Nước
Trong dòng chảy đô thị

TS. KTS. Trương Nguyễn Hoàng Long

“the only home we’ve ever known”

The astronomer Carl Sagan describes Earth when viewing from space

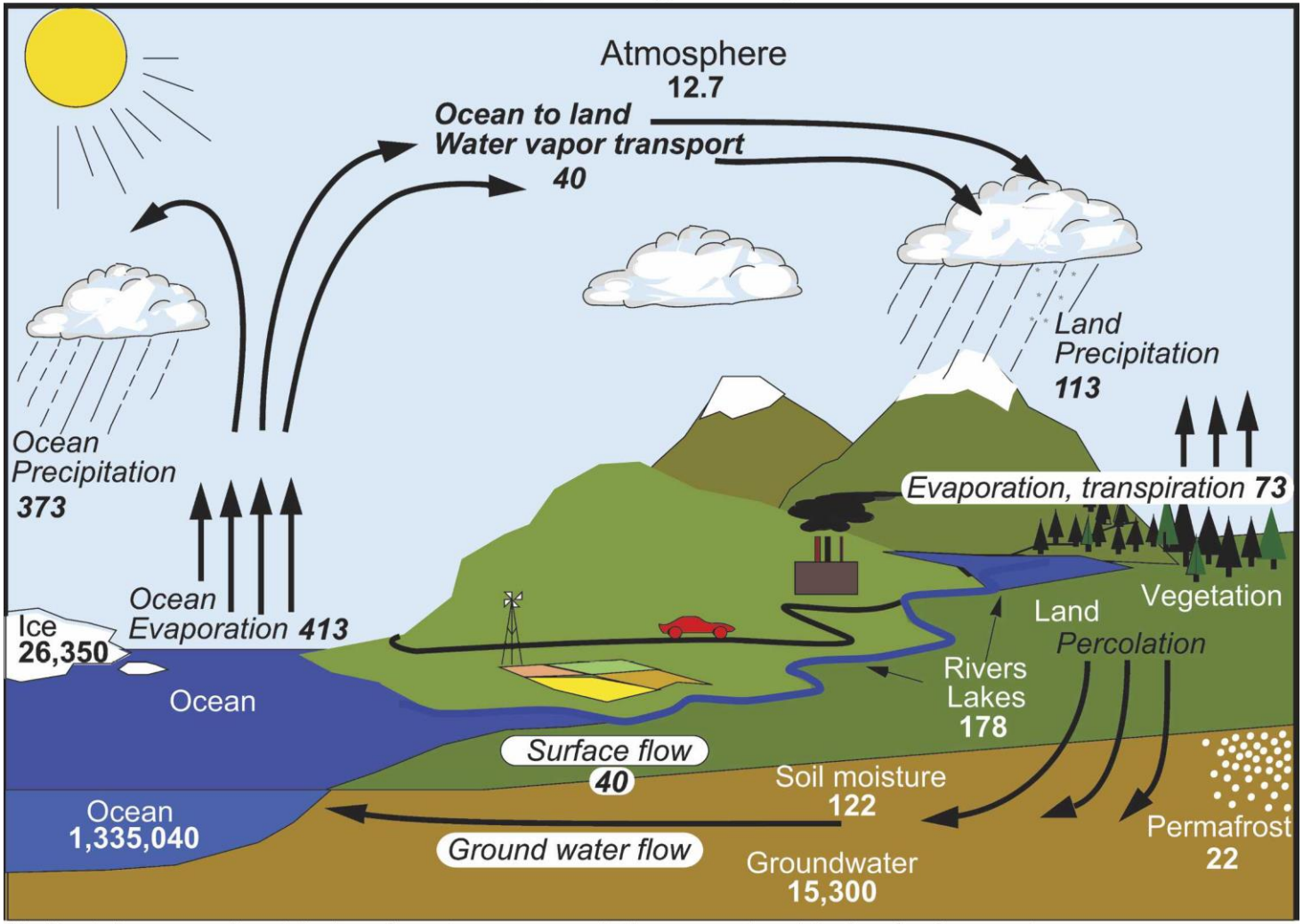
(Nguồn: NASA)

Sự thật

- 2/3 bề mặt trái đất là nước,
- 3% lượng nước là nước sạch,
- 2/3 lượng nước là băng,
- Phần lớn còn lại là nước ngầm
- 1% nước là hỗ trợ sự sống trên mặt đất

