



2023 Top 10 List of Hot **RESILIENT Trends in Greenroof & Greenwall Design:
*Building Resilience with Living Architecture***

Images: MVRDV © Ossip van Duivenbode, © Vincent Callebaut Architectures, © BIG, © Kengo Kuma & Associates



**By Linda S. Velazquez, ASLA, LEED AP, GRP, Greenroofs.com Founder & Publisher
Sky Gardens Studio Design Consultant**

Which designers, projects, systems & technologies are best handling climate-induced storm events?

Which cities are best planning long-term responses to resiliency issues with living architecture & green infrastructure?

10:

Client Specific

**'Boutique' Greenroofs &
Greenwalls**

for those living roof & wall projects just too unique to fit into any other category

Influencing local government while performing beautifully:

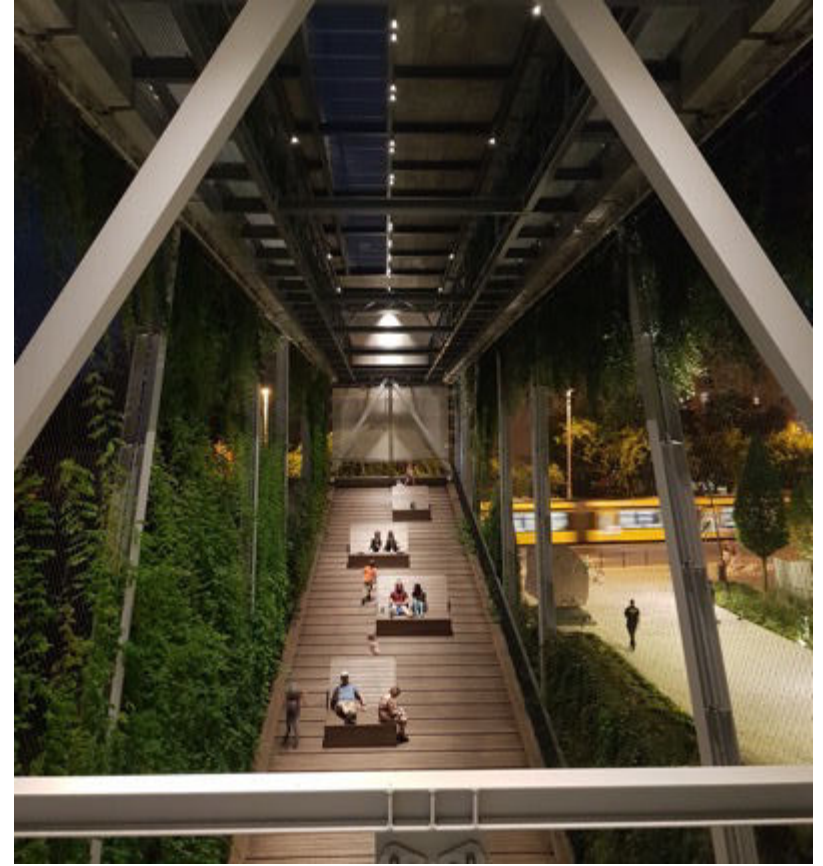
Széllkapu Park

Green Walls & 3-Dimensional Hanging Garden

Budapest, Hungary: 2020

- 13th District of Budapest obliges developers to build 5-10% green frontage on new office/commercial buildings with a frontage of over 500m² (2022)
- 1st comprehensive analysis of green space investment developments in the country, examining the quantitative & qualitative impacts of new green space development
- all the green wall surfaces = vertical extensions of the horizontal green areas of the park, adding 4550 m² of running frontage to the urban green space





3 types of green façades:

- concrete building façades: Hungarian-developed modular system with perennials
- Margit boulevard façade pre-grown ivy panels highlight a waterfall
- the most spectacular element: the 230-m long steel structure = the 3-D hanging garden

largest green façade completed in the country & Central Europe to date

walls provide habitat, nesting & food for small bird species & pollinators

15 types of creeping plants on the hanging wall & 10 types of perennials on the modular green walls

Széllkapu Park in total: 355 trees, 25,500 shrubs, 49,200 perennials, 22,000 ornamental grasses & 43,400 bulbs



Széllkapu Park

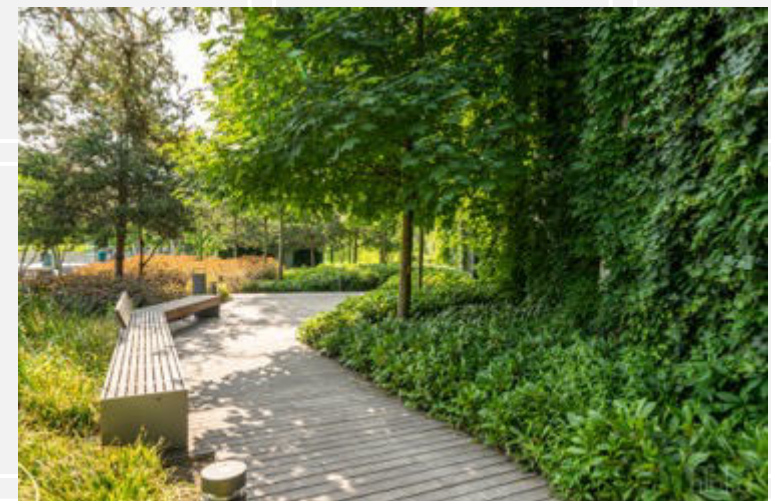
Green Walls & 3-D Hanging Garden

- BIM technology used to quantify calculation & modifications
- total length of the 4-story hanging garden: 230m, 6.6m wide & 19.3m high at top
- solar panels installed on top floor

By: 4D Landscape Design Ltd., TSPC Technical Supervision and Planning Consulting Hungary Kft., TSPC Group, 4D Tájépítész Iroda, Parkertech Kft.



All Images: 4D Landscape Design Ltd., TSPC Technical Supervision and Planning Consulting Hungary Kft.



HUASSMANN 2.0, A Resilient, Green & Breathable Paris 2023

Vincent Callebaut
Architectures rethinks
1853's transformation
of Paris - Napoleon III
told Haussmann to:

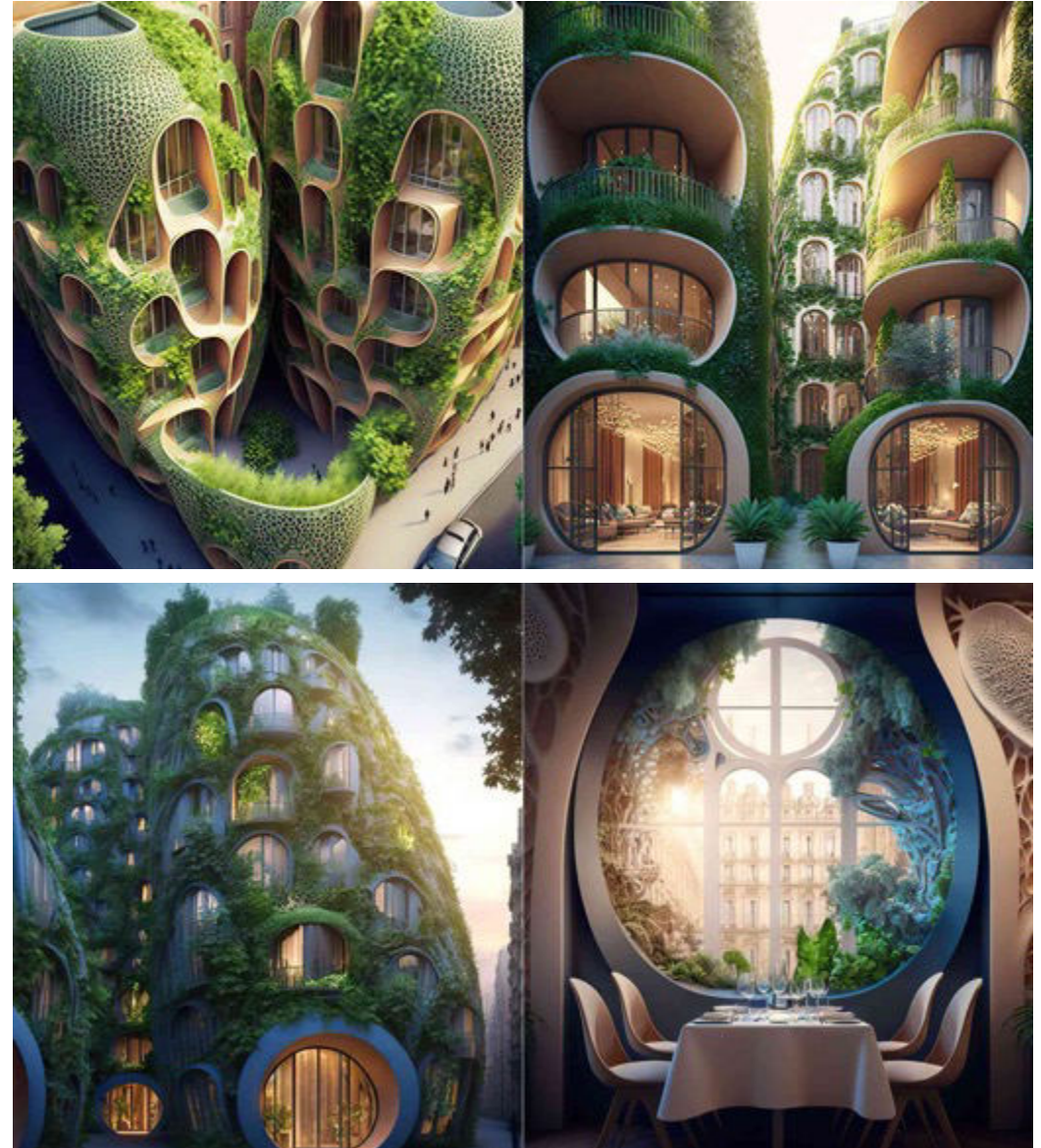
- bring air & light to
the center,
- unify different
neighborhoods with
boulevards,
- make the city more
beautiful



AI-Inspired Revolutionary Green Dreaming Visions of the future are NOW

In line with their “Paris Smart
City 2050” ecological transition
plan (2014), old medieval Paris
evolves to:

Climate & Energy Solidarity &
“positive energy
biomimetic architectures”

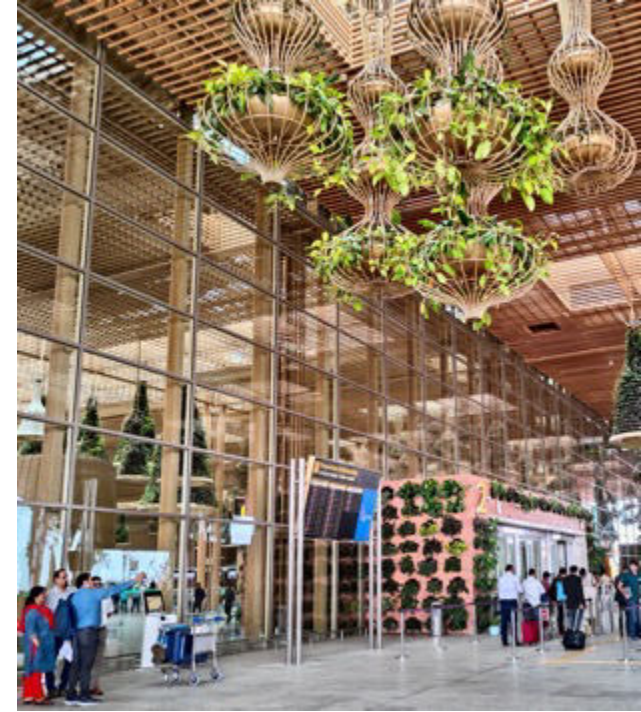
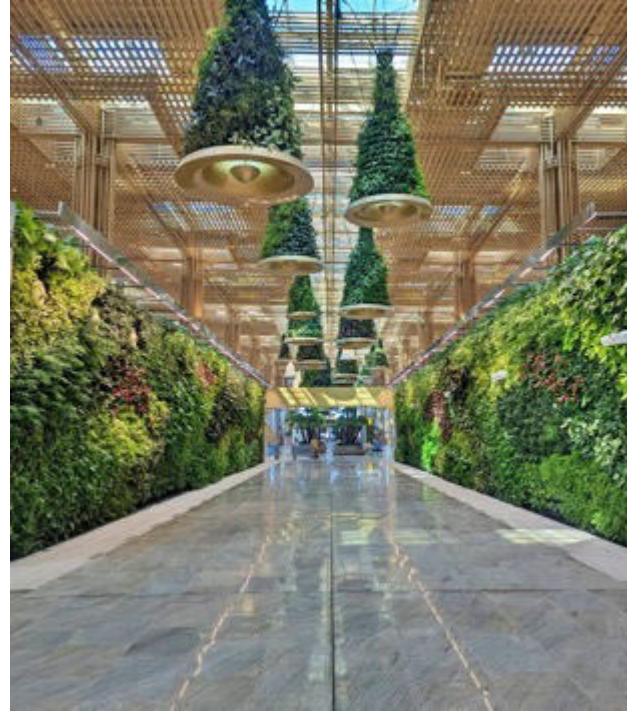




“Futuristic avant-garde investment in long-term community resilience with a hybrid of hard & soft resiliency solutions that can organically transform & adapt over time based on a city’s needs is imperative if we as designers are to rethink how design can effect changes in architecture, landscape architecture & our interconnected systems of humans, flora & fauna.”

~ Vincent Callebaut Architectures

By: Vincent Callebaut Architectures

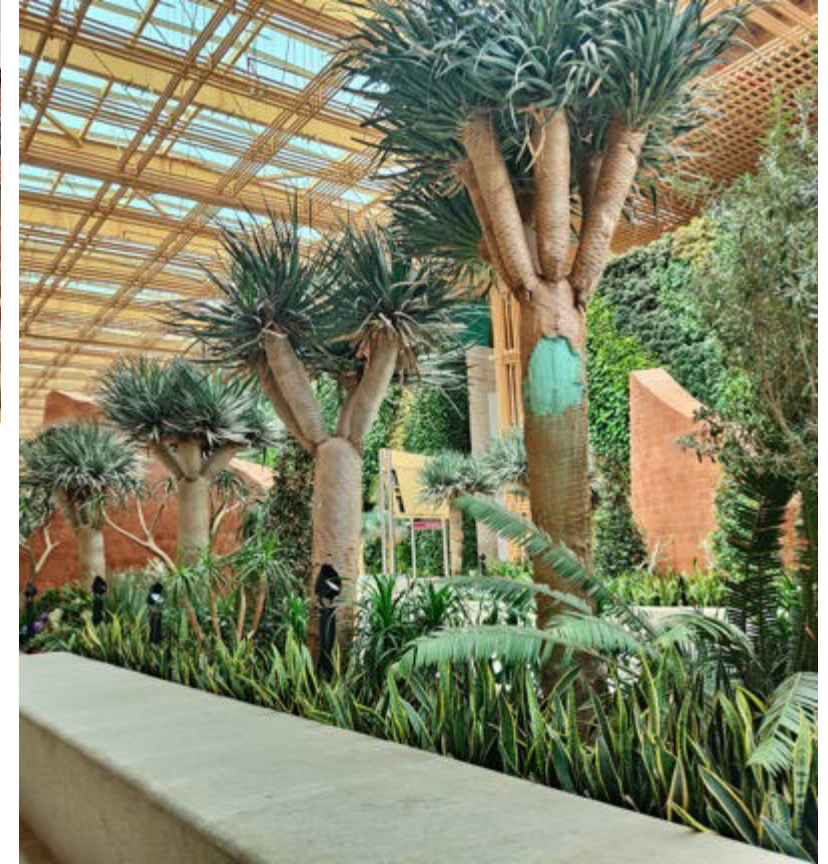


All Images: Prasannamurti Desai, Bengaluru International Airport Limited (BIAL)



Kempegowda International Airport Terminal 2 Bengaluru, India: 2022

- New 255,000 m² terminal designed & built on 4 key pillars: Terminal in a Garden; Sustainability; Technology; Art & Culture
- series of interconnected buildings joined by landscaped spaces + populated with plants, bamboo-clad pavilions, indoor waterfalls & rattan furnishings, 3-story 'forest belt'
- largest airport building in the world pre-certified as LEED Platinum
- greenwalls, hanging gardens & greenroofs galore!

