

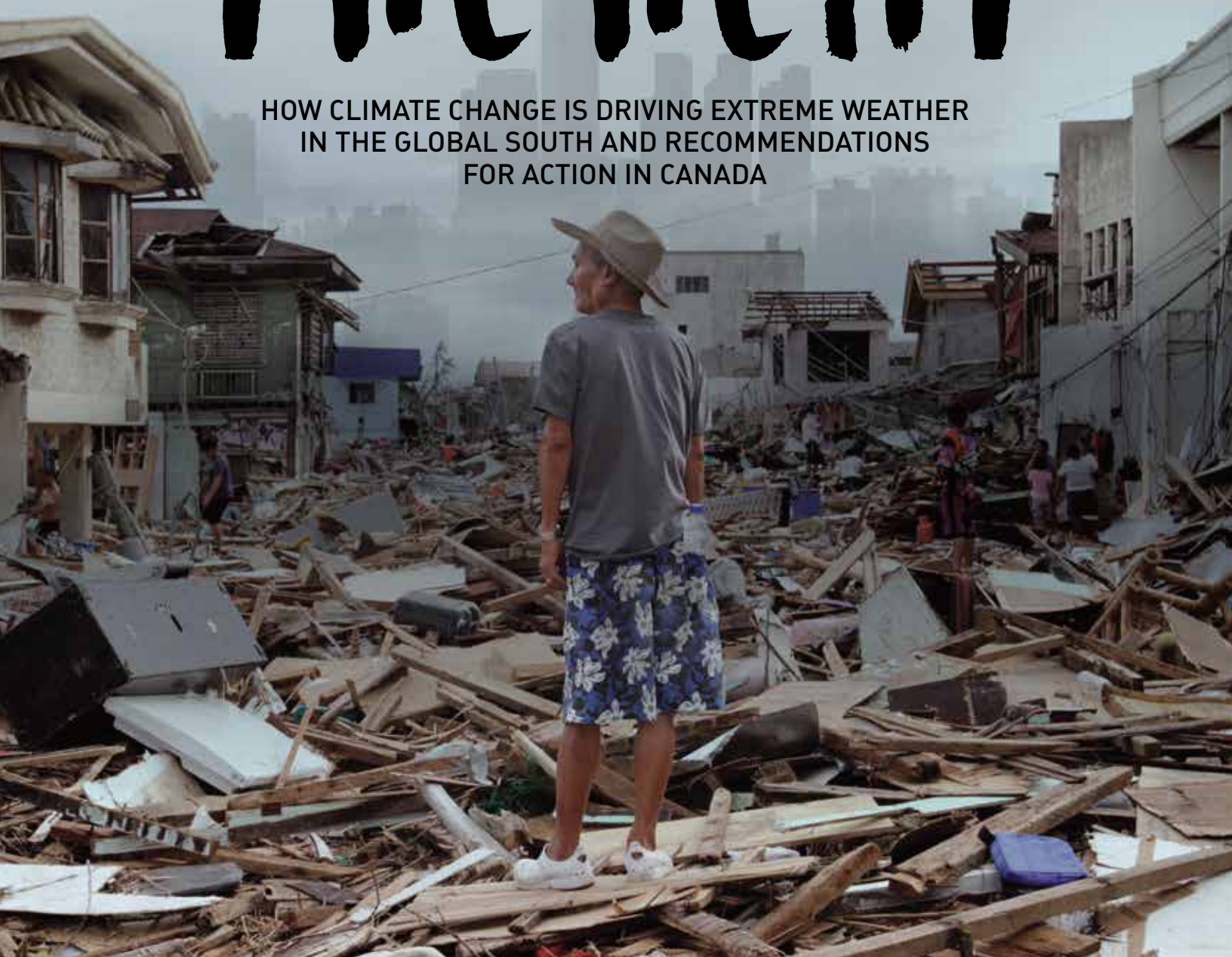


CANADIAN CATHOLIC ORGANIZATION FOR

**Development
and Peace**

FEELING THE HEAT

HOW CLIMATE CHANGE IS DRIVING EXTREME WEATHER
IN THE GLOBAL SOUTH AND RECOMMENDATIONS
FOR ACTION IN CANADA



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“THE BIGGEST PROBLEM
IS SOMETHING THAT MANY
PEOPLE IN THE WORLD
TAKE FOR GRANTED:
WATER.”

GEBRE NIGUSSE, Ethiopia

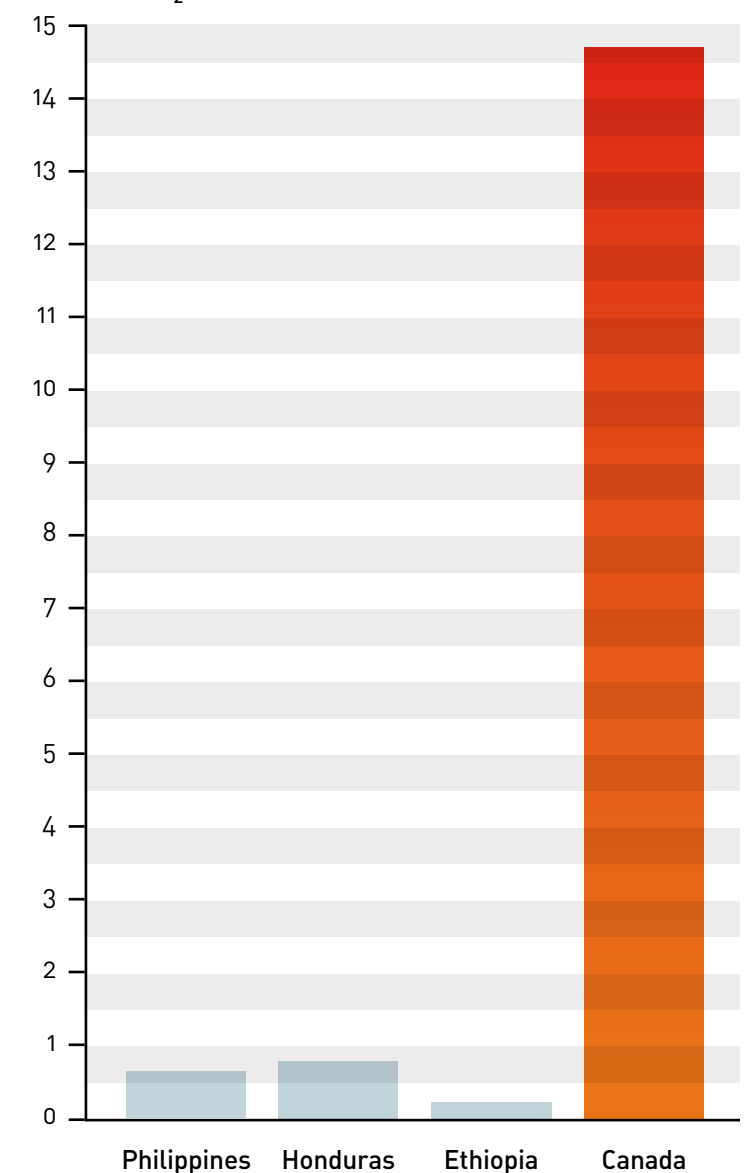
YOU KNOW THAT EXPRESSION "OFF THE CHARTS"?

THAT'S WHERE CANADA'S EMISSIONS ARE COMPARED TO THOSE OF THE COUNTRIES FEATURED IN OUR CLIMATE CHANGE REPORT.

In Honduras, Ethiopia, the Philippines, as well as in Canada, climate change is causing floods, extreme heat and extreme cold, droughts, disasters, water scarcity and food insecurity around the world. However, climate change is affecting the poorest countries most severely, and unlike Canada, these countries do not have the resources to respond. And yet, Canada has emissions per capita that are 150 times higher than those in Ethiopia.

It's true: the people who are doing least to cause climate change are suffering the most.

CO₂ emission per capita (metric tonnes)



The Canadian edition of *Feeling the Heat* is published by the Canadian Catholic Organization for Development and Peace, as part of its 2015 fall education and action campaign "Create a Climate of Change."

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Acknowledgements: Development and Peace would like to sincerely thank Trócaire, the overseas development agency of the Catholic Church in Ireland, for permission to produce this Canadian edition of *Feeling the Heat*. We would also like to thank Dr. Conor Murphy and Dr. Mabuto Thembo from the Department of Geography, Maynooth University in Ireland who undertook the review of the latest scientific information and produced the case study research for this report. Finally, we would like to thank Dr. Catherine Potvin and the whole team at Sustainable Canada Dialogues, who produced the report *Acting on Climate Change: Solutions from Canadian Scholars*.

Source: <http://data.worldbank.org/indicator/EN.ATM.CO2E.PC>

FOREWORD

Climate change is one of the greatest challenges facing our world today. The people who are doing least to cause it are suffering the most. Those with the power to address it, including our leaders here in Canada, have so far failed us. Canadians have one of the highest carbon footprints in the world, so we have a responsibility to change course.

People in the Global South are struggling to survive in the face of drought, storms and floods. Rains are becoming more erratic and extreme weather more common. Year after year crops are failing. Families can no longer plan and the lean season is growing longer. We cannot continue to tackle poverty in the world without addressing the causes of climate change and helping people adapt to its impacts.

Development and Peace believes that by working together, we can tackle the injustice of climate change. We can make the transition to a more sustainable and equitable world. Food can be produced in ways that are more sustainable and help vulnerable farmers to overcome the impacts of climate change. We can stop digging up fossil fuels from underground, and produce clean energy on our Earth's surface that is accessible to and affordable for all.

This report was first produced by our sister development agency, Trócaire in Ireland, in collaboration with the Department of Geography at Maynooth University.¹ Development and Peace is publishing this Canadian edition, which brings together the science around climate change and the personal experiences of communities and organizations that we support. In order to adapt the report to the Canadian context, we based our recommendations on the conclusions proposed in the report *Acting on Climate Change: Solutions from Canadian Scholars*. This report was produced by Sustainable Canada Dialogues, an initiative under the UNESCO-McGill Chair for Dialogues on Sustainability, and the Trottier Institute for Science and Public Policy². Sustainable Canada Dialogues has mobilized over 60 Canadian scholars from every province, representing climate change expertise in areas from engineering to sociology. Based on the best scientific information available, the report puts forward a series of policy proposals that need to be addressed if Canada is to play its part in addressing climate change.

This is possible if we all stand together. We can speak up, we can consume less, we can consume in more sustainable ways, and we can support the work of Development and Peace to empower people to adapt to climate change.

The year 2015 can be the moment when the world finally changes course. We can put stewardship and solidarity first. As individuals, as communities, as companies and as governments we must act. Together, we are the solution to climate injustice.

EXECUTIVE SUMMARY

THE YEAR 2015 COULD BE HISTORIC. IT MAY BE THE YEAR IN WHICH THE NATIONS OF THE WORLD FINALLY AGREE TO AN EQUITABLE, PRACTICAL AND LEGALLY BINDING AGREEMENT ON CLIMATE CHANGE – OR IT MAY BE, YET AGAIN, THE YEAR THAT THEY FAIL TO DO SO.

Climate change affects us all, even those of us in Canada. The glacial winter experienced in Ontario and Quebec in 2015, the floods in Toronto and Calgary in 2013, the drought in 2012 that seriously affected agriculture, the high tides that affected the Gaspésie in Quebec in 2010, as well as Hurricane Juan that hit Halifax in 2003 - these are all examples of climate catastrophes in Canada. Yes, we too are victims of climate change, however, we have the resources to face these catastrophes: sophisticated monitoring systems, contingency plans and a network of social security to lessen hardships. For countries of the Global South, as is demonstrated by the case studies in this report, climate change adds to existing challenges, especially since these countries have far fewer resources to cope with the problems.

“WARMING OF THE CLIMATE SYSTEM IS UNEQUIVOCAL, AND SINCE THE 1950S, MANY OF THE OBSERVED CHANGES ARE UNPRECEDENTED OVER DECADES TO MILLENNIA.

The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.”

IPCC Fifth Assessment Report, Summary Report, 2013.

Our report looks at three countries: the Philippines, Honduras, and Ethiopia, and reviews the scientific literature on the effects of climate change in these countries, both present and future. Below is a synthesis of our findings on the impacts of climate change on human well-being and socioeconomic development in these countries, followed by a summary of our recommendations.

THE STATE OF CLIMATE CHANGE

Global climate change is having serious impacts on the countries featured in our case studies. In each, increases in temperature both during the day and at night are clearly observed. Longer dry seasons and hotter days are leading to increased evaporation and greater risk of drought. When rain does fall, it falls more intensely, which increases the potential for flooding, damage to crops and risks to human health through water- and vector-borne diseases. As our oceans warm, tropical storms are expected to get stronger. This is a huge concern in countries already massively affected by tropical storms. In 2013, Super Typhoon Haiyan killed over 6,000 people in the Philippines and displaced millions more. In the last century, 6 of the 12 strongest hurricanes in the world hit Honduras, including Hurricane Mitch, which killed 10,000 people in 1998.



PROJECTED CHANGES IN CLIMATE

The graph below shows the projected changes in global temperature published by the Intergovernmental Panel on Climate Change (IPCC).¹ The red line shows what will happen to the global temperature if we continue with the 'business as usual' model – *i.e.* no reduction in emissions – whereas to maintain the temperature as shown by the blue line, requires immediate serious action by governments to curb emissions and mitigate the effects of climate change. Although this is known as the 'best case scenario,' in reality it is the only scenario in which we can hope to keep global temperatures below a 2°C increase – the limit which the international community agrees is necessary to prevent the worst effects of climate change.

In both cases, temperatures will rise for the next couple of decades. However, scenarios begin to diverge quite quickly when emissions are lowered, leading to a levelling off of warming compared to the 'business as usual' model, which will lead to a much higher change of temperature, with correspondingly more devastating effects on food security and livelihoods.

For the countries featured in the report, the predicted changes under a 'business as usual' scenario are mostly in line with the global mean, with the temperature rising by a projected 4°C by the end of the century.² The effects of rising temperatures will not be felt in the same way everywhere. Countries of the Global South are much more dependent on subsistence agriculture, and have far fewer resources with which to mitigate or adapt to climate change.



ACCESS TO WATER

With hotter days and a longer dry season, there is less rain to feed water sources, and greater losses from evaporation. In many countries where access to water is already a struggle, there will be less water to drink, to grow crops, and to power electricity. When rain does fall, it tends to fall more heavily. When this happens, less of it soaks into the ground where it's most needed for crops – instead, running off quickly and potentially causing flooding. Heavier rainfall also leads to increased sediment and pollutants in fresh water bodies. This is particularly harmful where people do not have access to safe water. In Ethiopia, for example, almost half of the population relies on unfiltered water sources such as ponds, streams or rivers.³



HEALTH

Compared with a future without climate change, the World Health Organization predicts 250,000 additional deaths per year globally as of 2030 due to higher temperatures: 38,000 due to heat exposure in elderly people; 48,000 due to diarrhoea; 60,000 due to malaria; and 95,000 due to childhood malnutrition.⁴ Changing climate conditions have been linked to increased epidemics in several of the countries featured here. For instance, rising temperatures have been associated with outbreaks of dengue fever, which struck 12,000 people in Honduras in 2013.⁵ Such communities are more vulnerable due to a lack of immunity and preparedness.



