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Climate Change Risks and Resilience in Urban Children in Asia

Synthesis Report for Secondary Cities: Da Nang, Khulna, and Malolos

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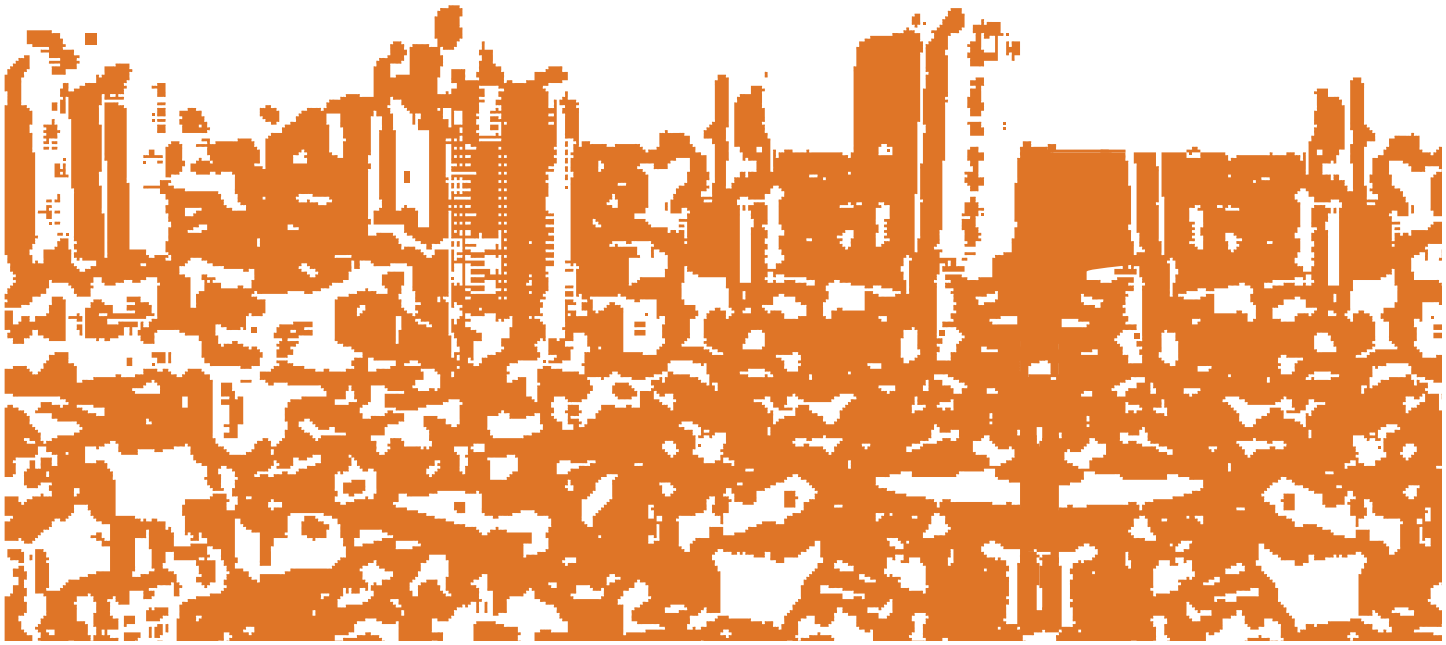

About the author

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Abstract

Climate change is a key challenge for Asian cities in the global south. Already half of Asia-Pacific's urban population live in secondary cities of less than 1 million, and as urbanisation continues more people will be exposed to direct and indirect hazards of climate change. The impacts will continue to devastate lives and homes – and have the potential to undo many development gains of the last few decades. Understanding these impacts begins to equip communities, governments and stakeholders to prevent long-term development losses.

This paper suggests that those most susceptible to climate change impacts are the children who live in slums, informal settlements and on the streets of secondary cities, as their exposure to increasing and dramatic weather events, disease outbreaks and fluctuations in temperature are made worse by entrenched poverty, economic recession, youth unemployment and fragile institutions. This multi-city study undertaken by IIED in partnership with Save the Children argues for a profound change in current thinking.

The study looks at three secondary Asian cities: Khulna (Bangladesh), Malolos (Philippines) and Da Nang (Vietnam). It considers the opportunities and gaps between current urban and climate change planning and argues for greater focus on secondary cities – in particular those cities at highest risk in Asia. It concludes by putting forward recommendations for government and non-government actors alike.

Abbreviations

ACCCRN	Asian Cities Climate Change Resilience Network
ADB	Asian Development Bank
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
CCA	Climate Change Adaptation
CCC	Climate Change Commission (The Philippines)
CCCO	Climate Change Coordination Office
CDKN	Climate and Development Knowledge Network
CRRERD	City Disaster Risk Reduction and Emergency Response Division
CSO	Civil Society Organisation
CUS	Centre of Urban Studies
DILG	Department of the Interior and Local Government
DMC	Disaster Management Committee
DOC	Department of Construction
DOE	Department of Environment
DONRE	Department of Natural Resource and Environment
DRR	Disaster Risk Reduction
HIES	Household Income and Expenditure Survey
IPCC	Intergovernmental Panel on Climate Change
KCC	Khulna City Corporation
KDA	Khulna Development Authority
LDP	Local Development Plans
LDRRMF	Local Disaster Risk Reduction Management Fund
LDRRMO	Local Disaster Risk Reduction Management Office
LDRRMP	Local Disaster Risk Reduction Management Plan
MoEF	Ministry of Environment and Forests
MOOE	Maintenance and Other Operating Expenditures
MTPDP	Medium-Term Philippine Development Plan
NAPA	National Adaptation Programme of Action
NEDA	National Economic and Development Authority
NGO	Non-Governmental Organisation
NTP-RCC	National Target Programme to Respond to Climate Change
RDP	Regional Development Plan
UN	United Nations
UNCRC	UN Convention on the Rights of the Child

1 Introduction: Background

1.1 Cities and children at risk

Asian secondary cities are facing increasing climate change impacts and increasingly children are the first victims. Children who lack appropriate safeguards and adequate care are vulnerable to heatwaves, sea-level rise, seasonal flooding and more extreme weather events such as typhoons. Yet very little is understood about the realties that children face, in particular the specific climate risks that impact their right to life, survival and development. Children's still evolving development makes them physiologically and metabolically less able than adults to cope with high exposure to hazards (Akachi *et al*., 2009; Costello *et al*., 2009). Furthermore, such exposure also threatens all other aspects of their wellbeing including their psychological health, education, safety and protection, and recreation. Living in cities can present further hazards for those children living in urban poverty, in precarious situations with respect to housing, land tenure, basic water and waste management systems, healthcare and emergency services (Dodman *et al*., 2013). Failure to address climate change will lead to increased risks that undermine children's development.

Recent research demonstrates that benefits of urbanisation are typically associated with increased income and proximity to services. Yet these benefits do not mean that the poorest and most vulnerable 40 per cent of the urban population are more likely to avoid malnutrition or gain access to basic services than poorer rural populations (Satterthwaite, 2002; Vlahov *et al*., 2007). Analysis of WHO data from 90 countries shows that infant mortality rates are typically lower among urban populations compared to rural populations within individual nations (Dye, 2008). However in many developing countries, the urban poor have higher rates of stunting and under-5 mortality than their rural counterparts (Van de Poel et al., 2007) People living in urban informal settlements in the developing regions face multiple health risks because of poor housing, lack of infrastructure and access to basic services, which make them, particularly children, vulnerable to communicable diseases such as respiratory and gastrointestinal illnesses, malaria, and accidents and injuries (Sverdlik, 2011). Vlahov *et al.* (2007) analysed WHO data from 154 countries and showed that the percentage of the population living in urban slum conditions is inversely associated with infant mortality, independent of the urbanisation of the country or average income.

With a quarter of the world's population – estimated at 863 million – living in slums (UN Habitat, 2013) the urban penalty should not be ignored. The advantages that cities notionally offer, such as improved access to clean water, sanitation, education, health services and livelihood opportunities, rarely trickle down to the urban poor, or worse, tend to bypass them all together. Impoverished urban children simply cannot thrive without resilient urban infrastructure, social protection mechanisms, inclusive urban planning and good governance that will lift them out of extreme poverty or declining conditions (McGranahan and Satterthwaite, 2014). The vast majority of the urban poor in the global south are forced to settle wherever they can find somewhere to set up informal homes or afford rents near places where they can find work. The poor tend to live on vacant land where there are inherent risks: environmental hazards (waterlogging, landslides, waste, lack of basic infrastructure provision and so on) and legal disputes over land ownership, among others. The urban poor typically have insecure tenure as they often illegally encroach on urban land earmarked for other uses or owned by others. Consequently local governments have no responsibility for provision of basic services unless the slums

are regularised. These communities are typically unable and often unwilling to invest in preventive measures to reduce the environmental risks due to uncertainty of tenure. Despite growing evidence that children in poverty can be catalysts for reducing risks to their lives and livelihoods in the disaster context (IDS 2012; Mitchel et al., 2008; Tanner 2010; Seballos and Tanner, 2011), in the absence of resources, an enabling environment and support for their capacity building, they may be exposed to increased personal risks.

1.2 Understanding climate change risk through a rights-based framework

UN Habitat (2014) estimates that 45 per cent of the urban population in developing countries live in slums and informal settlements, defined as 'a group of individuals living under the same roof lacking *one or more* of the following conditions: (1) access to improved water, (2) access to improved sanitation facilities, (3) sufficient living area that is not overcrowded, (4) safe structural quality and durability of dwellings, and (5) security of tenure'. These conditions represent the *five deprivations* that negatively affect the lives of slum dwellers. Such conditions violate several of the rights of children as enshrined in the United Nations Convention on the Rights of the Child (UNCRC), such as: the right of every child to a standard of living adequate for his or her physical, mental, spiritual, moral and social development (Article 27); the right of every child to reach the highest attainable level of health not only through access to healthcare but also through healthful living environments (Article 24); the child's right to play, recreation, rest and leisure through allocation of leisure time and provision of safe and appropriate spaces for play and recreation (Article 31); and so on. As insufficient attention is paid to improving the living environments of children in urban poverty in relation to the scale of the problem, millions of children across the world and particularly in low-income countries of the global south live in 'life and health-threatening' housing conditions (Hardoy *et al*., 1990) that pose great risks to their life and wellbeing. In any urban context, the gains made in child health and wellbeing will be undermined and the vulnerabilities of people living in urban poverty exacerbated due to the impacts of climate change in developing countries, unless the core issues of inadequate living environments are addressed in policy and practice.

Research shows that climate change presents particularly strong challenges to children in the global south. More than 700 million children below the age of 15 comprising 40 per cent or more of the population live in the 20 countries deemed at 'extreme risk' from climate change, mainly in the belt around and immediately north of the equator (Maplecroft, 2014). These countries are some of the fastest-urbanising in the world, many of them Asian, with some of the world's largest and most populated cities located on the floodplains of major rivers and in cyclone-prone coastal areas, making them susceptible to significant climate change impacts. Asia accommodates half of the world's urban population, 30 per cent of whom live in slums in Asia's cities (UN Habitat, 2013). Although coastal zones account for only 2 per cent of the world's total land area, approximately 13 per cent of the world's urban population live in these zones, with Asia having a higher concentration (UN Habitat, 2011). A large proportion of the population in Asia self-evidently are infants, children and adolescents. Yet few urban adaptation and resilience-building programmes in Asia focus on them, particularly those who live in low-lying coastal cities.

Research on child-centred adaptation in urban communities, particularly in the global south, is rare. Thus, it is unclear whether urban programmes run by child-led organisations are systematically building children's resilience to the specific challenges that climate change will bring to their lives. In order to address this gap in climate change adaptation and resilience research, this study highlights key vulnerabilities of Asian children in urban communities and seeks to identify ways and means to ensure that climate change does not undermine their development. The cities chosen for this study are secondary cities in countries deemed to be at 'extreme risk' from climate change (Climate Vulnerability Index, 2014; Maplecroft, 2014): Bangladesh, the Philippines and Vietnam.

2 Research Aims, Approaches and Methods

2.1 Aims

This study intends to make an important contribution to the growing literature on climate change and urbanisation; and will begin to address the substantial gaps in our understanding of child-centred urban adaptation. It will also provide a resource for non-government organisations including Save the Children country offices to integrate climate risk and resilience building into their core plans in urban areas, particularly, although not exclusively, in the Asia region. Three secondary cities – Khulna (Bangladesh), Malolos (Philippines), and Da Nang (Vietnam) – were chosen to examine the opportunities and challenges for children at risk to climate change; and to understand the challenges that practitioners and policymakers encounter on the ground. The research objectives of this paper are:

1. To understand the risks that climate change poses to the development of urban children
2. To explore children's prospects for participation in climate change adaptation
3. To consider the nexus between climate change, urbanisation, urban poverty and children

2.2 Approaches

The research applied several data collection methods. First, a desk-based review of current literature linking urban development, poverty reduction, child wellbeing and climate change with particular focus on understanding the impacts of climate change in urban areas; the key vulnerabilities of children to climate and non-climate hazards, particularly for those in poor and marginalised communities; and threats to adaptive capacities and urban resilience building. This review helped to sharpen the research questions, in developing appropriate methods for the empirical study and in the analytical framework for analysis of the city case studies.

Next, case study cities were selected based on a range of factors including: the current and future climate hazard burden, coastal or tidally-influenced location, the historical records of disaster management efforts and spatial analysis of the above information with reference to existing city development plans and master plans. The focus on secondary/smaller cities is important because such cities often have fewer resources and expertise to overcome disaster-related challenges and they are under-studied as compared to mega cities.

To build on the knowledge base of previous studies on climate change-related risks to urban children, the three city studies were designed to answer five research questions:

1. Which urban communities and children are at most risk from climate change-related hazards and disasters?
2. How are urban children impacted by the spectrum of risks posed by climate change?
3. What measures are currently taken by the city for climate change mitigation and adaptation activities and for building urban resilience to climate change?
4. What are the current practices of child participation in disaster risk reduction and management and climate change adaptation in policy and programming?
5. What are the implications for future child-centred CCA programming?

2.3 Methods

The methods used for the city-level studies included a literature review of relevant geographic information such as city-level records of frequency and impacts of hazards, population dynamics disaggregated by age and sex, and other social indicators. The review also examined city development plans, municipal records, slum surveys, urban studies, and national and state/province-level child protection policies and programmes. Next, the research conducted an observational study in selected wards that are considered climate hotspots. This process included site visits, child-led field trips and rapid assessments of local areas. Focus group discussions were used to understand the community perspective. Groups included young mothers and mothers of young children; and children in schools, community centres, drop-in centres, and shelters. Finally, key informant interviews were conducted with urban planners, policymakers, practitioners from local, national and international CSOs, and donors to local NGOs and community groups, in order to triangulate community data and understand an institutional viewpoint of urban children and climate change.

The case studies were then compiled, compared and analysed for similarities in child-related vulnerabilities to climate change in urban contexts. The results of this cross-study analysis are presented in this paper.

There were several assumptions made to maintain consistency throughout the case studies. First, the research considers a child to be a person under the age of 18. Also, children are considered as active agents in this research and not passive victims. Finally, informal settlements are understood to be urban settlements where poor communities have constructed shelters/houses using their own means on public or private land without formal permission.

3 Limitations of Study

The limitations of the studies are symptomatic of broader concerns at the city level in the global south, such as availability of accurate and up-to-date information including census and spatial data. Furthermore existing climate models are not downscaled to the city level or subdivision, which further adds to the difficulty of conducting research on climate change within cities of the global south.

Due to the small sample sizes (fewer than 100 respondents) in each city, the findings are not representative of the entire city, but are illustrative of typical situations. Even though poor migrants were found to be one of the most vulnerable groups, accurate data on the size and status of the migrant population are lacking. It was also difficult to access migrants for focus groups and follow-up interviews due to their inability to take time away from their daily money earning activities. Similarly, children who lived and worked on the street and disabled children were hard to reach. Many senior government officials were unable to attend expert interviews at short notice and sent junior officials who were not prepared for the sessions and had poor quality data to share.

