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Enhanced Climate Action in Response to 1.5°C of Global Warming

Scaling Up Nationally Determined Contributions

Published by

ACT Alliance Secretariat
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Route de Ferney 150
1211 Geneva, Switzerland

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We also thank Nicolas Abuya, Anna Axelsson, Atikul Haque, Ziaul Haque, Hussien Muhsen, Joanna Patouris, Mattias Soederberg, Brooke Takala, Solomon Woldetsadik and Gebreselassie Zegeye for their valuable comments.

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Acknowledgement

ACT Alliance would like to thank all of the contributing authors of this report for their time and energy in creating this piece.

This report is a product of ACT Alliance Global Climate Change Project implemented with the support of *Brot für die Welt*.

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R E P O R T

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Abbreviations

ADB	Asian Development Bank
BAU	Business as usual
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
CA4	El Salvador, Guatemala, Honduras and Nicaragua
CCC	Climate Change Commission (the Philippines)
CDR	Carbon dioxide removal
CCS	Carbon capture and storage
CRGE	Climate Resilient Green Economy (Ethiopia)
CVF	Climate Vulnerable Forum
EEA	European Environment Agency
ENSO	El Niño Southern Oscillation
ESR	(European Union) Effort Sharing Regulation
EU	European Union
EU ETS	European Union Emission Trading System
FBUR	First Biennial Update Report (Jordan)
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GTP II	Growth and Transformation Plan (Ethiopia)
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Inter-Tropical Convergence Zone
JNAP	Joint National Action Plan for Climate Change Adaptation and Disaster Risk Management 2014 – 2018 (the Marshall Islands)
LCO	Local Community Organizations (the Philippines)
LDCs	Least Developed Countries
LGU	Local Government Units (the Philippines)
LTS	2050 long-term (low emission/decarbonization) strategies
LULUCF	Land use, land-use change and forestry (related emissions)
MICs	Middle Income Countries
MRV	Monitoring, Reporting and Verification (under the UNFCCC)
NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan (the Philippines and Kenya)
NCCC	National Climate Change Committee (the Marshall Islands and Jordan)
NCCPF	National Climate Change Policy Framework (the Marshall Islands)
NDC	Nationally Determined Contribution (under the Paris Agreement)
NECPs	National Energy and Climate Plans (of the EU member states)
NELD	Non-Economic Loss and Damage (associated with climate change)
NEP	National Energy Policy (the Marshall Islands)
NFSCC	National Framework Strategy on Climate Change (The Philippines)
NGO	Non-Governmental Organization
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
PSF	People's Survival Fund (the Philippines)
RMI	The Republic of the Marshall Islands
SDGs	Sustainable Development Goals (of Agenda 2030)
SE4All	Sustainable Energy for All UN Initiative of the UN Secretary-General
SFDRR	Sendai Framework for Disaster Risk Reduction
SR15	IPCC Special Report "Global Warming of 1.5°C"
SIDS	Small Island Developing States
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
WWF	World Wide Fund for Nature

Glossary

Carbon budget: the calculated cumulative amount of greenhouse gas emissions, expressed in Gt CO₂ equivalents, that still can be deposited in the atmosphere without overshooting a certain level of global warming, as, for instance, 1.5°C or 2°C.

Carbon dioxide removal (CDR): Technologies that either remove CO₂ from the atmosphere through geo-engineering or that enhance carbon sequestration by activating carbon sinks (e.g., afforestation) or that avoid emissions by using technologies of carbon capture and storage (absorbing CO₂ emissions and storing it in the underground) and by carbon capture and use (i.e., absorbing CO₂ and using it for industrial processes). CDR is considered a means to neutralize emissions for which no mitigation measures could be identified (e.g., methane emissions from livestock or rice fields) and to achieve net negative emissions to draw down any excess in carbon emissions beyond the carbon budget.

Climate justice: According to the definition used by ACT Alliance, a term used for framing climate change as an ethical and political issue. It links climate policies to human rights and sustainable development, safeguarding the rights of the most vulnerable people and sharing the burdens and benefits of climate change and climate policies equally and fairly. Climate justice can also cover aspects of intergenerational and environmental justice, access to sustainable energy for all and a just transition for those whose jobs or livelihoods are endangered by ambitious climate policies.

