



The 7 C's of Neighbourhood Design
Neighbourhood Design that Supports Child Development

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August 8nd 2010

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Problem Statement

From birth onwards children's health and development is mediated by the conditions present in the external environment. These conditions can either help or hinder optimal child development, with impacts that last a lifetime. Research shows that a child's early experiences set them on a developmental trajectory that affects their health and economic wellbeing across the life course. In addition to influencing individual quality of life, society stands to benefit from investment in children's health and wellbeing. For instance, research in the USA shows that for every US\$1 invested in high-quality early childhood development programs, an economic return of US\$13 is gained (Calman & Tarr-Whelan, 2005). Other research from the Canadian context shows that investment in early child development (ECD) is critical from a human capital perspective where optimal chances at development will result in a more productive labor force and stronger economy (Kershaw, Anderson, Warburton, Hertzman, 2009).

Despite the importance of supporting healthy child development for individual success and that of society more broadly, 29% of children in British Columbia are developmentally vulnerable when they arrive to kindergarten (Kershaw et al., 2009). Research that discusses the economic return of investment in ECD calls for increased government spending on programs and services (Calman & Tarr-Whelan, 2005; Kershaw et al., 2009). While this suggestion is well founded, investment in the physical environments that children grow up in is also critical from a child development perspective. In addition to the home environment, the neighbourhood environment plays an important role in child development. By providing children with opportunities to exercise and engage socially with peers and community members the neighbourhood environment provides an important opportunity for physical, social and cognitive

development.

Neighbourhood planning and design predominantly falls under the jurisdiction of local governments. While some municipalities in BC have realized the importance of improving environments for children and are taking steps to do so, others either lack direction or are simply unaware of the importance of prioritizing this objective into their work, for children's sake and that of society more broadly. To support the advancement of environmental design that supports children's health and development this project thus seeks to provide relevant research and a practical design framework that can be used by governments, planners, communities and design professionals in the creation of child and family friendly neighbourhoods throughout the Metro Vancouver area.

The project is composed of four key sections, including: a literature review that provides a background on the environmental influences on health with a focus on the neighbourhood environment; a look at the importance of play for children's development and how opportunities for this activity are influenced by neighbourhood design; and details about a framework for achieving child friendly neighbourhood design based on a play-space design model called the 7 C's (Herrington, Lesmeister, Nicholls, Stefiuk, 2007). The last section of the report includes a discussion about the implementation of this model and the limitations that exist and should be addressed in future iterations of the model.

Literature Review: Children's health and the Environment

The relationship between the environment and health is a topic that has been explored in a range of academic disciplines including public health, psychology, geography and planning (Frumkin, Frank, Jackson, 2004; Frank, Engelke, Schmid, 2003; Gatrell, 2002; Jackson, 2002; Chesebrough, King, Gullotta, Bloom, 2004). While this literature points to

the broad population health outcomes associated with environmental conditions, children are identified as being particularly vulnerable to environmental influences on their health (Frumkin et al., 2004; Frank et al., 2003; Chesebrough et al., 2004).

From birth onwards children's experience of the external world directly influences their health and development. A child's first few years of life are marked by rapid development of the brain and other biological systems, a physiological process that is informed in part by conditions in the external environment. Early Child Development (ECD) research indicates that the physical and social environments children are exposed to from birth to age 4 literally 'sculpt' the human development process with implications for health, wellbeing, and learning across the life-course (Hertzman & Irwin, 2007). Numerous studies show the link between investment in children's development and long-term educational achievement, economic productivity as well as dollars saved in the criminal justice and health care systems (Kershaw et al., 2009; Alderman & King, 2006; Calman & Tarr-Whelan, 2005; Lynch, 2004). Ultimately, this research shows that access to stimulating and nurturing environments lead to better brain connections and improved developmental outcomes for children with impacts that span the individual life course and aggregately influence the social and economic wellbeing of society as a whole (Kershaw et al., 2009; Lynch, 2004).

A range of environments, including home, school and neighbourhoods, influence children's development. The neighbourhood environment has received particular attention in literature given the unique opportunities it presents for children to access important community-based services, develop socio-emotionally through interaction with the public and peers and develop physically through play and physical activity (Frumkin et al. 2004; Chesebrough et al., 2004; Lennard & Lennard, 2000; Christensen, O'Brien, 2003; HELP, 2009). Social interaction

at the scale of the neighbourhood also contributes to important social learning including awareness about social diversity (Frumkin et al., 2004; Lennard & Lennard, 2000). Lennard and Lennard (2000) explain that the public realm serves as a critical 'teacher' of social learning, where children are able to develop social competencies through observation and participation.

In addition to the socio-emotional development that takes place in the neighbourhood context, children's physical health is directly affected by neighbourhood design (Frumkin et al., 2004; Larsen, Gilliland, Hess, Tucker, Irwin, He, 2009; Carter & Dubois, 2010; Lennard & Lennard, 2000). Specifically, research shows that car-oriented communities impact children through increased exposure to air pollution, car related injuries and morbidities associated with sedentary lifestyles (Frumkin et al., 2004; Larsen, et al., 2009). In recent years there has been a significant decline not only in outdoor play among children but also in the number of children that walk or bike to school (White, 2004; Frank et al., 2003). Research shows that features of the built environment including sidewalks, street connectivity, traffic reduction and close to home places for play are critical to encourage physical activity among children, active transport to school and ultimately the mitigation of increasing levels of asthma, obesity and diabetes among this population group (Larsen et al., 2009, Frumkin et al., 2004; Frank et al., 2003).

In addition to walkability and access to play spaces, the presence of nature is an important environmental determinant of health for children. Richard Louv (2005) explains that exposure to nature is critical for healthy childhood development and prevents depression, obesity, and attention deficit disorder - conditions that are on the rise in today's generation of children who have increasingly less opportunity to explore nature and play outdoors. Contact with nature supports children's need for open-ended and imaginative play and promotes enhanced attention and better

emotional self-regulation among children (Rivkin, 1995; Evans, 2006 & Louv, R, 2005). In addition to benefiting their physical and emotional health, exposing children to nature also allows them to build an attachment to the environment and develop values and behaviors that are critical to the long term health of the planet and those living on it (White, 2004).

