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Children and Climate Change

An overview

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Cover photo	Gillian, 2 years old, sits among the debris where her village once stood before it was destroyed by typhoon Haiyan, in November 2013. In Dulag municipality, Leyte Province, the Philippines. Many coastal villages across Leyte were devastated by the storm, and debris blocking roads meant that access was impossible for rescue teams during the first days. © Save the Children / Jonathan Hyams

Content

Save the Children: Example of children's participation in Disaster Risk Reduction (DRR): During a DRR session in the courtyard of Mewat primary school. The children were asked if they had experienced disasters and what coping mechanisms, if any, they had in place. The focus groups were asked to consider how they would react if there was another disaster. *Photo: Hedinn Halldorsson / Save the Children*

Preface

This is an overview report commissioned by Save the Children Norway. When carrying out the assignment, we have gone through available scientific articles and reports concerning the relationship between children and climate change in a critical manner, in order to sift the most relevant and updated information. We have also supplemented the information with updated and relevant statistics from institutions such as the World Bank and WHO, for instance loss of life among children under 5 due to diarrhoeal diseases in 2011 (a number which is affected by climate change). The report constitutes a basic overview. It was carried out over a limited period and there will likely be relevant sources that we were not able to identify during this time. The report exclusively relies on sources in English and Norwegian, at the expense of sources in other languages. While the report at times refers to scientific articles concerning children and climate change, it cannot be considered a full literature review of the relevant scientific literature related to children and climate change.

We would like to thank CICERO (Center for International Climate and Environmental Research – Oslo), for suggestions and sharing of relevant scientific material. Vista Analysis is of-course solely responsible for the content of the report.

Oslo, 18 December 2013.

Rasmus Reinvang

Project leader
Vista Analysis

Summary

The overview report shows that children are an important group in the context of climate change, as a disproportionally and severely affected group and as an important resource for adaptation and policy response. Estimates from authoritative sources show that thousands of children die every year due to climate change and that millions are affected negatively. The world's children are mainly affected directly by climate change in the form of increased exposure to hunger and malnutrition, increased health burden, extreme weather events with disastrous impacts, lack of education and psychological stress. These factors are often interrelated. Among children the poor, the young and girls are disproportionally affected.

Children are a particularly vulnerable group in the context of climate change. As children are in a physical and cognitive development process, they are less well equipped on many fronts to deal with deprivation and stress and exposure to various risks is more likely to have long-term repercussions than with adults. The disproportionate health burden for children of challenging environmental conditions is well documented; research shows children under 15 are 44% more likely to die because of environmental factors than the population at large, and are most likely to be victims of extreme weather events and increasing health risks.

Climate change poses a threat to the world's children on a large scale. According to an international risk analysis company, more than 60 countries (mainly in a belt around and immediately north of the equator) are in the 'extreme risk' or 'high risk' category of negative impacts from climate change. More than 700 million children below the age of 15 live in the 20 countries deemed at 'extreme risk', often constituting as much as +40% of the population. Individual children and communities are, however, differentially exposed and vulnerable based on inequalities expressed through levels of wealth and education, disability, health status, as well as age, gender, class and other social and cultural characteristics.

Climate change is likely to increase the number of children at risk of hunger towards 2080. Climate change will impact the global food system as climate related events such as reduced rainfall and other changes affect agricultural production negatively. Sudden acute events linked to climate change may also cause or contribute to interruptions in food supplies. Poor nutrition currently causes the death of 3.1 million children under 5 each year. In addition, poor nutrition is the cause of stunting for 26% of the world's children under 5 years of age, and as much as 40% in Sub-Saharan Africa and 39% in South Asia. The Climate Vulnerability Monitor, a study commissioned by the world's most vulnerable countries, has estimated that the global impact of climate change on hunger leads to 100,000 deaths per year among children in low-income countries. Africa is considered especially vulnerable in the future.

WHO estimates that global warming has caused over 140,000 **excess health-related deaths** annually from the 1970s to 2004 and that many of the current major causes of death (diarrhoeal diseases, malnutrition, malaria and dengue) are highly climate-sensitive and are expected to worsen as the climate changes. WHO estimates that **+85% of the global disease burden due to climate change occurs in children under 5**. WHO estimations indicate that climate change in 2011 led to additional +30 000 excess health-related deaths among children under 5. Numbers of deaths fail to capture the full negative implications of disease, as **disease also leads to lower quality of life for the individual and family, weaker potential for economic development and compromises the development of human capital in society.**

Extreme weather events are expected to increase in the future due to climate change and **impact children's health and development directly through loss of life or injury, and indirectly by contributing to increased health risks, malnutrition, instability that compromises security, and an increase in child labour and trafficking.** Events such as cyclones, floods and storm surges become disasters when a society's capacity to cope within existing resources is overwhelmed. In 2011, more than 200 million people were affected by disasters, 100 million of which were children. Experience shows that children from the poorest families are up to 10 times more likely to bear the brunt of disasters linked to climate change. An study of flood-related mortality in Nepal found the death rate of children to be double that of adults, with pre-school girls five times more likely to die than adult men.

The right to education is among the basic rights of children. In especially developing countries, many children have to drop out of school due to a number of complex factors including deepening poverty, gender discrimination, emergencies and conflict situations, HIV and AIDS. **Climate change is increasingly exacerbating challenges impacting the ability of children to gain an education**. Children – most often girls – are in many cases forced to miss or drop out of school as a result of destruction of schools or related infrastructure or to help their families recover from extreme events. Examples from Ethiopia and Haiti show that schools have been closed for periods of time or permanently as a consequence of extreme climatic events. **More school dropouts and higher degrees of absenteeism is problematic, as education and knowledge is a crucial foundation for reducing risks among children and enabling children to contribute to and participate in adaptation and mitigation activities.** It also has high costs for society as it compromises human capital, the potential for value creation, as well as the future ability to handle climate change.

Children in developed countries are also subject to negative impacts of climate change, from extreme weather events as well as psychological stress. Opinion polls among children and young people in Norway and the UK show that a large majority are worried about climate change, want their governments to do more to solve climate change, and were worried about how climate change will affect families in developing countries. Cognitive dissonance, the experience of discrepancy between what you know is right and what you do or are part of, creates psychological stress. Western psychologists have in some instances documented obsessive behaviour among young people rooted in climate change worries. Researchers have noted that anxieties about global warming will likely increase among Western children as reports of the gravity of the situation becomes starker.

