



unicef 
for every child

DISCUSSION PAPER:

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

Acknowledgements

Author: Suchitra Sugar

Overall Guidance and Direction: David Anthony

Visual Communication Design: Shangning Wang

Contributions, Inputs and/or Review

UNICEF: Bassem Nasir, Celie Manuel, Cristina Colon, David Ponet, Fabio Friscia, Farai Tunhuma, Fiona Ward, Gautam Narasimhan, Godwin Mindra, Heidi Martinez, Jens Aerts, Joanne Vincenten, Kathleen Edison, Marie Wernham, Nada Elattar, Neven Knezevic, Nicholas Rees, Paige McGreevy, Rakshya Thapa, Shai Naides, Thomas George, Valentina Ruta, Willis Demas, Yoonie Choi, Zeinab Hijazi

Design Editor: Vamika Sardana

Copy-Editor: Paige McGreevy

Technical Experts: Dr. Cheryl Charles, Dr. Sudeshna Chatterjee, Dr. Louise Chawla, Dr. Roger Hart, Dr. Zakiul Islam, Dr. Marianne Krasny, Dr. Robin Moore, Dr. David Nowak, Dr. Vranckx Stijn, Dr. Ruth Wilson, Dr. Baohua Yan

Photograph Credits:

Cover: © UNICEF/UN0312703/Sokol
Page VI: © Gilbertson/UNI193997/UNICEF
Page 4-5: © UNICEF/UN017601/Ueslei Marcelino
© UNICEF/UN0346972/
© UNICEF/UNI220139/
© UNICEF/UNI117252/Estey
Page 8: © UNICEF/UN0249646/
Page 10: © UNICEF/UNI178926/Ramos
Page 12: © UNICEF/UN039713/Gilbertson VII Photo
Page 19: © UNICEF/UN045590/Kim
Page 23: © UNICEF/UN0346696/
Page 25: © UNICEF/UNI123453/Pirozzi
Page 27: © UNICEF/UNI178926/Ramos
Page 29: © UNICEF/UNI206456/
Page 31: © UNICEF/UN043546/Kapetanovic

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



CONTENTS

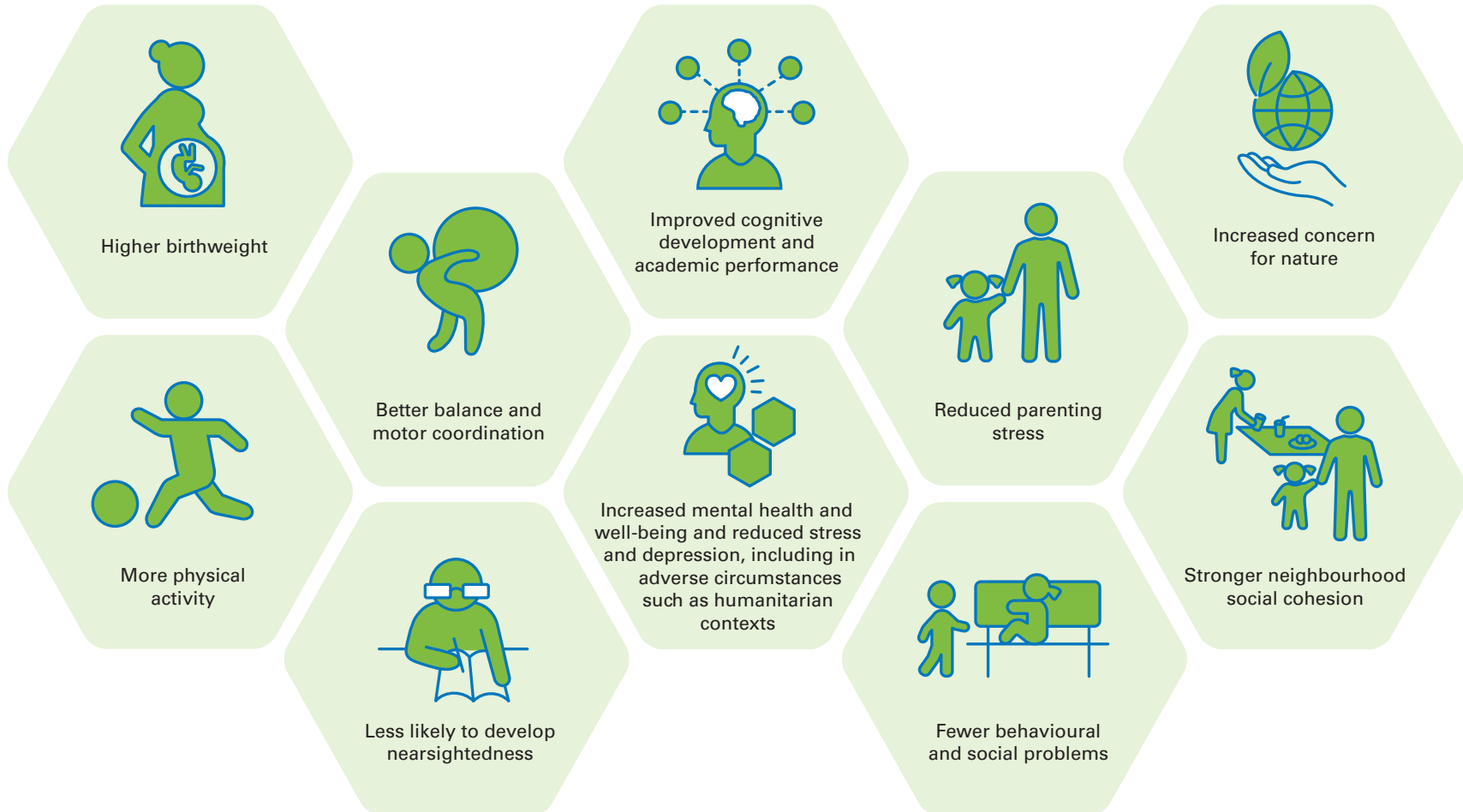
EXECUTIVE SUMMARY.....	1
INTRODUCTION.....	4
Chapter 1: WHAT IS GREEN SPACE?.....	6
Chapter 2: NORMATIVE FRAMEWORK.....	9
Convention on the Rights of the Child.....	9
Sustainable Development Goals.....	10
Chapter 3: GREEN SPACE IS BENEFICIAL TO CHILDREN’S DEVELOPMENT.....	13
Benefits for children.....	13
Physical Development.....	14
Mental development.....	14
Social Development.....	15
Benefits for the city.....	17
Chapter 4: ACCESS TO & SAFETY OF GREEN SPACES.....	20
Access.....	20
Distances.....	20
Entrance fees, limited opening times and park rules.....	20
Other users and power dynamics.....	20
Safety.....	21
Air Pollution.....	21
Noxious Waste.....	22
Pesticides.....	23
Diseases.....	23

Chapter 5: RECOMMENDATIONS.....26
 Recommendations at the level of Local Communities.....26
 Recommendations at the level of Local Institutions: Schools and Childcare Centres.....27
 Recommendations at the level of Municipal Governments.....28
 Recommendations at the level of National Governments.....29
Chapter 6: CONCLUSION.....32
Chapter 7: SOME ADDITIONAL RESOURCES.....32
Chapter 8: REFERENCES.....33



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 non-discriminatory 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 safeguarded 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 safe and accessible green spaces.



Measure progress and keep local governments accountable.

Recommended Actions for Schools and Childcare Centres



Preserve, improve, create and/or maintain safe and accessible 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 safe and accessible green spaces.

Support real estate developers to meet and exceed regulations on the inclusion of safe and 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 safe and accessible green spaces in and around schools and childcare centres.



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

Recommended Actions for National Governments



Set minimum national standards for safe and accessible urban green space.

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



Set up a ministerial/ interministerial technical body to oversee and provide guidance on urban greening issues, including allocation and monitoring of resources.



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. It is timely, as the devastating crisis, and resulting lockdowns, generated by the COVID-19 pandemic, have resulted in a surge of recreation in available green spaces and increased public appreciation of their health value.

In the current context, and with this new evidence in hand, caregivers, 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.





