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Emergency Management in the Swedish Electricity Grid from a Household Perspective

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Citizens', grid companies', and municipalities' preparedness and responsibilities during power outages in Sweden

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Abstract

This article focuses on households' action space and perceived responsibilities during power outages, and on how municipalities and grid companies understand their own and the households' responsibilities and action space. A case study was done in the county of Östergötland, including a questionnaire, participatory observation, and interviews. Household responsibilities in terms of preparedness for outages were unclear to the actors. Both municipalities and grid companies expected households to be somewhat prepared. Households, however, believed that they were not responsible for being prepared for power outages, even though they *need* to be prepared to survive. Often the preparedness concerns material factors, such as investment in auxiliary generating capacity for use in case of outages. However, how the households *perceive* outages is important for their capacity to handle and feel comfortable in such situations. The existence of "situational altruism" during outages also implies a need to include that phenomenon in official emergency management plans.

Key words: power outage, emergency management, citizen response, emergency preparedness, responsibility, accountability, electricity grid

Introduction

In 2005 and 2007, Sweden experienced two powerful storms, Gudrun and Per, which damaged the power grid and caused power outages in parts of southern Sweden. During Gudrun, 30,000 km of electricity lines were damaged, and 700,000 customers lacked power after the storm; half of these got their power back within 24 hours, but 68,000 lacked power for a week or more (SEA 2005a, SEMA 2005). In January 2007, Per left 440,000 households without electricity, and after 24 hours approximately 50,000 still lacked power. Historically, such severe outages are rare. On average, electricity users are struck by one outage a year, and 80% of such outages are unplanned. These outages last an average of 100 minutes a year, and approximately 70% of them last between 1 and 6 hours (SEA 2007a; Palm 2008).

Even though extensive and long-lasting outages, such as those caused by Gudrun and Per, are fairly uncommon, their consequences when they do happen are still far-reaching. Breakdowns in technical infrastructure have obvious social and economic consequences, as society is greatly dependent on technical systems such as the electricity grid. Most welfare services are also dependent on electricity. The consequences of an outage, visible in all public service areas, include closed schools, non-functioning security alarms in elder care, and lack of household water.

Experience of these storms has increased expectations regarding the ability of both private energy companies and the government to organize responses and take the lead in emergencies; co-operation among energy companies – private and public – and local and regional authorities to deal with outages is vital in this (Palm 2008). The role of households in the emergency management system, however, has not been addressed in any particular depth. In this article, I will analyse household action space during power outages, how households perceive their responsibilities during outages, and how municipalities and grid companies understand household responsibility and action space. The main research questions are: 1) What action space do households have in order to maintain functional everyday life during outages? 2) What restrictions and possibilities do households perceive during an outage?

A case study was done in the county of Östergötland, focusing on how households that suffered outages during Gudrun and Per experienced the emergency management and their own as well as other actors' responsibilities when it came to maintaining everyday activities, such as cooking, heating, and bathing. A small survey was conducted in Östergötland in which I asked households how they perceived the outage. The main purpose of this survey was to identify households that were willing to be interviewed about their experience of power outages. In total, I sent 200 surveys to households that had suffered outages during Per; of these, 62 households completed and returned the survey, and 15 of these were willing to be interviewed. The results of the survey are not statistically significant, and I will only cite them if they are relevant to our in-depth interviews. I will also refer to a survey conducted by the Swedish Energy Agency (2007b) shortly after the storm Per. The purpose with the survey was to see how many persons that were affected by the storms Gudrun and Per and how they were effected. The survey also concerns how the households had prepared themselves for the storms. 2000 questionnaires were sent out, of these 1072 were returned.

As well as the members of the households, I also interviewed 15 municipal administrators and four politicians working on emergency management and three executives of the three grid companies owning most of the distribution network in Östergötland. In total, 37 people were

interviewed. I also undertook participatory observation of a collaboration meeting, in which citizens in the municipality of Kinda could discuss outage-related issues with the grid company in the region.