The studies focused on adaptive capacities of cities and what different forms of governments, NGOs and local communities are doing to adapt to climate change. The role of the private sector in CCA and DRR was not explored. The study also did not map the sector activities of NGOs in the CCA and DRR domain and only gives an overall sense of NGO involvement.

4 Key Concepts

4.1 Vulnerabilities of children in urban poverty

'Vulnerability' can be defined as the set of circumstances of an individual, household, population group, system or asset that make it susceptible (or sensitive, in the case of ecosystems) to the damaging effects of a hazard and/or effects of climate change (Turnbull *et al*., 2013). These circumstances can be physical, institutional, political, cultural, social, environmental, economic and human, and depend on factors such as exposure, physical susceptibility, socioeconomic fragility and lack of resilience (Cardona *et al*., 2004).

Children in poverty face multiple deprivations rendering them vulnerable in fast-urbanising cities of the global south. They are frequently exposed to physical hazards, such as polluted water; open sewer systems; inadequate public transport; lack of local safe play areas or cultural facilities; toxic local environments; and overcrowding. The dangers severely restrict children's independent mobility and opportunities for play and recreation while increasing their exposure to hazards, violence and unintentional injuries (UNCRC General Comment no. 17, 2013). The cumulative effect of such risks severely undermines the adaptive capacities of children to climate change. Understanding these risks is important, as policies that lessen pressures on resources, manage environmental threats and increase the welfare of the poorest members of society can simultaneously advance sustainable development goals, enhance adaptive capacity and reduce vulnerability to climate change and other risks.

4.2 Climate change risks relating to urban children

The coastal regions of Asia, particularly urban areas, could face some of the most devastating impacts of climate change, such as increasing heat stress, extreme rainfall, flooding, drought and water scarcity (IPCC, 2014). 'Many of the world's largest cities are in the floodplains of major rivers in Asia and in cyclone-prone coastal areas.' (Huq *et al*., 2007, p.1). As different places experience changes in climate (e.g. increase in temperatures or rainfall), specific impacts on cities will vary. Cities have always lived with natural hazards, but climate change will increase the frequency (or intensity) at which some natural hazards occur (World Bank, 2011). These impacts and hazards will intensify risks for those lacking essential infrastructure and services, and make poverty reduction more challenging by prolonging existing and creating new poverty traps in urban centres (IPCC, 2014).

Children are physically more vulnerable to these changes due to their fragile, still-developing bodies. A comprehensive review carried out by Sheffield and Landrigan (2011) assessed the threats posed by climate change on children's health. They found that several factors contribute to children's environmental exposure thus increasing their susceptibility to potential impacts. These include children's physiology and metabolism that make them less able to cope with heat, their young age that makes them hypersensitive to exposure and dependant on caregivers, and their fruit and vegetable dependent diet that makes them more vulnerable to climate sensitive insect vectors. Additionally, children are potentially exposed to newly developing or worsening environmental hazards in the future.

Urbanisation, and rural-to-urban migration trends, are also amplifying climate-related risks in cities. The urban population of the world has grown exponentially since 1950, from 746 million to 3.9 billion in 2014. And while Asia's levels of urbanisation remain low, it is home to 53 per cent of the world's urban population and is expected to house the largest urban population in the world (UN Department Economic and Social Affairs, 2014). Bangladesh, the Philippines and Vietnam are among the few countries where most of the projected urban growth in Asia will be concentrated (Roberts and Kanaley, 2006). These three countries are also ranked as the third, fourth and fifth most at risk countries globally in terms of exposure to extreme weather events (under current and future climate scenarios) (Wheeler, 2011).

WHO estimates that more than 88 per cent of the global disease burden due to climate change occurs to children under five and estimates that, in 2011, climate change led to an additional 30,000 health-related deaths in children under that age (Reinvang, 2013). The International Food Policy Research Institute (2009) has shown that since the 1980s global maize and wheat production have declined by 3.8 per cent and 5.5 per cent respectively, compared to a world without climate change. This will contribute to a projected additional 25 million malnourished children globally by 2050. The global impact of climate change exacerbates rates of hunger causing more than 200,000 deaths per year, half of them among children in low-income countries (Dara, 2012).

Climate change is not gender neutral. While climate change-related shocks are often linked to higher rates of absenteeism and school dropout – as boys and girls are kept home to help their families supplement the household income or aid with debris clean-up (UNICEF, 2011) – more girls are taken out of school and are subsequently less likely to return afterwards (Plan, 2013). The existing gender gaps at school are thus further exacerbated by environmental shocks (Brody, et al., 2008) and undermine efforts towards the attainment of universal primary education. Climate change presents acute challenges to children in the global south, already disadvantaged by poverty, migration, rapid urbanisation, inequitable and poor access to infrastructure, education, health and other protective services. Table 1, below, summarises the key challenges, as recorded in current literature.

Table 1: How climate change impacts affect urban children

Exposures due to projected change in climate	Consequences for children's socio-physical environments in cities	Implications for children's health	Implications for children's safety, protection, education, play and recreation, and social development
Warm spell/ heat waves	■ Increased heat island effect ■ Declining urban air quality ■ Water shortage ■ Decreased water quality ■ Power outages	■ Heatstroke ■ Asthma and allergic disease, bronchitis ■ Renal disorders from heat-related dehydration ■ Water-borne and food-borne diseases: diarrhoea, malaria, dengue, cholera	■ Children living and working on the streets are most vulnerable to heat stresses ■ Children working in factories without proper ventilation and cooling for long hours are subjected to multiple health hazards
Heavy rainfall events Intense tropical cyclone	■ Flooding, strong winds and landslides ■ Disruption of public water supply and sewer systems, and adverse effect on quality of surface and groundwater ■ Damage and losses to physical assets and infrastructure: houses, public facilities and utilities ■ Disruption of transport, commerce and economic activities ■ Withdrawal of risk coverage in vulnerable areas by private insurers ■ Potential for population migrations	■ Drowning, injuries; ■ Ingestion of contaminated water leading to communicable water-borne and water-washed diseases: diarrhoea, cholera, hepatitis, leptospirosis ■ Post-traumatic stress disorder (PTSD) in populations displaced through natural disasters, which is often manifest in children through increased bedwetting and aggression	■ Young girls and boys are at highest risk of flood-related fatality ■ No safe play spaces ■ Children living in unsafe housing in informal settlements without proper drainage are at most risk from non-communicable and communicable diseases and injuries ■ More children out of school due to illnesses ■ Poor children likely to drop out of school and engage in paid work to augment family income ■ Separation from families including due to death of family members, migrating on their own, child trafficking ■ Migrant children are more vulnerable: least likely to attend school; more exposed to violence; typically unreached by child protection services

Exposures due to projected change in climate	Consequences for children's socio-physical environments in cities	Implications for children's health	Implications for children's safety, protection, education, play and recreation, and social development
Drought	■ Increased water demand put stress on water resources; declining water quality ■ Land degradation with lower agricultural yields and increased risk of food shortages; dust storms ■ Potential for population migration from rural to urban areas	■ Malnutrition ■ Diseases related to poor hygiene and inadequate sanitation as water sources get depleted: diarrhoea, scabies, conjunctivitis, trachoma ■ Pneumonia, measles	■ Forced migration occurs due to water stress and food shortage ■ Internally displaced persons typically seek refuge in marginalised urban areas and in urban poor settlements ■ Increased resource conflict exposes children to violence; girls and women especially vulnerable ■ Increase in cost of food leading families to adopt adverse coping strategies such as removing children from school, selling assets, and compelling children to work
Extreme high sea level	■ Permanent erosion and submersion of land; cost of coastal protection versus costs of land use relocation ■ Decreased groundwater availability because of saline incursion into aquifers ■ Increased effects of tropical cyclones and storm surges, particularly coastal flooding ■ Loss of property, enterprises, livelihoods; damage to buildings from rising water ■ Potential for population migration	■ Increased risk of deaths and injuries by drowning in floods ■ Physical and mental trauma ■ Highest health risks from salinisation of water supplies; long-term developmental implications for children ■ Diseases related to poor hygiene and inadequate sanitation as water sources get depleted ■ Water-borne, water-washed and food-borne diseases	■ Influx of displaced refugee children in cities ■ Loss of habitat, loss of sense of belonging to place, loss of favourite places and friendship and social networks, loss of cultural identity, loss of play and recreation opportunities ■ Disruption of children's everyday routines, healthcare and school attendance ■ Increasing vulnerability for children in poverty, migrant children, girls in poverty; reduction in protection

Sources: Akachi *et al*., 2009; Sheffield and Landrigan, 2011; UNICEF, 2008, 2012; Bartlett, 2008; Lawler and Patel, 2012

4.3 Framework of analysis for child vulnerability

The research considers climate change through a rights-based approach to child-led development underpinned by the commitments to children in the UN Convention on the Rights of the Child (UNCRC). Additionally, the research framework addresses the vulnerabilities faced by urban children in their everyday lives in three critical domains: physical, politico-legal and socioeconomic, which intersect with the UNCRC perspectives on child rights. *These can be summarised into 3Ps: Provision, Protection, and Participation*:

- Rights to *provision* refer to the 'inputs' necessary to ensure children's survival and development, including resources, skills and services.
- Rights to *protection* prevent acts of exploitation or abuse by adults, or institutions that threaten children's dignity, survival or development.
- Rights to *participation* offer children a means to engage with processes that bring about the realisation of their rights.

The 3Ps helps us to understand the indivisibility of these rights and how they interrelate; for example, a child cannot realise their rights if they are being abused. Considering these rights in the context of urban children faced with climate change will allow for an innovative exploration of how climate change places urban poor children at increasing risk (Save the Children Wales, n.d.).

4.4 Urban climate resilience

In recent years the concept of resilience has emerged as a popular term with civil society, donor agencies, multilateral organisations and government institutions. And yet, while the term is appealing and widely applied, it remains heavily contested. For the purposes of this paper we have borrowed from UNISDR and define resilience as 'the ability of individuals (including children) households and countries to resist, to adapt and to manage change by maintaining or transforming living standards in the face of shocks or stresses, without compromising their long term prospects. (UNSIDR).

In this study, urban climate resilience will be analysed based on the conceptual framework for urban climate resilience from the perspective of planning and intervention measures developed by the Institute for Social and Environmental Transition (ISET) (Tyler and Moench, 2012) as part of the Asian Cities Climate Change Resilience Network programme (through which this study was partly funded). This conceptual framework breaks down the idea of resilience into simplified elements such as physical infrastructure systems, human agents (individuals and social organisations), and social institutions (rules and practices), which link agents and systems. Within this conceptual framework, building urban climate resilience requires the physical strengthening of infrastructure and ecosystems, the building of capacities of social agents to adapt, and the addressing of institutional factors that constrain effective responses to system fragility. This approach focuses attention on enhancing the capacity of institutions, communities and individuals to adapt to shifting contexts and manage anticipated as well as unanticipated risks – rather than merely focusing on vulnerabilities.

4.4.1 Participation of urban children in the resilience-based approach

Child participation appropriate for CCA and DRR has no singular formula but is indeed dependent on community and institutional dynamics, livelihood strategies, living standards, cultural factors and the hazard risks of the community (Tanner, 2010). A study by Plan International argues that children are often more knowledgeable about climate change impacts than adults, based on information learned at school or from accessing environmental information through other media and communication sources (Plan-UK, 2002). In a multi-country study, UNICEF researchers found that children showed a high level of awareness of climate change impacts [1] (Lawler and Patel, 2012).

1 *In Indonesia, for example, children associated drought periods with increases in food prices. In Kiribati, children were aware of*

Children can be risk communicators, capable of identifying risks based on their conception and analysis of their environment. In the Philippines, children's groups have used participatory video to lobby local officials on the ways that some development practices (tree cutting and mining) have increased the risk of flooding (Lawler and Patel, 2012). A child-centred participatory research project in El Salvador and the Philippines found that children have a unique ability to conceptualise and understand risk in relation to their own experience of vulnerability, and that children's risk perceptions differed according to age and gender (Tanner, 2010). The research recommended a new role for children as risk communicators to create behavioural change in other people in their community. For example, youth have been trained as peer educators in schools and communities in the Solomon Islands to track seasonal changes, and communicate risks to protect their communities in times of natural disaster (Lawler and Patel, 2012).

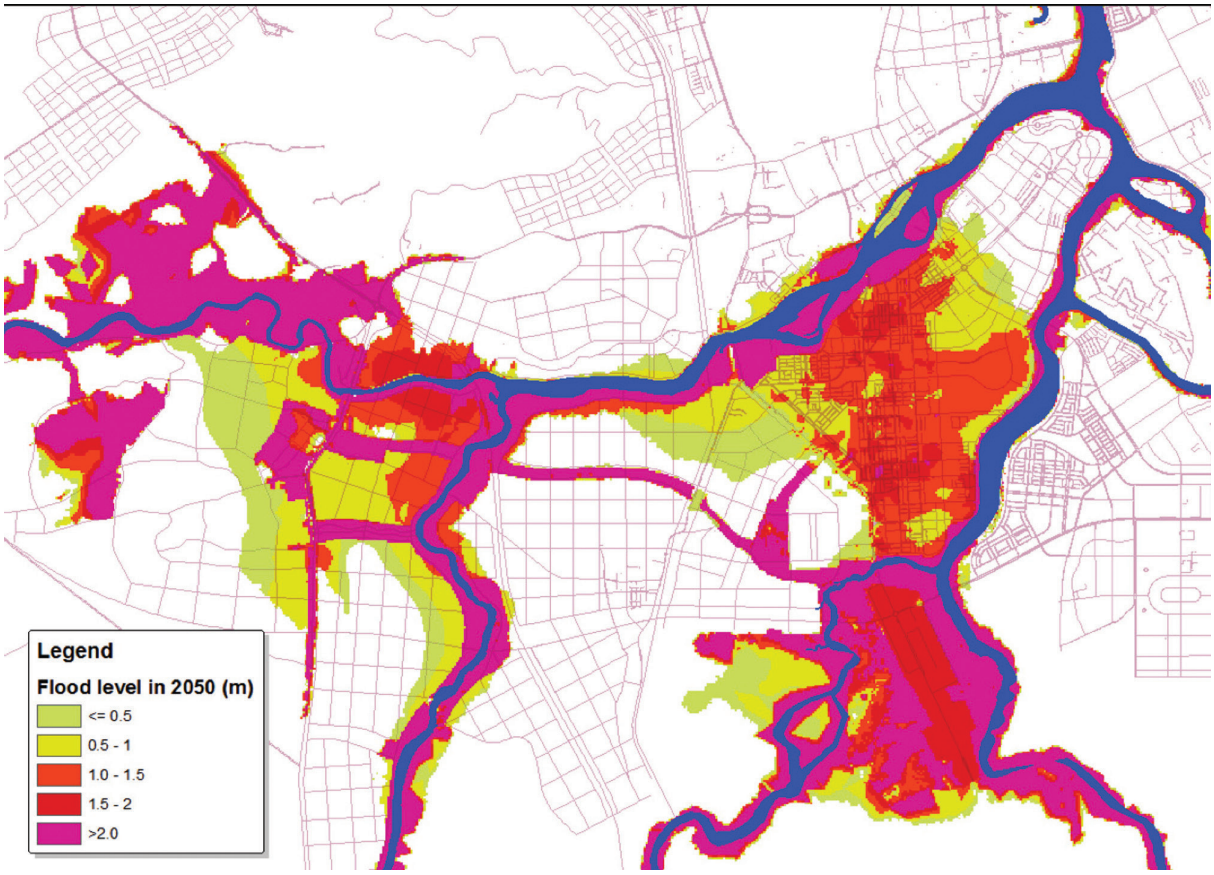
Children can also be change agents, and are often able to mobilise their communities and create a fertile ground for action. Evidence gathered from the children participating in a study in Kenya and Cambodia demonstrated their aptitude for absorbing new information, proposing adaptation strategies, acting on future visions and the needs of future generations, taking action for the benefit of their communities; and prioritising sustainable management of natural resources and environmental concerns (Polack, 2010). In the Philippines, schoolchildren skilled in disaster risk mapping and vulnerability assessments used their knowledge to successfully persuade school officials and community planners to relocate their school, previously situated in a high-risk landslide zone, to a safer area (Back *et al*., 2009). In Vietnam, 126 children developed and presented a declaration on climate change to government leaders as input for the UN Climate Change Conference (COP15) (Lawler *et al*., 2009).

migration as a direct impact of coastal flooding that had washed away their land and source of livelihood. These children also noted that development practices can exacerbate climate impacts; for example removing sand (a common practice in some islands) to sell for construction purposes results in greater coastal erosion.

