response”. The respondents’ perceptions of what time frame the term concerns could vary. Therefore, there was at first some thought on being more specific and write “day 1-3 in the emergency response”, or something similar to that. However, as time distortion is usual during the event of a crisis, it could be difficult for the respondents to remember with whom they communicated during such a specific time frame, and that may cause unwanted bias. In addition to that, the fact that the

accident happened some years ago, would possibly further bring bias in the responses. Thus, it was hoped that the respondents would understand the concept of “emergency response” and understand that the question not incorporates the risk mitigation- and the recovery phases of a crisis.

Importance

In addition to the contact-relations, other kinds of relations were, as well, found interesting in order to achieve an understanding of the network. For example, people that were not involved in the main organisations might be incorporated in the network because of an important knowledge or a resource that they could provide to the emergency response. These people might not have had many contact-relations in the network, but can still be found important for the emergency response (Uhr & Johansson, 2007).

Hence, it was found necessary to construct yet another network showing which actors that were found more or less important during the emergency response. This information was collected asking the respondents to grade their named contacts on ‘importance’. They had four categories to choose from, namely: “not important”, “somewhat important”, “important” and “very important”. As with the concept of ‘contacts’, the term ‘important’ can be perceived differently among different individuals. Therefore, the respondents were asked to think of importance in terms of how important an actor was for them in order to complete their work tasks during the emergency response (Uhr & Johansson, 2007).

Friendship

Krackhart and Stern (1988) test several assumptions deduced from principles of social science theory. The focus lies especially in how friendships and trust-relations affect the organisational response during times of crises. They state that friendship includes trust and that there cannot be friendship without the quality of trust.

The authors tested network friendship relations by asking objects to choose between five categories, namely: “trust as a friend”, “know well”, “acquaintance”, “associate name with face” and “do not know” (p.131). Their conclusion was that, during an emergency, organisational friendships can either hinder or facilitate cooperation. Friendship in-between organisational sub-units could often facilitate cooperation whilst friendships within a subunit of the organisation actually could hinder cooperation. The trust that, they mean, often is found in friendship relations was in this work believed to be a quality that can enhance cooperation between sub-units in an organisation.

Kapucu (2006) states that multi-organisational communication and coordination is needed for good emergency management in times of crises. Further the article indicates that strong communication, developed before the occurrence of a crisis, will enhance communication and hence the cooperation during the actual crisis.

Inter-organisational friendship is thus, by the authors of this work, believed to create natural communication pathways in terms of crises. This was yet another reason to why the friendship-relation was chosen to be included in the study.

In the research performed by Uhr and Johansson (2007), the authors chose to use the five friendship categories developed by Krackhart and Stern (1988). However, they chose to add one category, namely “trust as a co-worker” (p.109). This because they meant that co-workers can trust each other despite being friends and therefore there was need for another category of friendship.

In this work, however, the quality of trust was not included in the friendship category. This was because of concern that the responders might have some difficulty of understanding the difference between the categories. The respondent could possibly feel that the relation to a contact fits to more than one alternative. For example, the respondent might feel that “trust as a friend”, “trust as a co-worker” and “know well” all could describe a certain relationship. Hence, if the respondent was asked to choose only one, he or she might not feel it is of much matter which one to choose. Therefore, the categories of friendship that have been used in the survey were “good friend”, “friend”, “acquaintance” and “know by name/title”.

4.4 Compilation of data

Compilation of data was required for both the data collected in the Web-questionnaires and the interviews. Since a large amount of data was collected, compilation of data from the web-questionnaire was done in UCINET. It enabled analysis in terms of the following three aspects: contacts, importance and relationship. For the interviews, data was distinguished and later on compiled.

4.4.1 Web-questionnaire

The data from the web-questionnaire was compiled using the software package UCINET. According to Borgatti, Everett & Freeman (2013), an analysis of social networks requires the use of a software. UCINET is a free software, which facilitated the study and meant that no additional costs for software use were needed.

In UCINET the named contacts are represented as nodes. The nodes were colour coded depending on which organisation each individual represents. Individuals that were members of the Strategic Coordinating Group were also made recognisable by the shape of the node.

Additionally, the software enabled visualising of the social network in terms of the three aspects; contacts, importance and relationships. In UCINET, a tie between two nodes showed a contact between two individuals. A tie can represent either an asymmetric contact or a symmetric contact. If the contact was asymmetric, individual A named individual B in the questionnaire and not vice versa. The direction of this relation is denoted by an arrow. If individual A named individual B and B named individual A in the questionnaire, a symmetric tie with two arrows represents that

contact. For the aspects: importance, and friendship, a similar approach was used. However, each approach is further explained in the text below.

Contacts

Deduced from the answers to the web questionnaire, a social network graph could be presented showing how many contacts individuals in the response had. The number of contacts an individual had were determined based on the number of times the individual was named in the answers to the web-questionnaire. In UCINET, the number of times each node is denoted is called the Indegree-value. In order to visualise the Indegree-value, the size of the node was altered due to that value. A large node represents a high value while a smaller one represent a lower value.

Importance

In the web-questionnaire the respondents were asked to characterize their contacts as one of the following: “not important”, “somewhat important”, “important” and “very important”. In order to visualise how important individuals were perceived, the network was arranged to show the ties between individuals perceived as “important” and “very important”. For contacts perceived as “not important” or “somewhat important”, the ties were removed. Arrows were used in order to distinguish between an individual that said a contact was important, and one that was perceived as important. Thus, an arrow points the direction to the individual that was being perceived as “important” or “very important”.

Relationships

Finally, the social network graph presenting the relationship between contacts was performed. This was done because it enabled an analysis of whether personal relationships affected the flow of communication in the emergency response. In the web-questionnaire the respondents were asked to characterize their relationship to a contacts as: “good friend”, “friend”, “acquaintance” or “know by name/title”. For relations considered as “acquaintance” or “know by name/title”, the tie was removed. Hence, relations considered as “good friend” or “friend” were therefore showed in the network. As in previous cases, the arrow denoted the direction of to whom that was considered.

4.4.2 Interviews

All interviews were transcribed. This enabled compilation of the data which was of great significance for the study. The data of interest was divided into two main categories. The first category of data, was data which validated and helped understanding of the answers to the web-questionnaire. That was the data concerning the respondents’ definition of the emergency response phase and their definition of their internal and external relationships to other actors in the emergency response. The second category of data was the respondents’ interpretations of the emergency response in terms of successful factors, lessons learnt and organisational changes in the plans after the 2013 flood event. Further, data regarding the respondents’ interpretations of

differences or similarities between the actual emergency response and the emergency response plans were compiled.

5 Research results and findings

Research results and findings will be presented in the two main sections below, describing the intended and the actual emergency response. The first section covers the intended response while the second covers the actual response.

5.1 The Intended Emergency Response

The intended response refers to the response as it is described in plans and policies. It has further been described and explained by responders to the interviews. In this section the intended emergency response in Suffolk is described.

5.1.1 The SRF Generic emergency response plan

In the Suffolk Constabulary & Joint Emergency Planning Unit (2014) the SRF Generic Response Plan is presented, which is the framework for the response for all major incidents in Suffolk. As have been mentioned before, the plan undertakes the requirements in the Civil Contingency Act 2004. In this study, the plan was described in terms of: the structural framework, the multi-agency approach and the Joint decision model.

The structural framework

According to the Suffolk Constabulary & Joint Emergency Planning Unit (2014), the framework consists of three levels of coordination. That is the strategic, tactical and operational levels of coordination. First, the strategic level of coordination concerns representatives in the Strategic Coordination Group, SCG. Secondly, individuals concerned by the the tactical level of coordination are the members of the Tactical Coordination Group, TCG. Finally, the operating level of coordination concerns the forward command posts, or in the text referred to as the operational commanders.

The flow of communication, information and directives are shared across the lower and/or higher tiers of the coordination groups. Figure 5 shows this flow of communication. As can be seen in this figure, the exchange of information between the TCG and forward command posts occurs through Silver Command-/ Emergency Control Centres. However, it is not apparent that all agencies have a Silver command or Emergency Control Centre. Under the circumstances where a command or control centre is not in place, the exchange of information occurs through the TCG and Forward command posts.

