

# Swedish multi-level planning system for critical infrastructure protection: The regional core

C. Große

Mid-Sweden University, Sundsvall, Sweden

P.M. Olausson

Mid-Sweden University, Östersund, Sweden

**ABSTRACT:** With its growing dependence on electricity, modern society faces the risk of cascading failure of interconnected societal functions. To protect societal functions during an event of power shortage, Sweden has implemented a multi-level planning process called *STYREL*, which involves national-, regional—and local-level actors. As part of the Swedish crisis management system, the regional body operates as a co-ordinator that organises co-operation and interaction between private and public actors. This study examines the role of the regional hub in *STYREL* and the collaboration and co-operation between planning levels. It focuses on the co-ordinator's perspective and presents evidence from interviews and a survey among planners at County Administrative Boards, entrusted with the supervision and execution of *STYREL* within their regional area of responsibility. This paper indicates that the regional co-ordinator lacks the awareness, knowledge and resources to fulfil its core function in the national planning for critical infrastructure protection.

## 1 ELECTRICITY AND THE SWEDISH CRISIS MANAGEMENT SYSTEM

### 1.1 Background

Electricity is a vital resource in today's society, which largely depends on electricity for maintaining critical social functions. It can be argued that the reliable distribution of electricity is crucial for private households, businesses, and public operations to function and survive (Cohen 2010, Ghanem et al. 2016, Rinaldi et al. 2001). This dependency is likely to increase over time due to the continuous developments in important infrastructure such as railways and electric cars (Cedergren et al. 2015).

The power grid is vulnerable to various types of events, such as extreme weather conditions (e.g. storms and floods), technical failures due to outdated infrastructure and aging components, cyber-attacks and destruction. Disturbances in the grid can have severe consequences for society (Gheorghie et al. 2006, Pescaroli & Alexander 2016). For example, in Sweden, the storms Gudrun, Per, Dagmar and Ivar caused major problems that in some cases lasted for more than a month (EA 2006, 2007a, 2007b).

In the future, there is a risk that such extreme conditions will increase in number and magnitude due to the changing climate (Birkmann et al. 2016). Given the serious effects of such events on society,

creating the necessary conditions for sustainable power supply during a crisis is an important function of the Swedish Energy Agency (EA). In order to ensure undisturbed power supply to important users in society, i.e. critical infrastructure (CI), the EA has developed a planning process called *STYREL* (an acronym for *control of power supply to prioritized electricity users*), to provide critical infrastructure protection (CIP) against short-term power shortages.

### 1.2 Aim of the study

The County Administrative Board (CAB) plays a central role in the Swedish *STYREL* process as co-ordinator (EA 2014). The aim of this paper is to examine the role of the regional hub of *STYREL* and the collaboration and interaction between planning levels that are included in the process. The focus is on the differences between CABs regarding their performance as co-ordinators in *STYREL*.

### 1.3 The Swedish crisis management system

The Swedish crisis management system depart from three principles: The first one is *the principle of responsibility*, which implies that actors who are responsible for an activity or a process in everyday life are also responsible for it during a crisis. Next, *the principle of parity* implies that societal functions

during a crisis should as far as possible be carried out in the same way as they are during normal conditions. The third *principle of proximity* states that actors closest to the event handles the crisis when it occurs; this means that a municipality or county/region should primarily handle a crisis. If local resources are insufficient, the state can act through the CAB (MSB 2014, Pramanik et al. 2015, Tehler et al. 2012). In practice, this means that the CAB is responsible for co-ordinating between relevant actors in their county (MSB 2014). The co-ordinating role may involve some problems, as there is no explicit process for resolving possible conflicts within the Swedish crisis management system.

A study of the Swedish defence directors at the 21 CABs in Sweden has revealed what the problems are (Wimelius & Engberg 2015). According to the study, clearer governance, improvement in network management and increase in resources are measures that can help to improve co-operation among the various players in the county. Several defence directors expressed the view that the Swedish crisis management system is characterised by weak governance and lack of continuity (Wimelius & Engberg 2015). A study of the river groups in Northern Sweden further substantiated this view. The river groups exchange information in events such as floods and high flows through co-operation via networks. However, vague instructions from the Swedish Rescue Services Agency have resulted in the different river groups working differently, having different objectives, and involving different actors (Olausson & Nyhlén 2017). All these reports point to the need for a more integrated and standardised system when it comes to crisis management in Sweden.

