

Resilient Places

Green Infrastructure Riverside Regeneration

BDP. Ideas



Contents



Green Infrastructure

What is Green Infrastructure?



What is Green Infrastructure?

Green Infrastructure is a system representing the ways in which nature can provide services for urban or rural populations. Such services include flood protection, improving air and water quality, addressing the needs of wildlife, and providing greenways for people to easily and safely move through their communities.

Green Infrastructure includes urban forests and parks, wetlands, river corridors, green streets and roofs, road median strips and verges, nature reserves as well as all scales of vertical landscape.

To plant a garden today is to believe in tomorrow

Climate change, the worldwide health pandemic and rapid urbanisation are key challenges driving us to continually evolve our approach to create progressive and responsive design, that places people and planet at its centre.

There is much discussion around the benefits of green infrastructure and how it can stimulate a holistic approach to sustainable design. Offering sensitive and intelligent strategies for stormwater management, promoting health and wellbeing in our communities, together with its potential to revitalise our urban centres into rich and engaging city places that echo the biodiversity of the area.

In this report, we outline the components of green infrastructure, the benefits it can bring, and the key design principles that we have successfully incorporated into our schemes.

We then look at green infrastructure in relation to riverside regeneration, recognising that riverside spaces are ever more important within dense urban environments which can offer quality public spaces throughout the city, whilst effectively providing flood resilience.

Finally, we summarise BDP's and Nippon Koei's unique position as a multidisciplinary partnership, in being able to address the challenges governments and private developers continue to face in delivering schemes that are sustainable, resilient, attractive and financially viable.



Avon River Precinct, NZ

Why we must act now



The World Economic Forum's Global Risks Report 2021 identified environmental degradation as the top long-term risk. The report also identified climate action failure as the most impactful risk and the second most likely long-term risk.

Today, cities around the world face many environmental challenges including the reduction of green and blue areas, temperature increase, water, air and soil pollution, drought, flooding and sea level rise. Green infrastructure is not a perfect solution to solve all of these challenges, however it can certainly reduce these risks whilst improving quality of life.

Reduction of green and blue area

- Increased impacts on human health mentally and physically
- Decreased biodiversity
- Amplified urban heat island effect
- Increased risk of flood or drought

Temperature increase

- Amplified urban heat island effect
- Increased mortality and negative impacts on human health
- Increased energy use and demand
- Stressed water systems

Water, air and soil pollution

- Increased mortality and negative impacts on human health
- Increased temperatures that lead to all the hallmarks of climate change
- Reduced growth and survivability of flora and fauna
- Increased flora and fauna susceptibility to disease, pests and other environmental stresses

Drought

- Stressed water services and groundwater supplies
- Negative impacts on sanitation and human health
- Decreased water supply for industries reliant on fresh water
- Reduced food availability and access

Flooding

- Compromised stormwater management systems
- Disrupted transport and trade
- Spread of waterborne diseases

Sea level rise

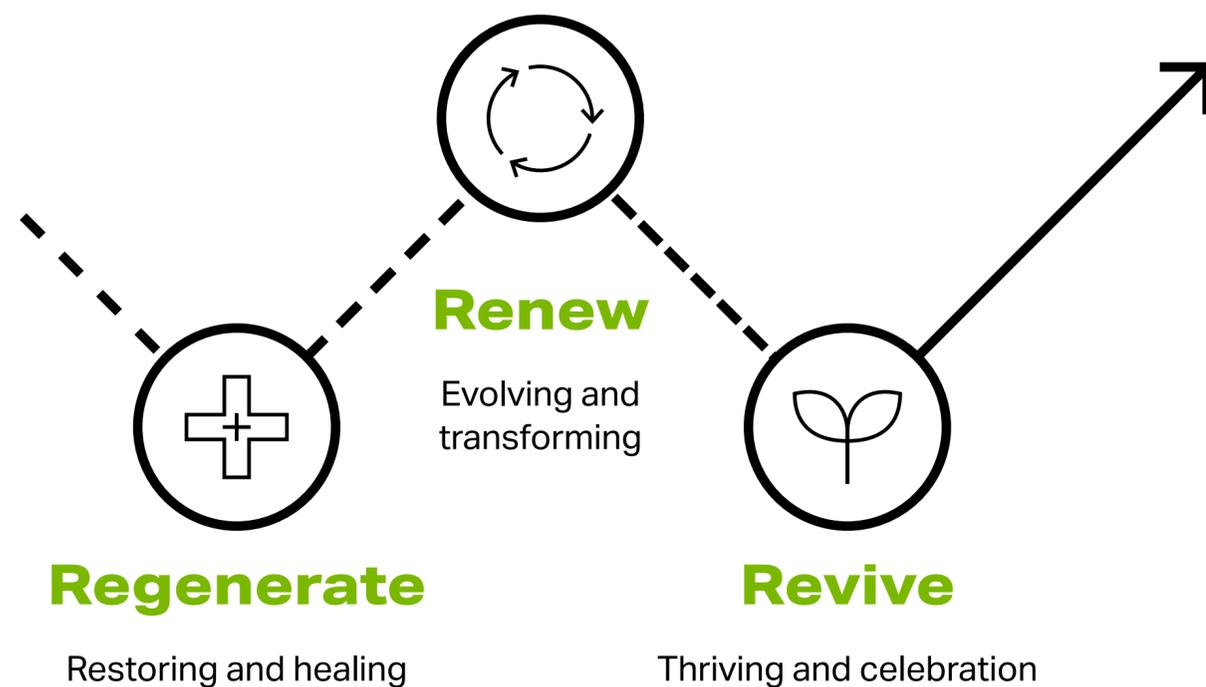
- Increased vulnerability to storm surges
- Compromised infrastructure
- Contaminated groundwater
- Increased incidence of vector-borne diseases

Regenerate, renew, revive

The process of developing a green infrastructure project is in a way similar to the process of reforestation.