5 City Profiles

5.1 Da Nang

Figure 1: Da Nang flood map



Source: Tran and Tran 2013

Da Nang is a coastal city lying on the central eastern seaboard at the mouth of the Song Han River, ringed by mountains on one side and the South China Sea on the other. It is the largest city in central Vietnam and one of the country's most important ports. Da Nang experiences a tropical, monsoon climate with two seasons, typhoon and non-typhoon. Peak rainfall occurs during September–December and is associated with typhoons and tropical depressions. During the dry months, Da Nang can experience prolonged drought.

The population of Da Nang is 926,018 (2010) and the total area of the city is 1,283 sq km (the population density is approximately 720 people per square km). The majority of Da Nang's inhabitants are under 45 years of age. The city's average gross domestic product was 13.5 per cent between 2011 and 2013. The share of industry and services is almost 55 per cent of the gross domestic product.

Urban poverty was around 10 per cent in 2013. The peri-urban districts in general have higher concentrations of urban poor. The most vulnerable are in the peri-urban districts of Lien Chieu (10.3 per cent), Son Tra (10.2 per cent), Ngu Hanh Son (12 per cent) and Hoa Vang (16 per cent). A large number of poor migrants from neighbouring provinces now work in Da Nang. These groups concentrate in Lien Chieu and Son Tra where cheap labour is needed for seasonal jobs in processing factories and on urban construction sites. A significant number also work in central districts as street vendors.

Key natural hazards

Typhoons

Annually, Da Nang is hit by typhoons and the effect is felt all over the municipal area. For example, in 2006, Typhoon Xangsane, the strongest in 70 years, caused severe damage in all the districts. Total losses were valued at over 250 million USD, 35 people were killed and over 10,000 households (over 40,000 people) were evacuated. In 2013 Typhoon Nari, moving at 133km/hr, caused a loss of 40 million USD and forced over 50,000 people to evacuate (Disaster Management Centre). Typhoons hitting Da Nang have generally increased in frequency and severity as a result of climate change.

Floods

River flooding usually occur in the rivers Cu De and Tuy Loan due to heavy and concentrated rains. Compared to the average precipitation between 1908 and 1999, the projection between 2020 and 2100 will increase from 0.7 to 4.1 per cent (Da Nang People's Committee, 2012). Due to the change of rainfall in the last ten years and the poor management practice of hydro-power plants upstream, floods have occurred in a sudden and unpredictable manner, with higher frequency and more extreme intensity. Before 1998, one flood happened about every ten years. However, between 1998 and 2009, six severe flash floods occurred. All were above level 3 and one reached approximately the level of the historic flood of 1964.

Droughts

Droughts in Da Nang have become prolonged and more intense under the impacts of increased temperature and change of rainfall. During a period of 33 years from 1960, only one severe drought was recorded, in 1983. But between 1988 and 2006 four impacted the city, in 1988, 1990, 1998 and 2002. The drought in 2002 (considered the worst in 20 years) lasted from May to mid-August, resulting in saline intrusion further upstream of Cau Do, Cam Le, Vinh Dien and Cu De Rivers (ISET, 2011).

Heatwaves

As weather patterns chang, Da Nang often receives five or six extreme heatwaves a year. Temperatures can reach 40 degree Celsius. Mainland winds from Laos and Cambodia blow continental heat throughout the central region. Forest fires and extreme heatwaves are common. As a result, sudden increase in demand for water, electricity and healthcare puts extra stress on urban services (Disaster Management Centre, n.d.).

River bank and coastal erosion

The main causes of river bank and coastal erosion are due to increased intensity and unpredictable patterns of rainfall causing change of water flow and storm surge. This coupled with sea-level rise has made the issue of riverbank and coastal erosion a serious climatic risk.

Saline intrusion

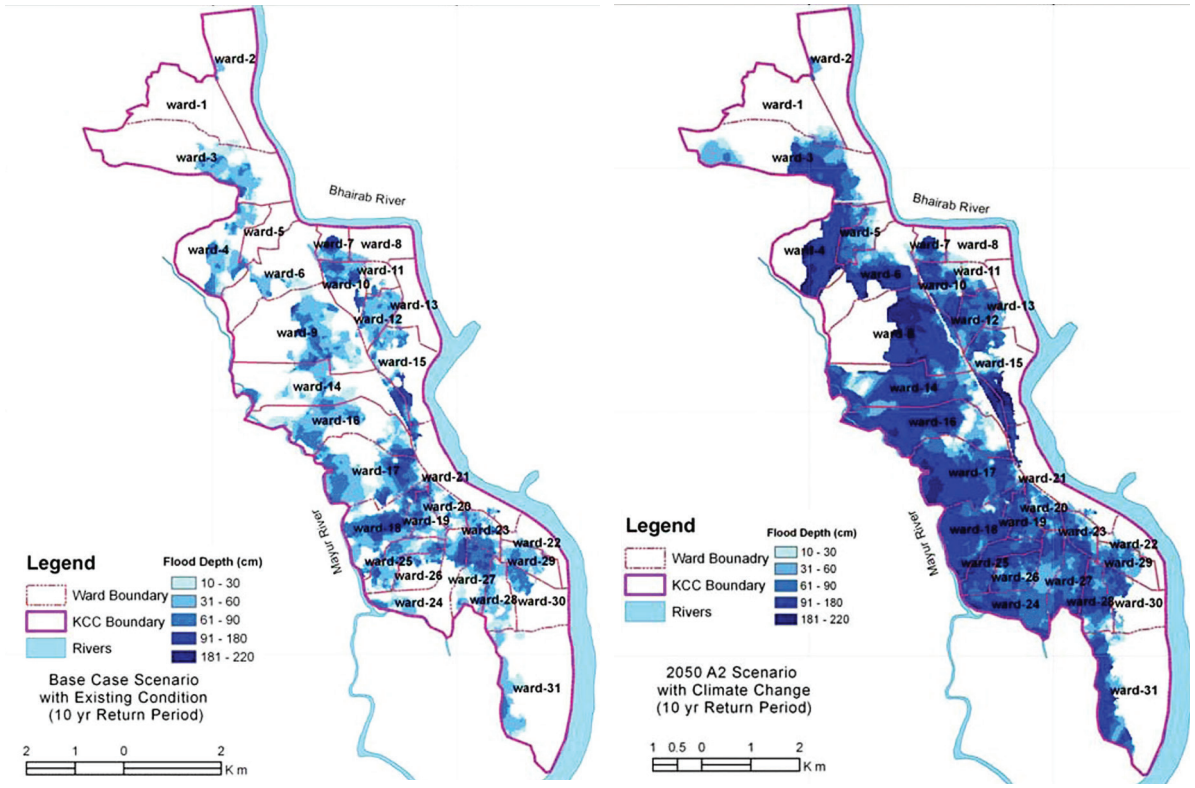
Saline water often intrudes further upstream in Vu Gia River, reaching the An Trach Dam in Hoa Tien Commune. In recent years saline intrusion often takes place for nine months during the dry season. In combination with limited water released from hydro-power plants upstream, saline water causes a severe shortage of water supply for agricultural activities and for urban piped water plants (ISET, 2011).

Tropical storms have caused severe damage to vulnerable coastal areas in Da Nang where many poor households live. Flooding is a recurring problem, both in poorly drained central areas as well as in peri-urban districts undergoing rapid land conversion. Rapid tourism development on exposed beaches that are exposed to tropical storms, sea surge and coastal erosion makes these newly developed areas very vulnerable to climate impacts. Such development also poses threats to critical ecosystems and flood buffers, which are already under pressure from coastal urban development. At the same time, direct drilling of deep wells to access fresh water is a common practice and leads to lowering of water tables.

In addition to climate hazards, Da Nang experiences a multitude of non-climactic hazards, such as traffic accidents due to increasing urbanisation and industrial pollution due to economic expansion, as well as earthquakes and tsunamis.

5.2 Khulna

Figure 2: Flood maps of Khulna



Source: ADB 2010

Khulna is located in the south western part of Bangladesh on the banks of the tidal rivers Rupsha and Bhairab. It is part of the largest delta in the world. In the southern part of the delta lies the Sundarban, the world's largest mangrove forest. Khulna is located to the north of the Sundarban. Khulna experiences hot and humid climate. Khulna has an annual average temperature of 26.3C (79.3F) and monthly means varying between 12.4C (54.3F) in January and 34.3C (93.7F) in May.

Annual average rainfall of Khulna is 1,809.4 millimetres (71.24 in). Approximately 87 per cent of the annual average rainfall occurs between May and October.

The population of Khulna, the 3rd largest city in Bangladesh, is 1,781,000 (2011). The total area of Khulna is 4389.11sq km of which 607.80 is riverine and 2,028.22 is under forest cover; the city corporation area is 45.65 sq km. The city has a high density of 3,335 people per square kilometre and about 40 per cent of the population is under 19 years of age. Economically speaking, Khulna generates a relatively low proportion of national GDP (11.7 per cent) according to a Planning Commission report (GoB, 2009).

There is high incidence of urban poverty in Khulna with poverty around 28 per cent and 15 per cent falling below the extreme poverty line (CDIA, 2009). A recent study shows that there are 520 slum clusters in Khulna city housing a population of 188,442, which is 19.5 per cent of the city's population (CUS, 2006).

Key natural hazards

Tropical cyclones

Bangladesh has been severely hit by at least eight major cyclones since 1965, wreaking significant damage and loss of life – those of 1970 and 1991 caused 300,000 and 140,000 casualties respectively. In 1988, 2002, and 2007 tropical cyclones made landfall near Khulna. According to government statistics the cyclone Sidr, which hit Bangladesh in November 2007, killed about 3,400 people and damaged 1,714 km of roads (total damage was estimated at USD1.7 billion). Storm surges are higher in Bangladesh because the Bay of Bengal narrows toward the north, and in recent years general cyclonic activity in the Bay has become more frequent (ADB, 2011). Affected by these cyclones, the landless poor of southwest coastal areas often come to Khulna City.

Salinity intrusion

According to the Department of Environment (DOE), salinity levels near Khulna have increased in the last several years. These levels will increase even more with rising sea levels and prolonged dry weather. Salinity intrusion from the Bay of Bengal into the river system around Khulna is influenced by the surface water hydrology prevailing around the city; tidal flow from the bay has daily, seasonal, and annual variations (ADB, 2011)

Waterlogging

Similar to other urban areas of Bangladesh, Khulna city has a serious drainage problem and the impacts of climate change on inadequate drainage is likely to be severe. Increasingly, natural drainage channels and other water retention areas have disappeared due to urbanisation. During intense rainfall particularly in the late monsoon, some parts of the city are flooded regularly; 38 per cent of households experience short-term waterlogging (e.g. for one day). Victims of longer periods of waterlogging live in wards 31, 21, 20 and in 22 located near the river and have high concentrations of slum pockets (Murtaza, 2001).

Rainfall

During 2004–2009, the average annual rainfall in Khulna was 1,924 millimetres (mm). More than 90 per cent of the annual rainfall occurs between May and October. The level of humidity rises to 89 per cent in July and high humidity continues till the end of September.

Heatwaves

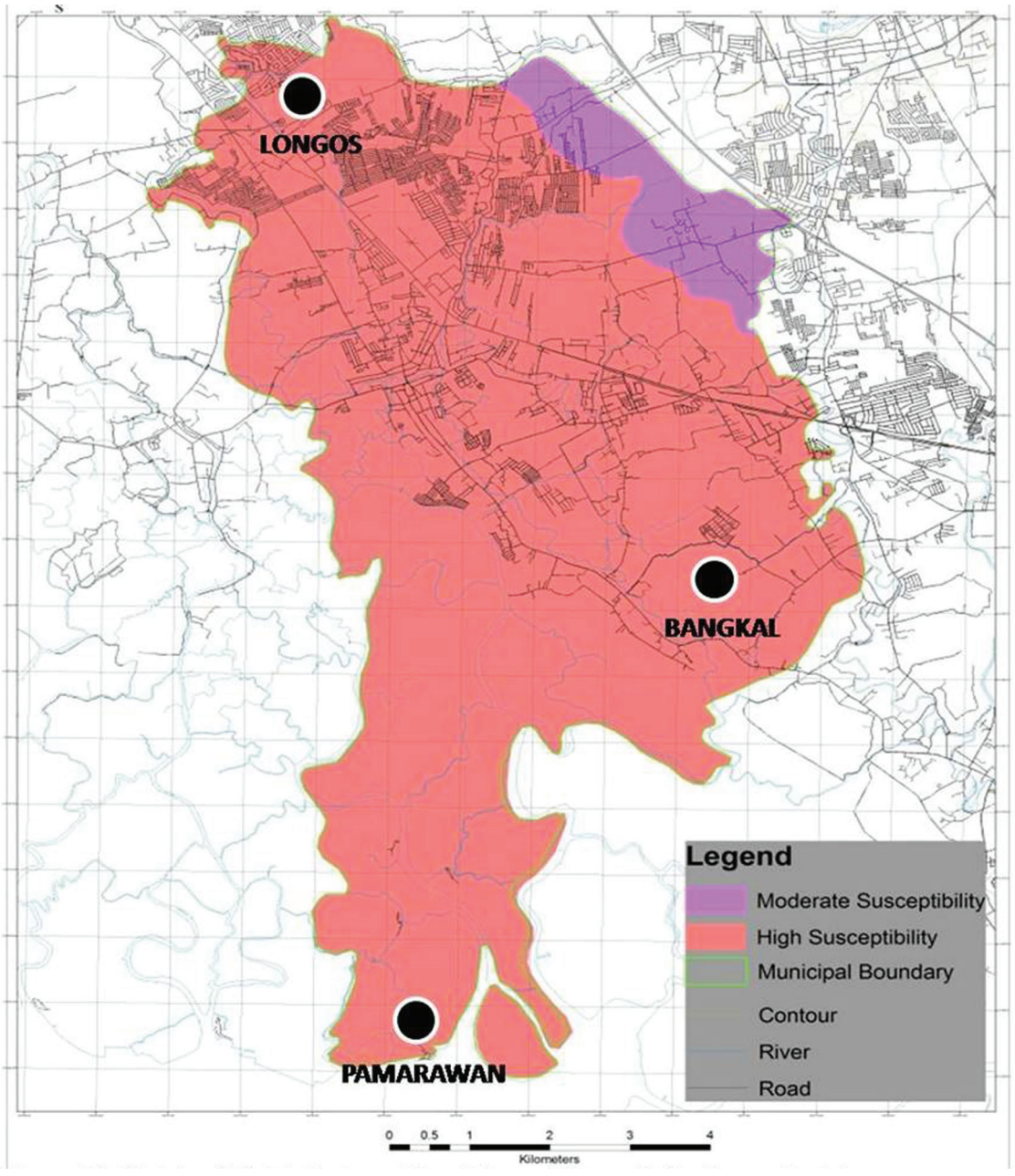
The average maximum temperature of 33C and above is usually recorded during March and May, and the average minimum temperature of about 15C is usually recorded in December and January (ADB, 2011). The south west region of Bangladesh including Khulna city experienced heatwaves in the first two weeks of June 2014. During that time 337

children were admitted in the children's hospital, overwhelming the capacity of 275 beds. Sick children had to share beds and the youngest were put on the floor (Daily Observer, 2014).

Other non-climatic hazards include traffic accidents, with 30 per cent of those involved being under the age of 20; and house fires. In Khulna 24 per cent of informal settlements have fire hazards (CUS, 2006), while encroachment by private builders in open areas blocks access for emergency vehicles.