The article is organized as follows. First, I describe the organization of the Swedish electricity market. Thereafter, I discuss household action space during outages, moving from the perspective of a hierarchical governmental decision structure to that of a more horizontal network decision structure. Then the interview results are discussed in relation to actor responsibilities and household action space. The article ends by presenting conclusions regarding household action space during outages.

Swedish electricity market organized in hierarchy and network

In 1996 the Swedish electricity market was deregulated. The reforms kept the production and sale of electricity separate from the transmission of electricity. Power trading and network operations could not be conducted by the same legal entity, entailing that trading and network operations would be kept separate in different organizations. The deregulation made it possible to produce and trade electricity in competition; network operations, however, were seen as a natural monopoly to be regulated and supervised by the authorities (Government Bill 2004/05:62). Today, the Energy Market Inspectorate of the Swedish Energy Agency is legally the regulator of electricity networks and the electricity market. It ensures that the network tariffs are reasonable and do not exceed the self-financing principle and that network operations do not subsidize other activities (Svenska Kraftnät et al. 2006). This deregulation of the electricity market in Sweden is in line with an international trend.

Policymaking, in most western states, is today argued to be characterized by a process of opening up government to broader governance via partnerships and network-oriented decision-making (Rhodes 1997). Network structures have partly developed in response to the state's increased need to mobilize actors (and their resources) outside its formal purview to formulate and implement public policy (Considine 2002). The traditional *government* approach highlights the formal chain of command of public organizations and top-down hierarchal decision-making by political actors. "Government" implies that governing takes place within governments and their formal institutions, and that the state monopoly on the use of legitimate coercion is central (Stoker 1998). According to the governance concept, networks are self-organizing and cannot be fully accountable to governmental bodies; the matter of responsibility thus becomes fuzzy for the actors. (Rhodes 1997; Peters and Pierre 2004).

The Swedish electricity grid is still a monopoly, while the trade in electricity is deregulated. Even so, issues concerning responsibility and accountability during outages have become increasingly discussed since deregulation, and will be discussed below. Issues concerning who is responsible for what during outages were on the agenda during both Gudrun and Per. What can, and should, different actors do? Historically, these issues were solved informally between actors during crises, but the current tendency seems to be to clarify and formalize roles and responsibilities beforehand.

Considine (2002:26) argues that, in network contexts, the "use of contracts and contracting is viewed as an efficient alternative to legal mandates, value-based collaboration, and hierarchy". Contracting is thus a way of handling the lack of amendments to legal frameworks

to meet the development of partnership and networked governance (Pierre and Peters 2000, 17). But as mentioned above, historically, there has been a lack of both legislation and contracts concerning issues related to outages.

The experience of Gudrun where the households faced unusual long outages without legal rights to compensation led to new regulations and changes to the Electricity Act (Government Bill 2005/06:27). The new Act gives consumers better guarantees of a secure electricity supply and strengthens the electricity companies' obligation to secure the electricity supply and make contingency provisions. For example, the energy companies now must compensate consumers if an outage exceeds 12 hours (a matter previously unregulated by law), and starting in 2011, an outage exceeding 24 hours will be even more expensive for the energy companies.

Swedish emergency management is based on responsibility for geographic areas, municipalities, county administrative boards, and the national government being responsible at the local, regional, and national levels, respectively. This means that these bodies are responsible for co-ordinating actors at their individual levels before, during, and after a crisis; they never encroach on the responsibilities, however, of another level of government. Swedish municipalities have a general social responsibility, for example to supply water, to their citizens and must ensure that they do not suffer prolonged power outages. Several municipalities have auxiliary generation capacity to use in case of emergency, most commonly in the form of diesel generating units. Such backup systems cannot handle large loads, so prioritization is often needed – a controversial issue in Sweden, because such prioritization has no legal basis today. The Electricity Act is usually interpreted as allowing no prioritizing to be done in peacetime, for example, when capacity shortage calls for load shedding or during power restoration after a protracted outage. In practice, however, municipalities and energy companies prioritize certain customers when absolutely necessary (Palm 2008).

