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The Necessity of Urban Green Space for Children's Optimal Development

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The Necessity of Urban Green Space for Children's Optimal Development

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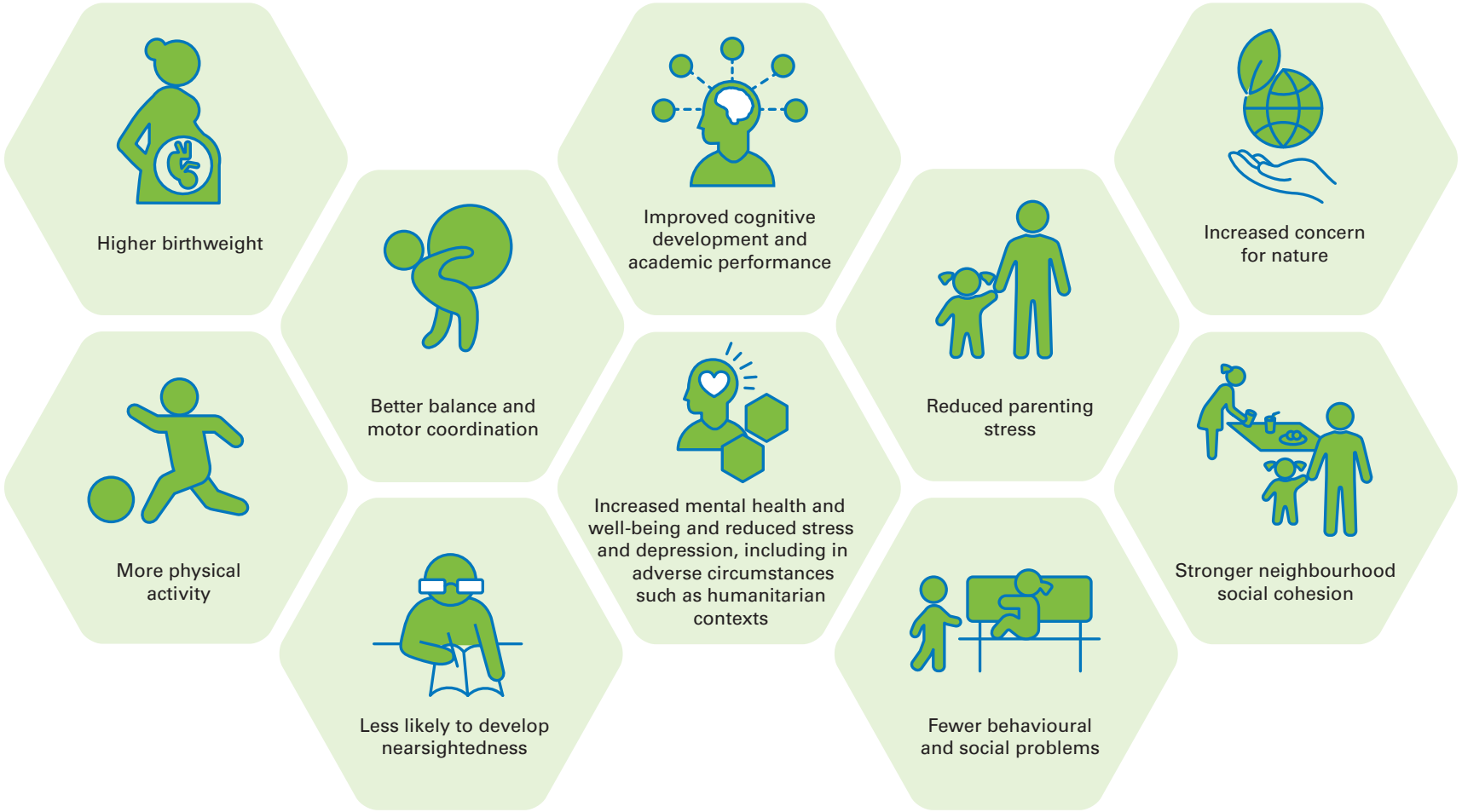
CONTENTS

EXECUTIVE SUMMARY

Green spaces can significantly benefit children's physical, mental and social development - from infancy into adulthood.



Each child, no matter where they live in the city, should be in easy walking distance from a safe and welcoming public green space. Recommended interventions focus on empowering communities to claim and maintain their local green spaces, securing government support to improve and create green space in cities, and prioritizing schools and child care centres for greening.

Recommended Community Actions

Organize regular clean-up events at local community green spaces

Establish community monitoring in green spaces popular with children to deter individuals or groups who may threaten their safety

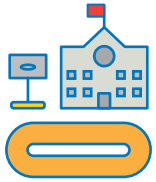
Partner with private entities to improve green spaces

Form local groups and organizations that take joint outings or offer nature education programmes for children

Build coalitions of local stakeholders, champions and experts – including children – to map the situation, pool resources, and engage local governments and institutions, such as schools and childcare centres, to preserve, improve, create, and/or maintain green spaces.

Measure progress and keep local governments accountable

Recommended Actions for Schools and Childcare Centres

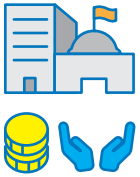


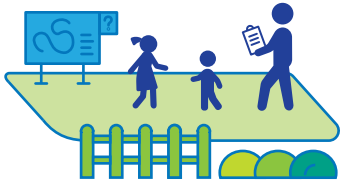
Preserve, improve, create and/or maintain green spaces on the institute's grounds.

Integrate environmental education into the curriculum, including both indoor and outdoor components.

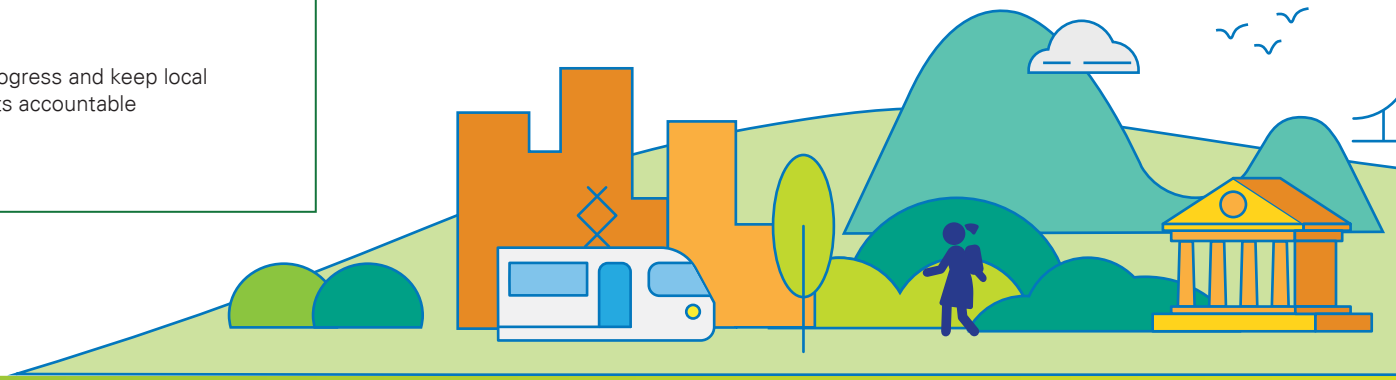
Set aside time for children's outdoor recreation during the day.

