UNIVERSITY OF TWENTE.

Bachelor Thesis

The potential of web 2.0 applications to enhance social cohesion and the emergence of collective action

Name:	Timo Hartmann
Student number:	s1736418
Date:	6 th July 2017
Educational program:	European Public Administration / Public Governance across Borders
Course module:	Bachelor Thesis
Supervisors:	Dr. Gül Özerol
	Prof. Dr. René Torenvlied

Abstract

The risks inherent in climate change and the vulnerability they pose to contemporary societies are widely acknowledged. Disasters often foster solidarity among affected people, who, in turn, show an increased willingness to engage collectively in coping with the consequences. In the last few years, web 2.0 ever more became a key coordination and mobilization tool for collective activists. This case study examines how Occupy Sandy, a grassroots disaster relief network that emerged in the aftermath of Hurricane Sandy in the U.S.A, used web 2.0 applications to organize collective action. Furthermore, it explores to what extent web 2.0 contributed to social cohesion among users who were engaged in Occupy Sandy. In a mixed-methods approach, I combined natural language processing and machine learning with a qualitative review of Occupy Sandy-related Twitter and Facebook contents. I find that web 2.0 applications were essential tools for Occupy Sandy to organize its disaster-relief efforts and crucial to mobilizing a broad network of volunteers. Furthermore, Occupy Sandy-users formed a socially cohesive group around their shared perception that formal organizations responded inadequately to the hurricane. This was reflected in a dense network of social relations, users' expressions of feelings of attachment to Occupy Sandy, and a distinct sense for the common good. This study reveals that social cohesion provides a great resource for the emergence of community-based disaster relief networks. Furthermore, the case of Occupy Sandy points to the promising potential of collective action from the grassroots that has lately been increasingly acknowledged by disaster response agencies.

Contents

Abs	tract	
1.	Intro	oduction
	1.1	Research question
2.	The	oretical background
	2.1	Coastal urban areas, climate change, and natural disasters7
	2.2	Collective action, social movements, and emergent response groups
	2.3	Socialcohesion
	2.4	Web 2.0
3.	Rese	earch design, data, and methods
	3.1	Contextual background
	3.2	Data and Methods14
	3.2.	1 Data sources: web 2.0 platforms
	3.2.2	2 Data Collection
	3.2.3	3 Data analysis
4.	Ana	lysis
	4.1	How did the Occupy Sandy disaster-relief network use social media platforms to organize collective action?
	4.1.	1 Occupy Sandy's emergence and maintenance over time
	4.1.2	2 Patterns regarding calls for action and organizing strategies
	4.2	Social Cohesion
	4.2.	1 Social Relations
	4.2.2	2 Feelings of attachment/belonging to the social entity
	4.2.3	3 Orientation towards the common good
5.	Con	clusion
Refe	erenc	es:
Арр	endic	ces
	1.	Figures
	2.	Tables
Con	tent o	of the digital appendix

Figures and tables

Figure 1. Operationalization diagram for the concept "Collective Action".	. 18
Figure 2. Operationalization diagram for the concept "Social Cohesion".	. 19
Figure 3. Number of Tweets by Occupy Sandy over time	. 21
Figure 4 Frequency of Facebook posts by Occupy Sandy over time.	. 22
Figure 5 Number of Tweets by Occupy Sandy per weekday and per time of the day	. 23
Figure 6 Most frequently used terms by Occupy Sandy on Twitter	. 24
Figure 7 Most frequently used terms by Occupy Sandy on Facebook.	. 25
Figure 8 Occupy Sandy Facebook post network. November 1, 2012.	. 29
Figure 9 Twitter mentions network graph of the Hashtag Occupy Sandy Corpus.	. 30
Figure 10 Facebook mentions network graph of the Occupy Sandy Facebook Page Corpus	. 31
Figure 11 Retweets network graph of the Hashtag Occupy Sandy Corpus	. 32
Figure 12 Hashtag Occupy Sandy Corpus sentiment time series.	. 33
Figure 13 Occupy Sandy Facebook Page Corpus sentiment time series	. 34
Figure 14 Hashtag Occupy Sandy Corpus collectiveness time series	. 37
Figure 15 Occupy Sandy Facebook Page Corpus collectiveness time series	. 38
Figure 16 Number of Facebook posts by Occupy Sandy per weekday and per time of the day	. 46
Figure 17 Top five Hashtags used most frequently by Occupy Sandy on Twitter	. 46
Figure 18 Top five Hashtags used most frequently by Occupy Sandy on Facebook.	. 47
Figure 19 Occupy Sandy post network. November 2, 2012	. 47
Figure 20 Occupy Sandy Facebook post network. November 3, 2012.	. 48
Figure 21 Occupy Sandy Facebook post network. November 4, 2012.	. 49
Figure 22 Occupy Sandy Facebook post network. November 5, 2012.	. 50
Figure 23 Occupy Sandy Facebook post network. November 6, 2012.	. 51
Figure 24 Occupy Sandy Facebook post network. November 7, 2012.	. 52
Figure 25 Occupy Sandy Facebook post network. November 8, 2012.	. 53
Figure 26 Occupy Sandy Facebook post network. November 9, 2012.	. 54
Figure 27 Occupy Sandy Facebook page network. November 10, 2012.	. 55
Figure 28 Occupy Sandy Facebook page network. November 11, 2012.	. 56
Figure 29 Occupy Sandy Facebook page network. November 12, 2012.	. 57
Figure 30 Occupy Sandy Facebook page network. November 13, 2012.	. 58
Figure 31 Occupy Sandy Facebook page network. November 14, 2012.	. 59
Figure 32 Occupy Sandy Facebook page network. November 15, 2012.	. 60

1. Introduction

The climate change poses a steadily increasing risk and vulnerability to contemporary societies. Mounting temperatures, sea level rise, droughts, heatwaves, and natural disasters such as floods or storms will most likely be the consequences (Jabareen, 2013, p. 220). Natural disasters disrupt social order and heavily impact the daily lives of affected people. In turn, they often lead those people to change their usual behavior. For instance, affected people show an increased solidarity toward their community as well as a heightened openness to interact with others, and voluntarily engage in collective action to provide mutual help (Kotani & Yokomatsu, 2016, p. 310; Sweet, 1998, p. 322; Townshend, Awosoga, Kulig, & Fan, 2015, p. 936). Messias, Barrington, and Lacy (2012, p. 111), for example, observed that Hurricane Katrina led people to form social ties with unknown others and to show an increased collective spirit.

In 2012, Hurricane Sandy devastated vast areas of the Atlantic basin, including substantial parts of New York and New Jersey. Only hours after Sandy had made landfall, members from the Occupy Wall Street movement used web 2.0 applications to spread the appeal to provide community-sourced post-disaster recovery. They created an Occupy Sandy Facebook page, initiated the Hashtag "#SandyAid" on Twitter and Facebook, and launched a WePay account to collect donations. Within four months, Occupy Sandy had gathered 60.000 volunteers and emerged to one of the largest humanitarian actors across New York City and New Jersey. Occupy Sandy established food distribution centers and served about 10,000 meals a day in the week following the hurricane. Furthermore, the grassroots disaster relief network coordinated 'motor pools to transport construction teams and medical committees to survivors in the field' (Blachman-Biatch, Edgemon, Hull, & Taylor, 2013, p. 41). Since the very beginning of its collective action, web 2.0 technology was the primary tool used by Occupy Sandy to mobilize volunteers, organize and coordinate its actions, and share information (Blachman-Biatch et al., 2013, pp. 23-30).

In the past years, disaster response agencies have increasingly acknowledged the potential of collective action from the grassroots. For instance, during the 2010 earthquake in Haiti, the United Nations and U.S. federal agencies planned their response primarily on the basis of crowdsourced datasets: more than 600 volunteers had reviewed satellite imagery and built a digital map of roads and critical infrastructure (Crowley, 2013, pp. 13-14). Moreover, after Hurricane Sandy had made landfall in the U.S., '6,717 volunteers analyzed more than 35,535 photographs, completing more than half of that work in 48 hours' (Crowley, 2013, p. 15). Their contribution saved the U.S. Federal Emergency Management Agency (FEMA) several days of work regarding the planning of its disaster response.

Thanks to new tools such as web 2.0 applications, community-based intelligence can organize immediately after a disaster has occurred (Crowley, 2013, pp. 13-15). Generally speaking, web 2.0 ever more becomes a key platform for collective activists to coordinate their action, share information, and

mobilize others to join. It allows users to share media and news, access and comment on already published information, invite others to pass their opinion and express feelings and emotions (Checker, 2017, p. 125; Kongthon, Haruechaiyasak, Pailai, & Kongyoung, 2012, p. 9). The relative anonymity that reigns in web 2.0 platforms increases the people's willingness to communicate with strangers (Wellman & Gulia, 1999, p. 8). Checker (2017, p. 125) suggests that the abstraction of web 2.0 and the often brief and perhaps sophisticated interactions allow 'activists to ignore potentially divisive political ideologies and interact around the issues they agreed on.' Other scholars, however, are less optimistic regarding the potential of web 2.0 applications for bringing people together and mobilizing volunteers to engage collectively. For instance, Kenski and Stroud (2006, pp. 182-183) suggest that they only play a minimal role when it comes to creating political actors and that rather other variables related to education, knowledge, and-or participation are key factors. Al-Kandari and Hasanen (2012, pp. 251-252) find that the internet functions as a useful tool for those who engage already, but not necessarily influences people to newly engage.

The case of Occupy Sandy seems to confirm what various scholars suggest: web 2.0 technology has become a key instrument for activists to organize themselves and to mobilize others. After Hurricane Sandy, web 2.0 applications helped to bring strangers together within a diverse region (Blachman-Biatch et al., 2013, p. 66). However, how did citizens use the web 2.0 platforms Twitter and Facebook to express their opinions, calls for action and feelings regarding Occupy Sandy? Do these platforms improve social cohesion or at least help people to find common issues they can cohere around?

A flurry of scholars credited the potential of web 2.0 technologies when it comes to organizing collective action, mobilize volunteers, express opinions and feelings, and share information. For instance, Wellman and Gulia (1999, p. 15) propose that web 2.0 technologies have the potential to connect diverse cultures and ideas and help people to form communities based on shared interests. Similarly, Checker (2017, p. 124) points out that web 2.0 platforms help activists to organize across difference. This study adds to the scientific understanding of how collective activists use web 2.0 platforms and how their use of these platforms affects social cohesion within groups of collective activists. This thesis is a constituent of a larger research project with the title "Building Urban Resilience". It is part of the "research and education program in Urban Resilience", an annual cooperation between the Stevens Institute of Technology, U.S.A., and the University of Twente, the Netherlands.

Subsequently, I first present the research question as well as consecutive sub-questions underlying this study. Next, I describe the theory and concepts on which the study is based. Third, I introduce the research design and outline the case selection as well as the operationalization of the main concepts. Next, I present a discussions of the results and, finally, provide a conclusion in which I answer the main research question.

1.1 Research question

The main research question underlying this study reads as follows:

To what extent do web 2.0 platforms contribute to social cohesion by functioning as tools for social movements to organize collective action?

The project focuses on web 2.0 platforms' ability to cohere people around a common identity. Based on this exploratory research question, I also investigated if web 2.0's ability to connect strangers with a common interest affects social cohesion among the members.

To answer the main research question, I studied the following empirical sub-questions:

1- How did the Occupy Sandy disaster-relief network use web 2.0 platforms to organize collective action?

This sub-question focuses on the way Occupy Sandy used web 2.0 platforms to organize and coordinate collective action, and mobilize volunteers. I answered this question based on a review of Occupy Sandy-related contents on Facebook and Twitter and looked for patterns regarding calls for action as well as discussions about organizing strategies.

