

Chapter 8

Eco-District Promenades

People around the world are beginning to recognize the importance of building cities in sustainable ways. Some cities have taken the lead by developing new ecological districts that incorporate a holistic approach to sustainable design. These districts are typically designed to have renewable energy sources, provide alternative modes of transportation, discourage automobile use, have a mix of uses so that people can meet their daily needs within the neighborhood, and have a variety of housing types attractive to people of different ages and incomes. The public realm is typically designed to be walkable and bikable and also provide ecological services, such as storm water management, habitat, and bio-diversity. When located along water bodies, eco-districts generally reserve the waterfront for public uses, so that the most compelling place in the community is accessible to everyone. The water's edge is often designed with continuous promenades that welcome people to the waterfront and create linear public open spaces that connect the community and become community social spaces.

The three eco-districts that follow have different density, land use mixes, and relationships with their central cities, and also differently designed waterfront promenades. They are located along different types of water bodies—an ocean, a river that experiences major tidal flows, a lake connected to the sea via canals—which present different opportunities, and also different challenges related to climate change and sea level rise. Their waterfront promenades have different characters and draw different numbers and mixes of people to them, but all are inventively designed.

Hammarby Sjöstad Promenades, Stockholm, Sweden

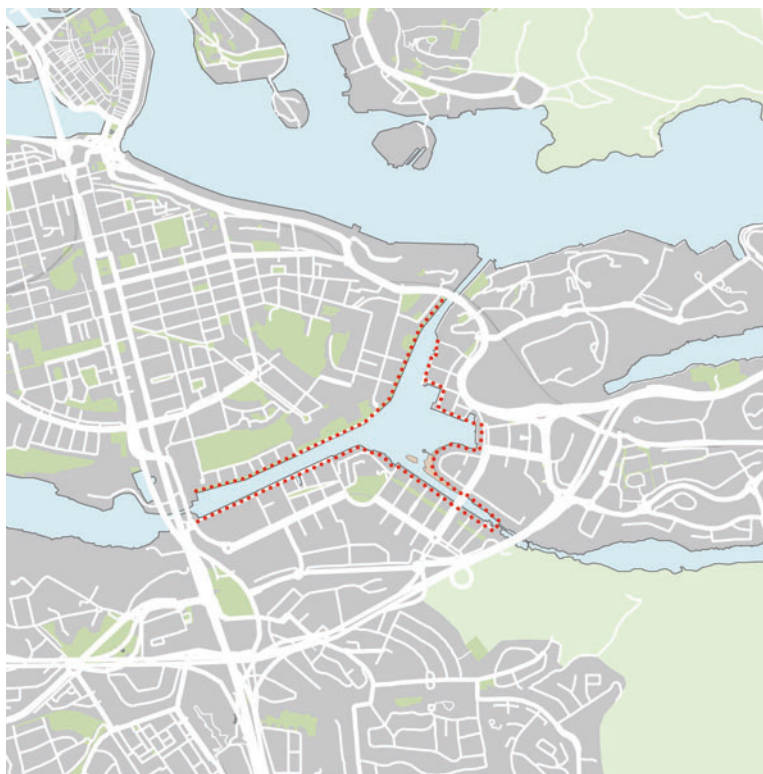


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Hammarby Sjöstad is a medium density mixed-use ecological neighborhood under construction at the edge of Stockholm's inner city. It covers three-quarters of a square mile (494 acres or 200 hectares) and upon completion, expected in 2018, will have 26,000 residents and 10,000 jobs.¹ Hammarby Sjö (Lake Hammarby) is at the heart of the neighborhood and promenades line its entire edge. The promenades have a combined length of about three and a quarter miles and constitute a major part of the neighborhood's open space. Those on the north side of the lake are not physically connected with those on the south side, because of intervening canals, but a free public ferry service operating during the day links the two shores, effectively creating a connected promenade system. Various promenade segments are different one from another, offering people who live in the neighborhood the choice of enjoying a variety of waterfront experiences.

Hammarby Sjöstad sits on former industrial land south of the city center. Stockholm spreads over 14 islands and its central area sits at the junction of Lake Mälaren, to the east, and Lake Saltsjön, to the west, which is a bay of the Baltic Sea. Hammarby Sjö lies south of Södermalm, the large island south of the city center that for a long time was the edge of the inner city. After World War I, city-owned land south of the lake became a marginal industrial area and it remained so into the late 1980s, when the city decided to redevelop the area into a mixed-use neighborhood.² A masterplan was under development when the city decided to make a bid to host the 2004 Olympics and locate the Olympic Village at Hammarby Sjö. This spurred the idea of designing the area as an ecological district to showcase Stockholm's commitment to sustainability. The Olympic bid was unsuccessful, but the ecological focus remained and a new masterplan was completed in

Scale: 1:40,000



2002. The city prepared the land and constructed streets, and then leased sites to developers for development.³

Key public realm ecological features of the neighborhood include: a storm water retention and filtration system, district heating from waste incineration and biogas production, a district-wide recycling system, and green corridors, including several land bridges over an adjacent highway that connect with a natural recreation area. The waterfront promenades contribute to the neighborhood's sustainability because they help make it walkable and bikable as well as highly livable.

Promenade Design Characteristics

The promenade along the northern side of the lake runs atop the wide, slightly arcing Norra Hammarbyhamnen quay, which is backed by a line of seven- to eight-story buildings arranged in courtyard fashion, and in one location a park. Many large tugboats and barges moor along the quay, lending a working dock feeling. The promenade is roughly 60 to 68 feet wide and mostly surfaced with cobblestones. Its width is divided into linear zones by a line of bollards 5 feet in from the water's edge and a low metal fence some 33 feet in from the bollards, which has occasional gaps. A line of light fixtures is integrated with the fence. Pedestrians and slow-moving public buses, which come by only infrequently, share the area between the bollards and the fence. Just inside the fence is a slightly recessed, 10-foot-wide, two-way cycle track, surfaced with concrete stamped in a brick pattern. Beyond this, a 20-foot-wide cobblestone sidewalk fronts the buildings and park.

Except for an occasional bench along the sidewalk and the grass of the park, there is no place to sit along the promenade apart from about 20 chairs and tables lined up along the sidewalk near a refreshment kiosk at the ferry dock. During the day there is no shade on the promenade except that cast by occasional clusters of linden trees.