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

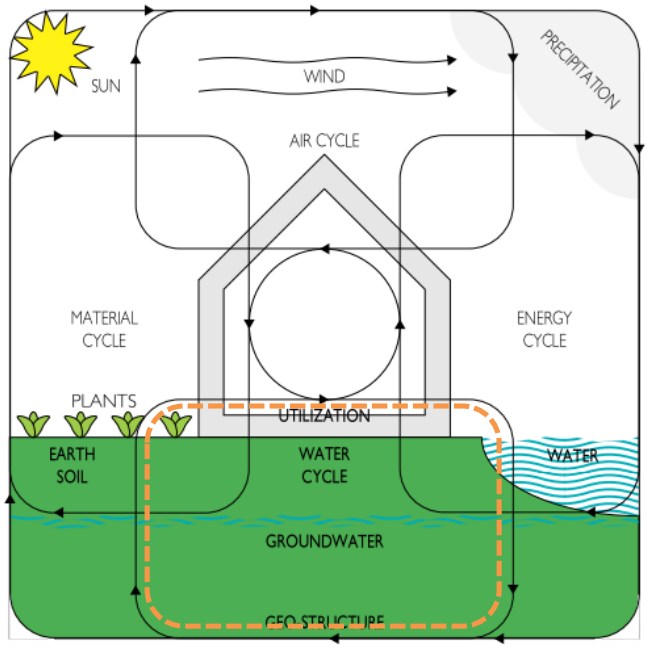
Chu trình nước



Units: Thousand cubic km for storage, and *thousand cubic km/yr* for exchanges

Nguồn: Trenberth et al. 2007

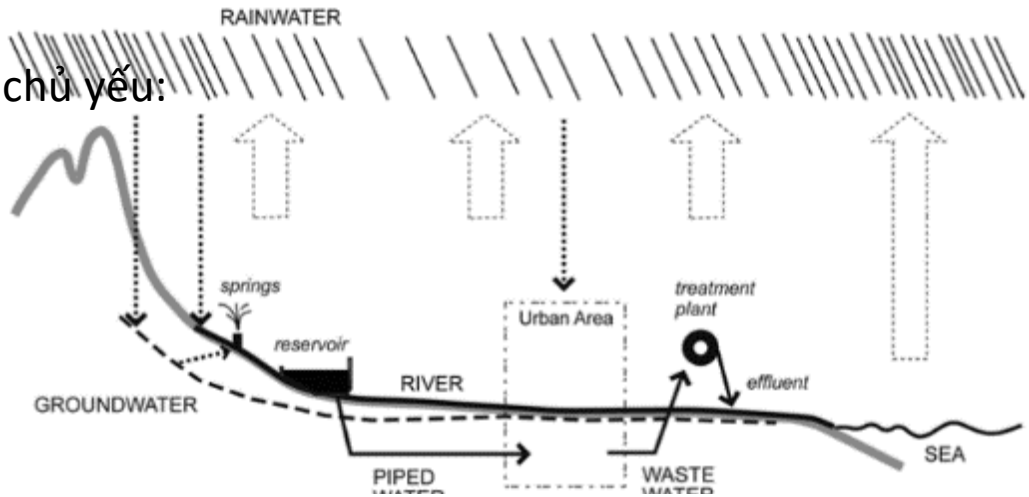
Nước trong môi trường xây dựng

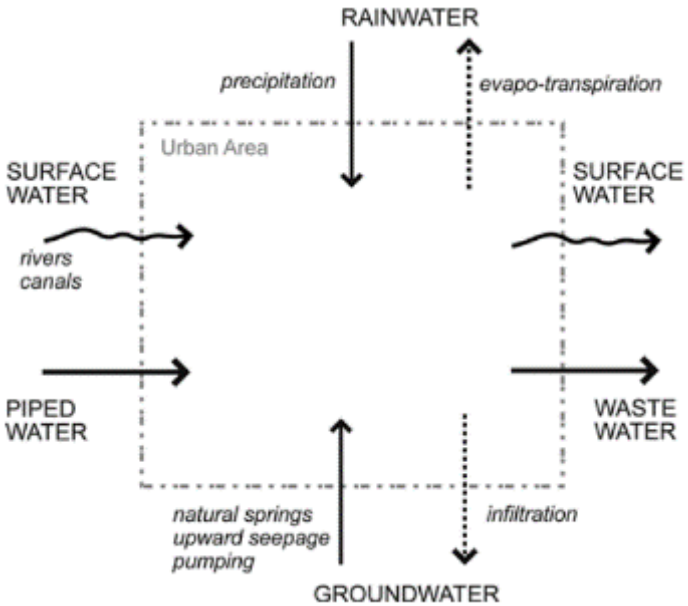


Chu trình nước trong đô thị

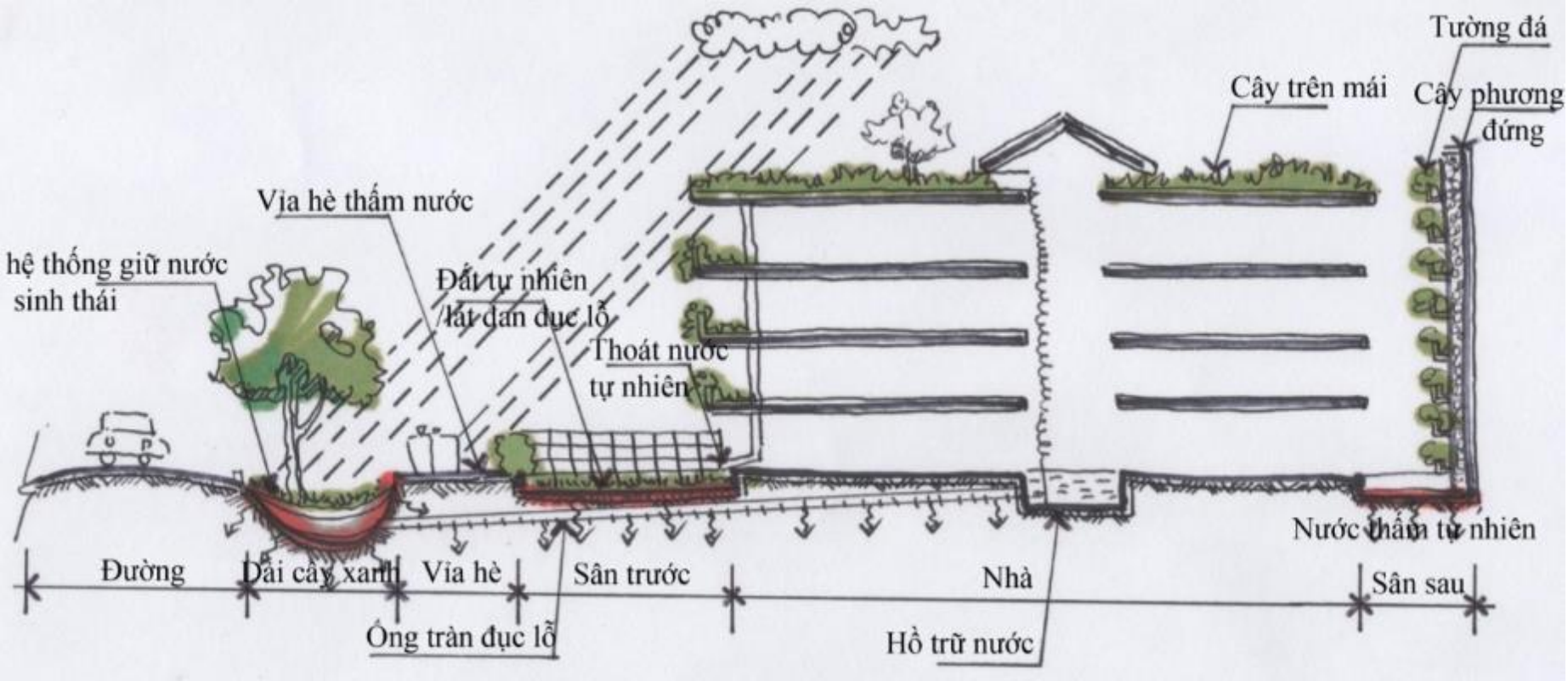
Thường quan tâm đến 5 luồng nước chủ yếu:

- Nước mưa
- Nước ngầm
- Nước sông
- Nước uống (nước sạch)
- Nước thải





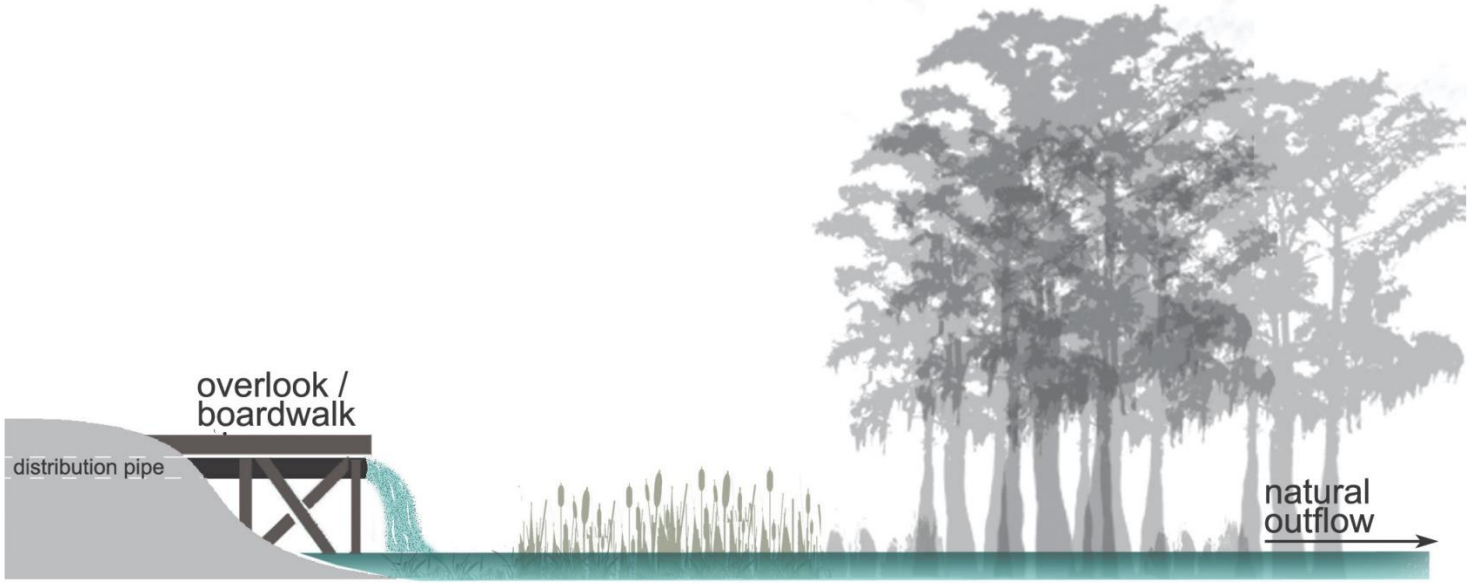
Chu trình nước trong công trình



Một số thuật ngữ

- Chu trình thủy văn (chu trình nước)
- Nước sinh hoạt
- Nước ngầm
- Nước mặt
- Nước mưa
- Nước tái chế (reclaimed water)
- Nước đen (blackwater)
- Nước xám (graywater)

Đất ngập nước (Wetlands)