2 To what extent did expressions regarding Occupy Sandy on web 2.0 platforms reflect social cohesion among citizens?

In this part of the study, I examined whether users of the hashtag '#OccupySandy' and the Facebook page of Occupy Sandy formed a socially cohesive group around a common interest. I studied their expressions of feelings, emotions, and opinions through web 2.0 platforms and compared these expressions with a set of indicators for social cohesion.

2. Theoretical background

In this chapter, I provide the theoretical framework of this thesis.

2.1 Coastal urban areas, climate change, and natural disasters

Over the past years, the world has encountered some unprecedented natural disasters such as the Tsunami in South-East Asia, Hurricane Katrina, and Earthquake Wenchuan in China (Zhou, Wang, Wan, & Jia, 2010, p. 21). Especially coastal zones are prone to natural hazards and sea-level rise. People living in these areas are, therefore, particularly vulnerable and increasingly exposed to risks (Neumann, Vafeidis, Zimmermann, & Nicholls, 2015, p. 2). Since most of the world's biggest urban areas face coasts and global urbanization continues rapidly, sea-level rise and related hazards directly impact an already significant and steadily growing number of people (Buhaug & Urdal, 2013, p. 1; Klein, Nicholls, & Thomalla, 2003, p. 36). Buhaug and Urdal (2013, p. 1) suggest that by 2050, the world's population

being urban will have increased by three billion people compared to 2010. However, to better understand what this growth in urban population means, it is necessary first to specify what the term "urban" actually refers to. Pickett et al. (2001, p. 129) define urban systems as 'those in which people live at high densities, or where built infrastructure covers a large proportion of the land surface.' Roberts (2000, p. 9) emphasizes the complexity and dynamics of urban systems. The author further suggests that cities are political centers that involve processes of physical, social, environmental, and economic transition. Similarly, Godschalk (2003, p. 141) suggests that urban systems are 'complex and dynamic metasystems [with] dynamic linkages of physical and social networks.' Thereby, physical systems refer to constructed and natural environmental components of the city, such as roads, infrastructure, or geology.

Blaikie, Cannon, Davis, and Wisner (2014, pp. 4-5) suggest that it is not only natural events that lead to natural disasters. They point out that the social, political, and economic characteristics of society are crucial regarding how natural events affect people. Hence, the authors propose that the natural and the social environment cannot be treated separately when it comes to measures of disaster preparedness and recovery. Especially urban areas are exposed to a high level of disaster risk (Gencer, 2013, p. 11). Gencer (2013, p. 11) sees the main reason for this in the dense settlement of population and assets and 'the embedded conditions of socio-economic and spatial vulnerabilities.' As the share of the world's urban population increases and the challenges inherent in climate change steadily grow and become more complex, the concept of urban resilience has gained attention by scholars and within political discourse (Carmin, Nadkarni, & Rhie, 2012; Godschalk, 2003; Leichenko, 2011; Liao, 2012). Godschalk (2003, p. 137) suggests that an urban system is resilient if it exhibits 'a sustainable network of physical systems and human communities.' Leichenko (2011, p. 164) defines urban resilience as urban systems' ability to quickly recover from shocks and stresses affiliated to the climate. Similarly, Wagner and Breil (2013, p. 114) characterize resilient cities as those in which the community is capable and able 'to withstand stress, survive, adapt and bounce back from a crisis or disaster and rapidly move on.' Similarly, Meerow, Newell, and Stults (2016, p. 39) define urban resilience as an urban system's ability 'to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity.' When it comes to urban resilience, Adger (2003, p. 387) proposes that collective action is a fundamental element regarding a societies ability to adapt to climate change and, hence, become more resilient. Similarly, Magis (2010, p. 406) also suggests that collective action contributes to resilience.

2.2 Collective action, social movements, and emergent response groups

Drabek and McEntire (2003, p. 99) find that disasters typically unify individuals and groups and make them more cohesive. Similarly, Kotani and Yokomatsu (2016, p. 310) argue that disasters and other extraordinary events might be the root that often forces people to change their usual patterns of behavior and provides an unusual opportunity for people to interact with others and engage in collective action. Scott and Marshall (2009, p. 96) define collective action as an 'action taken by a group (either directly or on its behalf through an organization) in pursuit of members' perceived shared interests.' More specifically, the term "social movement" refers to a collective action that aims at changing (or resisting change in) 'some major aspect or aspects of society' (Scott & Marshall, 2009, p. 704). According to the authors, social movements play an important role when it comes to political changes. Along with environmentalism, they name civil rights, gay rights, trade unionism, and feminism as examples for issues supported by social movements.

After disasters, affected people often act collectively through a membership in an emergent response group. An emergent response group can be defined as a group of individuals who self-organize spontaneously on a voluntary basis to act on perceived needs (Blachman-Biatch et al., 2013, p. 9). These groups gather on an ad-hoc basis having no preexisting structures (Majchrzak, Jarvenpaa, & Hollingshead, 2007, p. 147). Traditionally, emergent response groups take action whenever formal response organizations such as the Red Cross or the Federal Emergency Management Agency (FEMA) address problems inadequately (Carley & Harrald, 1993, p. 9). Thereby, as Quarantelli and Dynes (1977, pp. 94-95) suggest, they usually take over the following three types of action: damage assessment, operations, and coordination.

After a disaster, one might argue, affected people share specific common interests, which are, for instance, rebuilding infrastructures such as houses, providing medical aid, or making sure that their community has enough food and water. However, are these shared interests reason enough for people to become active themselves? Why would they not just wait until other community members or the government would solve the problems? Moreover, what moves people to be pro-active and engage in a social movement, or more specifically in a community-based disaster relief network? Mancur Olson (1971, p. 2) points out that 'unless the number of individuals in a group is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, *rational, self-interested individuals will not act to achieve their common or group* interests.' Furthermore, the author emphasizes

'that any group or organization, large or small, works for some collective benefit that by its very nature will benefit all of the members of the group in question. Though all the members of the group therefore have a common interest in obtaining this collective benefit, they have no common interest in paying the cost of providing that collective good. Each would prefer that the others pay the entire cost.' (Olson, 1971, p. 21)

According to Olson, rational individuals will only be stimulated to engage in collective action if they are offered a separate and "selective" incentive. 'The incentive must be "selective" so that those who do not join the organization working for the group's interest, or in other ways contribute to the attainment of the group's interest, can be treated differently from those who do' (Olson, 1971, p. 51). Similarly, Scott and Marshall (2009) suggest that a shared goal or a common interest is not enough for people to

engage collectively. Although it might seem logical, they argue, 'experience shows that this is not always the case and that many people who stand to benefit from a given collective action will refuse to join in' (Scott & Marshall, 2009, p. 96).

However, according to Olson (1971, p. 60), 'a desire to win prestige, respect, friendship, and other social and psychological objectives,' among others, can be incentives to act collectively. Similarly, Coleman and Coleman (1994, p. 274) observed that individuals' attachment to a group of people indeed affects their behavior. They find that team athletes often work harder than athletes in individual sports due to the social pressure from teammates. Lent, Schmidt, and Schmidt (2006, pp. 74-81) found that group cohesion has a positive effect on collective efficacy, which refers to a group's shared 'beliefs about how they can perform as a unit' (Lent et al., 2006, p. 74). Besides Lent et al., other scholars are also sanguine about the role of social cohesion when it comes to collective action. For instance, Uchida, Swatt, Solomon, and Varano (2013, p. 2) suggest that social cohesion, 'when high, ultimately help[s] structure collective productive action.' Similarly, Adger (2003, p. 389) points out that social networks and flows of information between individuals and groups are essential conditions for collective action. Regarding emergent response groups, Blachman-Biatch et al. (2013, p. 10) propose that they traditionally rely on preexisting relationships with neighbors, local friends, and other members of community organizations.' Hence, the literature suggests that social cohesion is a necessary condition for collective action. However, what exactly is meant by the term social cohesion? Subsequently, I provide a literature review to give an overview of how the term is used in science.

2.3 Social cohesion

There is not one single approach when it comes to a conceptualization of social cohesion. Scholars lack a common understanding of what it exactly entails (see: Dragolov, 2016; Hulse & Stone, 2007; Jenson, 2010). Chan, To, and Chan (2006, p. 298) propose that social cohesion refers to 'a state of affairs concerning both the horizontal and vertical interactions among members of society.' According to the authors, this state of affairs is characterized by (1) trust among the members of society, (2) the members' sense of belonging to the social entity, (3) their willingness to participate and help others, and (4) the three previous characteristics must be manifested in their objective behavior (Chan et al., 2006, pp. 289-298). Hulse and Stone (2007) distinguish between three elements of social cohesion. First, they refer to social relations to family, friends, or neighbors throughout the daily life as well as within networks and associations. Secondly, social cohesion involves an (in-)equality dimension between groups of people. Lastly, the scholars include a cultural dimension into their approach, 'referring to the norms underlying the 'ties that bind' people together and which include a sense of common purpose, shared identity, common values [...], and behaviours which reflect these' (Hulse & Stone, 2007, p. 124). Jenson (2010) suggests that social cohesion consists of two dimensions: (1) the inequality dimension that involves the goal of promoting equal opportunities and (2) social capital, defined as social relations, interactions, and

ties. In their literature review, Schiefer and van der Noll (2016) identify six dimensions that scholars often use as indicators for social cohesion: '*Social relations, identification, orientation towards the common good, shared values, quality of life, and (in)equality.*' The authors suggest that social relations, identification, and orientation towards the common good are the most central elements of social cohesion, being those that most approaches combine. Thereby, social relations refer to social networks, participation, trust, and mutual tolerance. Identification invokes the attachment and belonging to a social entity, and orientation towards the common good relates to both 'feelings of responsibility for the common good, solidarity [and] acceptance of and compliance to the social order and social rules' (Schiefer & van der Noll, 2016, p. 11). Therefore, they define social cohesion as 'a descriptive attribute of a collective, indicating the quality of collective togetherness' (Schiefer & van der Noll, 2016, p. 14). Table 1 summarizes the elements of social cohesion each of the authors discussed in this chapter identified.

Reference	Elements of social cohesion
Chan, To, & Chan, 2006	(1) Trust among the members of a social entity;
	(2) Sense of belonging to the social entity;
	(3) Willingness to participate and help others
	 (4) The objective manifestation of the subjective feelings in (1) – (3) in the behavior of members of the social entity.
Hulse & Stone, 2007	(1) Social relations to family, friends, or neighbors throughout the daily life and within networks and associations;
	(2) (In-)equality between groups of people;
	(3) Norms underlying "ties that bind" people together and which
	include a sense of common purpose, shared identity, common values, and behaviors reflecting these.
Jenson, 2010	(1) Inequality dimension that involves the goal of promoting equal opportunities;
	(2) Social capital, defined as social relations, interactions, and ties.
Schiefer & van der Noll, 2016	 (1) Social relations: social networks, participation, trust, and mutual tolerance; (2) Identification: attachment and belonging to a social antiture.
	(3) Orientation towards the common good: feelings of

Table 1 Literature review: Elements of social cohesion.

responsibility for the common good, solidarity, and acceptance of
and compliance with the social order and social rules.

However, is this *collective togetherness* regarding social cohesion a necessary condition for collective action? Is there no other way to make people act collectively even though they might be strangers or even very different and heterogeneous? Penney and Dadas (2014) suggest that web 2.0 technology provides new communicative platforms that bring people together in a way it was not possible before. Similarly, regarding emergent response groups Blachman-Biatch et al. (2013, p. 10) point out that 'with the advent of social media and portable communication devices, these groups form through, and come to rely heavily upon, online social connections through social media platforms.'

