

PUBLIC PARTICIPATION, HUMAN SECURITY AND PUBLIC SAFETY AROUND DAMS IN SWEDEN: A CASE STUDY OF THE REGULATED UME AND LULE RIVERS

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ABSTRACT

This paper presents findings from an empirical study of the current situation with geographical focus on two rivers in the north of Sweden, encompassing parts of the indigenous territory Sápmi. The major focus in Sweden with regards to “dam safety” is on the prevention of dam failure, and emergency preparedness. The issue of “public safety around dams” is left aside to the detriment of “human security”. While a major dam failure may cause the death of hundreds up to thousands of people, the current rate of human deaths caused by dam failure in the last 40 years is one person. The number of fatalities that may be referred to as having been caused by a lack of “public safety around dams” on the Lule River only amounts to 1-2 individuals per year. The risks and dangers involved also cause stress, anxiety, and difficulties on an everyday basis for residents along the regulated rivers and water courses. From a study of literature, available statistics, interviews and newspaper reports we discuss the accidents and incidents over the last decade (2002-12), how these may be defined as “public safety around dams”, the void of work to prevent such accidents and how the surrounding societal contexts play in, such as the lack of availability to fast and efficient emergency rescue services to be able to save lives in the event of a major disaster.

Finally, we discuss the current void of public participation and make recommendations to enhance public participation and thereby possibilities to an enhanced public safety around dams in Sweden. The research was funded by the Swedish research councils VR and FORMAS.

Keywords: Public Safety Around Dams, Dam Safety Sweden, Sápmi, Human Security

1. PUBLIC PARTICIPATION, HUMAN SECURITY AND PUBLIC SAFETY

1.1. Summary of Findings

This paper presents part of the findings of an empirical study of the current situation with regards to Public Safety around dams in Sweden. The geographical focus is on the Ume and Lule Rivers, in the northern part of Sweden.

The empirical study is mainly qualitative, and thus primarily made up of interviews, participatory observations and literature studies. The studies have been carried out as part of three different research

projects, stretching from June 2008 until December 2015. Due to limited funding, combined with a void of statistics, we have not been able to execute the study to the extent that we would have wished for. However our findings indicate that we have barely scraped the surface of the subject matter and that the problems we have discovered need far more attention. As far as we have seen there has been no other research project addressing these issues, nor any state initiatives. In addition we find that the limited understanding of “public safety around dams” where the majority of actors involved (the police, local authorities, rescue services, regional authorities, power companies and/or dam owners) do not address the issue in any coordinated way, meaning that much of the time has had to be spent on trying to find out if any work whatsoever is being done in this sector and to identify the current void of data. Starting this study, we believed that there would be statistics available.

We have come to the conclusion that in Sweden, as far as it concerns funds and time invested by authorities and dam owners, the issue of “Public Safety around dams and reservoirs” is currently more or less a non-issue. As an example, the latest state inquiry (SOU 2012) does not discuss public safety around dams at all. The same goes for several earlier studies (cf Idenfors et al 2012). For instance drowning accidents which take place on hydropower reservoirs are not necessarily categorized as dam safety – public safety around dam issues. Moreover, a number of other accidents and incidents caused by the regulation of the rivers, excluding drowning accidents, are not considered as part of the dam safety discourse at all (cf Idenfors et al. 2012). The reports on “Risk and vulnerability” of the Norrbotten and Västerbotten counties from 2008 until 2015, there are discussions on dam safety only in regard to the issue of a major dam failure and ensuing disaster, but nothing is mentioned in regard to public safety around dams, deaths and accidents (Länstyrelsen Västerbotten 2011,2012,2013,2014,2015; Länsstyrelsen Norrbotten 2008, 2009, 2010, 2011, 2012, 2013, 2014). The Västerbotten county Risk and vulnerability report for 2015 however states that in 2015, there was an large number of drowning accidents, although without mentioning the actual number or where those happened (Länsstyrelsen Västerbotten 2016,25).

We find that despite a reasonably strong legislation (SFS 2003:778) that holds the dam owner responsible for the safety of the public, as well as holding the local authorities responsible for making sure that the dam owners fulfill their responsibilities, public safety around dams is to a large extent neglected. We argue that this is an important problem that needs to be resolved, in particular as the number of deaths on regulated rivers is relatively high and because of this, the worry, anxiety and distress that the public is subject to due to the dangers on and around the regulated rivers is equally high. We argue that the concept of “human security” (UNDP 1994; Hoogensen/ Stuvøy 2006) should be used to analyse and resolve the situation.