The Importance of Play

As shown in the literature, the physical environment acts as an important mediator of children's health and development. The physical environment creates the conditions that allow children to engage in social learning and physical exercise. The physical environment also influences how children play, an activity that is considered particularly important from a child development perspective (Chesebrough et al., 2004). Enshrined as a basic right in the Convention on the Rights of the Child (CRC), children's play contributes directly to their healthy development (Gleeson & Sipe, 2006). Chesebrough et al. (2004) explain the critical role of 'play' in child development:

"Play, for young children, is active - the child does what he or she is thinking about, using body language as well as words. Such play is open-ended and builds skills in divergent thinking. Such play is also an intermediate stage in the development of complex sequences of which culminates in the child becoming a writer and reader. Children's play develops in a typical sequence, which parallels their physical, cognitive and social development" (2004, p.8-9).

In addition to supporting social and cognitive development, opportunities for play are critical for children's mental health and physical development. Research shows that children's play has significantly changed in the 20th century from an activity that was mostly outdoors and

physically active to an activity that now takes place mostly indoors and is sedentary (White, 2004, Tovey, 2007). Furthermore, play outdoors has increasingly been confined to formal play structures that often present little physical challenge (Tovey, 2007). This change in the nature of play has contributed to serious health consequences including the rise in childhood obesity and related chronic conditions with serious socio-emotional impacts (Tovey, 2007). Tovey (2007) explains:

“Childhood obesity has increased dramatically in the last twenty years. Statistics commissioned by the Department of Health indicate that nearly 30 per cent of children aged two to ten were identified as overweight or obese in 2006...Overweight and obesity are linked with chronic health problems, such as type 2 diabetes and potential cardiovascular disease, as well as psychological and social factors such as poor self-esteem, lack of confidence and social discrimination in friendship choices (British Medical Association, 2005; Underdown, 2007).

While the causes of overweight and obesity are complex there is little doubt that the ‘obesogenic’ environment with a loss of opportunity for spontaneous and vigorous outdoor play is one significant contributing factor. Indeed, a Report by the International Obesity Task Force (IOTF) in Europe urged governments to move away from what was argued to be ineffective ‘health education’ and to focus instead on the current ‘toxic environment’ including lack of outdoor play space. Children, they argue ‘deserve to be given back the freedom to play and exercise in safety enjoyed by previous generations’ (IOTF 2002:28).”

In addition to supporting physical health, outdoor play is also important for children’s mental health. Specifically, outdoor play allows children to develop friendships, reduce social isolation and gain a sense of autonomy and control (Tovey, 2007). Through play children are also actively constructing their individual identities and understanding of the world (Chesebrough et al., 2004). Play theory suggests that through pretend or imaginary play children develop self-esteem and forage their identities as they gain mastery of their thoughts, bodies, objects, and

social behaviors (Chesebrough et al., 2004). When children play they practice what they know while consolidating new information and skills and constructing new understandings about people, objects and situations (Chesebrough et al., 2004).

Play is an integral part of every child's experience growing up. Play is not only a favorite activity but also critical to children physical, social, emotional and cognitive development. Opportunities for play are either nurtured or hindered by the built environment. To support the development of children it is imperative that the field of planning responds by designing neighbourhoods that provide ample and rich opportunities for play.

Adapting the 7'C's of Play space design to the Neighbourhood

Given the importance of play for children's health and development, the remainder of this report will consider how neighbourhoods can be designed to foster this important activity. To do this, a model originally developed to inform outdoor play space design, called the *7 C's*, is adapted to child friendly design at the scale of the neighbourhood. Developed at the School of Landscape Architecture at the University of British Columbia (UBC) and funded by the Consortium for Health, Intervention, Learning and Development (CHILD), the *7 C's* model proposes 7 design principles that support the development of successful play spaces for children; these are: character, context, connectivity, change, chance, clarity, and challenge (Herrington et al., 2007). The rational underpinning the adaptation of the *7 C's* to neighbourhood design is based on three premises. First, children's play extends beyond formal play settings and into the neighbourhoods that they live, requiring that these environments also support play. Supporting this premise is a Swedish study that shows despite significant investment in traditional playgrounds only 10-20% of

children's time was spent in these formal play areas while the remaining 80-90% was spent in open city areas (CFCS). Second, the design suggestions advocated by the 7 C's model are reflected in other literature and strategies that address child-friendly planning, confirming the model's utility for neighbourhood planning. Third, the 7 C's model adapted to the neighbourhood scale not only supports child-friendly design but also the development of neighbourhoods that are livable for all residents.

In addition to the three premises listed above, the decision to use this model is based on the opportunity it provides to create a neighbourhood planning and design framework that is based on a lens of play. While play is often cited as an important part of any child friendly community, a comprehensive set of planning guidelines to support this activity through neighbourhood design does not exist. Furthermore, the strength of this model to inform child friendly design rests on its credibility within the ECD research community and the fact that its development was lead by Landscape Architect Susan Herrington who has significant experience in the research and design of landscapes for children.¹

The following is a description of the 7 Cs of play space design and their adaptation to the neighbourhood context. The section ends with a discussion about implementation of the model as well as its challenges and limitations.

1) CHARACTER

In the 7 C's model **Character** represents *the overall feel and design intent of the outdoor play space*. The report identifies the following four character typologies that reflect the type of play materials and learning opportunities that exist in different play spaces:

¹ See the following link for list of publications:
<http://herrington.mentalpaint.net/research.php>

Modern: where infrastructure and mechanisms of the environment are a focal point

Organic: where the outdoor environment is the main focus

Modular: where play equipment dominates the play area, or

Re-use: where the utility of the space was not originally intended as a play area and has since been redesigned.

In addition to informing the type of materials that will make up the play space, the character of the play space can help support the social and educational goals of the childcare centre. For instance, if teaching environmental awareness is a priority of a childcare centre then having an 'organic' play area could compliment this educational goal.

Character also supports children's learning through the observation and articulation of unique qualities that define the character of the play space. Herrington explains: "Character is also important to children's development. Young children are forming memories, learning classification skills, identifying concepts of scale, and using a language to describe these experiences; even humor. These are developmental milestones that can be directly supported by the physical environment" (Herrington, et al., 2007 p. 16).

Character at the scale of the Neighbourhood

The concept of character as a way to promote child friendly design is useful both at the scale of the individual play space as well as at the level of the neighbourhood. Just as the character of a play-space can be designed to reflect the goals of a childcare centre (Herrington et al., 2007), the character of a neighbourhood can be fostered to reflect the goals and values of the community, or city. Children who are actively observing and interacting with the neighbourhood environment through play will then learn these values reflected in the character. For instance, if a neighbourhood is concerned about environmental sustainability then incorporating and retaining ecological features in the neighbourhood,

including naturalized parks, bioswales and aquatic systems, will support the transmission of these values to children while they play and learn about the environment (Roseland, 2005).