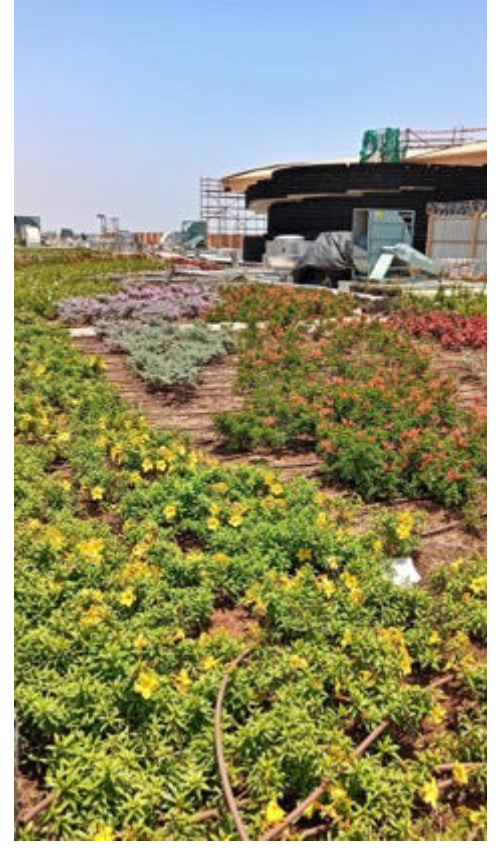


All Images: Prasannamurti Desai, BIAL



Outside Greenery & Domestic Entry

- serious sense of conservation: plants selected from around the world; acclimatized prior to installation; onsite exterior nursery; greywater capture & recycle
- various rare species of Cycads, Ancient Olives & Dracaena Dracos; Agaves, Yuccas, Aloes +more, ~ 400 species from Mediterranean



All Images: Prasannamurti Desai, BIAL



Greenroofs

- topsoil conservation, microbial biome & sustainable landscape methods, carbon sequestration, climate-smart irrigation & compatible planting palettes
- tropical & subtropical flora: 3600+ species includes 1200+ trees, 1800 shrubs & groundcovers, 190+ palms

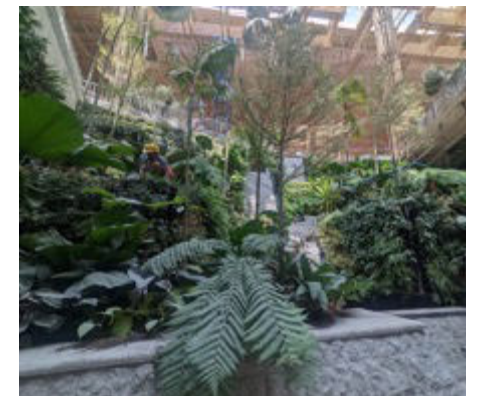
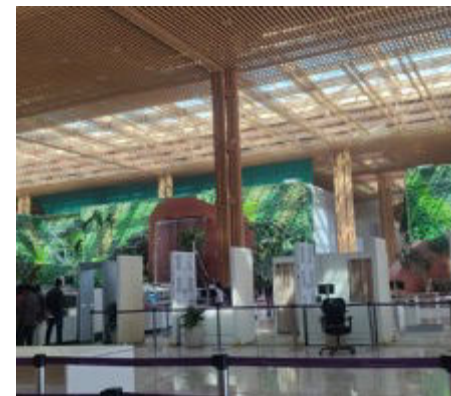


All Images: Prasannamurti Desai, BIAL



Kempegowda International Airport Terminal 2

- colors: 400 types of Lilies & Lotus, 400+ Roses & Hibiscus, 100 Heliconias & Gingers
- some rare plants have flowered & will collect the seeds for new propagation
- reflects Bengaluru's rich culture, history, its nature as the garden city & technology hub of India



By: SOM, Bengaluru International Airport Limited (BIAL)+

9:

**Subterranean Ripples in the Landscape:
weaving resilient hardscape & vegetative softscape
into the natural land**

earth sheltered sustainability protects & cools down temperatures like modern cave dwellings



Latypi Residence

Choulakia, Mykonos, Greece:
2020
magnificent indoor-outdoor living
concept

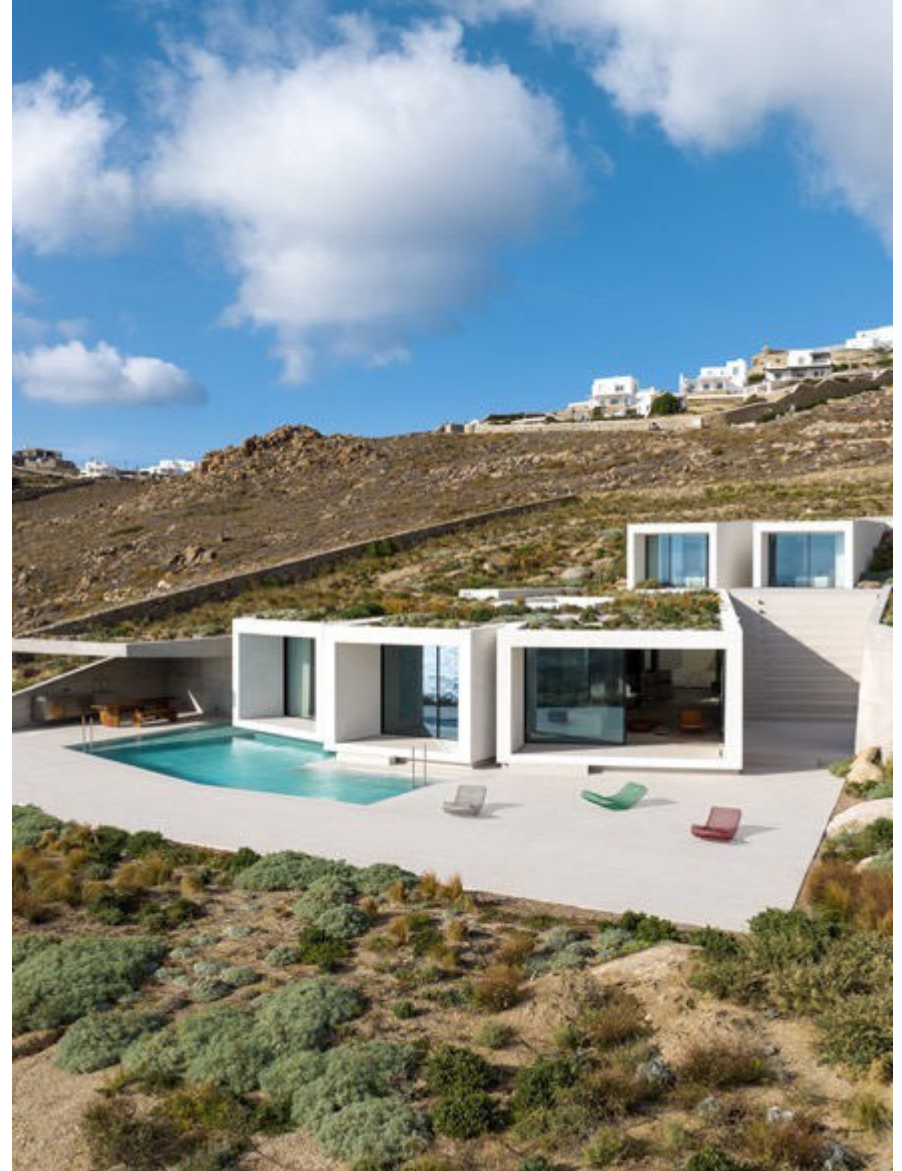
- Residence is sculpted out of arid sloping terrain & all spaces are developed around an atrium
- wrapped with full height windows, the residence's living spaces seamlessly extend to nature



"The building is guided by the plot's topography, slope & orientation while flowing among the solid ground & not above it." ~ A31



"The aim was to weave both the hardscape and soft scape of the building into the natural Mykonian landscape."



**above-ground
area spans
120m² & the
underground
section ~ 130m²**

Planted roofs were "meticulously planned" to preserve the ecology of the surrounding scenery:

By: A31 ARCHITECTURE CONSTRUCTION, Praxitelis Kondylis, Archetopo / Landscape Urbanism

Latypi Residence



landscape design is based on the existing natural terrain, borrowing from its elements & reinterpreting the variety, textures & colors of native plants to create a new palette



Gurdau Vinařství (Winery):
Emerging as a ripple in the
landscape

Kurdějov, Czech Republic
2022

Blending in harmoniously as a
green extension of its
surroundings





the region has rich
winemaking heritage

- sedum & herb roof cover forges symbiotic relationship between architecture & nature
- 150 shrubs & mature trees strategically planted in the surrounding area
- some trees pierce through the perforated roof!



a picturesque
tapestry in the rolling
hills

- expansive glazed surfaces, generous terraces & pitched roof
- subterranean: hub for wine production, storage & preservation
- ground level has wine tasting, seating & sales
- plus 2 apartments for overnight guests





Gurdau Vinařství

Increasing the wine & wine-tourist culture in the Czech Republic

By: Aleš Fiala, OK ateliér, Zahrady Zapletal+



8:

**Sanctuaries of Healing, Equity & Urban Ag:
resiliency for the mind & body**

fruitful structures built for the benefit of our souls & physical needs



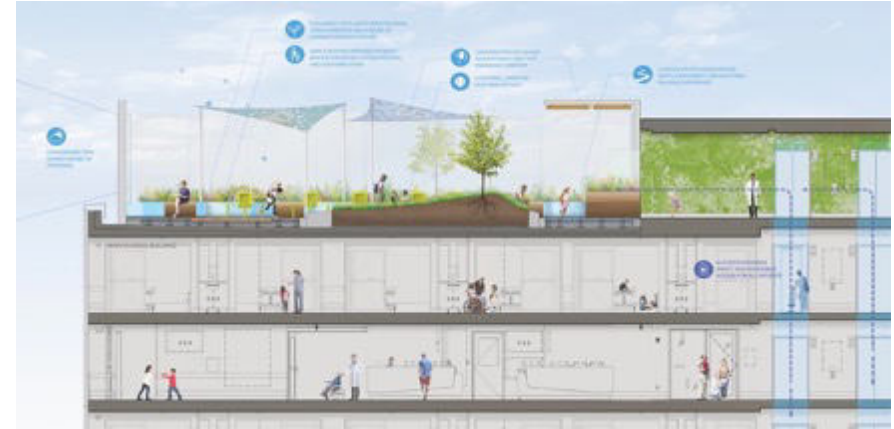
Boston Children's Hospital Healing Gardens

MA, USA: 2022 Part of the Green Urban Design Plan: human-centered design with accessible green spaces reimagining communal open space within clinical environment: 8 unique gardens

11th Floor:

8,000 sf garden offers sweeping skyline & harbor views, knoll for free play, diverse seating options & lush plantings

special design for disabled & immunocompromised kids





All Images: Milkyoung Kim Design



More immersive garden experiences & sense of play offer range of experiences from quiet contemplative to active & social:

- 2 welcoming street level gardens;
- 12th floor roof garden;
- 5th floor garden adjacent to the psychiatric care;
- 7th floor green roof;
- 2 interior winter gardens, totaling 3,700 sf





Boston Children's Hospital

Bringing restorative healing gardens & more effective medical care to patients, families & caregivers

By: Mikyoung Kim Design



HUB 32

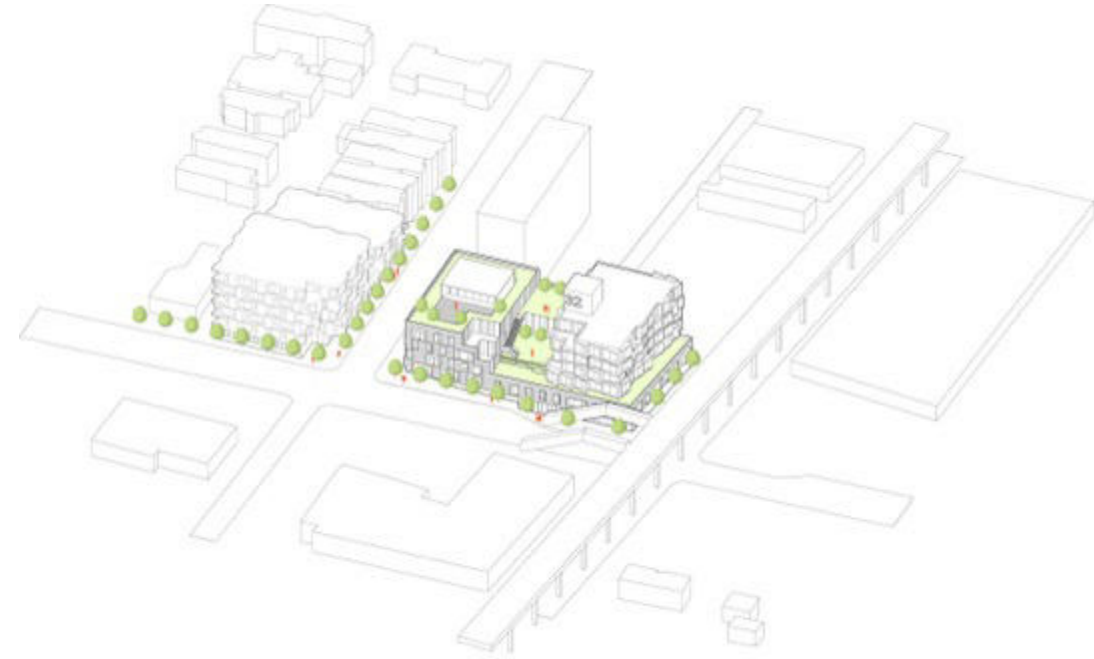
Chicago, IL: Current

Affordable 7-story 65-unit multifamily public housing
design inspiration: patchwork & quilting + city's
centuries-old history of courtyard buildings

elevated greenroof courtyard creates usable center
space

provides privacy & safety + sense of community





for residents making -60% of the Area Median Income with shared amenity spaces & laundry rooms + some apartments have private balconies

shared greenroof offers sense of connection & opportunities to grow fresh vegetables & herbs

Hub 32

courtyard typology promotes pedestrian-oriented neighborhoods as an alternative to sprawl

Design follows 5 guiding principles:

equity, innovation, a sense of place, environmental stewardship & community engagement

“Design excellence is not mutually exclusive. It can and should be for everyone.” ~ Brooks + Scarpa

By: Brooks + Scarpa



All Images: Brooks + Scarpa





Urban Farming Office

Ho Chi Minh City, Vietnam:
2022

Vo Trong Nghia Architects HQ
is wrapped in tropical
greenery with a roof garden
emblematic of firm's plant-
filled, low-energy architecture

*"new generations in urban
areas are losing their
connection with nature" ~
VTN*

+ food supplies are in
jeopardy



flexible planters cover
the glazed southern side:

filter sunlight & air;
prevent overheating;
create shaded microclimate
for office interiors

workspaces organized
around central atrium

= light-filled spaces





Urban Farming Office

- Showcasing the possibility of vertical urban farming
- together with the roof garden & ground, system provides up to 190% of green ratio to the site area = 1.1 tons of harvest
- local vegetation irrigated with stored rainwater
- evaporation cools the air



By: Vo Trong Nghia Architects

7:

**Cultural Resiliency:
informing design strategies**

protecting & promoting heritages keeps a community strong & healthy



!Khwat tu San Heritage Center Grootwater Farm South Africa: 2019

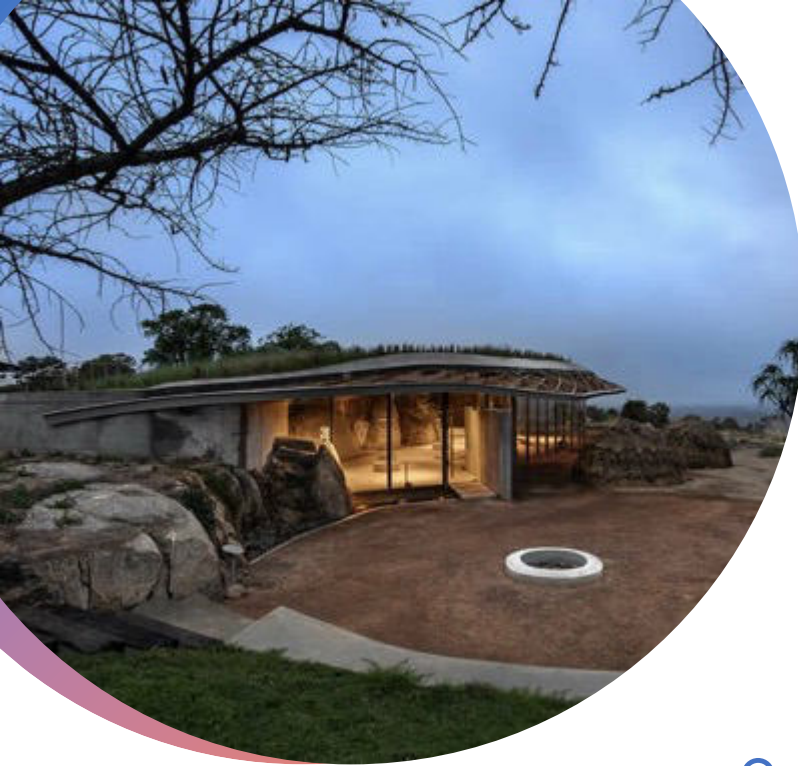
The "Embassy" of the San Spirit

- Strives to restore dignity & cultural pride, navigating a practical path between the old ways & the new world
- nestled along a granite ridge overlooking the Atlantic Ocean, the native-planted concrete roof merges the building into the setting
- visit, tour, book a delicious meal, stay for the night!



Images: !Khwat tu San Heritage Center, Adam Letch

Images: Adam Letch, !Khwat tu San Heritage Center



+



The San are the surviving indigenous culture of South Africa

- from human origins to contemporary San life: a compelling story told in 3 thought-provoking buildings
- the building is conceived as an organic landscape with an emphasis on sustainable & ethical design
- on the floor a special concrete mix was used to emulate the colors of the Kalahari San environment





!Khwat tu San Heritage Center

- Roof parapets are carefully molded to support the growing medium on top of multi-layered drainage insulation boards
- internally, the exposed granite rocks become an integral part of an exhibition wall
- the heritage restitution, conservation & responsible tourism practice create a powerful learning experience for young San from across southern Africa



By: KLG Architects, Henry Fagan & Partners, Vula Environmental Services+



All Images: Hundertwasser Art Centre; Zoe Avery, The Urbanist; drone by Richard Smart courtesy Hundertwasser Non Profit Foundation



Hundertwasser Art Centre + Wairau Māori Art Gallery
 Whangārei, New Zealand: 2022

In 1993 Hundertwasser invited to design an art gallery for Whangārei

Aotearoa's first & only Māori contemporary art gallery designed to reflect Hundertwasser's belief in the importance of integrating nature into the built environment



- native Northland specific plants: offshore island, threatened, endangered or rare species
- integrating endemic species with fruiting trees allows wandering through the forest to discover, pick & eat fruit
- feel like a guest of nature on the roof!



