

A close-up portrait of a young child with dark skin and short hair, smiling broadly and showing their teeth. They are wearing a yellow garment. The background is a soft, out-of-focus warm tone.

CLIMATE CHANGE THREATS TO HEALTH

CLIMATE
CHANGE
SERIES

PART 3

THE VULNERABILITY
OF CHILDREN

A photograph of a young child in Niger being measured for malnutrition using a MUAC tool. The child is looking up at the camera with a concerned expression. The MUAC tool is a white band with a green strip that has a red line indicating severe malnutrition. The child is wearing a patterned orange and blue garment. The background is blurred, showing other people and a bright light source.

“ The health status of millions of people is projected to be affected through ... increases in malnutrition, ... deaths, diarrhoeal ... and ... infectious diseases. ”

—Intergovernmental Panel on Climate Change, Fourth Assessment Report 2007

**a
fair
measure?**

Mayyara Village, Niger: Sabiou's arm is measured using the MUAC tool. The red means severe malnutrition.

Photo: Andrea Peer/World Vision

CLIMATE CHANGE THREATS TO HEALTH

Acute malnutrition, also called wasting, develops because children lose weight or can't gain weight. It is usually associated with emergencies where food supplies are scarce and disease outbreaks rampant. In its most serious form (severe acute malnutrition) children are visibly wasted and have oedema. For young children (aged 6-59 months) it can be detected by measuring the middle upper arm circumference (MUAC). Over recent years climate change has emerged as a new driver of malnutrition. In the wake of the 2008 food crisis, the number of children with this life-threatening condition escalated, increasing mortality rates by 5-20 times. The climate emergency is poised to exacerbate children's risk to physical injury, malnutrition and infection. For decades World Vision has worked with developing communities to help them carry an already heavy health burden from malnutrition, diarrhoea and vector-borne diseases. With climate change threatening to unravel decades of development, efforts to curb existing vulnerabilities and mainstream child-focused adaptation into development programming must be urgently stepped up. Ultimately the success of humanity adapting to a continually changing environment will be intrinsically tied to protecting the life of children.

GRATEFUL ACKNOWLEDGMENT

We wish to thank the following individuals and organisations for their contributions. Without your generous help this publication would not have been possible. Thank you!

Individuals

Catherine Johnston, Annabel Hart, Sue Ndwalu, Andrew Jalanski, Carolyn MacDonald, Beth Fellows, Martha Newsome, Suzy Sainovski, Wendy Barron

Organisations

Centers for Disease Control (CDC), Public Library of Science (PLOS), World Health Organization (WHO), Institute of Environmental Studies (IES), University of New South Wales (UNSW)

Photos

All photos World Vision International except as noted below:
Centers for Disease Control and Prevention (CDC) and Public Health Image Library (PHIL): p. 23 Dr. Mae Melvin, p. 24 (top) James Gathany

Production

Printed on recycled paper

ISBN

978-0-9807094-6-9

World Vision International. All rights reserved.

Climate Change Threats to Health © 2009 World Vision International

For a list of errors or omissions found subsequent to printing, please visit our website at: <http://worldvision.com.au>

Design: JML-Design

Cover Photo: Jon Warren/World Vision

Editor Contact: planetprepare@gmail.com

Author Contact: gerard.finnigan@worldvision.com.au

World Vision Australia, 1 Vision Drive

Burwood East, Victoria 3151, AUSTRALIA

P: +61 (0)3 9287 2233, F: +61 (0)3 9287 2427, W: <http://worldvision.com.au>

CLIMATE + HEALTH CORE TEAM

Lead Author

Gerard Finnigan

Series Editor

Johannes M. Luetz

Editorial Board

Brett Parris PhD (World Vision Australia Chief Economist & Manager, Economics, Climate & Natural Resources Team), David Lansley PhD (World Vision Australia Senior Economist), Gerard Finnigan (Manager, Health Technical and Policy Team, World Vision Australia), Melanie Gow (World Vision Australia Head Advocacy and Programme Effectiveness)

Design Production

Johannes M. Luetz

Executive Producer

Melanie Gow

Climate Change Series

Around the globe World Vision is witnessing first hand the devastating impact of climate change on poor communities. Governments, non-governmental organisations and communities are grappling to adapt to new threats and their impacts. We have much to learn. In this series of publications, World Vision is seeking to identify concrete responses to climate change both at the programming and policy levels.

LIST OF ACRONYMS

ADP – Area Development Programme
ANCP – AusAID-NGO Cooperation Program
Bt – *Bacillus thuringiensis*
CMAM – Community-Based Management of Acute Malnutrition
DALY's – Daily Adjusted Life Years
GHF – Global Humanitarian Forum
GPRS – General Packet Radio Service
ITBN – Insecticide-Treated Bed Nets
IPCC – Intergovernmental Panel on Climate Change
MDG's – Millennium Development Goals
MEWS – Malaria Early Warning System
MICAHA – Micronutrient and Health Initiative
NGO – Non-Government Organisation
NTDs – Neglected Tropical Diseases
ODA – Official Development Assistance
ORT – Oral Rehydration Therapy
PMCTC – Preventing Mother to Child Transmission
UNDP – United Nations Development Programme
UNFCCC – United Nations Framework Convention on Climate Change
UNICEF – United Nations Children's Fund
WHO – World Health Organization
WASH – Water, Sanitation and Hygiene
WV – World Vision
WVG – World Vision Ghana
WVIDN – World Vision Indonesia
All amounts shown in \$ are U.S. dollars unless otherwise indicated

TABLE OF CONTENTS

Executive Summary	6
Introduction.	8
The Vulnerability of Children to Climate Change.	11
Risk from Malnutrition and Under-nutrition.	13
Case Study 1 – Addressing Stunting through Improved Child Feeding.	15
Threat of Diarrhoeal Disease	17
Case Study 2 – Integrating Water, Sanitation and Hygiene Programming in Ghana	19
Danger from Vector-Borne Diseases	21
Case Study 3 – Community-Based Malaria Prevention in a Changing Environment	23
World Vision's Recommendations	25
Priorities For Action	27
Glossary	29
Endnotes.	30

Dhaka Shishu, Bangladesh: “Whenever I get something from World Vision I feel very happy, this mosquito net will protect me from mosquitoes,” says five-year-old World Vision sponsored child Fahima.

Photo: Amio Ascension

COVER CHILDREN

Executive Summary

“The security and stability of each nation and all peoples – our prosperity, our health, our safety – are in jeopardy. And the time we have to reverse this tide is running out ... The threat from climate change is serious, it is urgent and it is growing ... If we fail to meet it – boldly, swiftly and together – we risk consigning future generations to an irreversible catastrophe.” (U.S. President Barack Obama)

Health: Climate change poses unprecedented threats to the health and well-being of children through the incidence and spread of diseases, and through growing pressures on the availability and quality of air, food and water. The impacts of climate change on health are a core consideration of both the UN Framework Convention on Climate Change (UNFCCC) and reports by the Intergovernmental Panel on Climate Change (IPCC). Protection of health is critical for adaptive responses to climate change, alongside other overlapping priorities such as food and water security and disaster risk reduction. However, the social dimensions of adaptation are often neglected in discussions which tend to focus on the adaptation of physical systems.

Children: Climate change jeopardises the health of children significantly more than the health of adults. Children make up a larger share of the populations of developing

countries, and are physiologically far more vulnerable to a hotter, wetter and drier world. The prevalence of three of the greatest health threats to children – malnutrition, diarrhoeal disease and vector-borne diseases – are at risk of increasing as climate change progresses. Unless climate change can be successfully mitigated and contained through concerted global action, child mortality is likely to rise dramatically. More than 90% of these deaths will be related to malnutrition, diarrhoea and malaria, with the remainder caused by weather-related disasters. ⁽¹⁾ However, climate change is not constrained to the distant future. Already thousands of children in developing countries are experiencing its adverse effects.

Development Gains: World Vision has been working with communities for more than 50 years in emergency relief and longer-term development programmes to com-

bat the effects of poverty, particularly on children. Climate change threatens to reverse decades of investment and effort to reduce the burden of hunger, poverty, and maternal and child mortality.

Knowledge Gaps: In response to the mounting climate change challenge, researchers and policy makers have focused largely on adaptation plans and risk reduction strategies. However, to date there has been little advance on, or even analysis of, activities specifically targeting the health vulnerability of children. In part, this reflects the lack of child-specific data to help define and describe the nature and magnitude of the risks to children of different ages. While research has been conducted on large-scale health impacts of climate change, and possible exposure relationships, there has been little or no child specific data collected and analysed. Consequently, this paper focuses on the adaptation dilemma in order to provide policy makers with a clear direction to better deal with the growing problem of child vulnerability. This includes consideration of the greatest risks to children, including malnutrition, diarrhoeal disease and vector-borne diseases, and ways to accelerate efforts to reduce the impact of the main threats to child health.

Supporting Children: As a child-focused development agency, World Vision believes that all adaptation initiatives and activities must strengthen and support the capacity of children to survive and thrive in the face of the changing climate system. The lack of basic information about the impact of climate change on the highest risk group of the world's population must be corrected. Actions designed to improve the capacity of the world's poor to adapt to climate change must incorporate activities that strengthen the capacity of families to cope.

Summary: This publication explains why the world must build on progress already made at preventing deaths of children under five. Mainstreaming child-focused adaptation into development programming will be key to success.

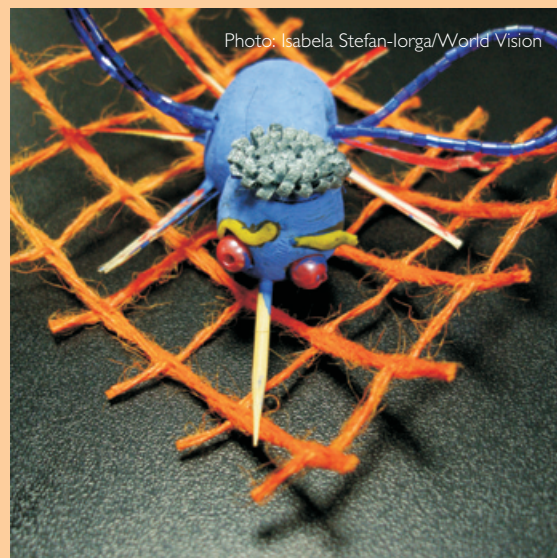


Photo: Isabela Stefan-Iorga/World Vision



Photo: World Vision Cambodia

■ **Constanta, Romania:** Children and youth from schools and universities raise funds to buy mosquito nets for families in Africa through the 'Every class buys a mosquito net' campaign.

Kerkorisogal, Kenya: Children learn English under a tree, taught by teacher James Nakure Etot (36). Kerkorisogal is named for the river that runs through it. But the river hasn't flowed in a year and a half. Ekurichanait Naborkut (34), head teacher at Kerkorisogol School, says hunger often hits his classroom hard: "When there is no food, the children become sleepy and are absent."