In municipalities with municipally owned electricity companies, these companies are often key actors, because they are formally responsible for and own the infrastructure, i.e., the power plants and distribution networks. If the municipality lacks its own energy company, it acts mainly as a consumer of energy, buying related services from private companies. In this case, the municipality's main capacity to exert influence, besides as a consumer, lies in its planning monopoly and its ability to govern through and within actor networks (Palm 2006).

The demands households can make of grid companies refer to both regulations and existing agreements between households and companies. Government Bill 2005/06:133 emphasizes that citizens have a responsibility to take appropriate measures to prevent and handle extraordinary accidents (page 52) The government does not however develop this any further. The Swedish Energy Agency (SEA) interpreted this as indicating that households should have a responsibility to deal with power outages, even if they are unplanned. (SEA 2007a) SEA has a general responsibility for reliable energy supplies in Sweden. This mainly consists of assisting other parties with the prerequisites that are required in order to prevent and mitigate interruptions in the energy supplies.

At the same time, SEA's own questionnaire (2007b) to the household reveal that people in general are unconscious about their responsibility. There is only one in ten households who consider that they themselves have the main responsibility for the interruptions, damage and inconveniences that a cut in the power or heating supply can cause. Most households consider

that the responsibility lies with the electricity or heating suppliers. SEA's own reflection is that different actors responsibilities need to be communicated much better and that people in general are not prepared because they lack knowledge in these issues. (SEA 2007c)

Household emergency management – related earlier studies

In contingency planning, the focus usually is on physical matters, for example, how to handle water distribution and keeping people warm. However, Karl Popper emphasizes that we need to consider three different but interacting sub-universes to understand the complexity of everyday life, world 1 consisting of physical bodies, world 2 being the mental and psychological world in which our subjective experiences fit, and world 3 consisting of the products of human mind, such as languages, myths, and stories (Popper 1977, 1978). Keeping this in mind, I will discuss household action space during outages also including actors' ideas of responsibility during outages, and social relationships and networks.

The physical consequences of storms are often visible, and it is the physical destruction of nature and falling trees that often causes power outages. As a result of Gudrun, many public and private actors invested in auxiliary generating capacity. Earlier research has shown that whether or not households prepare themselves for a crisis, such as a protracted power outage, depends on how they *perceive* the probability of the crisis. Tierney (1989) states that if households perceive the risk to be low, then they will feel it is not worthwhile to prepare for a possible crisis. Another reason for lack of preparedness is that households may feel that they lack information on how to prepare effectively (Tierney 1989). Helsloot and Beerens survey (presented in this issue) to residents of the Bommeler – and Tielerswaard that faced a severe outage in 2007 highlight the importance of rapid and correct information as support in peoples decision process. In their survey most respondents felt that they lacked information from both the municipal administration and the grid company.

It is also only when households believe that a crisis is real that they start taking precautionary action, and households continuously evaluate the information received to confirm the warnings. That is one explanation for the increased phone traffic during a crisis (Helsloot and Ruitenbergh 2004).

In-depth interviews with householders, dealing with how they perceive power outages are uncommon. However, a journalist in Sweden has collected stories of people who experienced Gudrun in 2005 (Hemström 2006), describing the consequences of Gudrun and how people tried to handle everyday activities without electricity. The stories indicate that rural households generally think that outages are not such a serious matter and that they are prepared for them. However, Gudrun led to much longer outages than people were used to, and households were unprepared for being without water, for example, for such a long period. The households had received warnings via the media before Gudrun, but had not realized that the storm would be much worse than usual. Households were used to warnings about storms that might lead to power outages, so familiarity with the situation kept the households from understanding its true seriousness. Many continued with their everyday routines and were caught in the storm when on their way to work, fetching children from school, or shopping.

