ABOUT THE CLIMATE VULNERABLE FORUM

Founded in 2009, the Climate Vulnerable Forum is a semi-formal group of developing countries facing high degrees of insecurity due to climate change and actively seeking a concerted response to the climate crisis. Advocating ambitious directions for international climate change policy, the Forum proposed setting the temperature increase goal at 1.5°C Celsius (2.7°F Fahrenheit). This target was subsequently taken up by other groups of countries and played an important boundary definition role in the UN climate negotiations at Copenhagen in 2009 (COP15). The Forum has insisted that decisions agreed at international talks on climate change and sustainable development be subject to accountability. Its members have committed themselves to low-carbon (or even carbon neutral) national development pathways. The Forum currently has 20 members and meets periodically at head of government, ministerial and delegate levels. The Monitor is an analytical input and communication tool for Forum members. The two country studies included in this report (Ghana and Vietnam) were undertaken in member countries.

ABOUT DARA

Founded in 2003, DARA is an international organization headquartered in Madrid, Spain, committed to improving the effectiveness of aid for vulnerable populations suffering from conflict, disasters and climate change. It is an impartial, non-partisan and independent non-profit entity. DARA is actively engaged in field research and evaluation of aid programmes and operations in developing countries. Its specialized publications present data and analysis on aid accountability and effectiveness and emerging strategic concerns for the development, humanitarian and disaster reduction communities. DARA’s Climate Vulnerability Initiative is mandated to develop the Monitor as an independent and politically impartial report. DARA convenes the external advisory bodies that provide third-party guidance and review inputs to this process. DARA alone is solely responsible for the final content of the report.

OTHER KEY PARTNERS AND SUPPORTERS

DARA is grateful to the number of partners with whom it has worked collaboratively in the development of this report.

Technical, quantitative and theoretical assistance has been provided by Commons Consultants, an advisory group based in Copenhagen, Denmark.

The Monitor’s research contributes to Facilitating Enhanced Organizational Responsiveness West African Risk Reduction (FOREWARN), an initiative of the Humanitarian Futures Programme based at King’s College, London. FOREWARN is supported by the Australian Agency for International Development (AusAID). FOREWARN is a collaborative project supporting the Economic Community of West African States (ECOWAS) to improve regional risk reduction capacity. It brings together DARA, the UN International Strategy for Disaster Reduction (UNISDR) and King’s College programmes, including its African Leadership Centre. Research in Ghana which contributed to the Monitor was undertaken as a component of the FOREWARN initiative. Country research in Ghana was organized in close collaboration and with the support of the country’s Environmental Protection Agency (EPA-Ghana) and its partners, the Ministry of Environment, Science and Technology and the National Disaster Management Organization (NADMO).

The Spanish International Development Cooperation Agency (AECID) funded the Monitor’s country activities in Vietnam and supported the Monitor’s development more generally. Research in Vietnam was organized by Live & Learn Vietnam with the participation of the Ministry of Natural Resources and Environment.

The Monitor’s development additionally benefitted from the financial support of Fundación Biodiversidad, a public foundation of the Spanish government.