5.3 Malolos

Figure 3: Preliminary Flood Hazard Map of Malolos with three study barangays highlighted



Source: City Government of Malolos 2011

The city of Malolos is one of the 24 municipalities and cities comprising the province of Bulacan in the Philippines and serves as Bulacan's politico-administrative capital. Malolos city is located in the Central Luzon region, just 42 kilometres away from Metro Manila. Malolos is surrounded by other municipalities except in the south where it is bounded by Manila Bay. Its topography is relatively flat to gently sloping. The city has two pronounced seasons: wet and dry. The months of May to October are wet and rainy, while November to April are relatively dry and cool. Southwest air currents prevail during the months of June to September, bringing in strong winds, tropical rains storms and typhoons. Annual temperature varies from 20C to 35C.

Malolos has a total population of 234,945 (2010). The city's population has been steadily increasing, growing at 4.31 per cent between 2007 and 2010. This most recent change has been attributed not only to natural increase but also to the influx of migrants from other areas. Malolos comprises 51 urban 'barangays', the lowest political unit in the Philippines, and occupies a total land area of 6,725 hectares. Malolos is a third-class urban component city. It is rapidly developing and fast becoming one of the major economic centres in the Central Luzon region. Its major economic activities are services, agriculture, manufacturing and tourism.

A total of 2,410 households with 10,932 members were classified as poor in 2011 according to the Draft Local Shelter Plan 2014–2021 or about 5 per cent of the total 2010 census population.

Key natural hazards

Typhoons

Like many areas in the Philippines, Malolos city is exposed to typhoons. Between 2006 and 2009, records from the Bulacan Provincial Disaster Risk Reduction and Management Office (PDRRMO) show that the province was visited by ten major typhoons, leaving a death toll of 45.

Flooding

Flooding is the most common hazard in Malolos2caused by continuous heavy rainfall, typhoons, high tides, storm surges, overflow from natural water bodies, and dam water releases. There are 11 major rivers and 15 creeks in Malolos, which overflow during heavy rains. Clogged drainage systems, improper solid waste disposal, encroachment of structures and silted waterways further exacerbate the situation.

Storm surge

Coastal barangays in Malolos are prone to storm surges. Wave surges from Manila Bay affect these areas during thunderstorms and typhoons. According to the city government, Pamarawan and Caliligawan among the coastal barangays have the highest population exposure to storm surge hazard occurrences.

While Malolos is not directly on a fault line, the Philippines rest on the Pacific's earthquake and volcano 'Ring of Fire'. Thus earthquakes and tsunamis may affect Malolos in the future due to the movement of the nearby Manila Trench Valley fault, the West Valley fault and active faults in Region III.

Demographic, social, and physical characteristics for each city are summarised in Table 2.

Table 2: Urbanisation and climatic trends for Da Nang, Khulna, and Malalos

	Da Nang	Khulna	Malolos
Demographics	Population: 926,000 in 2010, the majority under 45 years of age	Population: 1.78 million, 40% under 19 years of age	Population: 234,945 in 2010, 30% under 14 years of age Economy: services (banking), agriculture, manufacturing, tourism
Urban poverty	Estimated 10% of population	Estimated 28% of population. There are 520 slum clusters totalling 19.5% of the city's population; slum eviction is common	Estimated 5%, or 10,932 people, classified as poor, while 2,366 households classified as informal. Thus poverty does not equate to informal housing
History of disasters	Super-typhoon Nari, 2013; Super-typhoon Xangsane, 2006: damages totalled 250 million USD	Cyclone Aila, 2009; Cyclone Sidr, 2007: 3400 deaths, total damage 1.7bn USD	Typhoon Pedring, 2011: flooded 23 barangays; Typhoon Glenda, 2014: 13 barangays affected; southwest monsoon 'hagabat', 2012: 3 deaths, 43 barangays flooded
Climate threats	Typhoon, flood, drought, heatwave, coastal erosion, saline intrusion	Tropical cyclones, salinity intrusion, waterlogging, heavy rainfall, heatwaves	Typhoon, flooding, storm surge

6 Key Findings

This section highlights the common findings and conclusions from the three independent city studies relating to urban children's vulnerabilities to climate change. The first section explains how a changing climate will create and exacerbate risks. The next section considers urban infrastructures, associated adaptation and resilience planning, and how these impact urban children specifically. The last section explores existing child participation in urban CCA and DRR programmes. Combined, these findings offer insights into the nexus between climate change, urbanisation, urban poverty and children.

6.1 Impacts of climate change on urban children

6.1.1 Urban children most at risk of climate change impacts and non-climatic hazards

Box 1: Lack of education rights for migrant children

Mrs Tam is a migrant worker with two young daughters. Her mother comes over every day to take care of the two children in their rented room – as a migrant and not a local resident she is ineligible for state-owned pre-schools and private kindergartens are too expensive. So she has no choice but to keep the active little girls at home with their grandmother. 'I am helpless' said Mrs Tam. 'It is not right to do this but I have no choice. My salary is just enough to feed the whole family. As a migrant worker, I have no right to request for anything, but as young kids they should have the right to join a kindergarten.'

In the three cities some children are more vulnerable than others. The focus group discussions with school-going, non-school-going, working and street children, parents, teachers and communities showed the following children to be most vulnerable to climate change impacts.

Migrant children

Children migrate to cities for many different reasons: better economic and educational opportunities; to escape neglect and abuse; loss of a parent; to escape conflict or natural disasters; and other reasons. They are typically pushed to the margins of society with no access to public services, social protection, emergency healthcare and often education (UNICEF, 2012). This puts them in a more disadvantaged and vulnerable position than other children in urban poverty. Migrant children tend to get excluded from both rural (source) and urban (destination) policy designs and programmes. Migrant children, especially if migrating alone, are exposed to violence, abuse and exploitation, though most migrant children move with their families (van de Glind, 2010).

Even though urban poverty rates are low in Da Nang (10 per cent in 2013), closer inspection of the causes of structural vulnerability of the urban poor reveals a significant difference between the general resident poor and migrant workers. Over the past two decades, Vietnam has achieved impressive economic growth and also made steady progress towards achieving the Millennium Development Goals. However, by many of the criteria used to measure household wellbeing, migrant households across the city were found to be far more deprived than other urban poor households (Thanh, 2013) and are excluded from all government programmes.

Box 2: Experience of a young climate migrant in Khulna

'I ride the fruit van five or six days in a week. We start at ten in the morning. The ride is tough for me in summer when the sun is very hot. This is monsoon and it is raining incessantly. Recently, I have suffered from fever. I have also suffered from fever in the past years. Normally I take my lunch at 4 pm after reaching home. Sometimes, I take my lunch with only bread and bananas when the earning is limited.'

This 13-year-old boy is a climate migrant. He came to Khulna City with his family in 2007 after the cyclone Sidr. He dropped out of school and to support a family of seven started selling fruits with his father in the streets of Khulna. The family now lives in Sonadanga slum.

Half the migrant population comprise families with children (Da Nang Municipality Council, 2011) and such families are on the rise in Da Nang. While the official poor residents receive support from the municipality such as for better housing, migrant workers receive no support. Migrants live in scattered informal rental houses belonging to locally registered people including the urban poor; they do not even get equal access to essential services such as healthcare, education and child protection. As a result, their children are the most vulnerable in the municipality. No official data on migrant families or their children are released, including exact numbers, status, housing needs, employment records and the like. Neither is there any concrete proposal to support these families to build their resilience to climate change risks and uncertainties.

As an important coastal industrial city, Khulna has long been receiving environmental migrants, but their numbers have soared since recent cyclones Aila and Sidr (Roy *et al*., 2013). Cyclone Aila affected 3.9 million people and displaced 76,478 families in Satkhira and Khulna alone (the two worst affected districts) (IOM, 2010). Experience of rapid onset events, such as tornados in Bangladesh, suggests that timely and adequate assistance is a key factor in reducing migration as a direct consequence of cyclones (Paul, 2005 and 2003). Following Cyclone Sidr in 2007, a significant number of girls dropped out of schools and went to towns as domestic workers and in the garment industry. Most of them have not returned to school. Other girls are forced into prostitution, particularly those from the poorest families and households headed by women (PLAN, n.d.). In Khulna, migrants find housing in existing slums and other low-income settlements. Landowners speedily erect informal dwellings or expand their homes to provide accommodation for these migrants, without providing additional services. This increased density puts pressure on existing infrastructure and services. CUS (2006) shows that about 70 per cent of the slum dwellers of Khulna city are migrants from the adjacent south-western districts of Bangladesh, who came in search of employment and to escape poverty.

Even though migration is considered one of the factors contributing to the population growth of Malolos (4.31 per cent growth between 2007 and 2010), the city study in this research did not find migrants to be a significant vulnerable group except in the barangay of Bangkal. Here, resettlement housing was created by the government about five years ago to relocate poor migrant families who lived along unused rail lines (locally called 'riles'). When the railway service was extended to connect Bulacan to Metro Manila and neighbouring provinces in the north, migrant children from Bangkal unanimously reported being happier and safer in their old homes along the rail tracks. They knew their neighbours and had more space between houses; and conflicts were fewer as compared to the denser resettlement housing where families unknown to them were relocated from other parts of the city. The children also missed the open fields with trees along the railway tracks, which are lost to them in the new denser urbanised location.

Migrants are not only an illegal group in formal planning processes, but appear to be invisible. There is limited data and research on migrants in all three cities in the different country contexts. For migrant children to enjoy their rights as children within their countries, irrespective of their location, it is imperative to collect accessible, accurate and disaggregated data on their lives in urban areas. At the municipal level, surveys of migrant households and migrant children without families need to be integrated with geographic information systems to produce maps and visual representations of the spatial realities and disparities in the lives of migrants and non-migrants. This municipal data should be built up ward by ward and by district to construct a city-wide information base that should be easily available to planners and decision-makers.

Children living in informal settlements

Of the three study cities, Khulna has the largest population living in informal housing. A recent study shows that there are 520 slum clusters in the city, housing a population of 188,442, which is 19.5 per cent of the total population (CUS, 2006). About 39,638 houses, comprising 26 per cent of the city's total housing, are *Kutcha (temporary)*, making such housing extremely vulnerable to climate change impacts (see Section 6.2.3: Housing for the urban poor).

Box 3: Children's perspectives of climatic hazards in informal settlements of Khulna

'*On rainy days we have to work although we get wet. We catch cold and fever often but we don't receive any treatment. If there is heavy rainfall the drains are blocked and overflow inside the house. Lots of insects appear at that time and bite us. We have to collect water from very far as our tube wells go under the filthy water. We contract different diseases such as typhoid, fever, etc.*'

A participant from the boys' focus group in Sonadanga slum.

Girls in their FGDs reported having to collect drinking water from a distance during rainy season. They often slip, fall and injure themselves. They also said that in some tube wells, located near drains, they get dirty water, which makes them sick. Diarrhoea is very common in their slum during the rainy season. Cooking becomes a problem as there are no high dry places for keeping a stove. They get skin rashes, fever, colds and respiratory problems.

According to a report on Bangladesh Child Rights Situation (2013) prepared by Manusher Jonno Foundation, 502 children died from drowning in 2012, with 118 deaths in August alone during the rainy season.

The data show that the wards with the highest percentage of informal housing also have the highest proportion of children and those under 19 years of age. According to a study on urban health in Khulna (Hossain *et al*., 2010), in a sample of 115 children under five, 33 per cent were reported to have an illness, indicating a higher morbidity rate in slums than the city more broadly. The majority of children (42 per cent) suffered from fever followed by diarrhoea (11 per cent), typhoid (5 per cent), skin disease (5 per cent), malnutrition, dysentery, respiratory infections, and so on. As few of these children receive medical attention, what is often perceived as fever may have underlying implications. Most of the diseases reported are consequences of inadequate quality of surface and groundwater, water shortage and decreased water quality, heat stress, and declining air quality, among others. Climate change will undoubtedly exacerbate the conditions that cause these diseases and make children vulnerable in informal settlements in Khulna.

Even though Da Nang does not have localised slums settlements, scattered informal houses of migrants are common on private plots. By the end of 2011, 11,300 households with 114,300 people lived temporarily in Da Nang municipality, typically in informal housing, accounting for 11.5 per cent of the population (Da Nang Municipality Council, 2011). Due to rising land prices in central areas, registered urban poor households tend to relocate to cheaper peri-urban districts. While these areas are poorly serviced, they are supported in different ways to improve the housing conditions; families who cannot afford to build a safe house themselves are given loans to do so or the local authority builds one for them.

Urban poor households are also eligible to rent government-built apartments at a preferential rate. The Department of Construction (DOC) is in charge of building 7,000 houses by the end of 2015 for the urban poor. But migrant households are excluded from such programmes and their living conditions, as discussed above, fail to safeguard the rights of their children.

About 4 per cent of the urban poor population of Malolos live in informal housing, according to the Draft Local Shelter Plan 2014–2021. Such housing is dispersed over 51 barangays. The selected wards of this study – Bangkal, Longos and Pamarawan – count 22 per cent of their population as urban poor, comprising 507 households with 2,429 members. The largest number of urban poor households, 352, is in Bangkal, which is a site where slum dwellers from other parts of the city are relocated. In both Bangkal and Pamaravan, the poor do not live in slums but in state-provided resettlement housing. Children from Bangkal complained that in the new area floods are common and flood water recedes more slowly than in their previous slum next to the railway lines. Children also missed the open spaces around their previous settlement. Bangkal has the highest number of out-of-school children due to poverty, and so inadequate housing and lack of play spaces impact children's everyday lives even more.

Children living and working on the streets

Increasing urbanisation, population growth and migration have forced tens of millions of children to live and work on the streets of cities across the world (UNICEF, 2012). Children whose poverty and vulnerability (for example to violence or abuse at home or in the neighbourhood) leave them few choices and often they take to the streets as an escape and last resort (Thomas de Benitez, 2007). Children's age, gender, ethnicity and disability status influence the extent and type of violence they experience and the coping mechanisms they develop. In many countries, such children are criminalised and crimes against them are rarely investigated (UNICEF, 2012).

Street children comprise a diverse group with varying degrees of dependence on the street or in public places, and with their families. UNICEF categorised this diversity in three ways (Hardoy *et al*., 2001) as shown in Table 3. The sight of children living and working on city streets is one of the most compelling narratives of poverty, deprivation and abuse of children's rights.

Table 3: UNICEF categories of children living and working on the streets

Children *on* the streets	**Children *of* the streets**	**Abandoned children**
Children, who work on the streets but who have strong family connections may even attend school and typically return home to their families after their work day. This is the largest category of children seen in the streets.	These children see the street as their home as they seek shelter, food and work here. They may have families in other places, but ties are weak. This group may include children who have run away due to factors such as abuse, violence or poverty.	These children have no family ties and are otherwise indistinguishable from the first two categories.

Of the three countries included in this study, Bangladesh has an overwhelmingly high number of street children as well as more published research on their status. An estimated 500,000 children live and work in the streets of Bangladesh; about 75 per cent of them are in Dhaka (Conticini, 2001). There is no adequate mapping of street children in Khulna. Data from a recent empirical study (Subarna *et al*., 2014) show that the majority of Khulna's street children (25 per cent) reside in Khulna rail station and on its adjacent vacant land. The average age of children of the street in Khulna is 12 and most are male (77 per cent). More than 85 per cent of the street children have never been to school, and 94 per cent work on the street in various jobs: rag-picking, van/rickshaw pulling, begging, portering at the railway station, and as shop assistants and vendors in the marketplace/shopping areas (Subarna *et al*., 2014).

In the Khulna study the focus group discussions included street children. But the participants were mainly street children whose participation was facilitated by Prodipan, a national NGO working on reducing hazardous child labour through skill development training and informal education. The other two categories of children are even more vulnerable than this group and also hard to reach because of their mobility and lack of ties. Sudden onset disasters such as cyclones, storms, intense rainfall, and flooding greatly impact children living and working on the streets (see Box 4) as both their homes and workplaces are greatly affected. Future research needs to focus on the vulnerabilities of street children in greater depth and particularly include those who have been abandoned.