Climate projections: In general use, a projection is any description of the future and the path leading to it. A more specific interpretation has been attached to the term “climate projection” by the Intergovernmental Panel on Climate Change when referring to model-derived estimates of future climate. Modelling is necessary to project future trends of climate change that can be non-linear and thus go beyond what is derived from linear updates of observed climate data into the future.

Climate resilience: The capacity of a socio-ecological system to absorb stresses and maintain function in the face of external stresses imposed by climate change and to adapt, reorganize and evolve into more desirable configurations that improve the sustainability of the system, leaving it better prepared for future climate change impacts.

Nationally Determined Contributions (NDCs): Climate action plans, including specific nationally determined climate targets of state parties to the Paris Agreement, which contribute to the achievement of the goals of the Paris Agreement. NDCs have to be submitted to the United Nations Framework Convention on Climate Change every five years, with a first commitment period to start in 2020.

Paris Agreement: A global agreement made in 2015 under the United Nations Framework Convention on Climate Change dealing with mitigation, adaptation, loss and damage and climate finance, with the first commitment period for Parties to the PA starting in 2020.

Precautionary principle: A principle used to take and justify decisions to avoid possible harm without having final scientific certainty about the likelihood and magnitude of the harm expected.

Risk transfer: Transfer of the risk to suffer loss and damage from the potentially affected parties to a broader collective through risk insurance, markets (catastrophe bonds), the use of the solidarity principle (to the society, community of states or other donors) or transfer to those who are responsible for the loss and damage that occurred (“polluter pays”).

Sendai Framework for Disaster Risk Reduction: A global framework for disaster risk reduction, including five goals and seven targets, agreed by the community of states in 2015.

Shared socio-economic pathways: Science-based, coherent, internally consistent and plausible descriptions of future routes for societal and economic development. The five pathways the Intergovernmental Panel on Climate Change refers to have been elaborated in terms of both quantitative socio-economic models and qualitative storylines.

Sustainable Development Goals: A set of 17 goals and related targets for sustainable development by 2030 enshrined in the Agenda 2030 and agreed by the community of states in 2015.

Editorial

By Isaiah Kipyegon Toroitich

ACT Alliance developed this publication as a contribution to the growing need to understand the dual urgency of increasing the ambition to address climate change in the wake of its devastating impacts and to significantly increase the allocation of resources to support action, particularly in developing countries.

This publication provides the necessary link between climate change action, sustainable development and disaster risk reduction and takes advantage of the momentum provided by the recent special scientific report of the Intergovernmental Panel on Climate Change (IPCCC) on the 1.5°C threshold.

The findings of the IPCC Special Report “Global Warming of 1.5°C” (SR 15) serve as yet another strong wake-up call on the inadequacy of the individual country and cumulative Nationally Determined Contributions (NDCs) to reach the mitigation objectives set out in the Paris Agreement.

This study further elaborates the correlation between disaster risk reduction in general and reduction of climate-induced disasters in particular with climate action and sustainable development. Building a strong nexus between climate action, sustainable development and disaster risk reduction in both policy and practice is an important step toward coherence and efficiency.

We believe that this publication, particularly its analysis, case studies and policy recommendations, can serve as an important resource for a deeper understanding of the countries showcased and as an advocacy resource. We are particularly keen that ACT Alliance member organizations and our partners will use this as a tool for dialogue with governments and other stakeholders.

We are very grateful to the lead author, contributors and the peer reviewers of the content presented in this publication and the ACT Alliance Climate Change Group for providing the necessary direction and advice.

Executive Summary

Scaling up NDCs by 2020 is a humanitarian, human rights, development and justice imperative in order to respond to the risks of 1.5°C of global warming, which are presented in the IPCC Special Report “Global Warming of 1.5°C” and other scientific studies. ACT Alliance, building on these scientific findings, calls on states to take fast and ambitious action now by enhancing climate targets in NDCs to maintain a realistic chance to stay at 1.5°C.

This call for action is also backed by evidence from the grassroots that climate-induced risks of poor and vulnerable people, and women, in particular, being deprived of their fundamental human rights to be free from hunger, extreme poverty and an adequate standard of living are already higher today than for others. Without effectively aligning 1.5°C-consistent national mitigation and adaptation action with SDGs and disaster risk reduction goals, sustainable development will remain an illusion, leaving behind hundreds of millions of people.