2.4 Web 2.0

The term "web 2.0" has its origin in 2004 and refers to online applications that are open for user generated contents. Contrarily, contents on web 1.0 platforms such as personal web pages were created by individuals and not open for continuous modification by all users of the World Wide Web. The term "social media" is often used interchangeably with the term "web 2.0". According to Kaplan and Haenlein (2010, p. 61), social media 'is a group of Internet-based applications that build on the ideological and technical foundations of Web 2.0, and that allow the creation and exchange of User Generated Content.' Constantinides and Fountain (2008, pp. 232-233) suggest that web 2.0 is the "umbrella term" for online applications that are interactive and user controlled. The authors quote Blogs, Podcasts, social networks such as Facebook, and sharing sites such as YouTube and Flickr as examples of web 2.0 applications. Weber (2014, p. 941) points out that also online newspapers have implemented web 2.0 technologies, allowing their users to participate, for instance through comments and debate sections.

Over the last few years, collective activists increasingly began to use web 2.0 applications such as Facebook, Twitter, YouTube, blogs, or the comments section in online newspapers to organize themselves, mobilize others, and generate as well as share contents. These Internet-based platforms enable users to produce and share content and, thereby, to coordinate collective action and mobilize others to participate (Margetts, John, Hale, & Yasseri, 2015). 'For new social movements, the Internet provides the essential platform for debate, [...] and ultimately serves as their most potent political weapon' (Castells, 2007, p. 250). Margetts et al. (2015) suggest that some types of collective action have largely moved to the Internet, for example signing a petition.

Compared to traditional forms of communication, web 2.0 applications offer a relative anonymity that enables individuals to connect with others although they might be very diverse regarding their social characteristics or political ideologies. In turn, this might allow them to create a common identity based

on their shared goal and, ultimately, act collectively (Checker, 2017, p. 126; Wellman & Gulia, 1999, p. 14). Penney and Dadas (2014, p. 83) find that the informal interactions of citizens about a shared interest or a collective action lead some users of web 2.0 technologies to gain 'a sense of community, solidarity, and group identity.' In their study, they observed that these ties, in turn, reinforce the activists' commitment to a movement. However, Castells (2007, p. 249) points out that online interactions are not the root of collective actions, but rather an instrument their members use. Similarly, Checker (2017, p. 126) suggests that web 2.0 applications help to facilitate traditional offline actions such as marches rather than replacing them.

3. Research design, data, and methods

This study is based on a mixed-methods single-case study research design. It consists of an in-depth study of the case of the "Occupy Sandy grassroots disaster relief network". The data used in this study covers the period spanning October 15, 2012, through March 15, 2013. As Hurricane Sandy made landfall in New York City and New Jersey on 29th October 2012, this allowed an examination of both the emergence of Occupy Sandy and its development over half a year (Blake, Kimberlain, Berg, Cangialosi, & Beven II, 2013). According to Yin (2014, p. 16), a case study should be conducted, among others, when researchers want to understand a real-world case. I applied the theoretical framework underlying this study to the real-life case of the Occupy Sandy disaster-relief network. This allowed me to examine collective activists' use of web 2.0 applications and its influence on social cohesion. I argue that the case of the Occupy Sandy disaster-relief network is appropriate for the purpose of this study for the following reasons. First, Hurricane Sandy was the second costliest storm the United States of America had to cope with in the entire history of the country (Blachman-Biatch et al., 2013, p. 1). Hence, the disaster-relief demands caused by the storm were exceptionally challenging, which makes studying an emergent response group that reacted to this disaster particularly interesting. Second, web 2.0 platforms were the primary means of the Occupy Sandy disaster-relief network to mobilize volunteers and organize collective action. Third, Occupy Sandy mobilized more than 60.000 volunteers and emerged to one of the biggest humanitarian actors across New York City and New Jersey (Blachman-Biatch et al., 2013, pp. 1-66). This indicates the focal role Occupy Sandy played in the aftermath of Hurricane Sandy as well as the success the disaster-relief network had in mobilizing volunteers.

Flyvbjerg (2006, p. 228) argues that case studies often enable researchers to generalize findings to other cases, although they consist of only one or a few cases. The scholar finds that 'the case study may be central to scientific development via generalization as supplement or alternative to other methods. But formal generalization is overvalued as a source of scientific development, whereas "the force of example" is underestimated' (Flyvbjerg, 2006, p. 228). Nisbet and Watt (1984) in Cohen, Manion, and Morrison (2011, p. 481) suggest that a major weakness of case studies is that they are often selective and subjective, mostly because they do not allow cross checking. On the contrary, Flyvbjerg (2006, p.

236-237) points out that the case study research design is not more prone to a bias regarding subjectivity than other research methods. Based on these arguments, I propose that the case study design is the most appropriate for the purpose of this study.

3.1 Contextual background

On October 29th, 2012 Hurricane Sandy made landfall in the areas of New York State and New Jersey. According to the National Hurricane Center, Superstorm Sandy caused at least 147 direct deaths across the Atlantic basin. Moreover, the hurricane damaged hundreds of thousands of homes in the United States and other affected areas (Blake et al., 2013). Only hours after Hurricane Sandy devastated vast areas of New York City and New Jersey, members from the Occupy Wall Street movement used web 2.0 applications to mobilize volunteers willing to provide aid to affected people (Blachman-Biatch et al., 2013). In their study, Blachman-Biatch et al. (2013, p. 1) describe the development of the network as follows: 'Overnight, a volunteer army of young, educated, tech-savvy individuals with time and a desire to help others emerged.' Occupy Sandy provided mutual aid to communities affected by Sandy and became one of the largest humanitarian actors across New York City and New Jersey. Thereby, web 2.0 technology was the primary tool Occupy Sandy used to organize actions, mobilize volunteers, and share information (Blachman-Biatch et al., 2013, pp. 1-3). Four months after Sandy made landfall, Occupy Sandy consisted of as many as 60.000 volunteers, including members of the Occupy Wall Street movement as well as non-members (FEMA, 2013, pp. 1-2). Ten months after Sandy's landfall, the number of volunteers engaged in Occupy Sandy's actions had decreased to 30 to 40 people. However, 'the network maintains a database of contact information for tens of thousands of volunteers' (Blachman-Biatch et al., 2013, p. 62).

3.2 Data and Methods

In this section, I describe the data and the methods used to answer the sub-questions.

3.2.1 Data sources: web 2.0 platforms

I collected data from Twitter and Facebook.

Twitter (www.Twitter.com) is a microblogging social network that allows users to create and follow content streams. These content streams consist of short messages (called *Tweets*) that are limited to 140 characters each. By following other users, Twitter users receive all *Tweets* created by those they follow. Thereby, the users being followed do not need to follow back reciprocally. Users can *retweet* contents posted by other users, address a *Tweet* directly to one or more other users by placing an '@' followed by a username in a *Tweet*, and put a word behind a '#' to create a hashtag (Kwak, Lee, Park, & Moon, 2010, p. 591). A hashtag is associated with a content-related stream that is public and not related to a specific user's stream. Hence, by using hashtags, users contribute content to a high-profile stream that

allows them to attain a high level of visibility and to reach users who might never otherwise see the content.

Facebook (<u>www.Facebook.com</u>) is a social network site that allows its users to create a personal online profile. Users can interact with other users by sending them friend requests. After a friend request has been accepted, the users are "friends" and can see each other's profiles, post comments on each other's pages and communicate via messages. Facebook users can also become members of virtual groups based on shared interests. 'Facebook constitutes a rich site for researchers interested in the affordances of social networks due to its heavy usage patterns and technological capacities that bridge online and offline connections' (Ellison, Steinfield, & Lampe, 2007, p. 1144).

3.2.2 Data Collection

First, I gathered a random sample of Twitter contents containing the hashtag '#OccupySandy' in the period spanning 15th October 2012 through 15th March 2013. This dataset which I call *Hashtag Occupy Sandy Corpus* consists of 12,971 entries and includes the two weeks before Hurricane Sandy's landfall and the five months after it. This allowed me to study the disaster-relief network's use of Twitter from the day it composed its first Tweet. Blachman-Biatch et al. (2013, p. 62) suggest that ten months after the storm, 'Occupy Sandy has scaled down considerably in terms of volunteers and the type of work being done.' Therefore, I argue that the six-months period is long enough to analyze how it used Twitter to organize its collective action and mobilize volunteers. As I retrieved the sample of Tweets within this corpus randomly, it is representative although it does not contain every Tweet with the hashtag '#OccupySandy' that was created in this period. Furthermore, the random sample reflects the relative number of Tweets per day, which allowed me to make assumptions about the evolution of the frequency with which Occupy Sandy used Twitter.

Second, I retrieved a random sample of Tweets created by the Twitter Account 'Occupy Sandy' within the same period. This dataset, which I call *Occupy Sandy Twitter Account Corpus*, consists of 2,300 entries. Again, the sample of Tweets within this corpus is representative as I retrieved it on a random basis. Furthermore, also this sample reflects the relative number of Tweets per day.

This approach does not allow me to study content that does not contain at least one of these Hashtags or was created by Occupy Sandy's Twitter account. However, I argue that it is appropriate for two reasons that I borrow from Conover, Ferrara, Menczer, and Flammini (2013) who used a similar approach in their study:

'As outlined above, hashtags allow a user to reach an audience beyond his or her immediate followers, and it is this kind of expressly public engagement in which [I am] primarily interested. Moreover, while topic modeling techniques may allow for the analysis of untagged tweets, their

use would introduce noise that could cloud the interpretation of any analytical results.' (Conover et al., 2013, p. 2)

Furthermore, I downloaded every Facebook content created by the Facebook page called 'Occupy Sandy' in the period spanning 15th October 2012 through 15th March 2013 and saved it to a corpus that I call *Occupy Sandy Facebook Page Corpus*. This corpus consists of 2,411 entries. Lastly, I created a corpus called *Occupy Sandy Facebook Comments Corpus*. It contains every reaction by any user on any content within the *Occupy Sandy Facebook Page Corpus* and comprises 16,814 entries. Table 2 summarizes the four corpuses by listing to which platform they relate, by which criteria the data was selected, how many entries they comprise, and which timespan they reflect.

Corpus	Platform	Description	Number of entries	Timespan
Hashtag Occupy Sandy Corpus	Twitter	Random sample of Tweets containing the Hashtag '#OccupySandy'	12,971	12-10-15 through 13-03-15
Occupy Sandy Twitter Account Corpus	Twitter	Random sample of Tweets published by the Account 'Occupy Sandy'	2,300	12-10-15 through 13-03-15
Occupy Sandy Facebook Page Corpus	Facebook	Contains all Facebook posts published by the Facebook page 'Occupy Sandy'	2,411	12-10-15 through 13-03-15
Occupy Sandy Facebook Comments Corpus	Facebook	Contains all reactions by any Facebook user to the contents within the Occupy Sandy Facebook Page Corpus	16,814	12-10-15 through 13-03-15

Using the programming language "R", I processed and cleaned all three corpuses based on the method of text mining. Text mining 'refers generally to the process of extracting interesting and non-trivial patterns or knowledge from unstructured text documents' (Tan, 1999, p. 1). Specifically, I set all letters

of the columns containing the text of a Tweet or a Facebook post within the datasets to lower letters, removed punctuation, English stop words such as 'and', 'to', or 'or', deleted all 'HTTP'-links within the text as well as unnecessary spaces between words. Furthermore, I converted every word within the corpuses to its word stem. Lastly, I anonymized the usernames of individuals within the *Hashtag Occupy Sandy Corpus*. Within the *Occupy Sandy Facebook Comments Corpus*, the usernames of individuals were already anonymous when downloaded. The other two corpuses only contain data published by Occupy Sandy's public Facebook page and were, hence, not needed to be anonymized.