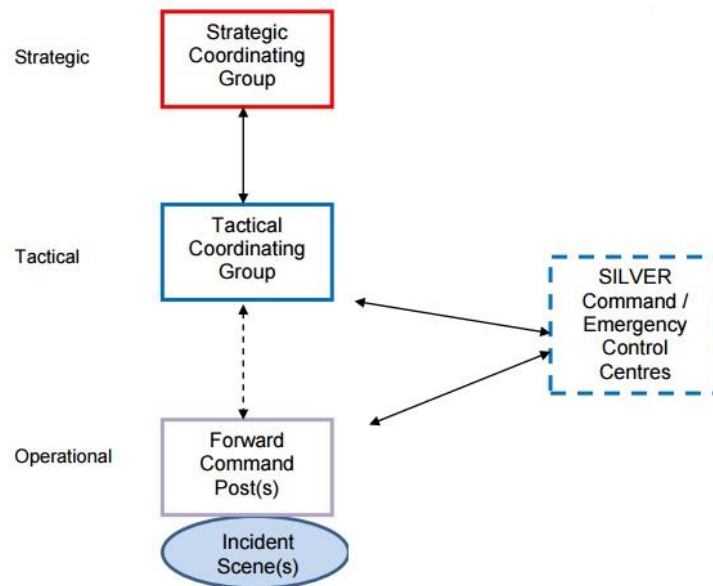


Figure 5. The structural framework in Suffolk (Suffolk Constabulary & Joint Emergency Planning Unit, 2014)

Multi-agency approach

The Suffolk response plan uses a multi-agency approach (Suffolk Constabulary & Joint Emergency Planning Unit, 2014). A multi-agency approach means that at least two or more agencies work towards the same goal, merging their abilities to facilitate their work and reaching that goal (Ovretveit, 1993). A multi-agency approach in flood risk management could concern several agencies. The Civil Contingency Act 2004 therefore considers agencies that are needed in the response and lists the agencies that are forced by law to respond to major incidents.

Thus, the list of representatives in the SRF Generic Response Plan follows that list. However, the Plan comprises additional agencies which are not listed in the Civil Contingency Act 2004. Representatives are included in at least one of the coordination groups, either in the SCG or the TCG. The actors in both the strategic and tactical coordination group are listed in table 2 below. However, representatives could vary depending on what type of incident that is current.

Table 2. Members of the SCG and TCG

Strategic Coordination Group	Tactical Coordination Group
Suffolk Constabulary	Suffolk Constabulary
Suffolk Fire and Rescue Services	Suffolk Fire & Rescue
East of England Ambulance Service	East of England Ambulance Service
NHS England	NHS England, Clinical commissioning Group
Public Health England	Public Health England
Suffolk County Council	Local Authority
Suffolk District or Borough Council	Environmental Agency
Environmental Agency	Voluntary organisations if required
Met Office	Utilities
DCLG Resilience & emergencies Division	UK military
Chair of STAC	
Chair Designate of Recovery Coordination Group	
UK Military	
Sizewell operators	
Office for Nuclear regulation	
If necessary, liaison officers from the Maritime & Coastguard Agency together with utilities and voluntary organisations could participate.	

The Strategic Coordinating Group

In the event of a major incident, the Strategic Coordinating Group will establish a meeting with the representatives from agencies listed in the table 2 under the headline Strategic Coordination Group. The group should have continuous meetings during the course of an emergency response.

The group has the overall responsibility for the multi-agency management. Their main tasks are to create a policy and a strategic framework for the emergency response, manageable for the tactical and operational command and co-ordinating groups. The framework is implemented using a Joint decision model and will be described below. The framework should consider and anticipate long term impacts that could arise from a major incident. Directives are cascaded to the Tactical Coordinating Group. At the same time, the SCG receives and considers information from TCG about the ongoing incident.

The Strategic Coordinating Group itself does not have the power to issue executive orders. Instead, collective decisions within the SCG are authorised by the agency or organisation in question.

The Tactical Coordination Group

The Tactical Coordination Group, TCG, is responsible for implementing the multi-agency tactical response plan which is based on the strategical directives from the Strategic Coordination Group. Members in the TCG are the representatives shown in table 2 under the headline Tactical Coordination Group. When creating the tactical response, the joint decision model is used. The group works as an intermediary between the SCG and the operational commanders via the Silver command/ Emergency Control Centre. Therefore, information is shared between both levels of coordination. Further, relevant knowledge concerning the framework should be distributed to the Strategic Coordination Group.

Operational level

Individuals on the operational level are operating commanders or individuals at the scene. Operations occurs in agreement to the directives composed by the Tactical Coordination Group. The operating commanders provide information, intelligence or issues to the Silver commanders/ Emergency Control Centres which further forwards it to the SCG. Furthermore, operating commanders control the welfare of the deployed staff.

Joint decision model

The joint decision model is supposed to support the commanders in the strategic, tactical and operational level in order to make effective decisions collectively (Suffolk Constabulary & Joint Emergency Planning Unit, 2014). The model is described in this chapter and refers to the model produced by JESIP (2016a). It is applied by each tier of coordination with the common goal to save life and reduce harm. The model consists of the five stages/boxes, namely to: gather information & intelligence, assess risks & develop a working strategy, consider powers policies & procedures, identify options & contingencies and take action & review what happened. The model is iterative and should therefore loop continuously. The model can be seen in figure 6 below.



Figure 6. Process chart of the Joint Decision model. (JESIP, 2016b)

Gather information & intelligence

The first box in the model regards collecting information about the emergency and sharing it to the involved agencies. In order to understand the emergency, the following questions are asked: What are the impacts? What are the risks? and What is being done to mitigate the emergency? Sharing information creates a better situation awareness about the emergency. As a result, conditions for a better multi-dimensional understanding of the emergency can therefore be established.

Assess risks & develop a working strategy

The second step in the joint decision model is regarding enabling an understanding of the risks, by setting up strategies to assess and control them. For example, by setting up necessary measures. Since risks can alter throughout an emergency it is of great importance to observe both the measures and the risks, constantly updating the strategy to assess them.

Consider power, policies & procedures

Further, when planning the emergency response, the joint decisions in question should consider the current procedures, power and policies in all the involved agencies. For instance, the policies in one service could challenge policies in another service. Decision making could therefore benefit from such considerations and thus enhance the chance of making appropriate decisions.

Identify options & contingencies

In the joint emergency response, it is of great importance to concern all the options and contingencies. Identifying the options and contingencies can be an efficient method to find solutions for coping with the emergency response. However, each option or contingency should be carefully assessed before implemented.

Take action & review what happened

At last, the plans and decisions are set into practice. The response is continuously evaluated and, if needed, modified. The joint decision model is iterative and once the actions had been both put to practice and evaluated the process continues to the first section again. This to ensure that decisions are appropriate and manages the response efficiently.

5.1.2 Validation of Interview- and questionnaire questions

In this section, summaries on the respondents answers to the questions for validation are presented.

Defining the Emergency response phase in 2013

The respondents' interpretations of the term emergency response phase varied. The interpretation of the term seems to correspond to what work task and responsibility the respondent had in the 2013 flood event. It does also appear to correspond to what agency/organisation/company the respondent belonged to. In addition to this, interpretations varied based on whether the respondent had strategic-, tactical- or operational responsibilities during the response.

In general, the representatives of the SCG perceived the emergency response to start at an early stage. This, in comparison to individuals in the Tactical Coordination Group and operational commanders. One explanation to this can be that the members of the SCG have strategic responsibilities and therefore have to plan the response as early as possible. Another is that because of early flood warnings the SCG was given the opportunity to respond a couple of days before the tidal surge hit. Operational commanders, on the other hand, were responding once consequences arose. Hence, operational commanders perceived the emergency response phase to start at a later stage.

Respondent 1, a member of the Environment Agency, considered the emergency response phase to start at Monday the 2nd of December 2013. This is highly connected to the role that the Environment Agency have, issuing flood warnings. Another member of the agency, respondent 2, expressed that the starting point of a response always alters depending on what type of flood warning to be issued. In addition, the respondent stated that it depends on how accurate predictions are. For instance, if a flood is induced by precipitation instead of a tidal surge other preparations than the ones to the 2013 flood would have been made.

Respondents 3, 4 & 5 said that the response phase started a couple of days ahead of the flood. Hence, 1-2 days before the 5th of December 2013. Respondent 5, further explained it started once there was a need to evacuate people. These respondents all work at a District Council in Suffolk. Important responsibilities for District Councils are to transport evacuees to rest centres and to run rest centres. Respondent 6 & 7, considered the emergency response phase to start on the 4th of December 2013. This is the day when the forecast changed from showing a low flood risk to a severe expected flood impact. These individuals are representatives from the County Council.

