The threats of climate change on undernutrition

A neglected issue that requires further analysis and urgent actions

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Introduction

Maternal and child undernutrition is the underlying cause of 3.5 million deaths each year and 35% of the disease burden in children younger than 5 years (Black et al, 2008). The recent food and economic crises have magnified the challenge of undernutrition (Bloem et al, 2010) — more than one billion people now suffer from hunger (FAO, 2009). These crises combine with the growing threat and negative impacts of climate change.

Climate change is happening now and it represents a major threat for the coming decades (Pachauri and Reisinger, 2007). Newly emerging scientific evidence suggests that the pace and scale of climate change may now be outstripping even the most sobering predictions of the last report of the Intergovernmental Panel of Climate Change (IPCC) (UNEP, 2009) (Allison et al, 2009). Climate change impacts both natural and human systems from the global to the local levels. From the scientific journals to humanitarian reports and grassroots testimonies, much has been written on the socioeconomic and humanitarian implications of climate change – yet it is only in the last few years that the "human face" of climate change has been fully acknowledged (Adapted from OCHA/WFP/IFRC, 2009).

Amongst issues comprising this "human face", undernutrition has not received the attention it merits, considering that determinants of undernutrition, which relate to food, health, sanitation, water and care practices, are directly affected by climate change. In addition, the nutrition sector is poorly linked to the emerging policies and practices in facing climate change. Unless urgent actions are taken, it will not be possible to ensure nutrition security under a changing climate, which poses an unprecedented challenge to the aim of reducing significantly and eradicating undernutrition.

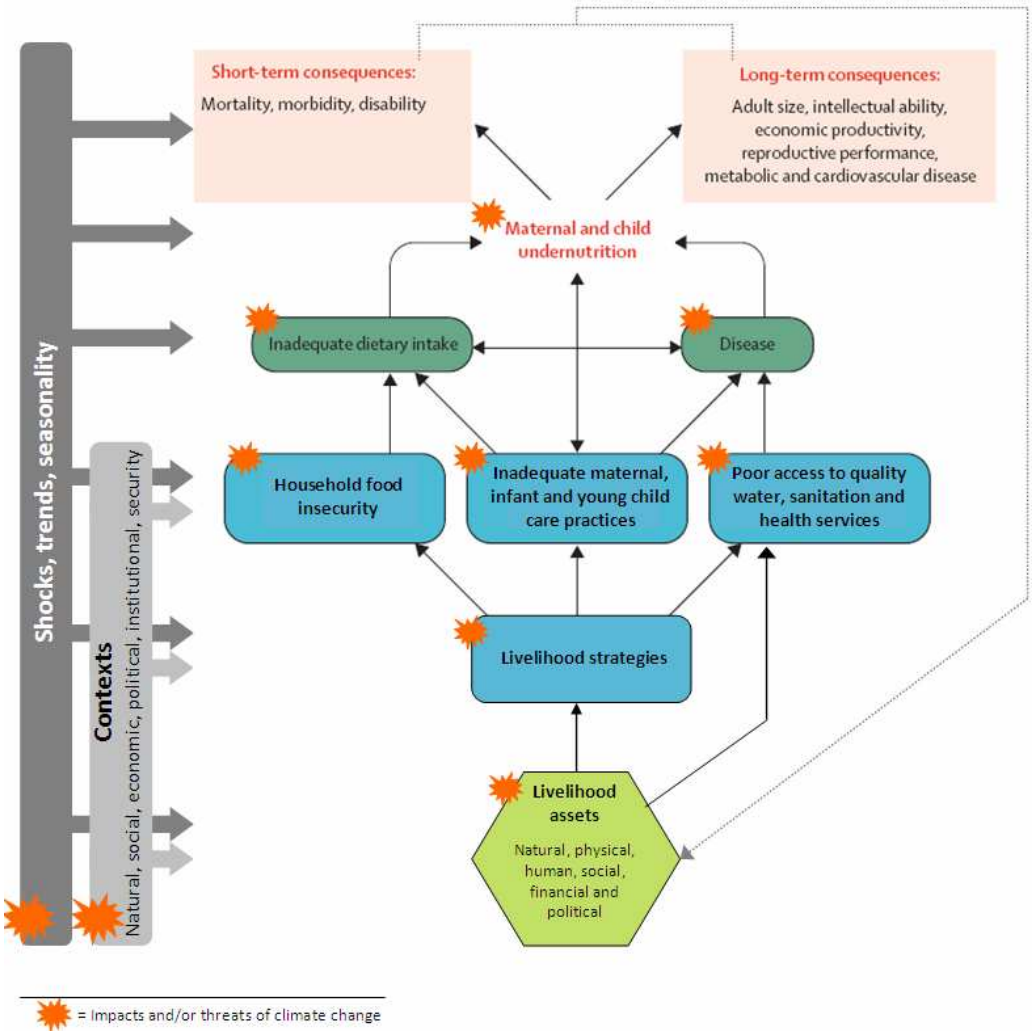
This article highlights how climate change further exacerbates the already-huge problem of undernutrition and suggests orientations for the nutrition sector to face this additional challenge.

