

NATURE-BASED PLAY

Fostering connections for
children's wellbeing and climate resilience



This publication is a product of the partnership between Arup and the Real Play Coalition, and it was possible thanks to the contribution of internal and external experts, for which we are very grateful.

We would like to acknowledge the collaboration of the Resilient Cities Network in the organisation of the event at COP26 in Glasgow, and thank the organisers of the Resilience Hub at COP26 for enabling the space and platform for this key discussion that led to this publication idea, and Arup for funding the development of this document. We also would like to thank the valued contributions of the experts listed on this page in the development of this document.

Released July 2022

Suggested citation: Candiracci, Sara, Larissa Miranda Heinisch, Daša Moschonas, and Spencer Robinson, eds. *Nature-based Play: Fostering connections for children’s wellbeing and climate resilience*. London: Arup, 2022.

ISBN: 978-0-9929501-4-9

Contact: sara.candiracci@arup.com

 #NatureBasedPlay

8 Fitzroy Street
London W1T 4BQ
arup.com
© Arup 2022

EDITORIAL TEAM

Dr Sara Candiracci
Team Lead & Co-Author
Associate Director, Arup

Larissa Miranda Heinisch
Editor & Co-Author
Climate Change Consultant, Arup

Dr Daša Moschonas
Editor & Co-Author
Urban Designer, Arup

Spencer Robinson
Editor & Co-Author
Consultant and Researcher, Arup

Rachel Dixon
Copy Editor
Communications Specialist, Arup

Yi-Pei Wu
Graphic Design and Layout
Graphic Designer, Arup Consultant

CONTRIBUTORS

Arup
Jo da Silva
Rory Canavan

WWF Cities
Dr Jennifer Lenhart

Fam Studio
Zelda Yanovich

Play Scotland
Marguerite Blair

**MRC/CSO Social and Public Health
Sciences Unit, University of Glasgow**
Dr Anne Martin
Dr Paul McCrorie

City of Barcelona
Ariadna Miquel
Neda Kostandinovic
Sílvia Casorrán Martos
Emma Cortés (Institut Infància i Adolescència)
Dr Roger Paez (Elisava Research, UVic-UCC)

CASE STUDIES

Alana Institute
Maria Isabel Amando de Barros, Paula
Mendonça, JP Amaral

Ciudad Emergente
Javier Vergara Petrescu

Evergreen
Cam Collyer, Heidi Campbell

Earth Wrights
Mike Jones

Grün macht Schule
Manfred Dietzen

Grün macht Schule – KinderGARTEN
Katrin Herrmann

Isthmus
David Irwin, Helen Kerr, Haylea Muir,
Brad Ward, Sean Burke, Alan England

LandLAB_
Ethan Reid

Mmofra Foundation
Amowi Phillips

Royal Horticultural Society
Rosie Naylor

Space for Play
Renet Korthals Altes, Thomas Tiel
Groenestege

The Speeldernis
Sigrun Lobst



ARUP

Arup’s mission is in our motto: “We Shape a Better World”. A global firm of designers, engineers, planners, technical specialists and researchers, we work across every aspect of today’s built environment to find innovative and tangible solutions that change people’s lives for the better. Globally, we have over 15,000 employees and operate out of 40 countries, across 92 offices. Arup was founded in 1946 as an employee-owned firm by Sir Ove Arup, a celebrated engineer and philosopher whose philosophy of ‘Total Design’ as a form of social usefulness is still the cornerstone of our practice today. Ove Arup was ahead of his time, discussing the importance of sustainable attitudes and innovative thinking as early as the 1950s – a legacy of which we as a firm remain proud.



The Real Play Coalition is a global non-profit coalition created in 2018 which includes UNICEF, National Geographic, Arup, IKEA and LEGO Foundation. It has the ambition to create a movement that narrows the play gap for 100 million children by 2030, by making play accessible and inclusive, because it is an essential right for children to thrive now and in the future. The coalition seeks to change the perception of the value of play; embed play-based principles into urban design and planning; support the implementation and upscaling of safe play activations in cities globally; and grow the number of play moments in the lives of children across the world.

Foreword

Every parent knows that play is essential for children’s well-being, happiness and development. Nature-based play is particularly important as it allows children to explore freely, use their imagination, and interact with other people, plants and animals. A connection with the natural world is associated with a range of mental and physical health benefits, and teaches children to appreciate the natural world and respect the environment.

Children need nature, and nature needs children who will grow up and value the resources, services and amenity it provides. This intimate relationship between people and our planet is at the heart of sustainable development yet in cities it can often seem very distant as our day to day lives are typically shaped more by the built environment rather than by the natural environment. As cities have grown and densified, forests and woodlands have disappeared, waterways have become polluted, and green spaces have been covered in asphalt or concrete. This has made it difficult for many children to access natural environments where they can play and cultivate a love of nature at a young age. This lack of green space also reduces the ability of cities to adapt to rising temperatures, heatwaves, and flooding as a result of climate change.

So, the question Arup began asking ourselves together with the Real Play Coalition and Resilient Cities Network was ‘is it possible to demonstrate that investing in nature-based play is a no regrets approach, that contributes to a sustainable future long term, and in the short- to medium- term results in tangible benefits for children, and for the communities and cities they are part of?’

The importance of nature-based solutions in combatting the impacts of climate change is increasingly being recognised. For instance, trees provide shade and sequester carbon, water bodies capture heavy rainfall, natural landscaping can reduce run-off and recharge aquifers. The opportunity exists to integrate play elements in the design of nature-based solutions, and into the fabric of our cities to improve climate resilience, whilst also providing environments where children can play, grow and develop.

Parks and other green spaces help our well-being and generate a sense of community where people of all ages from diverse backgrounds can meet. During the Covid-19 pandemic, local parks, forests, woodlands and waterways provided a welcome respite from the confinement of our homes. For many of us, our ability as adults to remain healthy and care for our children during the pandemic was linked to being able to temporarily escape our homes, exercise and spend time in nature.

Our hope is that this publication will inspire local authorities, urban practitioners, communities, and businesses to work together to foster connections between nature and play. Focussing on nature-based play is a positive step towards improving children’s health and well-being (SDG3), achieving safe, sustainable, inclusive and resilient cities (SDG11) and regenerating life on land (SDG14)*. Achieving these goals, will enable future generations to thrive.

*United Nations. “Sustainable development goals.” January 2022. <https://sdgs.un.org/goals>

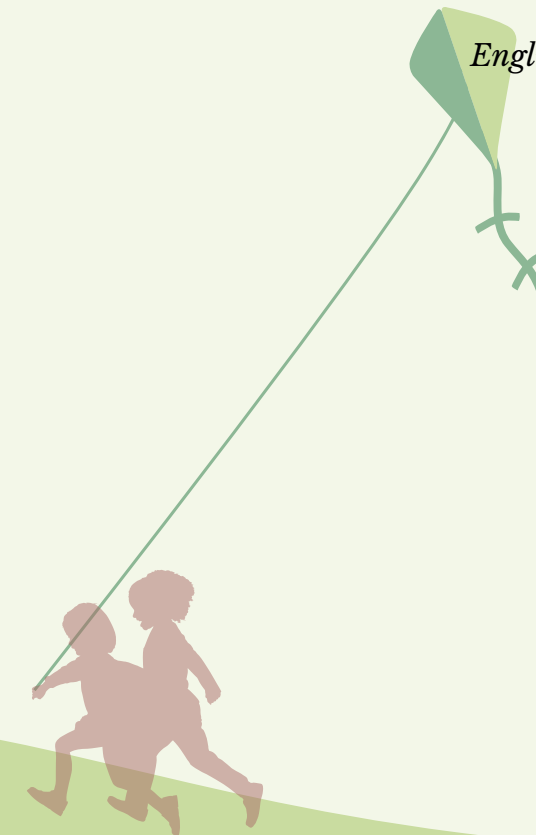


Jo da Silva

Global Director of Sustainable Development, Arup

“ No one will protect what they don’t care about, and no one will care about what they have never experienced.

*— Sir David Attenborough,
English broadcaster, biologist, natural
historian and author*



Contents



INTRODUCTION

6

Section 1 PERSPECTIVES

7

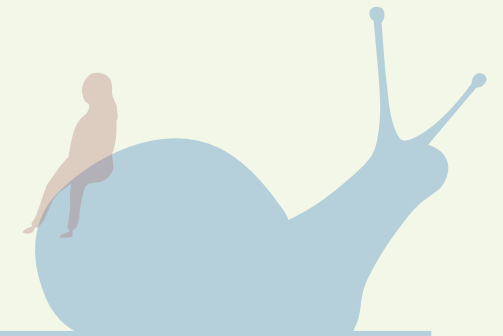
- ① Why nature in cities?
- ② Why does play matter?
- ③ The positives of nature-based play
- ④ Mainstreaming play in nature-based solutions
- ⑤ Blue positives: The benefits of water for children and play in cities
- ⑥ A city perspective: How to make it happen like Barcelona?



Section 2 CASE STUDIES

31

- ① Tactics for Conservation of Urban Ravines
- ② The Speeldernis
- ③ Hobsonville Point Play Strategy
- ④ Fortaleza Natural Playscapes
- ⑤ Children's Garden at Evergreen Brick Works
- ⑥ Mmofra Place Park
- ⑦ Grün macht Schule
- ⑧ The Woods in Amsterdam
- ⑨ Garden Bridgewater at Royal Horticultural Society
- ⑩ Stubbers Adventure Centre
- ⑪ Daldy Street Linear Park



CONCLUSION

54



Introduction

In November 2021, elected officials, advocates and activists from nearly every country in the world congregated in Glasgow at the long-awaited climate summit, COP26. This publication is born out of an event held during the Summit, organised by Arup, the Real Play Coalition and the Resilient Cities Network. This event explored the connections between children, nature and climate change. Its premise was simple:

Creating cities where there are more opportunities for children to play in nature has significant benefits for their physical and emotional development and creates cities that are more inclusive and better able to adapt to rising temperatures, increased rainfall or drought resulting from climate change.

Play is an essential part of a child's healthy and holistic development. Nature-based play teaches children to be curious and adaptable, to fall and fail but carry on, to interact with others and with the natural world. It makes our children more resilient, and more inclined to safeguard nature. It leads to cities that are more inclusive, where nature is valued and can play its role in mitigating the impacts of climate change by providing shade, regulating temperatures, storing water, attenuating run off, and sequestering carbon.

Over recent decades, play has been progressively edged out of the modern city, by rapid urbanisation, overzealous regulations, traffic, air pollution, and a host of other challenges. The same is true of nature. Urban expansion has placed enormous

pressure on natural systems, contributing to the climate crisis and to biodiversity loss and as Jennifer Lenhart, WWF Cities notes in Chapter 1 'without ambitious policies and interventions, this expansion will continue damaging ecosystems and undermining climate resilience'.

Putting nature-based play at the heart of urban planning and development is a win-win strategy providing an opportunity to address the play deficit in our cities and combat climate change. There is already growing awareness of the importance of nature-based solutions in addressing climate impacts, and examples of play spaces – in Copenhagen, Tokyo, Jakarta and New York – being expanded or repurposed as part of climate action.

Promoting nature-based play is also a strategy for addressing poverty and inequity in our cities. In the last two years, the COVID-19 pandemic has drawn attention the importance of outdoor spaces, and the vital role urban parks, woodlands and waterways play in our mental and physical health and wellbeing. But, it has also highlighted that it is the poorest and most disadvantaged communities that have least access to these spaces.

Healthy people, places and planet

Spending time in nature is associated with multiple health benefits, including lower rates of obesity, depression and attention disorders.⁵ There is growing evidence that playing in and with nature is especially beneficial for early years childhood development. It supports their well-being and helps them to acquire skills, develop healthy

attitudes and engage in relationships with other children and care for animals and plants. Natural spaces create opportunity for children to explore new terrain, re-imagine their surroundings and form attachments with other people, with animals and plants.⁶

Marguerite Hunter Blair from Play Scotland is clear that 'the ability to play in safe and stimulating environment builds children's emotional and social resilience, whilst fostering their cognitive and physical development', and she argues that 'more natural, as opposed to artificial urban spaces, lend themselves to the types of creative and adventurous play essential for developing physical coordination, teamwork, and risk assessment skills, and also support reflective and imaginative play.'⁷

This is supported by research carried out by Dr Anne Martin, University of Glasgow, who defines nature-based play as taking place in natural environments and involving interactions with natural elements. It is characterised by enriching, naturalised and diverse opportunities which bring unique benefits that are not prevalent through other forms of play. This connection with nature also teaches children to respect their environment, and cultivates an appreciation of the natural world that they are then more likely to value.

This publication explores in Section 1 the important relationship between play, nature and climate resilience, considering the *perspectives* of leading urban development, early childhood, play and nature-based solutions experts.

This is followed by *case studies* from cities around the world that demonstrate how local governments, business and communities have incorporated nature-based play into their urban environments – through parks and woodlands, neglected buildings and school yards. Each example highlights how the design of these interventions has combined play, nature, culture and climate to create environments that support childhood well-being and development, and enhance climate resilience.

0-17

definition of children

Based on the United Nations Convention on the Rights of the Child, we define children as people aged 0 to 17 years.⁸

1bn+

children

Live in urban settings around the world.⁹

70%

of the world's population will live in cities by 2050.¹⁰



Why nature in cities?

AUTHOR | *Dr Jennifer Lenhart, Global Lead at WWF Cities*

**“ We don’t inherit the earth
from our ancestors, we
borrow it from our children.**

— Native American proverb



For the first time in human history, we live in an urban era: cities are home to 55% of the world's population¹¹, and they are constantly expanding. Urban consumption, production and lifestyles place increasing pressure on ecosystems, contributing to the climate crisis and biodiversity loss.

Home to 80% of global GDP¹², cities are responsible for 70% of CO2 emissions¹³ and 75% of natural resource consumption¹⁴. Cities also hold many opportunities to reverse these trends. When planned well with ambitious policies and interventions that tackle climate change and biodiversity loss, cities can reduce their impacts, meet human needs more efficiently and find synergies between urban development, climate action and nature conservation. For instance, urban green areas and increased tree cover can reduce the heat island effect, thus reducing energy demand while cleaning air, supporting biodiversity and creating space for outdoor social interaction.

While the common narrative perceives cities as separate to nature – concrete jungles of human activity – cities have always had an intimate relationship with their surrounding landscape. When humans began to settle thousands of years ago, early towns and cities were founded near critical resources: fertile soils for farming, fresh water, access to natural resources and fisheries; today, we call these biodiversity hotspots.

This relationship between cities and natural landscapes continues, and it is putting biodiversity in danger. According to The Nature Conservancy¹⁵, roughly 40% of protected areas and nature reserves will be located within 50 kilometres of urban areas globally by 2030. And most of the world's forecasted urban expansion is expected in biodiversity hotspots, according to a 2022 report on BiodiverCities led by the World Economic Forum (WEF)¹⁶. That report warns that the exponential

growth of the built environment will undermine nature's ability to contribute to our societies and economies; for example, around 44% of GDP in cities is at risk from nature loss.

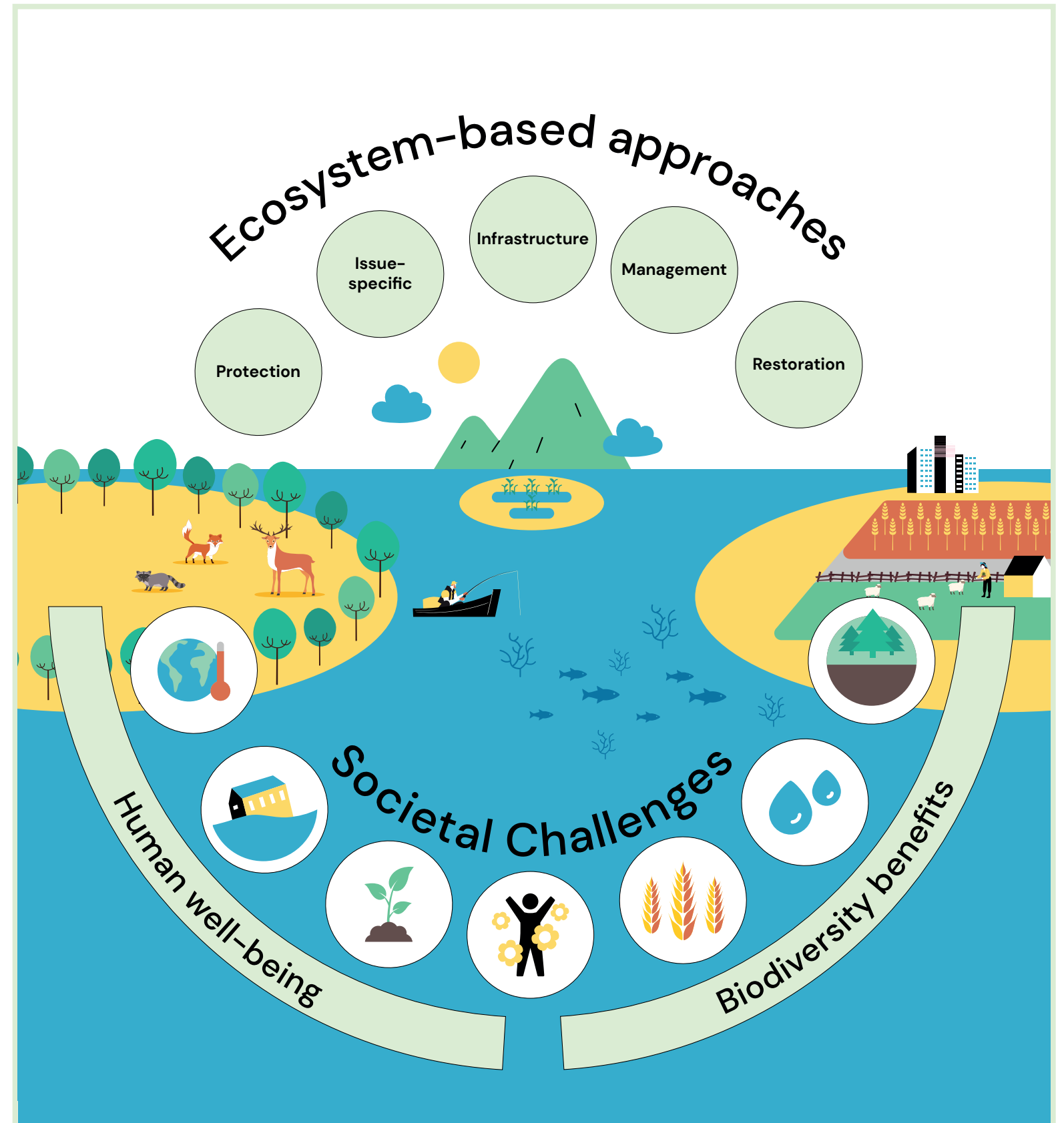
The message cannot be clearer: cities must urgently address the challenges of climate change and biodiversity loss.

Underscored by the United Nations 2022 IPCC (Intergovernmental Panel on Climate Change) report on adaptation and vulnerability,¹⁷ the climate crisis affects people and nature worldwide: from droughts, fires, flooding, and heat waves caused by extreme weather to coral reef destruction from ocean acidification. Impacts will worsen as global temperatures rise. Climate change and biodiversity loss impact vulnerable urban populations to a greater degree, many of whom live in informal settlements. It is, therefore, essential that cities build their resilience – that is, their capacity to absorb stress and maintain essential functions when facing the increasing challenges that climate change is presenting.

Cities are places of challenge and change, where new ideas manifest and take root, including how to better integrate cities within natural landscapes.

One method to integrate nature within and around cities is the concept of nature-based solutions (NbS), which can achieve human and ecological benefits, whilst synergistically improving wellbeing and biodiversity.

The International Union for Conservation of Nature (IUCN) define NbS as “actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human wellbeing and



Adapted from Nature-Based Solution Framework

biodiversity benefits.” WWF underscores that NbS should be designed to address clear societal challenges identified with and for beneficiaries. These include food and water security, climate change, human health, disaster risk, and natural and economic development. In addition, solutions must protect nature through monitoring of robust indicators.

In cities, NbS can foster sustainable development, climate mitigation and adaptation targets and efforts to protect urban biodiversity. NbS improve urban resilience and liveability because integrating nature into cities can: reduce extreme weather impacts; mitigate the urban heat island effect; recharge aquifers and reduce urban flooding; filter out air pollutants – especially important for children and youth who have accelerated breathing patterns compared to adults; improve overall health and wellbeing; and provide multiple job opportunities, including for low-skilled and high-skilled workers and planning professionals. Integrating NbS in the built environment should also adhere to local climatic and geographic realities. For example, they should prioritise native climate-resilient plant species.



© Renet Korthals Altes ~ SPACE FOR PLAY

Urban and peri-urban NbS have been used effectively in cities around the world, in developed and developing countries, in mega-cities and small towns, in agricultural, forestry and coastal zones. NbS may range from interventions like a single tree to shade a nearby building, to an entire urban forest or water body. WWF conducted a 2021 case study review of cities¹⁸ working to integrate nature in several categories, namely: (1) nature-based buildings & neighbourhoods – to integrate nature into the built environment; (2) vegetation, agriculture and forestry – with native vegetation prioritised in the design of public spaces, urban parks and urban forests; (3) living rivers – with fresh water at the centre of cities’ development to provide water, support flood prevention, improve wildlife habitats and offer a cooling effect; as well as (4) living shorelines – critical considering 40% of humanity reside near coastal zones, facing escalating threats from the climate crisis and requiring robust and nature-integrated approaches to protect and restore shoreline ecosystems.

The good news is that investing in urban nature and integrating nature-based infrastructure in the built environment can result in significant economic and social value, while addressing the climate crisis and biodiversity loss.