Images: drone by Richard Smart courtesy Hundertwasser Non Profit Foundation; Zoe Avery, The Urbanist; Hundertwasser Art Centre

landmark biodiverse living roof of ~
980m² creates a stunning extension
to the Centre

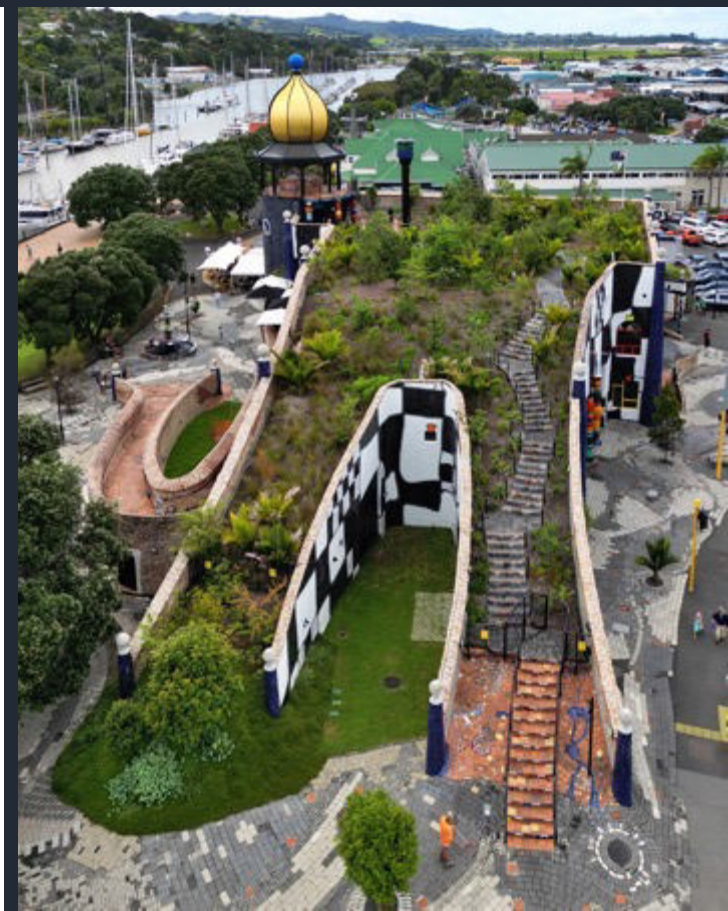
All Images: drone by Richard Smart courtesy Hundertwasser Non Profit Foundation; Hundertwasser Art Centre



the living roof creates a rich habitat for
plants, insects & birds, fostering a
thriving ecosystem that supports
biodiversity

home to the rarest tree in the world:
Three Kings Kaikomako, *Pennantia
baylisiana*

forest plantings set randomly, wild with
spontaneous vegetation beneath the
trees where new plants can self-seed as
happens in nature





Images: Hundertwasser Art Centre; Zoe Avery, The Urbanist; drone by Richard Smart courtesy Hundertwasser Non Profit Foundation; LDR



Hundertwasser Art Centre + Wairau Māori Art Gallery

- Innovative design: interlocking network of cells maintains the substrate, trees & drainage on the 1:4 slope
- greenroof has withstood 2 cyclones & several major weather events since it was installed last year!

*“Manaaki whenua, manaaki tangata, haere whakamua” ~
Care for the land, care for people, go forward*

By: Zoë Avery, Renée Davies, oversight from the Hundertwasser Non-Profit Foundation & Springmann Architecture, Dr Robyn Simcock, HB Architecture, Friedensreich Hundertwasser (concept design)

Museum of the Future

Dubai, UAE: 2022

LEEDv3 Platinum

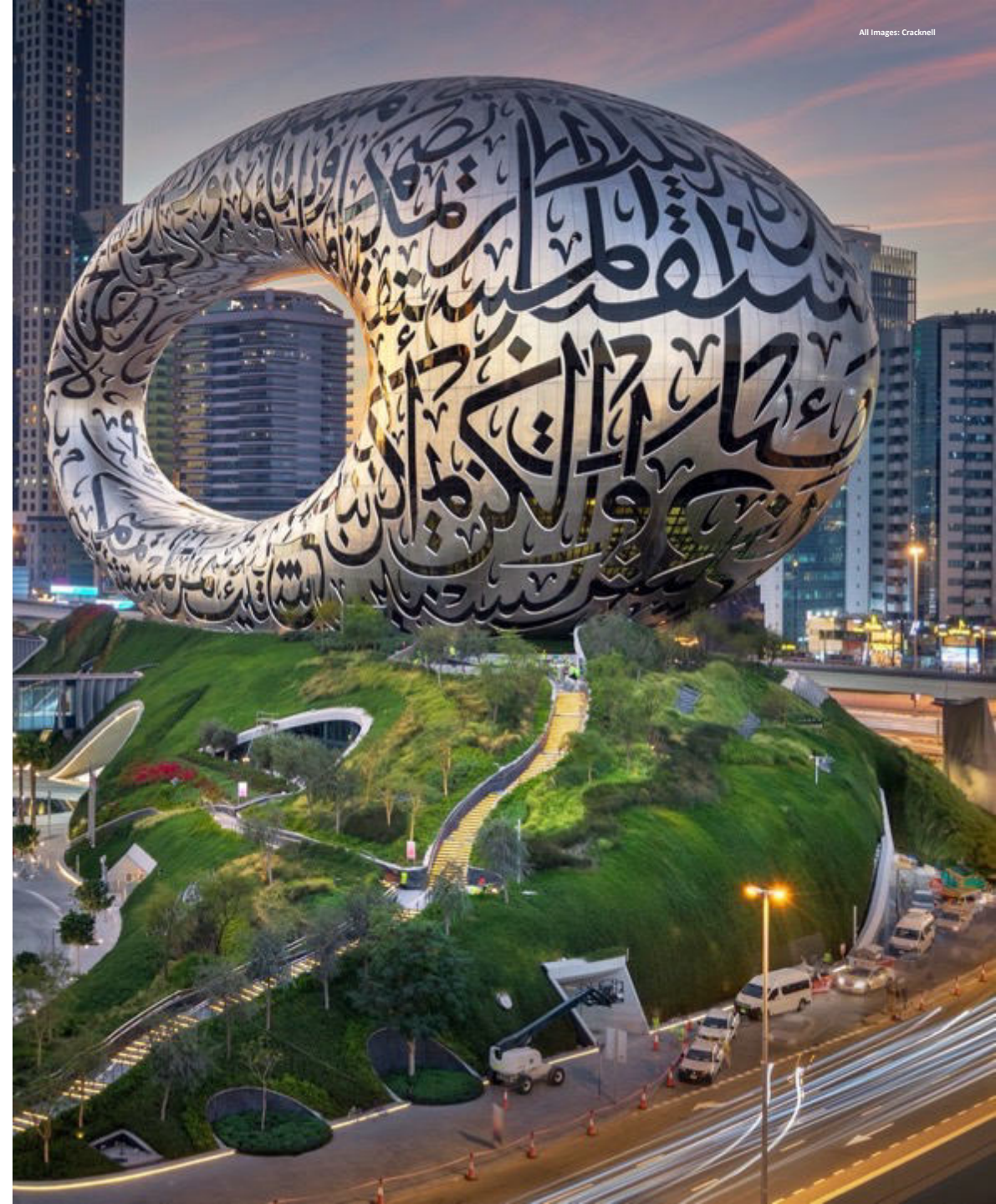
High profile, iconic landmark for science & technology:

Gleaming torus sits gently on a mounded landscape

to reduce solar gain & heat island effect, over 2/3 of building is situated below the podium greenroof

the building & landscape set new benchmarks for innovation & resilient design

parking & infrastructure concealed under 'green skin'



exterior torus façade comprises windows forming an Arabic poem in calligraphy by Dubai's ruler about emirate's future with 1,024 unique 3D, fire-retardant composite panels in stainless steel

the building depicts a ring around a void, designed to represent future knowledge that is yet to be revealed

the green mound represents Earth, with the main building symbolizing humanity

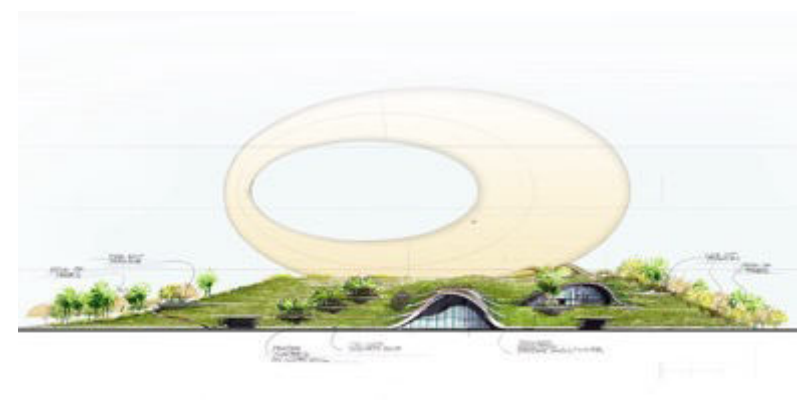
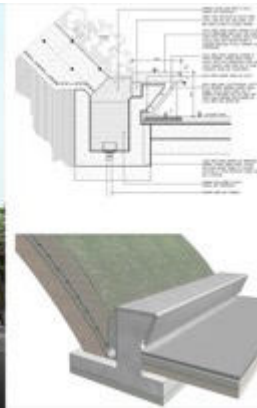


where 'people can see, touch & shape our shared future,' the landscape presents the latest innovation in green wall/steep slope technology:

over 60° slopes required new approach to suspend the soil 'carpet'

smart irrigation systems use grey/treated sewage water

lightweight expanded polystyrene (EPS) geofoam used with cocopeat & perlite improve soil's water holding capacity, creating a lightweight planting medium





Black Carpenter Bee on the carpet of Skyblue
Clustervine *Jacquemontia pentantha* on the Mound



Images: By Saaremees - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/wiki/File:WingZoo.jpg>, Cracknell, Dubai Future Foundation

Museum of the Future

- Native plants adapted to poor saline soils & self-propagating: sea purslanes, grasses & groundcovers + Ghaf, *Zizyphus spina-christi* (Sidr) & Acacias trees
- passive solar design, low-energy & low-water engineering solutions, recovery strategies for energy & water using building integrated renewables from an offsite solar farm

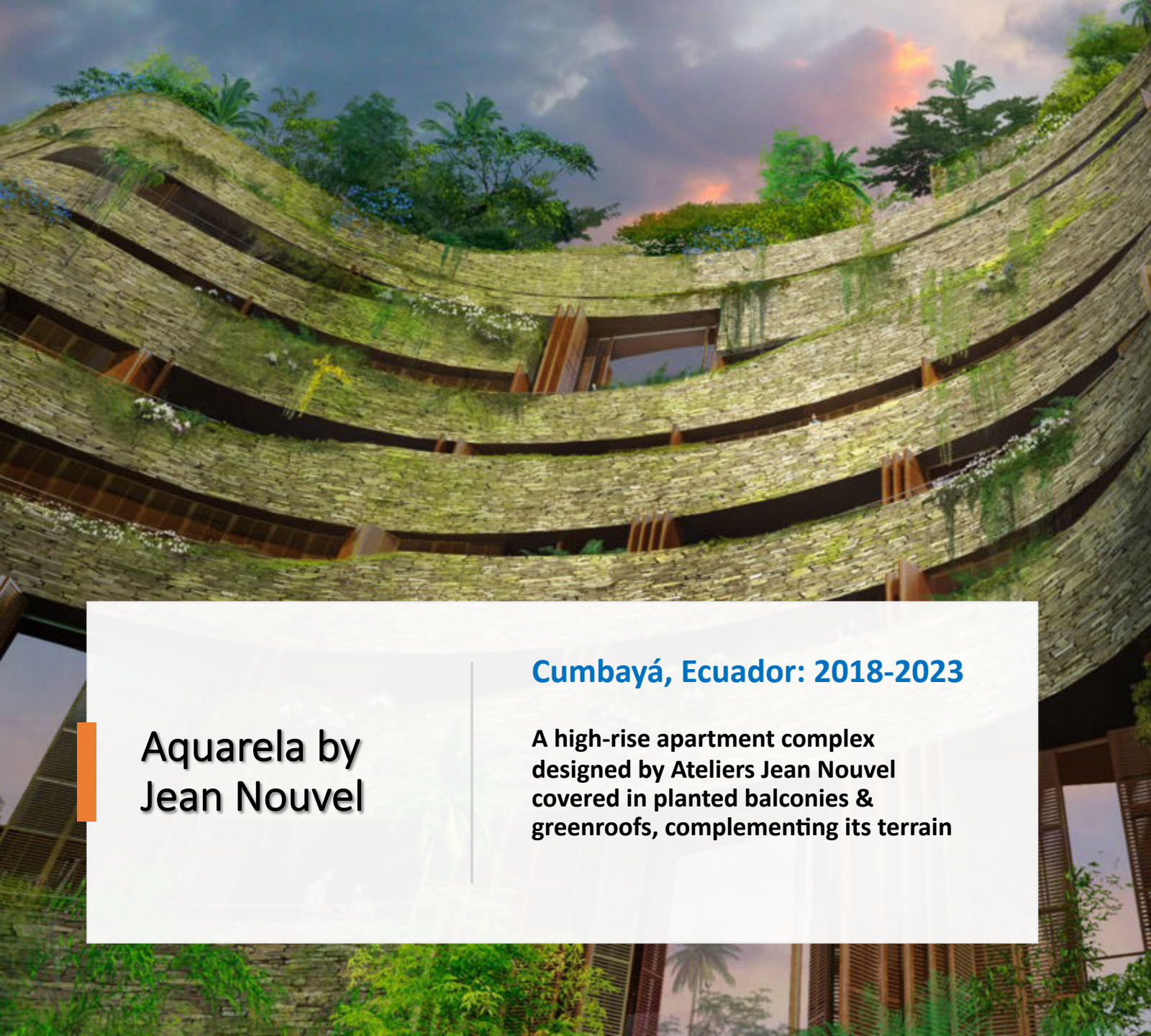
By: Killa Design, Buro Happold, Cracknell, Desert Landscape Co., Mattar bin Lahej+

6:

Starchitects Discover Ecuador:

Jean Nouvel, BIG, Safdie, MAD & Philippe Starck

new vertical urban shifts in the traditionally low-density, highly biodiverse country is transforming Quito into a cornerstone of architecture, design & innovation



Aquarela by Jean Nouvel

Cumbayá, Ecuador: 2018-2023

A high-rise apartment complex designed by Ateliers Jean Nouvel covered in planted balconies & greenroofs, complementing its terrain

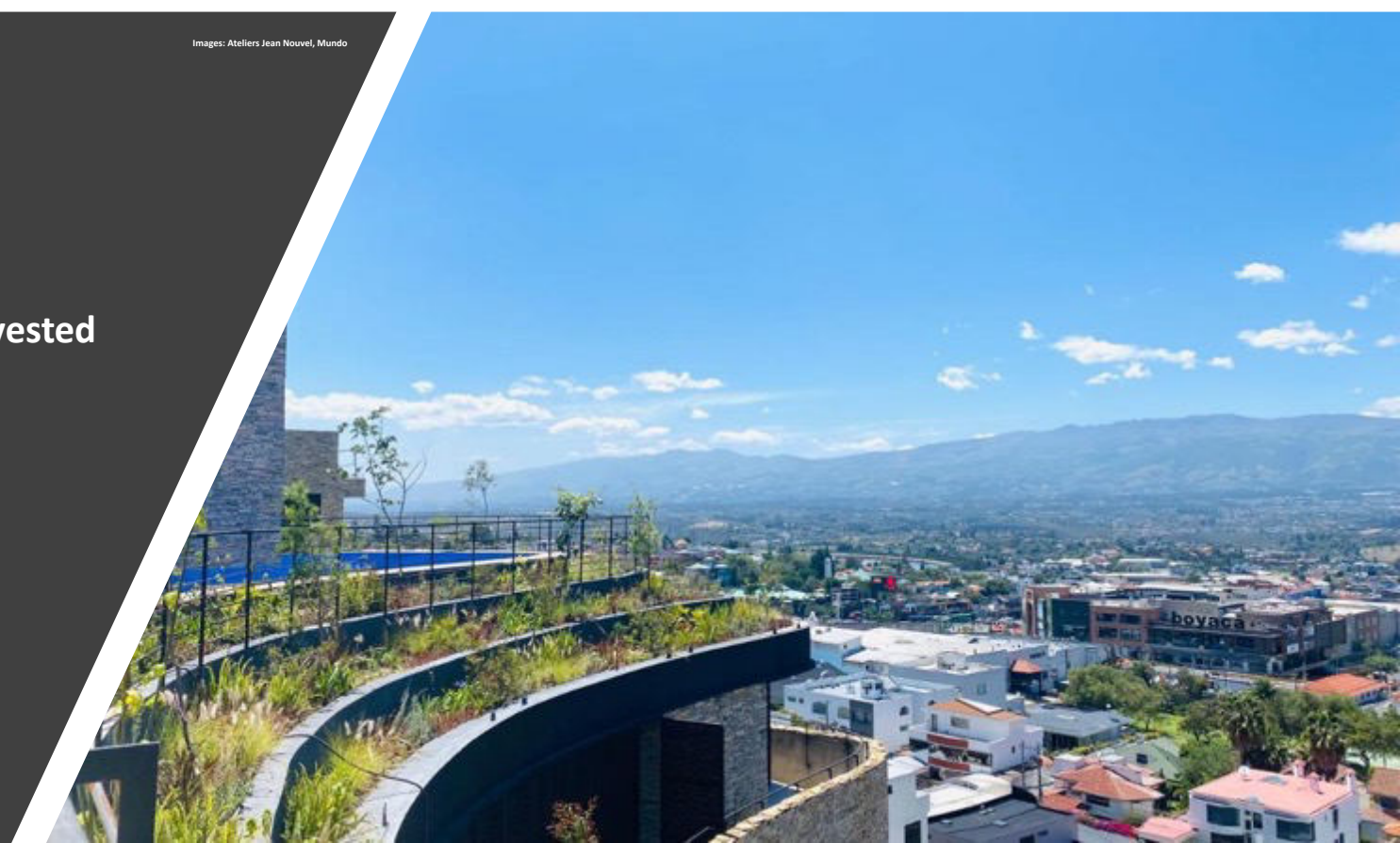


Images: Ateliers Jean Nouvel, Mundo

Aquarela

- greenroofs & vegetated balconies watered with harvested rainwater
- graywater filtered & recirculated
- 850 new trees planted
- solar panels mounted on surfaces