Further, respondent 8 said that the emergency response phase started once they picked up flood related emergency calls or were called to assist other agencies in their response. The individual explained that actions taking place before that should be considered as the preparation phase and, in other words, not the response phase. This interpretation was shared by respondents from the blue light services, in this occasion, the police officers and the Fire and Rescue Service officers. Respondents 9, 10 & 11 were also saying that the response phase begun once emergency calls occurred. The fact that blue light services have a more immediate response than other services can naturally be an explanation of that. Despite this, there were members in the blue light services which stated that the response started at an earlier stage. For instance, respondents 12, a representative from the Fire and Rescue Service said that it started 24 hours before the flood hit. The individual, whom had a strategic responsibility, further explained that the beginning of the response phase could be depending on whether the responder has a strategic, tactical or operational responsibility.

The different roles and responsibilities did also seem to impact how each individual interpreted the ending of the emergency response phase. Respondent 1 stated that it ended on Monday the 9th of December. However, most respondents expressed that the response phase ended on the evening of Friday the 6th of December, or on Saturday morning the 7th of December. In practice and according to documents, the major incident was being called over 08.30 am the 7th of December 2013. Further, respondent 9 said that once the following tides didn't reach over the flood defences, the response phase ended and moved to the recovery phase.

In summary, the time period for the Emergency Response phase begun with the Environment Agency issuing their first flood warning on the 2nd of December and ended on the 9th of December 2013. However, the majority of the respondents interpreted that the emergency response phase occurred between the 4th-5th of December and the 6th-7th of December. During the preface of this period the public should be warned, residents evacuated to rest centres and resources allocated within Suffolk at three different locations. Later on, when the tidal surge hits, blue lights services should start responding to emergency calls.

How do respondents describe their relations to emergency response staff?

The communication during the 2013 flood event could be divided into internal and external communication. The relationship between colleagues from the same organisation or company is considered internal relations, whereas the external relations refer to relationships between individuals from different companies, organisations or councils. The respondents' description of their internal and external relations varied. In the following text the difference is to be clarified.

In terms of internal relations, the respondents generally considered their colleagues at work as friends. For instance, respondent 13 expressed the following, "I know the ones I work with personally and have spent a lot of time with them. In the organisation there are some good friends". Respondent 1 described the internal relations as "friends at work". It was common that the respondents described the internal relationships as good working relations or colleague-relations. Respondent 5 expressed that the internal contacts were not friendship-relations, more contacts on a formal basis.

The external relation was generally defined as a professional working relation. Several respondents, for instance respondents 2 & 12, expressed that a majority of the individuals in the emergency response had worked with emergency related tasks for a long time and had throughout the years met in different emergency experiences or in other circumstances. Hence, several emergency responders had established good professional relationships to each other. Thus, there were examples of friendship relations across the agencies as well.

Respondents from the Strategic Coordination Group said that they had established professional relationships with each other. An explanation to this was believed to be induced by SCG-meetings, which occurred once every two weeks. In addition, respondent 11 explained that relationships had either been established or improved because of collaborated emergency exercises. Respondent 2 expressed that she or he was well aware about the responsibilities different people in the emergency response had.

In contrast to previous descriptions, respondent 14 expressed the following: “I knew the individuals that I talked to. I did not know to whom I should be talking to, which network that needed my input”. Further, respondent 15 said “The emergency planning team works in a silo, away from the remainder of the councils and departments. We don’t see them so often”. In general, external relations were seen as professional between the responders. However, these two answers raise the question whether important relations were established between all agencies. The answers indicated that relations were missing.

5.2 The actual emergency response

In this section, results regarding the actual emergency response to the 2013 tidal surge will be described. This will be done according to the observations of the authors through the completed interviews and web questionnaires as well as through describing the documented incident reports.

5.2.1 Incident reports

There are mainly two documents reporting the activity around the 2013 tidal surge incident. One is authored by Environmental Agency and the other by the Joint Emergency Planning Unit at Suffolk county Council. These two documents will here be summarised.

Environmental Agency (2014)

The report produced by Environmental Agency were commissioned by Eastern Area FCRM and covers the agency's preparation, response and the, at the time, ongoing recovery of the events of the 2013 tidal surge.

The Flood Forecasting Centre (FFC) and the Regional Flood Forecasting, who continually monitor tidal conditions, could on the morning of Sunday 1st December 2013 suggest that there was a potential for risk of flooding to escalate the next days ahead. However, the forecasts did not only suggest two consecutive tides happening, they also showed a great deal of uncertainty. In spite of this, EA decided to inform their partner organisations on the potential for flooding. Figure 7 below shows how the forecasts changed over the week, as the event got closer. As can be seen, the uncertainty was extensive until just the day prior to the event.

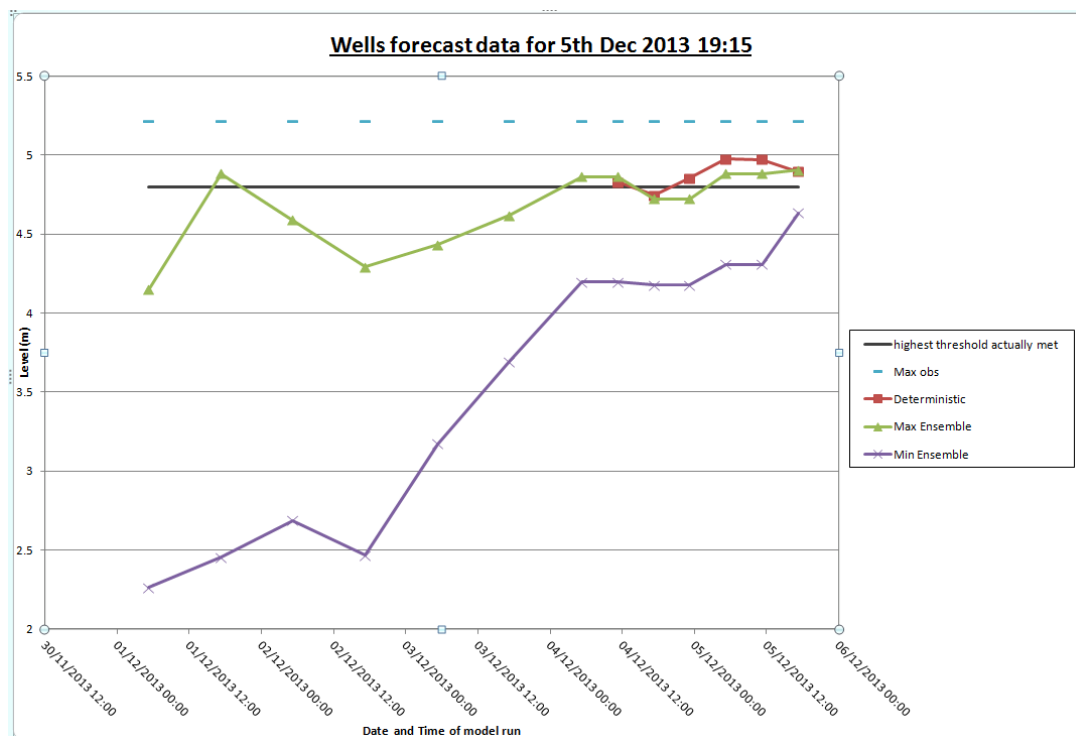


Figure 7. Forecast data from each model run for Wells next the Sea, leading up to the high tide on 5th Dec (Source: Regional Flood Forecasting)

Furthermore, the figure shows the upward trend that highlights why more Severe Flood Warnings had to be issued as the event got closer. For example, the Flood Guidance Statement on the 2nd of December was: “The likelihood of significant impact is currently very low and the overall flood risk is therefore LOW” (FFC, 1030 02/12/13). The forecasts unfortunately took a quick change, and, on Wednesday morning it became clear that springtide could coincide with the expected tidal surge resulting in sea levels higher than the ones seen in 1953. There was a consensus on the agency that they should set their own preparations in place in conjunction with partners and issuing the Severe Flood Warnings and Flood Warnings early Thursday morning. This way the public, on receipt of a warning, could receive a multi-agency response rather than get confused.