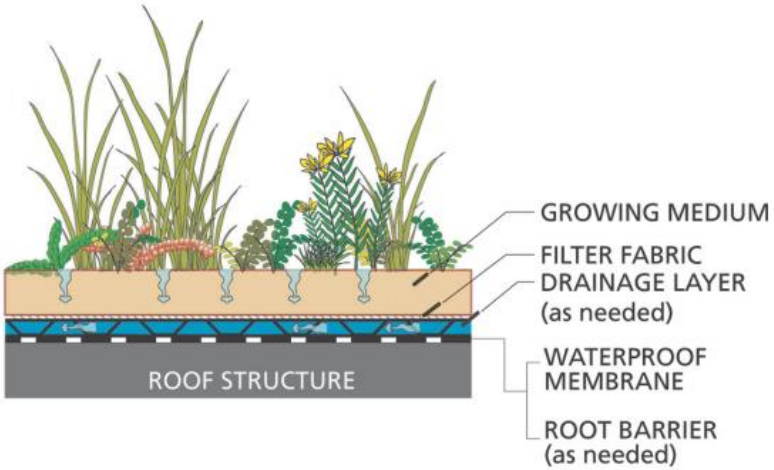


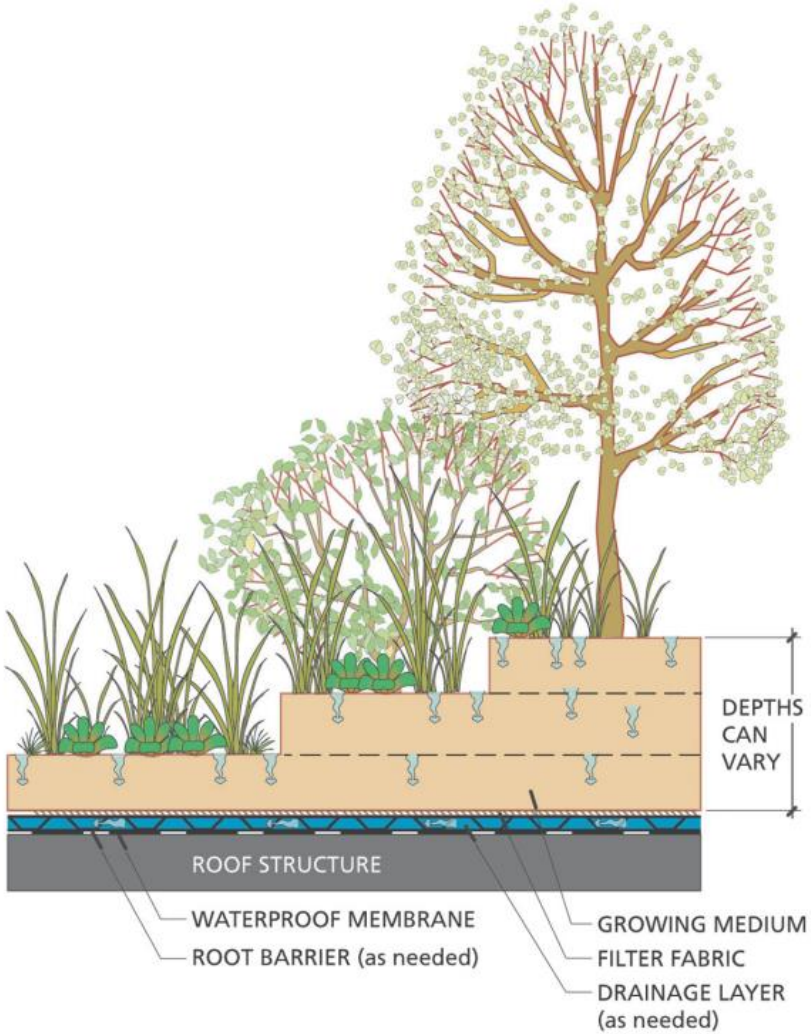
natural wetland

Quản lý thoát nước mưa bền vững

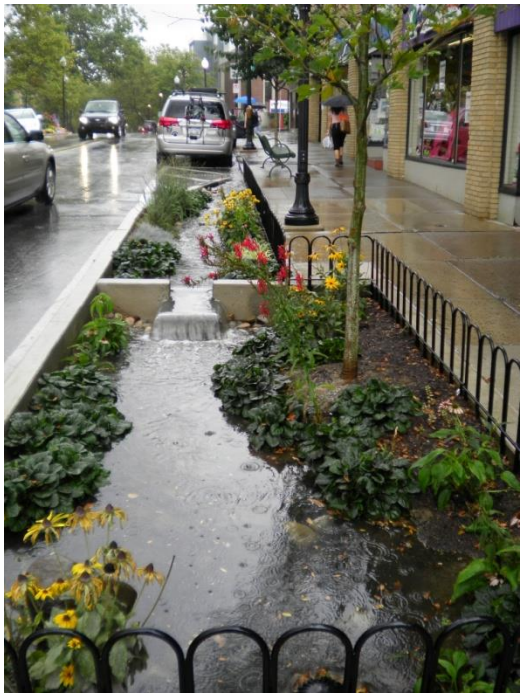
- Mục tiêu: tích hợp thoát nước mưa ngay tại công trình
- Dùng các yếu tố tự nhiên như các yếu tố tích hợp thoát nước mưa:
  - Làm chậm dòng nước
  - Lọc nước
  - Tăng quá trình tiếp xúc & bay hơi nước
- Các yếu tố có thể tích hợp:
  - Mương cảnh quan, bể thấm nước
  - Bộ phận kết cấu: bể chứa, cây xanh, mặt thấm nước, bề mặt bê tông, nhựa đường thấm nước