GENDER

Climate change will have the greatest impact on those with the least power. This includes women, who remain culturally disempowered in many communities. The adverse effects of climate change on agriculture will affect women disproportionately – women make up half the agricultural workforce in the least developed countries, but own only between 10-20 per cent of land.⁶ When natural disasters strike, socio-cultural norms can impact on women's ability to escape. However, when women are involved as equal participants in climate-related strategies and coping mechanisms, those strategies are more likely to succeed.



ECONOMIC IMPACTS

Our country profiles show the various ways in which climate change is already having an economic impact, and those it will have in the future. In Honduras, hurricanes have caused direct and indirect damages of over \$5 billion USD over the course of the 20th century, equivalent to 95 per cent of Honduras' GDP in 1998.⁷ In the Philippines, the cost of adaptation for agriculture and coastal zones is expected to be on average \$5 billion USD/year by 2020.⁸ In most countries of the Global South, climate change is likely to raise income inequality and reduce household wealth.



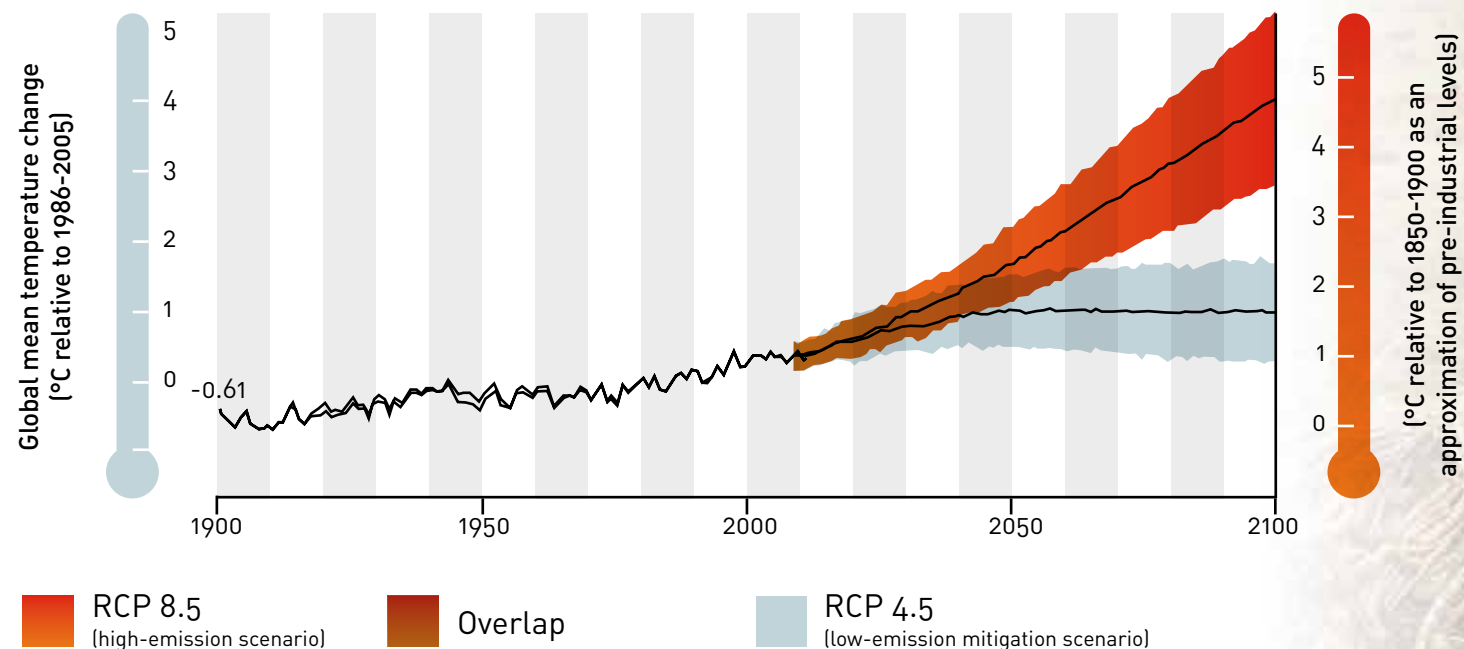
MIGRATION

Increased natural disasters, rising sea levels and prolonged droughts are all leading to increased migration and displacement. Typhoon Haiyan forced some 4 million people in the Philippines to leave their homes, approximately 400,000 of whom are still in evacuation centres. In Ethiopia, droughts have contributed to increased rural-urban migration, which is increasing urban vulnerability.



FOOD PRODUCTION

Our global demand for food is rapidly rising, but in many countries of the Global South, crops are failing with increasing frequency due to climate variability and drought. Climate change poses huge risks to global and regional food security, particularly if we continue with 'business as usual' emissions. In countries of the Global South, these risks are greatly exacerbated by low levels of investment in small-scale farmers, low access to technology, reliance on rain-fed agriculture, and high levels of pre-existing food poverty. By curbing greenhouse gas emissions, we can substantially lessen the risks of even greater food insecurity. By investing in small-scale farmers, especially women, we can increase people's resilience to climate change and food security.



RECOMMENDATIONS

At our current temperatures, the poorest in the world are already suffering the impacts of climate change, and they will suffer further as these continue to rise – which, they will inevitably do, no matter what we do next. The people who have done least to cause the problem are bearing the brunt of inadequate action to both mitigate and support adaptation. They need our support now and into the future. We also have a critical choice to make about what future we want for both the youth of today and the next generation. If we act now, urgently and ambitiously, temperature increases can be contained and will begin to level off. A failure to do so will see global poverty eradication become impossible and inequalities spiral. The following recommendations set forth what Development and Peace believes is needed in order to prevent and respond to the worst effects of climate change.

1

We must establish a fair, legally binding framework on climate change that keeps global temperature rises as far below 2°C as possible, and ensures that the most vulnerable women and men can adapt to the impacts of climate change.

An international agreement is essential to ensure co-ordinated and collective action – we all need to work together. All eyes are now fixed on the 21st UN Climate Change Conference in Paris in December 2015 (COP21), at which all the nations of the world have committed to negotiating a binding universal agreement on climate change. This action must also be replicated at the national level, with effective climate legislation here in Canada. In order to limit temperature rise to no more than 2°C, policymakers must strive for the ‘best case scenario’ by adopting ambitious targets and adaptation measures. While the threat of climate change may seem overwhelming, there is broad consensus that responding to it adequately is both achievable and affordable.⁹ A just climate agreement must also ensure the provision of sufficient, accessible and additional public finance to support communities to adapt in appropriate ways to the impacts of climate change.

2

We must switch to more sustainable ways of producing and consuming, in particular energy and agriculture.

An emissions framework as described above will provide the overall limits within which countries can operate.

To actually deliver the changes necessary to meet these targets, a transition in the way we produce and consume, particularly in the areas of agriculture and energy, is required. Agriculture, forestry, and other land use account for about a quarter of greenhouse gas emissions globally; in Canada, agriculture accounts for 10% of the total of our carbon emissions.¹⁰ These activities do not include transportation nor food transformation. The Food and Agricultural Organization (FAO) estimates that up to one-third of food produced for human consumption globally is lost or wasted, from initial agricultural production down to final household consumption.¹¹ In terms of energy, there is no alternative but to transition to a world free from fossil fuels. In order to contain temperature rise as far below 2°C as possible, more than two-thirds of current commercially viable fossil fuels will need to remain in the ground.¹² It is critical that policies are designed with adequate social and environmental safeguards to ensure that they do not result in unintended impacts on the rights and resilience of vulnerable communities.

3

We must support and promote sustainable agriculture and secure access to natural resources to ensure that the most vulnerable people can adapt to the impacts of climate change.

As the case studies demonstrate, some inevitable impacts of climate change will be felt in the coming decades even with effective action to reduce emissions. It is therefore vital that the most vulnerable people and communities around the world are supported so that they can adapt to these inevitable impacts. The scale and complexity of climate change can sometimes make the task of adaptation appear extremely difficult – but it is part of human nature to adapt, even in the face of seemingly insurmountable challenges. The individual stories of our partners in the Global South demonstrate the resilience of small family farmers, and how with even modest levels of investment in simple technologies (such as irrigation systems in Ethiopia) small family farming can flourish. Agriculture must be concerned with nourishment and the environment, and not only on commercial profitability. Ensuring that there is sufficient investment in sustainable approaches to agriculture is a first step to ensuring people not only survive, but thrive in the face of climate change. This investment must be supported by a policy framework that builds on the efforts of small family farmers and avoids the traps of ‘false solutions’ such as biofuels and ‘climate-smart agriculture.’ Guaranteeing access to natural resources, particularly land and water, are prerequisites to ensure that small family farmers can protect their livelihoods from climate change and thereby contribute to food sovereignty.

1. INTRODUCTION AND OVERVIEW

1.1 SETTING THE SCENE

Development and Peace believes that a just response to climate change requires tackling both the causes and the consequences of climate change in an equitable way. We are witnesses to vulnerable communities who are on the front-line of the impacts of climate change. They pay the price for something they have not created, and they have the fewest resources to cope with this problem. Extreme weather events such as storms and floods, as well as slower-onset events like drought, create large-scale hardships, as in the Horn and East of Africa in 2010-11 when more than 10 million people faced starvation. Projections of a future climate with even more greenhouse gases show that such extremes are expected to increase. Extreme climatic events force people living in poverty to sell what few assets they have in order to cope. They reduce the number of meals they eat per day, and pull their children out of school to work. They engage in dangerous income generating options, or migrate. This leads to a downward spiral in which escaping poverty is nearly impossible, and survival is an ongoing struggle.

The science has continued to grow around the imperative for action. *The Fifth Assessment Report* by the Intergovernmental Panel on Climate Change (IPCC), released in 2013-2014¹, builds with even more confidence on earlier scientific assessments and confirms that climate change is happening here, now and everywhere. Action on mitigation and adaptation is more urgent than ever. It is a challenge that not only requires the right government policies, but also a dramatic shift in the way we in rich countries live – a transition to a greener, low carbon future. It is up to us.

Despite this clear evidence, there have been few signs of significant progress. The commitment made by the international community at the 2010 Climate Summit in Cancun to keep the rise to a maximum temperature rise of 2°C above pre-industrial levels was an important milestone.

However, we are a long way from making this goal a reality. The *Fifth IPCC Assessment Report* confirms that

DESPITE A GROWING NUMBER OF CLIMATE CHANGE MITIGATION POLICIES, GREENHOUSE EMISSIONS ARE CONTINUING TO RISE – AND AT A HIGHER RATE.²

There has been a considerable increase in national mitigation planning since 2007, with 67 per cent of global greenhouse emissions subject to national legislation or strategies in 2012, compared to only 45 per cent in 2007.³ However, current commitments by countries to reduce their greenhouse emissions will only amount to between 3 and 7 gigatonnes of carbon dioxide emissions below ‘business as usual’ projections by 2020.⁴

This falls significantly short of the 14 gigatonnes that will be necessary to stay within the 2°C target, and even further short of the 18.5 gigatonnes needed to stay within the lower 1.5°C target that many countries of the Global South are calling for in order to ensure their survival.⁵

In order to have a greater than 66 per cent likelihood of not exceeding the 2°C threshold, the *Fifth IPCC Assessment Report* concluded that a cumulative carbon dioxide equivalent budget of less than 2,900 gigatonnes must be respected. Given that, by 2011, 1,890 gigatonnes had already been emitted, and that around 50 gigatonnes is currently emitted annually, the remaining budget for 2015 onwards is around 860 gigatonnes. If annual global emissions remain at the current level, this budget will be completely used up in less than 20 years, with one third of it gone after only 5 to 6 years. It goes without saying that the remaining budget to limit warming to 1.5°C is even smaller and will be exhausted in less time.

If additional efforts are not made to reduce emissions, the global mean surface temperature is expected to rise from 3.7°C to 4.8°C by the end of the century.⁶ At these temperature rises, the impacts of climate change will become catastrophic – beyond the limits of adaptation in many cases.

Unfortunately, Canada's record does not reflect the urgent need for action. As a signatory to the Kyoto Protocol, Canada had committed to reducing its emissions by 6 per cent below 1990 levels by 2012. Signed in December 1997 during the Third Conference of the Parties at the Convention (COP 3) in Kyoto, Japan, the Kyoto Protocol was to be renegotiated in 2012. However, during the 2011 Durban Conference on the Climate, Canada officially announced its withdrawal from the Kyoto Protocol. Canada was the only country to do so.

Canada's current target is to reduce emissions by 17 per cent from its 2005 levels. This target was established in 2009 under the Copenhagen Accord, when Canada adopted the same low targets as the United States. It is now widely recognized that Canada will not reach even this inadequate goal.⁷ However, as a state party to the United Nations Framework Convention on Climate Change (UNFCCC), Canada subscribes to the objective that was fixed at Cancun in 2010 to limit the maximum temperature increase to 2°C over the course of the 21st century.

Canada is increasingly isolated on the international scene. Since the adoption of the Canadian targets at Copenhagen, the international landscape has changed enormously. The European Union has announced that it will reduce carbon pollution to 40 per cent below 1990 levels by 2030; the United States announced in March 2015 a target of 26 to 28 per cent below 2005 levels by 2025. China has agreed to limit its emissions by 2030 or before, and during the same period generate 20 per cent of its energy from sources other than fossil fuels. Mexico announced that it will reach its maximum level of greenhouse gas emissions in 2026. In this context, it seems realistic to us that Canada follow in the footsteps of the United States and adopt a target to reduce greenhouse gas emissions by 26 to 28 per cent of 2005 levels by 2025.⁸

For Canada's climate change actions to be effective, Canada must not only work at the international level, but also on a national plan to execute a transition toward a sustainable, low-carbon society. This transition may take several paths, but the federal government needs to take the lead. The drafting and implementation of national climate policies are prerequisites to reducing Canadian emissions. However, as emphasized in the report *Acting on Climate Change*, any Canadian climate actions need to take into account the country's regional diversity. The book *Hot Air* paints a fascinating portrait of historical decision-making on emission reduction targets in Canada. The authors point out Canada's failure to meet its targets, an inability partially due to the absence of a concerted vision between the federal and provincial governments. Canada's federal government needs to show leadership on climate policy if we wish to be part of a climate solution.⁹

We must always be careful about solutions that do not take into account the impacts on the most vulnerable peoples. Policies that favour agrofuels are examples of false "good" solutions. While this type of fuel may decrease our emissions, agrofuel cultivation is to the detriment of people in the Global South. It interferes with their ability to feed themselves and with their access to land and water. It encourages land-grabbing – where land that could grow food is turned into land that grows more profitable agrofuels.

Developed countries have committed to contributing \$100 billion USD per year by 2020 in new and additional long-term financing to support adaptation and mitigation in countries of the Global South. They have also established the delivery mechanism for a significant portion of that funding, in the form of the Green Climate Fund. However, to actually deliver upon this commitment the international community must establish a clear, transparent and accountable process to increase public climate financing commitments to at least \$100 billion USD per year by 2020 in addition to overseas development assistance.