Children are competent agents in their own right and with rights to be taken into account and heard. **Children have a number of practical roles to play when addressing climate change**: a) Children are sources of knowledge about the needs and the vulnerability of their families and communities, b) Children can contribute as resourceful adaptive agents and communicators locally, c) Children bring wider perspectives to national and international processes related to climate change policy development, and d) Children are future leaders locally, nationally, and internationally.

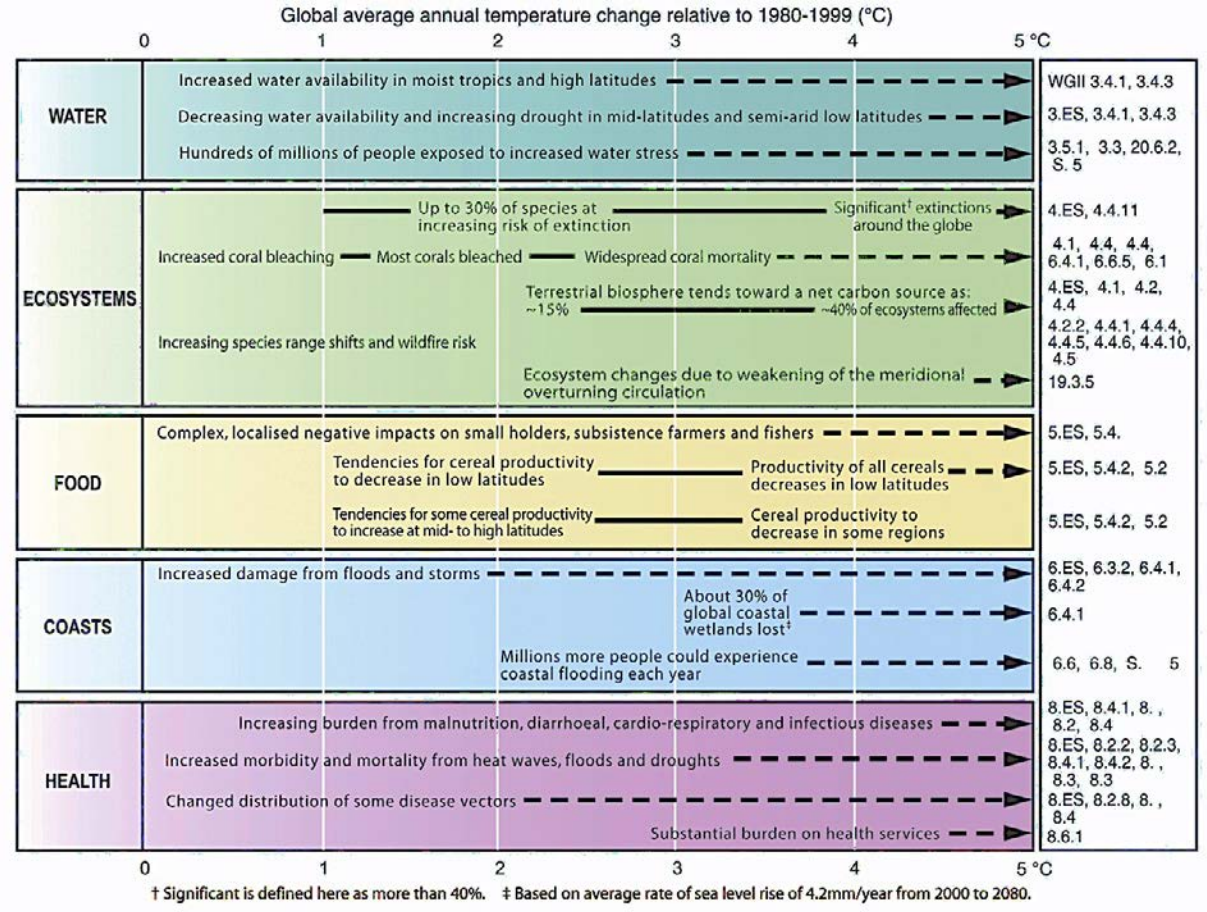
While children are increasingly taken into account in the climate change adaptation activities and the debate, **more research and action is called for** in order to understand how climate change affects children in different regions and under different emissions scenarios, in order to mitigate negative impacts of climate change on vulnerable children, and to empower children to respond to the challenges of climate change at all levels.

1. Introduction

This is an overview report describing how children are affected by climate change. In the report we try to answer the main questions; “Why are children important in a climate change perspective?”, “Where are children particularly affected or at risk?”, “How are Children affected by climate change?”, and “What roles do children have when addressing climate change?”.

This is not a report about climate science. We will refer to the reports of the Intergovernmental Panel on Climate Change (IPCC 2007, 2013) as the authoritative source for statements about the nature of climate change. It is clear that climate change occurs as a consequence of natural variability and as a consequence of human activity. The exact extent to which individual climate change hazards are due to anthropogenic influence is impossible to determine. In the report we will describe effects on children of climate change from weather-related phenomena for which there is a general scientific consensus that anthropogenic influence at least in part have contributed to them. An overview of the main effects of average temperature increase is shown in figure 1.1 below (IPCC 2007).

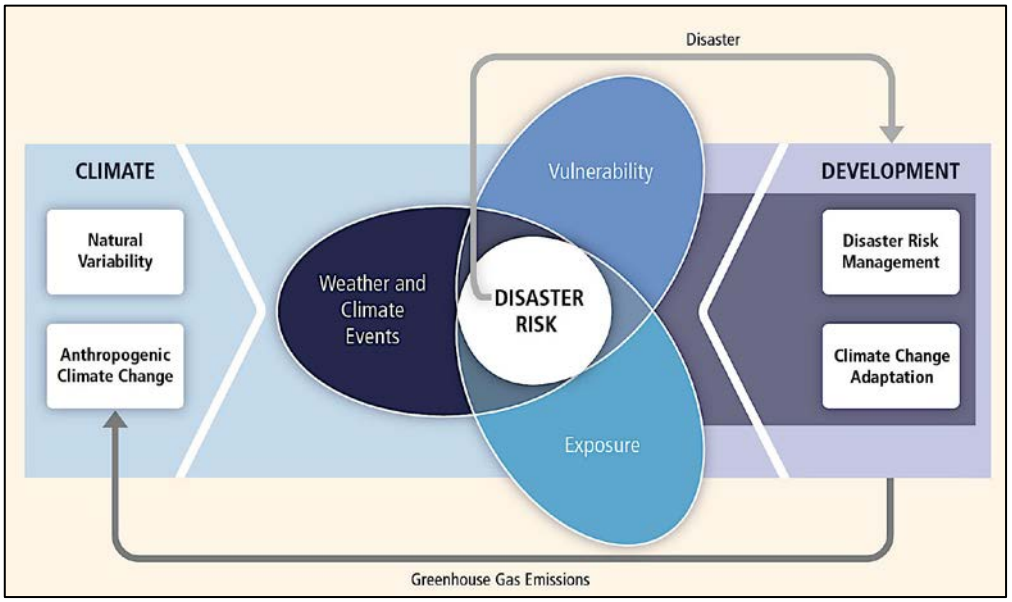
Figure 1.1: Expected effects (IPCC 2007) of temperature increase (IPCC 2007, IPCC 2013)



