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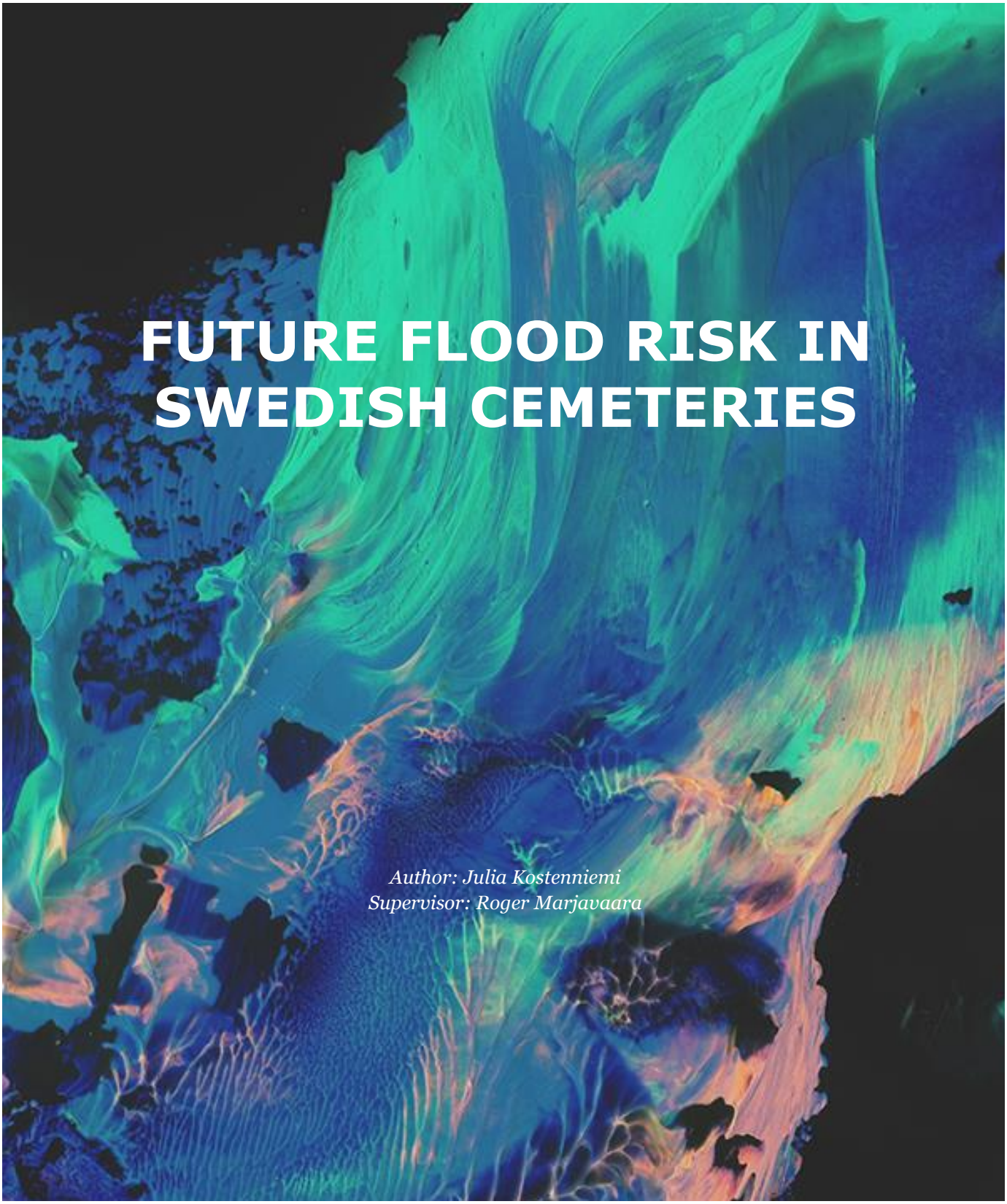

FUTURE FLOOD RISK IN SWEDISH CEMETERIES

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Abstract

Cemeteries have a lot of different values, both to people but also to society. Besides from being a burial place where survivors can go to be close to their deceased, they can also function as restorative places or cultural and historical places.
This study's aim is to investigate how future changes in the climate may potentially have impacts on cemeteries in Sweden in forms of flooding and to make a rough estimation of how many cemeteries that would be affected by this. This study will also investigate how many individuals that would be affected by this. In order to investigate this an overlay analysis was done in a Geographical Information System (GIS). The results showed that there are some cemeteries that would potentially have 10% or more of the total area flooded, given the scenarios in this study. It also shows that there could potentially be a lot of individuals that would be affected, in different ways.

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1. Introduction

Today we are soon halfway through year 2021 and we are more people on this planet than we have ever been before, around 7.8 billion people (Worldometers, 2021). In Sweden alone there are around 10 million people, and from the start of this millennium Sweden's population has increased with around 1.5 million inhabitants (Statistics Sweden, 2021a). This population increase is nothing that is expected to stop in a near future, it is expected to continue. According to population forecasts, made by Statistics Sweden, the population is expected to pass 11 million people in the year 2034 (Statistics Sweden, 2021b).

The population is not only increasing, the population distribution in Sweden is also uneven. This uneven distribution is mostly due to the urbanisation process that have been going on for decades (Statistics Sweden, 2015). The urbanisation process can be described as a change from a rural society to an urban society, where people tend to move from rural areas to urban which makes the urban areas grow (Rodrigue, 2020). In Sweden today this form of urbanisation is not an ongoing trend, instead we are talking about urbanisation rate, which is more complex. The urbanisation rate measures how big the share of the population that lives in urban areas (National Board of Housing, Building and Planning, 2019). The vast majority of the Swedish population today lives in an urban area, approximately 87% of the population, but two centuries ago it was the other way around. The population is still growing in urban areas, which is due to immigration and birth surplus (Eliasson Hovmöller, N.D).

An increasing population also mean a higher number of deceased individuals. Every year since the start of 2000, around 92 000 people have died in Sweden. And in year 2020 the greatest number of deaths happened, with around 98 000 deaths (Statistics Sweden, 2021c). The increase of death year 2020 can be linked to the ongoing pandemic (Hjalmarsson, 2021). But Sweden also has an ageing population, it is therefore expected that death will become more central in the future (Statistics Sweden, 2021c). Death is therefore not a marginal phenomenon, it affects us all in one way or another, and when it comes to life there is only one thing that we all know for certain, that we are all going to die, sooner or later. This makes death a central part in all our lives. Death manifests the end point of our life cycle and it is inevitable. A big part of the population has already experienced it, in forms of the death of a family member, friend or relative. So, death does not only affect the person who passed away, but also the survivors (Whitaker, 2004).

Today the most devastating natural disaster in the world is flooding. Every year floods cause tremendous damage to different societies, not just in the form of economical and property damage, it can also harm people and in severe cases, kill

them. Sweden has been, for the most part, unaffected by these major floods. And it is not common that people die from floods in Sweden. Most of the damages are material and economical (Swedish Meteorological and Hydrological Institute, 2017). However, flooding is expected to become a bigger problem in some parts of Sweden, due to climate changes (Swedish Meteorological and Hydrological Institute, 2021).

In many societies there is a common opinion that when a person passes away, they should rest in peace (Prendergast et al, 2006). This opinion can be traced to the legislation regarding burials in Sweden. It is not allowed to relocate buried remains, unless there are some special circumstances for the relocation (SFS, 1990:1144). But due to climate change and societal development this legislation and opinion is getting challenged. Examples of this are the cemeteries in Louisiana that are getting flooded (Schexnayder & Manhein, 2017), or the move of Kiruna where for instance the columbarium will be affected (LKAB, 2017).

2. Aim and research questions

The aim of this thesis is to investigate how future changes in the climate may have impacts on cemeteries in Sweden in forms of flooding and to make a rough estimation of how many cemeteries that may be affected by this. It will also investigate how big of an issue potential re-location may be due to this potential development.

I. How many cemeteries may be negatively affected by future flooding's due to climate change?
II. How many cemeteries may potentially have to be re-located?
III. How many deceased and survivors may potentially be affected by this?

3. Previous studies

3.1 An ageing population

As we can see an ageing population in different societies, there is no question that death and burial will become a more central part in our lives. Death affects a large part of different populations and according to Krull (2015) there is an average of five grieving survivors for one deceased individual in the United States (Krull, 2015). Basmajian and Coutts (2010) states that during the upcoming three decades, the mortality will increase in the U.S, which is due to an ageing population (Basmajian and Coutts (2010). A higher mortality rate is something that is expected in big parts of EU as well (Van Steen and Pellenbarg, 2006), nonetheless in Sweden. Since the generation of baby boomers are moving into an older age group (Statistics Sweden, 2021c). Death has always been inevitable and will always be inevitable. Despite that knowledge, planning for the dead is seldom included in comprehensive plans (Basmajian and Coutts, 2010). An example of this can also be seen in Sweden, where the three biggest cities in Sweden have an insufficient number of burial spaces. And this is, according to the association of "Sveriges kyrkogårdschefer", due to that cemeteries have been side-lined in the planning process (Tv4, 2021). Since the population in urban areas are still growing in Sweden (Eliasson Hovmöller, N.D), one can assume that other parts of the planning have been getting more focus to cover up other needs, like buildings and infrastructure.