The impacts of climate change on undernutrition

A nutrition security conceptual framework

A nutrition security conceptual framework – presented in Figure 1 – is proposed in order to capture the multiple impacts and threats of climate on undernutrition. This framework is based on three frameworks, respectively the framework presented in Black et al (2008), the DFID livelihood framework (DFID, 1999) and the WFP food and nutrition security framework (WFP, 2009).

Figure 1 – Adapted framework on the causes of undernutrition



The framework above is a causal analysis that considers the immediate, underlying and basic causes of undernutrition, and their interplay with livelihoods. A livelihood comprises capabilities including assets or capital (natural, physical, human, social, financial) and activities (referred to as livelihood strategies – e.g. cultivation, livestock-keeping, trade, remittances) used by a household for its means of living. A households' livelihood is secure when it can cope with and recover from shocks and stresses, and maintain or enhance its capabilities and productive asset base (Based on Chambers and Conway, 1992).

Inadequate dietary intake and disease are the immediate causes of undernutrition. Inadequate food consumption heightens vulnerability to infectious diseases, which, in turn, can prevent the body from absorbing adequate food. These immediate causes stem from underlying causes characterised by insufficient access to safe and appropriate food, inadequate maternal, infant and young child care practices, poor access to quality water, sanitation and health services. These underlying causes represent "negative livelihood outcomes". The immediate and underlying causes make up the determinants of undernutrition.

Livelihoods and the determinants of undernutrition – analysed at individual, household and community levels – are influenced by local, national, regional and/or global factors. The analysis of these factors focuses respectively (1) on the natural, social, economic, political, institutional and security contexts and (2) on the exposure to shocks and stresses (e.g. drought, food price crisis, negative trends, seasonality).

The documented impacts and threats of climate change on undernutrition are elaborated in the following section.

Climate change magnifies disaster risks, seasonal stresses and livelihood insecurity

Climate change is already changing the geographic distribution, frequency and intensity of **weather-related hazards** (or "shocks") such as droughts, floods and storms, magnifying the risk of disasters globally (UNISDR, 2008) (CARE/Mapplecroft/OCHA, 2009). Climate change also affects disaster risk by increasing the vulnerability of communities to natural hazards (Adapted from UNISDR, 2008). Each year natural disasters affect the lives and livelihoods of more than 250 million people worldwide, and this number could rise up to 375 million a year by 2015 (Oxfam International, 2009). Natural disasters lead to widespread death, injuries, disease, post-traumatic stress and destruction of livelihood assets. They induce or exacerbate insecurities, in terms of livelihoods, access to adequate food and clean water, and work against the gains made in humanitarian and development aid programs. The IPCC notes that undernutrition linked to extreme climatic events may be one of the most important consequences of climate change due to the very large number of people that may be affected (Confalonieri et al, 2009).