The character and severity of climate change depend not only on climate change itself but also on exposure and vulnerability (IPCC 2012). Exposure and vulnerability are dynamic; varying across temporal and spatial scales, and depend on economic, social, geographic, demographic, cultural, institutional, governance and environmental factors. For instance, a tropical cyclone can have very different impacts depending on where and when it makes its

landfall. A heat wave can have very different impacts on different populations depending on their vulnerability. Extreme impacts can result from individual extreme weather or climate events, but also from non-extreme events where exposure and vulnerability are high – or from a compounding of events or their impacts. Climate change related weather events also affect vulnerability to future events by modifying resilience, coping capacity, and adaptive capacity. Settlement patterns, urbanization, and changes in socioeconomic conditions have all influenced observed trends in exposure and vulnerability to climate extremes (IPCC 2012). Individuals and communities are also differentially exposed and vulnerable based on inequalities expressed through levels of wealth and education, disability, health status, as well as gender, age, class, and other social and cultural characteristics.

Figure 1.2: How anthropogenic climate change contributes to disaster risk (IPCC 2012)



It is not possible for this overview report to be able to properly reflect all the relevant nuances of how children are affected by climate change in different parts of the world. We have focussed on providing overall assessments of where children are especially at risk (chapter 2), but this does not mean that millions of children may not be equally at risk elsewhere due to specific circumstances. We have tried to highlight the main ways climate change directly affects children negatively and provide documented examples (chapter 3), but there are likely also many indirect ways climate change contributes negatively and which may also have severe and large scale impacts. This overview report thus provides a snapshot of the main picture with regards to children and climate change, demonstrating severity, scale and distributional patterns of the impact on the children of the world. More research is needed to assess in more detail how climate change affects children in specific societies and which strategies may work best to reduce the risk of negative impacts related to climate change.

In order to map the basis for a forward-looking agenda, the report also summarize present understanding of children's roles in handling climate change and summarize main points of the main connections between children and climate change.

2. Why are children important in a climate change perspective?

There are many vulnerable populations in the context of climate change and the impacts are not spread equally in terms of location, economic status, gender or age. Still, children – and especially children of poor families – stand out as a group that is especially affected in a detrimental manner. Children, especially young children, are in a stage of rapid development and are less well equipped on many fronts to deal with deprivation and stress. For instance, children have more rapid metabolisms, immature organs and nervous systems, developing cognition, as well as limited experience and behavioural characteristics. Their exposure to various risks is also more likely to have long-term repercussions than with adults.

The disproportionate health burden for children of challenging environmental conditions is well documented. Children under 15 are 44% more likely to die because of environmental factors than the population at large (Bartlett 2008). Small children, along with women and the elderly, are most likely to be victims of such extreme events as flooding, strong winds and landslides. Girls are generally more exposed than boys (Neumayer & Plümper 2007). In slower onset disasters such as drought sand famines, mortality rates are also more extreme for young children. Such situations are commonly determined as an emergency when crude mortality is one per 10,000 per day and under-five mortality is double that (Bartlett 2008). This reflects that risk exposure to such phenomena is generally considered 100% higher for small children than for the population as such in low-income countries. Almost all the disproportionate implications for children are intensified by poverty and the difficult choices low-income households make as they adapt to challenging conditions. Events that may have little or no effect on children in high-income countries and communities can have critical implications for children in poverty.

Overall death rates for young children continue to drop in most parts of the world due to improved health care, immunization rates and environmental conditions. But for many of the children (especially in Sub-Saharan Africa and South Asia) most at risk from the biggest killers – diarrhoeal and respiratory diseases, malaria and malnutrition – the situation is likely to worsen with some of the effects of climate change (World Bank (2012).

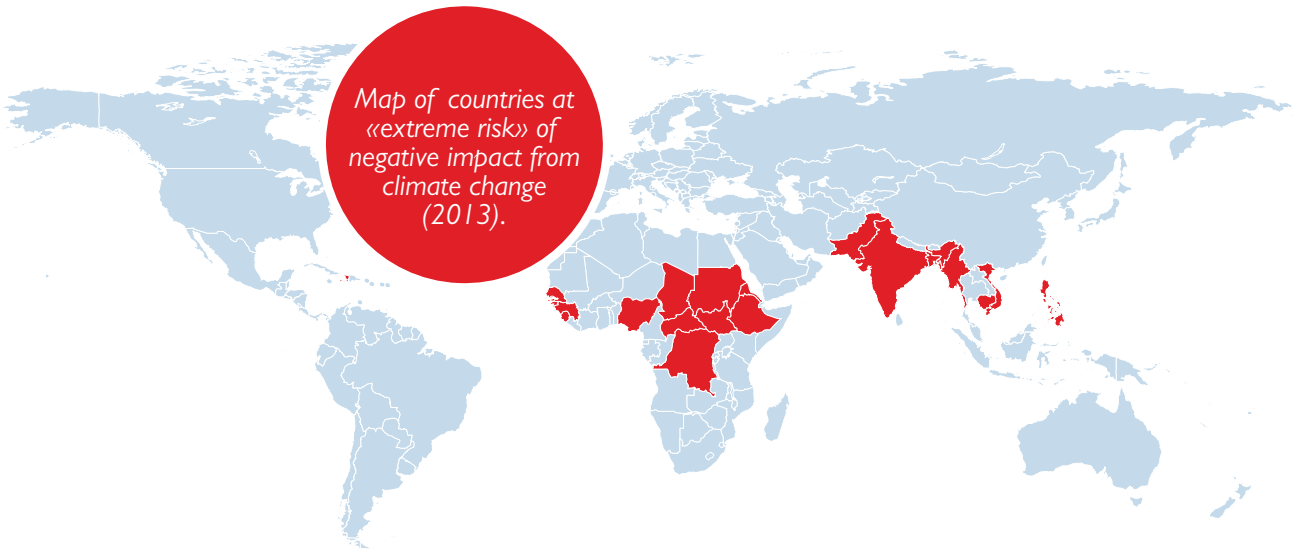
The scale on which the world's children are exposed to urgent risk related to climate change is indicated by the Climate Change Vulnerability Index 2014 (CCVI 2014), an annual report produced by UK-based risk analysis firm Maplecroft assessing the vulnerability of the world's countries to the impacts of climate change. In the report, climate change vulnerability has been assessed for each country by evaluating three factors: exposure to extreme climate-related events, including sea level rise and future changes in temperature, precipitation and specific humidity; the sensitivity of populations, in terms of health, education, agricultural dependence and available infrastructure; and the adaptive capacity of countries to combat the impacts of climate change, which encompasses R&D, economic factors, resource security and the effectiveness of government.