The problems are located on several levels, ranging from the aforementioned responsibilities of the dam owners and local/regional authorities to the much-needed support to the public for them to be able to avoid the dangers. We have identified a void of statistics as grounds for analyzing accidents and incidents; lack of information on and support for legal instruments to enter court processes to determine legal liabilities related to actual accidents and incidents; a lack of information to the public to avoid getting hurt, as well as a lack of fast access to rescue services in addition to a lack of local action plans to reduce the number of incidents and accidents.

Finally, in regard to being able to advance the situation, we have identified a void of public participation. So far little to no work has been carried out by state, regional or local authorities or dam owners in order to involve the public in addressing the issues around Public Safety around dams (cf Idenfors et al 2012, Palo 2013). We argue that involving the public is an important task as people reside, live, work and have their leisure time along the regulated rivers. In short, the people were there before the regulation took place, and the rivers became industrialised (cf Jakobsson 1996; Öhman 2007, 2016; Össbo 2014) i.e. regulated, and thus dangerous industrial areas and this ought to be addressed with regards to the issue of “Public Safety around dams”.

2. REGULATED RIVERS AND THE PUBLIC IN SWEDEN

2.1. Hydropower Regulation, Production and the Location of Dams in Sweden

There are roughly 10 000 dams in Sweden. Of these, approximately 2000 are so-called hydropower plants and dams. Out of these 190 dams are so called large dams, according to the international definition, with dam walls measuring at least 15 meters from foundation to crest. Hydropower stands for approximately 50% of the entire power production within Sweden. The majority of the hydropower dams were constructed between the 1950's and the 1970's (cf SOU 2012:46; RiR 2007:9).

The majority of the large dams and regulated water courses are located in the northern part of Sweden, known as "Norrland" and also "Sápmi" – the traditional core area of the Indigenous Sámi within the Swedish borders, which is also reindeer grazing, calving and migration lands. Sweden has in total about 9,5 million inhabitants. This area has about 1,1 million residents (SCB Befolkning 2014). There are a great number of tourists coming to these areas throughout the whole year. For instance Norrbotten, the northernmost county, topped the statistics with of a quarter of a million foreign guest nights during July 2013 (SCB Gästnätter 2014). How these tourists interact or indeed do not interact with regulated rivers is difficult to estimate as there is currently no such specific statistics available.

Next to all these regulated rivers – and thus regulation reservoirs or just downstream of hydropower plants, as well as dry beds due to regulation – there are homes, industries and infrastructure. Many people reside, work, or visit as tourists during all seasons of the year. Reindeer herders have to cross the regulated rivers to take care of their reindeer. Other locals do leisure or professional fishing, sports, bathe, sun bathe, drive snow mobiles during the winter or go out by boat in summer. We have not been able to estimate the number of people who are on the regulated reservoirs at each given moment, as there is no such statistics available. However, the number is likely to be high, as the regulated rivers were and are as important for transports and all other activities as they were before regulation took place.

2.2 Human Security

The concept of human security was popularized through the United Nations Development Programme's 1994 Human Development Report (UNDP, 1994). Traditional security policies are designed to promote demands ascribed to the state, and other interests are most often considered subordinated to those. We therefore depart from the human security concept which focuses on people and the protection of individuals. The original meanings of security : "security—from the Latin *securitas*—refers to tranquility and freedom from care, or what Cicero termed the absence of anxiety upon which the fulfilled life depends" (Liotta and Owen 2006). Security is relevant to feelings of safety and stability, routines, or rather, security of expectations, whereby we can count on certain things for our future, that which we most value, upon which we can build capacity (Hoogensen/ Stuvøy 2006; Wibben 2010).

2.2. The Lule River – Julevädno – and the Ume River – Ubmeje-iednuo

The geographical focus of the empirical study is on the Ume and Lule Rivers, in the two northernmost counties, Västerbotten and Norrbotten.

The Lule river – "Julevädno" in Lule Sámi – measures 461 kilometers from its mountain regulated source lakes to the coast and is dammed with 15 hydropower plants. The Lule River produces around 10 per cent of the totality of electricity produced within Sweden – or 13-16 TWh per year. In 2012, 16, 4 Twh was produced, which corresponds to ten per cent of the totality of power production and 21 per cent of the hydropower produced (78,0 TWh) within the Swedish borders (Svensk energi 2013). All dams and power plants on the Lule River are owned and run by the Swedish state owned power company Vattenfall. Regulations started in 1910, and peaked during the 1950's-1970's.