It will first **regenerate** the area by restoring and healing the biodiversity of the area. Secondly, it will **renew** the area by evolving and transforming the way we prioritise animal and pedestrian movement within it. Finally, the area will effectively **revive** by thriving and celebrating new ways of living.

Through our green infrastructure projects around the world, we have contributed to this process of regenerate-renew-revive, offering places to establish symbiotic relationships between nature and people.



The components of Green Infrastructure

Green infrastructure offers a diverse range of typologies which can effectively resolve complex and challenging urban issues. From building level to city level, these typologies can incorporate a more natural or managed approach.



Green Infrastructure

What are the benefits?

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Multiple benefits of Green Infrastructure



Environmental

- Climate change adaptation and mitigation
- Flood alleviation and management
- Land and biodiversity
- Enhances ecology and biodiversity
- Improves air and water quality, reduces noise
- Reduces cooling demands of buildings, cutting energy usage



Social

- Contributes to character and identity of a place
- Improves health and wellbeing
- Encourages outdoor activity
- Provides non-material benefits such as spiritual enrichment, education and cognitive development



Economic

- Improves productivity
- Lengthens the lifespan of grey infrastructure
- Increases land and property values
- Economic growth and investment
- Tourism
- Land produce
- Increases F&B revenue through increased recreation and leisure

Who benefits from Green Infrastructure?

Public sector

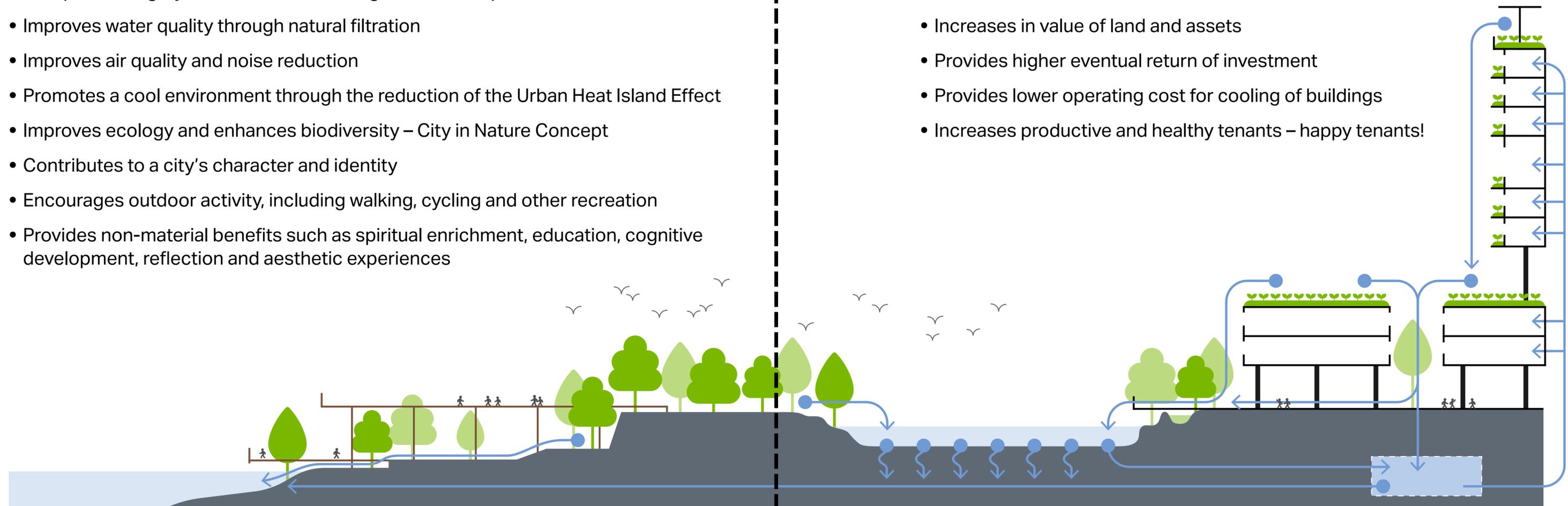
Governments & International Organisations

- Offers flood protection through stormwater management
- Complements grey infrastructure and lengthens its lifespan
- Improves water quality through natural filtration
- Improves air quality and noise reduction
- Promotes a cool environment through the reduction of the Urban Heat Island Effect
- Improves ecology and enhances biodiversity – City in Nature Concept
- Contributes to a city's character and identity
- Encourages outdoor activity, including walking, cycling and other recreation
- Provides non-material benefits such as spiritual enrichment, education, cognitive development, reflection and aesthetic experiences

Private sector

Investors and Developers

- Protects assets by way of built-in nature-based resilience
- Increases investor attractiveness of land and assets
- Increases in value of land and assets
- Provides higher eventual return of investment
- Provides lower operating cost for cooling of buildings
- Increases productive and healthy tenants – happy tenants!



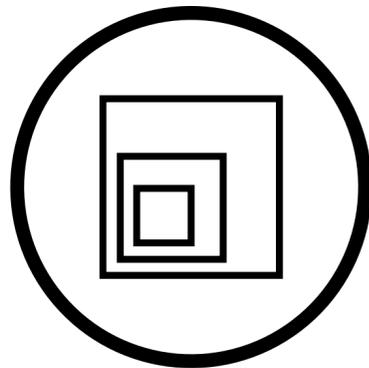


Green Infrastructure

Design principles

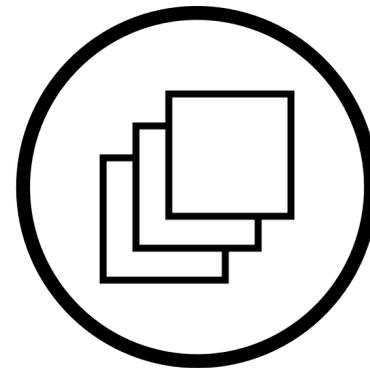
Green Infrastructure design principles

Our approach to the development of green infrastructure places the following design principles at the centre of our thinking, to ensure our solutions maximise the potential opportunity each unique and individual project can bring.