The southern side of the lake is lined with a succession of differently design promenades. Starting in the west, the promenade at Hammarby Kaj has a workaday feel. Eight- to nine-story residential buildings with ground floor commercial spaces front onto it, along with a few remaining



Storm water management system within the Hammarby Sjöstad neighborhood



The promenade along Norra Hammarbyhamnen

The promenade along Hammarby Kaj



industrial buildings. A narrow 11-foot-wide sidewalk fronts the buildings, followed by a 20-foot-wide two-way road, then another 15-foot-wide walk bounded by a metal guardrail. Next to this walk runs a 13-foot-wide lower walk, some 3½ feet down, accessible by ramps. It has three continuous steps along its waterside, where people sometimes sit and may even picnic on a summer evening. Boats tie up at a few places along the lowest step, which is 2½ feet wide, but elsewhere there is no edge protection, and so walking along it can feel hazardous.

East of Hammarby Kaj, the promenade wends around a park, passes a ferry dock, and then runs along the southwest side of the Sickla canal, passing a line of pleasure boats. It is lined with residential buildings, with those near the ferry dock having ground floor restaurants. Here, the promenade is 28 feet wide and surfaced in concrete. Clusters of linden trees are set toward the middle of the promenade within an 8-foot-wide cobblestone strip. Benches facing the water are set under the trees. A simple metal railing lines the bulkhead. Down below, a 12-foot-wide wooden dock, along which people can walk, cantilevers from the bulkhead's side.

A very different kind of promenade runs along the other side of the Sickla canal and around a promontory that protrudes into the lake. Part of this promenade is a gravel path, but most of it is a 12-foot-wide wooden boardwalk, elevated over a constructed wetland. The main boardwalk meanders through reeds and under overhanging trees for almost a mile. A number of boardwalk spurs lead off into the reeds, ending at docks or seating platforms, where people go to sunbathe, eat a meal, or sit with friends. In some places, wood benches are mounted on the boardwalk. Elsewhere, narrow wooden platforms parallel the boardwalk one step down from it, offering more places to sit or lie down. In short, this is a very sylvan atmosphere. At night, the path is lighted with bollard downlights spaced about 24 feet apart which provide a gentle illumination, contributing to the bucolic feeling.

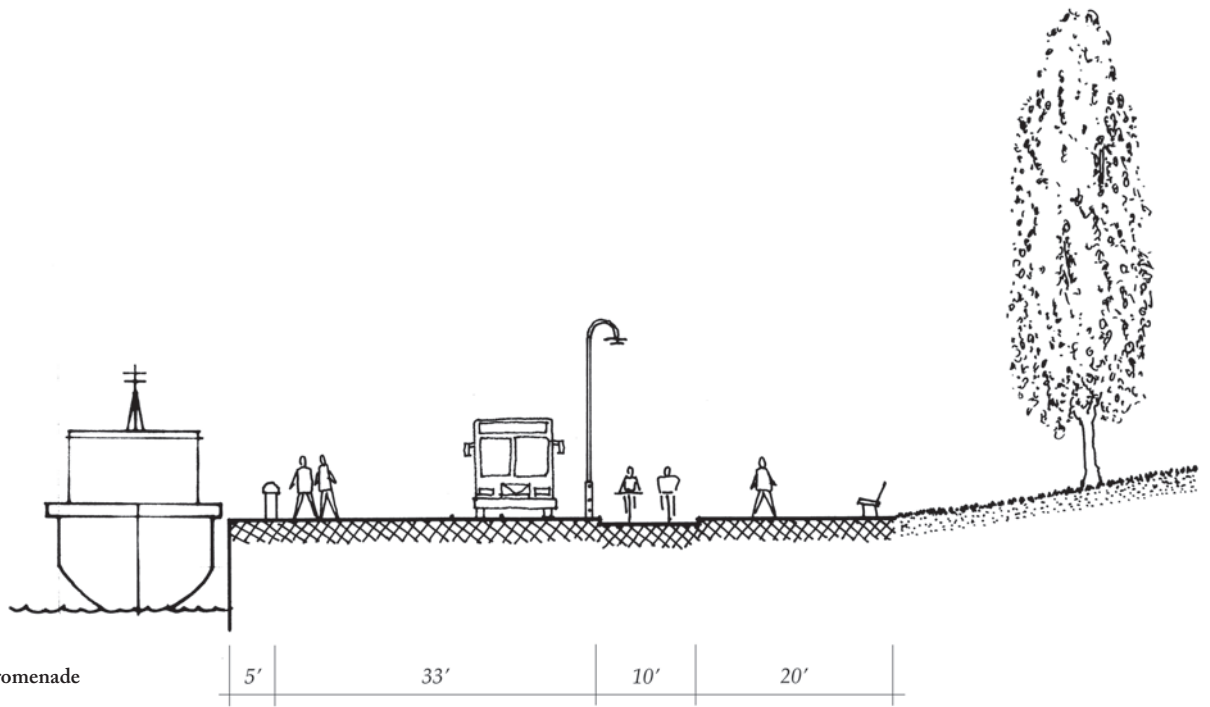
Beyond the boardwalk, the promenade continues around the lake and along the east side of the Danviks canal. It skirts a park and a wooden bathing platform, and then runs around a marina basin and along a canal. This area has many restaurants and can be lively at night, but the promenade itself has few places to sit and offers little shade.