Additionally, UNDP country offices in Ghana and Vietnam facilitated and participated in country research activities.
# ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AECID:</td>
<td>Agencia Española de Cooperación Internacional para el Desarrollo</td>
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<td>AusAID:</td>
<td>Australian Agency for International Development</td>
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<tr>
<td>BRIC:</td>
<td>Brazil, Russia, India, and China</td>
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<td>C:</td>
<td>Celsius/Centigrade</td>
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<td>CAPP:</td>
<td>Canadian Association of Petroleum Production</td>
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<td>CAR:</td>
<td>Central African Republic</td>
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<td>CCS:</td>
<td>Carbon capture and storage</td>
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<td>CDC:</td>
<td>Centers for Disease Control and Prevention</td>
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<td>CDM:</td>
<td>Clean Development Mechanism</td>
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<td>CE:</td>
<td>Climate Effect</td>
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<td>CER:</td>
<td>Certified Emission Reductions</td>
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<td>CFCs:</td>
<td>Chlorofluorocarbons</td>
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<td>CIESIN:</td>
<td>Columbia University’s Center for International Earth Science Information Network</td>
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<td>CIF:</td>
<td>Climate Impact Factor/Carbon Factor</td>
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<td>CO₂:</td>
<td>Carbon Dioxide</td>
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<td>COP15:</td>
<td>UN climate negotiations at Copenhagen in 2009</td>
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<td>CRED:</td>
<td>Centre for Research on the Epidemiology of Disasters</td>
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<td>CRED/EM-DAT:</td>
<td>CRED/Emergency Events Database</td>
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<td>CRIS:</td>
<td>Center for Remote Sensing of Ice Sheets</td>
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<td>CTI:</td>
<td>The Carbon Tracker Initiative</td>
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<td>CVI:</td>
<td>Climate Vulnerability Initiative</td>
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<td>CVF:</td>
<td>Climate Vulnerable Forum</td>
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<td>CWP:</td>
<td>Coal Worker's Pneumoconiosis</td>
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<td>DALY:</td>
<td>Disability-adjusted life year</td>
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<td>DCPP:</td>
<td>Disease Control Priorities Project</td>
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<td>DIVA:</td>
<td>Dynamic Interactive Vulnerability Assessment</td>
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<td>DR Congo:</td>
<td>Democratic Republic of the Congo</td>
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<td>EAC:</td>
<td>Economics of Climate Adaptation Working Group</td>
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<td>ECLAC:</td>
<td>Economic Commission for Latin America and the Caribbean</td>
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<td>ECOWAS:</td>
<td>Economic Community of West African States</td>
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<td>EDGAR:</td>
<td>Emission Database for Global Atmospheric Research</td>
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<td>EPA:</td>
<td>Environmental Protection Agency</td>
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<td>ERC:</td>
<td>Environmental Research Consulting</td>
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<td>EU:</td>
<td>European Union</td>
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<td>F:</td>
<td>Fahrenheit</td>
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<td>FAO:</td>
<td>United Nations Food and Agriculture Organization</td>
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<td>FORWARN:</td>
<td>Facilitating Enhanced Organizational Responsiveness West African Risk Reduction</td>
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<td>G20:</td>
<td>Group of Twenty Finance Ministers and Central Bank Governors</td>
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<td>GDP:</td>
<td>Gross Domestic Product</td>
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<td>GEF:</td>
<td>Global Environment Facility</td>
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<td>GHF:</td>
<td>Global Humanitarian Forum</td>
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<td>GHG:</td>
<td>Greenhouse gases</td>
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<td>GIM:</td>
<td>Generation Investment Management LLP</td>
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<td>GNH:</td>
<td>Gross National Product</td>
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<td>GTZ:</td>
<td>Deutsche Gesellschaft für Technische Zusammenarbeit</td>
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<td>GWh:</td>
<td>Gigawatt hour</td>
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<td>HFCs:</td>
<td>Halocarbons</td>
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<td>IAP:</td>
<td>Interacademy Panel on International Issues</td>
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<td>IEA:</td>
<td>International Energy Agency</td>
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<td>IFRC:</td>
<td>The International Federation of Red Cross and Red Crescent Societies</td>
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<td>ILO:</td>
<td>International Labour Organization</td>
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<td>IMF:</td>
<td>International Monetary Fund</td>
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<td>IPCC:</td>
<td>Intergovernmental Panel on Climate Change</td>
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<td>IPCC SRES:</td>
<td>IPCC Special Report on Emissions Scenarios</td>
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<td>ISO:</td>
<td>International Organization for Standardization</td>
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<td>IT:</td>
<td>Information Technology</td>
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<tr>
<td>Kt CO₂:</td>
<td>Kilotonne CO₂</td>
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<td>LDCs:</td>
<td>Least Developed Countries</td>
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<td>LLDCs:</td>
<td>Landlocked Developing Countries</td>
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<td>MAD:</td>
<td>Mean absolute deviation</td>
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<td>MDGs:</td>
<td>Millennium Development Goals</td>
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<td>Munich Re:</td>
<td>Munich Rückversicherungs-Gesellschaft (Munich Reinsurance Company)</td>
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<td>NADMO:</td>
<td>National Disaster Management Organization</td>
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<td>NAPA:</td>
<td>National Adaptation Programme for Action</td>
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<td>NATO:</td>
<td>North Atlantic Treaty Organization</td>
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<td>NASA:</td>
<td>National Aeronautics and Space Administration</td>
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<td>NASA GISS:</td>
<td>NASA Goddard Institute for Space Studies</td>
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<tr>
<td>NESDIS:</td>
<td>National Environmental Satellite, Data, and Information Service</td>
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<td>NOAA:</td>
<td>National Oceanic and Atmospheric Administration</td>
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<td>O₃:</td>
<td>Ozone</td>
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<td>ODA:</td>
<td>Official Development Assistance</td>
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<td>OECD:</td>
<td>Organisation for Economic Co-Operation and Development</td>
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<td>OPEC:</td>
<td>Organization of the Petroleum Exporting Countries</td>
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<td>OSOG:</td>
<td>Oil Sands Developers Group</td>
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<td>ORS:</td>
<td>Oral rehydration solution</td>
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<td>OZ:</td>
<td>Ozone</td>
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<td>PPM:</td>
<td>Parts Per Million</td>
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<td>PPP:</td>
<td>Purchasing power parity adjusted/international dollar</td>
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<td>RSNZ:</td>
<td>The Royal Society of New Zealand</td>
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<td>SIDS:</td>
<td>Small Island Developing States</td>
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<td>SO₂:</td>
<td>Sulphur Dioxide</td>
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<td>UNCCD:</td>
<td>United Nations Convention to Combat Desertification</td>
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<td>UNDP:</td>
<td>United Nations Development Programme</td>
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<td>UNECE:</td>
<td>United Nations Economic Commission for Europe</td>
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<td>UNEP:</td>
<td>United Nations Environment Programme</td>
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<td>UNESCO:</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
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<td>UNFCCC:</td>
<td>United Nations Framework Convention on Climate Change</td>
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<td>UNHCR:</td>
<td>United Nations High Commissioner for Refugees</td>
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<td>UNSDR:</td>
<td>UN International Strategy for Disaster Reduction</td>
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<td>UNICEF:</td>
<td>United Nations Children’s Fund</td>
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<tr>
<td>US EIA:</td>
<td>United States Energy Information Administration</td>
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<td>US EPA:</td>
<td>United States Environmental Protection Agency</td>
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<tr>
<td>USDA:</td>
<td>United States Department of the Army and Air Force</td>
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<td>USEIA:</td>
<td>U.S. Energy Information Administration</td>
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<tr>
<td>UNSD:</td>
<td>United Nations Statistics Division</td>
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<tr>
<td>WBGT:</td>
<td>Wet Bulb Globe Temperature</td>
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<td>WHO:</td>
<td>World Health Organization</td>
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<td>WRI:</td>
<td>World Resources Institute</td>
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GLOSSARY