## 2 THEORETICAL FRAMEWORK

This study focuses on the planning process for power shortages, *STYREL*, which involves both public and private actors (Große 2017). Pierre & Peters (2000) consider the management of society as a continuum that extends from traditional top-down control, at the one end, to self-organisation (auto-poiesis) and networks at the other end. The concept of governance is the common element of the entire continuum. In social sciences, the concept of governance has no clear definition, in which regard Pierre & Peters (2000) note:

*‘...Sufficiently vague and inclusive that it can be thought to embrace a variety of different approaches and theories, some of which are even contradictory’* (Pierre & Peters 2000: 37).

Governance can be regarded as a policy instrument in the context of institutionalism, rational

choice, and network and policy communities, or it can be analysed based on neo-Marxist and critical theories. The concept of governance describes how a society is organized, governed and who is involved in dialogue, participation, and networking. According to both governance and public policy theories, networks are an important phenomenon (e.g. Christopoulos & Ingold 2011, Henry 2011, McGinnis 2011, Petridou 2014). In this study of *STYREL*, we use the definition of governance as a policy instrument and subsequently as a network for steering. *STYREL* can also relate to the concept of risk governance, which considers legal, institutional, social and economic contexts as well as the actors involved in each of these contexts (Renn 1998).

Governance or policy networks can be either self-organized or created and co-ordinated by the state (Sørensen & Torfing 2005). Individual organizations often use networks to achieve their strategic and operative objectives, to maximize their influence over outcomes or to avoid dependence on other actors in the system. From this perspective, governance involves managing networks (Rhodes 1996).

This study examines material from interviews and a survey of planners at CABs to portray the CABs’ central role in the Swedish planning system. The analysis was based on the concept of complex systems governance, the aim of which is to ensure control, communication, co-ordination and integration of a complex system by several metasystem functions (Keating et al. 2014). In particular, the focus is on two functions of complex systems governance:

- *Policy and Identity*
- *Information and Communications.*

The aim of focusing on these two functions is to inform other functions of complex systems governance, such as learning and transformation and the operational performance of the Swedish crisis management system and its governance, i.e. the metasystem (Keating et al. 2015, Keating et al. 2017, Keating & Bradley 2015).

- *Policy and Identity*  
The role of policies is to provide direction and identity to the system components, e.g. the planners in the Swedish *STYREL* process, and to represent the system to external constituents, e.g. the Swedish crisis management system and the wider public.
- *Information and Communications*  
Secure and reliable information paths are particularly important in national planning for CIP. However, access to relevant information for decision-making is similarly vital for the performance

of the planning system, as is the consistent interpretation of available information throughout multi-level planning, such as in the case of *STYREL*.

This study examines the available evidence in light of these governance functions and highlights problems in the design, execution and involvement of the Swedish multi-level planning system for CIP, in order to inform further development of this complex system and its governance.

### 3 METHOD AND SELECTION OF CASES

In this study, we use interviews with co-ordinators at the CABs in three counties in Sweden: one in the rural north, one including one of the three major cities in Sweden, and one including some heavy industry close to the capitol of Sweden.

This study further includes a survey with all the co-ordinators at the 21 CABs in Sweden, carried out in October 2017. Until today, 15 of these co-ordinators have responded to the survey, which means that the participation rate is 71.4%. These 15 participants provided answers to 34 questions on their perceptions of the effectiveness and efficiency of the planning in general and on the proceedings during the last planning process iteration within their area of responsibility in particular. The survey has an overall response rate of 62.2%; the answers to the remaining questions were *do not know (N/A)*.

