



Territorial governance of managed retreat in Sweden: addressing challenges

Gunnel Göransson¹ · Lisa Van Well¹ · David Bendz¹ · Per Danielsson¹ · Jim Hedfors¹

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Abstract

Many climate adaptation options currently being discussed in Sweden to meet the challenge of surging seas and inland flooding advocate holding the line through various hard and soft measures to stabilize the shoreline, while managed retreat is neither considered as feasible option nor has it been explicitly researched in Sweden. However, failure to consider future flooding from climate change in municipal planning may have dangerous and costly consequences when the water does come. We suggest that managed retreat practices are challenging in Sweden, not only due to public opinions but also because of a deficit of uptake of territorial knowledge by decision-makers and difficulties in realizing flexible planning options of the shoreline. A territorial governance framework was used as a heuristic to explore the challenges to managed retreat in four urban case studies (three municipalities and one county) representing different territorial, hydrological and oceanographic environments. This was done through a series of participatory stakeholder workshops. The analysis using a territorial governance framework based on dimensions of coordination, integration, mobilization, adaptation and realization presents variations in how managed retreat barriers and opportunities are perceived among case study sites, mainly due to the differing territorial or place-based challenges. The results also indicate common challenges regardless of the case study site, including coordination challenges and unclear responsibility, the need for integrated means of addressing goal conflicts and being able to adapt flexibly to existing regulations and plans. Yet rethinking how managed retreat could boost community resilience and help to implement long-term visions was seen as a way to deal with some of the territorial challenges.

Keywords Case studies · Climate adaptation · Flooding · Sea level rise · Governance · Managed retreat

Introduction

Using the analytical framework of territorial governance, this paper investigates the challenges associated with discussing managed retreat as a strategy for dealing with coastal and riverine flooding and sea level rise in four Swedish case studies.

Recent evidence suggests that Europe could face increasing risk of sea level rise and flooding as climate change becomes more extreme (Vousdoukas et al. 2020). In Sweden, the Rossby Centre at the Swedish Hydrological and Meteorological Institute is responsible for downscaling global climate models into regional climate models. These

downscaled models show that Sweden is projected to be exposed to a precipitation increase for all precipitation indices (precipitation, maximum daily precipitation, number of days with heavy precipitation, maximum 7-day precipitation), but this will vary according to geography (<https://www.smhi.se/en/climate/future-climate/climate-scenarios/sweden/nation/rcp85/year/precipitation>). The runoff is projected to increase in Southern and Mid Sweden, especially along the coast, as well as in the mountain range. In parts of the central and northern hinterland and along parts of the northern coast, runoff is instead projected to decrease. (<https://www.smhi.se/klimat/framtidens-klimat/lansanalyser/sweden/total-100-year-inflow>). For the Scandinavian Peninsula, there are large regional differences in sea level rise because of post-glacial rebound of the crust. Land uplift is 10 mm/year in the north but only 1 mm/year in the south (Hieronymus and Kalén 2020). This means that while the southern Sweden is experiencing the effects of sea level rise now, northern Sweden may experience this much later, when the effects of

✉ Gunnel Göransson
gunnel.goransson@sgi.se

¹ Department of Geotechnical Risk and Climate Adaptation, Swedish Geotechnical Institute, SE-581 93 Linköping, Sweden

rising seas exceed the effect of land uplift. Sea level is projected to rise about 90 cm in the southern part and about 10 cm in the northern part of Sweden by year 2100 and for RCP 8.5 (<https://www.smhi.se/klimat/stigande-havsnivaer/framtida-medelvattenstand-1.165493>). While the coast is not a tidal area, flooding and erosion from storm surges are a problem along parts of the coast, especially in southern Sweden.

While the hardest hit will be communities located close to the coast and watercourses, adaptation can lessen the effects and the costs of flooding. Risk management of coastal and riverine flooding is a complex issue that spans several sectors and governance levels. Addressing this problem particularly demands involvement of local politicians and communities in decision-making (Naylor et al. 2019). Many climate adaptation options currently being discussed in Sweden to meet the challenge of surging seas and inland flooding advocate holding the line through various hard and soft measures to stabilize the shoreline. Little attention is paid to the option of letting the water take space by sustainable exploitation in the right place and potential long-term relocating buildings, business, facilities and infrastructure to safer ground. Failure to consider future sea level rise, storm surges and inland flooding from climate change in municipal planning may have dangerous and costly future consequences when the water does come.

Managed retreat is a planned, managed, controlled, proactive and long-term strategy to adapt with the changes that climate change causes. It includes the successive relocation of assets to safer ground and restoration of the land that is left behind and return it to nature (Koslov 2016; Hino et al. 2017; Neal et al. 2017; Rulleau and Rey-Valette 2017; Braamskamp and Penning-Rowsell 2018; Owen et al. 2018; Griggs and Patsch 2019; Siders 2019a and b). The basic idea lies in increasing society's resilience (to flooding) by allowing a dynamic shoreline, which will benefit long-term socio-economic development as well as the environment (Siders et al. 2019; World Economic Forum 2019; Lawrence et al. 2020). Managed retreat has been implemented at several places around the world, for example, in Australia (Niven and Douglas 2013), China (Pittock and Xu 2011), France (Rulleau and Rey-Valette 2017), New Zealand (Owen et al. 2018), UK (Esteves 2014; Myatt et al. 2003), USA (Dyckman et al. 2014; Freudenberg et al. 2016) and the Pacific Island countries (Campbell et al. 2005). In coastal areas, retreat has mostly been implemented as a response to recurring catastrophic flooding and associated consequences (Braamskamp and Penning-Rowsell 2018; Mach et al. 2019). That is, managed retreat strategies have mainly been implemented as responses to disasters rather than as proactive adaptation to climate change effects (Owen et al. 2018; Mach et al. 2019; Doberstein et al. 2020). Yet several scholars argue that managed retreat should be part of a proactive climate adaptation strategy (Carey 2020; Panda 2020). Examples of

managed retreat as long-term planning strategies, however, are still scarce.

Several challenges are associated with managed retreat as a first-choice strategy, for example, financial issues. The problem exists at two levels: who should pay and be compensated today and how should the costs be distributed between current and future generations. Other examples of barriers are land and water rights, conflicting interests, limited available land for relocation, identity, beliefs and perspectives (Gibbs 2013; Hino et al. 2017; Lindegaard and Funder 2017; Lovett 2017; Rulleau and Rey-Valette 2017; Owen et al. 2018; Lawrence et al. 2020). These barriers are also apparent in Sweden. Reduced costs in the long run and for future generations are seen as an opportunity for managed retreat (e.g. Fletcher et al. 2013; Koslov 2016; Hino et al. 2017). As Fletcher et al. (2013) put it, "Investing in managed retreat today will save communities from future costs of flood protection", thus tomorrow. Other opportunities mentioned in the literature are protection and improvement of the natural environment, enhanced opportunity for recreation, carbon storage, pollution control, contribution to fisheries and contribution to flood-risk management elsewhere in a catchment/estuary/coast (Tinch and Ledoux 2006; Luisetti et al. 2010; Niven and Douglas 2013; Fletcher et al. 2013; Esteves 2014).