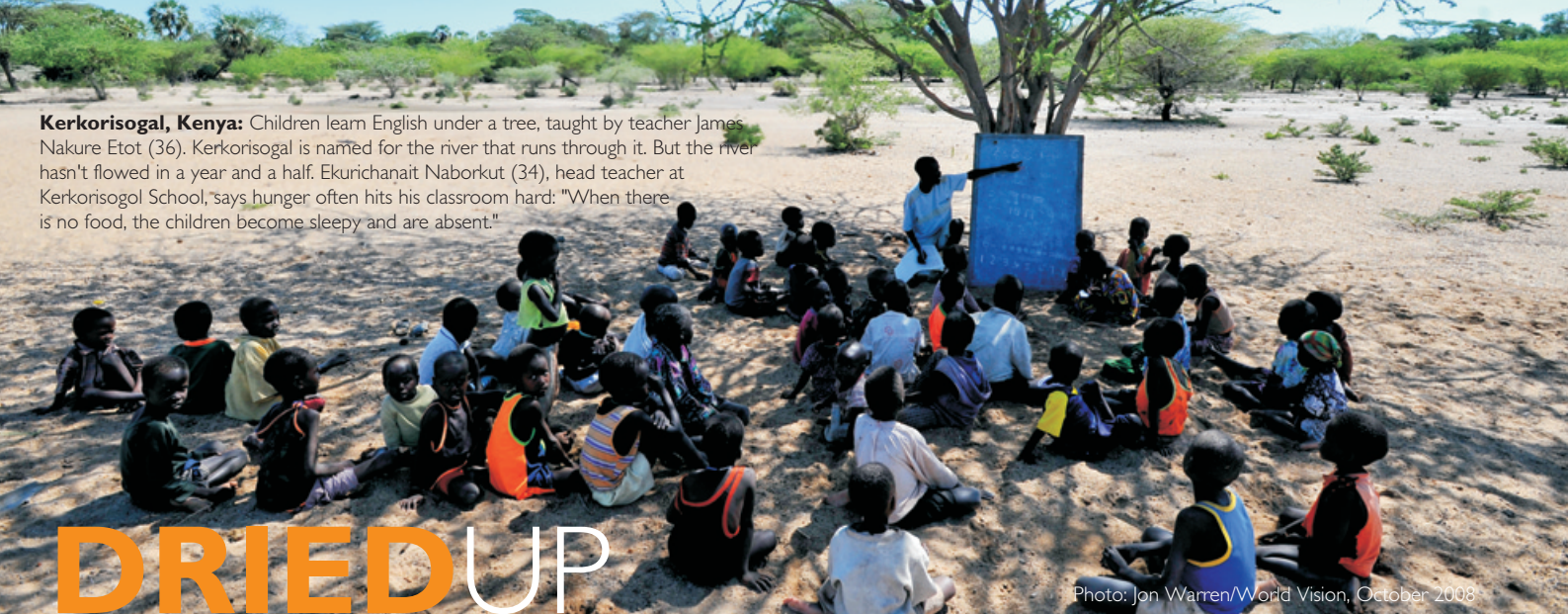


Photo: Jon Warren/World Vision, October 2008

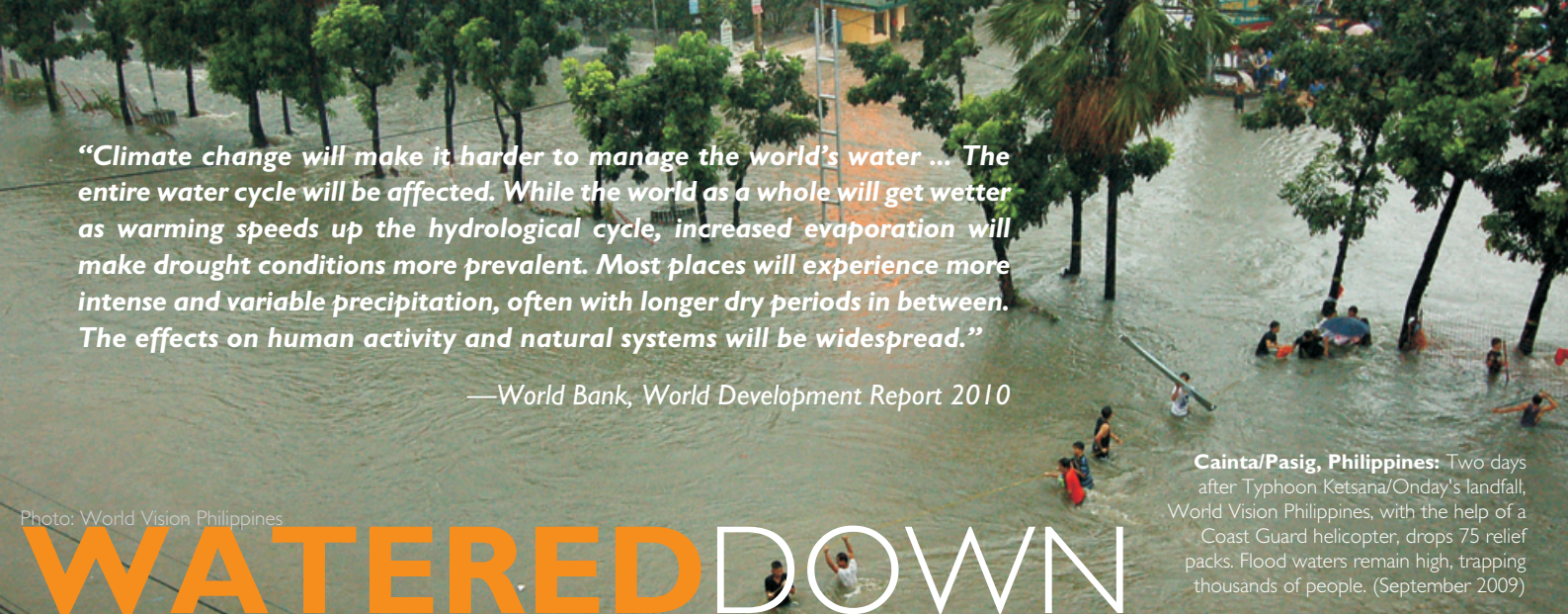
DRIED UP

Introduction

"Already today, hundreds of thousands of lives are lost every year due to climate change. This will rise to roughly half a million in 20 years. Over nine in ten deaths are related to gradual environmental degradation due to climate change – principally malnutrition, diarrhoea, malaria, with the remaining deaths being linked to weather-related disasters brought about by climate change." (Global Humanitarian Forum)

Climate Change Impacts on Health: The evidence of the impact on human health from the world's changing climate system is rapidly growing in certainty and magnitude. The direct physical injuries and impacts caused from changes in exposure to extreme weather events such as heatwaves, floods, cyclones, storm surges and drought are being observed at frequencies never before witnessed. ⁽²⁾ Weather-related disasters have more than doubled over the past 20 years (the global average now stands at 400 per year) ⁽³⁾ and the number of deaths from weather-related disasters is expected to rise to at least 500,000 per year. ⁽⁴⁾ Shifts and alterations to long-standing human disease patterns caused by vectors and from rising concentrations of air pollutants such as pollens and allergens are also being detected. ⁽⁵⁾ The World Health Organization (WHO) estimated that the small increase in average global temperature since 1970 was responsible for at least 150,000

excess deaths per year until 2000. ⁽⁶⁾ The Global Humanitarian Forum claims that this figure already increased to 300,000 deaths by 2008. ⁽⁷⁾ Truth is, climate system changes will continue to affect the health of the human population irrespective of how quickly measures are implemented to reduce the rate of change. The difference between nations in dealing with these increasing health threats is that poor populations do not have the capacity to cope without suffering crippling loss of well-being or life. Those people at greatest risk live in some of the poorest areas where climate change will be most severe, including the semiarid dry land belt countries, (Sahara to the Middle East and Central Asia), sub-Saharan Africa and the south Asian waterways and small island developing States. ⁽⁸⁾ As it stands today from a best-case global scenario, four billion people are currently vulnerable, 500 million people are at extreme risk, and six in ten people are physically vulnerable



“Climate change will make it harder to manage the world’s water ... The entire water cycle will be affected. While the world as a whole will get wetter as warming speeds up the hydrological cycle, increased evaporation will make drought conditions more prevalent. Most places will experience more intense and variable precipitation, often with longer dry periods in between. The effects on human activity and natural systems will be widespread.”

—World Bank, World Development Report 2010

Cainta/Pasig, Philippines: Two days after Typhoon Ketsana/Onday’s landfall, World Vision Philippines, with the help of a Coast Guard helicopter, drops 75 relief packs. Flood waters remain high, trapping thousands of people. (September 2009)

Photo: World Vision Philippines

WATEREDOWN

from the consequences of climate change. ^(9,10) While much of humanity will experience suffering, disability and even death from direct exposures to the changing climate, it is the indirect exposures that have the greatest potential to cause harm. This includes the transmission of infectious disease via water, food, mosquitoes and flies, and from the consequence of reduced production of local food, especially cereal grains. ^(11,12) As the population health dynamic changes from these exposures, the risk of individuals and communities will be heightened and their capacity to respond and adapt to climate change will be reduced. Further to these known negative climate impacts that increase the risk to population health, there will also be effects on health that are currently unknown or poorly understood. These will occur through shifts in physical security, food and water supplies, refugee patterns, coastal and agricultural livelihoods and the varied health impacts from responses to climate change, such as geo-engineering, carbon taxes, bio-fuel production and the per unit cost of water. ^(13,14) More-