3.2 Mobility and post mortal mobility

Since the world is more modern and globalized than ever before, people tend to be more mobile (Hall, 2005). People's migration patterns are related to their life cycle, it tends to be different depending on where in the cycle they are (Berger and Forsberg, 2013). It is most common for people between the ages 18 to 30 to move around, and when people turn 65 the moving rate usually drops. A survey has though shown that 20% of people aged 65 or older have made a residential move (Basmajian and Coutts, 2010). This trend can also be seen in Sweden. There have for example been an increase of pensioners moving abroad (Svenskar i världen, 2019). The moving patterns can also be related to a household's size. People who do not have kids tend to live in smaller and more central apartments, but when they are expecting kids, the family will be bigger and that requires a bigger home. They therefore tend to move to a bigger housing that is less central. But when the kids move out, they do not need as much space anymore, so they move to a smaller housing. There are also other happenings that lead to people moving, like divorces (Berger and Forsberg, 2013).

Previous studies have proven that people do not stop being mobile when they have passed away, even in Sweden. In 2010 7,5% of the deceased got buried in another

municipality and 22% in another parish (Marjavaara, 2012). When it comes to the post mortal mobility in Sweden, there are different factors that could be of importance and it is different from case to case. Marjavaara (2012) argues that there are two different types of post mortal mobilities. One that is a short-distance mobility, mainly to aligning municipalities, and one that is a long-distance mobility. The first one he says may happen due to lack of space in their own municipality. But the long-distance one may happen due to the deceased wanting to go to a, for them, valuable place. The deceased would most likely not want to be buried at a cemetery far away from where they were living unless the deceased had some attachment to the place. (Marjavaara, 2012). Åkesson (1997) talks about similar cases about the fact that not everyone wants to be buried at the place they were living at the time as they passed away. Sometimes people would like to be buried close to their second home, or at a small and idyllic cemetery that feels more personalised (Åkesson, 1997). Both Marjavaara (2012) and Åkesson (1997) talks about the fact that a place meaning for the deceased is of importance.

The importance of the burial place can also be of importance for the survivors. Like mentioned before, people are very mobile today, which can become problematic in some respects. Åkesson (1997) talks about how this mobility may be problematic, in combination with the legislation that we have in Sweden. She mentions a family who moved to a new city for only a couple of years, during these years the daughter of the family died and was buried. Later the parents were going to move away from the city and wanted to bring the buried remains with them, but this was not possible (Åkesson, 1997).

Post-mortal mobility in Sweden usually only happens once (Marjavaara, 2017). And the common opinion that deceased individuals should rest in peace and undisturbed can be seen in a study made by Marjavaara (2013). The participants got asked the question whether they think it should become legal to relocated buried deceased or stay the way it is now. Though the participants opinions were split, one could see that there were more people against it. 24,6% said yes, and 33,4% said no (Marjavaara, 2013).

3.3 The different functions of cemeteries

The most obvious function of cemeteries is to be a burial place for deceased individuals. In interviews made with cemetery users by Francis et al (2000) important functions of the cemeteries were brought up. Cemeteries serve as a function for survivors in different ways. It is for example an important place for survivors, since this is where they can go and remember their beloved ones or to communicate with them. It is also said to be important for the survivors to take care of the graves, since this is a way for them to keep an emotional involvement with their beloved deceased (Francis et al, 2000). The importance of having a place to go to and to care of can be empathised. Since it has become more common for deceased to choose a garden of remembrance as a burial place, their survivors

therefore do not have a grave to maintain. Survivors have expressed a wish of having a grave to maintain, but decided to fulfil the deceased wish instead (Åkesson, 1997).

But being a place where deceased get buried and survivors comes to visit is not the only function that cemeteries serve. Grönwall (2017) is talking about how cemeteries fill the function as a cultural and historical place. The Swedish cemeteries tell us about history and how culture and different views have changed (Grönwall, 2017). Many of our cemeteries are well-maintained and are very park-like environments (Nordh and Evensen, 2018). This started already back in the end of 1700s where they started to plan cemeteries with aesthetic reasons. They wanted to remove the view of cemeteries as something unhygienic, but trees and plants were also supposed to symbolize eternal life. The cemeteries were also divided into graves that you could buy and graves that were free, naturally the wealthy people would therefore be buried on one part of the cemetery and less fortunate people on the other side. During the 1800s it became more common to spend more money on the aesthetic of the graves. It was possible to use other types of materials than before, due to the progress of technology (Grönwall, 2017). In Sweden today it is common that deceased individuals get cremated, since more than 80% of all the deceased gets cremated. But it was not until the 1900s that cremation started to grow in Sweden. This change can be seen in our cemeteries, since gardens of remembrance where ashes either gets buried or scattered have become more common in the Swedish cemeteries (SKKF, 2020). Cemeteries are also protected under a law in Sweden, this law is called "Historic Environment Laws". This stresses the fact that cemeteries indeed have a cultural and historical value. They must be maintained so their cultural history does not change, and to make changes at a cemetery that was built before 1939 requires a permission from the County Administrative Board (Kulturmiljölagen SFS 1988:950).

We have now cleared that cemeteries in Sweden have got both cultural and historical value. But it can also serve as a restorative environment, where people go to reduce stress and mental exhaustion. In 2017 a qualitative explorative case study was made in a cemetery in Oslo, where they were looking to investigate cemeteries as a restorative environment. In this study they interviewed 59 people that visited the cemetery. They were looking for four restorative elements, which was "fascination, extent, being away, and compatibility". The results from the study showed that the cemetery can be used as a restorative environment. The interviewed visitors talked about the cemetery as a place where they for example can go to reflect on life and to find inner peace. Cemeteries were also found to be different from other green spaces, due to the park-like environment combined with culture, history and respect for the individuals who had passed away and their beloved ones. However, this study might not be relevant for every cemetery

or every culture (Nordh et al, 2017), but it tells us that some cemeteries can serve this purpose.

3.5 Cemeteries that have been affected before

In 2012 a cemetery called “Byske norra kyrkogård” in Byske, Västerbottens county, got flooded. The cemetery is located next to “Byskebäcken”, and due to high level of water flows in the stream parts of the cemetery got flooded. One concern with flooding like this is that the tombstones can fall and that it would cost money to repair the damages (Bergner, 2012).

Figure 1. Picture showing the flooded cemetery in 2012.

Source: Bergner, M 2012.

For the past 50 years, the state of Louisiana has lost around 88 square kilometres (34 square miles) of land every year. In a combination of sea water and storm surges many of their cemeteries have also been flooded. Some of the damages have led to that human remains have been exposed and vaults being broken (Schexnayder & Manhein, 2017).

In Kiruna municipality, Sweden, there is today an ongoing move of parts of Kiruna city. The move is due to one of the biggest underground iron ore mines that are located close to the city and it is moving even closer. The company is claiming more land and is not safe to live on that land, when the mining is going on under it (LKAB, 2016). Some of the parts that will be affected and therefore must move in the future is the church, memorial grove and the columbarium. This means that around 5 000 buried deceased will be affected, in one way or another (LKAB, 2017).

4. Study area

The study area for this thesis is the whole country of Sweden, which is in Northern Europe. The total area of Sweden is 528 447 km^2, whereas the total land area is 407 311 km^2 (Nationalencyklopedin, N.Da). Sweden's total population in 2020 was 10 379 295 inhabitants, and the population density was 25 inhabitants per km^2 (Nationalencyklopedin, N.Db). The country is also divided into different administrative districts, such as 290 municipalities and 21 counties (Nationalencyklopedin, N.Da).

The Church of Sweden is also divided into different geographical districts. There are 13 dioceses in Sweden, a total number of 1 329 different parishes. 971 of these parishes is a part of the 254 different pastorates that exist in Sweden, which is when different parishes collaborate. Each parish and pastorate also belong to one of the 13 dioceses (Church of Sweden, 2020a).

4.1 The history of Church of Sweden

The Church of Sweden has played an important role for Sweden. For many years the Church of Sweden was a part of the Swedish state, and it was the only church allowed back in the 1600s. They were responsible for important societal issues like education and healthcare, but it was also a meeting place for people with religious beliefs. But during the mid-1800s things started to change. The Church of Sweden was no longer responsible for the societal issues as they were before, and it was now allowed to leave the Church of Sweden for another Christian community. And in 1951 a new law came that guaranteed religious freedom for the Swedish population. Later in 2000 the state and the Church of Sweden separated, due to the changes in Swedish society being more multicultural and multireligious than before (Swedish Tax Agency, 2021). But the Church of Sweden kept being responsible for funeral activities after the separation (Church of Sweden, 2020b).

