

BIRKHAUSER

Zoë Ryan

Building with Water

CONCEPTS | TYPOLOGY | DESIGN

Introduction

Fluid Dynamics: Building on Water



Sandro Botticelli, "The Birth of Venus", 1485.



Caspar David Friedrich, "Wanderer above the Sea of Fog", 1818.



J. M. W. Turner, "The Slave Ship", 1840.

Water is essential to life in every form. One of the world's most valuable resources, it has been referred to as "blue oil".¹ A material that we are forever trying to preserve, conserve, clean and re-use, water is also an element we continue to fight against, barricading ourselves, for example, against rising sea levels and the threat of flood. Given the increasing emphasis on environmental approaches to living, working and playing, water has become central to discussions about new architecture and urban planning. It is, therefore, a particularly pertinent time to be discussing building on water and the many thought-provoking and experimental projects that architects, designers and engineers are initiating that aim to address these important issues in an effort to introduce new modes of thinking and practices that will radically change our relationship with this natural resource.

Water as a Symbol

The importance of water as a source and symbol of life goes without saying. Drawn to it for its life-supporting, playful and therapeutic qualities, we cannot exist without it. Although water covers about two-thirds of the earth's surface, only 3 percent of this amount is freshwater and about two-thirds of that is ice. Much of the remainder is locked underground. Therefore, a mere fraction of 1 percent of earth's water supports all life on land. It is this essential ratio of water that provides sustenance to all forms of life and is fundamental to social development. As Flemish chemist, physiologist and physician J. Baptist van Helmont wrote in his volume *Oriatrike or Physick Refined*, published posthumously in 1662, "All earth, clay, and every body that may be touched, is truly and materially the offspring of water only, and is reduced again into water, by nature and art ..."²

Water appears throughout religion, literature and art of every culture. In the religious world, water is sacrosanct – from baptisms in the river Jordan to the ritual immersion in the Ganges during religious festivals in India. Spring water is also venerated. From ancient Bath in England to the modern Floridian hot springs, this natural water source is considered beneficial to physical purification and spiritual rejuvenation. As attested by Sandro Botticelli's 1485 painting "The Birth of Venus", in which Venus rises out of the sea in a scallop-shaped shell, appearing to derive her seductive power from the water, fresh and clear water is equated with health and beauty.

Counter to the life-supporting properties of this elemental material, water can also threaten and even take life. The German Romantic painter Caspar David Friedrich (1744–1840) illustrated man's powerlessness in the face of nature in "Wanderer above the Sea of Fog" of 1818 in which a solitary man looks out over a vast rough sea. Two decades later, J. M. W. Turner portrayed the dangers of the sea in "The Slave Ship", painted in 1840, in addition to making a marked political commentary on the practice of slavery. More recently installation artists such as Olafur Eliasson have turned to urban waterways as a source of inspiration and discovery in an effort to further awareness of the inherent relationship between water and the built environment. In 2008 he created "The New York City Waterfalls". Three falls consisting of approximately 27 to 36 metre-high scaffolding poles were installed in sites along the East River, viewable from Lower Manhattan. Torrents of water pumped up from the East River cascaded down the structures to thunderous effect. Like many of Eliasson's projects, the falls encouraged exploration of the water's edge and illustrated the power of this natural waterway, its constantly changing state and its presence in the city.



Trevi Fountain, Rome, Italy, 1762.

Water in Public Spaces

The consideration of some historical examples of interactions with this natural resource help us to fully understand our relationship with water. Charles Moore credits the city of Rome as the first to fully explore the potential for new relationships between the built environment and water with projects such as the Trevi Fountain in Rome, completed in 1762 and designed by architect Nicola Salvi. The Greek God Oceanus stands strong at the centre of a triumphal arch guarding the well, as the mythic protector of the sea and a godfather to the Greek pantheon. The circulation of the water cascading from above, collecting in the basin below and then shooting back up stands as a powerful metaphor of the natural cycle of life. As Moore notes, "All around, water splashes, foams, churns, spits, caresses stone reefs, and, at night, its luminous sparkles dance on the façades of neighbouring stone walls, windows and medieval arcades. The Trevi is the ultimate joining of water and architecture."³ Fountains have since come to characterize many of the most famous gathering spaces from the Champs Élysées (1724) in Paris and London's Trafalgar Square (1845), to Chicago's Grant Park (1901).

Fountains continue to revitalize public spaces. In France, the Floodable Square in Bordeaux, situated on the Quai de la Douane has been surprising unsuspecting passers-by since its completion in 2006. Designed by landscape architects Atelier R and water feature designers JML, a shallow pool of water periodically floods the plaza and then recedes, disappearing within minutes, without a trace. Known for the Buckingham Fountain (1927), one of the largest in the world, Chicago's Grant Park is now also home to the Crown Fountain. An altogether different experience, this fountain, designed by Spanish artist Jaume Plensa and installed in 2004, is one of the most popular outdoor

attractions in the city's downtown area. Located in Millennium Park, adjacent to the Chicago Art Institute, the water feature attracts scores of adults and children. Water cascades down the media walls that flank either side of the plaza, creating a shallow pool suitable for paddling. The faces of 2,000 Chicago residents animate the media walls. At sporadic intervals, water shoots out of the mouths of the faces to the delight, and at times dismay, of unaware pedestrians.