By: Ateliers Jean Nouvel, Alberto MEDEM / Humbolt Arquitectos,
Uribe Schwarzkopf+

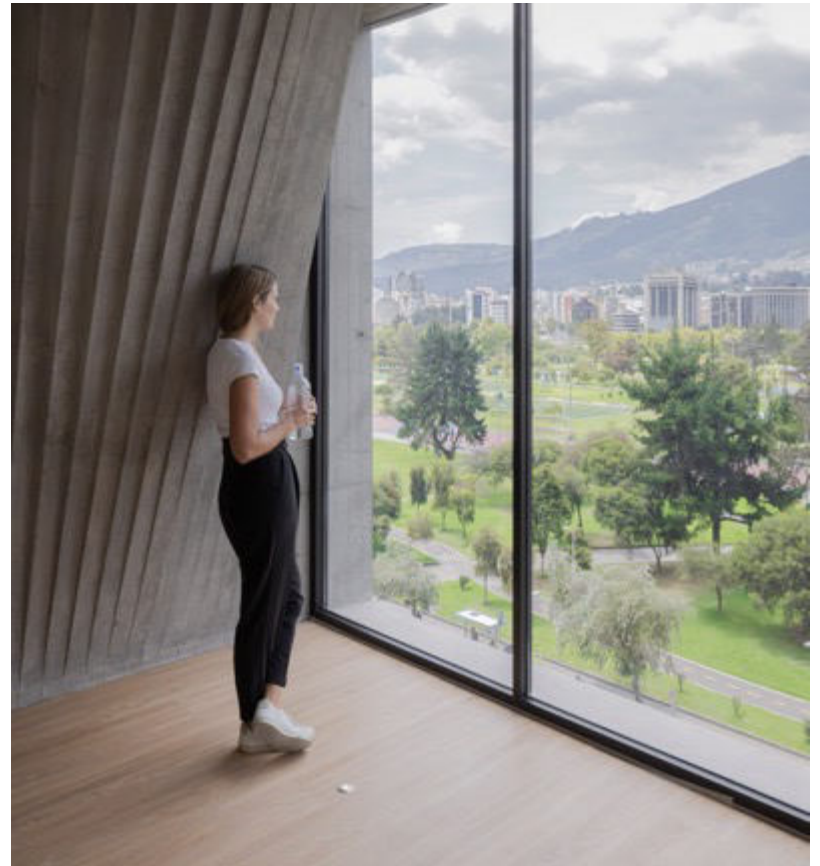
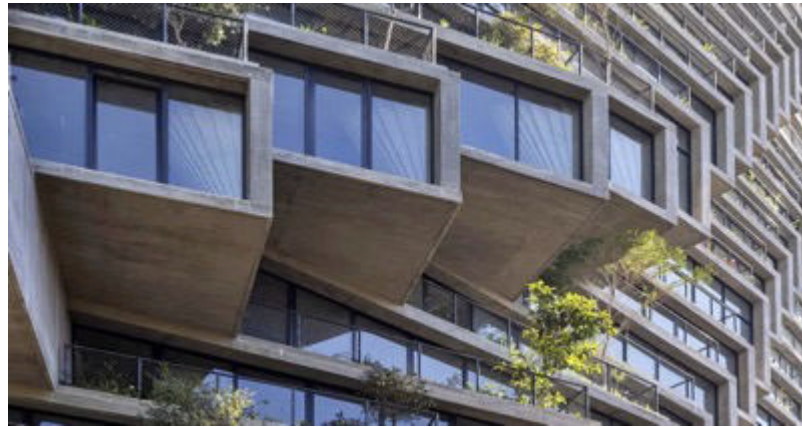




IQON by BIG

Quito, Ecuador: 2022

- 32-story, rotating green facade of planted exposed concrete blocks @ 133m high: tallest skyscraper in the capital with 215 residences, shops, offices & amenities
- planted with natives, the cascading balconies become an extension of nearby La Carolina Park
- BIG's 1st project in South America



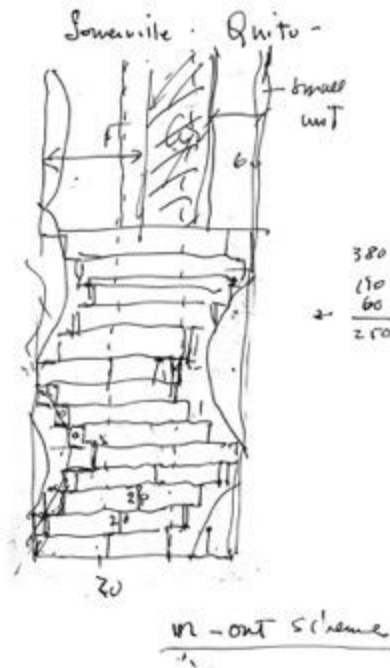
IQON

1 to 3-bed apartments including 9 penthouses, positioned to ensure panoramic views over Quito & the Pichincha volcano

each terrace has a different species of tree- once they outgrow their planters (~ 5 years), to be replanted in parks all over the city

By: BIG (Bjarke Ingels Group), Uribe Schwartzkopf+

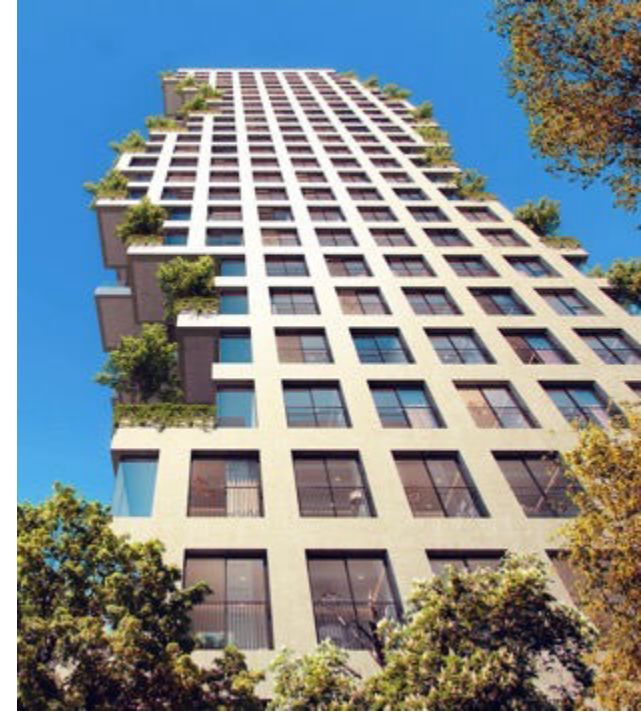
QORNER by Safdie Architects Quito: 2022



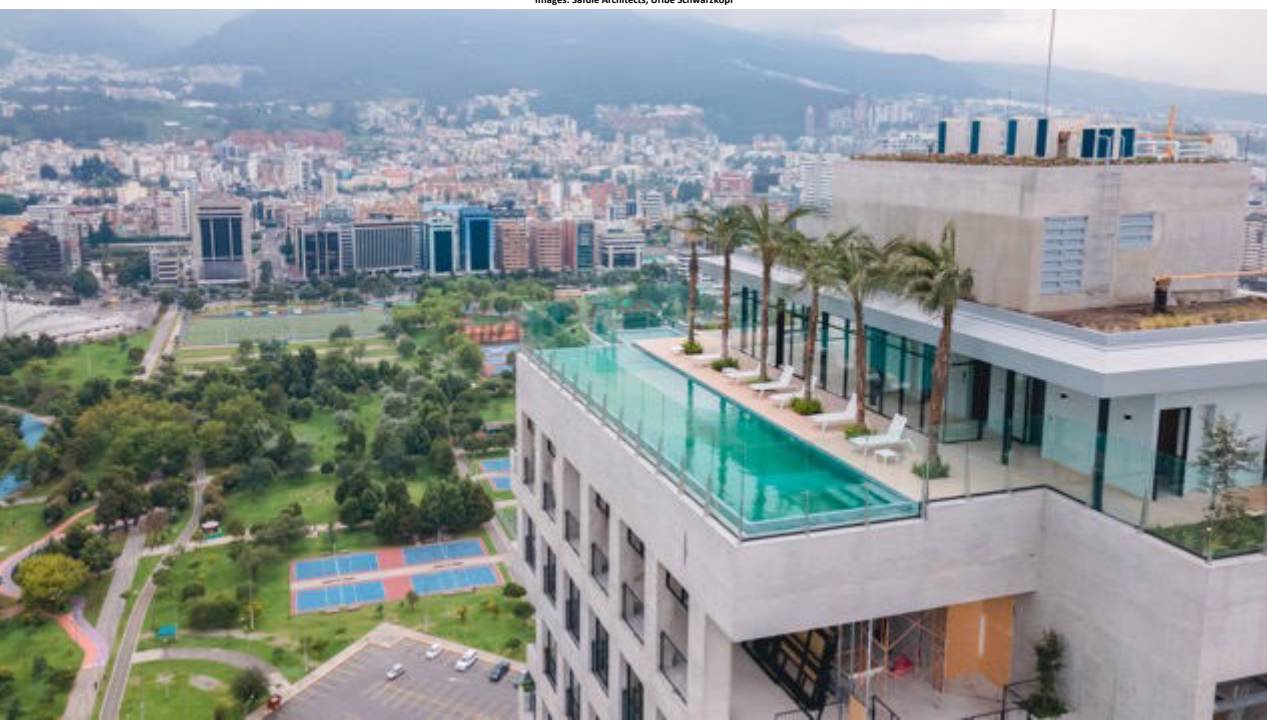
24-story fractalized tower
features vertically stacked
dwellings with units staggered
in & out

generous landscaped terraces
on each level with operable
glass walls that merge indoor &
outdoor living to take full
advantage of Quito's year-
round temperate weather





Images: Safdie Architects, Uribe Schwartzkopf



QORNER overlooking La Carolina Park

Indigenous regional plantings in protruding balconies resemble hillside

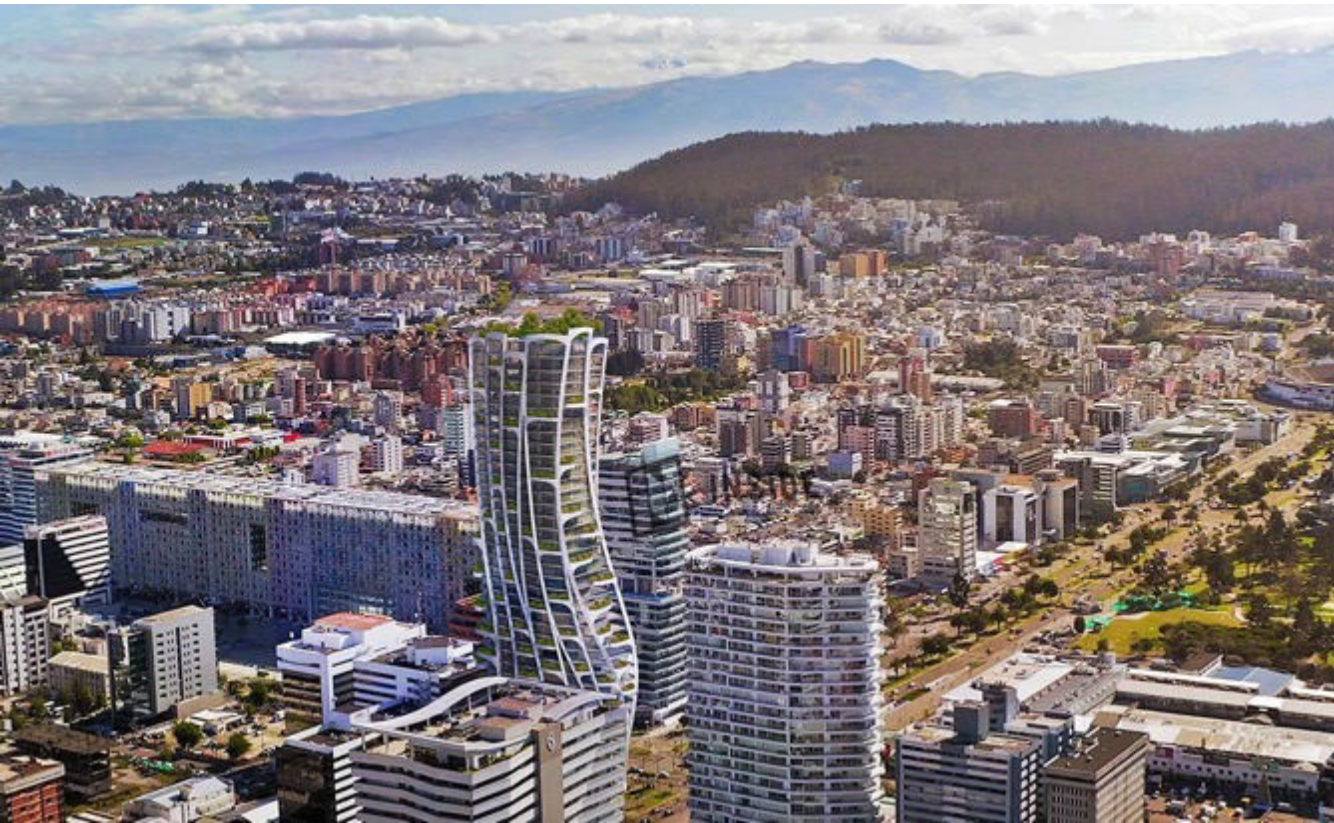
at the base it's set back from the street creating a generous tree-lined sidewalk, with retail & restaurants opening to the street

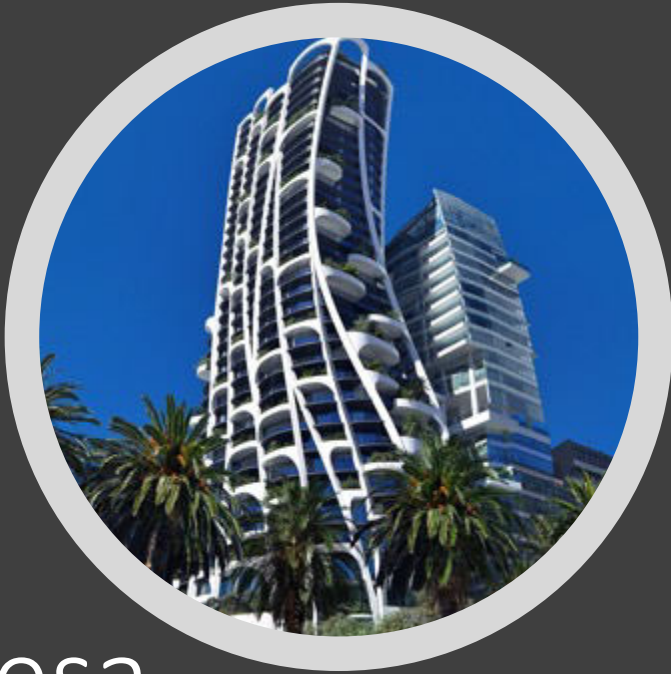
By: Safdie Architects, Uribe Schwartzkopf, Arup with Fernando Romo, Greenstar+

Qondesa

Quito, Ecuador:
Current

- Planted facade to resemble twisting vines "intimately-scaled" urban apartments
- exterior has "stone colouring" in reference to surrounding buildings, many of which were constructed from volcanic rocks
- MAD's first project in South America





Qondesa

next to 67-hectare La Carolina Park & connected to rest of the city via the neighboring Iñaquito metro station