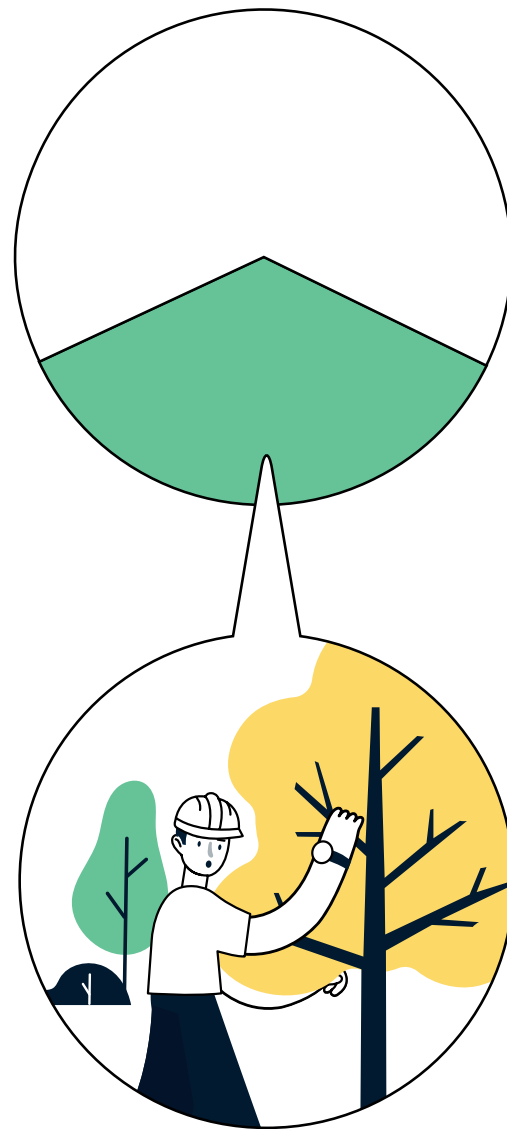
According to the WEF (World Economic Forum), investing around US\$583 billion on NbS for infrastructure as well as interventions and land conservation efforts could create over 59 million jobs by 2030, including 21 million livelihood-enhancing jobs dedicated to restoring and protecting natural ecosystems.¹⁹ Moreover, nature-based infrastructure can be 50% cheaper than grey infrastructure, have improved longevity and can deliver roughly 28% of added value in terms of



© Daldy Street Tanks

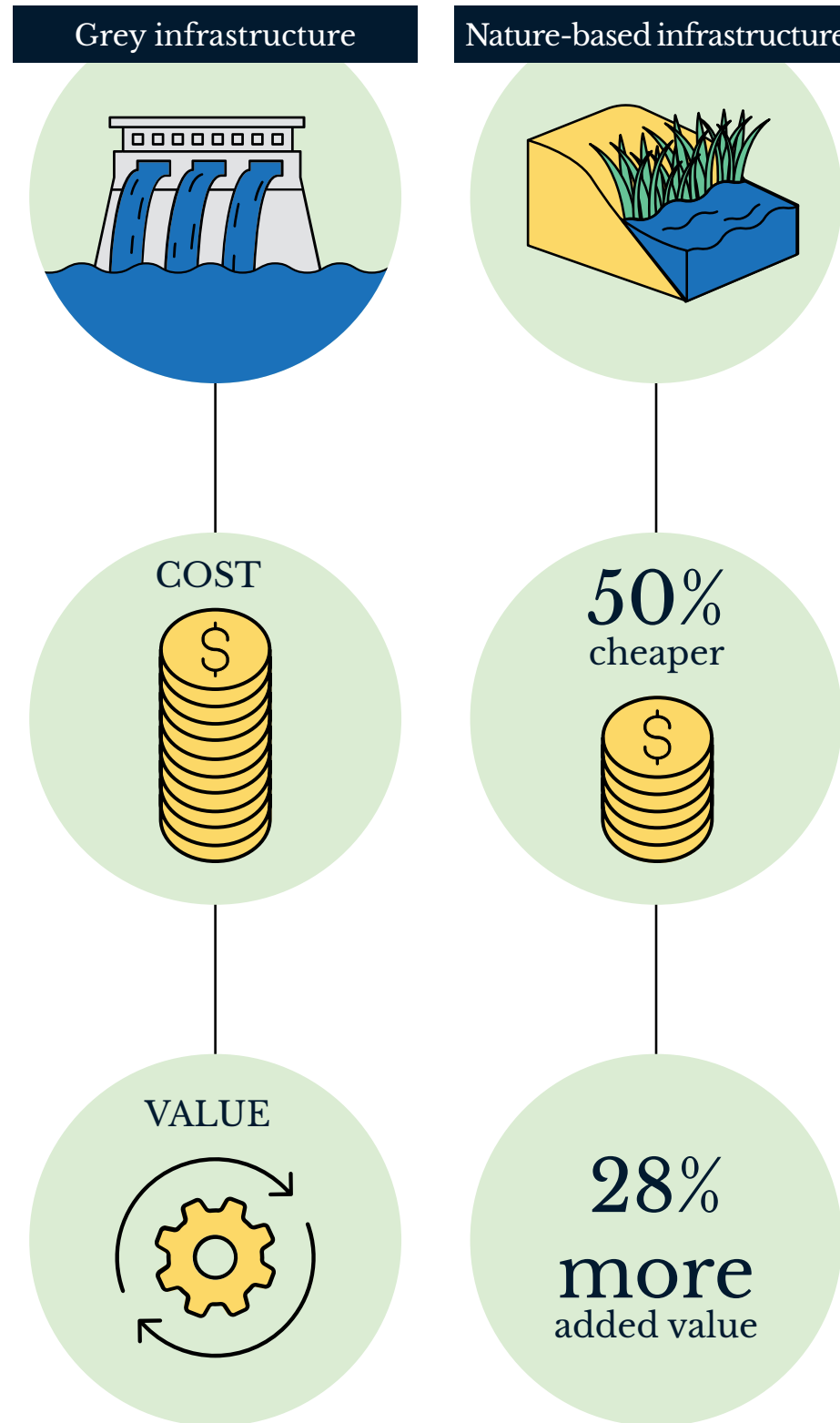
US\$583 bn

investment on NbS for infrastructure, interventions and land conservation could create



59 million jobs by 2030

21 million jobs dedicated to restoring and protecting natural ecosystems



productivity and positive externalities. Similarly, to tackle increasing electronic cooling in a warmer and more urban climate, NbS act as powerful tools to reduce cooling demand, counter urban heat island effects and improve outdoor thermal comfort, according to the 2021 UNEP-led Cool Coalition’s Beating the Heat Guide.²⁰ While the WEF and Cool Coalition reports reviewed global data and trends, a similar study was conducted in Tshwane, South Africa, with comparable results: investing in urban nature has significant payback and extended benefits, according to WWF South Africa and IISD.²¹

As evidence increases, efforts to support nature restoration in the built environment should be the backbone of future urban development and investments.

Doing so requires technical knowledge as well as a shift to a systems approach to urban governance where local decisionmakers and planners work with practitioners across multiple dimensions such as health, energy, economy and urban infrastructure because nature can play a strong role in all of them. While the ongoing and accelerating climate crisis creates an urgent need to act now, the immediate interests of our children provide a human face.

In addition to helping provide a future free from the worst impacts of climate change and biodiversity loss, due to many of the factors reviewed above, nature in our cities can also create the space and the environment that is needed for a healthy and safe childhood. ~~~

According to World Economic Forum (2022). Available: https://www3.weforum.org/docs/WEF_BiodiverCities_by_2030_2022.pdf. Last accessed 29th March 2022

Why does play matter?

AUTHOR | *Marguerite Hunter Blair, Chief Executive at Play Scotland*

“ If we want children to flourish, to become truly empowered, then let us allow them to love the earth before we ask them to save it. Perhaps this is what Thoreau had in mind when he said, “the more slowly trees grow at first, the sounder they are at the core, and I think the same is true of human beings.

— *David Sobel, environmental educator and academic*



CONCLUSION



Throughout the early years, children experience a critical phase of cognitive development. During this time, the stage is set for all future growth, including core skills, healthy attitudes and behaviours, and the flourishing of mature relationships.²² Supporting this process can have wide-ranging impacts on the individual, their community and, in the long-term, entire societies.

Play is crucial to the optimal development of children and young people. Former Chief Medical Officer, Professor Sir Harry Burns²³ was clear about the importance of play when he stated that investing in children’s play is the key to improving children’s enjoyment, health and wellbeing, and educational outcomes. Also, extensive evidence showing the essential contribution of play to children’s holistic development,²⁴ describes how important it is for children to have time and opportunity to play freely throughout their childhoods, to make their own choices and build their understanding of themselves and how they relate to the people and the environment around them.

Children need play to survive and thrive.²⁵

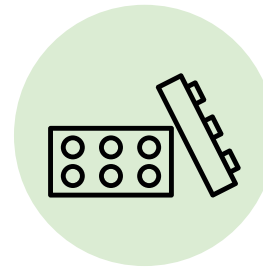
Children play in many ways, usually combining different types of activities. For children, play is behaviour for its own sake, something they do in their own time, for their own reasons and free from the direction of adults. A balanced diet of play is the obvious key to unlocking a wide range of necessary learning, development, and health benefits. This is confirmed by developmental psychologist David Whitebread:

Play in all its rich variety is one of the highest achievements of the human

FIVE FUNDAMENTAL TYPES OF HUMAN PLAY



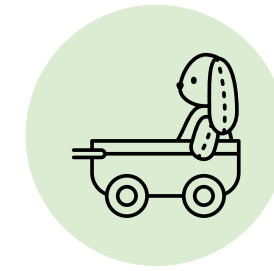
Physical play



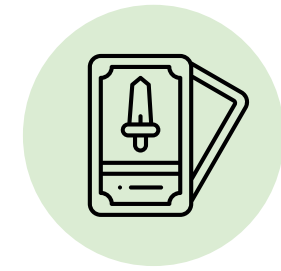
Play with objects



Symbolic play



Pretence or socio-dramatic play



Games with rules

species, alongside language, culture and technology. Indeed, without play, none of these other achievements would be possible. Psychological research has established that there are five fundamental types of human play. These are commonly referred to as: physical play, play with objects, symbolic play, pretence or socio-dramatic play, and games with rules. Each supports a range of cognitive and emotional developments, and a good balance of play experience is regarded as a healthy play diet for children.²⁶

As our understanding of play types continues to evolve, the challenge is to ensure that the practices necessary to facilitate them are adopted in early years. If we take a moment to listen to children playing we can hear joy and fun. If we watch children playing, we can see that it is something that comes naturally to them. It is an intrinsic part of who we all are as humans. We can all be playful even as adults but, if we do not allow young children the space, time, permission and resources to play, that playfulness may not fully develop.

A range of play opportunities helps foster resilience, creativity, curiosity, social skills, and well-being.

Children need time to play, space to move around freely, and environments where they feel safe and that offer a range of play experiences and opportunities.

Those responsible for children’s play include not just the ‘usual’ suspects but also those whose strategic decision making has a major impact on children’s play opportunities and experiences:



Parents and carers



Designers, architects, landscapers, developers, and builders;



Managers of roads, streets and open spaces, parks and playgrounds, and the school estate.

The vital importance of play in children's lives is enshrined as a fundamental right for all children in the United Nations Convention on the Rights of the Child (UNCRC).²⁷ Article 31 is focused on play, and other articles in the Convention are interconnected with and have an impact on children's right to play. The Convention also outlines play as 'a fundamental and vital dimension of the pleasure of childhood, as well as an essential component of physical, social, cognitive, emotional and spiritual development'.

Barriers to play can affect any child. Often, however, they disproportionately impact those who already experience discrimination, exclusion, or challenges. These barriers can be framed as a lack of space, time, and permission to play. Diversity of childhood experience is also highlighted in the Convention, and groups of children were identified who require particular attention so that their rights are realised. This includes the needs of girls, children living in poverty, children with disabilities, children in institutions and children from indigenous and minority communities.²⁸

The physical environment for play provides a blank canvas and prompts the way children use their imagination and creativity to develop their own games and play. If play spaces and facilities are to give children the experiences they need, they must be well designed and maintained to ensure children can frequently find new and interesting experiences that test and absorb them.

The quality of physical environments makes a significant difference to the quality of children and young people's experience and opportunities for play.²⁹

Children need good quality places to play outdoors near their homes. They need spaces where they feel safe, with natural features and a variety of opportunities for physical and social activity. Environments that allow children to be as close to nature as possible offer children many opportunities to explore, make decisions and test and stretch their own abilities. Facing an element of risk during play can help children build their confidence, resilience and self-esteem, helping their creative development and offering them the chance to rise to challenges and extend their physical, social and emotional boundaries. Children's understanding and respect for nature is also linked to their opportunities for outdoor play.

Experts in children's mental health and development believe that play, particularly in nature, is beneficial during times of anxiety, stress and adversity, providing a sense of control and independence, helping children make sense of things they find hard to understand and supporting their coping and resilience.³⁰ The recent pandemic has shown that access to greenspace is essential for the social and emotional wellbeing of our children and families. But not all children have time and opportunities to play outdoors in natural spaces.

Access to nature is not equal.³¹

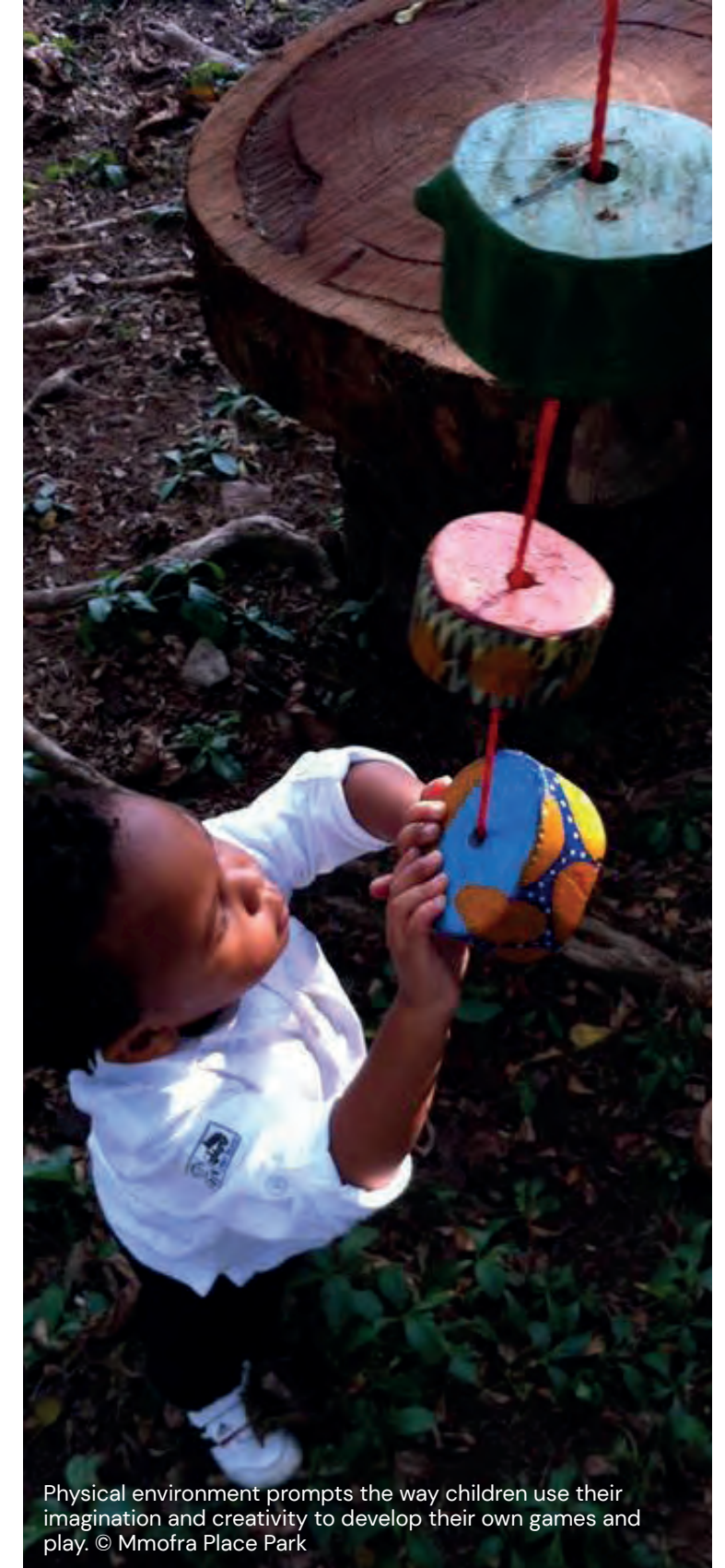
Even before the COVID-19 pandemic, children living in the least deprived areas were much more likely than those living in the most deprived areas to enjoy good local environments for play and recreation. But all our children have a right to experience opportunities to interact with and play in natural environments.³²

In Scotland, play is now recognised as part of the universal policies and the qualities of successful places – 'by designing, or retrofitting, spaces of all sizes and purposes to bring a sense of 'joy' and allowing people (whether individuals, families and groups) to meet safely, feel at ease, be included and feel positive towards being playful.'³³ There are provisions for the protection of existing play opportunities, incorporation of play opportunities into blue green infrastructure, as well as in the designing of streets and public realm, to adopt the principles that help to create safer environments, and liveable places to enable more spontaneous play opportunities for children.

As a society we have a responsibility to provide an inclusive and sustainable built and natural environment – one that is better for all of us.

More natural environments which support nature-based play and allow children and young people to socialise, explore, play and exercise are essential to promote positive health and wellbeing outcomes.

≈≈≈



Physical environment prompts the way children use their imagination and creativity to develop their own games and play. © Mmofra Place Park

The positives of nature-based play

AUTHORS | *Dr Anne Martin and Dr Paul McCrorie,*

*UK Medical Research Council, Scottish Chief Scientist Office
Social and Public Health Sciences Unit, University of Glasgow*

“ Let the children be free; encourage them; let them run outside when it is raining; let them remove their shoes when they find a puddle of water; and when the grass of the meadows is wet with dew, let them run on it and trample it with their bare feet; let them rest peacefully when a tree invites them to sleep beneath its shade; let them shout and laugh when the sun wakes them in the morning.

— *Maria Montessori, Italian physician and educator*



A growing body of work shows that play in the outdoor environment, particularly in nature, offers greater benefit to children's health and wellbeing, in addition to the potential wider benefits related to environmentally responsible behaviours and our connection with nature.

It is important to understand the conceptually similar but distinct constructs of 'outdoor play' and 'nature-based play'.

These have been used interchangeably across policy, practice, and research yet they can translate to entirely different experiences that are not necessarily equal in benefit.

Playing in nature enables children to realise their capabilities through different types of play. It fosters reasoning, communication and social interaction skills. Play can be creative, spontaneous, and free, and it can include different types and forms. Nature has a strong influence over the opportunities for diverse play experiences. In 1979, ecological psychologist, James J. Gibson wrote "the affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill".³⁶ For our purposes it speaks directly about the properties of objects within our environment, and importantly, how we perceive their function and action. These perceptions, and by extension the relationships therein, are inherently personal and specific to the individual, and they may change depending on context, climate, or culture. A tree in summer may afford a child the action of climbing, whereas in winter the same tree may provide shelter or space for imaginative play or hide and seek.



Outdoor play

Outdoor play has been defined as "a form of play that takes place outdoors, where the outdoors is defined as any open-air, wild, natural, or human-made space."³⁴ It refers to a broader environmental context in which play is situated, characterised by considerable variations in health enhancing/damaging conditions and contexts. For example, outdoor play on largely flat concrete surfaces beside busy roads or heavily polluted areas may afford children with the ability to develop certain locomotor skills for instance, but it may also lead to the development of diseases such as asthma.



Nature-based play

By contrast, nature-based play is defined as "a form of play that takes place in a natural environment and/or involves interaction with natural elements and features (e.g., water, streams, mud, rocks, hills, forests, and natural loose parts, such as sticks, pinecones, leaves, and grass)."³⁵ It is characterised by enriching, naturalised, and diverse affordances, and mixed terrain and topography. While nature-based play can incorporate physical activity, it also manifests in less active or even sedentary behaviours.

A review of 59 studies of over 10,000 children shows that nature play is linked to increased physical activity levels, improved balance, self-regulation, play interactions, nature relatedness and reduced sedentary behaviour.³⁷

The intrinsic fascination and functional diversity of nature in combination with presented challenges such as height or water may stimulate children's attention skills to play for longer.³⁸ The natural environment encourages adventurous, challenging or risky play which is known to nurture a sense of accomplishments and agency. Play with natural loose parts such as branches, sand and rocks are known to strengthen children's creativity as they encourage constructive and symbolic play enabling children to change the surrounding environment.³⁹

More generally, spending time in nature has been shown to also benefit children's mental health - partly through their perceived importance of nature connectedness - their thinking skills, physical activity and obesity levels.⁴⁰ Nature-based play in a biodiverse environment has the potential to change the immune system increasing children's resilience to diseases.⁴¹ Research also suggests that children's self-exposure to nature, partly in the form of nature-based play, is the strongest predictor of a number of aspects of adulthood environmental citizenship and of behavioral and attitudinal commitments to nature-based activities. Nature-exposure through organised and adult-directed programs such as outdoor classrooms, without self-directed play opportunities, are less likely to result in nature-based commitments and environmental citizenship in adulthood.⁴²

Despite the many known benefits of nature-based play, several challenges to adequate investments and implementation remain.

When referring to nature-based play, it is important to understand *how much*, and *what type* of nature is sufficient for benefiting children and planetary health.



To date, the existing methods for quantifying environmental features such as vegetation, noise, temperature, air quality and biodiversity have not been utilised in the context of children's nature-based play. Several observation tools on how to assess children's nature-based play have been developed recently, but all are time-intensive and are less practical to be used at scale. There is also uncertainty surrounding the minimum duration and frequency (i.e., how long and how often) children should engage in nature-based play. Knowledge of this would help the development and implementation of nature-based play policies and guidelines which could be included in existing policies for education, social care, and health promotion.

Deciding where to devote finite resources for future investment is a difficult and challenging task. Academic research can assist by working with key stakeholders to ensure they are asking and answering the most pressing questions.

So, what do we need to do?

1 We must look through the lens of the child/young person and recognise that they do not exist in a bubble. Their opportunities to engage in nature-based play are often more complex than just providing more nature; yet improving its accessibility for all children, regardless of background, is paramount.

2 It is critical to identify the key relationships (e.g., parents/peers), and physical/social environmental barriers and support that prevent/assist children in accessing and engaging in nature-based play.

3 A joined up and collaborative effort across multiple sectors to mainstream nature-based solutions is essential, where urban and city planners, housing developers, community groups, parks, forest and land agencies, and school environments - to name a few - play important roles.

You are never too old to enjoy nature-based play, but we should consider how best to create positive play experiences in nature at the earliest stages of a child's life to optimise their long-term benefits - for humans and their environments.