In addition to supporting the transmission of shared community values, fostering the character of a neighbourhood can also contribute to the development of community cohesion, an important indicator of environmental quality from a child development perspective (Chawla p. 228, Chesebrough et al., 2004, p. 124). Community cohesion is reflected in shared values and a sense of identity as well as collective efficacy (Chesebrough et al., 2004). Research shows that parents in communities where there is a high degree of social cohesion are more likely to participate in the supervision of all children in a neighbourhood (Chesebrough et al., 2004; Kearns & Forrest, 2000), making the neighbourhood safer for children to freely explore and play in. Examples of neighbourhood features that both reflect and foster community cohesion are: values-driven design, such as the ecological features described earlier, community art and banners that celebrate shared values and identity, and communal spaces that support social interaction and community building.

Given children actively forage their identity and knowledge of the world through play, the character of the neighbourhood a child plays in will provide them with information that influences this process of identity construction and knowledge production. Living in a community that celebrates its character through the built form thus provides formative learning opportunities for children. Furthermore, having features that reflect community values, and create an environment that is cohesive and reflects back to children that they live in a community that cares about their experience and that supports their development and growth is important. Consequently, from a child development perspective the specific 'character' of a neighbourhood matters less than the presence of

character. In other words, whether a neighbourhood is 'modern' in character or 'historic' is irrelevant; it is the opportunity that comes from the identification and celebration of this character in the creation of stimulating places for children that are built on a strong sense of community identity that ultimately make the place child friendly.

Neighbourhood features that support Character:

- Designs that reflect community values (ex. environmentally sustainable features, like green roofs)



Image 1.

Green roofs in Malmo, Sweden reflect the ecological values of the community and provide excellent play and educational opportunities for children.

Image 2.

Cardboard building, WestCliff Primary School (UK) is a detached activity space for children that teaches them about the use of cardboard as a sustainable construction material. Designed by Cottrell & Vermeulen Architecture.



- Public art

- Community signs and banners



Image 3. Community banners designed as part of neighbourhood beautification project in South Wedge Neighbourhood, New York.

- Architectural design that reflects neighbourhood character
- Public space that can be used for community events (ex. farmers markets) and children play while supporting social interaction and relationship building among residents (fostering social cohesion)

Image 4.

Public plaza in park, Hartcliffe, Bristol, UK. Youth participated in the design of this space within the park as part of Bristol's SPACEmakers project. This venue reflects the community building benefits of public space.



2) CONTEXT

In the Seven C's model Context is *the small world of the play space itself, the larger landscape that surrounds the centre (or play space) and how they interact with each other*. Contextual qualities of the individual play space and larger landscape relate to climate, site orientation, views, availability of space, and character of the larger environment. Examining the context is critical to create an optimal play

space that is suited to the climate and takes advantage of assets available in the broader neighbourhood. Furthermore, Herrington et al. (2007) explain that knowing the amount of open play space available in the neighbourhood is critical to assess how much is needed at the childcare centre.

Context at the scale of the neighbourhood

A neighbourhood's context includes the city or broader region that it is situated in, the climate and microclimate conditions that influence it, and the geographical features that define it. Just as a play space designer should look to the neighbourhood for information and opportunities to inform their work, the neighbourhood planner must look to the broader context to inform effective neighbourhood design. The context of a neighbourhood influences views that can be seen by children, weather conditions that effect outdoor play spaces, transportation access to and from the neighbourhood, traffic volumes that effect the safety and soundscape of the neighbourhood, access to natural and recreation areas for play, and demand on available open space for play. Ultimately, taking an inventory of what exists in the neighbourhood's context and conducting a careful site analysis is critical to determine what the surrounding area has to offer children, what opportunities and challenges it might present and how best to design neighbourhoods so they take advantage of contextual assets and maximize opportunities for children's play and development.

Contextual elements that should inform neighbourhood design:

- **Climate**

Understanding regional climate patterns is important for effective neighbourhood planning. Contextual climate conditions should inform how open spaces for play are designed and whether there are innovative ways to manage the weather and create places that are educational and fun for children.



Image 5.

The Augustenborg district in the city of Malmö, Sweden, is an example of a neighbourhood that let the contextual climate conditions inform its neighbourhood design. This image shows an open storm water management system that is suited to the local climate while also providing a high quality landscape for children and residents.

- Open space provision

The amount of open space available outside of the neighbourhood can help inform the neighbourhood's need for space. Open space outside of the neighbourhood could, for instance augment space deficits within the neighbourhood. To help with the assessment of open space needs within the neighbourhood municipalities can calculate a minimum outdoor open space requirement per child. This calculation can be used to inform the design of new developments and also to assess current levels of provision in the city or neighbourhood. The City of London, UK for example stipulates a minimum benchmark of dedicated play space per child at 10 sq m (GLA, 2008, p.47).

While open space in the broader neighbourhood context can help augment space in the neighbourhood, the utility of this external space depends on its accessibility for children. For space to be useful, children need to be able to access it by foot. The following are a list of calculations developed by the City of London for maximum walking distances from home to a play space by age group (GLA, 2008, p. 53):

- Under 5: 100m
- 5-11 year olds: 400m
- 12+: 800m

- Population density

Understanding population density outside of the neighbourhood informs planners about potential external demand neighbourhood open space and amenities.

- Traffic

Traffic volumes and patterns in the external context need to be assessed for the safety of nearby roads, and the potential for traffic spillover into neighbourhood streets. Furthermore, understanding the traffic conditions adjacent to the neighbourhood will inform planners about soundscape challenges that need to be addressed in the neighbourhood.

In response to heavy traffic conditions many neighbourhoods in the UK are in the process of setting up 'homezones' (www.homezones.org). These homezones (also called woonerfs in the Netherlands) involve the physical alteration of streets to reduce traffic and make them safe for alternative forms of transit and children's play. The need for a homezone in a neighbourhood could be informed by a contextual analysis that reveals heavy external traffic spilling into the neighbourhood and affecting local streets.



Image 6.

Children playing on streets in homezone. Bristol, UK

- Natural amenities

Access to nature is important for children's development. Knowing what natural areas exist in a neighbourhood's context will help planners work towards increasing accessibility to these areas and assess if additional provision is necessary within the neighbourhood environment.

- Public Transport

Researching the availability of public transport in a neighbourhood's context will inform planners about children and youth's access to play areas outside of the neighbourhood. Furthermore, transport routes that serve a neighbourhood will influence the number of

people that have access to neighbourhood amenities and spaces. Neighbourhoods can also be designed to integrate with these transit routes and provide safe, well-lit routes home from bus shelters and transit centres. Supporting neighbourhood connections to outlying transit will support children's autonomous growth and development.