In the CCVI 2014 (Maplecroft 2014), 20 countries were ranked to be in the "extreme risk" category of which practically all are situated in a belt around of equator and in Africa and South or South-East Asia. When we include the "high risk" category, we get a list of more than 60 countries, including China and Latin American countries, in the belt around and north of equator below 30 degrees latitude. As shown in table 2.1 below, 737 million

children under 15 years of age currently live in the 20 countries considered at extreme risk of negative impact from climate change.

Table 2.1: Number of children in countries at extreme risk of negative impact from climate change

Countries at "extreme risk" of negative impact from climate change, 2013	Population, 2012	Children under 15
Bangladesh (Asia)	154.7 million	48.0 million (31%)
Cambodia (Asia)	14.9 million	4.6 million (31%)
India (Asia)	1236.7 million	358.6 million (29%)
Myanmar (Asia)	52.8 million	13.2 million (25%)
Pakistan (Asia)	179.2 million	67.0 million (34%)
Philippines (Asia)	96.7 million	33.8 million (35%)
Vietnam (Asia)	88.8 million	20.4 million (23%)
Central African Republic (Africa)	4.5 million	1.8 million (40%)
Chad (Africa)	12.4 million	6.1 million (49%)
DR Congo (Africa)	65.7 million	29.6 million (45%)
Eritrea (Africa)	6.1 million	2.6 million (43%)
Ethiopia (Africa)	91.7 million	39.4 million (43%)
Guinea (Africa)	11.5 million	4.8 million (42%)
Guinea-Bissau (Africa)	1.7 million	0.7 million (42%)
Nigeria (Africa)	168.8 million	74.3 million (44%)
Senegal (Africa)	13.7 million	6.0 million (44%)
Sierra Leone (Africa)	6 million	2.5 million (42%)
South Sudan (Africa)	10.8 million	4.5 million (42%)
Sudan (Africa)	37.2 million	15.3 million (41%)
Haiti (Latin America)	10.2 million	3.6 million (35%)
Total number of children under 15 years of age in 20 countries at extreme risk of negative impacts from climate change per 2013		**736.8 million**
Source: Climate Change Vulnerability Index 2014, Maplecroft.	*Source: World Bank World Development Indicators 2013, table 2.1 (http://wdi.worldbank.org)*	



It should be stressed that the overview in table 2.1 does not mean that all children in the mentioned countries are at extreme risk as some groups (for instance the more wealthy

parts of the population) will be less vulnerable than others, nor that children in other countries may not also be at extreme risk under certain circumstances. The think tank and research institute Germanwatch (Kreft & Eckstein 2013) has assessed which countries have been most deeply impacted by extreme weather events in the period 1993-2012. The top-10 countries include Latin American countries such as Honduras (1), Nicaragua (4), Dominican Republic (8) and Guatemala (10), as well as Asian countries such as Mongolia (8) and Thailand (10) – which together had 17 million children less than 15 years of age in 2013.

Children are not only important because they are disproportionally affected victims of climate change. Children are also important because they are competent agents in their own right, who can participate in climate change adaptation and mitigation activities. Children under 15 constitute as much of 40% of the population in many countries that are severely exposed to climate change, often have refined knowledge of their local contexts and are thus an important resource when adapting to detrimental climate change. We shall return to the children as resource perspective in chapter 4.

3. In what ways are children affected by climate change?

Increased exposure to hunger and malnutrition

Climate change will impact the global food system as climate related events such as reduced rainfall and other changes affect agricultural production negatively. Sudden acute events linked to climate change may also cause or contribute to interruptions in food supplies.

Poor nutrition currently causes the death of 3.1 million children under 5 each year, nearly half (45%) of all deaths in this group (The Lancet 2013). In addition, poor nutrition is the cause of stunting for 26% of the world's children below 5 years of age – with levels in Sub-Saharan Africa and South Asia reaching 40% and 39% respectively (UNICEF 2013). According to the Climate Vulnerability Monitor 2012 (Dara 2012), an independent scientific report developed on the initiative of developing countries vulnerable to climate change, the global impact of climate change on rates of hunger causes more than 200,000 deaths per year - half of which are among children in low-income countries. Over 200 million people are estimated to each year be affected by hunger as a consequence of climate change, with India, Pakistan, Bangladesh and Nigeria among the most severely affected nations.

The IPCC (2007b) has noted that climate change is likely to increase the number of people at risk of hunger towards 2080, and that especially Africa will be affected. The Stern Review (Stern 2007), based on IPCC findings and further research, estimates that a temperature increase of +2 degrees above pre-industrial levels will lead to sharp declines in crop yield in tropical regions (5-10% in Africa), that +3 degrees will mean that 150-500 additional millions will be at risk of hunger, and that at +4 degrees agricultural yields will decline by 15-35% in Africa. The Stern Review estimates that a temperature increase of +3 degrees will lead to 1-3 million more people dying from malnutrition. An example of how this plays out may be provided by the reported associations between climate change-related droughts in Chad and an increase in the prevalence of global acute malnutrition (GAM) within the drought-affected regions, from 14.5% in 2011 and 18% in 2012 (UNICEF 2013b).

Malnutrition is an effect of food shortages, but is also closely tied to unsanitary conditions and to children's general state of health. The effects of malnutrition are thus compounded

Save the Children: As climate change impacts intensify, more children, who are among the groups hardest hit by extreme weather events, will be put in harms way. Photo: Hedinn Halldorsson / Save the Children

by other factors, some of which themselves may also partly be caused by climate change. Frequent bouts of diarrhoea and infestations of worms, for instance, lead to impaired absorption and a loss of nutrients. When children are malnourished, their vulnerability to infection is greatly increased and a vicious cycle results. A chronically malnourished tree or four-year old boy may be at permanent disadvantage, as stunted growth leads to physical disabilities and often also learning difficulties.