Strategic Co-ordinating Groups, SCGs, were formed in Norfolk, Suffolk and Essex on Monday, December 4th. SCG is a multi-agency group that is responsible for coordinating the strategic response to the incident. The SCG-members are also responsible for establishing a framework within which the tactical teams work.

In Lowestoft, Suffolk, an estimated total of 158 properties were flooded, more than any other urban area along the eastern coast. The two main bridges in the town were closed, cutting the town in half. The railway station was shut and remained closed several days.

Op FULSTONE – Joint Emergency Planning Unit (2014)

The report is a summary of the events in Suffolk associated with the tidal surge 2013, known under the operational name as Op FULSTONE. In the report, learning points are described, as well as recommended actions to be taken to improve the preparedness and response of the Suffolk local authorities. Further, the report includes a comparison with the 2007 storm surge, Op Landmark.

The FFC provided effective early warning (>3days) on the risk of coastal flooding and EA Flood Warning system provided at least 24 hours warning of severe flooding. The drastic change in flood forecasts on Wed 4th was discussed via a tele conference between Police, Fire, EA, County Council and Suffolk Coastal and Waveney district councils where it was decided to wait with declaring a major incident until the next morning on the 5th.

SRF Flood plan was activated on declaration of the major incident. Although, not all agencies were made aware of this. In the Strategic Coordination Centre (StratCC), the plan was not implemented until after agencies started to arrive at the Police head quarters on the morning of Thursday 5th which hampered the multi-agency working until the afternoon. There was no formal Tactical Coordination Group, TCG, in place.

Severe Flood Warnings were issued to the public early Thursday morning. In addition to this, the EA Flood Warning System provided continuous updates of changes to flood warnings to 4800 people in Suffolk. Especially vulnerable communities were advised to evacuate starting from noon that day. Unfortunately, the evacuation of people were hampered by the ability to share electronic flood mapping, and hard copies had to be printed.

The report notes that unfortunately, there was a lack of multi-agency coordination and information sharing at the StratCC. This shortage was due to lack of staff focused at this role. As a result, the information sharing to those ECCs further away from the Police HQ was less effective than it should have been. Although, Strategic Coordination meetings were held in a timely manner and effective decisions were taken. Unfortunately, there was a delay in sharing content from the meetings resulting in poor understanding of decisions.

Establishment of a tactical coordination group, TCG, was not immediately established following the declaring of a major incident. This led to executives becoming overly involved in detailed planning, which led to delays.

A multi-agency Media Coordination Centre was established between police and county council in the StratCC.

5.2.2 Participating actors' thoughts on the response

In this section, there will be a summary of the actual response, as described by the responders to the web questionnaire and interviews. The section will start with a short summation of common responses from the interviews and will continue with an overview of two selected questions from the web questionnaire.

From the Interviews

One aspect that several of the respondents mention is the lack of a tactical coordination group. This is an example of what many respondents name as a lesson learnt or a way the response plan has changed since the incident. For example, respondent 6 states the following:

“The main thing that changed since the response was regarding the local authorities. We introduced a silver level (tactical level), since the line was blurry between the strategic- and the tactical group. Thus they were split and separated and now the plans are rewritten and we have performed exercises”.

Another respondent naming ‘not setting up a tactical coordination group’ as a fallacy was respondent 20 who said the sequent: “Also, we didn’t set up a tactical coordination group, so it was not as effective as it should have been”. Yet another frequent phenomenon named as a ‘lesson learnt’ is the fact that the flood maps provided by Environment Agency were lacking in detail. For example, respondent 6 said that:

“The maps that we got from EA did not have sufficient detail. They were pdf maps rather than electronic maps so we could not identify specific addresses. Since many police officers weren’t from the local area they had little knowledge of it, which resulted in some people getting the evacuation leaflets and some didn’t”.

The issue concerning map quality, was mentioned as one of the problems which have been dealt with, and hopefully solved since the incident. An indication of this is the following answer by respondent 16:

“Some of the information was quite difficult to extrapolate, for example Environmental Agency’s flood maps. The Environmental Agency have now done a lot of work and pulled this up. Now we can give officers on the ground a list of post codes/zip data that they can go to”.

Furthermore, some of the respondents describe that there is a room for improvement related to their work on flood plans. This often came up when asking about the divergence between the actual and the intended response. In relation to this, respondent number 16 stated that:

“They did differ. If we had put the plans in place, we would have known what to do. By writing the plans you have already done the thinking and you can bring out the plans in an emergency and that’s your checklist right there. The multi-agency plans should have been used more effectively. The way we set up our Strategic coordination centres could have been more efficient if we had followed our plans that we wrote down.”

Finally, the researchers would like to say something about their own impression of the answers of the responders. To begin with, the interviews gave the impression that the responders had reflected a great deal on the 2013 flood response since they remembered a lot of the details around it. Often, the various respondents gave similar answers to each other, giving the researchers reasons to believe that they had sat together and worked through areas of improvements in the aftermath of the event. There were, for example, many of the responders who gave similar answers to the question concerning ‘lessons learnt’ during the interviews. Many of the responders were pretty self-critical and gave examples of scenarios when they thought their response had failed. However, they all, with a few exceptions, described the response as successful.

From the Web-questionnaire

In the web-questionnaire, one question that the respondents were asked was regarding the correspondence between the actual and the intended emergency response. The intended emergency response here refers to the existing plans and regulations on a flood response. More specifically, the question in the web based questionnaire was the following: “Do you think the emergency response turned out as it intentionally should, according to plans/instructions? Why or why not?” Additionally, the respondents were asked if they considered the emergency response successful. The question was as follows:” In your opinion, do you consider the emergency response during the flood incident 2013 successful? Why or why not?”

There are several reasons to why the researchers thought that these questions were meaningful to incorporate in to the questionnaire and interviews. First, the researchers thought that it would give a general comprehension of what different actors thought of the emergency response. As has been explained, the aim with the research is to describe the actual respectively the intended response. Therefore, asking the responders about the differences between the two can give

information that cannot be found in paperwork and policies. Additionally, it was found interesting to see if there was a correlation between; whether the respondents found the response successful, and whether they found it similar to the intended response.

When analysing the answers to these questions, the researchers, first and foremost, studied the answers to the web-questionnaire. Still, some people were interviewed but did not answer this question in the questionnaire. Therefore, their answers were taken from the interviews. The answers of the respondents, to the two questions mentioned can be seen in figure 8 below.