Revitalizing the Waterfront

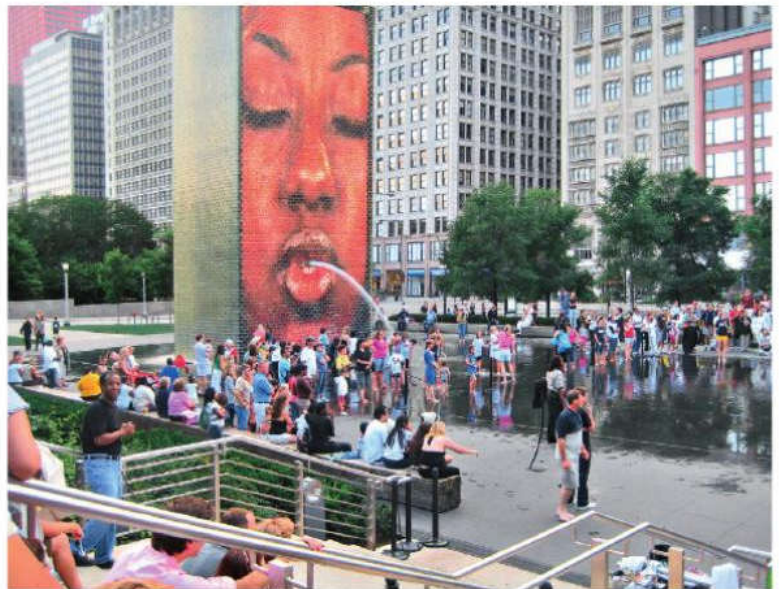
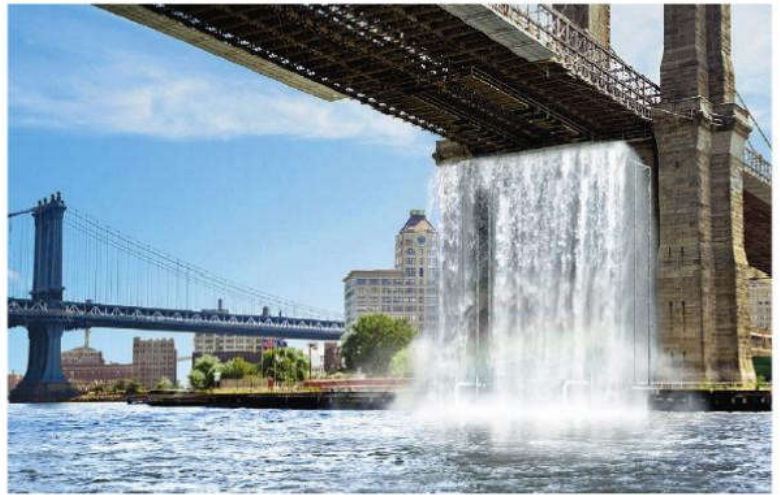
Urban waterfronts have become fertile areas for urban planning and redevelopment as a key part of rebuilding healthy cities. Throughout history, canals, rivers, lakes, seas and oceans forming an edge to or bisecting urban metropolises have determined the topographical character of urban areas. Used for defense, trade, transportation, industry and recreation, these bodies of water often provided a reason for founding a city in the first place and have come to define these cities and play a major role in their lively and unique characters.

The most significant event to affect cities was the development of mercantile cities such as New York, London, Rotterdam, Chicago, Lisbon, Rio de Janeiro and Cape Town into industrial ports in the 19th century. As steam-powered boats transported goods faster and in larger quantities to ports globally, many of the world's urban waterfronts took on an industrial character with warehouses, docks and wooden piers. In addition to the potential hazards of machinery from heavy industry, these areas of intense activity suffered from high levels of pollution, making them uninhabitable as well as unsuitable for recreational activities. A disconnect grew between the waterfront and the social, cultural and environmental life of the city.

Olafur Eliasson, "The New York City Waterfalls"
(artist rendering), an installation of four man-made
waterfalls in New York, USA, 2008.

Floodable Square, Bordeaux, France,
Atelier R and JML, 2006.

Crown Fountain, Chicago, Illinois, USA,
Jaume Plensa, 2004.



Where Water Meets the Land: The Rediscovery of the Waterfront

Dieter Grau | Zeljka Carol Kekez



A highly polluted irrigation canal has been restored as a 1-kilometre-long river which creates an attractive clean waterscape for all generations and a front to the housing estate of Zhiangijawo in Tianjin, China.



The banks are softly moulded and planted, and the water is accessible in many places by boardwalks, steps and ramps.

The world is experiencing an explosion of design and celebration of cultures on the water's edge. Capitalizing on topographical context, cities are commissioning architecturally distinctive landmarks and civic icons to honor interactions with their natural resource, water – the *raison d'être* for different idiosyncratic urban identities.