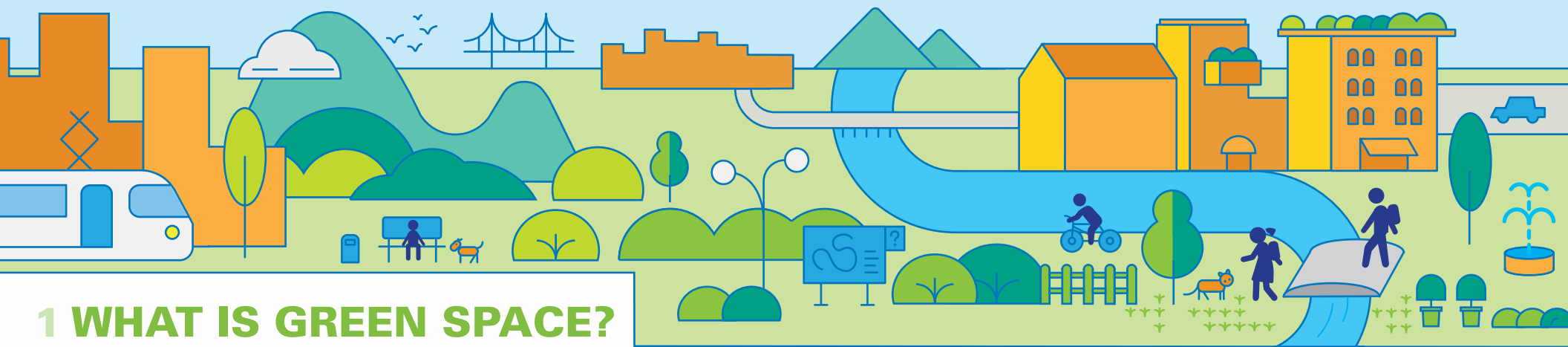
Where green spaces exist, maintenance of their safety and accessibility is crucial for their long-term use, which can be achieved through community stewardship and responsible governance. Finally, community groups can play a vital role in encouraging caregivers to bring children to green spaces through 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.





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 research³².

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 sports³⁵. 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
- **4.7:** By 2030, ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development
- **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 linked with children's development. ^{61a} 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 safe green spaces 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.^{61b} 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 parents⁶⁹⁻⁷⁰ (14% healthier according to one study⁷¹) 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.⁶³⁻⁶⁵ 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 views⁶⁶ 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 schools⁸³ and homes⁸⁴ 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 play⁹⁴, 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 nature¹⁰⁵

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 Contexts¹⁰⁶

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/caregivers 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 adults¹¹⁴, 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 stage¹²⁰

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)
<p>Increased birthweight¹²¹ 122 123 124</p>	<ul style="list-style-type: none"> • Improved balance and motor coordination¹²⁵ • More physical activity¹²⁶ • Better sleep¹²⁷ • Better general health (based on survey responses)^{128 129 130} • Fewer behavioural and social problems^{131 132} • Lower risk of psychiatric disorders later in life¹³³ • Lower rates of depression¹³⁴ • Reduced nearsightedness^{135 136 137} • Concern for nature in adulthood¹³⁸ 	<ul style="list-style-type: none"> • Increased brain density¹³⁹ • Lower blood pressure¹⁴⁰ • Improved concentration and attention^{141 142 143 144} • Reduced hyperactivity¹⁴⁵ • Increased self-discipline¹⁴⁶ • Better working memory¹⁴⁷ • Better academic performance^{148 149 150} • Better general health (based on survey responses)^{151 152} • Lower risk of psychiatric disorders later in life¹⁵³ • Lower rates of depression¹⁵⁴ • Better able to cope with stressful events¹⁵⁵ • Increased enthusiasm for learning^{156 157} • Concern for nature in adulthood¹⁵⁸ 	<ul style="list-style-type: none"> • Increased physical activity^{159 160} • Better general health (based on survey responses)^{161 162} • Increased enthusiasm for learning^{163 164} • Concern for nature in adulthood¹⁶⁵ 	<ul style="list-style-type: none"> • Increased physical activity¹⁶⁷ • Improved attention¹⁶⁸ • Better able to cope with stressful events¹⁶⁹ • Lower blood pressure and cortisol levels¹⁷⁰ • Better academic performance^{171 172} • Increased enthusiasm for learning^{173 174} • Concern for nature in adulthood¹⁷⁵

Benefits for the city

Violence, crime and road safety

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 177a} Green spaces can also help calm traffic and reduce road injuries - the leading cause of death for children over the age of five.^{177b}



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 shootings. Based on interviews with residents, the effect was due to more people spending time outdoors which, in turn, discouraged criminals from loitering. Across all neighbourhoods in the city, residents living near treated vacant lots felt significantly safer and reported a 76% increase in time spent outdoors.¹⁷⁸

Health care costs and equity

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 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 study¹⁸⁶, any green space interventions should consider explicit protections that anticipate affordable housing needs for lower income residents.¹⁸⁷

Urban resilience and environmental benefits

As measured by an expert lab in Europe, environmental benefits 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 and aquifer recharge for flood control, dampening of noise, greater biodiversity, and CO₂ absorption.¹⁸⁸ Integrated within a framework of climate and environment friendly policies, green space can increase a city's resilience to climate change and build a sustainable future for children.



Green space can provide significant gains for children's physical, mental and social health across the developing world, including during and after humanitarian crises.



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 of all abilities 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. Children and caregivers with disabilities face additional access challenges.

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.^{189a} 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



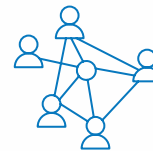
Ironically, the best designed and maintained green spaces, such as parks, are sometimes the most unwelcoming places for children and their play. Some parks forcibly remove or deny access to marginalized groups, such as street children - denying their right to peaceful assembly and association in public spaces.^{189b} Some also 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

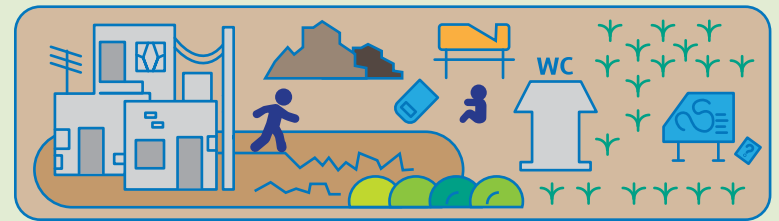
Power dynamics in outdoor spaces. A UNICEF-commissioned study on the situation of children in the low-cost, high-density “Pablo Mella Morales” housing development in the Dominican Republic revealed that children found the recreational spaces to be insufficient, explaining that when adolescents turned 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 home¹⁹⁵. Even though most caregivers 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 caregivers need to be assessed and addressed in each context – for example, using focus groups to elicit caregivers’ concerns. Key considerations include children’s safety from violence and crime, safety from road traffic injuries, and clean and sanitary conditions of the green space.

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 Organization²⁰⁰, children and pregnant women should take precautions to limit their exposure.

To ameliorate air quality in green spaces²⁰¹ 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.

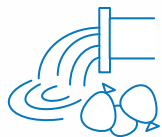
Air circulation determines whether pollution builds up locally or gets disbursed. When designing urban green spaces, local sources of pollution and wind patterns must be considered. For example, green buffers can help reduce air pollution in children's play spaces if planted between play spaces and major 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.

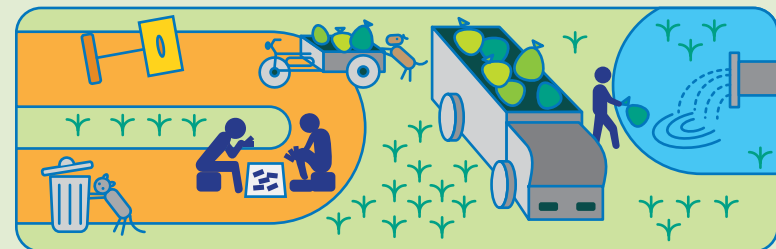


The consequences of improper design in a West Bengal slum upgrading project²⁰⁶

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

Building a sense of **joint ownership** and **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**, ensuring proper child safeguarding measures. 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 caregivers 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 properly **safeguarded child-friendly activities** are organized in local green spaces, caregivers 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



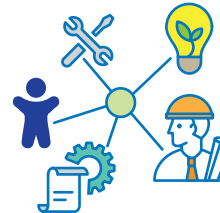
Organize regular clean-up events at local community green spaces.