Although managed retreat is becoming a subject to a large body of international research (e.g. Esteves 2014; Rulleau and Rey-Valette 2017; Schliephack and Dickinson 2017; Siders et al. 2019; Siders 2019a, b; Doberstein et al. 2020; Johnson 2020; Lawrence et al. 2020; Tubridy et al. 2020), it is still in its infancy in Sweden and is rarely mentioned as an alternative in Swedish climate adaptation strategies, action plans and measures at local, regional or national levels. An exception is the climate adaptation plan for the southernmost region in Sweden issued by Skåne County Administrative Board (Länsstyrelsen 2014) which highlights the need to explore more closely the possibility to let the beach retreat and let erosion take its place to form a new coastline.

Managed retreat as a potential strategy for coastal and riverine communities to adapt to rising sea levels and riverine and lake flooding is a complex issue which involves coordination of responsibilities among a range of policy actors from local, region, national and international levels. Indeed, questions of financial responsibility and management are still unsolved in many places in the world such as the USA (Siders et al. 2019) and Sweden (SOU 2017). As an adaptive measure, managed retreat is interconnected with many different policy sectors, including water, land use planning, agriculture, environment and health (Termeer et al. 2016), as well as regional development and tourism. As managed retreat is essentially a local, place-based question, it needs to be inclusive and sensitive to the values and experiences of affected stakeholders in the area (e.g. Hino et al. 2017), and ways to mobilize these stakeholders in participatory processes will be at the forefront.

Flexibility and adaptability of a range solution to increase community resilience in an uncertain and changing context should be built into existing strategic planning practices (Brown et al. 2017). How communities utilize the place-based knowledge of climate impacts as well as epistemic climate services available will be central in developing fair and effective managed retreat strategies (Van der Molen 2018). Considering these challenges pinpointed in the literature, we propose a territorial governance framework of analysis as a heuristic to help understand how managed retreat is understood and managed in Swedish communities.

Based on this, our research questions are as follows:

- What are the narratives of desirable future development related to managed retreat in the case study areas?
- How can we understand the stakeholders' views of managed retreat in Sweden through the prism of territorial governance?
- How could managed retreat be implemented in light of the territorial challenges?
- What is the usefulness of the territorial governance framework for understanding the challenges associated with discussing managed retreat in Sweden?

Through participatory methods and knowledge co-creation workshops in four communities in Sweden, our objectives were to (1) understand actors' approaches to managed retreat (barriers and opportunities) as a way to deal with sea level rise and coastal and riverine flooding; (2) develop a set of visions of what coastal/river communities could look like in the future; and (3) understand the territorial governance aspects of managed retreat for each of the four case study areas. In this study, five dimensions of the territorial governance perspective of the analytical framework for addressing these objectives.

Towards territorial governance theory and framework

Territorial governance as a concept first emerged as a way to understand how different territories of a nation state were governed (OECD 2001; CEMAT 2006) and has later been taken up by the European Commission as a way to achieve territorial cohesion in the EU Cohesion policy (NTCCP 2013). The use of these concepts called for a place-based or territorially sensitive and integrated approach to governance as an extension of governance, multi-level governance and adaptive governance frameworks (Van Well and Schmitt 2016).

There are many forms of governance analyses developed within the social sciences. Most of these types portray the shift in policymaking away from state-dominated bodies towards a

broader spectrum of actors involved in taking decisions, including local actors and supra-national actors, private interests and civil society organizations, often for intersectoral issues such as climate adaptation (Kern and Bulkeley 2009). Multi-level governance has traditionally traced the vertical and horizontal linkages among actors and sectors, respectively, at fixed or more flexible jurisdiction boundaries (Hooghe and Marks 2010) in planning and public administration. Adaptive governance seeks to understand how formal and informal institutions and networks can help create resilient socio-ecological systems and climate adaptation (e.g. Partelow et al. 2020).

These governance theories have been utilized to understand issues such as environmental policy and climate adaptation actions but have paid little attention to the crucial underlying territorial preconditions of the area of study. Territorial governance was introduced as a framework of analysis (Davoudi and Cowie 2016; ESPON and Nordregio 2013) to address other forms of governance's criticized lack of geographical specificity (Jordan 2008). The point of departure for the territorial governance framework was to bring together various key points from the literature on governance and multi-level governance but also with inspiration from literature around the concepts of stakeholder participation (e.g. Healey 1997) as well as resilience and adaptability (e.g. Gupta et al. 2010).

Territorial governance analysis includes specific place-based territorial elements like (hydro)geology, topography, hydrology, shoreline morphology as well as urban development patterns, cultural heritage and demographic and socio-economic contexts in addition to regulations and legal frameworks and decision-making praxis and to understand the different place-based contexts. This makes it particularly useful to address the “wicked” problem posed by climate change (Moser et al. 2012; Termeer et al. 2016) and managed retreat as a means to adapt to this change.

Territorial governance has been conceptualized in five dimensions as “...the formulation and implementation of public policies, programs and projects for the development of a place/territory by: 1) coordinating actions of actors and institutions, 2) integrating policy sectors, 3) mobilizing stakeholder participation, 4) being adaptive to changing contexts, 5) realizing place-based/territorial specificities and impacts” (ESPON and Nordregio 2013; Van Well and Schmitt 2016:13).

Like the territorial governance concept, Termeer et al. (2016) sought to extend conventional governance to better enable actors to face such problems. Thus, they developed an integrated theoretical governance framework of the Five R Governance Capabilities (Termeer et al. 2016) — (1) reflexivity, (2) responsibility, (3) resilience, (4) revitalization and (5) rescaling, which may be useful to show the hindering or enabling conditions of climate adaptation strategies as well as their mutual interplay. Partelow et al. (2020) in their

review of environmental governance theories have showcased combined theories and discussed their analytical strengths and applicability to coastal systems, including adaptive governance, interactive governance theory and evolutionary governance theory (EGT). In particular, EGT theory emphasizes that the role of discourse in governance analysis adds a temporal aspect to the analysis.

The territorial governance concept and its five dimensions were developed to analyse a broad range of spatial development issues at multi-levels, from the neighbourhood level to the macro-regional level, and encompass issues ranging from river basin management, public transport and structural fund management (Schmitt and Van Well 2016). The Five R Governance Capabilities framework is more specific to climate adaptation across scales and provides an added layer of depth to the territorial governance perspective. As the two perspectives complement one another, several conceptual concepts of the Five R Governance Capabilities were added to the territorial governance framework of analysis as a way to enrich the discourse analysis of what managed retreat means in Sweden.

In our study of four municipalities at risk for coastal and riverine flooding in Sweden, the territorial governance perspective was chosen to identify wider visions and specific challenges in the current implementation of climate adaptation strategies to understand why managed retreat is a barely addressed issue in Sweden.