4.1.2 The Burial Act

"The Burial Act" is the law that regulates funeral activities in Sweden, such as cremation, funerals and who are responsible for these (SFS, 1990:1144). Parts of the law will be mentioned below.

The ones who are responsible for these activities are called the burial authority (begravningshuvudmän). The burial authorities in Sweden are mostly parishes within the Church of Sweden, but in Stockholm and Tranås it is the municipality itself that is the burial authority (SFS, 1990:1144). The reason for this is because these two municipalities have been the burial authority since 1800, and when the church and state separated, this was decided to continue (Church of Sweden, 2020b). The burial authorities are responsible for a certain geographical district. They must provide enough graves for the people living in their geographical

district, which means that they must also provide graves for people with different religious beliefs. This is because everyone in Sweden has the right to be buried within the geographical area that they are registered, and it is financed through tax money (SFS, 1990:1144).

Even if you are granted a burial place at a cemetery within your parish, it does not necessarily mean that you cannot get buried within another parish, but it is not guaranteed (Church of Sweden, 2020c). But human remains must be buried at a cemetery, public or private, unless they have been given permission from the Swedish government to do otherwise (SFS, 1990:1144).

One part of the law that is central for this study, and has been mentioned before, is whether buried remains can be moved or not. As stated before, it is not allowed to move buried remains. But a permission can be given by the burial authority, or in some cases the County Administrative Board (Länsstyrelsen), if the place of a new burial is decided and if there is a certain reason for it (SFS, 1990:1144).

4.2 Cemeteries in Sweden

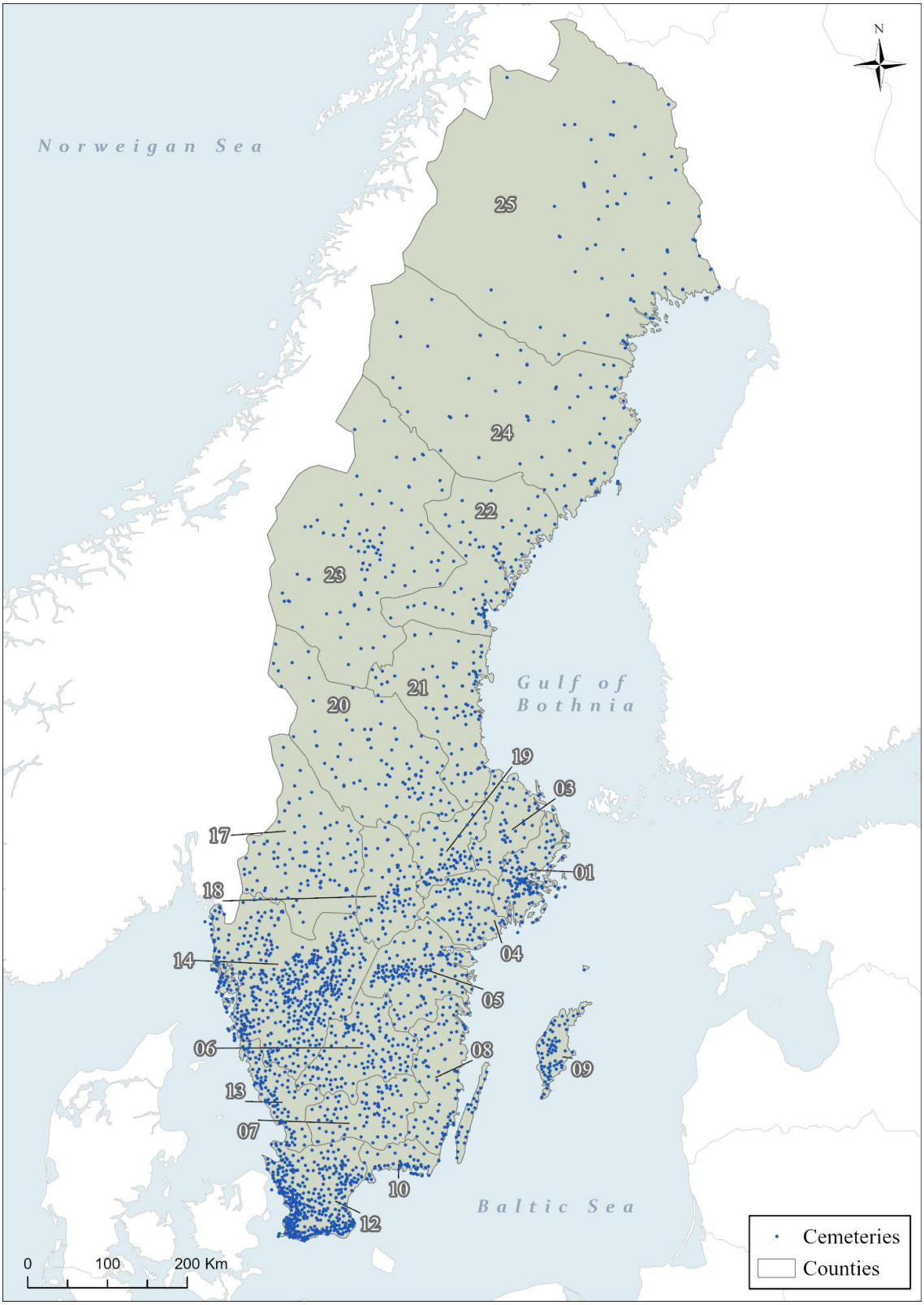

Figure 2. Overview map of the distribution of cemeteries in Sweden.

Sources: Cemeteries © Swedish Mapping, Cadastral and Land Registration Authority; Background data: Country and county boundaries: Natural Earth

In Sweden there are 2 822 different cemeteries (Swedish Mapping, Cadastral and Land Registration Authority,). Figure 1 is an overview map of what the distribution of cemeteries looks like in Sweden. It can give a hint of which areas that are more densely populated than others, since a greater number of cemeteries could correlate with a bigger population.

Table 1. About the different cemeteries in the counties of Sweden.

	County	Number of cemeteries	Total population	Cemeteries per 10 000 inhabitants	Mean size m^2
01	Stockholm	125	2 391 990	0,5	49 596
03	Uppsala	61	388 394	2	25 722
04	Södermanland	83	299 401	3	22 792
05	Östergötland	151	467 158	3	15 615
06	Jönköping	139	365 010	4	18 425
07	Kronoberg	91	202 263	4	15 973
08	Kalmar	114	246 010	5	17 253
09	Gotland	69	60 124	10	7 765
10	Blekinge	58	159 056	4	20 833
12	Skåne	454	1 389 336	3	16 334
13	Halland	99	336 748	3	17 903
14	Västra Götaland	623	1 734 443	4	15 333
17	Värmland	103	282 885	4	23 585
18	Örebro	78	305 643	3	25 140
19	Västmanland	62	277 141	2	22 813
20	Dalarna	94	287 676	3	22 954
21	Gävleborg	86	287 502	3	19 235
22	Västernorrland	86	244 554	4	24 951
23	Jämtland	92	131 155	7	13 750
24	Västerbotten	81	273 192	3	25 610
25	Norrbotten	72	249 614	3	32 053

	Sweden	**2 822**	**10 379 295**	**3**	**19 812**

Sources: Cemetery data © Swedish Mapping, Cadastral and Land Registration Authority; Population data: © Statistics Sweden

In table 1 the number of cemeteries in relation to the total population in each country is displayed. It is possible to see that a big population does not necessarily correlate with a high number of cemeteries. The county with the greatest number of cemeteries per inhabitants is Gotland county, with 10 cemeteries per 10 000 inhabitants, followed by Jämtland with 7 cemeteries per 10 000 inhabitants. These two counties also have the lowest total population, meanwhile Stockholm county with the least number of cemeteries per inhabitants have 0,5 cemetery per 10 000 inhabitants, and by far the biggest population. And the mean size of the cemeteries in Stockholm is by far the biggest. And the cemeteries on Gotland have got the smallest mean size, even though they have the most cemeteries per 10 000 inhabitants.

Table 2. Top 5 biggest and smallest cemeteries in Sweden.

		Name	**Area m^2**	**County**
Biggest				
	1	Skogskyrkogården	1 136 966	Stockholms County
	2	Stockholms norra begravningsplats	669 984	Stockholms County
	3	Berthåga kyrkogård	530 352	Uppsala County
	4	Västra kyrkogården	464 067	Västra Götalands County
	5	S:t Eskils kyrkogård	412 604	Södermanlands County
		…..		
Smallest				
	2 818	Kapelludden	383	Stockholms County
	2 819	Unknown	372	Hallands County
	2 820	Örskärskyrkogården	358	Västerbottens County
	2 821	Storfjäten	332	Dalarnas County
	2 822	Stensholmen	289	Västra Götalands County

Source: Cemetery data © Swedish Mapping, Cadastral and Land Registration Authority

In table 2 we can see that the biggest and smallest cemeteries are very different in size. It is also possible to see that most of the biggest ones are located in counties

with a bigger population. The smallest one, Stensholmen, is a cemetery where people from World War 1 got buried (Karlsson, 2016).