In Vietnam, all participants in this research confirmed that there are no working children, including migrants, below 15 years of age in Da Nang. However, a significant number of outdoor construction workers in the urban wards of Da Nang are migrant teenagers aged between 15 and 18, according to local authorities. Even though official statistics on working teenagers in Da Nang are non-existent, a significant number of teenagers both from local urban poor and migrant groups work in a variety of jobs in the streets, factories and stone workshops. Da Nang is committed to being a prosperous and child-friendly city in its planning vision. Such a vision is predicated upon eradication of hard and hazardous work by children under 18 *including* migrants. But the reality is different as poverty causes families to send children to work; the lack of official data and surveys means that young working people remain invisible in formal policy-making processes.

Malolos does not have any consolidated data on working children. However, the key informant interviews and focus group discussions during this research showed that many children work as street vendors of local food products in Bangkal barangay, which has the highest concentration of urban poor. Children travel several kilometres each day selling 'buko salad' on the streets of their own and other barangays. Many of these are school-going children who do this after school, while others do this from early morning to afternoon. The hazards cited by children working on the streets were traffic, extreme heat that gives them headaches, and loss of income in times of typhoons, floods, and heavy rain.

Children working and living on the streets tend to be among the poorest, with limited access to public services, local social support programmes or healthcare provisions. They have limited adaptive capacity when faced with heatwaves or heavy rainfall. They are vulnerable to climate impacts both while working outdoors and in their poorly constructed informal housing. However, children living and working on the streets are not a homogeneous group, and it is imperative to develop in-depth research on climate change impacts on each sub-group. Such knowledge is critical for planning child-centred resilient cities.

Box 4: Experience of a child rag-picker from Khulna

One of the FGD participants in Khulna was a 13-year-old boy from Rupsha slum who migrated with his family from Gopalgonj District. He works as a Tokai (rag-picker) and collects different things such as metal objects, plastics, rubber parts, paper and polythene. He lives with his family of six. As a new migrant, his father was unable to find work and support the family which is why his son had to drop out of school in class 2 and start working in the streets. Poverty means that his sister does not go to school. The child rag-picker earns 30 or 35 taka (40 US cents) per day by selling what he finds in the old market.

Child labourers

Many children have to work to survive. An estimated 215 million boys and girls aged 5–17 were engaged in paid work in 2008, 115 million of them in hazardous work (ILO, 2010). As well as working on the streets as rag-pickers, sellers of goods and shoeshiners, they also work at tea stalls, in people's homes and in factories, frequently putting in long hours and without social security (UNICEF, 2012). Domestic labour, a predominantly urban phenomenon, engages children from slums, especially migrant girls. Often they face physical abuse and violence, and become victims of rape; many suffer psychological problems.

According to the Labour Law of Bangladesh 2006, the minimum legal age for employment is 14. Of particular interest to this study is the finding of the BBS-UNICEF Multiple Indicator Cluster Survey (2006), which showed 19 per cent of slum children (5–14 years) are engaged in paid work (UNICEF, 2007). Many of the focus group participants in the Khulna study were working children from the Rupsha and Sonadanga slums. Some of them have been involved in hazardous jobs from a young age and do not attend school. In the focus group discussions, slum dwelling working children revealed that they have no choice but to go to work even when the streets are waterlogged, otherwise they lose their daily wage. However, sometimes they have to stay home during extreme waterlogging and wait for the water to drain. Sickness is also a major cause of lost daily wages. Securing food becomes a problem without money, and food prices increase during heavy rains. The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) of 2009 considers food security, social protection and health as strategic areas for development. Ensuring all three for slum dwelling, working street and migrant children should be a priority area for Khulna city resiliency planning.

Vietnam has no official record of working children under the age of 15. According to the Vietnam National Child Labour Survey 2012, some 1.75 million working children are categorised as 'child labourers', accounting for nearly 9 per cent of the national child population. Nearly 85 per cent of these children live in the rural areas, 60 per cent aged 15–17; 40 per cent of child labourers are girls. Even though it is illegal, some children start work as young as 12, and nearly 55 per cent of these children do not attend school (5 per cent will never attend school). Children work in different sectors, about 67 per cent in agriculture, 16 per cent in construction/manufacturing, and 17 per cent in services. Most children involved in work in the secondary economic sector are in open-air workplaces that demand great mobility and expose them high accident risks, extreme temperatures and toxic environments, which can inflict injuries and damage their physical development.

There are 1,407 out-of-school young in Malolos (MCG, 2013). The most impoverished barangay, Bangkal, records the highest number no longer going to school – 124 boys and 85 girls. Focus group discussions with out-of-school children in the three selected barangays found the main reason for dropping out is inadequate family income, which compels the young to join paid work.

Disabled children

Malolos has a total of 839 people with disabilities across 51 barangays. However, this data is not disaggregated by age. During the focus group discussions with parents of children with disabilities, they expressed concerns about the day-to-day safety and security of their children. These children normally stay indoors as the parents are worried that it may be unsafe for them to be outside. The situation for disabled children is particularly challenging in Bangkal where there are no playgrounds or open spaces and children normally can only play on the streets, which have increasing traffic every year.

Da Nang Municipality has a total of 2,265 children with disabilities out of 213,112 children under the age of 16 (2013), according to the data provided by the Department of Labour, Invalids and Social Affairs. These children have different types of disability, including sight, hearing, and mental and movement impairments. The researchers on interaction with an urban poor family with a disabled child in Da Nang, found that a family member, in this case the grandmother, needs to supervise the adolescent while the parents work on the streets as vendors. Their house is informally built and vulnerable to storms, during which the child and his grandmother must leave, helped by neighbours. There is no official help provided by the municipality.

The Khulna city study accessed children through a local NGO that works on issues linked to urban poverty, vulnerable children and climate change. Largely due to the invisibility of children with disabilities particularly when living in poverty, and the tight timeline and limited resources available to the city study, the focus group discussions that were arranged in the selected wards failed to secure the participation of children with disabilities. The overwhelming problems of children living in slums, working on the streets and climate migrants in Khulna eclipsed the vulnerabilities faced by other children including those with disabilities. In Bangladesh, the Standing Orders on Disaster (SoD) clearly specify the roles and responsibilities of different departments and divisions under several ministries. The disaster management framework prioritises the overall security of women, children and people with disability when they are moved to safe places and shelters. However, research on the vulnerabilities of those with disability in the urban context of Bangladesh

due to climate change is missing. Future research needs to specifically address this issue particularly for children with disabilities and living in poverty.

6.1.2 Climate sensitive hotspots and risks to children in Da Nang, Khulna and Malolos

Urban functions and urban populations located in climate hotspots are most at risk from climate change impacts. Urban areas located in coastal zones and low-lying land close to river systems are vulnerable to typhoons, cyclones and floods. Such types of land are generally considered untenable for urban development and thus these peri-urban areas are prime sites for informal settlements of the urban poor. Drought sensitive hotspots are those areas where there is inadequate water supply during dry seasons as in most urban poor areas that lack adequate basic services and infrastructure, and where households are dependent on agriculture for livelihoods and food security. The Hoa Vang district in Da Nang is an acute drought hotspot in the city because of its inland location away from major river systems and its dependence on agriculture. Some of the severe impacts of droughts are food insecurity, loss of livelihoods, school dropouts, migration, child labour, and malnutrition.

In Da Nang, Khulna and Malolos, the areas that are located in climate hotspots typically have high concentrations of urban poor. Khulna's informal settlements are widespread in these locations, whereas in Da Nang and Malolos, the poor live in scattered informal houses with no tenure security, in state provided relocation housing with tenure security, or have other arrangements, but not necessarily in slums. Physical, socioeconomic and politico-legal characteristics of urban settlements determine the type and extent of vulnerability of the urban poor to climate change and the outcome of impacts (Roy *et al*., 2013).

The most recognised climate change-induced disasters by urban communities, including children, are the sudden onset large disasters such as typhoons (Da Nang and Malolos), cyclones (Khulna), and river floods and waterlogging following intense rain. Strong winds from a typhoon or cyclone impact a whole city; but the urban poor, whose houses are typically built with cheap, weak materials, are most at risk. The city-level studies under this research found that as houses collapse, roofs fly off and electricity fails, children are most at risk of being injured or killed. During floods, housing, crops, food reserves and roads are damaged and children run the risk of injury or even drowning. These sudden onset large disasters have lasting impacts on children's everyday lives and routines. In the most insecure informal houses, water can stand inside homes for days, disrupting normal family life. Cooking and storing food become difficult as floor space is under water and bio-mass based cooking fuel gets wet, affecting food preparation. Latrines, typically with no water connection or sewage systems, overflow and contaminate the standing water inside homes. Caring for young children and infants without any safe dry area, inadequate clean water and nutritious food also becomes a challenge.

Common diseases after such events are fever, skin rashes, diarrhoea, food poisoning and respiratory tract infections, among others. These events lead to disruption of schooling as roads are blocked or inundated and school buildings are damaged. These climate change impacts threaten the lives and survival of the most vulnerable children such as infants and the very young, children in acute poverty and environmental migrants, and children working outdoors. They also undermine the development of children by violating the rights to health, education, play and recreation, and an adequate standard of living (Table 4). Table 5 provides stories of climate-related risks of children from the three cities.

Table 4: Spectrum of disaster risks for children (climate and non-climate)

Disaster and hazards	Da Nang	Khulna	Malolos	Key risks
Sudden onset large disaster	Typhoon; flood; potential earthquake and tsunami risk although the frequency, severity and likelihood are very low (Da Nang People's Committee, 2012)	Cyclone; flood	Typhoon; flood; earthquake and tsunami (these non-climatic disasters are potential risks in Malolos and included in its contingency plan; the city is yet to experience these directly)	Loss of human lives and livelihoods, disease outbreaks due to water-borne and water-washed vectors after floods and prolonged waterlogging in low-income settlements. Disruption to daily life patterns as a result of house damages, electricity cuts, water and food shortage. Sudden onset events frequently result in rises in food prices, making it difficult for families to afford adequate nutrition for children, with implications for stunted growth and wasting. Loss of school days as access to schools is cut off and school buildings damaged. The cyclone SIDR affected education of more than 100,000 children in 589 schools in 12 districts of Bangladesh. Oversupply of casual labour during periods of natural disaster with implications for low and irregular income, loss of skills, underemployment, rise in social problems.
Slow onset large disaster	Drought; sea-level rise; temperature increase; river bank and coastal erosion; saline intrusion	Sea level rise; temperature increase; salinity intrusion, River erosion; sedimentation	Sea level rise; temperature increase; salinity intrusion; river erosion	Loss of land, food insecurity. Increased salinity of drinking water supplies is a major issue leading to shortage of water. Loss of human lives and livelihoods, disease outbreaks. Loss of and damage to housing, damage to fishing boats; damage to roads, irrigation and basic services infrastructure, and communication systems. Loss of tourism. Loss of work and school days, climate migration.
Small disasters	House fires occur in informal housing	House fires common across the city, particularly in slums; seasonal flooding	House fires, traffic	Injuries and death, loss of assets, damage to property. House fires are mostly from kitchens and electric wiring. Unsafe cooking practices that use bio-mass based fuels in inefficient stoves kept on floors are contributing factors.
Everyday hazards	Traffic; industrial hazards (in some wards); hazardous outdoor spaces for play and recreation with no designated spaces	Traffic; unsafe and unhealthy living environment in slums; lack of drainage, sanitation and safe drinking water in most slums; hazardous outdoor spaces for play and recreation with no designated spaces		Risky urban development with no provisions for pedestrians and non-motorised transport are contributors to traffic accidents. With no provisions of safe play spaces children have no choice but to play on the streets. They are thus prime victims of traffic hazards. In Khulna children were found to be particularly at risk of traffic accidents: about 10 per cent of the victims were under 10 years of age and 20 per cent were aged 10 to 19 in all traffic accidents recorded for 2001 and 2002.

Table 5: Children's stories of climate-related risks from Khulna, Da Nang, and Malolos

'Our house is located near the canal. Every year our house floods during the rainy season. Because of this I failed to go to school for a week. I was also not able to do the homework for English which was hard for me while staying at home. When I attended school after a week, my teacher did not care about my situation. Instead I was beaten mercilessly. I suffered from fever immediately after the incident. My parents tried very hard to send me back to school but I did not go back to school since the teacher had beaten me for no fault of mine.' Thirteen-year-old boy from Khulna, Bangladesh who dropped out of school at 11 and now works long hours in a restaurant.	'I miss work regularly during the rainy season due to waterlogging. I have never been to school. I started working at the candy factory with my mother eight years ago. We live in a Kutcha house. Our house, cooking area, and toilet get standing water for a few days every year during the rainy season. We get sick that time, and cannot go to work. Often we have no money to buy food that time. Waterlogging is worsening every year.' Fifteen-year-old girl living in ward no. 21 in a Khulna slum.
'We were most scared in 2013 when Typhoon Haiyan warning came. People around us were scared too. We packed our things, and we helped our parents pack food and clothes. However, there were not enough buses, as too many people were evacuating. We remember that we had to abandon our house for two days before Typhoon Nari hit. When we got back, our roof had blown away and our books had got wet. There was no electricity or water. We had to stop school too. Then one month later, typhoon Haiyan came. We had to leave our house again. This time we were lucky as it did not hit our city. Before, we had never been forced to evacuate like this. We were afraid of drowning or getting injured.' Primary school student from Hoa Quy ward in Da Nang, which is a climate hotspot with high risk of typhoon and flood.	"After completing my secondary education I could not study further. I had to earn some money to help my parents raise my two younger brothers. In recent years there had not been enough water to plant rice and grow crops. Also, as part of our fields turned into urban areas, agriculture became difficult and our income dropped. I now work in this stone-cutting factory. It is very noisy, dusty and hot in the workshop. In summer it is much hotter than home. I have to wear gloves and a mask in this heat. It is a hard job, the stone is very heavy as are the equipment and machinery. I want to go back to school but my family has no choice.' Sixteen-year-old boy from Hoa Hai ward in Da Nang.
'I stopped going to school this year to help my mother. Our father abandoned us when I was young. So every day, I peddle buko salad. I usually start around 7am and finish about 2pm or 3pm. I walk in the hot sun, from one barangay to another. It's a difficult job, especially now when sometimes it gets hot even when it's not summer. When it gets very hot, I get headaches; then I stop and take a rest under the shade of a tree.' Fifteen-year-old girl from Malolos, Philippines, who dropped out of school and is now a street peddler.	'When it is high tide, we normally experience floods. But classes are not suspended right away. Only when the flood is deep or when there is a strong typhoon school is closed. We are used to these conditions now; we just wade through the floodwater.' Fourteen-year-old boy from a coastal community in Malolos that is perennially exposed to coastal flooding

6.2 Adaptive capacity across sectors and stakeholders

The World Bank's 'Guide to Climate Change Adaptation in Cities' (2011) reiterates that urban climate change adaptation requires collaborative problem solving and inter-sectoral coordination as climate change will have impacts on many sectors, such as land use, housing, transportation, and public health.

According to the Fifth Assessment Report of the IPCC (2014) the adaptive capacity of any city provides a foundation for building city resilience. The reach of a city's adaptive capacity depends on the quality of provision and coverage of infrastructure and services, the capacity for investments and land use management, and the degree to which buildings and infrastructure meet health and safety standards. Second, the report recognises the importance of city and municipal

governments acting now to incorporate climate change adaptation into their development plans, policies and infrastructure investments, for the sake of all urban poor residents, but especially children. The following sections will discuss the role of key sectors, such as urban planning, urban infrastructure and services, housing for the urban poor, emergency response and recovery, and the role of key stakeholders (the government and civil society) in climate change adaptation, and examine how these roles impact children specifically in Da Nang, Khulna and Malolos.

6.2.1 Urban planning

Da Nang, which is among the most developed locations in Vietnam, is one of the country's most important seaports. The Department of Construction and the Urban Planning Institute are the key agencies for urban planning and development. According to the master plan for Da Nang to 2030 and vision to 2050 (2013) the old central districts are earmarked for socioeconomic development, new greenfield developments, industrial parks, tourism and new urban settlements. In addition, the master plan promotes a number of metro-rail systems, and extensive highway expansion, with little attention to the impact of climate change on any of these plans. More attention is paid to the financial benefits of public–private partnerships than to the environmental problems they may cause (Huang and Douglass, 2007). Nor does the master plan provide any guidance on climate change adaptation.