Advocate for support and funding from local governments and the private sector.





Partner with local communities to provide safe and responsible access to the institution's green spaces outside of school hours.



Recommended Actions for Municipal Governments

Set child-responsive building and infrastructure regulations, land-use standards and plans, including standards for green space.

Support real estate developers to meet and exceed regulations on the inclusion of accessible green space by new developments.

In consultation with local communities, including children, provide funds and expertise to identify, map, reclaim and redesign public spaces as green spaces.

Provide technical and financial support to create green spaces in and around schools and childcare centres.

Support community groups which maintain green spaces and organize outings for children.

Recommended Actions for National Governments

Set minimum national standards for urban green space.

Integrate standards for the inclusion of accessible green space by new developments into relevant national policies.

Allocate funds to support the preservation, improvement, creation and maintenance of green spaces.

INTRODUCTION

A simple walk in the park can significantly improve a child's ability to concentrate.[1]

Green views out of school windows correlate with improved academic performance.[2]

And children who grow up in greener neighbourhoods are often less depressed, less stressed and generally healthier and happier.[3 4 5 6 7 8 9]

Both greener views and surroundings as well as time spent within green spaces offer children numerous mental, physical and social developmental benefits and spur their growth into ecologically aware and responsible citizens. Moreover, when equally accessible, green spaces serve to reduce the health inequities suffered by socio-economically disadvantaged children.[10 11]

And yet, children's access to fields, woodlands and other green spaces is quickly diminishing. And children around the world, especially those growing up in cities, play outside considerably less often than their parents did - girls and children from developing countries less often still.[12]

City living can have negative impacts on children's development from early childhood through adolescence and beyond. Cities are often associated with higher rates of most mental health problems compared to rural areas.[13 14]

One study found an almost 40% higher risk of depression and over 20% more anxiety in urban vs. rural populations.[15] Other studies show urban living can double one's risk of developing schizophrenia.[16 17 18 19 20]

Right now, approximately 55% of all children, almost 1.5 billion, live in cities.[21] And the numbers are growing rapidly. By 2050, the number of children in cities will be close to 1.9 billion with over half living in Sub-Saharan Africa and South Asia, often in crowded settlements which lack even an inch of safe and accessible green space.[22 23] In a city like Lagos, Nigeria, the most populous city in Africa, an estimated 70% of the city's children live in slums.[24] Many will never experience the joy of playing in a river, picking fruit and flowers, or balancing across a fallen log.

This paper presents compelling and current scientific evidence that green spaces can ameliorate the negative effects of city living and help children develop to their full potential.

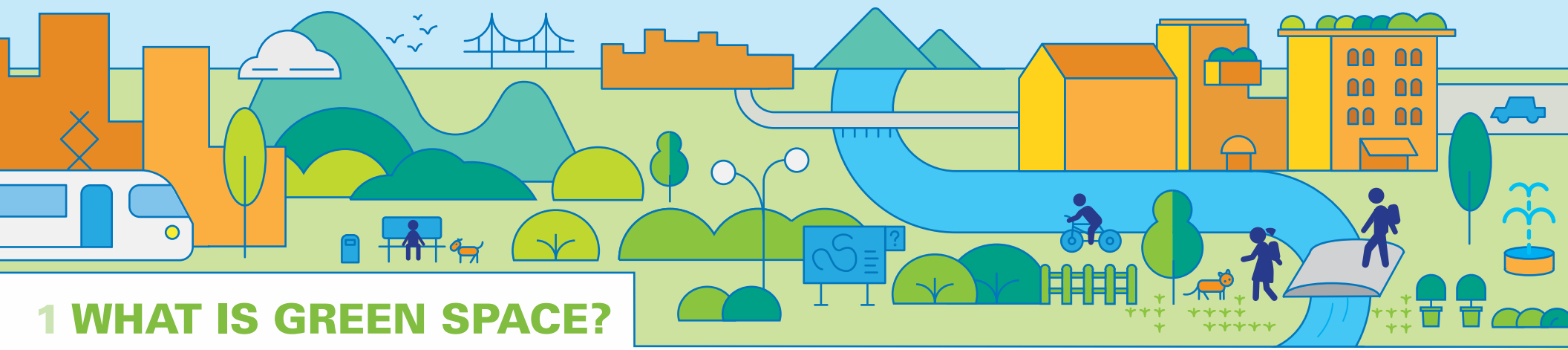
With this new evidence in hand, parents, communities, institutions and governments can take immediate action to create new green spaces and improve existing green spaces in their urban neighbourhoods, prioritizing places children naturally congregate, such as around schools and childcare centres. Where green spaces exist, maintenance of their safety and accessibility is crucial for their long-term

use, which can be achieved through community stewardship and responsible governance. Finally, community groups can play a vital role in encouraging parents to bring their children to green spaces through organized activities.

Increasing safe and accessible green spaces not only directly benefits a child's holistic development, it has also been shown to convey a host of significant health benefits for adults and economic and environmental benefits to cities such as lower health care costs, reduced levels of violence and crime and flood protection.[25] [26] [27]

To protect our children's health and happiness, we must prioritize the preservation and creation of green space within our rapidly growing cities. The evidence is compelling and the advantages are clear. We need to act.

> "I used to wake early in the morning… I was going for a morning walk, near the river Mai… I enjoyed the chilly cold of fresh morning, while I was washing there my pleasure mind made me to go little far across the river… This fresh environment brought some kind of pleasure that could make me dream of tomorrow and forget the sorrows in the life of a refugee."[28]
>
> -Arati, a 17-year old refugee from Bhutan



1 WHAT IS GREEN SPACE?

'Green space' has not been universally defined and, as of yet, there are no internationally accepted minimum standards for green space in cities. At a minimum, green space is vegetated land. Examples of green space may include public and private parks, grassy lawns, home and community gardens, playgrounds, agricultural land, overgrown vacant lots, street trees, roadside verges, and green roofs.[29]

The independent benefits of 'blue space' such as lakes, rivers, and seacoasts have been less studied but appear to have similar beneficial effects on children's development as 'green space'[30 31] and are sometimes included within green space research[32].