How municipalities and grid companies prepare themselves for outages is important for how citizens and households can handle outages. Evaluation of experience of Gudrun showed that

municipal and grid company co-ordination and information dissemination did not work as planned for example where phone lists not updated and communication with media where sometimes problematic. Many citizens had difficulties contacting different parties, which in some cases resulted in passivity on the part of households (SEA 2005, 7–8)

Anshelm, Gyberg, and Hultman (2006) discuss how the Swedish media articulated two story lines regarding citizen experiences of Gudrun: one concerned household passivity in an emergency in which households lacked both heat and water, while the other told of heroic citizens in rural communities who united and locally solved the problems that arose. Helsloot and Ruitenberg (2004) emphasize that citizens are usually not helpless or dependent on others during a crisis and seldom use public or volunteer resources for protection during a storm. Helsloot and Beerens survey (see research note in this issue) confirm this. During the outage in Bommeler- and Tielewaar 87 % of respondents said that they did not ask for any help at all. Instead, they usually seek shelter with family or friends. Dynes (1994) discusses the existence of “situational altruism”, which is a certain norm applicable during crises and that influences how citizens behave. To regard citizens as helpless victims is thus completely wrong-headed, and governments should instead treat them as the powerful actors they are. (Cited in Helsloot and Ruitenberg, 2004)

In the following, I will analyze household action space with reference to physical issues, ideas and perceptions of outages and responsibilities, and social relationships and local networks.

Results from the case study in Östergötland

This section presents the results of the case study in Östergötland. As mentioned above I did a small survey to households living in rural areas. The results of that survey are not statistically significant and I will only cite them if they are relevant to our in-depth interviews. During the same period the Swedish Energy Agency did a larger survey to 2000 households where 1072 responded (SEA 2007b). I will discuss the result of this survey when it relates to the issues discussed below. The material also consists of interviews with 15 householders, 15 municipal administrators, four politicians working on emergency management and three executives of three grid companies owning most of the distribution network in Östergötland.

What is problematic during outages?

As mentioned in the introduction in connection with Per 440 000 customers were left without electricity. The longest power cut duration was approximately 10 days. Historically, such severe outages are rare. The householders we interviewed however lived on the country side and were used to outages, as they occurred several times per year.

The householders interviewed meant that outages of 12–24 hours are acceptable, but that if they last any longer than this, problems arise concerning lack of water, heat, and light. However, the respondents had developed routines to deal with these problems related also to longer outages, exemplified in this comment:

Yes, in connection to outages I have learned to store water in the bathtub beforehand. (Interview, Household B)

Even so, it is a huge disturbance to everyday life when routines are disturbed. According to householders, the greatest problems during outages are non-functioning freezers and toilets, lack of home heating, and lack of water, though lack of light is also mentioned. Information, or rather a lack of information, is another problem for households:

It is not having information and not knowing what has happened and when it will be fixed. I think that is the most problematic. I can handle other matters with some inventiveness. (Interview, household A)

To become informed, the households started calling the grid company, as will be discussed below. Many households, however, never tried to contact the grid company, and the questionnaire revealed that only 22 of 62 respondents had contact the grid company during Per. In SEA's survey 27 % stated that they had contacted their grid company. In interview, four of the householders said they trusted that the grid company would handle the problem as best they could:

I never phoned. I don't think I would call anyone, even if it was long lasting ... I would only wait. It [i.e., the electricity] will eventually come back on, and they are doing what they can. That is what I would think. (Interview, household C)

One important factor when it came to the level of household trust in the grid company was the company's awareness of the local context (*lokalkännedom*). If the household thought the company lacked such local awareness, trust in it quickly evaporated. One householder described how the grid company Vattenfall could not tell her when her electricity would be restored, because her house "did not exist" on its map. Vattenfall could not find her house on the grid map and said that they did not work in her area. In this situation, distrust in the company obviously arose, as well as a certain bitterness that the company did not regard rural customers as equally important as urban customers. In this case, trust was partly salvaged when Vattenfall's workers succeeded in repairing the grid. The woman in the household happened to run into Vattenfall's workers, who assured her that Vattenfall indeed knew that her house existed and that her electricity would be restored in a few days. The grid workers were mentioned by several of the respondents, who seemed to have great trust in them and their predictions of when their electricity service would be restored.