Promenade Use

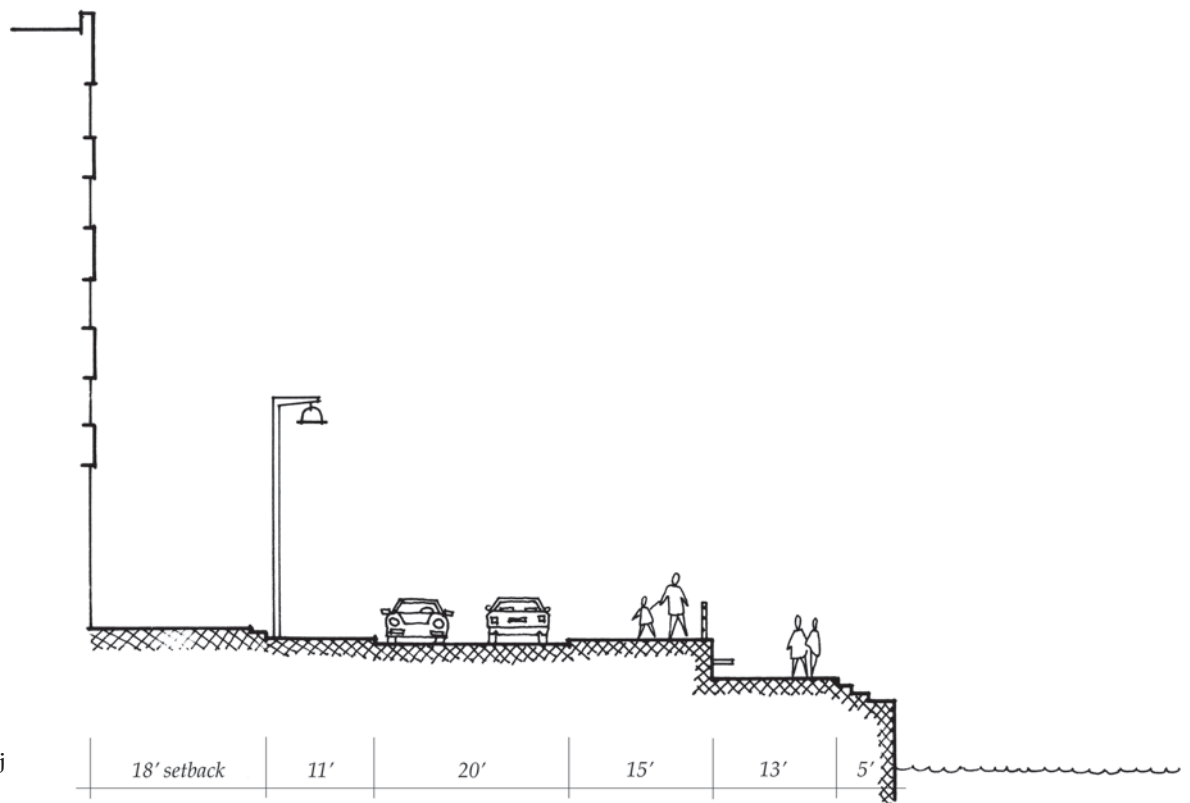
People from the neighborhood seem to be the main users of the Hammarby Sjöstad promenades, probably because there are many long-standing waterfront promenades around the city's more central islands and people from neighborhoods on those islands go to them. The boardwalk through the



The promenade along the southwest side of the Sickla Canal near the ferry dock



Section: Norra Hammarbyhamnen promenade
Scale: 1" = 20'

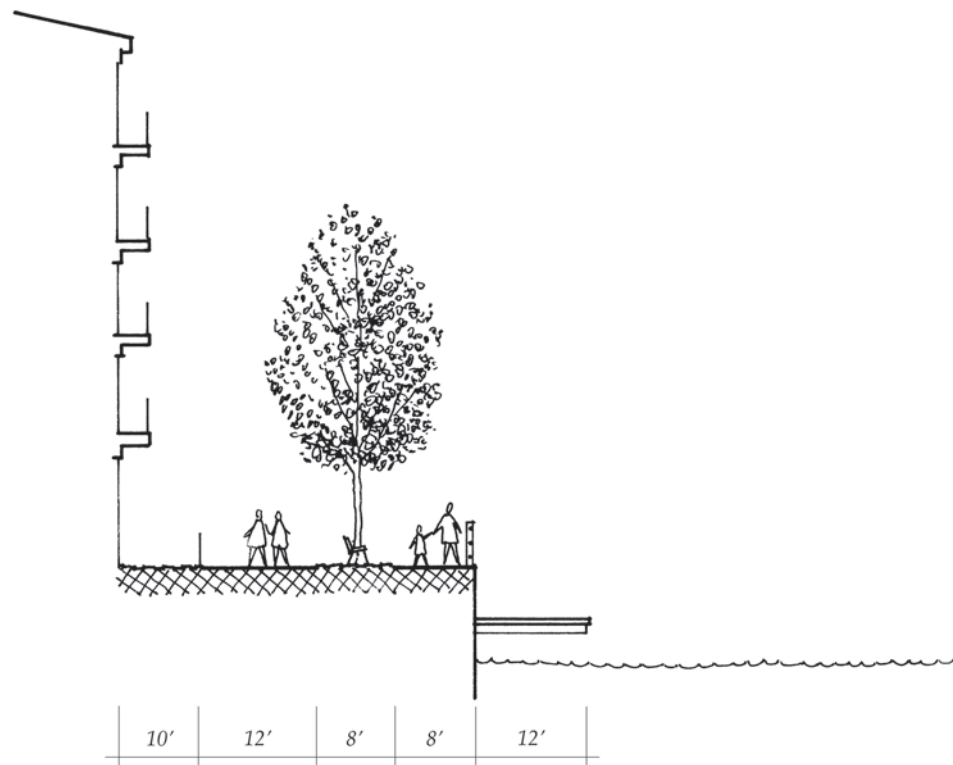


Section: Hammarby Kaj promenade
Scale: 1" = 20'

wetland is the most highly used. Late on a warm summer's evening, as the sun was slowly setting, 354 people per hour moved along it, most on foot (84%), the others biking. Most people were moving leisurely and most were with others, primarily in couples. Less than a quarter of the people observed were alone.



The wetland boardwalk



Section: Sickla Canal promenade
Scale: 1" = 20'

Hammarby Sjöstad's waterfront promenades have a comfortable neighborhood feel to them and they are clearly the district's main social gathering place for leisurely activity. The wetland boardwalk is the promenade most in consonance with the ecological focus of the district and also provides a signature identity for the neighborhood. Here, the soft marsh edge provides natural water management and the elevated boardwalk and platforms respect the marsh's functioning and help educate people about natural processes by bringing them into the marsh.