While even seeing green space from a window is beneficial to children's development, significantly greater benefits can be unlocked when children spend time within a safe green space, playing, creating, relaxing and reflecting. The local context, including limitations of the available space, climate, culture, community preferences and budget, will determine what form a new or existing green space can take - ranging from a single street tree to a vast public park. Children and the local community should fully participate and be heard in any design process. Methods for involving children in planning and design processes include model-making, collective drawings and focus groups, among others.[33 34]

In general, the greater diversity of natural elements in the space, the better, as the diversity enables a richer set of experiences for children – helping them unlock a fuller range of physical and psychological benefits and fostering their awareness of and concern for nature. Such benefits are more limited in manicured and monocultured green space settings. These elements may include a diversity of perennial plants, edible plants, trees, vines and shrubs, water elements, birds and other wildlife, shaded and sunny spaces, elements children can move and manipulate such as stones, mud and sand, pathways, gathering and sitting spaces, and open areas for running and organized sports[35]. Where possible, local and indigenous vegetation, adapted to the soil and climate, should be preserved or planted – for example, in dry climates, an appropriate 'green space' may not be green at all. Green elements should be considered within a holistic design process which may include additional context-appropriate elements such as topographical elements, restrooms, sports facilities, and covered spaces.[36]

Green space may be measured as green cover – such as the proportion of 'green' in a satellite image, which could be composed primarily of street trees and private gardens and does not necessarily correspond to spaces accessible to the public. Or it could be measured as land surface covered by designated 'green' areas. In this paper, most studies used one of the following types of green space measurement:

- Neighbourhood greenness, as measured by the proportion of 'green' in satellite imagery within a certain distance around a home, school or locality.
- Percent of land covered by green space, based on land-use maps, in a locality or within a certain distance around a home or school.
- Distance, usually from home, to the nearest public green space.
- Time spent in green space.
- Whether or not children see green space when looking out from a window at home or school.

'Green space' - vegetated land - may include public and private parks, grassy lawns, home, school and community gardens, playgrounds, agricultural land, overgrown vacant lots, street trees, roadside verges, green roofs, etc.

2 NORMATIVE FRAMEWORK

Children's access to safe green spaces has relevance to several international frameworks including the Convention on the Rights of the Child, the Sustainable Development Goals, the Convention on the Rights of Persons with Disabilities, the Rio Declaration on Environment and Development, the United Nations Declaration on the Rights of Indigenous Peoples, and others. The first two are highlighted below.

Convention on the Rights of the Child

The Convention on the Rights of the Child was adopted by the UN General Assembly in 1989 and has since been ratified by almost every country in the world. Children's access to green space contributes to the fulfillment of many of these rights (see Table1).

Table 1 The Convention on the Rights of the Child: Links to Green Space Access

CRC Article Number and Description[37]		Why Green Space Matters
Article 2	Non-discrimination	Inclusive public green spaces serve as equalizers of socioeconomic disparities in health[38 39]
Article 3	Best interests of the child	The best interests of the child should be a primary consideration in all actions concerning them[40] – such as when designing, creating and maintaining any green spaces which they may use
Article 6	Survival and development	Access to green space is significant for children's optimal cognitive and motor development and their health[41]
Article 12	Respect for the views of the child	Opinions of children of all ages, even very young children, should be heard and considered in matters affecting them[42] – including in the design, creation and maintenance of relevant green spaces
Article 14	Freedom of thought, conscience, and religion	Nature-based experiences strengthen young children's spiritual development and empathy[43]
Article 15	Freedom of association	Public green space increase social cohesion by providing an inclusive place for young people to interact [44 45]
Article 24	Health and health services	Children have a right to the highest attainable standard of health[46]- green spaces serve to enhance their health and well-being[47]
Article 27	Adequate standard of living	Access to safe green spaces help achieve children's right to a standard of living that adequately meets their physical and mental needs[48]
Article 29	Goals of education	Children's education should develop their abilities to the fullest potential and grow their respect for the natural environment[49]– outdoor and nature-based education, which takes advantage of green spaces, significantly enhance children's enthusiasm for learning, their academic performance, and their concern for the environment.[50 51 52 53 54 55 56 57]
Article 30	Children of minorities/ indigenous groups	Environmental education and access to culturally relevant natural places help affirm indigenous children's cultural heritage[58]
Article 31	Right to play	Green spaces promote both structured outdoor play, sport and recreation and free, unstructured and imaginative play[59 60]

Sustainable Development Goals

The seventeen Sustainable Development Goals were adopted by world leaders in 2015, and 2030 targets were set, to promote peace and justice, end all forms of poverty, fight inequalities, take on climate change and environmental degradation, and address other global challenges.

Ensuring children's access to green space can contribute to the achievement of many Sustainable Development Goal targets including:

- **3.4:** By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being
- **11.7:** By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities
- **12.8:** By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
- **13.1:** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
- **15.9:** By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

Many of the Sustainable Development Goals are clearly linked with children's development. However, the direct link of Goals 14 and 15 to children's rights has been less clear.

Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

The evidence presented in this paper demonstrates how healthy marine and terrestrial ecosystems, with a focus on the latter, are key to children's development, linking work toward Sustainable Development Goals 14 and 15 to the child rights mandate.

Children's access to green space contributes to the fulfillment of their rights and the achievement of SDG targets.

3 GREEN SPACE IS BENEFICIAL TO CHILDREN'S DEVELOPMENT

Though most research has been done in high income countries, the evidence is sufficient to assume that children universally need green space for their optimal development. There is abundant anecdotal evidence of children seeking out and benefiting from green spaces across the developing world, including during and after humanitarian crises.[61] Further, many studies have measured physiological changes such as reduced levels of stress hormones and blood pressure in children consequent to green space interventions.[62] Such autonomous biological reactions are likely to be consistent for children from any part of the world.

Benefits for children

Recent research, summarized below, has demonstrated green space can provide significant gains specifically for children's physical, mental and social health and development.