There are around 100 000 inhabitants residing in the municipalities located along the Lule river from the mountains to the coast. The majority of these (around 75 000 inhabitants) do not reside permanently near the reservoirs, but downstream of the last of the 15 dams/hydropower plants (Boden) in the

municipality of Luleå. However, many of the inhabitants of Luleå travel up towards the mountain areas for both work and leisure. Furthermore, this is a river with the majority of reindeer herding enterprises in Sweden. Along the Lule river there are 224 registered reindeer herding companies, and a maximum of 40 800 reindeer in the winter herd (Sametinget 2014).

The Ume river – Ubmeje-iednuo in Ume Sámi – measures 470 kilometers from its mountain regulated source lakes to the delta at the coast and is dammed with 21 dams/hydropower plants. During 2012 the Ume river produced 9,4 TWh, or 8,3 per cent of the totality of hydropower production and five per cent of the totality of power production, 162,0 TWh in Sweden (Idenfors et al. 2012; Svensk Energi 2013). In the whole of the Ume river valley there are approximately 150 000 inhabitants within six municipalities (SCB 2010). Furthermore there are 53 reindeer herding companies, within three Sámi reindeer herding communities known as a “sameby” in Swedish, and a maximum of 24 300 reindeer in the winter herd (Sametinget 2014).

The dams/hydropower plants along the Ume River are owned by four different companies; the Swedish state owned Vattenfall, the Norwegian state owned Statkraft, the private owned companies Eon, Skellefteå kraft, Holmen energy, Umeå kommun and Vattenregleringsföretagen. Vattenregleringsföretagen is a company jointly owned by the different power producers in the rivers (Länsstyrelsen Västerbotten, 2011; Widén et al, 2016).

3. TYPE OF ACCIDENTS AND INCIDENTS – LACK OF STATISTICS

3.1. Identifying a Void of Official Statistics on Accidents Related to Public Safety

Within our empirical study a lot of effort has been devoted to finding out if there are official statistics available to easily identify accidents and incidents, which can be considered as being related to the concept of “public safety around dams”. The result of the investigation shows that there is currently no such data available and there is currently no ongoing effort to collect such data. The power companies do not keep such records, nor do the local rescue services (Idenfors et al 2012; Palo 2013; Öhman 2008-2015).

There is a national database available on drowning accidents – fatalities. But within this database, a lake is equated to a regulated reservoir (MSB 2014). Thus one has to identify the accident by geographical location and then find out if the location is on a reservoir or on an unregulated river/water course. Furthermore, to be able to establish whether it was an accident caused by the regulation – for instance more release of water causing the ice to crack up faster in combination with increasing temperature (Öberg 2009) – there is much more information needed than what is currently available.

For other information regarding the circumstances to be able to identify to what extent the power company could have prevented the accident, information is needed from the local rescue services or the police. When asking for such information from the different local rescue services, it turned out that at some cases we could get good help while in other cases we did not receive answers within the time limit of the empirical studies when interviews were made by phone and email by Idenfors (2013), for Ume river, and Palo (2013) for Lule river. Both these empirical studies were limited to two months full time each.

To the question if it possible to receive statistics regarding accidents on or nearby a reservoir the answers were from local rescue services by the Lule River:

Jokkmokk municipality: ”I can not provide you with such statistics, it might be better if you contact Vattenfall regarding this issue” (Ström 2013).

Boden municipality rescue services responded: ”Our system unfortunately has deficiencies in its search functions. Therefore it takes very much working time to go through the data base which I do not have the time for at this point”(Lindvall, 2013).

The Gällivare municipality rescue manager stated that he had no information whether there are any specific statistic available on accidents near the dams. He also stated that he had no information regarding what statistical system that is used in Gällivare for such reporting (Sonesson 2013).

We also contacted the police authorities of Norrbotten County, to get more information on the accidents on the Lule River. We were provided with a number of accident reports from 2004 until 2012. However, the details in these reports were not exact enough to be able to define whether the regulation was the cause of the accident or not (Palo 2013).

As many accidents in winter are related to snow mobile transportations – for work or leisure – we contacted the Non-Governmental organization (NGO) SNOFED, the Swedish Snowmobiles owner national association, where one part of the tasks is work with information to avoid accidents. The response regarding statistics on accidents on regulated water courses was: “the exact geographical position is not information that we receive, or we have difficulties to verify. [...]When and if we get exact position data we cannot enter this into our data base other than as place or lake names. We invest the time we have possibility to in this registration, and more deeper analysis would request more staff resources than what we have today. Also we do not have the possibility to access details today. It is only a small part of our and my work time that is dedicated to this task” (Persson 2013)

For the Ume River, the situation is equal to that of the Lule River. Information on accidents and incidents are difficult to access and there is no specific data base available for “public safety around dams” accidents and incidents at any official level. Nor are there any records kept by power companies/dam owners (Idenfors 2013; Palo 2013).