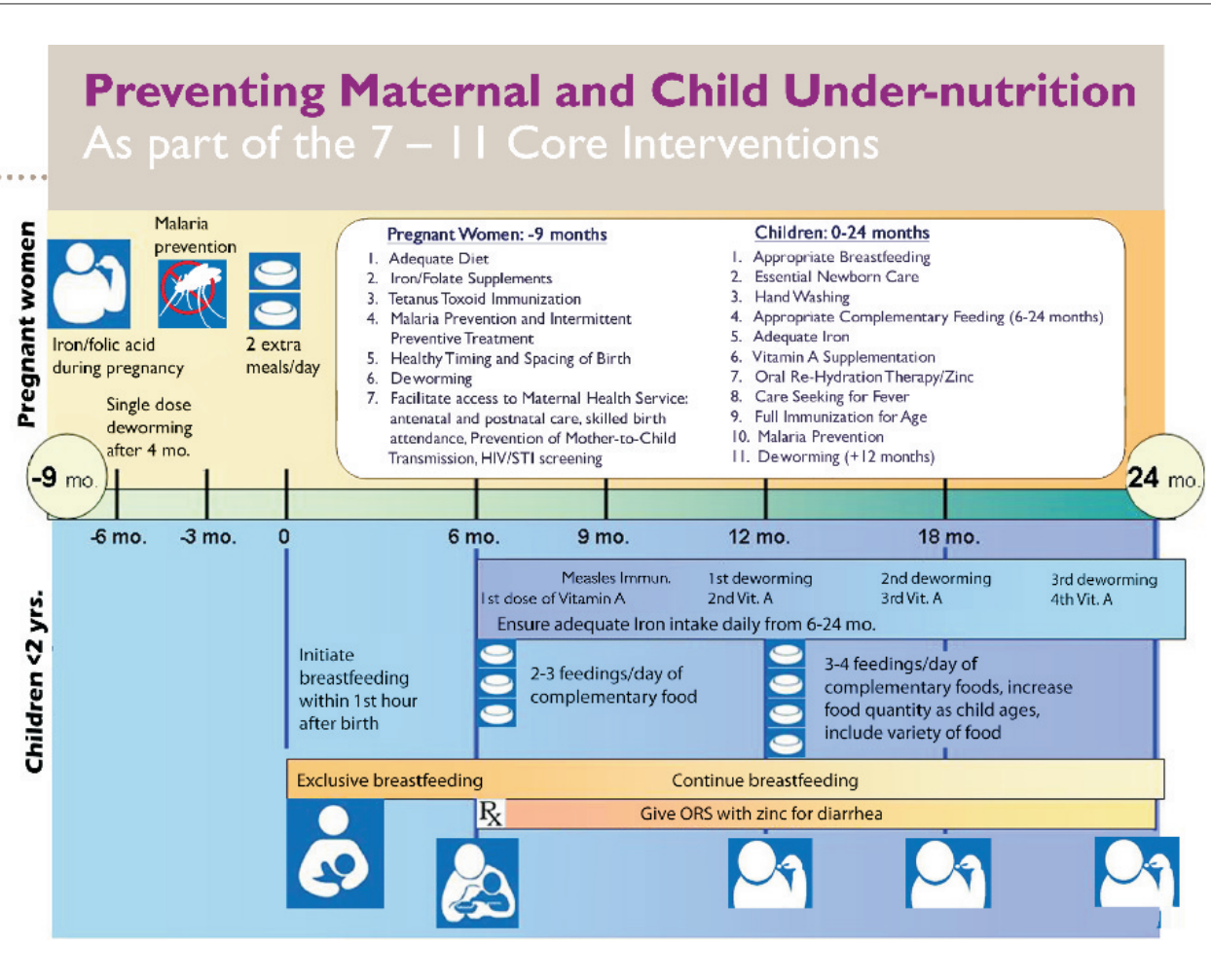
“Climate change threatens sustainable development and all eight Millennium Development Goals. The international community agreed at the beginning of the new millennium to eradicate extreme hunger and poverty by 2015. Yet, today, climate change is already responsible for forcing some fifty million additional people to go hungry and driving over ten million additional people into extreme poverty.” (Global Humanitarian Forum)

over, there are very real risks from “low-probability high consequence” events that would cause injury, illness and death. These will most likely be sudden extreme climate events or sea level rises caused by threshold phenomena (tipping points) being crossed in climate systems. ⁽¹⁵⁾ For

example, runaway methane emissions from the tundra or rapid loss of parts of the Arctic/Antarctic ice sheets ⁽¹⁶⁾ are likely to have major health consequences. While the human health cost and loss of life from such events are difficult to estimate, those hardest hit will be children, the elderly, traditional societies, subsistence farmers, and low-lying and densely settled coastal communities. ⁽¹⁷⁾

World Vision is uniquely placed to contribute to developing responses to the challenges that climate change presents to the world’s poorest and most vulnerable communities. Since its inception in 1950, World Vision has been actively working with communities to improve children’s health. Many of the countries that World Vision has worked in for decades are now at the

Chart 1: World Vision 7-11 Health Interventions



front line of climate change. By developing a set of evidenced-based, cost-effective preventative practices that focus on improving the health and nutrition of women and children, the vulnerability of children to the impacts from climate change can be reduced. These interventions are

referred to as '7-11' (chart 1). In recognition of the critical window of opportunity from pregnancy to 2 years of age to prevent malnutrition and its debilitating long-term effects, these interventions focus primarily on pregnant women and young children under 2 years of age.

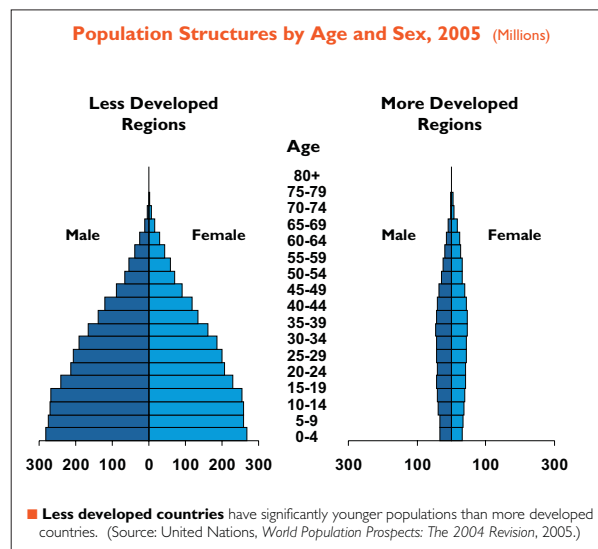
The Vulnerability of Children to Climate Change

“Climate change exacerbates existing inequalities faced by vulnerable groups particularly women, children and the elderly. The consequences of climate change and poverty are not distributed uniformly within communities. Individual and social factors determine vulnerability and capacity to adapt to the effects of climate change. Women account for two-thirds of the world’s poor and comprise about seven in ten agricultural workers. Women and children are disproportionately represented among people displaced by extreme weather events and other climate shocks.” (Global Humanitarian Forum)

Vulnerability of Children: By virtue of their early stage in development, children and especially very young children, are at greatest risk of injury, disability and death from the consequences of the changing climate system. They are less well equipped physically, mentally and emotionally to cope with life-threatening conditions. Combined with their dependence on others for sustenance, nurturing, protection from infection and physical harm, the susceptibility of children to threats is increasing. ⁽¹⁸⁾ The overwhelming scientific evidence suggests that the greatest killers of children—malnutrition, diarrhoeal disease and malaria—will be exacerbated by climate change. ^(19,20) For children living in developing countries the risk of harm is greatest, not because climate effects will be most extreme in these countries, but because poverty limits their ability to respond. Poor communities simply do not have the resources and infrastructure to mitigate risks or effectively adapt. ⁽²¹⁾ The most startling reminders of this inequity can be seen in adverse health events. The mortality and morbidity risk from environmental conditions is 44% higher in children under 14 years than in the rest of the population. ⁽²²⁾ Injury and death from extreme weather has caused thousands of child deaths each year, and in some cases death and injury rates are 2-5 times higher in children. ⁽²³⁾ In refugee emergencies and displaced populations, a similar picture emerges with under-five mortality escalating as high as one child in every 50. ⁽²⁴⁾ Currently, the WHO estimates that 88% of the total disease burden attributed to climate change affects children under five and that this situation is likely to worsen as climate change progresses. ⁽²⁵⁾

Disparity: Not surprisingly, children who live in countries with the least progress in reducing under-five child mortality are at greatest risk, including those in sub-Saharan Africa and south Asia, where the vast majority of all under five child deaths currently occur. ⁽²⁶⁾ Child mortality in sub-Saharan Africa accounts for more than 48% (4.5 million) of all child deaths under five and south Asia accounts for 32% (3.0 million). ⁽²⁷⁾ These two regions alone represent more than 80% of all deaths of children under five, compared to 1% (100,000) in all industrialised countries combined. ⁽²⁸⁾

Chart 2: Age Distribution, World Population



Rising: One analysis published in the Stern Review estimates that from GDP losses alone, child mortality will increase in south Asia and sub-Saharan Africa by 40,000-160,000 deaths per year using the baseline scenario, and increase to 60,000-250,000 child deaths per year by 2100. ⁽²⁹⁾

Silent Majority: The other critical piece in understanding the relationship between child vulnerability and climate change is that newborns, children and adolescents make up 40% of the world's population, 85% of which live in developing countries. ⁽³⁰⁾ In much of the developing world, almost one-third of the population is younger than 15 years, which compares to one-fifth in developed populations. ⁽³¹⁾ This amounts to a staggering two billion children younger than 20 years living in less developed countries. Naturally these population distributions vary depending on country or region. For example, in sub-Saharan Africa over 40% of the population is under 15. ⁽³²⁾



■ **Kerkorisogol, Kenya:**

Ekamol's children scoop the water out one cup at a time.

Ramification: Irrespective of the size or shape of the distribution, this over-representation means those communities facing the greatest health threats typically are those with the largest number of children. Moreover, these communities are likely to have fewer adults to care for sick or injured children. Consequently, as the risk to health and well-being of children increases, fewer people within the community will be able to respond to the increased demand, especially if they themselves are already fighting to fend off health threats. The burden to support and care for the growing number of children will fall largely onto an already overwhelmed and under-resourced health system.

Domino Effect: The extent to which this “flow-on” effect will impact health facilities or the health system at large has not yet been recognised. Nor have all implications for child mortality and morbidity been determined. However, there is widespread consensus that population displacement will occur due to adverse conditions caused by droughts, floods and crop failures. ^(33,34) As such, population migration is likely to increase existing health care pressures. Less well understood, but arguably more critical to estimate, will be the increase in demand placed on health services and systems from the existing population, who need health care and support to manage conditions that they ordinarily would not be at risk from.

Raising Readiness: To acknowledge the increased vulnerability of children to climate change is to accept that children must be central to climate-related responses and adaptation initiatives and plans. Even though children, especially very young children, are highly sensitive to environmental change and stress, they can also be extremely resilient if provided support and opportunity. ⁽³⁵⁾ Children of all ages have long demonstrated their importance as agents for social change, economic advancement and innovative ingenuity. ⁽³⁶⁾ The capacity of children to help create and implement adaptation activities must be embraced and encouraged in an effort to ward off the worst potential health consequences from climate change.



Photo: Jon Warren/World Vision

FOOD CRISIS

Kerkerisogal, Kenya: Ekamol Amodoi joins her neighbors at a World Vision food distribution.

Risk from Malnutrition and Under-Nutrition

“Climate change is one of the greatest challenges of our time. Climate change will affect, in profoundly adverse ways, some of the most fundamental determinants of health: food, air, water ... While the reality of climate change can no longer be doubted, the magnitude of consequences, and – most especially for health – can still be reduced.” (Margaret Chan – Director General, World Health Organization, WHO)

Food For Thought: Nutrition is one of the most significant factors determining risks to the health of a child. Its importance extends beyond ensuring survival of an individual. Nutrition provides the source from which future social and economic opportunities flow for generations to come. Despite universal understanding of the minimum daily food requirements for survival, the importance of breastfeeding, and the micro-nutrient needs for growth, under-nutrition still contributes to at least 3.5 million deaths each year and more than one-third of all deaths of children under five. ⁽³⁷⁾ Conservative estimates reveal 138 million children under five are stunted (chronically under-nourished) and a further 18 million children severely wasted (weak and emaciated), ⁽³⁸⁾ although these figures were calculated prior to the global food crisis. As it stands, under-nutrition contributes more to the global burden of disease than any other single factor, accounting for 15% of total

disease burden in Daily Adjusted Life Years (DALYS). ⁽³⁹⁾ As shown in our special report on climate change and food security, ⁽⁴⁰⁾ expected changes in the world's climate will have a major impact on the amount of food available to the poor. The IPCC estimates that climate change will increase the number of malnourished people by 80-90 million, ⁽⁴¹⁾ and other projections calculate the number of hungry people to grow by two-thirds by 2020. ⁽⁴²⁾ Importantly, all underlying causes of malnutrition will be exacerbated by climate change, including household food security, access to clean water and health services, infectious diseases, and adequate sanitation and shelter. ^(43,44) Extreme weather events and chronic droughts and floods will impact all variables, but especially food production, affecting crops, forestry, livestock, fisheries, aquaculture and water systems farmed and fished by small holder and subsistence farmers and traditional societies. ⁽⁴⁵⁾

Food Crisis: The recent global food crisis showed how malnourishment can escalate rapidly; without an adequate global response, climate change is poised to exacerbate malnutrition. Studies suggest that staple food sources will be severely affected, including cereal crops, which account for 70% of global food energy. ⁽⁴⁶⁾ Other assessments of the impact on crop yields from 18 countries forecast reductions in agricultural productivity of 5-25% by 2080 in Africa and Latin America. ⁽⁴⁷⁾ The IPCC estimates that food production could decline by 50% in some parts of Africa by 2020. ⁽⁴⁸⁾ To gain clearer insight on these projections, consider the food crisis of 2008, which despite near record crop yields plunged an additional 40 million people into hunger, ⁽⁴⁹⁾ with estimates ranging from 100-850 million more people suffering food insecurity. ⁽⁵⁰⁾ The United Nations World Food Programme has reported a doubling of food emergencies over the past 20 years, rising from an average of 15 per year during the 1980's to now more than 30 annually. ⁽⁵¹⁾



Kerkorisogol, Kenya: Ekomol and her family eat WV relief food in their village in Turkana district.