Seasonality represents an important source of stress in the lives and livelihoods of poor rural communities (Devereux et al, 2008). Climate change magnifies these seasonal stresses; for example, rainfall is reported to be more erratic, shorter and more violent (Jennings and Magrath, 2009). Smallholder farmers who depend upon rain-fed agriculture as their main livelihood strategy are dependent on the timing of rains and intra-seasonal rainfall patterns, which ultimately determine the success or failure of their crops (in sub-Saharan Africa, rain-fed agriculture covers 96% of all cultivated land (FAO, 2007)). Changing seasonality induced by climate change can therefore lead to more livelihood insecurity, seasonal hunger and undernutrition.

Climate change induces or worsens negative trends in the **environment and natural resources** on which populations depend for their lives and livelihoods, including the loss of local biodiversity which provides essential food and medicine. For instance, climate change affects the coastal populations (at least 150 million people live within 1 metre of the high tide level, and 250 million live within 5 metres of the high tide (USAID, 2009)) in two slow-onset pathways. Firstly, rising sea levels induced by global climate change amplify coastal erosion and the risk of storm surges in low-lying areas. Secondly, climate change, in synergy with other factors, affects the marine ecosystems and fish population, damaging fishing livelihoods that constitute important sources of food and income for coastal residents (Nicholls et al, 2007).

Increased exposure to natural disasters and seasonal and environmental stresses has profound effects on the socio-economic as well as the political and institutional context. It can force population groups to radically change their livelihoods and/or move to other regions (e.g. urbanisation), thus leading to a re-composition of socio-economic and ethnic groups and the relationships between them. It can also create or exacerbate conflict between population groups for access to diminishing resources. These changes can put considerable stress on traditional and modern political institutions and social solidarity mechanisms. These factors directly or indirectly affect the determinants of undernutrition.

Climate change induces multiple risks on all determinants of undernutrition

Climate change undermines current efforts to end the suffering of over 1 billion **food insecure** people and will increase the risk of hunger and undernutrition by an unprecedented scale within the next decades (WFP et al, 2009). Climate change induces various types of stresses on livelihoods, resulting in less food being produced or less money to buy food. Significantly negative impacts of climate change on food security could occur as early as 2030 for several crops and regions, with the most severe effects projected for South Asia and Southern Africa (Lobell et al, 2008). The frequency and severity of production shortfalls are projected to increase due to climate change, thereby increasing food prices even further (DFID, 2009).

According to the Lancet (Costello et al, 2009), climate change is the biggest global **health** threat of the 21st century, and is already contributing to the global burden of disease and premature death. Important future trends for human health include an increase in the number of people suffering from death, disease and injury from heatwaves, floods, storms, fires and droughts; changes in the range of infectious disease vectors; and an increase in the burden of diarrhoeal diseases (Based on Confalonieri et al, 2007). Climate-related shocks can also have a severe impact on the mental health of those affected (Fritze et al, 2008).

Climate change will also put further strain on the already heavy workload of women (CIDA, 2002). For instance, in Sahel and in the Horn of Africa, men commonly migrate during periods of drought, leaving the women alone to look after their children, work in the fields, tend the herds and manage the home. This can compromise their ability to provide proper **care** to infants, heightening the risk of undernutrition.

Safe and reliable access to **clean water** and good sanitary conditions are essential for good nutrition. Water resources are predicted to be strongly impacted by climate change, with wide-ranging consequences for human societies and ecosystems (Bates et al, 2008). Hundreds of millions of people risk being exposed to a growing scarcity of water (Pachauri and Reisinger, 2007). By 2025, 1.8 billion people will live in countries or regions suffering from a shortage of water (FAO, 2007). Climate change-related alterations in rainfall, surface water availability and water quality will impact on the incidence of water-related diseases (Confalonieri et al, 2007).

The poor have to face the growing impacts of climate change when their coping strategies are already strained

In the face of difficulties (e.g. a drought, less fish in fishing grounds), households resort to coping strategies – defined here as generally short-term strategies, motivated by a crisis and oriented towards survival – or adaptation strategies – defined here as strategies oriented towards longer-term livelihood security (Adapted from Dazé, 2009). Some coping or adaptations strategies are successful, in the sense that they do not (further) undermine the livelihood assets of household members, e.g. the diversification of livelihoods. However, some of these strategies may directly or indirectly undermine the livelihoods and nutrition status of people with the reduction of dietary diversity, the sale of productive assets or the intensive and uncontrolled marketing of firewood and charcoal. Recent crises have already strained the coping strategies of the poor (FAO, 2009), decreasing their capacity to withstand current and future food, economic and climate crises and to adapt to climate change. As a consequence, already-vulnerable populations worldwide find themselves fast-tracked along the downward spiral of livelihood insecurity and undernutrition (Adapted from Bloem et al, 2010).