3.2. Types of Accidents and Incidents

Within the research project, despite not being able to receive official relevant statistics, the interviews and requests for information have provided a certain, although not full, understanding of the situation. We have interviewed both rescue services and also people living and working along the rivers.

According to the local rescue services the number of fatalities that may be referred to as “public safety around dams” on the Lule River only amount to 1-2 individuals per year. (Lundström 2010; Nilsson 2013). On the Ume River and regulated river courses adjacent to the Ume River the number of drowning or incidents – with injuries or no injuries - amounted to ten during the period of 2002 to 2013 (Backman 2013; Asp 2013).

In an overview report regarding drowning accidents over the last ten years, 2006-2015, the Swedish Life Saving Society (Svenska Livräddningssällskapet) an NGO with focus on safety and security in regard to water, states that the northernmost counties have the highest incident of deaths by drowning, in relation to the number of inhabitants. The tentative explanation provided is that “the cold water in the north is a major factor” (Svenska Livräddningssällskapet 2015). However, nothing is stated regarding to the regulation – industrialization - of the rivers.

Secondly, there are other types of accidents that fall out of the category of drowning. For instance, the danger in winter time is to fall into holes in the ice. One may not drown, but if one does not get help within a short period of time, one is likely to die as a result of hypothermia within a very short time, depending on the location and actual air temperature at the time of the accident. This is in particular a problem for reindeer herders who work a lot on their own and thus can be subject to accidents without anyone noticing.

One of our informants speaks of such an accident, by a regulated water course adjacent to the Lule River. The accident occurred around 2005-2006:

“A man froze to death here. They went into the water with their snow mobiles. I don’t know how wet he got, but he never made it to the cabin. His friend made it to the cabin and survived.” (Pittsa, 2011).

The informant continues stating regarding the ice situation in the area that "The ice is very bad here. All of this stretch is made up of really bad ice, the whole of this stretch is river course. [...] it might be considered a 'snow mobile accident' but I am not so sure the accident would have happened if it was not regulated. The stream would not be the way it is [without the regulation] (Pittsa, 2011).

Participatory observations – field studies and interviews provides a number of other types of accidents, incidents and also risks that can be categorized as "public safety around dams". Below are some, but not all, examples of the mentioned accidents, incidents and risks identified through interviews and participatory observations –field studies:

- Cracks in the ice that can cause snow mobile accidents, broken limbs for both humans and animals, and also become traps for children and animals

One woman having a residence by the Suorva reservoir – Lule River – tells how she managed to save her two year old daughter from slipping into such a crack at the last second (Harnesk 2009). Öhman herself when walking on the ice-track on the Suorva reservoir happened to step into a crack covered with snow and fell (Öhman 2008-2015). Accidents of this type were also reported by the security coordinator of Storuman Municipality – Ume River (Sundqvist 2013).

- The regulated reservoirs become large inland seas, in the mountain areas. As people need to travel on these lakes, to and from their residences, they need big boats which become difficult to handle at the eroded shores, especially when one is alone and especially for older people. (Öhman 2008, 2009, 2010).

- In the mountain areas, storms can appear very suddenly, and as the shores are heavily eroded at the Suorva reservoir, it can become impossible to land a boat and get into safety (Harnesk 2009; Palo 2013).

- Erosion caused by the regulation causes holes in the bottom. An older woman told how she stepped into such a hole when getting out of her boat, thereby getting injured (Nordqvist 2009).

- The four regulations of the Suorva reservoir have forced people to move up on the hillsides at Änonjalme and Vaisaluokta. Combined with the regulation, the amplitude makes it difficult to access the houses from the boats, or snowmobiles in winter when the snow is not good enough to get close to the houses. It is especially difficult for older people and people with disabilities and when carrying baggage. Also for tourists there are reports of problems when the lifts do not function properly. (Öhman 2008-2015, 2009; Palo 2013).



