ORIGINAL ARTICLE

Managing resource transposition in the face of extreme events: Fieldwork at two public networks in Germany and the US

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Abstract

As administrations increasingly rely on interorganizational networks to organize public service provision, this article inspects the role resourcing plays in the way managers working in networks cope in the face of extreme events. Using comparative analyses of fieldwork in the context of two emergency service networks in two major cities in Germany and the US, we introduce the concept of resource transposition. This concept holds the potential to explain why and how networks might perform well in situations that drain its central participants' resources. We highlight the relevance of four practices: resource (re)production; resource administration through integration; resource administration through centralization; resource support. We derive a set of propositions underlining the usefulness of the concept of resource transposition.

1 | INTRODUCTION

A major crisis erupts and the response required exceeds the resources available to the public organizations involved—how do public managers proceed? Understanding how public organizations respond to extreme events—that is, crises that trigger important capacity overload for the organizations in charge and the resulting need to enact network resources in new, unpredicted ways (Pearson and Clair 1998)—is a central research interest in the field of public administration and management (Moynihan 2008; Zhang et al. 2018). Public management research often reports on the role of interorganizational networks as a means to alleviate resource interconnectivities in the face of crises (e.g., Agranoff and McGuire 2001; Kapucu 2006; Moynihan 2008; Berthod et al. 2017b). That said, we know little about how public managers make use of interorganizational relations in and outside of such networks to alleviate sudden resource scarcity when their community is hit by an unexpected event of unusual magnitude.

If we turn to the literature on public networks in general, a central argument is that relations support resource transfers from one point to another (O'Toole 1997; Mandell and Steelman 2003; Herranz 2008; Hicklin et al. 2008; Rethemeyer and Hatmaker 2008). While crisis responses certainly take advantage of existing interorganizational relations (Berthod et al. 2017b), public managers also recraft them and create new ones, moving towards rapidly emerging and ephemeral systems (Kapucu 2006; Moynihan 2008). Research on network resources, however, tends to join one of two streams. On the one hand, studies focusing on structural features of networks tend to concentrate more on the financing of the networks' existence than on resourcing their daily operations (Provan and Milward 1995; Rethemeyer and Hatmaker 2008; Lange et al. 2013). On the other hand, research on management within public networks proposes that organizational resources need to be adapted when shared across organizational boundaries, in the main without revealing what such a process of resource adaptation might look like (Agranoff and McGuire 2001; Agranoff 2007; Herranz 2008; Saz-Carranza and Ospina 2011). Building on this second stream, our goal in this article is to refine existing theory by naming and describing central elements of the process of resource adaptation. We therefore ask: How do public managers turn organizational assets into resources for a collective purpose to face extreme events?

Observing extreme events in real time is particularly difficult. Such events typically catch organizations by surprise, are rare, and are limited in duration. In this article, we explore such a process of resourcing by comparing ethnographic data collected during two extreme events at the central coordinator of emergency response networks. These two cases report on a destructive 2014 thunderstorm over the city of Düsseldorf, Germany, and a 2015 natural gas explosion and fire in New York City, US. Inspecting the work of the public managers in charge in these two cases, our findings point to a dynamic and processual view of resourcing in interorganizational settings. Specifically, we reveal the practices on which public managers relied to organize and manage resources in this context. These findings contribute to refining our understanding of the role officers and managers of emergency response organizations play in making organizations responsive in the face of questions of life and death at worst and the integrity of public space at best.

2 | NETWORKS AND RESOURCES: TOWARDS A PRACTICE VIEW

The dilution of traditional bureaucratic models of governance towards more interorganizational ones has produced a surge of research on networks in general and 'goal-directed networks' in particular. Goal-directed networks consist of relations between three or more organizations assembled towards a common goal (Provan and Kenis 2008; Isett et al. 2011; Lecy et al. 2013; see Provan et al. 2007 for a review). Goal-directed networks shed light on the potential of interorganizational collaboration and emerge typically in the face of problems that cannot be tackled by single organizations alone (Provan and Milward 1995; O'Toole 1997; Klijn and Koppenjan 2000; Agranoff and McGuire 2001; Moynihan 2008).

Resources, defined here as the inputs a social system needs to perform towards its goals and maintain its operations, constitute a central element in research on interorganizational networks (Powell 1990; Provan and Milward 1995; Rhodes 1997; Gulati 2007). For example, resources are often a rationale for network managers to 'activate' partners in their network or include new ones and make resources flow (Gray 1989; Agranoff and McGuire 1999). From this managerial perspective, network managers not only activate, but also frame, mobilize and synthesize network relations (Agranoff and McGuire 2001; McGuire 2006). In more specific terms, public managers 'mobilize' participants by securing their commitment and contribution over a shared goal. They 'frame' the operating rules of interactions in the network (see Kickert et al. 1997), and 'synthesize' these various participants and their inputs into a coherent whole (O'Toole and Meier 2004).

This understanding of network management sheds light on the role of the organizations that are central to facilitating resource streams. Organization theorists call these central facilitators 'network orchestrators' to highlight their constant efforts in both maintaining extant and creating new ties to animate the network and its resource streams

(Dhanaraj and Parkhe 2006; Paquin and Howard-Grenville 2013). This managerial perspective offers a view that is oriented towards what network orchestrators do with organizational resources at the interorganizational level. On the one hand, this approach identifies the need for participants to adapt resources, as network orchestrators make them available. On the other hand, it highlights the fact that participants sometimes withhold contributions to the collective enterprise, thereby prompting the need to develop alternative resources (Agranoff 2007). This literature rarely examines, however, how network orchestrators handle these resource dynamics in crisis events, when resource requirements suddenly and unexpectedly shift, all of which happens in real time from the managerial perspective.