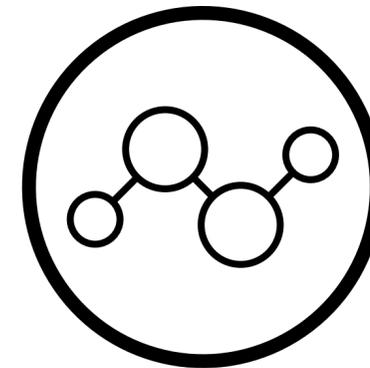
Multiscale

Develop appropriate green infrastructure solutions in various scale from plot level to regional scale.



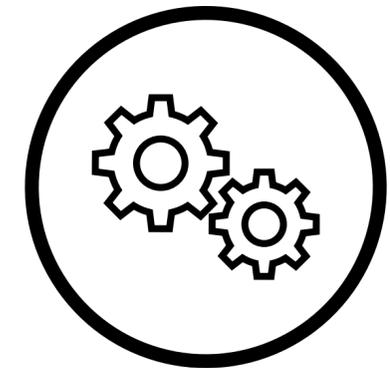
Multifunctionality

Provide multiple social, ecological and economic functions within limited green spaces within a city.



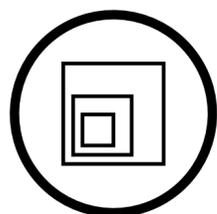
Connectivity

Connect green spaces to form a network that serves both humans and animals.



Integration

Integrate green and grey infrastructure to form a holistic stormwater management system.



Multiscale

From building to regional planning

Green infrastructure can be planned from building and street scale (e.g. green roofs, bio-swale etc), to neighbourhood and urban scale, to regional planning scale (e.g. a green infrastructure network plan).

It is important to plan and implement green infrastructure strategies at all scales to establish a well connected network throughout cities and regions.



Building/
street scale



Cornmill Gardens, UK



Royal Garden, Vietnam



Alder Hey Children's Health Park, UK



Neighbourhood/
campus scale



Monnikenhuizen, the Netherlands



Bank Indonesia Karawang Campus



Jinchen Villas, China



Urban and
regional scale



Patimban New City, Indonesia



Jakarta River Project, Indonesia



South Hongqiao Master Plan, China



Patimban New City, Indonesia



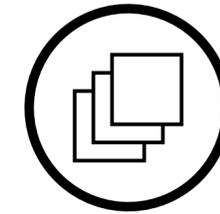
Cornhill Gardens, UK



Birchwood Park, UK



West Gorton Community Park, UK

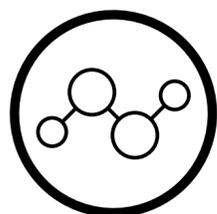


Multifunctionality

Multiple functions, multiple benefits

Multifunctional green infrastructure has the potential to provide a spectrum of social, ecological and economic functions, which offer higher resiliency to environmental challenges compared to those developments which do not take advantage of this holistic approach.

It can offer cost effective solutions which perform multiple functions including mitigating floods, improving the quality of spaces, promoting health and wellbeing for both nature and people, increasing land and property values, and more.



Connectivity

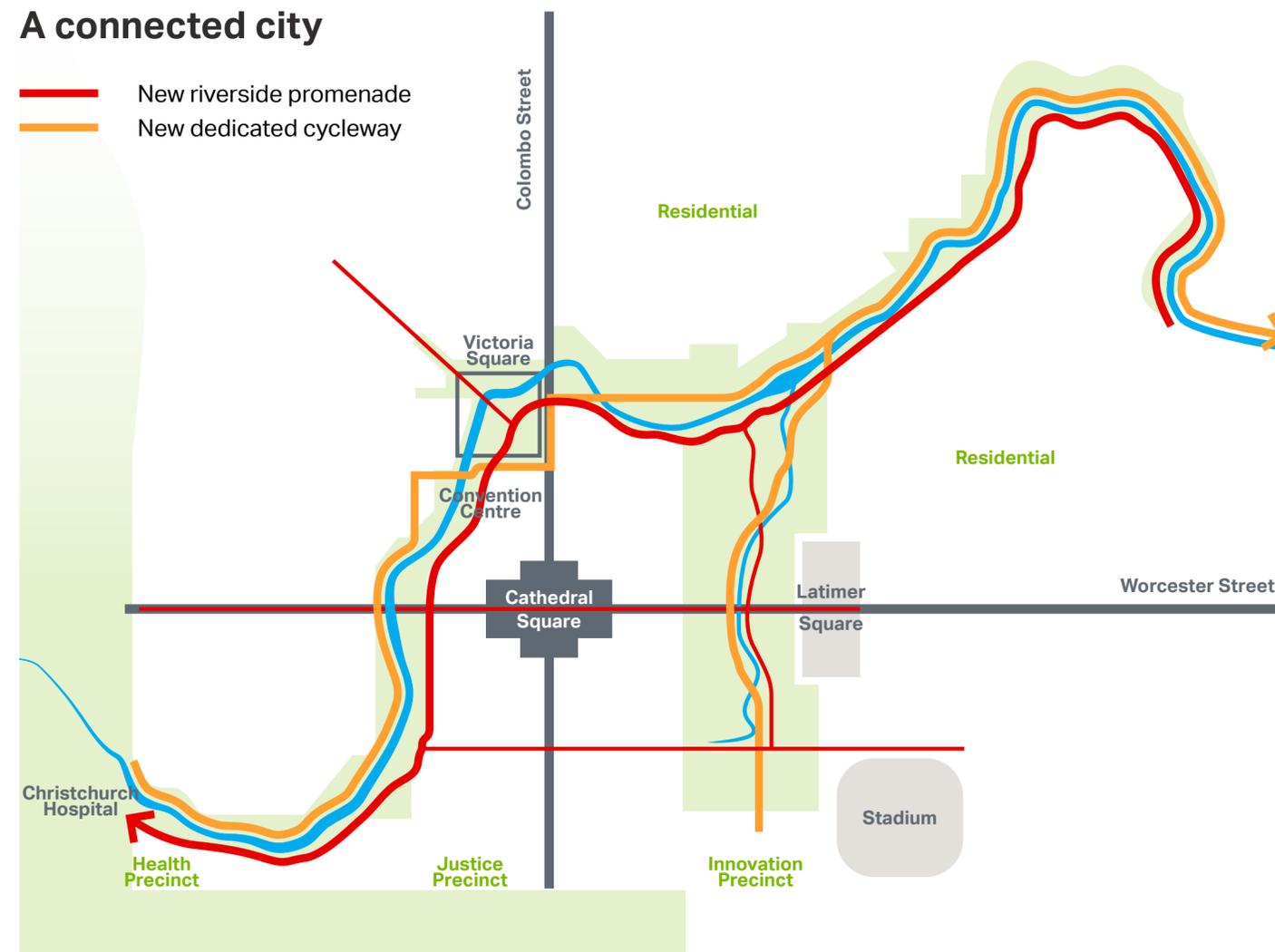
Creating networks for both nature and people