Africa and Asia are projected to experience 75 percent of the global risk exposure, with 85 to 90 percent of the exposed population, approximately half in South Asia. This puts an enormous extra burden on governments in those regions to achieve the SDGs. Providing massive international financial support to these and other climate-vulnerable developing countries is, therefore, another imperative of climate justice. It is also a clear case for the “polluter-pays principle”, given the globally unequally caused GHG emissions, with most of the disproportionately affected countries and populations being the smallest polluters.

This report echoes the main message of the IPCC Special Report that 1.5°C — not 2°C — should be considered the new limit to protect the world from dangerous climate change. High risks are already appearing at 1.5°C of global warming, such as the almost complete extinction of corals, huge marine biodiversity and fish stock loss and the hampering of food security and coastal-dependent livelihoods. On land, huge damages are predicted to happen, too, caused by drought, heat, flooding and more extreme weather events, endangering health, food and water security.

This report analyzes the cases of ten developing countries and the European Union regarding their specific risks and the level of ambition already included in their NDCs. It provides concrete policy recommendations for how each of these countries and regions could better mobilize inherent potentials to enhance their NDC to better meet the challenges of staying at 1.5°C of global warming and to reduce and manage the related risks that cannot be avoided even at 1.5°C.

The report concludes with a plan of action for all governments, including ten steps to be taken between 2018 and 2020 to respond adequately to the risks of 1.5°C of global warming:

- ensuring accountability
- undertaking gap analysis
- ratcheting up mitigation
- fostering climate resilience
- initiating co-beneficial fast-start projects
- scaling up climate finance and investments
- reducing climate-induced loss and damage
- aligning climate and development planning
- ensuring inclusive processes and institutional set-ups
- deepening multilateral cooperation

1 Summarized impacts and associated risks of 1.5/2°C of global warming

By *Thomas Hirsch*

Staying at 1.5°C and achieving the SDGs are mutually interdependent

“Leaving no one behind” is the key promise made by the Agenda 2030, titled “Transforming the World” and agreed by the international community of states in 2015, the same year the Sendai Framework for Disaster Risk Reduction (SFDRR) and the Paris Agreement were adopted. The Agenda 2030 is comprised of 17 Sustainable Development Goals (SDGs) setting specific goals and targets for sustainable development and eradicating poverty. Three years later, the main conclusion to be drawn from the High-level Political Forum on Sustainable Development, held in New York in July 2018, is that the world is “off-track” in implementing the SDGs. This is mainly due to a lack of policy coherence, with contradicting climate and energy policies the most striking examples. As pointed out in the report of non-governmental organizations (NGOs) “Spotlight on Sustainable Development 2018”, most governments have not yet turned a transformational vision into development planning and real politics; they are still postponing urgently needed action and are even partly moving in the opposite direction of the SDGs.¹

Along the same lines, the Intergovernmental Panel on Climate Change (IPCC) Special Report “Global Warming of 1.5°C” notes that “without societal transformation and rapid implementation of ambitious greenhouse gas reduction measures, pathways to limiting warming to 1.5°C and achieving sustainable development will be exceedingly difficult, if not impossible, to achieve.”² Based on a thorough analysis of the current scientific body of evidence, the same report concludes that the risks for human well-being and livelihoods, food, water and ecosystem security, which are already significant and disproportionately affecting vulnerable people and communities, will be severely higher at 1.5°C. The risks will increase further with every level of additional warming, particularly affecting already disadvantaged and vulnerable populations and putting at further risk the achievement of certain SDGs, especially those on poverty, health, water and sanitation.³

The knowledge base on the specific implications of different scenarios of global warming (1.5°C, 2°C or beyond 2°C) for achieving SDGs, particularly with regard to gender and inequalities, remains limited. Thus it deserves more scientific, societal and political attention to bridge these gaps and to guide adequate action to achieve the triple set of goals of the SDGs, the SFDRR and the Paris Agreement. While it is evident that enhancing climate resilience through disaster risk reduction and adaptation action is in most cases co-beneficial for achieving the SDGs, at least some trade-offs are possible, too, and thus need to be addressed, leading, for example, to land use conflicts (e.g., protection of biodiversity versus resource utilization for livelihoods). Ambitious greenhouse gas (GHG) mitigation could also lead to both