The flood map (Figure 1) overlaid on the city master plan for 2050 prepared by ISET (Tran & Tran 2013) shows that, with future development completed as proposed, the flooded area will be relatively large, covering almost the entire southern part of the city despite the elevated ground. Flood levels will also increase in the upstream rural communes adjacent to the newly filled urban areas, seriously affecting local livelihoods, housing, property and infrastructure of these agricultural-based communes. Land use planning and management have an important role in ensuring not only sufficient land for housing that avoids dangerous sites and protect key ecological services and systems, but that also shield urban communities and livelihoods (UN-Habitat, 2011). However, the current planning processes ignore the present and future risks of climate impacts.

In 1998, the Khulna Development Authority (KDA) introduced a four-tier planning system for Khuna city that together came to be known as the 'Khulna Master Plan 2001'. As this master plan did not legally mandate compliance, its recommendations were blatantly disregarded and land use zoning norms were violated even by public sector agencies. The weak institutional set-up of KDA further failed to monitor and check large-scale violations of land use provisions of the master plan, which enabled informal settlements to encroach on vacant public and private land (Khulna City Report, Save the Children, 2014). The settlements are often overcrowded, lack proper services, and up to 42 per cent flood during the rainy season (ibid).

While there is no updated land use or master plan available for Malolos, climate change is mandated to be mainstreamed into all development plans by the Climate Change Act of 2009. The National Economic and Development Authority (NEDA) guidelines are tasked to reflect this, choosing 'green growth' as the theme for the 2011–16 Medium Term Philippine Development Plan (MTPDP). Using these guidelines, all LGUs, which are at the frontline of the climate change campaigns, are to formulate their Local Climate Change Action Plan (LCCAP) through their local development councils (LDCs), Also, the city of Malolos has developed its own Local Disaster Risk Reduction and Management Plan (LDRRMP) (City Government of Malolos, 2011). This provides engineering guidance on reconstruction/rehabilitation and recovery works for 'immediate mobilisation of the general public'. It has little focus on long-term rehabilitation planning or on integrating climate change adaptation in long-term urban planning for managing the spatial growth of the city; for effectively updating land use changes in the light of future climate change impacts particularly due to flooding and water related disasters; and for meeting urbanisation challenges. An integrated flood risk management master plan for Metro Manila is currently being formulated with World Bank support.

The city's Local Shelter Plan 2014–2021 estimates that there are 2,920 households living in dangerous areas, many of which are informal settlements along rivers and creeks. In cooperation with the Department of Science and Technology and PAGASA (DOST/PAGASA), a flood hazard map for the city was developed and updated in 2012, using Typhoon Ondoy as baseline for the worst-case scenario. According to this map, the vast majority of Malolos land area is highly susceptible to flooding (Figure 3).

Throughout the three case study cities, failures in urban planning are witnessed, pushing urban poor families into dangerous informal living conditions, threatening the children living in them both physically and socially. *Disaster- and climate-aware urban planning could be one approach to reduce these risks*.

6.2.2 Urban infrastructure and services

Children living in poor quality urban environments are at higher risk of ill-health, injury and premature death. Preventable diseases and injuries from everyday hazards in physical environments cause the vast majority of infant and child deaths. The lack of adequate water, health and sanitation services often found within these communities amplifies the risks that children, whose immune systems are still developing, face regarding climate change. The most common childhood diseases, including lower respiratory tract infection, diarrhoea and malaria, could also worsen with climate change (Sheffield and Landrigan, 2011). The three case cities all face challenges relating to infrastructure and service provision that directly impact children's vulnerability to climate change.

In Khulna the poor have extremely limited access to formal basic services such as water, sanitation, electricity, drainage and solid waste management systems. Only 61 per cent of households in Khulna City Corporation (KCC) have access to electricity, 30 per cent to piped water supply, and 64 per cent to tube wells. In areas outside KCC limits there is almost no piped water supply, with 89 per cent of households using hand tube wells. As this is a coastal city, water from ground sources is almost undrinkable because of high salinity and tube wells are very common. Twenty-four per cent of the urban population do not have access to sanitation provided by KCC; even among higher and middle income groups, and sewage management through septic tanks at the house level is common (CUS, 2006). Migrants living in slums are highly vulnerable to unhygienic sanitary systems such as pit latrines and often have no option but open defecation (Save the Children, 2014). In Khulna, most dwellers (above 50 per cent) rely on community toilets that were found to be poorly maintained and unclean, and in inadequate numbers, leading to long queues (Hussain *et al*., 2010). Only 23 per cent of the urban population have access to solid waste collection and disposal. Many depend on NGO support or private arrangements to access this basic service. People in Khulna throw waste into the river, drains, ditches or by the roadside (open dumping) (Hussain *et al*., 2010), compromising the water quality for the entire community.

In contrast, basic infrastructure and services cover the majority of municipal wards of Da Nang. The old districts often enjoy more stable supplies of water, electricity, primary healthcare and education. For instance, by 2010, almost 100 per cent of households had access to electricity and 90 per cent had access to piped water. In the districts of Lien Chieu and Ngu Hanh Son, piped water supply has not yet covered the newly urbanising wards, leaving a significant number of families without. Similarly, universal coverage of drainage and sewage systems is achieved in more established central wards but not in newer districts where supplies are less stable and sometimes disrupted for days. The temporary settlement areas in the districts of Son Tra and Ngu Hanh Son suffer from more electricity and water cuts during heatwaves and the district of Cam Le faces unstable storm water drainage during heavy rain.

In Malolos, electricity is available in all 51 barangays and used by 98 per cent of households in the city. Even though water supply is available in all barangays, residents of Bangkal and Longos reported that the quality of water from the faucet is generally not drinkable as it often smells, tastes salty and sometimes appears murky, indicating saline intrusion and possibly ill-maintained water pipes. Drainage systems in Malolos are still insufficient and not yet fully interconnected, as reported in the city's latest Ecological Profile. Moreover, there is no centralised wastewater treatment facility in the city. Domestic and commercial wastewater is discharged directly into tributaries flowing into Manila Bay without any treatment. Irregular garbage collection was cited as a serious problem by some of the children, particularly in Bangkal. Pamarawan, an island community not served by city trucks. So the community has resorted to open dumping and burning of garbage at dump sites.

6.2.3 Housing for the urban poor

With increasing urbanisation of poverty, the urban poor settle wherever they can find land for setting up homes or afford rents near places where they can find work. Most vacant land in cities where the urban poor settle has inherent risks, from environmental hazards (such as flooding, landslides, waste, and no basic infrastructure provision) as well as legal disputes over ownership. The overcrowded, underserviced areas, or 'slums', create further environmental hazards that impact the health and recreation of the young.

In Bangladesh *slums* are defined as legal occupation of housing units, but in terms of physical quality, slums are similar to those of squatter settlements, which are unauthorised informal construction (Parvin *et al*., 2013. The basic difference between slums and squatters is that slums are legalised over time, conferring security of tenure to residents (KDA, 2002). Both, however, are informally produced and managed, typically functioning outside the formal control of the state. The housing options for the urban poor in Khulna city are inadequate at best. Only 12 per cent live in semi-permanent structures while the rest live in weak temporary or *kutcha* housing. Such houses are built with readily available cheap materials including straw, leaves and polythene bags. Even the units rented from private property owners are mostly *kutcha* in nature. About 60 per cent of such housing is rentals, but many squatters pay no rent and only 17 per cent own the property. In Khulna city, 79 per cent of the slum clusters are on privately owned land (CUS, 2006) and are continuously threatened by forced evictions.

The Action Plan to Respond to Climate Change in Da Nang estimates that in 2010 around 15,000 households lived in poor housing conditions. In general, there is no housing shortage for the *urban poor*. To a large extent, poor families have been supported to build houses that can cope with regular high winds, which is why there are no slums in the city. Several other programmes support families in poverty and help children to have a better life, such as the Livelihood Support Programme that focuses on diversification and training.

But *migrants* were excluded from the entitlements provided to registered urban poor, including affordable housing and in Da Nang they typically live in temporary informal shelters that they rent from private landlords. Often registered urban poor construct and rent out informal structures on their property. There is no mapping or realistic data on such informal migrant housing. Such houses are not structurally resilient. The majority use water from drilled wells, which are provided by the landlords. Electricity supply is not stable and migrant families buy it at a higher price from the landlord. Few shelters have indoor toilets; communal latrines are more typical. These shelters can be found scattered in many urban districts such as Lien Chieu and Son Tra, which are vulnerable to coastal sea surges and storms and where industrial facilities, processing factories and markets are located that offer jobs to migrant workers.

The Local Shelter Plan 2014–2021 for Malolos (2011) classifies a total of 2,410 households with 10,932 members as poor spread over all the barangays. Slums are not widespread and pervasive in Malolos. Overall, a total of 2,366 households are considered as informal settlers, accounting for about 4 per cent of the total number of households in the city. But for those living day-to-day in these areas, heightened environmental risks abound. Paved roads that lack drainage make flood waters more damaging by allowing the water to remain above the surface for longer, and amplify temperature during major heat events (Save the Children, Malolos Report). The concentration of houses restricts wind flow, increasing heat in summer and it restricts the available space for children, who often share homes with families of seven or more (Ibid), in which to play

6.2.4 Emergency response and recovery

Children's experiences during disaster events leaves an imprint on their consciousness, as well as on their health. They may experience fear and distress at the noise, lack of services and panic of their family. It may also be traumatic for them to adjust to rationed food, limited space, and a generally chaotic environment of temporary shelters (Save the Children, Malolos Report). Thus, it is critical that children's welfare be carefully considered in emergency response and recovery planning.

Bangladesh has an elaborate system of disaster management comprising a series of interrelated institutions at both national and sub-national levels to ensure effective planning and coordination of disaster management and emergency response events. For instance, the Standing Orders on Disaster (2010) clearly outline the roles and responsibilities of the ministries, divisions, agencies, organisations, committees, public representatives and citizens in how to cope with any disaster. It is a guidance document that aims to ensure that every possible preparedness and risk reduction measure has been taken into account. The Ministry of Social Welfare is required to perform some of the following risk reduction activities:

- build basic skills and competency of Upazila social services officers and union social workers in child protection including rapid assessment, coordination, care of orphans, separated and vulnerable children, psychosocial support and protection from possible abuse, violence, and exploitation;
- ensure volunteers groups who are selected and trained in disaster management also receive training on child protection during disasters;
- purchase relevant supplies such as family kits, education kits and psychosocial support kits, and place these safely in strategic areas and also with the relevant institutions.

The government has significant resources to support these actions, but NGOs make a significant contribution to emergency response and recovery in Bangladesh. National NGOs coordinate their programmes with the government whereas community-based NGOs tend to deliver first response efforts and fill in the necessary resource gaps.

Building urban resilience to climate change is part of staff capacity building activities which are under way in Da Nang. Like any other cities in Vietnam, Da Nang organises disaster management at each level of administration (city, district, and ward) to manage emergency response and recovery. The Disaster Management Centre in Da Nang has staff, facilities and protocols for emergencies. Further initiatives include Save the Children's 2011–2013 training of teachers and education officers on key contents of CCA and DRR, including preparedness and evacuation drills. This initiative is further discussed in Section 6.3.1 in School-based CCA and DRR curricula.

In the Philippines, all disaster management and recovery is managed through the local government units. Malolos residents are informed of the months when typhoons, 'habagat' (monsoon or southwest monsoon) and dam releases are expected to occur, although previous seasonal patterns are now beginning to be more unpredictable. Climatic events impact the poorest families the most as they are generally the least prepared. The city study found that most poor families, particularly the migrants in Bangkal, do not have preparedness kits, not even a flashlight, which is particularly important as electricity supply is usually down at the height of, and immediately after a major typhoon. In the relatively better-off community of Longos, children reported that their parents prepare a kit, with medicines, first aid, clothing, canned goods, water and a flashlight, before they go to evacuation areas. During extreme events, younger children are usually safe inside their homes, but many 15- to 17-years-olds take on responsibilities such as helping to secure the roofs and clear drainage canals (Save The Children, Malolos Report).

6.2.5 Governance, institutional and financial structures

The three countries included in this study have varying levels of involvement by national, regional/state, provincial and local governments in addressing the challenges of climate change in urban areas (see Table 6). Of the three, the Philippines has done most to increase the resilience of its cities to climate change through the recent implementation of a strong, coordinated strategy to mainstream climate compatible development into local planning. The Philippines' Climate Change Act establishes a legal and institutional framework for climate change governance, as explained in Table 6. The Climate Change Commission, the central coordinating body for implementing the Act, reports to the country's President. This secures the commitment to climate change adaptation at the highest political level. Additionally, local government units develop and implement local climate change action plans by prioritising local needs and integrating best practices into development activities (CDKN, 2012).

Da Nang set up a Climate Change Coordination Office (CCCO) in 2013 with the support of the Asian Cities Climate Change Resilience Network (ACCCRN) to plan, implement and adapt to climate change on a daily basis. This new body faces financial constraints as Da Nang does not receive any funding for CCA from central government. There is also inadequate policy support and technical backstopping from central government and concerned ministries to effectively adapt to climate change at the city level. As Vietnam is still formulating national policies and laws on climate change, actions by different players (public, private and CSO) on the ground are difficult to coordinate and implement at city and ward level.

Table 6: Comparison of urban governance for climate change adaptation

Da Nang	Khulna	Malolos
Governance Structure		
Vietnam does not have a strong lead ministry to guide climate adaptation. Under the Provincial People's Council, the Department for Food, Agriculture and Forestry (DFAF) is the government agency responsible for flood control infrastructure at the commune level and the Department of Natural Resources and the Environment (DONRE) is responsible for local-level climate change adaptation. These agencies, while experienced in inter-ministerial coordination, is set up to respond to disasters when/if they happen, not to coordinate ministry actions to reduce vulnerabilities over the long term. The problem is compounded by a general lack of horizontal integration, leading to overlap and competition among agencies (Webster and McElwee, 2009). There is also little active involvement of ministries like the Ministry of Construction, Ministry of Finance, and Ministry of Planning and Investment in climate change adaptation plans, as climate change is still seen as an 'environmental' issue (Webster and McElwee, 2009). In 2008, Vietnam approved the NTP-RCC and in 2011 the National Climate Change Strategy.	Bangladesh is highly dependent on central government structures for major infrastructure improvement and development, responding to climate change and extreme disasters, and related financial decision making. The Ministry of Environment and Forests (MoEF) is the focal central ministry for implementing all programmes and projects on climate change. The Ministry of Food and Disaster Management (MoFDM) is responsible for disaster management and planning. There are also 35 other ministries that contribute to activities under disaster management and climate change. At the local level, the municipal corporation is the local governing body that is the fulcrum of urban adaptation planning. The uncoordinated activities of the different ministries are a big threat to integrated interventions for climate change adaptation and disaster risk reduction planning. In 2005 Bangladesh developed the National Adaptation Programme of Action (NAPA). The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) was developed in 2008 and revised in 2009.	The President of the Philippines provides the strategic direction on climate change governance and is assisted by the Philippine Climate Change Commission (CCC). This is the sole policy-making body for coordination, monitoring and evaluation of government programmes and action plans relating to climate change as per the provisions of the Climate Change Act of 2009 (Republic Act No. 9729). The climate change policies are be integrated into the Medium-Term Philippine Development Plan (MTPDP) and all other plans of the National Economic and Development Authority (NEDA), the central development planning agency of the country. The President is Chairman of both the CCC and the NEDA. The CCC Advisory Board comprises representatives from several government agencies and local government units (LGUs), as well as representatives from academia, business and non-government organisations.