Early intervention creates opportunities to shape behaviours, support positive habits, and optimise cross/multi-generational changes in culture; all of which are crucial if we are to successfully mainstream play in nature-based solutions. ~~~

Mainstreaming play in nature-based solutions

AUTHOR | *Rory Canavan, Ecologist, Associate Director, Arup*

“ Passion is lifted from the earth itself by the muddy hands of the young; it travels along grass-stained sleeves to the heart. If we are going to save environmentalism and the environment, we must also save an endangered indicator species: the child in nature.

— *Richard Louv, children's book author*



An ever-growing body of research continues to highlight the surge of negative health impacts on the physical, mental, and social wellbeing of children across the world. These trends are so serious that some health professionals believe that the steady rise in life expectancy over the past century may soon be ending.⁴³ Indeed, the explosion of non-communicable diseases, such as diabetes, cardiovascular disease, chronic respiratory disease, is positively linked to this demographic transformation and the associated adverse side-effects from urbanisation.⁴⁴

It has long been acknowledged that urban living encourages activity within indoor environments and creates barriers to outdoor play for children. Consequently, the activity and exercise necessary for a child's healthy physical development is difficult to achieve.

Today's children are not getting outdoors enough and not benefiting from the critical experiential access to nature.

In short, this reflects the reduction in “free range childhoods” resulting in a significant unhealthy lifestyle with profound negative consequences for our children.⁴⁵ This includes ‘nature-deficit disorder’ which suggests a wide range of behavioural problems arising from children's limited access to the outdoors.⁴⁶ Extensive research and evidence clearly demonstrates how access to nature and nature-based play is very successful in maintaining good all-round health and tackling poor wellbeing arising from social issues such as loneliness, inactivity and poor mental health.

There is also a further compelling and positive link between childhood experience of nature and subsequent greater environmental stewardship for the natural world within adult life.⁴⁷

The wider global discourse has begun to recognise the interconnectedness of the climate emergency and the biodiversity crisis and the necessity for integrated approaches, such as Nature-based Solutions (NbS), which we explored earlier. These interventions are fundamentally solutions underpinned by biodiversity and are aimed at addressing many key societal and environmental challenges, while providing benefits for human well-being.

The global community is increasingly recognising the fundamental and essential relationship between people and biodiversity. There are high expectations for the UN Convention on Biological Diversity Conference of the Parties (CBD COP 15) scheduled this year, to finalise a new set of goals and targets to reverse the loss of biodiversity. The draft post-2020 Global Biodiversity Framework of the CBD has a dedicated target to specifically *‘Increasing benefits from biodiversity and green/blue spaces in urban areas (Target 12).’* A key tangential but related initiative, is the recent resolution adoption by the United Nations Human Rights Council, which recognises the human right to a clean, healthy, and sustainable environment as an important human right.⁴⁸ This wider recognition paves the way for effective adoption of international principles and stronger implementation within domestic legislation.

Within this context, there is undoubtedly a major opportunity to co-embrace the health and wellbeing of our children and their environment.



Public park in Barcelona. © Barcelona City Council

Designing play to be immersive and truly nature-based requires us to think far more systemically.

This means truly realising and harnessing the ecological foundational capacity of nature.

Traditional green infrastructure and the more recent NbS concept tend to be focused across a single or limited range of purposes or services, e.g. urban drainage, flood attenuation, carbon sequestration, recreation, etc. While these environmental services are important, there is a clear argument that the interventions often miss the opportunity to deliver greater societal value. The acid-test for NbS is to strive to achieve comparable multi-functionality as natural systems.⁴⁹ This multi-functionality is dependent on healthy ecosystems, which is in turn underpinned by biodiversity; and defines the abundance, extent and condition of nature.

Much of existing urban green infrastructure and newer NbS typologies do not purposefully consider or aim to create nature-based play opportunities. Indeed, it is not uncommon for many priority urban greenspaces to be underperforming for both nature and nature-based play; a situation which is often more pronounced within deprived urban communities.⁵⁰

There is a very strong, but frequently overlooked rationale, that the effective design of appropriate NbS could successfully integrate the health of both children and planet.

There are innate synergies in the configuration and provision of healthy urban ecosystems to deliver immersive nature-based play. Extensive and long-standing research confirms that children



Play with loose material. © Play Scotland

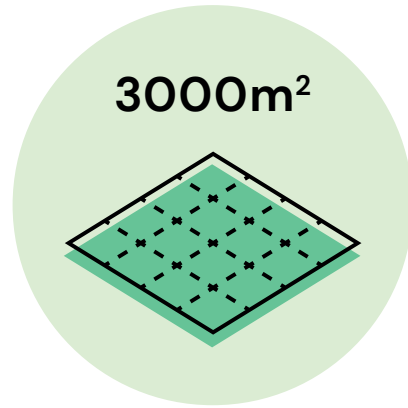
preferentially interact with all aspects of the environment, and it is the relative diversity of such environments and the available access to them that are the most important factors for nature-based play.⁵¹ Children's play in nature rich environments is characterised by a dynamic flow of play between fast movement across open spaces and slower contemplative activity in sheltered locations.

The Outdoor Play Environment Categories (OPEC) tool developed a method to assess the optimal design configuration for children's play in natural environments.⁵² This emphasised the need for



The Speeldernis (Rotterdam) creates nature-based play opportunities with trees. © Speeldernis

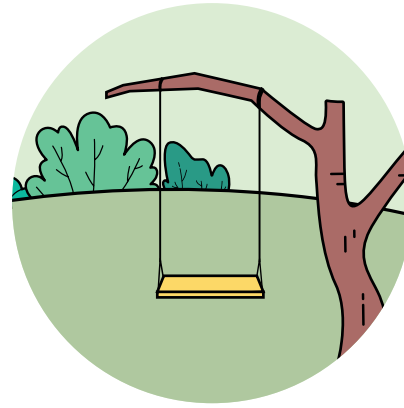
THE OPEC ASSESSMENT TOOL FOR CHILDREN'S PLAY IN NATURAL ENVIRONMENTS



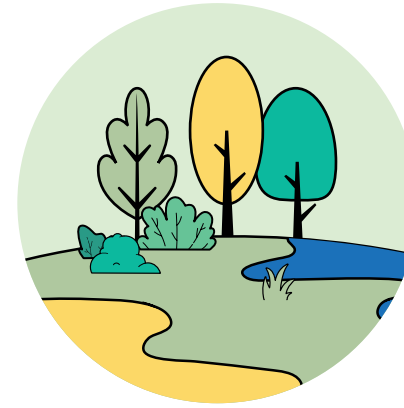
Large space



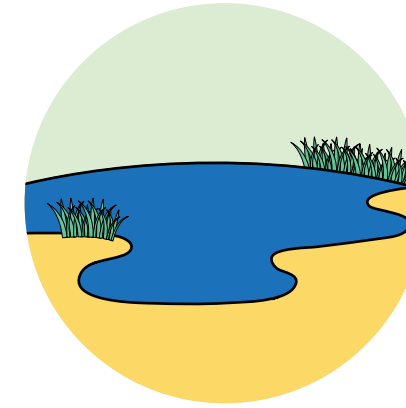
Distribution of trees, shrubs and hilly terrain



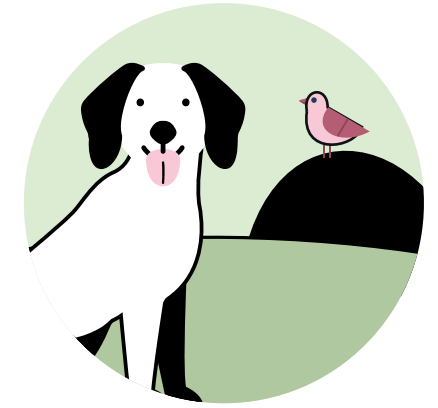
Equal integration between vegetation, open areas and play areas



Tree/shrub in play areas with connecting open grassland between spaces



Presence of water



Presence of animals

large space, (e.g. 3000m²), with a distribution of trees, shrubs and hilly terrain, and an approximate equal integration between vegetation, open areas and play areas. This is further optimised by tree/shrub planting adjacent to play areas with connecting open grassland situated between these spaces. Two other essential components which are significant for children's nature-play is the presence of water and animals.⁵³ The key design parameter is the necessity for structural diversity; indeed, it has been shown that more visitors enjoyed nature in parks with higher structural diversity, which increased their overall enjoyment of the park.⁵⁴

Importantly, biodiversity is generally strongly and positively influenced by structural diversity, which within an urban context may often equate to high quality nature-based play opportunities. Equally, the minimum structural requirements for quality nature-based play (e.g., as characterised by the OPEC tool), will frequently coalesce with the underpinning ecological requirements for NbS. This is assuming that NbS have been designed

with ecological coherence and consideration of urban biodiversity gradients.

Perhaps the single greatest intervention in terms of developing high quality and connected urban nature-based play infrastructure, is the 'ecological greening' of urban communities.

Specifically, addressing the creation, enhancement and connectivity of parks and greenways. This builds on the wider concept of ecological networks which permeate urban spaces, linking core diverse nature areas and appropriate NbS, (e.g., urban forests, local nature reserves, ponds/wetlands, etc), while providing safe passage for children to high quality nature based-play opportunities.

The Sanlihe River Ecological Corridor in Qian'an City, in China demonstrates the potential of a well-planned urban ecological network. The Corridor reclaimed an extensively polluted 13km stretch of river and transformed derelict land into

135ha of ecologically diverse landscape for city residents. Hard engineered infrastructure, such as concrete channels, were removed and a system of natural wetlands created to remove pollutants and attenuate floodwater. Mature trees were retained, species rich grasslands planted, and a network of walkways and cycle routes, connected residential areas with schools and natural play areas. The corridor is now a popular gathering place for children, offering tranquil and diverse environments outside of school hours for both play and learning.

Designing high-quality urban ecological networks with the same considerations and planning as traditional infrastructure, provides tangible opportunities to create 'children's infrastructure.'

This key feature of a child-friendly city enables and improves children's ability to play and socialise in cities with high levels of independent mobility.⁵⁵ Children's infrastructure provides the crucial

opportunities to build playful behaviours beyond playgrounds.

Well-designed and equitable planning of urban ecological networks can achieve the desired multifunctionality for neighbourhoods, including traditional amenities, such as space for ball games, picnics, community gardens/allotments, etc; footpaths, cycleways and green drainage swales, whilst raising the bar for wildlife habitats and healthy exploratory nature-based play opportunities. Fundamentally, connected large ecological networks, provide a natural opportunity to meaningfully integrate children's infrastructure at scale. However, the quality of the place where children spend their childhood must become a central focus of urban design.

The quality of the world depends on the quality of attention we pay to it. ~~~

Blue Positives: The benefits of water for children and play in cities

AUTHOR | *Zelda Yanovich, Co-Founder of the FamStudios*

“ You are not a drop in the
ocean; you are the entire
ocean in a drop.

— *Jalal ad-Din Muhammad Rumi, poet*



As we recognise that the ocean covers 70% of the earth’s surface, generating 50% of the earth’s oxygen and capturing 90% of the heat generated from carbon dioxide emissions – as well as being home to 80% of all life on earth⁵⁶ – we can say that if children need nature and nature needs children, then as part of that children need blue and blue needs children among its stewards.

Blue ecosystems notably came to the fore in climate discourse in 2022 in the Intergovernmental Panel on Climate Change (IPCC)’s⁵⁷ Sixth Assessment Report⁵⁸ and with the ocean being mentioned in the pre-ambule to the Glasgow Climate Pact.⁵⁹ Freshwater and ocean ecosystems are recognised as having the potential to reduce carbon emissions to limit global warming and risk factors for the community. On the other hand, the 2022 UN Ocean Conference underscores the unprecedented threats that the ocean is facing.⁶⁰

Blue learning has also seen momentum build during the United Nations Decade of Ocean Science for Sustainable Development, 2021-2030.⁶¹

UNESCO has called on all countries to include ocean education in school curricula by 2025, launching The Blue Curriculum and toolkit.⁶²

While the curriculum focuses on schools, it recognises the need for extra curricula learning and experiences that enhance student wellbeing and allow for cooperation with local communities, NGOs and academic institutions and finding ways to value local, traditional and indigenous knowledge about the ocean.

The case for blue ecosystems and infrastructure

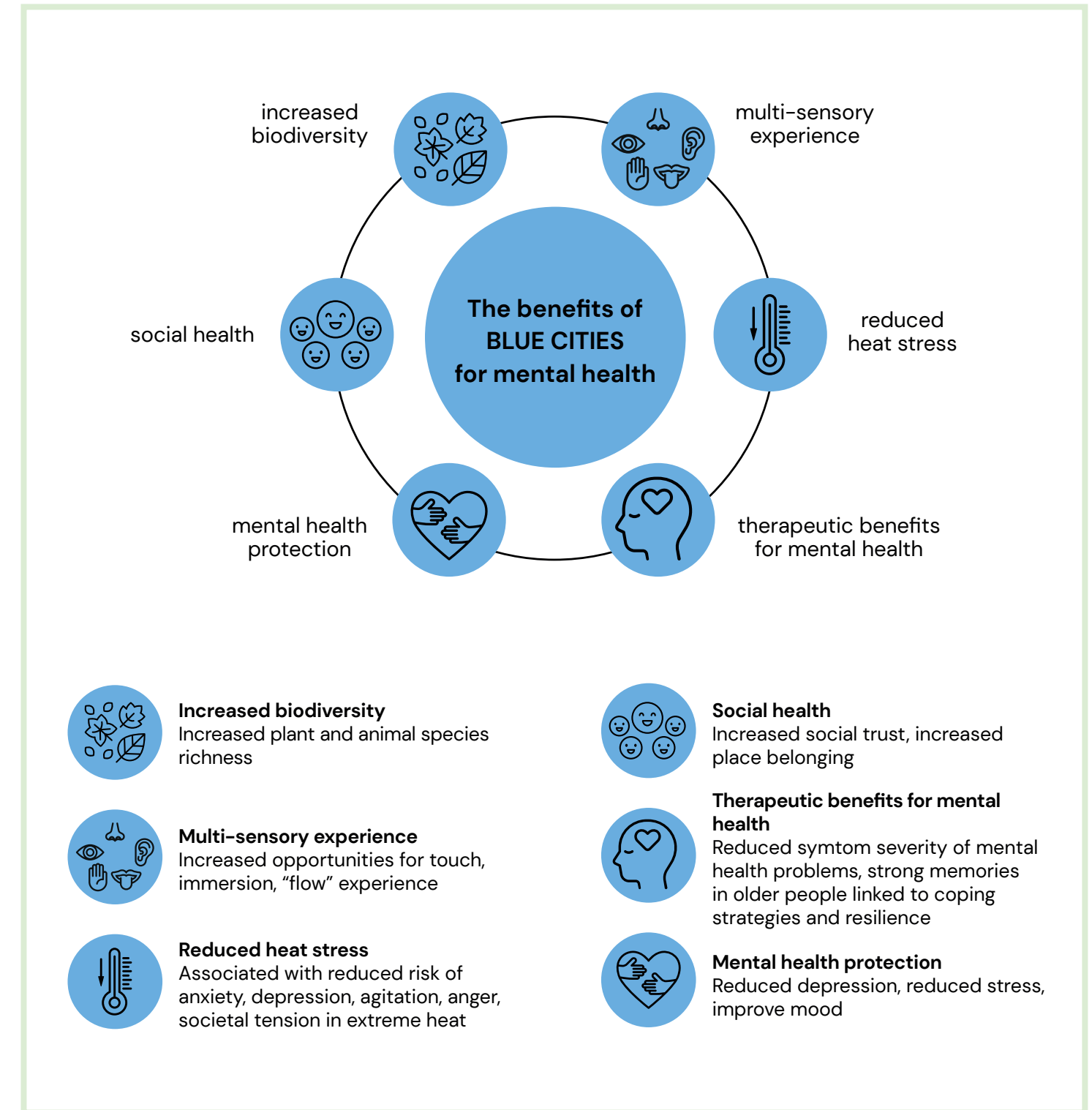
in cities for children and play, is gaining attention and prevalence. Since the UNICEF State of the World Children’s Report ten years ago where water as part of the natural landscape in urban settings and water play in children’s playgrounds were recognised as having positive impact on children’s “physical, mental, social and spiritual health”, the science has continued to evolve.⁶³

It has been found that the benefits of blue in urban environments is particularly important for the emotional wellbeing of children. Recent systematic reviews and meta-analysis of blue space, found that living closer to and having more blue space in your environment, is linked to increased levels of physical activity. Access to blue space also links to lower levels of stress and anxiety and to improved mood and psychological wellbeing.⁶⁴ As Roe states, the inclusion of both passive and interactive water features can (as well as having a key climate resilient role by helping manage storm water levels) provide meaningful “opportunities for play, curiosity, animation and stress alleviation, as well as having a key climate resilient role by helping manage storm water levels.”⁶⁵

‘Blue research’ is underdeveloped compared to the literature on green space.

However, the UK Environment Agency found that blue spaces are associated with greater post-visit restoration as a marker of wellbeing and resilience, as opposed to green spaces. In terms of fostering community, evidence was found that blue spaces may increase opportunity for beneficial social interaction, as well as aiding attachment to a place.⁶⁶ The benefits and pathways of blue space for improved wellbeing and climate resilience are shown in figure on the right.

Reviews on nature relatedness constructs and



Redrawn from the Blue City from Restorative Cities, urban design for mental health and wellbeing (Roe and McCay, 2021)



The water tank from Daldy Street Tanks, Auckland.

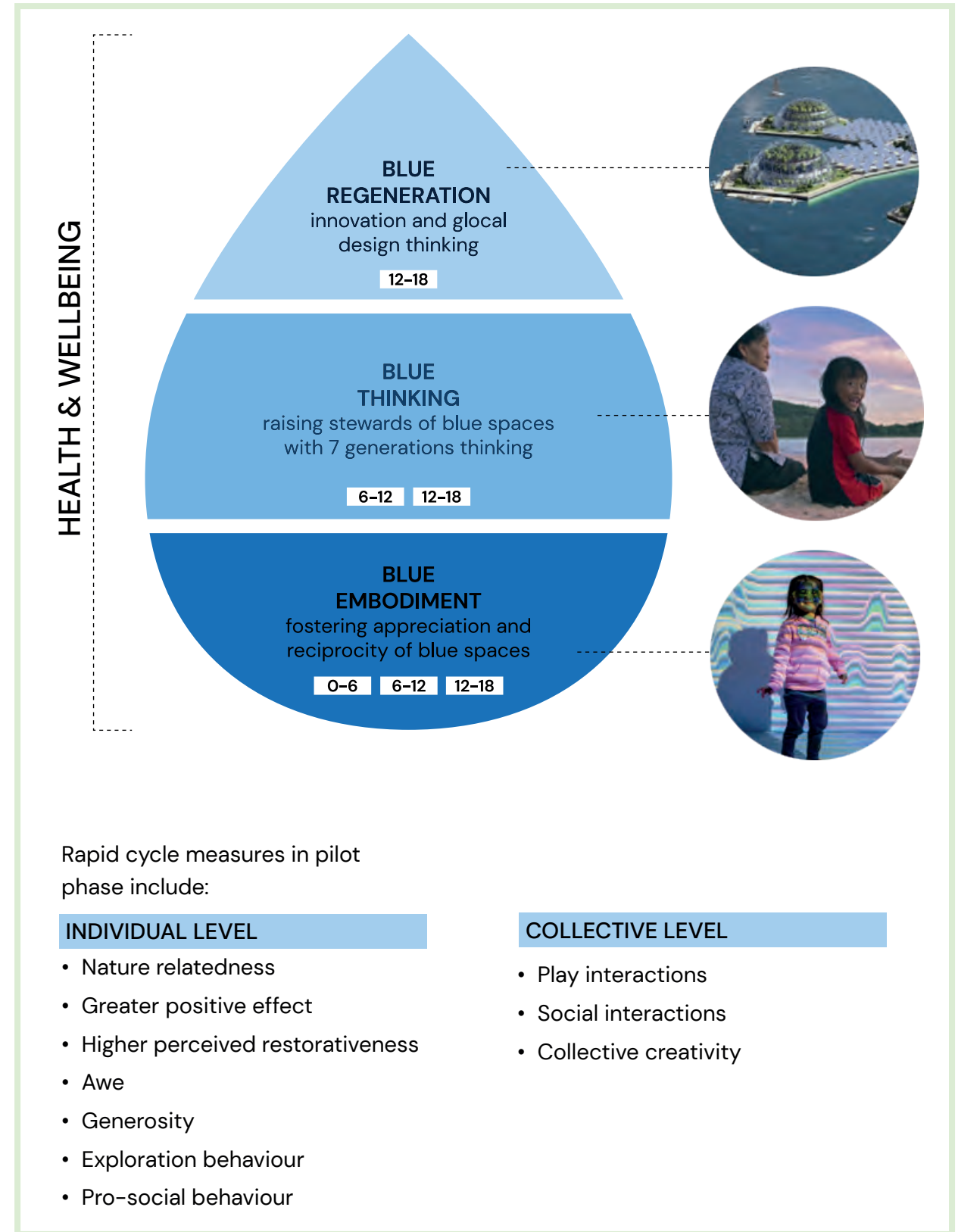
measures have shown that the concept of ‘inclusion of nature in self’ has stronger correlation to happiness and an overall feeling of connectedness. Design that considers a sense of not being separate from nature allows us to consider nature-based play and blue inspiration that can prompt play behaviour in the urban environment, see figure on page 23.⁶⁷

Water play fosters curiosity⁶⁸ and explorative behaviour, an important predictor of creativity, as well as STEM skills. Indirect exposure, beyond water play, has benefits too where blue imagery links self-regulation, predictive of academic success and wellbeing and blue sounds (sounds of water) are more stress reducing than other natural sounds such as bird song.⁶⁹

To maximise the health and wellbeing for children and their families, as well as the planet and its ecosystems, a Blue Learning Framework, planned to be launched in June 2022, has been developed as a global good by Fam Studios - a Family invention studio and specially accredited organization for the UN Ocean Conference.

Key concepts underpinning the framework are:

1. Blue Embodiment - incorporating a sense of nature in self
2. Blue Thinking - related to exploration behaviours, creativity, and the links between a sense of awe and generosity behaviours
3. Blue Regeneration - with links to citizenship, nature relatedness and ocean literacy. The framework and measurement tools, piloted in Venice in June 2022 in partnership with TBA21, are featured first during 2022 UN Ocean Conference and then within the New European Bauhaus initiative.