- Views

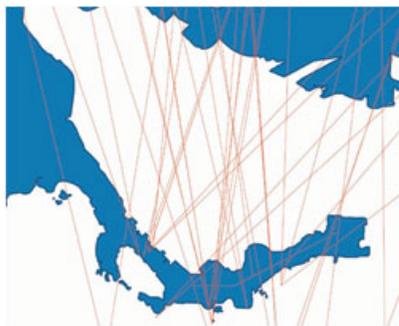
Views are interesting for children and give them opportunities to gain literacy skills through verbal accounts of what they see (Herrington et al., 2007). Planners should consider if there are views that can be accessed by rooftop gardens or simply through building orientation.



Image 7.

Roof top gardens are one way to incorporate views of the surrounding context into neighbourhood design. This image shows an elegant rooftop garden in New York City.

Image 8. View Corridors, Vancouver



The city of Vancouver through preservation of 'view corridors' in 2000 presents an example of urban planning that takes into consideration contextual attributes. These view corridors protect the view of mountains from major parks and key vantage points at arterials (Punter, 2003). Furthermore, several recent Master Planned

communities in British Columbia, including East Fraser Lands in Vancouver and Dockside Green in Victoria, present good examples of community plans that incorporate contextual views into their design.

3) CONNECTIVITY

In the 7 C's model, **connectivity** refers to *the physical, visual, and cognitive connectivity of the play space*. According to the model, "connectivity is physical, but also activates cognitive development, such as the way a hierarchy of pathways can orchestrate movement in a play space and helps children understand that space (Herrington et al., 2007, p. 25)." In addition to facilitating movement and an understanding of place, pathway design is critical to enhance accessibility through accommodating different forms of mobility and speeds of movement within the play space. The 7 C's model also emphasizes the importance of the indoor/outdoor connection (between play space and centre) and how this can facilitate increased use of the play areas and enhance the indoor atmosphere of the centre.

Connectivity at the scale of the Neighbourhood

Connectivity at the scale of the neighbourhood refers to how well the neighbourhood fabric is connected physically and visually and how different uses relate to each other. A connected urban fabric is supported through physical paths and roads that are easy to navigate, lead to destinations and facilitate movement in the neighbourhood. These roads and paths can be designed to support varying levels of mobility by ensuring they are wheelchair accessible and safe for pedestrian and bike use. A well connected urban fabric is critical to children's development as it allows them to gain a sense of autonomy by being able to move independently through the neighbourhood and also supports their physical health through active exploration and play (Gleeson & Sipe, 2006, Lennard & Lennard, 2000; Frumkin et al., 2004). A grid-like street pattern as opposed to cul-de-sacs reduces the distance children need to travel to destinations and are easier to navigate (Frank et al., 2003). Furthermore, streets that are designed to prioritize pedestrian and bike use, such as the

woonerf, support children's movement and are generally safer (Frank et al., 2003).

The connection between different neighbourhood functions, for instance between public and private spaces, between commercial and residential uses, and generally between interior and exterior spaces is also important for children's experience in the neighbourhood. This connection between different uses can be supported both through the use of transparent materials (ex. glass) and building orientations that visually and physically connects these places. This visual and physical connectivity between different neighbourhood uses enhances accessibility, activates neighbourhood destinations, and adds to a child's cognitive understanding of the neighbourhood. Visual and physical connectivity also adds to a sense of security in the neighbourhood through physical connections that are easy to navigate and the addition of "eyes on the street" (Lennard & Lennard, 2000).

While connectivity in the 7 C's model speaks only to connections within the play space, from a neighbourhood planning perspective connectivity to other parts of the city or broader geography is as important as connectivity within the neighbourhood. For instance, neighbourhoods that are well connected by public transport and other alternative forms of transport (ex. bike paths) to the city or region reduce car dependence and increases children's range for play. The importance of connectivity at the scale of neighbourhood to broader city is reflected in public health literature that speaks to the detrimental impact of suburban design on children's health and wellbeing where children's range of play is restricted by large highways, distance between places and traffic danger (Frank et al., 2003; Frumkin et al., 2004). Literature on children's health discusses the decline of children walking and biking to school and consequently the importance of safe routes to school so children are not required to be driven by their parents to class (Frank et al., 2003; Hinshaw, 2007).

Schools are not always located within neighbourhood boundaries and as such this issue relates to enhancing connectivity between home and school, which may extend into adjacent areas. A study conducted by International Play Association (IPA) in Sweden also revealed that children play going to and from school, thus revealing the importance of a safe, accessible and interesting connection between home and school for children's play (CFCS). Children's autonomy and social development is also supported by independent actions that take place away from their home and neighbourhood (Gleeson & Sipe, 2006). Children's independence, especially as they get older, is supported by allowing them to explore and play beyond the comfort of their neighbourhood - an activity that requires good connectivity to other parts of the city or area that they reside in. Lennard (2007) speaks to the critical importance of a connected urban form for children to develop autonomy and spatial skills:

"The extent to which children can develop autonomy is strongly influenced by the degree to which their city is accessible by foot, bicycle and public transportation. We are repressing the child's innate need to develop independence, and in so doing we create frustration and anger.

Children should be given the opportunity to walk to school on safe traffic-free streets. These streets should be populated by "familiar" adults who play an unofficial "in loco parentis" role. Children also need a continuous citywide network of traffic-calmed streets and dedicated bike lanes. As they grow older they also need a good public transit system to continue to develop autonomy and explore their city.

A child taken everywhere by car, or school bus, cannot learn how places are connected, or visualize the neighborhood or city. The child has the impression of living in a disconnected world. When children are allowed to walk around and explore their city they quickly develop spatial skills" (Lennard, 2007, pg.4-5).

Connectivity is a critical element of the physical environment from a child development perspective. This quality of the built form supports children's need for independent mobility, play and physical

exercise, activities that are critical to their health and autonomous development. Connectivity is critical within the neighbourhood and also beyond, recognizing that children's play and activity is not limited to the boundaries of the neighbourhood, especially as they get older.

Neighbourhood features that support Connectivity:

- Grid-like street pattern to reduce distances between destinations, support navigation and contributes to a cognitive understanding of the place (Frank et al., 2003).