As part of the global agreement at COP21 in Paris,

ALL DEVELOPED COUNTRIES WITHIN THEIR INTENDED NATIONALLY DETERMINED CONTRIBUTIONS MUST PROVIDE INFORMATION ON THEIR PLANNED CLIMATE FINANCING PROVISIONS.

TURNING THE TIDE: FROM MISSED CHANCES TO REAL OPPORTUNITIES

Despite a series of missed opportunities over the past seven years, 2015 provides leaders – in Canada and internationally – with a series of opportunities to put us on a path to a more equitable and sustainable future. In Canada, the federal elections in the fall of 2015 will be an opportunity for Canadian voters to tell our leaders that the climate matters to us. We can propose concrete solutions to transition to a low-carbon economy. Internationally, 2015 will be a milestone year, as three international processes coincide to set the context for human development in the coming decades.

The three processes are: the negotiation of the second Hyogo Framework for Action for disaster risk reduction in March; agreement on a new set of Sustainable Development Goals (SDGs) at the UN General Assembly in September; and the negotiation of a new global agreement on climate change at COP 21 in Paris in December.

Together, these agreements will shape what is possible in terms of sustainable development and poverty reduction in the coming decades. They will set targets for emission reductions, articulate a vision of what sustainable development, including adaptation, looks like, and establish the financial and resourcing commitments needed to translate goals into action. The case studies in this report, which come from the Philippines, Ethiopia, and Honduras, illustrate the human imperative to make urgent changes. These are required to avoid reversing decades of development, and instead build and sustain peaceful, prospering and just societies into the future.

1.2 ABOUT THE CASE STUDIES

This report provides a comprehensive review of observed changes in climate, climate change projections and impacts in three Development and Peace program countries: the Philippines, Honduras and Ethiopia. The report reviews over 150 publications on recent research, predominantly from peer-reviewed international scientific journals, to provide a current overview of our emerging knowledge on how climate change is likely to unfold in some of the most vulnerable countries in the world. This is therefore a solid scientific evidence base for understanding the impacts and uncertainties of climate change in each of the aforementioned countries.

Where limited information is provided, this indicates a gap in the available scientific data. For each country an in-depth profile is provided with the following structure:

- An introduction and overview of the country's particular vulnerabilities with regards to climate change.
- Evidence on observed climate variability and change.
- Scientific information on projected changes in climate from regional and national level studies in each country.
- Assessment of impacts in key sectors, including food production, water resources, human health, migration and economic impacts. Issues of gender are also considered.

1.3 HOW TO READ THE CASE STUDIES

The *Fifth IPCC Assessment Report* of 2013/2014 provides the most comprehensive assessment of our understanding of climate change to date. Much of the global and regional data contained in this report draws upon it. It is important to understand how projections of climate impacts work, and how the latest IPCC projections are derived, in order to read and interpret this report. Global climate models, which represent current understanding of the global climate system are used to project future changes in climate. Future scenarios of greenhouse gases are used as input in these models to explore how differing global concentrations of greenhouse gases are likely to affect important climatic variables such as temperature and precipitation. There are a large number of different climate models, and different models give different results – this gives rise to uncertainty in projections. Given the importance of understanding future impacts to society, studies usually employ a number of different models so that a good understanding can be obtained about ranges of future change.

Models agree that increases in greenhouse gases will result in increases in temperatures. However, the specific amount of warming expected for an equivalent increase in greenhouse gases varies between models. Changes in rainfall and extreme events are more difficult to capture and are associated with greater ranges of potential change in the future. In order to give a best estimate, averages across different models are usually taken to represent a central estimate across the ranges of change projected by different models. The different scenarios in the *Fifth IPCC Assessment Report* are based on greenhouse gas emissions in the atmosphere, known as Representative Concentration Pathways (RCPs). While four different scenarios were examined in the IPCC report, we have concentrated here on the two most extreme. At one end, the 'business as usual' scenario (RCP 8.5) represents high emissions, where no policy changes to reduce emissions have taken place. At the other, if ambitious greenhouse gas reductions are achieved, CO₂ emissions stay at current levels until 2020, and then decline and become negative by 2100. This is the low emissions 'best case scenario.'

2. THE PHILIPPINES

IN BRIEF: WITH OVER 7,000 ISLANDS AND AFFECTED BY EL NIÑO, THE PHILIPPINES IS EXTREMELY VULNERABLE TO NATURAL DISASTERS AND ERRATIC AGRICULTURAL PRODUCTION DUE TO CLIMATE VARIABILITY.

RIGHT NOW

In 2013, Typhoon Haiyan claimed 6,000 lives.

FUTURE CLIMATE CHANGE RISKS

Eroded coastlines and coral reefs; increased risk of tropical storms.

EMISSIONS OF CO₂ PER CAPITA

0.9 metric tonnes – more than sixteen times less than Canada.

2.1 INTRODUCTION

The Philippines is classified as one of the least developed countries in the world, ranked at 117 out of 187 countries on the 2014 Human Development Index. Over half of its population live in poverty.¹ As population rates grow, people are increasingly constrained to living and farming in areas not suitable for settlement and practicing agriculture on marginal lands such as riverbanks and mountain slopes, thereby exacerbating the damage caused by extreme weather events and climate change.²

The Philippines has always been susceptible to variations in ocean temperature and rainfall, due to the El Niño effect. According to the 2013 Climate Change Vulnerability Index, the Philippines ranked as the ninth most at-risk country in the world. As early as 2012, the Asian Development Bank (ADB) released a study stating that “50.3% of the country’s land area is economically at risk from multiple hazards such as floods, typhoons, and earthquakes. This means some 81.3% of the country’s population, or around 76.6 million Filipinos, are vulnerable to economic impacts brought by natural disasters.”³

Indeed, in recent years the country has seen an increase in both frequency and intensity of extreme weather events.⁴ In 2011, a study highlighted the early recognition of the increased potential for disasters as a matter of urgent concern.⁵ Two years later, Super Typhoon Haiyan devastated the Philippines, killing over 6,000 people and displacing millions of families.

In addition to the direct impact on human life, and the costs of response and recovery, such extreme events seriously impact the country’s natural ecosystems that are major sources of livelihoods and development.⁶ Over 7,000 islands make up the nation of the Philippines, of which some 2,000 are inhabited. Rising sea levels are projected to result in agricultural land loss⁷ and destruction of coral reef ecosystems, on which many Filipinos are dependent for coastal protection, subsistence fisheries and tourism.⁸ Future projections of climate indicate that the Philippines is expected to experience a significant rise in temperature and increased rainfall variability, with the highest increases projected to occur in major agricultural regions.⁹ Climate change therefore presents a systemic challenge to the country’s efforts to address poverty and realise sustainable development.¹⁰

As a nation, the Philippines is acutely aware of the threats posed by climate change to their people’s well-being. A national Climate Change Commission was established in 2009 as an independent government agency. In the aftermath of Typhoon Haiyan, the Climate Change Commission delegation to the UN Climate Change Summit in Warsaw pleaded with the international community to “take drastic action now to ensure that we prevent a future where super typhoons are a way of life,” and to “stop calling events like these natural disasters” because “It is not natural when science already tells us that global warming will induce more intense storms.”¹¹ The Commission’s message is representative of a general awareness and activism on climate change and disaster risk reduction in the Philippines, where local organizations and networks strive to raise these issues at a national and more global level.

In 2012, Margareta Wahlstrom, then the Special Representative of the United Nations’ Secretary-General for Disaster Risk Reduction, affirmed that the Philippines’ legislative framework for climate change was one of the best in the world. During an interview she said, in speaking of the Philippines: “You do have now an excellent legal framework for disaster risk reduction and an excellent framework for climate adaptation. The basis (of the laws) is really for empowering local governments.”¹²

In fact, two laws frame the actions of the government on climate change. The first is the Climate Change Act, adopted in 2009, which created a national commission on climate change, and the second is the Philippines Disaster Reduction and Management Act adopted in 2010. In addition to these two laws, the government has developed a national plan of action on climate change (PANCC) covering 2011 to 2028. The plan identifies food security, water sufficiency, ecosystem stability, human security, climate-smart businesses and services, and knowledge and capacity development as action priorities¹³.

Unfortunately, the economic policies of the Filipino government, which are based on exports and opening the country to foreign investment, undermine these initiatives. The mining policy adopted in 1995 and the subsequent reforms implemented by the Aquino government illustrate the contradictions between the legal framework on climate change and the economic and development policies put forward by the government. Despite its economic “opening” and the fact that the Philippines is the country in Southeast Asia with the fastest economic growth in recent years, the living conditions of the population as a whole have not improved, rather to the contrary. The economic growth of the country has not translated into a decrease in poverty, nor a reduction in the unemployment rate, even less into a decrease in the gap between the rich and the poor, and nor a significant increase in socioeconomic conditions. According to an October 2013 survey by the organization Social Weather Stations, nearly 10.4 million families described themselves as poor, while 8.5 million said they had difficulty meeting the food needs of their family in the previous three months.¹⁴

Given that poor people are the least able to cope with climate change,

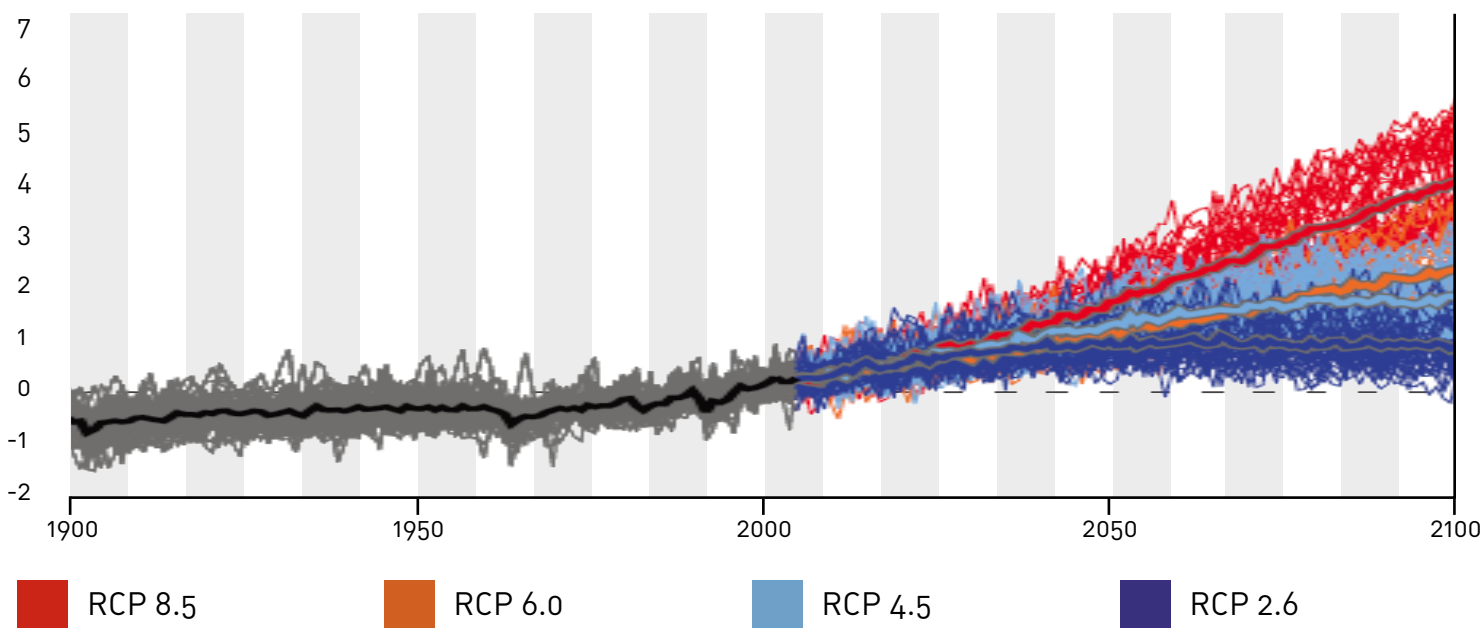
AN IMPORTANT PART OF THE FILIPINO POPULATION IS VULNERABLE TO THESE CHANGES.

2.2 OBSERVED CLIMATE VARIABILITY AND CHANGE

There is an increase in observed mean temperatures in the Philippines of 0.64°C from 1951-2010.¹⁵ The increases in temperature were greater in the latter half of that period, and 1998 and 2010 were the warmest years since 1951 in the Philippines.¹⁶ The country is experiencing an increased number of hot days and a decreasing number of cool nights.¹⁷

The El Niño effect causes year-to-year variations in rainfall and large variability in extreme precipitation in the Philippines.¹⁸ Increasing trends in the number of “no rain” days have been observed over the western Philippines.¹⁹ The total southwest monsoon rainfall has declined significantly over the last 50 years, with time series analysis showing rates of decrease ranging from 0.026 per cent to 0.075 per cent per decade in the western half of the country.²⁰ For all of the Philippines, significant drying trends in the dry season are observed, which may cause droughts, while a wetting tendency is observed during the wet season which may increase risk of flooding.²¹ Households have seen changes in climate including an increase in rainfall variability, rising sea levels and an increase in the intensity and frequency of storm events.²²

Temperature change Southeast Asia (land) annual (°C)



Projected changes in annual temperature relative to 1986-2005 under different greenhouse gas emissions pathways for Southeast Asia. Red is ‘business as usual’ emissions (RCP8.5), dark blue represents ambitious reductions in global emissions (RCP2.6) Thin lines denote a single model projection; thick lines show the mean simulation for multiple climate models.²³

2.3 PROJECTIONS OF FUTURE CLIMATE CHANGE

The graph below shows the projected changes in annual temperature for Southeast Asia to the end of the 21st century. Temperature increases are predicted for all scenarios of greenhouse gas emissions examined, with the rate of temperature increase diverging after mid-century. If greenhouse emissions are not decreased – the ‘business as usual’ RCP 8.5 scenario – an average warming of approximately 4°C is predicted, with some models indicating temperature increases above 5°C. The best case scenario (RCP2.6), which would require an ambitious global agreement to reduce emissions, shows an average warming of approximately 1°C by the end of the century. Longer seasonal dry periods, and more frequent droughts are likely under the ‘business as usual’ scenario. Longer wet and dry periods would have implications for food production, coastal system services including fisheries,²⁴ human settlement and health, livelihoods and socioeconomic development.

Country-level studies for the Philippines project a mean annual temperature increase of 0.9 to 1.1°C by the 2020s, and 1.8 to 2.5°C by 2050 under a medium high emissions scenario (SRES2).²⁵ These climate projections further indicate that a reduction in rainfall in most parts of the country during the summer season is expected. Yet, the country is expected to experience increases in both the frequency and intensity of extreme daily rainfall events.²⁶

2.4 FOOD PRODUCTION AND CLIMATE CHANGE

Climate change poses significant risks for food security in the Philippines, particularly due to impacts on agriculture and fisheries. Under current conditions natural climate variability has a large impact on agricultural productivity with the effects of El Niño being felt in various sectors of the economy: agriculture, environment, water resources, energy and health. The agricultural sector is most vulnerable to drought and changes in the southwest monsoon rainfall.²⁷ About thirteen million hectares of agricultural area produce a wide variety of fruits, grains and vegetables. More than half of this area is devoted to rice and corn, the Filipino staple foods. Corn and rice producing areas are vulnerable to El Niño.²⁸

Coastal resources are highly vulnerable in the Philippines. Over 60 per cent of the population live by the coast, with the majority of these people depending on agriculture and fisheries for food and livelihoods.²⁹ Resources on the coast will likely be severely impacted by global warming, particularly coral reefs which underpin fisheries in the country.