Four case studies in Sweden and their territorial specificities

The study included four case study areas (three municipalities and one county), each with its own specific shoreline morphology and challenges brought on by the sea level rise and riverine flooding. Case study areas represented different types of urban development processes in varying Swedish geographies (see Fig. 1). Common to all places is that most of the new urban development is planned towards the water as it is assumed that this is a way to attract residents and businesses into the area.

This study focused mainly on municipalities as most Swedish planning, including climate adaptation measures, is done at the municipal level. Swedish municipalities have a planning monopoly, meaning that they are fully responsible for the planning process in both the cities and rural areas within the municipality. The Swedish municipal planning process includes comprehensive planning as a political instrument to communicate the longer-term future visions of the municipality. Detailed planning regulates the use of land, water, buildings and structures and planning permission.

While the detailed plan is legally binding, the comprehensive plan is only advisory. The comprehensive plan generally

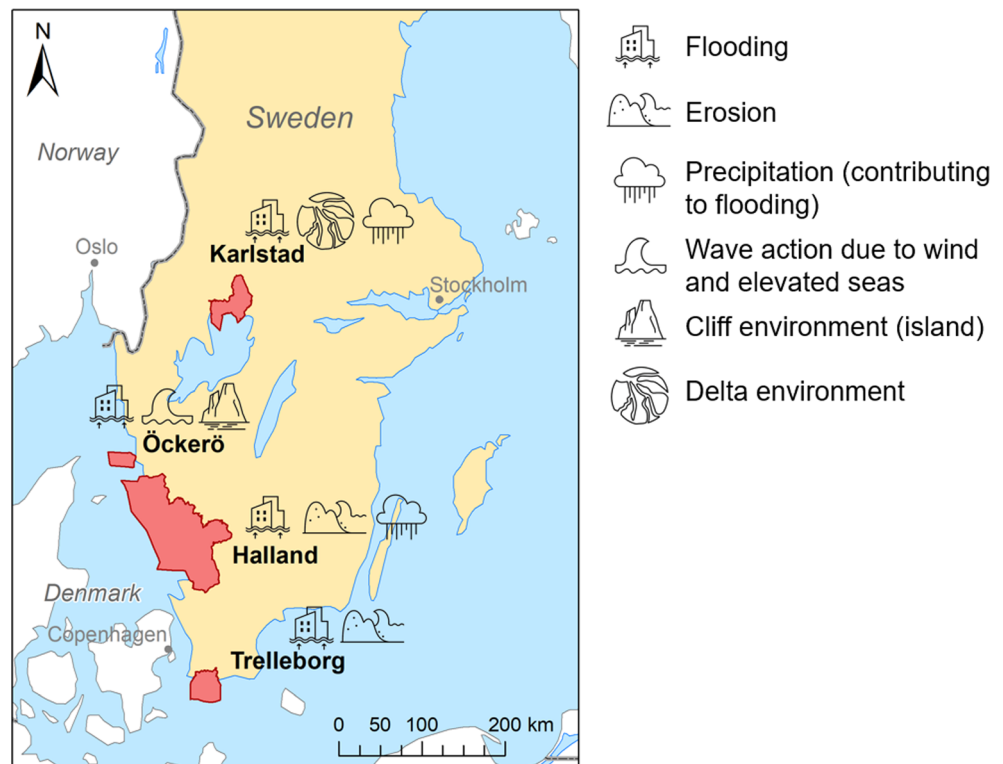
does not apply for more than 10 years. The detailed plan is valid until it is either revoked, changed or replaced by a new detailed plan. Comprehensive planning and detailed planning are both guided and supervised by the County Administrative Board (Länsstyrelsen), and public dialogue also is involved in all stages. Regional development strategies have been in place since 2019, and these are linked to growth and job provision. Municipalities also must include national interests, identified by national agencies, in the planning process, such as national infrastructure, nature reserves and cultural heritage. The political system for land use, climate change and risk management is divided among several national authorities, each with its own area of sectoral responsibility. But it is the local government that largely has the main responsibility for planning and implementing measures within the framework of current regulations. (See further <https://coastal-management.eu/governance/sweden> for a brief overview.)

The Värmland county seat of Karlstad municipality is situated in the mid-south part of Sweden on the delta of the River Klarälven, on its entrance to Lake Vänern, the largest inland lake in the European Union. The town is exposed to flooding from the river and the lake and affected by erosion and land subsidence. The river discharge and the water level in Lake Vänern are regulated through several hydro power plants. Flooding occurs occasionally but has not yet had disastrous consequences. In extreme situations with extensive floods, it is not primarily the buildings that present the biggest problem but access roads. The municipality has developed guidelines for floods, contingency plans, flood programmes, climate adaptation plans, etc. Boosting growth in the core of the municipality is a specific goal (<https://karlstad.se/karlstadvaxer/>), and this will be done by densifying the city to reduce the need for transport. Densification is taking place near the river and lake, as the attraction to the water is high. As a municipal official expressed at the workshop, “For a managed retreat to be considered an alternative, the threat from Lake Vänern must probably be perceived as greater”.

Öckerö municipality consist of 10 rocky islands located on the west coast of Sweden outside of Gothenburg and is exposed to flooding from storm water levels, rising seas and heavy rains. However, flooding is not considered a problem today. In 2020, Öckerö municipal representatives were only just beginning to consider a local climate adaptation strategy or plan. There are many protected areas on the islands, and the decision-makers are not particularly keen on more protected areas. The decision-makers at the municipality are very sensitive to public opinion as they live close to the citizens. As one municipal official said at an initial meeting of the project, “Managed retreat - then there will be no room for us, we have other ideas, like floating houses”.

Trelleborg municipality is a coastal city situated in a low-lying area on the southern coast of Sweden. The area is exposed to flooding from storm water levels, rising seas and

Fig. 1 Four case study sites in Sweden and their main characteristics (source: © Lantmäteriet and SGI. Made with Natural Earth. The pictograms were made by Nina Lemon at RISE Research Institutes of Sweden, one of the project partners)



flooding from streams. Coastal erosion is also a major challenge. The city is presently working under a “Sea Town” urban strategy (<https://www.trelleborg.se/bygga-bo-miljo/stadsutvecklingsprojekt/vastra-sjostaden/>) which develops new mixed function neighbourhoods at the border between the port and the city to create attractive meeting places along the quayside for residents, businesses and visitors. The “Sea Town” project involves moving and expanding the harbour, rerouting a road to facilitate access to the harbour and exploiting the old port area. The plan includes building a sea wall to protect this area from sea level rise and storm surges. The Trelleborg municipality has a coastline of 35 km with buildings, and almost all land along the coast is privately owned; only a small strip by the beach is available for public use. The beach meadows are disappearing due to erosion, and coastal areas are exposed to what is usually called “coastal squeeze”.

Halland County is located on the southwest coast of Sweden and includes seven municipalities, including Halmstad the county seat. The county is exposed to flooding from sea level rise, storm water levels and riverine flooding. During periods of heavy rain, all sites suffer from flooding in topographic lows spots. There are also problems with high groundwater levels on occasion. All county administrative boards are assigned to coordinate the work with climate adaptation within the county. The county administration has the mandate to stop a detailed plan if there is a risk, e.g. flooding.