Managing resources in interorganizational settings includes assets that are necessary to the network's daily activities and their production of services. This understanding could include a wide diversity of inputs, ranging from material assets such as equipment, money and staff, to immaterial assets including time, expertise or even the quality of interpersonal relations (Feldman and Khademian 2002; Feldman 2004; Agranoff 2007). Against this background, a classical proposition in organization theory is that resource slack supports an organization's capacity to develop new solutions to problems (Cyert and March 1963). A competing perspective concludes that lack of resources and the risk of underperforming provoke the reconfiguration of assets at hand into more situated and thereby expanded resources (Bolton 1993; Baker and Nelson 2005; Lampel et al. 2014).

Attention to the process and the practices of resourcing network activities can help us understand how public managers enact the latter theoretical proposition. This perspective on resources draws on the general notion of resource fungibility, that is, that some resources can be transferred from one organization to the next, or converted from one use to another, more easily than others (Edwards and McCarthy 2004). Previous research has revealed the existence of multiple processes that make use of fungibility, albeit in other settings. Starr and MacMillan (1990) consider resource cooptation as the process through which entrepreneurs reach out to important field constituents or contacts to access underutilized assets. Macpherson et al. (2015) call resource accretion 'the gradual accumulation and integration of resources' through interorganizational relations (p. 259). And Garud et al. (2016) evoke exaptation when an organization starts using a trait of an artefact or technology for a radically different purpose when its previous purpose has become irrelevant. Taken together, these concepts propose that organizations do transfer fungible resources across contexts. Fungibility, however, only highlights the potential transformability of resources. In the course of resource accretion and exaptation, organizations leverage fungibility to increase and adapt their resources basis. While we embrace these lines of work, these studies do not reveal how managers transfer resources into interorganizational contexts in order to utilize them for analogous purposes.

In this article, we propose to enrich this scholarship by exploring what the process of adapting resources to new networked contexts entails, a process which we capture using the concept of resource transposition. In line with the views on resources that we have introduced, considering resource transposition implies seeing resources as embedded in a particular relational context. This view is rooted in a social constructionist approach to institutions, organizations and interorganizational networks (March and Olsen 1985; Sydow and Windeler 1998; Feldman and Khademian 2002, 2007). From this perspective, resources are not out there objectively and ready to be dispatched. Instead, the participants in a particular context are responsible for enacting assets into resources. Thereby, organizational resources are constantly mutating (Feldman 2004) as they are made to fit into new organizational or interorganizational situations. We define resource transposition as the process of managerial practice turning assets that are in the possession of other organizations into resources that become useful for a different, collective purpose. Provan and Kenis (2008) referred to this collective purpose and defined network effectiveness as 'the attainment of positive network level outcomes that could not normally be achieved by individual organizational participants acting independently' (p. 230). Network effectiveness during a crisis, from this point of view, increases in likelihood when public officials engage in resource transposition in their daily operations. If the process of resource transposition describes how organizational assets are turned into network resources, then this process contributes to maintaining the collective response capability of the organizations involved. Hence, resource transposition can increase the likelihood of an effective operation overall.

Our approach to cooperation is guided by Giddens' (1984) theory of structuration (Berthod et al. 2017a). The theory of structuration sheds light on social practices as an analytical middle between structure and agency. On the one hand, the work of public officials constitutes the social systems in which they operate (e.g., a network). On the other hand, these very systems influence the management practices of officials by providing the necessary rules and resources for action. Giddens sees social structure as emerging from the mutual instantiation of material and immaterial resources and the rules that inform their use. Bourdieu (1977), in his theory of *habitus*, argues that social actors use 'practical metaphors' to transpose rules of action across contexts. If rules are transposable through analogical application in different contexts, so too are resources. This is different from the initial insight of resource fungibility, which sees resources as transformable. Transposition, by contrast, is the adaptation of a resource across contexts for an analogous purpose.

3 | METHODS

In order to specify this generic understanding of resource transposition, we report on a comparative in-depth case study including the emergency management of the cities of Düsseldorf, organized around the local Fire and Emergency Department (FED), and New York, formally organized around the city's Emergency Management agency (NYCEM, enacting a local version of the National Incident Management System (NIMS)). See Table 1 for a comparative overview of the two cases in point. In both settings, we relied on direct observations in the course of two different ethnographies with the FED and NYCEM as focal points. Direct observations at the case level produce findings that help scholars understand how agents work and organizing happens in and across social systems. In other words, ethnography reveals how public administration is practised in real situations.

In Düsseldorf, we observed interorganizational planning meetings, large-scale events (concerts, carnival festivities, soccer games), the handling of unexploded ordnance in the harbour, the management of the call and coordination centre, as well as everyday emergency and rescue operations. Although these operations were filled with uncertainty, they were all performed using a rich resource endowment and the building of slack. During our two years of observations, we observed one single case during which the resources used ran out: a large-scale storm in the summer of 2014 called Ela.

In New York City, we observed interagency exercises and training, planning meetings, network administrative meetings, event monitoring, daily response operation, and community engagement. Observations also included the handling of several medium-scale incidents, including a potential outbreak of Ebola Viral Disease, a snowstorm, a potential transit strike, and widespread protests related to alleged police brutality. In the course of this ethnography, we observed the second case we report on in this article, which was also characterized by performance demands temporarily exceeding available resources: the explosion of a mixed-use building in the city's East Village and the collapse of two adjacent multi-storey structures.