A document study complemented the interviews and the survey and provided important background information, which allowed for data triangulation (Gerring 2007). The documents for study included a handbook for the planning process (EA 2014), evaluations of the pilot study in 2008 (Länsstyrelsen Blekinge 2009, Dalarna 2009) and evaluations of the first round of planning in 2010 at the national level (EA 2012) and in Stockholm County (Länsstyrelsen Stockholm 2012). Moreover, a report on the grid operator's plans for manual load shedding (MFK) completed the document study (Veibäck et al. 2013). We conducted the interviews after the document study, which deepened the information gained from the documents and allowed for verification of the evidence from the documents in the interviews.

### 4 SWEDISH PLANNING FOR CRITICAL INFRASTRUCTURE PROTECTION-*STYREL*

In Sweden, different actors are responsible for energy supply at the national level. The EA is responsible for creating the conditions for efficient, resilient, and sustainable energy use and cost-effective distribution of Swedish energy (EA

2012). The Swedish Energy Markets Inspectorate (EI) is responsible for supervision, regulation and licensing in the energy market. The Swedish Civil Contingencies Agency (MSB) bears the overall responsibility of the crisis management system and the measures taken before, during and after an emergency or crisis. Finally, the Svenska Kraftnät (SvK) is nationally responsible for the power grid. When a power shortage occurs, the SvK is responsible for MFK in as informed and socially efficient a way as possible. The mission is to ensure that local and regional power grid operators can perform such MFK within 15 min (EA 2012, Veibäck et al. 2013).

In order to enable the national, regional and local grid operators to run an MFK without affecting critical social functions, the four national-level actors (the EA, the EI, the MSB and the SvK) have developed the planning process *STYREL*. The planning and prioritisation process for power shortages has been used 2010 and then repeated in 2014. The next planning process iteration will take place in 2019. In *STYREL*, the CAB acts as co-ordinator between governmental agencies and municipalities, on the one hand, and the municipalities and power grid companies on the other, as Figure 1 depicts.

During the recent planning in 2014, the following multi-level process was agreed upon (EA 2014):

With the aid of an eight-digit scale for prioritisation of CI (see Table 1), national agencies identify and prioritise the CI that each of them operate.

In step (1) (see Fig. 1), each agency sends a portion of these ranked objects to the CAB of the regional area of responsibility in which the CI object is located. Each CAB merges the received

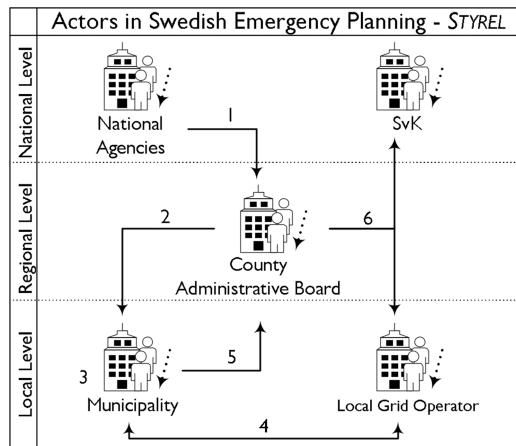


Figure 1. Actors and information paths in the Swedish multi-level planning process for CIP against power shortages.

Table 1. Priority classes of critical infrastructure.

Class	Description
<i>Electricity consumers that have/represent:</i>	
1	significant impact on life and health—short-term (hours)
2	significant impact on society’s functionality—short-term (hours)
3	significant impact on life and health—long-term (days)
4	significant impact on society’s functionality—long-term (days)
5	significant economic value
6	significant importance for the environment
7	significant importance for social and cultural values
8	others

lists of prioritised objects and divides them into portions that correspond with each municipality’s area of responsibility. In step (2), the CAB forwards these portioned lists to each municipality. In step (3), the municipalities make an inventory of locally important infrastructure and prioritise the objects in accordance with the list in Table 1.

In step (4), the municipalities exchange information on the prioritised consumers with each locally operating power grid provider, which provides information on the technical feasibility of control. The CI objects merges into controllable power lines. Thereby, the used spreadsheet performs additive aggregation of the objects’ ranking scores, which yields another list that contains the ranking of the power lines. After a final evaluation, the municipalities send this latter list back to the CAB in step (5). Each of the CABs merge these lists from the municipalities in their jurisdiction, resolve conflicts between lines that cross municipal or regional borders and make the final decision about the ranking of power lines. In step (6), the CABs send the final document to the SvK and dedicate portions of it to each power grid provider that operates in the region.