SEA LEVELS ARE FORECAST TO RISE AND SOME LOW-LYING ISLANDS MAY BE COMPLETELY SUBMERGED.³⁰

Climate variability also impacts heavily on fisheries. In El Niño years, when the Pacific Ocean warms, fish move to colder waters in search of food. An increase in the occurrence of El Niño events would therefore impact fish catch. Fish catch, which tends to be lower during dry (summer) months than during rainy months, will also be affected by the projected lengthening of the dry seasons.³¹ Coastal flooding, coastal erosion, saltwater intrusion and drought may exacerbate food insecurity and habitat degradation in coastal regions, for example in Manila Bay.³² Among the various socioeconomic groups in the Philippines, poor coastal families, specifically small-scale fishermen and shellfish gatherers, are the most vulnerable to these impacts, followed by the enterprising poor and the self-employed. Women within these socioeconomic groups are particularly vulnerable to food insecurity impacts.³³

As noted above, increasing temperatures are expected to negatively impact coral reefs, an important resource in small tropical islands and a source of well-being for many island communities. Reefs play a significant role in supplying sediment to island shores and in dissipating wave energy thus reducing potential foreshore erosion.³⁴ Coral reefs also provide habitat for a host of marine species upon which many island communities are dependent for subsistence foods, and underpin beach and reef-based tourism and economic activity. There is clear evidence that climate change will kill off living coral and consequently fishing production.³⁵ The impact of climate change in the Philippines could therefore lead to more malnutrition, higher poverty levels, and possibly, heightened social unrest and conflict in certain areas in the country due to loss of land.

2.5 ACCESS TO WATER

Freshwater supply in small island environments continues to present challenges and in all previous IPCC reports fresh water supply in small islands has remained highly vulnerable.³⁶ Watersheds and river catchments are highly sensitive to rainfall variations. In the Philippines, rivers on volcanic and granitic islands have limited storage for water. In addition rivers on porous limestone and low atoll islands have minimal surface runoff and water rapidly percolates into the groundwater. Therefore, the projected changes in rainfall, with longer dry seasons and more intense rainfall in the wet season, are expected to create severe water shortages and stress both in quantity and quality. Increases in rainfall variability and longer dry periods will affect the amount of water in dams which provide irrigation services to farmers, especially those in rainfed areas, thereby limiting agricultural production. The *Fifth IPCC Assessment Report* indicates that stress on water due to heavy rain and increases in temperature will increase the risk of diarrheal diseases among the resource poor.³⁷ The effects of climate change on domestic water supply are compounded by governance and infrastructure challenges in the Philippines, adversely affecting access to safe water, especially in rural areas. Although the joint Monitoring Programme for Water Supply and Sanitation indicates that access to improved water sources is being achieved and access to sanitation is on track, the country’s water quality is greatly compromised.³⁸ Surface water and groundwater quality is deteriorating rapidly. Major pollution sources for surface and coastal waters in terms of Biological Oxygen Demand (BOD) load are point sources. Among non-pollution sources, agricultural runoff is the major source of pollution.³⁹ More intense rainfall will increase nutrient washout from agricultural land.

2.6 GENDER

It is clear that climate variability has rapidly become a serious threat to human society and well-being in the Philippines.⁴⁰ The country often experiences climate-related disasters, and both men and women have developed adaptation strategies that make them resilient to extreme weather events.⁴¹ Available evidence shows that men and women adapt to flooding according to their traditional roles but women have extra new roles and burdens in addition to farming roles and managing daily household welfare.⁴² Contemporary studies indicate that often men occupy freer spaces in society, enabling them to cope with and recover from disasters much more easily than women, who occupy enclosed private spaces without windows of opportunity to adapt.⁴³ Even in their productive roles, women struggle to cope with and recover after disasters because they are marginalized in governance structures and have unequal access to entitlements compared to male counterparts.⁴⁴

In the Philippines women lack resources and power and usually take up roles that make them less mobile.⁴⁵ Although in the Philippines there is some transformation that may help women cope with climate-related extreme events, literature shows that culturally, they continue to have less power over family finances and other assets.⁴⁶ There is gender bias in power and decision-making that limits engagement in community development and politics for women, and is exacerbated by many cultural restrictions on mobility and education.⁴⁷ Women in the countryside have lower incomes and are more likely to be economically dependent which compromises their adaptive capacity.⁴⁸ Following disasters, the vulnerabilities of poor women are exacerbated, leaving them more at risk to the threat of trafficking.

ACCORDING TO ANECDOTAL EVIDENCE, THERE IS AN INCREASE IN HUMAN TRAFFICKING IN THE WAKE OF DISASTERS.



2.7 MIGRATION

Literature indicates that Filipinos have always migrated, seeking employment globally. With future climate change projections and intensifying disasters, however, migration is likely to increase. Weather related disasters have forced huge numbers of Filipinos to leave their homes. Caroline Coiati, featured in the following story, was just one of the 4 million people displaced by Typhoon Haiyan. Following disasters, many Filipinos have migrated to seek employment and support their families through remittances as a way of coping.

Internal migration in the Philippines is driven by socioeconomic factors. The general trends of migration show that poor people move away from areas of high risk, especially into cities. Urban-rural migration is common, with people moving into cities where services and infrastructure are more developed.⁴⁹ This is exacerbated by the impact of climate variability on the agricultural sector. Crop and livestock producers abandon agriculture because of decreasing yields and migrate to urban areas to seek new job opportunities.⁵⁰ These shifts in population result in additional pressures on already under-resourced and vulnerable urban areas, particularly in mega cities.

“ALL THIS DESTRUCTION WAS BECAUSE OF THE TYPHOON... IT IS ALL BECAUSE OF CLIMATE CHANGE.”



Even more than a year after Super Typhoon Haiyan hit her coastal community in Tacloban City in the Philippines, Caroline Coiati, 25, can't help but get emotional thinking about the day the storm landed. It was the last time that she saw her parents, who disappeared with the storm. "My parents stayed behind to help my brother who had been injured by the strong winds," she says, her eyes welling with tears as she tells the story of that fateful day.

Caroline had decided not to evacuate because her house was made of concrete, but when she saw the rising waters, which were reaching above her waist, she became concerned for her 3-month-old baby. She decided to go to a warehouse where her brother-in-law worked. Even there, they were not completely shielded from the strength of this unprecedented storm, whose winds were reaching over 300 km/hour. As the people in the warehouse climbed to the roof to escape the flooding inside, her baby was carried away by the rushing water. Thankfully, her husband managed to catch the baby and bring him back to safety.

Once the typhoon had calmed and it was safe for them to return to their home, they were confronted by piles of debris everywhere. Nothing was left of her house but the floor. As they passed dead bodies on the way, Caroline, who had no news of her parents, checked to see if they were among them.

"Previous typhoons never caused the house to collapse. It was because of the storm surge, which we were never warned about. We were not expecting it," she says. The storm surge was a massive tidal wave, created by the strong winds, that reached as high as 5 metres. It was a phenomenon that had never before been seen in Tacloban. Due to the lack of knowledge about the possibility of a storm surge, many did not evacuate, and the typhoon caused the death of over 6,300 people.

It has been over a year since Super Typhoon Haiyan hit her community, and Caroline Coiati is still experiencing the trauma and impacts of the experience.

2.8 HEALTH

Globally, the effects of climate change on human health will be both direct and indirect, and are expected to exacerbate existing health risks, especially in the most vulnerable communities where the burden of disease is already high.⁵¹ Direct impacts of climate change on health in the Philippines relate to increased incidences of floods and droughts, and also typhoons. Incremental increases in temperatures and changing rainfall regimes could trigger adverse health impacts; in particular, the outbreak and spread of water-based and vector-borne diseases leading to higher morbidity and mortality. For example, in addition to the direct loss of life caused by Super Typhoon Haiyan in the Philippines, the storm was also associated with water-borne illnesses.⁵²

2.9 ECONOMIC IMPACTS

Between 1998 and 2009, 12.1 million people were exposed to extreme weather events, with damages accounting for a 23.9 per cent loss in GDP.⁵³ Under a medium high emissions scenario, losses of up to 2.2 per cent of GDP are projected annually by 2100 due to climate change impacts on agriculture.⁵⁴ Projected losses are well above the world's projected mean GDP loss of 0.6 per cent each year by 2100 due to market impact alone. Losses connected to agriculture could reach 5.7 per cent of GDP and 6.7 per cent of the GDP if catastrophic risks are also taken into account.

“Climate change is our opportunity to make the Philippines a better nation. Even if it is a huge problem, it still has a positive side to it because it can change the way we govern our country...”

THIS IS A WAR AND WE WILL SURVIVE BECAUSE THERE IS NO CHOICE.”⁵⁵

2.10 LOOKING TO THE FUTURE

The future for the Philippines looks challenging – eroding coast lines and destruction of coral reefs leading to loss of livelihoods, increased risk of typhoons which already cause widespread destruction on a regular basis, and increased risk of climate variability with serious implications for agricultural production. Even with these seemingly overwhelming challenges, there is hope.

With the help of the global community, the Philippines can avoid the worst effects of climate change, and adapt to the challenges that will inevitably arise. Development and Peace has worked in the Philippines since the 1970s, first through the Asia Partnership for Human Development (APHD). This partnership, now ended, grouped 23 Catholic development agencies from Asia, Europe, Australia, New Zealand and Canada. During the 1990s, Development and Peace developed a specific program for the Philippines and supported social movements and local organizations in projects having a social justice aim.

Following Super Typhoon Haiyan, Development and Peace and its Filipino partners on the ground modified the program to integrate concepts of humanitarian aid and the reduction of risks within a perspective of long-term development. Our reconstruction program aims to break the vicious cycle of chronic poverty and climate catastrophes by supporting local and national initiatives which will permit a diversity of means of subsistence, guarantee access to land, and facilitate the participation of peoples touched by the typhoon to identify relocation sites which respond to their needs. Finally, our programming calls for local governments to be more accessible to citizens and, in time, to respond in an adequate fashion to climate catastrophes.

2.11 SUMMARY OF FINDINGS



TEMPERATURE

Significant warming is predicted for the region of Southeast Asia. With unabated emissions an average warming of approximately 4°C is simulated across all models by the end of the century.



RAIN

Rainfall projections for the region show a large range of changes over the coming century, with the direction of change uncertain. Country level studies indicate a reduction in rainfall in most parts of the country during the dry season and an increase in rainfall during the monsoon seasons.



GDP

Under a medium high emissions scenario, an estimated loss of up to 2.2 per cent of gross domestic product (GDP) is projected annually by 2100 due to climate change impacts on agriculture.



FOOD

Climate change poses significant risks for food security in the Philippines, particularly for agriculture and fisheries. Under current conditions natural climate variability has a large impact on agricultural productivity with the effects of El Niño being felt in various sectors of the economy. The agricultural sector is most vulnerable to drought and changes in the southwest monsoon rainfall.



WATER

Projected changes in rainfall are expected to create severe water shortages and stress both in quantity and quality. Increases in rainfall variability and longer dry periods will affect the amount of water in dams that provide irrigation services to farmers, especially those in rain-fed areas.



HEALTH

The effects of climate change on human health will be both direct and indirect, and are expected to exacerbate existing health risks, especially in the most vulnerable communities where the burden of disease is already high. Direct impacts of climate change on health in the Philippines relate to an increased incidence of floods and droughts. Increases in temperatures and changing rainfall regimes could trigger adverse health impacts; in particular, the outbreak and spread of water-based and vector-borne diseases leading to higher morbidity and mortality.



GENDER

Research asserts that women are disproportionately impacted by disasters, severe weather events, and climate change because of cultural norms and the inequitable distribution of roles, resources, and power, especially in countries of the Global South. In the Philippines there is gender bias in power and decision-making that limits engagement in community development and politics by women, and is exacerbated by many cultural restrictions on mobility and education.



MIGRATION

Migration and relocation are important coping mechanisms for communities living in disaster vulnerable areas. The projected impacts of climate change on agriculture and coastal resources may influence migration. Following weather related disasters many Filipinos have migrated to seek employment and support their families through remittances as a way of coping. With future climate change projections and intensifying disasters, migration as adaptation is likely to increase.

3. HONDURAS

HIGHLY VULNERABLE TO EXTREME WEATHER EVENTS, INCLUDING TROPICAL HURRICANES.

RIGHT NOW

Currently rated the country in the world worst affected by extreme weather events.

FUTURE CLIMATE CHANGE RISKS

Increased water scarcity and contamination, reduced staple food production yields.

EMISSIONS OF CO₂ PER CAPITA

1.1 metric tons – 13 times less than Canada.

Vulnerability to extremes has consistently increased over recent years as a result of pervasive and structural poverty, extremely high levels of inequality in terms of income distribution, the impacts of persistent extreme events and limited access to critical infrastructure and basic services such as the water supply.