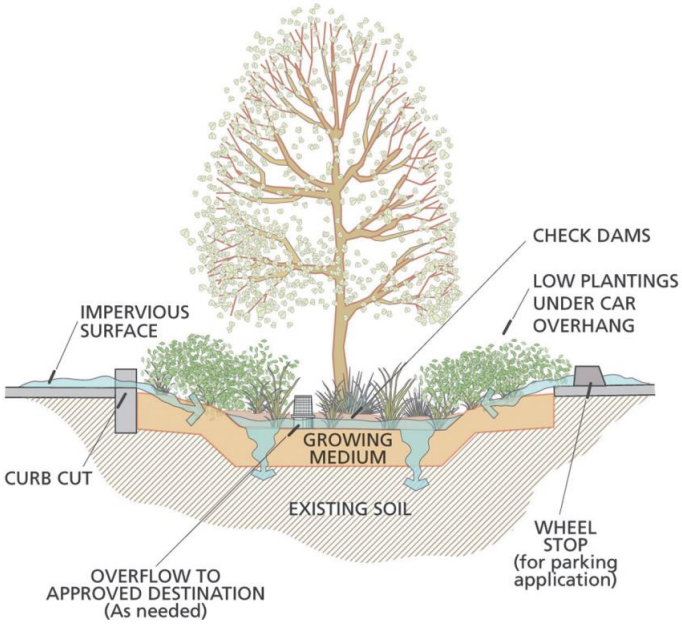
Mái xanh


GROWING MEDIUM
FILTER FABRIC
DRAINAGE LAYER
(as needed)
WATERPROOF
MEMBRANE
ROOT BARRIER
(as needed)
ROOF STRUCTURE

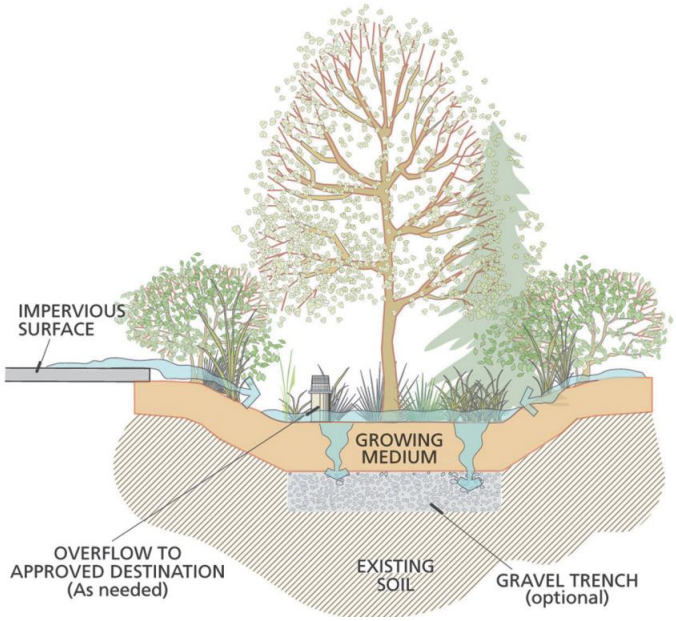

DEPTHS
CAN
VARY
ROOF STRUCTURE
WATERPROOF MEMBRANE
ROOT BARRIER (as needed)
GROWING MEDIUM
FILTER FABRIC
DRAINAGE LAYER
(as needed)