Figure 1: The hole in the ice created by water release from the Ritsem power station, Suorva reservoir, Lule River. Two men, Sámi reindeer herders, died as they went through the ice near this hole in May 2008, and the rescue operation was not fast enough. Photo: May-Britt Öhman

4. ACTORS, RESPONSIBILITIES AND VOID OF PUBLIC PARTICIPATION

4.1 Strong Legislation but Weak Enforcement of Laws

The dam owners along the Ume and Lule Rivers work with certain preventive measures, although to a rather small extent. For instance, the state power company Vattenfall provides for the maintenance of ice roads at two locations on the Lule River, at Ritsem – Anonjalme, and at Saltoluokta (Palo 2013). However Vattenfall leaves most of the responsibility with the individuals, who are more or less considered to be out on the ice or the waters of the reservoirs at their own risk (Palo 2013, Öhman 2008-2015). In addition to this, the ice roads are closed by the end of April – beginning of May each year, which is the time when the reindeer herders come with the reindeer, and the local Sámi residents starts coming into the area for the summer residence (Öhman 2008-2015).

The work with “public safety around dams” is not defined at all in most of the municipalities that we have contacted. Overall, it seems to be a concept that is not discussed or analysed at all. However, during the interviews that were made by telephone many of the informants started thinking about the concept, and agreed that it is an important issue that is far too neglected. A response was that there is certainly room for more work in this regard (Idenfors 2013; Palo 2013). With regards to the existing legislation, the informants at the rescue services of the municipalities claim that the legislation regarding public safety is potentially very strong. However, several of them stated that the legislation is not enforced to the extent which it potentially could be and that there seems to be a void of actually prosecuting dam owners when accidents and incidents regarding public safety around dams occur (Idenfors 2013; Palo 2013).

Moreover, the responsibilities of the municipalities to work with prevention against such accidents is according to the interviews not something that is spent time or efforts on by the municipalities along the Ume River (Tapani 2013; Wiklund 2013; Jonsson 2013) and to a very little extent along the Lule River (Nilsson 2013).

According to the “law on protection against accidents” (2003:778) the responsibilities are quite clear. According to this law the dam owners are responsible to both warn and either keep or finance emergency preparedness including staff, property as well as other measures to hinder or limit damages and accidents. Furthermore, the dam owner is responsible to analyze all serious risks for accidents that may be a threat to a person’s life or health (SFS 2003:778 §2:4). Apart from the dam owner, the local authorities – the municipality – is also responsible to work with accident prevention, as well as through advice, information and by other means ensure that dam owners comply with their responsibilities according to the law LSO (2003:778 §3:2). The municipality is furthermore required to have an action plan of preventive actions, within which the organization of such activities should be defined. This action plan is to be renewed for each electoral period, that is every four years (2003:778 §3:3). According to this law, the State has certain responsibilities as well. In the mountain areas the state should delegate to specific rescue services to assist and rescue those that have had an accident (or a disease) and who needs a rapid medical care or other assistance (2003:778 §4:1).

4.2 Lack of Available Rescue Services as Cause of Unnecessary Fatalities

Despite the fact that the legislation is very far reaching with regards to what has to be done to prevent accidents and it actually places a large responsibility on the dam owner, as well as on the local and state authorities, our study indicates that this legislation is currently far from enforced. For instance, one problem is the time for rescue services to be able to assist. Interviews with the rescue service in Jokkmokk, where the number of fatal accidents – drowning – on the regulated rivers amounts to 1-2 annually, indicates that although the rescue services can be ready to assist anyone in danger within five minutes – the distances are long and there is a need of helicopters. The local rescue services however, does not have access to any rescue helicopter, which is the responsibility of the mountain rescue service (Lundström 2010).

For instance, despite the legislation, the State power company Vattenfall does not finance any helicopters stationed by the Suorva reservoir to support rescue operations. There are no other available resources by the reservoir that can be operated by people who are witnessing an accident. One accident on

the Suorva reservoir in 2008 where two men went down a hole in the ice on the snow mobile had several witnesses, not far away from the accident location. (See Fig 1), but due to the condition of the ice, no one could reach them in time to save their lives. The ambulance helicopter, stationed by the closest helicopter in Gällivare, which arrived on site after 32 minutes, was not equipped for life saving operations. The helicopter staff could not even take care of the bodies of the men themselves, but had to be assisted by people on site, who witnessed the accident and are friends of the deceased (Pittsa 2011). This may be compared to another occasion, in the village Porjus further down stream on the Lule river, in 2009 when three men went down into a hole in the ice. Thanks to the private helicopter station in Porjus, where there were people available, two of the men could be rescued (Pittsa 2011). Thus the access to fast rescue may obviously be the difference between death and survival in these situations.