The two ethnographies inform our observations and understanding of the two particular cases reported on in this article. We spent time with these organizations up to the point of developing a deeper understanding of the work, lives and daily routines of our informants. To structure our inductive analysis of the process of resource transposition, we followed Barley (1996), in which fieldwork and analyses proceed along two crossing streams of analysis: emic and etic analyses. In emic analyses, the researchers rely on the participants' perspective and on their own immersion into the field to produce descriptions of phenomena that are as realistic as possible. The goal of this approach is to go through the field notes and interviews using one's experience in the field to produce thick descriptions of the observations. These descriptions include descriptive elements as well as explanations for the descriptions. For example, the researchers can explain observing anger and shouting if they know that the participants were under great stress and lacking sleep. In etic analyses, researchers leave the emic perspective of the insider to apply concepts and theories on the material produced during data collection. The goal of this approach can be to abstract out some of the details to focus on specific dimensions of the fieldwork, to produce theoretical concepts that are

TABLE 1 Comparison of cases

	New York City case	Düsseldorf case
Network orchestrator (NO)	New York City Emergency Management (NYCEM)	Fire and Emergency Department (FED)
NO's responsibility	Interorganizational coordination	Handling all non-criminal emergencies in routine and crisis situations
NO's experience of operative work	Does not provide emergency response services directly. With a staff of 153 people, pulls together the operational capacity of other first-response organizations, primarily the NYPD and FDNY, along with the Bureau of Emergency Medical Services (EMS). Conducted an average of 853 field responses to emergency incidents each year between 2013 and 2017, and an average of eight full Emergency Operations Center activations per year in the same period (City of New York 2017, p. 78)	Provide emergency response services directly. In 2014, conducted 139,478 operations with a staff of approximately 1,000 employees, mostly technicians and officers in firefighting and emergency management, and 300 additional volunteers. Only 2.3 per cent of these operations related to fire (FED's business intelligence system 2014)
Case in point	Natural gas leak in a five-storey building in the East Village, 26 March 2015	Thunderstorm ('Ela') on 9 June 2014
Crisis consequences	Two deaths, 25 persons injured, three buildings fully destroyed, 144 apartments in 11 buildings evacuated, and the handling of more than 4,000 tons of debris	Four deaths, 33 injured persons, hit over 50,000 trees (30,000 trees destroyed and 24,000 more in need of extensive care and trimming), with severe consequences for mobility in the city and various parts of the city infrastructure
Main operations and tasks	45 days: Combating fire; police investigation; handling of more than 4,000 tons of debris; evacuations and relocation of residents	8,008 operations in 11 days. Tree by tree, the FED needed to identify and eliminate all threats to people passing by
Resource challenge	Lack of personnel to take care of relocation; housing; shelters; incorporating volunteers; managing distraught residents' requests to retrieve pets; handling debris	Lack of personnel; exhaustion among volunteers; competing requests for technical relief by other agencies (e.g., schools, parks, forest and recreation); state district's refusal to send more units
Resourse response	Reception Center (RC) with the Red Cross; RC as platform for service provison (counselling, search missing pets, temporary housing procurement, information); securing disaster relief funds; integrating volunteers from the Community Emergency Response Teams (CERT); repurposing of sanitation trucks	Requesting units from other FEDs; requesting equipment; requested assistance from the Federal Armed Forces (250 soldiers)

grounded in the dataset, or simply to sort out observations in specific theoretical phases (e.g., the phase of the formation of interorganizational relations).

To compare ethnographies, Barley (1996) proposes bringing about the emergence of etic categories by comparing emic analyses. In line with this recommendation, we wrote two emic narratives about these two networks and these two particular incidents and compared the two cases repeatedly. While comparing the cases, two main etic dimensions emerged. First, the two cities were using different network structures based on their own reading of the

ICS (Incident Command System) and DV 100 (*Dienstvorschrift 100*), respectively. A second etic dimension that emerged concerned the fact that both cases were facing a sudden event that strained the participants' resource capacities.

We captured the differences in network structures using Provan and Kenis' (2008) seminal typology of network governance modes in order to differentiate between the role of NYCEM, a coordinative agency with limited direct operative responsibilities, and the role of the FED, an operative agency with coordinative duties, and great autonomy in decision-making during incidents. We qualified the FED as a lead organization because 'in lead organization governance, all major network-level activities and key decisions are coordinated through and by a single participating member, acting as a lead organization' (Provan and Kenis 2008, p. 235). Similarly, we qualified NYCEM as a Network Administration Organization (NAO) because 'the NAO is not another member organization providing its own services. Instead, the network is externally governed, with the NAO established, either through mandate or by the members themselves, for the exclusive purpose of network governance' (Provan and Kenis 2008, p. 236). While NYCEM in times of crisis offers services of its own, its work is directed at facilitating interagency emergency response and making sure that the incident command framework is effectively implemented. In consequence, these two cases differ with respect to network governance and how the networks are orchestrated in practice (Paquin and Howard-Grenville 2013). For a comparative overview of the two approaches to interorganizational responses, see Table 2. For more details on the frameworks and the cases, please refer to the narratives in the online supplementary material.

With respect to resources, we noticed that both case descriptions reported that NYCEM and the FED had to deal with missing inputs and assets to conduct their operations. In the case of Düsseldorf, human resources quickly became a problem. During the first two days, the FED was able to source staff from other FEDs in cities unaffected by the storm as part of a framework for resource pooling during states of emergency, and relied on volunteers. Soon, however, the local federal state decided to cancel the emergency state, which restricted access to these resources. The city needed to find new solutions to source additional staff. 'In 26 years of service', the deputy chief told us, 'I have never experienced anything like that.' In the New York case, NYCEM faced similar problems with respect to finding sufficient resources to address the surge in demand for services caused by the physical destruction inflicted by the gas explosion (in particular, clearing debris), as well as in containing and repairing damage to the social fabric of the community (in particular, organizing lodgings and helping residents retrieve some of their possessions and locate relatives and friends). For a detailed description of each case, please refer to the online supplementary material.