5. Methodology

In order to investigate how many cemeteries in Sweden that may potentially be threatened by future flooding and how many deceased and survivors that would potentially be affected, a quantitative approach was chosen. The analysis was conducted in the geographic information system (GIS) software, ArcGIS Pro. This was considered the most appropriate method for the purpose, since the study involves large amount of data. A qualitative approach could have been used to for example find out what survivors' opinion on this subject would be, however that is not the purpose of this thesis.

5.1 Data

The data in this thesis have been downloaded from different data sources. Table 3 presents an overview of what data that have been used and where they have been downloaded from. Further down there are more details about the used data.

Table 3. Overview of the data being used in this thesis.

Data	Source	Description	Date updated
Cemeteries	Swedish Mapping, Cadastral and Land Registration Authority	Polygons that show the area of the cemeteries	1993 - 2019
Country boundaries	Natural Earth	Polygons that show the country areas	2018
County boundaries	Natural Earth	Polygons that show the county areas	2018
Flood mappings	Swedish Civil Contingencies Agency	Polygons that show the flooding area	2013 - 2020
Orthophotos	Swedish Mapping, Cadastral and Land Registration Authority	Orthophotos that show some of the cemeteries	2018
Population data	Statistics Sweden	Population data for each county year 2020	2020

The cemetery data comes from the Swedish Mapping, Cadastral and Land Registration Authority (Lantmäteriet). Since this is a governmental authority, this

data got a high reliability. The cemetery data includes details about when the different polygons were added or last updated. Some of the oldest polygons were updated back in 1993 meanwhile some of the newer ones were updated in 2019. The data also includes some of the names of the cemeteries, but far from most of them. However, the data does not include whether the cemetery is in use now, or if they no longer accept new burials.

The county- and country boundaries data were downloaded from Natural Earth. This is an open-source website and compared to the governmental authority's data, the relatability is lower. But since the data used from this source only shows where the county and country boundaries are, they were judged to be reliable. This since these boundaries are not changing very often and should be accurate for the purpose.

The flooding data comes from the Swedish Civil Contingencies Agency (Myndigheten för samhällsskydd och beredskap). The Swedish Civil Contingencies Agency is a governmental authority, which makes it a reliable source. The data is said to be suitable as a support for planning in municipalities and others. Together with the Swedish Meteorological and Hydrological Institute and the different County Administrative Boards, they have decided which watercourses to create flood maps for (Swedish Civil Contingencies Agency, 2021). The data comes in different shapefiles for each watercourse that they have mapped. For this thesis, the theme files for a 100- and 200- year flood were chosen. They are both based on an expected climate in the end of the century. These theme files are polygons that show the flooding areas for the two different flood scenarios (Swedish Civil Contingencies Agency, 2013).

Table 4. The chance of flooding for the two different flows over different time spans.

Flow	10 years	50 years	100 years	200 years	500 years	1 000 years
100-year	10%	40%	63%	87%	99%	100%
200-year	5%	2%	39%	63%	92%	99%

Source: Swedish Civil Contingencies Agency, 2013

Table 4 shows the chance of the two different flows occurring over different time spans. A 200-year flow has a 39% chance of happening during a 100-year period. So, it does not mean that a 200-year flood can only happen once every 200 years (Swedish Civil Contingencies Agency, 2013).

To find out how many deceased that would potentially be affected by the flooding, an email was sent out to each burial authority. This was only done for the cemeteries that, according to the analysis, would have 10% or more of their area flooded. The answer rate was 58%, N/A will be used in the table for the cemeteries where the number of deceased was not available. To find out how many survivors

that would be affected Krull's (2015) will be used to calculate this. The number of deceased will therefore be multiplied by five.

5.2 Study area

The overview map of the cemeteries in Sweden (figure 1) was created with data that comes from Natural Earth and The Swedish Mapping, Cadastral and Land Registration Authority. To create table 1 and 2 I used the cemetery data and population data for each county that came from Statistics Sweden (Statistiska centralbyrån). The county boundaries were used to find out how many cemeteries there are in each county, this by using the tool "select by location" which will select all the cemeteries that intersect with the county boundary. This was later added to excel together with the population data, and then calculated to find out the difference between the mean size of cemeteries for each county and how many cemeteries per 10 000 inhabitants each county has. The counties have been labelled with their county code instead of their full county names in figure 1. The reason for this so it is possible to locate the different counties, but to make sure that map does not get too messy.

5.3 Overlay analysis

Overlay analyses are useful when it comes to finding out how different data spatially interacts with one another. It can for example be used to find out what land uses that are within a certain parcel. There are different types of overlay analysis, raster and feature (Esri, N.D a). A feature overlay analysis has been used in this thesis since the data for this analysis is vector data.

In preparation to perform an overlay analysis, I first merged all the watercourses for each scenario together, since they were all separated into different feature classes. Merge has been used since it combines multiple feature classes and turns them into one, without changing the features (Esri, N.D b).

The overlay analysis was made with the tool "intersect". The intersect tool will find where the input feature classes overlap and create a new feature class containing these new overlapping areas (Esri, N.D c). The input features in this case are the cemetery feature class and the merged watercourse feature class.

The results from the analysis are then being imported into an excel table, and together with the total area of the cemetery polygons the overlap in percentage gets calculated. The percentage gets calculated in order to delimit the results. The cemeteries that have less than 10% of its area flooded will only be displayed in a map and appendix.

To visualize where the affected cemeteries are located, they were divided into two different categories. One category showing the ones that would be flooded with

more than 50% of its area, and the other category showing the ones that would be flooded 10% to 50%. This way it is easy to see the worst affected areas.

Table 5. Name and description of the two different flows in this thesis.

Name	Flow	Description
Scenario 1	100-year flow	Statistically occurring once every 100 years
Scenario 2	200-year flow	Statistically occurring once every 200 years

Source: Swedish Civil Contingencies Agency, 2021.

These scenarios do not mean that the cemetery will be permanently flooded.

5.4 Limitations

The limitations for this study are important to keep in mind. The flooding data that has been used in this thesis does not include all water bodies in Sweden. This analysis will therefore not include all waterbodies and there could be other cemeteries that are facing threats as flooding's, but they will not be included in the results for this thesis.

The total number of affected deceased and survivors is also a limitation. This since the data for that have not been possible to get. The number of survivors could also be counted or defined in various ways. In this thesis it is assumed that one deceased person is leaving five survivors behind, but there could be other survivors affected too. For example there could be a famous person buried in one of the cemeteries, which then could affect people who wants to come and see that persons grave and so on.

Another limitation is that the flooding data is based on an expected climate in the end of this century. It is therefore hard to know how many buried deceased that these cemeteries will have in the future and how many survivors that would be affected.

But despite these limitations, the results will still provide a rough overview of how many cemeteries that may be threatened and how many individuals that may be affected, given these scenarios, meaning that potentially affected cemeteries and individuals presented in this study may be an underestimation of the real magnitude of the phenomenon.

5.5 Discussion of Method and Data

In various of reports from the Swedish Civil Contingencies Agency (MSB) regarding the flood data, they mention that some of the data can have different accuracy, due to lack of data and information. In some of them they also mention that the data should be re-calibrated, so the accuracy gets better. It also says that the data should be used cautiously (översiktligt). But this is the data that could be

found, and in ways it will be used more detailed, in the sense that the percentage of the flooding areas will be displayed etc. The results in this study may therefore not be of the best accuracy, but since this study aims to give a rough estimation of the problem, the data were judged to be used anyway.

The cemetery data does not include all of the different names for the cemeteries, so some of the names in tables and appendix may not be the correct one. But for the purpose of this thesis, to make a rough estimation of the problem, it is being judged to not make a big difference.

The cemetery data also have some cases where the cemeteries have been split up into two or more polygons. Some of these cemeteries have therefore been counted as one, which can be seen in the appendix under "ID".

The data that has been used are of different detail levels. When the number of cemeteries for each county were calculated, some ended up outside of the county boundary. These had to be manually counted, so that the right number of cemeteries were counted.

5.6 Ethical considerations

This study has been made from secondary data from different authorities in Sweden. No interviews have been done or personal details described, there are therefore no possibilities that individuals can be identified or be harmed in any way. The data regarding the number of buried deceased could be gathered by anyone. The data does not include who or when people were buried, it only shows a total amount in different cemeteries.