Nutritional risk as a result of disasters tends to be low if children were previously well nourished and if the acute malnutrition associated with the event does not go on for too long (Bartlett 2008). After Bangladesh's 1998 floods, when families were unable to compensate over time for the shortage of food and the deterioration in health conditions, flood-exposed children failed to experience the "catch-up" growth common after a shock, remaining shorter than unexposed children from the same neighborhoods (Del Ninno & Lundberg 2005). Similarly significant impacts on children's growth were found in Zimbabwe following a drought, in this case over a much longer term. Children in the critical 12–24 month-old age group during the drought in the early 1980s were found 13 to 16 years later to have had an average loss of stature of 2.3 inches. Their potential loss in lifetime earnings was calculated to be 14% (Alderman et al. 2004).

Increased health burden

Children are among the most vulnerable groups globally for the impacts of disease. WHO estimates that global warming that has occurred since 1970s had caused over 140,000 excess health-related deaths annually by the year 2004 and that many of the major causes of

death (diarrhoeal diseases, malnutrition, malaria and dengue) are highly climate-sensitive and are expected to worsen as the climate changes (WHO 2013a). The WHO (WHO 2009) also estimates that +85% of the global disease burden due to climate change occurs in children under 5.

The Stern report (Stern 2007) estimated that a temperature of +1 degree compared with pre-industrial levels (we are currently at about +0.8 degrees), will lead to at least 300,000 more people each year dying from climate-related diseases (predominately diarrhoea, malaria and malnutrion).

Globally, children under five are the main victims of **water and sanitation-related illnesses** and **diarrhoeal** disease, mainly due to less-developed immunity and because their play behaviour can bring them into contact with pathogens. WHO data shows that 644,717 children under 5 died from diarrhoeal diseases in 2011 (WHO 2013b). WHO has estimated that in 2004, climate change was on average responsible for 3% of deaths due to diarrhoea (WHO 2009). If the same factor pertains to 2011, this would mean that climate change in 2011 caused 19,342 deaths from diarrhoea among children under 5. The IPCC (IPCC 2007b) has projected that climate change will likely increase the burden of diarrhoeal disease in low-income countries by approximately 2-5% by 2020. A 2% increase in diarrhoea-infected deaths among children under 5 (using 2007-numbers; 808,862 deaths), would mean an additional 16,177 deaths in this group in 2020 caused by climate change, compared with a reference scenario without such climate change. It should be remembered that diarrhoeal disease also results in higher levels of malnutrition and increased vulnerability to other illnesses, with effects on overall development.

Various conditions associated with climate change are likely to result in increased risks for young children related to inadequate access to clean water and proper sanitation. A study in Bangladesh found that the number of non-cholera diarrhoea cases per week increased by 5.1% for every 10mm increase above the threshold of 52mm average rainfall. The number of cases also increased by 3.9% for every 10mm decrease below the same threshold of rainfall (UNICEF 2013c). After extreme events, diarrhoeal illnesses related to breakdowns in piped water supplies and sanitation can in some cases take more lives than the initial disaster (Bartlett 2008). The risks in underserved urban settlements also increase with “minor” events. During heavy or prolonged rains, blocked drains and flooded latrines can make contamination difficult to avoid, increasing the incidence of diarrhoeal illness in children. Where the incidence and duration of rainstorms increases because of climate change, these conditions will become more prevalent. Contamination of water supplies is also a risk during droughts. For small children’s health, water quantity is generally considered even more important than its quality (Bartlett 2008). Unwashed hands, food, utensils, floors and cooking surfaces all contribute to higher levels of endemic illness. When water must be fetched from a distance, or when supplies are low or erratic, households make do with less than necessary to meet children’s routine health needs.

Increased temperatures and changes in precipitation are increasing the incidence and range of various **vector-borne diseases** and with it the level of exposure, with particular implications for children. The most serious threat is **malaria**, which especially affects Africa. WHO data show that 483,925 children under 5 died from malaria in 2011 (WHO 2013c). WHO has estimated that in 2004, climate change was on average responsible for 3% of

deaths due to malaria (WHO 2009). If the same factor pertains to 2011, this would mean that climate change in 2011 caused 14,518 deaths from malaria among children under 5.

IPCC (IPCC 2007b) notes that the precise dynamics between climate change and malaria is difficult to model. It seems clear that increasing temperatures will increase the spread of malaria to for instance large populations in highland areas of Eastern Africa, but in some cases climate change may also lead a contraction of malaria areas (for instance due to a drier climate). In total, however, the impact of climate change on malaria is deemed negative. The Stern report (Stern 2007) estimates that a temperature increase of 2 degrees will lead to 40-60 million more people in Africa being exposed to malaria, and an increase of 4 degrees that up to 80 million more people in Africa will be exposed.

Numbers of death fail to capture the full implications for children. Malaria results in chronic anaemia, increases the severity of other diseases and more than doubles the mortality rates for children under five (Bartlett 2008). It contributes to impaired development in some children because of the insult to the brain during acute episodes, which is also mediated by the effects of anaemia, repeated illness and undernutrition related to the disease. A survey in Kampala, Uganda, found that children in 36 per cent of surveyed households had experienced fever in the previous two weeks, but less than one per cent received the recommended medical treatment despite the proximity of clinics and hospital. Only 11 per cent of households (the wealthiest) used treated nets (Bartlett 2008). Even this is high for Africa, where a multi-country survey found that treated nets were used by only 2 per cent of households with children under five (Bartlett 2008).

Climate change likely also has negative health effects related to respiratory illnesses, heat stress and temperature fluctuations (pneumonia is a major cause of death among children under 5).[1] As the contribution of climate change to such diseases is more difficult to assess and less documented, we have not tried to elaborate on that here.

Disasters and injury

The IPCC (IPCC 2007a, IPCC 2013) projects an increase in the frequency and intensity of hydro-meteorological events such as cyclones, floods and storm surges, with increasing risk of natural hazards. Hazards become disasters when a population or society's capacity to cope within existing resources is overwhelmed. In such situations, children are among the most vulnerable. Extreme weather events impact children's health and development through loss of life or injury, or by aggravating diseases related to malnutrition, poor water and sanitation. Infants and young children's chances of surviving beyond age 5 also decrease if their mother dies, in part because they are less likely to receive adequate nutrition and health care (UNICEF 2011). It has been documented that disasters usually impact girls and young women significantly harder than boys and young men (Neumayer & Plümper 2007, Plan 2013). Girls are generally given less food when it is scarce and are less likely to be rescued than boys (Plan 2013). In the 1991 cyclone in Bangladesh and the 2004 Asian Tsunami, women and girls accounted for 80-90% of the loss of lives (Ikeda 1995, Bartlett 2008, Plan 2011).