What is the extent of the problem?

Quantifying the problem remains a complex exercise, because of the cross-sectoral nature of undernutrition, and only a few studies have attempted the exercise. The International Food Policy Research Institute (IFPRI) has assessed climate-change effects on food security and human well-being using two indicators: per capita calorie consumption and child malnutrition numbers, stating that: *by 2050, the decline in calorie availability will increase child malnutrition by 20 % relative to a world with no climate change. Climate change will eliminate much of the improvement in child malnourishment levels that would occur with no climate change* (Nelson et al, 2009). Given the multiple causes of malnutrition, this figure represents a conservative estimate, and thus, a 20 % increase in child malnutrition may be reached much more rapidly, or in others terms, the expected increase in malnutrition in 2050 could be much more considerable.

The links between the nutrition sector and the climate change agenda

Climate change is expected to increasingly reshape humanitarian and development programming, becoming a transversal challenge to be considered in all analysis and policy development. This section presents an overview of the links between important climate change-related initiatives and the nutrition sector.

Climate change research and undernutrition

Although the links between climate change and undernutrition have been increasingly examined recently, most analyses consider isolated pathways such as those of food insecurity, health or water. Undernutrition is poorly considered in the 4th Assessment Reports (AR4) of the IPCC. However, the 5th Assessment Reports (AR5), in the early stages of preparation and due in 2013/2014, represents an opportunity to highlight undernutrition.

The following undernutrition issues require further and urgent attention (Based on Standing Committee on Nutrition, 2009):

- Comprehensive analyses of the multiple climate change-related threats to nutrition;
- Setting up and/ or strengthening nutrition early warning and surveillance systems, integrating (further) the climate dimension;
- Identifying, validating and budgeting the set of interventions required to protect nutrition from climate-related risks;
- Capitalizing on lessons learnt on the ground.

International climate change-related policies and undernutrition

The United Nations Framework Convention on Climate Change (UNFCCC) manages an intergovernmental framework tackling the challenge posed by climate change. The 15th Conferences of the Parties, which took place in Copenhagen in December 2009, represented the latest important step of the UNFCCC, whose objective was to establish an ambitious global climate agreement. The negotiations in the frame of the UNFCCC focused on:

- Climate change mitigation (the reduction of greenhouse gas concentrations in the atmosphere);
- Climate change adaptation (the efforts to assist developing countries to adapt to climate change); and;
- The provision of financial resources, technology development and transfer, and capacity-building.

Given that these initiatives relate directly or indirectly to nutrition, the Standing Committee of Nutrition released an important statement in time for Copenhagen addressing the implications of climate change on undernutrition (Based on Standing Committee on Nutrition, 2009).

The outcomes of COP15 are of concern for the nutrition sector but also more globally for the humanitarian and development communities:

- Two weeks of intense negotiations at the COP15 led to the Copenhagen "Accord", an unambitious and vague agreement that is not legally binding. Further attempts to reach a real agreement will be fostered throughout 2010, culminating with the 16th Conferences of the Parties (COP16) in Mexico in late 2010.
- The concerns highlighted in the SCN statement (related to climate change mitigation, adaptation and finances) remain pertinent and urgent to address.

- Some climate change-related funding mechanisms – that were originally envisaged as being additional to the Official Development Assistance (ODA) – are recycled from the ODA funds. This might exacerbate the current lack of funds dedicated to addressing the Millennium Development Goals (MDGs), and more specifically already grossly under-financed food security and nutrition sectors.
- The nutrition sector was poorly represented in the frame of the UNFCCC processes, and more specifically, in the frame of the recent COP15.