6. Results

6.1 How many cemeteries would potentially be affected?

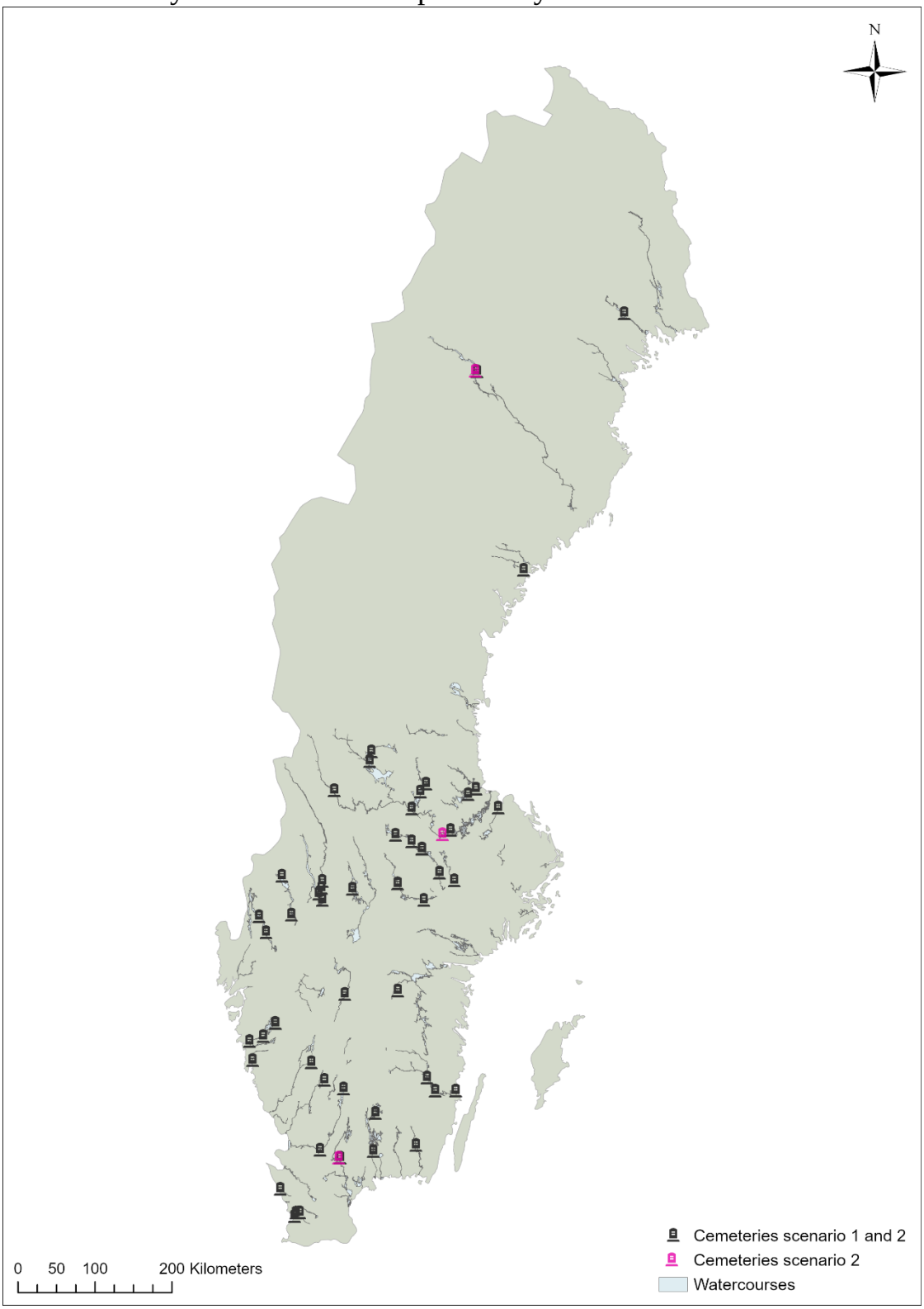

Figure 3. Map showing all the affected cemeteries for both scenarios.

Sources: Cemeteries © Swedish Mapping, Cadastral and Land Registration Authority; Flooding data: © The Swedish Civil Contingencies Agency; Flooding data for urban area Arboga: © County Administrative Board Västmanland; Background data: country boundaries Natural Earth

In figure 3 the location for all the affected cemeteries in these scenarios are being shown. The black symbols show the cemeteries that would be affected in both scenario 1 and 2, and the pink symbols show the cemeteries that would be affected in scenario 2 only. In scenario 1 there would be roughly 53 cemeteries, and for scenario 2 there would be roughly 56 cemeteries affected. The map also shows us that the affected cemeteries is mostly in middle and south of Sweden since the lack of flooding data in the rest of the country. But for the watercourses up north it seems to be less affected cemeteries. This could be due to less cemeteries located close to the water, but this could also mean that the watercourses up north would be less affected by the flooding in these 2 scenarios compared to the ones further south.

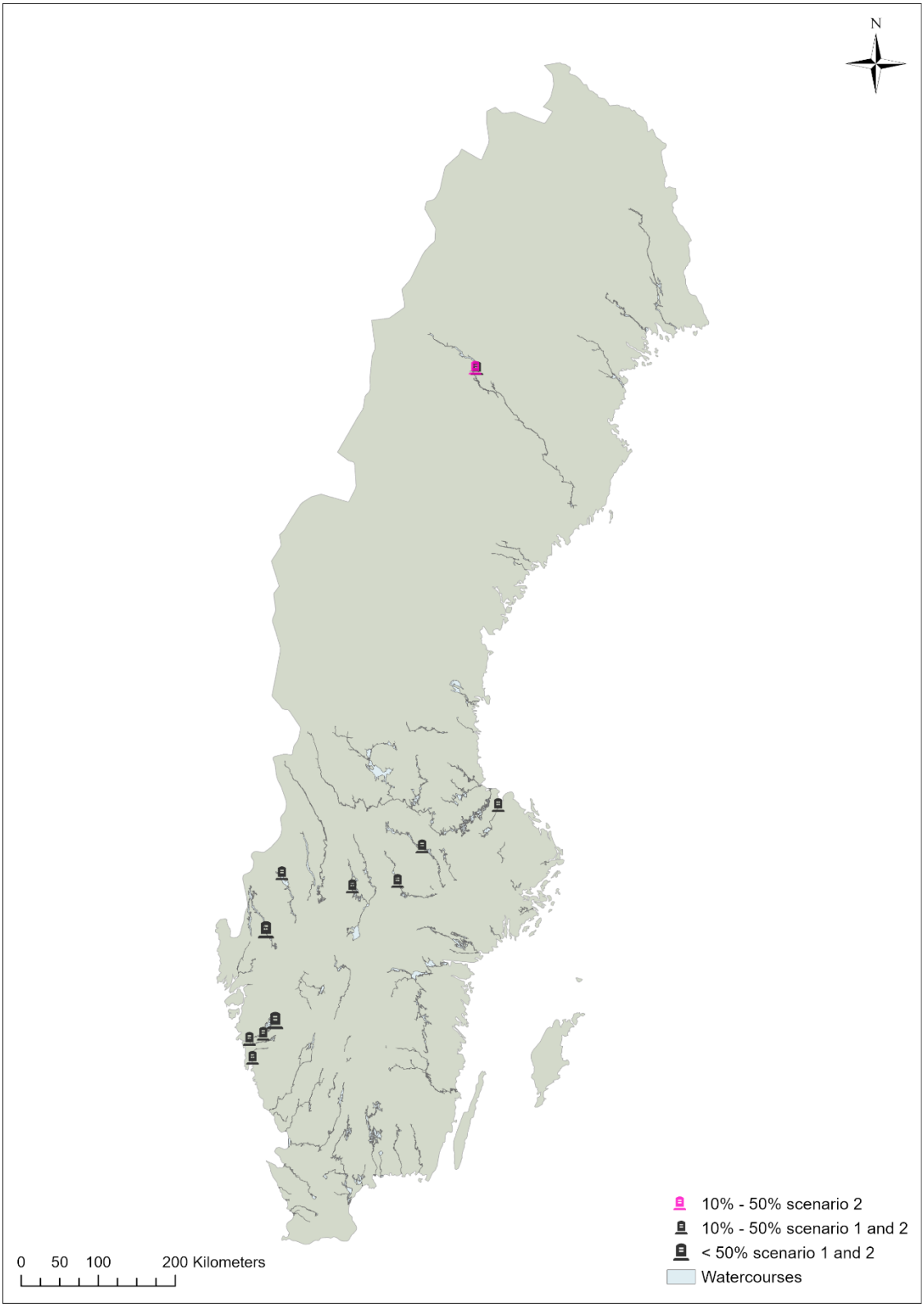

Figure 4. Map of all the cemeteries that would be flooded with 10% or more of their total area. For both scenarios.