The Blue learning Framework. © FamStudios 2022

Worldwide, cities are incorporating considerations such as the ones above to promote high-quality design and planning approaches across different scales – from strategies to pilot projects.

Among the considerations for affording high quality design the following considerations can guide us:

- The lack of prevalence of blue spaces may be due in part to safety, but can on balance encourage nature-based play opportunities and improved wellbeing
- Blue inspired spaces that enable multi-sensorial engagement have proven benefits for learning and wellbeing. These can consider light, sound, and conceptual constructs inspired by the ocean, as well as interactive water play.
- Meaningful and high-quality family engagement strategies that design for intergenerational and child-child interaction and play benefit the child, their family, and their communities most
- Designing for equality of access and realising the potential social inclusion benefits of water and blue-inspired play is important, in an historic context where there is evidence of structural and cultural inequality of access
- Designing for constructs of inclusion of nature in self may hold strongest results for happiness and nature relatedness
- Incorporating local communities, cultural institutions, NGOs, and academic institutions and valuing local, traditional and indigenous knowledge about the ocean and blue experiences deepens nature relatedness for children and the connection with place that high quality design can afford.



Engaging all children, including urban children, their families, their schools and their communities in blue exploration is an exciting area of development for nature-based play that is only recently gaining momentum. ~~~



Redrawn from the Blue City from Restorative Cities, urban design for mental health and wellbeing (Roe and McCay, 2021)

A city perspective: How to make it happen like Barcelona?

AUTHORS | *Ariadna Miquel, Urban Strategy director, Barcelona City Council (BCC)*
Sílvia Casorrán Martos, Deputy Chief Architect, BCC
Neda Kostandinovic, Sustainability and Urban Ecology specialist, BCC
Roger Paez, Elisava Research (UVic-UCC)
Emma Cortés, Institute of Childhood and Adolescence of Barcelona

“ Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody.

— *Jane Jacobs, urbanist and activist*



CONCLUSION

Be open minded.
Bring people together in the process.
Set indicators and follow them.

These are three key recommendations for cities by Barcelona – a world leader in nature and play planning policies and implementation. How is Barcelona transforming from a compact and dense city into a *green playable city*?

One of the main drivers for nature-based play in Barcelona is the **Plan for Play⁷⁰** – a strategy aiming to improve and diversify play and physical exercise options by developing more creative, accessible, and inclusive spaces by 2030. It is based on a comprehensive, cross-cutting approach that combines **urban planning actions** (ranging from micro-interventions and tactical planning to major urban development projects) and **social actions**

(from touring animation initiatives to new public service concepts). This is a joint initiative of district authorities and four City Council departments – (1) Ecology, Urban Planning and Mobility, (2) Social Rights, (3) Citizens' Rights, Participation and Transparency, and (4) Culture and education.

The Barcelona Institute for Children and Adolescents, as the City Council's instrumental

body, was the one responsible for coordinating the participatory process, as well as providing professional guidance on pedagogical approaches to urban play. This cross-cutting, interdisciplinary, and collaborative work brought a range of expertise and perspectives together. The Plan starts from initiatives already under way in the districts, and works on highlighting, redirecting, giving new meanings to, or scaling them up to a city level.



From compact and dense to green and playable – the Barcelona 'how to' © Barcelona City Council

The Plan for Play is based on a comprehensive baseline study on play areas, conducted by the City of Barcelona in 2018. This study is a unique approach to understanding play on a city scale. It showed that the city has 868 play areas totalling 159,100 m², but that around 50% of play areas are outside of a green space. Following the Plan for Play, play is being integrated into the city structures through three layers:

1 Play areas and school playgrounds are specifically designated and designed for playing. They include enclosed playgrounds and outdoor spaces at nursery, infant, primary and secondary schools.

2 Playful spaces and school surroundings are exclusively used by pedestrians with possibilities for play and playful uses alongside other public activities. They are places in which people meet socially, and are crucial for intergenerational relations, encounters between neighbours and strangers and for community life. They include parks, squares, gardens, interiors of residential blocks, and urban spaces around nurseries and schools.

3 Playable city includes urban and natural spaces, as well as pedestrian routes in the city where children, adolescents, adults and elderly people play or do physical activity intentionally, spontaneously or by chance.

The Plan for Play also highlights the urgency to provide more nature-based play, including loose nature material, trees, water and sand play. This target aligns with other city plans, such as the Nature Plan 2021-2030⁷¹ – aiming for 1m² more space per resident, Tree Master Plan 2017-2037⁷² – recognising trees as citizens, Climate Emergency Action Plan for 2030⁷³, and Green Infrastructure Impetus Plan⁷⁴ – increasing greenery in the city through participatory projects such as green roofs competitions.

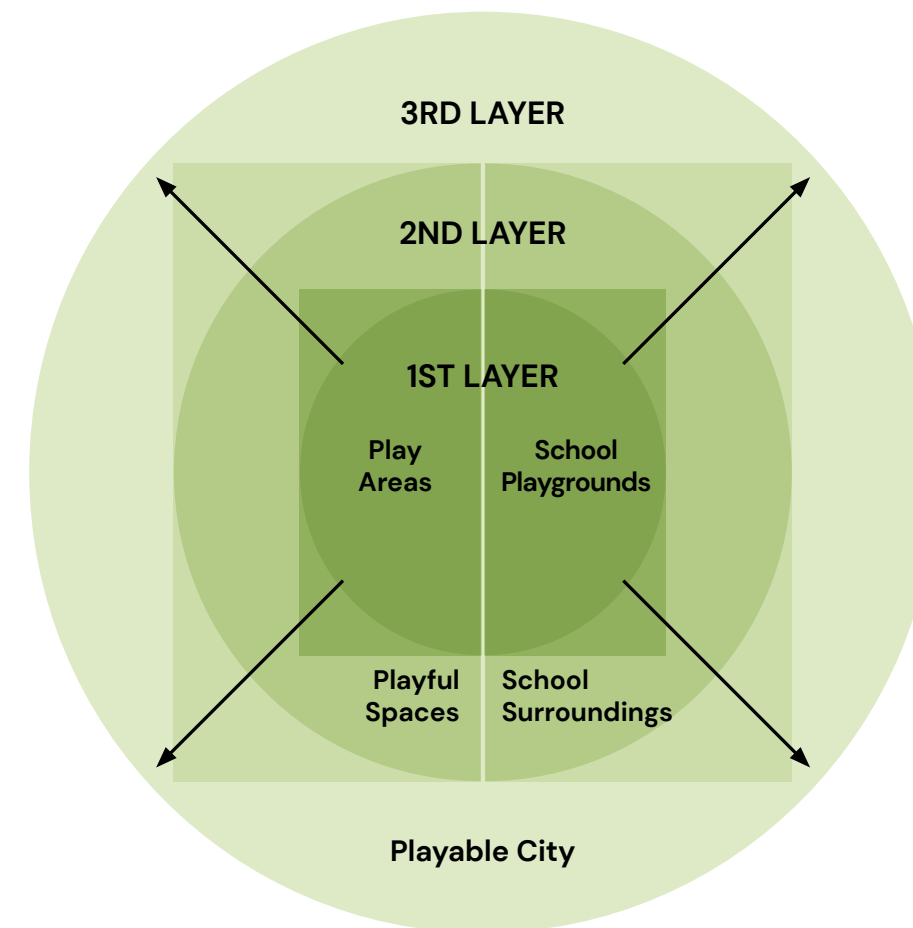
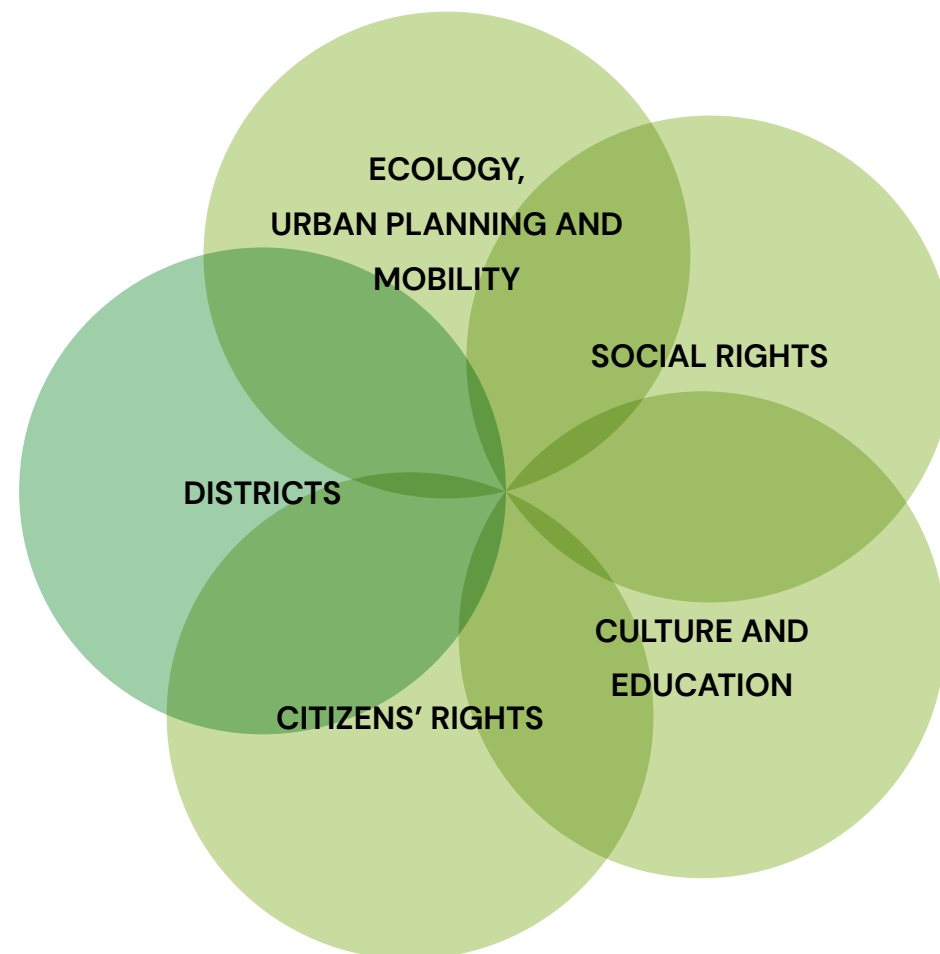
One of the strategies outlined in the Plan for Play and implemented is the ‘Let’s Protect the Schools’ (Protegem les Escoles) programme (2020-2023), aiming to improve the safety of schools’

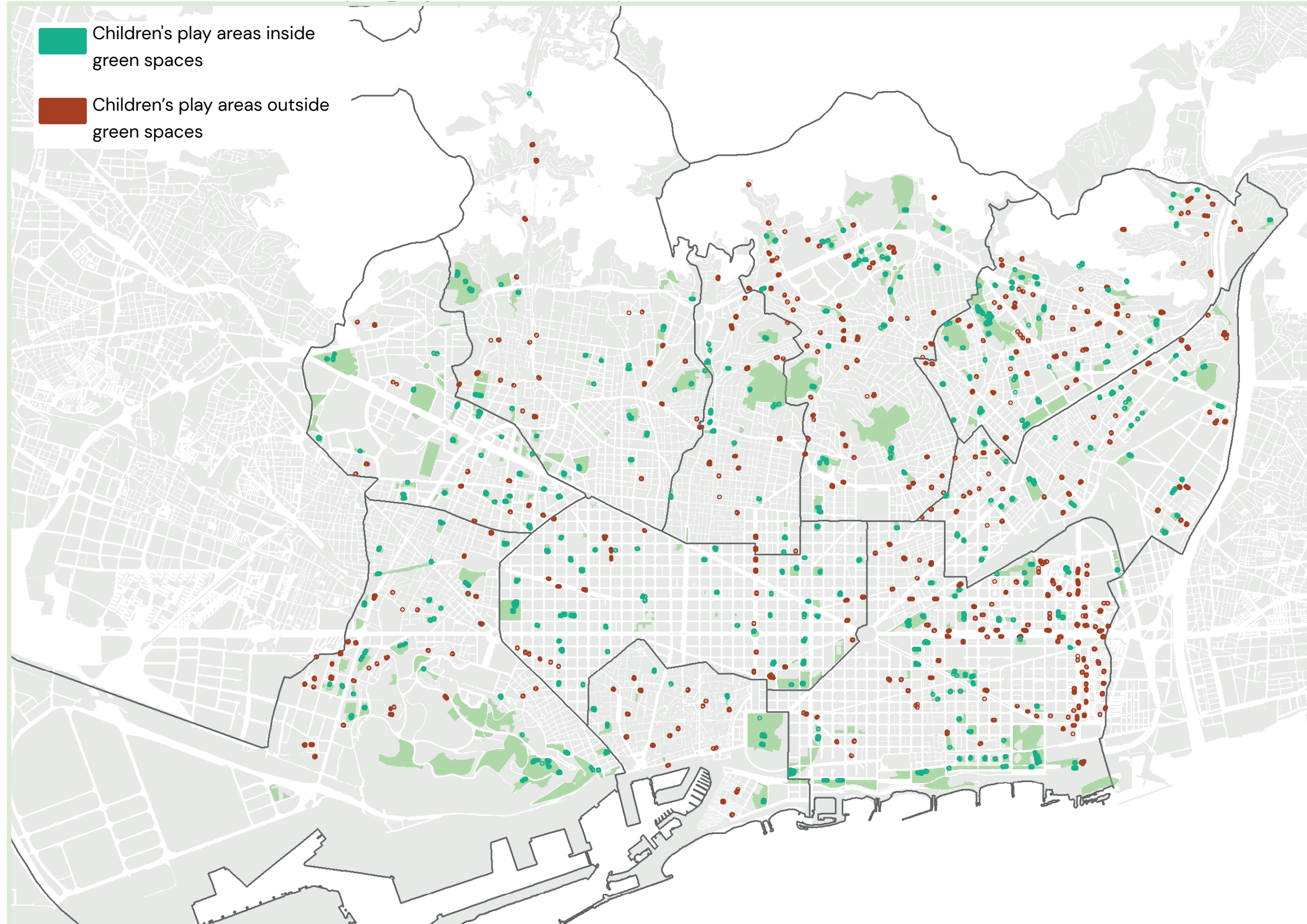
surroundings, and to decrease the proved negative effects of pollution (acoustic and atmospheric) in children’s development.

By 2030, it is expected that all 585 schools of Barcelona will offer safe and comfortable surroundings.

Nature-based play is triggered with the requirement of the programme to always include new natural elements and facilitate discussions on maintenance strategies with local and school communities.

Furnish Kids project is part of the 200 interventions implemented within the ‘Let’s Protect the Schools’





Location of play areas inside green places in Barcelona (2018). Source: Barcelona Regional, based on data from Barcelona City Council

programme. International design school Elisava (UVic-UCC) co-designed diverse nature-based play elements for public space with Antoni Brusi school community. The project lasted six months, from July to December 2021, funded by the Cross-KIC New European Bauhaus Call. Furnish Kids demonstrated innovation in integrating nature-based play and urban furniture standards. It tested technical and organisational processes for incorporating more nature-based urban elements in the city council catalogue.

The participatory process and the construction of the prototypes by the users themselves – students, parents, and schoolteachers – were the main drivers of the design and implementation process.

The project promotes circular development through the re-use of materials, local production, and manufacture, and designing with nature. The partnership with Elisava enabled experimentation with materialisation and production. The resulting prototype, “RAW”, is a set of elements made of earth – a natural, reusable, and recyclable material with a very small carbon footprint.

“RAW” elements are made of earth in three different densities: compressed, rammed manually, and loose. This variability added complexity to the resulting uses and types of play. Finally, as repeated use and play cause the “RAW” blocks to progressively break down, the physical intervention will blend completely into the surface of the playground in a few months, returning to the natural cycle.



Rammed earth block allow for different playful experiences. © Barcelona City Council



With time, "RAW" blocks will blend into the surface of the play space. © Barcelona City Council



One of the participatory design sessions with children. © Barcelona City Council

The variety in the level of material compression and in the configuration of the modules offers numerous options for generating play infrastructures. The rectangular modules of "RAW" have been dimensioned so that in combination they can form seating, dividers, and surfaces for playing, running, and jumping. They also allow pretend, imaginary and emotional play.

The testing and experimentation of "RAW" prototypes was very important for the City of

Barcelona. It allowed partnerships to form, people to experience the possible benefits of the change in city's policies and regulations, and to trigger the discussion on maintenance and other requirements in order to upscale nature-based designs to the city level.

The Furnish Kids project, embedded in the 'Let's Protect the Schools' programme, demonstrates the principles of the way the city of Barcelona is linking the nature-based solutions and play.

It requires the **open-minded approach**, experimentation, and trust in innovative solutions. It needs to be done **with people** – from strategic partnerships with educational institutions and commercial sector, to the active and meaningful involvement of children in participatory design processes. Finally, it requires **understanding impacts** and learning from the process with indicators that can inform the implementation of nature-based play based on citizen science, public data, and research.

The city of Barcelona demonstrates how nature-based play approach can have positive impacts in the revitalisation processes upstream – in plans, strategies and municipal operation across silos – and downstream, in pilots and micro interventions. Nature-based solution can be an innovative and inclusive way to address multiple city challenges. ≈≈

Case Studies

A range of international case studies was selected to showcase the diversity of nature-based play projects and initiatives around the globe. Each case starts with a short description*, followed by the classification of the main *nature and climate positives*, and *children and community positives* that it generates. These case studies were chosen based on several criteria: diversity of geographical and bio-physical contexts, diversity of natural assets, diversity of urban contexts, demonstrating a clear and intentional link between nature and play through design approaches, a range of investment levels, and the ongoing, active use of spaces in the moment of the publication launch. The projects vary in scale and demonstrate how nature-based play can be integrated in a variety of stimulating ways within the cityscape – from natural areas and neglected buildings to wild-play spaces and school yards.

*Please note, the level of investment (cost) of the projects are indicative only: (1) low relates to budgets below USD 10.000, (2) medium to budgets between USD 10.000 and 100.000, (3) high to budgets over USD100.000, and (4) very high to budgets over USD 10.000.000.



Summary of approaches for nature-based play

Eight categories of approaches for nature-based play were identified through the analysis of the selected projects: transform perceptions, enable proximity and access, strengthen partnerships, diversify play through nature, connect with play heritage, celebrate change, experiment publicly and grow facilitation. Within each approach, a range of activities were identified to provide guidance on how to engender nature-based play and trigger positive impacts. This is not meant to be a definite categorisation of approaches and activities, but rather a starting point and inspiration for future projects, partnerships and initiatives.

Transform perceptions

- Community awareness activities
- Use of urban debris and pruning material
- Designing with nature
- Using natural loose materials for designing
- Waste collection and reuse
- Integration with the existing landscape features
- Promoting environmental education
- Reusing site materials
- Design as a facilitator of nature-based play
- Connecting play and nature through art
- Using natural materials

Connect with play heritage

- Connecting nature and tradition
- Cultivating indigenous knowledge
- Context-relevant designing

Enable proximity and access

- Safe and direct pathways
- Designing recognisable landmarks
- Enabling easy access
- Enabling safe access to various landscapes
- Opportunities for social interactions and community cohesion

Strengthen partnerships

- Establishing community movement
- Partnering with environmental organisations
- Uniting stakeholders
- Create multidisciplinary design teams
- Co-designing and co-constructing
- Co-designing as capacity building
- Partnering with university programmes
- Scaling-up through partnerships network
- Co-designing with children
- Engaging with neighbours and local stakeholders

Diversify play through nature

- Providing a wide range of colours, smells, tastes, sounds, textures
- Diversifying play area atmospheres
- Facilitating risky play in natural surroundings
- Making the water flow visible
- Desealing
- Engaging with diverse natural elements, materials and habitats
- Diversifying challenging play opportunities
- Planning for nature-based play across scales

Celebrate change

- Exposing changes in space
- Protecting existing natural habitats
- Triggering curiosity through design
- Renaturing urban matrix
- Celebrating seasonal change
- Incorporating green/blue infrastructure in urban development

Experiment publicly

- Reusing site materials
- Demonstrating good practice
- Experimenting with nature-based materials
- Rainwater harvesting
- Hands-on learning about science and green technologies
- Context-adapted best-practice examples
- Circular development promotion

Grow facilitation

- Investing in experienced facilitation of nature-based play
- Nurturing excitement and curiosity about nature

Tactics for Conservation of Urban Ravines

FROM AN URBAN WASTELAND TO A NATURAL PLAYGROUND FOR CHILDREN AND ADULTS

Organisation

Ciudad Emergente

Client

UNDP and the Chilean Agency for International Cooperation

Collaborators

Crecer Guatemala Foundation, Jungla Urbana Ecological Park, Barranquando, Taller ACA, Torus, Barranco Invertido, Aricneco, Fundaeco, Calmecac Foundation, Guatemala Green Building Council, WWF Guatemala, The Nature Conservancy, Techo Guatemala, Colegio Sagrada Familia, Ambiente, Universidad Rafael Landivar

Year

2017-18

Location

Guatemala City, Guatemala

Urban system

Existing natural habitat (public space)

Level of investment

Medium



Exploring the ravine through a new pathway. © Ciudad Emergente

PROJECT DESCRIPTION

This project aimed to help people understand the opportunities the ravines of Guatemala hold as places for recreation, exploration, and play. It is centred on shifting perspectives about ravines – the lungs of Guatemala City – natural landscapes criss-crossing the city like green fingers.

While these urban jungles make up 42% of the city's surface⁷⁵, they are considered to be undervalued green corridors, dangerous public spaces and even dumping grounds. They are also often illegally inhabited which highlights a wider challenge regarding a lack of regulation and planning codes as well as access to affordable housing. Many organisations have previously attempted to work in this area, although not always in unison.

This project was initiated as part of a larger two-year initiative *Ciudades Compartidas* (Shared Cities), fostering knowledge transfer on tactical urbanism methods among Guatemalan and Honduran environmental and social organisations. The ravine at the heart of this project crosses two city districts (Zone 10 and Zone 15, see image on the right), connecting two areas with contrasting socio-economic demographics.

The intervention enabled the access from both sides of the ravine, by building and maintaining safe pathways, painting murals to mark the entrances, and stimulating the relationship between nature and people of all ages through educational and social activities. This allowed for enhanced social connectivity between these two areas, while significantly cutting commuting distances for those reliant on travelling on foot or by public transport.