From the start, civilizations have flourished, declined and revitalized settlements on rivers, lakes, canals and on the more than 850,000 kilometres of coastline that mark the edges of the world's continents and islands. In early days, the prosperous cradle of a sophisticated civilization, Mesopotamia, located in modern day Iraq and Syria, was situated between the life-giving rivers of Tigris and Euphrates. Also, the ancient societies of Egypt, the Indus Valley and China lived in harmony with life-sustaining and spiritual qualities of water. Small local rivers in Tianjin, China, formerly used for irrigation and farm flooding, now serve as the new waterfront edge for the Zangjiawo residential area. The restored ecological integrity of the river-canal makes it a community asset and a focal point for leisure and socializing for all generations. Throughout the world, cultural history has always been associated with hydrology. The science of aquaculture was also elemental to early societies in South America and in the Mexico Valley where the floating market gardens, *chinampas*, at the remains of the ancient Lake Xochimilco, are still in use. The man-made islands consisting of large planted rafts between the networks of canals allow for harvesting throughout the year. Historically, there is a long tradition of using water as a sculptural element and object of reverence, an inspiration for creativity, defense, art, agriculture and tourism; at the same time, water power has been harnessed for many centuries for entrepreneurial activities.

In the process of settlement, cities such as Venice, Amsterdam, Suzhou and Birmingham thrived on the technology of artificial waterways used for trade, transportation and industry. The mercantile cities of London, Paris, New York, Buenos Aires and Shanghai continue to be lively destinations celebrated for vibrant industrial and civic waterfront identities. Since the late 1980s, the river Thames provided the main impetus for developing the Paddington Basin, The Docklands and the Thames Barrier Park, regenerating some of the most deprived parts of the city and attracting high profile capital investors. Anchored by the bustling water's edge, Tokyo, Chicago and Hong Kong also owe their successful legacies to water routes and the resultant expansion of waterfront commerce, recreation and cultural activities. Renowned for its Victoria Harbour skyline, Hong Kong attracts people to the waterfront, by maritime approach as much as by land, while the Lake Michigan, along with the Chicago and Calumet Rivers, provides a dynamic network of water infrastructure contributing to Chicago's evolving identity. In a similar fashion, Honshū Island, Tokyo Bay and the Pacific Ocean distinguish Tokyo's waterfront as the premier intersection of natural and built environment.

Creating a compelling reinterpretation of the water's edge, islands like Singapore and Stockholm have flourished as thriving waterfront locations. They offer world-class cultural, commercial, recreational and residential amenities near water and encourage ecological exploration of this precious natural resource. In the case of Stockholm, intrinsic natural resources such as the Stockholm Archipelago, Lake Mälaren, the Baltic Sea and the Riddarfjärden Bay offer a strong sense of place for the waterfront itself, blurring boundaries between water and built environment. Looking back in history shows that the im-



The extension of the Dubai Creek forms the edge of the Dubai Business Park Development and creates a high potential for activating the waterfront and implementing a design which increases the outdoor comfort for the people.

portance of water to a society has not changed much. Working in concert with nature to emphasize the cycle of life was an inherent and practical matter for our predecessors. Today, water is not only essential for life, it is imperative to mimic its natural systems to reintegrate waterfront improvements into the surrounding urban fabric as socially and ecologically responsible developments.

In one of the greatest human migrations of modern times, people are rediscovering coastlines around the world, particularly those in Asia and Africa. In the 1950s, New York City was the planet's only megacity. Today, there are 14 coastline megacities with more than 10 million inhabitants, while two-fifths of the world's major cities are located near water.¹ Significantly, future population growth patterns are intensely focused on urban waterfronts of less economically developed countries. In areas of North Africa and the Middle East where access to safe drinking water is scarce, waterfront vitality is continually challenged by social deprivation and physical dereliction. Resuscitating the river Fez in Morocco is an example of a rehabilitation effort combining practical solutions for infrastructure, social, economic and environmental concerns at the water's edge. The goal is to enhance regional water quality while addressing the lack of open public space, overpopulation and an aging infrastructure within the Medina of Fez, the historic city.

The project consists of critical interventions strategically phased to enhance water quality, remediate contaminated sites, create open spaces, and build on existing resources for economic development. According to the Régie Autonome Distribution d'Eau & Électricité de Fés (RADEEF), the Department of Water and Power of the Municipality of Fez, "The