Quito aims to create a more environmentally friendly city with better commuting options & an overall higher quality of life for its inhabitants

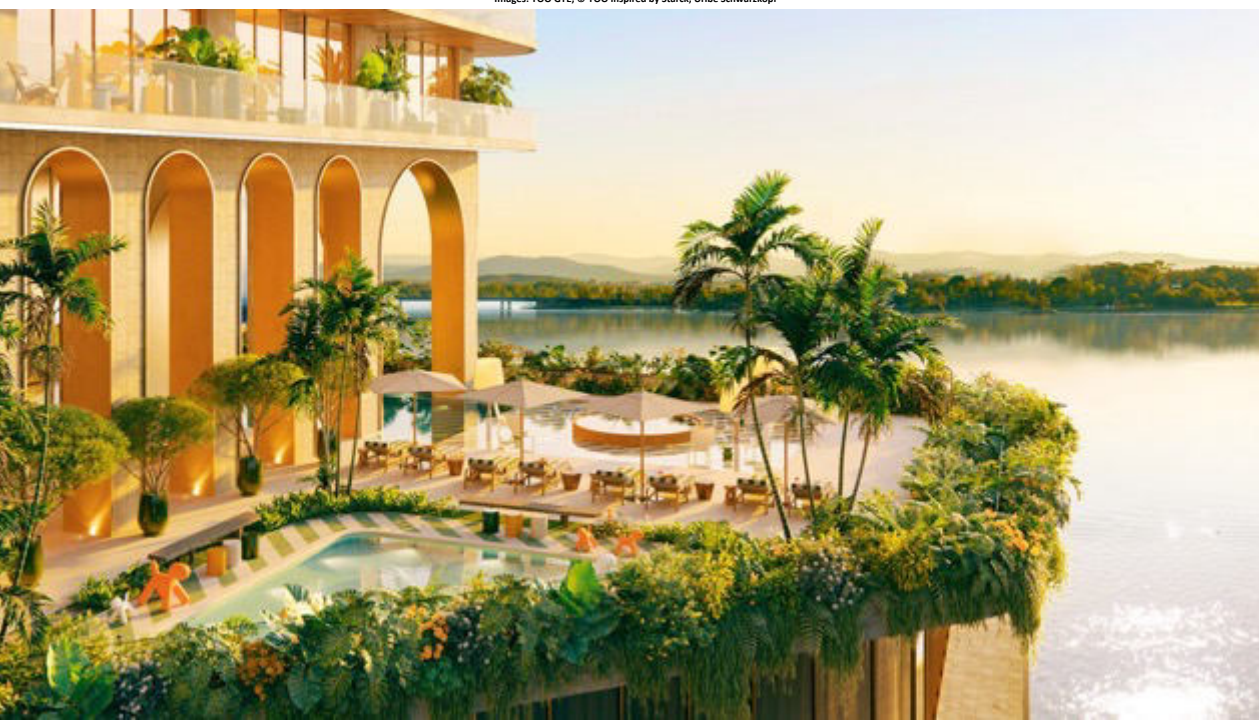
to take the title of city's tallest building from BIG's nearby Iqon tower

By: MAD Architects, Uribe Schwartzkopf+





Images: YOO GYE, © YOO Inspired by Starck; Uribe Schwarzkopf



YOO GYE

Guayaquil, Ecuador Current- 2027

- 176m high, 46-floor mixed use skyscraper to be located alongside Rio Guayas river running through the city
- arches serve as frames, seamlessly connecting with the surrounding landscapes + integrate windows & shutters for ventilation
- nature takes center stage with native tropical vegetation & seamlessly combines the charm of urban living with waterfront panoramas

By: YOO Inspired by Starck, Uribe Schwarzkopf+

5:

Bathed in Nature:

**are floating cities really the answer to
sea rise, climate refugees & garbage?**

autonomous floating urban resiliency? the UN & designers seem to think so!



2019 Prototype



OCEANIX CITY



OCEANIX Busan

- Unveiled at 2nd UN Roundtable on Sustainable Floating Cities, UN HQ in 2022
- 15.5 acres of interconnected platforms for 12,000 people with potential to expand to 100,000+
- each neighborhood designed to serve specific purpose – living, research & lodging



All Images: Oceanix



OCEANIX Busan

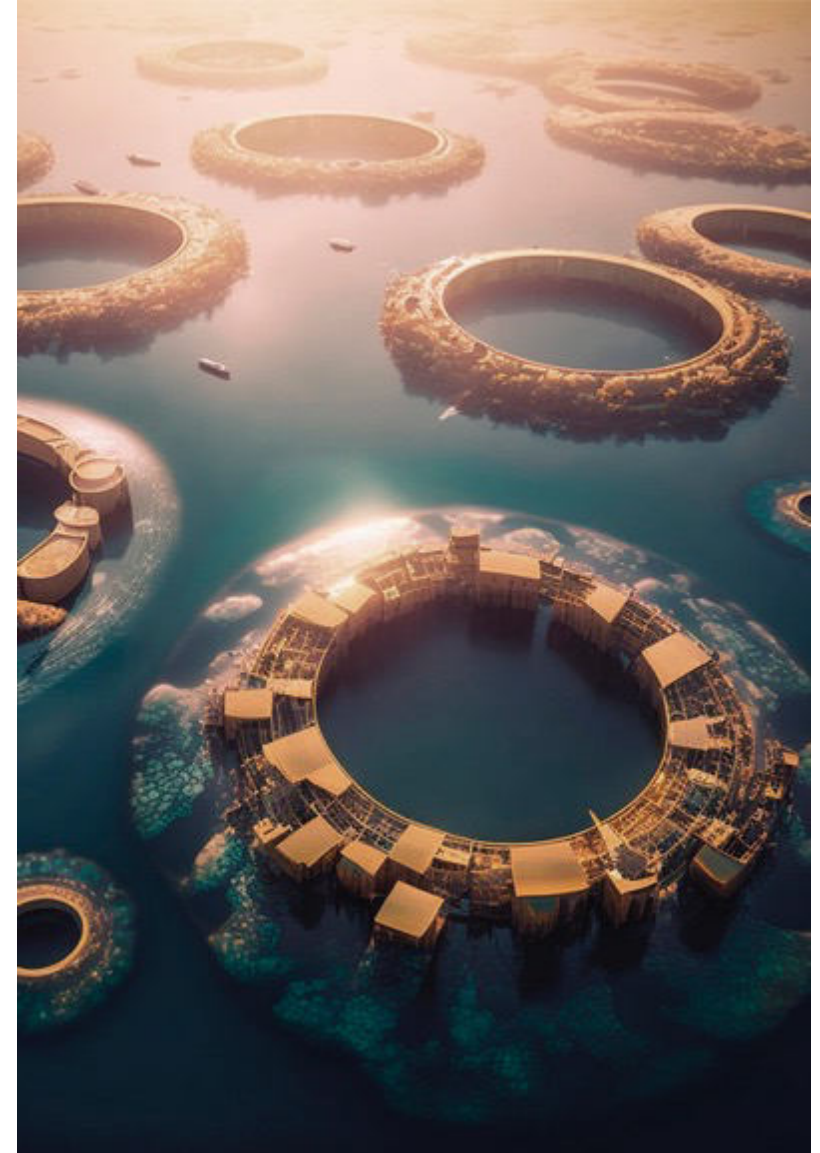
- **interconnected systems generate 100% of required operational energy on site through floating & rooftop photovoltaic panels**
- **each neighborhood will treat & replenish own water, reduce & recycle resources + provide innovative urban agriculture**

By: Oceanix, BIG, Busan Metropolitan City, UN Habitat, SAMOO, ARUP, Prime Movers Lab, Center for Zero Waste Design, Sherwood Design Engineers, Transsolar, Mobility in Chain, Global Coral Reef Alliance, Wartsila, Korean Maritime and Ocean University

Polimeropolis

Great Pacific Garbage Patch: Concept

- Giant cluster of floating cities enclose lagoons of clean ocean water & capture waste
- new sustainable ecosystem of habitation thanks to AI & 2 creative architects
- cleanses w sustainable self-contained cities built from captured & recycled plastic
- self-sustainable relying solely on tidal movement, reverse osmosis & cultivation of local flora & fauna for electricity, water & food production



Polimeropolis

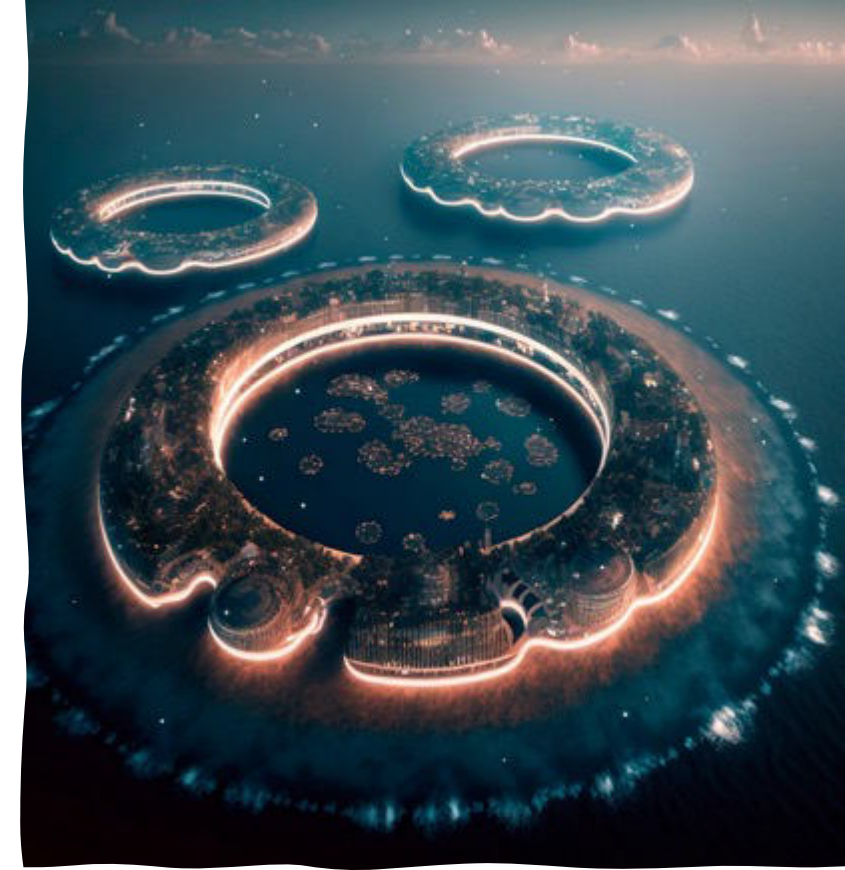
blend of an eco-city & a smart city

- mixed-use urban 'rings' have housing for 4,000+ people each
- waste-collecting phytoremediation uses nets & vegetation to restrict passage of microplastics + purify the water
- waste crushed & compacted in situ in floating factories

"Prevents us from drowning in our own garbage." ~ Estudio Focaccia Prieto

By: Estudio Focaccia Prieto

All Images: Estudio Focaccia Prieto

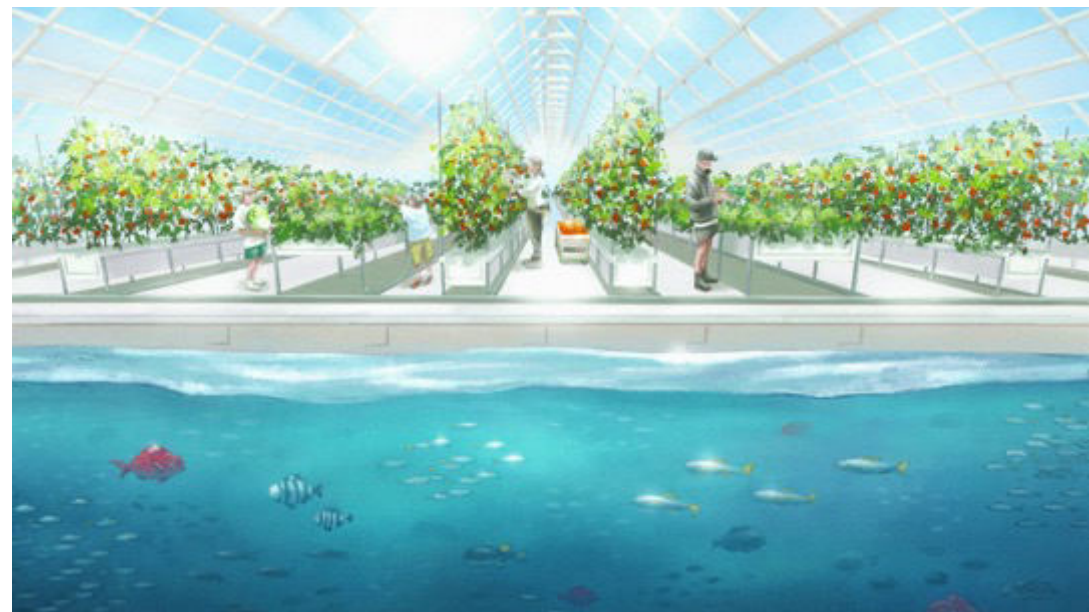


Dogen City 2030

'Ark' for 40,000 people as sea levels rise, with a sports stadium, parks & 'residential hotels'

3 infrastructure products:
Habitable Ring, Undersea Edge
Data Center & Autonomous
Floating Architecture

fresh vegetables grown in the
city via method of agriculture
that incorporates seawater



Floating & smart healthcare metropolis: energy, food production, architecture, data & water

DOGEN CITY FUNCTIONS

都市機能



SIZE | 直径

1.56km

ONE ROUND | 一周

4km

RING COMPONENT SIZE | リングー箇所の大きさ

150m



INDUSTRIES | 関連産業

10.0

- 先端医療実証実験産業
- 医療データ産業
- 農業・養殖産業
- 海洋建築産業
- 海洋ディベロッパー産業
- 海洋エネルギー産業
- 海洋資源循環産業
- 海洋データインフラ産業
- 旅客輸送ロケット関連産業
- エンターテインメント産業

POPULATION | 人口



RESIDENT POPULATION | 定住可能人口

110,000

DAYTIME POPULATION | 昼間人口予想

130,000

ANNUAL POWER GENERATION | 年間発電量

22,265,000kW

ANNUAL GARBAGE DISPOSAL | 年間ゴミ処理量

3,288t

ANNUAL WATER CONSUMPTION | 年間生活用水量

2,000,000L

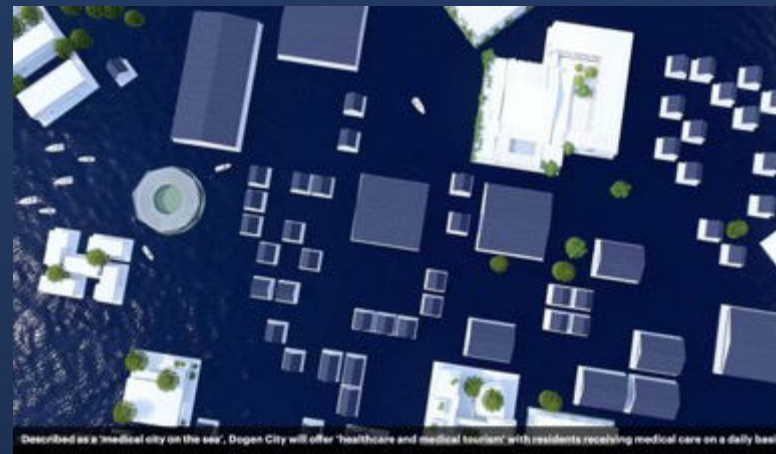
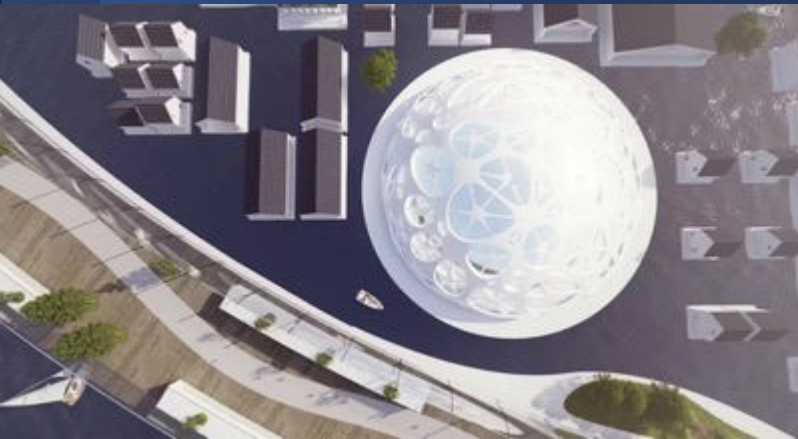
ANNUAL FOOD PRODUCTION | 年間食料生産量

6,862t



Dogen City

'medical city on the sea' to feature undersea medical research facilities



Committed to NEW OCEAN, an ocean business innovation promoted by industry, academia & government

By: N-ARK, Luca Curci Architects, Tim Fu Design

Neom's Oxagon

Saudi Arabia: 2030

- BIG: masterplanner of the floating port city & logistics hub, 1 of 10 upcoming cities of huge Neom development including luxury island Sindalah, Trojena ski resort & controversial The Line
- partially on land, "world's largest floating structure" (48 km² core) arranged around water-filled squares connected by small canals
- predominantly waterfront housing for 90,000 residents



WHAT IS OXAGON?