Establish non-discriminatory 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 safeguarded 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 safe and accessible 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 centers can add **environmental education** and/or **education for sustainable development** 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, while helping them develop life skills needed to learn, work and engage with their communities.

Ideally, any green space would be shared with the local community and take the special needs of the disabled into consideration. Green schoolyards, for example, could be made **accessible to the community**, especially children, outside of school hours. To make schools more environmentally sustainable and resilient to natural disasters, renewable energy and climate-smart water, sanitation and hygiene solutions can be considered alongside green space interventions.



Recommended Actions for Schools and Childcare Centres



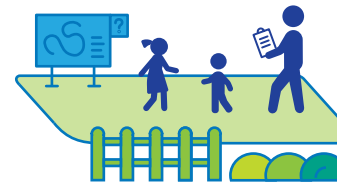
Preserve, improve, create and/or maintain safe and accessible green spaces on the institute's grounds.

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 and integrate holistic design considerations in land-use plans, city development strategies, and urban planning policies, taking into account the needs of children and caregivers from all backgrounds and abilities.²¹⁸ An urban planning approach is recommended which simultaneously includes local project interventions and systems-level policy changes while engaging children and the community every step of the way.^{219 220} Refer to [UNICEF's handbook on child-responsive urban planning](#).

- So that everyone can live near a public green space, urban planners often recommend integrating **spaces of varying sizes throughout a city**. 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 caregivers 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 safe and accessible green space.

Support real estate developers to meet and exceed regulations on the inclusion of accessible and safe 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 safe and accessible green spaces.

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



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

Recommendations at the level of National Governments

Recommended Actions for National Governments



Set minimum national standards for safe and accessible urban green space.

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



Set up a ministerial/interministerial technical body to oversee and provide guidance on urban greening issues, including allocation and monitoring of resources.



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



Nature's beauty
Teaches optimism
To the aspiring heart.

- 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.

REFERENCES

- (Faber Taylor and Kuo 2009) from Chawla 2015
- Li, D., Sullivan, W.C., (2016). Impact of views to school landscapes on recovery from stress and mental fatigue. *Landscape and Urban Planning*, 148, 149-158.
- Urban green spaces and health. Copenhagen: WHO Regional Office for Europe, 2016.
- Song C, Ikei H, Miyazaki Y. Physiological Effects of Nature Therapy: A Review of the Research in Japan. *Int J Environ Res Public Health*. 2016;13(8):781. Published 2016 Aug 3. doi:10.3390/ijerph13080781
- Kyung Song, Min & Bang, Kyung-Sook. (2017). A Systematic Review of Forest Therapy Programs for Elementary School Students. *Child Health Nursing Research*. 23. 300-311. 10.4094/chnr.2017.23.3.300.
- Maas J, Verheij RA, de Vries S, et al Morbidity is related to a green living environment *Journal of Epidemiology & Community Health* 2009; 63:967-973.
- Amoly E, Dadvand P, Fornis J, López-Vicente M, Basagaña X, Julvez J, Alvarez- Pedrerol M, Nieuwenhuijsen MJ, Sunyer J. 2014. Green and blue spaces and behavioural development in Barcelona schoolchildren: the BREATHE Project. *Environ Health Perspect* 122:1351–1358;
- Markevych et al. 2014. A cross-sectional analysis of the effects of residential greenness on blood pressure in 10-year old children: results from the GINplus and LISApplus studies. *BMC Public Health* 2014;14:477
- Wells, N. M., & Evans, G. W. (2003). Nearby Nature: A Buffer of Life Stress among Rural Children. *Environment and Behaviour*, 35(3), 311–330.
- Braubach M., Egorov A., Mudu P., Wolf T., Ward Thompson C., Martuzzi M. (2017) Effects of Urban Green Space on Environmental Health, Equity and Resilience. In: Kabisch N., Korn H., Stadler J., Bonn A. (eds) *Nature-Based Solutions to Climate Change Adaptation in Urban Areas. Theory and Practice of Urban Sustainability Transitions*. Springer, Cham
- Richard J. Mitchell, Elizabeth A. Richardson, Niamh K. Shortt, Jamie R. Pearce, Neighbourhood Environments and Socioeconomic Inequalities in Mental Well-Being, *American Journal of Preventive Medicine*, Volume 49, Issue 1, 2015, Pages 80-84, <https://doi.org/10.1016/j.amepre.2015.01.017>.
- [Singer, D. G., Singer, J. L., D'Agostino, H., & DeLong, R.](#) (2009). Children's pastimes and play in sixteen nations. *American Journal of Play*, 1(3), 283-312.
- Lambert KG, Nelson RJ, Jovanovic T, Cerdá M (2015) Brains in the city: Neurobiological effects of urbanization. *Neurosci Biobehav Rev* 58:107–122.
- Lederbogen F, et al. (2011) City living and urban upbringing affect neural social stress processing in humans. *Nature* 474:498–501
- Peen, J. , Schoevers, R. A., Beekman, A. T. and Dekker, J. (2010), The current status of urban-rural differences in psychiatric disorders. *Acta Psychiatrica Scandinavica*, 121: 84-93. doi:[10.1111/j.1600-0447.2009.01438.x](https://doi.org/10.1111/j.1600-0447.2009.01438.x)
- Peen, J. , Schoevers, R. A., Beekman, A. T. and Dekker, J. (2010), The current status of urban-rural differences in psychiatric disorders. *Acta Psychiatrica Scandinavica*, 121: 84-93. doi:[10.1111/j.1600-0447.2009.01438.x](https://doi.org/10.1111/j.1600-0447.2009.01438.x)