Based on these etic considerations, we then zoomed into the micro level of what we call the process of resource transposition. Using a grounded approach (Glaser and Strauss 1967), we assigned labels ('codes') to statements in our material on actions taken by the FED or NYCEM when they required inputs they could not provide themselves. For reasons of length, please refer to the online appendix for a detailed description of the coding process. Our coding revealed four aggregate dimensions that we introduce in more detail below: resource (re)production (in the sense that new resources are produced out of other assets); resource administration through integration; resource administration through centralization; resource support. Below, we present and define these concepts independently for analytical reasons. Nevertheless, in practice, such activities and actions are closely entangled and overlapping.

4 | CASE OBSERVATIONS

4.1 | Resource (re)production as a theoretical concept for practice

A first step in resource transposition includes the production and reproduction of resources. We propose that this first practice is being performed when managers, lacking proprietary assets to run a specific operation, (i) turn to the closest equivalents among the assets controlled by other organizations, and (ii) leverage the social embeddedness of

TABLE 2 Interorganizational frameworks in comparison

	New York City	Düsseldorf
Command	Multiple configurations possible, based on a primary agency matrix	Fire and Emergency Department (FED)
Framework	Incident Command System (ICS)	DV 100
Components	*Incident Command*:	*Operative-tactical group chaired by FED*:
	Functions: Operations; logistics; planning; finance/administration (all staffed by various organizations depending on the nature of incident and skills needed)	Functions: personnel; information; operations; logistics; media/press; IT (all FED staff)
	Additional participants: private contractors, other agencies or NGOs involved in operative work	Additional participants: private contractors, other agencies or NGOs involved in operative work
	NYCEM:	*Administrative-organizational group*:
	Coordinator of resources, data and information for the Incident Command; mediation in cases of conflicts and competing requests; involved in decision-making in logistics	Consult on potential consequences of operations for other public services (liaison officers from all potentially relevant public agencies and companies)

this new asset to facilitate its transposition. Actors determine closest equivalents based on the particular needs that must be fulfilled. Against this background, 'social embeddedness' (Granovetter 1985) refers to the notion that actors' options are constrained and enabled by their social relations. We use leverage in the sense of 'using for gains'. Gain, in this case, corresponds to putting these assets to positive use.

4.1.1 | Turning to closest equivalents

The FED and NYCEM serve as the nexus through which interagency resource requests are routed. In Düsseldorf, however, the FED manages such requests based on its needs, that is, with a focus on emergency management only, and involves its own resources as much as possible. For example, as mentioned in Table 1, the FED required assistance from the Federal Armed Forces. The 250 soldiers needed chainsaws to work, and these chainsaws needed maintenance:

> Regarding the federal forces' chainsaws: We have turned a school into a grinding shop. Station 6 is there (i.e., staffing the school) and the saws are sharpened during the night. (Fieldnotes)

Looking for room to host people, any unoccupied space would do. Schools being closed at this period, the FED requested them to install grinding shops and did the same with a local concert arena to host the 250 soldiers. In NYC, the city's emergency response plans are oriented towards coordinating the distribution of resources from across multiple agencies within a single incident response command structure. Resource transposition as a process is more common and broader. NYCEM staff see resource transposition not only as a practice, but also as a competence central to their work:

> I'm not going to tell you how to fix things, because I don't know how to fix them. But I know something needs to be fixed. I leave it up to you to fix it. But once you identify [the problem] I can assign it to the right resource. (Interview Transcript, NYCEM)

NYCEM uses its experience and overview of the resources of all participants to create propositions for substitutes that are closely equivalent. As mentioned above, in Düsseldorf, the storm had hit over 40,000 trees. The FED needed to check all trees to identify broken limbs and branches that needed action. Resources needed for this line of operations included: turntable ladder vehicles, mobile cranes, chainsaws, fuel, staff, intelligence about priorities in the streets and time. To produce these resources, the FED turned to equivalents. For example, the FED and the organizations concerned secured more time by aligning operations in the street based on the organizations' work schedules and shifts. Unmanned infrastructures and transportation lines are ready to be worked on during the night without disrupting the daily routines of the local citizens. While this approach was not the one initially favoured, it could be made possible through night shifts of FED staff and lighting equipment, all of which the FED could employ using its own equipment or renting some from companies in the region. Most importantly, the FED decided to request assistance from the Federal Armed Forces. The FED requested additional staff but also materials like chainsaws, field kitchens, and vehicles to pull and transport trees and debris. In the latter case, combat engineering tanks were used for the task. Eventually, the soldiers' coming implied the need to organize their housing and logistics for daily life. Here too, the FED, as central coordinator, turned to the next equivalents:

> We reach the Mitsubishi Hall [i.e., the local concert hall] and walk towards the backstage area. Military vehicles are parked everywhere, and in the middle of it, there is a trailer bar from the local brewery. I speak about it with [anonymous] because I know he's a good friend of the family who owns the brewery. He laughs and says that he organized it. They needed something to cool the drinks for the armed forces. (Fieldnotes)

Similar approaches were at play in New York. In particular, the technical challenge of removing debris produced by the three collapsed buildings exceeded the capacity of any one agency alone. As the city's Department of Sanitation (DSNY) controls a fleet of trucks specifically designed for hauling heavy loads, NYCEM coordinated the deployment of DSNY trucks to the scene, along with equipment from other city agencies, to receive and dispose of building debris. Turning to next equivalents is the mainstay of response activity in NYCEM's Emergency Operations Center (EOC). City buses are often given as an exemplar. They can be used to transport survivors and response personnel, but also as temporary shelters and even as work spaces:

> You can use [buses] for mass transit. You can use them for just holding people. I mean, there's really endless—just for space. You can use them for office space. Really anything. It really goes to that creativity side again. What do you need? (Interview Transcript)

Knowledge of asset distribution across city agencies and jurisdictions was therefore seen as important. If, for example, a request for a mass transit bus from the Metropolitan Transit Authority is denied, it may be rerouted through a different agency with similar assets:

> It's being able to say, 'how do I get into that house if I can't get through the front door? Ah, there's a back door.' DOE [Department of Education]—they've got school buses. Sheriff—they have buses …. I mean, does it really matter if—at the end of the day, I need a set of wheels, right? (Interview Transcript)

In another instance of turning to the nearest equivalent, NYCEM temporarily transformed a nearby public library building into a Reception Center (RC) to receive displaced residents, provide them with food and water, and connect them to services provided by other city agencies or nonprofit entities. The density of the neighbourhood magnified the effect of the explosion. In addition to the residents in the collapsed buildings, residents of neighbouring buildings were also evacuated or prevented from returning to their homes until their buildings could be declared structurally sound.

4.1.2 | Leveraging the social embeddedness of assets

Rerouting assets takes place in a particular relational and institutional context. Observing FED and NYCEM in action shows not only attention towards next equivalents, but also attention towards social embeddedness and ways to manage it. At this point it is important to note that leveraging social embeddedness means not only its opportunistic use to solve one's problems, but also the reflexive enactment of acceptance of the new resource as it is transposed into the new context. For example, turning assistance from the Federal Armed Forces into additional staff was a very unusual decision for political and cultural reasons. Having soldiers involved in municipal work is a sensitive issue in Germany. The armed forces had not been 'activated' as a partner in over a decade and the political leadership was at odds with this proposal. A FED officer saw the right moment to send their request in the absence of a recalcitrant employee at the regional directorate. Similarly, turning trailer bars from the local brewery into cooling stations came together with a few bottles of local beer as a gesture of gratitude. Finally, to enforce the soldiers' inclusion and counteract potential criticisms from the political leadership, the FED determined the modalities of their presence in town:

> The FED officer and the others joke about the tanks of the armed forces. He says that nobody wants to see tanks rolling over Königsallee [i.e., the city's main shopping mile that has a reputation for luxury]. The tanks must stay at the city's gates. 'If I see a tank cruising through the city, I'll kill them.' (Fieldnotes)

The social context in which the FED works was such that the mere inclusion of soldiers in the operative work without further reflection on how to prepare stakeholders for their presence was not possible. Instead, the FED used contacts to accommodate the soldiers and designed the modalities of their presence in such a way that critics would have fewer arguments at their disposal.

In NYC, the problems were even more diversified and necessitated more interplay, hence more instances of the enactment of this particular practice. NYCEM operates a formal liaison programme with other city agencies, in which officers are detailed to work on a routine, non-emergency basis at the NYCEM headquarters. An important benefit of this programme is building a shared knowledge of what assets are available in different agencies and how those assets are understood within the social contexts of those agencies:

> I know where they're coming from. I understand their world. And they understand me. They know me. ... It's a huge asset to be able to have that experience. When you have a guy [a liaison] who's worked at the fire department for 15, 18 years or longer, I can say what *I* think. But I'm not a fireman or fire person. I don't know. And they can give you that real life perspective. ... I always say that to get the answer you're looking for, you have to ask the right questions. (Interview Transcript)

This liaison programme shows how NYCEM maintains access to knowledge about the contexts in which resources will be transposed to facilitate the process. The building collapse also damaged the social structure of the neighbourhood in a way that traumatized residents, some of whom came for assistance at the RC. To assist with this situation, NYCEM mobilized a local Community Emergency Response Team (CERT), a reserve corps of volunteers trained in light emergency response. These locals provided important assistance, accompanying NYCEM staff as they helped displaced residents make temporary trips back to their residences:

> One of my jobs was to escort some residents returning to their apartments, to help gather their belongings or to clear their apartments. So when I was escorting these folks, a lot of them were anxious. They wanted to get back in as soon as possible. Then just seeing their reactions when they saw some of the damage to their apartments upon returning ... the folks were pretty devastated ... And then people didn't want to—when we asked them after clearing, when they had to leave and kind of

go back to the shelter where they were staying temporarily, some folks put up a fight there. ... The CERT volunteers were really essential—kind of a bridge for a lot of NYCEM staff to gain the trust of the community. (Interview Transcript)

4.2 | Resource administration through integration and centralization as theoretical concepts for practice

A second step in resource transposition regards how network orchestrators administer the resources produced; administering in the lay sense of providing something officially and remedially. We propose that this second practice can take two different forms depending on the governance of the network at hand. Resource integration, in the sense of combining assets collaboratively and situatively, is the pattern practised by the FED, a lead organization. Integration is being performed when managers promote (i) collectiveness in operations and (ii) transparent assemblages. Resource centralization is the pattern practised by NYCEM, an NAO. We use this term in its organizational sense: the presence and actions of a central office with decision-making authority regarding the problem of resource production and allocation. Centralization, we propose, is being performed when managers (i) demonstrate their organization's central position as orchestrator and (ii) promote discretionary solutions.