Workshops to understand managed retreat in the case studies

The research questions in this study were examined in a participatory process by inviting relevant stakeholders in each case study — including decision-makers, planners, experts and interest groups — to a half-day workshop to co-create a set of visions for what managed retreat could look like, as well as the challenges of such an adaptation strategy. Both individual visions and consensual visions were developed for each of the case areas. The aims of the workshop for the project team and participants were to:

- Understand how stakeholders perceive managed retreat and the challenges of implementing it as a strategy to deal with flooding and rising sea levels.
- Develop visions of how the coastal/watercourse communities would develop in the short-term and the long-term and how managed retreat could fit into the wider visions

The aims communicated to participants were to discuss long-term and short-term visions for watercourse areas and to present the most recent data on water levels for the specific case. One workshop per case study area was held between April and November 2019. Lessons learnt by the project team from each workshop were transferred to successive workshops in order to improve the process and output of each workshop.

In each of the participating municipalities/county, a person was linked to all parts of the project as an associated member of the project who helped to organize the workshop. These persons were chosen because of their significant role in the municipality's/county's work with climate change adaptation. Workshop participants for each case area were identified by the associated member in the respective municipality/county, after discussions with the rest of the project group. A balanced mixture of public and private stakeholders, politicians, municipal employees in different sectors and representatives from the regional authority (the County Administrative Board) was sought. Prior to the workshops, a kick-off meeting was held with the associated members from the case study sites and the project team to introduce them to the project. At that meeting, the associated members let the project team understand that “managed retreat” is a sensitive subject and it would be better to omit this wording. Thus, the invitations were therefore formulated in a more neutral manner, such as “The Vision for Water in Society: Sustainable alternatives in strategic planning”. The invitation for each of the case areas was designed by the project team together with the respective associated member and adjusted to the case study area's specific challenges with respect to sea level rise and flooding.

The number of participants and affiliations is shown in the Supplementary Table S1. The workshop at Karlstad was held in April 2019 with 16 representatives from the municipality, the County Administrative Board, the private sector and two external municipalities in the county. The workshop in Trelleborg was held in May 2019 with 20 participants with representatives from the municipality including politicians, the County Administrative Board, NGOs, interest groups and the private sector. The workshop at Öckerö was held in October with 24 representatives from the municipality including politicians, the County Administrative Board and the private sector. The workshop at Halland County was held in November 2019 with 14 representatives from the County Administrative Board and from six of the seven municipalities in the county (the seventh municipality did not have the opportunity to participate).

Each workshop was divided into two sections. The first section consisted of short presentations from the project team to introduce the participants to the research project and to present climate change scenarios and trends specific for the case area. The climate scenarios and trends were presented by the Swedish Meteorological and Hydrological Institute (SMHI). The second section consisted of group discussions to develop visions of an attractive city/county area and how ideas of managed retreat could be integrated into the visions. Questions guiding the discussions are shown in Table 1.

For each workshop, the project team divided the participants into three to four discussion groups, depending on the number of participants. Participants were encouraged to think freely, and discussion was semi-structured around the

questions (Table 1) to enable a good dialogue but to ensure that all questions were addressed. Participants completed both individual as well as group templates.

Each of the four workshops commenced with discussions about visions of a desirable long-term future development for the community, why the visions were important, the goal conflicts associated with the visions and what the municipality/county could do to achieve these visions. The visioning exercise sets the context for understanding the role that managed retreat could play in the community, and the results of the visioning exercise helped in analysing the results from a territorial governance perspective. These visions are significant as they zoom out the viewpoint to put policies and actions for adapting to the effects of climate change into a wider perspective and help to better understand how managed retreat fits into with community values and perceptions. As such, it was an important element for participants to consider prior to a more focused discussion on the challenges of managed retreat. While the territorial governance perspective was implicit in designing the workshop discussion questions, it was not explicit within the workshops and used as a heuristic tool to understand the challenges of managed retreat in Sweden in the analysis.

Each participant wrote down their own answers before the questions were discussed in the group. Both the individual and group answers were collected for analysis.

A few Mentimeter (www.menti.com) questions were dispersed throughout the workshop. These were designed to start the participants to thinking about managed retreat and to understand how they perceived the barriers to the same. Mentimeter questions were also used as an evaluation and learning phase of the meeting. The following questions were asked: What does managed retreat mean to you? What is the biggest obstacle to “water planning” in your municipality? What did you learn today that you did not know before? What new insight have you gained about managed retreat? Do you think that managed retreat could be a possible long-term strategy? The answers to the questions formed a basis for understanding the starting point but were also useful in comparing the baselines between the different case study sites.

Narratives of desirable future development related to managed retreat

In the Karlstad workshop, justice and responsibility visions of a desirable society centred on making the best use of environmental resources and providing assessable infrastructure and social inclusion for both residents and visitors. (Inter-)generational justice visions mainly had to do with long-term economic development perspectives and investing in infrastructure for the future. Safety and security visions also focused on the provision of sustainable and safe infrastructure,

Table 1 The topics and questions that were discussed during the workshops

Visions	Managed retreat
In a few words, what is your vision of a desirable future societal development for your municipality/county?	What does “managed retreat” mean for you?
How would you imagine your municipality’s/county’s future social development in 30 to 40 years, i.e. how do you want your municipality/county to be then?	How can “managed retreat” be compatible with your vision?
Why is this vision important and for whom?	What are the barriers with “managed retreat”?
Are there goal conflicts and which are these?	What possibilities/opportunities can “managed retreat” offer?
What the municipality/county can do to achieve the vision?	

maintaining vital societal functions in risk areas and accessibility in times of crisis. In terms of quality of life, infrastructure was also specified, in terms of climate-adapted housing and good public transport. Economic development visions, with strong biodiversity, bioeconomy and a blue-green centre, were apparent in a quality of life visions. Territorial integration/inclusion visions included ideas about where to build out the city, how to develop municipal areas outside of the city centre and using the lakeside location for attractive housing developments. This last vision, however, was not shared by all participants, as others believed that development in flood-risk areas should be avoided.

In the Trelleborg workshop, visions of a desirable and responsible society tended to be formulated in terms of environmental aspects of reducing emissions and climate adapting the city but as well in terms of social and cultural aspects to secure public spaces by the water. Inter-generational justice visions were prevalent with respondents valuing long-term economic sustainability, social responsibility for citizens and preserving infrastructure and recreational values by the coast. Safety and security values were less prevalent than other dimensions in Trelleborg, being distributed among the aspects in terms of building and new developments in safe places. Quality of life concerns in Trelleborg were illuminated during the workshop across the aspects, focusing on the unique structure and position of the harbour city and increasing accessibility to the sea. Territorial dimensions came out most clearly during the workshop, particularly linked to economy and cultural aspects of maintaining Trelleborg’s identity as an attractive coastal city. Aspects of inclusiveness for all citizens and cooperation with other Baltic Sea cities were also strong themes within the workshop.