The connectivity of parks and open spaces are crucial for both nature and people. For nature, habitat fragmentation is one of the major impacts of urban development on flora and fauna. Connectivity is crucial in maintaining and nurturing complex ecological systems. For people, connectivity serves as transit and recreational corridors, linking destinations. The quality of these contribute to the enjoyment and wellbeing of those who use them.

Our design proposal for the Avon River Precinct Project in Christchurch, New Zealand, recognised the river as the 'life-force' of the city and repairing its damaged ecology was key to bringing back life to the central city waterway. It aimed to renew the river as a source of Mahinga Kai, whilst creating welcoming, enjoyable and accessible public spaces with a new riverside promenade and dedicated cycleway.

A connected city

- New riverside promenade
- New dedicated cycleway





New Pujiang
Centre Urban
Design, China



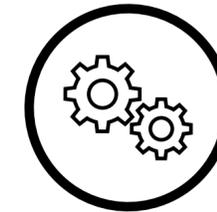
New Cathedral Street, UK



Avon River Precinct Project, New Zealand



Patimban New City, Indonesia



Integration

Optimisation of Green and Grey Infrastructure

Integrated and optimised green-grey infrastructures are promising solutions which can effectively combat urban flood and water quality problems, which have been severe owing to the increase in urbanisation and the effects of climate change.

The integration principle also applies to the relationship between private and public green infrastructure developments, by seamlessly connecting those which are owned and managed by different parties and stakeholders.

Green Infrastructure

Riverside Regeneration

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A river doesn't just carry water, it carries life

The relationship between cities throughout the world and the rivers that run through them are often considered fundamental to their urban development, because of their profound interactions with both humans and nature.

On the pages that follow, we showcase a selection of green infrastructure riverside regeneration projects our global collective of experts have developed which holistically support the environmental, social and economic needs of the communities and biodiversity they serve.



Patimban Port City Masterplan

Location

Subang, Indonesia

Scope of services

Concept masterplan

Site area

528 ha

Project completion

2021

BDP were commissioned by JICA and the West Java Government to develop a 525 hectare mixed-use and waterfront development concept masterplan within Patimban New City, Indonesia.

Located between mangrove forests and Patimban Port, the existing flood-prone site consists of fishponds, rice fields and mangroves.

The location's wide ranging qualities have inspired us to create a waterfront destination which harmonises with the port development and the biodiversity of the site.

The proposed masterplan aims to unlock the full potential of the area and transform the site into a catalyst for exceptional waterfront communities which are flood resilient, ecological and prosperous.



-  Multiscale
-  Multifunctionality
-  Connectivity
-  Integration

Patimban Port City Masterplan

We worked with the local authorities to identify the suitable location of mangrove forests to conserve and nurture, in and around the site. All embankments along the sea, rivers, lakes and mangrove forests are proposed to form part of the park connector that brings people close to the water.

Green infrastructure components such as rain gardens, green roofs, attenuation ponds and tanks, bio-retention swales, wetland filtration beds, enhanced green space, porous hard surfaces, floating planting and aeration systems are proposed to form the city-wide green infrastructure network strategy, which will enhance the biodiversity and flood resiliency of the site.

Upon the completion of the project, Patimban New City will be a leading example of a sustainable maritime city that demonstrates innovative urban development and progressive placemaking strategies, to celebrate a new standard of waterfront living in Indonesia.

BDP's and Nippon Koei's unique multidisciplinary partnership provided specialist masterplanning, urban design, architecture, landscape architecture, ecology, hydrology and civil engineering services for this innovative and progressive masterplan concept scheme.



Avon River Precinct Framework

Location

Christchurch, New Zealand

Scope of services

Masterplanning,
Landscape Architecture,
Urban Design

Site area

182.67 ha

Key dates

Concept design period

January–April 2013

Developed design period

September–December 2013

Phased implementation

Ongoing

The city of Christchurch was badly damaged by a sequence of earthquakes including a major event in February 2011 which led to widespread damage and loss of life. The city wide recovery plan envisages a greener, more accessible city with a compact core, stronger built identity and a greater focus on people and nature.

BDP won the commission to prepare design proposals for the regeneration of the Avon River Precinct which flows through the centre of the city. The project will restore the health of the river and create a habitat to encourage the return of native birds and aquatic life forms to the central city.

The rejuvenated landscape will represent a blend of the best of exotic and native planting and reflect the weaving together of the city's cultures.

The area will be accessible for all with a pedestrian promenade and separate cycleway running the full length of the Precinct. Board walks and terracing will allow easy access to the river and feature lighting will improve safety in the evenings and enhance the natural beauty of the central city.

The project received a highly commended award for Urban Design & Masterplanning at the Landscape Institute Awards 2015.