ADAPTATION
An action or response that helps communities or their ecosystems cope with a changing climate. In particular, steps that reduce any losses or harm inflicted - the possible levels of which the Climate section of the Monitor attempts to estimate.

ADAPTIVE CAPACITY
The ability of a system to adjust to climate change, variability and extreme to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

AFFECTED COMMUNITIES
Communities that have seen their livelihoods compromised temporarily or permanently by climate change.

ANTHROPOGENIC
Produced as a result of human activity.

BLACK CARBON
An aerosol rich in carbon that absorbs sunlight and gives soot its black color. It is produced both naturally and by human as a result of the incomplete combustion of fossil fuels, biofuels, and biomass.

BIODIVERSITY
The international definition of biodiversity is “variability among living organisms” (CBD, 1992).

CARBON
The term “Carbon” is used as the moniker for the second part of the Monitor’s assessment, which broadly speaking deals with socio-economic effects of the carbon economy. Carbon dioxide (CO₂) is a principal greenhouse gas along with numerous other “heat-trapping” pollutants, such as methane, black carbon or nitrous oxide. Like these other pollutants, CO₂ is typically generated as a by-product of combustion when fuels of many different kinds are burned.

CARBON DIOXIDE (CO₂)
A naturally occurring gas and a by-product of burning fossil fuels, land use changes, and other industrial processes and is the main greenhouse gas that causes atmospheric temperature changes.

CLIMATE
Climate is taken to mean the average weather. The classical time period used by the World Meteorological Organization to determine the climate is 30 years. So the climate is the average weather over a given period of 30 years. Parameters such as temperature, rainfall and wind can be examined to determine key characteristics of the state of the climate at different periods in time, and to identify variation across time periods.