In the Öckerö workshop, visions of a desirable and responsible future society were considerable. In terms of environmental aspects, visions were to value nature and live more efficiently and sparsely. Social concerns were about ensuring fewer societal differences and fair distribution of resources and responsibilities. But at the same time, economic and infrastructure concerns were for developing innovative

business, transport and communication and increased growth, within the limited land area of the island. Participants also mentioned that it was important to be a self-sufficient municipality and preserve its island character. This was echoed in some of the inter-generational equity concerns expounding that although there is a need to plan for long-term societal development, participants wanted to maintain the special island character for older generations — “this is what we have always done”, but still also make the community attractive for coming generations. Safety and security visions mainly focused on protecting and adapting infrastructure, as ferry connections to the mainland were vital for the community. But some respondents dared to break out of conservative thinking and considered construction on the inland bedrock or considering floating houses. Quality of life visions also centred on accessibility to the mainland metropolis of Gothenburg but retaining jobs on the island and keeping the quite lifestyle and green spaces. Territorial integration visions focused on community participation, public–private partnerships, learning from other municipalities and seeing water as an asset for a happy community.

In the Halland County workshop, the emphasis was on desirable future visions for the county as a whole. The environmental justice and responsibility visions included preserving green spaces, integrating eco-system services into planning and learning more about climate adaptation. Participants deliberated social justice questions about how to ensure that all citizens in the county could have access to shorelines along rivers and coast and that the coastline should not be privatized. Inter-generational justice visions centred on preserving positive development to maintain population and keeping the special natural values which makes Halland a place where people want to live full time. Safety and security visions focused on health and participation. Participants mentioned that the whole of Halland County should have a good and inclusive quality of life with sustainable building and expansion. The vision for the region is to be an attractive functional labour market, capitalizing on its proximity to water, nature and blue-green infrastructure and efficient transport

methods. Territorial integration visions included developing with nature, not against it, dialogue and joint efforts among partners and interaction between authorities and businesses and encouraging growth inland, rather than towards the sea. Participants were eager to see Halland as a front-runner county in sustainability issues.

Figure 2 shows a summary of the long-term visions for a desirable future community by the water in the four case study sites.

Managed retreat through a territorial governance prism

We used the prism of a territorial governance perspective in order to ponder the question of why managed retreat as a strategy to adapt to changing sea levels and coastal and riverine flooding was so little discussed in Sweden. Thus, we analysed challenges of local/regional managed retreat discussed in the workshops in accordance to the territorial governance framework (Table 2).

Table 2 provides an outline of the analytical frameworks and the key coding concepts used in the discourse analysis of the workshop results for coding responses to each dimension.

Researchers performed discourse analysis to the managed retreat questions in Table 1 from each of the individual and group templates filled out by the participants, and their discussions in the four workshops. As the number of responses was not overwhelming, the analysis was done “by hand”, looking for certain key words and phrases (Table 2) in the transcribed results, rather than using a software such as NVivo. Implicit in this task is that interpretation and some value judgments in the coding process may not be amenable to strictly quantitative results. But as the aim was to produce a more overarching

qualitative picture of how managed shoreline retreat was understood in the case studies, this method was deemed feasible.

In the Karlstad workshop, both the barriers and opportunities associated with managed retreat were found in each of the five categories. However, most of individual and collective responses were in the *coordination* category and mentioned the difficulty in dealing with the costs assumed to be associated with managed retreat. The unwillingness of politicians to consider this type of climate adaptation strategy and market forces was also thought to favour private exploitation close to the water as something the municipality had a hard time managing. Related to these elements were the problems related to *integration* — or managing goal conflicts between economic and social and environmental interests.

Opportunities also centred on *mobilization* elements, with participants mentioning the long-term economic benefits that could accrue, reduction in costs of managing flooding events, and the importance of municipal authorities retrieving power from the private developers. *Mobilization* of stakeholder participation was thought to help provide for a more pleasant city for all, yet there were still difficulties getting residents and their varying interests on board in considering managed retreat. Karlstad workshop participants remarked on the difficulties of structural *adaptation* to changing climate contexts through planning away from the water, particularly with respect to existing infrastructure and buildings, for which the prevailing strategy focused on constructing hard defences. The *realization* of territorial specificities of the municipality on the shores of Lake Vänern was seen to be a draw in attracting residents and businesses to the municipality.

In the Trelleborg workshop, participants cited *coordination* problems and lack of state and regional support and guidance in pursuing such a strategy, as well as the perceived costs of moving buildings, and lack of political will and ownership issues. Participants stated *integration* dimensions in goal

Fig. 2 Summary vision for a desirable future community (source: Participants’ individual notes and notes from the group discussions and transcripts)

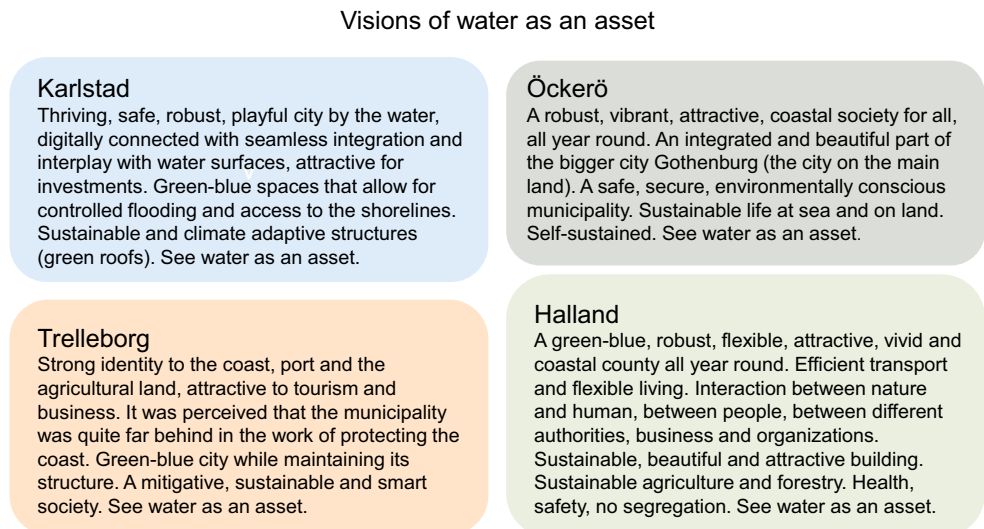


Table 2 Territorial governance analytical framework and key concepts

Territorial governance	Key concepts
Dim 1: Coordinating actions of actors and institutions (coordination)	Rights and responsibility, who pays for adaptation, power, multi-levels
Dim 2: Integrating policy sectors (integration)	Goal conflicts, integration, various, sectors, issue complexity, problems with multiple frames
Dim 3: Mobilizing stakeholder participation (mobilization)	Stakeholders, public participation, citizens, legitimatizing actions, public demands
Dim 4: Being adaptive to changing contexts (adaptation)	Learning, monitoring, flexibility, building capacity, administrative routines
Dim 5: Realizing place-based/territorial specificities and impacts (realization)	Knowledge of physical and social environment, awareness, new perspectives, placed-based safety and security

conflicts between market forces in developing the coastline and claiming valuable inland agricultural land for development, the so-called coastal squeeze effect.

