

The Dutch Have Solutions to Rising Seas

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In the waterlogged Netherlands, climate change is considered neither a hypothetical nor a drag on the economy. Instead, it's an opportunity.

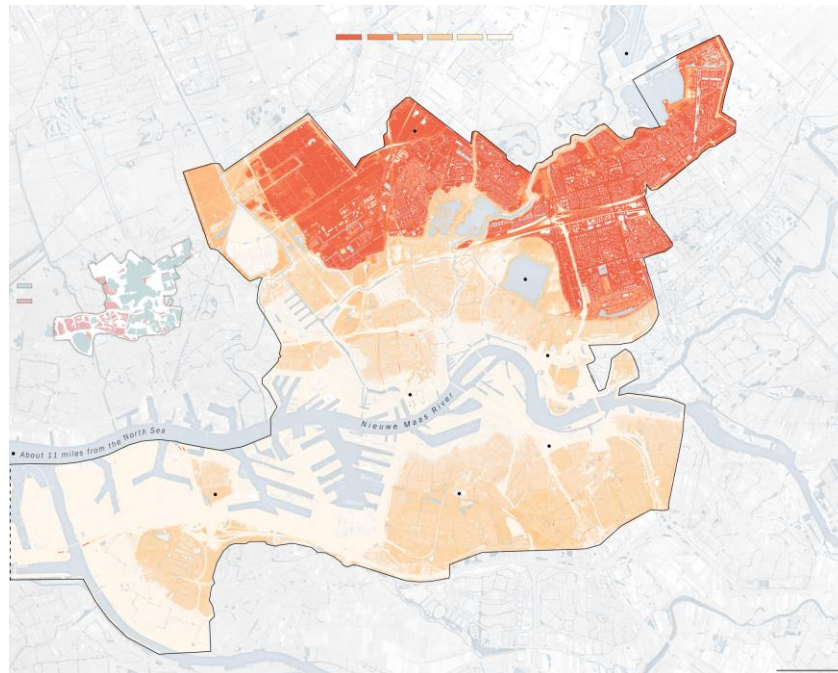
By [MICHAEL KIMMELMAN](#), Photographs by [JOSH HANER](#) JUNE 15, 2017

ROTTERDAM, the Netherlands — The wind over the canal stirred up whitecaps and rattled cafe umbrellas. Rowers strained toward a finish line and spectators hugged the shore. Henk Ovink, hawkish, wiry, head shaved, watched from a V.I.P. deck, one eye on the boats, the other, as usual, on his phone.

Mr. Ovink is the country's globe-trotting salesman in chief for Dutch expertise on rising water and [climate change](#). Like cheese in France or cars in Germany, climate change is a business in the [Netherlands](#). Month in, month out, delegations from as far away as Jakarta, Ho Chi Minh City, New York and New Orleans make the rounds in the port city of Rotterdam. They often end up hiring Dutch firms, which dominate the global market in high-tech engineering and water management.

That's because from the first moment settlers in this small nation started pumping water to clear land for farms and houses, water has been the central, existential fact of life in the Netherlands, a daily matter of survival and national identity. No place in Europe is under greater threat than this

waterlogged country on the edge of the Continent. Much of the nation sits below sea level and is gradually sinking. Now climate change brings the prospect of rising tides and fiercer storms.



Source: Municipality of Rotterdam

From a Dutch mind-set, climate change is not a hypothetical or a drag on the economy, but an opportunity. While the Trump administration withdraws from the Paris accord, the Dutch are pioneering a singular way forward.

It is, in essence, to let water in, where possible, not hope to subdue Mother Nature: to live with the water, rather than struggle to defeat it. The Dutch devise lakes, garages, parks and plazas that are a boon to daily life but also double as enormous reservoirs for when the seas and rivers spill over. You may wish to pretend that rising seas are a hoax perpetrated by scientists and a gullible news media. Or you can build barriers galore. But in the end, neither will provide adequate defense, the Dutch say.

And what holds true for managing climate change applies to the social fabric, too. Environmental and social resilience should go hand in hand, officials here believe, improving neighborhoods, spreading equity and taming water during catastrophes. Climate adaptation, if addressed head-on and properly, ought to yield a stronger, richer state.