[1] According to the WHO (2013d) 1,214,531 children under 5 died of acute lower respiratory infections in 2011.

Save the Children: Usmanpur, home to around 200 people, in a low lying area in the North-East district of Delhi, has to cope with seasonal storms, high winds and annual floods from the Yamuna river. The two major livelihoods are sorting garbage and selling cow dung for fuel. Photo: Hedinn Halldorsson / Save the Children

In 2011, almost 200 million people were affected by disasters among which 100 million were children (CCCC 2013). The Stern Review (Stern 2007) estimates that an increase in temperature of +2 degrees means that up to 10 million more people will be affected by coastal flooding each year, an increase of +3 degrees that up to 170 million more people will be affected by flooding each year, and that an increase of +4 degree means that up to 300 million more people will be affected.

Children are particularly at risk from disasters and natural hazards. Death and injury rates are related to challenging conditions, increasing health risk, overcrowding, complexity in the environment and higher levels of preoccupation on the part of adults – all factors commonly experienced in the post-disaster context as well as in the context of gradually worsening conditions. A study of flood-related mortality in Nepal found the death rate of children to be double that of adults, with pre-school girls five times more likely to die than adult men (Pradhan et al 2007). Poor households were at six times higher risk than their better-off neighbours. UNICEF (UNICEF 2013c) notes that children from the poorest families are up to 10 times more likely to bear the brunt of environmental disasters linked to climate change. Documenting the disproportionate effect of environmental shocks on poor children, Save the Children has reported that 67% of the poorest children in Ethiopia were hit by an environmental shock in the period 2005-2010, compared to 6.5% of children from better off families (quoted in UNICEF 2013c). The negative impacts of climate change related disasters on children are not only direct but also indirect, as disasters often contribute to increased

non-lethal health risks, malnutrition, instability that compromises security and an increase in child labour and trafficking (CCCC 2013). For instance, UNICEF reports that in September 2008 more than 200,000 people in Northern Thailand were diagnosed with waterborne diseases after 19 days of heavy flooding (UNICEF 2011).

The Asia-Pacific region is the most disaster-prone area in the world. Globally, the majority of lives lost to disasters are concentrated here (UNICEF 2011): Over the period 1975-2008 Asia accounted for 88% of people affected by disasters worldwide, 61% of total fatalities and 47% of economic damage.

The composition of the climate related risk varies between countries and regions. Maplecroft (Maplecroft 2014) notes that the countries in South and Southeast Asia, are considered likely to face an increased risk of severe flooding due to projected changes in seasonal rainfall. These would also increase the likelihood of summer droughts, and in turn, declining crop yields. The most susceptible populations in these areas are in areas with high levels of poverty, and where large populations has clustered on marginal land such as flood plains or coastal regions in cyclone-prone areas. The vulnerability of many African countries is considered partly to be due to their natural susceptibility to extreme climate-related events such as floods, droughts, fires, storms or landslides. But also as a consequence of the vulnerability of the population, and the inadequacies of existing infrastructure to adapt to or tackle the problem, due to weak economies, governance, education and healthcare.

According to the Climate Vulnerability Monitor 2012 (Dara 2012), **flooding and landslides** induced by climate change is globally estimated to be responsible for close to an average of 3,000 deaths per year and around 10 billion dollars in economic losses. For every death, there can be as many as 10,000 people in need of emergency assistance and each year over 25 million more people are affected, than in earlier periods when climate change was not so marked. The report notes that over the next 20 years, the climate-related flood death toll is expected to increase modestly to 3,500 deaths per year with economic losses more than tripling as a share of global GDP. India, China, Bangladesh and Vietnam will likely be among the most severely affected nations.

According to the Climate Vulnerability Monitor 2012 (Dara 2012), the impact of climate change on both **tropical cyclones and major storms** outside of the tropics is estimated to cost 15 billion dollars and to be responsible for an average of almost 2,500 deaths each year, with around 1.5 million people affected and in need of emergency assistance. In global terms, the number of countries experiencing extreme effects is limited, particularly since the great majority of losses relate to tropical cyclones, which are a serious concern for only 30 to 40 countries in the world's cyclone belts. Bangladesh is currently estimated to suffer the greatest human impact of these effects, with over 1,000 additional casualties due to climate change on an averaged yearly basis. Myanmar and India are also nations predicted to be severely impacted over the next decades.

The negative effects on children from disasters may also be seen in light of the economic case for focussing more on prevention compared with recovery when addressing disaster risk; according to the World Meteorological Organization, every US$ 1 invested in prevention save US$ 7 in recovery (WMO 2009). Similarly, every dollar invested in child-related

resilience will likely save many-times larger numbers of dollars in child-related emergency and recovery cost.

Infringement of the rigth to education

The right to education is among the basic rights of children. Yet, in especially developing countries, many children have to drop out of school due to a number of complex factors including deepening poverty, gender discrimination, emergencies and conflict situations, HIV and AIDS and disabilities. UNICEF (UNICEF 2013c) has pointed out that climate change is increasingly exacerbating these challenges and negatively impacting the ability of children to gain an education.

Children may in many cases be forced to miss or drop out of school as a result of destruction of schools or related infrastructure or to help their families recover from extreme events. A review conducted by the World Bank on the impact of disasters on human capital showed that household income typically falls after a disaster, especially for already poor households, and the effects of reduced household expenditure included a decline in investments in children's education (Baez J. et al. 2010). Negative impacts of climate change on livelihoods generally make it more likely that parents remove their children from school. Girls are particularly at risk, as they are more likely to be pulled out of schools during emergencies – and least likely to return afterwards (Plan 2013). In Pakistan, after the 2010 floods, one quarter of the girls and just six per cent of the boys in Grade Six dropped out of school. In Zimbabwe, two in three heads of households said boys would be more likely than girls to return to school after a disaster (Plan 2013).

A recent global baseline report on school safety from disasters (ISDR 2012), notes that school safety comprises three main elements; safe school facilities, school disaster management, and disaster prevention and risk reduction education. Each of these requires separate tracking because the types of policies, decision-making authority, resources, expertise, and implementing actors are substantially different for each.