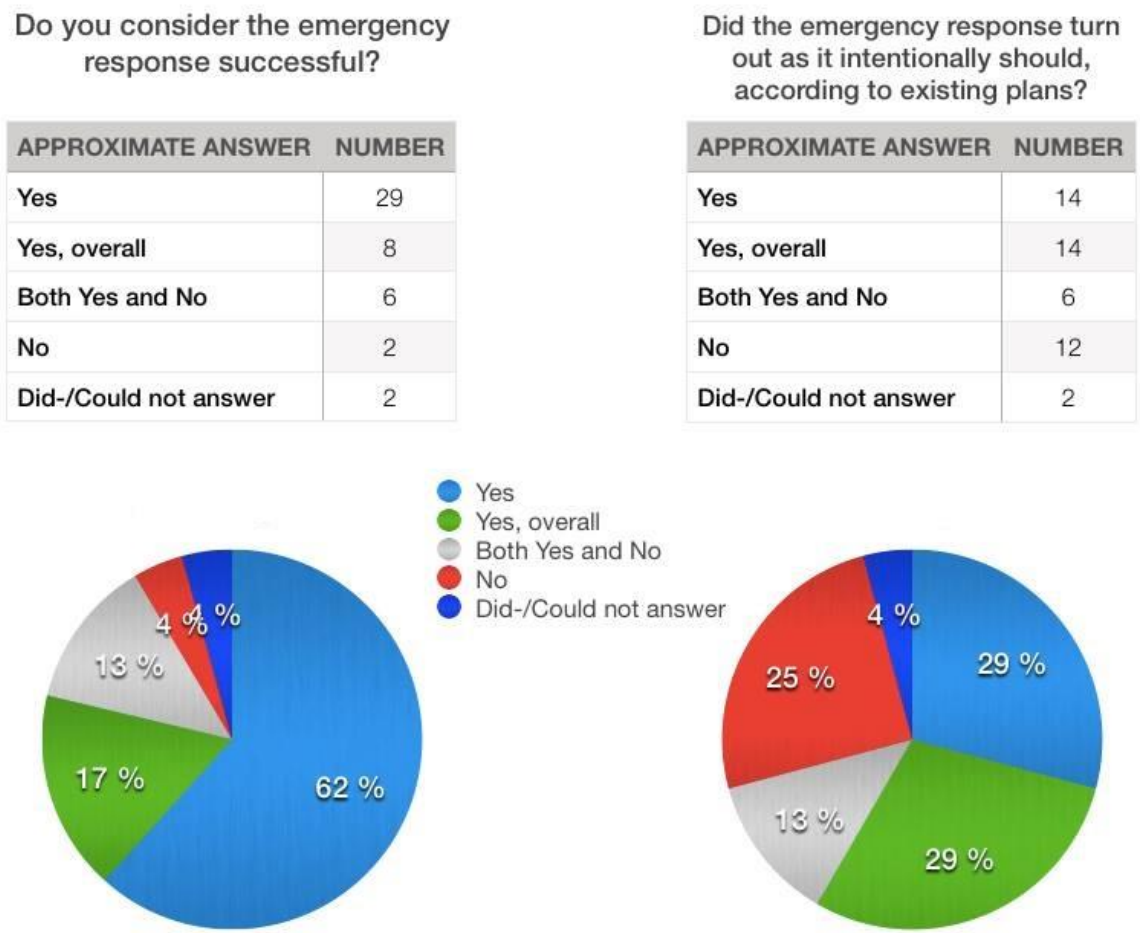


Figure 8. The figure shows the answers of the respondents when asked whether they considered the emergency response successful, respectively, if they found that the response coincided with the intentional response.

The questions above were for some respondents difficult to answer which replied that they found themselves too unsure to respond. Whether or not this were the case for respondents who still chose to respond to this question is hard to tell, but it is important to keep in mind that the responses are merely rough estimations rather than the truth. This due to several biases. For example, some may answer the question while thinking about the response from their own organisation, while, others might think about the emergency response from a multi-agency perspective. Some have also thought about both, which resulted in the “Yes and No” answer to the question.

An example of an answer interpreted as a “Yes and No” answer to the question regarding whether the response was successful or not is the following stated by respondent 22: “It was unsuccessful. Local knowledge was key since the centre did not communicate effectively. Limited information on risk areas where we had vulnerable people. But locally we provided an effective response”.

This answer is indicating that the control centre did not provide efficient communication to local areas and that instead local knowledge became critical because of this. A contradicting answer to this is the following, also regarding whether the response could be considered successful or not, stated by respondent 23: “Not sure - as some decisions were made locally rather than listening to the central command centre”. Hence there seem to have been some problems related to communication amongst local and regional actors.

However, figure 8 above shows that the majority of the responders found the response successful. Also, most of the respondents believed the response to be consistent with the flood plans. Interestingly, more respondents thought that the emergency response was successful than that it was consistent with the plans and provisions. An example of an answer indicating that the response went well, but no cohesion between plans and actual response was the following answer by respondent 15:

“By and large yes, although there were no clear plans/instructions to follow as such as we had to respond dynamically i.e. use our combined knowledge and experience to respond appropriately as the flood developed and circumstances changed - thinking and acting on our feet!”

Another example of this was respondent 17 who commented that: “The response provided worked fairly efficiently, however plans and specifically contact names were out of date, if I had not been local and held my own information, delays would have been experienced”. These and several other answers indicated that the respondents found the overall emergency response to be successful, despite believing the response plans were insufficient, out of date and/or diverged from the actual response.

The answers given in the web-based questionnaire clearly shows that the majority of the respondents found the emergency response to be successful. Most of the respondents stated that they thought that the response turned out successful or even very successful. Some believed that the reason for this were the pre-existing good cooperation, that allowed relationships to be built across divisions and organisations. An example of a response indicating this is the one from respondent 18: “I strongly believe that the emergency response initiated was due to sound planning and testing ahead of the 2013 tidal surge.” Further, respondent 19 stated the following:

“Yes. Lessons learned about flood mapping during the 2007 flood had been learned. Good multi agency interaction at the Strategic Coordination Centre. Good liaison between the Environment Agency and the Strategic Coordination Group regarding the timing of severe flood warnings. Good multi-agency cooperation at forward response hubs set up in locations likely to be cut off by flood water.”

Naturally, not every part of the response turned out successful and even though most responders stated that the response was, overall, successful, they did point out several parts of it to be improved. For example, respondent 4 stated that “The decision was taken not to set up a Tactical Coordinating Group and with hindsight this would have been helpful and is part of the emergency response plan.” Another example of a response indicating the room for improvement is the following stated by respondent 21:

“‘No plan survives contact with the enemy’. The documents we produce are not supposed to be exact but are flexible to the circumstances of an activation (guidance) as mentioned above lessons are always identified and when necessary resolution is sought and built into future arrangements”.

5.2.3 Social Network Analysis

The Social Network Analysis is presented using three different perspectives; indegree-value, friendship, and importance. Describing the social network using these different perspectives enabled interpretation and analysis of the flow of communication in a tensed moment. In this section, the social network graphs are presented and explained.

Description of the colour scheme

The different colours show what type of organisation/authority the individuals work for. In figure 9, a delineation of this can be seen.



Figure 9. Description of the colour scheme

The different perspectives

In figure 10, the social network is presented based on the indegree-values. This means that the size of the node grows based on how many times the individual has been named as a contact in the emergency response. Further, in figure 11, the social network is presented based on values of friendship. Figure 12 shows the Social network based on values of importance.

Figure 10. The Social network graph presented based on indegree values.

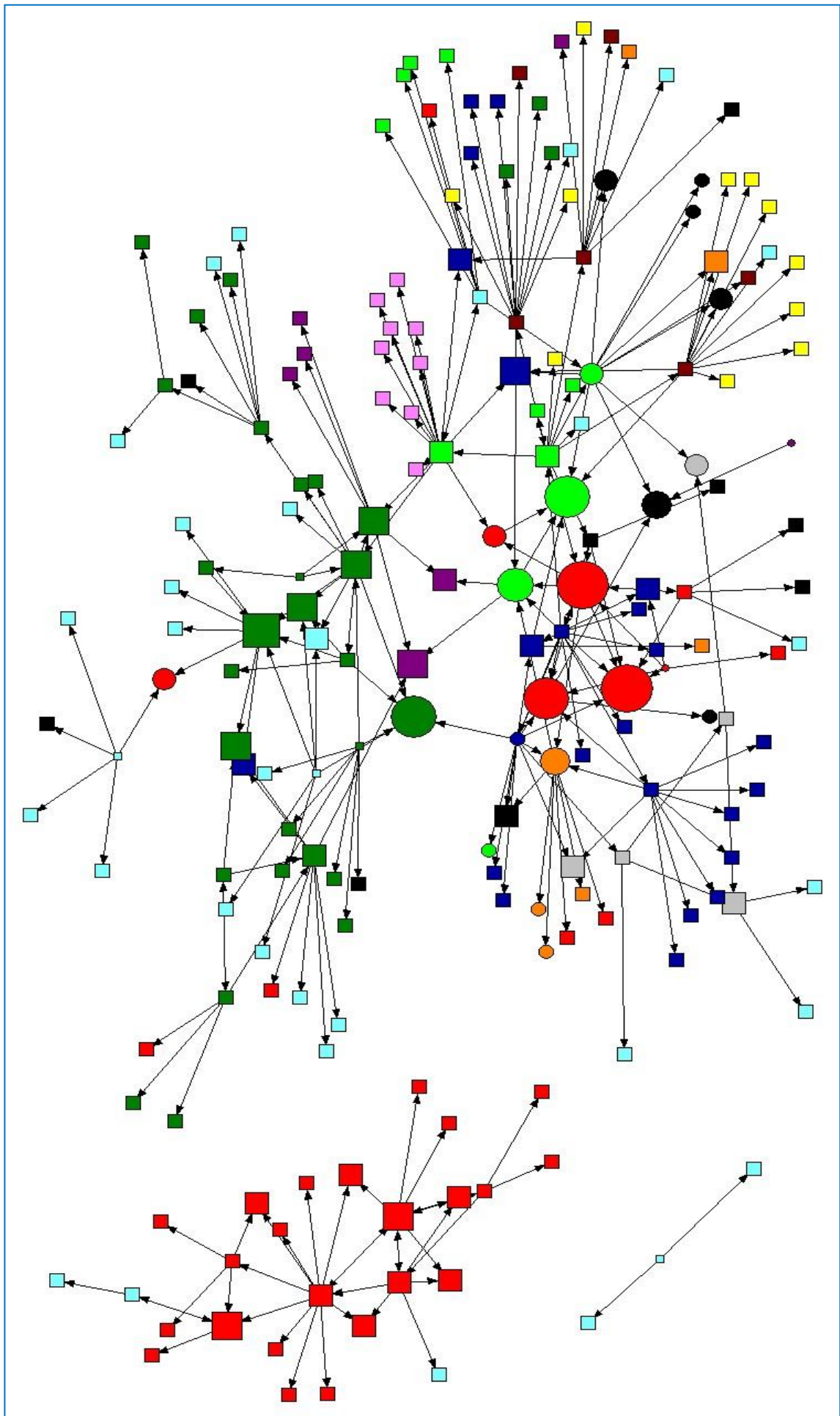


Figure 11. The social network graph based on values of friendship.