This is the message the Dutch have been taking out into the world. Dutch consultants advising the Bangladeshi authorities about emergency shelters and evacuation routes recently helped reduce the numbers of deaths suffered in recent floods to “hundreds instead of thousands,” according to Mr. Ovink.

“That’s what we’re trying to do,” he said. “You can say we are marketing our expertise, but thousands of people die every year because of rising water, and the world is failing collectively

to deal with the crisis, losing money and lives.” He ticks off the latest findings: 2016 was the warmest year on record; global sea levels rose to new highs.



Rowing teams practice at the Eendragtspolder, a site intended to be both a public amenity and a reservoir for floodwater.

He proudly shows off the new rowing course just outside Rotterdam, where the World Rowing Championships were staged last summer. The course forms part of an area called the Eendragtspolder, a 22-acre patchwork of reclaimed fields and canals — a prime example of a site built as a public amenity that collects floodwater in emergencies. It is near the lowest point in the Netherlands, about 20 feet below sea level. With its bike paths and water sports, the Eendragtspolder has become a popular retreat. Now it also serves as a reservoir for the Rotte River Basin when the nearby Rhine overflows, which, because of climate change, it's expected to do every decade.

The project is among dozens in a nationwide program, years in the making, called Room for the River, which overturned centuries-old strategies of seizing territory from rivers and canals to build dams and dikes. The Netherlands effectively occupies the gutter of Europe, a lowlands bounded on one end by the North Sea, into which immense rivers like the Rhine and the Meuse flow from Germany and France. Dutch thinking changed after floods forced hundreds of thousands to evacuate during the 1990s. The floods “were a wake-up call to give back to the rivers some of the room we had taken,” as Harold van Waveren, a senior government adviser, recently explained.

“We can’t just keep building higher levees, because we will end up living behind 10-meter walls,” he said. “We need to give the rivers more places to flow. Protection against climate change is only as strong as the weakest link in the chain, and the chain in our case includes not just the big gates and dams at the sea but a whole philosophy of spatial planning, crisis management, children’s education, online apps and public spaces.”



To earn a swimming certificate, fifth graders practice in the pool with their clothes on.

Mr. van Waveren was talking about a national GPS-guided app created so that residents always know exactly how far below sea level they are. To use public pools unrestricted, Dutch children must first earn diplomas that require swimming in their clothes and shoes. “It’s a basic part of our culture, like riding a bike,” Rem Koolhaas, the Dutch architect, told me.

In the Netherlands, scholarly articles about changes to the Arctic ice cap make front-page headlines. Long before climate change deniers began to campaign against science in the United States, Dutch engineers were preparing for apocalyptic, once-every-10,000-years storms. “For us, climate change is beyond ideology,” said Rotterdam’s mayor, Ahmed Aboutaleb. He took me one morning around new waterfront development in a formerly poor, industrial neighborhood, to show how urban renewal dovetails with strategies to mitigate the effects of climate change.

“If there is a shooting in a bar, I am asked a million questions,” Mr. Aboutaleb said of his city. “But if I say everyone should own a boat because we predict a tremendous increase in the intensity of rain, nobody questions the politics. Rotterdam lies in the most vulnerable part of the Netherlands, both economically and geographically. If the water comes in, from the rivers or the sea, we can evacuate maybe 15 out of 100 people. So evacuation isn’t an option. We can escape only into high buildings. We have no choice. We must learn to live with water.”

A Moroccan-born Muslim and a rising star in the Dutch political world who denounces religious radicals and reactionary nationalists alike, the mayor runs a traditionally tough, working-class city. Rotterdam today is anything but a paradise. It is riven by social fissures and discord over immigration. But it has begun to improve in recent years as it has become greener and more diverse. When asked about climate threats, the mayor talks about creating a less divided, more attractive, healthier city — more capable of facing the stresses climate change imposes on society.

“That’s just common sense,” Mr. Aboutaleb said. The Eendragtspolder is one example, he pointed out, repaying Rotterdam’s investment with green spaces and the rowing course, which has the added perk of aiding a prospective Dutch bid for the 2028 Olympics.