In their early years, children living closer to green spaces and attending schools with greener schoolyards have been rated healthier by their parents[69 70] (14% healthier according to one study[71]) while older children and adolescents, living in greener neighbourhoods, have self-reported better health.[72]

Does green space also matter for children in rural contexts?
Studies show that most children growing up in rural areas have significantly more nature-related experiences than their urban counterparts, in both developed and developing countries.[63 64 65] There is a lot less research on the benefits of green space for children in rural contexts, but the available evidence is in agreement with urban studies– including for improved performance on tests of attention by high school students in classrooms with greener views[66] and a better ability of children to cope with stressful events with more nearby nature.[67] For example, when 337 rural US children, in grades 3 through 5, were asked about the frequency of stressful events in their life, such as getting bullied by other kids and arguing with their parents, researchers found that, even when controlling for family income, children who lived in homes with nature views, greener yards and more indoor plants were better able to cope with stressful events—based on both the children's own ratings of self-worth and ratings of symptoms such as anxiety, depression and good behaviour by their mothers. In fact, the protective effect of nearby nature was strongest for the most vulnerable children—those experiencing the highest frequency of stressful life events.[68]

Recognizing that wealthier neighbourhoods usually have more trees, parks, gardens and other greenery, only correlational studies that controlled for socio-economic status or were exclusively carried out in low-income neighbourhoods were selected for this paper. Further evidence based on experimental, quasi-experimental and observational studies were also included.

Physical Development

Birthweight is a key indicator of child health, with low birthweight increasing the risk of infant mortality and poor health later in life. Studies indicate that mothers, especially mothers with lower education and income levels,[73] who live in greener neighbourhoods, generally give birth to **higher birthweight** babies.[74]

Early childhood is a critical period for the development of a child's gross and fine motor skills. Kindergarteners who played daily in the varied topography and vegetation of a natural environment, such as a forest, instead of a standard playground, performed significantly better on tests of **balance and motor coordination**.[75]

Research shows that children of all ages tend to engage in **more physical activity** when they have access to nearby green spaces[76 77] and, as a result, can access the physical and mental health benefits widely associated with exercise.[78] Even street trees can increase the likelihood of children's walking and cycling outdoors.[79 80]

Nearsightedness has reached epidemic proportions, especially in East Asia. In China, up to 90% of teenagers are nearsighted, of whom one-tenth are likely to develop vision loss later in life. Research is beginning to show that children who spend time in sunlight – such as in green schoolyards - are significantly **less likely to develop nearsightedness.**[81 82]

Mental development

Recently, research has linked the proportion of 'green' around schools[83] and homes[84] with children's **improved cognitive development**,[85] including evidence of higher density in cognition-related regions of children's brains.[86] Even greener window views have been found by several studies to improve concentration[87 88] and academic performance.[89 90 91 92 93] Some research indicates that natural spaces may also foster imaginative and creative play[94], considered beneficial to a child's intellectual development.

Green views from school windows improve academic performance: In a randomized controlled trial of 94 students across 5 high schools in Illinois, USA, researchers Dongying Li and William Sullivan assigned participants to 1 of 3 classrooms—a classroom with no windows, a classroom with windows that opened onto a built space, and a classroom with windows that opened onto a green space. Students with green window views recovered more quickly from stress and scored 14% better on tests of attention than students in classrooms with barren views or no windows combined.[95]

Social Development

Green spaces can provide a place of play, refuge and recovery, significantly **increasing mental health and well-being and reducing stress and depression**, especially for children of low income families—as found by several studies.[96 97 98 99 100 101 102] There are many compelling accounts of children seeking out green spaces during times of crisis, such as during the war in Sri Lanka,[103] and of impoverished children in city slums, such as in India, traveling through risky terrain to reach cherished parks.[104]

Children's stories of healing through nature[105]
After the father of Menan, a 16-year-old, was killed during the war in Sri Lanka, he preferred living on his family's land in the countryside where he had the freedom to explore the jungle paths and rice paddies. After rejoining his mother in the city, he shared a picture and essay in which he drew a young boy planting a tree, representing that "environment grows with great flourishing. Therefore… all the species of creatures live freely," and drew a man chopping down a tree, which he said represented both the environmental destruction of war and the fate of his people, who were being cut down like trees.

Green Space in Humanitarian Contexts[106]
Empirical evidence of the benefit of green spaces to children's mental health and well-being, along with children's stories of healing through nature in adverse circumstances, strongly suggest green space to be an asset in strengthening children's resilience in humanitarian contexts. As such, it would be valuable to consider integrating green spaces and activities such as gardening, where possible, into the child-centred spaces created by aid agencies in war zones and refugee camps as well as in other humanitarian programming.

Studies have also indicated that parents who live in greener neighbourhoods are less stressed,[107] and presumably bring less stress home to their children. **Reduced parenting stress** can significantly improve child behaviour and development.[108 109]

In their early years, children living in greener neighbourhoods and those living closer to city parks have **fewer behavioural and social problems**.[110 111 112]

Improved concentration of children with ADHD: After children with attention deficit and hyper-activity disorder (ADHD) took a twenty-minute walk in a city park, the improvement in their ability to concentrate was on par with improvements seen after the administration of ADHD medications. In the same study, there was no such improvement for the children who walked through a downtown district or residential neighbourhood.[113]

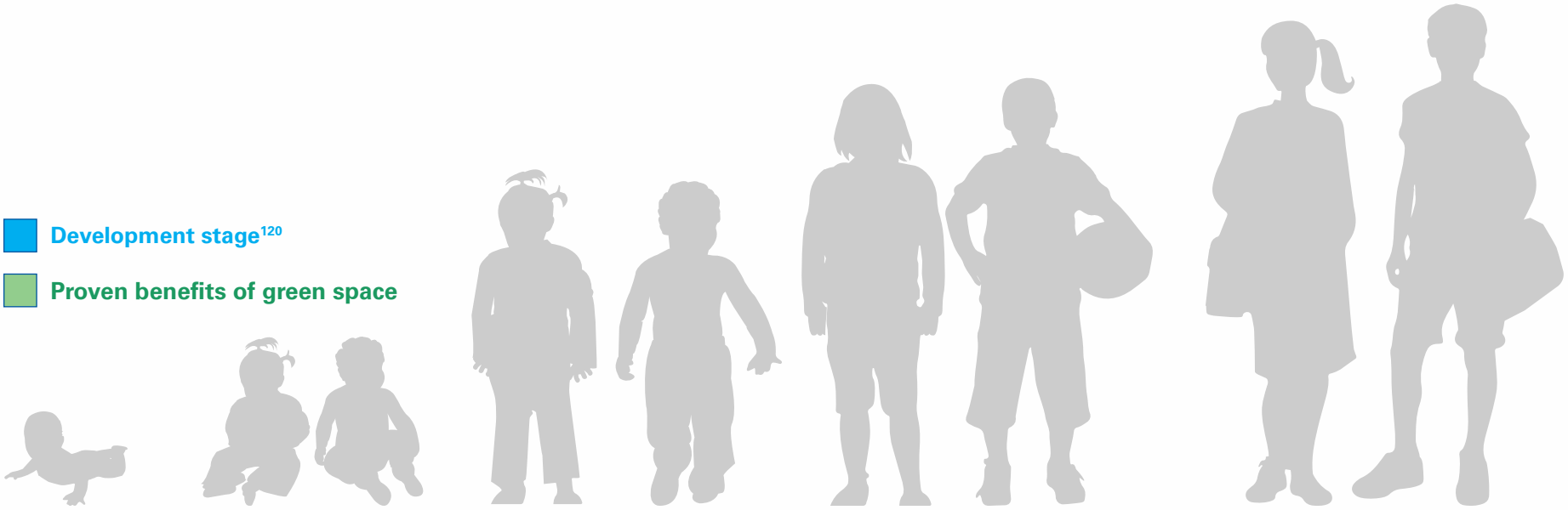
Neighbours often meet and socialize in their local parks. By fostering such relationships, green spaces can help build trust and tolerance in the local community. Research is beginning to demonstrate that, similar to adults[114], proximity to and time spent in green space tends to increase children's perception of their neighbourhood's **social cohesion**.[115 116]