Perception of actors' responsibilities during outages

The interviews revealed that municipal responsibilities during power outages were unclear to both households and grid companies. Both these actors, however, assumed that the municipalities would take care of their citizens and keep providing healthcare, schooling, preschooling, etc., during any outages. At the same time, care of the elderly was something the households said they would try to safeguard themselves. When municipal representatives were asked what their responsibilities were in the event of outages, they all responded care of the elderly and children. They also said that they had a responsibility to keep local inhabitants informed, something I will discuss further below. Municipalities and households believed that the grid company should prevent outages, repair the grid as fast as possible, and, together with the municipalities, prioritize between electricity users when possible. The grid companies agreed to this, but added that they also have a responsibility to keep customers informed and give them economic compensation.

Households were well aware that it could be difficult for companies to repair the grid during a storm, not least because this work entailed huge risks for workers.

If the wind rose, as happened with Gudrun, nobody should be sent into the forest. Then you have to realize that you will have to wait until the storm has ended ... It must be related to what is reasonable. (Interview, household I)

The householders were more critical of the grid companies' preparedness for the storms than of their work repairing the damage.

The respondents had reflected the least concerning their responsibility for preparedness for outages. Municipalities and grid companies expected households to have a certain level of emergency preparedness, and that rural households would be more prepared than urban ones. At the same time, nothing in the material indicated that the rural households received less support than any other citizens during Gudrun or Per. However, this may be because it was mainly rural households that were affected by the storms, so all resources could be concentrated in rural areas.

The householders interviewed all lived in rural areas, and we asked them whether they believed they had a responsibility to be prepared for power outages and whether this responsibility was greater than that of urban households. Their answers were equally divided between the following three categories:

- 1) those who felt they had a responsibility and should be more prepared,
- 2) those who felt they had no responsibility to be prepared, and
- 3) those who felt that, ideally, they *should* have no responsibility and *should not need* to be more prepared, but who in practice said they needed to be prepared, otherwise they could not handle an outage.

Even though householders did not think they were responsible for preparing for outages, in practice they were all somewhat prepared. All householders said that they always kept a supply of, for example, batteries, candles, and extra heat sources at home in case of an outage.

Perceptions of economic compensation

Since 1 January 2006, compensation for outages is paid automatically by energy companies, the amount depending on outage length and yearly net cost. The minimum compensation is SEK 900, or approximately EUR 100. Accordingly, damages are paid to compensate for expenses incurred, loss of income, or other losses due to the outage, but not losses relating to commercial activities. The last category is regulated in Swedish law, but I was interested in how *households* – not businesses – perceived the compensation received. The observation on compensation for commercial activities could be combined in one separate sentence.

In our questionnaire, most replied that they thought that EUR 100 was reasonable compensation. At the public meeting in the municipality of Kinda, monetary compensation for the outage during Per became the main issue. The energy company spent more than half the time explaining when and how much the company would compensate what customers, and why the monetary compensation had not yet been paid. There was disagreement, however, as to what the compensation should cover. The energy company E.ON intended this compensation to cover all expenses incurred during outages; the citizens, however, emphasized that the energy company should compensate its customers for being unable to deliver electricity according to the contract, and that, on top of that, households should be compensated for their expenses. Similar opinions were expressed in interview, in which the

householders stated that monetary compensation should cover all the expenses incurred due to the outage.

Most householders saw a direct link between the right to have a secure electricity supply and paying the electricity bill on time:

And you have to pay your bill. I mean, they sent the bill, and I had to pay it on time, even if I didn't get anything for it then. This is very annoying every time an outage occurs. (Interview, household E)

The energy companies' profits were also cited as a why the households did not accept outages.