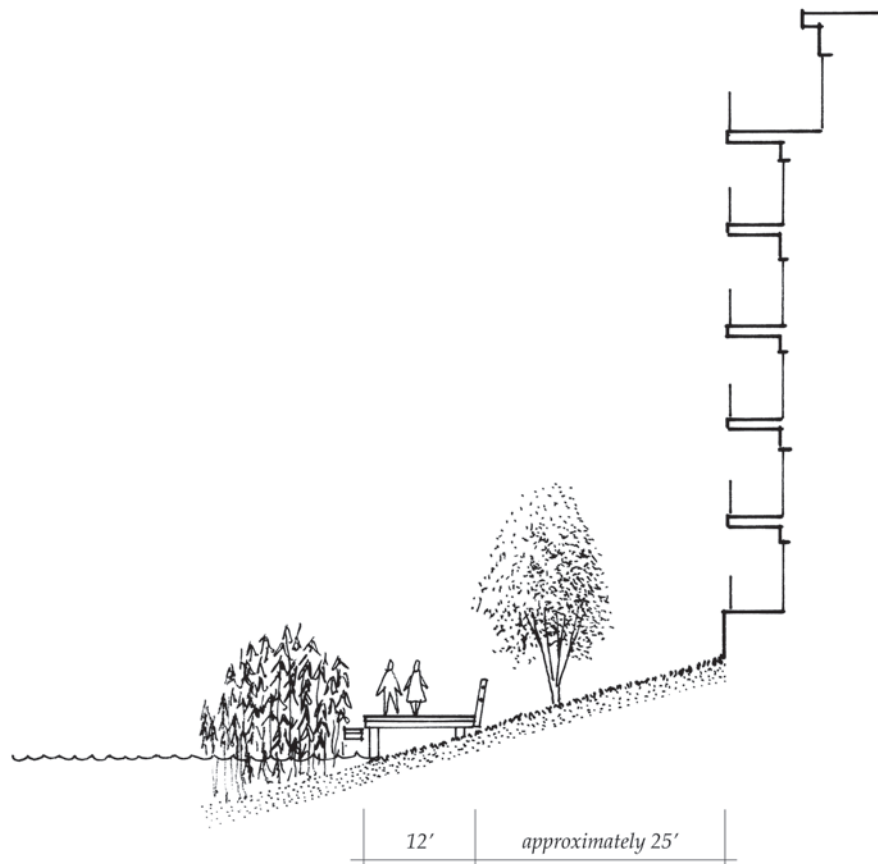


The wetland boardwalk and community bathing platform

Climate Change and Sea Level Rise Concerns

The Hammarby Sjöstad promenades are in an important location relative to Stockholm's complex sea level rise issues. The islands of central Stockholm sit astride four narrow passageways where Lake Mälaren connects with the Baltic Sea. The lake is Stockholm's main source of fresh water, and since 1943, locks and floodgates at these passages have maintained stable water levels in it, keeping salt water intrusion out during high tide events and releasing fresh water into the sea when lake level gets too high during flood events.⁴ One of the floodgates is the Hammarby Canal lock at the west end of Hammarby Lake. Currently, the mean water level of Lake Mälaren is 66 centimeters (2.2 feet) above the mean water level of the Baltic Sea.⁵ Future sea level rise of the Baltic Sea will be somewhat mitigated by land uplift, which has been occurring at the rate of 4 millimeters a year since the end of the last ice age when the glaciers that used to cover Sweden melted,⁶ but it is predicted that by 2100 Lake Mälaren will be only 22 centimeters (8.66 inches) above the Baltic Sea.⁷ Climate change will mean increased rainfall, more water flowing into Lake Mälaren, and more risk of flooding around the lake, but with a higher sea level it will be more difficult to discharge lake water into the sea and to keep saltwater intrusion out.⁸

The biggest floodgate between Lake Mälaren and the Baltic is at Slussen, which lies between Södermalm and Gamla Stan, the historic city center island. The city has for some time been planning to rebuild the Slussen lock and the highway and transit infrastructure associated with it. A plan prepared in 2008 envisions a massive renovation including new waterfront public spaces and new development, but controversy has held up its implementation. No plans have been made to rebuild the Hammarby Canal lock, but it's a good guess that something will be done to it in time, perhaps including something that will protect Hammarby Sjö from sea level rise. Meanwhile, the lake's bulkheads seem high enough to protect the neighborhood for some time to come.



Section: Wetland Boardwalk,
along the northeast side of Sickla
Canal
Scale: 1" = 20'

Western Harbour Promenades, Malmö, Sweden



Scale: 1:400,000

Promenades wrap the seafront of Malmö's Western Harbour ecological district being built on former industrial lands close to the city's downtown. Since their construction about a decade ago, the promenades and the parks through which they run have become among the city's most popular and frequented public open spaces, collectively functioning as something of an urban living room. The promenades are fronted mostly with residential buildings, plus a handful of restaurants and small eateries, and so have a neighborhood ambience. At the same time, they have a distinctly urban feel because of the many people who come to them and the social life that occurs on them. This is particularly true of one promenade segment, called Sundspromenaden (Sound Promenade), which is lined with a long wooden multi-stepped structure that is a favored place for gathering. This gregarious new public space is emblematic of the outgoing and forward-looking image the city is seeking to create for itself.

Malmö lies toward the southern tip of Sweden along the eastern shore of the wide sound that separates the Swedish peninsula from the islands of Denmark. With a population of about 300,000, it is Sweden's third largest city and a major commercial center. Long associated with industry, the city has over the last several decades rebranded itself as a "city of knowledge"⁹ and the spearhead of this effort is the new eco-district.

The Western Harbour District, which will eventually cover approximately two-thirds of a square mile (432 acres or 175 hectares), sits on a peninsula of reclaimed land that was created in successive stages from the early 1900s through the mid-1980s, and long occupied by shipbuilding industries and then car manufacturing industries. In the early 1990s, after these industries had left, the city bought the land and began developing the eco-district. The newly founded University of Malmö opened there in 1998, and in 2001 a pedestrian-oriented neighborhood was built along the western edge of the peninsula as part of the European Housing Expo Bo01. Three more neighborhoods have since been built and more are being planned.¹⁰

The celebrated sustainability features of the district include energy efficient buildings, green roofs, permeable ground surfaces and an open storm water system, energy producing solar panels and



Scale: 1:40,000



Storm water catchment strategies have been designed into the public realm throughout the Western Harbour District