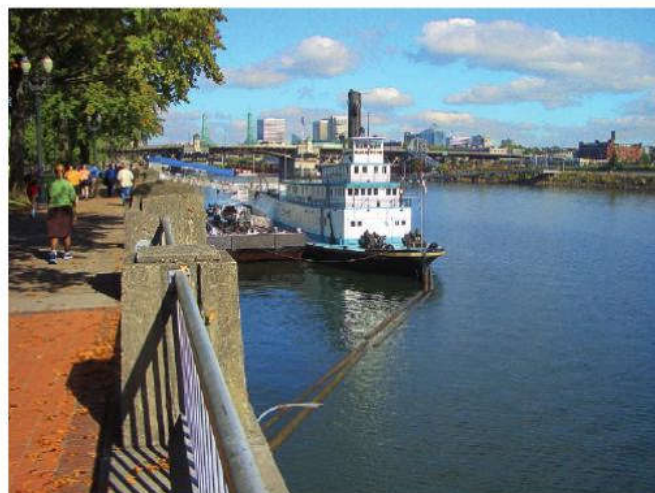
overall effect is a master plan that elevates the river into an urban infrastructure for bridging the gap between the needs of a 21st-century population and the historical standards for preserving the integrity of a UNESCO World Heritage designation."²

The successful transformation of Fez and other waterfront efforts worldwide depends on a dynamic and farsighted vision, flexible implementation plans and a commitment to sustainable initiatives. In the case of Dubai, the world's fastest growing city – at least until a recent economic bust – the waterfront is home to ambitious designs for some of the world's largest artificial islands. Though impressive in scale and imagination, these illustrious land reclamation efforts present a challenge for the health of the Persian Gulf. Though environmentalists speculate of their potential to cause profound ecological transformations, only time will reveal true lessons and set the stage for new expressions of city aspirations.

The 35-hectare Dubai Business Park site located adjacent to the proposed extension of the Dubai Creek lies some 10 kilometres west of the existing Central Business District (CBD) of Dubai and is about 7 kilometres from the airport. The waterfront planning and design for the Business Park and Dubai Creek extension, which attracts people and uses to the water's edge for cultural, recreational and residential developments, was a serious challenge considering harsh local climatic conditions. In an effort to offer a counter example to the big palm island projects, Atelier Dreiseitl, a planning office for water schemes based in Überlingen, Germany, collaborated, from the inception of the project, with ecological specialists applying sustainable design approaches to generate a clean and healthy



Portland, Oregon, served as the timber and grain export gateway to Asia but its port industry went into decline after the 1950s.



In 1927, the city built a seawall of some 10 metres height to protect its urban core from unpredictable water level fluctuations. Today, the wall is deteriorating and hinders access to the water.

waterscape at the water's edge. As the Dubai Creek already faces water quality problems, the concept was based on tidal energy without the use of pumps.

Envisioned as a place for pedestrian and bicycle experience, the promenade offers opportunities for enjoying nature, people-watching and active recreation. Cafés and ice cream parlours are situated along the water's edge on the way to the Seaside Plaza. The promenade is staged in different levels stepping down to the waterfront adorned with an artistic paving pattern of a unique character. The Seaside Plaza is partially sheltered by trees and shading structures with a stage for public events. Highlighted through a series of water features, ending with a cascade into the creek, the plaza creates a refreshing atmosphere and emphasizes the visual axis with the Central Business District.

To optimize public use, large-scale waterfront master plans such as the Dubai waterfront should have appropriate phasing implementation steps. Often unveiled with the promise of recapturing land that has fallen into disrepair, large-scale waterfront master plans are difficult to implement and parts often never get built. The same excitement that captures the public's imagination and the media's attention for these mega plans can also bring about their demise. It is therefore crucial to have strong community outreach garnering broad public support.

Throughout history, similar experimental and thought-provoking urban development near the water's edge led to comparable patterns of environmental use. Many waterfronts were left decrepit and disconnected from neighbouring communities. Important wetland habitats, coral reefs, rivers and estuaries

were being degraded or destroyed. Struggling with conflicting agendas, generations of government leaders have mismanaged long-term waterfront visions producing only mediocre results. That's why in recent times, designers, engineers and municipal leaders have often been criticized for focusing solely on iconic waterfront projects occupying the land adjacent to the waterfront rather than on a holistic waterfront experience embracing a delicate balance of the natural and built environment.

The Succession of Waterfront Uses

Water and waterfront activities have always been strategic resources in the world, a symbol of life, and impetus for development of human settlements. Since the beginning, as engines of economic growth, cities have subscribed to evolving technologies to alter the shape and the pace of their waterfront redevelopment efforts. Many coastal communities owe their origin and prosperity to access to water, successful cultivation of land near the water's edge, related craftsmanship, industry and trade as well as water transport.

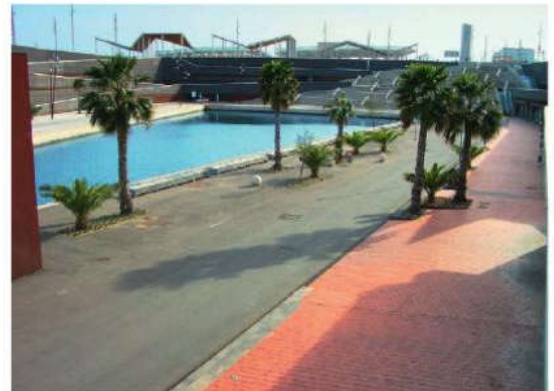
Initially, industrial ports were gateway destinations where the movement and exchange of goods were facilitated and urban services developed to promote maritime trade. Subsequently, a waterfront served as the focal point of activity, the place where water-related and urban-based functions merged. Anchoring liquid highways of worldwide commerce that carried people and goods from the heartlands to the coasts and then across the oceans, the waterfronts of the world adapted to ever-changing needs of a growing urban population.