Da Nang	Khulna	Malolos
Institutional Structure		
Da Nang's People's Committee is responsible for overall management of national and bilateral climate change adaptation programmes at the city level. With the support of the Asian Cities Climate Change Resilience Network (ACCCRN), Da Nang has established a new municipal-level structure called the Climate Change Coordination Office (CCCO). The role of CCCO is to enhance institutional adaptive capacity at the city level and to prepare and assist Da Nang to plan, implement and adapt to climate change. CCCO follows the guidance of DONRE, which is charged with execution and management of the National Target Programme to Respond to Climate Change (NTP-RCC).	The Department of Environment (DoE) under MoEF is the designated nodal institution for coordinating all programmes and projects on climate change. Similarly, the Disaster Management Bureau (DMB) is the apex organisation for coordinating all national level disaster interventions across all agencies. However, central government institutions are typically fragmented and uncoordinated, marked by bureaucratic competition and institutional incapacities (Hossain and Huq, 2013).	Municipalities and cities are to be assisted by the Department of the Interior and Local Government (DILG), various local government leagues, and their provincial governments in the formulation of the Local Climate Change Adaptation Plan and the local development plans (LDPs). All these LDPs are to be integrated and used for the formulation of regional development plans (RDPs), which are to be formulated by multi-stakeholder participation by national, regional and provincial government agencies, and civil society organisations. The risks and disasters at the city level, including the impacts of climate change, are managed by the CRRERD.
Financial devolution		
Da Nang receives no budget from central government to implement programmatic activities on climate change adaptation and has to depend on a few donors including NGOs and bilateral development agencies. Financial constraints significantly contribute to the inability of the municipality to effectively build resilience and adaptive capacity of local communities. For this reason CCCO is currently managing and implementing donor-based projects while strengthening the networks with organisations working on CCA and with government departments particularly at the province level to strengthen education and training on CCA.	The MoEF formed the Bangladesh Climate Change Trust Fund (BCCTF) and together with the Bangladesh Climate Change Resilience Fund (BCCRF) it makes up the main funding instrument for the BCCSAP. Bangladesh has several different institutional funding mechanisms on climate change mitigation and adaptation activities. The development budget of almost every city in Bangladesh is greater than the revenue budget. This provides a good opportunity to integrate urban development and growth with environmental safety and sustainability and for mainstreaming CCA and DRR in urban development.	The Local Disaster Risk Reduction Management Plan (LDRRMP) in the Philippines has three main sources of funding: the Local Disaster Risk Reduction Management Fund (LDRRMF), General Fund, and the Maintenance and Other Operating Expenditures (MOOE) under the City Administrator's office. About 5 per cent of local government's regular revenue must by law contribute to LDRRMF. The Act also requires government financial institutions to provide LGUs with preferential loan packages for climate change activities. Once this policy is finalised, these loans will provide a means of financing that is separate from the internal revenue allotment. Aside from the LDRRMF, local governments can also tap into their development funds to support CCA and DRR. They can also receive additional funding from other organisations, such as CSOs, international development organisations and the private sector.

6.3 Incorporating child participation into CCA and DRR programming and policy

Children are seen as direct and indirect beneficiaries of many top-down national welfare programmes in the three study cities, such as for poverty reduction, labour and employment, environmental protection, education and primary healthcare. These programmes impact the welfare and development of children through the support provided to families as well as through the direct outreach work by NGOs with children in difficult circumstances (for example, hard to reach working children in Khulna). However, neither families nor children typically play any direct role in design, implementation and monitoring of these programmes.

There is limited room for children's active engagement in development programmes of the city. Children are observers, supporters and beneficiaries rather than active participants in implementation and monitoring of disaster risk and climate change adaptation work in the urban context. Children are not systematically strengthened to become resilient actors to climate change impacts. In cases where child-centred organisations have developed children's clubs as viable places to secure children's participation (Save the Children, for example, has initiated clubs in DRR and emergency relief work post-disasters in many districts of Bangladesh), the activities of these clubs were found to be more successful in rural areas than urban ones (Rajkumar and Kabir, 2013). This is perhaps due to the complexity of urban decision-making processes involved in implementing projects in urban areas. This section explores the extent to which children are involved in disaster risk reduction initiatives and the potential to increase their presence in planning, preparedness and implementation.

6.3.1 School-based CCA and DRR curricula

Experts now acknowledge that to scale up the participation of children in DRR and adaptation would require increased efforts to incorporate children's perspectives, knowledge, and potential for action in regular community-driven development programmes (Tanner *et. al*., 2009). The school plays an important role in imparting climate knowledge and raising awareness of action and advocacy in community-based everyday processes. In the three cities children had primarily heard about climate change from schools but had no detailed understanding of impacts and adaptation action to reduce risks except for preparedness and response for large disasters.

The role of educational curricula for primary schools in creating awareness about climate change is gaining importance in Da Nang. At the national level, the Ministry of Education and Training is undertaking a number of activities on training material development within the scope of the NTP-RCC. Budget has been allocated to the ministry to undertake a review of curricula to assess how adequately climate change adaptation is integrated. This study found that currently no official educational curricula teach about climate change in Da Nang schools. The focus group discussions with teachers revealed that they try to include facts about climate change in their lessons wherever relevant and possible, feel that it should be a part of the primary education curriculum and that children in the coastal wards of the city that are at high risk of climate impacts need to be made aware and prepared to take action.

The efforts by the Department of Education and Training, and by Save the Children in Vietnam, on extra-curricular activities in 2010 and 2012, indicate that child-centred CCA can be integrated into existing school curricula to effectively create awareness of climate change. For example, in the 2011–2013 Save the Children initiative 'Increasing Emergency Preparedness and Resilience of Vulnerable Coastal Communities', teachers were trained in CCA and DRR and then conducted extracurricular activities for students in their schools. A variety of extra lessons were included in the curricula, with contests being held between classes. Thousands of primary students in six primary schools learnt basic information about typhoons, floods and droughts through awareness raising campaigns. These campaigns included participatory risk mapping exercises, child protection, environmental protection, school-based preparedness and evacuation drills, and so on. In general, a significant impact on children's positive attitude, awareness and understanding and practical skill was created. These activities should be rolled out to more schools in Da Nang.

In Malolos, despite children having heard of climate change, they were often unable to recall the detail of the subject matter. Many of the focus group participants attributed climate change to the cutting of trees and not to the severity of typhoons and floods in their city. This study found that quality of teaching about climate change and disasters at school depends largely on the knowledge and personal interest of the teacher. As climate change is not systematically included in the curriculum students rely on DVDs, the internet and newspapers to learn about its impacts. Government prescribed textbooks include floods, earthquakes, and volcanoes as natural hazards, but not climate change.

The Bangladesh Climate Change Strategy and Action Plan involves major ministries under the Government of Bangladesh. However, the Ministry of Women and Children's Affairs and the Ministry of Education are not involved in managing the impacts of climate change. Even though primary and secondary school children are aware of climate change and have some idea about the concepts of greenhouse gases, global warming and extreme weather events due to a changing climate (as suggested by the children in the Khulna study), no national curricula have been developed on climate change. The Reducing Vulnerability to Climate Change project by CARE Bangladesh developed a curriculum on climate change at a secondary level, which was piloted in 65 schools involving 15,000 students (Ahmed and Neelormi, n.d.). The curriculum had been incorporated in science and geography courses in cooperation with the relevant regional authority in the southwest region of Bangladesh where Khulna is located. However, this has not been scaled up to influence national curricula.

6.3.2 Children and youth participation in projects by CSOs

Non-government organisations can target programmes and projects towards urban children to develop their understanding of risk and response in regards to hazards and disasters. While this is a potential avenue for youth participation in climate change adaptation, it was only minimally performed in the study cities.

In Da Nang a number of community-level projects on disaster risk reduction and climate change adaptation were implemented with funding from international development agencies. Following a participatory approach, these projects often invite a large number of stakeholders to share their vision and take part in the implementation and monitoring processes. Youth unions, and adolescents who drop out of school (and start working), are active contributors to mobilising community resources for small-scale risk reduction actions. They help organise public awareness raising events, including street theatre sessions, and distribute materials that include community-level competitions. Adolescent girls are particularly effective working with female-headed households and the elderly, as they often have a better understanding of the community and living conditions. These projects not only help raise public awareness but provide adolescents with a way to communicate both natural and social risks to municipal authority.

In Khulna, many NGOs work on community development to strengthen adaptive capacity as well as providing emergency services during disasters. Through an urban innovation programme to stimulate household income, Save the Children and its local implementing partner Manob Sheba O Shamajik Unnayan Shangstha (MSSUS) have been working on economic empowerment of 1,200 households with children. Households have received skill development training, input support for income generating activities and linkage support with different service providers to ensure that the children from beneficiary households are not engaged in hazardous work. Most of the children are now in school and their families have been able to increase and diversify their livelihood options, which in turn helps build broad adaptive capacity. However, there is little evidence of children in Khulna being engaged in CCA and DRR projects as most local, national and international NGO and government responses focus on post-disaster relief, including the distribution of drinking water during shortages, saline packs during outbreaks of diarrhoea, and other relief items after disasters.

The Malolos report did not investigate youth participation in CSO projects.

6.3.3 Children's role in disaster preparedness and response within families

The participation of children in family discussions about disaster preparedness and risk reduction has increased after typhoon Haiyan in Da Nang in 2013, as was suggested by the participants of this study. The super typhoon was the opportunity to remind families of the importance of comprehensive preparedness. The interviewed families, local officials and migrant workers shared the view that children do understand disaster risks and have the ability and skills to prepare and cope with natural hazards.

Within the family context, Da Nang children act as effective risk communicators to parents and relatives. They share information (a list of things to do before, during and after typhoons) with parents, mainly from what they have learned at school. For example, during Typhoon Haiyan, children helped to pack food, clothes, schoolbooks and essential household items in preparation for evacuation. They actively cooperated during the massive evacuation that took place in Da Nang in 2013. It is within the family context that children are most proactively engaged with disaster and climate change issues.

In Khulna, families have developed different coping mechanisms to manage their physical environments and socioeconomic activities when faced with climatic threats of extreme rain, cyclones, flooding or extreme heat. Haque *et al*. (2014) describes in detail the individual level adaptation activities in the socio-economic and physical domains. The children in the focus group discussions in this research talked about collecting polythene sheets which families put on the roofs and in wall openings to protect from the rain; collecting mud from the river for raising the height of the mud plinths and restoring the mud plinths when they are washed away following prolonged rainfall, waterlogging or flooding; collecting nypa leaves (golpata) to repair damaged houses; putting bricks, stone chips and sand on the pathway in front of the house to facilitate mobility during waterlogging; and looking after animals.

The Philippines has some wonderful examples of community-based initiatives in flood-prone rural areas on disaster preparedness and disaster risk reduction planning, some of which secured children's participation primarily as risk communicators (Gaillard and Maceda, 2009; Molina *et al*., 2009). Nonetheless, this study in the urban context of Malolos found very limited involvement of children and families in any climate adaptation activities even within homes.

The focus group discussions showed that most families did not have disaster preparedness plans and seldom discussed them even if they had such plans. Consequently, preparedness kits are not available in most households and are not usually adequate (typically they contained only clothes). According to city officials interviewed in this study, parents and not children mostly disobey orders for evacuation sometimes at the expense of their children's safety. At the community level, disaster preparedness seminars and training are reportedly being regularly conducted by the city government, covering first aid as well as evacuation protocols. The evacuation centres in Malolos are generally the schools, so most children know their way there despite the lack of any signposting of evacuation routes. Evacuation drills are also regularly conducted at school. In Pamarawan, the older children were found to be familiar with areas in the community that are unsafe during floods.

6.4 Implications for future child-centred CCA programming

Save the Children recently hosted a workshop for urban CCA stakeholders, including child-centred NGOs, to discuss a draft of this report. At this workshop, participants identified several barriers to urban climate change adaptation action. These include:

- Climate change being seen by governments as more of a future issue that does not need to be addressed now.
- Lack of resources for both planning and implementation.
- Low political commitment (political leaders are typically not aware of the importance of addressing climate change).

Adaptation is now broadly recognised as a dynamic and iterative process involving an ongoing cycle of preparation, response and revision (The World Bank, 2011). Both governments and governance are crucial to this process to measure progress and assess effectiveness of policies and action. Adaptation also requires an alliance of multiple stakeholders to ensure that cities invest scarce resources in truly adaptive ways and achieve maximum co-benefits, while avoiding unintended consequences.

Climate change threatens the broader sustainable development agenda of cities and efforts to meet the Millennium Development Goals by countries linked to reduction of poverty, hunger, disease, child and maternal mortality, achieving universal primary education and gender equality, among others. The fourth and fifth assessment reports of IPCC call for immediate and sustained action to prevent climate change from causing irreversible and potentially catastrophic damage to our environment and societies. The need for adaptation is now imminent as an active adjustment process in the context of failures of past mitigation efforts to reduce greenhouse gases. Adaptation in low-elevation coastal cities in Asia with high prevalence of urban poverty is especially critical as large populations in risky informal settlements, particularly children in slums and in other hazardous living and working environments, suffer disproportionately from the impacts of climate change and disaster.

6.4.1 Child-centred CCA and DRR

Several different humanitarian and development organisations are now engaged in CCA and DRR work across the world. Some of these organisations are child focused and explicitly recognise the rights of children and their important connection to sustainable development. International efforts to connect children, climate change and disasters have typically focused on ensuring a child's basic right to survival and development, leading NGOs and governments to focus their actions on disaster preparedness, ensuring sensitivity to child protection during relief and rehabilitation efforts (IDS, 2012). For example, Save the Children considers reducing risks and building resilience to be crucial elements for achieving sustainable development and seeks to integrate CCA and DRR into sector-based programming as both a humanitarian and a development priority. It is important to point out that there is quite a lot of good work being done on CCA in rural areas, building on the strong engagement in DRR, but not much is being done to translate it to the urban context (see Box 5).

Box 5: Programme difficulties in the urban context

A child-led evaluation of a child-centred disaster risk reduction project of Save the Children in two districts (Dhaka and Pirojpur) of Bangladesh revealed that children can: (i) protect themselves from harm during disasters; (ii) identify the risks and resources in their surroundings; (iii) set achievable action plans for reducing disaster risk; (iv) prepare for disasters; and (v) advocate for mitigation of their disaster risks. The biggest achievement of the project was found to be empowering children as risk communicators. The project's activities were the same in the urban and rural location. However, the process was found to be comparatively more realistic and appropriate for the rural context as compared to the urban one. The complexity of the urban social structure and its politico-legal environment made the Hazard Vulnerability Capacity Assessments Action Plan difficult to implement by children, as the risks are more complex and risk reduction actions required further examination and more investment. Save the Children also found lack of space in urban slums to be a limiting factor for setting up urban child clubs, the anchoring platform for such programming.

Climate change risks in cities are complex, and affect both the physical and social domains, and cut across sectors, spanning geographic and social scales in communities and cities. Decision making in the urban environment is often more complex than in rural areas, and urban physical systems are overwhelmed by the pressures of urbanisation and density particularly in low-income countries with inadequate coverage of protective infrastructure. In this urban context CCA and DRR programming typically covers both ends of the decision-making spectrum: **child-sensitive policy and programming**, which ensures the safeguarding of the best interests of children where they are recipients or beneficiaries of top down initiatives; and **participatory policy and programming**, where children are actively engaged in bottom-up decision making, planning and accountability processes for prevention, preparedness and response (IDS, 2012).

Given the disproportionate risks of urban children in vulnerable situations to climate change, child-centred adaptation needs to address all aspects of risk reduction planning, such as protection from longer-term risks, preparedness for extreme events, response to immediate losses and threats, and climate-smart rebuilding to reduce future risks (Bartlett, 2008). This mirrors the thinking of the 3P format for the UN Convention on the Rights of the Child. The responses and adaptation measures for child-centred CCA should consider the protection (from abuse and exploitation), provisions (needed for survival and development) and participation (to be involved in society) rights of children. Co-benefits (direct and indirect) of long-term risk reduction, preparedness and recovery from a child-sensitive and participatory approach should also be considered, spanning different systemic levels and different sectors (see Tables 7-9).

The findings of this study suggest that children have limited voice in risk reduction and adaptation activities in Da Nang, Khulna and Malolos. To support and encourage children's agency, development programmes in DRR elsewhere have effectively promoted the idea of children's groups as a way for providing opportunities to children to come together with a common purpose to plan and deliver action (IDS, 2012). For example, Save the Children established child clubs in vulnerable communities in Bangladesh two decades ago to address the issues of out-of-school children from a rights perspective and to provide a well-provisioned space for play and recreation. The NGO has used the child club structure to implement a child-centred disaster risk reduction project. Children have been actively involved in hazard vulnerability capacity assessments of their local areas.