-  Multiscale
-  Multifunctionality
-  Connectivity
-  Integration

Jakarta River Masterplan

Location

Jakarta, Indonesia

Scope of services

Concept design

Site area

182.67 ha

Project completion

2019

The Jakarta River was once a center of life for the Betawi people, the natives of Jakarta. Sadly, the effects of rapid and unregulated urbanisation have brought about severe flooding, pollution and damage to the waterway and its surrounding environment. Communities have slowly turned their backs on the once thriving river.

As well as the obvious health risks associated with high levels of pollution, the risk of flooding has been a real and reoccurring threat to life and property which regularly forces people from their homes to escape the high-water levels, that often rise to the roof levels of their riverside dwellings

BDP's masterplan looks to bring life back to the Jakarta River. Whilst preserving existing communities, the scheme presents a vision for more accessible and liveable riverfront developments that celebrate the river's history, unique character and its influence on life along its edges.



-  Multiscale
-  Multifunctionality
-  Connectivity
-  Integration

Jakarta River Masterplan

Our multifunctional design proposes a family of green infrastructure elements, which form part of a holistic strategy applied to both buildings and landscape, to achieve an integrated stormwater management and flood prevention solution.

Key to this, is the introduction of green headland fingers and the greening of the riverside's edge. These interventions cleverly utilise a range of multiscale green infrastructure water management techniques and bring life back to the area with opportunities for public space, retail and various other activities that will promote the wellbeing of the environment and those who use it. Crossing points re-establish connections from the river to the city and beyond, drawing both the local community and other user groups to its revived riverside edge.

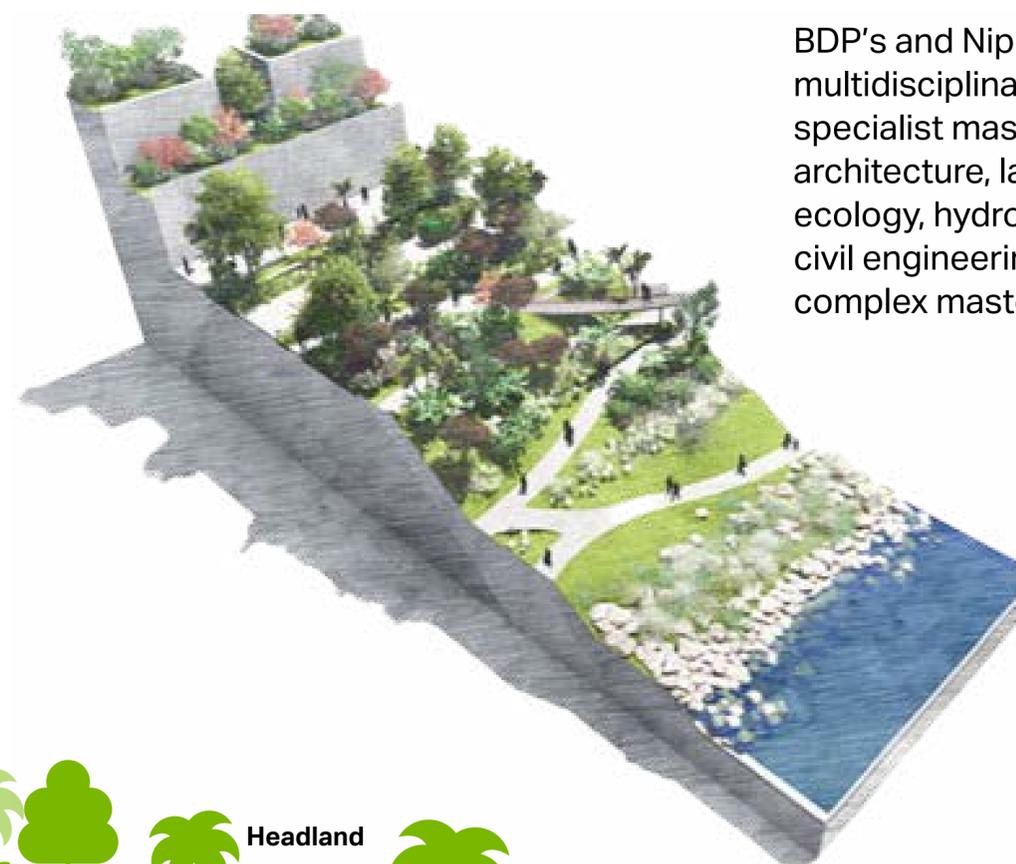


Jakarta River Masterplan

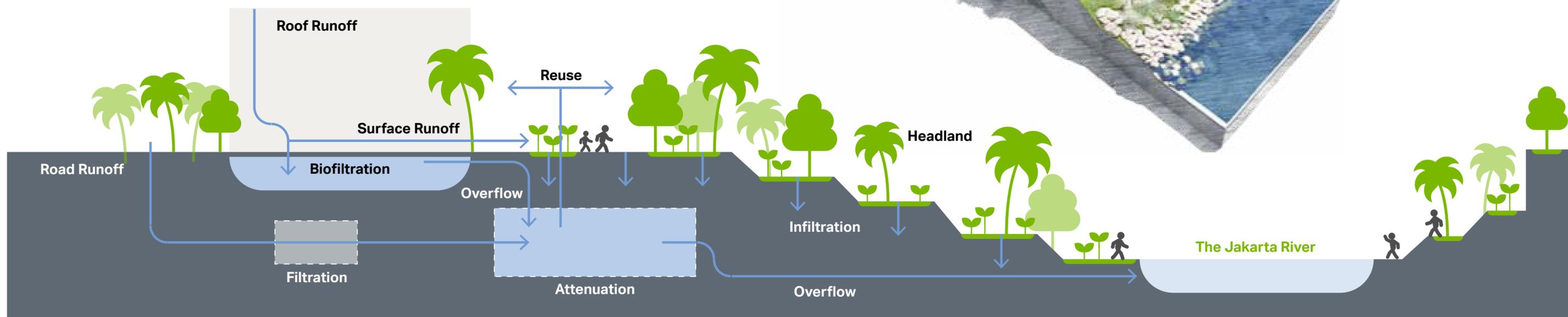
Sustainable drainage

Best practice water management principles will be incorporated into the green fingers of the development. Each quarter will have a comprehensive water management capacity and will typically include the following elements:

- Filtration of contaminated water, from roadways for example, before entering the larger system
- Storage and attenuation systems to reduce flooding
- Collection of clean water into natural systems such as biofiltration ponds
- Permeable landscape areas to allow water to infiltrate into the soil and be taken up by planting and trees.