3.2.3 Data analysis

In this section I provide a description of the operationalization of the concepts underlying this study and how I measured them. I also discuss which data corpuses I used for each sub-question (see Table 3 for a summary).

Sub-question	Corpuses used	
How did the Occupy Sandy disaster-relief network use web 2.0 platforms to organize their collective action?	(1) Occupy Sandy Twitter Account Corpus(2) Occupy Sandy Facebook Page Corpus	
To what extent did the expressions on web 2.0 platforms regarding Occupy Sandy reflect social cohesion among citizens?	(1) Hashtag Occupy Sandy Corpus(2) Occupy Sandy Facebook Comments Corpus	

Table 3 Summary of the corpuses used for the analysis of each sub-question

For the analysis of the first sub-question (How did the Occupy Sandy disaster-relief network use web 2.0 platforms to organize their collective action?), I used both the *Occupy Sandy Twitter Account Corpus* and the *Occupy Sandy Facebook Page Corpus*. I conducted the analysis using natural language processing. The latter can be defined as 'a theoretically motivated range of computational techniques for analyzing and representing naturally occurring texts at one or more levels of linguistic analysis' (Liddy, 2001, p. 1). The analysis conducted to answer the first sub-question was based on two indicators: I examined the emergence and maintenance of Occupy Sandy on Twitter and Facebook over time and looked for patterns regarding calls for action and organizing strategies. Figure 1 shows the operationalization diagram for the concept 'Collective Action'.



Figure 1. Operationalization diagram for the concept "Collective Action".

First, I analyzed how many Tweets and Facebook posts Occupy Sandy created over time and on what weekdays. This allowed me to analyze study how quickly after the storm Occupy Sandy emerged, in which phase it was most active, and how its activity evolved over time. Secondly, I measured on what weekdays and to which time of the day Occupy Sandy was most active on Twitter and Facebook. This analysis gave me insights regarding whether the volunteers had designated times to which they maintained the web 2.0 platforms of Occupy Sandy or if they were constantly active.

Regarding the second indicator, I measured the most frequent hashtags as well as words Occupy Sandy used in its Tweets and Facebook posts and examined the contexts in which they were used. In addition, I conducted network analyses of all posts within the *Occupy Sandy Facebook Page Corpus* created in the period ranging from 1st November 2012 until 15th November 2012, as this was the period in which Occupy Sandy was most active on Facebook. This part of the analysis is limited to Facebook, because the collected Twitter data does not contain information about users' reactions on contents. This analysis enabled me to identify those Facebook posts by Occupy Sandy that had the highest outreach, that is that gained most reactions by other users, and patterns among these posts.



Figure 2. Operationalization diagram for the concept "Social Cohesion".

Regarding the second sub-question (To what extent did the expressions on web 2.0 platforms regarding Occupy Sandy reflect social cohesion among citizens?), I reviewed any content within the *Hashtag Occupy Sandy Corpus* as well as in the *Occupy Sandy Facebook Comments Corpus*. I compared these contents with the set of indicators for social cohesion identified by Schiefer and van der Noll (2016) that are depicted in the operationalization diagram in Figure 2: (1) Social relations, (2) attachment/belonging to Occupy Sandy, and (3) orientation towards the common good. Importantly, in this study the concept of social cohesion was used as a *formative* construct rather than a *reflective* construct. A *reflective* approach would have assumed that each indicator for social cohesion equally or similarly reflects the whole concept. For example, in this case, a change in the indicator *social relations* would be reflected in a similar change in the remaining two indicators. In this study, however, social cohesion and the indicators for social cohesion are theoretically derived. Only the very combination of all three indicators "builds" the phenomenon social cohesion. The three indicators are treated as components of the concept and seen to be interrelated. Thereby, the indicators are purposefully chosen based on the literature review (Schiefer & van der Noll, 2016, p. 18).

To measure *social relations*, I conducted network analyses and visualized the findings. This enabled me to examine how densely the users within the corpuses were connected amongst each other. Secondly, I conducted a sentiment analysis for the two corpuses. For this purpose, I used a dictionary of words related to positive and negative sentiments developed by Hu and Liu (2004). I limited these analyses to contents produced between 25th October and 30th November 2012, since Occupy Sandy's activity was considerably higher during this period than before and after these dates. The sentiment analysis allowed

me to study how positive, negative, or neutral users were about Occupy Sandy. I used this analysis to measure to what extent users showed an *emotional attachment or a feeling of belonging to the social entity*, which in this case study is the Occupy Sandy disaster-relief network.¹ Lastly, I studied the contents within the corpuses regarding their orientation towards the common good. For the same reason that applied for the sentiment analysis, this analysis also focuses on the period spanning 25th October 2012 and 30th November 2012. I examined to what extent the contents predominantly contained collective words such as 'we', 'group', or 'community', or disjunctive words, such as 'their', 'my', or 'others'.² I then qualitatively reviewed the contents regarding expressions of solidarity and emotions related to the common good and looked for articulations of feelings of responsibility for the common good.

4. Analysis

This chapter provides a discussion of the analysis' results and makes a comparison between Twitter and Facebook.

4.1 How did the Occupy Sandy disaster-relief network use social media platforms to organize collective action?

In this section, I discuss the results regarding the concept 'Collective Action' indicator by indicator. First, I analyze when the Occupy Sandy emerged on Twitter and Facebook. After that, I provide an analysis of patterns regarding calls for action and organizing strategies, before concluding this section with a discussion of how Occupy Sandy used Twitter and Facebook to spread information by sharing links.

4.1.1 Occupy Sandy's emergence and maintenance over time

The Occupy Sandy Twitter account composed its first Tweet on 29th October 2012 at 11:34 pm Eastern Standard Time, which is the day on which Hurricane Sandy made landfall in New York and New Jersey. In this Tweet, Occupy Sandy asked users to donate money to a WePay account: '\$\$ Donations here: wepay.com/donations/occupy-sandy-cleanup-volunteers' (see appendix *Occupy Sandy Twitter Account Corpus*, row number 2). On average, the *Occupy Sandy Twitter Account Corpus* contains 19 (19.32) Tweets per day. As Figure 3 shows, the account was most active in the first half of November 2012, where a high peak in the number of Tweets created per day can be observed. On 4th November, Occupy Sandy published 218 Tweets, which was the maximum of Tweets per day throughout the whole period. After 15th November 2012, the frequency with which Occupy Sandy tweeted remained more constantly at around 20 (20.23) Tweets per day. After 15th November 2012, the average number of Tweets by Occupy Sandy per day decreased to approximately four (3.57) Tweets per day.

¹ See appendix for the dictionaries of positive and negative words used for this part of the analysis.

² See appendix for the whole dictionary used for this part of the analysis.



Figure 3. Number of Tweets by Occupy Sandy over time

Only about an hour after tweeting for the first time, Occupy Sandy created its first Facebook post. On 30th October 2012 at 12:4am Central Eastern Time, Occupy Sandy shared the same link leading to a WePay account it had shared via Twitter also on its Facebook page (see appendix Occupy Sandy Facebook Page Corpus, row number 2). On Facebook, Occupy Sandy created 2,411 contents during the period spanning 30th October 2012 and 15th March 2013. This means an average of daily posts of around 18 (17.59) which is only slightly lower than the average daily number of Tweets by Occupy Sandy (19.32). Similar to Occupy Sandy's Twitter activity, Figure 4 indicates that the disaster-relief network published most of their posts within the first half of November, with a peak of 103 posts on 4th November 2012. However, in contrast to the Twitter observations, Figure 4 also shows another increase in daily posts between 5th March and 15th March 2013. In this period, Occupy Sandy repeatedly asked for volunteers to help rebuilding areas affected by Hurricane Sandy. For instance, in one post from 5th March 2013, Occupy Sandy posted: 'People have done so much and there is still so much to do. Join them as they take care of what needs to happen. Volunteer this week: http://interoccupy.net/occupysandy/volunteer/' (see appendix Occupy Sandy Facebook Page Corpus, row number 2158).



Figure 4 Frequency of Facebook posts by Occupy Sandy over time.

In both the graph depicting the number of Tweets by Occupy Sandy and the graph showing the frequency of its Facebook posts, some significant dips can be observed. For the early phase after Hurricane Sandy, this might, in part, be explained by the major power outages New York and New Jersey had experienced (Blake et al., 2013). That the disaster-relief network was indeed affected by the power outages and tried to cope with them is, for instance, reflected in a Facebook post by Occupy Sandy from 2nd November 2012:

'If you are without power, follow these directions to make your own pedal power energy bike system <3 power your block!' (see appendix for *Occupy Sandy Facebook Page Corpus*, row number 2203)

Whereas Occupy Sandy's usage of Twitter and Facebook is similar in terms of the average number of contents created per day, the disaster-relief network used the two platforms differently regarding on which days of the week and at what time of the day it created contents. As can be seen in Figure 5, Occupy Sandy was most active on Twitter during Saturdays and Sundays and relatively active on Mondays and Fridays. Regarding the time of day, the account tweeted most between 6 am and 8 pm on Saturdays, and between 8 am and 3 pm on Sundays.



Figure 5 Number of Tweets by Occupy Sandy per weekday and per time of the day.

However, on the contrary to its Twitter activity, Occupy Sandy used Facebook with a relatively constant frequency throughout the whole week (see Figure 16 in appendix *Figures*). Only a slight increase in activity is observable for Sundays, Wednesdays, and Fridays. Furthermore, the heat map shows a tendency towards a high frequency of posts between 9 am and 7 pm. This might indicate that the maintenance of the Facebook page was more institutionalized and regulated than the Twitter usage. The reason could be that around three weeks after Sandy hit, Occupy Sandy had deployed a team of 15 people who were dedicated solely to managing its Facebook activities (Occupy Sandy NY & NJ, 2012). Contrarily, in the minutes of Occupy Sandy's network assembly meeting on 20th November 2012, one of its volunteers stated regarding Twitter that 'it was a few of us tweeting' (Occupy Sandy NY & NJ, 2012). This seems to indicate that the management of the Twitter account was less institutionalized than the management of the Facebook account. In turn, it might explain why the frequency of Tweets was less balanced across all weekdays.

Furthermore, according to the minutes of a meeting of Occupy Sandy on 5th November 2012, the team managing Facebook was highly engaged in answering requests by other Facebook users. In the minutes it reads: 'We don't have enough people managing Facebook given the number of questions coming thru there' (Occupy Sandy Recovery, 2012). This might also be a reason for the consistency in the frequency of activity of Occupy Sandy on its Facebook page since it could be that these requests kept the team busy all week.

4.1.2 Patterns regarding calls for action and organizing strategies

In this section, I discuss patterns regarding calls for action and organizing strategies within the contents created by Occupy Sandy.



Figure 6 Most frequently used terms by Occupy Sandy on Twitter.

Figure 6 and Figure 7 both demonstrate the most frequent terms Occupy Sandy used in its Tweets and Facebook posts respectively. On both platforms, words with the stem 'need' are by far those Occupy Sandy used most frequently. In many of its Tweets and Facebook posts, the disaster-relief network directly asked users to get engaged in its relief efforts. For instance, on 16th November 2012 it tweeted: 'Hey folks! Jacobi really needs white vinegar, boric acid & peroxide. We also need people! Lacking volunteers today http://interoccupy/occupysandy/locations/sunsetpark/ ...' (see appendix for Occupy Sandy Twitter Account Corpus, row number 1511). Similarly, a Facebook post composed on 31st October 2012 reads: 'Volunteers needed for recovery and info distribution work in Chinatown tomorrow meet up at CAAAV s office at 46 Hester St. at 10am. Specific needs: a generator & bottled water' (see appendix for Occupy Sandy Facebook Page Corpus, row number 52). Similar to the Tweets that are limited to 140 characters each, these Facebooks posts, especially those published early after Hurricane Sandy struck, were also relatively short and straight forward. Both the Tweets and the Facebook posts show a clear pattern: most of them consisted of a description of what exactly was needed as well as a location. Some of them also included HTTP-links for further, more detailed information. Checker (2017, p. 125) suggests that the often brief interactions on social media platforms bring users together. As Occupy Sandy mobilized around 60.000 volunteers at its peak, the pattern regarding how it addressed needs seems to confirm the effectiveness of briefness on social media platforms.