Faced with this situation, the Honduran government in 2010 adopted a National Climate Change Strategy (NCCS). The goal of this national strategy is to reduce the country's vulnerability to climate change by enhancing its legislative framework linked to climate change, but also by improving strategies and measures for adaptation and the reduction of greenhouse gas emissions in Honduras. The NCCS identified 17 strategic goals, of which 15 deal with adaptation and 2 with emissions reduction goals.⁵

While this government initiative is promising, other Honduran policies contradict its goals. In January 2013 Honduras adopted a new mining law, formulated with the support of the Canadian government, and replacing the former mining code. Its objective is to create a climate favouring national and foreign mining investment. A free trade agreement between Honduras and Canada also came into force in November 2014. Since the adoption of this law, there are 98 mining concessions for metallic minerals in operation and 329 new requests for concessions. A further 194 non-metallic mining concessions are in operation, and 233 new requests in this area are pending. Our partners estimate that if all these requests had been approved and the mining operations started, close to 65 per cent of Honduran territory would now be dedicated to mining activities.⁶

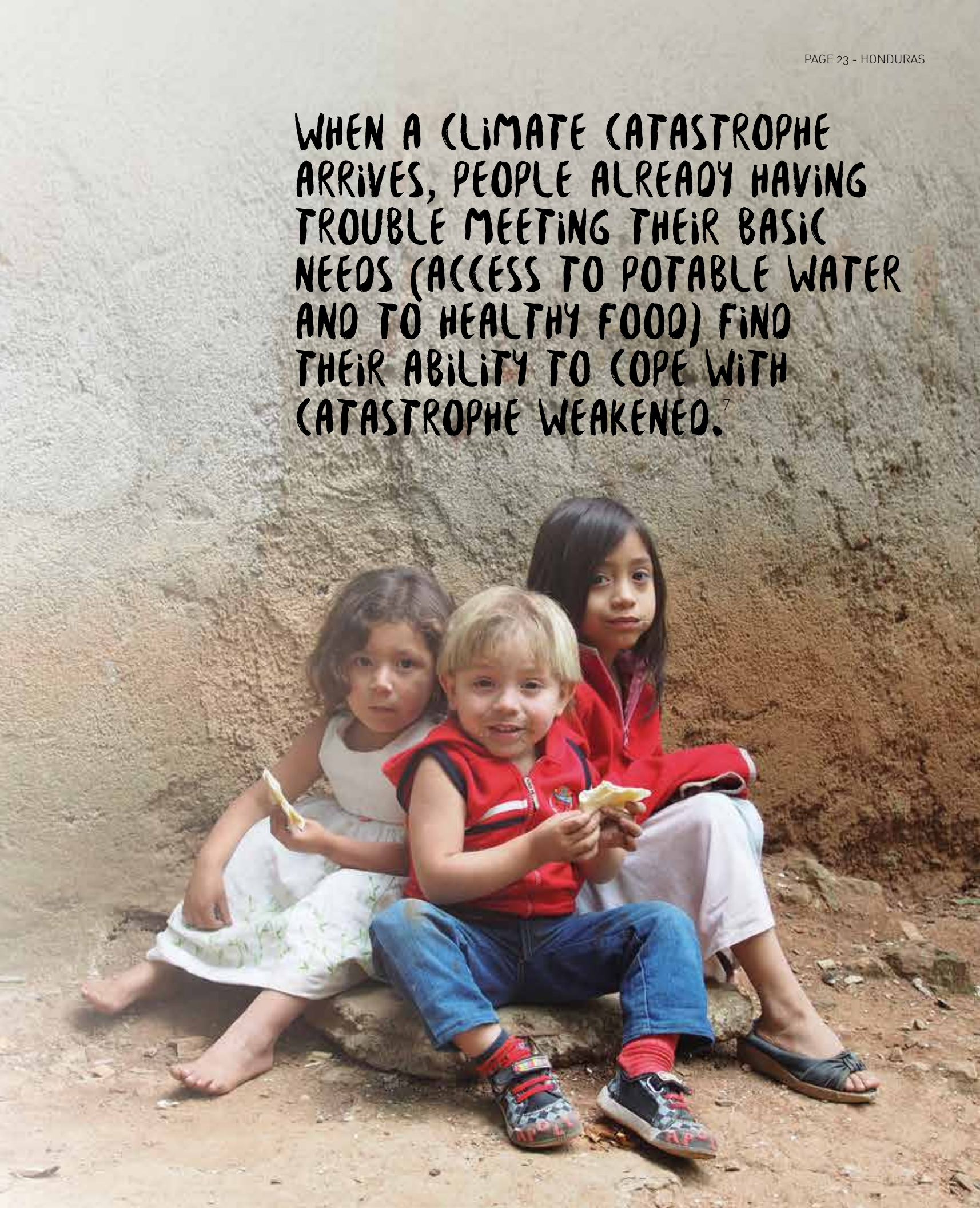
The new mining law will hinder the efforts being made under the NCCS, because of the contribution of mining to climate change. Mining affects both the adaptation ability of local populations and mitigative measures. Greenhouse gas emissions that are part of mining operations contribute to climate warming, decreasing the effectiveness of any mitigative measures. The impact of mining activities primarily affects the ability of populations to adapt. Mining activities affect water and air quality and degrade the land. Access to water, but also to fish and to agriculture, are threatened. When a climate catastrophe arrives, people already having trouble meeting their basic needs (access to potable water and to healthy food) find their ability to cope with catastrophe weakened.⁷

WHEN A CLIMATE CATASTROPHE ARRIVES, PEOPLE ALREADY HAVING TROUBLE MEETING THEIR BASIC NEEDS (ACCESS TO POTABLE WATER AND TO HEALTHY FOOD) FIND THEIR ABILITY TO COPE WITH CATASTROPHE WEAKENED.⁷

3.1 INTRODUCTION

In global terms, Central America and Honduras are hotspots for adverse climate change impacts, consistently ranking highly on global assessments of climate change vulnerability. Honduras is one of the poorest countries in Central America. Currently, about one million households live below the poverty line.¹ Poverty is greatest in rural areas and closely related to land scarcity and governance of land distribution. Less than 2 per cent of farmers own more than 40 per cent of farmland and an estimated 300,000 families are landless.

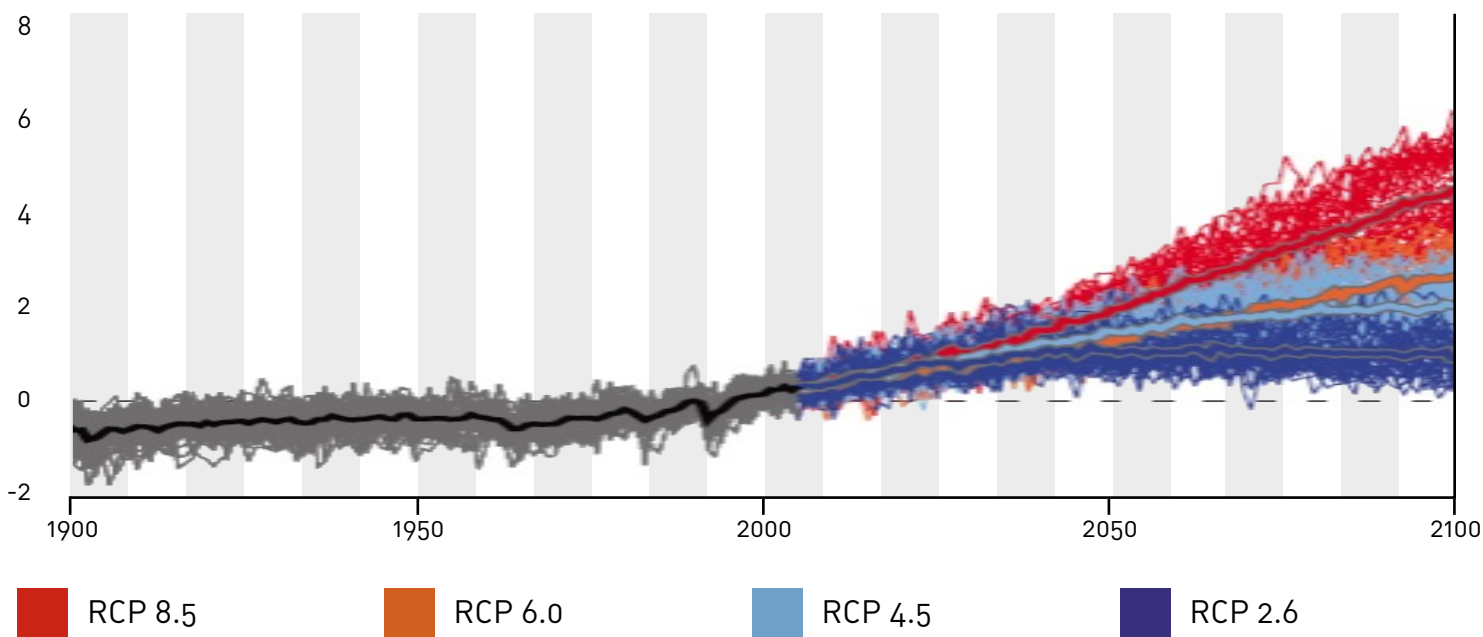
Like the Philippines, Honduras is vulnerable to extreme weather events, including tropical storms. Taking into account casualties and GDP losses, Honduras was the country in the world worst affected by the impacts of extreme weather events from 1993 to 2012.² Over those 20 years, at least 65 extreme weather events occurred in Honduras, leading to annual economic losses of over 2.6 per cent of GDP.³ Six of the twelve strongest hurricanes of the 20th century affected Honduras. The most notable was Hurricane Mitch in 1998, which resulted in more than 10,000 deaths, devastation of the country's infrastructure and drinking water network, and extensive crop losses.⁴



3.2 OBSERVED CLIMATE VARIABILITY AND CHANGE

Honduras has seen increases in the number of warm days and decreases in the number of cold days.⁷ Extremely warm temperatures occur more frequently while extremely cold temperature events have decreased.⁸ There have not been significant increases in the total amount of rainfall, but rainfall is intensifying, with more wet and very wet days.⁹ This leads to risks of both floods and droughts, as more of the total rainfall occurs as extreme events. Drought conditions affect Honduras with high frequency with negative social and economic impacts. Rural populations in central and southern Honduras are frequently subjected to food insecurity due to drought conditions linked to El Niño. Further warming and changes in the intensity and variability of precipitation may pose a serious threat to biodiversity, water resources and related socioeconomic sectors for Honduras and throughout Central America.¹⁰

Temperature change Central America annual (°C)



Projected changes in annual temperature relative to 1986-2005 under different greenhouse gas emissions pathways for Central America. Red is business as usual emissions (RCP8.5), dark blue represents ambitious reductions in global emissions (RCP2.6) Thin lines denote a single model projection; thick lines show the mean simulation for multiple climate models. (Source: IPCC, 2014)

3.3 PROJECTIONS OF FUTURE CLIMATE CHANGE

The figure below shows the changes in annual temperature and precipitation for Central America. Under a 'business as usual' scenario, with no reduction in emissions, the average projection is for temperature increases of approximately 4°C by the end of the century. Some individual models show increases of up to 6°C above current temperatures. With ambitious reductions in global emissions the central estimate of warming is approximately 1°C with projections from individual models ranging from slight increases to increases of up to 2°C by the end of the century.

Decreases in rainfall are expected throughout Central America under 'business as usual' scenarios – by as much as 40 per cent according to some projections. Large reductions in rainfall during the rainy season are projected, with negative impacts for the regions high value ecosystems.¹¹

Droughts are very likely to intensify and become more prolonged in the 21st century in Central America, due to reduced rainfall and/or increased evapotranspiration.¹² Changes in dryness will have implications for crop production on which the economy of Honduras is heavily dependent. Increases in sea surface temperatures in the region are likely to affect monsoonal rainfall upon which agriculture, water and energy depends. Projected sea level rise will compound the impacts of tropical storms where storm surges have been associated with great loss during past events. Increases in intense rainfall events will also increase the likelihood of mudslides, debris flows and slope failures to which there is high exposure and vulnerability in many parts of Honduras.¹³

One study looks at coping with climate variability and change in the city of La Ceiba in Honduras, highlighting the high risks associated with flooding due to lack of city drainage infrastructure, river flooding from the Rio Cangrejal and flooding from heavy rainfall and storm surges associated with hurricanes.¹⁴ An increase of 13 per cent in the volume of heavy rainfall is associated with high emissions for the 2050s, which would result in about a 60 per cent increase in flood flows. With more intense hurricanes the flow of the Rio Cangrejal could increase by one-third during storms. Projected rapid development in coastal zones is also likely to increase the risks of sea level rise and storm surges.¹⁵

LOSSES FROM MAIZE PRODUCTION IN HONDURAS COULD AMOUNT TO 120,000 TONNES ANNUALLY, VALUED AT \$40 MILLION USD BY 2025.¹⁹

3.4 FOOD PRODUCTION AND CLIMATE CHANGE

Maize and beans are the core components of diets and culture in Honduras with most small family farmers engaged in production of these crops. Overall yields are low. Land degradation coupled with climate change and limited access to credit and basic services are likely to adversely impact agriculture in Honduras. Across El Salvador, Guatemala, Honduras and Nicaragua, losses in the gross production value of maize of \$120 million USD are expected by 2025.¹⁶ These losses are expected for all global emissions scenarios, since the beneficial effects of reduced emissions would not be seen until after 2050. Maize is highly sensitive to water shortages with decreases in rainfall and more intense and prolonged drought likely to be problematic for agriculture.

Without adaptation and mitigation further losses in production will pose challenges to the food security of many of the rural poor. All parts of the country are expected to experience yield losses in excess of at least 10 per cent by 2020.¹⁷

Beans are very sensitive to drought conditions and temperature extremes, especially night time temperatures that reduce flowering and overall production. With temperature rises of just 2°C by the end of the century, bean production in Honduras could be reduced by more than 20 per cent. Rural households will have an especially hard time coping with climate change where infrastructure (equipment and roads) is inadequate, access to natural resources (water and land) is limited, financial resources are scarce, and social capital is very weak.¹⁸

A further study estimated the sensitivity of maize and beans, and small-scale cultivation of these staple crops, to projected increases in temperatures and reductions in rainfall.²⁰ Their results indicate significant reductions in yields with climate change. Maize yields are expected to decrease by 4 per cent by 2025, and by 12 per cent by 2050, compared with 2000. Average bean yields are expected to decrease by 11 per cent by 2025 and 32 per cent by 2050. Yields in lowland areas were more affected by increasing temperatures. Increasing instability of rainfall patterns will render agricultural planning more difficult and crop losses more probable.²¹

3.5 ACCESS TO WATER

Water resources in Honduras are already threatened by overexploitation, as well as by contamination from diverse sources that include waste, agricultural drainage, surface runoff and mining leachates.²² Access to treated drinking water is limited in many rural parts of Honduras. In urban areas, particularly in the capital Tegucigalpa, population growth as a result of rural-urban migration is increasing pressures on the water supply where water rationing is in effect throughout the year.

Current pressures are likely to be exacerbated by climate change, leading to severe water scarcity. Reductions in annual rainfall, particularly in the northwest and southeast of the country pose significant challenges for water supply. For the second half of this century, runoff which is critical for replenishing rivers may be reduced by as much as 30 per cent in dry seasons with significant secondary effects for water supply, particularly in urban areas.²³ For the Lempa River basin, one of the largest basins in Central America, covering portions of Guatemala, Honduras and El Salvador, research has shown that future climate projections (increase in evaporation and reduction in precipitation) imply a reduction of 20 per cent in inflows to major reservoirs in this system with a potential reduction in hydropower capacity of up to 53 per cent by 2070-2099.²⁴

3.6 GENDER

Research suggests that, given the opportunity, women are more likely to receive and act on early warnings.²⁵ An example of the power of involving women in disaster response is the story of the municipality of La Masica, which reported no deaths following Hurricane Mitch, unlike other municipalities in the northern Atlantida department.²⁶ Six months before the disaster, a community emergency preparedness plan had been put in place, and the community had decided that men and women should participate equally in all hazard management activities. When Mitch struck, women participated alongside men in all aspects of the relief operations – including stepping in when men abandoned continuous monitoring of the early warning system.²⁷ Women in La Masica reported a lower incidence of depression following the disaster, most likely because of their active role.²⁸

3.7 MIGRATION

Increases in land scarcity, coupled with displacement following extreme events are currently changing migration patterns in parts of Honduras. Where temporary migration was the norm, in building resource bases before returning to rural villages, contemporary trends are showing more permanent migration driven by changing power structures around land tenure, economic decline and extreme weather events.²⁹

3.8 HEALTH

Apart from the danger of loss of life associated with increased flooding and storms, rising temperatures and increases in rainfall intensity have implications for the spread of vector-borne diseases. The aftermath of Hurricane Mitch saw outbreaks of malaria, dengue fever and cholera. Climate variability and change have also been linked to outbreaks of dengue fever in Honduras.³⁰ In 2013, Honduras declared a national state of emergency in response to an outbreak of dengue fever which affected over 12,000 people.