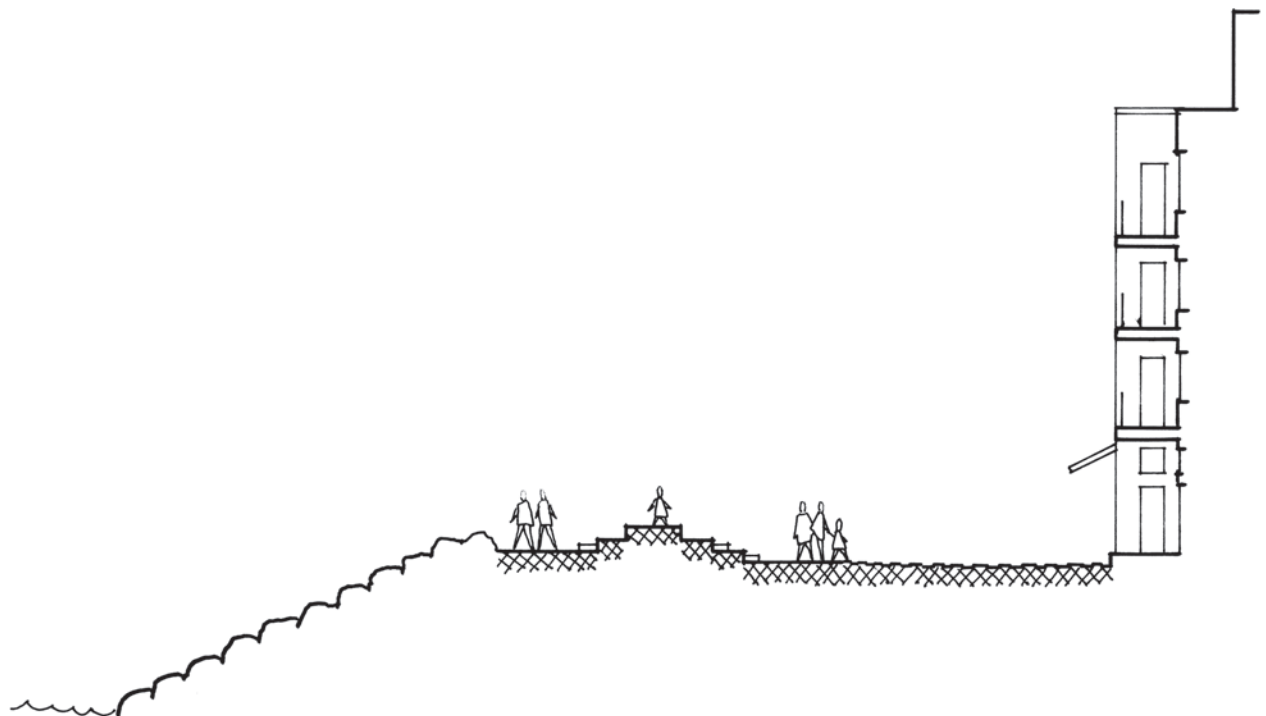
wind turbines, a district heating and cooling system fueled by natural aquifers, and a community wide recycling system that generates biogas from food waste. A working port surrounded by industrial land abuts the eco-district's eastern edge, so some industrial ambience remains.

Promenade Design Characteristics

The sea-facing northern and western sides of the Western Harbour peninsula are lined with parks that link with an older park along the city's western beachfront. Walking and biking paths in the new parks link with a path in the beach park. Walkers and bikers mix on the new paths and are segregated, though just barely, on the older path. With the exception of the Sundspromenaden, all the paths are simply designed with emphasis being placed on structures that give access to the water.

Moving from east to west starting at the northeast tip of the peninsula, the walk begins with a narrow asphalt path running between a raised riprap revetment and wide, grassy lawns. Toward its middle, this path runs past a wide wooden deck that gives access to three bathing piers. Turning a corner and heading south, the path diverges into two separate paths that go around a landscaped area. One path, surfaced with decomposed granite, runs at the water's edge along a parapet wall that tops a steeply inclined riprap embankment. The other runs at the edge of buildings facing the park, and is surfaced with pavers. The water's edge path gives access to a large elevated viewing platform and to three sets of steps leading down to circular bathing platforms. The paved and unpaved paths come together at a broad plaza, which juts over the sea at an angle.

Next comes the Sundspromenaden, beyond which the path leads south through a wide plaza fronting a small marina, crosses a short wood plank bridge spanning a short canal, and then runs along the side of a longer canal, eventually merging with the almost two-mile-long Ribersborgsstigen path that runs along a series of grassy meadows lying back of dunes fronting the beach. This asphalt-paved path is 25 feet wide and has a white strip painted down its middle and painted icons signifying that



Section: Sundspromenaden
Scale: 1" = 20'

approximately 40'

10'

3'

6'

3'

3'

10'

varies 13' - 50'



Sundspromenaden in the early evening

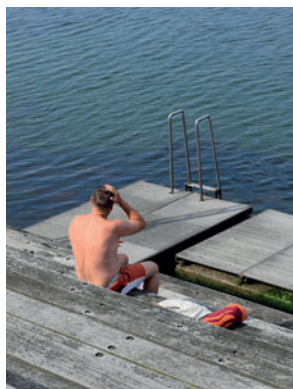
bikers should keep to the outside and walkers to the inside. Along its length, it gives access to paths leading across the meadows, dunes, and beach to ten bathing piers, some long and elaborately designed and others more modest.

The Sundspromenaden segment is about 720 feet long and consists of a multi-level boardwalk backed by an asphalt path. The dimensions are modest: a 10-foot-wide boardwalk path closest to the water, a 6-foot-wide raised boardwalk flanked on both sides by continuous 3-foot-wide steps, and a 10-foot-wide asphalt path on the inland side. The promenade sits atop a high riprap embankment and gives access to the water at one location via broad steps leading down to a bathing platform. There is no shade along the Sundspromenaden, or any of the other promenades, but this is the far north and Swedes apparently like to be in the sun whenever they can.

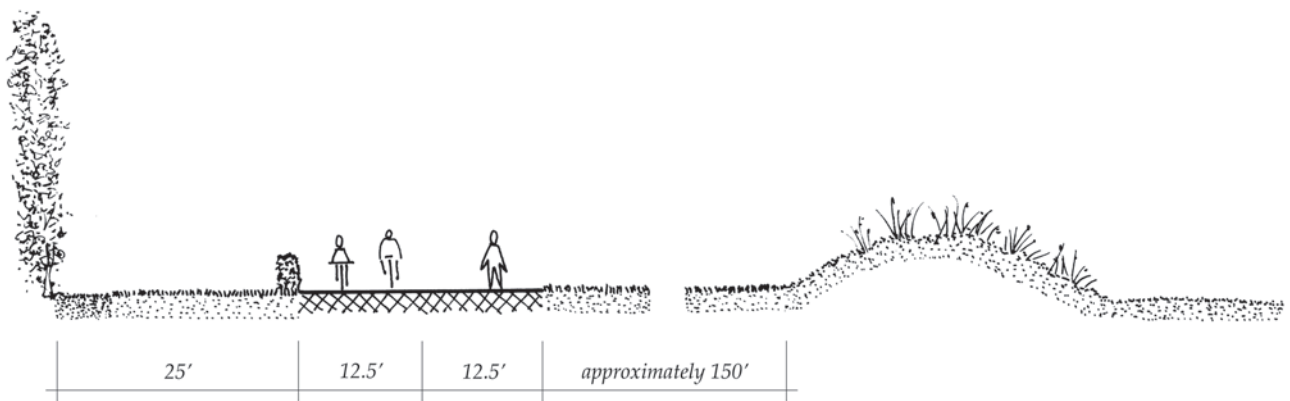
Five-story residential buildings front the Sundspromenaden, some of which have restaurants or cafés at the ground floor. The buildings are set at an angle to the promenade, creating a series of saw-toothed plazas at the edge of the promenade's asphalt path, onto which people can and do overflow. Similar buildings front the park spaces further north. These buildings are designed to provide wind protection for lower-scale residential buildings inland, because winter winds off the Øresund can be vicious.