Similar to its use of words with the stem 'need', the disaster-relief network also frequently appealed volunteers to get active using words with the stem 'help' on both Twitter and Facebook. The same applies for words with the stem 'donat'. For instance, in a Tweet composed on 17th November 2012

Occupy Sandy asks for food donations: 'We don't have a kitchen today, so any donations of hot food for volunteers at Jacobi would be much appreciated! #mutualaid' (see appendix for *Occupy Sandy Twitter Corpus*, row number 1545).



Figure 7 Most frequently used terms by Occupy Sandy on Facebook.

Furthermore, Occupy Sandy used Tweets to answer questions of other Twitter users by mentioning them. For instance, in one Tweet it replied to '@ShamblingAfter No need to sign up! Just come to one of our volunteer hubs: http:// interoccupy.net/occupysandy/lo cations/...' (see appendix for *Occupy Sandy Twitter Account Corpus*, row number 1446). In addition, both on Twitter and Facebook Occupy Sandy often mentioned their locations of distribution hubs and shelters in Rockaway, Brooklyn, and at the St. Jacoby Church in Sunset Park.

Most frequent Hashtags. The five most frequent hashtags used by Occupy Sandy's Twitter account were '#sandyaid', '#sandy', '#occupysandy', '#ows', and '#sandyvolunteer' (see Figure 17 in appendix *Figures* for a frequency plot). The hashtag '#ows' refers to the Occupy Wall Street Movement. The fact that Occupy Sandy frequently used the hashtag '#ows' reflects that a number of people who were involved in the Occupy Wall Street movement had initiated it. To some extent, this contradicts the suggestion of Majchrzak et al. (2007, p. 147) that community-based disaster relief networks gather on an ad-hoc basis having no preexisting infrastructure.

The most frequent hashtags on Occupy Sandy's Facebook page were similar as those on Twitter, although the hashtags '#ows' and '#sandyvolunteer' were not amongst them (see Figure 18 in appendix *Figures* for a frequency plot). '#toollibrary' was the second most frequently used Facebook hashtag by the disaster-relief network. Occupy Sandy's 'Staten Island Tool Library' was founded during its Sandy-relief efforts, is still operating and 'offers short term loans of tools, cleaning supplies & items used in

storm clean up, structural construction & sustainable rebuilding projects' (Occupy Sandy Recovery, n.d.). In most of the posts including '#toollibrary', Occupy Sandy asks for volunteers to run the Tool Library. In a post published on 14^{th} March 2013 they wrote: 'Volunteers needed! Occupy Sandy locations~ Staten Island ~ [...] 489 Midland Ave ~ Neighborhood Relief Hub Volunteers are needed daily 9 AM – 8 PM help support @midlandrelief & run @OccupySandy s Community #ToolLibrary' (see appendix for *Occupy Sandy Facebook Page Corpus*, row number 44).

Most outreaching Facebook posts by Occupy Sandy. Regarding the analysis of those posts by Occupy Sandy that had the highest outreach among Facebook users, I focused on the first half of November, as this was the period during which the account was most active on Facebook. The most outreaching posts are those with the highest engagement of other users. The more users liked, commented, or shared a post, the higher is its engagement. Table 2 demonstrates the distribution of types of posts among the five most outreaching posts for each day throughout the period spanning 1st November through 15th November 2012. Among the 75 most outreaching posts within this period, 64 percent included photos. Only around 15 percent of the most outreaching posts within this period were status updates, and around 17 percent were HTTP-links, whereas videos appeared among them on three days only. Therefore, it can be said that the most efficient way for Occupy Sandy to reach as many people as possible via Facebook was posting photos. Subsequently, I provide an overview of the most outreaching posts on each day throughout this period (see Table 5 in appendix *Tables* for a list of HTTP-links for the most outreaching posts on each day in this period).

Date	Photo	Status	Link	Video
01-Nov-12	4	1		
02-Nov-12	2	1	2	
03-Nov-12	4	1		
04-Nov-12	4	1		
05-Nov-12	2		3	
06-Nov-12	4		1	
07-Nov-12	2	3		
08-Nov-12	3		2	
09-Nov-12	4	1		
10-Nov-12	3		1	1
11-Nov-12	4	1		
12-Nov-12	2		3	
13-Nov-12	5			
14-Nov-12	3	1		1

Table 4 Types of posts among the five Facebook posts by Occupy Sandy with the highest engagement for each day.

15-Nov-12	2	1	1	1
sum	48	11	13	3
Percent	64,00%	14,67%	17,33%	4,00%

Figure 8 shows the network of Occupy Sandy's posts on 1st November 2012 within the observed period.³ Each node represents either a post by Occupy Sandy (labeled with the description of the type of post) or a reaction by any other user (labeled as 'user'). The more edges lead to a node representing a post by Occupy Sandy, that is the higher the engagement of the post was, the bigger it appears within the network. The colors of the nodes are determined by which group of engagement the users belong to. The order of the nodes within the network is based on the *Force Atlas* algorithm. This algorithm groups the nodes in clusters and prevents them from overlapping (Bastian, Heymann, & Jacomy, 2009, p. 361).

Besides the fact that photos were the most outreaching type of posts during this period, the contents of the posts with the highest outreach reveal three main patterns. First, users highly engaged in posts that demonstrated accomplishments made by Occupy Sandy. For example, on 2nd November 2012 Occupy Sandy's mostengaging post included a picture of a barbecue in front of a building in which its volunteers operated pedal-powered electrical generators. Their post 'Pedal Power and Hamburgers at ABC No Rio in East Village. Serving People what they want' (Occupy Sandy, 2012d) engaged 808 users and their reactions to this post were almost exclusively positive. One user commented: 'This is awesome, this is what people need to be doing all over!' This reveals that spreading optimism seems to have been appreciated by Facebook users. Another user commented: 'we all need to show each other in this time that we really do care for each other. Spread the love.' The perceived positivity that appears to have been mediated by the photo resulted in users encouraging each other to care for others and support them. That this post was shared over 400 times indicates that publishing photos that show the accomplishments of collective action was particularly effective when it came to reaching other users. Similarly, the post by Occupy Sandy with the highest outreach within the whole period was a photo which provides a bird's eye perspective of the disaster-relief network's supply depot at St. Jacobi Church:

'HUNDREDS of bags of clothes, kitchen supplies, food, batteries, toiletries, gallons upon gallons of fuel, water, anything the people of the city need to survive is here. The most amazing thing is that this will likely ALL be gone by mid-day -given to the people of Far Rockaway, Staten And Coney Islands and other places-, their stock's will be replenished, and the cycle will repeat.' (Occupy Sandy, 2012e).

The high engagement of 2.882 in this post confirms that posts referring to accomplishments gained much attention. Furthermore, this post reveals how quickly Occupy Sandy mobilized people to donate

³ I created such graphs for each day for the period spanning 1st November through 15th November 2012. See Figure 19 through Figure 32 in appendix *Figures* for all graphs.

these supplies. Only three days after Sandy had made landfall, the disaster-relief network already wrote about 'cycles' that repeat themselves, which implies that it received plenty of donations the days before as well. That the supplies depicted in the photo were described as the amount of one day indicates both how many people Occupy Sandy provided with goods and the large humanitarian needs that had been caused by the hurricane.

Second, in a majority of Occupy Sandy's most outreaching posts, it blamed formal institutions such as FEMA or the Red Cross to have responded inadequately to the hurricane. In this regard, the disaster-relief network emphasized that the consequence needed to be that the community stood together and took care of the disaster response by itself. For instance, in its most outreaching post on 7th November 2012, Occupy Sandy referred to an inadequate disaster-response by FEMA. In the description of the photo used in the post, the disaster-relief network urged users to 'step up in FEMA's place, SHARE this photo and say #WEGOTTHIS!' (Occupy Sandy, 2012b). With the hashtag '#WEGOTTHIS' Occupy Sandy emphasized that the community itself could cope with the humanitarian disaster by standing together. The photo shows a sign that indicates: 'FEMA CENTER CLOSED DUE TO WEATHER.' In the comments, most users expressed their disbelief, anger, and consternation. This corresponds with what Carley and Harrald (1993, p. 9) suggest: that emergent response groups usually take action whenever formal response organizations address problems inadequately. Furthermore, it illustrates that their common aversion regarding these organizations allowed them to cohere around the shared interest to provide community-based disaster relief.

However, as the most influential post of Occupy Sandy on 6th November 2012 unveils, it was not only the case that users agreed when the disaster-relief network blamed formal institutions. The post included a photo which shows a man being stuck under the front wheel of a truck. In the description, Occupy Sandy explained that the truck belonged to the National Guard and that it ran over a man in Chinatown, New York City. In the comments to this post, users were mainly divided into two groups. On the one hand, a group of them was expressing their anger about the National Guard. On the other hand, however, a majority of users enunciated their incomprehension about why Occupy Sandy posted this, claiming that it had nothing to do with its relief efforts (Occupy Sandy, 2012c). This indicates that the primary reason for people to join the conversations was not the actual blaming, but rather their concern about lacking disaster response and their feeling of the urge to organize alternative measures to cope with the consequences of the hurricane.

Third, in a flurry of posts Occupy Sandy urged users to stand together as a community, engage with the disaster-relief network as well as share their knowledge regarding specific technical issues. For instance, in the most outreaching post on 4th November 2012, Occupy Sandy shared a photo of fire-powered cell phone chargers and asked for people who knew how to make them. In most of the comments, users expressed their amazement about the power generators. However, some users also suggested how they

could be constructed or offered to donate their solar-powered cell phone chargers (Occupy Sandy, 2012a).



Figure 8 Occupy Sandy Facebook post network. November 1, 2012.

Answering the first sub-question. Occupy Sandy started to use Twitter and Facebook immediately after Hurricane Sandy had made landfall in New York City and New Jersey and was especially active during the two following weeks. Its calls for action were mainly formulated in short messages both on Facebook and Twitter, whereas the latter platform itself limits the number of characters per message to 140. Most of these contents included precise descriptions of what kind of supplies or workforce and where exactly they were needed. In a flurry of contents, Occupy Sandy referred to the Occupy Wall Street movement. This contradicts to some extent with Majchrzak et al.'s (2007, p. 147) suggestion that emergent response groups usually have no pre-existing structure. Furthermore, most of the posts with an extraordinarily high amount of reactions by other users in the form of likes, comments, or shares included photos. Thereby, three main patterns could be observed: (1) Spreading positive news in the form of photos was especially efficient when it came to engaging users. (2) Occupy Sandy often blamed formal organizations such as FEMA or the Red Cross for having responded inadequately to the disaster. (3) In many highly outreaching posts, the disaster-relief network urged users to stand together as a community and help each other.

4.2 Social Cohesion

In this section, I discuss the results of the analysis of the concept 'Social Cohesion' indicator by indicator.

4.2.1 Social Relations

The first of three indicators for social cohesion identified by Schiefer and van der Noll (2016) refers to social relations. Figure 9 and Figure 10 show network graphs of all mentions within the *Hashtag Occupy Sandy Corpus* and the *Occupy Sandy Facebook Page Corpus* respectively. Each node within the networks represents a user and is illustrated by a dot. The edges between the nodes represent the connections between users who mentioned each other. The more often users mentioned or were mentioned by other users within the network, the bigger their nodes appear within the graph.