While the evidence reported often is anecdotal, the causal link seems well documented. A study on school enrolment in rural areas of India found that a 10% decline in agricultural income due to heavy rainfall led to an average decline in school attendance of five days (Baez et al. 2010). UNICEF reports that research in the Pacific islands Kiribati and Vanuatu show that children were often kept out of school after extreme events to help their family and community clean up debris (UNICEF 2011). A UNESCO report (UNESCO 2010) cites examples from Pakistan and Uganda, where climate-related shocks have resulted in children being taken out of school – especially girls. In Gode, Ethiopia, a sustained drought contributed to high rates of student absenteeism and dropouts. Girls were often the first to be removed from school. 8 out of 31 schools in the region were forced to close due to high drop-our rates (Baez et al 2010). Interviews carried out by UNICEF in Kenya, brings report of children who have dropped out of school as they cannot concentrate due to hunger (UNICEF 2013c). In 2008, four hurricanes hit Haiti in a period of just a few months and all the schools in the country were closed for one month (UNICEF 2013c).

More school dropouts and higher degrees of absenteeism triggered by climate change have high costs for society as it compromises human capital and thus the potential for value

creation. Investing in climate change related resilience (prevention of risk) in the education sector will thus likely be a cost-effective measure in a longer-term value creation perspective, in line with the general benefits of investing in prevention compared with in recovery mentioned above (WMO 2009).

Effects on children in developed countries

Also in developed countries children are exposed to negative effects of climate change-related weather events but the vulnerability is generally much lower than in the developing countries due to the normally robust capacity of these societies to mitigate risk. Still, in some cases impacts can be severe and children are generally more physically and emotionally vulnerable to dramatic manifestations of climate change, whether through direct experience of natural hazards (such as local landslides and flooding), disasters that may be linked to climate change (such as the massive damages caused by the hurricane Sandy in the New York metropolitan area in 2012), or news reports of disasters related to climate change from all over the world.

A recent American study (Coyle & Susteren 2012) has looked at the psychological impacts of climate change, including impacts on children. In 2011, the people in the United States experienced a bad drought in Texas, record heat in the eastern states, a rise in heat-related deaths in many US cities, violent floods in the East and Midwest, and an expanded range and season for some of the worst tornados on record. The authors note that the American Academy of Pediatrics has compiled research that shows a relationship between global warming, hotter weather and children's health. The studies show an increase in a number of respiratory illnesses, including asthma – partly triggered by the fact that higher temperatures favor the formation of ozone. The authors refer to warnings issued by Harvard researchers and the American Public Health Association, that millions of poor and minority children in America's cities will likely suffer even higher rates of asthma and other respiratory illnesses in the future. Climate change is considered a contributing factor.

In Norway, increased rainfall and snowmelt over the last decades are causing heavy floods, especially in the eastern part of Norway. Climate change is expected to lead to temperature increase in all parts of the country, more rain, and in many parts of the country the risk of a 200-year flood is estimated to increase with 10-60% (NOU 2010). While lives are rarely lost due to extreme weather events in Norway, hazards such as floods often create large damages to infrastructure and can be disruptive to the economy and environment of families with children in the flood-pronged areas. In the period 1980-2010, 30,000 insurance or compensation claims were registered in Norway related to floods – with a strong increase in the last decade (Government of Norway 2012).

In the American study (Coyle & Susteren 2012) the authors note that as global warming in the future increasingly will affect the surroundings (including relations and ecosystems as well as lifestyles) of 70 million American children, anxiety will likely increase as reports of the gravity of the situation becomes more stark. Some children are reportedly already anxious about global warming and begin to obsess about the future, unmoved by reassurances adults attempt to put forth. In a 2007 survey of children in drought-hammered Australia, a quarter of the children were reportedly so troubled about the state of the world that they honestly believed it will come to an end before they get old (Tucci et al. 2007). In one

example, a depressed 17-year-old boy was hospitalized for refusing to drink water out of fear it would cause more deaths in drought-ridden Australia (Coyle & Susteren 2012). The authors also point to the body of research showing how distressed Russian and American children were by the threat of nuclear bombs during the cold war, as an indication of the potential destructive psychological impact climate change may have on children (Coyle & Susteren 2012).[2]

An opinion poll among Norwegian youth in the age group 15-24 in 2011 showed that the younger segment (15-18 years old) were the most concerned about anthropogenic climate change. A large majority (70%) also expressed concern that the Norwegian government should do more to help solve climate change (LNU 2012). A poll in the UK in 2012/2013 showed similar figures: 74% of children expressed worry about how climate change affects the future of the planet and believed the world will have changed as a result of climate change by the time they are adults, 73% wanted the government to do more to tackle climate change, and 64% were worried about how climate change will affect children and families in developing countries (UNICEF 2013c).

Children in OECD-countries such as Norway and the UK are strongly exposed through media and the education system to information about climate change, the link between GHG-emissions and current Western lifestyles, as well as impacts that to a large extent take place among the poor in developing countries. Regularly reports about catastrophic climate change-related effects in developing countries are brought into the homes of Norwegian and UK children via coverage in television and other media. This likely creates a state of cognitive dissonance, where there is an experienced inconsistency between the knowledge one has about how the world should be and the reality one is part of. Experiences of cognitive dissonance are commonly considered to lead to psychological stress.

[2] One study (Chivian et al. 1985) in the early 1980s found that nearly 50% of the surveyed children thought that nuclear war would directly affect their lives and reacted with despair and loss of motivation. Many believed the world would soon end.

Save the Children: The children of the village of Mewat, at school, during an outdoor session on disaster risk reduction. *Photo: Hedinn Halldorsson / Save the Children*

4. What roles do children have when addressing climate change

Children have contributed the least to climate change but are already disproportionately affected by its impacts, and the same will apply to future generations of children in the foreseeable future. The children of today have rights according to the UN Convention on the Rights of the Child, which give them the right to be taken into account, to adaption support and to participate in decisions and actions that will affect their future (IDS 2009a). Intergenerational justice perspectives extend those rights to also cover the children of tomorrow (IDS 2009b), who increasingly will be exposed to anthropogenic climate change.

An understanding of children as active agents is a vital component of a rights-based approach to children and also an accepted reality within theory on children's development. Children do not just passively experience the process of development, but are actively engaged in it in purposeful ways, even from their earliest days (Bartlett 2008). On some level, even smaller children often know what they need and they contribute to create the circumstances of their own development. This is even more so with older children who also routinely make practical contributions to their households and communities. In some cases, they are already surviving on their own without the support of adults.