Climate change adaptation, disaster risk reduction and undernutrition

Climate change adaptation (CCA) and disaster risk reduction (DRR) have been progressively mainstreamed into the humanitarian and development agendas for the past few years, in response to climate change and the increasing risks of disasters. According to the UNFCCC, climate change adaptation is *the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities*. According to the UNISDR, *disaster risk reduction is the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events* (UNISDR, 2009). While their scope and specific interests may differ, climate change adaptation and DRR have very similar aims in terms of seeking to build resilience in the face of shocks and stresses in the broader objective of sustainable development (Adapted from Venton and La Trobe, 2008).

The prevention of undernutrition is highly amenable to the policies and practices of DRR and CCA. However, insufficient effort has been made so far by the humanitarian and nutrition communities to consider how these approaches can be integrated and mainstreamed into nutrition programming. A greater exchange between the nutrition sector with those working with DRR and CCA would be synergetic for addressing the future challenges of hunger and undernutrition.

Conclusion and recommendations

Hundreds of millions of people are currently at a degree of risk from the impact of global climate change. This number is likely to increase in the future, not only because of the increasing risk and multiple threats of climate impacts, but also due the largest consequences and negative impact on livelihood and nutrition security. Climate change amplifies the risk of undernutrition, given that disaster risk, seasonal stresses and livelihood insecurity will be magnified. Climate change is a major threat to all determinants of undernutrition, at a time when coping strategies of poor people are already strained.

Despite the growing threat and incidence of climate change, too little has been done so far in reducing, and adapting to, the impacts of climate change on nutrition and increasing the resilience of poor communities and households to climate change. The nutrition sector remains largely disconnected from key climate change issues and initiatives.

The international community and nutrition stakeholders have recently shown their capacity to mobilise following the recent food and economic crises, and have demonstrated innovation and commitment to address undernutrition, e.g. through the expansion of community-based food security and livelihoods interventions, the development of safety nets (cash and vouchers programmes) and the introduction of Ready-to-Use Therapeutic Food (RUTF) and Community-based Management of Acute Malnutrition (CMAM).

Humanitarian and nutrition policy-makers and practioners should:

"Do more of the same, and better":

1. Scale-up coverage of and increase access to interventions to treat acute malnutrition, especially at community level and where possible mainstreamed through existing national healthcare system.
2. Develop comprehensive and multi-sector programming to face climate change – building upon DRR and CCA approaches – and expand nutrition interventions that successfully and sustainably address the immediate and underlying causes of undernutrition and develop populations' resilience to the growing impacts of climate change, e.g. small-scale agricultural development, income generation, water and sanitation, nutrition education and hunger safety nets.
3. Mainstream the climate dimension into existing initiatives and nutrition programs dealing with undernutrition, particularly those developed in response to the food and economic crises.
4. Promote good environmental practices in nutrition interventions and humanitarian responses, (fuel-efficient cooking, effective water management, etc.).

Nutrition researchers, experts and IPCC stakeholders should:

1. Build further evidence on the links between climate and undernutrition, on projected effects and on threats that specific climate change mitigation actions pose on nutrition, along with a knowledge base to inform future programming on climate change and nutrition.
2. Ensure the inclusion of nutrition specialists in the process of knowledge-building and the peer review of the IPCC 5th Assessment Report.

Negotiators and observers involved in UNFCCC-related processes and in COP16 should[1]:

1. Ensure that future agreements on climate change adaptation in the frame of UNFCCC aim at protecting and promoting food and nutritional security, prioritising actions for the most vulnerable livelihoods groups, households and individuals (particularly nursing and pregnant women, infants and young children) and providing immediate, sufficient and funding additional to ODA.
2. Ensure that adaptation and climate change mitigation are equal priorities, and that that climate change mitigation actions will not undermine the ability of poor people to feed themselves, to provide adequate care and access adequate public health and safe water.

Multilateral and bilateral donors, the private sector, foundations and charities should:

1. Provide the humanitarian and nutrition sectors with long-term funding to scale up nutrition interventions that successfully address the growing impacts of and threats from climate change.
2. Provide researchers with adequate funding to build further evidence on the links between climate and undernutrition and the required response.
3. Provide sufficient and additional financial resources to support climate change adaptation.