Double Jeopardy: For children, malnutrition is a double edged sword. As their body weakens from a lack of sustenance, their resistance to infection and resilience to trauma is compromised, increasing the risk of not surviving any threat to their health. Malnutrition has long been associated with parasitic infections and especially with the worst outcomes in children with malaria. ⁽⁵²⁾ Climate change will significantly increase the threat of malnutrition to children, both in magnitude and global distribution, and is set to create the worst possible conditions to reduce its current prevalence, especially in sub-Saharan Africa and south Asia. In addition, two other variables are important to better understand the likely impact on childhood malnutrition from climate change. First, childhood survival rates (or mortality) for children suffering malnutrition and who are exposed to different scales of sudden onset climate-related shocks will be adversely affected. ⁽⁵³⁾ Second, population displacement projections indicate a greater risk of malnutrition among children of uprooted families. ⁽⁵⁴⁾ To date, there have been no assessments or projected estimates of the childhood death toll or morbidity associated with these increasingly likely events. These problems could be particularly severe in urban regions with high population densities.

Urbanisation Risks: By 2030, 56% of the population in developing nations is expected to live in urban areas. ⁽⁵⁵⁾ Typically when urbanisation occurs rapidly and significant social and spatial segregation occurs, sprawling slums and squatter settlements are often established in dangerous locations prone to natural hazards, such as floods and landslides. Moreover, poor housing structures, lack of water and sanitation, exposure to mosquitoes, and indoor air pollution from cooking stoves often combine to increase the risk from heat exposure, respiratory and diarrhoeal diseases, mosquito-borne infections and mental illness. The rapid proliferation of slum settlements in the developing world dramatically exacerbates existing vulnerabilities. Clearly adaptation measures must take an holistic view, considering physical housing development, water and sanitation infrastructure as well as health service capacity.

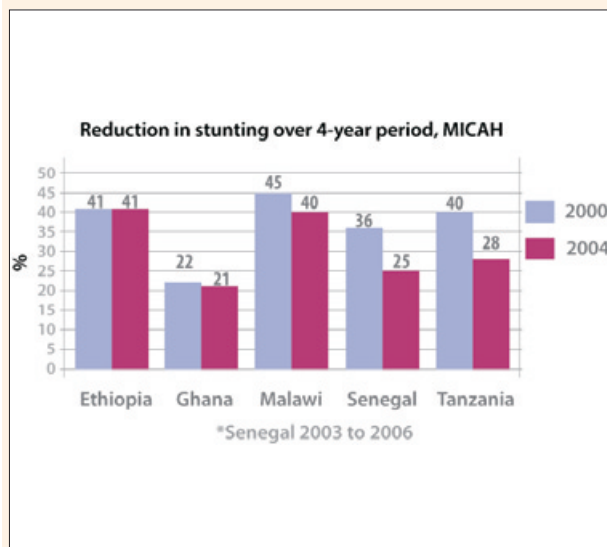
Case Study I – Addressing Stunting Through Improved Child Feeding

Lessons Learnt

World Vision has worked with communities on addressing malnutrition for over a decade with remarkable results. The most successful programmes integrated similar characteristics and procedures, including:

- **targeted** and monitored reduction of stunting
- **incorporated** multiple sectors (i.e. integrating nutrition interventions with health, agriculture, and WASH interventions)
- **prioritised** evidence-based interventions focused on mothers and children under five.

Chart 3: Reductions in Child Stunting



A good example of such a programme is MICAH, the MICronutrient And Health initiative, managed by World Vision Canada, and implemented in Ethiopia, Ghana, Malawi, Senegal and Tanzania over a 10-year period. MICAH focused on community-based approaches to improving nutrition, coupled with national level advocacy, strong nutrition and health inputs, and an emphasis on managing results. Reductions in stunting occurred in four of the five MICAH countries (see Chart 3). The MICAH Programme focused on improving household food security, promoting good infant and young child feeding practices (e.g., exclusive breast-feeding, appropriate complementary feeding), improving micronutrient status (vitamin A, iron and iodine), improving women's nutrition, prevention and treating diseases, and improving access to clean water, sanitation and hygiene. World Vision's MICAH Programme was also designed to address the problems of iron, vitamin A and iodine deficiencies with a focus on women and children. Iron

Chart 4: Change in Prevalence of Anemia

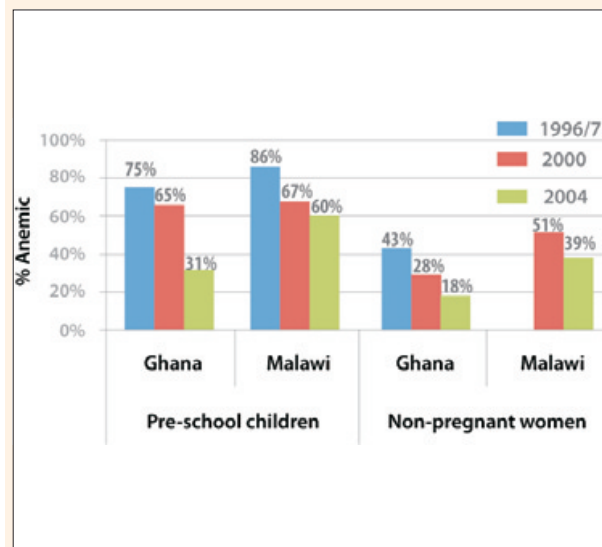


Photo: Paul Bettings



Koukane Water Project: Before World Vision came to this village and installed taps that supply clean water, villagers were using a well that supplied water only good enough for cleaning pots and plates. Seydou Demba, World Vision Koukane Project Manager, says: "Research indicates diseases related to non-potable water have been reduced."

■ **Veligara, Senegal:** Women crush maize in a small village in Senegal, 450 kilometres from the capital city Dakar.

deficiency and anaemia were identified as serious public health problems among children and women in both Ghana and Malawi. The MICAHA baseline survey found that 75% and 86% of children 6-59 months of age and 43% and 51% of non-pregnant women were anaemic in Ghana (1997) and Malawi (1996), respectively. A set of integrated interventions were used to increase iron intake and decrease malaria and other parasitic infections which contribute to anaemia. Nutrition education was complemented with iron supplementation for children (both pre-school and school-age) and women (both pregnant and non-pregnant), promotion of iron-rich vegetable and animal food production, and fortification of staple foods with iron and other nutrients (Malawi only). Programme evaluation results in 2000 and 2004 showed that anaemia levels had dropped considerably in Ghana among women and children (see Chart 4), while levels in non-programme areas remained high for all target groups. In Malawi, anaemia in children and non-pregnant women also decreased over the programme period. Anaemia in pregnant women was significantly lower in 2004 in MICAHA areas (48%) than in non-MICAHA areas (68%).

Veligara, Senegal: In the Veligara district of Senegal World Vision's MICAHA Programme also informed communities of the benefits of using iodised salt, and of government policy on salt iodisation. Communities caught on to the concept that iodised salt helped their children learn better in school and grow taller and stronger. Several communities appointed volunteer salt monitors whom World Vision equipped with salt testing kits. When the salt monitors discovered traders (usually from neighbouring countries) trying to sell un-iodised salt, they alerted the village health committees who ran these traders out of town. In sum, over the programme period 802 retailers were visited of whom 734 were selling iodised salt (92%). In 2005, a separate survey was carried out by the United Nations Children's Fund (UNICEF) which confirmed that the use of salt iodisation in the Veligara district was significantly higher than the national rate (16%).



Kpalang Village, Ghana: The only water source is this dirty pond. The water tastes foul and is the colour of green pea soup. Nearly every family seems affected by the Guinea worm in this remote farming village of 600 people.

Photo: Jon Warren

WATERWOES

Threat of Diarrhoeal Disease

“The human impact of climate change is happening right now – it requires urgent attention. Events like weather-related disasters, desertification and rising sea levels, exacerbated by climate change, affect individuals and communities around the world. They bring hunger, disease, poverty, and lost livelihoods – reducing economic growth and posing a threat to social and, even, political stability.” (Global Humanitarian Forum)

Diarrhoeal Disease is already the most common cause of illness and the second highest cause of death of all children under five years of age, causing as many as 1.6 million deaths (17%) per year. ⁽⁵⁶⁾ It is estimated that 80% of the mortality from diarrhoea is attributable to unsafe water and lack of sanitation ⁽⁵⁷⁾ with nearly 90% of the global burden of diarrhoeal disease caused by the lack of access to safe water and sanitation. ⁽⁵⁸⁾ UNICEF estimates that 1.1 billion people in developing countries have inadequate access to water and 2.6 billion lack basic sanitation. ⁽⁵⁹⁾

Children are especially vulnerable to infections that cause diarrhoea because, in part, their immune system is less robust in fighting infections than that of older people, ⁽⁶⁰⁾ but also because their behaviour increases the likelihood of exposure to infectious agents from water and other people, especially family members and children. Climate change

will directly affect the risk to children from diarrhoeal disease if the provision and quality of water and sanitation are compromised through changing rainfall patterns, increased temperatures and more frequent extreme weather events. Numerous studies have demonstrated the relationship between rainfall and diarrhoea, both in terms of incidence (higher number of cases related to reduced water availability) and the mortality rates of children under five. ^(61,62) Lack of access to clean water will likely exacerbate the burden of diarrhoeal disease and increase the risk of death and disability in children who need more water per body mass as compared to adults. ⁽⁶³⁾

Rising Risk: By 2030 it is estimated that climate change will have increased the risk of diarrhoeal disease in some regions by 10%. ⁽⁶⁴⁾ This equates to an increase in the number of cases of diarrhoeal disease by 180 million per



■ **Villages in Ghana (top) and Kenya (bottom):** There is no vaccine or medicine for Guinea worm. Only access to clean water can eliminate it.