KEY DRIVERS

1 Transform perceptions

As the focus was to change public perception on the ravines, the project focused more on interventions for valuing the natural landscape and less on designing physical assets. A natural slope was set up as an amphitheatre for the children’s choir and old tree stumps were used as picnic spots under the shadow of standing trees. Community awareness activities such as cleaning competitions, learning about ravine’s flora and fauna, recycling games, and a Christmas concert within the natural amphitheatre, aimed at bringing people closer to the natural landscape.

Before the project, local kids played games, killing birds using slingshots; afterwards they became activists, calling for protection activities, and using the maps (designed for the project) to learn to identify different species.



© Ciudad Emergente

2 Enable proximity and access

A key design aspect was to improve accessibility to the ravine, including wayfinding. The ravine is a green area of six hectares and the project highlighted two main entrances in contrasting neighbourhoods to better connect them. A giant mural was painted at each entry point drawing attention to the ravine’s access. New paths were mapped, built and marked throughout the ravine, with nature walks hosted by The Nature Conservancy during the initial project. These pathways have seen a threefold increase in foot traffic enabling easier and more enjoyable commuting or exercise through this green corridor for residents of different ages. Having more people actively use the ravines has increased public safety and appreciation of these urban wild areas.



© Ciudad Emergente

3 Strengthen partnerships

The project and Ciudad Emergente managed to bring various stakeholders together: Guatemalan and international NGOs, local government, neighbourhood groups and architectural firms. Five years after the start of the project, the partnership remains active, developing a community-based movement called the “Raviners’ Board” to advance knowledge and conservation of these unique spaces.



© Ciudad Emergente

A citizens’ petition was launched, gathering public support with almost 3,500 local signatures for the permanent conservation of the area. The Ravine Board later delivered this petition to the Guatemalan National Congress, enforcing National Decree 236-2006, and continuing to advocate for the protection of this ‘urban jungle’.

Resident surveys found a 30% increase in community awareness among neighbours and community members to conserve the ravines, and an 89% reduction in former indifference to the area’s degradation.

Read further: [Project](#) [Publication](#)

POSITIVES FOR SOCIETY AND THE PLANET

ACTIVITIES

- Community awareness activities
- Safe and direct pathways
- Designing with nature
- Establishing community movement
- Uniting stakeholders
- Protecting existing natural habitats
- Waste collection and reuse

NATURE AND CLIMATE POSITIVES

- Improved water quality
- Temperature and microclimate regulation
- Increased resilience to flooding
- Urban soil regeneration
- Natural habitats and biodiversity safeguarding
- Solid waste management
- Improved air quality

CHILDREN AND COMMUNITY POSITIVES

- Diverse and increased physical activity
- More opportunities for playful learning
- Emotional connection with nature
- Sense of place
- Increased mobility
- Increased social cohesion

Hobsonville Point Play Strategy

NATURE-BASED PLAY FOR RAISING HAPPY, HEALTHY NEIGHBOURHOODS

Organisation

Isthmus

Client

Hobsonville Land Company

Collaborators

Nelson Byrd Woltz, Phillip Meier

Year

2013-16 (designed) 2017-18 (built)

Location

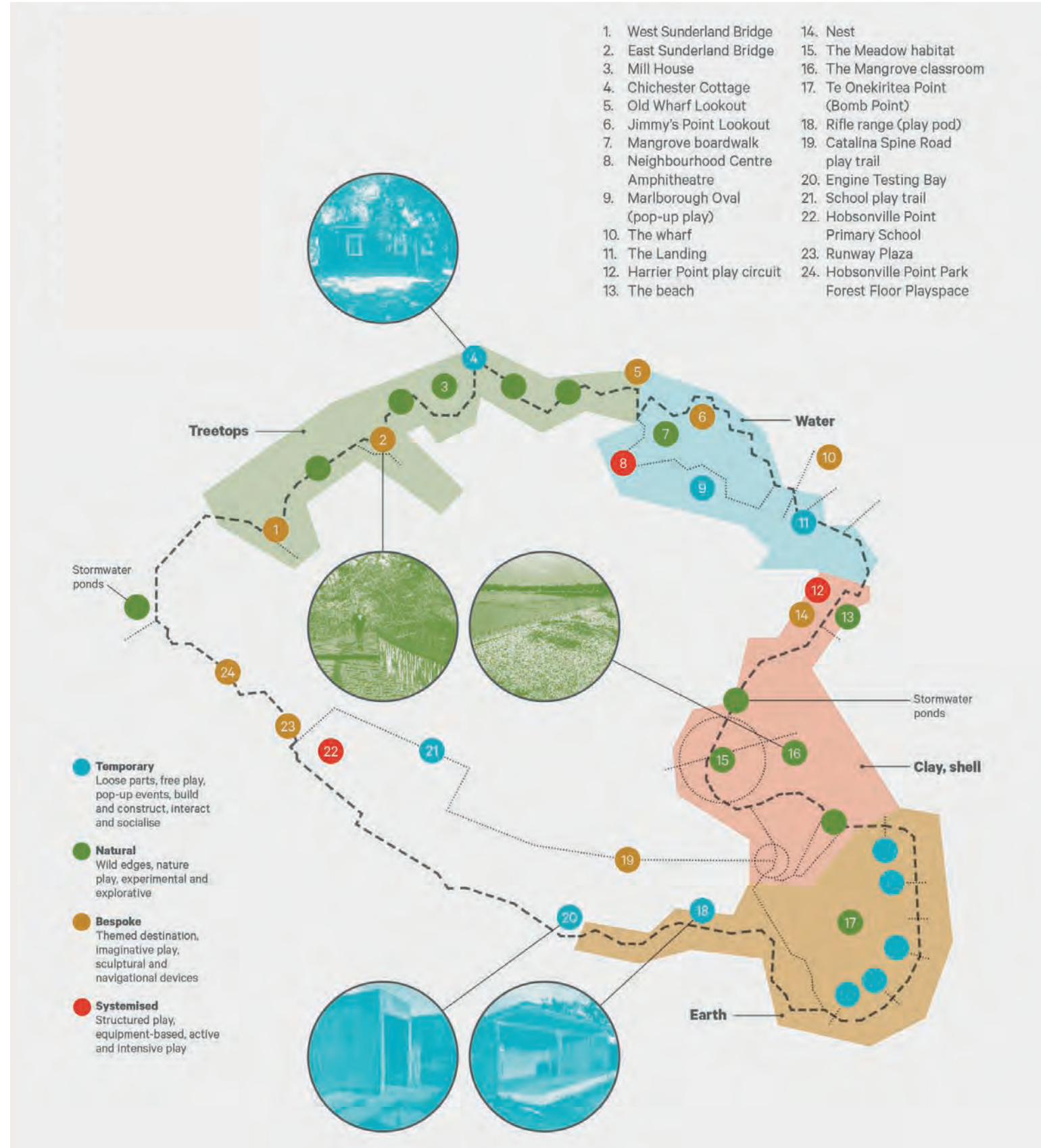
Auckland, Aotearoa (New Zealand)

Urban system

Medium-density suburb masterplan

Level of investment

High



PROJECT DESCRIPTION

Hobsonville Point Play Strategy is an exemplary approach to incorporating nature-based play in a neighbourhood masterplan. It demonstrates how designers and developers can create habitats for both people and wildlife. The Play Strategy incorporates the coastal, 4km long walkway, Te Ara Manawa (‘pathway among the mangroves’ in te reo Māori), linking play destinations and playful encounters with nature and with remnant structures on site.

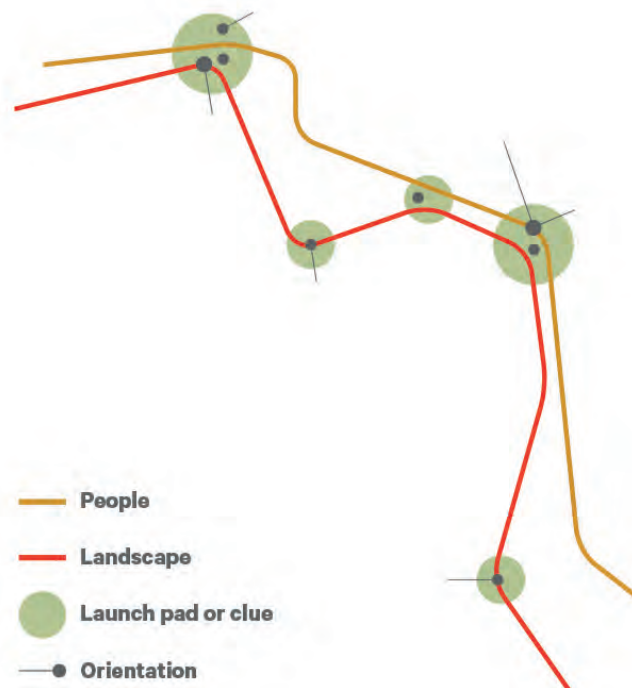
The coastal edge sustains a host of native plants and wildlife, from insects, tree lizards and terrestrial birds in the coastal forest, scrublands and long grass meadows, to fish, crabs and coastal birds in the mudflats, shellbanks and rocky shoreline. Many people would not be aware of the special form of kānuka (*Kunzea linearis*) or the Auckland green gecko, kakariki, that inhabits the scrublands. To make connections with the local ecology, a play strategy and smaller spatial interventions have been designed as part of the masterplan.

Opportunities for play are carefully planned, creating a playable public realm for all ages and abilities. The strategy is made of four complementary play types: (1) temporary – social, with loose parts and through pop-up events, (2) natural – wild and exploratory, (3) bespoke – imaginative play triggered by themed destinations and (4) systemised – structured, mainly rule-based play such as ball sports. These four types allow multiple play opportunities as they are integrated with four different landscapes: treetops, water, clay/shell, and earth. In this network, places emerge where landscape and people meet through art installations, natural landmarks, or specifically designed play points.

KEY DRIVERS

1 Transform perceptions

The Play Strategy is based on the idea of access; types of play and landscapes are entangled in different ways to enable a variety of experiences. In the abstract diagram below, two coloured lines represent land and people, and the meeting points between the two lines, the 'nodes', represent cultural interventions that bring them together: imprints on the land over time. For example, a timber boardwalk section is built through the mangrove thickets and over the tidal mudflats, as part of Te Ara Manawa. Shaped as a small amphitheatre, it enables the experience of tides, water flows, and wildlife, as well as the access to the mudflats.



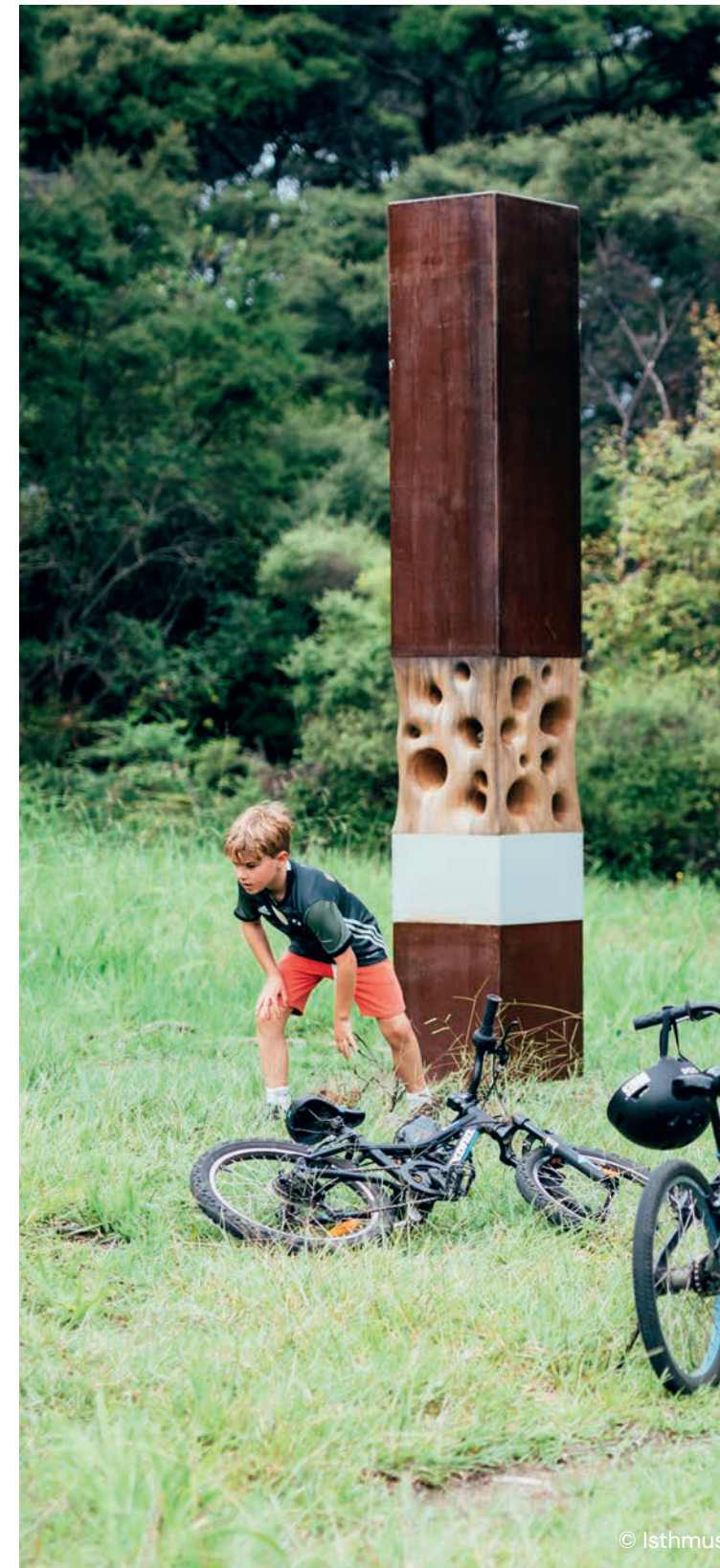
2 Enable proximity and access

Our planet is home for all, not only for humans. This project makes this connection more obvious in a curious and fun way, by creating architecture both for wildlife and people. A 'habitat marker' is a wooden totem used as a signpost and a bench that provides a chance for playful encounters with nature. The CNC-machined holes and hollows provide a habitat for different forms of wildlife. The children of Hobsonville may monitor and track signs of occupation over time and come to know the wider community that they live amongst.



3 Strengthen partnerships

One of the main play spaces has been planted with species with bird-attracting fruit and flowers, as well as 'planted' with a series of giant native seed sculptures of the same plants. These plants encourage tūi, kererū and other native birds into the playground, while their enlarged sculptures stimulate children to observe closer, learn about them, and imagine how it might be to be the size of a bird in relation to the seed. Using design to make connections with the natural world around us, is creating more and more diverse play opportunities, contributing to early childhood development and environmental education.



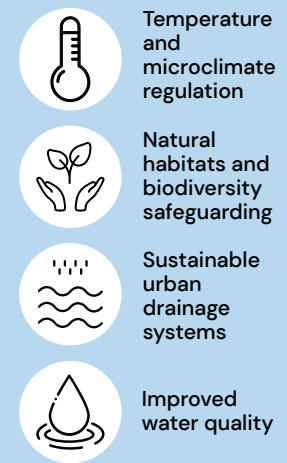
Read further: [Project](#)

POSITIVES FOR SOCIETY AND THE PLANET

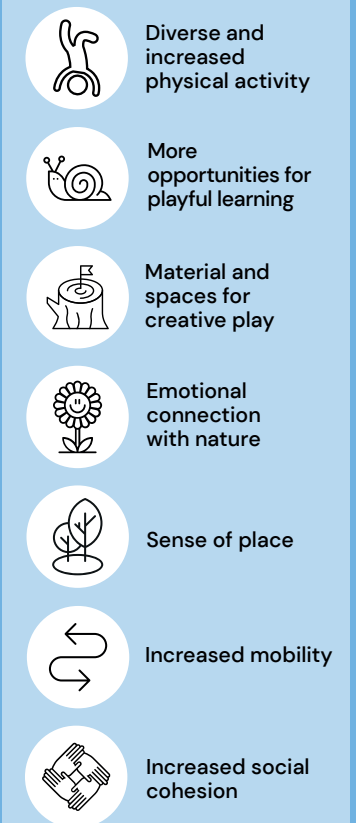
ACTIVITIES



NATURE AND CLIMATE POSITIVES



CHILDREN AND COMMUNITY POSITIVES



Mmofra Place Park

CONNECTING PLAY HERITAGE
AND CITY RESILIENCE

Organisation

Mmofra Foundation

Collaborators

Friends of Mmofra, Foundation for Contemporary Art Ghana

Year

since 2012

Location

Accra, Ghana

Urban system

Private property, open to public

Level of investment

Low



PROJECT DESCRIPTION

Mmofra Place Park (meaning ‘children’ in Ghana’s Akan language) is where the *Playtime in Africa Initiative* takes place, connecting the child-centric and play-friendly public space with resilient urban living principles. Ghana’s population is young — 40% are under the age of 15 and the median age of 21. Despite this, there are very few spaces for play which support a child’s development.

Rapid urbanisation, depletion of green spaces, play in dangerous environments, formal educational models that leave few opportunities for development of imagination and creativity are just some of the main challenges for play here. The *Playtime in Africa Initiative*,⁷⁶ connects traditional and imaginative play with resilient spatial planning principles for the 21st century.

The focal area of the initiative is Mmofra Place Park, occupying 6,000m² of property under the stewardship of the foundation. It is a site where nature-based play has developed organically over the last 10 years. It is one of very few green open spaces under the shade of mature trees in urban Accra - a site where children of all backgrounds participate in designing, making, building, growing things, experimenting with nature-based prototypes, and a place for researching play. It regularly engages around 90 children at a time in arts and humanities activities, performing arts, and educational support. It is a flexible space, an outdoor classroom, green laboratory, place to accommodate STEM discovery and children field trips, a place to demonstrate resilience.

KEY DRIVERS

1 Strengthen partnerships

The design process started in 2012, with a design charette that gathered local and international architects, planners, engineers, indigenous knowledge specialists, artists, educators, politicians, children and community leaders. It resulted in a masterplan for the site and a range of strategies for sustainability, resource management and context-sensitive construction. The interdisciplinary and international engagement on the actual ground is essential, from design implementation workshops with architecture schools, to collaboration with technologists and scientists.



2 Connect with play heritage

The concept of play is built in the spirit of sankofa – keeping what is of value from the past. Traditional African games and practices are integrated with natural elements, with the aim of creating new connections with climate resilience and biodiversity solutions. For example, teaching local youth about traditional herbal medicine practices is motivating them to perceive and value the urban vegetation. Or, carving a large *oware* board⁷⁷ in the old tree trunk stimulates intergenerational play, encourages STEM learning through play, and stimulates sensorial explorations of various textures.

3 Experiment publicly

The Park is a microcosm of the city of Accra, allowing the experimentation with prototypes addressing some of its main challenges: water and stormwater management, healthy water supply, sanitation, waste, provision of power. Children participate in designing, building and learning about sustainable solutions. For example, collaborating with Biofilcom, a local engineering firm to instal a low-flow composting toilet. The toilet structure is made of ferrocement and painted with traditional mural-making techniques, so it evokes the shape and aesthetic of the Northern Ghana architecture.

Or, collaborating with architectural scientist Mae-Ling Lokko to install a pavilion incorporating a building material made of recycled coconut husks.



Read further: [Project](#)

POSITIVES FOR SOCIETY AND THE PLANET

ACTIVITIES

- Connecting nature and tradition
- Partnering with university programmes
- Hands-on learning about science and green technologies
- Cultivating indigenous knowledge
- Experimenting with nature-based materials
- Context-relevant designing
- Demonstrating good practice
- Promoting environmental education
- Protecting existing natural habitats
- Co-designing and co-constructing
- Providing a wide range of colours, smells, tastes, sounds, textures
- Circular development promotion

NATURE AND CLIMATE POSITIVES

- Improved air quality
- Improved water quality
- Temperature and microclimate regulation
- Increased resilience to flooding
- Sustainable urban drainage systems
- Urban soil regeneration
- Natural habitats and biodiversity safeguarding
- Agroecological practices for food security and safety

CHILDREN AND COMMUNITY POSITIVES

- Diverse and increased physical activity
- Opportunities to use all senses
- More opportunities for playful learning
- Emotional connection with nature
- Developing knowledge and responsibility through caring for plants and spaces
- Improving noise regulation
- Sense of place
- Designing for universal access

The Speeldernis

PLAYING IN AND WITH NATURE

Organisation

Playground association The Speeldernis

Client

City of Rotterdam

Collaborators

Playgroundwork Rotterdam, City of Rotterdam, Children's day-care

Year

Built between 2001-2003

Location

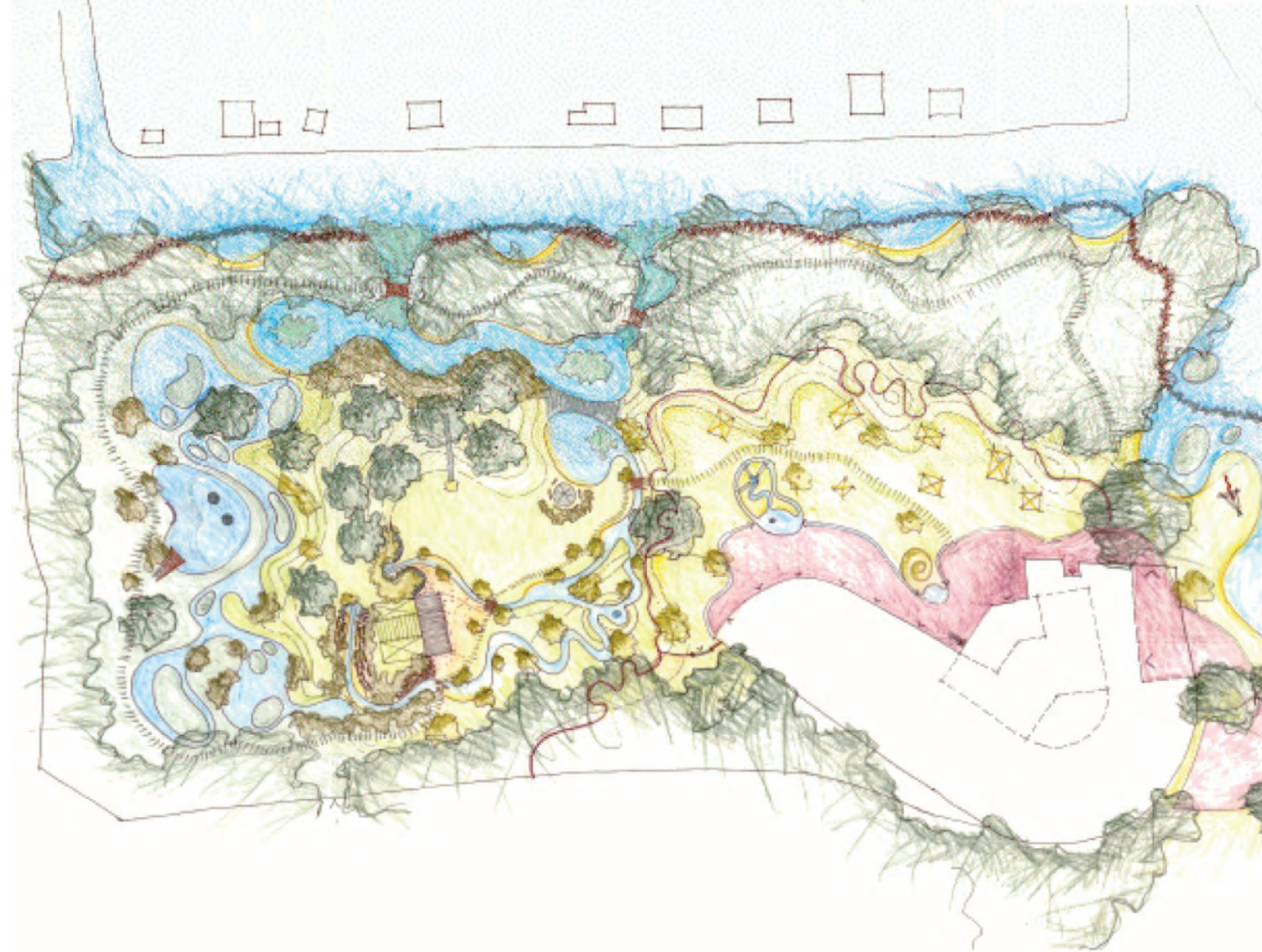
Rotterdam, The Netherlands

Urban system

Urban playground (semi-private space)

Level of investment

High



PROJECT DESCRIPTION

The Speeldernis is a natural playground and knowledge centre where children and adults learn about how to achieve a sustainable future in playful ways. It started as a renovation project of an old playground, triggered by the European play safety standards issued in 2000 and funded by city authorities. The board of the Playground Association, together with the Department for Sports and Recreation decided to use this opportunity to test the implementation of a new concept of nature-based play in Rotterdam.