## 5 RESULTS OF THE STUDY

### 5.1 Analysis of the reference process model

The Swedish planning process for CIP involves actors from a large number of national agencies—all the CABs and municipalities and locally, regionally and nationally operating power grid providers. In Figure 1, the CAB makes two appearances as co-ordinator of the proceedings. The *STYREL* process can therefore be considered as a multi-agency planning process (Alexander 2015, Bharosa et al.

2010) that occurs at multiple hierarchical levels (Allouche & Berger 2011). This Swedish multi-level planning system consists of three hierarchical levels—the local, the regional and the national level.

The *STYREL* process can be decomposed into single problems at each level, at which responsible planners act on behalf of public or private organisations in sequential order, while the CABs play a central role as co-ordinators of the planning decisions. This role is directed top down and bottom up, but the latter role is incomplete because the procedure lacks co-ordination at the national level.

In the top-down part of the sequence (step (1) & (2)), a CAB receives information on an electricity-dependent CI that national agencies operate in the CAB’s regional area of responsibility. The survey results in Tables 2 and 3 indicate that although the CABs perceived the collaboration with national agencies as good, 84.6% of the CABs stated the need for a more structured process for this activity, particularly for the consistent interpretation of priority classes. Further, on in the process, the CAB portions the information on national objects and sends them to each of the municipalities in its juris-

Table 2. Co-ordinators’ perceptions of *STYREL*.

Population: 21, Response rate: 71.4%, n = 15	
Participation <i>STYREL</i> : never: 58.3%, once: 25%, twice: 16.7%	
Proceedings of <i>STYREL</i> : Knowledge: 42.5%, Perception: 78.9%	
	Median 0 1 2 3 4 5
Importance of <i>STYREL</i>	4.64 0 0 0 1 3 10
Usefulness in crisis mngt	3.80 0 2 0 2 6 5
CIP in power shortages	3.00 1 0 0 3 3 0
Collaboration with	
• National agencies	3.11 0 1 1 3 4 0
• Municipalities	4.00 0 0 1 3 4 5
Trust in	
• National agencies	2.90 0 1 2 4 3 0
• Municipalities	3.55 0 1 0 3 6 1
• Energy Agency	3.90 0 1 2 4 3 0
Impact of CABs’ work	2.45 0 3 2 4 1 0
Knowledge of <i>STYREL</i>	2.36 3 2 1 4 3 1
Level of system control	3.23 1 1 2 2 4 3
Good information access	3.22 0 1 2 2 2 2
Good information security	2.75 2 1 2 1 5 1
Clear information paths	3.10 1 0 1 3 5 0
Good resource access	2.67 1 2 1 6 0 2

Note: Scale running from 0 (don’t agree) to 5 (totally agree).

Table 3. Co-ordinators' experiences with *STYREL*.

	Yes	Mostly	No	N/A
Request for clearer processes				
• with national agencies	84.6%		15.4%	
• with municipalities	69.2%		30.8%	
• with power grid providers	53.9%		38.5%	
Followed the handbook	16.7%	41.7%	0.0%	41.7%
Regular meetings	15.4%	42.9%	0.0%	38.5%
... was handled of	Municip.	Collaboration	CAB	N/A
National/regional CI	7.7%	30.7%	15.4%	46.2%
Final compilation	0.0%	25%	38.6%	33.4%
Cross-local lines	0.0%	25%	25%	50%
Cross-county lines	0.0%	30.7%	0.0%	58.3%

dition that host such assets. In addition, according to the reference process model, the CABs should provide training and guidance to their municipalities during subsequent planning at the local level. Since the questions on concrete proceedings had a low response rate of 57.5% during the survey, it is possible that the knowledge within the planning system is stunted. In addition, 58.3% of the CABs have not participated in the planning process before. This may influence their ability to co-ordinate the proceedings and to provide guidance to the municipalities. Nevertheless, the CABs' responses with regard to collaboration with the municipalities were slightly positive and indicated that they rather trusted the municipalities. However, the reference process did not provide any measures to evaluate the correctness of the planning decisions, so aside from communication, the CABs have no means of assessing the information they receive—neither in the top-down nor in the bottom-up phase.