Sources: Cemeteries © Swedish Mapping, Cadastral and Land Registration Authority; Flooding data: © The Swedish Civil Contingencies Agency; Flooding data for urban area Arboga: © County Administrative Board Västmanland; Background data: country boundaries Natural Earth

In figure 4 the cemeteries that could have 10% or more of their total area flooded is being shown. The black symbols show the ones for both scenarios, and the pink symbol for scenario 2. It is possible to see that most of the cemeteries are in the middle of Sweden. But there are also a few in north and a few on the west coast. There would only be one more cemetery affected in scenario 2 compared to scenario 1.

Table 6. Percentage of flooding area in each cemetery.

Cemetery	Cemetery area m^2	Flooding area m^2		Percentage	
		Scenario 1	Scenario 2	Scenario 1	Scenario 2
Landskyrkan Alingsås	6 821	6 333	6 396	93	93
Billingsfors kyrkogård	7 776	6 040	6 332	78	81
Gamla kyrkogården Sorsele	17 107	6 618	8 568	39	50
Cederborgska kyrkogården	1 987	670	751	34	38
Stampens kyrkogård	43 655	10 486	10 843	24	25
Västlands kyrkogård	17 844	4 216	4 331	24	24
Gamla kyrkogården Kungsbacka	8 925	1 657	3 021	19	34
Arvika kyrkogård	145 816	23 906	28 564	16	20
Västanfors kyrkogård	14 610	1 968	2 160	13	15
Lungsunds kyrkogård	9 929	1 187	1 278	12	13
Skogskyrkogård Sorsele	37 547		4 568		12
Östra kyrkogården Lerum	32 886	3 651	3 947	11	12

Sources: Cemetery © Swedish Mapping, Cadastral and Land Registration Authority; Flooding data: © The Swedish Civil Contingencies Agency

In table 6 the size of each cemetery and the flooding area for the different scenarios are displayed, that could have more than 10% of their area flooded are being shown. It is possible to tell that scenario 2 would not be that much worse than scenario 1 in most cases, only two cemeteries would have more than a 5% increase from scenario 1 to scenario 2 when it comes to the flooded area. It would only be one more cemetery affected for scenario 2, compared to scenario 1. The cemeteries that would have the biggest area flooded would be Arvika kyrkogård and Stampens kyrkogård, but percentage is still fairly low.

Figure 5. Example of how Arvika kyrkogård would be affected, given these scenarios.

Sources: Cemetery and Orthophoto © Swedish Mapping, Cadastral and Land Registration Authority; Flooding data © The Swedish Civil Contingencies Agency

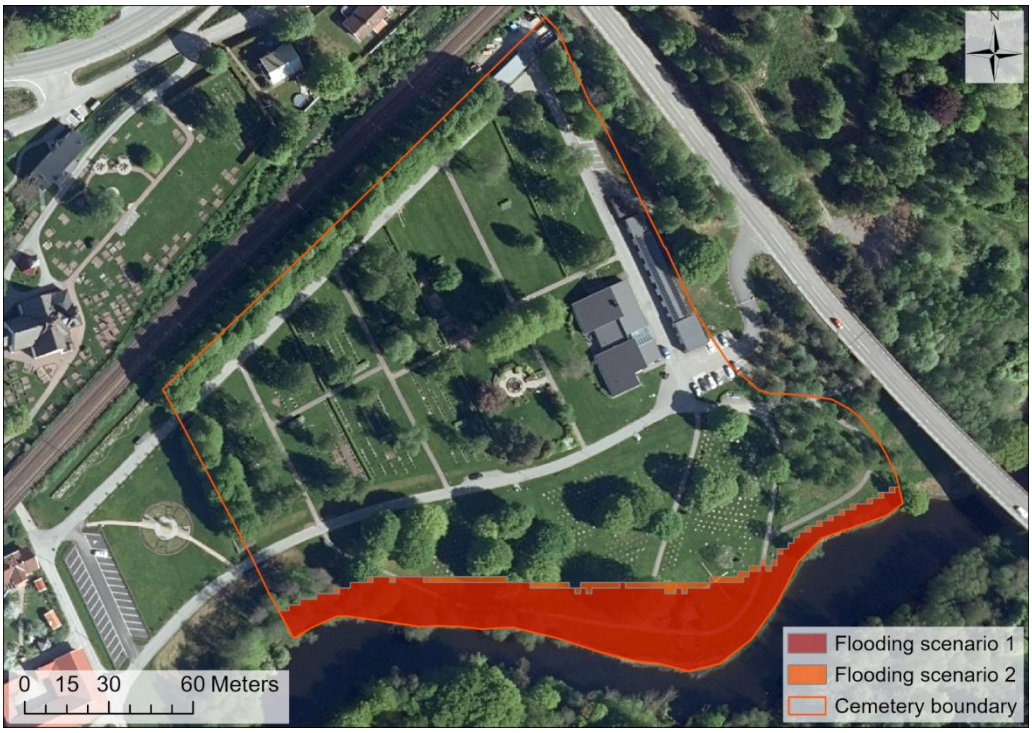

Figure 6. Example of how Östra kyrkogården would be affected, given these scenarios.

Sources: Cemetery and Orthophoto © Swedish Mapping, Cadastral and Land Registration Authority; Flooding data © The Swedish Civil Contingencies Agency

Figure 5 and 6 shows an orthophoto of Arvika kyrkogård and Östra kyrkogården and how the flooding area, given these two scenarios, would affect them. The red area is the flooded area for scenario 1 and the orange area is the flooded area for scenario 2. It is possible to tell that big parts of the cemeteries would be rather unaffected by the flooding. The flood area in figure 5 would go from 16% to 20%, and the flood area in figure 6 11% to 12%.

6.2 How many deceased and survivors would potentially be affected?

Table 7. Number of buried deceased in the different cemeteries.

Cemetery	Scenario 1	Scenario 2
Västanfors kyrkogård	480	480
Sorsele gamla kyrkogård	422	422
Arvika kyrkogård	15 914	15 914
Gamla kyrkogården Kungsbacka	759	759
Stampens kyrkogård	7 280	7 280
Östra kyrkogården Lerum	N/A	N/A
Lungsunds kyrkogård	N/A	N/A
Västlands kyrkogård	N/A	N/A
Billingsfors kyrkogård	N/A	N/A
Cederborgska kyrkogården	116	116
Landskyrkan Alingsås	N/A	N/A
Skogskyrkogård Sorsele		1 120
TOTAL	24 971	26 091

In table 7 the number of buried deceased are shown. In scenario 1 there would be approximately 24 971 deceased affected, and for scenario 2 there would be 26 091 deceased affected. The number of affected survivors would have been approximately 124 585 for scenario 1, and for scenario 2 approximately 139 455.

But since there is a lack of data for buried deceased in some cemeteries, one can only assume that overall there would be a greater number affected deceased and survivors in both scenarios.

7. Discussion

This study aimed to investigate and make a rough estimation of how many cemeteries that would potentially be affected by future flooding given two different scenarios based on an expected climate in the end of the century, and also to see how many cemeteries that may potentially have to relocate. It also investigated and roughly estimated how many deceased and survivors that would potentially be affected. This was done by doing an overlay analysis using a geographical information system (GIS) software.

How many cemeteries would potentially be affected and how many cemeteries may potentially have to relocate?

The result from the analysis shows that 56 cemeteries would be affected by future flooding if these two scenarios occur, whereas 53 cemeteries for scenario 1 and 56 cemeteries for scenario 2. It is also important to keep in mind that these cemeteries would not be permanently flooded, and the probability of these two scenarios happening can be seen in table 4. But these cemeteries would all be affected in different ways, as for scenario 1 22 of the affected cemeteries would have less than 1% of their area flooded. And for scenario 2 there would be 26 cemeteries (which can be seen in the appendix). One could argue that the cemeteries with less than 1% or even 10% of their area flooded, or any other given percentage, would be rather unaffected by the flood in these two scenarios and therefore it would not matter. However, even if it is only 2% there could still be an area of 387 m^2 (see appendix) that gets flooded. So despite that it is only 2% of the total area of the cemetery, the flooded area could still be as big as a house. Therefore, even if the flooded area would be rather small, it could still do significant damage. And in the example of when Byske kyrkogård got flooded (Bergner, 2012), one concern was that there would be damages that would cost to fix. So even if the area is small, the costs of fixing it could be big. And cemeteries also have a lot of different values, so a flood could affect it in different ways, not just in a matter of cost to restore it. Since we do not know if the cemeteries are “inactive” as in they do not perform burials anymore, or if it the flooding would just be on a small area, they can still be valuable in forms as a cultural and historical place (Grönwall, 2017), and it is not allowed to make changes to cemeteries built before 1939 without a permission (SFS, 1988:950). A flood would not ask for permission, and damages could be done to these.