- Joanne Newbury, Louise Arseneault, Avshalom Caspi, Terrie E. Moffitt, Candice L. Odgers, Helen L. Fisher; Why Are Children in Urban Neighbourhoods at Increased Risk for Psychotic Symptoms? Findings From a UK Longitudinal Cohort Study, *Schizophrenia Bulletin*, Volume 42, Issue 6, 1 November 2016, Pages 1372–1383, <https://doi.org/10.1093/schbul/sbw052>
- Mortensen PB, et al. (1999) Effects of family history and place and season of birth on the risk of schizophrenia. *N Engl J Med* 340:603–608.
- Vassos E, Pedersen CB, Murray RM, Collier DA, Lewis CM (2012) Meta-analysis of the association of urbanicity with schizophrenia. *Schizophr Bull* 38:1118–1123.
- Residential green space in childhood is associated with lower risk of psychiatric disorders from adolescence into adulthood. Kristine Engemann, Carsten Bøcker Pedersen, Lars Arge, Constantinos Tsirogiannis, Preben Bo Mortensen, Jens-Christian Svenning. *Proceedings of the National Academy of Sciences* Feb 2019, 201807504; DOI: 10.1073/pnas.1807504116
- Calculation: from file [POP/8-1: Total population \(both sexes combined\) by broad age group, region, subregion and country, 1950-2100 \(thousands\)](#); 2,596,771,000 aged 0-19, medium variant, estimated for 2020 (2019 not available). Multiplied by 56.2% from query on 2020 in [Annual Percentage of Population at Mid-Year Residing in Urban Areas](#).
- United Nations, Department of Economic and Social Affairs, Population Division, 2018 Revision of World Urbanization Prospects, and 2017 Revision of World Population Prospects UN Department of Economic and Social Affairs, New York, 2018. Calculated: from file [POP/8-1: Total population \(both sexes combined\) by broad age group, region, subregion and country, 1950-2100 \(thousands\)](#); 2,758,787,000 world total, 935,471,000 in Sub-Saharan Africa, 626,072,000 in Southern Asia, aged 0-19, medium variant, estimated for 2050. Multiplied by 68.4% from query on 2050 in [Annual Percentage of Population at Mid-Year Residing in Urban Areas](#).
- Rigolon, Alessandro & Browning, Matthew & Lee, Kangjae & Shin, Seunguk. (2018). Access to Urban Green Space in Cities of the Global South: A Systematic Literature Review. *Urban Science*. 2. 67-91. 10.3390/urbansci2030067.
- Ibidun O. Adelekan, PhD. VULNERABILITY OF POOR URBAN COASTAL COMMUNITIES TO CLIMATE CHANGE IN LAGOS. Fifth Urban Research Symposium Marseille 2009. University of Ibadan, Ibadan, Nigeria
- Kondo, M.C.; Fluehr, J.M.; McKeon, T.; Branas, C.C. Urban Green Space and Its Impact on Human Health. *Int. J. Environ. Res. Public Health* 2018, 15, 445.
- Bogar, S., & Beyer, K. M. (2016). Green Space, Violence, and Crime: A Systematic Review. *Trauma, Violence, & Abuse*, 17(2), 160–171. <https://doi.org/10.1177/1524838015576412>
- <https://groentool.antwerpen.be/themes.xhtml#lucht>
- Tidball, Keith & Krasny, Marianne. (2013). Greening in the Red Zone: Disaster, Resilience, and Community Greening.
- Urban green spaces and health. Copenhagen: WHO Regional Office for Europe, 2016
- Völker, Sebastian & Kistemann, Thomas. (2011). The impact of blue space on human health and well-being - Salutogenetic health effects of inland surface waters: A review. *International journal of hygiene and environmental health*. 214. 449-60. 10.1016/j.ijheh.2011.05.001.
- Gascon, Mireia & Zijlema, Wilma & Vert, Cristina & P. White, Mathew & J Nieuwenhuijsen, Mark. (2017). Outdoor blue spaces, human health and well-being: A systematic review of quantitative studies. *International Journal of Hygiene and Environmental Health*. 220. 10.1016/j.ijheh.2017.08.004.
- Urban green spaces and health. Copenhagen: WHO Regional Office for Europe, 2016
- Iltus, S., & Hart, R. (1994). Participatory planning and design of recreational spaces with children. *Architecture & Comportement/Architecture & Behaviour*, 10(4), 361-370.
- Khan, M., Bell, S., McGeown, S., Silveirinha de Oliveira, E., (2019). Designing an outdoor learning environment for and with a primary school community: A case study in Bangladesh. *Landscape Research*
- https://naturalelearning.org/wp-content/uploads/2017/09/Top-Ten-Activity-Settings_InfoSheet.pdf
- Chawla, Louise. (2015). Benefits of Nature Contact for Children. *Journal of Planning Literature*. 30. 10.1177/0885412215595441.
- Convention on the Rights of the Child <https://www.unicef.org/child-rights-convention/convention-text>
- Braubach M., Egorov A., Mudu P., Wolf T., Ward Thompson C., Martuzzi M. (2017) Effects of Urban Green Space on Environmental Health, Equity and Resilience. In: Kabisch N., Korn H., Stadler J., Bonn A. (eds) *Nature-Based Solutions to Climate Change Adaptation in Urban Areas. Theory and Practice of Urban Sustainability Transitions*. Springer, Cham
- Richard J. Mitchell, Elizabeth A. Richardson, Niamh K. Shortt, Jamie R. Pearce, Neighbourhood Environments and Socioeconomic Inequalities in Mental Well-Being, *American Journal of Preventive Medicine*, Volume 49, Issue 1, 2015, Pages 80-84, <https://doi.org/10.1016/j.amepre.2015.01.017>.
- Convention on the Rights of the Child <https://www.unicef.org/child-rights-convention/convention-text>
- Chawla, Louise. (2015). Benefits of Nature Contact for Children. *Journal of Planning Literature*. 30. 10.1177/0885412215595441.
- Convention on the Rights of the Child <https://www.unicef.org/child-rights-convention/convention-text>
- Schein, D., (2014). Nature's role in children's spiritual development. *Children, Youth and Environments*, 24(2), 78-101.
- Dimitrova, B Tilov, A Dzhambov; Social cohesion mediates the association between urban greenspace and mental health in youth: Donka Dimitrova, *European Journal of Public Health*, Volume 27, Issue suppl_3, 1 November 2017, cck189.123, <https://doi.org/10.1093/eurpub/ckx189.123>