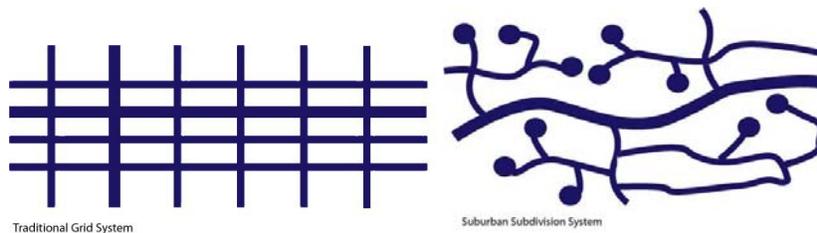


Image 9. Traditional street grid compared to a suburban street pattern made up of cul-de-sacs and dead-ends

- Playspace that is accessible for different age groups, recognizing that younger children require space much closer than those who are older (See 'context' section).
- Street design that is safe for pedestrian and bike activity (ex. Woonerf, Homezones)



Image 10. Pedestrian path and trail systems support children's autonomous movement can often themselves serve as interesting places for play and are protected from traffic dangers.

Image 11.

The Dutch woonerf for British homezone street design represents an example of urban street design that is safe, accessible for children and allows for play in addition to transport. Instead of posing as barriers to play, the woonerf street design simply extends the street into children's realm of play. This image shows a 'homezone' street design in Vauban neighbourhood, Freiburg, Germany.



- Visual connectivity between housing, other buildings and public realm (play areas) through building orientation, size (human scale) and materials that foster sense of permeability/transparency (ex. glass).

4) CHANGE

Change relates to *a range of differently sized spaces designed in the play area and how the whole play space changes over time.*

Change reflected in differently sized sub-spaces in the play area is important because this allows different numbers of children to play in groups and meets children's needs to play independently and be alone at times. Furthermore, children's participation in change through play with malleable materials (sand, mud, gravel) and their observation of change in plants and living organisms present valuable learning opportunities. In addition to learning about change through observing this quality in play areas, children often vocalize their experience of change, which contributes to literacy skills development (Herrington, et al., 2007). Change within play spaces is also supported through the design of distinct play zones that contain specific play materials (ex. sand) and that are open

to modification based on the children's process of self learning which involves interaction with these materials and modification of the zones.

Change at the scale of the Neighbourhood:

Change at the scale of the neighbourhood can be fostered through a broad range of elements, including natural features that change colour and shape throughout the year (ex. plants) and permanent features of the built environment that change in shape and scale (ex. a walkway with irregular elevations or differently sized garden and play spaces delineated in the environment).

By observing change within the neighbourhood children learn about the dynamic nature of life. To support observable change in the neighbourhood setting the presence of nature, rich ecosystems and animal habitats is important. Furthermore, to maximize children's opportunities to observe change, designers need to be cognizant of children's perceptual fields making sure they include plants and other features that children are able to see.

In addition to the importance of observing natural change in the environment, the built environment should be designed so that it reflects change in the size of spaces available for children's play and exploration. Similar to the play space environment, providing differently sized spaces within the neighbourhood allows children to either play alone, in pairs or in larger groups. The option for children to play in solitude or in pairs is particularly important for children who live in smaller homes with little option for privacy. Thus the provision of small garden spaces in the neighbourhood or pocket parks in addition to larger parks is important in the neighbourhood setting.

Key to the importance of change is also ensuring that children are able to participate in this change by shaping and moving materials within

the landscape. Being agents of change in the environment can help children gain a sense of self and control (Herrington et al., 2007). In addition to including landscape materials that can be moved and shaped by children, children's participation in neighbourhood change can be supported by the inclusion of children in activities that will result in neighbourhood changes such as community arts projects.

Change is identified in the City of London's Play strategy as an indicator of a quality neighbourhood play environment for children (GLA, 2008). In this report, change is identified as involving "building/demolishing, transforming environments, the effect of the seasons and weather, growth and decay, predicting and planning, interesting physical environments - plantings, varied levels, enclosed/open spaces, mounds, steps, walls, shelters, surfaces, platforms, seating, privacy, vistas, flexibility (GLA, 2005, pg. 29). The city of London's strategy recognizes that children's play takes place outside of formal play areas and thus should be incorporated broadly in the environment to support stimulating spontaneous play throughout the neighbourhood.

Neighbourhood features that support Change:

- Presence of nature: plants, trees, and natural systems (ex. aquatic systems such as streams), living walls that change in appearance throughout year and are at a scale that is observable by children.



Image 12. Young girl stops to smell a flower

- Features or events that allow children to engage in change
Urban agriculture is a neighbourhood feature that directly allows children to both actively observe and participate in change. By going through the process of digging in dirt, planting seeds, weeding, watering and watching plants grow, urban agriculture provides a rich opportunity for children to engage in their changing environment.



Image 13.

This garden is part of the Middlesbrough Urban Growing Project (UK) that takes place in 264 locations across the town and leads to a town meal. Children are able to see plants grow from seedlings to mature plants.

Image 14.

Community events like this street painting festival in Seaside neighbourhood, Florida allow children to be active agents of change in their neighbourhood.

- Change in materials so children observe change as they move through the neighbourhood.



Image 15.

In Vauban neighbourhood, Freiburg Germany, the landscape contains a variety of plants that will change in appearance throughout the year. Children can observe this change as they navigate the neighbourhood or by looking through their home window.

- Change in size of neighbourhood spaces so children have the option to play independently or socially

The importance of differently sized spaces in neighbourhoods is observed in these images where children are seen playing independently as well as in groups.

Image 16.



Image 17.



- Building orientation and design that allows children to observe change from home (ex. housing facing park or public realm that allows children to observe the dynamic nature of the neighbourhood environment)
- Landscapes made up of malleable materials, such as sand and soil, that can be modified by children contributing to their sense of self and control (Herrington et al., 2007).



Image 18. Child makes "mud pie" out of malleable material found in his neighbourhood. As described on the website containing this photo the activity of mud making has many benefits, including the fact that it "strengthens the muscles in the fingers they write with and improves their dexterity. It allows for uninterrupted (stay away from them!) play - this improves their ability to focus."

- Arts projects that temporarily change the urban environment (ex. temporary art installations, community art projects)

Image 19. Temporary art installation as part of ArtsQuest Arts Festival in Northwest Florida shows the power of art to introduce temporary change into the neighbourhood environment.