Figure 9 Twitter mentions network graph of the Hashtag Occupy Sandy Corpus.

Overall, Twitter users utilized the mentions function significantly more often than Facebook users. At the same time, some Facebook users, represented by the larger dots, used the mentioning-function

proportionally often. Contrarily, the graph representing Twitter shows a dense network of nodes. Especially the center of the graph is heavily concentrated, and the nodes are not scattered in clusters. Surrounding the dense center, some groups of users, as well as several individual users, can be observed. Moreover, only a relatively small proportion of the users applied the mentions function or were mentioned by other users proportionally often and, thereby, functioned as bridges between clusters of users. Additionally, the graph exhibits only few structural gaps, which are the empty spaces between clusters of interconnected users. These structural gaps can be interpreted as those areas within the social network that are prone to potential brokerage within the social entity. Hence, regarding Twitter, it can be stated that the users within the *Hashtag Occupy Sandy Corpus* formed a relatively densely connected entity. This indicates a high level of social relations among these users. However, due to the low number of nodes within the Facebook mentions network, it is difficult to make any predictions regarding social relations among the users. However, it can be concluded that users within this corpus used the mentions function substantially less often than the Twitter users.



Figure 10 Facebook mentions network graph of the Occupy Sandy Facebook Page Corpus

Besides the mentioning function, Twitter also allows its users to retweet other users. Figure 11 shows a network graph of all retweets within the *Hashtag Occupy Sandy Corpus*. Again, each

node represents a user who retweeted or was retweeted by another user within the corpus. The edges between the nodes represent the connections between users who retweeted each other. The more connected a node is, the bigger its dot appears within the network. Compared to the Twitter mentions network, the retweets network contains significantly fewer nodes. This means that substantially fewer users within the *Hashtag Occupy Sandy Corpus* retweeted each other, compared to how many of them mentioned each other. However, taking into account the lower number of nodes, the share and size of structural gaps appear to be comparable to those within the Twitter mentions network. The center of the network is relatively interconnected, and the number of above average sized nodes is relatively limited. Therefore, it can be confirmed that the Occupy Sandy users on Twitter were closely interconnected.



Figure 11 Retweets network graph of the Hashtag Occupy Sandy Corpus

4.2.2 Feelings of attachment/belonging to the social entity

To measure the extent to which Occupy Sandy users felt attached to the Occupy Sandy disaster-relief network, I conducted sentiment analyses for both Twitter and Facebook. Their results are represented in Figure 12 and Figure 13. The x-axes display the dates. The y-axes indicate the number of Tweets or Facebook posts. The yellow line shows the total number of Tweets or Facebook posts. Positive contents are shown in blue, negative contents in red, and neutral contents are depicted by the green line.



Figure 12 Hashtag Occupy Sandy Corpus sentiment time series.

First, the trends in the proportions of positive, negative, and neutral contents were similar on Twitter and Facebook. On both platforms, only a few contents were negative. Thereby, most of the negative contents did not directly refer to Occupy Sandy, but rather to the circumstances that had resulted out of Hurricane Sandy's landmark. Other users were complaining about inadequate disaster response by governmental or other formal organizations such as the Red Cross. For example, one user tweeted: '#OccupySandy Volunteer Sounds Alarm on 'Humanitarian Crisis', Near-Complete Absence of Government Aid in Coney Island Projects...' (see appendix for *Hashtag Occupy Sandy Corpus*, row number 282). A Facebook user stated: 'Disgusting!!! Obama declared the Rockaways as part of a national disaster area in Sandy's aftermath, and yet, federal, state, and city agencies are truly neglecting the Rockaways (and other hard-hit areas)' (see appendix for *Occupy Sandy Facebook Comments Corpus*, row number 1913). Only very few negative contents referred directly to the Occupy Sandy disaster-relief network. One of those rare examples was a Twitter user uttering the following: 'hey #occupysandy - you folks never did shit for #katrina, I'll deal w/ my stuff here in CT w/out you, go fuck yourselves #racist #arrogant' (see appendix for *Hashtag Occupy Sandy Corpus*, row number 9011). However, this Tweet stands out from the majority of contents within the two corpuses regarding the harshness of the wording and the level of frustration it expresses. Hence, it is not representative for the overall tone.



Figure 13 Occupy Sandy Facebook Page Corpus sentiment time series.

Both on Twitter and Facebook neutral posts were in the majority. One reason for the high quantity of neutral posts is that many users shared information via the social media platforms and called other users to engage. These contents mainly did not involve expressions of sentiments. For example, one Twitter user appealed to other 'Volunteers: Head to Sunset Park, St. Jacobi Church – 5406 4th' (see appendix for *Hashtag Occupy Sandy Corpus*, row number 78). Other users simply communicated that they had

34

shared a post by Occupy Sandy or made a donation. Next to the neutral contents, many of the users' expressions were positive both on Twitter and Facebook. A flurry of users credited the efforts of Occupy Sandy. For instance, one user tweeted that Occupy Sandy 'proves the incredible power and benefits of solidarity and agile autonomous networks! Great work (3)' (see appendix for Hashtag Occupy Sandy Corpus, row number 3708). On Facebook, a user who had volunteered with Occupy Sandy also expressed feelings of attachment to the disaster relief-network: 'I did some volunteer work with Occupy Sandy recently in NYC. They have been doing a great job from the start. Great organization to support in this matter. Directly from the people to the people' (see appendix for Occupy Sandy Facebook *Comments Corpus*, row number 1924). In another example, a user tweeted: 'Feeling very inspired by the #OccupySandy initiative. Amazing' (see appendix for Hashtag Occupy Sandy Corpus, row number 1192). Users also related the efforts of Occupy Sandy to the Occupy Wall Street movement. In this context, one user composed the following Tweet: 'I'm in love all over again w/ #OWS. The elegance, heart, savvy of the #occupysandy relief is as perfect a bit of organizing I've ever seen' (see appendix for Hashtag Occupy Sandy Corpus, row number 5375). In this case, the user communicated feelings of attachment to Occupy Sandy, but they were clearly also related to the Occupy Wall Street movement. Once more, this shows that the Occupy Sandy disaster-relief network and the Occupy Wall Street movement cannot be looked at as two entities that are fully independent from each other.

Based on the results of the sentiment analyses, it can be concluded that a great extent of users within the two corpuses expressed feelings of attachment to Occupy Sandy. Especially compared to the number of contents containing expressions of negative sentiments regarding Occupy Sandy, the positive contents were by far in the majority. Most of the negative expressions in both corpuses referred to the damage Hurricane Sandy caused, or to disappointment regarding the response of formal organizations like FEMA. Contents containing negative expressions about the Occupy Sandy disaster-relief network were only marginal. However, neutral Tweets and Facebook posts were in the majority, with most of them comprising calls for action addressing other users as well as information about how and where to get engaged.

Overall, a striking insight this analysis revealed is that a high number of users expressed their disappointment and anger regarding the regime. Many of them blamed capitalism for being the reason why formal institutions like FEMA and the Red Cross had not reacted adequately to what the communities needed after Hurricane Sandy had made landfall. Many users within the two corpuses indicated to feel left alone by the political system. This, in turn, seems to have increased their attachment to the community. This appears to conform with what Wellman and Gulia (1999, p. 14) suggest: that web 2.0 platforms allow a diverse group of people to create a common identity around a shared goal. Similarly, it corresponds with Checker's (2017, p. 125) suggestion that these platforms allow users 'to ignore potentially divisive political ideologies and interact around the issues they agreed on.' One users'

Tweet especially confirms this: 'I probably groan and roll my eyes every time someone brings up occupy wallstreet but they did a lot of good work this week #occupysandy.' Once more, this Tweet shows that Occupy Sandy wass often associated with the Occupy Wall Street movement. The user who composed this Tweet undoubtedly does not have a very favourable opinion of the movement. However, he/she shared Occupy Sandy's interest of providing humanitarian aid to people affected by Hurricane Sandy and credited its efforts.

4.2.3 Orientation towards the common good

To measure the users' orientation towards the common good, I analyzed to what extent their Tweets and Facebook posts included collective words compared to disjoint words⁴. Figure 14 and Figure 15 both represent the results of this analysis. On the x-axes, the dates are displayed. The y-axes indicate the number of Tweets or Facebook posts respectively. The yellow lines depict the total number of Tweets or Facebook posts. Neutral contents are displayed in blue, contents containing collective words in red, and the green line depicts contents containing disjoint words.

First, the diagrams reveal that both on Twitter and Facebook most of the contents were neutral in terms of collective or disjoint words. On Twitter, the reason for this is that many contents consisted of relatively impersonal information or calls for action, as, for instance, in this Tweet: '@OccupySandy Great article on #OCCUPY in @cnn <u>http://bit.ly/T3FcW7</u> #occupysandy' (see appendix for *Hashtag Occupy Sandy Corpus*, row number 25).

⁴ See appendix for the dictionary of collective and disjoint words



Figure 14 Hashtag Occupy Sandy Corpus collectiveness time series

On Twitter, only a few contents within the corpus were unambiguously reflecting either collectiveness or disjointedness respectively. Most of the Twitter users who used disjoint words stated that they were impressed and thankful for the efforts Occupy Sandy had taken. Also, many of the Tweets with disjoint words were related to the common instead of the personal good. One user tweeted: 'I did try my best to lift myself from that shit hole. I focus my efforts on #Occupysandy relief efforts. Bring joy to others made me happier' (see appendix for Hashtag Occupy Sandy Corpus, row number 11746). This user seems to have experienced that working together when coping with a disaster made him/her happier than when he/she only worked for the own good. Another user expressed joy that someone close to him/her got involved in Occupy Sandy and acted for the common good: 'I am so happy my kiddo is jumping in and getting her hands dirty to help those in need. #sandyhelp #occupysandy' (see appendix for Hashtag Occupy Sandy Corpus, row number 5943). Among the Tweets that predominantly contained collective words, the users' orientation towards the common good can be observed even clearer. For instance, one user expressed consternation about formal organizations and concluded that the community needed to take care of coping with the consequences of Hurricane Sandy instead: 'We know capitalism is broken, so we have already been focused on organizing to take care of our own community needs. #OccupySandy' (see appendix for Hashtag Occupy Sandy Corpus, row number 4331).



Figure 15 Occupy Sandy Facebook Page Corpus collectiveness time series

Contrarily to the users within the *Hashtag Occupy Sandy Corpus*, Facebook users' posts predominantly containing disjoint words were decidedly in the majority compared to those in which collective words were predominant. For instance, one Facebook user asked the Occupy Sandy Facebook community: 'Do I Qualify for "Housing Needs" Assistance?' (see appendix for *Occupy Sandy Facebook Comments Corpus*, row number 14889). Another user expressed anger about the Red Cross and FEMA and stated that 'NOW I have to APPEAL their decision!!! Like I don't have ENOUGH to do to TRY to rebuild my house with amount of money they're giving me!!' (see appendix for *Occupy Sandy Facebook Comments Corpus*, row number 4719). However, similar to those on Twitter, Facebook users' contents with predominantly disjoint words often still referred to the good of the community. One user pointed out that 'the residents of Breezy Point are in need of your help more than ever. My heart is breaking for my sister and the community where I spent my summers while growing up. I thank you for any help you can provide!' (see appendix for *Occupy Sandy Facebook Comments Corpus*, row number 13679). Just as on Twitter, Facebook contents that predominantly contained collective words clearly show the users' orientation towards the common good. For example, a user appealed to others to cooperate:

'Kropotkin wrote that cooperation was the basis of animal life and human society. The life of competition we prefer in the US is what is killing civility and is why we are allowing to the 1% to exploit the rest of us. [...] We need to wake up and realize that life is better for all when we cooperate.' (see appendix for *Occupy Sandy Facebook Comments Corpus*, row number 310)

Answering the second sub-question. To answer the second sub-question, I reviewed the users' Twitter and Facebook contents based on three categories: (1) social relations, (2) expressions of feelings of attachment/belonging to the social entity, and (3) orientation towards the common good. Overall, the users' expressions regarding all three categories indicate a great extent of social cohesion, as is outlined subsequently. The analysis also conforms with the assumption that web 2.0 platforms allow people to ignore potentially divisive political ideologies and to cohere around a common interest. Furthermore, I find that the users' shared perception that formal organizations responded inadequately to the hurricane fostered their sense of community, solidarity, and group identity.