References

Allison I, Bindoff NL, Bindschadler RA, Cox PM, de Noblet N, England MH, Francis JE, Gruber N, Haywood AM, Karoly DJ, Kaser G, Le Quéré C, Lenton TM, Mann ME, McNeil BI, Pitman AJ, Rahmstorf S, Rignot E, Schellnhuber HJ, Schneider SH, Sherwood SC, Somerville RCJ, Steffen K, Steig EJ, Visbeck M and Weaver AJ (2009). The Copenhagen Diagnosis, 2009: Updating the world on the Latest Climate Science. The University of New South Wales Climate Change Research Centre:Sydney. Available at: www.copenhagendiagnosis.org/

Bates BC, Kundzewicz ZW, Wu S and Palutikof JP (eds.) (2008) Climate change and water. Technical paper of the Intergovernmental Panel on Climate Change. IPCC Secretariat: Geneva. Available at: www.ipcc.ch/publications_and_data/publications_and_data_technical_papers_climate_change_and_water.htm

Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, Mathers C and Rivera J (2008) Maternal and child undernutrition: Global and regional exposures and health consequences. The Lancet 371: 243-60. Available at: www.thelancet.com/journals/lancet/article/PIIS0140-6736(07)61690-0/abstract

Bloem MW, Semba RD and Kraemer K (2010) Castel Gandolfo Workshop: An Introduction to the Impact of Climate Change, the Economic Crisis, and the Increase in the Food Prices on Malnutrition. Journal of Nutrition 140: 132S–135S, 2010.

CARE/Mapplecroft/OCHA (2009) Humanitarian Implications of Climate Change: Mapping Emerging Trends and Risk Hotspots. Care International. Available at: www.careclimatechange.org/files/reports/CARE_Human_Implications.pdf

Chambers R and Conway G (1992). Sustainable rural livelihoods: practical concepts for the 21st century. IDS Discussion Paper No. 296. Institute of Development Studies:Brighton

CIDA (2002) Gender equality and climate change: why consider gender equality when taking action on climate change? Canadian International Development Agency:Quebec. Available at: www.acdicida.gc.ca/INET/IMAGES.NSF/vLUImages/Climate%20change3/$file/Gender-2.pdf

Confalonieri U, Menne B, Akhtar R, Ebi KL, Hauengue M, Kovats RS, Revich B and Woodward A (2007) Human health. *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, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.) Cambridge University Press:Cambridge, 391-431. Available at: www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2chapter8.pdf

Costello A, Abbas M, Allen A, Ball A, Bell S, Bellamy R, Friel S, Groce N, Johnson A, Kett M, Lee M, Levy C, Maslin M, McCoy D, McGuire B, Montgomery H, Napier D, Pagel C, Patel J, Puppim de Oliveira JA, Redclift N, Rees H, Rogger D, Scott J, Stephenson J, Twigg J, Wolff J, Patterson C (2009) Managing the health effects of climate change. The Lancet 373: 1693–733. Available at: www.ucl.ac.uk/global-health/ucl-lancet-climate-change.pdf

Dazé A, Ambrose K and Ehrhart C (2009) Climate Vulnerability and Capacity Analysis handbook. CARE International. Available at: www.careclimatechange.org/cvca/CARE_CVCAHandbook.pdf

Devereux S, Vaitla B and Hauenstein Swan S (2008) Seasons of Hunger. Fighting cycles of starvation among the world's rural poor. Pluto Press:London

DFID (2009) The neglected crisis of undernutrition: Evidence for action. DFID:London. Available at: www.dfid.gov.uk/Documents/publications/nutrition-evidence-paper.pdf

DFID (1999) Sustainable Livelihoods Guidance Sheets: Introduction. DFID:London. Available at: www.nssd.net/pdf/sectiono.pdf

FAO (2007) Climate change, water and food security. FAO:Rome. Available at: ftp://ftp.fao.org/docrep/fao/010/i0142e/i0142e07.pdf

FAO (2009) The State of food insecurity in the world. Economic crisis – Impacts and lessons learned. Food and Agriculture Organization:Rome. Available at: www.fao.org/docrep/012/i0876e/i0876e00.htm