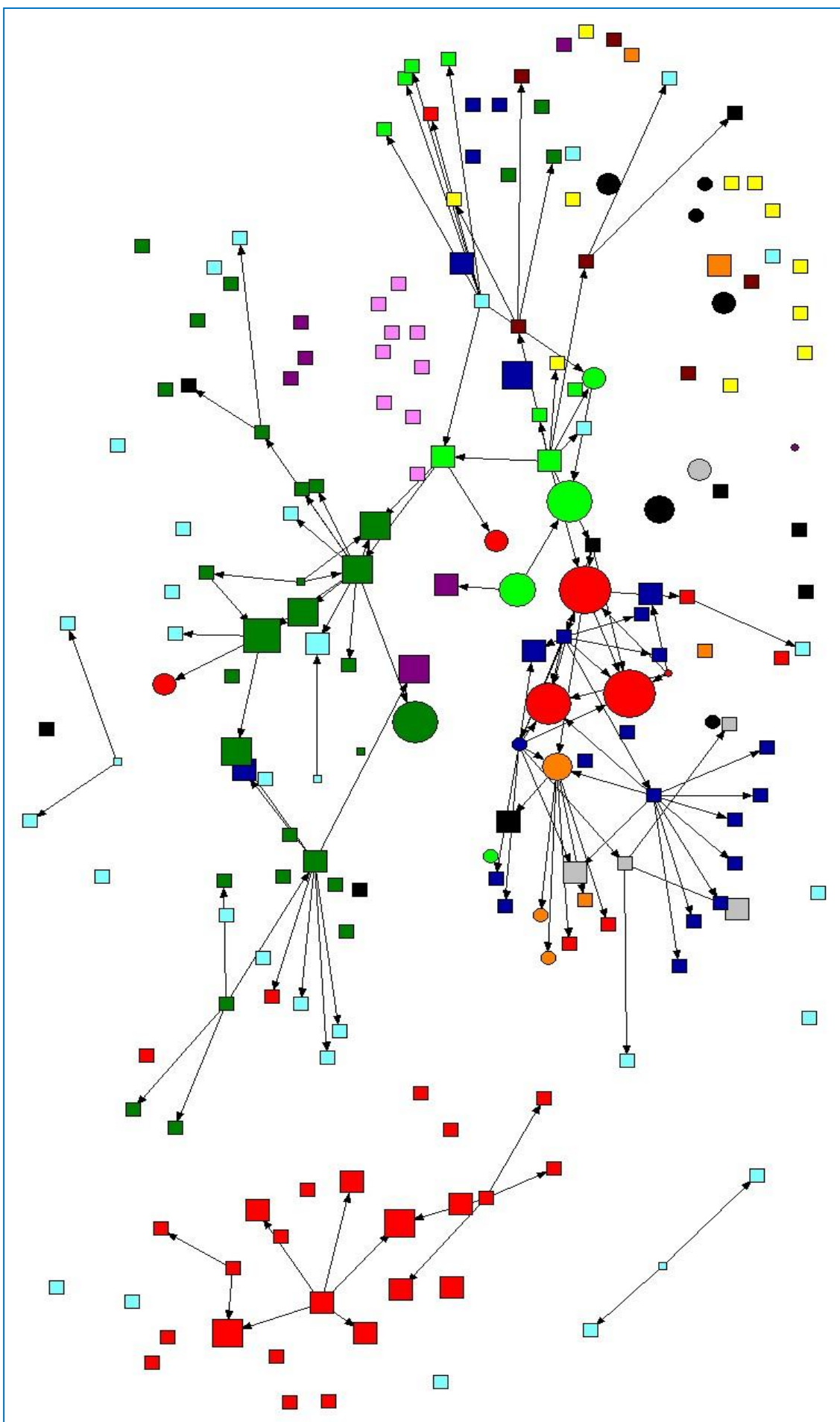
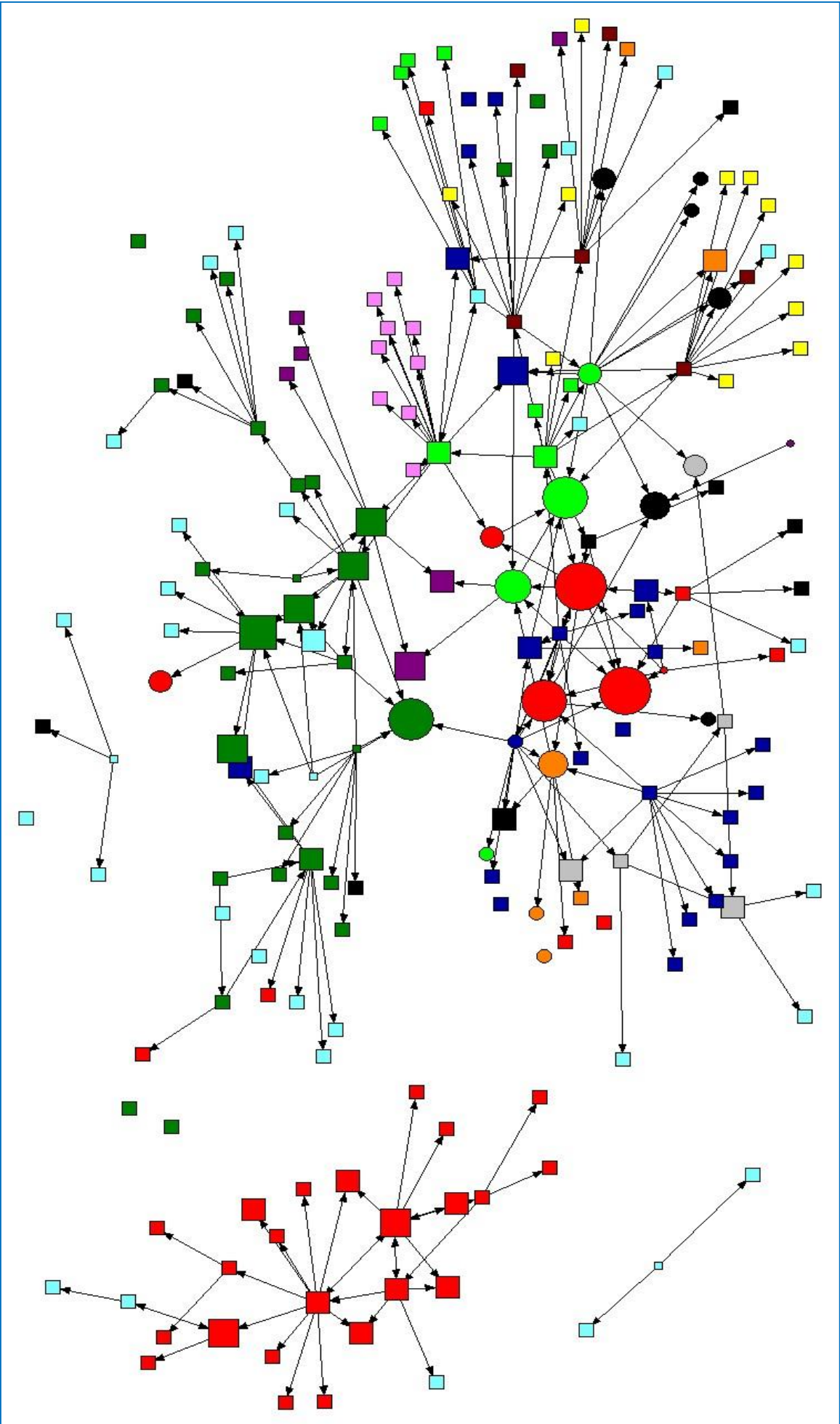


Figure 12. The social network graph presented based on values of importance.