- Social relations: Both on Twitter and Facebook, the users were relatively closely connected through mentions. This also applies to the Twitter network of retweets, although it consists of much fewer nodes. However, the Twitter mentions network was much denser than the one reflecting Facebook mentions given the higher number of users who utilized the mentions function. This might either imply that users on Facebook were less connected than those on Twitter. On the other hand, this could also be due to the use of the mentions function being generally much more common on Twitter than on Facebook. It can be concluded that the social relations reflected by the users' behavior on Twitter and Facebook implies that the users formed a socially cohesive group.
- Expressions of attachment/belonging to the social entity: A great extent of the users' expressions on Twitter and Facebook were neutral in terms of expressions of attachment to Occupy Sandy. This is due to the reason that many of the contents included solely information about where and how other users could engage. However, a comparably significant amount of contents was positive. Lots of users credited the disaster-relief network's work, stated that working with it would increase their happiness, and expressed that they were inspired by the collective. The number of Tweets and Facebook posts including negative sentiments was considerably lower than of those including positive sentiments. Moreover, the majority of negative contents did not directly refer to Occupy Sandy, but rather to other organizations or the hurricane itself. Hence, it can be concluded that the extent to which users expressed feelings of attachment and belonging to Occupy Sandy is very high. The extent to which users within the corpuses expressed their feelings of attachment also indicates that they formed a socially cohesive group.
- Orientation towards the common good: The analysis regarding collective and disjoint words revealed that the extent to which users expressed their orientation towards the common good is relatively high. Even users who do not seem to have been directly involved in Occupy Sandy's efforts expressed their concerns about the wellbeing of the community. Many of them thanked Occupy Sandy for its actions or called them to get involved in a specific neighborhood.

5. Conclusion

This thesis addressed two empirical sub-questions by conducting an in-depth study of the case of the "Occupy Sandy disaster-relief network". First, I examined how Occupy Sandy used web 2.0 platforms to organize collective action. The analysis showed that web 2.0 platforms allowed Occupy to start organizing immediately after Hurricane Sandy had made landfall. Moreover, Facebook and Twitter allowed the disaster-relief network to formulate calls for action and share information easily. Thereby, Occupy Sandy kept its posts and Tweets relatively brief and asked precisely for specific needs of supplies or workforce. Furthermore, the results of the analysis revealed that especially Facebook posts including photos reached a particularly high number of users who liked, shared, or commented on the post. Regarding the content of these posts, three main patterns could be observed: (1) Spreading positive news in the form of photos resulted in a particularly large amount of user reactions. (2) Occupy Sandy often blamed formal organizations for responding inadequately to the disaster. (3) In many highly outreaching posts, the disaster-relief network urged users to stand together as a community and help each other.

The second empirical sub-question referred to the extent to which Occupy Sandy users' expressions on web 2.0 platforms reflected social cohesion among them. The results unfolded that the extent of which they formed a socially cohesive group was high. This conclusion is based on the results of measurements for the three indicators for social cohesion used in this study: *social relations, feelings of attachment/belonging to the social entity,* and *feelings of responsibility for the common good.* First, users formed a relatively dense network of social relations. Especially on Twitter, this manifested itself in a dense network of reciprocal mentions and retweets. Second, a flurry of users uttered positive sentiments regarding Occupy Sandy, expressed their gratefulness for its efforts, and stated that they felt inspired by its action. Lastly, only a minority of users expressed concerns about their personal well-being. Instead, most of the reviewed contents showed that they felt a distinct responsibility for the common good.

After Hurricane Sandy had devastated large parts of New York City and New Jersey, many people felt left alone by formal organizations such as FEMA or the Red Cross. The informality of web 2.0 platforms allowed them to express their frustration and anger regarding the regime. Moreover, the relative anonymity that reigns on Twitter and Facebook enabled them to overcome potentially divisive ideologies and cultivate a sense of community based on their shared emotions. Occupy Sandy was able to capture their consternation, translate it into a willingness to act collectively, mobilize volunteers and organize community-based disaster relief using web 2.0 technology. In other words, it provided those people with a platform to cohere around their common ground. On this basis, Occupy Sandy-users quickly formed a socially cohesive group on Twitter and Facebook.

However, the success of Occupy Sandy was, in part, also based on its appeal to a wider network of the Occupy Wall Street movement and, hence, its drawing upon pre-existing structures. Al-Kandari and

Hasanen (2012) suggest that web 2.0 platforms are useful tools for people who already engage collectively, but not necessarily when it comes to recruiting new activists. Although the case of Occupy Sandy partly confirms what the authors propose, I find that web 2.0 applications were essential tools for Occupy Sandy's disaster relief efforts. Beyond the users who were already engaged in the Occupy Wall Street Movement, Occupy Sandy mobilized a wide range of independent users.

These findings provide an answer to the main research question underlying this study: To what extent do web 2.0 platforms contribute to social cohesion by functioning as tools for social movements to organize collective action? In short, web 2.0 platforms to a high extent contribute to social cohesion as they easily allow users with shared concerns to find together, although they might have divisive political ideologies. In turn, social movements can take advantage of the formation of these cohesive groups and mobilize them to act collectively for the purpose of their shared interest as well as the common good.

Despite these findings, though, it is important to clarify that this case study does not reveal insights about the persistence of social cohesion among collective activists. This points to the need for future research on the long-term maintenance of social cohesion among users who form socially cohesive groups on web 2.0 platforms. This applies to both their online and offline behavior. In the case of emergent response groups, do members uphold their relations among each other even after they cease their disaster-relief efforts? Do they maintain a network of activists that can quickly be deployed in case of future disasters? Moreover, a limitation of this case study is that those Occupy Sandy-members who have been recruited from the Occupy Wall Street network had most likely already formed a socially cohesive group before they engaged with Occupy Sandy. Furthermore, another direction for future research could be to investigate how the degree of social cohesion before a disaster affects the emergence and maintenance of grassroots disaster relief networks. Lastly, further research might be needed to examine how exactly the online behavior in the context of collective action is reflected offline. Do most of the users engaging in discussions about a social movement engage in offline collective action? Furthermore, does social cohesion among the users uphold in a less anonymous context of face to face interaction?

However, the findings of this study reveal that social cohesion provides a great resource for the emergence of community-based disaster relief networks. Furthermore, the case of Occupy Sandy confirms those disaster response agencies that increasingly acknowledge the potential of collective action from the grassroots.

References:

- Adger, W. N. (2003). Social Capital, Collective Action, and Adaptation to Climate Change. *Economic Geography*, 79(4), 387 404.
- Al-Kandari, A., & Hasanen, M. (2012). The impact of the Internet on political attitudes in Kuwait and Egypt. *Telematics and Informatics, 29*(3), 245-253. doi:<u>http://doi.org/10.1016/j.tele.2011.10.005</u>
- Bastian, M., Heymann, S., & Jacomy, M. (2009). Gephi: an open source software for exploring and manipulating networks. *Icwsm*, *8*, 361-362.
- Blachman-Biatch, I., Edgemon, K., Hull, P., & Taylor, A. (2013). The Resilient Social Network. @OccupySandy #SuperstormSandy. Falls Church, VA: Homeland Security Studies and Analysis Institute.
- Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (2014). At risk: natural hazards, people's vulnerability and disasters: Routledge.
- Blake, E. S., Kimberlain, T. B., Berg, R. J., Cangialosi, J. P., & Beven II, J. L. (2013). Tropical Cyclone Report. Hurricane Sandy. Miami, FL: National Hurricane Center.
- Buhaug, H., & Urdal, H. (2013). An urbanization bomb? Population growth and social disorder in cities.GlobalEnvironmentalChange,23(1),1-10.doi:https://doi.org/10.1016/j.gloenvcha.2012.10.016
- Carley, K., & Harrald, J. (1993). Organizing for Response: Comparing Practice, Plan, and Theory: Natural Hazards Research and Applications Center, University of Colorado.
- Carmin, J., Nadkarni, N., & Rhie, C. (2012). *Progress and Challenges in Urban Climate Adaptation Planning: Results of a Global Survey.* Retrieved from Cambridge, MA:
- Castells, M. (2007). Communication, Power and Counter-power in the Network Society. *International Journal of Communication*, 1/2007, 238-266.
- Chan, J., To, H.-P., & Chan, E. (2006). Reconsidering Social Cohesion: Developing a Definition and Analytical Framework for Empirical Research. *Social Indicators Research*, *75*(2), 273-302. doi:10.1007/s11205-005-2118-1
- Checker, M. (2017). Stop FEMA Now: Social media, activism and the sacrificed citizen. *Geoforum*, *79*, 124-133. doi:<u>http://dx.doi.org/10.1016/j.geoforum.2016.07.004</u>
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7th ed. ed.). London: Routledge.
- Coleman, J. S., & Coleman, J. S. (1994). Foundations of social theory: Harvard university press.
- Conover, M. D., Ferrara, E., Menczer, F., & Flammini, A. (2013). The digital evolution of occupy wall street. *PloS one, 8*(5), e64679.
- Constantinides, E., & Fountain, S. J. (2008). Web 2.0: Conceptual foundations and marketing issues. Journal of Direct, Data and Digital Marketing Practice, 9(3), 231-244. doi:10.1057/palgrave.dddmp.4350098
- Crowley, J. (2013). Connecting grassroots and government for disaster response. Washington, DC: Commons Lab of the Woodrow Wilson International Center for Scholars.
- Drabek, T. E., & McEntire, D. A. (2003). Emergent phenomena and the sociology of disaster: lessons, trends and opportunities from the research literature. *Disaster Prevention and Management: An International Journal, 12*(2), 97-112. doi:doi:10.1108/09653560310474214