Fritze JG, Blashki GA, Burke S and Wiseman J (2008) Hope, despair and transformation: Climate change and the promotion of mental health and wellbeing. International Journal of Mental Health Systems 2:13. Available at: www.ijmhs.com/content/2/1/13

Jennings S and Magrath J (2009) What happened to the seasons? Oxfam research report:Oxford. Available at: www.oxfam.org.uk/resources/policy/climate_change/research-where-are-the-seasons.html

Lobell DB, Burke M, Tebaldi C, Mastrandrea M, Falcon W and Naylor R (2008). Policy brief—Prioritizing climate change adaptation needs for food security to 2030. Stanford University: California. Available at: http://iis-db.stanford.edu/pubs/22098/Lobell_et_al_Science_2008.pdf

Nelson GC, Rosegrant MW, Koo J, Robertson R, Sulser T, Zhu T, Ringler C, Msangi S, Palazzo A, Batka M, Magalhaes M, Valmonte-Santos R, Ewing M and Lee D (2009) Climate Change Impact on Agriculture and Costs of Adaptation. International Food Policy Research Institute:Washington, D.C. Available at: www.ifpri.org/sites/default/files/publications/pr21.pdf

Nicholls RJ, Wong PP, Burkett VR, Codignotto JO, Hay JE, McLean RF, Ragoonaden S and Woodroffe CD (2007) Coastal systems and low-lying areas. *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, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.) Cambridge University Press:Cambridge, 315-356. Available at: www.ipcc.ch/pdf/assessmentreport/ar4/wg2/ar4-wg2-chapter6.pdf

OCHA/WFP/IFRC (2009). Addressing the Humanitarian Challenges of Climate Change: Regional and National Perspectives. Preliminary Findings from the IASC Regional and National Level Consultations. OCHA/WFP/IFRC. Available at: www.humanitarianinfo.org/iasc/downloaddoc.aspx?docID=4862&type=any

Oxfam International (2009) The right to survive. The humanitarian challenge for the twenty-first century. Oxfam International:Oxford. Available at: www.oxfam.org/policy/right-to-survive-report

Pachauri RK and Reisinger A (eds.) (2007) Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC:Geneva. Available at: www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

Standing Committee of Nutrition (2009) Implications of climate change on undernutrition. SCN:Geneva. Available at: www.unscn.org/files/Statements/SCN_statement_climate_change_final.pdf

UNEP (2009). Climate change science compendium 2009. UNEP: Nairobi. Available at: www.unep.org/COMPENDIUM2009/

UNISDR (2008) Climate change and disaster risk reduction. UNISDR briefing note 01:Geneva. Available at: www.unisdr.org/eng/risk.../Climate-Change-DRR.pdf

UNISDR (2009) Adaptation to Climate Change by Reducing Disaster Risks: Country Practices and Lessons. UNISDR briefing note 01:Geneva. Available at: www.preventionweb.net/files/11775_UNISDRBriefingAdaptationtoClimateCh.pdf

USAID (2009) Adapting to coastal climate change: A Guidebook for Development Planners. USAID:Washington. Available at: www.usaid.gov/our_work/environment/climate/policies_prog/vulnerability.html

Venton P and La Trobe S (2008) Linking climate change adaptation and disaster risk reduction. Tearfund/IDS: London. Available at: www.preventionweb.net/files/3007_CCAandDRRweb.pdf

WFP (2009) Emergency Food Security Assessment handbook. WFP:Rome. Available at: www.wfp.org/content/emergency-food-security-assessment-handbook

WFP, FAO, IFRC, OXFAM, WVI, CARE, CARITAS, WHO and Save the Children (2009) Climate change, food security and hunger: Key messages for UNFCCC negotiators. Technical Paper of the IASC Task Force on Climate Change. Available at: http://www.reliefweb.int/rw/RWFiles2009.nsf/FilesByRWDocUnidFilename/SNAA-7XM3WP-full_report.pdf/$File/full_report.pdf

***Note**: All referred material on the World Wide Web was consulted in February 2010.*