At the same time, it was strongly believed that it should not be possible to pay for a more secure electricity supply. In the questionnaire, 51 of 62 indicated that it should not be possible to pay a higher grid fee to obtain a more secure supply; the eight who indicated that it should be possible thought that approximately EUR 10/month was a reasonable premium to pay. The same tendency was evident in the interviews, and a typical response was as follows:

I think it is pretty expensive as it is today. Then when you hear about the companies' profits, then I think there is enough money as it is to secure the grid. (Interview, household E)

Information and communication

For the municipalities and energy companies, better communication with customers and better information provision had high priority for the future.

Seventy per cent of the crisis consists of a lack of information, so if we can handle the information issue, we can relieve a huge part of the suffering. In this regard, IT is an important tool. (Interview, Emergency Management Co-ordinator, Mjölby Municipality)

Both municipalities and grid companies worked a lot with and, for that reason, talked a lot about their websites and their future importance in disseminating information. It was through their websites they planned to communicate regarding emergency management with their citizens/customers in the future. In SEA's survey 9% said that they had used the Internet to get information during the outages; half the respondents had Internet access during the storm (SEA 2007b).

In interview, household members expressed their surprise at having been told to get their information from the Internet:

And then they tell us to use the Internet for information, but how can I do that when I don't have any electricity? (Interview, household O)

According to both our and SEA's survey, most households use radio, followed by newspaper and neighbours to get information. In interview, four respondents told us how they tried to contact their grid company, but that it was nearly impossible because of the overloaded company switchboard. Other householders stated that they did nothing during the outage, but relied on other people contacting the grid company to tell them about the outage. They also

felt no need to get any information about the outage or when it would end. One householder put it this way:

Yes, you can see that quite easily. When the light is on, then the electricity is back on. (Interview, household F)

The four householders who wanted to speak with the grid company phoned the company over and over again until they got an answer as to when the electricity would be restored. It is only that question – when the electricity will be restored – that the households wanted to get answered. Not knowing when power will be restored has a paralyzing effect on households. The householders explained that if they know how long an outage will last, households will also know what efforts to make; for example, they may need to move the groceries in the freezer to a “safer place” or start a portable generator.

Actors’ access to auxiliary generating capacity

In the survey, two thirds of the households stated that they had a wood fuel stove and all said they had candles or a torch at home. It is however unclear if this was as preparedness for an outage or just a coincidence. Of the 62 surveyed households, 17 said that they had a portable generator. In SEA’s survey approximately 30 percent had wood fuel stoves and about 8 percent bought or hired/borrowed generator sets during Per. In our interviews, 5 householders had a generator. All these said that they had bought the portable generators because of the inconvenience experienced in connection with the storm Gudrun. The purpose of the portable generator was often to maintain “normal” everyday life and be able to cook and watch TV even during an outage. At the same time, households need knowledge not only of what is a reasonable amount to spend on a generator, but also of how to run the generator. Installing and running older generators was regarded as both time consuming and troublesome.

Networks of municipalities and energy companies

All municipalities in Östergötland lacked formal agreements with the energy companies covering issues such as aggregate backup generating capacity, responsibilities in event of outage, and prioritizing users. According to representatives of both municipalities and energy companies, they have not needed to formalize their co-operation.

The co-operation between municipalities and energy companies differs, however, between municipalities. Some municipalities have no contact with the grid companies, while others, often those that have long had an official responsible for emergency management issues, had established networks with ongoing meetings. For example, both Kinda and Norrköping municipalities had established informal co-operation with E.on, giving them influence on how E.on prioritized the grid repairs after Per. These municipalities also felt that they received enough information during the storms, contacting the energy company every night to discuss conditions and how they could limit damage for citizens.

Municipal involvement in networks also determined whether or not a municipality had priority lists in place. Where there was such involvement, the energy company had drafted priority lists, but where such involvement was lacking, priority lists were lacking and municipalities even thought it was not legally possible to prioritize one user over another.