BDP's and Nippon Koei's unique multidisciplinary partnership has provided specialist masterplanning, urban design, architecture, landscape architecture, ecology, hydrology, water-treatment and civil engineering services for this vast and complex masterplan concept scheme.



New Pujiang Centre

Location

Shanghai, China

Scope of services

Urban design,
masterplanning

Site area

5.25 sq km

The New Pujiang Centre is a district-level project which forms part of the Minhang 2035 masterplan. Through the transformation and modernisation of the Mindong Industrial Park, the BDP led consortium with JAE, will strengthen innovative functionality in the area, create a unique public service and deliver a state-of-the-art activity center, to provide world-leading research and landmark industry-city integration.

Focusing on civilisation, development, history and nature, the competition winning design builds a new urban picture, lays out a new industrial blueprint and strives to build a new city in Mindong which supports easier accessibility, diversified cultural tourism and an unrivalled quality of living.

-  Multiscale
-  Multifunctionality
-  Connectivity
-  Integration



New Pujiang Centre

Proposed as a world-class sponge city, the development brings the riverfront back to life and introduces a large man-made lake, which weaves into the ecological network to promote greater biodiversity. A series of green infrastructure components will collect and purify rainwater, prevent flooding and recycle water resources to become a self-growing and self-improving urban ecosystem.

Surrounding transportation and road infrastructure network developments will crucially enhance connectivity to the new city, which will become a bustling and engaging urban community with ecology, health and wellbeing at its heart.



Green Roofs



Tree Pits



Green Spaces



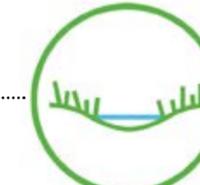
Floating Planting



Aeration



Attenuation



Bio-retention Swales



Permeable Surface



Rain Gardens



Filtration Beds

South Hongqiao Masterplan

Location

Hongqiao, China

Scope of services

Concept design

Client

Hongqiao District
Government

Project completion

Masterplan

2020

BDP was invited to submit a concept masterplan proposal for the international competition in South Hongqiao District. The site comprises an overall 10 sq km urban planning area, of which 2 sq km is identified as the core urban design area that includes a mix of workplace, residential, cultural, exhibition, education and research and development uses.

Our proposal for the Hongqiao Eco Metropolis seeks to create a harmonious and symbiotic relationship between the ecological environment, people and development.

The unique aquatic ecology of the surrounding area is extended from the Suzhou River into the heart of the new urban centre. Formed as a ring shape, the new section of the river symbolises harmony and unity, bringing together the rich diversity of the river's ecological functions and breathing new life into public realm spaces and private developments.

-  Multiscale
-  Multifunctionality
-  Connectivity
-  Integration



South Hongqiao Masterplan

The masterplan presents a new urban model for the public realm, with an open campus community that promotes collaboration, sharing of ideas and infusion of diverse cultural experiences.

Complemented by a meandering network of waterfront landscapes and elevated observatory decks, the ring-shaped river offers opportunities for people to co-exist, observe, engage with and preserve Suzhou River's ecosystems.

Connecting these open community spaces is a pedestrian-centric green web of linked walking trails, parks and community farms that weave through the heart of every development. The waterscape, biotopes, podium parks and skyrise greenery function as stormwater management systems which filter, cleanse, slow down and drain stormwater to public drains. These multifunctional green infrastructure design features also provide recreational opportunities in an entirely automobile-free realm, where local fauna habitat zones can thrive.



Trung Son Innovation Hub

Location

Ho Chi Minh City, Vietnam

Scope of services

Architectural concept

Site area

5,257 sqm

Project completion

2019

Our design for this mixed-use commercial development in Ho Chi Minh City creates a unique vertical work-play environment, nurturing a dynamic, enterprising community with co-working, co-living, retail and office spaces.

Formed of a multiplicity of innovative areas which are curated within a campus, the Creative Hive offers its users a variety of environments, destinations, amenities and circulation route choices.

The concept draws inspiration from the vibrancy of the city streets and its energy and diversity, by creating a vertical continuity of city life, its public and green spaces, and its active commercial and retail frontages. Through these 'vertical streets' the building connects the users to various interior micro-destinations including intimate lounge space, chic sky terraces, social pantries or private focus rooms. These micro-destinations are characterised as extruded volumes from the building's surface and face the street to showcase the Creative Hive's activities.

The design aims to evoke a sense of inclusivity and openness by extending the existing common green spaces along the riverfront into the building. These green spaces can be enjoyed by both occupants and the public. The unique development not only returns green spaces back to the urban fabric of the city but also brings recreational park spaces to the local communities.

The passive design includes spatial planning and orientation to control solar gain and to maximise daylighting, carved out building volumes to facilitate natural ventilation and the effective use of thermal mass to reduce peak internal temperatures. The rooftop rain garden absorbs rainwater and slowly discharges it to the ground level and lush rooftop greenery reduces urban heat island effect and the building's temperature.



Royal Gardens

Location

Ho Chi Minh City, Vietnam

Scope of services

Masterplan, architectural concept

Site area

16.3 ha

Project completion

2019

Our masterplan proposal for this luxury mixed-used residential and commercial development takes inspiration from Vietnam's natural landscape to create a rich and diverse tapestry of materiality, natural elements and topography.