year and 95,000 more deaths. ⁽⁶⁵⁾ These are conservative estimates and do not reflect more complex risk assessments with significantly higher results. For example, should the current trend in rising ambient temperatures continue, a commensurate increase in the concentration of pathogens (protozoa, bacteria and viruses) in water sources may occur, which would increase the risk of childhood infection. ⁽⁶⁶⁾ Similarly, wide-ranging reductions in water availability caused by reduced rainfall and increased evaporation or drought may heighten water scarcity and reduce water quality. ⁽⁶⁷⁾ Higher temperatures have been strongly associated with increased cases of diarrhoea in adults and children in many parts of the world, including Peru, Pacific Islands, Israel and Australia. ⁽⁶⁸⁾

Clean Water Is Life: Access to safe water is one of the most important global health issues today. More than two billion people live in dry regions ⁽⁶⁹⁾ and children and infants living in such environments die from diseases caused by the consumption of contaminated water. ⁽⁷⁰⁾ As these regions experience drier climatic conditions and drought, the risk to the health of children and infants will increase considerably. In many low-income countries in sub-Saharan Africa, diarrhoeal disease remains one of the highest contributors to child mortality. ⁽⁷¹⁾ Oral rehydration solution often cannot prevent death. ⁽⁷²⁾ And some children may survive the initial diarrhoeal infection only to succumb later to malnutrition or persistent diarrhoea. ⁽⁷³⁾ The importance of the health impact on children from water scarcity is not merely based on the cause and effect relationship of illness. Children rehydrate less efficiently and their survival is often dependent on safe, potable water as part of first line treatment with Oral Rehydration Therapy (ORT) and prioritised combination interventions against malnutrition (including optimal infant and child feeding, vitamin A, zinc and vaccination). ^(74,75) Similarly, ample safe water supply is important for breast-feeding mothers who need to maintain an adequate milk supply for feeding infants who quickly become dehydrated from diarrhoeal disease and elevated ambient temperatures.

Case Study 2 – Integrating Water, Sanitation and Hygiene Programming in Ghana

Context

In Ghana, traditionally, women and children are the primary collectors, users, and managers of household water. When water systems break down women and children are most affected as they then have to travel far to search for alternative household water supplies. Women are also the key players in implementing changes in hygiene behaviour. However, despite this obvious knowledge and experience that women bring to water resource management, their contributions are often overlooked or under-utilised in the drafting of water and sanitation policies.

Samari-Nkwanta is a small village of 650 inhabitants located 373 km from Ghana's capital Accra. This remote village in Eillage Ejura-Sekyedumasi District is part of a World Vision Ghana (WVG) Area Development Programme. The community is situated in a rural area where 60% of the economically active population use farming as their main livelihood. Before the water project women in this area worked a daily average of 19 hours, men around 12 hours. During the dry season when the community's regular water sources dried up, women and girls had to walk three to four miles over dangerous terrain to bring water and firewood to their families, sometimes twice daily. Their primary water source area was described as "Aberewa nnko," meaning *old women cannot get there*. Many girls also had to abandon their schooling to help search for water.

Integrated Approach

The water and sanitation programme was developed to address a serious infestation of Guinea worm which had existed among the community for decades. In Ghana, Guinea worm is prevalent in remote areas where there are



Photo: Jon Warren



Kpalang Village, Ghana: Maria (top) watched her daughter Lela (4) suffer through a ghastly episode of Guinea worm infection. Maria said: "It was as if I was also in pain."

■ **Kpalang Village, Ghana:** Adults and children bear scars and stories of pain. The worms literally burrow out through the skin, a little bit at a time, and it's excruciatingly painful.

Photos: Jon Warren



World Vision-built well

■ **Rahinatu Sayibu** of nearby Gbum-Gbum Village (photos) knows the pain villages without clean water are suffering. "I have tasted that life before, and I know how these communities suffer."

few wells and where people draw drinking water from infested ponds and water holes. It is extremely painful and can cause permanent disability. Given the region's poor access to potable drinking water and the wider issues involved, the programme aimed to shift from a strictly infrastructure-driven approach to a community-based, people-oriented, and demand-driven focus which addressed the correlation between gender issues, poverty alleviation and the well-being of children. Through the initiative WVG supplied the Samari-Nkwanta village with two boreholes fitted with hand pumps, two public Ventilated Improved Pit (VIP) latrines, and a urinal. The community has since identified this water and sanitation project as having addressed a core felt need by offering considerable relief.

Achievements:

- **Gender Equality:** a shift from male-dominance to a more equitable sharing of power and decision-making, particularly within the WATSAN committee.
- **Gender Roles:** women have on average five more hours per day to use more productively on their farms, in their households and for other activities.
- **Education:** girls now make up 53% of primary school students as compared to 43% when the programme commenced.
- **Access to Water:** farming practices have improved due to reliable access to water.
- **Health and Hygiene:** Guinea worm has been eradicated among the entire water user group.

Summary: Overall, the project increased education for community members, yielded healthier individuals, and promoted deeper respect for women. Women can now spend more time with their families. One man in the village noted: "My marriage has become more cordial and we have time for other economic development projects."



Photo: World Vision Ethiopia

HEALTH+CLIMATE

Health+Climate:
"Major killer diseases could expand their coverage. For example, an additional 220-400 million people could be exposed to malaria – a disease that already claims around 1 million lives annually." (2007/2008 UN Human Development Report)

Danger From Vector-Borne Diseases

"Rich countries are already preparing public health systems to deal with future climate shocks, such as the 2003 European heatwave and more extreme summer and winter conditions. However, the greatest health impacts will be felt in developing countries because of high levels of poverty and the limited capacity of public health systems to respond." (2007/2008 UN Human Development Report)

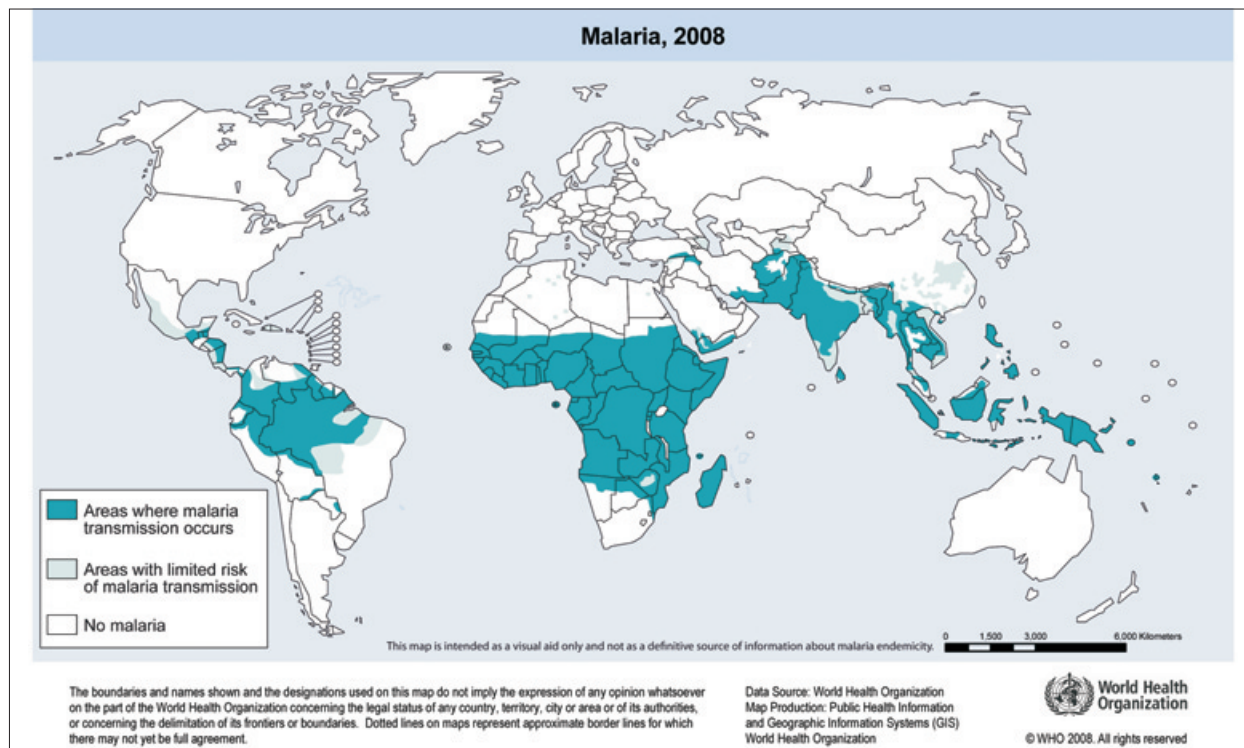
Vector-borne diseases (infections transmitted by the bite of arthropods) kill 1.1 million people each year. ⁽⁷⁶⁾ Of all diseases potentially impacted by climate change those borne by vectors are most significant, both because of their global prevalence and their sensitivity to climatic change. ⁽⁷⁷⁾ Malaria poses the greatest threat, putting nearly 50% of the world's population at risk, ⁽⁷⁸⁾ with the burden of the disease concentrated in Africa, and the remainder in South-east Asia, Western Pacific and the Americas. ⁽⁷⁹⁾

Malaria has an especially severe impact on infants and children under five. There are at least 300 million acute cases of malaria diagnosed each year, and 80% of the one million deaths caused by malaria occur in children under 5 years of age. ⁽⁸⁰⁾ This translates to around 2,200 child deaths every day. But malaria also increases the risk of mortality from other diseases, more than doubling overall mortality ⁽⁸¹⁾

and causing malaria-related anaemia during pregnancy, resulting in low birth weight. ⁽⁸²⁾ Of all diseases this mosquito-borne malady best describes the inequity of the poor, as per capita mortality rate from vector-borne diseases is virtually 300 times greater in developing nations as compared to developed regions. ⁽⁸³⁾ According to the WHO only 4% of the population at risk in sub-Saharan Africa are currently using insecticide-treated bed nets, and only 27% of people with malaria receive treatment. ⁽⁸⁴⁾

Climate Change: With increases in temperature and changes in weather patterns, the geographical range of malaria transmission looks likely to expand alongside seasonal transmission patterns. ⁽⁸⁵⁾ Such changes have already been observed in some parts of the world. Until recently, malaria transmissions was unknown in the highlands of Kenya. ⁽⁸⁶⁾ The spreading of malaria to previously unaffected high-

Chart 5: Global Malaria, 2008



lands would represent a catastrophic effect of climate change. Unlike populations living in low-lying regions, people in highland areas are more at risk from the severe effects of the deadly malaria parasite *Plasmodium falciparum*, because of the lack of naturally acquired immunity in the populations.⁽⁸⁷⁾ Such a circumstance occurred in Irian Jaya in 1997 when a dramatic increase in malaria was responsible for more than 550 deaths.⁽⁸⁸⁾ Current models estimate that climate change may blow out the population at risk of malaria in Africa by 90 million by 2030.⁽⁸⁹⁾ These same projections estimate that 260-280 million more people could be affected by 2080 as a consequence of shifting geographical transmission patterns.⁽⁹⁰⁾ Climate change-triggered malaria outbreaks are already believed to have

affected more than 10 million people and killed approximately 55,000.⁽⁹¹⁾ There is further scientific evidence of climate-related shifts in other vector-borne diseases such as dengue, rift valley fever, yellow fever, leishmaniasis and schistosomiasis.^(92,93) Estimates of the likely increased range for dengue due to climate change suggest that the global population at risk could increase to 3.5 billion by 2080,⁽⁹⁴⁾ as one-third of the world's population lives in countries where the climate is suitable for transmission.⁽⁹⁵⁾ Such increases in disease risk are likely to overwhelm health care systems unless they are adequately resourced and staffed. Without enhanced community health support the risk to children suffering the worst possible health outcomes from infection will be increased.