CLIMATE CHANGE
Climate change is a change in average weather. For the purpose of this study, it is assumed that human activities are the principal and overwhelming – if not exclusive – cause of the contemporary warming of the climate, in accordance with the broad consensus and more recent evidence on this subject (IPCC, 2007; Rohde et al., 2012; Muller, 2012). According to the UN Framework Convention on Climate Change, climate change is also in addition to natural climate variability (UNFCCC, 1992).

CLIMATE DISPLACED PEOPLE
Persons displaced temporarily or permanently due to climate change and its impacts or shocks, notably land desertification, sea-level rise and weather-related disasters. It is almost never possible to identify an individual as exclusively a climate displaced person due to the range of factors that are likely involved in forced or voluntary movement of people.
CLIMATE EFFECT
Indicates the relative effects of climate change on social and economic variables at the country level. It is calculated based on observed values of social and economic variables and the effects of climate change.
Climate Impact Factor
The relative contribution of climate change to the development of a given variable.

CLIMATE MODEL
Numerical representations of the climate system based on the physical, chemical and biological properties of its components, their interactions and feedback processes. They account for all or some of its known properties.

CLIMATE SCENARIO
Probable representations of the future which are consistent with assumptions about future GHG emissions and other pollutants based on existing understanding of the effect of increased atmospheric concentrations GHGs on the global climate.

CLIMATE VULNERABILITY
The degree to which a community experiences harm (or not) as a result of a change in climate. Vulnerability encapsulates socio-economic concerns, such as income levels, access to information, education, social safety nets and other meaningful determinants of the resilience of a given community. It also encapsulates environmental or so-called “bio-physical” factors, such as geographic location, topography, natural resource supplies, vegetation and otherwise.

CLIMATE VULNERABILITY LEVEL
Aggregate vulnerability levels indicates the extent to which countries are affected in comparison with effects experienced by all other countries. Vulnerability levels are determined statistically, using mean absolute standard deviations.

CLIMATE VULNERABILITY MONITOR
The Climate Vulnerability Monitor provides a global overview of vulnerability to climate change and the carbon economy. It provides fair estimates of the types of impacts already faced by society. It also shows where the impacts are taking place and captures the evolving global vulnerability to climate change/carbon economy.

CONFIDENCE
Degree of accuracy and repeatability of a statistical test.

COST-EFFECTIVENESS
Refers to the relationship between the economic input/cost of a given adaptation measure and the degree of beneficial output.

DESERTIFICATION
Land degradation in arid, semi-arid and sub-humid areas resulting from various factors including climatic variations and human activities (UNCCD, 2010).

DEVELOPMENT AID
Aid to support the economic, social, and political development of developing countries. The aim is to alleviate poverty in the long run. It is often termed Official Development Assistance (ODA).

DISABILITY-ADJUSTED LIFE YEAR (DALY)
This time-based measure combines years of life lost due to premature death and years of life lost due to time lived in states of less than full health. The DALY metric was developed in the original Global Burden of Disease 1990 study to assess the burden of disease consistently across diseases, risk factors, and regions.

DISASTER RISK REDUCTION
A framework for assessing measures for minimizing vulnerabilities and disaster risks throughout a society, to prevent or limit the adverse impacts of hazards.

DROUGHT
In general terms, drought is a recurring extreme climate event that, over a period of months or years, has precipitation levels that are below-normal (Dai, 2010).

EMISSION SCENARIO
Emissions scenarios describe future releases into the atmosphere of greenhouse gases, aerosols, and other pollutants and, along with information on land use and land cover, provide inputs to climate models. They are based on assumptions about driving forces such as patterns of economic and population growth, technology development, and other factors. Levels of future emissions are highly uncertain, so scenarios provide alternative images of how the future might unfold (WMO, 2012).
ENVIRONMENTAL DISASTERS
Disasters that are generated in whole or in part through human activities. This report measures the role of climate change or the carbon economy in extreme weather events or geographically restricted pollution disasters. Extreme weather events affected by climate change are natural phenomena, but their aggravation through climate change constitutes a human-induced contribution and influence on the final scale of disaster – disasters are also widely understood as socially constructed regardless of the natural phenomenon involved.

EXPOSURE TO CLIMATE CHANGE
Exposure to physical manifestations of alterations in weather conditions and the environment as a result of climate change. See also “Vulnerability - Physical vulnerability to climate change”.

EXTREME WEATHER EVENT
Infrequent meteorological events having a significant impact on the society or ecosystem in a specific location.