In the second part of the sequence (steps (5) & (6)), the information flow is in the bottom-up direction. Information about local prioritisation also comprises the national CI assets, but they are masked. During the recent iteration of the planning process, information exchange was limited to power lines and the number of objects per priority class. Even though this reduction in information may ensure a certain level of information security, it makes regional—or national-level co-ordination impossible. The study results indicate that the CABs used meetings as a means to gain more information and to align the

prioritisations in their area of responsibility. Nevertheless, 69.2% of the CABs stated that they require a more structured process for collaboration with municipalities. Moreover, each CAB must also merge the lists from the municipalities and then decide upon the regional ranking of power lines. Half of the CABs that answered this question decided to merge the lists entirely on their own. Further, one CAB performed the merging by itself and announced the changes to the concerned municipalities. The remaining respondents stated that they co-operated with the municipalities to align the results and to compile the final ranking list. Finally, the CAB divides this list into bundles of power lines that correspond to each local power grid operator in the region and sends this list to each of them. In addition, each CAB delivers a complete list to the national power grid provider. Interestingly, even though the process does not necessitate intensive collaboration of the CAB with the grid providers, 53.9% of the CABs stated that they required a more structured process anyway. This is probably because the CABs do not receive any feedback from the power grid providers about next-level planning for MFK because of national information security concerns.

Due to the immense information processing and process management involved, CABs bear a double burden—as participants in the process and as regional co-ordinators. Hence, the CAB represents the central hub in the current multi-level *STYREL* planning process in Sweden.

## 5.2 Organisation and execution of *STYREL*

Each CAB is responsible for co-ordinating work related to crisis management in its own county in Sweden. Therefore, the CAB is also responsible for co-ordinating the execution of *STYREL*, in which the CAB plays the central role in the planning approach, but with little influence on the quality of the process outcome. The evaluation after the pilot and the first round of planning showed overall, the CABs perceive *STYREL* as an important planning process for identifying CI. The survey substantiates this perception, as 92% voted on *agree/strongly agree*. However, due to the limited influence of the CABs on the outcomes of the *STYREL* planning and the subsequent MFK planning, the CABs expressed some doubt about the usefulness of *STYREL*'s outcomes for crisis management. Further, they expressed considerable doubt about whether *STYREL* can provide the intended protection for society during a power shortage.

The interviews show that the three CABs organised their work according to the reference model. All three CABs emphasise the importance of working within existing networks. In particular, the CABs used already existing networks, used



in ordinary work with crisis management and emergency response. No new networks emerged in the three regions. Evaluation of the first run in 2010 indicates that the CABs acknowledged the *STYREL* process' contribution to improved cooperation within existing networks (EA 2012). However, the organisation of these networks differs between the three counties, and the counties' size seems to be the main reason for the differences. The two smaller counties worked more closely together, e.g. meetings included representatives from all municipalities. The larger county also used existing networks meetings. In this case, the county divided into four or five different groups; northeast, north-west, southeast, south-west, and the large city. This division ensured a smoother planning process in the region, but it also made it difficult for the municipalities to have an understanding of the region as a whole. Instead, individual municipalities had only experienced the discussion in their part of the region, which could lead to differences in principles and priorities among the four parts. According to the evaluation of the first run in 2010, the major challenge was to find a common view on the prioritisations among municipalities in a region. Thereby, how to deal with the dependence chains and to which extent an analysis of these chains is appropriate seem unclear (EA 2012). In *the rural north county and the county close to Stockholm*, all municipalities participated in the discussions on principles and priorities. In the latter one, the municipalities made notes in the planning document, which made it easier for the CAB to identify the objects along the line. This could also have impact on the result: *'For the result then ... because we have a bundle of power lines, without knowing what is on them, it is extremely difficult. Because you could, in theory, cut off the hospital using a few ICA stores, or some water pumps'*. The notes made it possible for the CAB to identify such effects.