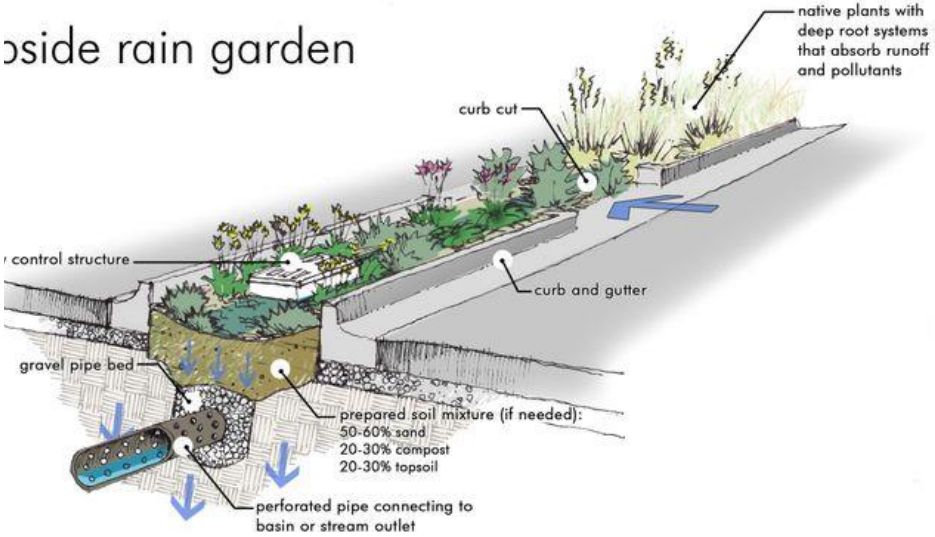
Mương sinh học

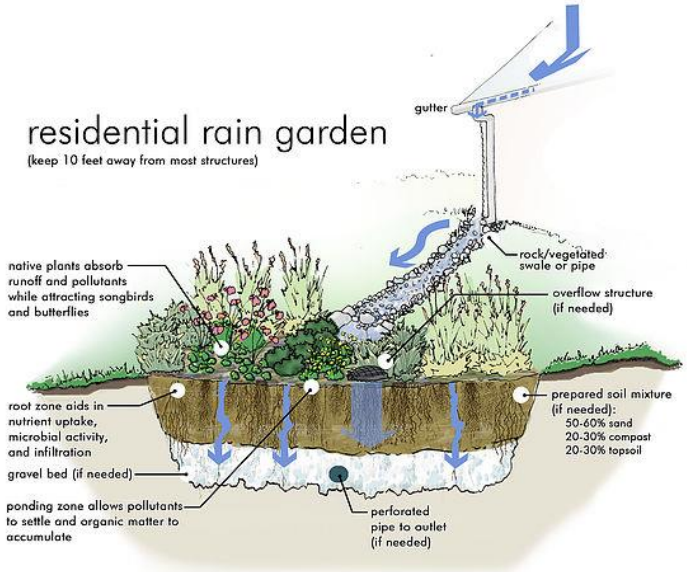




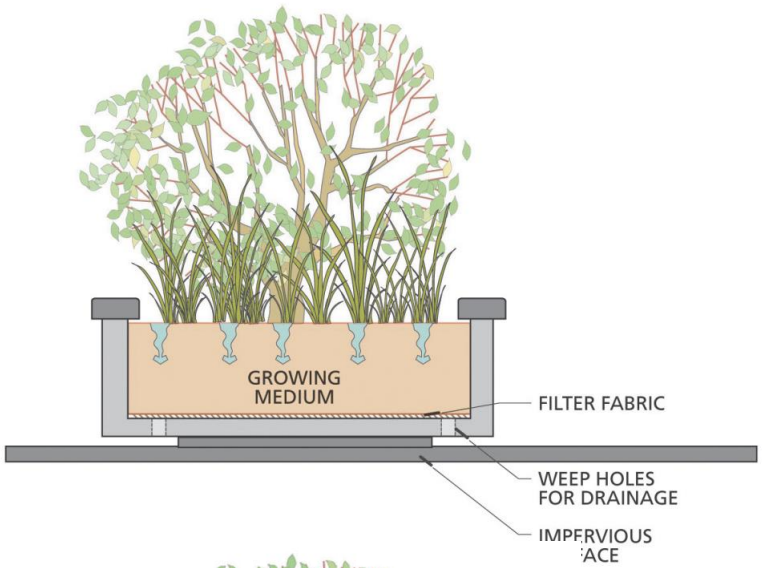
Hồ/bể thấm sinh học; vườn mưa

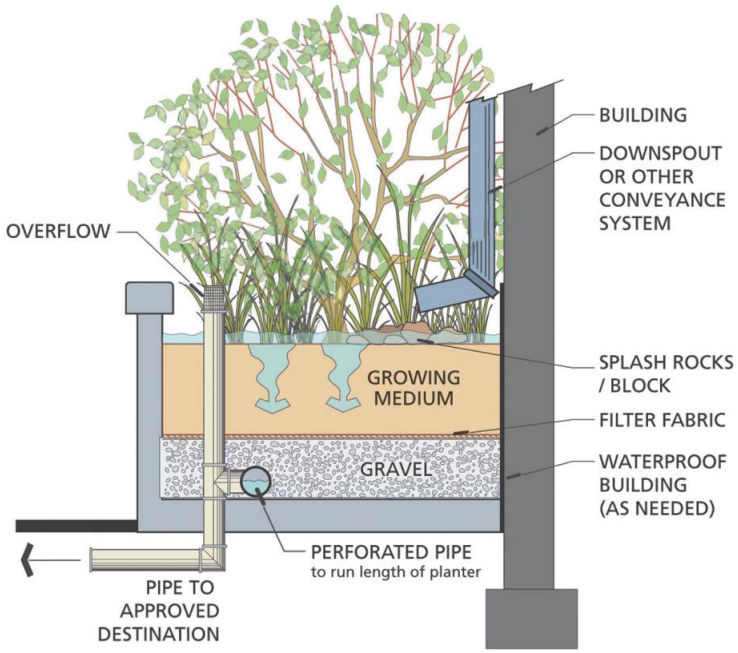


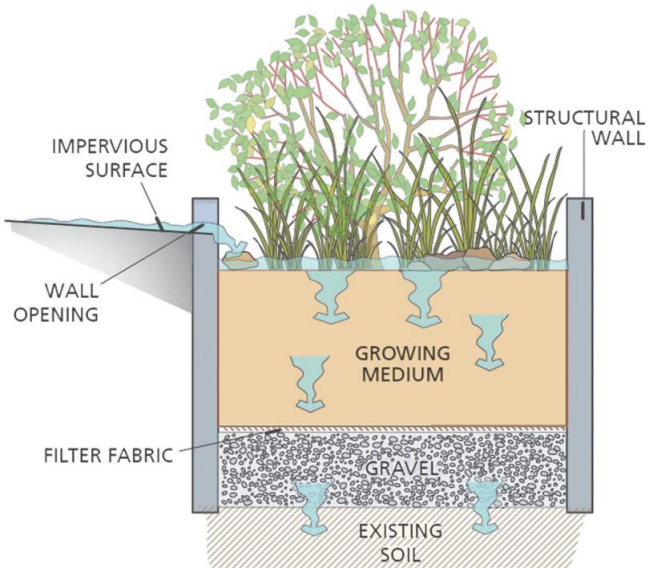




Bồn hoa


GROWING MEDIUM
FILTER FABRIC
WEEP HOLES FOR DRAINAGE
IMPERVIOUS

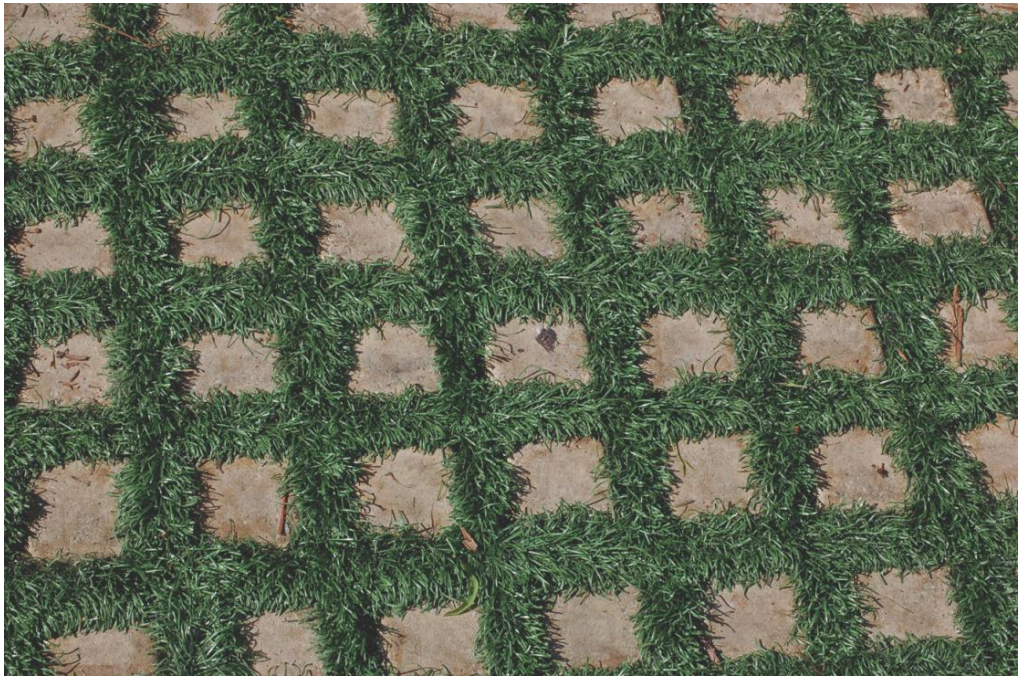

BUILDING
DOWNSPOUT OR OTHER CONVEYANCE SYSTEM
OVERFLOW
SPLASH ROCKS / BLOCK
GROWING MEDIUM
FILTER FABRIC
GRAVEL
WATERPROOF BUILDING (AS NEEDED)
PERFORATED PIPE
to run length of planter
PIPE TO APPROVED DESTINATION


STRUCTURAL WALL
IMPERVIOUS SURFACE
WALL OPENING
GROWING MEDIUM
FILTER FABRIC
GRAVEL
EXISTING SOIL

Bề mặt thấm nước

Pervious vs. Impervious

Bề mặt lát hở



Nước trong không gian công cộng

Trevi Fountain in Rome, completed in 1762 and designed by architect Nicola Salvi.