Promenade Use and Connectivity

People use all of the Western Harbour promenades when the weather is the least bit good, with late afternoons and evenings being particularly popular times to visit them, especially in



Bathing platform along the Sundspromenaden



Section: Ribersborgsstigen path
Scale: 1" = 20'



Ribersborgsstigen path on a Sunday morning

the summer. The Sundspromenaden is generally the most active area in the evening. On warm summer nights, the step along the raised platform facing the water is often completely full of people watching the long, slow sunset, many enjoying a picnic meal, complete with wine. One hundred and thirty-one people were observed sitting there at 8:15 pm on a Saturday night in July. At the same time, 1,299 people per hour were moving along the promenade. A few used the outer boardwalk at the water's edge, but most pedestrians and all the cyclists used the inner asphalt path, perhaps out of courtesy to not interrupt the views of those sitting. Most people were strolling (80%) and the rest were biking. Most were in couples or groups. Because of the constrained space, everyone was moving slowly, but nobody seemed to mind. In all, the atmosphere was calm and relaxed. Just north of the promenade, on the broad plaza angling over the water, couples were tango-dancing to soft music.



The promenade along the northern tip of the Western Harbour



Strolling along the Sundspromenaden in the late afternoon

Tango dancing at sunset on the platform at the northern end of the Sundspromenaden



The Sundspromenaden illustrates how much can be achieved with a promenade that is relatively narrow and not very long. Key to its success is an abundance of seating that is conducive to social gathering, and the relaxed atmosphere generated by the lack of any nearby vehicle traffic and the moderate amount of commercial activity.

Fewer people promenade along the Ribersborgsstigen path, which is more of an exercise trail than a promenade. On a sunny Sunday morning in May, 357 people per hour were observed moving along it, almost 60 percent on bikes.

The many people who visit the Sundspromenaden and the other new park promenades get there by walking, cycling, or public transit. In keeping with the eco-district objectives, few nearby parking areas have been provided but even though the promenades are at some remove from the rest of the city they are easily accessible via the city's extensive system of connected bicycle and walking paths and two bus lines. The neighborhood adjacent to the promenade is largely pedestrianized and otherwise traffic-calmed so it is not necessary to cross major traffic streets to get to the waterfront. Access to the Ribersborgsstigen path and to the beach can be had at several park entries, serviced by car parking lots, public transit stops, and pedestrian and bicycle paths.

Climate Change and Sea Level Rise Concerns

Like so many other coastal cities, Malmö faces challenges from future sea level rise related to climate change. Sweden's land mass is experiencing uplift, so the relative local sea level rise along Malmö's coast will be less than the global average, but is still projected to be sizable.¹¹ The Western Harbour District was planned around the assumption that by 2100 the sea level will have risen .22 to .66 meters (.72 to 2.2 feet) above the current level, and that extreme flood heights could reach 3 meters (9.8 feet). The western edge of the Western Harbour district where the Sundspromenaden is located sits above the 3-meter line and the revetment in front of the promenade is designed to protect against wave action, so it is in a position of some safety. However, other parts of the Western Harbour, as well as the beach area to the southwest and parts of the central city just inland, are lower than 3 meters and so some protective action will at some time become necessary. Meanwhile, the city has enacted a policy that requires all new buildings be constructed with ground floors raised above the 3-meter flood zone.¹²

On the one hand, the sea level rise predictions are ominous. On the other hand, the city seems up to the many challenges, given its ecological awareness. Answers to Malmö's specific problems may not be known now but recent history suggests that the city will look for answers and put them into operation as becomes necessary.

HafenCity Promenades, Hamburg, Germany



Scale: 1:400,000

Since 2002, a major new mixed-use development, HafenCity, has been under construction in Hamburg on former docklands protruding into the Elbe River near the historic city center. A series of innovatively designed promenades, meant to sometimes flood, line the water's edge of areas so far developed, and more floodable promenades will be built in future development phases.

Hamburg, which sprawls along both banks of the Elbe River some 65 miles upstream from the North Sea, is Germany's second largest city and its largest port. HafenCity is replacing just a small part of the port but is a monumental undertaking that will expand Hamburg's city area by 40 percent. The development is being built from west to east in ten different neighborhoods, with completion expected by 2025. In all, it will occupy 388 acres (157 hectares), 20 percent of it water. Plans call for a total gross floor space of 2.32 million square meters, to include housing for 12,000 people and space for 45,000 service and office jobs.¹³ Major cultural facilities include a new HafenCity University and a philharmonic concert hall. Recreational facilities include a number of parks and over 10.5 kilometers (6.5 miles) of waterfront promenades.

The particular qualities of the Elbe River have contributed to HafenCity's unique design. The Elbe River is one of Europe's major rivers, draining a catchment area of over 57,000 square miles. From the coast to a weir beyond Hamburg, it has significant twice-daily tidal cycles, with a tidal range of 3.6 meters (12 feet) at Hamburg.¹⁴ Storm surge can elevate the water even higher. While central Hamburg is protected from flooding by a high dike, HafenCity sits outside the dike, occupying a series of layered quays that stretch parallel to the river's edge from a landmass that was originally an island in the river. The self-imposed challenge was how to develop the quays with flood protection and yet allow people to get close to the water. The design solution was to raise habitable spaces above the flood level and create floodable promenades at a lower level.