Comprising 1–3 bed residential units, garden villas, sky suites and penthouses with supporting commercial offerings on the ground level, the concept responds to the surrounding area's rapid urbanisation and scarcity of greenery, by introducing a lush tropical environment and urban sanctuary for residents and the local community. Applied holistically to all levels of the development, the biophilic approach reduces thermal gain, promotes good air quality, wellbeing and biodiversity.

The residential towers and podium's form are inspired by Vietnam's mountainous landscape. Three large voids, cut through the podium's roof, allow daylight to penetrate into the commercial spaces below, whilst its terrace facilitates the convergence of lush gardens and green networks around the site.





Green Infrastructure

Our expertise

BDP. Ideas

Our core values

Green infrastructure projects require a multidisciplinary team that can work with a wide range of stakeholders. BDP's core values are aligned with the essential requirements to build effective green infrastructure developments:

1

Creative

We are passionate about good design. Curious by nature we are thought leaders, innovators and early adopters of new technologies. In a constantly changing world we create clever solutions which add value for our clients.

2

User Inspired

We place people at the centre of our thinking. The best designs spring from fusing people, activity and place to produce experiences which are unique, inspiring and surprising.

3

Collaborative

Founded on the idea of interdisciplinary working, a one-team ethos is fundamental to our approach. Within our studios different professions are encouraged to spark off each other and deliver innovation through collaboration.

4

Supportive

We respect and care for each other and the world we inhabit. Our design community nurtures the skills of talented people within a stimulating environment to support our evolving practice and consistently produce great work for our clients.

5

Organised

Excellent design comes from excellent management. We eliminate risks to our projects and take pride in running a sustainable and profitable business delivering the highest level of service to our clients.

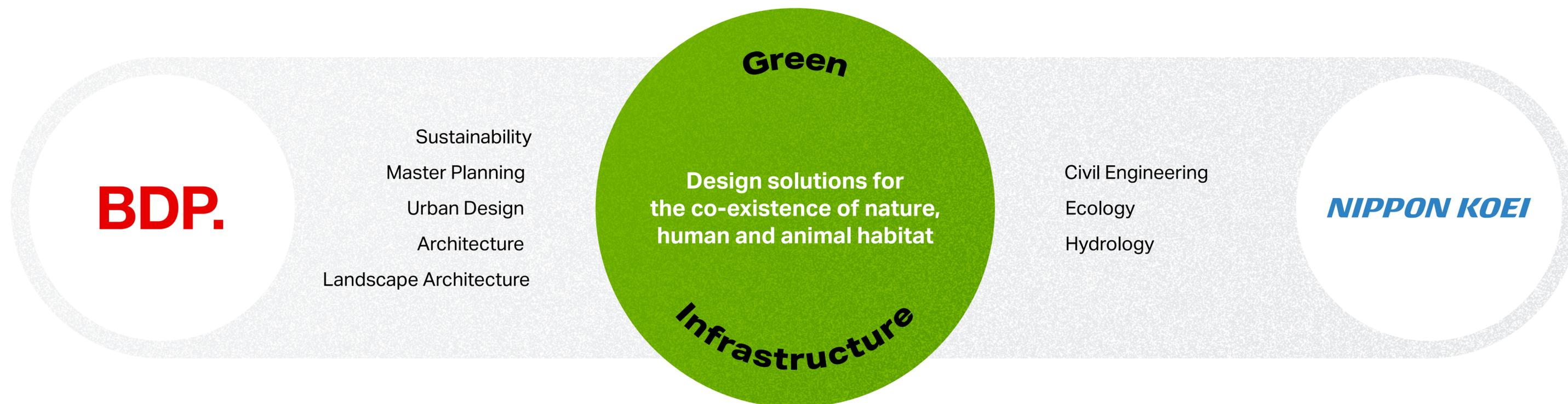
Why us?

BDP's and Nippon Koei's unique position as a multidisciplinary partnership, offer a specialist global team of masterplanners, urban designers, architects, landscape architects, ecologists, hydrologists and civil engineers. Who are experienced and well positioned to address the challenges governments and private developers continue to face in delivering schemes that are sustainable, resilient, attractive and financially viable.

Our multidisciplinary design approach offers our clients integrated thinking across all specialities, at the earliest stages of a project, to ensure the design of green infrastructure projects are holistically developed from the start of the design process.

We possess specialist expertise in life-cycle assessment, circular economy and resource management, energy and carbon consultancy and ecology services, with expertise in developing, implementing and monitoring bespoke development environmental strategies.

This approach has seen us work across exemplar sustainability projects around the world.



Our specialist global expertise



BDP.

Sustainability

We work closely with clients to identify sustainability drivers and establish sustainability policies, objectives and targets for proposed developments that respond to the global climate and biodiversity emergency. Our holistic understanding of the dependencies and interaction between urban design and the sustainability agenda ensures our proposals are capable of responding to an ever-changing legislative, economic and technological landscape.

We are actively engaged with industry to ensure that we are contributing to the global agenda, and that our design approach continues to deliver progressive, practical and financially sound solutions in response to environmental, social and economic challenges. Our global collective includes individuals with experience and certification to a variety of regional and global professional accreditations including Green Mark, LEED, BREEAM, CEEQUAL, Ska, WELL and Fitwel.

Urban Design and masterplanning

We provide a creative lead in our approach to masterplanning and regeneration. Our track record is second-to-none; tackling issues of de-industrialisation and market stagnation to delivering places of enduring quality with flair and imagination. Our masterplans respond to local conditions and client aspirations whilst also promoting universal qualities of environmental harmony, social cohesion and physical beauty. True places for people.

Architecture

Our architects are passionate about the role of design to improve the quality of life. We design places for all of life's activities and at every scale. We are united by the simple idea that people are at the heart of the design process. we design across all the major sectors and our specialist skills include sustainability, urban design, heritage and creative re-use. We are recognised as international leaders in each.