45. Klaus Seeland, Sabine Dübendorfer, Ralf Hansmann, Making friends in Zurich's urban forests and parks: The role of public green space for social inclusion of youths from different cultures, *Forest Policy and Economics*, Volume 11, Issue 1, 2009, Pages 10-17, ISSN 1389-9341, <https://doi.org/10.1016/j.forpol.2008.07.005>.
46. Convention on the Rights of the Child <https://www.unicef.org/child-rights-convention/convention-text>
47. Chawla, Louise. (2015). Benefits of Nature Contact for Children. *Journal of Planning Literature*. 30. 10.1177/0885412215595441.
48. Chawla, Louise. (2015). Benefits of Nature Contact for Children. *Journal of Planning Literature*. 30. 10.1177/0885412215595441.
49. Convention on the Rights of the Child <https://www.unicef.org/child-rights-convention/convention-text>
50. Lieberman & Hoody (1998) Closing the achievement gap: Using the environment as an integrating context for learning. Results of a Nationwide Study. Sand Diego: SEER.
51. Kuo, M., Barnes, M., Jordan, C., (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10
52. Wells, Nancy M. and Kristi S. Lekies. (2006). "Nature and the Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism." *Children, Youth and Environments* 16(1): 1-24.
53. Chawla, Louise & Derr, Victoria. 2012. The development of conservation behaviours in childhood and youth. In S. Clayton (Ed.), *The Oxford handbook of environmental and conservation psychology* (pp. 527-555). Oxford University Press.
54. Wu et al. (2014). Linking student performance in Massachusetts elementary schools with the "greenness" of school surroundings using remote sensing. *PLoS ONE* 9(10): e108548: 1-9
55. Kuo, M., Barnes, M., Jordan, C., (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10
56. Kuo M, Browning MHEM, Sachdeva S, Lee K, Westphal L. Might School Performance Grow on Trees? Examining the Link Between "Greenness" and Academic Achievement in Urban, High-Poverty Schools. *Front Psychol*. 2018;9:1669. Published 2018 Sep 25. doi:10.3389/fpsyg.2018.01669
57. H. Matsuoka, Rodney. (2010). Student performance and high school landscapes: Examining the links. *Landscape and Urban Planning*. 97. 273-282.
58. Baines, C., Zarger, R.K., (2017). "It's good to learn about the plants": Promoting social justice and community health through the development of a Maya environmental and cultural heritage curriculum in southern Belize. *Journal of Environmental Studies and Sciences*, 7(3), 416-424.
59. Chawla, Louise. (2015). Benefits of Nature Contact for Children. *Journal of Planning Literature*. 30. 10.1177/0885412215595441.
60. Boone-Heinonen J, Casanova K, Richardson AS, Gordon-Larsen P. Where can they play? Outdoor spaces and physical activity among adolescents in U.S. urbanized areas. *Prev Med*. 2010;51(3-4):295-8.
61. (a) Wernham, M. Mapping the Global Goals for Sustainable Development and the Convention on the Rights of the Child.
(b) UNICEF Tidball, Keith & Krasny, Marianne. (2013). Greening in the Red Zone: Disaster, Resilience, and Community Greening.
62. Song C, Ikei H, Miyazaki Y. Physiological Effects of Nature Therapy: A Review of the Research in Japan. *Int J Environ Res Public Health*. 2016;13(8):781. Published 2016 Aug 3. doi:10.3390/ijerph13080781
63. Singer, D. G., Singer, J. L., D'Agostino, H., DeLong, R., (2009). Children's pastimes and play in sixteen nations. *American Journal of Play*, 1(3), 283-312.
64. Muslim, H.F.M., Hosaka, T., Numata, S., Yahya, N.A., (2017). Nature-related experience during childhood in urban and rural areas: The case of Peninsular Malaysians. *Urban Studies Research*, 2017
65. Hsu, S-H, (2017). Significant life experiences affect environmental action: A critical review of Taiwanese research. *Japanese Journal of Environmental Education*, 26(4), 51-56.
66. Li, D., Sullivan, W.C., (2016). Impact of views to school landscapes on recovery from stress and mental fatigue. *Landscape and Urban Planning*, 148, 149-158.
67. Wells, N. M., & Evans, G. W. (2003). Nearby Nature: A Buffer of Life Stress among Rural Children. *Environment and Behaviour*, 35(3), 311-330.
68. Wells, N. M., & Evans, G. W. (2003). Nearby Nature: A Buffer of Life Stress among Rural Children. *Environment and Behaviour*, 35(3), 311-330.
69. Söderström, M., Boldemann, C., Sahlin, U., Mårtensson, F., Raustorp, A., & Blennow, M. (2013). The quality of the outdoor environment influences children's health – a cross-sectional study of preschools. *Acta Paediatrica*, 102(1), 83-91.
70. Aggio. (2015) Mothers' perceived proximity to green space is associated with TV viewing time in children: the Growing Up in Scotland study. *Prev Med*. 2015 Jan;70:46-9
71. Feng, X., Astell-Burt, T., (2017). Do greener areas promote more equitable child health?. *Health & Place*, 46, 267-273.
72. Kytä, A., Broberg, A., & Kahila, M. (2012). Urban Environment and Children's Active Lifestyle: SoftGIS Revealing Children's Behavioural Patterns and Meaningful Places. *American Journal of Health Promotion*, 26(5), e137-e148.
73. (Dadvand2012a,b, Dadvand2014, Agay-Shay2014),
74. Dzhambov, A. M., Dimitrova, D. D., & Dimitrakova, E. D.. (2014). Association between residential greenness and birth weight: Systematic review and meta-analysis. *Urban Forestry & Urban Greening*, 13(4), 621-629.
75. From Chawla2015 referencing Fjortoft 2001 and Grahn 1997
76. Chawla, Louise. (2015). Benefits of Nature Contact for Children. *Journal of Planning Literature*. 30. 10.1177/0885412215595441.
77. Boone-Heinonen J, Casanova K, Richardson AS, Gordon-Larsen P. Where can they play? Outdoor spaces and physical activity among adolescents in U.S. urbanized areas. *Prev Med*. 2010;51(3-4):295-8.
78. Janssen, Ian & Leblanc, Allana. (2010). Systemic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioural Nutrition & Physical Activity*, 7, 40. The international journal of behavioural nutrition and physical activity. 7. 40. 10.1186/1479-5868-7-40.
79. Larsen K, Gilliland J, Hess P, Tucker P, Irwin J, He M. The influence of the physical environment and sociodemographic characteristics on children's mode of travel to and from school. *Am J Public Health*. 2009;99(3):520-6.
80. Lovasi, Gina & Jacobson, Judith & W Quinn, James & Neckerman, Kathryn & Ashby-Thompson, Maxine & Rundle, Andrew. (2011). Is the Environment Near Home and School Associated with Physical Activity and Adiposity of Urban Preschool Children?. *Journal of urban health : bulletin of the New York Academy of Medicine*. 88. 1143-57. 10.1007/s11524-011-9604-3.
81. Dolgin, E. (2015). The myopia boom – Short-sightedness is reaching epidemic proportions. Some scientists think they have found a reason why. *Nature*, 519, 276-278.
82. Morgan, I.C., Rose, K.A., (2019). Myopia: Is the nature-nurture debate finally over?. *Clinical and Experimental Optometry*, 102(1), 3-17.
83. Green spaces and cognitive development in children Payam Dadvand, Mark J. Nieuwenhuisen, Mikel Esnaola, Joan Fornas, Xavier Basagaña, Mar Alvarez-Pedrerol, Ioar Rivas, Mónica López-Vicente, Montserrat De Castro Pascual, Jason Su, Michael Jerrett, Xavier Querol, Jordi Sunyer Proceedings of the National Academy of Sciences Jun 2015, 112 (26) 7937-7942
84. Amoly E, Dadvand P, Fornas J, López-Vicente M, Basagaña X, Julvez J, Alvarez-Pedrerol M, Nieuwenhuisen MJ, Sunyer J. 2014. Green and blue spaces and behavioural development in Barcelona schoolchildren: the BREATHE Project. *Environ Health Perspect* 122:1351-1358;
85. Chawla, Louise. (2015). Benefits of Nature Contact for Children. *Journal of Planning Literature*. 30. 10.1177/0885412215595441.
86. Dadvand 2018
87. ANDREA FABER TAYLOR, FRANCES E. KUO, WILLIAM C. SULLIVAN, VIEWS OF NATURE AND SELF-DISCIPLINE: EVIDENCE FROM INNER CITY CHILDREN, *Journal of Environmental Psychology*, Volume 22, Issues 1-2, 2002, Pages 49-63
88. Wells, N. M. (2000). At Home with Nature: Effects of "Greenness" on Children's Cognitive Functioning. *Environment and Behaviour*, 32(6), 775-795.
89. Wu et al. (2014). Linking student performance in Massachusetts elementary schools with the "greenness" of school surroundings using remote sensing. *PLoS ONE* 9(10): e108548: 1-9
90. H. Matsuoka, Rodney. (2010). Student performance and high school landscapes: Examining the links. *Landscape and Urban Planning*. 97. 273-282.
91. Li, D., Sullivan, W.C., (2016). Impact of views to school landscapes on recovery from stress and mental fatigue. *Landscape and Urban Planning*, 148, 149-158.
92. Kuo M, Browning MHEM, Sachdeva S, Lee K, Westphal L. Might School Performance Grow on Trees? Examining the Link Between "Greenness" and Academic Achievement in Urban, High-Poverty Schools. *Front Psychol*. 2018;9:1669. Published 2018 Sep 25. doi:10.3389/fpsyg.2018.01669
93. Matluba Khan, Sarah P. McGeown & Mohammed Zakiul Islam (2019) 'There is no better way to study science than to collect and analyse data in your own yard': outdoor classrooms and primary school children in Bangladesh, *Children's Geographies*, 17:2, 217-230, DOI:

- 10.1080/14733285.2018.1490007
94. Chawla, Louise. (2015). Benefits of Nature Contact for Children. *Journal of Planning Literature*. 30. 10.1177/0885412215595441.
 95. Li, D., Sullivan, W.C., (2016). Impact of views to school landscapes on recovery from stress and mental fatigue. *Landscape and Urban Planning*, 148, 149-158.
 96. Urban green spaces and health. Copenhagen: WHO Regional Office for Europe, 2016.
 97. Song C, Ikei H, Miyazaki Y. Physiological Effects of Nature Therapy: A Review of the Research in Japan. *Int J Environ Res Public Health*. 2016;13(8):781. Published 2016 Aug 3. doi:10.3390/ijerph13080781
 98. Kyung Song, Min & Bang, Kyung-Sook. (2017). A Systematic Review of Forest Therapy Programs for Elementary School Students. *Child Health Nursing Research*. 23. 300-311. 10.4094/chnr.2017.23.3.300.
 99. Maas J, Verheij RA, de Vries S, et al Morbidity is related to a green living environment *Journal of Epidemiology & Community Health* 2009; 63:967-973.
 100. Amoly E, Dadvand P, Forns J, López-Vicente M, Basagaña X, Julvez J, Alvarez- Pedrerol M, Nieuwenhuijsen MJ, Sunyer J. 2014. Green and blue spaces and behavioural development in Barcelona schoolchildren: the BREATHE Project. *Environ Health Perspect* 122:1351-1358;
 101. Markevych et al. 2014. A cross-sectional analysis of the effects of residential greenness on blood pressure in 10-year old children: results from the GINIplus and LISAPlus studies. *BMC Public Health*201414:477
 102. Wells, N. M., & Evans, G. W. (2003). Nearby Nature: A Buffer of Life Stress among Rural Children. *Environment and Behaviour*, 35(3), 311-330.
 103. Tidball, Keith & Krasny, Marianne. (2013). Greening in the Red Zone: Disaster, Resilience, and Community Greening.
 104. Sudeshna Chatterjee (2015): Making Children Matter in Slum Transformations: Lessons from India's National Urban Renewal Mission, *Journal of Urban Design*, DOI: 10.1080/13574809.2015.1044506
 105. Tidball, Keith & Krasny, Marianne. (2013). Greening in the Red Zone: Disaster, Resilience, and Community Greening.
 106. Tidball, Keith & Krasny, Marianne. (2013). Greening in the Red Zone: Disaster, Resilience, and Community Greening.
 107. Urban green spaces and health. Copenhagen: WHO Regional Office for Europe, 2016.
 108. Dennis, Meredith L., "The Influence of Parental Mental Health on Child Outcomes: The Role of the Parenting Process" (2016). Loma Linda University Electronic Theses, Dissertations & Projects. 462. <http://scholarsrepository.llu.edu/etd/462>
 109. Neece CL, Green SA, Baker BL. Parenting stress and child behaviour problems: a transactional relationship across time. *Am J Intellect Dev Disabil*. 2012;117(1):48-66.
 110. Balseviciene, B., Sinkariova, L., Grazuleviciene, R., Andrusaityte, S., Uzdaviciute, I., Dedele, A., & Nieuwenhuijsen, M. (2014). Impact of Residential Greenness on Preschool Children's Emotional and Behavioural Problems. *International Journal of Environmental Research and Public Health*, 11(7), 6757-6770.
 111. Aggio. (2015) Mothers' perceived proximity to green space is associated with TV viewing time in children: the Growing Up in Scotland study. *Prev Med*. 2015 Jan;70:46-9
 112. Eirini Flouri, Emily Midouhas, Heather Joshi, The role of urban neighbourhood green space in children's emotional and behavioural resilience, *Journal of Environmental Psychology*, Volume 40, 2014, Pages 179-186, <https://doi.org/10.1016/j.jenvp.2014.06.007>.
 113. (Faber Taylor and Kuo 2009) from Chawla2015
 114. Vries, S. de, Dillen, S.M.E. van, Groenewegen, P.P., Spreeuwenberg, P. Streetscape greenery and health: stress, social cohesion and physical activity as mediators. *Social Science & Medicine*: 2013, 94(Oct), 26-33
 115. D Dimitrova, B Tilov, A Dzhambov; Social cohesion mediates the association between urban greenspace and mental health in youth: Donka Dimitrova, *European Journal of Public Health*, Volume 27, Issue suppl_3, 1 November 2017, cckx189.123, <https://doi.org/10.1093/eurpub/ckx189.123>
 116. Klaus Seeland, Sabine Dübendorfer, Ralf Hansmann, Making friends in Zurich's urban forests and parks: The role of public green space for social inclusion of youths from different cultures, *Forest Policy and Economics*, Volume 11, Issue 1, 2009, Pages 10-17, ISSN 1389-9341, <https://doi.org/10.1016/j.forpol.2008.07.005>.
 117. Wells, Nancy M. and Kristi S. Lekies. (2006). "Nature and the Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism." *Children, Youth and Environments* 16(1): 1-24.
 118. Chawla, Louise. (2015). Benefits of Nature Contact for Children. *Journal of Planning Literature*. 30. 10.1177/0885412215595441.
 119. Hsu, S-H, (2017). Significant life experiences affect environmental action: A critical review of Taiwanese research. *Japanese Journal of Environmental Education*, 26(4), 51-56.
 120. https://www.unicef.org/cwc/cwc_58619.html
 121. Glazer et al. Residential green space and birth outcomes in a coastal setting, *Environmental Research*, Volume 163, 2018, Pages 97-107
 122. Dadvand et al., Green space, health inequality and pregnancy, *Environment International*, Volume 40, 2012, Pages 110-115
 123. Ebisu et al. 2016, Association between Greenness, Urbanicity, and Birth Weight, *Sci Total Environ*. 2016 Jan 15; 542(0 0): 750-756.
 124. Agay-Shay K, Peled A, Crespo AV, et al Green spaces and adverse pregnancy outcomes *Occup Environ Med* 2014;71:562-569.
 125. Ingunn Fjørtoft. (2004). Landscape as Playscape: The Effects of Natural Environments on Children's Play and Motor Development. *Children, Youth and Environments* , Vol. 14, No. 2, Collected Papers (2004), pp. 21- 44
 126. Lovasi, Gina & Jacobson, Judith & W Quinn, James & Neckerman, Kathryn & Ashby-Thompson, Maxine & Rundle, Andrew. (2011). Is the Environment Near Home and School Associated with Physical Activity and Adiposity of Urban Preschool Children?. *Journal of urban health : bulletin of the New York Academy of Medicine*. 88. 1143-57. 10.1007/s11524-011-9604-3.
 127. Söderström, M., Boldemann, C., Sahlin, U., Mårtensson, F., Raustorp, A., & Blennow, M. (2013). The quality of the outdoor environment influences childrens health – a cross-sectional study of preschools. *Acta Paediatrica*, 102(1), 83-91.
 128. Söderström, M., Boldemann, C., Sahlin, U., Mårtensson, F., Raustorp, A., & Blennow, M. (2013). The quality of the outdoor environment influences childrens health – a cross-sectional study of preschools. *Acta Paediatrica*, 102(1), 83-91.
 129. Aggio. (2015) Mothers' perceived proximity to green space is associated with TV viewing time in children: the Growing Up in Scotland study. *Prev Med*. 2015 Jan;70:46-9
 130. Feng, X., Astell-Burt, T., (2017). Do greener areas promote more equitable child health?. *Health & Place*, 46, 267-273.
 131. Balseviciene, B., Sinkariova, L., Grazuleviciene, R., Andrusaityte, S., Uzdaviciute, I., Dedele, A., & Nieuwenhuijsen, M. (2014). Impact of Residential Greenness on Preschool Children's Emotional and Behavioural Problems. *International Journal of Environmental Research and Public Health*, 11(7), 6757-6770.
 132. Eirini Flouri, Emily Midouhas, Heather Joshi, The role of urban neighbourhood green space in children's emotional and behavioural resilience, *Journal of Environmental Psychology*, Volume 40, 2014, Pages 179-186, <https://doi.org/10.1016/j.jenvp.2014.06.007>.
 133. Residential green space in childhood is associated with lower risk of psychiatric disorders from adolescence into adulthood. Kristine Engemann, Carsten Bøcker Pedersen, Lars Arge, Constantinos Tsirogiannis, Preben Bo Mortensen, Jens-Christian Svenning. *Proceedings of the National Academy of Sciences Feb 2019, 201807504; DOI: 10.1073/pnas.1807504116*
 134. Maas J, Verheij RA, de Vries S, et al Morbidity is related to a green living environment *Journal of Epidemiology & Community Health* 2009;63:967-973.
 135. He M, Xiang F, Zeng Y, et al. Effect of Time Spent Outdoors at School on the Development of Myopia Among Children in ChinaA Randomized Clinical Trial. *JAMA*. 2015;314(11):1142-1148. doi:10.1001/jama.2015.10803
 136. Pei-Chang Wu, Chia-Ling Tsai, Hsiang-Lin Wu, Yi-Hsin Yang, Hsi-Kung Kuo, Outdoor Activity during Class Recess Reduces Myopia Onset and Progression in School Children, *Ophthalmology*, Volume 120, Issue 5, 2013, Pages 1080-1085, ISSN 0161-6420, <https://doi.org/10.1016/j.ophtha.2012.11.009>.
 137. Morgan, I.C., Rose, K.A., (2019). Myopia: Is the nature-nurture debate finally over?. *Clinical and Experimental Optometry*, 102(1), 3-17.
 138. Wells, Nancy M. and Kristi S. Lekies. (2006). "Nature and the Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism." *Children, Youth and Environments* 16(1): 1-24.
 139. Dadvand P, Pujol J, Macià D, Martínez-Vilavella G, Blanco-Hinojo L, Mortamais M, et al.2018. The association between lifelong greenspace exposure and 3-dimensional brain magnetic resonance imaging in Barcelona schoolchildren. *Environ Health Perspect* 126(2):027012
 140. Markevych et al. 2014. A cross-sectional analysis of the effects of residential greenness on blood pressure in 10-year old children: results from the GINIplus and LISAPlus studies. *BMC Public Health*201414:477
 141. Wells, N. M. (2000). At Home with Nature: Effects of "Greenness" on Children's Cognitive Functioning. *Environment and Behaviour*, 32(6), 775-795.