Throughout HafenCity, roadways and building ground floors are set at 7.3 meters (23.9 feet) above mean sea level (MSL), matching the flood protection benchmark set for the central city, but the promenades along the edges of the quays are at the original quay height of 4.5 to 5.5 meters



Scale: 1:40,000

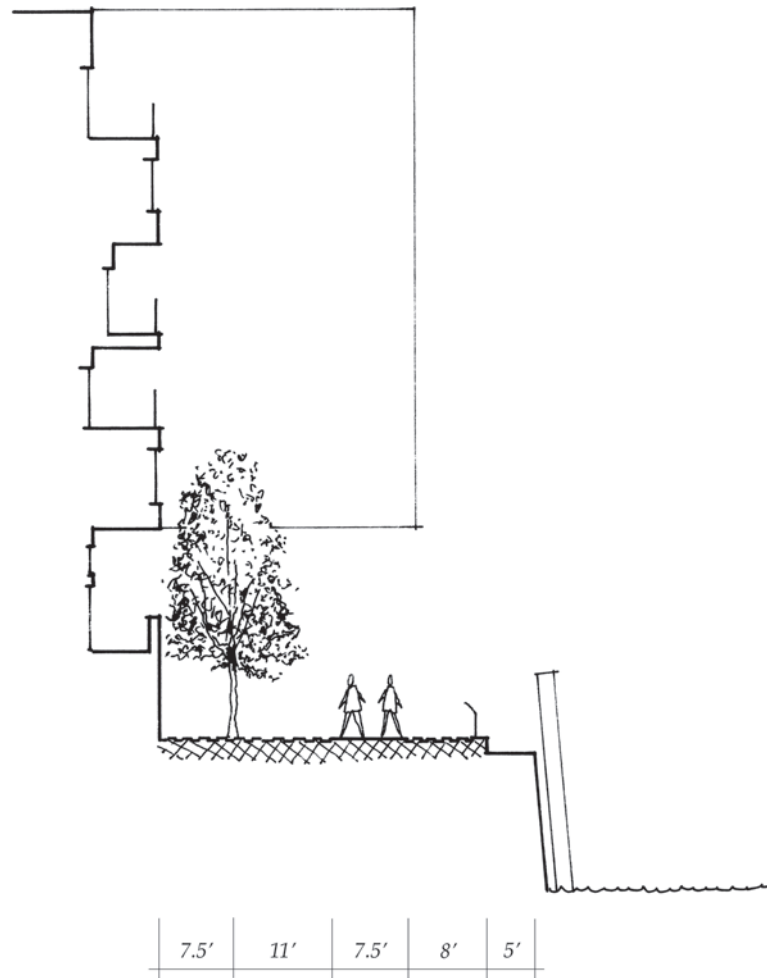
Sandtorhafen harbor basin, with the Sandtorkai promenade on the left



Grasbrookhafen harbor basin, looking over the Dalmannkai promenade



(13.1 to 16.4 feet) above MSL. Building basements along the promenades contain parking garages enclosed in “bathtub” containers, some of which are lined with retail spaces and cafés that can be closed off with massive steel panels during very high water, others of which present blank walls to the promenades.



Section: Kaiserkai promenade
Scale: 1" = 20'

Promenade Design Characteristics

The promenades in the first completed neighborhood, Am Sandtorkai/Dalmannekai, are representative of how the promenades are being designed. The neighborhood is structured around two harbor basins. The inner basin, Sandtorhafen, has promenades along both sides of it, and also another promenade atop a line of pontoons floating on the water, which provide moorage for traditional harbor craft. The outer harbor basin, Grasbrookhafen, has a promenade along its north side.

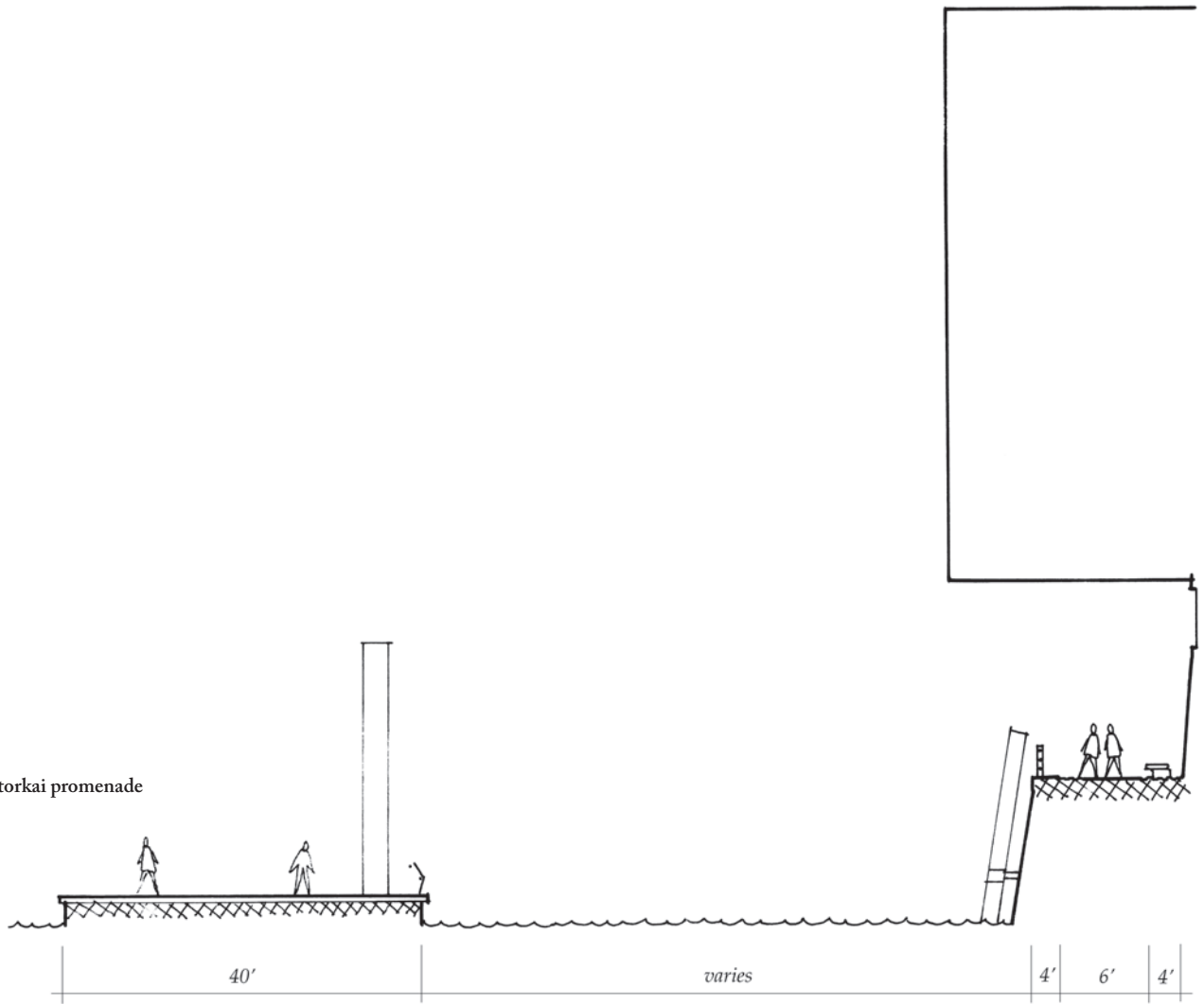
The promenades lining Sandtorhafen are each different. The one on the south side, Kaiserkai, is 34 feet wide and the one on the north side, Sandtorkai, is 14 feet wide. Neither have any commercial spaces along them, so the walks are along blank facades. Along the latter, cantilevered buildings overhang the walkway some 35 feet overhead, giving a sense of enclosure to the promenade that is not always comfortable. The cobblestone surface has a 6-foot-wide concrete path toward the center. Occasional benches are placed at the building line. Kaiserkai has a more open feel, several small trees along it, and only a handful of benches. The floating pontoon walk is 40 to 65 feet wide and accessible via two gangway ramps from the north side promenade and a third from the plaza at the head of the harbor.