Time spent in green spaces as a child significantly enhances **concern for nature** later in life.[117 118 119]

Table 2 Benefits of green space for children in each developmental stage are shown based on research that found significant results. Among correlational studies, only those that controlled for socioeconomic status or focused solely on low-income communities were considered.

Development stage[120]

Proven benefits of green space



Prenatal development and birth	Early years (0-6)	Middle years (7-11)	Early adolescence (12-14)	Middle adolescence (15-17)
Increased birthweight[121] [122] [123] [124]	• Improved balance and motor coordination[125] • More physical activity[126] • Better sleep[127] • Better general health (based on survey responses)[128] [129] [130] • Fewer behavioural and social problems[131] [132] • Lower risk of psychiatric disorders later in life[133] • Lower rates of depression[134] • Reduced nearsightedness[135] [136] [137] • Concern for nature in adulthood[138]	• Increased brain density[139] • Lower blood pressure[140] • Improved concentration and attention[141] [142] [143] [144] • Reduced hyperactivity[145] • Increased self-discipline[146] • Better working memory[147] • Better academic performance[148] [149] [150] • Better general health (based on survey responses) [151] [152] • Lower risk of psychiatric disorders later in life[153] • Lower rates of depression[154] • Better able to cope with stressful events[155] • Increased enthusiasm for learning[156] [157] • Concern for nature in adulthood[158]	• Increased physical activity[159] [160] • Better general health (based on survey responses)[161] [162] • Increased enthusiasm for learning[163] [164] • Concern for nature in adulthood[165]	• Increased physical activity[167] • Improved attention[168] • Better able to cope with stressful events[169] • Lower blood pressure and cortisol levels[170] • Better academic performance[171] [172] • Increased enthusiasm for learning[173] [174] • Concern for nature in adulthood[175]

Benefits for the city

Violence and crime

Green spaces can provide significant additional economic, social and environmental benefits for cities. Violence and crime tend to decrease around green spaces, likely a result of increased social cohesion, more people spending time outdoors, and the perception of orderly, maintained spaces.[176] [177]

Well-maintained green spaces reduce violence. Through a randomized controlled trial, researchers in Philadelphia discovered that clearing and landscaping trash-filled vacant lots in low-income neighbourhoods can reduce gun violence - resulting in a 29% decline in local shooting incidents. Based on interviews with residents, the effect was due to more people spending time outdoors which, in turn, discouraged criminals from loitering. In fact, across all neighbourhoods in the city, residents living near treated vacant lots felt significantly safer and reported a 76% increase in the time they spent outdoors.[178]

Health care costs and equity

Many municipalities are also starting to measure the economic savings green space can provide in overall health care costs. One conservative study estimates green space interventions could reduce health care costs in the United States by USD 2.3 to 4.6 billion.[179] There is evidence that the health benefits of green space are highest for children and adults from the lowest socioeconomic groups, perhaps because they generally have worse health and have more to gain.[180] [181] [182] Increasing green space in cities can not only reduce overall healthcare costs,[183] it can also help close the health gap between the rich and poor, leading to greater health equity.[184] [185]

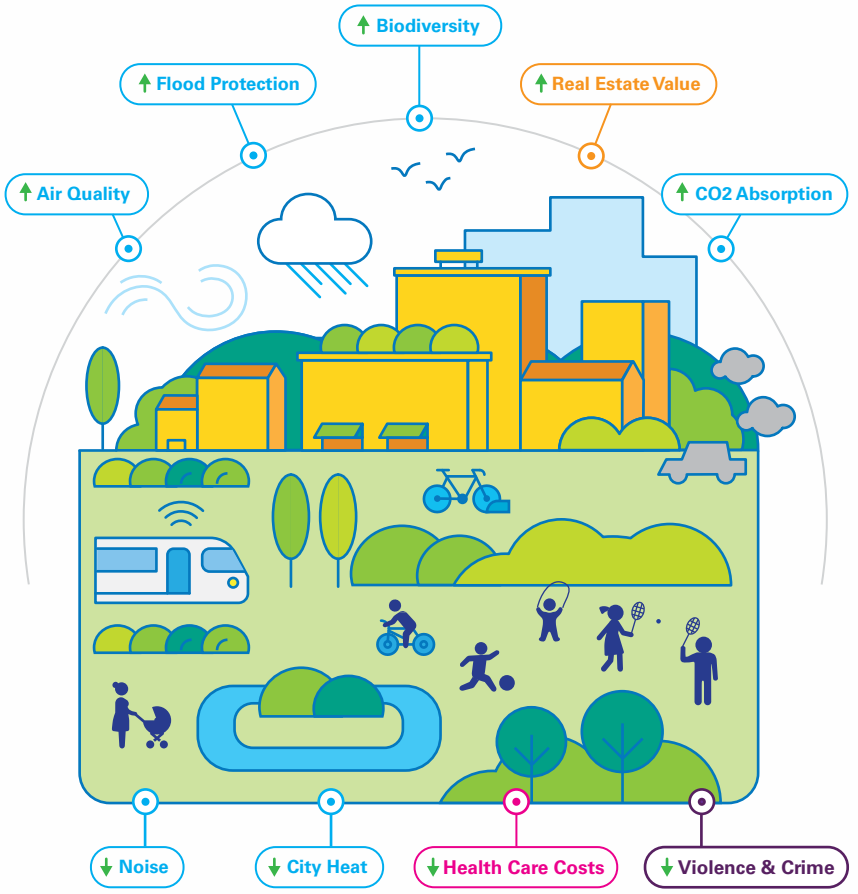
Real estate value

Since well-maintained urban green spaces can increase surrounding real estate values by 5-20%, according to one study[186], any green space interventions should consider explicit protections that anticipate affordable housing needs for lower income residents.[187]