142. Green spaces and cognitive development in children Payam Davdand, Mark J. Nieuwenhuijsen, Mikel Esnaola, Joan Fornas, Xavier Basagaña, Mar Alvarez-Pedrerol, Ioar Rivas, Mónica López-Vicente, Montserrat De Castro Pascual, Jason Su, Michael Jerrett, Xavier Querol, Jordi Sunyer Proceedings of the National Academy of Sciences Jun 2015, 112 (26) 7937-7942
143. Amoly E, Davdand P, Fornas J, López-Vicente M, Basagaña X, Julvez J, Alvarez- Pedrerol M, Nieuwenhuijsen MJ, Sunyer J. 2014. Green and blue spaces and behavioural development in Barcelona schoolchildren: the BREATHE Project. *Environ Health Perspect* 122:1351–1358;
144. Taylor, A. F., & Kuo, F. E. (2009). Children With Attention Deficits Concentrate Better After Walk in the Park. *Journal of Attention Disorders*, 12(5), 402–409.
145. Amoly E, Davdand P, Fornas J, López-Vicente M, Basagaña X, Julvez J, Alvarez- Pedrerol M, Nieuwenhuijsen MJ, Sunyer J. 2014. Green and blue spaces and behavioural development in Barcelona schoolchildren: the BREATHE Project. *Environ Health Perspect* 122:1351–1358;
146. ANDREA FABER TAYLOR, FRANCES E. KUO, WILLIAM C. SULLIVAN, VIEWS OF NATURE AND SELF-DISCIPLINE: EVIDENCE FROM INNER CITY CHILDREN, *Journal of Environmental Psychology*, Volume 22, Issues 1–2, 2002, Pages 49-63
147. Green spaces and cognitive development in children Payam Davdand, Mark J. Nieuwenhuijsen, Mikel Esnaola, Joan Fornas, Xavier Basagaña, Mar Alvarez-Pedrerol, Ioar Rivas, Mónica López-Vicente, Montserrat De Castro Pascual, Jason Su, Michael Jerrett, Xavier Querol, Jordi Sunyer Proceedings of the National Academy of Sciences Jun 2015, 112 (26) 7937-7942
148. Wu et al. (2014). Linking student performance in Massachusetts elementary schools with the “greenness” of school surroundings using remote sensing. *PLoS ONE* 9(10): e108548: 1-9
149. Kuo, M., Barnes, M., Jordan, C., (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10
150. Kuo M, Browning MHEM, Sachdeva S, Lee K, Westphal L. Might School Performance Grow on Trees? Examining the Link Between “Greenness” and Academic Achievement in Urban, High-Poverty Schools. *Front Psychol*. 2018;9:1669. Published 2018 Sep 25. doi:10.3389/fpsyg.2018.01669
151. Feng, X., Astell-Burt, T., (2017). Do greener areas promote more equitable child health?. *Health & Place*, 46, 267-273.
152. Kytta, A., Broberg, A., & Kahila, M. (2012). Urban Environment and Children’s Active Lifestyle: SoftGIS Revealing Children’s Behavioural Patterns and Meaningful Places. *American Journal of Health Promotion*, 26(5), e137-e148.
153. Residential green space in childhood is associated with lower risk of psychiatric disorders from adolescence into adulthood. Kristine Engemann, Carsten Bøcker Pedersen, Lars Arge, Constantinos Tsirogiannis, Preben Bo Mortensen, Jens-Christian Svenning. Proceedings of the National Academy of Sciences Feb 2019, 201807504; DOI: 10.1073/pnas.1807504116
154. Maas J, Verheij RA, de Vries S, et al Morbidity is related to a green living environment *Journal of Epidemiology & Community Health* 2009; 63:967-973.
155. Wells, N. M., & Evans, G. W. (2003). Nearby Nature: A Buffer of Life Stress among Rural Children. *Environment and Behaviour*, 35(3), 311–330.
156. Lieberman & Hoody (1998) Closing the achievement gap: Using the environment as an integrating context for learning. Results of a Nationwide Study. Sand Diego: SEER.
157. Kuo, M., Barnes, M., Jordan, C., (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10
158. Wells, Nancy M. and Kristi S. Lekies. (2006). “Nature and the Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism.” *Children, Youth and Environments* 16(1): 1-24.
159. Boone-Heinonen J, Casanova K, Richardson AS, Gordon-Larsen P. Where can they play? Outdoor spaces and physical activity among adolescents in U.S. urbanized areas. *Prev Med*. 2010;51(3-4):295-8.
160. Larsen K, Gilliland J, Hess P, Tucker P, Irwin J, He M. The influence of the physical environment and sociodemographic characteristics on children’s mode of travel to and from school. *Am J Public Health*. 2009;99(3):520-6.
161. Feng, X., Astell-Burt, T., (2017). Do greener areas promote more equitable child health?. *Health & Place*, 46, 267-273.
162. Kytta, A., Broberg, A., & Kahila, M. (2012). Urban Environment and Children’s Active Lifestyle: SoftGIS Revealing Children’s Behavioural Patterns and Meaningful Places. *American Journal of Health Promotion*, 26(5), e137-e148.
163. Lieberman & Hoody (1998) Closing the achievement gap: Using the environment as an integrating context for learning. Results of a Nationwide Study. Sand Diego: SEER.
164. Kuo, M., Barnes, M., Jordan, C., (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10
165. Chawla, Louise & Derr, Victoria. 2012. The development of conservation behaviours in childhood and youth. In S. Clayton (Ed.), *The Oxford handbook of environmental and conservation psychology* (pp. 527-555). Oxford University Press.
166. <http://www.wsupgdocs.org/family-medicine/WayneStateContentPage.aspx?nd=1603>
167. Boone-Heinonen J, Casanova K, Richardson AS, Gordon-Larsen P. Where can they play? Outdoor spaces and physical activity among adolescents in U.S. urbanized areas. *Prev Med*. 2010;51(3-4):295-8.
168. Li, D., Sullivan, W.C., (2016). Impact of views to school landscapes on recovery from stress and mental fatigue. *Landscape and Urban Planning*, 148, 149-158.
169. Li, D., Sullivan, W.C., (2016). Impact of views to school landscapes on recovery from stress and mental fatigue. *Landscape and Urban Planning*, 148, 149-158.
170. Song C, Ikei H, Miyazaki Y. Physiological Effects of Nature Therapy: A Review of the Research in Japan. *Int J Environ Res Public Health*. 2016;13(8):781. Published 2016 Aug 3. doi:10.3390/ijerph13080781
171. H. Matsuoka, Rodney. (2010). Student performance and high school landscapes: Examining the links. *Landscape and Urban Planning*. 97. 273-282.
172. Kuo, M., Barnes, M., Jordan, C., (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10
173. Lieberman & Hoody (1998) Closing the achievement gap: Using the environment as an integrating context for learning. Results of a Nationwide Study. Sand Diego: SEER.
174. Kuo, M., Barnes, M., Jordan, C., (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10
175. Chawla, Louise & Derr, Victoria. 2012. The development of conservation behaviours in childhood and youth. In S. Clayton (Ed.), *The Oxford handbook of environmental and conservation psychology* (pp. 527-555). Oxford University Press.
176. Kondo, M.C.; Fluehr, J.M.; McKeon, T.; Branas, C.C. Urban Green Space and Its Impact on Human Health. *Int. J. Environ. Res. Public Health* 2018, 15, 445.
177. (a) Bogar, S., & Beyer, K. M. (2016). Green Space, Violence, and Crime: A Systematic Review. *Trauma, Violence, & Abuse*, 17(2), 160–171. <https://doi.org/10.1177/1524838015576412>
(b) FIA Foundation. July 2020. [THESE ARE OUR STREETS MANIFESTO 2030: SAFE AND HEALTHY STREETS FOR CHILDREN, YOUTH AND CLIMATE.](https://www.fiafoundation.org/our-work/manifesto)
178. Citywide cluster randomized trial to restore blighted vacant land and its effects on violence, crime, and fear. Charles C. Branas, Eugenia South, Michelle C. Kondo, Bernadette C. Hohl, Philippe Bourgois, Douglas J. Wiebe, John M. MacDonald. Proceedings of the National Academy of Sciences Mar 2018, 115 (12) 2946-2951; DOI:10.1073/pnas.1718503115
179. Kathleen L. Wolf, Marcus K. Measells, Stephen C. Grado, Alicia S.T. Robbins, Economic values of metro nature health benefits: A life course approach, *Urban Forestry & Urban Greening*, Volume 14, Issue 3, 2015, Pages 694-701,
180. Eirini Flouri, Emily Midouhas, Heather Joshi, The role of urban neighbourhood green space in children’s emotional and behavioural resilience, *Journal of Environmental Psychology*, Volume 40, 2014, Pages 179-186, <https://doi.org/10.1016/j.jenvp.2014.06.007>.
181. Agay-Shay K, Peled A, Crespo AV, et al Green spaces and adverse pregnancy outcomes *Occup Environ Med* 2014;71:562-569.
182. Balseviciene, B., Sinkariova, L., Grazuleviciene, R., Andrusaityte, S., Uzdaviciute, I., Dedele, A., & Nieuwenhuijsen, M. (2014). Impact of Residential Greenness on Preschool Children’s Emotional and Behavioural Problems. *International Journal of Environmental Research and Public Health*, 11(7), 6757-6770.
183. Tiziano Tempesta, Benefits and costs of urban parks: a review, *AESTIMUM* 67, Dicembre 2015: 127-143.
184. Braubach M., Egorov A., Mudu P, Wolf T., Ward Thompson C., Martuzzi M. (2017) Effects of Urban Green Space on Environmental Health, Equity and Resilience. In: Kabisch N., Korn H., Stadler J., Bonn A. (eds) *Nature-Based Solutions to Climate Change Adaptation in Urban Areas. Theory and Practice of Urban Sustainability Transitions*. Springer, Cham
185. Richard J. Mitchell, Elizabeth A. Richardson, Niamh K. Shortt, Jamie R. Pearce, Neighbourhood Environments and Socioeconomic Inequalities in Mental Well-Being, *American Journal of Preventive Medicine*, Volume 49, Issue 1, 2015, Pages 80-84, <https://doi.org/10.1016/j.amepre.2015.01.017>.
186. Zhang, Biao & Xie, Gaodi & Bin, XIA & Canqing, ZHANG. (2012). The Effects of Public Green Spaces on Residential Property Value in Beijing. *Journal of Resources and Ecology*. 3. 10.5814