This study evinces that the CAB in general has followed the planning model as stated in the handbook for *STYREL*. However, there were some deviations from the model due to lack of time. Since some actors did not follow the predetermined schedule, the CABs ran out of time for their part of the process. Although the other actors in the process caused this delay, the three CABs perceive the initial plan as too optimistic. The co-ordinators argued that there was a risk that such a compressed schedule, which speeds up the work of municipalities and CABs, led to a widespread copy-and-paste behaviour in the municipalities: *'It may be necessary to give more time because it became very stressful when it became so delayed in the first line from government agencies'*.

Evaluation of the *STYREL* planning process in 2010 revealed that there were only a few, if any, contacts between CABs and private actors, except for contacts with the power grid providers (EA

2012). Due to time constraints, the interviews with the three CABs indicated that no other private actors or actors representing civil society have been involved in the current *STYREL* planning.

Between the two rounds of planning, the CABs' role in the process changed. In the first one, the CAB participated more actively in assessing and balancing the priorities of the CI objects at the county level, whereas in the second planning, the CAB only compiled the results from the municipalities. One of the counties did not fully apply this change; instead, the municipalities, the region and the CAB made the final ranking list together. The participating municipalities were, according to the co-ordinator, unanimous about this departure from the official planning process: *'Yes, in what other way would we do? It's just like a damn long list'*.

### 5.3 Integration and governance

*STYREL* is an integrated part of the Swedish crisis management system. As stated, the three principles of the system are *responsibility, parity, and proximity*. The CAB is responsible for co-ordinating work with the system at the regional level. Critique from CABs against the *STYREL* process mainly includes problems with the process itself and the lack of feedback during the process in the multi-level system.

In the interviews, the co-ordinators at the CABs all agreed that it is important to identify CI objects, i.e. societally important objects, in advance in order to ensure that there is as much power supply as possible to these CI objects in the event of a power shortage. Therefore, there are certain elements of *STYREL* that are important for the functioning of society. However, all three CAB co-ordinators interviewed are critical about the design of the reference process model and process execution in the two rounds. They are also critical about, the limits of the usefulness of the planning process. Today, the process stands to some extent for itself; therefore, the co-ordinators regret the absence of a holistic, integrated view on *STYREL*. One co-ordinator envisioned that integration and transition of the planning process of *STYREL* would be an important pay-off to the Swedish crisis management system at subsequent planning levels, such as preparedness and contingency planning.

In two of the counties, the co-ordinator at the CAB described the process as smooth without any major conflicts between the included parties. The problem was primarily that the CAB, according to changes in the process in the second round of planning, could not access information about the objects themselves, but only the lines. All three co-ordinators at the CAB emphasised on the problems of this change. Since the co-ordinators did not get information about individual objects along high-

priority lines, there is a risk that important objects is down prioritised due to the process design. In all three cases, the co-ordinators preferred to have more information about the objects in order to ensure the quality of the process outcome.

There were solutions to deal with the problems. In one case, the CAB and the municipalities first discussed how to grade a certain objects. Then the municipalities made notes in the planning document indicating which objects are located along the line. In another case, the CAB, the municipalities, and the region made the final ranking together. In the third case, they only used initial discussions, but there were no discussions on individual objects. In theory, this could imply a down prioritization of the line for the major hospital in favour for other lines. Finally, before submitting the final ranking list, the CAB ensured that they were along one of the highest prioritised lines.

## 6 DISCUSSION AND CONCLUDING REMARKS

### 6.1 *Policy and identity*

From this study, it appears that *STYREL* is part of a reliable energy supply plan, even in the event of power shortages. However, the findings also indicate that the execution of *STYREL* does not follow on the process created by the EA. The risk of 'copy-and-paste' behaviour can particularly affect the prerequisites for reliable power supply during a power shortage. In accordance with the concept of resilience, this study on the co-ordinating function of the CAB highlights that there is a risk that society cannot maintain important social functions. The implementation of the process does not provide any guarantee for a resilient power supply. Further, any form of systematic co-operation between the system components, such as private and public actors, seems to be absent in the current *STYREL* process. Systematic co-operation, if any that occurs at the municipal level remains to study.