3.9 ECONOMIC IMPACTS

In Honduras, financial losses due to disasters over the past 30 years are estimated at \$4.7 billion USD, representing approximately 50 per cent of losses throughout Central America.³¹ Throughout the 20th century, hurricanes caused direct and indirect damages to Honduras of over \$5 billion USD, equivalent to 95 per cent of Honduras' GDP in 1998.³² Impacts of such extreme events are felt most strongly by the poor. Studies in the aftermath of Mitch indicate that among rural households the greatest losses were experienced through loss of crops, household assets and loss of wages or income. Relief amounted to less than one-tenth of the losses incurred by households.³³ Such extreme events can push households into poverty traps from which recovery can be difficult, and can greatly weaken their capacity to deal with future extremes.³⁴

3.10 LOOKING TO THE FUTURE

Climate variability has always presented challenges in Honduras, and climate change is expected to greatly intensify these problems. The World Bank estimates that 62 per cent of the territory of Honduras and 92 per cent of the total population are at risk of two or more natural hazards, placing it in the world's top ten countries at risk from natural disasters.³⁵ However, by strengthening communities and providing effective response, resilience to climate related extremes can be improved.

The Development and Peace program in Honduras is focused around human rights and advocacy for responsible mining practices. Development and Peace partners accompany communities whose rights are violated by mining practices. Development and Peace approaches the question of climate change in Honduras from the perspective of the environmental degradation caused by mining. By our overconsumption of products that use mined materials, we are partly responsible for the difficult living conditions of the Honduran people. By modifying our way of life, we could improve the quality of life of Hondurans.

3.11 SUMMARY OF FINDINGS



TEMPERATURE

The occurrence of extreme warm maximum and minimum temperatures has increased while extremely cold temperature events have decreased. Despite the large spatial variability in precipitation change, observations indicate that although no significant increases in the total amount are found, rainfall events are intensifying and the contribution of wet and very wet days is growing.



RAIN

Decreases in rainfall are expected throughout Central America under unabated emissions scenarios. There is high confidence that droughts will intensify and become more prolonged. Increases in sea surface temperatures in the region are likely to affect monsoon rainfall upon which agriculture, water and energy depends. Projected sea level rise will compound the impacts of tropical cyclones where storm surges have been associated with great loss during past events.



GDP

Economic losses associated with extreme events are likely to be high in Honduras. Financial losses for the country due to disasters over the past 30 years are estimated at \$4.7 billion USD, representing approximately 50 per cent of losses throughout Central America. Throughout the 20th century, hurricanes caused direct and indirect damages to Honduras of over \$5 billion USD, equivalent to 95 per cent of Honduras' GDP in 1998.



FOOD

Maize is highly sensitive to water shortages with decreases in rainfall and more intense and prolonged drought likely to be problematic for agriculture. All parts of the country are expected to experience maize yield losses in excess of 10 per cent by 2020. Beans, the other staple crop, is also likely to be negatively impacted. Increasing instability of rainfall patterns will render agricultural planning more difficult and crop losses more probable.



WATER

Honduras faces considerable water scarcity challenges in the near future. Current water supply is affected by high levels of land degradation and deforestation with current pressures likely to be exacerbated by climate change. Reductions in annual rainfall, particularly in the northwest and southeast of the country pose significant challenges for water supply. Reductions in rainfall will likely imply a reduction in inflows to major reservoirs with a potential reduction in hydropower capacity.



HEALTH

Very little research has been conducted on the health implications of climate change in Honduras. Increases in the intensity or frequency of extreme events would be associated with direct and indirect impacts on health. Research has also shown linkages between climate variability and outbreaks of dengue fever in Honduras.



GENDER

Research suggests that, given the opportunity, women are more likely to receive and act on early warnings. The equal participation of women in hazard management activities in one community yielded positive results during Hurricane Mitch where, unlike neighbouring municipalities, no deaths were recorded and a lower incidence of depression was reported following the disaster.



MIGRATION

In Honduras, issues of land tenure and access to resources influence adaptive migration patterns. Increased scarcity of land, coupled with displacement following extreme events is currently changing migration patterns in parts of Honduras. While this is not directly associated with climate change per se, increases in extreme events will add complexity to migration patterns.

A portrait of Francisca Muñoz, a woman with dark hair pulled back, wearing a black top. She is looking directly at the camera with a slight smile. The background is dark and out of focus, with some green foliage visible on the right side.

**“WITH GOLD,
WE CANNOT BUY
A NEW PLANET”**

FRANCISCA MUÑOZ GROWS HER FAMILY’S FOOD IN HER HOMETOWN OF EL CORPUS IN HONDURAS. IT IS EXTREMELY VULNERABLE TO TROPICAL STORMS, SUCH AS HURRICANE MITCH, WHICH ARE INCREASING IN FREQUENCY.

An environmentalist at heart, Francisca is worried about the growing number of small gold mining projects in her region, which have been developed since a large open-pit mine was established there.

Water is already scarce in Honduras, and extracting gold requires lots of water, which becomes contaminated by toxic metals at these small artisanal mines. The mercury and cyanide that is left in the rivers and lakes pollutes the drinking water of communities around El Corpus. These toxins also leach into the fruit and vegetables the communities grow in their fertile valleys, as well as into the fish that are an important part of the economy on the coast.

These small mining projects contaminate not only the local rivers and streams, as well as the food supply, but they also contribute to climate change because of the deforestation that they cause, and because of the fossil fuels that are burned in the processing and transportation of the gold.

“We can live without gold, but we can’t live without water. Our future will be a desert,” explains Francisca. “I wish the governments would understand that they are there temporarily and that the natural resources do not belong to them. The resources belong to us and to our children. With gold, we cannot buy a new planet. The speed of destruction of our planet is increasing, and we all live here!”

Development and Peace works in partnership with CEHPRODEC in Honduras to support communities in defending their right to manage their natural resources.

4. ETHIOPIA

IN BRIEF: MASSIVELY RELIANT ON RAINFED AND LOW-TECH AGRICULTURE, HIGHLY VULNERABLE TO CLIMATE CHANGE.

4.1 INTRODUCTION

Ethiopia is particularly vulnerable to global climate change. This situation is explained by Ethiopia's heavy reliance on agriculture combined with difficulties accessing land, high variability in rainfall and poor weather. Ethiopia ranks as one of the countries at risk of extreme weather events due to climate change.¹ The agricultural sector employs 80 per cent of the population² and 85 per cent of Ethiopians live in rural areas, relying mainly on subsistence farming for survival. Nearly 95 per cent of the country's agricultural production is cultivated on family holdings, most of which are less than one hectare. Agriculture accounts for more than half of GDP and as much as 90 per cent of exports and employment.

Farmers and pastoralists in Ethiopia rely on two annual rainy seasons: Kiremt, the main rainy season for most of the country that runs, from June to September, and Belg, the shorter rainy season from February to May.

RIGHT NOW

The growing season has already been reduced by 15 per cent in the region.

FUTURE CLIMATE CHANGE RISKS

Worsening difficulties with access to water, large decreases in staple cereal crops, more vulnerability to disease.

EMISSIONS OF CO₂ PER CAPITA

0.1 metric tonnes – approximately 150 times less than Canada.

THE MAJOR DROUGHT OF 1984 RESULTED IN OVER 300,000 DEATHS AND AFFECTED MORE THAN 7.5 MILLION PEOPLE, WHILE DROUGHT IN 2003 AFFECTED MORE THAN 12.6 MILLION PEOPLE.

Yet, rainfall during these two seasons is already highly variable. As most farmers have no access to irrigation, when the rains do not come, it can equal catastrophe. Nearly 40 per cent of Ethiopia's population of 90 million is considered food insecure.³ Between 1980 and 2010, 10 major drought disasters were reported in Ethiopia. Each successive drought makes it more difficult to recover, making the people of Ethiopia all the more vulnerable to climate change.

Temperatures have been rising in Ethiopia, and the length of the main growing season across eastern Africa has been reduced by 15 per cent. Even if drastic reductions in emissions are achieved, future climate changes are expected to significantly reduce Ethiopia's main cereal crops. If emissions continue unabated, average temperature increases of approximately 4°C could be devastating. And yet, Ethiopia has relatively little control over which scenario plays out – since its carbon dioxide emissions, at 0.1 metric tons per capita, are already among the lowest in the world, it must rely on other countries reducing their carbon emissions to ensure its future.

Having said that, the Ethiopian government has undertaken steps to cope with climate change. In February 2011, the government launched an initiative called the "Climate-Resilient Green Economy." This policy has the goal of identifying opportunities linked to the green economy that could stimulate and support Ethiopia's economic development while keeping its carbon emissions at a low level. Thanks to this initiative, Ethiopia could benefit from the Green Climate Funds, which were created at the 2009 Copenhagen Conference, the COP 15 of the United Nations Framework Convention on Climate Change (UNFCCC). These funds are meant to support projects in four main areas: hydroelectric development, the production of cattle, forest development and rural cooking technology. In the agriculture sector, the first principle is of "intelligent agriculture to cope with the climate." Nevertheless, several researchers and practitioners emphasize that "if Ethiopia does not formulate a satisfying and adequate response to the challenges of small family farmers the capacity of Ethiopia to transform its agriculture in a way that will feed its people is put into question."⁴

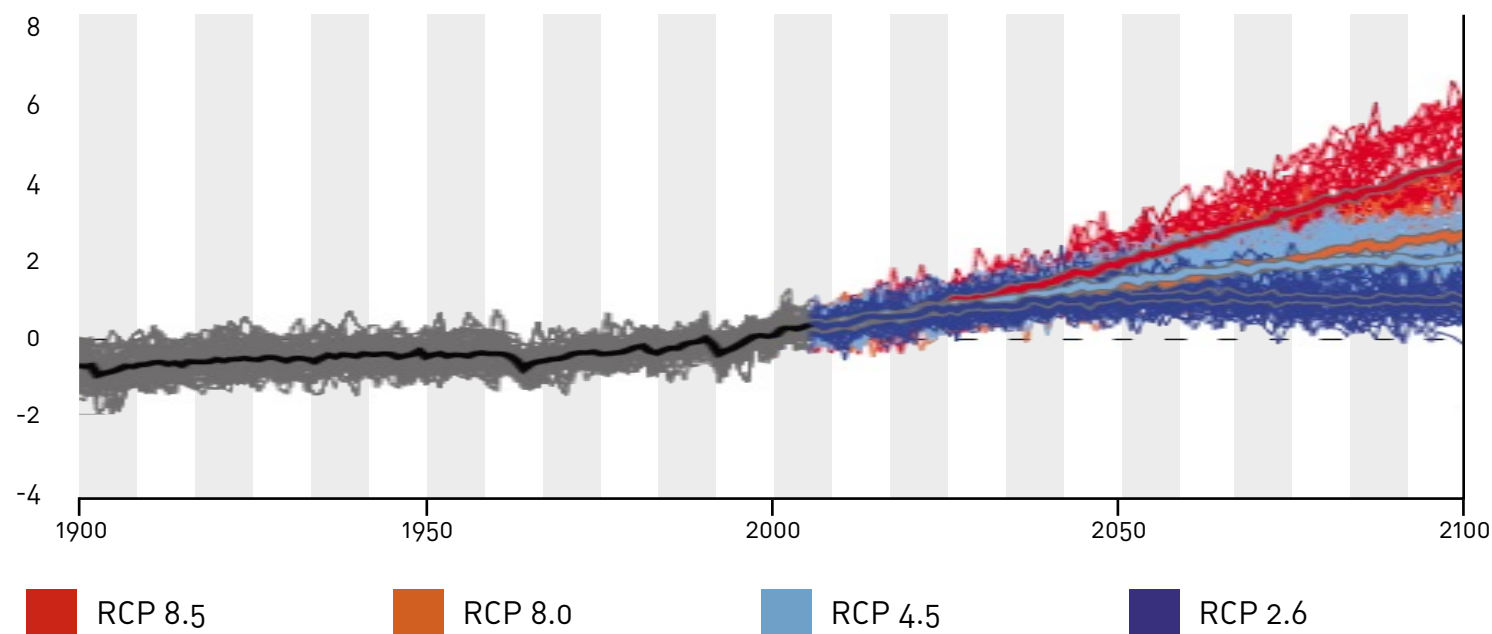


4.2 OBSERVED CLIMATE VARIABILITY AND CHANGE

There has been an increase in seasonal mean temperature in many areas of Ethiopia over the last 50 years.⁵ For the past four decades the average annual temperature in Ethiopia has been increasing by 0.37°C per decade, with the majority of warming occurring during the second half of the 1990s.⁶

Ethiopia experiences a high degree of variability in rainfall from year to year and season to season. Changes in rainfall are non-uniform and highly sensitive to the region and period of analysis, as a number of studies show. From the majority of studies, the most prominent trend has been towards reduced rainfall amounts with the main growing season length (March-May) across much of East Africa declining by approximately 15 per cent since the 1980s.⁷ Such changes have had multiple effects on agricultural production and water availability for irrigation, especially in the north, northeast and eastern lowlands of the country. Occurring during the main growing seasons in poor countries like Ethiopia that are dependent on rainfed agriculture, these declines are societally dangerous. They impact adversely on household livelihoods and food security, and have been associated with human-induced warming of the Indian Ocean.⁸

Temperature change East Africa annual (°C)



Projected changes in annual temperature relative to 1986-2005 under different greenhouse gas emissions pathways for East Africa. Red is 'business as usual' emissions (RCP8.5), dark blue represents ambitious reductions in global emissions (RCP2.6) Thin lines denote a single model projection; thick lines show the mean simulation for multiple climate models. (Source: IPCC, 2014)

In addition, recent years have seen significant socioeconomic disruption due to flooding. Floods along many major rivers in 2006 resulted in the death of over 800 people and resulted in over \$3 million USD losses, with more than 20,000 people being made homeless.

4.3 PROJECTIONS OF FUTURE CLIMATE CHANGE

Warming is expected to continue in Ethiopia, for all seasons, in all regions, and even if emissions decrease. A medium high emissions scenario shows an annual warming across Ethiopia of 1.2°C by the 2020s, and warming of 2.2°C by the 2050s.⁹ Regional differences in warming are modest, with warming associated with a greater frequency of heatwaves and increases in evaporation leading to moisture deficits.

The graph below shows the considerable projected warming in East Africa, with highest temperature rises expected with higher emissions. Under a 'business as usual' scenario with no policy changes to reduce global emissions, the average warming across all models shows temperature increases of approximately 4°C by the end of the century. Some individual models show temperature increases approaching and exceeding 6°C.

Under ambitious global greenhouse gas emission reductions (RCP2.6) temperatures are expected to increase by approximately 1°C by the end of the century; however, even under this ambitious scenario, increases in mean annual temperature above current conditions still approach 2°C for some models.