Barcelona established one of the most recognized urban waterfront redevelopments of the 20th century. Urban beaches, parks and an emphasis on outstanding design contributed to its success. Triggered by the Olympics in 1992, the Port Vell, the city's old obsolete and run-down harbour, was transformed into a popular urban area featuring an entertainment complex and a large aquarium, next to the old customs building Aduana from 1902.



Along the Columbia and Willamette Rivers in the Pacific Northwest, Portland, Oregon, USA, served as the timber and grain export gateway to Asia and the gold fields of California in the 19th century. Similar to other premier freshwater ports around the world, Portland has had its challenges in sustaining its harbour's competitive standing and waterfront vitality. The accumulation of industrial waste and raw sewage, frequent flooding and pollution, had forced businesses to locate away from the waterfront. Portland was not unique in its decline of port industry and its effort of constructing a seawall, built in 1927 and approximately 10 metres tall, to separate downtown businesses from the unhealthy waters and to protect its urban core from unpredictable water level fluctuations. Capitulating to the rise of automobile and presence of national interstates along its banks, further hindered Portland's access to its waterfront as recently as in the 1970s. Since then, Portland's River Renaissance programme has been focused on a long-term vision and a layered approach to waterfront development efforts. The strategy of linking Portland's diverse neighbourhoods and districts back to the rivers aided the city in creation of a dynamic waterfront skyline.



Previously predominantly industrial and then imbued with romanticism through the passage of time, waterfronts continue to be visually seductive settings and one of the main attractions in a city. They certainly should not be places to pass through in a car cutting people off from a distinctive public asset and opportunities for enjoyment, leisure and recreation. Many great cities throughout the world including New York, Seattle, Barcelona and Paris, share a history of subordinating panoramic views to a drive-by experience. It was and still is not uncommon to encounter raised freeways, levees and parking lots dominating stunning waterfront views.



These swimming facilities on the waterfront, designed by Beth Gali in 2004, are part of the Barcelona Forum.

Towards Flood-Resilient Urban Environments

Chris Zevenbergen



Monsoon-caused flooding in the city of Fatehpur in Rajasthan, India.

Yesterday's Cities

Many cities around the world are facing the challenges of sustainable living and development and are exploring ways to enhance their ability to manage an uncertain future. In the developing world these challenges are often due to increasing concentrations of vulnerable people in vulnerable locations adjacent to rivers, coasts and in low-lying zones that are more likely to flood. Drivers and pressures include relative wealth, population growth, the provision of food, lifestyle expectations, energy and resource use and climate change. These pose new challenges for the way in which we design our cities of the future.

We live in "yesterday's" cities. Many of the urban patterns that we see today – such as city layouts, buildings, roads and land ownership – are legacies of up to a century and a half of urban policy and decision making, even longer in some of our cities. Tomorrow's cities will also be shaped by the decisions we make today. They must respond to faster changes in physical, social, economic and institutional conditions than previous generations had been used to. Cities are evolving systems. We have little understanding of their behaviour. We know that they are highly dynamic, in that they face changing environments and influences, and adapt to these changes. Over a long period in history, cities have always coped successfully with new environmental conditions and thus have been extremely resilient. From 1100 to 1800, only 42 cities worldwide were deserted at some point after they developed.¹

Cities everywhere are changing faster than we can assess and understand the diverse forces that cause those changes – these forces themselves are dynamic and fluid. Urban planning on the other hand is relatively static. It is the code by which development decisions are made and therefore by definition an exercise in deciding a city's future form and in so doing giving certainty to the "actors" in that future. Urban planning occurs within a political ideology that informs the decision making process at a given time. Thus to a large extent, we live in "yesterday's cities" in the sense that many of the urban patterns we see today – roads, buildings, land ownership, etc. – reflect decision-making periods of the past. As the prevailing ideology changes so does the planning of our cities. Understanding the role of time and the way it conditions future urban options is a crucial part of urban resilience.

The year 2007 marks a turning point in history: since then, half of the world population has been living in cities.² Moreover, the trend of rapid urban growth since the mid-20th century in industrialized countries has now shifted to the developing regions of Asia, Africa and Latin America. Urbanization has led to an increase of economic and social wealth in some places, but also to continuing poverty in others. The urban population is expected to double from 2 to 4 billion over the next 30 to 35 years.³ These growth rates imply that, every week and over the next four decades, another city will cross the threshold of 1 million inhabitants.



Flooding of the city of Deventer, the Netherlands, in 1995. After the river Meuse floods of 1993 and 1995 the Dutch flood risk management policy has been changed radically. Instead of constraining the rivers between embankments, the new strategy termed "Room for the River" was embraced.