The core statement of its philosophy is that good-quality, long-lasting play does not need playground equipment; playful landscapes at children's scale, with loose natural and added materials, can provide a plenitude of opportunities for a broad variety of meaningful play forms.

More than twenty years since its opening, Speeldernis is a testament to the strength and importance of the children-nature connection. A part of the current Speeldernis' staff consists of young people that have spent much of their time growing up in its waters, tunnels, branches and bushes.

KEY DRIVERS

1 Transform perceptions

The design was focused on the elements of the natural landscape, using nature-based play materials over pre-built play constructions and stimulating a new way of thinking about designing for play. This included; reshaping the edges of the waterside from steep, reinforced walls to naturally faint banks; planting flowering, fruit-bearing native shrubs and trees; marking the borders with branch walls instead of fences; adding diverse sizes of dead wood in different places (tree trunks and roots, branches); sowing native flower fields; removing all constructed drainage so the landscape collects rainwater for play.



2 Diversify play through nature

The Speeldernis occupies 10.000m2 of land with only a few built elements, such as the firewood storage, the fireplace and a section for birthday parties. It is a demonstration of how nature-based surroundings can provide a large variety of play spaces (big, intimate, elevated, low and deep, light and warm, shady and wet), as well as play materials (big, heavy, light, small, subtle, rough).

These spaces and materials enable:

- *physical play* – moving fast, slow, and in between, climbing, swimming, jumping, balancing, crawling
- *creative play* – assembling loose parts (e.g. making huts and mandalas), building, solving problems
- *cognitive play* – observing and understanding natural processes, playful experimenting, trial-and-error learning
- *emotional play* – deep contact with nature and senses, role playing, experiencing (un)comfortable situations because of temperature, mud and dirt. Children interact with play workers, teachers, parents, and all kinds of plants and biotopes for insects, amphibia's, soil animals, and birds.



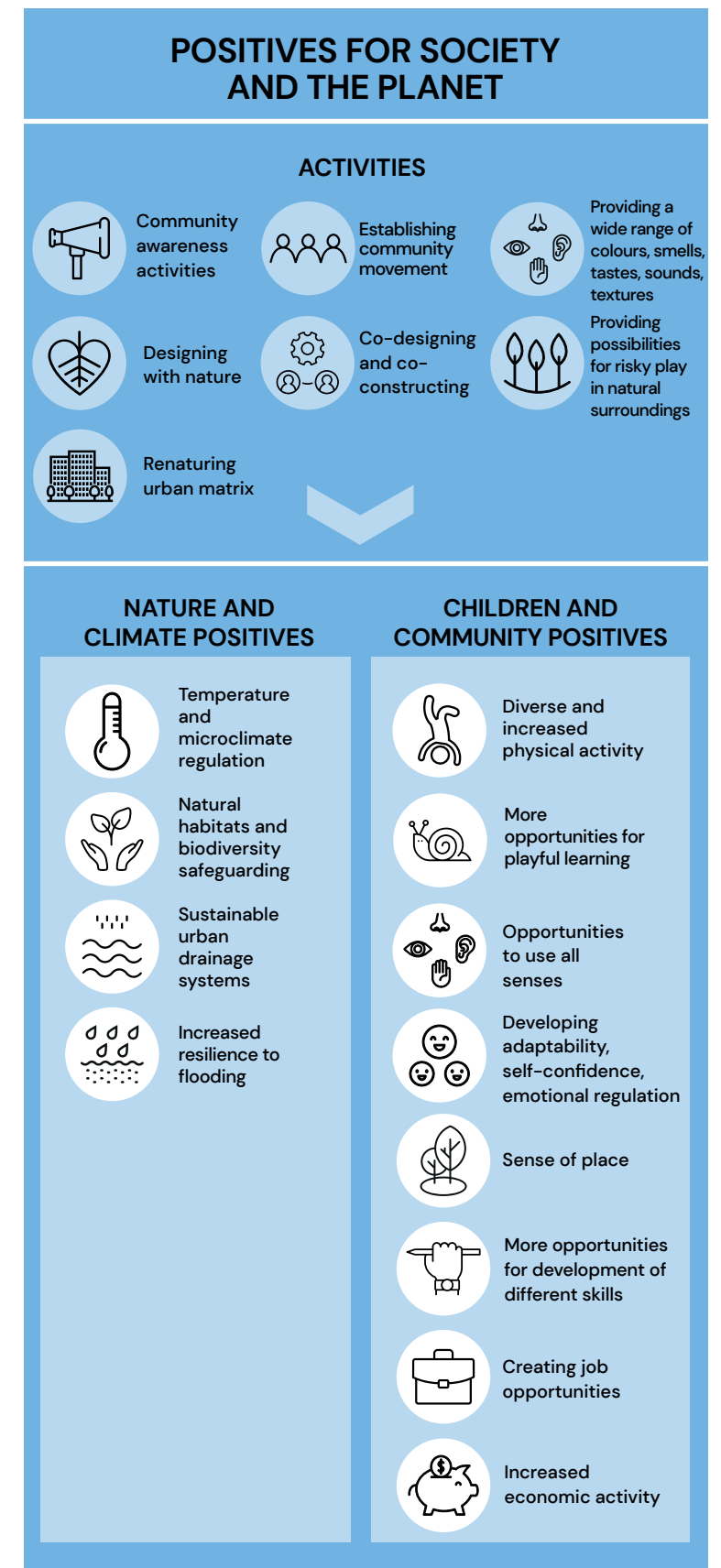
3 Experiment publicly

The Speeldernis is a result of a highly participative process, involving members of the Playground Association (parents and children), neighbours, and local and foreign experts. It consisted of excursions, model-building workshops, design and construction sessions. It is a testament to the project and the partners involved, that more than twenty years later, the involvement of users is still at the core of the playground: building the willow structures, planting and maintaining the vegetation, caring for the bees and more.

This participatory process was specifically significant in relation to safety on various levels, such as enabling the alignment of nature-based play and safety policies, finding solutions for providing water for play of required quality, and changing perspectives of parents and educational institutions about the risk of nature-based play.



- Read further:
- Project
 - Design
 - Building process



Children's Garden at Evergreen Brick Works

FROM A BROWNFIELD SITE TO A PLACE FOR SUSTAINABILITY IN ACTION

Organisation
Evergreen

Collaborators
Ferruccio Sardella (artist), FORREC

Year
Opened in 2010

Location
Toronto, Canada

Urban system
Civic centre (remains of an abandoned brick factory)



Bill Wilson © Evergreen

PROJECT DESCRIPTION

Over the last 30 years, Evergreen has evolved from a small charity focused on community-based environmental programmes, to a nationally recognised organisation that helps cities across Canada integrate with nature. Evergreen Brick Works, Evergreen's headquarters, is a testament to the organisation's values and a test site for green design ideas. It is a revitalisation of an abandoned brick factory – built in 1889, within Toronto's ravine system – into a sustainable civic centre comprised of office space, event space, a restaurant and a native plant nursery and gardens. The Children's Garden is one part of the complex, designed to provide a living lab for Evergreen's long history of integrating nature, loose parts and free play into the design and programming of public spaces serving children, such as schools, childcare settings, and public parks. It provides an abundance of design ideas and elements that could be adapted elsewhere.

The Children's Garden occupies 1,300m² space that features a large group gathering area, a small greenhouse, a bake oven, a climbing structure, a cob hut, a willow shelter and a water tower – all integrated with gardens, shrubs and trees. The design was informed by a summer of public experimentation workshops on a neighbouring site: playing with sand piles, gardening in farming feed bags, and testing low walls and borders using cob construction technique.

One of the main challenges for design was complying with the current accessibility standards while enabling natural surfacing and topography. The design team aimed to create a rough-hewn quality and expose natural elements in their whole form (uncut logs, uncut stone, etc.). Opportunities to interact with fire, water and earth were given high priority. A significant portion of the site was intentionally created as a space for building and experimenting with the large quantity and quality of loose parts, such as tree logs and stones.

KEY DRIVERS

1 Celebrate change

Play is inspired by growth and change in natural elements throughout the seasons and over time, as well as the changing layout from the movement of big and small loose parts by children and staff. The space is set up to be quickly and easily transformed between public and private space as it regularly shifts from hosting free play, visiting schools' programmes, summer camp, clubs, workshops, dinners and seasonal ceremonies and feasts with indigenous partners. Site wide at Evergreen Brick Works, the long-term change of transforming an industrial brick factory to a sustainable civic hub is a central goal of the entire complex.



© Evergreen

2 Enable proximity and access

Located centrally in Toronto and accessible by public transport, nature-based play is close to a great diverse mix of neighbourhoods. Many children visit the garden routinely throughout their childhood and the benefits for children accrue over time, including a strong sense of belonging and safety in public space.

3 Transform perceptions

The Children's Garden downplays the association between equipment and play and increases the association between imagination and play. The design of play spaces was inspired by seven primary nature play themes articulated by David Sobel.⁷⁸

- (1) *Adventure* – physical challenge and risky play
- (2) *Fantasy and imagination* – stories, role play, and fantastical creations
- (3) *Animal allies* – tracking, birding, animal architecture and sounds
- (4) *Maps and paths* – paths lead children to concealed spaces and inspire exploration
- (5) *Special places* – crafting and art regularly contribute to seasonal ornamentation
- (6) *Small worlds* – sand, water and snow play contribute to world making activities
- (7) *Hunting and gathering* – scavenger hunts, garden harvest, blindfold play.

4 Grow facilitation

Both nature and play need maintenance and investment. Seasonal mulching, weeding, planting and restocking loose parts are all part of the site operation. Play workers are a tremendous benefit to the play environment and require training to help facilitate and provoke play rather than lead it. They immensely contribute to the affordance of more 'risky' play, a positive and safe social environment and a programming touch that adds much surprise and delight for attendees.



W.D. Wilson © Evergreen



Jim Felstiner © Evergreen

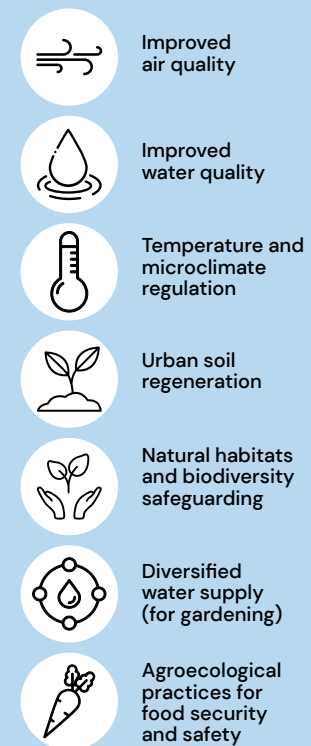
Read further: [Project](#)

POSITIVES FOR SOCIETY AND THE PLANET

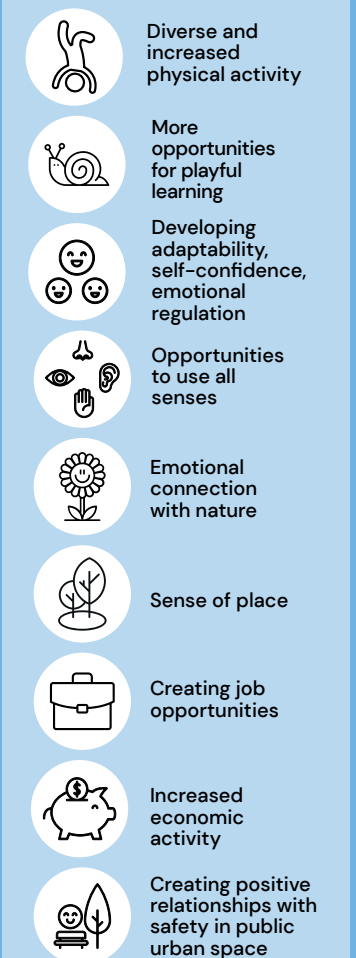
ACTIVITIES



NATURE AND CLIMATE POSITIVES



CHILDREN AND COMMUNITY POSITIVES



Fortaleza Natural Play Spaces

SPACES WHERE BOTH NATURE AND CHILDREN THRIVE

Organisation

Children and Nature Program (Alana Institute) and Urban95 Brazil

Funding entity

Bernard van Leer Foundation

Developer

Fortaleza Municipality

Collaborators

Sustainable Cities Institute and Ciranda da Vida

Year

2020-2021

Location

Fortaleza, State of Ceará, Brazil

Urban system

Natural playground (public space)

Level of investment

Low



© Tais Costa

PROJECT DESCRIPTION

Despite the rich biodiversity and landscapes, nature-based play and learning are still emerging in education and urban practices in Brazil. The implementation of natural play spaces is not prevalent; people are very much drawn to traditional playgrounds, where nature is seen as dirty or even an obstacle. There is resistance related to safety issues, maintenance and resilience of natural play spaces in opposition to a concrete/plastic play equipment.

Since 2017, *The Children and Nature Program* of Alana Institute has been working on advocacy and mobilisation strategy to change that. This includes study trips to explore best-practice projects and policies, research on socio-cultural features of nature-based play in Brazil, collaboration with municipalities throughout the country to engage and give technical support to implement public policies to promote nature-based play opportunities for children. The main aim is to scale-up nature-based play in Brazil and make it accessible to as many families as possible.

Fortaleza is a partner city in the network established by the Urban95 initiative from Bernard van Leer Foundation. Through this partnership, two pilot projects – natural play spaces on wasteland in underprivileged neighbourhoods – were planned and implemented in 2020. Since then, the Fortaleza municipality has adopted this approach as a public policy and is working to spread it to other 40 areas. The same work is ongoing in the new six municipalities.

KEY DRIVERS

1 Connect with play heritage

Brazil has a rich play culture tradition, linked to territory and natural resources. Plants have been part of the childhood culture in Brazil for decades, offering beautiful, sophisticated, colourful, interactive and seasonal toys. Making dolls with tufts of grass, building miniatures with seeds, blowing dandelions, rubbing hands with dormice and painting yourself with *urucum* seeds, among many others, are experiences that remind us that the child, not the toy, are the real play protagonist, and that joy is found not in having but in creating.



© Lara Lima

2 Strengthen partnerships

Two premises permeated all planning processes: the community's active participation and the engagement of multidisciplinary teams from the municipality, including traffic control, park management, climate and urban planning, education/public schools, health, and volunteer staff. The whole implementation process

felt like a long capacity building workshop, promoting a creative learning process that could strengthen the implementation of future projects independently. From learning how to use the tools, through imagining play areas, to the creation and design of structures and spaces, every step required the active participation of the teams involved.



© Tais Costa

3 Transform perceptions

To gain community support, the design had to use a hybrid format – combining natural elements, such as a mud 'kitchen' and loose parts, with traditional playground equipment with a focus on accessibility. This allowed the introduction of the nature-based play, through the familiar playground features. A key technique adopted was the use of urban debris and pruning as construction materials, as a way to use organic materials and at the same time significantly reduce the cost. The project gathered families with babies and young children, school-age children, adolescents and adults. They report to have gained a close-by leisure area to enjoy nature and community encounters, in

place of a waste disposal and violence-related space. They feel that their connection with nature, with their neighbourhood and their own culture was enhanced.

In these two pilots, 77 trees were planted, five tonnes of urban organic debris and pruning used, 85 people from the community involved, 10 municipality staff trained, 18 play structures installed.



© Lara Lima

Read further: [Project](#)

POSITIVES FOR SOCIETY AND THE PLANET

ACTIVITIES

- Use of urban debris and pruning material
- Opportunities for social interactions and community cohesion
- Context-adapted best-practice examples
- Design as a facilitator of nature-based play
- Create multidisciplinary design teams
- Connecting nature and tradition
- Scaling-up through partnerships network
- Co-designing as capacity building
- Protecting existing natural habitats
- Engaging with diverse natural elements, materials and habitats

NATURE AND CLIMATE POSITIVES

- Improved air quality
- Improved water quality
- Temperature and microclimate regulation
- Increased resilience to flooding
- Natural habitats and biodiversity safeguarding

CHILDREN AND COMMUNITY POSITIVES

- Diverse and increased physical activity
- More opportunities for playful learning
- Material and spaces for creative play
- Emotional connection with nature
- Sense of place
- Increased mobility
- Increased social cohesion
- Understand human dependence on the natural world

Grün macht Schule – Green grounds at Schools and Kindergartens

NATURE-BASED PLAY AS ENVIRONMENTAL EDUCATION

Organisation

Grün macht Schule and Grün macht Schule – KinderGARTEN

Funding entity

Berlin Senate

Collaborators

Schools and kindergartens

Year

1983-2022 (design and construction of more than 500 project)

Location

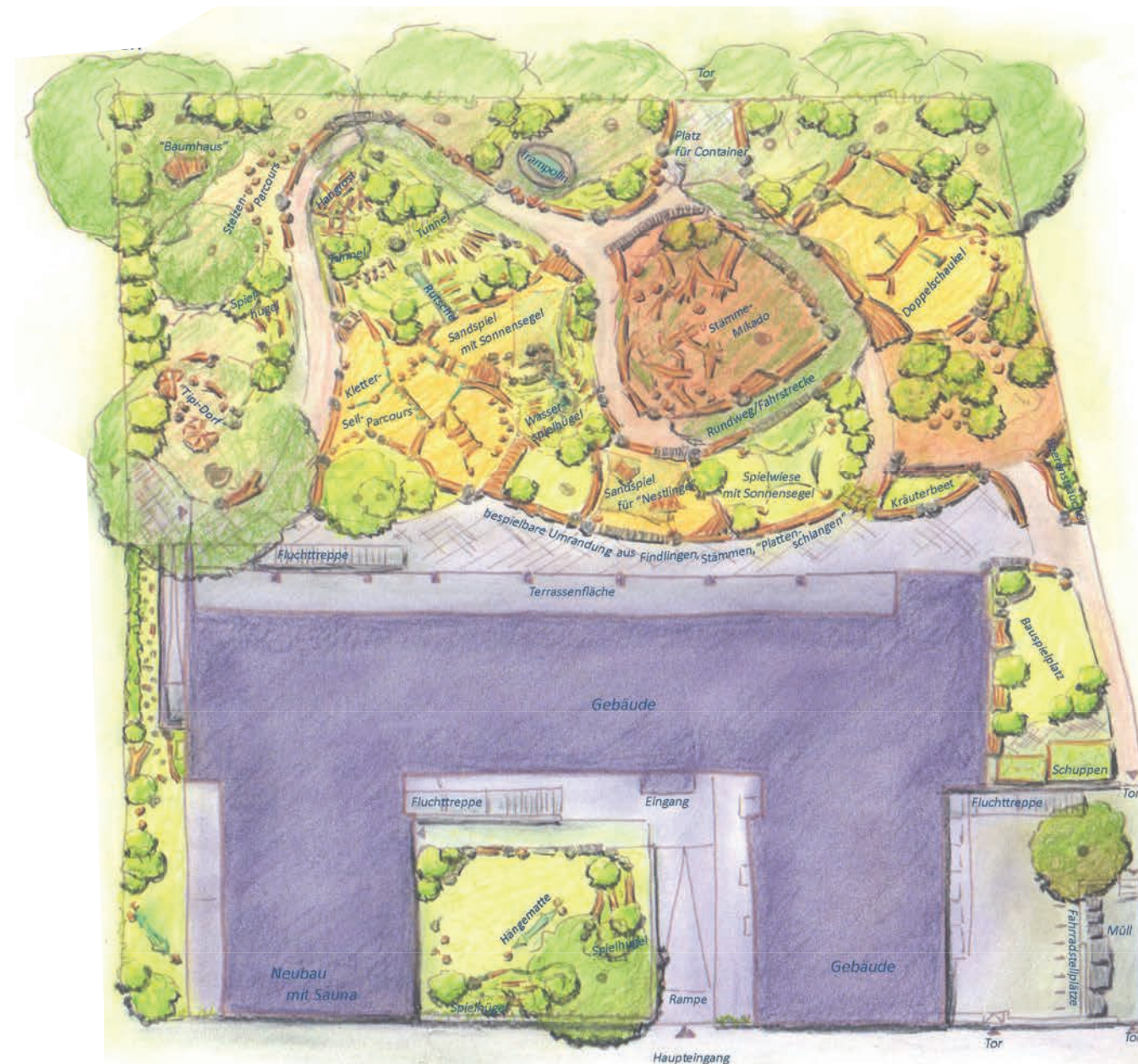
Berlin, Germany

Urban system

School and kindergarten courtyards

Level of investment

Varies across projects, from low to very high



The concept for Kindergarten Mandelstrasse © Antje Schwabersberger

PROJECT DESCRIPTION

Grün macht Schule (Green grounds at School) has been informing, advising and supporting schools and school initiatives since 1983 in the implementation of sustainable schoolyard projects and participatory planning. Children and young people spend around 20,000 hours at school during their entire school years. It is precisely there that future values and behaviour towards the environment are shaped. However, a large part of school's open spaces is sealed with asphalt, providing little opportunity to be in contact with nature and not considering climate impacts that might have on the city as a whole, such as aggravating flooding and heat island effect.