5) CHANCE

In the 7 C's model *Chance involves an occasion that allows something to be done; an opportunity for a child to create, manipulate, and leave an impression on the play space.* The opportunity for children to explore, manipulate, modify and engage creatively with the materials present in their environment is critical to the development of fine motor skills, spatial awareness, balance, integration and expressive activities (Herrington, 2007, p. 32). Also referred to as open-ended, flexible, unstructured, or spontaneous free play (Gleeson & Sipe, 2006; Herrington et al., 2007; SCY, 2000), play that involves chance is supported through the inclusion of “messy zones” where children can dig and play with water and sand freely allowing their imaginations to fully engage in the play experience. In addition to the importance of free play with malleable materials, encouraging spontaneous exploration in beneficial for children’s development. Spontaneous play links “physical movement with the mind” and can “enhance perceptual motor functioning – gross motor, spatial awareness, balance, integration (hitting a moving ball), expressive activities” (Herrington et al., 2007, p. 32). Spontaneous play also increases children’s cognitive understanding of the play space. Spontaneous play is encouraged by creating areas that consider children’s

perceptual field and create a sense of mystery through structures such as low walls and plant material.

Chance at the scale of the Neighbourhood

Creating chance in neighbourhoods can be achieved in the same way as in smaller-scale play spaces. Landscapes can be designed to be places for investigation and discovery through the use of plants, malleable materials, and running water. Retention of natural areas in neighbourhoods is also critical because these locations are often ideal for children's open-ended play. Open spaces in the neighbourhood can be designed to attract children's play by taking into consideration children's field of vision and creating places of 'mystery' for children to explore. Ensuring that neighbourhoods are safe and do not have significant physical barriers (e.g. unsafe streets) to open-ended play is also important and will increase children's range for play (Frumkin et al., 2004). While spontaneous and open-ended play in the neighbourhood will lead to a better cognitive understanding of the place, neighbourhoods should also be designed in a way that is intuitive for children, supporting their mobility and play.

Important to note in this section is the sensitivity designers and planners need to have to not "over-design" neighbourhood spaces, which can impede unstructured play. While specific design guidelines can certainly help entice children to play, there is a certain irony about designing for spontaneity that is worth taking heed of. Thus while this report is advocating for design solutions to encourage play, it is important for designers to ensure that they achieve a balance between design that encourages open-ended and spontaneous play and the provision of space that is fairly unstructured itself to allow for this type of play.

Neighbourhood features that support Chance:

- Natural areas for open-ended play and exploration



Image 20. Child sets out to explore in natural area

- Design that reflects an element of mystery (this can be achieved by incorporating stepping stones, low walls and plant material) and considers children's perceptual field, attracting them to explore areas and engage in 'spontaneous play'



Image 21. The height of plant material makes this path child friendly and draws children to observe and explore this natural area

- Malleable material used for landscaping and in play areas that can be shaped and moved by children such as river rocks, sand and soil.



Image 22. Play area in Vauban neighbourhood, Freiburg Germany that is composed of sand that children can mold, sift and move

- Street and path network that is safe and supports a large range of autonomous play/exploration.

6) CLARITY

In the 7 C's report *Clarity combines physical legibility and perceptual imageability*. This aspect of a successful play area takes into account the importance of designing places so that they support children's full expression of play. For instance, designing play areas so they take into account the scale and movement of children is critical (Herrington et al. 2007, p. 34). Furthermore, ensuring that play structures are situated in a way that does not interrupt children's movement (for instance, play apparatus located in the centre of the play space) is cited in the 7 C's report (Herrington et al., 2007). The report also discusses the sound-scapes of play areas, noting that the louder the outdoor play space the more confusion and stress that is experienced by users of the space (Herrington et al., 2007).

Clarity at the scale of the Neighbourhood

Clarity at the scale of the neighbourhood supports children's movement and full range of play. Clarity within neighbourhood can be achieved by ensuring that the features that make-up a neighbourhood's fabric (streets, open spaces, housing) are comprehensively design in a way that is intuitive and results in a cognitive understanding of the neighbourhood fabric by children. Specifically, clarity can be achieved by ensuring that neighbourhood features are well connected, easy to navigate, and relate well to each other (ex. through compatible uses and strategic building orientation and design). In addition to the neighbourhood fabric being designed in a way that facilitates children's movement throughout the neighbourhood, thus increasing children's range of play, open spaces that allow for uninterrupted movement also need to be integrated into the neighbourhood fabric. Furthermore, as mentioned in the 7 C's model, the soundscape of an environment also contributes to the clarity of that place and should be considered by neighbourhood planners.

Considering the scale and movement of children within the neighbourhood also adds to clarity and can be achieved through sensitivity to the heights of features such as walls and hedges as well as children's needs for mobility including pedestrian only zones and paths that children can safely walk and bike on. The physical legibility of the neighbourhood can also be supported by ensuring that different neighbourhood uses relate to each other, for instance through building orientation that connects residential, commercial and institutional uses with civic spaces of the neighbourhood. Buffer zones between different uses, for instance a front porch that leads to a shared outdoor space, can also aid in children's cognitive understanding of different neighbourhood functions (ex. private and public uses) and help them acquire independence from home (COP, 2007). Ultimately, clarity can be used as a design principle to guide the

placement of different elements and uses in the neighbourhood to support children's movement, full range of activity and play and in general a comprehensive and clear understanding of the neighbourhood fabric.

Neighbourhood features that support Clarity:

- Grid-like street pattern supporting navigation, versus sharply curving streets with dead ends and cul-de-sacs.
- Clear pedestrian crossings at major roadways that act as barriers to children's movement.
- Signage and design of pathways take into consideration size of children, assisting in their navigation and movement



Image 23. Boy walks home from school along path that is familiar, easy to navigate, and safe from traffic.

- Soundscape improved through traffic calmed street design (such as home zones or woonerfs) and use of plants and soft materials in public realm.
- Open areas for uninterrupted play integrated throughout neighbourhood.
- Neighbourhood uses that are compatible (relate to each other) (ex. housing with retail), well connected (physically and visually) and relate to each other through building orientation (ex. housing facing green space or public plaza)
- Buffer zones between different neighbourhood functions, such as private and semi-public spaces space (COP, 2007).

7) CHALLENGE

In the 7 C's report *Challenge refers to the physical and cognitive encounters that a play space provides*. Play that challenges children supports their physical and cognitive development. With increasingly strict safety standards applied to the design of children's play equipment challenge has been removed from many play areas (Herrington & Nicholls, 2007; Gill, 2007). The 7 C's report states that without taking risks, opportunities for learning are hindered. As such, children need to be encouraged to take risks within play spaces that are challenging physically and cognitively without being hazardous (Herrington et al., 2007, p. 35). Challenge can be incorporated into the play environment through the inclusion of features that can be climbed on, balanced on and crawled through. Furthermore, design elements that include "graduated challenges" are importance to satisfy age related differences in ability while also fostering learning and growth (Herrington, et al., 2007, p. 36).