The importance of private-public co-operation in networks for enabling actors (i.e. the municipalities, regions, CABs and power grid providers) to identify and prioritise CI objects is further emphasised by the evaluation of the three pilot studies in 2009. The results from our current study reveal that none of the three CAB formed new networks for the process.

The findings signify the underrepresentation of private actors and actors representing civil society in the planning process and its reference model, developed by the EA. However, the deliberately vague definition of the reference model allows municipalities and CABs to include private actors to obtain as much information as possible for the

ranking of CI objects. Thus, the system permits components to adapt to local regional commitment to improve the process. This means that the regional outcomes of a process instantiation can vary distinctly, which questions the national character of the planning. Particularly, since *STYREL* prescribes neither an over-regional nor a national alignment of CI and the power lines, it remains uncertain how local and regional proceedings during the planning affect CI objects of over-regional and national importance.

Although the policy is accepting alternative proceedings, the CABs used already existing networks, which only include public actors, mainly at the municipal level making the proceeding more effective. However, such an approach carries the risk that important information from private actors, such as private care providers, is lost ignoring proper risk communication to society.

### 6.2 *Information and communications*

This study implies that it is important that specific public actors, such as persons responsible for crisis management, have authorised access to crucial information on power lines that ensure power supply to CI objects, such as different care providers. It seems that there is no guarantee that the actors update available information, due to the earlier mentioned 'copy-and-paste' behaviour. Moreover, due the limited information content in the received lists, the CAB cannot control the correctness and completeness of the CI objects; instead, it has to rely on the performance and commitment of other actors.

*STYREL* can contribute to the maintenance of CI during power shortages, but there is no proof of its success in this role due to the absence of any assessable success factors. This presupposes that actors at the municipal level execute the planning in accordance with the national strategic objectives. However, the interviews in this study reveal that in some cases, individual interpretations of these objectives resulted in an adapted, time-saving behaviour, i.e. 'copy-and-paste' of local results from the first planning round. Since there is no way of ensuring that the available data on CI objects from the previous planning also applies four years later, there emerges a risk that the results of *STYREL* do not properly reflect the intentions and priorities of municipalities and agencies.

In addition, the absence of specific feedback from power grid providers on the planned proceedings during a power shortage hampers further reliable integration of *STYREL* in regional crisis management. These preconditions illustrate that the regional co-ordinator cannot rely on the results of *STYREL* planning for CIP in subsequent planning processes, such as preparedness and continuity planning.

## 7 CONCLUSIONS

*STYREL* as planning process does not necessarily contribute to the creation of a reliable energy supply as stated by the governmental guidelines of the EA. *STYREL* can contribute to the maintenance of CI and societally vital services, but it is difficult to gauge this in the absence of assessable success factors.

It appears that there are no integration of the *STYREL* process into the Swedish crisis management system. Such integration may further improve the effectiveness and efficiency of this complex multi-level planning system. In particular, such integration could facilitate the further development of co-ordinated information paths and directed communication. In turn, such development can assist with ensuring adequate national and international information security with regard to sensitive information about CI. Therefore, it is necessary for authorised persons to designate and monitor the necessary information with confidentiality, integrity and availability to fulfil strategic and operative objectives in the context of national CIP.

The present analysis shows that the results of the *STYREL* process, implemented in a Swedish multi-level planning system, rely on the commitment of the CABs as the co-ordinator for achieving a common understanding of the criticality of infrastructure and for mediating regional collaboration. The level of trust between the different levels of the planning system seems likely to further influence the resulting emergency response plan. Moreover, the planner's perceptions regarding the significance of the planning task, the likelihood of a power shortage situation and the crisis management capability of a county can have an impact on the effectiveness of the complex multi-level planning system in a crisis.

This paper also indicates that there is a lack of awareness at the regional level about the function of core players in the Swedish *STYREL* approach. In addition, the regional hub lacks the knowledge and resources to fulfil adequately its dedicated function in the national planning process for protecting CI objects from the consequences of a power outage.

With insights from the Swedish case, this paper highlights the regional core of *STYREL* and contributes thereby to international discussions on the identification, prioritisation and protection of CI objects.

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