Whether cemeteries should be relocated or not is nothing that this thesis can decide. There are most likely other ways of solving a flood problem, perhaps building a wall or something else, and relocating are probably seen as a “worst case scenario” solution. However, this can be discussed. In this thesis the 12 cemeteries that, according to the analysis, would have more than 10% of their

total area flooded if the flood scenarios occurred, will be seen, as potential relocating cemeteries. Even if it is "only" 10% of the area and it is not a permanent flood, there could still be reasons to relocate it, or parts of it. For example the survivors who have their beloved one buried within the flood area, they might want to move the grave to a place that have no potential risk of getting disturbed at all. Marjavaara (2012) writes about how individuals do not cease to be mobile, even after their death. And according to this analysis, the post-mortal mobility could potentially become more common in the future. However, this would go against both the legislation in Sweden, but also the general opinion. Relocating buried remains could also go against the deceased wish of having their final rest. As Åkesson (1997) and Marjavaara (2012) mentions that some people choose their burial place due to the meaning of the place for them. For some of these, the cemetery maybe be the important place for them, and not just the city where it is located. Their wish of burial would in this case not be fulfilled anymore.

How many deceased and survivors would potentially be affected?

Since we do not know the number of deceased in all the cemeteries in table 7, and the numbers we do know are based on today and not at the end of the century. The number of both the deceased and survivors will be uncertain, and the number may be bigger or smaller than what the results show. There could for example be that some graves will be pretty old by the end of the century, and for these there are no longer any survivors. But an estimation has been done from what we know from this thesis. And given the two scenarios and these numbers, there would be approximately 24 971 deceased affected and approximately 124 585 survivors affected for scenario 1 and approximately 26 091 deceased and approximately 130 455 survivors for scenario 2. For this thesis it is assumed that all buried deceased and all survivors would be affected, in one way or another, no matter how big an area that would potentially be flooded. As Francis et al (2000) stated that cemeteries are important for the survivors since this is a place where they can go and care for their beloved deceased. Also maintain their graves (Francis et al, 2000). And as Nordh and Evensen (2017) talked about the cemetery as a restorative place, one of the important aspects was the nature and being able to find inner peace (Nordh and Evensen, 2017). One could assume that a flood in a cemetery would therefore affect more than just the people with their graves flooded. It would most likely disturb the overall atmosphere and peace in the cemetery, and therefore all survivors would be affected.

7.1 Conclusion

A general conclusion in this study is that cemeteries are valuable places in different aspects, which are stated in previous studies. It is therefore important to maintain these so that their value does not get affected. A flood could damage

cemeteries in different ways, which could lead to negative effects on the functions or values of the cemeteries. The result in this study shows that there are cemeteries that are in the risk of getting flooded, given the two scenarios, some more than others. The result from this analysis also shows that post mortal mobility could potentially become a more common thing in the future, which in that case would challenge the general opinion and the legislation.

7.2 Future studies

Since this study had a lot of limitations when it comes to flooding data, the real magnitude of this issue might not be covered. It would therefore be interesting to study all waterbodies and all watercourses to see whether there are more cemeteries that are at risk for flooding.

Since the legislation regarding moving bodily remains is already getting challenged by the move in Kiruna municipality. It would be interesting to see whether this may become more common or not. Since a lot of cemeteries are central in urban areas, and urban areas are still growing in population. Possibly it would be harder for already existing cemeteries to expand in these areas, if death becomes a more central feature in the future. And maybe there are some cemeteries in "the way" of other kinds of industries.

Another aspect of this subject that would be interesting to study closer is what the survivors, who had their beloved ones relocated or that will have their loved one relocated.

8. References

Basmajian, C., & Coutts, C. (2010). Planning for the Disposal of the Dead. *Journal of the American Planning Association*, *76*(3), 305–317. https://doi.org/10.1080/01944361003791913

Berger, S., & Forsberg, G. (2013). *Planeringens utmaningar och tillämpningar* (2. uppl.). Liber.

Bergner, M. (2012). Kyrkogård översvämmad i Byske. Retrieved from https://sverigesradio.se/artikel/5300896

Church of Sweden (Svenska kyrkan). (2020a). Så styrs svenska kyrkan. Retrieved from https://www.svenskakyrkan.se/organisation

Church of Sweden (Svenska kyrkan). (2020b). FAQ om begravningsavgift. Retrieved from https://www.svenskakyrkan.se/arvika/nyheter/faq-om-begravningsavgift

Church of Sweden (Svenska kyrkan). (2020c). Välj grav och gravplats. Retrieved from https://www.svenskakyrkan.se/valj-grav-och-gravplats

Church of Sweden (Svenska kyrkan). (2021). Svenska kyrkan i siffror. Retrieved from https://www.svenskakyrkan.se/statistik

Eliasson Hovmöller, E. (N.D). Urbaniseringen har stannat av. Retrieved from https://www.sosalarm.se/inblick/redaktionella-artiklar/urbanisering/

Environmental Systems Research Institute (Esri). (N.D a). Overlay analysis. Retrieved from https://desktop.arcgis.com/en/arcmap/10.3/analyze/commonly-used-tools/overlay-analysis.htm

Environmental Systems Research Institute (Esri). (N.D b). Merge (Data Management). Retrieved from https://pro.arcgis.com/en/pro-app/latest/tool-reference/data-management/merge.htm

Environmental Systems Research Institute (Esri). (N.D c). Intersect. Retrieved from https://desktop.arcgis.com/en/arcmap/10.3/tools/analysis-toolbox/intersect.htm

Francis, D., Kellaher, L., & Neophytou, G. (2000). Sustaining cemeteries: The user perspective. *Mortality (Abingdon, England)*, *5*(1), 34–52. https://doi.org/10.1080/713685994

Grönwall, E. (2017). Kyrkans begravningsplatser förr och nu. Retrieved from https://www.svenskakyrkan.se/filer/begravning_f%c3%b6rr_nu_a5_tryck(7).pdf

Hall, C.M. (2005). Tourism: Rethinking the social science of mobility. Harlow: Pearson Education.

Hjalmarsson, O. (2021). Överdödlighet – under coronakrisen. Retrieved from https://www.svt.se/datajournalistik/overdodlighet-under-corona/

Karlsson, S. (2016). Seglar till krigskyrkogården. Retrieved from https://www.bohuslaningen.se/nyheter/tanum/seglar-till-krigskyrkog%C3%A5rd-1.2091772

Krull, E. (2020). Grief by The Numbers: Facts and Statistics. Retrieved from https://www.therecoveryvillage.com/mental-health/grief/related/grief-statistics/

LKAB. (2016). Samhälle och gruva tillsammans. Retrieved from https://samhallsomvandling.lkab.com/sv/om-samhallsomvandlingen/samhalle-och-gruva-tillsammans/

LKAB. (2017). Mariaskapellet, kolumbariet och minneslunden i Kiruna flyttas. Retrieved from https://samhallsomvandling.lkab.com/sv/nyhetsarkiv/mariakapellet-kolumbariet-och-minneslunden-i-kiruna-flyttas/

Marjavaara, R. (2012). The final trip: Post-mortal mobility in Sweden. Mortality 17, no. 3: 256-275. doi: 1 0.1080/13576275.2012.699227.

Marjavaara, R. (2013). Platsen för den sista vilan: Resultat av två enkätundersökningar rörande människors val av begravningsplats. GERUM Kulturgeografiska arbetsrapport 2013-12-20. Umeå universitet.

Marjavaara, R. (2017). Selecting a place of rest after a life on the move: determinants of post-mortal mobility in Sweden. *Applied Mobilities*, *2*(2), 166–181. https://doi.org/10.1080/23800127.2017.1326779

National Board of Housing, Building and Planning (Boverket). (2019). Urbanisering. Retrieved from https://www.boverket.se/sv/samhallsplanering/bostadsmarknad/bostadsforsorjning/flyttningar/urbanisering/

Nationalencyklopedin, NE. (2020) Sverige. Retrieved from https://www-ne-se.proxy.ub.umu.se/uppslagsverk/encyklopedi/l%C3%A5ng/sverige

Natural Earth. (2018). 1:10m Cultural Vectors. Retrieved from https://www.naturalearthdata.com/downloads/10m-cultural-vectors/

Nordh, H., Evensen, K., & Skår, M. (2017). A peaceful place in the city—A qualitative study of restorative components of the cemetery. *Landscape and Urban Planning*, *167*, 108–117. https://doi.org/10.1016/j.landurbplan.2017.06.004

Nordh, H., & Evensen, K. (2018). Qualities and functions ascribed to urban cemeteries across the capital cities of Scandinavia. *Urban Forestry & Urban Greening*, *33*, 80–91. https://doi.org/10.1016/j.ufug.2018.01.026

Prendergast, D., Hockey, J., & Kellaher, L. (2006). Blowing in the wind? Identity, materiality, and the destinations of human ashes. *The Journal of the Royal Anthropological Institute*, *12*(4), 881–898. https://doi.org/10.1111/j.1467-9655.2006.00368.x

Rodrigue, J. (2020). *The geography of transport systems* (Fifth edition.). Routledge.