Environmental benefits

There are a myriad of environmental benefits as well. As measured by an expert lab in Europe, these can include overall improvements in air quality, of up to 5% across the city, cooling of hot city temperatures, yielding energy savings of 6-30% in some contexts, increased drainage for flood control, dampening of noise, greater biodiversity, and CO2 absorption.[188] Taken together, these benefits reduce a city's greenhouse gas emissions and build its resilience to climate change.

Benefits for the city



Green space can provide significant gains for children's physical, mental and social health across the developing world, including during and after humanitarian crises.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4 ACCESS TO & SAFETY OF GREEN SPACES

Ideally, each child, no matter where they live in the city, would be in walking distance from a public green space and would have safe routes to get there. The space itself would be open, safe and inviting for children and their play. To achieve this ideal, challenges to children's access to green space and the safety of green spaces themselves need to be considered when advocating for, planning or designing such spaces.

Access

In many cities, green spaces are few and, even where they exist, may be inaccessible or unwelcoming to children and their play due to prohibitive distances, strict rules and power dynamics.

Distances

Distances children must travel to reach a cherished green space can be prohibitively long, especially in low income neighbourhoods, and often include traversing dangerous roads and intersections.[189] Distance to green spaces particularly constrains access for children with disabilities, younger children and girls who, in many cultures, are expected to stay closer to home.

Entrance fees, limited opening times and park rules

Ironically, the best designed and maintained green spaces, such as parks, are sometimes the most unwelcoming places for children and their play. Some parks do not allow marginalized groups, such as those living in slums, to enter or charge entrance fees, creating further challenges for low income children, and many are only open during certain times of day. Once inside a park, children may be discouraged or barred from running and playing by park rules.

Limited access of slum children to landscaped parks

Dr. Chatterjee shares the unfortunate experience of some Indian slum children with improvement projects: "Children living in a small slum in Delhi, India had access to only one badly maintained park, even though the local area had several landscaped parks. When I asked 12-year-old Rinki, who was a play leader of the slum children, what sort of improvements she would recommend for the park, she told me, 'Please don't do anything otherwise we will not be able to play here anymore.' This poignantly sums up the attitude of the city. While, in theory, investment in parks is seen as benefiting children, in practice the temptation is to protect the newly beautified parks from slum kids, who are viewed as vandals. In some communities, slum children are actively evicted from parks, which defeats the purpose of providing them as public spaces."[190]

Other users and power dynamics

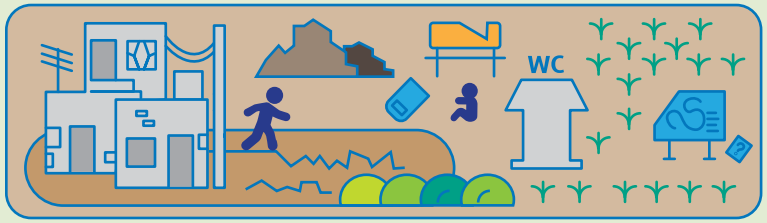
Other green space users can also proscribe children's access and activities. In some extreme cases, older residents, worried they would get hit by a ball thrown by children, actually opened litigation cases against them.[191] More commonly, natural group dynamics result in the exclusion of weaker groups from limited and coveted green spaces. In the capital city of Bangladesh, for example, where many green spaces consist only of playing fields, older boys take over these spaces to play organized sports, such as cricket, excluding girls and leaving no room for young children's creative and unstructured play.[192]

Power dynamics in outdoor spaces. A UNICEF-commissioned study on the situation of children in the low-cost, high-density "Pablo Mella Morales" housing development in the Dominican Republic revealed that children found the recreational spaces to be insufficient, explaining that when adolescents turned up they pushed the smaller kids off the space and when adults turned up they pushed the adolescents off.[193] In Delhi, India, neighbourhood parks are often controlled by caste groups who bar entry by children or adults from other castes; parks are also often treated as private gardens by some residents who prohibit active use by others, especially children.[194]

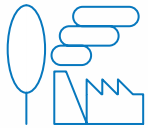
Safety

Children's safety needs to be intrinsic to green space design and maintenance. Safety is a key issue which often keeps children, especially girls, indoors or close to home[195]. Even though most parents recognize the benefit to children, they are afraid, often with good reason, to let their children freely play or travel outdoors without adult supervision.[196] [197] To increase children's access, concerns of parents need to be assessed and addressed in each context – for example, using focus groups to elicit parents' concerns. Key considerations include children's safety from violence and crime and clean and sanitary conditions of the green space, including safety from hazardous chemicals, noxious waste, air pollution and disease.

Unsafe outdoor spaces in Mumbai slums. In the slums of Mumbai, lack of safe open spaces often prevents children—especially girl children, younger children, and children with disabilities—from playing outdoors. Any common space is claimed by adults and older boys. The common open spaces in the community have turned into places to dump garbage and hot spots for substance abuse and public sexual harassment due to the lack of everyday maintenance. As children do not have access to natural play environments within the community, they actively seek out more distant green spaces, often taking great risks such as crossing major roads with heavy traffic.[198]



Air Pollution



To maximize health benefits, a green space needs good air quality. Air pollution can cause miscarriages, pre-term childbirth and low birthweight, harm the healthy development of children's brains and scar children's lungs, contributing to respiratory diseases which kill hundreds of thousands of young children each year.[199] Where and when levels of outdoor air pollution far exceed air quality guidelines set by the World Health Organization[200], children and pregnant women should take precautions to limit their exposure.

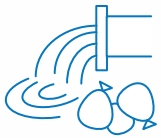
To ameliorate air quality in green spaces[201] [202]:

- Urban planners should place public and green spaces as far as possible from major pollution sources, such as highways, and take air circulation patterns into account (see box).
- As pollution levels can vary significantly across time and space, improved air quality monitoring systems should be installed to inform the public when and where safety is a concern.