187. Jennifer R. Wolch, Jason Byrne, Joshua P. Newell, Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough', *Landscape and Urban Planning*, Volume 125, 2014, Pages 234-244,
188. <https://groentool.antwerpen.be/themes.xhtml#lucht>
189. (a) ACE Trust and UNICEF India. 2018. Promoting Safe Communities: Mapping with children in Mumbai
(b) [CRC General Comment No. 21 on Children in Street Situations](#)
190. Chatterjee, S. (2012) 'Challenges and Opportunities for New Urban Imaginations', *Early Childhood Matters*, 118: 17–23.
191. Conversation with Dr. Sudeshna Chatterjee on 19 September 2018.
192. Conversation with Dr. Zaki Islam on 18 Sept 2018
193. UNICEF Dominican Republic. 2018. Affordable housing and children's rights in the Dominican Republic. The case of the "Pablo Mella Morales" housing development. Recommendations for the private sector.
194. Play@Khirkee project by Sudeshna Chatterjee. <http://playatkhirkee.blogspot.com/>
195. Islam MZ, Moore R, Cosco N. Child-Friendly, Active, Healthy Neighborhoods: Physical Characteristics and Children's Time Outdoors. *Environment and Behavior* Volume 48, Number 5 June 2016
196. Singer 2009
197. Marzi I, Reimers AK. Children's Independent Mobility: Current Knowledge, Future Directions, and Public Health Implications. *Int J Environ Res Public Health*. 2018;15(11):2441. Published 2018 Nov 1. doi:10.3390/ijerph15112441
198. ACE Trust and UNICEF India. 2018. Promoting Safe Communities: Mapping with children in Mumbai
199. UNICEF. Clear the Air for Children. 2016
200. World Health Organization. WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. Global update 2005. [WHO/SDE/PHE/OEH/06.02](#)
201. <https://groentool.antwerpen.be/themes.xhtml#lucht>
202. conversation with Dr. Nowak and from Chawla, Louise. (2015). Benefits of Nature Contact for Children. *Journal of Planning Literature*. 30. 10.1177/0885412215595441.
203. Vos2013, Vranckx2015, conversations with Vranckx and Dr. Nowak
204. <https://groentool.antwerpen.be/themes.xhtml#lucht>
205. Conversation with Dr. Sudeshna Chatterjee on 19 Sept 2018
206. Action for Children's Environments (2013). Analyzing the Impact of JnNURM Funded Slum Improvement Projects on Children across India. New Delhi: ACE Trust
207. James R. Roberts, Catherine J. Karr, COUNCIL ON ENVIRONMENTAL HEALTH, *Pediatrics* Dec 2012, 130 (6) e1765-e1788; DOI: 10.1542/peds.2012-2758
208. Krasny, Marianne E. (Ed.), 2018, *Grassroots to global: Broader impacts of civic ecology*. Ithaca, NY: Cornell University Press.
209. Vasanthi Hariprakash. 2011. 'Ugly Indians' clean up Bangalore. BBC News. <https://www.bbc.com/news/world-asia-15769402>
210. Recommendation by Nada Elattar, UNICEF Early Childhood Development Specialist
211. Conversation with Dr. Ruth Wilson from the [Children and Nature Network](#) on 10 September 2018 – re. the Crianca e Natura programme of the Alana Institute, a partner of the Children and Nature Network.
212. Conversation with Dr. Baohua Yan on 28 Sept 2018
213. Conversation with Dr. Zaki Islam on 18 Sept 2018
214. Chatterjee, Sudeshna. "Landscapes of Play." *mylivablecity*. Jul-Sept 2015: 68-73.
215. Kuo, M., Barnes, M., Jordan, C., (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10
216. Play in Wales: The Assembly Government's Play Policy Implementation Plan. DfTE Information Document No: 002-06. February 2006. <https://www.aber.ac.uk/en/media/departmental/sell/pdf/wellbeinghealth/Policy-Implementation-Plan-2006.pdf>
217. <https://www.playwales.org.uk/eng/home>
218. UNICEF. Shaping urbanization for children: A handbook on child-responsive urban planning. 2018. New York.
219. Hart, R., & UNICEF. (1997). *Children's participation: The theory and practice of involving young citizens in community development and environmental care*. London: Earthscan.
220. Derr, Victoria, Chawla, Louise & Mintzer, Mara. 2018. *Placemaking with children and youth: Participatory practices for planning sustainable communities*. New York: New Village Press.
221. Natural England. 'Nature Nearby' Accessible Natural Greenspace Guidance. NE265. March 2010. www.naturalengland.org.uk
222. UNICEF. 2017. Generation 2030 Africa 2.0: Prioritizing investments in children to reap the demographic dividend
223. UN Habitat. 2012. URBAN PATTERNS FOR A GREEN ECONOMY: WORKING WITH NATURE
224. Djoko Kirmanto, Imam S. Ernawi, and Ruchyat Deni Djakapermana, Ministry of Public Works, Indonesia. 2012. Indonesia Green City Development Program: an Urban Reform. 48th ISOCARP Congress 2012.
225. Law No. 26 year 2007 on Spatial Planning. <http://extwprlegs1.fao.org/docs/pdf/ins163446.pdf>
226. A Ardiansah and Sudi Fahmi. The Implementation of the Law on Spatial Planning in Pekanbaru, Indonesia. 2018 IOP Conf. Ser.: Earth Environ. Sci. 175 012079