Urban waterfronts, Almere, the Netherlands. Almere is one of the new towns in the Netherlands. In this city water is being appreciated as an indispensable element of the urban environment.

Increasing Flood Vulnerability

Since most of these large cities are located in deltaic regions and other low-lying areas, an unintended side effect of their growth and the ensuing concentration of the number of people there is the increased exposure to floods. Worldwide, the number of dwellers threatened by flooding has increased dramatically. Moreover, floods have become much more frequent and have had more devastating effects than in former times. Indeed, these trends suggest that citizens and urban communities are becoming more vulnerable to floods.

The question arises of how we can dampen this increasing trend of flood vulnerability. Do we know enough about the exposure and sensitivity of cities towards flooding to reveal the underlying processes responsible for this overall increase? Do we understand how cities grow and what the impact of this growth will be on their susceptibility to floods? The answer, unfortunately, is no. In any case, many of the theories of how cities function and grow have been developed in and for industrialized cities, although much of the urban growth of the 21st century is occurring in the developing world. Although comprehensive and systematic research is still lacking, a number of studies substantiate the general assumption that urbanization is largely an uncontrolled process. Based on estimates of the United Nations, only 5 percent of new development under way in the world's expanding cities is planned.⁴

Generally speaking, cities are becoming larger and denser. Urban expansion is an issue of serious concern and is often used as a justification for densification. The fundamental question of whether urban expansion should be resisted, accepted

or welcomed is still largely unresolved. From the perspective of flooding, concerns for indiscriminate urban expansion or "sprawl" have captured the attention of both policy makers and academics during the last decade. This is because alongside climate change, it is considered as the major driver for increased flood risk. Sprawl will occur where unplanned, decentralized development dominates as is common in developing countries. Where growth around the periphery of the city is coordinated by strong urban policy, more compact and less vulnerable forms of urban development can be secured. It is evident that these approaches to development have direct consequences for the way floods are managed both in terms of the potential vulnerability of the urban area and its inhabitants, and also in terms of the often indiscriminate effect that urban growth has on run-off and flood probabilities.

At first glance there seem to be conflicting interests between the flood risk managers advocating open, green spaces in their cities and those who are adherents of the compact cities concept as the sustainable urban form that will help to control transport-related greenhouse gas emissions. It follows from the above that there are many theories and concepts on the ideal form of cities and their effectiveness in achieving sustainability; they range from concentration and centralization on the one hand to decentralization with some degree of autonomy on the other. There is, however, no single "magic" recipe for successful planning of a city in response to the challenges of sustainability, climate change and flood risks. Nor is there a single, prescribed sequence of measures, tools, applications and procedures. This is because every city has a unique context.

In many Dutch polders the need for stormwater control, water supply and urban expansion resulted in competing land claims which necessitate the search for multi-functional land-use. Polders such as the Haarlemmermeer and the Zuidplaspolder will accommodate a significant amount of the Randstad's housing growth over the next two decades and about an additional 20 percent of its total surface area is needed for water storage. These renderings of a flood-resilient community at low and high water level show how high density urban developments which are adapted to fluctuating water levels (up to 1 metre) and water storage can be combined in the same area. This has resulted in a structure of compartments containing flood-resilient communities comprised of flood-resilient homes, infrastructure and public green spaces.



Whitney Water Purification Facility

Steven Holl Architects

COMPLETION

2005

LOCATION

Lake Whitney, New Haven, Connecticut, USA

DESIGN TEAM

Steven Holl, Chris McVoy (design architects)

Anderson Lee, Urs Vogt (associates)

Arnault Biou, Annette Goderbauer (project architects)

Justin Korhammer, Linda Lee, Rong-hui Lin, Susi Sanchez (project team)

STRUCTURAL ENGINEERING

CH2M HILL; Tighe and Bond

LANDSCAPE DESIGN

Michael Van Valkenburgh Associates

CLIENT

South Central Connecticut Regional Water Authority

Most industrial plants do not typically inspire visits, but Steven Holl Architects' design for a water treatment facility in southern Connecticut doubles as a public park with educational tours where visitors can learn about water purification and conservation.

Given the importance of water as a natural resource, the design of the plant, which is situated on Lake Whitney, a natural reservoir, and which purifies up to 68,000 cubic metres of water a day for the state of Connecticut, takes into account its natural setting with a building that fuses the architecture with the landscape.

Light is often a driving element in Steven Holl's designs and water is embraced for its reflective properties and ability to connect architecture with the landscape. A case in point is the critically acclaimed Nelson-Atkins Museum in Kansas City, Missouri (2007), which is sited in front of a large pool designed in collaboration with artist Walter De Maria. Circular skylight discs in the bottom of the pool bring water-refracted light into the garage below.

In the Lake Whitney project, the architects decided to embed the majority of the water treatment below ground. Project architect Chris McVoy explains that, "Usually, for treatment plants like this, engineers build big boxes, and try to make it look like something with applied architecture. We proposed to put all the functions (seven-eighths of the total) below the ground under a new park." The challenge was then how to make visible the plant's workings and engage the general public. The result is two-fold based on both the architecture and the landscape component of the site.