1 <http://sdg.iisd.org/commentary/policy-briefs/sdg-knowledge-weekly-2018-high-level-political-forum-part-2/> (last accessed 22 August 2018)

2 IPCC Special Report “Global Warming of 1.5°C”, Executive Summary of chapter 5

3 IPCC Special Report “Global Warming of 1.5°C”, chapter 5

co-benefits and contradictions; for instance, conflicts over agricultural land used for food or biofuel production. These examples underline the importance of well-aligned and coherent policies guided by a truly transformational vision. One of the significant strengths of the IPCC Special Report is that it sheds light on these linkages. However, more country-specific analysis and enhanced cooperation between the development and climate experts should follow in order to inform aligned planning, budgeting and programming. This is the reason we wrote this report.

Risks of a 1.5°C and 2°C global warming scenario for sustainable development and how countries should prepare for it

ACT Alliance is issuing this report to underpin the great urgency for ratcheting up the NDCs of all countries in view of the intolerable risks to sustainable development if global warming exceeds 1.5°C. Our analysis shows that there are significant risks of global warming of 1.5°C or more for all countries covered by this report. It shows that none of them adequately prepares for 1.5°C-consistent pathways and the associated risks, but that some countries use their potential better than others. It concludes with country-specific recommendations on how to improve the NDC respectively and what would be the co-benefits for achieving the SDGs and the SFDRR goals.

The report was written between May and October 2018. For the country-specific risk profiles, our team of authors first reviewed the latest scientific literature, including many sources that have been used for the IPCC Special Report and, in the final phase, the IPCC report itself. They then assessed the NDCs against the risk profile and identified gaps in terms of adaptation, risk reduction and GHG mitigation. They concluded with a set of country-specific policy recommendations on how to shape national climate policies and what would be the triple wins between adaptation/risk reduction, decarbonization and sustainable development.

The IPCC has warned, with increasing evidence, that climate change leads to negative effects on natural and human systems. This includes both impacts of slow-onset (e.g., sea level rise) and sudden-onset (e.g., extreme weather events like a cyclone) events. The latter is likely to cause disaster risks (the risk for a community or society to face “widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery”⁴).

Even though current scientific impact research is still relatively limited regarding a comparison between a 1.5°C and a 2°C scenario, the IPCC Special Report (SR 15) can be seen as an important landmark in closing this knowledge gap. It gives strong arguments why the 1.5°C aspirational target of the Paris Agreement should be taken very seriously as a climate threshold (or tipping point), defined as “a critical limit within the climate system that induces a non-linear response to a given forcing,”⁵ which may lead to abrupt or rapid climate change that may be irreversible. One can read the overarching message of SR 15 as follows: 1.5°C — not 2°C — should be considered the new limit to protect the world from irresponsibly dangerous climate change.

According to SR15, global warming of 1.5°C is very likely a tipping point for the partial survival or global extinction of corals, and thus also a tremendous trigger for huge marine biodiversity loss (directly conflicting with SDG 14: Life below water). Furthermore, an almost total loss of corals and severe damage

4 Definitions according to IPCC at https://www.ipcc.ch/pdf/special-reports/srex/SREX-Annex_Glossary.pdf, p.557f.

5 *Ibid.*

to seaweed and seagrass —projected as an “above 1.5°C impact” — in combination with other adverse impacts of warmer and more acid oceans on fish stock, is likely to hamper food security⁶ (SDG 2: Zero hunger) and even more so coastal-dependent livelihoods, for instance, in Small Island Developing States (SIDS) in Asia and Africa (SDG 1: No poverty).

Climate change puts food security at risk not only with a view on oceans, but also on land, due to drought, heat and extreme weather events. Here again, the 1.5°C threshold is important to be kept to limit losses. Authors from Ecofys, in a study commissioned by the World Wide Fund for Nature (WWF) (2016), conclude that global loss in agricultural production (SDG 1,2) can only be limited to 10 percent or less if the 1.5°C threshold is kept (WWF 2016).