However, the opportunities associated with managed retreat in the discussions fell into different categories — *mobilization*, *adaptation* and *realization*. Participants in Trelleborg discussed the potential for increased citizen satisfaction and a long-term belief in the future, which could be realized through better and more robust future planning and securing societal functions. Finally having better place-based knowledge about the community and coastal processes could help to turn “negative” problems into “enjoyable” opportunities.

In the Öckerö workshop, responses to the barriers to managed retreat were spread among all the territorial governance dimensions but with *coordination* concerns the most numerous. The barriers included lack of financing, lack of guiding legislation, short-sighted political interests and property ownership as the main barriers. Similar to Trelleborg, the *integration* goal conflict between developing the coastal areas or further inland on the island was mentioned. But barriers in the *mobilization* dimension, concerning citizen resistance to moving infrastructure and functions inland, as well as citizen traditions and emotions connected to the island mentality held strong. As an island, with little room to expand, the *realization* dimensions of understanding how collective short-term memories and the unique geographical position of Öckerö also coloured how residents see the potentials and pitfalls of managed retreat.

Interestingly, while some participants illuminated opportunities that could be associated with managed retreat on Öckerö as *coordination* arguments (cost-effectiveness in the long-term), more and more intense responses were characteristic of *adaptation* and *realization* dimensions. This was seen in discussions on managed retreat as an opportunity to correct shortcomings in previous planning, to increase accessibility of the coastline and facilitate access to the sea and beach life. Managed retreat was also seen as an opportunity for new thinking and innovative solutions.

The Halland County workshop differed from those in Karlstad, Trelleborg and Öckerö, in that participants represented municipalities from the whole county, as well as the County Administrative Board. While participants also mentioned the *coordination* dimensions of costs, most of the discussion about barriers to managed retreat centred on the *realization* dimension of awareness and knowledge — fear of change and lack of understanding among county residents, including a number of climate deniers in the populace, ambiguity and uncertainty of the climate change knowledge, lack of courage and innovation among decision-makers and a general reluctance to consider managed retreat as a viable strategy for dealing with flooding and sea level rise. This pattern was also seen in answers falling into other dimensions — short-term thinking and difficulty in changing citizen mindsets.

Likewise, the opportunities discussed in the Halland workshop also fell into the *realization* category, with participants citing new opportunities to use climate adaptation knowledge, new ways of thinking about living close to water and the possibility to foster a deeper understanding of safety and security in the county as positive aspects of managed retreat. The *adaptation* dimension was also present in the responses in the sense that managed retreat might be able to provide better planned communities and areas attractive for recreation, nature and sustainable environments.

Implementing managed retreat in light of territorial challenges

One of the questions posed to participants in the workshops was how managed retreat could be compatible with the communities’ long-term visions (Section 5) and territorial challenges. The answers to these questions give some clues as to actions should be taken for managed retreat to be considered as part of a strategy to deal with sea level rise and recurring flooding. Table 3 shows the summarized ways that managed retreat could be compatible with the long-term vision narratives, analysed according to the territorial governance

Table 3 A summary of ways managed retreat could be compatible with a vision for a desirable future, according to the territorial governance framework (source: participants' individual notes and notes from the group discussions on workshop templates)

	Karlstad	Trelleborg	Öckerö	Halland
Dim 1. Coordination	State funds/-grants, less expansion	Capital, compensation, state aid, restrict ownership	Clear financing, social responsibility, demands on exploitation and architects	Financing, funding, subsidies, clear guidelines from higher levels
Dim 2. Integration	Long-term planning	Resolve goal conflicts, what should be protected, resolve market forces, holistic approach	Shift priorities, better comprehensive planning, communication with landowners	Comprehensive planning, value land and nature, action plans
Dim 3. Mobilization	Dialogue with residents and other stakeholders and functions	Collaboration with similar issues, citizen dialogue, creative dialogues between administrators and politicians	Dialogues and knowledge transfer, more communication get citizens involved, good examples communication knowledge and risk	Increase understanding of public, raise knowledge of public
Dim 4. Adaptation	Stop building barriers, adaptation residential areas, adapt society to nature	Long-term signals and thinking, beach nourishment	Preserve and create green spaces, long-term thinking, test new strategies and techniques, build “with” water, adapt buildings	Protect nature in coastal zone, encourage inland development, preserve important (ag) land, use coastal areas in new ways, flexible social structures and attractive places
Dim 5. Realization	Change mindset, new incentives, raise awareness	Provide more information on consequences	Use knowledge of sea that already exists, technical solutions, planning with support of research, more knowledge at political level	Review suitability of areas to be built, long-term socio-economic analyses, identify areas that can be flooded, raise awareness, more knowledge

framework. Supplementary Table S2 presents a selection of participants' individual unabridged notes from workshops.

In each workshop, participants mentioned *coordination* of administrative and political levels as crucial for making managed retreat a reality — particularly the clearing up who is responsible for financing managed retreat actions. While municipalities in Sweden have the monopoly in urban planning, they often lack the resources to make long-term investments in security and safety. In each of workshops, participants discussed how the municipalities would need help from the regional or national level to cover buy-out costs or compensation for the perceived loss of economic revenue due to successively relocating infrastructures, buildings and functions.

Dealing with the *integration* dimension of first recognizing, and then accepting, the goal conflicts implicit in managed retreat may be a vital precursor to dealing with the conflicts and moving forward. While there was little discussion on how

goal conflicts could be managed, the workshops themselves provided participants with a means to recognize and cognize the different goals within the visions proposed.

Engaging in dialogue with citizens and other interest groups (the *mobilization* dimension) was mentioned by participants in all workshops as a method to gain acceptance for managed retreat and to increase understanding about the risks of shoreline and waterside development.

The responses categorized in the *adaptation* dimension differed slightly in the workshops, presumably due to the geographic and territorial differences among the case studies. But what they had in common was the desire to find ways to build with nature and with water, rather than seeing these as opposing forces, or shoreline development as the only way for attractive community development.

The need for specific information on the impacts and consequences of climate change on sea level rise and flooding in

the case study areas (*realization* dimension) was evident in the discussions in the municipalities and Halland County. But rather than requesting greater robustness or quantity of specific knowledge and data to be used in cost–benefit analysis of measures or in a multi-criterion analysis, respondents mentioned that knowledge needed to be carefully packaged to raise awareness and understanding of citizens and politicians of the potentials of integrating managed retreat into a climate adaptation strategy. This may demonstrate that municipal professionals already have access to the types of technical knowledge they would need for planning with managed retreat but that it is more difficult to use this knowledge to realize the perceptions and values of the general public and decision-makers in the issue.

Despite our municipal partners' initial concerns that it would be controversial, participants were quite willing to consider managed retreat as a potential strategy in the workshop settings. Although it was difficult to realize and plan for, many argued that it was important to initiate the discussion and that the workshops were good starting points to address managed retreat.