Nguồn ảnh: https://www.wantedinrome.com/news/tourists-fined-for-jumping-into-romes-trevi-fountain.html

Nước và Lũ lụt

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.

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và lũ lụt

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và lũ lụt

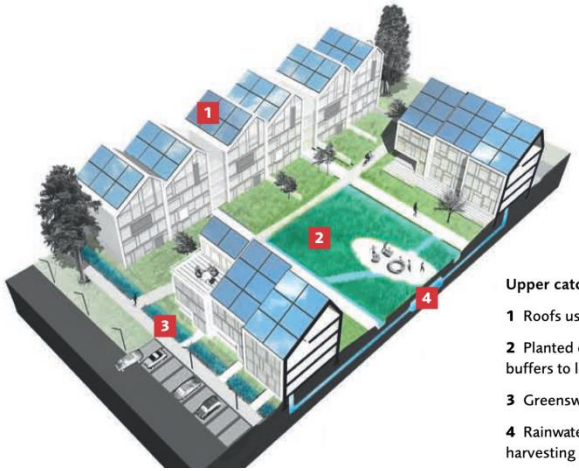
Amphibious homes, Maasbommel, the Netherlands, Factor Architects, 2007. The site is located outside the dikes in a recreational area and was chosen for its regularly high water levels. Floods in recent years and subsequent dike reinforcements in the catchment basin have led to the development of houses according to an entirely new concept: houses that only float during floods. To allow the houses to move with the water level, they are built on concrete floating bodies with a coupling construction. At low water level, the houses rest on a concrete foundation. The houses have a wooden frame construction in order to make them as light as possible. To prevent the houses from drifting away during a flood event, they are anchored to flexible mooring posts that cushion the swell of the water. It is expected that once every five years the floodwater will rise to such a level that the houses will lift off the ground. They can accommodate a difference in water level of up to 5.5 metres.

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và lũ lụt

Floating community "New Arcania", Advin and Dura Vermeer, 1999. This concept for a flood-resilient city was one of the winning entries of a first-of-its-kind Dutch design idea competition aimed at generating innovative solutions for adapting the Netherlands to rising sea levels.

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser



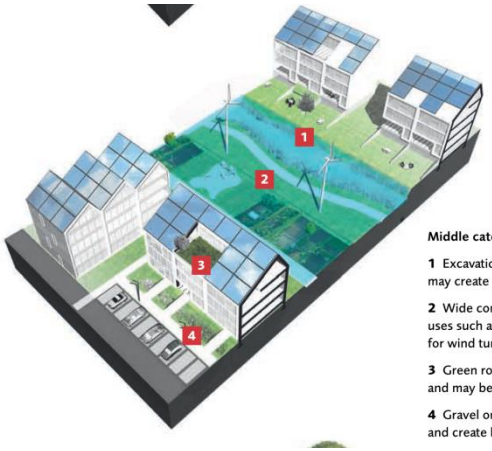
Upper catchment: rain courtyards

1 Roofs used for solar PVs and solar hot water

2 Planted communal "rain gardens" provide buffers to local areas of play

3 Greenswales provide building thresholds

4 Rainwater is collected within a communal harvesting system



Middle catchment: stream corridors

1 Excavations where the water table is high may create attractive permanent water bodies

2 Wide conveyance paths offer multiple daily uses such as allotments, amenity and locations for wind turbines

3 Green roofs collect rainwater for harvesting and may be integrated with solar PVs

4 Gravel or planted swales attenuate rainwater and create building thresholds

Lower catchment: behind defenses

1 Generous elevated balconies or walkways can provide safe access and egress

2 Level variation and street layout can slow flood flows, even behind defenses

3 Concrete frame buildings designed to allow floodwater to pass through help to resist structural collapse

4 Rainwater needs to be attenuated and potentially stored, particularly during high tides, when drains can be blocked

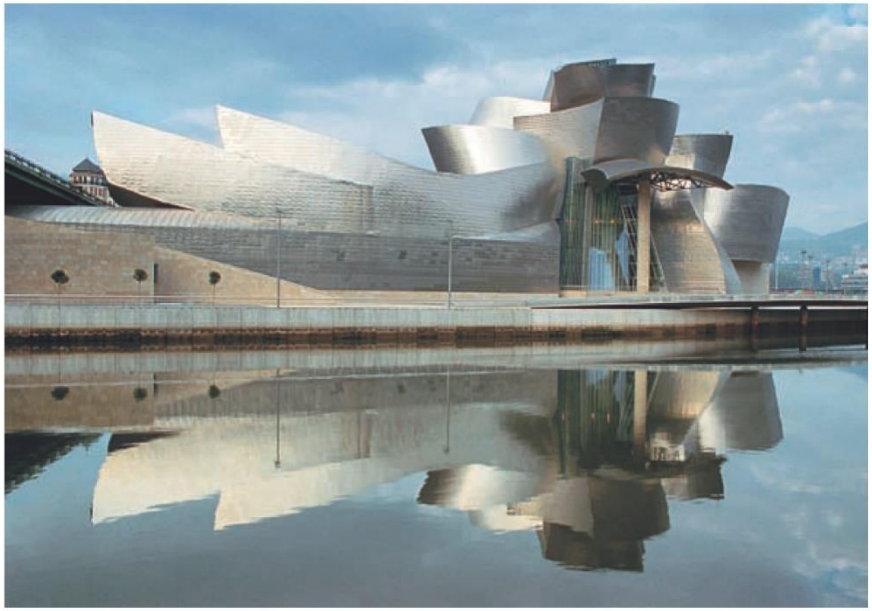
Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và văn hóa