7 Recommendations

With the insights into the climate change–urban poverty–children nexus provided in Section 4.0, lessons and goals for resilience building among urban children can be assembled. This section proposes future steps to best incorporate child interests and involvement in further urban CCA and DRR planning and programmes. Adaptation in urban areas depends upon the competence and capacity of local governments and a locally rooted iterative process of learning about changing risks and opportunities, identifying and evaluating options, making decisions and revising strategies, in collaboration with a range of actors (IPCC, 2014). This includes not only building that foundation of resilience (and its institutional, governance and financial underpinnings) but also mobilising new resources, adjusting building and land use regulations, and continuously developing the local capacity to respond.

7.1 Roles for CCA actors

The role of the national government is to encourage and support locally driven climate change adaptation within the framework of national policies and climate change and risk management strategies. Local authorities are also accountable to their citizens through engagement with community-based organisations and NGOs, which act as conduits for the transfer of information between urban residents and urban authorities, and can also be effective implementers of projects to reduce disaster risk and for adapting to climate change.

International donor agencies can support the development of necessary technical capacity of local governments through the development of learning and advocacy tools, developing evidence for the effectiveness of local strategies that can be upscaled, and introducing innovations to suit local needs (The World Bank, 2011). Child-centred organisations can play crucial capacity building and advocacy roles, and can work alongside city governments to link urban adaptation to child-centred development goals. These goals may include:

- supporting advocacy and dialogue about child-centred urban adaptation in urban planning;
- offering technical assistance to cities on mitigation and adaptation that acknowledges the most vulnerable urban children;
- assisting with community-based participatory approaches to integrate community (including children's) perspectives and priorities in adaptation planning;
- building technical capacity of local governments (including planning capacity) through development of training and advocacy tools.

It is possible to adopt an integrated, inter-disciplinary approach to climate adaptation in cities through broad partnerships involving governments, local communities, non-profit organisations, academic institutions and the private sector (The World Bank, 2011). For example, technically complex assessments are likely to need external experts, who can be drawn from universities, scientific institutions and research agencies; local knowledge on simple and low-cost (or no-cost) actions can be drawn from communities to inform adaptation planning by working with NGOs and community based groups. Examples of low-cost actions with the potential to boost resilience include: short-term clearing of solid waste from

urban waterways to prevent localised flooding caused by clogged drains, and public awareness efforts to share information about emergency evacuation and public health risks.

Raising awareness about climate change and securing children's participation in urban adaptation action, as suggested by Christian Aid (2009), would require informing children about climate science, such as what meteorological/weather and climate modelling data say about the past, present and future in terms of both weather/seasonal variability and longer-term climate change trends. Children should also be informed on community or local knowledge of adapting to the changing climate contexts. A 'most likely scenario' based on emerging climate trends and how they might impact living environments in cities in the future can be discussed with children in schools, child clubs and other participatory learning and action platforms to develop community-based adaptation plans. It is also important to train children in participatory vulnerability and capacity assessment of their local communities and to encourage them to be part of local adaptation planning for climate change.

7.2 Child-centred CCA programmes

Child-centred CCA programming should aim to build upon local child and youth clubs and associations for community-based CCA. However, these structures need to be joined up across the city and scaled up to bring about changes in polices that impact the rights and entitlements of the urban poor. These changes should set out to promote the right to information and inclusive governance, and to benefit the poor, particularly children and young people, from new knowledge and innovations in climate change adaptation.

Challenges in integrating CCA and DRR also involves upgrading staff skills, with new frameworks and methodologies for analysis, terminologies and language of programming. To effectively integrate CCA and DRR into an existing programme requires a thorough review of the programme's regular work plan in order to identify appropriate entry points for effective and efficient integration of new methodologies. Also, integrating CCA and DRR into activities requires consultation and collaboration with all stakeholders, including children and communities, with all levels of government departments and like-minded NGO partners. Finally, resilience building activities should include measures for improving responsiveness, resourcefulness and capacity, so as to reduce vulnerabilities in the socioeconomic domain.

There is now an important shift away from conventional 'predict-and-prevent' paradigms in risk management under resilience thinking, with a new focus on understanding complex linkages based on a flexible, learning-based approach to avoid major disturbances under conditions of uncertainty (Reed *et al*., 2013). There is also an emerging consensus that increasing resilience in cities involves addressing basic poverty reduction and sustainable development goals (The World Bank, 2011) and considering adaptation as a development process instead of reducing it to fragmented responses addressing only risks and hazards associated with climate change (Sanchez-Rodriguez, 2009). The need for integrating disaster risk planning in cities with climate change considerations has been voiced by many (Hilleboe *et. al*., 2013) as has the need for collaborative problem solving and coordination among sectors (The World Bank, 2011).

7.3 Recommendations based on the 3P framework

Based on the findings from Da Nang, Khulna and Malolos, the following child-centred urban adaptation measures for climate resilience building are recommended from the perspective of protection, provisions and participation rights of children as well as from the perspective of considering adaptation as a development process addressing basic poverty reduction and sustainable development goals (Tables 7–9).

Table 7: Response and adaptation measures for urban resiliency from a *protection rights* perspective

Co-benefits (direct and indirect) of long-term risk reduction	Sector	Primary responsibility
Support mapping of most marginalised children such as migrants, street children and working children, not only on their numbers but on their living and working environments and the range of climate and non-climate risks.	Urban planning	City government
Create awareness about child rights in local communities, schools and local governments, particularly emphasising the principles of non-discrimination (children of migrants, girls) and best interests of children to stop negative coping practices such as early child marriage, trafficking, early school dropouts and child labour following disasters.	Social and child development	CSOs
Create awareness about the linkages between climate change and migration and the disproportionate risks faced by migrant children in cities with discriminatory policies. Advocate for more equitable urban policies for migrants to enable access to affordable housing, healthcare and education.	Public policy. social security	National, state/ district/ provincial/city governments
Improve access to food aid following climate shocks, and other social safety nets (for example, income support) and the implementation of policies that reduce food price variability and volatility.	Food security, social security	National, state/ district/ provincial governments
Establish nutritional programmes to ensure that children can withstand a crisis. In climate hotspots establish feeding programmes through child-care centres, schools and community organisations and support organisations running such programmes, and make micro-nutrients readily available.	Health and nutrition	City government, health ministry and departments
Support the establishment of drop-in centres, which can serve as a base for meeting the practical needs of children on the street and also serve as a platform for building adaptive capacity in responding to various disasters while living on the street.	Social security	City government
Remove from work the youngest children (under 14 years) and those in the most hazardous and developmentally damaging situations, while ensuring such children and their families are not forced into more precarious situations.	Social development	All forms of government, CSOs
Broad-based efforts to eradicate poverty and the creation of relevant, accessible and affordable education for children in poverty in high risk areas to prevent influx of children into inappropriate work after disasters.	Public policy, education	National, state/ district/ provincial governments
Create havens for children and women in need of care and protection where they can receive temporary shelter, food, medical treatment and counselling.	Women and child development	All forms of government, CSOs
Skills training and input support to allow diversification of livelihood to mitigate the effects of loss of livelihoods after disasters.	Labour and employment	All forms of government, CSOs
Support the training of architects and planners to engage with issues of urban informality through inclusive processes of working with local communities including children to create safe, healthy, affordable and culturally appropriate housing for the urban poor.	Technical capacity building	National governments, universities, CSOs and private sector

Table 8: Response and adaptation measures for urban resiliency from a *provision rights* perspective

Co-benefits (direct and indirect) of long-term risk reduction	Sector	Primary responsibility
City master plans to receive inputs from climate modelling scenarios and climate impact studies, in order to make effective recommendations for climate change adaptation through planning and reduce vulnerabilities of cities to climate impacts.	Urban planning	City government, relevant ministries
Municipal efforts for city resiliency planning should use Geographic Information Systems (GSOs) to produce maps and visual representations of spatial realities, risks and disparities between formal and informal settlements.	Urban planning	City government
Policies and regulations to make new housing affordable, appropriate for health and safety, have structural integrity, and built to climate-resilient standards.	Housing, health	National governments
Provision of basic services such as piped water, sewers and drains to be priority components of the climate change adaptation plans at city and community level irrespective of status of housing (such as the most deprived informal settlements with insecure tenure and infrastructure).	Basic services and infrastructure	City government
Provide support for basic services to increase resilience in local areas particularly in climate hotspots. For example, support access to clean water in all communities as supply gets interrupted during the dry season and contaminated at times of intense flooding; support creation of hygienic conditions in the event of water and electricity shortages (or cuts) in schools and communities.	Basic services	City government,
Stronger consideration for flood and other climate hazards in city master plans to guide decisions about new urbanisation and future growth areas.	CCA and urban planning	City government, planning institutions and professionals
Flood management – flood warning system; improved public information on flood risks; new decision-support framework using centralised geographic information system (GIS) for infrastructure planning and structural measures like draining areas with a high groundwater table.	Infrastructure	City government, relevant ministries
Advocacy for improving aging electricity infrastructure to reduce carbon emissions and ramp up renewable energy (wind and solar) to make the electricity system more resilient and reliable.	Infrastructure	National governments, private sector
Facilitate development of national curriculum integrating CCA and DRR in primary and secondary education. Disseminate information on climate change risks through primary and secondary schools.	Education	National governments, CSOs
Development of teacher training manuals and quality textbooks that will inform and engage children in urban climate change adaptation activities.	Education	National governments, CSOs
Institutional capacity building for organisations entrusted with CCA and DRR at the city level.	Governance	City government, CSOs
Training of builders, masons, carpenters and private developers by working with training institutions; develop training materials for child-friendly, climate sensitive and disaster resilient design and planning approaches.	Urban planning and housing	Private sector, academia and CSOs

Table 9: Response and adaptation measures for urban resiliency from a *participation rights* perspective

Co-benefits (direct and indirect) of long-term risk reduction	Sector	Primary responsibility
Support and collaborate with communities and organisations fighting for legal tenure of the urban poor to access formal assistance, legal protection and other services for vulnerability reduction.	Housing rights	CSOs, community
Encourage communities to create neighbourhood-level self-help groups and join city-level federations of such groups particularly for women and children.	Social security	CSOs, city governments
Facilitate children's and youth groups at the community-level utilising existing networks or through external interventions by NGOs working with the most vulnerable urban children.	Social security	Community, CSOs, city governments
Support the formation of children and youth groups using community-based resources such as schools, health centres, drop-in shelters or adult-led disaster groups, or through external interventions by child-centred NGOs. Establish local committees for vulnerability reduction with active participation of children's groups.	Social security	Community, CSOs, city governments
Conduct training activities in schools and communities aimed at changing behaviour, or increasing disaster preparedness using interactive methods. Ensure that children understand the key concepts linked to climate change, emerging trends, anticipated risks and urban adaptation; discuss specific ways for children to participate and contribute to city and community-based adaptation action.	Education and training	CSOs, city governments, community

8 Conclusions

By examining the vulnerabilities of urban children and communities to various climate change threats, this paper has explored the nexus between climate change, urbanisation, poverty and children. Urban communities, including children, recognise sudden onset, large-scale climatic disasters such as typhoons (Da Nang, Malolos), cyclones (Khulna), river floods, and waterlogging following intense rain. These climate change impacts threaten the lives and survival of the most vulnerable children such as infants and young children, children in acute poverty and environmental migrants, girls, and children working outdoors, among others. In addition they also undermine children's development by violating their rights to health, education, play and recreation, and an adequate standard of living. But there is meagre understanding in local communities and therefore among children, of the impacts of slow-onset disasters, such as saline incursion and droughts, which equally undermine children's health and wellbeing over the long term. City governments also have a poor understanding of slow-onset disasters and no strategies for adapting to lessen their impacts are in place. This is a serious threat to resilience building efforts that are needed to adapt to current and future risks.

The findings of this research suggest that there are many barriers to effective climate change adaptation in Da Nang, Khulna and Malolos, which make it difficult for children to function and for adults to safeguard their rights. Among urban children, some groups were found to be more vulnerable to the impacts of climate change, particularly migrant children, children living in informal housing, children living and working in the streets, disabled children and child labourers. These children are most vulnerable because of the lack of adequate protective mechanisms in the physical, socioeconomic and politico-legal domains that structure their lives. Though this research recognises children with disabilities as a particularly vulnerable group, it has not been able to study the vulnerabilities and risks of this group in great detail. Similarly, the age segregated vulnerabilities of the most deprived boys and girls needs to be studied in more depth. Both these issues should be the focus of future research.

Gaps in city-level data and research make further exploration of these vulnerabilities difficult: lack of data on housing quality, basic infrastructure and protective services of the urban poor and especially for most vulnerable families and children. There is also a need for more accurate data on environmental hazards and mapping of climate hotspots where many informal settlements are located, and where much new urban expansion occurs through the formal master plans of the cities. These data gaps are delaying the development of strategies for addressing slow-onset climate related hazards and the understanding of current and future vulnerabilities of urban children to extreme weather.

Despite multiple programmes on urban poverty reduction, and more specific programmes on child protection and education, opportunities for child participation in adaptation initiatives remains weak. Children are seen simply as automatic beneficiaries of the top-down efforts to improve the lives of the urban poor. There is little evidence of children's participation in urban programming for CCA activities in Da Nang, Khulna and Malolos; no attempt has been made to create spaces and structures for children's participation by child-centred CSOs who have done this in other cities and districts of the three countries. In the case of DRR, youth unions, adolescents and members of child clubs are often active contributors to mobilising community resources for small-scale risk reduction actions, risk assessments, and raising public awareness. Currently the only space available for children to participate to some extent in disaster risk reduction activities is within family-level coping and adaptation practices. Moreover, NGOs are yet to adequately build on or adapt their rural experience to address climate change issues in the complex urban sector. Similarly, there is a lack of textbooks and other learning aids on climate change adaptation at primary or secondary school level. Despite NGO efforts to integrate CCA in

school curricula through some pilot projects, there is no CCA integration in the national curriculum of the three countries. Children themselves were keen on more interactive learning modes such as contests, theatre and multi-media than simply text-based learning.

Urban infrastructure plays a large role in this nexus. Land use planning and management have important roles in ensuring sufficient land for housing that avoids dangerous sites and protects key ecological services and systems, but the master plan of each city was found to promote the opposite. The coverage of basic services in urban poor areas ranges from non-existent to minimal, with frequent disruption in bad weather. The informal housing of the poor provides no protection against climate impacts. However, households in poverty have developed a range of coping strategies to modify and reinforce elements of their homes to protect themselves from sudden onset extreme weather events. Children also participate in these activities. Emergency response in the study cities is stronger on immediate response after disasters than recovery and long-term rebuilding including climate change adaptation. Often important ministries such as those responsible for finance, construction, planning, education, and women and children are not engaged in the adaptation planning process, while the uncoordinated activities of the multiple ministries entrusted with CCA and DRR create greater threats for urban children than climate change alone.

In the context of the disproportionate risks of urban children to climate change, child-centred adaptation needs to address all aspects of risk reduction planning. These includes protection from longer-term risks, preparedness for extreme sudden and slow-onset climatic events, and response to immediate losses and threats. Child-centred adaptation also needs to engage with urban planning and urban local development processes to integrate CCA into the physical, socioeconomic and politico-legal vulnerability domains of urban children's lives to reduce future risks. This paper recommends that responses and adaptation measures will have to address the *protection, provision and participation* (3Ps) rights of children as well as consider the co-benefits (direct and indirect) of all long-term risk reduction programming, climatic and non-climatic. This may be possible if a child-centred perspective (such as promoting best interests of children in top-down policies and programming) is adopted and a participatory approach that includes all children is practised in all bottom-up efforts of urban community development. In order for child-centred CCA programming to build upon the structures of the child and youth clubs and associations for community-based CCA, these structures need to be united across the city. Scaling up will help to bring about change at higher systemic levels in polices that impact rights and entitlements of the urban poor, to advocate for right to information and inclusive governance, and benefit from new knowledge and innovations in climate change adaptation.

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