When considering ranges of projected changes it is important to note that the average does not imply a greater likelihood of occurrence. The full range of projected changes must be accounted for when considering impacts and adaptation – the greater the temperature increases the more severe the impacts are likely to be. For Ethiopia, even the projected temperature change under the most ambitious emissions scenarios will have significant impacts for agriculture, extreme events and the livelihoods of many.

Global warming will furthermore enhance the likelihood of anomalously intense, short rains across East Africa.¹⁰ The main climate hazards in Ethiopia are associated with rainfall variability including amount, timing, intensity and associated floods and droughts. Increased precipitation trends are projected from early this century.¹¹ The link between observed declines in growing season rainfall and human induced warming in the Indian Ocean is likely to intensify over the coming decades as warming continues.¹²

Future projections of rainfall are more complex to disentangle. Research indicates a future positive shift in rainfall for most models with increases in both average rainfall and intensity simulated for most of East Africa, including Ethiopia.¹³ Increases in rainfall extremes are likely to translate into rising flood risks for the region.¹⁴ In addition, rising temperatures and the higher risk of excessive rainfall have implications for the health sector by shifting and extending the areas affected by diseases such as malaria or Rift Valley fever – a viral disease spread to livestock and humans via mosquitoes.¹⁵ In highland regions, warming is leading to an expansion of crop pests into previously cold-limited areas.

In the coffee-producing Ethiopian highlands, warming trends may result in increased presence of the coffee berry borer with implications for livelihoods based on coffee production.¹⁶ Smallscale coffee producers are likely to be hardest hit because they rely more heavily on natural resources for survival and have little capital to invest in costly adaptation strategies and/or pest and disease management.¹⁷

4.4 FOOD PRODUCTION AND CLIMATE CHANGE

Food production is expected to be consistently and negatively impacted in Africa in the coming decades due to higher average temperatures, greater extremes, longer periods of dangerously hot weather, and high temperatures at important and vulnerable times in the life cycle of plants.¹⁸ *The Fifth IPCC Assessment Report* projects fluctuations and variability in precipitation and temperature over the coming century. In Ethiopia, the variability of precipitation and temperature is critical to 84 per cent of rural Ethiopians dependent on rainfed agricultural livelihoods¹⁹ with changes likely to affect productivity of certain crops, timing of agricultural practices and losses imposed by pests and diseases, all of which impact on food security. Stories such as Gebre's provide just one example of where these impacts are being felt, and how they are being addressed with support from Development and Peace.

The impacts of climate change on food production are expected to be widespread and complex to manage as food production systems differ widely according to socioeconomic conditions and ethnicity in Ethiopia.²⁰ Climate variability and change will impact farmers and pastoralists differently.

For farmers, the decline of main growing season rainfall will increase difficulties in decision making – particularly for deciding on planting dates and increasing the risk of crop failure. Similarly, critical decisions around the timing of land preparation and planting for long-cycle crops such as maize, sorghum and millet will become more problematic due to changes in variability. Changes in rainfall can adversely impact the flowering and development of perennial crops, in particular coffee.²¹ Such changes in climatic inputs highlight the challenges for food and livelihood security in Ethiopia. One study shows the sheer scale of the challenge for cereal production²², with decreasing trends for the four main cereal crops (teff, maize, sorghum and barley) currently critical to food security. Barley was predicted to have the greatest reductions, with net losses in land area ranging from 28 to 62 per cent. Sorghum had the least change, ranging from a possible net loss of 21 per cent to a possible net gain of 14 per cent. In addition, the study shows dramatic geographic shifts in land suitability for cereal production over the coming century.²³

For pastoralists, climate change is likely to lead to increased conflicts over land and water for livestock.²⁴ For pastoral communities in Ethiopia, droughts and high temperatures threaten cattle life, feed and water. Some pastoralists may shift from livestock to crop cultivation, from nomadism to sedentary livestock keeping, from pastoralism to agro-pastoralism.²⁵

The most significant coffee pest, the coffee berry borer, had never been reported in plantations above 1,500m until 10 years ago. Arabica coffee, a valuable crop which grows at high altitudes was largely unaffected, but

INCREASING TEMPERATURES NOW MEAN THAT ATTACKS OF THE INSECT ARE REPORTED AT HIGHER ALTITUDES.

4.5 ACCESS TO WATER

The impact of climate change on African fresh water resources is likely to be significant by the end of the 21st century.²⁶ It is expected that increasing temperatures will affect the water balance and thus water availability through changes in transpiration, vegetation structure and distribution. Increasing temperatures in arid and semi-arid areas will decrease water availability for human consumption and for agriculture. Climate change will undermine the technical performance of large reservoirs with secondary effects for agriculture and electricity production.²⁷

In Ethiopia projected water supplies are affected by increases in temperature and local variability of precipitation.²⁸ In the Gibe catchment in the south west of Ethiopia, average annual streamflow (an important indicator of water availability) is predicted to decrease until 2050.²⁹ In addition, research on the Geba river suggests annual reductions in river flows by up to 50 per cent by the end of the century under a high emissions scenario, with significant decreases also expected under lower emissions scenarios. Reduced river flows in the Ganane and Nile Basins in Ethiopia are expected towards the end of 21st century because of increasing temperatures and associated evaporation losses.³⁰

It is also expected that climate change will reduce raw water quality and even pose risks to treated drinking water because of anticipated increases in extremes.³¹ Increased intense rainfall will bring increased floods and soil erosion, which introduces sediments and pollutants in freshwater bodies.³² Soil erosion is already a serious problem in Ethiopia. Every year, 1.5 billion metric tonnes of topsoil erodes from the highlands into streams and rivers, thus increasing sediments, pollutants and reducing stream flows.³³

Climate change is only one of the many pressures that will determine access to water in future decades. Forty-eight per cent of the population in Ethiopia is without access to safe water and relies on water sources such as unprotected springs, ponds, streams and rivers many of which are located far from households and are contaminated.³⁴ Drought seriously impacts pastoral regions, which cover 50 to 61 per cent of the surface area of Ethiopia.³⁵ In these semi-arid and arid regions droughts and temperature rise cause traditional water sources for people and livestock to rapidly disappear. Water access also has important gender dimensions throughout much of Africa, including Ethiopia. Women and girls are mainly involved in water collection in Ethiopia, but young girls are particularly vulnerable to associated health and physical risks.³⁶

4.6 GENDER

Existing gender inequality is heightened by climate-related hazards.³⁷ Men and women are affected differently by climate change and climate variability related disasters intertwined with socioeconomic, institutional, cultural and political drivers.³⁸ Women play a vital role in food security. In Ethiopia, as in most African countries, more women than men are engaged in the production, distribution and utilization of food. Agriculture is therefore central to women's livelihoods, with climate change impacts on agricultural production making women especially vulnerable. Evidence shows that during extreme weather conditions, women experience more social disruption given their greater reliance on agricultural employment in rural areas as compared to men employed in service sectors across the country.³⁹

4.7 MIGRATION

Historically, drought has been a major driver of population movements in Ethiopia. An increased frequency and intensity of extreme events is expected under climate change and may lead to further migration as changes exceed the coping capacity of individuals.

One study exploring mobility dynamics in two rural areas of the northern highlands gives us insight into climate-driven migration in Ethiopia.⁴⁰ Within the region, livelihoods revolve around small-scale, rainfed subsistence agriculture. Over the past 20-25 years, the region has experienced worsening rainfall conditions (less rainfall totals, shorter seasons, and more intense and variable rainfall), increased exposure to severe frosts at high altitudes and losses of topsoil and soil fertility.⁴¹

The impact of such extreme weather events has led to production shortfalls with many households seeing their stores of wealth reduced and cattle stocks depleted due to lack of available grazing or through their sale to purchase cereals and other necessities.⁴²

Such circumstances have resulted in high levels of migration to urban areas, particularly among the young. In addition, access to credit is generally available only to those with land who can offer holdings as collateral. The pursuit of education in developing alternative livelihoods also forces movement to urban areas.⁴³

Shrinking land holdings also play an important part in shaping livelihoods in Ethiopia. The system of land ownership means that households cannot acquire land other than through centrally organized re-distributions. Coupled with rural population growth, this system of redistribution tends to fracture landholdings so that individual household plots are very small. Reducing land holdings compromises livelihood security by reducing available harvests and limiting the size of herds that households can maintain. Such land tenure arrangements decrease the coping and adaptive capacity of communities to extreme climatic events. This is particularly the case for women where land ownership is traditionally held by men.⁴⁴

4.8 HEALTH

Limited scientific information is available on the impact upon health from current and future climate change in Ethiopia. Rising temperatures and increases in rainfall intensity may shift or extend the areas affected by vector-borne diseases. Increased occurrence of floods and heat waves will also have implications for health, as will impacts on food production.

As noted above, climate change may impact on water quality and availability, with significant impacts on an already vulnerable populations. Deaths from diarrheal diseases in Ethiopia are already significantly higher than in other East African countries.⁴⁵

4.9 ECONOMIC IMPACTS

The economic cost of climate change to Ethiopia is high given the importance of the agricultural sector to livelihoods, production and employment. In addition, in poor countries large costs can be incurred due to small shifts in climate due to low levels of adaptive capacity, technology and resources. Ethiopian agriculture accounts for nearly 42 per cent of the nation's output, employs 85 per cent of the population and contributes more than 90 per cent to national exports and serves as the main input to the industrial sector. The main export commodity is coffee accounting for 35.7 per cent of total exports. Failure in agriculture therefore has widespread impacts throughout the economy, as has been experienced by recent climate extremes.

Agricultural output is closely linked to fluctuations in rainfall in Ethiopia with micro-level analysis suggesting that climate variability has already created costs through the drying of lakes, decreased water volumes leading to serious electrical power interruptions, increased drought length and frequency, and a greater number of flood events. One study estimates that Ethiopia lost a cumulative level of over 13 per cent of its agricultural output between 1991 and 2008, leading to increased poverty, while over the coming years the country could lose in the order of \$2 billion USD due to rainfall variability.⁴⁶

By 2050, climate change could reduce Ethiopia's GDP by 8 to 10 per cent and increase variability in agricultural production by a factor of two.⁴⁷ Adapting to climate change in the areas of agriculture, energy provision and road infrastructure may cost an annual average of \$0.8-2.8 billion USD.⁴⁸ Climate change impacts are likely to be felt most by the rural poor and particularly women. The poor in urban areas are also likely to be negatively impacted due to increasing food prices. Climate change will make the prospect of economic development harder for Ethiopia in at least two ways: first, by reducing agricultural production and output in sectors linked to agriculture, which is likely to reduce Ethiopia's GDP by about 10 per cent from its benchmark level; and second, by raising the degree of income inequality which is likely to further decrease economic growth and fuel poverty.⁴⁹ In addition, extreme climatic events have historically been shown to be costly to individuals, reducing consumption or forcing the sale or destruction of assets, thereby re-enforcing poverty.⁵⁰

“THE BIGGEST PROBLEM
IS SOMETHING THAT MANY
PEOPLE IN THE WORLD
TAKE FOR GRANTED:
WATER.”

PROLONGED DROUGHTS AND DISAPPEARING WATER SOURCES HAVE CAUSED GREAT DIFFICULTY FOR RURAL COMMUNITIES IN TIGRAY, WHO MUST BATTLE THE EFFECTS OF CLIMATE CHANGE ON THEIR FARMS.

Development and Peace, in partnership with Trócaire, CAFOD and SCIAF, has funded a project which has brought irrigation and increased food production to over 30,000 people in the region of Tigray in northern Ethiopia. Irrigation has enabled farmers in Tigray to harvest up to three times a year and boost crop production. Farmers have also been trained in new farming techniques, while newly constructed hygiene and sanitation facilities have greatly reduced health risks for the people.

Gebre Nigusse, 46, from Biera village was among the farmers to benefit from the project. The lack of water was making it difficult for Gebre to harvest enough food to provide for his family. There was no irrigation and erratic rains could not be relied upon. The project has changed everything. “I did not do much irrigation until I joined the project four years ago,” he explains. “The project constructed canals and I took part in the construction. I received training, fruit and elephant grass seedlings. “I dug two hand wells for irrigation and bought a water pump from the vegetable money. I have planted coffee trees and will increase my fruit trees up to 120. I know I can resist drought through irrigation.”

4.10 LOOKING TO THE FUTURE

It is clear that, if the worst possible effects of climate change are to be averted, global emissions must be reduced right now. However, even in the most optimistic of scenarios, large losses in the production of key cereal crops are forecast, posing very significant risks to food security in Ethiopia.

The majority of small family farmers do not have the resources to facilitate adaptation of their cropping and livestock systems to climate variability, casting into serious doubt their ability in future decades to feed more than 90 million people in Ethiopia.

These risks are exacerbated by our increasing need for food worldwide – the FAO estimates that 60 per cent more food will be needed worldwide by 2050.⁵¹ In Ethiopia, multinational corporations are leasing large tracts of land for agrofuels or agricultural exports, which will “result in a type of farming that will have much less powerful poverty-reducing impacts than if access to land and water were improved for the local farming communities”, according to Olivier de Schutter, the former UN Special Rapporteur on the Right to Food.

RISKS ARE EXACERBATED BY OUR INCREASING NEED FOR FOOD WORLDWIDE - THE FAO ESTIMATES THAT 60 PER CENT MORE FOOD WILL BE NEEDED WORLDWIDE BY 2050.⁵⁰

Having produced the majority of the emissions that are contributing to Ethiopia’s food insecurity through climate change, we in the developed world are further undermining the potential of small family farmers to provide for themselves.

The story of Gebre Nigusse illustrates how, with the help of Development and Peace and other agencies, Ethiopian farmers can begin to adapt to the uncertainties of climate change. Development and Peace, CAFOD, SCIAF and Trócaire work together in Ethiopia to build the capacity of marginalized men and women and reduce their vulnerability to shocks and stressors, including climate change. Poor households are supported to become more resilient by promoting more diversified and increased incomes, enabling sustainable access to water and natural resources, increasing productivity in agriculture and livestock, and reducing the risks associated with disasters. The humanitarian program at Development and Peace works to ensure an effective response when disasters strike. Risk reduction is integrated into the program, for example, through strengthening early warning and rapid assessment systems linked to contingency planning and finance.



4.11 SUMMARY OF FINDINGS



TEMPERATURE

Increases in seasonal mean temperatures have been observed across Ethiopia over the past 50 years, and the length of the growing season has decreased by ~15 per cent in the region. Increased rates of warming are associated with all greenhouse gas emissions scenarios. Under a ‘business as usual’ scenario median temperature increases of approximately 4°C are projected. With ambitious reductions in emissions warming may be contained within the 2°C threshold associated with dangerous climate change.



RAIN

Increased rainfall intensity is likely to result in greater likelihood of flood events. Greater extreme hot events are also expected. The impact of climate change on drought is unclear and depends on the balance between increased rainfall and increased evaporation losses.



GDP

Climate change will reduce agricultural production and output in sectors linked to agriculture and is likely to reduce GDP by ~10 per cent. At an individual level climate change is likely to raise income inequality, reduce household wealth and fuel poverty.



FOOD

Food production is expected to be consistently and negatively impacted and compound challenges of food security. Changes in rainfall will make critical decisions at the household level, such as dates for preparing and planting, more difficult. Large decreases in the productivity of major cereals have been projected. Coupled with small and decreasing farm sizes, adaptation to future impacts will be challenging.