OXAGON is being built as the future of advanced and clean industries, and a hub for innovation, enabled by an automated port integrated with a smart supply chain network. The coastal city in NEOM will offer exceptional livability, brought to life by thriving communities, designed in harmony with nature.



13%
OF GLOBAL TRADE
PASSES THROUGH
THE SUEZ CANAL



90,000
POPULATION
BY 2030



70,000
JOBS BY 2030



OXAGON



7KM



LARGEST
FLOATING STRUCTURE
IN THE WORLD



100%
CLEAN ENERGY



48km²
OXAGON CORE
DEVELOPMENT AREA

NEOM.COM

WHICH INDUSTRIES WILL OXAGON BECOME HOME TO?

With regulations to enable growth and promote innovation, OXAGON is a natural home for advanced technology industries. Businesses will be supported by an agile and responsive infrastructure, accelerating ideas from labs to market and enabling moonshots to become reality across NEOM and the world.

01 RENEWABLE ENERGY

Solar PV, green hydrogen, battery storage, on-shore wind



02 AUTONOMOUS AND SUSTAINABLE MOBILITY

Autonomous pods and shuttles, urban air mobility, green heavy duty commercial vehicles, green watercraft



03 MODERN CONSTRUCTION

Modular construction, 3D printing, sustainable steel, zero emission heavy machinery



04 WATER INNOVATION

Seawater desalination, brine management, wastewater treatment, system management devices



05 SUSTAINABLE FOOD PRODUCTION

Greenhouses, aquaculture, alternative meat, sustainable packaging



06 HEALTH AND WELLBEING

Pharma, biotech, nutrition, medtech



07 TECHNOLOGY AND DIGITAL

Industrial, service and general purpose robots, communication infrastructure for 5G+, space systems, electronic components, 3D printing equipment



NEOM.COM

HOW IS OXAGON DIFFERENT?

As NEOM's catalyst for advanced transformational industries, OXAGON is a place to turn grand ambitions into reality. It provides a new way of living and working, where you can make the biggest impact on your business and the smallest impact on the planet.

01 A HUB FOR ADVANCED AND CLEAN MANUFACTURING



02 LIVING LAB FOR RESEARCH AND INNOVATION



03 NEXT GEN AUTOMATED AND INTEGRATED PORT AND SUPPLY CHAIN WITH GLOBAL CONNECTIVITY



04 EXCEPTIONAL LIVABILITY



05 100% CLEAN ENERGY



NEOM.COM

Oxagon

To revolutionize global manufacturing

By: BIG, Adjaye Associates, Coop Himmelb(l)au, Delugan Meissl Associated Architects, Studio Fuksas, Luca Dini Design and Architecture, LAVA

4:

**Graceful Horizontal Greening Goes
Above & Beyond**

plant-filled, lower-energy biophilic architecture is more human scaled



The Welcome Project

Milan, Italy

2021-Current

- "Biophilic office of the future" urban regeneration project, wood-enveloped mixed-use complex
- anchored around a public piazza, project to act as catalyst to revive the city & unite people + nature for a better quality of life & work
- 50,000 m² interwoven over 6 sites have been layered & rotated

"...very horizontal, and it is built on the hills. From here, people can get the perfect picture of the city of Milan." ~ Kengo Kuma



green architectural intervention reestablishing urban axis

- solar panels on roof, layered floors topped with timber panels & vegetation
- low-carbon-emission materials
- natural light & noise mitigation
- encouragement of movement
- healthy eating & easy circulation
- large inside & outside areas for work meetings

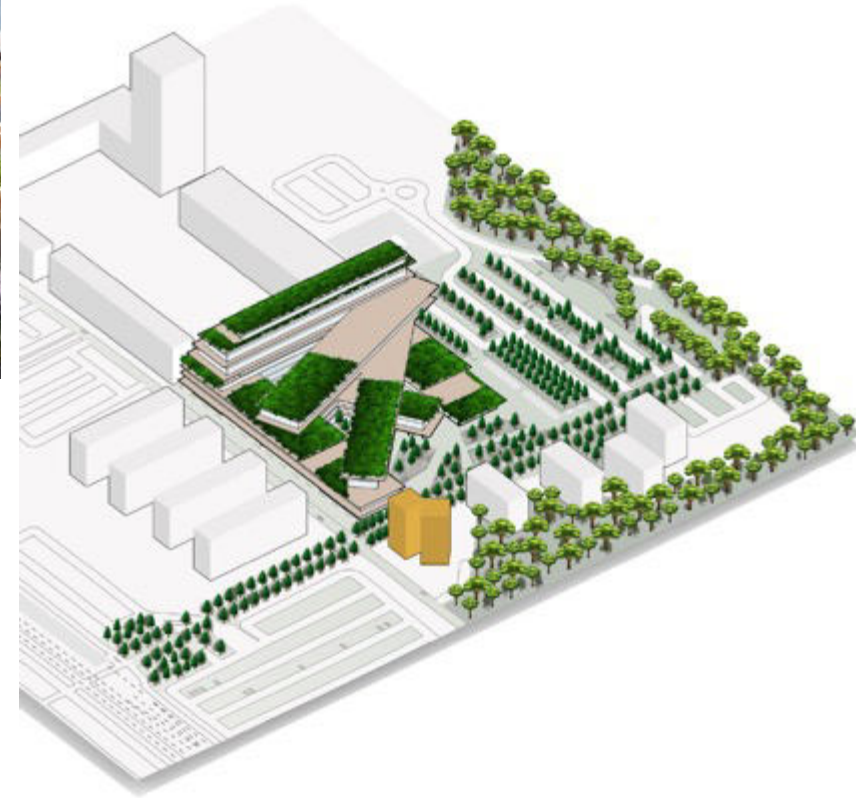


+

•



By: Kengo Kuma, Europa Risorse



Welcome

- Piazza: greenery-infused, for informal work + meetings
- Terraces: kitchen & flower gardens & sheltered walkways
- Greenhouses: special workplaces also used for fun & entertainment
- to be Platinum LEED



Howard County Library

Columbia, MD, USA:
2024-2027

-
- Public library as "new type of community center" with events space alongside Lake Kittamaquindi
 - appears as if lifted from surrounding landscape with cascading planted staircases weaving across the façade to reveal the open, double-story atrium



Howard County Library

reflecting the changed role of the library

By: Heatherwick Studio

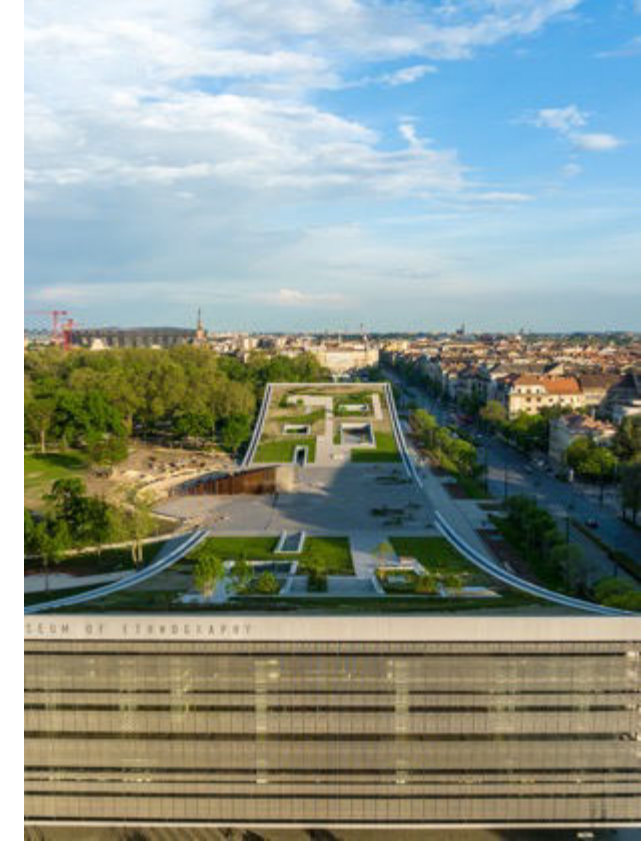
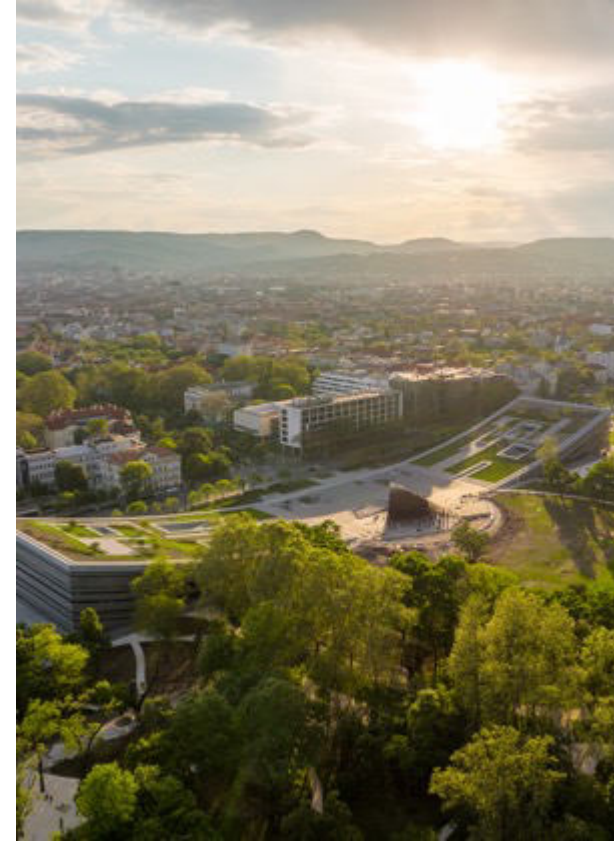
- 5 stories topped with series of interconnected, walkable roofs to be covered with grass & trees
- Columbia's socially radical vision: *"inspired us to evolve the traditional library beyond books and into a new type of community centre for broader learning and social exchange."* ~ Heatherwick Studio

Museum of Ethnography

Budapest, Hungary: 2022

- collection debuted on site at 1896 Millennium Exhibition
- state-of-the-art building designed specifically to cater to its needs
- walkable greenroof = pleasant community space
- “communicates with the urban texture of its surroundings”





Dynamic yet simple design harmonized with the natural environment of Városliget Park

- glass curtain wall surrounding the landscaped roof garden features metal grid raster of ethnographic motifs
- 60% is underground with spectacular views on top



Images: Gyorgy Palko, Museum of Ethnography



Museum of Ethnography

- Gently curving lines enable the building to function as a gateway & passage linking the city + the park
- facilitates historical heritage + various aspects of contemporary society

By: NAPUR Architect, Marcel Ferencz DLA, EXON 2000, ZÁÉV Építőipari, Magyar Építő, Garten Studio+

3:

**Mega Green Districts:
transforming communities &
renewing nature in the city**

lowering carbon emissions, creating healthier environments & working towards a zero-carbon future

Toranomon Azabudai District: Azabudai Hills

Tokyo, Japan:
2019-Current

“Create cities, nurture cities”
~ Mori Building Co.



- Pre-certified Platinum-level LEED ND & WELL (Core, v.2 Pilot) at 8.1 ha
- diverse urban functions with substantial greenery, walkable urban center with a central square & renewable-energy power supply
- District Category 1 Azabudai Hills “Modern Urban Village” 2.4 ha masterplan: 3 towers by Pelli Clarke Pelli Architects & landscaped public realm & lower-level architecture by Heatherwick Studio





- District Category 1: irregularly-shaped plot = scaled up pergola-like system to organize & unify the complex's many different elements
- utilizing topographical differences, 6,000m² open space filled with lush greenery bringing people together in total of 24,000m² of green space
- housing, shops, hotels, spas, school & temple within the sections framed by the grid



Toranomon Azabudai District

mixed-use city will host ~ 20,000 employees & 3,500 residents + welcome 25-35 million visitors/yr

seamlessly connecting people's lives— working, living, relaxing, getting together, learning, playing



By: Pelli Clarke Pelli Architects, Heatherwick Studio, Mori Building Co., Sou Fujimoto+

Oakridge Park

Vancouver, BC, Canada

Phase 1: 2024, Phase 2: TBD

Vancouver's new town center & cultural hub

- On 28-acres, the 5-tower development is mixed-use: residential, office, retail, civic uses & park above a consolidated below-grade parking garage
- 2,600 homes for 6,000 residents
- ~ 500,000 sf of workspace for over 3,000 creative economy workers





Oakridge Park

"The whole world will look to us for inspiration in the way we restore nature, establish community and revolutionize retail." ~ Oakridge Park

1 million sf of retail; 100,000 sf of multicultural Oakridge Kitchen; ~ 10-acre city park; 1 of the largest community centers & daycares; public library; world-renowned performing arts academy; multiple live music venues + indoor & outdoor performance spaces

Targeting: LEED Certification, City of Vancouver Low Emission Green Building Policy, Low Carbon Energy System



Bao'an Masterplan

China: 2020-21

- On Shenzhen's Qianhai Bay, 43 ha development for 1.2 km waterfront integrates nature, culture + commerce into a single cohesive environment
- priority given to open green spaces, fluid engagement with water & pedestrian connections
- Retail Housing & Village, Urban Business District; Cultural Heritage Park is center of recreation with large public plaza, marina, sports parks & bus terminal

Bao'an Masterplan

"commercial
structures gently
engage the earth"



- network of undulating greenroofs created by subtle shifts in the stacking levels
- multiple waterways create diverse lush habitats & microclimates = canals, rivers & wetland delta
- convenient access to public transportation via subway & bus; world class sports, entertainment & leisure facilities
- OCT Bao'an Waterfront Park: LEED ND GOLD
- a cultural community within a coastal ecology

By: **Laguarda.Low Architects, SWA, AUBE, Rocco Design Architects+**

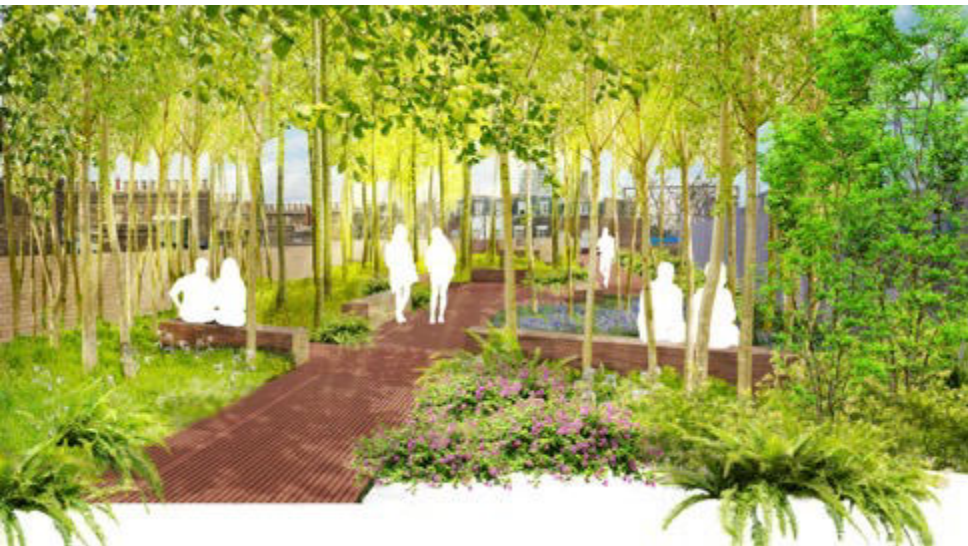
2:

**The (Sky)Rise of the Public Realm:
reaching higher with biophilia +
reestablishing green connections with the city**

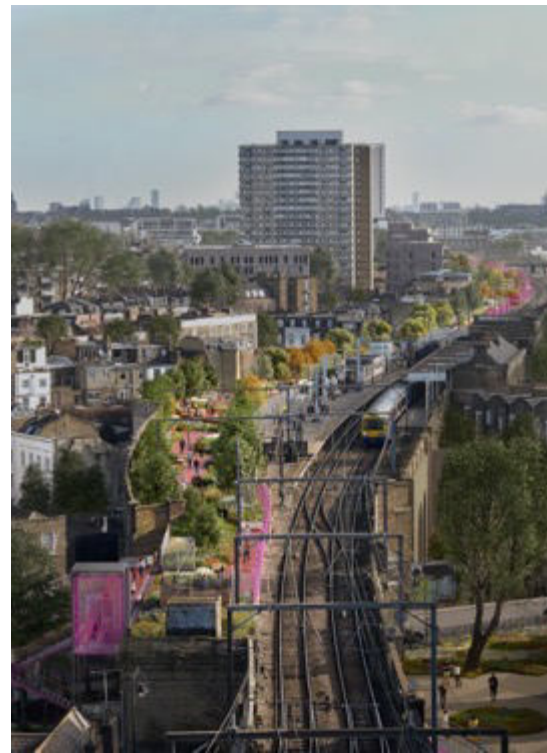
social resiliency & responsibility with urban biophilia on land & grasping for the sky



Images: Camden Highline, © Hayes Davidson



maximize opportunities to improve biodiversity, sustainability, resiliency, community & the local economy