Case Study 3 – Community-Based Malaria Prevention in a Changing Environment

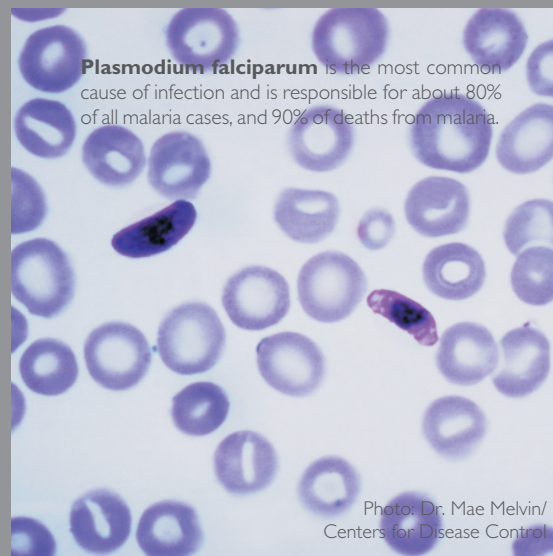
Context

Despite a rich cultural history, the island of Sumba is one of the poorest in the Indonesian archipelago. Some 72% of the local population have an annual income lower than the national average. The persistence of poverty in Sumba can be explained by the scarcity of natural resources on which to build an economic base, the small size of the population, and isolation from the central government in Java. The majority of people in Sumba live in small villages and engage in subsistence agriculture. Cassava, sweet potato and rice are grown and consumed, and livelihoods are supplemented by animal husbandry and fishing. The prevailing climate and small workforce limit the production of food for export.

World Vision's Response

From 2001-2007, World Vision Indonesia (WVIDN), in partnership with local health authorities, communities, and the National Institute of Health Research and Development, implemented a two-phase malaria project in East and West Sumba. The goal was to reduce malaria-related morbidity and mortality rates in target areas through raising awareness of preventative measures and increasing community access to curative treatment. To be sustainable the project needed to employ cost-effective measures and use materials locally available. An holistic approach which increased community awareness of the causes of malaria and simple preventative measures was imperative in raising the resilience of target communities. More than 19,000 insecticide-treated bed nets (ITBN) were purchased and distributed in target areas with priority given to families with pregnant mothers and children under five. Locally mobilised self-help groups selected the recipients of bed nets and the distribution process was overseen by village

post cadres. A minimum fee of \$0.50 was charged for an ITBN to cover costs and fund further stocks and insecticide treatment. A credit system was set up to reduce the financial burden on recipient families. At the end of Phase I (June 2004) its repayment rate was 90.8%. Information and education materials were developed in consultation with government health workers, village heads, self-help group members, village health post committees and school teachers. Over the course of the project more than 3,200 posters, 6,300 brochures, and 150 leaflets were distributed in quarterly awareness campaigns. These campaigns were complemented by school-based interventions involving 1,200 students and 125 teachers who identified the major causes of malaria, early diagnosis, preventative approaches and natural predators for *Anopheles* larvae. To address the inaccessibility of health services in Sumba, WVIDN built capacity in 450 village health post cadres and established 20 new village health posts. Village health workers



■ **Photomicrograph** of a blood smear containing a macro- and microgametocyte of the *Plasmodium falciparum* parasite.

Anopheles albimanus

mosquito feeding on a human. This mosquito species is a vector of malaria. Mosquito control is a very effective way of reducing the incidence of malaria.

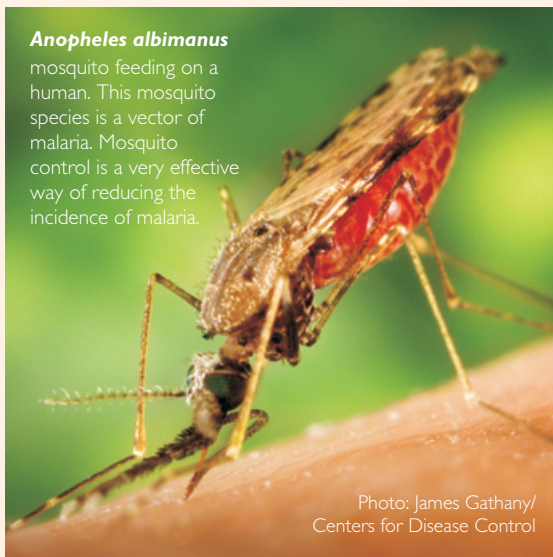


Photo: James Gathany/
Centers for Disease Control

Photo: Jon Warren



Mosquitoes are estimated to transmit diseases to more than 700 million people each year. More than 2 million people die of mosquito-borne diseases annually.

■ **Zamtan, Zambia:** Filling in holes that fill with wet-season stagnant water and become breeding grounds for Mosquitos. Reducing mosquito habitat reduces chances of contracting malaria.

were trained in malaria case management and encouraged to collaborate with workers at public health centres to provide malaria medicine through village health posts. These health posts also carried out mapping of *Anopheles* larvae breeding sites in their specific locations and developed databases for bed net distribution with reference to these maps. The project also introduced species of fish that eat *Anopheles* larvae to reduce numbers in identified breeding sites. This aspect was particularly effective as the Mujaer fish not only consumes *Anopheles* larvae, but can be eaten within 6 months of fingerling stage. Fish distribution ended in 2003 and communities took on the responsibility of breeding and replenishing stocks. In smaller pools where larvae was prolific but fish could not survive a different approach was required. Partnering with the Vector and Reservoir Control Research Unit of the National Institute of Health Research and Development in Java (June 2004 - June 2007), WVIDN utilised a bacteria called *Bacillus Thuringensis* (Bt). This bacterium naturally completes with *Anopheles* larvae and has no environmental side-effects. Colonies of Bt were developed in a coconut and distributed to village medicine cadres to be multiplied and introduced to known *Anopheles* breeding sites. School teachers and children were introduced to this approach in 34 villages.

Achievements

Over three months, *Anopheles* larvae infections in stagnant pools of water where Bt was introduced decreased by 60%. Knowledge, Attitude, Practice (KAP) surveys showed that community awareness of malaria prevention and care increased from 72% in 2001 to over 87% in 2007. During the first phase of the project (2001-2004) malaria infection rates among children declined from 18% to 5%. This decline also reduced other complications associated with malaria (i.e., severe brain damage, cognitive impairments, etc.). The net effect was also a reduced burden of caring for sick children, traditionally performed by mothers. At the end of the project, 82% of people who owned bed nets were using them (up from 22% in 2001).



Photo: Paul Bettings

Democratic Republic of the Congo: A mother and daughter wait to be treated at Rwanguba Hospital, 3 hours north of Goma. World Vision provides this hospital with plumpy nut, a peanut-based nutritional supplement, medication such as Amoxycilin, training for the patients, and mosquito nets.

CLIMATE STEWARDS

World Vision's Recommendations

“The climate change that the world is already locked into has the potential to result in large-scale development setbacks, first slowing, then stalling and reversing progress in poverty reduction, nutrition, health, education and other areas ... Hoping – and working – for the best while preparing for the worst, serves as a useful first principle for adaptation planning.” (2007/2008 UN Human Development Report)

Act Now: A narrow window of opportunity remains to prevent what could be an incalculable number of child deaths caused by the climate emergency. Success requires:

- 1 Strong binding emissions reduction targets to decelerate and reverse changes to the Earth's climate.
- 2 Public financing for developing countries of at least \$150 billion per year for adaptation and mitigation.
- 3 A radical expansion of efforts to reduce the existing vulnerability of children living in developing countries.

Adapt Now: Often the social dimensions of adaptation are neglected in discussions which focus on adaptation of physical systems. As it stands, the majority of climate change

adaptation efforts could be compromised because all adaptive capacity is ultimately dependent upon the health of a community. Many developing nations already carry a heavy health burden from malnutrition, diarrhoea and vector-borne diseases. Central to the success of adapting life to a continually changing environment is reducing and preventing child and maternal mortality. Protecting life and therein reducing mortality requires the systemic, relational and technological advances necessary to promote community-based knowledge and sustained health advancement. Despite lagging economic development in many poor countries the humanitarian community has achieved notable progress in reducing child mortality.

Protect Now: Many developing communities understand what is required to reduce the vulnerability of children and increase their resilience through at least a decade of work

to tackle the Millennium Development Goals (MDGs). Even countries with very low per capita income have succeeded in reducing child mortality through the provision of prioritised, high coverage health interventions which have been delivered with maximum uptake through outreach or basic health services, including immunisation, Insecticide-treated bed nets, prevention of mother-to-child transmission, family planning and vitamin A supplementation drives. This knowledge and experience can be confidentially used to build the protective systems needed by children in developing nations both now and in years to come.



Photo: Jon Warren

Del Picacho Village, Honduras:

Chagas is a potentially fatal disease transmitted by a parasite in the feces of the "kissing bug." Poor housing and sanitary conditions provide habitat for the bugs that transmit the Chagas disease.



Priorities For Action

■ **Accelerate existing programmes aimed at reducing child and maternal mortality**

While disaster risk reduction strategies and pre-emergency planning will remain vital to better protect communities against the growing exposure to natural hazards, these efforts will be counter-productive unless the vulnerability of children can be drastically reduced. Lowering the rate of child and maternal mortality means decreasing community vulnerability which in turn reduces the number of children at risk. Existing programmes need to be identified and focused strategically around the needs of children at risk.

■ **Rapidly expand integrated programming for under-five child health**

Increased investment must be allocated to integrated health programmes that are community-based and community-driven and incorporate prevention, prophylaxis and treatment of malnutrition, pneumonia, diarrhoea and malaria. By channelling intergovernmental support and financial assistance toward agencies and organisations with established inter-agency collaborations already combining resources, the integrated health programming model can be scaled more quickly and efficiently. Increased funding and carefully targeted allocation can provide the stimulus for widespread adoption of integrating health programming. This will pay a significant dividend for the benefit of under-five child health.

■ **Build local capacity through innovative partnerships**

Local capacity must be improved through new innovative partnerships between bilateral and multi-lateral agencies, governments, non-government organisations and research institutions. These relationships could likely increase capacity in local health policy and programme implementation through improved strategic and technical policy advice, provision of resources (not only financial contributions but medical goods and services) and assistance with governance.

■ **Ensure child focus in adaptation initiatives**

Adaptation initiatives must empower communities to assume an active role in protecting the health of children. Policies and activities focused on adaptation must target children and raise the capacity of children and families to better withstand climate shocks. This requires child-impact assessments (e.g. in carrying out health care responses), emergency response planning, and micro-credit and micro-insurance risk sharing mechanisms.