The Karlstad workshop depicted a general awareness that the buildings and infrastructure close to the water's edge created a barrier and that could restrict inclusive accessibility. There was however an indication that there might be a certain discrepancy between where the municipal management perceived a high exploitation pressure (building close to water) and how the private developers saw it (using the waterfront areas for parks, etc.). Improving communication and dialogue between actors could avoid such a misunderstanding.

Trelleborg had perhaps the most difficulty in seeing the viability of retreat, especially in the urban environment. The ongoing development project of Trelleborg, "Sea Town 2025" (<https://www.trelleborg.se/bygga-bo-miljo/stadsutvecklingsprojekt/vastra-sjostaden/>), and the local identity of being a coastal city was pervasive. It was therefore difficult for most of the participants to ignore the plan. The decision to relocate the port and the construction of a ring road as part of this plan appeared unalterable, and discussing relocation out of flood exposed areas seemed infeasible. This could be since city and beach areas are squeezed between the sea and the valuable agricultural land, and most of this land is privately owned. While most participants agreed that sea level rise and flooding were problems in the community, their views on how to face the problem varied. Some mentioned that in a way, the municipality is already working with retreat, for example, by relocating pipelines from areas exposed to erosion from the coast to further inland, which means that the municipality no longer needs to protect the site against erosion.

At the Öckerö workshop, the invited participants had little prior knowledge about the impacts of climate change or managed retreat as an option. The municipality was just initiating

the development of a climate adaptation plan. This might be a reason for the great enthusiasm and commitment to the topic. The workshop was also characterized by consensus among the participants, who tried to reason broadly openly. For the islanders, it was important to preserve the inland rocky outcrops and the naked cliffs as their "forest" and place for recreation. While raised buildings and construction on higher ground were seen important to meet a rising sea and flooding in low-lying areas, it was important that this should be done with care and with respect for the scenery. Sea walls were considered an opportunity to combat rising sea levels and storm surges, as long as they could blend into the environment and be accessible to property owners and the public. Managed retreat was also seen as an opportunity to move industrial buildings that are currently blocking accessibility to the sea. While relocation to the mainland was not an option for anyone, Öckerö islanders displayed an adaptable spirit for considering other more innovative options to deal with sea level rise (such as turning streets into canal waterways, as in Venice).

At the Halland workshop, the participants were well informed and had a high level of knowledge about climate change and sustainability and worked actively with these in their daily jobs. Based on their experience, the participants saw an urgent need to raise citizen awareness and boost the knowledge of local politicians and citizens. The workshop was partly characterized by a slight despair that adaptation work is too slow and that it is difficult to push through long-term sustainable solutions. The municipality of Varberg expressed that they already work according to the principles of retreat but that they do not call it retreat. Several Halland municipalities already work to avoid exploitation in areas close to the shore. Transforming unbuilt coastal areas into nature reserves was considered a viable alternative.

Usefulness of the territorial governance framework in understanding managed retreat in Sweden

The territorial governance framework has been a helpful framework to analyse the output of the workshop results on the barriers and opportunities of managed retreat. This framework provided a conceptual prism from which to analyse the complex patterns for how managed retreat was perceived and understood in the four workshops. The framework includes not only coordination linkages among administrative levels of responsibility and intersectoral integration but also the unique territorial and community specificities. It may therefore be a useful framework of analysis for other coastal and shoreline communities to find motivations to illuminate challenges but also the opportunities of managed retreat. The analysis also confirms that mobilizing the relevant stakeholders in participatory processes is one of the more important steps in changing attitudes and considering managed retreat as an option for sustainable and safe community development.

The territorial governance framework helped to understand how issues of responsibility and coordination or actors and actions were most evident in the discourse of managed retreat in the Swedish case studies. Like much of the international literature (e.g. Dyckman et al. 2014; Siders 2019a, b), questions of responsibility that are not yet solved make it difficult to consider retreat as an option. The *coordination* aspect was also evident in the four Swedish workshops where climate adaptation and actions to support managed retreat are explicitly the responsibility of the municipality. But municipalities point out that they have neither the funding nor the guidance for regional or national level to be able pursue such a path. This came out most clearly during the Karlstad workshop where participants discussed the perceived power imbalance between the municipal authorities and the private contractors in planning for construction close to the water. However, in the Swedish workshops, this was not an unsurprising result. The lack of clarity in understanding who is responsible and who should pay is a defining factor in Swedish climate adaptation policy, which is still not resolved (SOU 2017). Still it displayed that power balances and conflicts of interest are still important in territorial issues like managed retreat, something that the territorial governance perspective could better highlight. This is also echoed in the Five R Governance Capabilities framework (Termeer et al. 2016) analysis of multi-level climate governance of the Delta Programme in the Netherlands, as they found that the governance capability of rescaling to be very relevant to their analysis.

Integrating various sectoral interests of the territorial governance framework evokes how elements of multi-level governance can highlight the vertical organizational configurations that affect the implementation of environmental policies (Partelow et al. 2020) and how to deal with conflicting interests (Johnson 2020). In the Swedish cases, while the potential conflicts of interest were illuminated by workshop participants, finding ways to overcome these conflicts and work intersectoral was difficult. However, several workshop participants at each site remarked that the workshop offered a first-time forum for officials from different administrative sectors, businesses, interest groups and politicians to meet and discuss strategic intersectoral issues around coastal development.

The territorial governance dimension of *mobilization* of stakeholder participation, like the Five R dimension of responsiveness (Termeer et al. 2016), has made explicit the importance of dialogue among stakeholders. This element is not unique to Sweden as coastal issues often demand the involvement of several relevant stakeholder categories, including local politicians and the community (Naylor et al. 2019). Participation and co-creation processes are vital when discussing managed retreat and the equity dimensions of who gains benefit from adaptation plans (e.g. Siders 2019b). Making the element of equity and inclusiveness more explicit in the territorial governance framework could add to its usefulness in analysing issues related to managed retreat.

Being adaptable to changing circumstances, the territorial governance dimension of *adaptability* has been an important element in adaptive governance and in understanding coastal issues in the UK (Brown et al. 2017), as well as in Sweden. There are two sub-dimensions to this in the Swedish cases: (1) workshop respondents felt that more could be done in dealing with the challenges of flooding and sea level rise, if the current regulations and existing plans could be more flexible, and (2) on an individual level, residents appeared to be quite adaptable to changing climatic circumstances.

The provision and accessibility of place-based climate and geographical knowledge is an essential element to understand if, and how, managed retreat could be a strategy to deal with flooding and sea level rise (Van der Molen 2018). An alleged added value of the territorial governance framework is that it considers place-based or territorial challenges including physical, geographic and socio-economic factors or land availability (Doberstein et al. 2020) which are often missing from more generic governance, multi-level governance and adaptive governance analyses (Van Well and Schmitt 2016). Territorial governance, with its focus on the *realization* dimension (realizing place-based /territorial and impacts), brings forth aspects of both epistemic and local knowledge to the forefront. The revitalizing dimension of the Five R Governance Capabilities framework also does this and has enriched the territorial governance dimension as used in this study (Termeer et al. 2016) by adding a greater focus on awareness raising and using knowledge to unblock stagnation. The results of our analysis of managed retreat in four cases in Sweden highlighted the challenge to make territorial knowledge about the impacts of managed retreat more useful and understandable for citizens and politicians.