Camden Highline

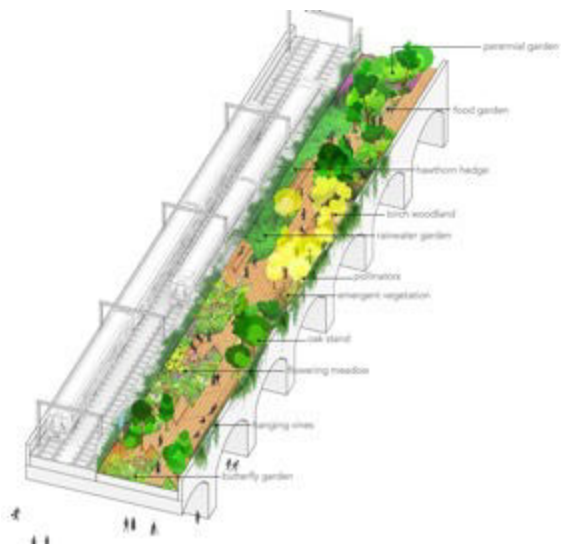
London, UK

Proposed, 2017-Current

Approval in January for new sky park - turn 1.2km disused railway viaduct into new elevated urban park, connecting Camden Town to King's Cross, for up to 20,000 users

offers much-needed greenspace to underserved communities while also creating a new attraction & destination

social amenity & ecological greenspace & important pedestrian connectivity with 4/5 public access points



- designs explore how to connect ground level to the Camden Highline through art installations on the underside of bridges & lighting on staircases
- sections of the walkway- separated from the still operational tracks by a perforated fence- to have picnic tables, conversation pits, grandstand seating & trampolines
- alongside the walkway, various planters will contain birch & oak trees, butterfly gardens & perennials with hanging vines growing over edge of the viaduct



By: James Corner Field Operations, Piet Oudolf, vPPR Architects, Street Space, Hew Locke, Speirs + Major, Pentagram, AKT II, Atelier Ten, Tony Gee, RLB, London Wildlife Trust, Lichfields+

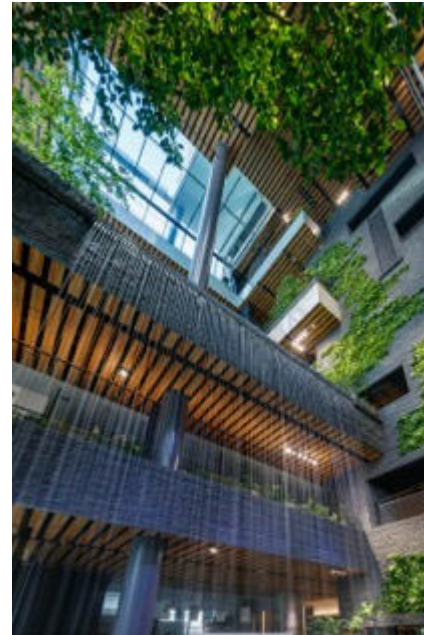


Camden Highline

Thousands of locals have donated time & money to the ~£35 million linear park, with workshops + public engagement to ensure local benefit within a 15-minute walkable neighborhood

"We could not be more excited to work with residents and stakeholders to create a one-of-a-kind elevated park that speaks to the magical symbiosis of nature, culture, arts & community." ~ James Corner

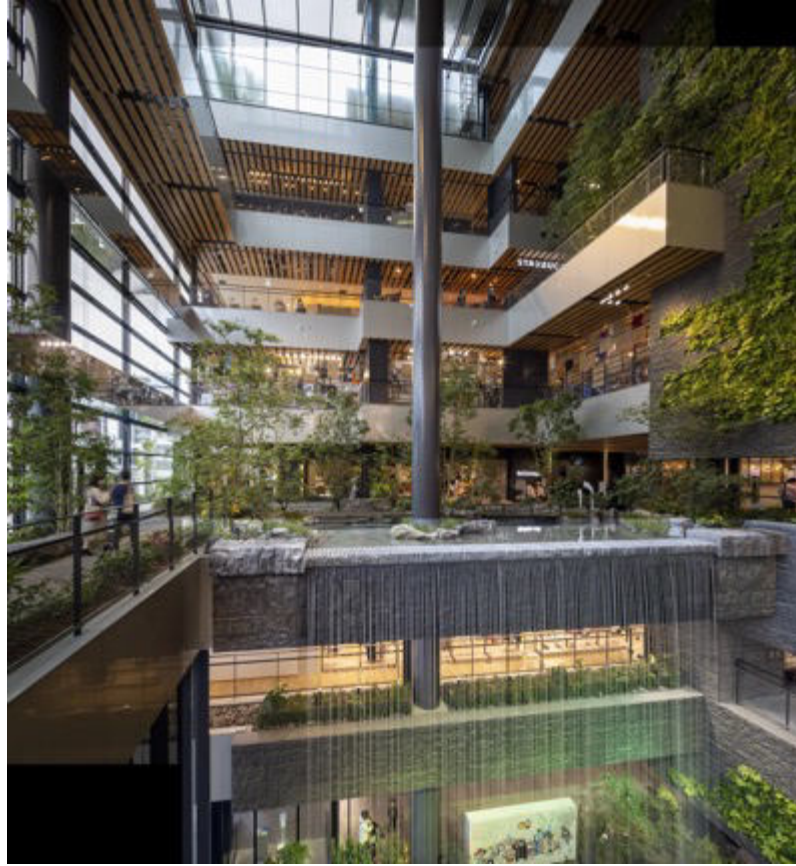




JR Kumamoto Railway Station Building

Kumamoto, Japan: 2021

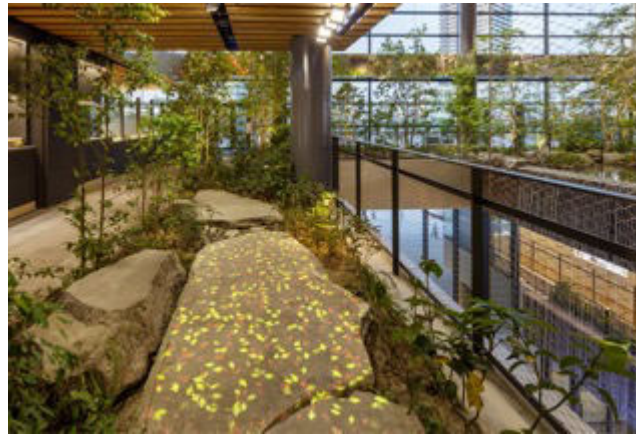
- Create a city where people want to live, work & visit: retail, hotels, offices & residences
- centerpiece: “*Boken no Mori*” (Adventure Garden), a large indoor multi-floor garden of water & greenery that extends from the ground to the 7th floor
- blurs the conventional boundaries between “train station” & “park”



3 waterfalls run through 30m high glass & stone walls to main feature:
10m high waterfall based on famous Nabega-taki falls

atrium is stepped to allow natural light

famous Kato Shrine, dedicated to local hero Kiyomasa Kato, has been partially reconstructed here



Images: ©SSCo., Harunda Noda | Gangkohsha



2022 Stephen R. Kellert Biophilic Design Award winner integrating architecture with nature of the Kumamoto Aso region

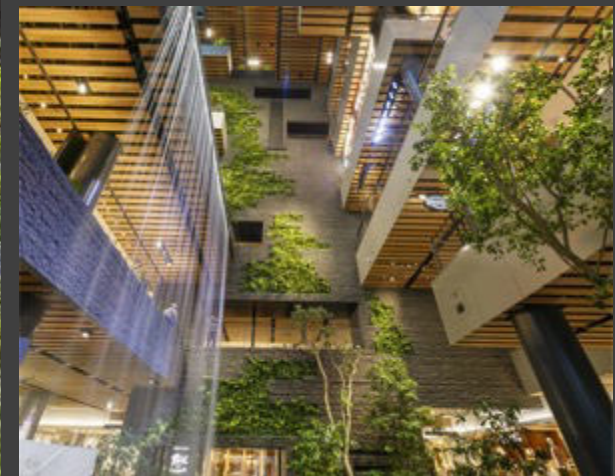
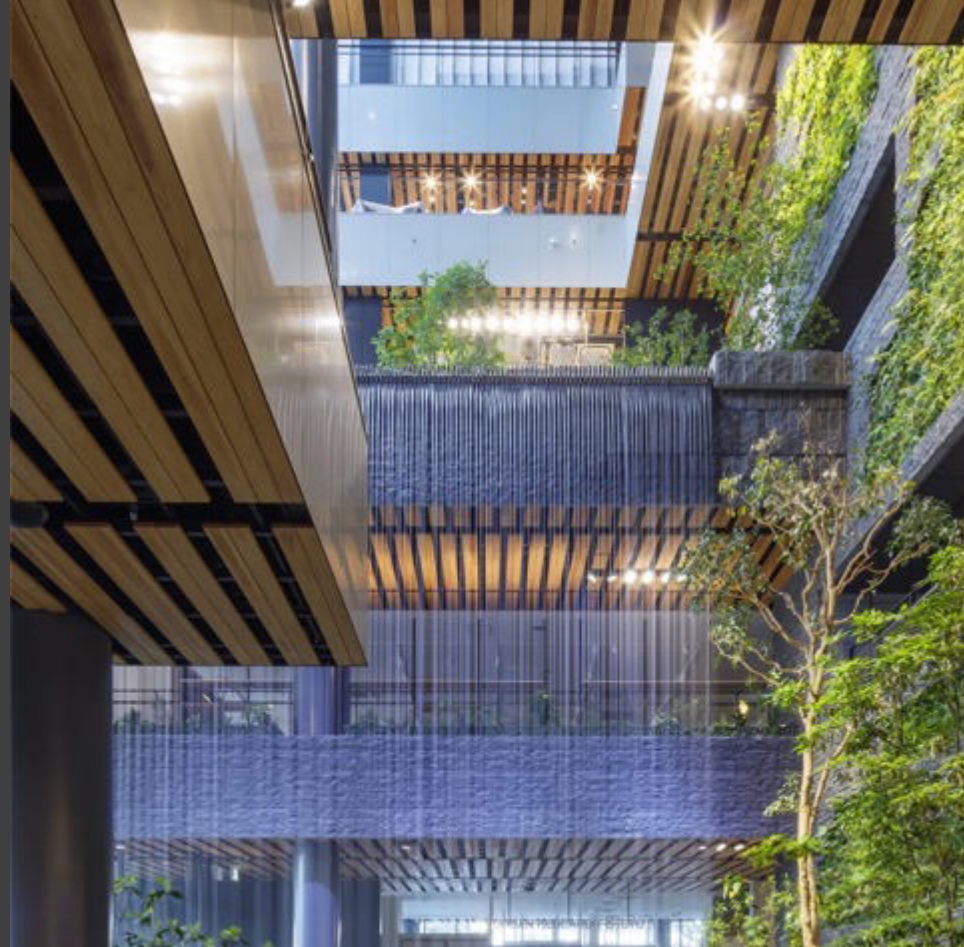
- ~ 50 Japanese plant species, many from the mountains of Kumamoto
- practice of *shinrin-yoku* (forest bathing) has been proven to have positive psychological & physical health impacts
- in the lush green atrium space, misting cools down & creates fantastic "mountain-like" landscape

JR Kumamoto Railway Station Building

Symbol of recovery from large-scale earthquake that hit in 2016, bringing in happiness & green energy

a place to get up close & personal, reaping natural health benefits both consciously & unconsciously

By: Nikken Sekkei Ltd, Obayashi Corporation, Sirius Lighting Office+



1:

Treescrapers:

forests of imagination inside & out

trees, trees & more trees = resilient green lungs & climate responsive vertical villages

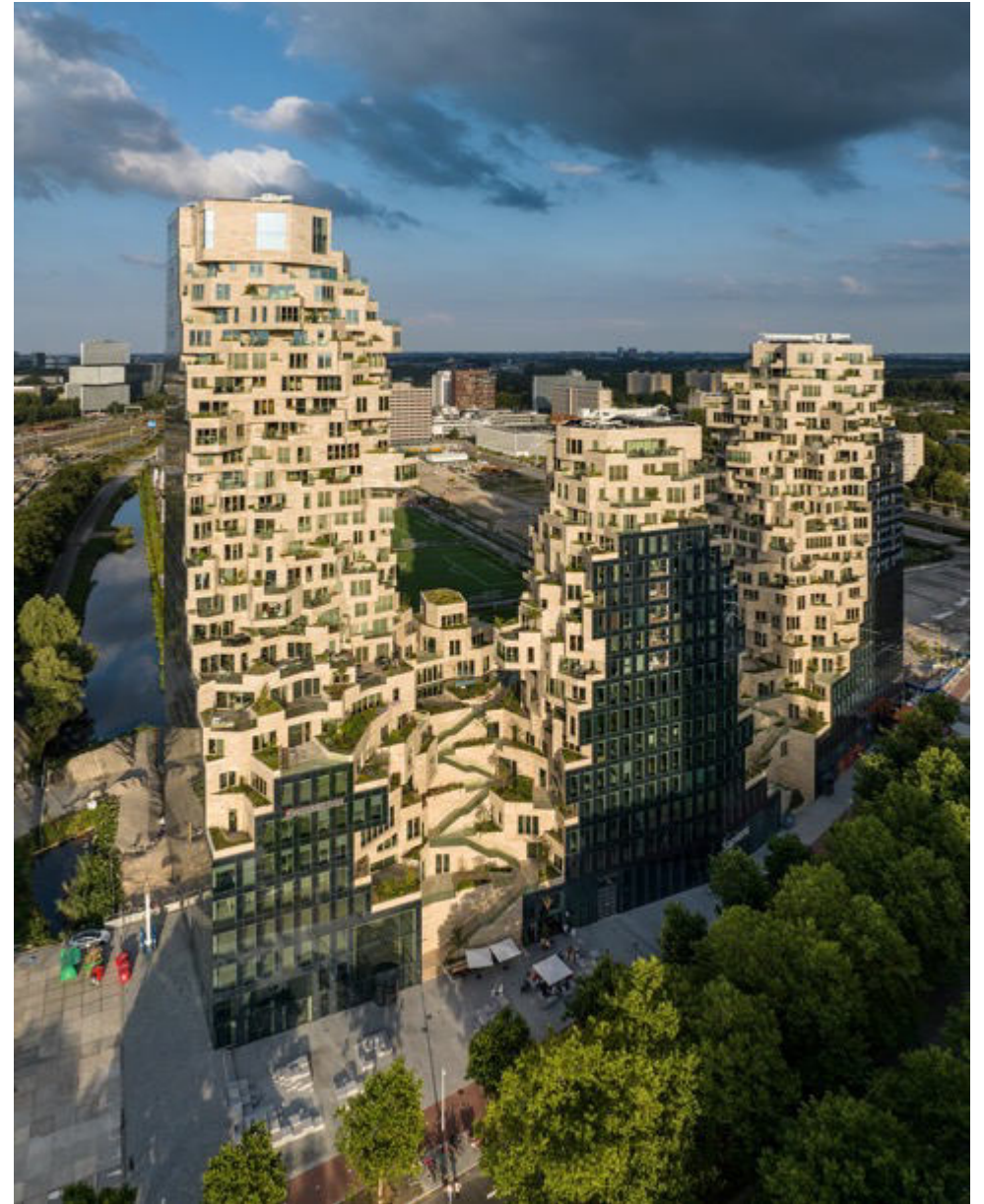


Valley

Amsterdam,
Netherlands:
2021

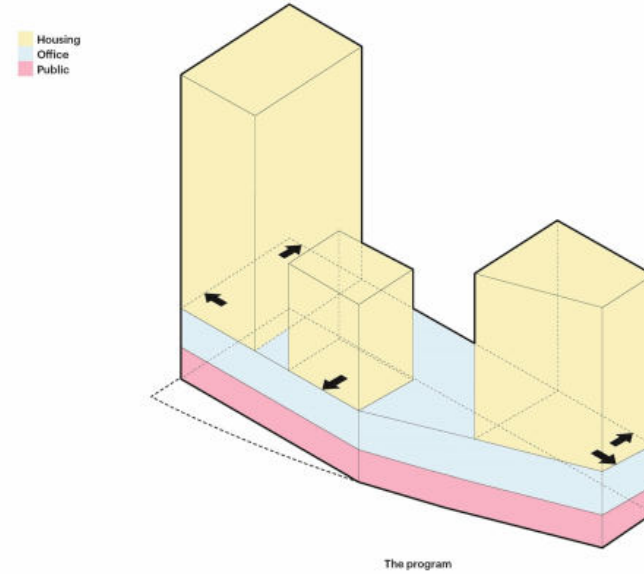
3 mixed use towers =

- 3 story underground parking;
- 7 stories of offices;
- 200 apartments on 8th floor & up;
- sky bar on tallest tower has spectacular views open to public