- Dragolov, G. (2016). Social cohesion in the Western world : what holds societies together: insights from the social cohesion radar. Switzerland: Springer.
- Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The Benefits of Facebook "Friends:" Social Capital and College Students' Use of Online Social Network Sites. *Journal of Computer-Mediated Communication*, *12*(4), 1143-1168. doi:10.1111/j.1083-6101.2007.00367.x
- FEMA, F. E. M. A. (2013). Hurricane Sandy: Youthful Energy and Idealism Tackles Real-World Disaster Response. Washington, DC: FEMA.
- Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative inquiry, 12*(2), 219-245.
- Gencer, E. A. (2013). Natural Disasters, Urban Vulnerability, and Risk Management: A Theoretical Overview *The Interplay between Urban Development, Vulnerability, and Risk Management: A Case Study of the Istanbul Metropolitan Area* (pp. 7-43). Berlin, Heidelberg: Springer Berlin Heidelberg.
- Godschalk, D. R. (2003). Urban hazard mitigation: creating resilient cities. *Natural hazards review*, 4(3), 136-143.
- Hu, M., & Liu, B. (2004). *Mining and summarizing customer reviews.* Paper presented at the Proceedings of the tenth ACM SIGKDD international conference on Knowledge discovery and data mining.
- Hulse, K., & Stone, W. (2007). SOCIAL COHESION, SOCIAL CAPITAL AND SOCIAL EXCLUSION. *Policy Studies*, *28*(2), 109-128. doi:10.1080/01442870701309049
- Jabareen, Y. (2013). Planning the resilient city: Concepts and strategies for coping with climate change and environmental risk. *Cities, 31*, 220-229. doi:<u>https://doi.org/10.1016/j.cities.2012.05.004</u>
- Jenson, J. (2010). *Defining and Measuring Social Cohesion*. London: Commonwealth Secreteriat and United Nations Research Institute for Social Development.
- Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities ofSocialMedia.BusinessHorizons,53(1),59-68.doi:https://doi.org/10.1016/j.bushor.2009.09.003
- Kenski, K., & Stroud, N. J. (2006). Connections Between Internet Use and Political Efficacy, Knowledge, and Participation. *Journal of Broadcasting & Electronic Media*, 50(2), 173-192. doi:10.1207/s15506878jobem5002_1
- Klein, R. J. T., Nicholls, R. J., & Thomalla, F. (2003). Resilience to natural hazards: How useful is this concept? *Global Environmental Change Part B: Environmental Hazards*, 5(1–2), 35-45. doi:<u>https://doi.org/10.1016/j.hazards.2004.02.001</u>
- Kongthon, A., Haruechaiyasak, C., Pailai, J., & Kongyoung, S. (2012). The role of Twitter during a natural disaster: Case study of 2011 Thai Flood. Paper presented at the 2012 Proceedings of PICMET '12: Technology Management for Emerging Technologies.
- Kotani, H., & Yokomatsu, M. (2016). Natural disasters and dynamics of "a paradise built in hell": a social network approach. *Natural Hazards*, 84(1), 309-333. doi:10.1007/s11069-016-2432-8
- Kwak, H., Lee, C., Park, H., & Moon, S. (2010). *What is Twitter, a social network or a news media?* Paper presented at the Proceedings of the 19th international conference on World wide web.
- Leichenko, R. (2011). Climate change and urban resilience. *Current opinion in environmental sustainability*, *3*(3), 164-168.
- Lent, R. W., Schmidt, J., & Schmidt, L. (2006). Collective efficacy beliefs in student work teams: Relation to self-efficacy, cohesion, and performance. *Journal of Vocational Behavior, 68*(1), 73-84.

- Liao, K.-H. (2012). A theory on urban resilience to floods—a basis for alternative planning practices. *Ecology and Society, 17*(4).
- Liddy, E. D. (2001). Natural language processing.
- Magis, K. (2010). Community Resilience: An Indicator of Social Sustainability. *Society & Natural Resources*, 23(5), 401-416.
- Majchrzak, A., Jarvenpaa, S. L., & Hollingshead, A. B. (2007). Coordinating Expertise Among Emergent Groups Responding to Disasters. *Organization Science*, 18(1), 147-161. doi:10.1287/orsc.1060.0228
- Margetts, H., John, P., Hale, S., & Yasseri, T. (2015). *Political turbulence: how social media shape collective action*: Princeton University Press.
- Meerow, S., Newell, J. P., & Stults, M. (2016). Defining urban resilience: A review. *Landscape and Urban Planning*, 147, 38-49. doi:<u>https://doi.org/10.1016/j.landurbplan.2015.11.011</u>
- Messias, D. K. H., Barrington, C., & Lacy, E. (2012). Latino social network dynamics and the Hurricane Katrina disaster. *Disasters*, *36*(1), 101-121. doi:10.1111/j.1467-7717.2011.01243.x
- Neumann, B., Vafeidis, A. T., Zimmermann, J., & Nicholls, R. J. (2015). Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding - A Global Assessment. *PloS one, 10*(3), e0118571. doi:10.1371/journal.pone.0118571
- Occupy Sandy (Producer). (2012a, 24 Jun 2017). FIRE POWERED cell phone chargers chop up that [Facebook status update]. Retrieved from https://www.facebook.com/OccupySandyReliefNyc/posts/517930088218463
- Occupy Sandy (Producer). (2012b, 7 November 2012). If you're ready to step up in FEMA's place [Facebook status update]. Retrieved from https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654.91112.3804 89552031252/383546015058939/?type=3
- Occupy Sandy (Producer). (2012c, 24 Jun 2017). The National Guard/Army ran over and most likely [Facebook status update]. Retrieved from https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654.91112.3804 89552031252/383546015058939/?type=3
- Occupy Sandy (Producer). (2012d, 24 Jun 2017). Pedal Power and Hamburgers at ABC No Rio [Facebook Status update]. Retrieved from <u>https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654.91112.3804</u> <u>89552031252/381907785222762/?type=3</u>
- Occupy Sandy (Producer). (2012e, 24 Jun 2017). "The supply depot at St. Jacobi Church in Brooklyn [Facebook status update]. Retrieved from https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654.91112.3804 89552031252/382353565178184/?type=3&theater
- Occupy Sandy NY & NJ. (2012). OCCUPYSANDY NETWORK ASSEMBLY MEETING (11/20/2012). Retrieved from <u>http://interoccupy.net/sandycoord/minutes/occupysandy-network-assembly-meeting-11202012/</u>
- Occupy Sandy Recovery. (2012). Minutes 11/5/12. Retrieved from occupysandy.net/2012/11/minutes-11512/
- Occupy Sandy Recovery. (n.d.). Occupy Sandy Staten Island Tool Library. Retrieved from occupysandy.net/?projects=occupy-staten-island-tool-library

- Olson, M., Jr. (1971). *The logic of collective action : public goods and the theory of groups* (2nd ed.). Cambridge, MA: Harvard University Press.
- Penney, J., & Dadas, C. (2014). (Re)Tweeting in the service of protest: Digital composition and circulation in the Occupy Wall Street movement. New Media & Society, 16(1), 74-90. doi:doi:10.1177/1461444813479593
- Pickett, S. T. A., Cadenasso, M. L., Grove, J. M., Nilon, C. H., Pouyat, R. V., Zipperer, W. C., & Costanza, R. (2001). Urban Ecological Systems: Linking Terrestrial Ecological, Physical, and Socioeconomic Components of Metropolitan Areas. *Annual Review of Ecology and Systematics*, 32, 127-157.
- Quarantelli, E. L., & Dynes, R. R. (1977). Response to social crisis and disaster. *Annual review of sociology*, *3*(1), 23-49.
- Roberts, P. (2000). The evolution, definition and purpose of urban regeneration. *Urban regeneration*, 9-36.
- Schiefer, D., & van der Noll, J. (2016). The Essentials of Social Cohesion: A Literature Review. Social Indicators Research, 1-25.
- Scott, J., & Marshall, G. (2009). A dictionary of sociology (3rd ed.). Oxford: Oxford University Press.
- Sweet, S. (1998). The Effect of a Natural Disaster on Social Cohesion: A Longitudinal Study. *International journal of mass emergencies and disasters, 16*(3), 321-331.
- Tan, A.-H. (1999). *Text mining: The state of the art and the challenges.* Paper presented at the Proceedings of the PAKDD 1999 Workshop on Knowledge Disocovery from Advanced Databases.
- Townshend, I., Awosoga, O., Kulig, J., & Fan, H. (2015). Social cohesion and resilience across communities that have experienced a disaster. *Natural Hazards*, *76*(2), 913-938. doi:10.1007/s11069-014-1526-4
- Uchida, C. D., Swatt, M. L., Solomon, S. E., & Varano, S. (2013). *Neighborhoods and Crime: Collective Efficacy and Social Cohesion in Miami-Dade County*. Retrieved from <u>https://www.ncjrs.gov/pdffiles1/nij/grants/245406.pdf</u>
- Wagner, I., & Breil, P. (2013). The role of ecohydrology in creating more resilient cities. *Ecohydrology* & *Hydrobiology*, *13*(2), 113-134.
- Weber, P. (2014). Discussions in the comments section: Factors influencing participation and interactivity in online newspapers' reader comments. *New Media & Society*, 16(6), 941-957. doi:doi:10.1177/1461444813495165
- Wellman, B., & Gulia, M. (1999). Net surfers don't ride alone: Virtual communities as communities. *Networks in the global village*, 331-366.
- Yin, R. K.-z. (2014). *Case study research : design and methods* (Fifth edition, [second printing]. ed.). Thousand Oaks, CA: Sage Publications.
- Zhou, H., Wang, J. a., Wan, J., & Jia, H. (2010). Resilience to natural hazards: a geographic perspective. *Natural Hazards*, 53(1), 21-41. doi:10.1007/s11069-009-9407-y

Appendices



Figure 16 Number of Facebook posts by Occupy Sandy per weekday and per time of the day.



Figure 17 Top five Hashtags used most frequently by Occupy Sandy on Twitter.



Figure 18 Top five Hashtags used most frequently by Occupy Sandy on Facebook.



Figure 19 Occupy Sandy post network. November 2, 2012.



Figure 20 Occupy Sandy Facebook post network. November 3, 2012.



Figure 21 Occupy Sandy Facebook post network. November 4, 2012.



Figure 22 Occupy Sandy Facebook post network. November 5, 2012.



Figure 23 Occupy Sandy Facebook post network. November 6, 2012.



Figure 24 Occupy Sandy Facebook post network. November 7, 2012.



Figure 25 Occupy Sandy Facebook post network. November 8, 2012.





Figure 27 Occupy Sandy Facebook page network. November 10, 2012.



Figure 28 Occupy Sandy Facebook page network. November 11, 2012.



Figure 29 Occupy Sandy Facebook page network. November 12, 2012.



Figure 30 Occupy Sandy Facebook page network. November 13, 2012.



Figure 31 Occupy Sandy Facebook page network. November 14, 2012.



Figure 32 Occupy Sandy Facebook page network. November 15, 2012.

2. Tables

Table 5 Occupy Sandy's posts with the highest engagement for each day between 1st November and 15th November 2012.

Date	Link	engage ment
01- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/381284791951728/?type=3	446
02- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/381907785222762/?type=3	808
03- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/382353565178184/?type=3	2882
04- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/posts/517930088218463	1366
05- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/383023995111141/?type=3	782
06- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/383546015058939/?type=3	646
07- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/383897705023770/?type=3	2128
08- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/384143191665888/?type=3	486
09- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.381314701948737. 91333.380489552031252/384578111622396/?type=3	2244
10- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/384905421589665/?type=3	1311
11- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/posts/385013381578869	1407
12- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/385471051533102/?type=3	1042

13- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/386160044797536/?type=3	985
14- Nov- 12	https://www.facebook.com/OccupySandyReliefNyc/photos/a.380505532029654. 91112.380489552031252/386495361430671/?type=3	594
15- Nov- 12	https://www.facebook.com/TheOther98/photos/a.115969958413991.17486.114 517875225866/514067601937556/?type=3	1084
Sum		18211

Content of the digital appendix

- 1. Corpuses
 - Hashtag Occupy Sandy Corpus.xlsx
 - Occupy Sandy Facebook Comments Corpus.xlsx
 - Occupy Sandy Facebook Page Corpus.xlsx
 - Occupy Sandy Twitter Account Corpus.xlsx
- 2. Scripts
 - Anonymization.R.html
 - Collective Action_Facebook.R.html
 - Collective Action_Twitter.R.html
 - Social Cohesion_Facebook.R.html
 - Social Cohesion_Twitter.R.html
- 3. Dictionaries
 - Sentiment analysis
 - Negative-words.txt
 - Positive-words.txt
 - Collectiveness analysis
 - Collectivewords.csv
 - Disjointwords.csv