- In cities where air pollution levels are high, direct measures must be taken to reduce emissions from pollution sources, such as traffic, industry and heating. Planting trees and other vegetation can help filter fine particles from the air and improve city-wide air quality but this is not sufficient to clear high levels of air pollution.
- When planting green spaces, a variety of vegetation types should be used, and allergenic species avoided, to avert any aggravation of children's asthma or other allergic reactions.

Air circulation needs to be considered when designing green spaces. Air circulation determines whether pollution builds up locally or gets disbursed. When designing urban green spaces, local sources of pollution and wind patterns must be considered. For example, green buffers can help reduce air pollution in children's play spaces if planted between play spaces and major sources of air pollution such as highways. As green spaces also have the potential to increase concentrations of air pollutants locally by reducing wind speed, when planted around a source of emissions, care must be taken in choosing safe locations when establishing a new space.[202 204]

Noxious Waste



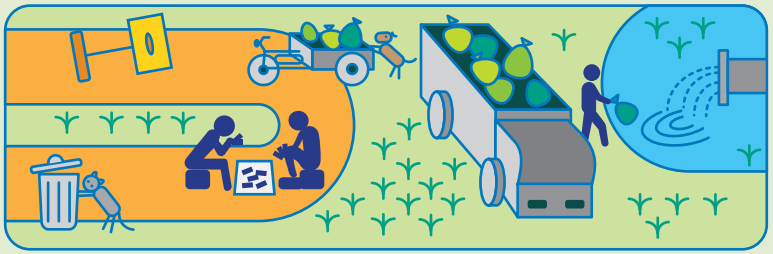
In some slums, large open spaces and even water elements, such as lakes, exist with unquestionable potential as public green spaces or playgrounds, but are often used as the community's dumping grounds and open toilets instead.[205] Such spaces cannot be reclaimed unless solutions are first developed for toilets, closed sewage systems and garbage collection. Once the waste is removed, the soil and water should also be tested for residual chemicals, such as lead and certain pesticides.

The consequences of improper design in a West Bengal slum upgrading project[206]

Kongar Nagar-I is a slum on the outskirts of Kolkata in West Bengal, on the banks of the river Ganga, which was targeted for slum upgrading between 2005 and 2012.

Before the upgrade, and in sharp contrast with the crowded slums in the core city of Kolkata, which lack any significant green space, the children of Kongar Nagar-I had access to clean rolling green fields, a pond, a large playground and abundant trees. The playground was usually empty of children – it was in bad shape and considered unsafe, as men sat around it playing cards and it was frequented by gangs of adolescent boys. Instead, young boys and girls preferred to play either on the streets inside the slum or in the fields outside. Their favorite hangout place was the shade of a Banyan tree where they would sit for hours. After middle childhood, boys and girls were not allowed to play together and, from adolescence, girls had no opportunities for play as social norms demanded they stay home to help with domestic chores.

The slum upgrading programme was mis-managed. It did not carry out a proper environmental assessment and installed open storm drains in the slum with incorrect slopes. The open drains were littered with waste in no time and discharged directly into the pond and fields, bringing garbage and foul water. The green rolling fields, beloved by children, rapidly deteriorated and posed health hazards for the children who sought these natural spaces for play. Not only did the slum upgrade project miss out on optimizing the natural resources of the site through environmental improvements, but in implementing inappropriate design strategies, caused the degradation of children's natural play spaces.



Pesticides

The spraying of pesticides can poison children, cause birth defects to the unborn, lead to developmental disorders, trigger cancers and eventually lead to death.[207] These same chemicals are often used in the maintenance of parks and other green spaces to control vectors such as mosquitoes carrying malaria or dengue. Safer alternatives should be considered and all precautions taken to ensure the safe use and handling of these harmful chemicals.

Diseases

Health risks from green spaces need to be assessed and addressed, where possible. These can include exposure to vector-borne diseases transmitted by mosquitoes, ticks or sandflies. Ingestion of animal faeces by young children can also cause serious illness and the faeces can attract flies that carry disease. As a precaution, the access of dogs and other animals to children's play areas can be limited.

Each child, no matter where they live in the city, should be in easy walking distance from a safe and welcoming public green space.

5 RECOMMENDATIONS

Recommended interventions focus on empowering communities to claim and maintain their local green spaces, securing government support to improve and create green space in cities, and prioritizing schools and child care centres for greening.

Recommendations at the level of Local Communities

Stewardship of green spaces by the local community is essential to their safety and maintenance. Naturally, a green space will fall into disrepair unless the local community takes ownership of it—using it and maintaining it regularly. There are many examples of formal and informal groups of community members organizing clean-up days, planting trees or gardens, and generally watching over their green spaces – often in partnership with the local government or institution officially responsible for maintaining the space.[208] [209] Children, including young children, can be engaged, alongside adults, in safe, playful clean-up activities.[210]

Clubs and community groups can also serve to bring children and their families together for **joint outings**. In Florianopolis, Brazil, for example, where people were once afraid to go out alone, mothers organized a community group that takes outings, together with their children, to local parks. The parents feel safety in numbers and an added social incentive to join the outings, through which they meet new people and catch up with friends, while their children play freely in the green space provided by the park.[211]

Similarly, when **child-friendly activities** are organized in local green spaces, parents feel more comfortable having their children participate. These activities may be organized by park staff, such as ranger programmes, by local organizations, such as the Scouts, or by community groups with access to the green space. For example, in China, Dr. Louv's book, *Last Child in the Woods*, recently sparked a new nature education movement. Local communities and organizations have sprung up with the purpose of facilitating children's interaction with nature by providing them with organized outdoor activities.[212]

Recommended Community Actions

Organize regular clean-up events at local community green spaces

Establish community monitoring in green spaces popular with children to deter individuals or groups who may threaten their safety

Partner with private entities to improve green spaces

Form local groups and organizations that take joint outings or offer nature education programmes for children

Build coalitions of local stakeholders, champions and experts – including children – to map the situation, pool resources, and engage local governments and institutions, such as schools and childcare centres, to preserve, improve, create, and/or maintain green spaces.