4.2.1 | Resource integration

The FED fostered deployment of the newly produced resources by promoting collectiveness in the operations. They did so by constantly defining and repeating the shared purpose of the newly produced resources and by repeating how they constituted important assets to fulfil a legitimate mandate. For example, regarding the armed forces and their soldiers:

The deputy chief of the FED, who is also present, adds: 'It is important that we always make clear that what we are doing is *always and only* emergency management'. (Fieldnotes)

This remark highlights the limits regarding the mission and mandate of the FED with respect to the city; it also mirrors the strong municipal autonomy of emergency management in Germany. Insisting on the nature and limits of the work performed collectively helps the Federal Armed Forces to understand how their resources fit (or do not fit) into the local administration and that it is not being misappropriated or otherwise misaligned. In line with this approach, the FED officers we observed never missed an opportunity to acknowledge gratefulness about such contributions and to approach liaison officers and the professionals who were present in the field with humility:

We go to the back of the Mitsubishi Hall. There, the soldiers have built three mobile kitchens. Tony [a pseudonym] goes to the soldiers and greets each of them with a handshake. 'Hi, I'm Tony, the officer in charge. Thank you very much for your support' (he goes on to explain his rank to the soldiers). (Fieldnotes)

Relying on official purposes and their definition also helped to promote transparent assemblages of resources, that is, easily seen through in terms of mandates and thereby free from deceit. By way of example, the soldiers in Germany are not allowed to intervene in the streets and interrupt traffic to work on trees. So the FED ensured that all sites with soldiers were staffed with employees from the local office for public order to manage traffic. This clarity helped to integrate the resources in such a way that the FED was able to align them in operations as if they were part of one single organization operationally:

> Now it all happens very quickly. The THW [Federal Agency for Technical Relief] must clarify what is the best angle to reach the tree. The crane operator (a private firm) positions the vehicle and stabilizes it. Soldiers help the operator and add wedges under the footholds. Once the crane is stable, the C-officer (FED) tells the Rheinbahn operator (public transportation) to turn off the electricity. The operator calls the central … (Fieldnotes)

It was our observation that FED officers communicated tasks and expectations openly and made clear what the tasks implied in terms of resource contributions. Thereby, they tried to ensure that each contributing organization would see how their resources were facilitating the work of others.

4.2.2 | Resource centralization

Where the FED worked to integrate resources, NYCEM's focus was on resource centralization for redistribution. Specifically, its work illustrated a dual focus on centralizing information and demonstrating centralization. A reviewer mentioned that this is typical of the NIMS approach. Indeed, following protocol, NYCEM ensured that information pertaining to the emergency and to resources were centralized in the EOC before distribution to the public and decision-makers:

> That's ultimately what we do in the Emergency Operations Center. We pull together a lot of information, look for patterns, look for ideas, look for solutions and present those to executives to make decisions about actions that will be carried out by other people. (Interview Transcript)

NYCEM worked to demonstrate this centrality throughout the event. While incident operations were directed from the scene, they were coordinated from the EOC. This meant that representative staff from all participating agencies were present and working alongside NYCEM staff, exchanging information, issuing and resolving requests. The agency hosted interagency meetings on the progress of the response at the start of each operational period, both at the scene of the incident (with NYCEM officials present) and in the EOC at NYCEM headquarters. This centre provided the coordinating space for information gathered from the response agencies (FDNY, NYPD, Con-Edison (the major utility company in the city), Department of Environmental Protection, and Department of Buildings). Information was dispatched back into the field where appropriate. For example: Which buildings were still considered unsafe for entry? Where was debris being deposited? Had any of the persons reported missing been found? NYCEM maintained the overall status of the site, summarizing all information with a running tally of open tasks. Its Geographic Information Systems unit centralized incident data onto maps, which were and circulated back into the field. Incident information was shared with elected officials through teleconferences hosted by NYCEM. Information for public dissemination was broadcast through NYCEM's social media channels and alert email system.

4.3 | Resource support as a theoretical concept for practice

A third step includes the support of the resources produced. Resource support is the pattern practised by NYCEM and FED when managers (i) anticipate frictions and (ii) promote reciprocity. We borrow the notion of frictions from Ghosh and Rosenkopf (2014, p. 625): 'generally defined as the resistance that one surface or object encounters when moving over another', frictions can preclude resource flows. By anticipating friction, we mean the reflexive work performed by managers to anticipate any issues that might slow down the transposition of the resource and its subsequent use. By contrast, reciprocal obligations emerge when participants anticipate that others will not voluntarily engage in opportunistic behaviour (Uzzi 1999).

4.3.1 | Anticipate frictions

In Düsseldorf, bringing soldiers of the Federal Armed Forces into emergency staff made this resource suddenly highly visible and compelling for other agencies and their staff. An important practice for the FED became one of having to anticipate frictions in competing orders. Mandates helped to preserve resources, for example by mitigating queries from other agencies (e.g., the park authority asked soldiers to help with cleaning the woods even though emergency response was not yet completed):

> 19 and 67 [i.e., mobile units sent out to gather intelligence] are checking the situation with the river because it can become a problem if too much stuff gets stuck and we have heavy rain again. We agreed that the detectors should call 112 in case of danger. We did not discuss the park situation despite the pressure they [i.e., the press] put on us during the press conference yesterday. (Fieldnotes)

Similarly, the FED anticipated a potential withdrawal of the newly transposed resources. Generally, the FED and its closest partners in operations continuously monitored the full usage of resources, planning and talking as if all were part of one single organization:

> The THW consultant says: 'At fire station 3, there are two squads of ours ready to saw. They should be sent out with two elevators [i.e., hired from private firms] and FED staff to operate the pods.' (Fieldnotes)

With few of its own resources directly at stake, NYCEM engaged less in resource support than in securing its position as a network orchestrator. During the response, NYCEM asserted itself visibly as the response coordinator. For example, the NYCEM commissioner appeared alongside the mayor and fire commissioner at the two mayoral press conferences dedicated to the incident, giving reports on the agency's efforts, and answering questions from reporters. Furthermore, NYCEM became the face of resident assistance and public information and directed its provision. The anticipation of frictions is largely built into the ICS system and planning documents, with delineated task jurisdictions for each agency involved in response. One of the city's major motivations in implementing the ICS system was to establish a structure that would reduce jurisdictional conflicts between city response agencies.