Grün macht Schule was established as an environmental, education initiative to revitalise schoolyards, strengthen environmental awareness, intensify environmental education and share practical knowledge about nature-based designing with city authorities and urban practitioners. In 2012, the programme expanded to include early years (kindergarten) revitalisation projects. The Senate of Berlin supports the near-natural and child-friendly design of kindergartens and school grounds by funding these two programmes. On a larger scale, these programmes contribute to sustainability plans, such as the National and the Berlin Strategy for Biodiversity, or the Berlin Strategy for Urban Landscape.

To date, hundreds of courtyard projects have been designed and built, from short-term measures such as tree planting, to complete school courtyard redesign. One of them is the revitalisation of Kindergarten Mandelstrasse that started as part of a bigger renovation project of the adjacent housing complex and monument restoration programme. The participatory design process was led by "Grün macht Schule – KinderGARTEN" and designed by the landscape architect Antje Schwabersberger, an expert in climate resilient and child-friendly school courtyards, implementing the Grün macht Schule quality standards.

KEY DRIVERS

1 Diversify play through nature

Play and exercise opportunities - with varying levels of difficulty - serve to meet the needs of different age groups in a kindergarten. Therefore, a mix of near-natural terrain, terrain remodelling and play equipment offers a plenitude of support and inspiration for play. Playing with mud, water, experiencing different surfaces through touch and movement, balancing on challenging structures, climbing hills, running or rolling down hollows, observing animals or sowing seeds are only a few of nature-based play activities. A small herbal garden is also used by the kindergarten cook. Through these, children develop self-esteem, self-effectiveness, attention, concentration, and interact and support each other to reach a goal together which has a great impact on their social behaviour.

2 Enable proximity and access

The whole-year access to nature-based play makes its integration with all six fields of the Berlin Educational Programme for Kindergarten possible:

- (1) *Health* (physical development, movement, nutrition)
- (2) *Social and cultural life*
- (3) *Communication* (language)
- (4) *Art* (making artworks)
- (5) *Mathematics* (practical basis)
- (6) *Nature – environment – technology.*



3 Grow facilitation

The biggest challenge for the project is to allay the fears of risk, accidents and losing caregiver’s control in near-natural play areas. “A good schoolyard is as safe as necessary, not as safe as possible” – is one of the Grün macht Schule design principles. To enable children’s development, it is necessary to incorporate calculable risks in the courtyard design, and to support caregivers in nature-based play facilitation.



4 Experiment publicly

The reuse of materials plays a major role in courtyard redesign. Finding creative ways to reuse the old pavement and play equipment demonstrates sustainable design principles. The old concrete pavement was recycled through building new balancing structures and through creating smaller paved paths.



Read further: [Project](#)

POSITIVES FOR SOCIETY AND THE PLANET

ACTIVITIES

- Desealing
- Diversifying challenging play opportunities
- Diversifying play area atmospheres
- Reusing site materials
- Uniting stakeholders
- Promoting environmental education
- Providing a wide range of colours, smells, tastes, sounds, textures
- Renaturing urban matrix
- Investing in experienced facilitation of nature-based play
- Facilitating risky play in natural surroundings
- Circular development promotion

NATURE AND CLIMATE POSITIVES

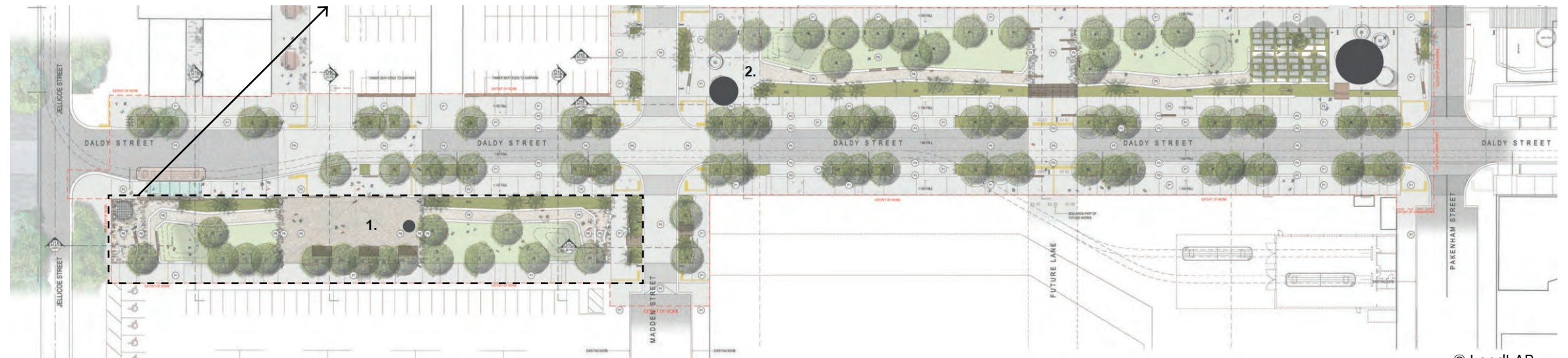
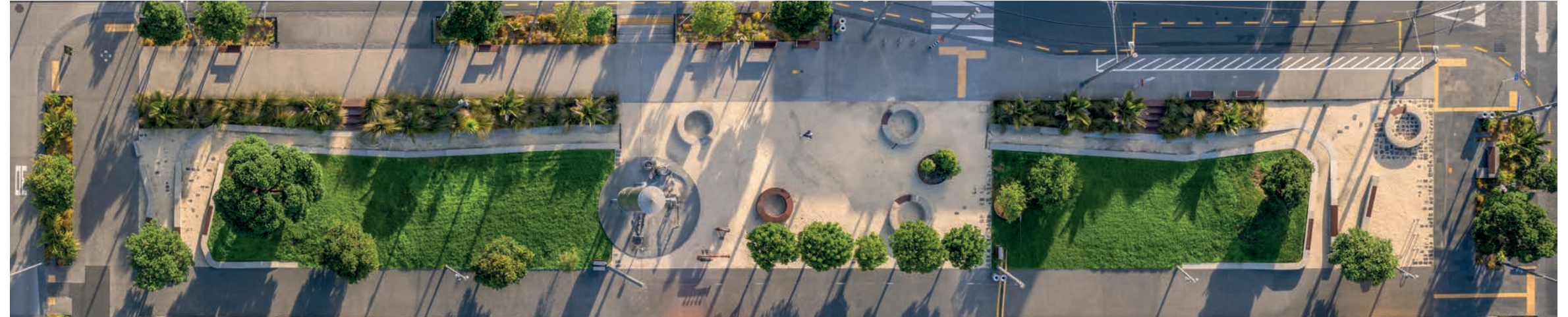
- Improved air quality
- Temperature and microclimate regulation
- Increased resilience to flooding
- Sustainable urban drainage systems
- Urban soil regeneration
- Natural habitats and biodiversity safeguarding
- Agroecological practices for food security and safety
- Solid waste management

CHILDREN AND COMMUNITY POSITIVES

- Diverse and increased physical activity
- Opportunities to use all senses
- More opportunities for playful learning
- Developing knowledge and responsibility through caring for plants and spaces
- Emotional connection with nature
- Helps with reducing and binding dust
- Improving noise regulation
- Developing adaptability, self-confidence, emotional regulation

Daldy Street Linear Park

REVITALISING INDUSTRIAL HERITAGE SITE THROUGH PLAY WITH WATER AND MOON



© LandLAB_

Organisation

LandLAB_

Client

Waterfront Auckland

Collaborators

Architectus, OPUS

Year

2009-2013

Location

Auckland, Aotearoa (New Zealand)

Urban system

Street

Level of investment

Very high

PROJECT DESCRIPTION

Daldy Street Linear Park is a hybrid space that combines the functionality and linearity of a street with the rhythmical, natural and diverse programs of a park. The project experiments with nature-based play in the post-industrial terrain of the Auckland's Waterfront. Originally part of the wider Freemans Bay catchment, this area was used by the petrochemical industry and is being revitalised into the residential area. The design brief was challenged by the question of how to bring back nature to this site, since it has been absent for a long time.

The play area is designed as a series of tanks which reference the unique marine and industrial heritage. The tank interventions bring together people, play, ecology, infrastructure buildings and landscape. The rain gardens, which flank the footpath, collect storm water and deliver it into a below-ground storm water system. The Water Tank triggers water-based play, harvests and stores water from raingarden system for reuse on site for lawn irrigation. The plants used bring back the indigenous heritage (Sand comprosa, purei, rautahi, Māori sedge, pukio, Dianella,

mikoikoi, New Zealand flax and pohuehue), while 85 native trees are dotted around the site. Play Tank is designed to inspire physical play, climbing and sliding. There are also many opportunities for social interactions and encounters among the numerous circular benches and areas.

KEY DRIVERS

1 Connect with play heritage

The Play Tank is made of 12 steel supports referencing 12 months of Maramataka, the Māori lunar calendar. The calendar was traditionally used to accompany days with information about fishing, gardening and other nature-related activities. For example, eel fishing is not productive on the full moon (Rākaunui) because bright moon light would not allow the eel to hunt as its prey could see them. These elements not only reflect the indigenous heritage of the area, but also teach about biology and astronomy. Another example are Unaunahi paving inlays and pre-cast concrete upstands. Unaunahi is a type of traditional Māori surface decoration representing fish scales. It is a playful element that triggers learning about nature and heritage.



2 Transform perceptions

The Water Tank is a 13,000 litre recycled stainless steel bulk liquids tank, used for water storage and reticulated to park irrigation. One of the famous whakataukī (proverbs) is painted on its wall: Ko tew ai te ora nga mea katoa – *Water is the life giver of all things*. Seeing how water flows through different blue infrastructure elements while playing with it, enables children to connect with nature in this fast-changing, urban industrial heritage place.



Read further: [Project](#)

POSITIVES FOR SOCIETY AND THE PLANET

ACTIVITIES

- Safe and direct pathways
- Cultivating indigenous knowledge
- Reusing site materials
- Connecting nature and tradition
- Rainwater harvesting
- Designing recognisable landmarks
- Incorporating green/blue infrastructure in urban development
- Making the water flow visible
- Triggering curiosity through design
- Designing with nature
- Opportunities for social interactions and community cohesion
- Circular development promotion

NATURE AND CLIMATE POSITIVES

- Increased resilience to flooding
- Sustainable urban drainage systems
- Urban soil regeneration
- Natural habitats and biodiversity safeguarding
- Diversify water supply (for the irrigation of the park)

CHILDREN AND COMMUNITY POSITIVES

- Diverse and increased physical activity
- More opportunities for playful learning
- Emotional connection with nature
- Sense of place
- Increased mobility
- Increased social cohesion

The Woods in Amsterdam

SMALL SPACES LEAD TO BIG CHANGES

Organisation

Space for Play and Studio SOMA

Client

Zonova, organisation for education in
Amsterdam Zuid-Oost

Collaborators

IVN (Institute for Nature Education
Amsterdam) for the 'Tiny Forest',
Municipality of Amsterdam

Year

2020-2021 (design and construction)

Location

Amsterdam, The Netherlands

Urban system

School yard

Level of investment

Medium



© Renet Korthals Altes ~ SPACE FOR PLAY

PROJECT DESCRIPTION

The project focused on the revitalisation of three urban spaces around a school, integrating them with the educational programme requirements and in the everyday life of the neighbourhood. It successfully implemented nature-based play within a complex regulatory framework, typical for highly urbanised areas.

It is funded by the Amsterdam 'Impulse' Schoolyards (AIS) strategy, aiming to stimulate active play, add 25% green space per schoolyard, contribute to the rainwater absorption programme, increase nature education, citizen participation and sustainability. The two main design challenges were that all school playgrounds receive the same budget from the municipality despite their size (considering the large area of this space), and reaching the target of 25% greenery, which may be difficult to achieve for some spaces. The additional funding was secured through strong partnerships, extra subsidies, and co-construction with teachers and children. The main nature-based design feature is Amsterdam's first Tiny Forest – 200 indigenous trees planted and named by children. On the southern side, the space features five apple trees as the neighbourhood's fruit garden, and on the eastern side a 'Satellite Tiny Forest' for toddlers and their caretakers.

AIS is the result of interdisciplinary collaboration within the Municipality of Amsterdam, between Education and Green & Sustainability departments. It started in 2016 with the aim to increase urban climate resilience, nature education and healthy environments. While the projects funded are small, they make a significant impact when they are upscaled. By 2019, 85 schoolyards were redesigned, and the programme has been extended to include 60 more up to 2024. Together, they build a network of green spaces, which will form 120,000 m² of green space.

KEY DRIVERS

1 Strengthen partnerships

Taking children seriously in real, open-minded participation, creates new opportunities for design. Children, teachers and caregivers were involved in every step of the design process: from the formulation of the initial design concept, to planting and maintaining green spaces. Children advocated for the importance of sports, dance and performing spaces, more trees, flowers, butterflies and edible berries. Space for play integrated all these needs within the design. The Institute for Nature Education Amsterdam organises training for teachers and educational activities with children, stimulating their role as future ‘forest rangers’ and nurturing ownership of this place.



2 Experiment publicly

A total of 700 m² (2,800) concrete tiles have been removed from the courtyard and reused to build low walls as protection borders around different areas. These are also used for sitting, balancing, climbing and jumping. Scattered over the whole schoolyard, fifty aluminium plates with educational pictures of trees, insects and birds have been installed on these walls, to spark curiosity and support educational activities that combine cognitive development, play and nature.

3 Grow facilitation

For sustainable projects, it is crucial to think beyond the boundaries of the school playground and consider the entire neighbourhood and their use of space. Various site programming activities have been organised in collaboration with local neighbourhood organisations, such as vegetable garden planting, maintaining and harvesting lessons. Teachers run cooking classes with harvested vegetables. The involvement of local volunteering organisations ensures that green spaces are maintained all year round.



Read further: [Project](#)

POSITIVES FOR SOCIETY AND THE PLANET

ACTIVITIES

- Designing with nature
- Co-designing with children
- Providing a wide range of colours, smells, tastes, sounds, textures
- Partnering with environmental organisations
- Reusing site materials
- Desealing
- Promoting environmental education
- Engaging with neighbours and local stakeholders
- Community awareness activities
- Circular development promotion
- Renaturing urban matrix

NATURE AND CLIMATE POSITIVES

- Improved air quality
- Improved water quality
- Temperature and microclimate regulation
- Urban soil regeneration
- Natural habitats and biodiversity safeguarding
- Agroecological practices for food security and safety

CHILDREN AND COMMUNITY POSITIVES

- Diverse and increased physical activity
- Opportunities to use all senses
- More opportunities for playful learning
- Emotional connection with nature
- Improving noise regulation
- Sense of place
- Creating a healing and calming environment for all ages
- Increased social cohesion

RHS Garden Bridgewater

LEARNING THROUGH OUTDOOR PLAY

Organisation

The Royal Horticultural Society

Major funders

Salford City Council, Peel L&P, Garfield Weston Foundation, Arcadia, The Oglesby Charitable Trust, National Lottery Heritage Fund, Rural Payments Agency, The Preston Family Charitable Settlement, United Utilities, Esmée Fairbairn Foundation

Year

2017 – 2021 (construction)

Location

Salford, United Kingdom

Urban system

Public garden

Level of investment

Very high



© RHS – Nell Hepworth

PROJECT DESCRIPTION

RHS Garden Bridgewater is one of the largest gardening projects undertaken in Europe in recent years.

The transformation of this 154-acre greenspace aims to enrich the lives of local communities and their environment for the future, by contributing to the city's natural capital, employment opportunities, education programmes, community outreach initiatives, and serving as a cultural and tourist destination.

Many design solutions on site are nature-based, from the Welcome Building's rainwater harvesting system and a green roof of wildflowers and sedum, to sustainable site drainage designed to slow the water flow, diverting it through the naturally wet woodland located at the north of the site via a series of swales, leaky brush dams and seasonal pools. The site's car parks have permeable surfaces to collect water run-off, which is channelled through a swale to a detention pool that can hold up to 24 hours' worth of constant rainfall. These features not only reduce the pressure on drainage systems, but create habitats for amphibians, birds and invertebrates.

The Woodland Play area is densely planted with grasses, flowers and shrubs to create an interactive play space within a garden setting, introducing children from all ages to plants and wildlife. The design of the space is flexible, allowing children to make up their own games and interact with plants and nature in a fun and engaging way. It promotes adventure, physical activity, creativity, imagination and a desire to explore nature. It is an impressive example of large scale wild play.

KEY DRIVERS

1 Strengthen partnerships

Bringing a world-class garden to life takes a lot of people: horticulturalists and plant specialists, designers and architects, project managers, engineers, construction, community outreach advisors, educators, communicators, fundraisers, retail, events and caterers, and a team of volunteers. One example of the importance of partnerships is collaboration with schools. Through the schools programme, young people can engage in learning about plants, growing to eat, biodiverse gardening, nature art. The schools programme includes the *Green City Challenge*, where students work together to design a garden or greenspace for their school or local community to make it resilient to climate change, and the primary school programme *Planting for the Planet* where pupils are encouraged to think about our impact on the environment and the importance of plants. Six thousand young people visited RHS Garden Bridgewater within the first year of opening.



© RHS - Mark Waugh

2 Grow facilitation

Nature and play are linked through specifically designed education and outreach programmes. The Community Outreach team supports community groups, schools and youth organisations to work together, build their skills and inspire long-lasting community change. The garden has provided a place for inspiration for a number of youth-led projects. Youth-focused programmes have encouraged young people to explore and respond creatively to the climate emergency through photography, creative writing, drawing, painting and pottery workshops using plant-based techniques and facilitated in partnership with local creative practitioners. These creative outputs have been developed into youth-led campaigning and educational resources to share among peers and raise awareness of nature in underpinning climate resilience.

3 Transform perceptions

A range of interactive workshops and spaces aim to deepen the knowledge and care for nature. The Peel Learning Garden is inspired by the idea of plants as machines, encouraging children to discover how plants grow and the amazing adaptations that help them survive. With a range of interesting species to explore, including sensory herbs and edible plants, the garden is the perfect place to apply horticultural skills and knowledge in a fun and practical way.

4 Diversify play through nature

Children, through their inquisitiveness, invent places to play wherever they are. Be this looking for bugs or dipping their fingers into the dipping pools in the kitchen garden, looking at fungi growing on log edged paths, skipping across

steppingstones along the Chinese Streamside Garden or running through the grass meadows or rhododendrons within the play area. The garden provides an opportunity to come face to face with nature, watching bees pollinate flowers and the woodpeckers and tree creepers on the trees. There are plenty of features to encourage imaginative play too, including magical Hobbit Houses, mud kitchens and fairy homes, all made from materials on site by volunteers and set within existing rhododendrons. The Yew Circle also provides an ideal spot for outdoor performances, storytelling, dressing-up and playing music.



© RHS - Mark Waugh

Read further: [Project](#)

POSITIVES FOR SOCIETY AND THE PLANET

ACTIVITIES

- Designing with nature
- Providing a wide range of colours, smells, tastes, sounds, textures
- Rainwater harvesting
- Nurturing excitement and curiosity about nature
- Reusing site materials
- Community awareness activities
- Incorporating green/blue infrastructure in urban development
- Circular development promotion
- Promoting environmental education
- Facilitating risky play in natural surroundings
- Investing in experienced facilitation of nature-based play

NATURE AND CLIMATE POSITIVES

- Improved air quality
- Improved water quality
- Temperature and microclimate regulation
- Increased resilience to flooding
- Natural habitats and biodiversity safeguarding
- Diversified water supply
- Agroecological practices for food security and safety

CHILDREN AND COMMUNITY POSITIVES

- Diverse and increased physical activity
- Opportunities to use all senses
- More opportunities for playful learning
- Emotional connection with nature
- Creating a healing and calming environment for all ages
- Creating job opportunities
- Increased economic activity
- Developing knowledge and responsibility through caring for plants and spaces
- Developing adaptability, self-confidence, emotional regulation

Stubbers Adventure Centre

DESIGN AS A TRIGGER FOR
NATURE-BASED PLAY

Organisation
Earth Wrights

Client
Stubbers Adventure Centre

Year
Built 2021

Location
Upminster, United Kingdom

Urban system
Adventure park

Level of investment
High



© Earth Wrights

PROJECT DESCRIPTION

Stubbers is a well-established outdoor adventure centre, on the eastern edge of London, gathering children from London and Essex. It is built on an ex-landfill site; the property owner had the vision to plant trees and create lakes which today make up the new landscape. Earth Wrights were asked to design and build new play areas with the aim to create a big central landmark play space with high visitor capacity and to activate play across the entire 130 acre site. The centre is visited by more than 40,000 visitors per year; children, teenagers, schools, community groups and families explore trails through the wooded areas and around the lake edges. The design brief focused on designing elements that would activate nature-based play and enable it to reverberate throughout the site.



© Earth Wrights

KEY DRIVERS

1 Transform perceptions

Play equipment can be the steppingstone to a wider engagement with natural surroundings. It can help people overcome trepidation, invite them to feel welcome and able to play freely in nature. Through the exploration of the site's character and topography, landscape's features are combined with the designed interventions to foster children's biophilic connection. Once the invitation has been taken up and play begins, the activity will spill out into the surrounding area. Children will start ranging and playing in amongst nature, more than they would have done, had there been no invitation.