General observations

As can be seen in figure 10, the social network that is presented based on indegree values consists of three groups. One major group with several nodes/individuals and two subgroups with less amount of nodes/individuals. Group A consists of individuals who had an immediate role in the emergency response whilst group B, more or less, had responsibilities that concern business continuity questions. Group C consists of members from a utility company.

As can be seen in the figures, the groups are separated and have no connection between them. It raises the question if the social network in reality describes the complete social network or not. It is much likely that connections are missing in the network and thus visualises an incomplete social network. On the other hand, the network could in fact consist of three social networks and the connection between them should be non-existing. As mentioned earlier, it is a difficult task to visualise a complete social network in social network analysis. With that in mind, it could be argued that our social network analysis probably is missing one or more connections in the network. It could also be argued that the visualised social network shows only a fraction of the complete social network. If, and to what extent, the complete social network has been covered is unfortunately hard to determine.

5.2.4 Comparing different perspectives

Presenting the social network using the perspectives: friendship and importance, enables an opportunity to explain and understand how and why the flow of communication turned out the way it did. In further reading, the social networks with the perspectives friendship and importance are to be compared with the network portraying the indegree-value.

Friendship versus indegree

When comparing the two networks that concerns the indegree-value and friendships, the number of ties in the network showing friendships decreases to a relatively high extent. The majority of the decrease is seen between connections from different agencies. In general, connections seem to stay between individuals from the same agency. On the other hand, there are examples of connections between individuals from different agencies which stays in the social network concerning friendship.

The friendship-relations found in the upper-right part of group A are especially interesting, as it shows friendships-relations between agencies. The trend is most viable among the red and blue nodes, which represents the Suffolk County Council (red) and Suffolk Constabulary (blue). From the Fire and Rescue Service one actor seems to have several friendship-relations to members from other agencies. The Environmental Agency, represented in the network as neon green nodes, has several representatives with friendship-relations to different agencies. In the lower section of Group A, friendships-relations can be seen between nodes in dark green, which represent Waveney District Council and Suffolk Coastal District Council. They also seem to have friendships-relations to different utility companies, seen as turquoise nodes.

Importance versus indegree

When comparing the networks between importance and indegree, there are relatively small differences between the two networks. The number of ties between the nodes are approximately the same, only a few connections are removed. The reason as to why the networks are so similar can be explained by particularly two reasons. The first reason is that nearly all people named in the questionnaire are of great importance for the respondents in order to achieve their work task and responsibilities. Another reason could be that respondents only remembered the important individuals in the response phase 2013, and were perhaps not able to name all the contacts the respondent had.

5.2.5 Multi-agency

All figures show that nodes/individuals representing the same agency often are close to each other in the social network. The nodes with the dark green colour, positioned in the lower part of group A, and red, positioned in group B, appears to be positioned close to members from the same agency. From a multi-agency perspective communication only between co-workers can be interpreted as undesirable. On the other hand, it is likely that individuals within the same agency are positioned in the same office and/or have similar responsibilities. Therefore, communication between people at the same agency, which carry similar responsibilities, is likely to occur and is also expected.

However, there are examples which indicates that the multi-agency approach has affected the flow of communication. In the upper part of group A, a mix of the color-coded nodes appears and some nodes are connected to several different agencies. At first glance, individuals in the SCG seem to follow the multi-agency approach, since connection to several other agencies appears. However, there are members in the network that connect to several different agencies which are not members of the SCG.

In fact, the social network shows that there are several different agencies involved in the emergency response. The network shows that representatives from several different agencies were present and communicated in the emergency response. It also suggests that the emergency response was a multi-agency response.

6 Discussion

During the course of this thesis work, it has become evident to the researchers that there are both similarities and differences between the actual and the intended emergency response. In this section, a small comparison will be made in which consistencies as well as inconsistencies will be brought up and the reason of their existence will be discussed.

6.1 Consistencies and inconsistencies

There is primarily one consistency that stood out, namely, the multi-agency cooperation which was held together by continuous SCG meetings. This is the most evident consistency as it is present both in plans and in the actual emergency response. For example, interviews, incident reports and the social network graphs showed evidence of an existent multi agency cooperation. Also, almost all of the actors with obligations in the written response plans were identified in the social network graphs. Further, the network graphs showed patterns of the structural framework.

In the social network graphs, it can be seen that members of the Strategic Coordination Group, generally, have centralised positions in the network from where connection to other nodes grows. A centralised position is potentially a preferable position when receiving and cascading information from/to other actors in the emergency response. If we assume that all relevant information is shared between the nodes in the network, it can also be said that a centralised position offers preferable conditions to achieve a holistic overview of the emergency.

Moving on to inconsistencies, there were some revealed when comparing the actual and intended response. One example is that there were no organised Tactical Coordination Group during the actual emergency response. This became evident through incident reports, interviews as well as through answers to the web questionnaire.

6.2 Why do these consistencies and inconsistencies exist?

The researchers have tried to evaluate whether or not the communication flow between actors active in the 2013 response depends on more factors than the guidance from the response plans. If this is the case, it could be one reason for inconsistencies between the actual and the intended response. However, it was not possible to conclude that, for example, friendship- or importance-relations affected the actual response in a way that differed to the intended. On the other hand, the SCG-meetings and practices induced by the response plans seem to have established relations between actors in the network. These relations have probably been beneficial for sustaining the cooperation between the different agencies and thus sustained the multi-agency cooperation. However, it cannot be denied that relations have been established under other circumstances as well. Even if patterns can be found in the graphs or from interviews it cannot be taken for granted that all relations have established under occasions such as planned practises et cetera.

When comparing the network concerning importance to the network that showing indegree, there were few differences found. Thus, when a respondent named contacts he or she often named these contacts as important as well. There could be several reasons for this, one being that the

multi-agency response plan and/or the meetings have made the respondents aware of the responsibilities of other agencies. In turn, this might have led the respondent to limit his or hers contact to persons only important for him or herself in order to complete his or hers work tasks. Another reason for this could be that the respondent only named the important contacts because these were the ones that he or she could remember contacting. Had the social network analysis been performed right after the occurrence of the event, the network would most probably have looked differently.

Furthermore, the interviews and answers to the web questionnaire brought up possible reasons to why the intended and actual response differed in several ways. For example, some respondents stated that there was a lack of communication between regional and local authorities and/or organisations. Issues regarding communication can of course be a reason for the actual response not ending up like it is supposed to, due to plans and regulations. Furthermore, it should be noted that there are several different response plans to take in to account. All local organisations and authorities have their own local response plans, despite the generic response plan regarding several agencies. This could be a reason as to why the answers differed to the question regarding whether the response turned out as described in plans and policies. Some actors stated that they did not have a formal plan, or that it was lacking. That led to a more impulsive response since, naturally, they could not follow an inadequate plan. Other stated that the response ended up successful owing to the planning and exercising ahead of the incident, which indicates a more functioning response plan.

6.3 The validity of the results

In all kinds of research, researchers will be subjective in their different selections throughout the work process and this applies for this work as well. In this work, also the respondents give their own biased and subjective view on the response. This is inevitable and should not be seen as a problem. However, it is important to discuss why the results of the study ended up the way they did. Therefore, this section will include a critical review of the results achieved in this work.

6.3.1 The initial choice of respondents

In this work, an initial set of respondents was interviewed and asked to perform the web questionnaire for the snowball sampling approach. Therefore, the initial selection of individuals highly affects the results. The researchers wanted to capture as many of the actors as possible that were active in the response to the 2013 flood incident. The researchers therefore studied incident reports to get an overview of the participating actors in the response. However, it was found that our contact person in Suffolk had a good overall view of which actors that were active in the response. Therefore, the choice of initial respondents was made in agreement with him.

However, it can be questioned whether this method of selecting the initial set of individuals ended up covering the complete flow of communication. Since the choice of initial individuals was made in agreement with the contact person, there is a risk that the network originated from him and his relations. On the other hand, he had a central role in the response, as a part of the SCG

and had contact with several actors from other agencies. Therefore, it is likely that he holds a centralised position in the network either way.