4.3.2 | Promoting reciprocity

The FED made sure that it facilitated the combining of resources by building reliable interplays between participants, for example by ensuring that the armed forces received sufficient maintenance of chainsaws, or that the building authority received notices of damage in time. This practice goes hand in hand with the one of leveraging social embeddedness in the sense that it contributes to reinforcing the relationship and facilitating future transposition efforts. For example, the FED made sure that the Federal Armed Forces received their fair share of media attention and positive image:

> We go to the press conference. It is a rare occurrence. Present upfront: EMS organizations, three military officers, the mayor, a deputy, the police, the THW, and the sanitation department. No firefighters. Instead, they have set up a huge poster of a FED truck in the background. The mayor seems relaxed. Explains what has happened and been done so far and thanks the three officers from the federal forces for their engagement and the substantial 'plus' they contributed. (Fieldnotes)

The work of promoting reciprocity was more routine in the EOC. NYCEM staff mentioned a tension that can emerge when pushing their contacts for information—about resources, about the status of aspects of an emergency—and their ability to provide something in return. One emergency manager stressed the importance of:

> … asking enough questions to make sure that you have the answers that you need, rather than just assuming that the person gave you the right answer. I think I've been burned on that too many times … I trust people too much, and I think that's where my questions need to get better. Making sure that you are relaying the right information is critical and really depends on you getting the information out of that person in the right way. So asking the same question three times to get them to think, well, did I think of all the components? (Interview Transcript)

This questioning shows reciprocity in the sense that NYCEM staff must make sure that interagency participants think broadly enough and relay things that might not be immediately relevant for them. Hence, what facilitates reciprocation is not so much the fungibility of resources as such, but much more the ability of NYCEM to connect staff from one agency with the resources from another:

> We don't explicitly have any authority, except to coordinate. The police department doesn't have to give me any information. They can just say 'hey, screw you buddy', and that can be their answer every single time. But it's all about being a team player and being able to make it a two-way street. Because sometimes the cops need stuff as well. That's really what the point of the EOC is, to keep that two-way street moving. And being able to talk to people and relate to people, and to get what you need at the same time as giving them what they need. (Interview Transcript)

5 | DISCUSSION

Building on and diverting from ideas of resource adaptation (Agranoff 2007; Herranz 2008; Saz-Carranza and Ospina 2011) and exaptation (Garud et al. 2016), we examined the transposition of resources as a process during extreme events. Such a perspective implies conceiving of resources as embedded in the relational context in which they are produced. Operations in times of crisis are contingent upon many variables and uncertainties. Network operations then are more likely to be effective if public officials engage in processes of resource transposition reflexively to develop the resources they need to operate in full; a process that happens under the pressure of time demands and scarcities.

At the outset of this article, we defined this process as the result of managerial practices, when managers act upon their environment (including network structures) and turn assets that are in the possession of other organizations into resources that are useful for a collective purpose. While we present these practices separately for analytical purposes, these practices are very much entangled in reality and can be the object of much variation from case to case. Building on the case observations, however, we can specify this definition. We propose that resource transposition is the result of three particular practices: resource (re)production, administration, and support. The first practice, resource (re)production, happens when actors produce new or reproduce existing resources through turning to the next equivalents of missing assets and use the social embeddedness of these equivalent assets to the advantage of the collective operations at hand. Administration of the newly produced resources can follow two specific paths: (i) resource integration and/or (ii) resource centralization. Integration manifests itself through the promoting of collectiveness in operations and transparent assemblages of assets. Centralization manifests itself through more opaque and discretionary decision-making about the resources, based on the needs of single organizations. Finally, resource transposition entails the practice of supporting the newly produced resources. Exploring this specified description of the process of resource transposition, our empirical observations show how much work is involved in resourcing

interorganizational networks in such extreme situations, thereby explaining how public managers engage in the adaptation of resources as signalled by previous research (Agranoff 2007).

These elements of a definition constitute a first step towards a more elaborated theory on the process of transposing resources in network contexts. Building on these specifications, we can theorize propositions about conditions for resource transposition in interorganizational networks during extreme events. FED and NYCEM enact two different templates for interorganizational coordination. In both cases, however, the problem of resourcing operations became salient as FED and NYCEM started looking for assets that they could not provide themselves in the usual way. Effective resource transposition takes place when the process we described above is accomplished and the new resources are made to contribute. While we cannot predict whether and when an effective process of resource transposition will ultimately turn an operation into an effective one (in line with the definition of network effectiveness we cited above; see also Provan and Kenis 2008), we suggest the following, more modest but fundamental proposition:

> *Proposition 1*: Effective handling of extreme events via interorganizational networks depends on the practices of public officials to act upon their environment and turn assets that are in the possession of other organizations into resources that are useful for the collective response.

This understanding of resource transposition sheds light on the role of network orchestrators, that is, organizations that not only coordinate networks but also develop and animate the many relationships within networks (Paquin and Howard-Grenville 2013). New York City and Düsseldorf both rely on different institutional frameworks to support the emergence of interorganizational response to crises, with a different understanding of the role of the most central organizations: the FED as a polyvalent, operative (in the sense of being in charge of operations on site) agency focused on emergencies, and NYCEM as a facilitating and coordinating agency with a much broader scope of application. Hence, a comparative point that we need to address is the difference in network governance between the FED and NYCEM. At this point, it is important to note that we do not mean to characterize the whole networks involved. Instead, our work focuses on the activities performed purposefully by the FED and NYCEM as network orchestrators in these particular contexts. The FED is an operative lead agency that strives to develop and/or maintain the necessary skills, equipment and training to deliver emergency services on site on its own and coordinate the operations of other organizations involved. Its scope of operations, however, concentrates on emergency management, that is, its own mandate. In the case observations, we saw how this approach contributed to integrating resources for managing emergencies and inhibited access to resources for other agencies.