Leveled by bombs during World War II, Rotterdam is not quaint and touristic like Amsterdam but industrial, down to earth, a surprisingly stylish sleeper among Europe’s cultural hubs, with a legacy of radical architecture, attracting young designers and entrepreneurs. Its tradition of openness has made it a magnet for outsiders and helped it recover from years of hardship, when, during the 1970s, ’80s and ’90s, it became notoriously crime-ridden and filthy, a place wealthy people fled.

Lately the city, accustomed to starting over, has reinvented itself as a capital of enterprise and environmental ingenuity. It has pioneered the construction of facilities like those parking garages that become emergency reservoirs, ensuring that the city can prevent sewage overflow from storms now predicted to happen every five or 10 years. It has installed plazas with fountains, gardens and basketball courts in underserved neighborhoods that can act as retention ponds. It has reimagined its harbors and stretches of its formerly industrial waterfront as incubators for new businesses, schools, housing and parks.

These are all stops on the standard tour for visiting foreign delegations: proof-of-concept urban interventions, if not actually all-encompassing solutions, that address climate threats in ways that incrementally serve the economy and social needs.

“A smart city has to have a comprehensive, holistic vision beyond levees and gates,” as Arnoud Molenaar, the city’s climate chief, put it. “The challenge of climate adaptation is to include safety, sewers, housing, roads, emergency services. You need public awareness. You also need cyber-resilience, because the next challenge in climate safety is cybersafety. You can’t have vulnerable systems that control your sea gates and bridges and sewers. And you need good policies, big and small.

“This starts with little things, like getting people to remove the concrete pavement from their gardens so the soil underneath absorbs rainwater,” Mr. Molenaar said. “It ends with the giant storm surge barrier at the North Sea.”



The Maeslantkering, an immense sea gate conceived decades ago to protect the port of Rotterdam.

A Vast Floodgate

That would be the Maeslantkering, built near the mouth of the sea, about a half-hour drive west from downtown Rotterdam — the city's first line of defense. It is the size of two tubular Eiffel Towers, toppled over.

In the 20 years since it opened, the Maeslantkering hasn't actually been needed to prevent a flood, but it is tested regularly just in case. Picnickers line the shore to watch. The trial closings are a little like the Dutch version of the Macy's Thanksgiving Day Parade.

I drove with Mr. van Waveren to see it one day. It is not uncommon here to witness the astonishing sight of ships cruising by overhead. This happens in a country where the highways are frequently below sea level.

The Maeslantkering is a consequence of repeated historic calamities. In 1916, the North Sea overwhelmed the Dutch coastline, inaugurating a spate of protective construction that failed to hold back the water in 1953 when an overnight storm killed more than 1,800 people. The Dutch still call it the Disaster. They redoubled national efforts, inaugurating the Delta Works project that dammed two major waterways and produced the Maeslantkering — the giant sea gate, completed in 1997, keeping open the immense waterway that services the entire port of Rotterdam



*A storm surge in 1953 flooded the Dutch coastline, killing more than 1,800 people. Co
Zeylemaker/Agence France-Presse — Getty Images*

Protecting the port is paramount. Once the world's busiest, Rotterdam's port remains the most important in Europe, each year serving tens of thousands of ships from around the world, supplying steel to Germany, petrochemicals to South America and pretty much everything else to everywhere. The port is still the bedrock industry in this city of more than 600,000, according to port officials, accounting for 90,000 jobs, not to mention another 90,000 workers whose businesses depend on the port, too.

The port supports five oil refineries, belonging to companies including Shell and the Koch brothers, along with a massive coal-fire power plant. Officials say the port accounts for 17 percent of the entire nation's carbon footprint. A central paradox — and to skeptics, the ultimate hypocrisy — of this city's environmental self-branding is that, at heart, Rotterdam's economy continues to rely on the fossil fuel industry.