The Dalmannekai promenade along Grasbrookhafen is about 47 feet wide and has commercial uses fronting onto it, including restaurants and cafés whose tables spill onto the promenade, plus a few small shops whose wares also spill out. The promenade is surfaced with cobblestones except for a 7-foot-wide concrete band that is the walking/cycling throughway. There are some benches in the cobblestone areas on both sides of the path and some trees along the inner area that are widely spaced

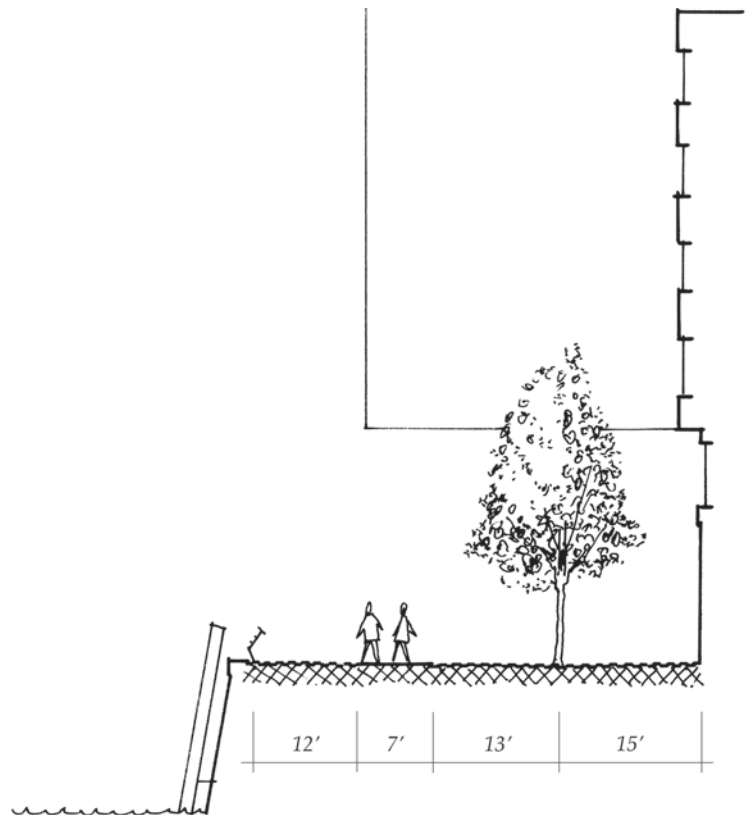


The blank facades along the Kaiserkai promenade are embellished with art

Section: Sandtorkai promenade
Scale: 1" = 20'



Section: Dalmannkai promenade
Scale: 1" = 20'



and as yet small, not offering much shade. A tree-lined linear park lies along the outer edge of the promenade at its western end, and beyond this is a ferry dock.

Promenade Use and Connectivity

From within HafenCity the promenades are easily accessible via broad stairs at the harbor basin heads into which ramps serving both wheelchairs and bicycles have been integrated. The promenades can also be reached mid-block by wide stairs into which sitting places are integrated. However, access to the promenades from the city center is very constrained, limited to four bridges that span the Zollkanal and the historic Speicherstadt district of former warehouses that lie between this part of HafenCity and the city's dike. A new rapid transit line under construction will eventually better connect HafenCity with the rest of the city, making the promenades more accessible.

For now, the lack of easy access to HafenCity from the rest of the city is likely the reason the promenades do not yet see much regular activity. On weekdays, the promenades are most used during the lunch hour, but numbers are not high. Office workers walk along the promenade on the north side of Sandtorhafen going to and from the district's many eating establishments, joined by handfuls of tourists. On an overcast day in late July 2014, 549 people per hour were observed moving along the promenade around noon, only a handful on bikes. Almost as many people were strolling along Grasbrookhafen during the noon hour, many on their way to or from the cafés or the ferry dock or just strolling along enjoying views of the river that this promenade affords. On summer weekends, the open plazas at the quay heads are programmed with special events, such as concerts, which draw people to HafenCity and more people to the promenades. Likely, there will be more activity on the promenades in the future after HafenCity is completely developed and more people are living and working here.

Climate Change and Sea Level Rise Concerns

The Elbe River is going to be impacted by future sea level rise because its fluvial dynamics are closely connected with those of the North Sea. The North Sea has frequent storms and the associated storm



Dalmannkai promenade during lunch hour

Sandtorkai promenade during lunch hour



surge reaches up the Elbe Estuary to Hamburg. With climate change, the frequency and severity of storms is expected to increase and hence Hamburg stands to experience more frequent and larger storm surge events in the future. The city's 7.3-meter-high dike was built following the major flood of 1962 that inundated a large part of city, destroyed over 20,000 buildings, and killed over 300 people.¹⁵ The question is whether this benchmark, which was used to set the ground height in HafenCity, will be adequate to contain flooding in the future. Sea level rise along Germany's coast is expected to be close to the global average, and some of the rise would translate up the Elbe River.¹⁶ The Intergovernmental Panel on Climate Change projects that global sea level might rise by as much as .98 meters (3.2 feet) by 2100.¹⁷ Should this much rise occur, HafenCity's promenades could be overtopped by regular tidal flows, as well as during flood events. Floods have inundated the promenades several times since they were built, most notably in 2013. It is likely that the promenades will be inundated more frequently as time goes on.

The approach taken with the promenades at HafenCity, allowing them to flood periodically, offers a possible approach that could be taken by other cities in adapting their existing promenades to sea level rise as well as in the planning of new ones.

Notes

- 1 "Hammarby Sjöstad – a New City District with Emphasis on Water and Ecology" (GlashusEtt, 2011; Development Office, Box 8189, SE-104 20 Stockholm, Sweden).
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- 3 *Ibid.*, 98–101.
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