Schexnayder, J.H. and Manhein, M.H. (2017). Fragile Grounds: Louisiana's Endangered Cemeteries. Jackson: University Press of Mississippi.

SFS. (1988). Kulturmiljölagen (1988:950). Kulturdepartementet. Retrieved from https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/kulturmiljolag-1988950_sfs-1988-950

SFS. (1990). Begravningslagen (1990:1144). Kulturdepartementet. Retrieved from https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/begravningslag-19901144_sfs-1990-1144

Statistics Sweden (SCB). (2015). Urbanisering – från land till stad. Retrieved from https://www.scb.se/hitta-statistik/artiklar/2015/Urbanisering--fran-land-till-stad/

Statistics Sweden (SCB). (2020a). Tätorter i Sverige. Retrieved from https://www.scb.se/hitta-statistik/sverige-i-siffror/miljo/tatorter-i-sverige/

Statistics Sweden (SCB). (2020b) Population by region, marital status, age and sex. Year 1968 – 2020. Retrieved from

http://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__BE__BE0101__BE0101A/BefolkningNy/

Statistics Sweden (SCB). (2021a). Sveriges befolkning. Retrieved from https://www.scb.se/hitta-statistik/sverige-i-siffror/manniskorna-i-sverige/sveriges-befolkning/

Statistics Sweden (SCB). (2021b). Befolkningsprognos för Sverige. Retrieved from https://www.scb.se/hitta-statistik/sverige-i-siffror/manniskorna-i-sverige/befolkningsprognos-for-sverige/

Statistics Sweden (SCB). (2021c). Döda i Sverige. Retrieved from https://www.scb.se/hitta-statistik/sverige-i-siffror/manniskorna-i-sverige/doda-i-sverige/

Swedish Mapping, Cadastral and Land Registration Authority (Lantmäteriet). Cemeteries.

Swedish Mapping, Cadastral and Land Registration Authority (Lantmäteriet). (2018). Geodata extraction tool. Retrieved from https://zeus.slu.se

Swedish Civil Contingencies Agency (MSB). (2013). Översvämningskartering utmed Arbogaån. Retrieved from https://www.msb.se/siteassets/dokument/amnesomraden/skydd-mot-olyckor-och-farliga-amnen/naturolyckor-och-klimat/oversvamning/oversvamningskartering-vattendrag/arbogaan-2013.pdf

Swedish Civil Contingencies Agency (MSB). (2021). Översvämningskarteringar. Retrieved from https://www.msb.se/sv/amnesomraden/skydd-mot-olyckor-och-farliga-amnen/naturolyckor-och-klimat/oversvamning/oversvamningskarteringar-och-samordning/

Swedish federation of Cemeteries and Crematoria (SKKF). (2020). Den framtida krematorieverksamheten. Retrieved from https://skkf.se/wp-content/uploads/2020/02/krematorieutredningen_for_tryckning.pdf

Swedish Meteorological and Hydrological Institute (SMHI). (2017). Översvämningar. Retrieved from https://www.smhi.se/kunskapsbanken/hydrologi/oversvamningar-1.5949

Swedish Meteorological and Hydrological Institute (SMHI). (2021). Framtida översvämningar vid sjöar och vattendrag. Retrieved from

https://www.smhi.se/kunskapsbanken/klimat/klimateffekter-i-sjoar-och-vattendrag/framtida-oversvamningar-vid-sjoar-och-vattendrag-1.28791

Swedish Tax Agency (Skatteverket). (2021). Svenska kyrkan. Retrieved from https://www4.skatteverket.se/rattsligvagledning/edition/2021.6/1744.html

Svenskar i världen. (2019). Pensionärer utomlands. Retrieved from https://www.sviv.se/wp-content/uploads/2019/04/Kapitel-Pension.pdf

Van Steen, P., & Pellenbarg, P. (2006). Death and Space in the Netherlands. *Tijdschrift Voor Economische En Sociale Geografie*, *97*(5), 623–635. https://doi.org/10.1111/j.1467-9663.2006.00369.x

Worldometers. (2021). Current World Population. Retrieved from https://www.worldometers.info/world-population/

Withaker, A. (2004). Livets sista boning: Anhörigskap, åldrande och död på sjukhem. Stockholm: Institutionen för socialt arbete, Stockholms universitet.

Tv4. (2021). Här byggs ny begravningsplats – mitt på discgolfbanan. Retrieved from https://www.tv4.se/artikel/6mPK4GzWhMv28o9lnLaXzz/haer-byggs-ny-begravningsplats-mitt-pa-discgolfbanan

Åkesson, L. (1997). Mellan Levande och Döda: Föreställningar om Kropp och Ritual. Stockholm: Natur och Kultur.

Appendix 1: Affected cemeteries for both scenarios, despite %

ID	Name	Total area	Flood area m^2 100	Percentage 100	Flood area m^2 200	Percentage 200
2238	Arvika kyrkogård	145 816	23 906	16	28 564	20
1311	Stampens kyrkogård	43 655	10 486	24	10 843	25
2327	Fredentorps begravningsplats	104 221	6 903	7	6 907	7
1573	Gamla kyrkogård Sorsele	17 107	6 618	39	8 568	50
23	Landskyrkan Alingsås	6 821	6 333	93	6 369	93
653	Billingsfors kyrkogård	7 776	6 040	78	6 332	81
1327	Sorsele Skogskyrkogård	37 547			4 568	12
790	Västlands kyrkogård	17 844	4 216	24	4 331	24
2036	Gamla begravningsplatsen Arboga	47 415	3 797	8	4 297	9
919	Lerums östra kyrkogård	32 886	3 651	11	3 947	12
2059	Nya begravningsplatsen Mora	69 783	3 572	5	4 041	6
1318	Markaryds kyrkogård	54 786	2 116	4	2 267	4
1686	Västanfors kyrkogård	14 610	1 968	13	2 160	15
2571	Skogskapellet Västanfors	77 830	1 676	2	2 240	3
2507	Gamla kyrkogården Kungsbacka	8 925	1 657	19	3 021	34
1902	Wallinska kyrkogården	21 518	1 402	7	1 587	7
882	Högsby kyrkogård	41 318	1 309	3	3 203	8
974 and 1369	Vissefjärda kyrkogård	36 923	1 191	3	1 279	3
958	Lungsunds kyrkogård	9 929	1 187	12	1 278	13
2619	Forshaga kyrkogård	42 444	1 066	3	1 206	3
707	Anderstorps Kyrkogård	32 075	675	2	675	2
1092	Cederborgska kyrkogården	1 987	670	34	751	38
2372	Raus kyrkogård	10 345	638	6	827	8
1651	Stadskyrkogården Alingsås	45 763	630	1	797	2
1108	Lomma kyrka	26 355	577	2	582	2
1658	Påskallaviks kyrkogård	14 199	533	4	533	4
2347 and 1638	Skogskyrkogården	121 669	295	<1	295	<1
435	Sundborns kyrkogård	12 237	152	1	172	1
1941	Söderbärke kyrkogård	17 689	137	1	198	1
8.	Fridene kyrkogård	4 908	127	3	129	3
794	Malungs kyrkogård	41 372	79	<1	143	<1
1400	Gunnarsbyns kyrkogård	12 665	78	1	190	2
1066 and 1147	By Kyrkogård	27 004	67	<1	214	1
540	Norra kyrkogården Värnamo	134 494	67	<1	99	<1
1786	Svärdsjö kyrkogård	27 788	39	<1	48	<1
1118	Tranemo kyrkogård	36 477	34	<1	53	<1
819	Orsa kyrkogård	85 675	32	<1	51	<1
731	Öjaby kyrkogård	18 019	20	<1	35	<1
2485	Torrskogs kyrkogård	12 389	17	<1	24	<1
1593	Nedre Ulleruds kyrka	22 975	11	<1	626	3

2300	Östra kyrkogården Osby	22 769	7	<1	20	<1
2292	Gamla kyrkogården Osby	25 606			387	2
736	Gamla kyrkogården Ludvika	18 080	5	<1	7	<1
1698	Grava kyrkogård	26 533	5	<1	78	<1
1802	Sya kyrkogård	5 031	3	<1	5	<1
2700	Forsbacka kyrkogård	12 897	3	<1	12	<1
2792	Fjelie gamla kyrkogård	5 909	3	<1	4	<1
553	Torsångs griftegård	5 758	2	<1	14	<1
796	Nätra kyrkogård	48 525	1	<1	1	<1
1169	Landskyrkogården	32 818	1	<1	1	<1
975	Mörlunda kyrkogård	21 502	<1	<1	<1	<1
2477	Sura kyrkogård	25 568	<1	<1	2	<1
501	Kila kyrkogård	12 495	<1	<1	1	<1
759 and 247	Almundsryd kyrkogård	31 322	<1	<1	<1	<1
328	Folkärna kyrkogård	48 123			1	<1
690	Västra kyrkogården	37 406	<1	<1	2	<1