How the port eventually transitions to a greener economy, authorities concede, is the greatest challenge they face, along with climate change. They describe plans for immense [wind farms](#) in the North Sea and strategies to capture heat from fuel-burning factories to warm the greenhouses that supply the country's agricultural yield. The Netherlands [exports](#) nearly \$100 billion a year in agricultural products, second only to the United States.

In any case, the safe transport of all those raw materials, not to mention the responsibility of keeping the feet of people in the city dry, now and in the future, depends on the Maeslantkering.

The idea behind it, first discussed decades ago, was unprecedented — a monumental gate with two arms, resting on either side of the canal, each arm as tall and twice as heavy as the Eiffel Tower. It was a staggering work of engineering. Wim Quist, the architect, devised an object of surpassing beauty, one of modern Europe's lesser-known marvels.



Photograph by Frans Lemmens/Hollandse Hoogte — Redux

Mr. van Waveren described how it works. When the gate is closed, the arms float out onto the canal, meet and lock, the tubes filling with water and sinking onto a concrete bed, making an impenetrable steel wall against the North Sea. The process takes two and a half hours. Pressure from the sea is then transferred from the wall to the largest ball joints in the world, embedded in the banks on either side of the river.

Computers, using a closed electronic system to avoid cyberattack, monitor sea levels hourly and can shut the gate automatically — or open it. This is critical: Thirty pumps inside the gate are linked to one of the country's power grids. They extract water from the tubes when it is time for the Maeslantkering to be reopened.

If the grid fails, there is a backup grid and, as a last resort, a generator, because even more dangerous than the gate's not closing is the gate's not reopening. In that case, water pouring down from the Rhine and Meuse rivers could not flow into the sea and would overwhelm Rotterdam even more swiftly than the North Sea could. As Mr. Aboutaleb noted, escape would be impossible.

Mr. Ovink said only half-jokingly, "the last resort would be to blow it up." The Maeslantkering was clearly built with Hollywood disaster-movie scenarios in mind: There are redundancies to redundancies, and the barrier is prepared for the most extreme climate change models, with sea levels rising beyond current forecasts.

Even so, Rotterdam port officials have plans underway to add another two feet to the height of the gate.



The Dakpark, a rooftop park incorporated into a dike in Rotterdam.

Reshaping Neighborhoods

Beyond the Maeslantkering, back in town, there are countless fortifications, big and small, knitted into streets and squares. One sunny afternoon, I met Wynand Dassen, manager of Rotterdam's resilience team, and Paul van Roosmalen, who oversees rooftop development for the city, at the Dakpark, a dike in a poor, largely immigrant neighborhood bordering industrial waterfront. The site of the Dakpark used to be a railway switching station, a grim nowhere place abutting a cluster of social housing blocks. This was a red-light district, notorious for drug dealers and crime.

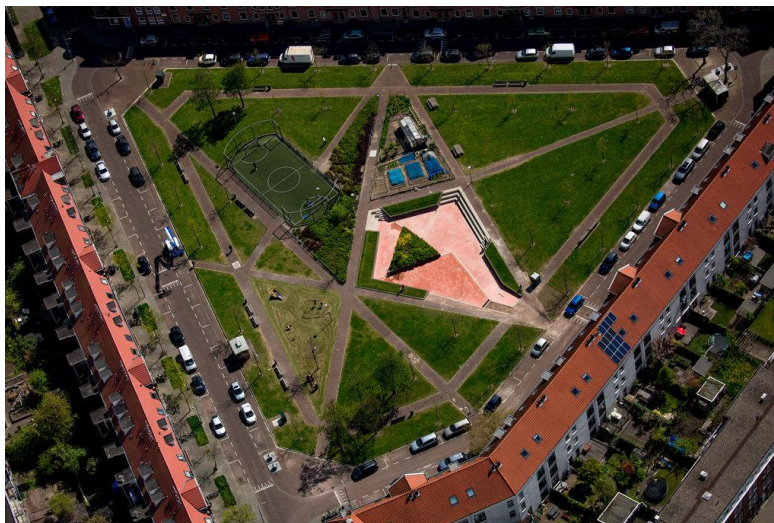
The dike does a lot more than just hold back water. It has a shopping center, which the neighborhood needed, and a park on the roof. Shops face the waterfront and help pay to keep up the park. The park slopes from the roof down to streets and housing blocks, creating a grassy hill that links park and neighborhood.