Challenge at the scale of the Neighbourhood

Creating neighbourhoods that challenge children physically and cognitively can be achieved through thoughtful urban design and planning. Varying heights of surfaces, integrating objects that can be climbed on (ex. rocks or stumps) and structures that can be used for balancing activities (such as a low wall) are examples of physical features that can be included in the public realm of neighbourhoods to create challenging opportunities for play. Natural areas are often ideal places for play from this perspective because they contain more challenging and uneven surfaces and other materials (water, soil, rocks) that involve careful play and navigation. In addition to these features, streets can also be designed to support children's play and simultaneously teach them about environmental risks and the importance of good judgment and decision-making. The woonerf street design or "home zones" presents a model of street design that

prioritizes human activity, including play, challenging children to learn the skills necessary to live in an environment where risk exists (while they play). Neighbourhoods should also contain a range of spaces that require different play skill levels. This incorporates the “graduated challenge” component suggested for playspaces into neighbourhood design and thus supports a range of ages and the development of new competencies and skills as children grow.

Neighbourhood features that support Challenge:

- Varied heights and surfaces of walkways and in public realm.



Image 24. The elevated path found in the gardens of Valbyparken and Faelledparken, Copenhagen is an example of a built form feature that introduces challenge into the neighbourhood fabric

- Objects that can be climbed on (rocks, stumps)

Image 25. Tree for climbing, gardens of Valbyparken and Faelledparken, Copenhagen



- Structures for balancing (walkway borders)



Image 26. Wall for balancing, gardens of Valbyparken and Faelledparken, Copenhagen

- Streets for play (woonerf, home zones).
- Neighbourhood spaces that require varying levels of skill, supporting play at a range of ages and also children's transition into later stages of developmental growth. For instance, in a neighbourhood with a range of spaces, a toddler can graduate from playing in small pocket parks with even surfaces and few physical barriers to a naturalized play area that includes running water, uneven surfaces, rocks and boulders. The graduated challenge presented by this range of spaces in the neighbourhood simultaneously parallels and supports children's growth.
- Features that allow children to challenge themselves physically through play integrated throughout the neighbourhood.

Image 27. The stepping stones placed across this river in Seoul, South Korea as part of the Cheonggyecheon Restoration project is an example of a design intervention that slows children to engage with the environment in a way that challenges them without posing significant risk.



- Natural areas for play (forest, ponds, creeks, streams)



Image 28. Found in Augustenborg neighbourhood, Malmo, Sweden, this open water system collects 70% of rainfall while also adding a natural area for play to the neighbourhood.

Summary, Limitations, and Implementation of the 7 C's for neighbourhood design

Originally developed to inform play space design at childcare centres, the 7 C's of play space design also provide a useful framework for neighbourhood planning and design. The reality is that children's play extends beyond formalized play areas and into the neighbourhoods that they live, requiring that the spaces that make up neighbourhoods and the infrastructure that connects them be play friendly as well. The neighbourhood design suggestions found in this report are also reflected in other child friendly planning literature and strategies (for instance, London's Play Strategy) supporting the credibility of this model for neighbourhood planning. Furthermore, the 7 C's model adapted to the neighbourhood environment results in neighbourhood features, such as traffic calmed streets and green spaces, that not only support children but are also contribute to livability for all residents. Using this model to inform neighbourhood planning and design requires a discussion about implementation. Furthermore, despite its benefits the model isn't without challenges and limitations, thus the final section of this report will explore these in detail.

Implementation

The 7 C's of neighbourhood design are meant to inform the physical planning and design of neighbourhoods. As such, implementation of this model would most effectively take place under the authority of municipal planning departments. Specifically, these design principles and examples can be incorporated in neighbourhood planning design guidelines to ensure that any neighbourhood revitalization plans or new developments are child-friendly. In addition to informing design guidelines these principles can be used to inform broader planning strategies and policies aimed at creating child friendly environments. For instance, the City of Surrey in

British Columbia is currently developing a child and youth friendly strategy. The 7 C's of neighbourhood design could be used to inform the physical environment component of the strategy and achieve surrey's goal of making "neighbourhood design that provides young people with spaces and places that promote their healthy development" (COS, 2009).

In addition to informing design and planning that takes place at the government level, communities can also use the 7 C's to advocate for change within their neighbourhoods and work towards the introduction of neighbourhood features that are child and family friendly. Furthermore, community members who have the resources and capacity to make direct changes to their neighbourhood can use these guidelines to inform their work. For instance, this model could be applied to the design of street greening initiatives, making them play friendly and appealing to children. Some of the C's will be more directly implementable by community members than others. For instance, through neighbourhood greening initiatives, community arts projects, and the creation of signs that slow traffic, community members can foster the principles of chance, change, and clarity in the neighbourhood environment.

In addition to government and community-based implementation, private developers can use these principles to inform their residential design proposals and projects. This will result in plans that are not only quality places for children and their families, but will also appear innovative to consumers and municipalities during the development approval phase.

Challenges for Implementation

All in all the usefulness of the 7 C's of neighbourhood design depend on successful implementation of these principles either through government planning, private development or community-based work. However, while clear avenues for implementation exist, there are several

challenges associated with this step. Firstly, many of the suggestions included in this model require a significant capital investment. The costs of public realm and street improvements for instance are high and would require taxpayers' support for governments to be willing to move forward with implementation. If municipalities are unable to make the investments directly from the public purse some of the development costs can be passed onto private developers. However, to receive community benefits from developers, municipalities will have to provide some form of compensation, which could result in other tradeoffs for the city. For instance, density bonusing in the City of Vancouver is one way that the city receives many public amenities. The tradeoff associated with this approach however is more density. From the perspective of child-friendly planning it is important to assess whether the tradeoff associated with implementing the 7 C's doesn't conflict with the goals of the model.

Another challenge associated with the implementation of this model is the practice of planning itself and the reality that many municipalities are not prioritizing healthy community planning. Support for a model like the 7 C's, and a commitment to the resources required to implement this model, require a firm belief in the value of supporting children's development through the built form. While many cities are leading the way in child friendly planning (for instance the City of London UK and the City of Surrey, BC), others are continuing to build the suburban sprawl that is contributing to negative environments for children leading to problems such as childhood obesity.

The culture of fear associated with children's play can also act as a major barrier to implementation of this model. Designing neighbourhoods that support children's autonomous movement and free play requires that the public, and particularly parents, feel comfortable with this. Related to this culture of fear is the heavy reliance, by local and regional agencies in Canada, on strict safety standards to inform the design of children's play

spaces. These safety standards, established by the Canadian Standards Association, are driven by fear and profit as opposed to knowledge about children's play and development (Herrington & Nicolls, 2007). While these standards typically inform the design of formal play areas, not informal spaces of the neighbourhood, the fear underpinning these standards and their adoption into government policies could influence planners' willingness to introduce certain components of the model such as those relating to creating challenging play environments for children.