Measure progress and keep local governments accountable

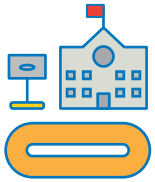
Recommendations at the level of Local Institutions: Schools and Childcare Centres

If the **grounds of schools and childcare centres can be transformed into green spaces**, in close and constant consultation with children and local communities, children attending the institutions can have immediate access to the space, they do not have to compete with adults for its use, and the institutions take responsibility for the spaces' safety. Such institutions often contain underutilized outdoor spaces which can be transformed into green havens, gardens and safe play areas. For example, in the crowded cities of Bangladesh, government-owned public schools are often the only undeveloped spaces available.[213] Furthermore, studies in the developing world have shown that school playgrounds are often the only outdoor spaces that girls can access as cultural fears and social taboos prevent them from playing in the neighbourhood.[214]

To maximize the benefits of green spaces, schools and child care centres can add **environmental education** into their curriculum, including both indoor and outdoor classroom components. Such interventions have been shown to increase children's enthusiasm for learning and improve test scores.[215] School time can also be set aside for outdoor recreation, giving children the opportunity to play freely and creatively in the natural space.

Ideally, any green space would be shared with the local community. Green schoolyards, for example, could be made **accessible to the community**, especially children, outside of school hours.

Recommended Actions for Schools and Childcare Centres

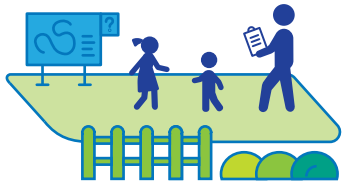


Preserve, improve, create and/or maintain green spaces on the institute's grounds.

Integrate environmental education into the curriculum, including both indoor and outdoor components.

Set aside time for children's outdoor recreation during the day.

Advocate for support and funding from local governments and the private sector.



Partner with local communities to provide safe and responsible access to the institution's green spaces outside of school hours.

Welsh Assembly Government Play Policy. In 2002, the Welsh Government adopted a Play Policy which recognizes the importance of children's free play to their development. It mandates local authorities to provide rich play environments, inclusive of all children, which meet national minimum standards. The implementation plan, developed in 2006, includes government support and funding for the creation of natural spaces on available school grounds.[216] The national charity, Play Wales, continues to successfully push the implementation of the policy.[217]

Recommendations at the level of Municipal Governments

Municipal governments are usually responsible for **setting codes and enforcing regulations** on how space throughout the city is classified, developed and maintained. They can set standards for the minimum amount of green space necessary throughout the city and can integrate holistic child-responsive design considerations in land-use plans, city development strategies, and urban planning policies.[218] An urban planning approach is recommended which simultaneously includes local project interventions and systems-level policy changes to achieve incremental change and engages children and the community every step of the way.[219 220]

- So that everyone can live near a public green space, urban planners often recommend integrating **spaces of varying sizes throughout a city**. For example, an advisory body on the natural environment for the UK government recommends green spaces at least two hectares in size to which children and their parents can walk from home in less than five minutes.[221]
- **Design solutions exist** to create varied, multi-use, green spaces throughout a city which encourage and welcome multiple types of users in the space—helping to increase access and reduce the exclusion of weaker groups. In high-density cities, existing public spaces are often occupied by parked cars, merchants, or trash, such as vacant lots, interstitial spaces next to buildings and wider areas on sidewalks and roads. These spaces can be identified and mapped, with the participation of local children and communities, reclaimed and redesigned as green space. **Innovative solutions** can be considered, such as providing incentives for green roofs that are accessible to children, creating underground green spaces, or finding temporal solutions to access private parks and gardens.

In rapidly growing cities, such as cities in Africa which are expected to more than double in population by 2050,[222] it is important for municipal governments to **work closely with real estate developers** to help them achieve, and encourage them to exceed, set standards on the inclusion of accessible green space by new developments. Where large parks are built, standards can call for the design of safe, multi-use spaces that are appropriate for a variety of age groups, especially young girls and boys. In some contexts, legislation on green space may be linked with city zoning laws that specify a minimum surface area which must be permeable.

Protecting green corridors in a rapidly urbanizing city in China. In Hangzhou, China, at a time of rapid urban growth, the State Council approved the Hangzhou City Master Plan in 2001 to develop a sustainable city that is "prosperous, harmonious, well-equipped and ecological." The protection of the historical and cultural cityscape and its integration with the natural landscape was emphasized. Actions to conserve the natural systems include protection of the cloud-capped hills and mountain areas of northwest Yuhang and hilly areas of southern Xiaoshan, as well as protecting the urban water resources of the Qiantang and Shao rivers. Other interventions include establishing suburban forest parks, water reservation areas, wetland reserves and the development of green belts along rivers, streams and roads.[223]

Recommended Actions for Municipal Governments

Set child-responsive building and infrastructure regulations, land-use standards and plans, including standards for green space.

Support real estate developers to meet and exceed regulations on the inclusion of accessible green space by new developments.

In consultation with local communities, including children, provide funds and expertise to identify, map, reclaim and redesign public spaces as green spaces.

Provide technical and financial support to create green spaces in and around schools and childcare centres.

Support community groups which maintain green spaces and organize outings for children.

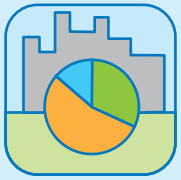
Recommendations at the level of National Governments

Recommended Actions for National Governments

Set minimum national standards for urban green space.

Integrate standards for the inclusion of accessible green space by new developments into relevant national policies.

Allocate funds to support the preservation, improvement, creation and maintenance of green spaces.



Indonesia Green City Development Programme. In 2007, the government of Indonesia mandated each city, over the next 20 years, to allocate at least 30% of its territory to green open space, 20% of which must be accessible to the public. A master plan sets 5-year benchmarks, identifies existing green open space, establishes local strategies to achieve realistic long-term and short-term objectives, and prioritizes locations for new green space development.[224] [225] The law currently remains in force, but implementation has been difficult.[226]

We can have harmony if
we have a deep reverence
for Mother Nature.

- Sri Chinmoy

6 CONCLUSION

Green space that is accessible and safe for children's play can be rare, especially in the cities of the developing world. Yet the scientifically proven advantages to children's physical, mental and social development, provided by such spaces, are real and multifold. Local communities and institutions as well as municipal and national governments are called on to recognize green spaces as valuable assets in their cities and to ensure their preservation, improvement, creation and maintenance.

7 SOME ADDITIONAL RESOURCES

UNICEF's handbook on child-responsive urban planning for all those involved in planning, designing, transforming, building and managing the built environment.

UNICEF's Child Friendly Cities Initiative supports municipal governments in realizing the rights of children at the local level using the UN Convention on the Rights of the Child as its foundation.

The Children and Nature Network, a core #NatureForAll partner, is a global movement to increase equitable access to nature so that children – and natural places – can thrive. It includes a rich research library and many other resources for anyone who is ready to take action.

The Natural Learning Initiative helps communities create stimulating places for play, outdoor learning, and environmental education.

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