The initial set consisted of 20 individuals that came from five different agencies. This was believed to be a fair amount of individuals for the interviews, in order to cover different perspectives of the 2013 incident. Also, it was found appropriate due to the time range of this work. This set of 20 individuals was also believed to be adequate for using the snowball sampling method. Further, this enabled covering of the internal and external communication during the flood response. Since the responsibilities of the responders also varied in terms of strategical, tactical and operational roles, it enabled us to capture the flow of communication within those dimensions.

As mentioned earlier in the report, the number of individuals in the network grows as the sampling continues. The snowball sampling method was used in order to identify as many involved individuals in the response as possible. This since the boundaries of the network were unknown. The number of identified actors was about 200, which by the researchers, is considered to be a large number. Also, actors from all agencies named in the incident reports and plans were identified. However, the time frame of the work led the researchers to stop the sampling and it is thus certain that not all actors active in the response were identified.

The snowball sampling is supposed to stop once all new identified individuals in the network starts referring back to individuals that already have been identified. This was thus not the case in this work. Naturally, some individuals intentionally avoided to answer the questionnaire which affected the completeness of the network. Also, considering the time gap between this study and the event, it is natural to believe that the memory of the respondents has faded, making it difficult to remember who they contacted. This is yet another thing that might have affected the entirety of the network.

Despite the potential errors mentioned above, the number of individuals answering the questionnaire is perceived to be high. It was thus considered to be enough in order to perform a social network analysis.

6.3.2 The time period

In section 5.1.2 it can be seen that the respondents define the response phase differently. The reason for this might be that the different responders had different responsibilities and roles. A comparison of the answers related to the question concerning the duration the event showed that some respondents thought of a longer time period than others when referring to the response phase. The reason to this could be related to the specific definition of the term at a given agency. This was the case for Environmental Agency who meant that a response phase takes place under a longer period of time, in comparison to other actors.

As a consequence, it cannot be rejected that some of the individuals in the social network named contacts they had during a time period which others thought of as the preparation or recovery phase. On the other hand, it can be argued that it is natural that the response phase for different agencies can occur during different time periods. This since all the respondents responded when

there was a need for them or their agency to act. Some individuals had, in their response phase, roles that considers pre-emergency responsibilities while others dealt with the consequences from the flood.

With the definition of the response phase in mind, seen in 2.2.1, the response phase as described by the responders are within the boundaries that characterises a response phase. The phase starts with pre-emergency actions, for instance the Environment Agency issuing a first flood warning. It also ends when actions move from dealing with the consequences to dealing with people's needs.

6.3.3 The intended response

The thesis has presented the intended response by looking at selected response plans with its structural framework, multi-agency approach and joint decision model. It is believed that these perspectives give a comprehensive description of the intended response. It was not the researchers' intention nor was it possible to present the complete set of different response plans and procedures. Instead the presentation of the intended response aims to capture an overview.

Specific responsibilities for different agencies has intentionally not been presented. Also, the agencies often have their own response plans which are complemented by the generic plan. These local response plans have intentionally been left out as well.

The validity of the documents used is considered to be high since they are current and up-to-date. Information about the response plans was collected under the site visit in England. The main sources of information used while describing the intended response in this work were the Suffolk Generic Response Plan and Flood Response Plan. These documents were provided to the authors by the Head of emergency planning in Suffolk Joint Emergency Planning Unit. In addition to the plans, information about the intended response was collected from interviews as well. The interviews have helped the researchers to understand the information in the response plans.

6.4 Further research

Throughout the work process of this master thesis we have noticed a more regional planning and decision making on flood management purposes than in Sweden where more responsibilities lie within the municipalities. Therefore, it would be interesting to perform some kind of comparison between the flood risk management in Sweden and in the UK. During the course of this work we have had the impression that regional flood risk management can be an effective approach when handling flooding. Flooding often affects several municipalities and cooperation between different actors are needed and can facilitate an effective distribution of staff and resources to affected areas.

However, a flood management system with the decision making on a more regional level demand effective communication from the regional to the local level and vice versa. This can of course be challenging which we saw examples of in the answers to the web questionnaire.

The study performed in this master thesis indicates that important lessons can be learned though a meticulous investigation of the emergency response. The authors of this work have not been able to cover all interesting aspects and learnings on this subject, and there is thus room for plenty of further research. A description similar to this study may help to improve the emergency response to similar events in the future. For example, it would be interesting to perform a corresponding study more immediately after a past flood incident since this will lead to a more complete network and thus better understanding of the flood response.

7 Conclusion

The study has aimed to describe both the intended and the actual emergency response to the 2013 flood incident in Suffolk, UK. The methodical approach and model used in this study have been executed in a way that facilitates for future analysis and comparisons to be done. Furthermore, a comparison between the actual and the intended response have been performed. Patterns of the structural framework described in response plans were seen in the social network graphs presenting the actual response. Also, there were inconsistencies between the two but as a respondent stated: “No plan survives contact with the enemy”.

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9 Appendices

Below, the appearance of the web based questionnaire can be seen.

Web questionnaire - Page 1

Emergency Response Mapping

0%

This survey has been sent to you especially. This, because you are identified as an essential actor in the emergency response network during the december 2013 flood in Suffolk. In order to complete this Social Network Analysis, your answer to this short survey is crucial to us. Hence, we truly appreciate your participation.

Observe, you will be anonymous by name and title. All personal data such as; name, work title and e-mail, will remain between the researchers. Although filling in this information will make data collection and analysis easier for the researchers.

1. What is your name?

2. Which corporation/authority do you work for?

3. What is your work title?

4. What were your work tasks during the emergency response?

5. At what specific time were you most active in the emergency response?

Next

Web-questionnaire - Page 2

Emergency Response Mapping

25%

This survey has been sent to you especially. This, because you are identified as an essential actor in the emergency response network during the december 2013 flood in Suffolk. In order to complete this Social Network Analysis, your answer to this short survey is crucial to us. Hence, we truly appreciate your participation.

6. Please name the contacts you communicated with during your most active work phase in the emergency response.

Maximal number of contacts you can name is 15. Naturally, you may name less than that. If you had more contacts than that during the initial emergency response, choose the contacts you communicated with the most.

Further, it is appreciated if you refer to the individuals at least by name/email.

	Name and Title/Organization	E-mail
1	<input type="text" value="a"/>	<input type="text" value="-"/>
2	<input type="text" value="b"/>	<input type="text" value="-"/>
3	<input type="text" value="c"/>	<input type="text" value="-"/>
4	<input type="text" value="d"/>	<input type="text" value="-"/>
5	<input type="text"/>	<input type="text"/>
6	<input type="text"/>	<input type="text"/>
7	<input type="text"/>	<input type="text"/>
8	<input type="text"/>	<input type="text"/>
9	<input type="text"/>	<input type="text"/>
10	<input type="text"/>	<input type="text"/>
11	<input type="text"/>	<input type="text"/>
12	<input type="text"/>	<input type="text"/>
13	<input type="text"/>	<input type="text"/>
14	<input type="text"/>	<input type="text"/>
15	<input type="text"/>	<input type="text"/>

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Web-questionnaire - Page 3

Emergency Response Mapping

50%

This survey has been sent to you especially. This, because you are identified as an essential actor in the emergency response network during the december 2013 flood in Suffolk. In order to complete this Social Network Analysis, your answer to this short survey is crucial to us. Hence, we truly appreciate your participation.

7. Please grade your contacts in terms of importance and friendships

When grading the importance of a contact, consider importance in terms of how important this contact were for you to complete your work tasks during the emergency response.

	Importance	Friendship
a	Not important ▾	Know by name/title ▾
b	Somewhat important ▾	Aquaintance ▾
c	Important ▾	Friend ▾
d	Very important ▾	Good friend ▾

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Web-questionnaire - Page 4

Emergency Response Mapping

75%

This survey has been sent to you especially. This, because you are identified as an essential actor in the emergency response network during the december 2013 flood in Suffolk. In order to complete this Social Network Analysis, your answer to this short survey is crucial to us. Hence, we truly appreciate your participation.

8. In your opinion, do you consider the emergency response during the flood incident 2013 successful? Why or why not?

9. Finally, do you think the emergency response turned out as it intentionally should, according to plans/instructions? Why or why not?

[Back](#) [Submit](#)