The main visual element is a 110-metre-long extruded stainless steel tube that houses the plant's administrative facilities and public programmes. Like an inverted drop of water, the reflective property of the shiny surface of the building reflects the sky and natural surroundings connecting it to the land.

The decision to build below ground was as much aesthetically driven, allowing for the 5.7-hectare site park above, as it was pragmatic and environmental. Embedding the plant below ground sets the treatment process below lake level, allowing the water filtration to be gravity-driven, thus obviating the need for energy-consuming pumps. Every aspect of the building has been considered in terms of its environmental impact and sustainability. This includes using local materials wherever possible such as the cast concrete that makes up 40 percent of the overall building materials with cork and re-cycled glass-chip floor tiles used throughout. The plant has the largest green roof in Connecticut, spanning 2,790 square metres, increasing insulation and controlling stormwater run-off. Skylights that resemble water bubbles in the green roof bring light down into the plant and maximize connections between the two environments as



Aerial views of the Water Purification Facility showing its adjacency to the Lake Whitney natural reservoir (upper right corner).





well as provide natural lighting to the areas below. McVoy states that taken together, "The below-grade location of the process spaces, the insulation value of the green roof, the thermal mass of the extensive concrete tanks and walls, and a ground-source heating and cooling system minimize the project's energy consumption."

The public park, designed by landscape architect Michael Van Valkenburgh from Cambridge, Massachusetts, is arranged in six sections, which are analogous to the six stages of the water treatment process. Developed in collaboration with the Connecticut Department of Environmental Protection, the US Army Corps of Engineers and the Inland Water Committee, a plan for extensive erosion control and water conservation was put in place. Stormwater runs naturally across the site and is filtered and cleaned through the six different landscapes, each inspired by the internal working of the plant processes: rapid mix, flocculation, air flotation, ozonation, granular activated carbon (GAC) filtration and a clear well. Landscaping rather than pipes circulate the stormwater into the treatment plant.

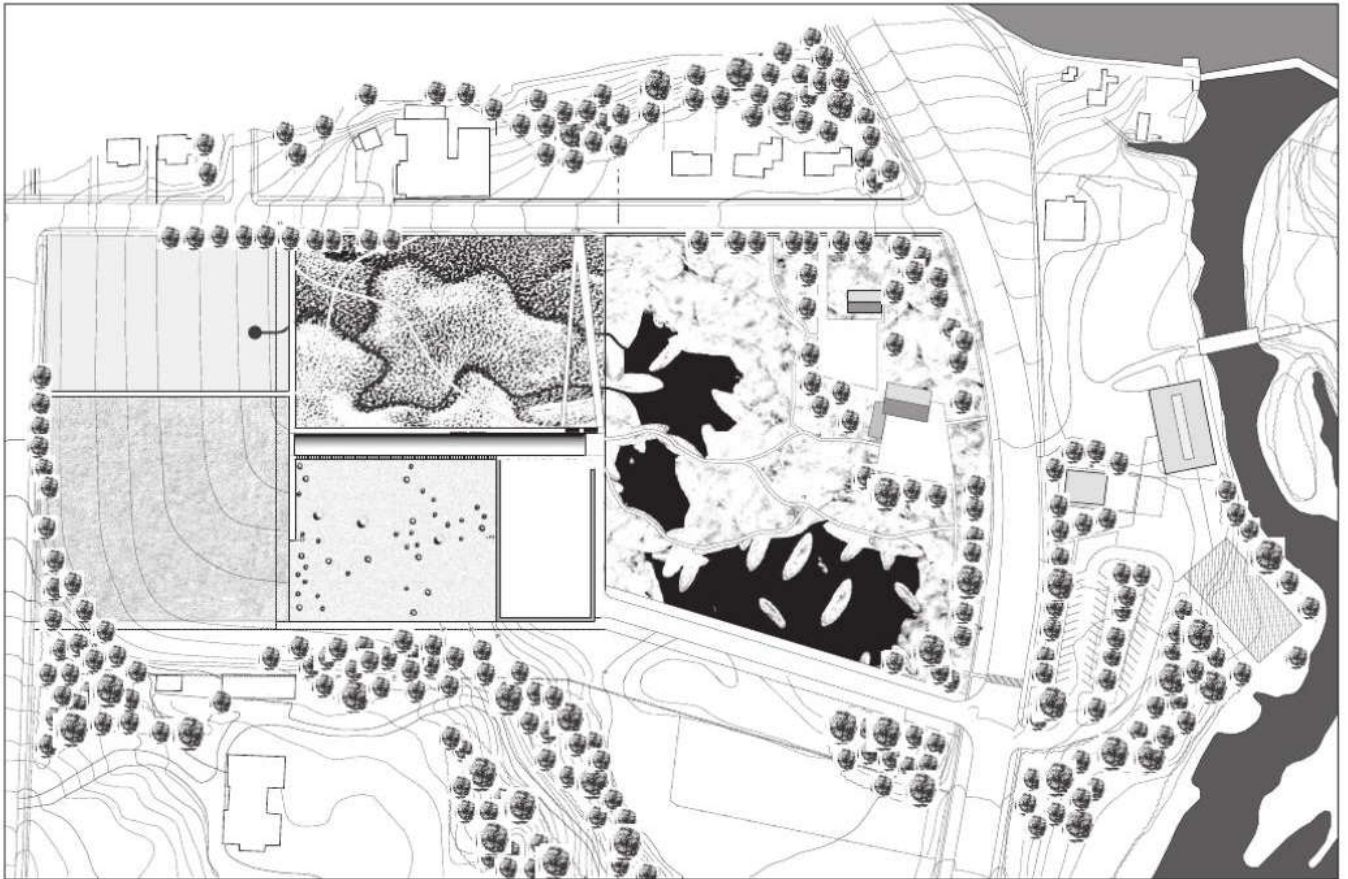
The park, a natural wetlands, caters to local residents as a recreational venue as well as to visitors to the neighbouring children's museum. Designed to demonstrate the water treatment process, it has also been reconstructed as a natural habitat for birds, insects and small mammals. McVoy asserts that from the beginning, the brief was manifold, and that the project should "educate the public about environmental issues, such as maintaining an abundant supply of clear water, protecting riparian resources, and encouraging sustainable wetlands stewardship." In addition to the on-site considerations, the plant also respects the needs of the adjacent Mill River, which is connected to the lake by a waterfall. In order that the flow of the river is not disrupted, only enough water to satisfy the needs of the region is extracted through a pipe that feeds into the water purification plant, maintaining the local ecology of the site.