The householders emphasized the importance of prioritizing during power outages. In the survey, 59 of 62 respondents said that prioritization should be done when possible, and that

hospitals and care of the elderly and children should receive the top priority. These responses were identical to those of the municipalities and grid companies.

Municipal contact with the grid companies is ultimately important for citizens. Municipalities with a well-developed relationship with the grid company were better prepared and had considered how to prioritize between different users and activities. These municipalities were also better informed during outages than those lacking such contacts. They had better knowledge of the grid and its weaknesses and better overall knowledge of where there were needs for auxiliary generating capacity.

Grid company and municipality co-operation with citizens

Neither the municipalities nor grid companies had established regular contact with the households or their associations. Instead of networking, they developed one-way information dissemination, for example, via websites. It was through these the municipalities and companies communicated with their citizens/customers.

The interviews with the householders highlighted the importance of informal neighbourhood networks. As mentioned above, neighbours were a common information source during power outages. Several householders took it for granted that “someone else” would phone the grid company; these householders did not, however, know who that other person was. There was a lack of any formal network or organized means of information dissemination, though information dissemination did seem to work very well. There was a tradition of common action in the villages, where the neighbours felt responsible for and looked after each other. Social altruism seemed to exist in Swedish rural areas.

Conclusions

As mentioned above households space of action is discussed in relation to Popper’s sub-universes, which includes restrictions and possibilities related to physical and psychological factors and factors related to the world of human minds. If we relate this perspective to the electricity system it is a matter of fact that the households are often not interested in electricity per se, but rather in the functions and convenience it can provide. Electricity is required to meet various needs, such as to prepare food, provide heat and light, or maintain health and cleanliness (Carlsson-Kanyama & Lindén, 2002). In this perspective the production and distribution of electricity is rather irrelevant, the important is to fulfil those needs. What is happening during an outage is that these normal services are interrupted and people act in different way to provide or sustain the services. Some of the households prepared themselves and acquired physical appliances such as portable electricity generators to be able to watch TV, cook, or take a shower also during the outage. Other did no preparation, more than to have candles and torches at home. Not all households asked for or felt that they needed help or information (compare also Helsloot and Beerens, this issue). They expressed trust to that the grid companies can deal with the situation and for them these normal services were not that important to uphold. They simply did other things not involving electricity use during the outage.

For the households that wanted to uphold normality information became central, to know how long the outage should last. Here we can see a mismatch between the strategies for the different actors. For the households radio and telephone were the major communication tools,

for the municipalities and the grid company it was Internet. To gather all information on websites is though a waste of time if the receiver of the information will not search for information there. A more suitable strategy for the near future is to make use of the existence of local networks and communication among neighbours. This is an important communication channel for the households and to identify the communication node in these small communities and inform that person about for example relevant websites could be a successful strategy.

The municipalities with established networks with the grid companies also had emergency plans including preparations for outages. Those municipalities that lacked such networks, also lacked preparation for outages. To even have a plan for those occasions is of course fundamental and important for the municipality to be able to uphold important functions such as water supply. The municipal emergency management planning could however be improved and include more aspects such as the existence of situational altruism during outages. Including this factor would imply a need to investigate these local co-operation patterns and how these could be used in the emergency management system as a whole. It could also open up new avenues for prioritizing in the system, if it is established that in some areas there is no need for heated shelters and meeting places.

The study of households' action space during power outages emphasized new important aspects to take into consideration in planning the emergency management system. The physical aspects of preparedness are often the focus, but as we have seen here, both perceptions of responsibility and social networks are also important. How households perceive outages can be decisive for their ability to feel comfortable during them. Believing that an outage is "no big deal" and simply another part of everyday life results in less inconvenience for the households. Keeping Popper's three worlds in mind when analyzing outages, made it possible to highlight important factors otherwise not fully considered in power supply contingency planning.

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