So far in our study, we have not been able to follow up if there has been any legal consequences for the dam owners or the local authorities/rescue services in any of the fatal accidents. However, as we have made several interviews and conversations, it seems that no one has heard of such legal consequences, and also followed report in media.



Figure 2. Reindeer herder on snow mobile on the ice of a regulated river, Lule River, herding the migrating reindeer. Photo: Fia Kaddik

4.3 Void of Public Participation in the Understanding of Public Safety around Dams

The interviews made within the study indicate that first of all there is a lack of discussion on what “public safety around dams” should be defined as, and secondly that there is currently little or no work to change this situation. The majority of the informants responded that issues of dam safety – in particular the issue of “emergency preparedness” is discussed to a large extent within a specific setting named “River groups” (Älvgrupper) involving different local and regional authorities as well as the dam owners (Idenfors

et al 2012). One informant stated that sometimes issues of what can be defined as “public safety around dams” is discussed, but to a very limited extent (Tapani 2013).

These River Groups seems to be a potential way for highlighting the issues of public safety around dams, although so far they do not involve professional groups such as reindeer herders or professional fishermen/women (Tapani 2013).

Within our empirical study we have found that there is a wide knowledge and understanding among communities as well as individuals that could be utilised in order to enhance the safety for the public around the existing dams, but that this knowledge and understanding is not considered to be of importance today. An interview with reindeer herders along the Lule River shows a number of risks that they confront when migrating with the reindeer. Some of these could rather easily be avoided if they were dealt with and taken seriously and if the hydropower company would be willing to pay the actual costs. One example is that the reindeer herders have to decide whether to travel over the regulated reservoir to reach their reindeer when the ice is risky, in particular in the month of May, and that due to the economic cost of going by helicopter or taking an extra route – up to 120 kilometers long – they may take the risk of crossing (Utsi 2013). The reindeer herding is already charged with a lot of extra costs, due to the regulation of rivers, and it is economically difficult to spend more. Thus, if the hydropower company would have to reimburse for these extra costs, reindeer herders could move around more safely.

Another explanation may be that the issue of public safety around dams has not been invested in, and thus the need for understanding the problems, risks, and worries of the public, has not been dealt with. Some of the explanation may reside within that the hydropower exploitation era, the overwhelming focus was on power production, and that all other uses of the river and water courses were more or less completely neglected (Jakobsson 1996; Öhman 2007; Össbo 2013).

5. CONCLUSION AND RECOMMENDATIONS

Our study clearly indicates a major void in regard to Public Safety around dams in Sweden. The current situation is that despite far reaching legislation, which holds authorities and dam owners responsible for human security around the regulated rivers – the industrialized rivers – no authority nor dam owner is currently actually assuming this responsibility.

There are a great number of accidents, incidents and also perceived risks and threats with regards to the regulated rivers. The current lack of attention to the issue means a continued high number of accidents and deaths, as well as distress and anxiety for the local inhabitants along the rivers and visitors. An obvious recommendation based on the findings is that there should be major investments into further studies and actual work to enhance public safety around dams, and to engage with the concept of human security, involving the public from all parts of society, taking into account the different age groups, gender, ethnicities, language, disabilities, professional groups and the indigenous Sámi – where reindeer herders use of the rivers and water courses need to be addressed in particular - and other local inhabitants cultural and traditional relationships to the rivers. These rivers have due to the production of electricity become major risky industrialized areas where the public are left to deal with all risks on their own. When an accident occur, which not necessarily would have to be fatal, rescue is often far away, in combination with cold waters, which our study points at an increased risk of dying from freezing to death rather than drowning.

As the void of data available makes the task to investigate the number of accidents and deaths more than reasonable difficult, as stated by the informants, there is a need to invest into making data available for investigations into the causes of accidents and deaths caused by regulation – the industrialization – of the rivers.

Parallel with an increased investigation into the causes of accidents and deaths, we find that already with the information provided in this study, there are several measures that can be made to enhance the chance to survival when an accident occur. One such measure would be to increase rescue services

preparedness, access to helicopters amongst other, in the areas of regulated rivers. Finally, we see the strong focus from the authorities and dam owners on possible dam failure and ensuing disaster as the most important risk seem to steer away focus from other risks regarding dams, this situation needs to be further investigated. It should be possible for authorities and dam owners to engage into work regarding the risks for dam failure parallel to work public safety around dams, and the cause for this not having happened already needs to be analysed and measures taken to change the situation.

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