■ **Establish baselines and evidence of child health impacts**

Comprehensive evidence-based assessments are needed to describe and define the health impact of the changing climate system on children of different age groups. Population health surveillance systems must be upgraded to provide rapid data collection and real-time capability. Humanitarian aid agencies must support the utilisation and building of national capacity in the use of real-time surveillance tools such as GPRS and mobile data transfer systems.

■ **Establish standard**

National Disease Surveillance Systems

Local human disease surveillance must become standardised within and across countries. The Malaria Early Warning System (MEWS) must be established, especially in sub-Saharan Africa, and developed across all endemic countries. Lead by the WHO, endemic countries must be provided with the capacity and local resources to allow early detection of, and response to emerging epidemics. This includes diagnostic services, human resources and equipment, close case monitoring and rapid data collation and assessment by local health agencies, with standardised response protocols. Similarly, UNICEF and WHO must support strategic vector and vector-borne disease surveillance at borders of current disease distributions where climatic projections suggest a higher probability of change.

■ **Increase research on climate and vector-borne diseases**

Coupled with surveillance tools and technologies, modelling how climate change might affect the pattern of vector-borne diseases needs to become a priority. Predictive models can be used in combination with real-time surveillance to significantly reduce child risk and mortality. Despite the complexity around the relationships, research institutions must be provided the capital to develop and enhance models, while the humanitarian community focuses on prevention and protection to change the risk profile.

■ **Support capacity building and technology transfer**

The international community must support initiatives for sustainable development, including capacity building and technology transfer, that prioritise health care and enhance diagnostic and therapeutic capabilities. Similarly, health monitoring and disease outbreak surveillance will be essential to improve preventative and emergency responses.

■ **Assess existing resilience of ODA expenditure**

Given that between one-fifth and one-third of ODA is currently allocated to climate sensitive sectors, ⁽⁹⁶⁾ standard tools and approaches should be developed to ensure existing financial commitments maximise the resilience of communities to climate shocks.

■ **Finance adaptation additional to existing aid commitments**

Climate change adaptation activities will increasingly form a core component of good development programming. However, funding directed to climate adaptation should be additional to the 0.7% of Gross National Income pledged by donor countries before climate change emerged as a global emergency.

Glossary

Guinea Worm

Guinea worm is a painful and debilitating parasitic infection caused by a large roundworm, *Dracunculus medinensis*. The name "Guinea worm" appeared after Europeans first saw the disease on the Guinea coast of West Africa in the 17th century. The disease begins with a painful blister, usually on the leg. Around the time of its eruption, the person experiences fiery searing sensations. Infected persons try to relieve the pain by immersing the infected part in water, often an open pond. This stimulates the worm to emerge and spill thousands of larvae into the water. If swallowed by a water flea (cyclops), the ingested larva develops and becomes infective in two weeks. When a person drinks the water the cyclops is dissolved by the stomach acids and the larva penetrates the gut wall and migrates through the subcutaneous tissue. After one year, a big blister forms and the mature worm, 1 m long, tries to emerge, thus repeating the life cycle. Guinea worm is one of 14 Neglected Tropical Diseases (NTDs). These diseases persist only in the poorest and most marginalised communities. More than 1 billion people are affected by NTDs. Guinea worm is prevalent in only 13 countries in Africa. Provision of safe drinking water is the pillar intervention to eliminate the disease. It is hoped that Guinea worm will be the first parasitic disease to be eradicated, and the first disease in history to be eradicated through behavior change, without vaccine or cure. ⁽⁹⁷⁾

Stunting

Reduced growth rate in human development. It is a primary manifestation of malnutrition in early childhood, including during fetal development brought on by the malnourished mother. In developing countries, stunted growth is a common problem affecting a large percentage of children. Once established, stunting and its effects typically be-

come permanent. Stunted children may never regain the height lost as a result of stunting, and most children will never gain the corresponding body weight. It also leads to premature death later in life because vital organs never fully develop during childhood.

Wasting

In medicine, wasting refers to the process by which a debilitating disease causes muscle and fat tissue to "waste" away. Wasting is sometimes referred to as "acute malnutrition" because it is believed that episodes of wasting have a short duration, in contrast to stunting, which is regarded as chronic malnutrition. Wasting can be caused by an extremely low energy intake (e.g., caused by famine), nutrient losses due to infection, or a combination of low intake and high loss. Infections and conditions associated with wasting include tuberculosis, chronic diarrhea and AIDS.

Climate change must not be allowed to undermine progress made towards eradicating these debilitating conditions.



Photo: Jon Warren

Lusaka, Zambia: HIV-positive Given Chipepo (13) walks home with a friend after a visit to the clinic. Since starting on ARVs last year, Given has gained 12 kgs. She has told her friends about her status and that she is on ARVs.

Endnotes

“Climate change is a health issue affecting billions of people, not just an environmental issue about polar bears and deforestation. The impacts will be felt ... all around the world – and not just in some distant future but in our lifetimes and those of our children.” (Professor Anthony Costello, Co-Director Institute Global Health, University College London)

- (1) Global Humanitarian Forum 2009: Climate Change – The Anatomy of a Silent Crisis (May 2009) p.3
- (2) UNICEF, 2008: ‘Our Climate, Our Children, Our Responsibility: the implications of climate change for the world’s children’, United Nations Children’s Emergency Fund UK, p.5
- (3) Global Humanitarian Forum 2009, p.12, op. cit.
- (4) Global Humanitarian Forum 2009, p.13, op. cit.
- (5) McMichael, A. J., et al., ‘Climate Change and Human Health: present and future risks’, *The Lancet*, Vol. 367, March 2006, pp. 859-869
- (6) WHO. The World Health Report 2002: reducing risks and promoting healthy life. World Health Organization: Geneva, 2002.
- (7) Global Humanitarian Forum, 2009, p.11, op. cit.
- (8) Global Humanitarian Forum, 2009, p.15, op. cit.
- (9) Global Humanitarian Forum, 2009, p.12, op. cit.
- (10) Global Humanitarian Forum, 2009, p.13, op. cit.
- (11) Confalonieri, U., et al. 2007: ‘Human Health. Contribution of Working Group II to the Fourth Assessment Report of the IPCC, Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the fourth Assessment Report of the Intergovernmental panel on Climate Change’, M.L. Parry, et al. Eds., Cambridge University Press, Cambridge, UK, pp. 391-431
- (12) Epstein, P.R. Climate and health. *Science* 285, 1999, pp. 347-348
- (13) Smith, K.R. 2008: ‘Challenges for Health and Climate: Time and Morality’, Available at: <http://ehs.sph.berkeley.edu/krsmith/publications/2008%20pubs/RMIT%20%20Jul%2008.pdf>
- (14) Haines, S. Et al., ‘Climate Change and Human Health: Impacts Vulnerability and Mitigation’, *The Lancet*, Vol. 367, June 2006, pp. 2102-2109
- (15) Schneider, S.H., et al. 2007: ‘Assessing Key Vulnerabilities and Risk from Climate Change. Climate change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental panel on Climate Change’, M.L. Parry, et al. Eds., Cambridge University Press, Cambridge, UK, pp. 779-810
- (16) Smith, K.R. 2007: ‘IPCC: Impressions from a foot soldier’, Available at: <http://ehs.sph.berkeley.edu/krsmith/presentations/IPCC%20-%20UNA%20Oct%2008.pdf>
- (17) UNICEF, 2008, op. cit.
- (18) Bartlett, S. ‘Children – a large and vulnerable population in the context of climate change’. Prepared for the expert Group meeting on population Dynamics and Climate Change UNFPA and HED In collaboration with UN-HABITAT and the Population Division of UN/DESA 24-25 June, 2009.
- (19) Schneider et. al. 2007, op. cit.
- (20) UNICEF, 2008: Climate Change and Children: A human security challenge, United Nations Children’s Innocenti Research Centre, p.4
- (21) UNFCCC, 2007: *Climate change: Impacts, Vulnerabilities and Adaptation in Developing Countries*, United Nations Framework Convention on Climate Change, p.5
- (22) Pruss-Ustun, A and C Corvalan (2006) *Preventing Disease through Healthy Environments. Towards an Estimate of the Environmental Burden of Disease*. World Health Organization: Geneva
- (23) UNICEF, 2008: Climate Change and Children: A human security challenge, United Nations Children’s Innocenti Research Centre, p.11
- (24) Kiros, G.E. and Hogan, D.P., “War Famine and excess child mortality in Africa”, *International Journal of Epidemiology* 30 (2001): 1-9.
- (25) AAAS News, 8 July 2009. ‘S&T Forum Panel: Addressing Climate Change Will Benefit Global Health.’ Available at: http://www.aaas.org/news/releases/2009/0513stpf_climate.shtml
- (26) UNDP. Human Development Report 2007/2008, *Fighting Climate Change: Human Solidarity in a Divided World*. New York: United Nations Development Programme (UNDP); 2007
- (27) Global Health Council, Where do child deaths occur? Available at: http://www.globalhealth.org/child_health/child_mortality/where_occur/
- (28) United Nations General Assembly, World Youth Report 2005, Report of the Secretary-General, A/60/61, E/2005/7, 6 December 2004.
- (29) UNICEF, 2007, p.18, op. cit