Hồ Gươm, Nguồn ảnh: Internet

Nước và văn hóa

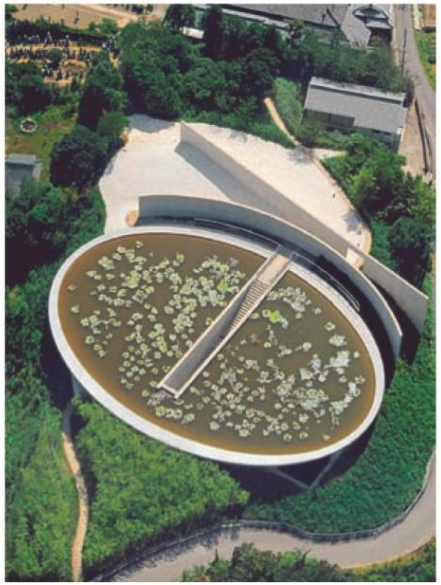
Entrance and central courtyard of Salk Institute for Biological Studies, La Jolla, California, Louis I. Kahn, 1965.



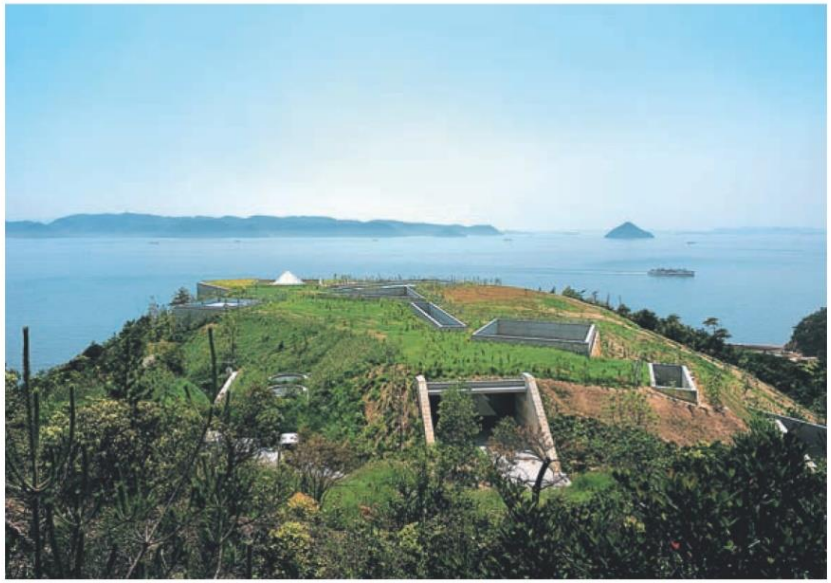
Guggenheim Museum Bilbao, Spain, Frank Gehry, 1997.

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và văn hóa



Aerial view of The Water Temple, Awaji Island, Japan, Tadao Ando, 1991.



Aerial view of Chichu Art Museum, Naoshima, Kagawa, Japan, Tadao Ando, 2004.

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và văn hóa

Groninger Museum, Groningen, the Netherlands, 1994.
The museum consists of three volumes: a silver cylindrical building designed by Philippe Starck, a yellow tower by Alessandro Mendini, and a pale blue pavilion by Coop Himmelb(l)au.

National Centre for Science and Technology NEMO, Amsterdam, the Netherlands, Renzo Piano Building Workshop, 1997.

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và văn hóa

National Assembly Complex Sher-e-Bangla Nagar, Dhaka, Bangladesh, Louis I. Kahn, 1962–1983.

Capitol Complex, Chandigarh, India, Le Corbusier, 1964.

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và Giải trí

Floating Swimming Pool, Brooklyn, New York, Jonathan Kirschenfeld Associates, 2007.

Paris Plage transforms the capital city in the summer into a car-free zone with places for relaxation and sports activities along the banks of the river Seine.

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và Giải trí

Công viên Đầm Sen, Nguồn ảnh: Internet

Nước và giải trí

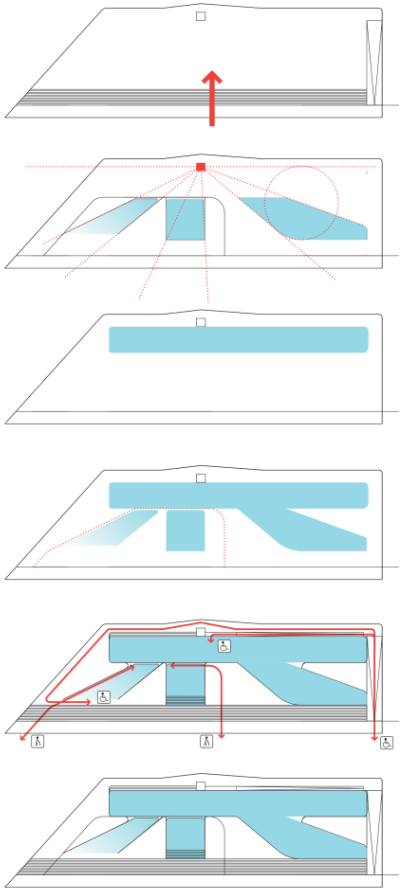
Hồ Con Rùa, Nguồn ảnh: Internet

Nước và lối sống

Fallingwater, Bear Run, Pennsylvania, USA, Frank Lloyd Wright, 1936.

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và Lối sống



Harbour Bath | BIG and JDS Architects

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và lối sống

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và lối sống

COMPLETION
2005

LOCATION
Kastrup, Denmark

DESIGN TEAM
Fredrik Pettersson (project architect), Rasmus Skaarup, Pernille Vermund, Göran Wihl, Henrik Haremst, Johnny Gere (project team)

STRUCTURAL ENGINEERING
NIRAS Rådgivende ingeniører og Planlæggere A/S

CONTRACTOR
Tårnby commune

Kastrup Sea Bath | White Architects

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Nước và lối sống

Nguồn: Ryan, Z. (2010). Building with water: Concepts, typology, design. Basel: Birkhäuser

Cảm các bạn!