Limitations of the model

In addition to some of the potential challenges associated with implementing this model, other limitations of the 7 C's of neighbourhood design exist. The first limitation of this model relates to the challenge of adapting a model originally intended for small-scale play space design to planning at the scale of the neighbourhood. The risk of adapting a model to a geographic scale larger than it was intended for is that certain details might be missed or unaccounted for. This reality is reflected in the need to expand some of the definitions of the 7 C's to fit planning at the neighbourhood scale. For instance, the model addressed connectivity within the playspace boundaries, however connectivity between the playspace and neighbourhood were not discussed. From a neighbourhood planning perspective connectivity both within the neighbourhood and between the neighbourhood and broader city matter. As such, the original definition of this part of the model had to be expanded to account for the importance of connectivity between the neighbourhood and city. In addition to having to expand some definitions, other aspects of child friendly neighbourhood planning simply did not fit within the parameters of the model. For instance, land use and zoning did not fit with the model despite the role this plays in supporting livable communities that are child and family friendly (COS, 2009). The 7 C's therefore have to be used in

concert with other urban design best practices for complete and walkable communities.

Also adding to the difficulty of applying this model to the neighbourhood scale is the reality that descriptions in the 7 C's study are often brief and do not detail the theory behind the design suggestions. For instance, in the description of connectivity pathways are identified as critical components of the play space because they accommodate different forms of mobility and facilitate movement in the play space. This description did not however link the importance of accommodating mobility to child development (for instance to support the development of autonomy) making it hard to conceive how to apply this 'C' at the scale of the neighbourhood while staying true to the original intentions of the model. Furthermore, some of the themes covered by the 7 C's overlapped with each other resulting in a lack of clear distinction between some of the recommendations at the neighbourhood scale. For instance, the suggestions for achieving connectivity and clarity at the scale of the neighbourhood were very similar.

In addition to the limitations that come from adapting a model for playspace design to the neighbourhood scale, the model is limited in its focus on physical planning. A comprehensive child-friendly plan also needs to take into consideration the social and economic environment. Furthermore, some neighbourhood qualities that have both physical and social dimensions were hard to place in this model. For instance, the opportunity for children to observe social diversity in public places and though mixed tenure developments is important for children and yet was difficult to address in the model. Thus while the model was fairly comprehensive from a physical planning perspective some aspects of a child friendly environment were difficult to address, further supporting the need for other research to augment any policy or planning strategy using this model.

In addition to missing some components of a child friendly environment this model also neglects the importance of children's participation in planning, an essential component of any child-friendly plan (CFC; Gleeson & Sipe, 2006; Christensen & O'Brien, 2003). As such, later iterations of this model would benefit from soliciting children's opinions on how to effectively achieve each of the 7 C's and which ones matter most to them. Children's knowledge of local conditions in their neighbourhood will also contribute to the successful implementation of this model, which is fairly global in its approach and doesn't address local conditions and qualities.

Related to neglecting the importance of children's involvement in child-friendly design, this adaptation of the model also fails to address diverse needs that exist within the child population. For instance, the guidelines in this report fail to address specific needs of children who are not able-bodied or who are visually impaired. Further research is required to consider how to support children in the neighbourhood who face these additional physical challenges. Furthermore, this model is predominantly based on western norms associated with play. Most of the research included in this report is from Europe, Canada or the US. As such, to ensure that we are designing inclusive child-friendly neighbourhoods additional research on children's play from other parts of the world should be investigated.

Lastly, while the design suggestions in this report reflects principles of livability more broadly - supporting both children and the wider population, further investigation into how this model of neighbourhood design supports different segments of the population is needed. In other words, while a neighbourhood that is well connected, filled with traffic calmed streets, and has plenty of natural spaces is livable for all residents, not just children, additional research into how the suggestions in this report benefit seniors, recent immigrants, low-income people and the general public would be useful.

Child Friendly Neighbourhood Design: Conclusion

The first few years of life mark a critical period for human development. During this time a developmental blueprint is established influencing the health and wellbeing outcomes across the life course. The environments that children are exposed during this important period influence this development process. The neighbourhood is identified as a particularly influential environment from a child development perspective. This is where children engage in exercise, interact with peers and develop autonomy. The benefits children gain from the neighbourhood environment however depends on how they are planned and designed. Studies attribute recent increases in childhood obesity to community design that breeds car-dependence and sedentary lifestyles. To promote children's health, neighbourhoods need to be planned so that they are walkable, bikable, easy to navigate and include desirable spaces for play.

Of all the activities children participate in, play is identified as one of the most critical. Play not only contributes to physical health but important social and cognitive development. Through play children gain interpersonal skills, construct knowledge about the world and develop a sense of their own identities. Given the importance of play for children's development this report explores how to make neighbourhoods child friendly through design that supports this activity. The neighbourhood design framework introduced in this report is adapted from a model originally intended to inform outdoor play space design, called the 7 C's. The 7 C's model proposes 7 principles of design that support children's play, these are: character, context, connectivity, change, chance, clarity, and challenge. Ultimately, this report explores how these principles of design can be extended to the neighbourhood environment to meet

children's developmental needs with a particular emphasis on opportunities for play.

While the 7 C's model provides a useful framework for child friendly neighbourhood planning, there are some specific challenges related to implementation as well as general limitations of the model. The model is of value to government planning, private residential development and community planning initiatives; however, prior to successful implementation several challenges need to be studied and addressed. These challenges relate to the capital cost associated with implementation, tradeoffs associated with transferring the responsibility of implementation to developers, the requirement of planning authorities to prioritize child friendly planning in their approach to community development and design, and the culture of fear that prevents healthy risk taking associated with challenging play environments. In addition to challenges for implementation, the model itself has limitations. These limitations are associated with the challenge of adapting a model intended for small-scale playspace design to a complex neighbourhood fabric, the reality that the model only addresses physical planning, and that children's participation is left out. Furthermore, the model would benefit from further research related to the unique needs within the child population, different cultural norms associated with play, and how the model benefits other non-child residents of the neighbourhood. Despite these limitations and opportunities for further research, this model contributes to an important area of planning: the design of neighbourhoods that meet children's developmental needs with specific emphasis on supporting the critical activity of play. Given the concerning decline of children's health status this application of the model is timely and will hopefully contribute to a reversing of the trend toward optimal development and health for our youngest generation.

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