WATER

The benefits of potentially increased rainfall will be compromised by increased floods and soil erosion, which are associated with increased sediments and pollutants in freshwater bodies. A number of studies of the response of major rivers suggest decreasing river flows towards the end of the century due to increasing temperatures and associated evaporation losses.



HEALTH

Rising temperatures and increases in rainfall intensity may shift or extend the areas affected by vector-borne diseases. Increased occurrence of floods and heat waves will also have implications for health, and will have impacts on food production.



GENDER

Women are more reliant on agriculture than men and are therefore more likely to be adversely affected by climate change. In addition water access has important gender dimensions, with young girls in particular being more vulnerable to changes in water availability and competition.



MIGRATION

Historically drought has been a major driver of population movements in Ethiopia. Research is also highlighting that issues with land tenure, coupled with increases in climatic extremes are acting as important drivers of rural-urban migration in the northern highland of Ethiopia under present conditions. Increases in the frequency of extreme events is likely to reduce coping capacities and increase rates of migration with social and cultural impacts in both sending and receiving areas.

5. RECOMMENDATIONS

1

CLIMATE CHANGE IS HAVING PROFOUND EFFECTS ON PEOPLE THE WORLD OVER, BUT, AS THIS REPORT SHOWS, POOR PEOPLE ARE THE MOST VULNERABLE TO THE IMPACTS OF CLIMATE CHANGE.

Unfortunately, according to the latest scientific evidence, the worst is yet to come. Limiting the effects of the climate crisis will require policy changes at the international and national levels, and in our own way of life. Such a change in direction will require enormous effort – but it is not impossible.

Tackling the causes and consequences of climate change will require an integrated series of actions – actions that prioritize the rights of the most vulnerable women and men at all levels.

We should adopt a new universal agreement on climate change that is fair, ambitious and legally binding, will keep global warming below 2° Celsius, and will provide the most vulnerable populations with the resources they need to adapt to climate change.

While the threat of climate change may seem overwhelming, the *Fifth IPCC Assessment Report* concluded that it is both technically possible and economically feasible to limit the rise in global warming to 2°C up to 2100. The international community has identified a temperature rise of 2°C above pre-industrial times as the critical threshold necessary to avoid the most dangerous impacts of climate change. However, for many countries, a rise of 2°C would be catastrophic. For this reason they have called for a global temperature increase of less than 1.5°C.

An international agreement is essential to coordinate, implement and ensure follow-up on collective action. Such an agreement was to be negotiated at the 2009 Copenhagen Climate Summit, replacing the Kyoto protocol. At Copenhagen, Canada symbolically committed to reducing its greenhouse gas emissions by 17 per cent compared to 2005 levels. But Canada had previously promised a far more ambitious target at Kyoto in 1997 – to reduce emissions by 6 per cent below 1990 levels by 2012.

The Copenhagen Summit was considered a resounding failure by many observers. However, at the Durban Climate Change Conference of 2011, a new platform emerged when the international community committed to developing a new, binding global agreement by December 2015, at the Paris Climate Change Conference, COP 21. There, each party will identify a national target for reducing their greenhouse gas emissions with the overall goal of keeping global average temperatures at less than 2°C above pre-industrial levels. Nevertheless, at the 2011 Durban Climate Conference, Canada officially announced its withdrawal from the Kyoto Protocol. This was despite moral and legal commitments to the Canadian people and the international community.

Equity must be at the heart of any new international agreement, requiring those countries that have greater responsibility to take the lead. They should not only reduce their own greenhouse gas emissions, but also contribute financially to the Green Climate Fund (GCF). The goal of the GCF is to provide funding for both adaptation efforts and the reduction of greenhouse gases in countries of the Global South. These funds should be added to existing publicly-funded development aid. At Copenhagen 2009, developed countries committed to contributions of more than \$100 million USD annually to the GCF by 2020, and promised to respect this commitment. Nations should therefore include in their national greenhouse gas reduction objectives reports on their contributions to climate financing instruments. During the financial years 2010 to 2013, Canada lived up to its commitments by agreeing to \$1.2 billion CAD in new, additional financing to combat climate change.¹ However, 74 per cent of the financing was in the form of loans, not grants, contrary to the requests of nations of the Global South. Just 18 per cent of these funds were for projects that would mitigate the effects of climate change.² Canada made no financial contributions between 2013 and 2015.

Climate change is a global problem that requires an international solution. But as history shows, international targets have not been enough for Canada to make significant progress in reducing its own greenhouse gas emissions.

Canada's current target is to reduce greenhouse gas emissions by 17 per cent in relation to levels of 2005, a target that is inadequate. It was established within the framework of the Copenhagen 2009 agreement, when Canada followed the United States' reduction targets. It is now widely recognized that Canada will not even meet this objective.³ The drafting and implementation of national climate policies are prerequisites to reducing Canadian emissions. However, as emphasized in the report *Acting on Climate Change*, any actions on Canadian climate need to take into account the regional diversity of the country. The book "Hot Air" paints a fascinating portrait of the history of decision-making on emission reduction targets in Canada. The authors point out Canada's failure to meet its targets, an inability partially due to the absence of a concerted vision between the federal and provincial governments. Canada's federal government therefore needs to show leadership on climate policy if we wish to be part of a climate solution. We suggest that the federal government adopt and implement the ten strategic orientations to climate policy outlined in the report *Acting on Climate Change: Solutions from Canadian Scholars*.⁴

To ensure that Canada's actions on climate change are effective, Canada should transition toward a sustainable, low-carbon society. This transition could follow several paths, but the federal government should take the lead. Since Canada adopted its reduction targets at the 2009 Copenhagen Accord, the international landscape has changed greatly. The European Union has announced that it will reduce carbon pollution to 40 per cent below the levels of 1990 by 2030. In March 2015 the United States announced a new target of 26 to 28 per cent below the levels of 2005 by 2025. China will limit its emissions by 2030 or sooner, and generate 20 per cent of its energy from sources other than fossil fuels during the same period. Mexico announced that it will reach its maximum level of greenhouse gas emissions in 2026. In this context, it seems realistic for Canada to follow in the footsteps of the United States and adopt a greenhouse gas emissions reduction target of 26 to 28 per cent below the levels of 2005, by 2025.

2

We must adopt more sustainable ways of producing and consuming, particularly with regards to energy and agriculture.

An international agreement limiting greenhouse gas emissions, as described above, provides an overall framework within which countries can operate.

However, to meet these targets we should begin a transition toward a sustainable, low-carbon society. This will require changes in our methods of production and our consumption habits, particularly in the energy and agriculture sectors.

Globally, the agriculture, forestry and other land use sectors account for about a quarter (approximately 10 to 12 gigatonnes) of net anthropogenic greenhouse gas emissions, mainly from soil and nutrient management and livestock. In Canada, agricultural activities produce about 10 per cent of all greenhouse gas emissions,⁵ not including emissions from food transportation or processing. According to the *Fifth IPCC Assessment Report*, the most promising climate change mitigation options for agriculture are improved management of cultivated land, forests and pastures and the organic restoration of degraded soils and lands. Regarding demand for agricultural products, changes in food habits will be necessary. For example, by reducing industrial and household food waste we could also shrink wastage in the food supply chain. These two measures would reduce greenhouse gas emissions in agricultural production.

Globally, the burning of fossil fuels (coal, oil and natural gas) in industry, in residential, commercial and public sectors, and in transport and energy supply, accounts for more than 60 per cent of greenhouse gas emissions. Based on various scenarios, scientists predict that direct emissions of carbon dioxide from the energy sector alone will double or even triple by 2050 compared to 2010. In the last decade, a growing demand for energy and an increase in the global use of coal have been the main contributors to increasing greenhouse gas emissions.⁶

In order to keep global warming below 2°C, large-scale changes will be necessary in the global energy supply system. As the IPCC notes, reductions of 90 per cent or more below 2010 levels must be reached between 2040 and 2070, and kept at close to zero thereafter.

According to Canada's latest greenhouse gas inventory (1990-2012), energy accounts for 81 per cent of all human-related greenhouse gas emissions.⁷ Yet, thanks to our abundant hydropower capacity and rich potential in undeveloped sources of energy with lower greenhouse gas emissions, Canada could reduce its dependence on fossil fuels. To keep global warming at 2°C or less, we must, in the short term, radically reduce our dependence on petroleum and other fossil fuels. Proven reserves cannot be consumed without resulting in runaway climate change. This would have devastating consequences, as much for the economy as for humanity and the environment. Two-thirds of remaining reserves should be left in the ground. Despite a political commitment of more than three years to gradually move away from fossil fuels, the world's richest countries continue to support fossil fuel production financially, just as Canada supports the tar sands. The negative effects of this choice are ongoing. In effect, fossil fuel subsidies create perverse incentives that favour investments in energy with the largest carbon emissions. Such decisions are a major obstacle to green investment and undermine efforts to put a price on carbon.

To begin the transition toward a sustainable low-carbon society, Canada must develop an economy based on renewable energy and energy efficiency. To do this, the Canadian government must include the petroleum and gas sector in climate policies and develop a national energy policy at different levels. Energy efficiency, cooperative electricity agreements and an emphasis on renewable energy should be central to such a policy. The process for implementing these policies should be clear, transparent and easily understood.

3

We must support and promote sustainable agricultural production and food systems, ensure that vulnerable people have access to natural resources and strengthen their ability to adapt to climate change.

As the case studies in this report show, agriculture, particularly small family farming, is especially vulnerable to climate change. The agricultural sector in countries of the Global South witnessed a dramatic decline in investment. The percentage of international aid going to this sector plunged from 18 per cent in 1979 to 2.9 per cent in 2006.⁸ Issues linked to small-scale farming have made inroads into policy agendas, particularly since the food crisis of 2008. But this has not translated into more resources for small-scale farmers. For the majority of small-scale producers, access to land, water and organic agricultural inputs remains fragile.

Even so, the stories of our partners in the Global South are eloquent: the resilience of small-scale farmers is strong. With even minimal investment and simple technology (for example, Ethiopia's irrigation system), small-scale agriculture can make all the difference.

An estimated 500 million small family farmers in countries of the Global South feed 2 billion people, one-third of the world's population.⁹ Small family farming protects the integrity of soils, the diversity of seeds, and the survival of thousands of breeds of animals.

Human-scale agriculture is respectful of the environment and considerably reduces greenhouse gas emissions. In following the principles of food sovereignty, we could revive a positive and appealing image of the agricultural world, promote the work of small family farmers and strengthen their social bonds with the general population. We must emphasize the nourishing and environmental dimensions of agriculture, no longer just the commercial aspects. To develop the potential of small family farming, adequate funds must be invested, including the \$100 billion USD already committed to the Green Climate Fund. This investment should be accompanied by a policy framework which supports – instead of weakening – the practices of small family farmers, such as open-pollinated seed varieties, crop diversity and low-input agricultural practices.

If they are guaranteed access to natural resources, especially land and water, small-scale farmers can protect their livelihoods from the impacts of climate change and can contribute to food sovereignty. However, for many of the world's poorest people, global trends such as climate change, a new scramble for resources driven by agricultural investment and various forms of land appropriation for environmental purposes, further threaten their access to these resources.

In countries of the Global South, customary rights to land and natural resources need to be strengthened. Globally, the following guidelines and principles should be rapidly adopted: Voluntary Guidelines for the Responsible Governance of Land, Fisheries and Forests¹⁰, and the FAO Committee on Food Security's principles on Responsible Agricultural Investment.¹¹

**SUCH A CHANGE
IN DIRECTION WILL
REQUIRE ENORMOUS
EFFORT -
BUT IT IS NOT
IMPOSSIBLE.**

CONCLUSION

WHILE THE CASE STUDIES IN OUR REPORT PRESENT SOME OF THE WORST POSSIBLE OUTCOMES OF CONTINUING WITH 'BUSINESS AS USUAL' EMISSIONS, THEY SHOULD ACT NOT AS A REASON TO DESPAIR, BUT AS A SPUR TO ACTION.

The scenarios presented by climate change models clearly demonstrate that we still have a choice – by acting now, we can curb the worst effects of climate change. And more and more, ordinary citizens understand the importance of action. The Climate Change Summit in New York in September 2014, as well as the Marche Action Climat in Quebec City in April 2015 showed a renewed impetus around climate change. The march through the streets of New York and the hundreds of other marches throughout the world showed a renewed energy in the climate movement which had been dormant and despondent since Copenhagen in 2009.

In the six years since Copenhagen, the conversation and the means of communicating on climate change has shifted. People themselves are making the link between addressing climate change and related challenges such as divestment in fossil fuels. Ordinary citizens – not just NGO supporters or environmental campaigners – have come to the conclusion that climate change is an issue that is going to affect them and their children. It is no longer only about polar bears and ice caps but about the people of the Philippines, Honduras, and Ethiopia – communities in these and many other countries around the world faced with the devastating consequences of a problem they did little to cause.

As momentum builds towards COP21, the UN Climate Change Conference in Paris at the end of 2015, we must continue to speak up, individually and collectively,

**TO GUARANTEE
A BRIGHTER, MORE
SUSTAINABLE FUTURE
FOR ALL PEOPLE
AND FOR FUTURE
GENERATIONS.**

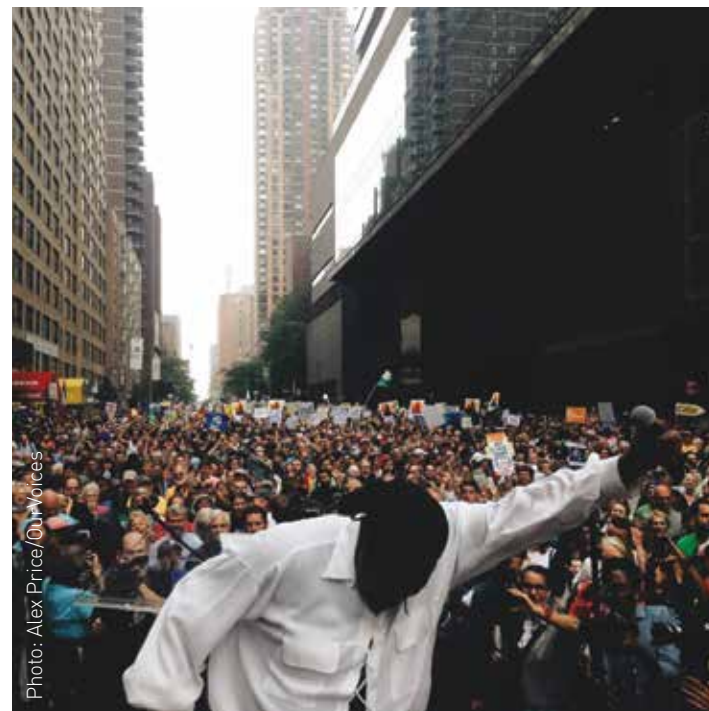


Photo: Alex Price/OurVoices

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Photos: Development and Peace, Caritas Internationalis

Design: Marie-Soleil Provençal

Printing: AGL Graphiques inc.

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