By contrast, NYCEM is a coordinating agency that has a more limited presence on site, but is responsible for maintaining and operating the EOC, facilitating—as an NAO—interagency operations, ensuring that the ICS is properly implemented and correctly operating, and assisting in the resolution of disputes and conflicts between agency partners. With its Citywide Incident Coordinators and mobile command facility, the agency also facilitates interagency meetings and coordination at the site of emergency responses. In case observations, we saw how this process is described as more centralized and discretionary. Hence we propose the following:

> *Proposition 2a*: Network orchestrators with a mandate and operational duties on site practise resource administration through integration. Such a practice can produce a potential imbalance between the organizations that have an influence on the mandate of the orchestrator and the other participants with regard to resource access.

> *Proposition 2b*: Network orchestrators with interagency collaboration as a mandate and fewer operational duties on site practise resource administration through centralization. Such a network can produce a potential imbalance between participants with regard to gaining a transparent overview of the resource basis it centralizes.

Finally, while the FED's rich experience accounted for its capacity to assess situations and resource needs, similar work processes were at play in New York despite NYCEM's lack of direct operational experience in certain fields. While the agency deliberately cultivates a staff of individuals with direct experience with many operational fields in emergency response, which facilitates interagency communications and informs decision-making, the agency in its institutional role serves more as a coordinator than commander. Within the city's emergency response network, NYCEM maintains its neutrality, brokering resources to resolve problems rather than issuing commands. The EOC staff ask that resource requests be phrased in terms of 'what your problem is' rather than 'what you need', since it is generally easier for NYCEM to determine substitute resources to solve a problem than to track down specific resources, which might be unavailable. Through NYCEM's frequent interactions with other city agencies and private sector actors, the agency's staff build experience with respect to the assets available across the network. This experience can be diluted over time due to staff turnover—turnover is a challenge for emergency management organizations from the leadership level down (Choi 2008)—but the high frequency of the agency's interactions across organizational boundaries in small-scale responses mitigates the negative effects of turnover. A second explanation is their systematic hiring of former first-response agency operatives, which contributes to an expansion of the organization's basis of knowledge. Hence we theorize the following:

> *Proposition 3*: Network orchestrators do not need to be involved in operations work on site to organize resource transposition, provided they tap into a more diversified workforce as a means to compensate for their lack of operational duties and experience.

Our findings advance the literature in three ways. First, expanding the treatment of resources to include the notion of transposition (and their management for collective, here interorganizational purposes) helps us better understand how emergency response networks reorganize towards effective handling of critical situations characterized by resource scarcity. We also demonstrate that an interest in social practices helps bridge the two streams of research introduced above, that is, on structural and managerial network scholarship, respectively (Giddens 1984). For example, Raab et al. (2015) provide evidence for the role of administrative capacity as a substitute for financial resources. Our propositions open analysis to the wider diversity of assets, including administrative capacities, but not these alone. The propositions also shed light on the role of practices to explain such findings. In the two networks in play in this article, money was of less interest than purposeful turning to closest equivalents and transforming seemingly irrelevant or incongruent organizational assets into network resources meaningful for the task and context (Feldman 2004). Whatever the governance form given, the presence of a network orchestrator proved to be an important common factor in both cases (Paquin and Howard-Grenville 2013). Zooming into the work of network orchestrators, our propositions shed light on the leadership and ingenuity of career officials in charge of networks and on how they make network effectiveness happen, even in such extreme conditions, thereby confirming recent findings on the predominant role of public managers and their skills (Klijn et al. 2010; Maccio and Cristofoli 2017).

Second, a focus on the necessity to enact resources (Feldman 2004) helps to better understand a dilemma that concerns organizations in general. As stated above, some propose that resource slack supports an organization's capacity to develop new solutions to problems (Cyert and March 1963). Others claim that resource scarcity and the risk of underperforming provoke the reconfiguration of other assets into situated resources (Bolton 1993; Baker and Nelson 2005; Lampel et al. 2014). If we attend to how public managers enact network resources, we capture the rich diversity of processes and mechanisms, which account for how networks go from scarcity to slack, and back-and-forth; especially in the face of extreme events, for which it is difficult to predict *ex ante* the nature of the resources needed. From this perspective, the theoretical explanation is neither about slack nor about scarcity. In fact, resource excess could be as challenging as resource scarcity: too much data to sort through; too many volunteers to coordinate; too many donated goods. Instead, our propositions uncover a view in which public managers struggle to operate between scarcity and slack as two poles of the same tension that they need to balance. This point of departure

asks how much autonomy public officials might need to transpose resources, and how we can create the account-ability instruments that help them do so without losing transparency and control (Olsen 2015).

Finally, a focus on resource transposition sheds light on the relevance of a practice-based perspective for the study of governance in general. When public managers build interorganizational arrangements, they create rules and resources that structure these networks, and transform these rules and resources as the network and its goals evolve and collective public service provision is practised into existence. This etiology is in line with an increasing body of work that studies network governance from the perspective of managerial practices (e.g., Huxham 2003; Provan et al. 2007; Rethemeyer and Hatmaker 2008; Crosby and Bryson 2010; Saz-Carranza and Ospina 2011; Paquin and Howard-Grenville 2013). Similar to colleagues interested in how inclusive management helps strengthen communi-ties and democratic participation (Feldman and Khademian 2002), we contend that a line of practice-based studies on resourcing in and of interorganizational networks, including other practices of resourcing such as contracting, donating or purchasing, can help us better understand the generative dynamics that underlie networks as gover-nance instruments.

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