Our application of this augmented territorial governance framework of analysis could have been more stringent if we were to develop more stringent indicators for categorizing workshop responses into each dimension. This would lend a more rigorous scientific application of the framework. However, the societally relevant aim of the workshops was to communicate information about the potentials of managed retreat and to provide forums to help Karlstad, Trelleborg, Öckerö and Halland County to more clearly deal with adaptation to sea level rise and flooding. The territorial governance framework could be used by local administrators as a support in motivating what types of information need to be communicated to appeal to the hearts and minds of decision-makers about the importance of considering managed retreat elements in planning processes. The visions produced in the four Swedish managed retreat workshops illuminated what was important and for whom in Karlstad, Trelleborg, Öckerö and Halland County and particularly relates to the *coordination* dimension and the need to iron out questions of justice and responsibility and provide safety and security for inhabitants in the four case studies.

The future of managed retreat in local and regional planning in Sweden

The challenges to managed retreat in Sweden are primarily linked to short-term economics and short-term thinking, while opportunities lie mainly in a longer-term perspective. The solutions for managed retreat are therefore not primarily linked to incremental technical solutions but in forming and implementing transformative visions for the communities considering their territorial preconditions. As a respondent from Halland mentioned, “Managed retreat can be facilitated by new effective societal structures such as blue-green pathways or publicly accessible coastal zones. For this to work, we need to be able to present long-term socio-economic analyses as a basis for decisions”. The project team noted an interest from most participants see managed retreat as an option in theory and to learn more about how it might be implemented in their communities and in light of their unique place-based or territorial characteristics. A respondent from Öckerö stated, “If we are to think about the future, we can’t keep building near the water. We need to reconsider this”. However, implementing a managed retreat strategy demands multi-level dialogue and cooperation and the ability for long-term holistic thinking and planning. The local and regional territorial conditions also play a role in the ability to consider other solutions and to see flexible solutions.

The interest in discussing climate adaptation and managed retreat turned out to be greater than the project team’s first indications. One of the success factors may have been the dedicated associated member at each of the case study sites who helped to promote the idea of managed retreat and attract participants to attend the workshops. At the end of each workshop, all participants were asked to answer the Mentimeter question “Do you think that managed retreat could be a possible long-term strategy?” The result is shown in Fig. 3.

Results of the workshop also showed that the timing of the adaptation process in each community could have played some role in the participants’ ability to think flexibly and broadly about managed retreat. The municipalities who were still developing climate adaptation strategies or coastal development plans (such as Öckerö) were more open to new insights than in the municipalities (such as Trelleborg) where there was already a coastal plan in place. The level of risk perception may have influenced the discussions of how participants envisioned future climate adaptation strategies. For example, at Öckerö, one of the participants expressed that one must remember that the inhabitants of the municipality are used to coping with hard weather conditions (“We have always dealt with challenges ourselves. Certain things must be managed when one lives on an island”). At Karlstad it was pointed out that periodic flooding of the Klarälven River was to be expected — “We don’t really see the risks here”.

Do you think that managed retreat could be a possible long-term strategy?

■ Yes, absolutely ■ Yes, maybe ■ No, probably not ■ No, absolutely not

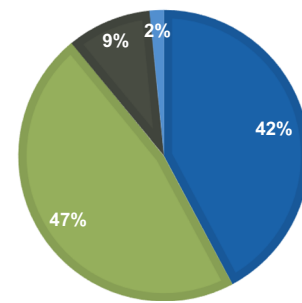


Fig. 3 Collective Mentimeter answers to the question “Do you think that managed retreat could be a possible long-term strategy?” It was also possible to answer, “I do not know” (0%). $N = 64$ (Source: Mentimeter results from four participatory workshops)

The analysis of the challenges associated with managed retreat in the four case studies using a territorial governance perspective points out that the costs, the available knowledge base and the public opinion of managed retreat area are important challenges, but other barriers are also evident, including lack of understandable climate services. Challenges still mainly centred on *coordination* dimensions — costs, financing opportunities and goal conflicts (with the exception of the Halland workshop). Yet, the opportunities associated with managed retreat spanned all the territorial governance dimensions, particularly the *adaptation* and *realization* dimensions. This could be significant in how the case studies considered making managed retreat amenable with their long-term community visions. Many of the challenges discussed in the workshops were specified as short-term coordination barriers including the problems the municipalities had with funding of measures and difficulties meeting their responsibilities for climate adaptation. But the opportunities were formulated in terms of long-term visions and wider community resilience. This points to a mismatch between how municipal actors associate the costs and constraints of managed retreat action to the expected benefits or opportunities that could accrue to the entire community. It also brings into question if the Swedish municipal planning monopoly is the most suitable governance form for meeting territorial challenges such as climate adaptation and managed retreat.

Depicting the long-term community visions in the workshops helped to understand what the implementation of managed retreat must consider if it is to be part of a long-term strategy. Common to all the visions in the four workshops was the aim to have a good quality of life for all and to achieve sustainable development and smart growth. Accessibility to water was seen as a way to make the communities attractive for current and future generations. But these visions demanded the ability to consider more integrated solutions, change behaviours and attitudes and engage the relevant stakeholders in dialogue about

how to make these visions reality, rather than a reliance on technical or engineering solutions.

The results of this study can be significant for the four case study sites in their work with developing climate adaptation plan and comprehensive plans. Regardless of how they perceive or consider managed retreat as part of a climate adaptation strategy, looking at the wider community visions and the challenges of managed retreat through the territorial governance prism can provide input to the four case study sites to develop these plans.

In conclusion, this study has shown that a territorial governance framework of analysis could reveal important aspects of how communities consider managed retreat. Such a framework has not previously been evoked in the analyses of managed retreat strategies in Sweden. In fact, no previous scholarship focused explicitly on managed retreat for Swedish circumstances has been identified. Using this framework has illuminated that the challenges to managed retreat in Sweden are not only financial or lack of technical knowledge but also deal with issue integration, mobilization of stakeholders and citizens and the ability to adapt flexibly within existing regulatory frameworks. The study has also indicated that within the case studies, working close to stakeholders and municipal and regional authorities has facilitated the introduction to what managed retreat would mean and how it could be integrated into long-term local development visions. This has promoted an increase in awareness and a willingness to at least discuss the potentials of managed retreat, in an environment that previously has been characterized by a reliance on protection from flooding and sea level rise.

While coastal and shoreline areas of Sweden have not yet been sufficiently impacted by changing climatic conditions to warrant a large-scale plan for managed retreat, planning for longer-term developments where the climate impacts could be more devastating gives shoreline communities the opportunity to potentially avoid more drastic governance measures in the future.

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Declarations

Conflict of interest The authors declare no competing interests.

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