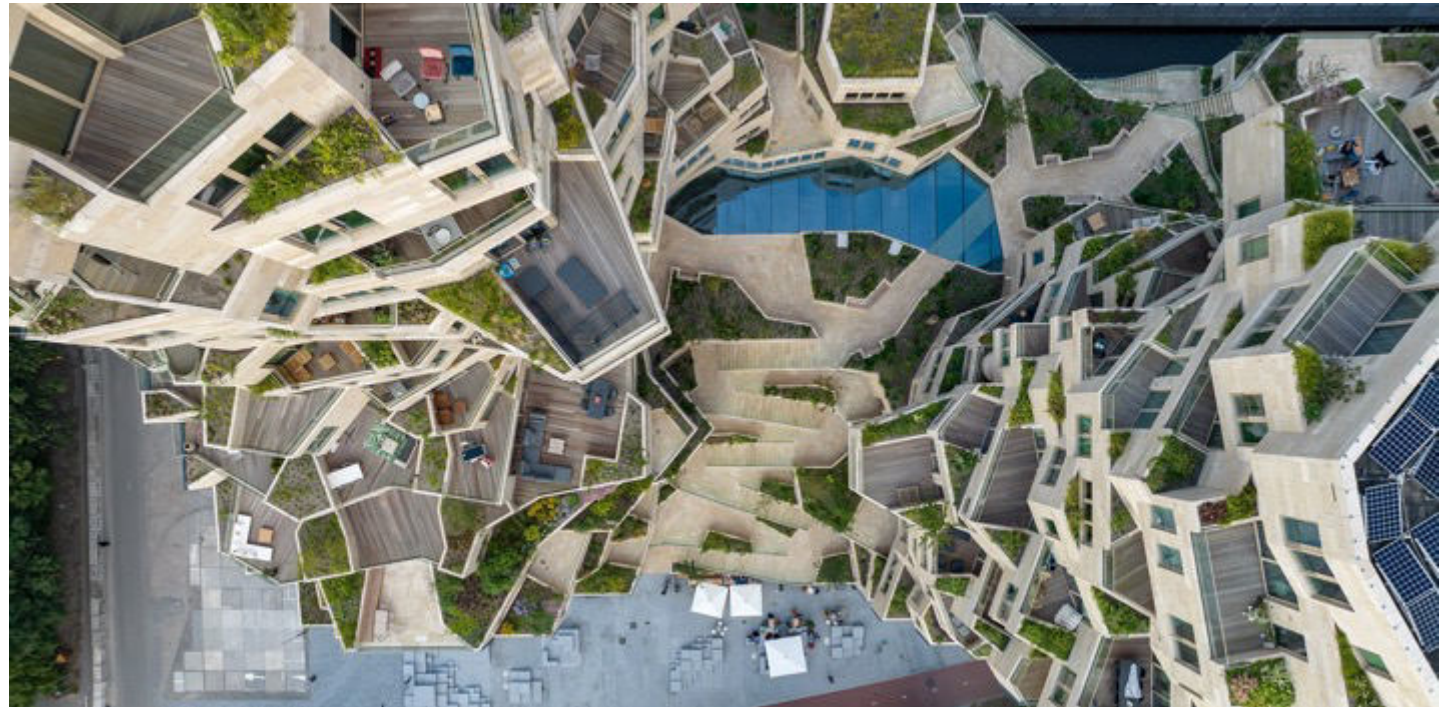


the green valley winding between the 4th & 5th floor towers is accessible to everyone via 2 external stone staircases



Dramatic, geology-inspired, plant-covered Valley

- outer edges: a shell of smooth mirrored glass
- inside, glass block has crumbled away: craggy natural rock covered in greenery
- spectacular cantilevered apartments





Valley: entirely custom-made design & construction

Biodiversity:

- 271 trees & shrubs & ~ 13,500 plants in planters = 220 plant species
 - bird & bat boxes + bee & insect hotels

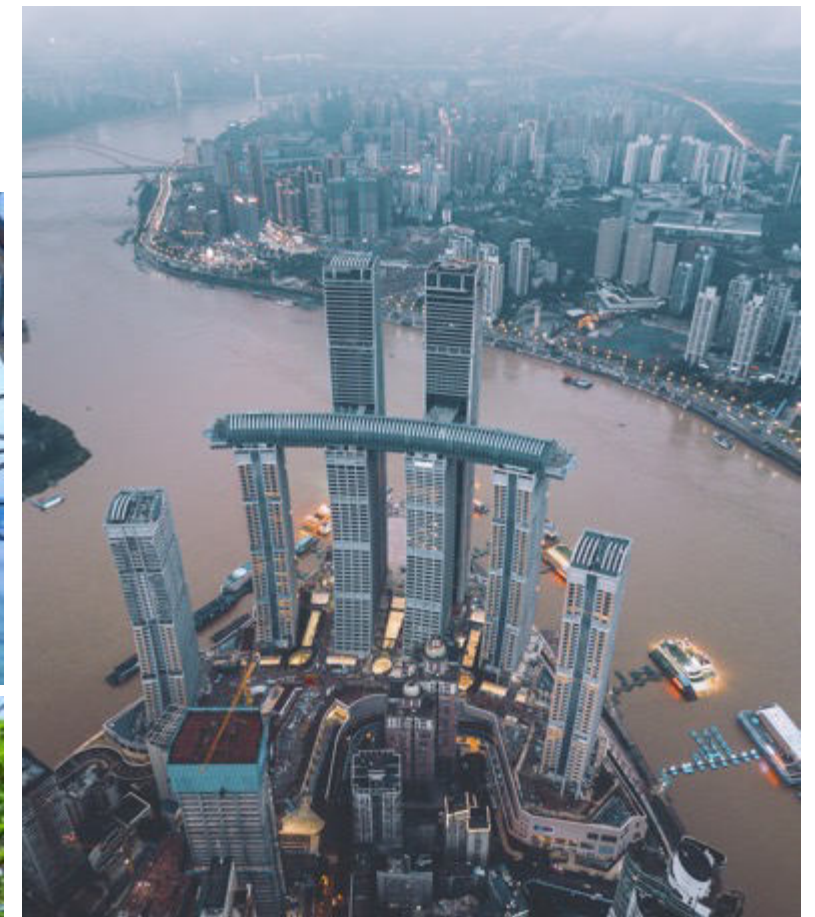
By: MVRDV, Piet Oudolf, DeltaVorm Groep, Arup, G&S Bouw & Van Eesterent+

The Crystal @ Raffles City Chongqing

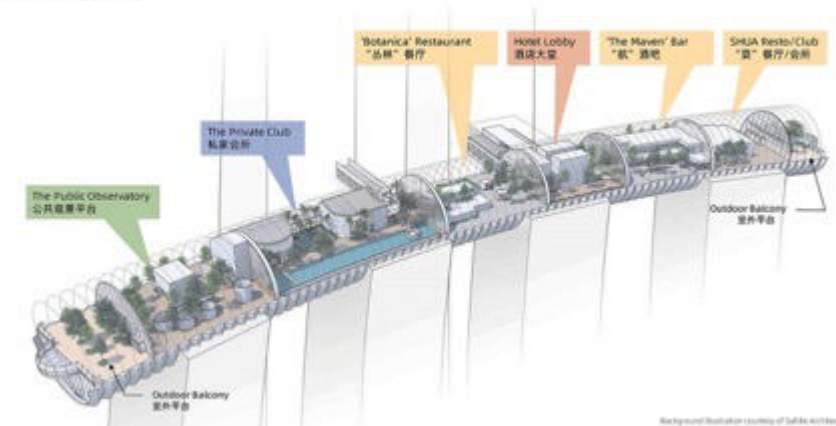
China: 2020-2021

- Mixed-use development & civic hub at the estuary of famed Yangtze & Jialing Rivers on historic Chaotianmen Plaza
- fully landscaped Gateway Park podium; private gardens & civic spaces: al fresco dining, lookouts, interactive fountains, playgrounds, public art & outdoor infinity pools

Images: ©Ryan Brooker, EJay Photography, ©WAA, ©Safdie Architects



The Crystal @ Raffles City Chongqing
OPERATIONAL ZONING

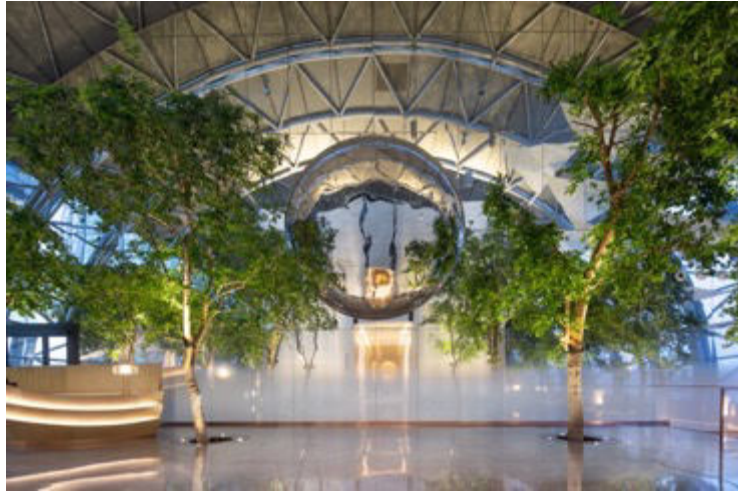


Background: Botanical courtyard of Safdie Architects

The Crystal:

iconic green jewel is the largest indoor sky garden in the world

- perched high above its public park, 120+ mature trees planted in micro-climates for unique functions
- challenges: establishing 300 m-long interior microclimate balance between human comfort & tropical tree conditions



Images: ©WAA, ©Capitaland

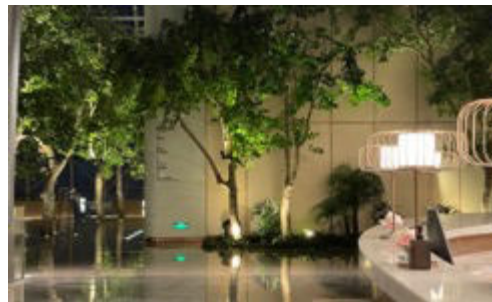
The Crystal @ Raffles City Chongqing
REPLACEMENT TREE ROUTING



- used “low-E” façade glazing, retractable shade sails, integrated grow lights, floor ventilation in addition to correct plants
- innovative tree replacement strategy: planting additional mature trees in “on-site nurseries” to be replenished as necessary

The Crystal

a fully programmed
horizontal skyscraper



- glass-bottomed public viewing deck projects from one end, accessible through the open-air park, 250m up
- acts as a catalyst for downtown regeneration, creating a new icon for Chongqing, providing 30,000m²+ of public space

Images: Raffles, ©Safdie Architects, ©WAA

By: Safdie Architects, P&T Architects, WAA+, ARUP, WSP, CL3 Architects, INdulge, Wilson Associates, C'est la Vie, Intercontinental Hotels, Gallagher, National Geographic+



Treescrapers

New York, NY, USA:
Schematic Design

New York's Green New Deal or "Climate & Communities Protection Act" = 85% reduction in greenhouse gas emissions by 2050 compared to 1990, 70% renewable energy by 2030, 0 electricity emissions by 2040

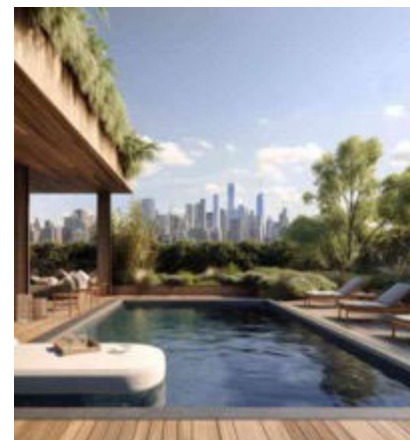
- should be directed to low-income & pollution-affected communities
- envisioning 4 different adaptable Treescraper typologies using BIM & AI



“Waves” Typology

eco-design strategy based on 4 major pillars:

1. compliance with climate responsive design:
sculpting buildings based on climatic data



eco-design strategy:

2. integration of renewable energies: self-consumption by axial wind turbines, solar panels, geothermal energy

“Pixels” Typology:





eco-design strategy:

3. spatial agility: hyper-flexible habitats that can be transformed at will



“Pebbles”
Typology



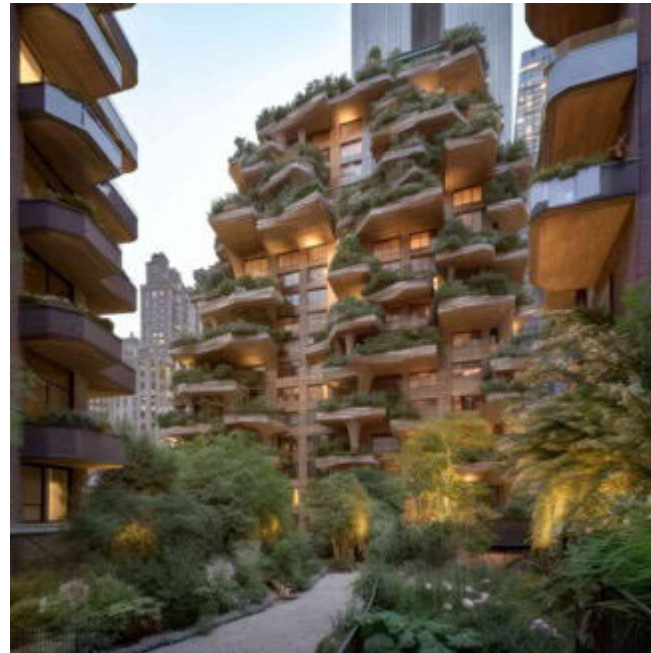
“Slabs” Typology:

eco-design strategy:

4. Urban Agriculture:

"On the roofs of buildings and in the heart of the plots, we imagine integrating greenhouses and market gardening orchards cultivated in permaculture and dedicated to urban agriculture to strengthen solidarity and social cohesion at the scale of residents and neighbors."

~ Vincent Callebaut Architectures



2023 Top 10 List of Inspirational Sources & Resources:

designboom	ASLA	BIG	NEOM
Dezeen	AIA	MVRDV	Museum of Ethnography
Greenroofs.com	Architizer	Safdie Architects	for Mori Building Co.
CNN	LANDEZINE	Heatherwick Studio	Oakridge Park
World Landscape Architect	Treehugger	Kengo Kuma	Adamson Associates
Architect Magazine	Pelli Clarke & Partners	Adjaye Associates	Laguarda.Low Architects
ArchDaily	Cracknell	SOM	SWA
Archinect	Vo Trong Nghia Architects	N-ARK	Camden Highline
Bengaluru International Airport Limited	!Khwa ttu San Heritage Center	Arup	James Corner Field Operations
4D Landscape Design Ltd.	Zoë Avery	MAD	CapitaLand
Vincent Callebaut Architectures	The Urbanist	Uribe Schwartzkopf	Mikyoung Kim Design
Atelier Jean Nouvel	Building, Design + Construction	YOO Inspired by Starck	Brooks + Scarpa
A31 ARCHITECTURE CONSTRUCTION	Luca Curci Architects	OCEANIX	World Green Infrastructure Network (WGIN)
Richard Smart	Estudio Focaccia Prieto		



Join Us for the World Green Infrastructure Congress 2023 in Berlin on
June 27 - 29



SPOTLIGHT



PROMOTED CONTENT
The Triple Bottom Line: How Green Businesses Can Excel in Financial, Social, and Environmental Sustainability



FEATURED PROJECTS
ReFeatured Project: Potsdamer Platz, Berlin



EVENTS
Happy World Green Roof Day 2023!



Weltkongress Gebäudegrün
World Green Infrastructure Congress

EVENTS

Kingsland Wildflowers at Broadway Stages Open Hours
June 23 @ 5:00 pm - 8:00 pm EDT

BOMA International Conference 2023
June 24 - June 27

World Green Infrastructure Congress 2023
June 27 - June 29

Archi Summit 2023
July 5 - July 7

RECOVERING THE WATER FROM OUR ROOFS: Discover Rainwater Management Solutions
July 5 @ 1:00 pm - 2:00 pm EDT

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Interactive Projects Database Google Map

Explore Amazing Living Architecture Projects from Around the World

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ADVANCED SEARCH

FILTER

- TYPE
- EXTENSIVE
- EXTENSIVE & INTENSIVE
- GREEN FACADE
- INTENSIVE
- LIVING WALL
- SEMI-INTENSIVE

SYSTEM

- CUSTOM
- OTHER
- SINGLE-SOURCE PROVIDER

BUILDING PROGRAM

- ABOVE-GROUND PARKING GARAGE
- AT-GRADE PARKING GARAGE
- AVIATION
- COMMERCIAL
- CORPORATE
- EDUCATIONAL
- HEALTHCARE
- INDUSTRIAL
- LIBRARY
- MULTI-FAMILY RESIDENTIAL
- MULTI-USE
- MUNICIPAL / GOVERNMENT
- MUSEUM
- NON-PROFIT
- OTHER
- PARK
- RELIGIOUS
- SINGLE-FAMILY RESIDENTIAL

TEST/RESEARCH

- NO
- YES

ACCESS

- ACCESSIBLE
- BOTH
- INACCESSIBLE

PRIVACY

- BY APPOINTMENT
- PRIVATE
- PUBLIC



Potsdamer Platz
Berlin, Germany



Collins Arch-Sky Garden
Melbourne, VIC, Australia



Arbutus Residences
Vancouver, BC/VA-Columbia VLE/OCL, Canada



The Parks at Capital One Center
Tyngsboro, VA, USA



Chao Phraya Sky Park
Bangkok, Thailand



Pricotta Halls, Belgium "Rooftop as Part of a..."
Halle, Belgium



Watermark Kendall West Second Floor Ser...
Cambridge, MA, USA



SPC Delray Beach Greenwall
Delray Beach, FL, USA



Vancouver Convention Centre West / Esplan...
Vancouver, B.C., VAC/OCL, Canada



LUMA Island
New York, NY, USA



Victorian Desalination Plant
Warragul, Victoria, Australia



VWA M
Paris, France

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