Children and young people have a number of practical roles to play when addressing climate change:

- They are sources of knowledge about the needs and the vulnerability of their families

and communities, thus enabling more effective responses to such needs.
- They have detailed knowledge about local conditions and can function as resourceful adaptive agents and communicators, and provide useful advice to improve local disaster risk reduction governance
- They bring wider perspectives to national and international processes related to climate change policy development, helping ensure a long-term sustainable development perspective
- They are the future leaders, locally, nationally and internationally

An extensive survey of focus groups with adults and children in 17 developing countries in Asia, Africa and Latin America (Plan 2009), indicated that children in developing countries are, by and large, excluded from the activities that contribute to the resilience of their local communities. The survey showed that children and young people are not satisfied with what is being done to prevent or mitigate disaster risk. The children and young people were of the opinion that to include them more in such efforts, would build their own resilience, improve disaster risk reduction governance and strengthen the resilience of the community as a whole. The survey also showed that education and knowledge is the top priority for children and the foundation for achievement of international goals related to building resilience of communities and nations to disasters (ref. the international Hyogo Framework for Action).

The coalition *Children in a Changing Climate* is a group of leading child-focused research, development and humanitarian organisations, who document and advocate children's perspectives on climate change on their website.[3] A 10-step child-centred approach to disaster risk reduction and adaptation has been developed by the Institute of Development Studies (IDS 2012), as a methodological approach to harness the resources of children and young people to their benefit and the benefit of society as a whole.

In 2011 more than 600 children across 21 countries in Africa, Asia and Latin America provided input towards the development of a Children's Charter (UNICEF et al. 2011), which calls for stronger commitment from government, development agencies and donor partners to protect children and to use their knowledge and various capacities to engage in disaster risk reduction and climate change adaptation. The Charter outlines five priority areas:

- Schools must be safe and education must not be interrupted.
- Child protection must be a priority before, during and after a disaster.
- Children have the right to participate and to access the information they need.
- Community infrastructure must be safe and relief and reconstruction interventions must help reduce future risk.
- Disaster risk reduction response must reach the most vulnerable people.

UNICEF (UNICEF 2011) notes that while more governments are acknowledging the vulnerabilities and capacities of children, few are incorporating children's issues in necessary frameworks. Analysis of the institutional structures of five countries uncovered a complex array of agencies and overlapping mandates important for children in a climate change perspective, but little focus on children. When children are mentioned, it is usually in context of their vulnerability to climate change impacts. A content review of the national adaptation plans for action and the national communications to the climate change

[3] http://www.childreninachangingclimate.org/home.htm

Save the Children: Kampong Cham, Cambodia: Many children in Cambodia have responsibility for cows or buffaloes from the age of eight. The responsibility leads to worries about floods and food shortage.
Photo: Hanne Bjugstad / Save the Children

convention (UNFCCC) in the Pacific region, revealed that most acknowledge children's vulnerability, but only Kiribati and the Solomon Islands provided specific examples of how children can be involved in adaption processes (Burton et al. 2011).

Since 2005, youth engagement in the UNFCCC process has increased and since 2009 youth has been recognized as a civil society actor in its own right with the right to be heard in the negotiation process (UN 2009).[4] The youth network related to the negotiations does not, however, necessary fully reflect a children's perspective. Also the smaller children, who are the most vulnerable, have rights to be heard and taken into consideration. UNICEF (UNICEF 2013c) has noted that so far there has been no systematic way to include young people and children in climate change decision-making. While there are opportunities at the international level in the UNFCCC-process via the youth network, more needs to be done especially at the national government level (including in developed countries such as the UK) to ensure children and young people can regularly participate in and be consulted on climate change policy.

[4] UN 2009: *Growing Together in a Changing Climate. The United Nations, Young people and Climate Change*. This report presents an overview of the global youth movement around climate change issues, as of 2009.

5. Conclusions and points of future focus

Children are especially vulnerable to climate change

- Estimates indicate that **thousands of children die every year** due to climate change and **that millions are affected negatively**.

- Children are mainly affected by climate change through **increased disease burden, exacerbation of malnutrition and hunger, higher risk from natural hazards and disasters, infringement on the right to education, as well as psychological stress**.

- **Children in developing countries** are especially affected negatively by climate change, as developed countries generally are more exposed to climate change and have less capacity to handle climate change. Among children, **children of poor families, children under 5, disabled children and girls** and are especially vulnerable.

- **Children and young people have significant resources** that can be harnessed in a consistent and systematic manner in climate change adaptation as well as policy development at all levels, but this is today only done to a limited degree.

Points of engagement and focus

- The severe impact of climate change on the world's children, especially in developing countries, underscore the importance to limit anthropogenic climate change by **reducing greenhouse gas emissions**.

- **Reducing vulnerability** can mitigate immediate negative effects of climate change on children significantly. Building climate change resilience though addressing relevant physical and social circumstances at local level in developing countries that are exposed to climate change is an effective way to reduce vulnerability.

- **Education** is crucial for building climate change resilience and mitigating impacts, as it empowers children and local communities to make informed decisions and harness their expertise about local conditions and possibilities. This makes a twofold effort necessary: to prevent loss of education due to climate change related events, and to strengthen education efforts including knowledge about climate change.

- Reducing negative climate change impact on children is closely related with **equity** issues, as the impact has a clear gender and poverty bias. Strategies for building resilience should thus be **gender and poverty sensitive**, and **sex and age disaggregated reporting** should be included in relevant reporting mechanisms.

- Improving **disaster risk reduction governance** in developing countries is crucial to reduce negative impact on children from climate change.

- As economic, social, geographic, demographic, cultural, institutional, governance and environmental factors condition vulnerability, vulnerability reduction strategies must be **tailored according to local conditions**.

- International and national funding streams aimed at climate change adaptation should take into account **children as a vulnerable group and explicitly target children's needs and rights**, such as children's right to participation and influence on processes that concern them.

- This overview report shows that knowledge and data about how climate change affects children is still limited and often anecdotal in nature. **More research is called for about where and how children are most vulnerable** to climate change-related impacts due to an overlap of exposure and vulnerability factors.

- Children will be differently exposed and impacted in different GHG emissions scenarios for the future, but such implications are not clear today. Assessments of the **impacts on children in different GHG emission scenarios** would provide important background information for policy decisions affecting emission trends.

- Children and young people are the leaders of tomorrow and should be equipped with **knowledge and tools that will enable them to handle the challenge** of reducing greenhouse gas emissions as well as adapting to increasing climate changes in the foreseeable future.

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