FOOD SECURITY
Refers to the availability of food and people’s access to it. A household is food secure when its occupants do not live in hunger or fear of starvation.

FOSSIL FUEL EMISSIONS
Emissions of greenhouse gases resulting from the combustion of fuels from fossil carbon deposits such as oil, gas and coal.

GLOBAL DIMMING
Reductions in solar radiation that reaches the Earth’s surface during the last 50 years (Stanhill and Cohen, 2005).

GREENHOUSE EFFECT
Greenhouse gasses effectively absorb thermal infrared radiation, emitted by the Earth's surface, by the atmosphere itself due to the same gases, and by clouds. Atmospheric radiation is emitted to all sides, including downward to the Earth's surface. Thus, greenhouse gases trap heat within the surface-troposphere system (IPCC, 2007).

GREENHOUSE GASES (GHG)
Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth’s surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect.

HABITAT CHANGE
Refers to shifts, changes or loss of human and ecological habitats due to climate change impacts.

HEALTH IMPACT
The impacts of climate change that have an effect (positive or negative) on human health.

HYDRO ENERGY
A “green energy” source in which running water is used to turn turbines, which in turn generates electrical energy (Eon Energy Lab, 2012).

HUMANITARIAN AID
Activities involving protection of civilians and those no longer taking part in hostilities, and provision of material or logistical assistance for people affected by humanitarian crises and to facilitate their return to normal lives and livelihoods.

INDUSTRY STRESS
The effect of climate change on specific industry sectors captured in this report is based on e.g. fisheries, forestry, and agricultural losses or gains.

LANDSLIDES
Landslides occur when masses of rock, earth or debris move down a slope and are caused by disturbances in the slope's natural stability. They often accompany heavy rains, droughts, earthquakes, or volcanic eruptions. This report only considers weather-related landslides.

MITIGATION
Mitigation is broadly understood as human actions and interventions that stem global warming, i.e. that mitigate the warming effect.
OCEAN ACIDIFICATION
The ocean absorbs approximately one third of the carbon dioxide emitted to the atmosphere from the burning of fossil fuels. As carbon dioxide dissolves in seawater, the pH of the water decreases, which is called "acidification" (Ocean Acidification Network).

OIL SANDS
Oil sands are a major source of unconventional oil for fuel/energy. They comprise a mixture of sand, water, clay and bitumen. Bitumen is oil that needs to be diluted or heated in order to be pumped due to its heaviness or thickness (CAPP, 2012).

PERMAFROST
Ground (soil or rock and included ice and organic material) that remains at or below 0°C for at least two consecutive years (IPA, 2012).

PROJECTION
A future value calculated according to predetermined changes in the assumptions of the environment (IPCC, 2007).

RESILIENCE
The ability of a community or ecosystem to recover from, return to equilibrium, or bounce back following a shock.

SCENARIO
Model-generated set of market projections based on assumptions other than those used in the baseline. They are used to provide quantitative information on the impact of changes in assumptions on the outlook.

SEA-LEVEL RISE
The rising of sea-levels due mostly to thermal expansion and the melting of land-based ice.

SINK
Any process, activity or mechanism that removes a greenhouse gas, an aerosol, or a precursor of either from the atmosphere.

SOCIO-ECONOMIC IMPACT
Refers to climate change impacts of both social and economic character, comprising for instance mortality, illness (social) or monetary losses (economic).

SRES SCENARIOS
Emission scenarios developed the IPCC.

VULNERABILITY
The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

VULNERABILITY - PHYSICAL VULNERABILITY TO CLIMATE CHANGE
Refers to people who live in regions that are prone to more than one type of physical manifestation of climate change: floods, storms, droughts, sea-level rise, etc (similar to "exposure").

VULNERABILITY - SOCIO-ECONOMIC VULNERABILITY TO CLIMATE CHANGE
Refers to the capacity of individuals, communities, ecosystems, economies, and societies to adapt to climate change impacts and avoid suffering from long-term, potentially irreversible, losses in well-being and stability. Also referred to as "underlying vulnerabilities".

WEATHER-RELATED DISASTERS
Natural disasters that are related to weather patterns, such as floods, droughts, and heat waves. Geophysical disasters such as earthquakes are not considered by this report.

WET BULB GLOBE TEMPERATURE (WBGT)
Composite temperature for estimating temperature, humidity, wind chill and solar radiation effect on humans.


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