- (30) UNICEF, 2008: Climate Change and Children: A human security challenge, United Nations Children's Innocenti Research Centre, p. 4
- (31) Bartlet, 2009, p.2, op. cit.
- (32) PRB (2008) 2008: Population Data Sheet, Population Reference Bureau, http://www.prb.org/presentations/g_age-distribution.ppt
- (33) Tacoli, C., Crisis or adaptation? Migration and climate change in a context of high mobility. Prepared for Expert Group Meeting on Population Dynamics and Climate change UNFPA and HED in Collaboration with UN_HABITAT and the Population Division, UN/DESA 24-25 June 2009.
- (34) Global Humanitarian Forum, 2009, op. cit.
- (35) UNICEF, 2008: Climate Change and Children: A human security challenge, United Nations Children's Innocenti Research Centre, p. 4
- (36) UNICEF, 2008: Climate Change and Children: A human security challenge, United Nations Children's Innocenti Research Centre, p. 5
- (37) World Health Organization (WHO) 2008: 'Protecting Health From Climate Change'. The World Health Organization – World Health Day 2008
- (38) Black R, Allen LH, Bhutta ZA, et al. Maternal and Child Under-nutrition Study Group. 'Maternal and child under-nutrition: global and regional exposures and health consequences'. *Lancet* 2008;371 (9608): 243-260
- (39) WHO. The World Health Report 2002: reducing risks and promoting healthy life. World Health Organization: Geneva, 2002.
- (40) Lansley, D., World Vision, Climate Change Series Special Report, *Poverty And A Parching Planet*, Food And Water Security, Part I, 2009, Melbourne, Australia, ISBN 978-0-9807094-4-5. Available at: <http://www.worldvision.com.au/Learn/ReportsResearchPublications/ReportCategoryIndex.aspx>
- (41) McMichael AJ, Campbell-Lendrum DH, Corvalan CF, et al., eds. Climate change and human health: risks and responses. Geneva: World Health Organization, 2003
- (42) Global Humanitarian Forum, 2009, p.24, op. cit.
- (43) Costello et. al. 2009, op. cit.
- (44) WHO, 2008, op. cit.
- (45) Costello et. al. 2009, p.1705, op. cit.
- (46) McMichael AJ, Campbell-Lendrum DH, Corvalan CF, et al., eds. Climate change and human health: risks and responses. Geneva: World Health Organization, 2003, p. 48
- (47) UNICEF, 2008, p.9, op. cit.
- (48) Boko, M., et al. (2007): "Africa." Climate Change 2007: Impacts, Adaptations and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, et al. Eds., Cambridge University Press, Cambridge, UK, 433-467, p.435.
- (49) Joint Statement of the Rome-based Agencies UN World Food Programme (WFP), the UN Food and Agriculture Organization (FAO) and the International Fund for Agricultural Development (IFAD) on the occasion of the Interactive Thematic Dialogue of the UN General Assembly on the Global Food Crisis and the Right to Food, New York, 6 April 2009. Available at: <http://www.un.org/ga/president/63/interactive/globalfoodcrisis/wfp.pdf>
- (50) Costello et. al. 2009, p.1704, op. cit.
- (51) Costello et. al. 2009, op. cit.
- (52) UNICEF, 2003: Roll Back Malaria The Africa Malaria Report 2003, Roll Back Malaria, Chapter 4 "Malaria during Pregnancy". Available at: <http://www.rollbackmalaria.org/amd2003/amr2003/pdf/amr2003.pdf>
- (53) See for instance UNICEF, 2008: The State of Asia Pacific's Children 2008: Child Survival. Available at: http://www.unicef.org/sapc08/docs/SAPC_Full_Report.pdf
- (54) See for Instance Jayatissa R, Bekele A, Piyasena C.L, Mahamithawa S. (2006) Assessment of nutritional status of children under five years of age, pregnant women and lactating women living in relief camps after the tsunami in Sri Lanka, *Food and Nutrition Bulletin*, Vol. 27, No. 2, pp. 144-52
- (55) Confalonieri et. al. 2007, op. cit.
- (56) WHO & UNICEF, (2004) Joint statement on clinical management of acute diarrhoea. Available at: http://www.unicef.org/publications/index_21433.html
- (57) UNICEF, 2008: The State of the World's Children 2008: Child Survival, United Nations Children's Emergency Fund, New York, p.15 Available at: http://www.unicef.org/publications/files/The_State_of_the_Worlds_Children_2008.pdf
- (58) WHO, 2008, p.7, op.cit.
- (59) UNICEF, 2008, p.15, op. cit.
- (60) Keusch G, Fontaine O, Bhargava A, et al. Diarrheal diseases. In: *Disease Control Priorities in Developing Countries*. New York: Oxford University Press; 2006,371-388.
- (61) Confalonieri et. al. 2007, op. cit.
- (62) Masalahiro, H. et al., (2007) 'Association Between Climate Variability and Hospital Visits for Non-Cholera Diarrhoea in Bangladesh: Effects and vulnerability groups', *International Journal of Epidemiology*, Vol. 36, No. 5, pp. 1030-1037
- (63) Bunyarvanich, S, Landrigan, C. P, McMichael, A. J. and Epstein, P.R. (2003) The Impact of Climate Change on Child Health, *Ambulatory Paediatrics*, Vol 3, No.1, p. 46
- (64) McMichael AJ, Campbell-Lendrum DH, Corvalan CF, et al., eds. Climate change and human health: risks and responses. Geneva: World Health Organization, 2003

- (65) Global Humanitarian Forum, 2009, p. 30, op. cit.
- (66) Woodruffe, R. and A.J. McMichael, 'Climate Change and Human Health: All effected but some more than others', *Social Alternatives*, Vol. 23, No. 4, 2004, pp. 17-22
- (67) WHO, 2008, p.11, op. cit.
- (68) Confalonieri et. al. 2007, p.401, op. cit.
- (69) Confalonieri et al. 2007, op. cit.
- (70) WHO, 2008, p.9, op. cit.
- (71) Borrazzo J. How do water and sanitation look from a child health perspective? Available at: content.worldwaterforum5.org/.../wat%20san%20and%20child%20health%20-%20VWF5%20
- (72) Confalonieri et. al. 2007, p.401, op. cit.
- (73) Bunyavanich et. al. 2003, op. cit.
- (74) PATH. Diarrhoeal Disease: Solutions to Defeat a Global Killer. Available at: <http://www.eddcontrol.org/solutions-to-defeat-a-global-killer.php>
- (75) Sphere Project (2004) *Humanitarian Charter and Minimum Standards in Disaster Response*. Available at: <http://www.sphereproject.org/>
- (76) WHO, Burden of disease statistics. Geneva, World Health Organization, 2006. Available at: http://www.who.int/healthinfo/global_burden_disease/en/index.html
- (77) See for instance Confalonieri, U., et al. 2007: 'Human Health, Contribution of Working Group II to the Fourth Assessment Report of the IPCC, Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the fourth Assessment Report of the Intergovernmental panel on Climate Change', M.L. Parry, et al. Eds., Cambridge University Press, Cambridge, UK, pp. 391-431
- (78) Breman, J, MS Alilio, A Mills (2004) "Conquering the intolerable burden of malaria: what's new, what's needed: a summary", *American Journal of Tropical. Medicine and. Hygiene*, 71 (2 suppl) 1-15.
- (79) A Haines, R S Kovats, D Campbell-Lendrum, C Corvalan. 'Climate change and human health: impacts, vulnerability and mitigation', *The Lancet*, Vol. 367, June 24, 2006, p. 2105
- (80) Lopez, A. D. et al., Global and Regional Burden of Disease and Risk Factors (2001) 'Systematic analysis of population health data', *The Lancet*, Vol. 367, No. 9524, May 2006, pp. 1747-1757.
- (81) UNICEF, Progress for Children: A world fit for children statistical review, No. 6, 2007, p.36. Available at: http://www.unicef.org/progressforchildren/2007n6/index_41401.htm
- (82) WHO, Lives at Risk: Malaria in pregnancy. Available at: <http://www.who.int/features/2003/04b/en/>
- (83) McMichael AJ, Campbell-Lendrum DH, Corvalan CF, et al., eds. Climate change and human health: risks and responses. Geneva: World Health Organization, 2003, p. 119
- (84) UNICEF and Roll Back Malaria Partnership, 'Malaria and Children: Progress in intervention coverage', 2007, p. 1-7. Available at: http://www.unicef.org/health/files/MalariaOct6forweb_final.pdf
- (85) Tanser FC, Sharp B, le Sueur D. 'Potential effect of climate change on malaria transmission in Africa', *Lancet*, 2003; 362: 1792-1798
- (86) Alsop, Z., 'Malaria returns to Kenya's highlands as temperatures rise', *The Lancet*, Vol. 370, No. 9591, 2007, pp. 925-926.
- (87) Menne BB, Kunzil N, Bertonlini R. 'The health impact of climate change in developing countries', *International Journal of Global Environmental Issues*, 2002; 2: 181-205
- (88) McMichael AJ, Campbell-Lendrum DH, Corvalan CF, et al., eds. Climate change and human health: risks and responses. Geneva: World Health Organization, 2003, p. 86
- (89) WHO, 2008, p.7, op. cit.
- (90) Lindsay SW, Martens WJM, 'Malaria in the African highlands: past, present and future. *Bulletin World Health Organization*, 1998; 78: 33-45. Available at: [http://whqlibdoc.who.int/bulletin/1998/Vol76-No1/bulletin_1998_76\(1\)_33-45.pdf](http://whqlibdoc.who.int/bulletin/1998/Vol76-No1/bulletin_1998_76(1)_33-45.pdf)
- (91) Global Humanitarian Forum, 2009, p.30, op. cit.
- (92) Mas-Coma S, Valero MA, Bargues MD. 'Effects of climate change on animal and zoonotic helminthiasis'. *Revue Scientifique et technique*, Vol. 27, 2008, pp. 443-457
- (93) McMichael, A. et al., 'Climate change and human health: present and future risks', op. cit, pp. 859-869
- (94) Hales S, de Wet N, Macdonald J, Woodward A. 'Potential effect of population and climate changes on global distribution of dengue fever: an empirical model', *The Lancet*, Vol 360, pp. 830-834
- (95) Confalonieri et. al. 2007, op.cit.
- (96) Global Humanitarian Forum, 2009, p.4, op. cit.
- (97) Based on World Health Organisation, Water-related Diseases, Guinea-Worm Disease (Dracunculiasis), available at: http://www.who.int/water_sanitation_health/diseases/guinea/en/ http://www.who.int/neglected_diseases/en/

Community Combats Child Malnutrition: Kabita Begum with her one-year-old daughter Maksuda Najnin Mim in front of a huge rice paddy. Mothers in northern Bangladesh are learning to improve the health of their children through the Positive Deviance (PD) hearth programme. This programme teaches mothers to prepare nutritious foods and maintain the health of their children. Maksuda Najnin Mim weighs 6.5 kg but should be at least 8 kg. Kabita enrolled in the programme to help her firstborn achieve a healthy weight.



“ We must, above all, shift from a culture of reaction to a culture of prevention. Prevention is not only more humane than cure; it is also much cheaper... Above all, let us not forget that disaster prevention is a moral imperative, no less than reducing the risks of war. ”

—Former United Nations Secretary-General Kofi Annan on occasion of the closing of the International Decade for Natural Disaster Reduction

Photo: Andrew Goodwin/World Vision

■ **Climate Change Series:** Around the globe World Vision is witnessing first hand the devastating impact of climate change on poor communities. Governments, non-governmental organisations and communities are grappling to adapt to new threats and their impacts. We have much to learn. In this series of publications, World Vision is seeking to identify concrete responses to climate change both at the programming and policy levels.

Contacts:

www.wvasiapacific.org

World Vision Australia

1 Vision Drive
Burwood East, Victoria 3151
Australia
P: +61 (0)3 9287 2233
F: +61 (0)3 9287 2427
australia@worldvision.com.au

Humanitarian and Emergency Affairs

750B Chai Chee Road #03-02
Technopark @ Chai Chee
Singapore 469002
P: +65 65117694
F: +65 6243 5826
hea_ap@wvi.org

Asia Pacific Regional Office

29 Bangkok Business Center, 13th Floor
Sukhumit 63 (Ekamai), Klongton Nua, Wattana
Bangkok 10110, Thailand
P: +66 (0)2 3916155
F: +66 (0)2 3811976
asiapacific@wvi.org

World Vision International

800 West Chestnut Avenue
Monrovia, CA 91016-3198
USA
P: +1 626 303 8811
F: +1 626 301 7786
worvis@wvi.org

International Liaison Office

6 Chemin de la Tourelle, CP 50
CH-1211 Geneva 19
Switzerland
P: +41-(0)22-798 4183
F: +41-(0)22-798 6547
geneva@wvi.org

European Union Liaison Office

33 Ave. Livingstone
B-1000 Brussels
Belgium
P: +32 2 230 1621
F: +32 2 280 3426
eulo-info@wvi.org

United Nations Liaison Office

216 East 49th Street, 4th floor
New York, NY 10017
USA
P: +1 212 355 1779
F: +1 212 355 3018
wwun_offices@wvi.org