© Earth Wrights

2 Celebrate change

Play in nature is always changing, with the weather and the seasons. The project is using natural materials and site-specific design to complement and blend in with the changing surroundings. For example, a house for faeries and a house for

play have the same design layout but are different in size – the change in scale triggers children's imagination and invites nature-based pretend play.



© Earth Wrights

3 Grow facilitation

The project takes cues from forms found in nature and gives children the chance to play with the challenge and unpredictability that this brings. The structures provide opportunities for physical, sensory, social, emotional, creative, and risky play. Designed equipment helps with facilitating risky play by introducing controlled risk in the natural surroundings. A big cantilever swing serves that age old physical need to swing wildly in all directions, and faerie houses ignite the imaginative risk that maybe someone magical lives here.



© Earth Wrights

Read further: [Project](#)

POSITIVES FOR SOCIETY AND THE PLANET

ACTIVITIES

- Designing with nature
- Using natural materials
- Design as a facilitator of nature-based play
- Facilitating risky play in natural surroundings
- Opportunities for social interactions and community cohesion
- Renaturing urban matrix
- Nurturing excitement and curiosity about nature
- Protecting existing natural habitats

NATURE AND CLIMATE POSITIVES

- Improved air quality
- Improved water quality
- Temperature and microclimate regulation
- Natural habitats and biodiversity safeguarding

CHILDREN AND COMMUNITY POSITIVES

- Diverse and increased physical activity
- More opportunities for playful learning
- Opportunities to use all senses
- Developing adaptability, self-confidence, emotional regulation
- Emotional connection with nature
- Creating job opportunities
- Increased economic activity

Conclusion

The interdependency between play, nature and climate resilience is clear. The expert contributions, research and real-world case studies demonstrate the unique power of nature-based play to support the wellbeing of our children and the health of our planet. By encouraging and enabling nature-based play, particularly in our cities, we will improve children's health and wellbeing and progress towards safe, sustainable and inclusive cities.

To help inspire and support collaboration and action between city authorities, urban planners, designers and communities, the eight key drivers provide clear recommendations that will generate benefits for children, communities and nature:

- (1) **Transform perceptions** of the community around the significance, value and fragility of natural habitats and ecosystems.
- (2) **Enable proximity and access** by consciously connecting people and natural landscapes, taking into consideration the needs of caregivers and young children of all abilities.
- (3) **Strengthen partnerships** between different organisations and groups that are working on

placemaking, environmental preservation, co-design approaches, children's rights, education and design innovation.

- (4) **Diversify play through nature** by emphasising how different play experiences and design requirements can lead to the development of different skills through play: namely, cognitive, emotional, social, creative and physical skills.
- (5) **Connect with play heritage** through co-designing with local partners and stakeholders, following the intergenerational links through both tangible (e.g., play objects) and intangible (e.g., play practices) play traditions.
- (6) **Celebrate change** in the environment through seasons, through growth cycles, and through long-term change from grey and sealed public spaces to green and permeable green/blue ecosystems.
- (7) **Experiment publicly** with different materials, construction processes, water-sensitive urban systems and green technologies.
- (8) **Grow facilitation** of nature-based play through guided and semi-guided activities,

frequent activation of spaces, and permanent programmes that remind and inspire children and their caregivers to stimulate and nurture nature-based play.

These drivers represent a range of activities across bio-physical, social and urban contexts, yet focus on a shared outcome – to advocate for and prove the sustainability of nature-based play interventions. The drivers can be used by stakeholders to make informed, context-relevant decisions when delivering nature-based play solutions for children's wellbeing and climate resilience. Collectively these drivers form a framework for designing, delivering and measuring interventions for nature-based play across different urban systems, financial contexts and stakeholder ecosystems.

Our aim in sharing this publication is to inspire key decision makers, local authorities, communities, and businesses to work together to foster connections between nature and play. We aim to integrate play with nature to create healthier, more playful and more resilient environments where children, communities and our planet can thrive.



References

- 1 – Arup. “Climate change: resilience and adaptability.” Accessed March 3, 2022. <https://www.arup.com/perspectives/climate-change-resilience-and-adaptability>.
- 2 – Arup. “Regenerative land management.” Accessed March 3, 2022. <https://www.arup.com/expertise/services/planning/regenerative-land-management>.
- 3 – Arup and The LEGO Foundation. *Playful Cities Toolkit*. London: Arup, 2021. <https://www.arup.com/perspectives/publications/research/section/playful-cities-toolkit-resources-for-reclaiming-play-in-cities>.
- 4 – UN Climate Change. “Around 120 leaders gather at COP26 in Glasgow for ‘last, best chance’ to keep 1.5 alive.” Accessed May 5, 2022. <https://ukcop26.org/around-120-leaders-gather-at-cop26-in-glasgow-for-last-best-chance-to-keep-1-5-alive>.
- 5 – Gill, Tim. “The Benefits of Children’s Engagement with Nature: A Systematic Literature Review.” *Children, Youth and Environments* 24, no. 2 (2014): 10–34. <https://doi.org/10.7721/chilyoutenvi.24.2.0010>.
- 6 – Williams, Samuel, Hannah Wright, and Felicitas zu Dohna. *Cities Alive: Designing for Urban Childhoods*. London: Arup, 2017.
- 7 – Williams, Samuel, Hannah Wright, and Felicitas zu Dohna. *Cities Alive: Designing for Urban Childhoods*. London: Arup, 2017.
- 8 – United Nations. *The United Nations Convention on the Rights of the Child*. UN: 1989. Accessed September 9, 2017. <https://www.unicef.org/uk/what-we-do/un-convention-child-rights>.
- 9 – Lindsey, KR. “Small Beginnings.” *Financial Times*. Published 2012. Accessed October 2, 2017. www.ft.com.
- 10 – UNICEF – Nations Children’s Fund. *The State of the World’s Children 2021: Executive Summary*. 2021. <https://www.unicef.org/reports/state-of-worlds-children>.
- 11 – The World Bank. “Urban Population (% of total population).” Accessed March 14, 2022. <https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS>.
- 12 – The World Bank. “Urban Development Overview.” Accessed March 14, 2022. <https://www.worldbank.org/en/topic/urbandevelopment/overview#1>.
- 13 – UNFCCC. “Urban Climate Action is Crucial to Bend the Emissions Curve.” Published October 5, 2020. Accessed March 14, 2022. <https://unfccc.int/news/urban-climate-action-is-crucial-to-bend-the-emissions-curve>.
- 14 – Dodman, David, Loan Diep, and Sarah Colenbrander. *Resilience and Resource Efficiency in Cities*. United Nations Environment Programme, 2017.
- 15 – The Nature Conservancy. “Nature in the Urban Century.” Published November 13, 2018. Accessed March 29, 2022. <https://www.nature.org/en-us/what-we-do/our-insights/perspectives/nature-in-the-urban-century/>.
- 16 – World Economic Forum. *BiodiverCities by 2030: Transforming Cities’ Relationship with Nature*. World Economic Forum, 2022. https://www3.weforum.org/docs/WEF_BiodiverCities_by_2030_2022.pdf
- 17 – Pörtner, H.-O. et al. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Intergovernmental Panel on Climate Change, 2022. <https://www.ipcc.ch/report/ar6/wg2>.
- 18 – Magdelenat, Canddie, and Jordan Hairabedian, eds. *Urban Nature Based Solutions: Cities leading the way*. WWF, 2021. https://wwfint.awsassets.panda.org/downloads/exe_wwf_a4_template_sbn_final2.pdf
- 19 – World Economic Forum. *BiodiverCities by 2030: Transforming Cities’ Relationship with Nature*. World Economic Forum, 2022. https://www3.weforum.org/docs/WEF_BiodiverCities_by_2030_2022.pdf
- 20 – UN Environment Programme. *Beating the Heat: A Sustainable Cooling Handbook for Cities*. UNEP, 2021. <https://www.unep.org/resources/report/ beating-heat-sustainable-cooling-handbook-cities>.
- 21 – WWF. *Making the case for investing in nature-based solutions: A case study from Tshwane*. WWF South Africa: Cape Town, 2021. https://wwfint.awsassets.panda.org/downloads/making_the_case_for_investing_in_nature_based_infrastructure.pdf.
- 22 – Newton, William Isaac, and Sara Candiracci. *Proximity of Care: A New Approach to Understanding Early Childhood Development in Vulnerable Urban Contexts*. Arup & the Bernard van Leer Foundation, 2021.
- 23 – Play Scotland, and Cole-Hamilton, I. “Getting it right for play: The power of play: an evidence base.” Play Scotland, 2012. <https://www.playscotland.org/play/play-for-health/the-power-of-play>.
- 24 – Play Scotland and Cole-Hamilton, I. “Getting it right for play: The power of play: an evidence base.” Play Scotland, 2012. <https://www.playscotland.org/play/play-for-health/the-power-of-play>.
- 25 – Playboard NI. “The Children Play Policy Forum: Play Builds Children.” Published February 5, 2019. <https://www.playboard.org/the-childrens-play-policy-forum-play-builds-children>.
- 26 – Whitebread, David. *The importance of play: A report on the value of children’s play with a series of policy recommendations*. Newcastle: Cambridge Scholars Publishing, 2012. <https://www.csap.cam.ac.uk/media/uploads/files/1/david-whitebread---importance-of-play-report.pdf>
- 27 – United Nations. *The United Nations Convention on the Rights of the Child*. UN: 1989. <https://www.ohchr.org/en/professionalinterest/pages/crc.aspx>
- 28 – United Nations. *Convention on the Rights of the Child: Committee on the Rights of the Child (CRC), General Comment No. 17 (2013) on the right of the child to rest, leisure, play, recreational activities, cultural life and the arts (art.31)*. UN, 2013. <https://www.refworld.org/docid/51ef9bcc4.html>
- 29 – Play Scotland. *Playful Streets: Supporting play in the community*. Play Scotland, 2022. <https://www.playscotland.org/resources/playful-streets-supporting-play-in-the-community>.
- 30 – Play Scotland. *Play First: Supporting Children’s Social and Emotional Wellbeing During and After Lockdown*. Play Scotland, 2020. <https://www.playscotland.org/resources/play-first-supporting-childrens-social-and-emotional-wellbeing-during-and-after-lockdown>
- 31 – Public Health Scotland. *Children and Young People Public Health – Covid-19 Impact Report*. March 2022. <https://www.scotphn.net/resources/children-and-young-people-public-health-covid-19-impact-report-march-2022/>
- 32 – United Nations. *Convention on the Rights of the Child: Committee on the Rights of the Child (CRC), General Comment No. 17 (2013) on the right of the child to rest, leisure, play, recreational activities, cultural life and the arts (art.31)*. UN, 2013. <https://www.refworld.org/docid/51ef9bcc4.html>
- 33 – Scottish Government. *Scotland 2045- fourth National Planning Framework-draft*. November, 2021. <https://www.gov.scot/publications/scotland-2045-fourth-national-planning-framework-draft>.
- 34 – Outdoor Play Canada. *Outdoor Play Glossary of Terms*. January 2022. https://www.outdoorplaycanada.ca/portfolio_page/outdoor-play-glossary-of-terms
- 35 – Outdoor Play Canada. *Outdoor Play Glossary of Terms*. January 2022. https://www.outdoorplaycanada.ca/portfolio_page/outdoor-play-glossary-of-terms
- 36 – Gibson, James J. *The ecological approach to visual perception*. New York: Psychology Press, 2014.
- 37 – Johnstone et al. “Nature-Based Early Childhood Education and Children’s Social, Emotional and Cognitive Development: A Mixed-Methods Systematic Review.” *International Journal of Environmental Research and Public Health*, 19, 10 (2022); Johnstone et al. “Nature-Based Early Childhood Education and Children’s Physical Activity, Sedentary Behavior, Motor Competence, and Other Physical Health Outcomes: A Mixed-Methods Systematic Review.” *Journal of Physical Activity and Health*, 1 (2022): 1-17.
- 38 – Mygind et al. “Landscapes of becoming social: A systematic review of evidence for associations and pathways between interactions with nature and socioemotional development in children.” *Environment International*, 146, p.106238 (2021). <https://doi.org/10.1016/j.envint.2020.106238>.
- 39 – Sando, Ole Johan, and Ellen Beate H. Sandseter. “Affordances for physical activity and well-being in the ECEC outdoor environment.” *Journal of Environmental Psychology* 69, p.101430 (2020). <https://doi.org/10.1016/j.jenvp.2020.101430>
- 40 – Dankiw, Kylie, Margarita Tsiros, Katherine Baldock, and Saravana Kumar. “The impacts of unstructured nature play on health in early childhood development: A systematic review.” *Plos One*, 15 (2), p.e0229006 (2020). <https://doi.org/10.1371/journal.pone.0229006>; Mygind et al. “Landscapes of becoming social: A systematic review of evidence for associations and pathways between interactions with nature and socioemotional development in children.” *Environment International* 146, p.106238 (2021). <https://doi.org/10.1016/j.envint.2020.106238>; Piccininni, Caroline, Valerie Michaelson, Ian Janssen, and William Pickett. “Outdoor play and nature connectedness as potential correlates of internalized mental health symptoms among Canadian adolescents.” *Preventive Medicine* 112 (2018): 168-175; Tillmann, Suzanne, Danielle Tobin, William Avison, and Jason Gilliland. “Mental health benefits of interactions with nature in children and teenagers: A systematic review.” *Epidemiology and Community Health* 72, no. 10 (2018): 958-966.
- 41 – Roslund et al. “Biodiversity intervention enhances immune regulation and health-associated commensal microbiota among daycare children.” *Science advances* 6 (42), p.eaba2578 (2020). [10.1126/sciadv.aba2578](https://doi.org/10.1126/sciadv.aba2578)
- 42 – Asah, Stanley, David Bengston, Lynne Westphal, and Catherine Gowan. “Mechanisms of children’s exposure to nature: Predicting adulthood environmental citizenship and commitment to nature-based activities.” *Environment and Behavior* 50, no.7 (2018):807-836. <https://doi.org/10.1177/0013916517718021>
- 43 – Olshansky et al. “A potential decline in life expectancy in the United States in the 21st century.” *The New England Journal of Medicine* 352, no.11 (2005):1138-45. [10.1056/NEJMs043743](https://doi.org/10.1056/NEJMs043743)

- 44 – Goryakin, Yevgeniy, Lorenzo Rocco, and Marc Suhrcke. “The contribution of urbanization to non-communicable diseases: Evidence from 173 countries from 1980 to 2008.” *Economics & Human Biology* 26 (2017): 151–163. <https://doi.org/10.1016/J.EHB.2017.03.004>
- 45 – Louv, Richard. *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*. Algonquin Books: 2005.
- 46 – Louv, Richard. *The Nature Principle: Human Restoration and the End of Nature-Deficit Disorder*. Algonquin Books: 2011.
- 47 – Chawla, Louise, and Karen Malone. “Neighbourhood quality in children’s eyes.” In *Children in the City*, edited by P. Christensen and M. O’Brien, 136–159. London: Routledge, 2003; Wells, Nancy, and Kristi Lekies. “Nature and the Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism.” *Children, Youth and Environments* 16, no.1 (2006): 1–24.
- 48 – United Nations. “UN Human Rights Council: The human right to a clean, healthy and sustainable environment; (A/HRC/RES/48/13).” Accessed October 8, 2021.
- 49 – Everard, Mark, and Robert McInnes. “Systemic solutions for multi-benefit water and environmental management.” *Sci Total Environ*, 2013: 461–462:170–9. <https://doi.org/10.1016/j.scitotenv.2013.05.010>.
- 50 – Rehling, Julia, Christiane Bunge, Julia Waldhauer, and Andre Conrad. “Socioeconomic Differences in Walking Time of Children and Adolescents to Public Green Spaces in Urban Areas—Results of the German Environmental Survey (2014–2017).” *International Journal of Environmental Research and Public Health* 18, no.5 (2021). <https://doi.org/10.3390/ijerph18052326>
- 51 – van den Bosch, Matilda, and William Bird. *Oxford textbook of nature and public health: the role of nature in improving the health of a population*. Oxford: Oxford University Press, 2018.
- 52 – Mårtensson, F. “Guiding environmental dimensions for outdoor play.” *Journal of Social Medicine* 90, no.4, (2013): 658–665.
- 53 – Hellmund, P. & Smith D. *Designing Greenways: Sustainable Landscapes for Nature and People*. Washington DC: Island Press, 2006.
- 54 – Vierikko et al. “Biocultural diversity (BCD) in European cities – Interactions between motivations, experiences and environment in public parks.” *Urban Forestry & Urban Greening* 48 (2020). <https://doi.org/10.1016/j.ufug.2019.126501>.
- 55 – Williams, Samuel, Hannah Wright, and Felicitas zu Dohna. *Cities Alive: Designing for Urban Childhoods*. London: Arup, 2017.
- 56 – United Nations. “UN Ocean Conference: Save our Ocean, Protect our Future.” Accessed April 12, 2022. <https://www.un.org/en/conferences/ocean2022>.
- 57 – IPCC. “Working Group II: Impacts, Adaptation and Vulnerability”. Accessed April 4, 2022. <https://www.ipcc.ch/working-group/wg2>.
- 58 – Pörtner, H.-O. et al. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Intergovernmental Panel on Climate Change, 2022. <https://www.ipcc.ch/report/ar6/wg2>.
- 59 – United Nations Climate Change. “The Glasgow CLimate Pact – Key Outcomes from COP26.” Accessed April 4, 2022. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-glasgow-climate-pact-key-outcomes-from-cop26>.
- 60 – United Nations. “UN Ocean Conference: Save our Ocean, Protect our Future.” Accessed April 12, 2022. <https://www.un.org/en/conferences/ocean2022>.
- 61 – UNESCO. “United Nations Decade of Ocean Science for Sustainable Development (2021–2030).” Accessed April 12, 2022. <https://en.unesco.org/ocean-decade>.
- 62 – UNESCO and Intergovernmental Oceanographic Commission. *A New Blue Curriculum: A Toolkit for Policymakers*. UNESCO, 2022. <https://unesdoc.unesco.org/ark:/48223/pf0000380544>.
- 63 – UNICEF – Nations Children’s Fund. *The State of the World’s Children 2021: Executive Summary*. 2021. <https://www.unicef.org/reports/state-of-worlds-children>.
- 64 – Georgiou, Michail et al. “Mechanisms of Impact of Blue Spaces on Human Health: A Systematic Literature Review and Meta-Analysis.” *International Journal of Environmental Research and Public Health* vol. 18,no. 5 2486 (2021) 10.3390/ijerph18052486; Niamh Smith, Michail Georgiou, Abby C. King, Zoë Tieges, Stephen Webb, and Sebastien Chastin. “Urban blue spaces and human health: A systematic review and meta-analysis of quantitative studies.” *Cities* 119 (2021) <https://www.sciencedirect.com/science/article/pii/S0264275121003127>.
- 65 – Roe, Jenny. “Blue’ space: Access to water features can boost city dwellers’ mental health.” *The Conversation*, 2019 <https://theconversation.com/blue-space-access-to-water-features-can-boost-city-dwellers-mental-health-122995>
- 66 – Brown, Sam. *The social benefits of Blue Space: a systematic review*. Environment Agency, 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/928136/Social_benefits_of_blue_space_-_report.pdf
- 67 – Capaldi et al. “The relationship between nature connectedness and happiness: a meta-analysis.” *Frontiers in Psychology*, September 8, 2014. <https://www.frontiersin.org/articles/10.3389/fpsyg.2014.00976/full>
- 68 – Gross, Carol. “Science concepts young children learn through water play.” *Dimensions of Early Childhood* 40 (2012).
- 69 – Van Hedger, Stephen, Howard Nusbaum, Luke Clohisy, Susanne Jaeggi, Martin Buschkuhl and Marc Berman. “Of cricket chirps and car horns: The effect of nature sounds on cognitive performance.” *Psychonomic Bulletin & Review* 26 (2019): 522–530. <https://link.springer.com/article/10.3758/s13423-018-1539-1>
- 70 – Barcelona City Council. “Plan for Play in Barcelona’s Public Spaces | Ecology. Urban Planning, Infrastructures and Mobility”. Accessed 14 April 2022. <https://ajuntament.barcelona.cat/ecologiaurbana/en/what-we-do-and-why/quality-public-space/barcelona-plays-things-right>.
- 71 – Barcelona City Council. “Nature Plan (2021–2030) | Ecology. Urban Planning, Infrastructures and Mobility”. Accessed 11 April 2022. <https://ajuntament.barcelona.cat/ecologiaurbana/en/what-we-do-and-why/green-city-and-biodiversity/nature-plan>.
- 72 – Barcelona City Council. “Tree Master Plan | Ecology. Urban Planning, Infrastructures and Mobility”. Accessed 11 April 2022. <https://ajuntament.barcelona.cat/ecologiaurbana/en/what-we-do-and-why/urban-greenery-and-biodiversity/tree-master-plan>.
- 73 – Urbana, Gerència d’Àrea d’Ecologia. “Climate Emergency Action Plan for 2030”. Published 2021. <https://bcnroc.ajuntament.barcelona.cat/jspui/handle/11703/123712>.
- 74 – Barcelona City Council. “Green-Infrastructure Impetus Plan | Ecology. Urban Planning, Infrastructures and Mobility.” Accessed 11 April 2022. <https://ajuntament.barcelona.cat/ecologiaurbana/en/what-we-do-and-why/urban-greenery-and-biodiversity/green-infrastructure-impetus-plan>.
- 75 – Monterosso et al. *Análisis estratégico de potencialidad y economía territorial de los barrancos del Municipio de Guatemala*. Guatemala: Universidad de San Carlos de Guatemala, 2014.
- 76 – The initiative is based on the historical, ground-breaking book by Efua Sutherland (Playtime in Africa, 1960), founder of the Mmofra Foundation. She was a cultural advocate for children from the early 1950s and played an important role in developing educational curricula, literature, theatre and film for and about Ghanaian children.
- 77 – Traditional strategy and calculation African game, also known as *awale*, *adji*, and *wari*.
- 78 – Sobel, David. *Childhood and nature: Design principles for educators*. Stenhouse Publishers, 2008.

ARUP

for the