When the weather is good, sunbathers sprawl on the grassy roof and toss Frisbees. Formal gardens open onto acres of well-kept lawns. The park is a kilometer long. And wonderful. Its success — not only as a barrier but also as a boon to business and the area — has persuaded officials to consult neighborhoods and set aside money for community-initiated projects. “We became invested in getting more people involved in all kinds of civic issues,” Mr. Dassen told me, “and water inevitably becomes an integral part of this process. We believe you get the smartest solutions when communities are engaged and help make the links between water and neighborhood development.”

Mr. van Roosmalen agreed. “It’s an example of what you can do if you connect storm-water management with social welfare and neighborhood improvements,” he said. “It’s what we mean here in Rotterdam by ‘resilience planning.’”

In a neighborhood nearby, where drug addicts used to trek all the way from France to buy cheap heroin, I came across Marleen ten Vergert, a single parent supporting a young daughter on a civil servant’s modest salary. Women in hijabs lugged groceries, old men lounged on park benches and children rode skateboards over broken concrete paths, past aged housing blocks. One block of houses surrounded a water plaza created to capture floodwater. Young families were enticed by prices of a single euro to buy abandoned houses around it. Many families came and went. The water park was vandalized. But, slowly, little by little, it has come to be embraced by the neighborhood.

“Now, for the most part, it works,” Ms. Vergert told me. “People want the water square, so they take better care of it. There’s a greenhouse nearby run by a Turkish community. The value of houses in the neighborhood has gone up.”



A water plaza in the Spangen neighborhood of Rotterdam was created to capture floodwater.

A few blocks away, a start-up in a converted industrial waterfront building is developing solar-powered sailing drones for collecting plastic trash from the sea, and, back in the middle of the city, a warehouse with a Brooklynesque mix of artisanal food stalls, a circus academy and a pinball museum has rejuvenated a formerly dingy pier. Where the old Hotel New York, a century-old landmark, used to be the tallest building along a stretch of waterfront, skyscrapers have sprung up, producing a whole new business district in Rotterdam, with a photography museum across the street from the city’s signature office tower, De Rotterdam, by Mr. Koolhaas, and Ben van Berkel’s harplike Erasmus Bridge.

Rotterdam is clearly trying to cast itself as a model of inventive urbanism. A local businessman, Peter van Wingerden, envisions floating dairy farms along the waterfront. One in every three trucks coming into the city carries food, he said. Floating farms would reduce truck traffic and carbon emissions, supplying the city with its own milk. With the city’s encouragement, he is constructing a \$2.2 million prototype, for 40 cows, producing a half-million liters (about 130,000

gallons) of milk a year. “The river is no longer just for industry,” he told me. “We need to find new uses, which keep us safe from climate change, and help the city grow and prosper.”

That’s the city’s mantra. When I asked Mr. van Wingerden if it was unsettling to live in a waterfront city mostly below sea level, he said: “It seems to us less dangerous than living on the San Andreas Fault. At least when we flood, we’ll have some warning before our feet get wet.”

To the Dutch, what’s truly incomprehensible, he added, is New York after [Hurricane Sandy](#), where too little has been done to prepare for the next disaster. People in the Netherlands believe that the places with the most people and the most to lose economically should get the most protection.

The idea that a global economic hub like Lower Manhattan flooded during Hurricane Sandy, costing the public billions of dollars, yet still has so few protections, leaves climate experts here dumbfounded.

Mr. Molenaar, Rotterdam’s climate chief, summed up the Dutch view: “We have been able to put climate change adaptation high on the public agenda without suffering a disaster in many years because we have shown the benefits of improving public space — the added economic value of investing in resilience.

“It’s in our genes,” he said. “Water managers were the first rulers of the land. Designing the city to deal with water was the first task of survival here and it remains our defining job. It’s a process, a movement.

“It is not just a bunch of dikes and dams, but a way of life”.



The Erasmus Bridge in Rotterdam, seen from a water taxi.