The treatment plant exemplifies the possibilities of integrating industrial facilities with the natural environment in a way that establishes links between mechanical and natural process, both of which are essential to sustaining life.

The entrance building to the water purification plant resembles an extruded drop of water, a reference to the building's function.

top left: Overall view of the stainless steel tube housing the administrative and public facilities.

bottom left: Site plan.



WISA Wooden Design Hotel | Pieta-Linda Auttila

COMPLETION
2009

LOCATION
Helsinki, Finland

DESIGN TEAM
Pieta-Linda Auttila (design)

STRUCTURAL ENGINEERING
Tero Sundberg; Hannu Hirsi

CLIENT
UMP-Kymmene Timber

Designing a building in 24 hours, complete with construction documents, might seem challenging enough, but the project to conceive a new hotel for Helsinki's South Harbour came complete with additional difficulties. These included the lack of access by road so that all the construction materials had to be brought to the site via boat, in addition to the location of the project on a rocky islet at the mercy of unpredictable weather. And yet, these drawbacks did not stop 100 architects entering the WISA 24h Wooden Design Workshop, a competition that sought inventive designs for an approximately 30–40-square-metre wooden building. Organized by sustainable forestry company UPM to exploit the potential of recyclable Finnish woods, the winning design by Pieta-Linda Auttila, an interior architect who graduated from the University of Art and Design Helsinki in 2009, responds to the natural setting with a sculptural form that draws inspiration from drift wood found washed up on the beach. "I loved the very open and conceptual topic of the project", says Auttila while she admits that "the logistics were demanding." Built in three sections, the hotel incorporates two guest rooms separated by a central atrium that is open to the elements.

In contrast to the angular forms of the pine guest rooms that sit at opposite edges of the site, the billowing lengths of slatted birch plywood that provide a canopy over a central communal space are reminiscent of a boat's sail fluttering in the wind. Auttila was able to construct the design with the help of five professional carpenters who used 8-millimetre-thick planks of birch, which they submerged in water until saturated, then molded into the desired shapes and eventually joined to the structural planes of the guesthouses with additional layers of plywood for support. "I was interested in using techniques drawn from the boat-building industry", notes Auttila, "as a way to connect to the conceptual theme of the competition and as a response to the waterfront setting." Although expertly constructed, Auttila acknowledges that compromises were needed to realize the complex design. These included the use of vertical ceiling supports for the central canopy. "It was impossible to build scaffolding that was high enough on the rocks, and with the strong wind, to make the supports less visible", she explains. However, given the challenges to the design, the high level of craftsmanship is evident in the resultant vocabulary of forms that characterize this isolated retreat. The open form of the central atrium is in contrast to the closed boxes of the guest houses, and yet these are both oriented towards the water and framed on two sides by floor-to-ceiling glass panel, providing views across the water to the city of Helsinki.

In a country where three-quarters of the land area is covered by forest, experimental projects such as the WISA workshop help determine innovative concepts that foster progressive thinking and fresh responses to building with this traditional material. Taking up the challenge, Auttila asserts, "I have always been interested in finding new ways to use familiar materials."

Rear view of the WISA Wooden Design Hotel in Helsinki's South Harbour.

The discrete side entrance to the hotel, made from a wood plank construction, is located on the water's edge.