Landscape architecture

Whether urban or rural, the external environment helps to shape and define the places we live, work and spend our leisure time in. Our landscape architects are engaged with projects across the world, protecting and enhancing the natural landscape or working with clients and communities to create 'smart' green masterplans, imaginative urban spaces, lively parks and attractive settings for new development.



Our specialist global expertise



Civil engineering

Nippon Koei is Japan's No.1 International Engineering Consultants. Our project managers and engineers provide strong engineering solutions for our clients by planning, designing and supervising construction of infrastructure projects in the fields of energy, transportation, resources, urban and public sector development. As the oldest independent consulting firm in Japan, it is during our 75 years history that Nippon Koei has worked on over 5000 multi-disciplinary infrastructure projects in 156 countries all over the world.

Ecology

Nippon Koei is one of the few one-stop consulting services in the field of climate change. Our services range from policy making to project implementation involving mitigation (energy reduction) and adaptation activities (science-based policy adjustments like CDM, JCM & REDD+). Nippon Koei has prepared sound policies that strike the delicate balance of environmental protection with economic development. Where development is moving at a rapid pace, we plan to minimise environmental degradation. Where environmental degradation has already occurred, we make plans for remediation so that areas become safe for development.

Hydrology

Nippon Koei has a global track record of delivering a broad variety of hydrology projects that focuses on principles of resilient design. This includes nationwide water resource development masterplans across many Asian and African nations, a diverse array of flood prevention and mitigate projects in both urban and rural locations, and numerous hydro-electric power dams, networks and facilities.

Our global practice

18

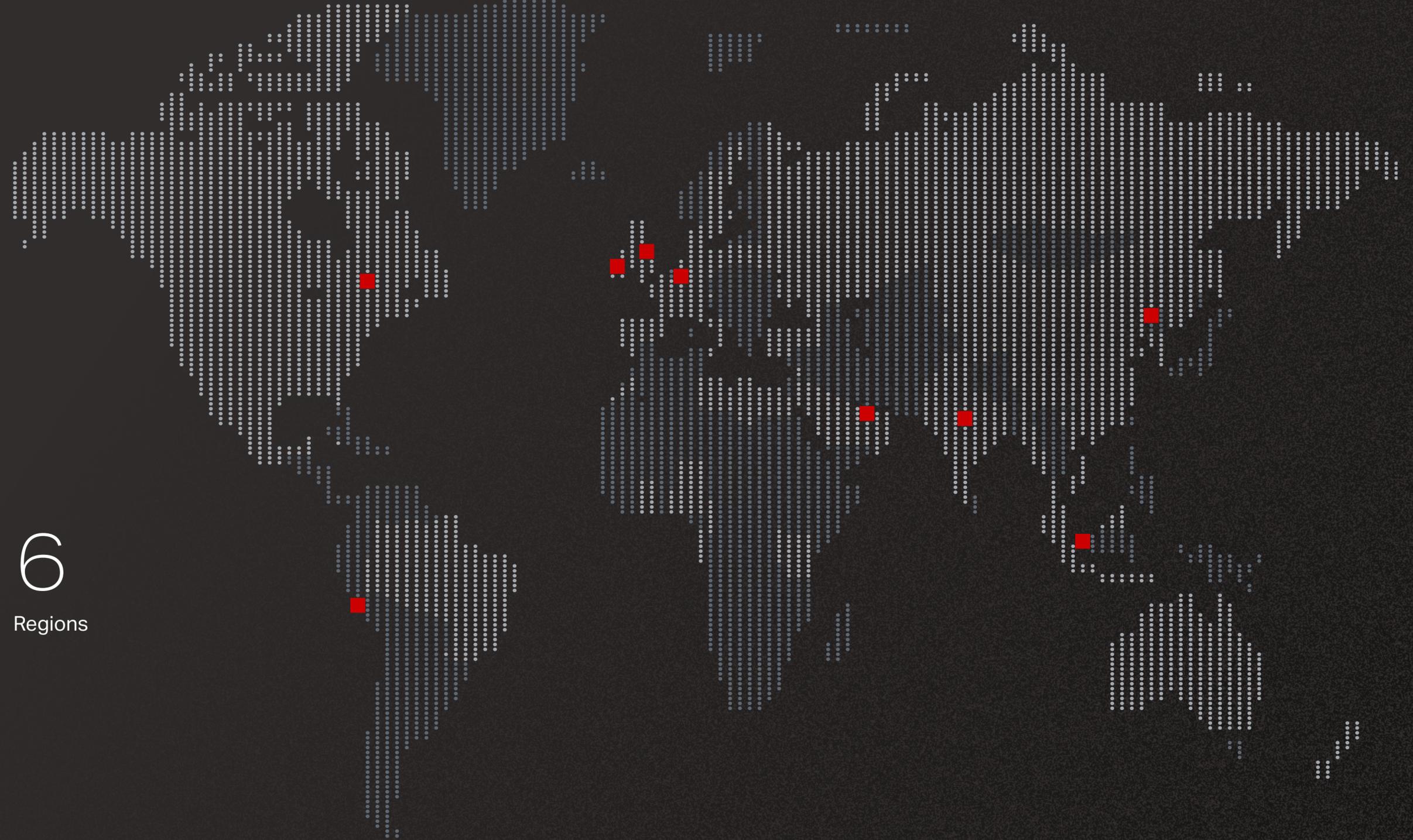
Studios

10

Countries

6

Regions



North America

Toronto

South America

Lima

UK

Birmingham
Bristol
Cardiff
Edinburgh
Glasgow
Leeds
Liverpool
London
Manchester
Sheffield

Europe

Dublin
Rotterdam

MENA

Abu Dhabi

Asia Pacific

New Delhi
Shanghai
Singapore

BDP is different. Our unique position as a collective with experts spanning the spectrum of the built environment gives us a special status and capability in the design world.

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