Apart from these and other sectoral impacts discussed in the country reports, the world might move toward climate crossroads that have huge impacts on the entire Earth system. According to a new and intensely debated study of Steffen, Rockström et al. (2018)⁷, too new to be considered in the SR15, any further level of temperature increase bears the increasing risk of crossing a climate threshold that could prevent stabilization of the climate even if future anthropogenic GHG emissions are pushed to zero. The report says such an increase may cause continuous warming on a so-called “Hothouse Earth” pathway through self-enforcing geophysical feedbacks, leading to much higher temperatures for millennia, with serious disruptions to ecosystems, societies and economies. Following the precautionary principle, and to avoid such a non-linear, irreversible and deeply disruptive change with unimaginable consequences for humankind, deep and fast emission cuts are a prerequisite.

However, even if climate change impacts aren’t global, abrupt or irreversible, they still should be taken into account by governments when designing climate action or development plans. Regional or even local impacts and changes that are gradual rather than abrupt also can hit countries disproportionately hard, depending on their level of vulnerability and adaptive capacity. Countries that are especially climate vulnerable due to high risk exposure (e.g., SIDS) or that have limited adaptive capacity, for instance, due to limited access to knowledge, technology and finance (e.g., Least Developed Countries or LDCs, SIDS and African countries), are urgently called to carefully assess their climate risk profile and what it implies for their sustainable development aspirations. We argue in our country reports that the targeted mobilization of climate and development co-benefits and the identification and sensitive treatment of possible trade-offs between the climate and the development agenda should become an integral element of policy design.

6 Three billion people depend on 20 percent of their protein intake from fish, and global fish catch is projected to go down by 1.5 million tons per year at 2°C as compared to 1.5°C (Cheung et al. 2016).

7 Steffen, W., J. Rockström et al. (2018) Trajectories of the earth system in the Anthropocene. Proceedings of the National Academy of Science of the United States of America.

Figure 1: Risks of 1.5°C and 2°C global warming for sustainable development in selected regions

Source: Authors, based on scientific literature, including the IPCC Special Report “Global Warming of 1.5°C”

Weather	Social, economic and ecological impact	Impact level at 1.5°C	Impact level at 2°C	Most affected regions	People most at risk/SDG most at risk
Heat/heatwaves	Significantly more hot days and heatwaves; higher maximum temperatures	 High	 Very high	Mediterranean region; Southern Africa; Southern South America	People in megacities; vulnerable and disadvantaged people SDG 3: Good health and well-being SDG 11: Sustainable cities and communities
Rainfall	More erratic precipitation; accelerated seasonal changes; more heavy rainfall events	 Moderate to high	 High to very high	South Asia; Europe	Poor people; people dependent on agriculture SDG 1: No poverty SDG 2: Zero hunger
Drought/dryness	More frequent and more intense drought/dryness	 High	 Extremely high	Mediterranean region; Southern Africa; Northeastern Brazil	Poor people; people dependent on agriculture SDG 1: No poverty SDG 2: Zero hunger SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth
River flooding	More frequent and more intense river flooding due to heavy rainfall	 High	 High to very high	Mediterranean region; South and Southeast Asia; East Africa; Northern Andes	Poor people; people dependent on agriculture SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 11: Sustainable cities and communities
Tropical storms and cyclones	More intense storms and cyclones; tropical cyclones migrating more poleward	 High	 Very high	Caribbean region and Central America; South Pacific; East China Sea; Gulf of Bengal	Coastal people and small islanders SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 11: Sustainable cities and communities
Sea level rise	Increase by 80-100 cm by 2100	 High (mainly after 2050)	 Very high (mainly after 2050)	Low-lying SIDS; low-lying coastlines and delta regions (e.g., Amazon, Ganges, Nile, Niger, Mekong, Mississippi)	Coastal people and small islanders SDG 1: No poverty SDG 2: Zero hunger SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 11: Sustainable cities and communities SDG 16: Peace, justice and strong institutions
Systems	Social, economic and ecological impact	Impact level at 1.5°C	Impact level at 2°C	Most affected regions	People most at risk/SDG most at risk
Marine ecosystems	70-99 percent of corals at extinction risk; reduced fish stock; uncertainty about many impact chains of ocean acidification	 High	 Very high	Coral reefs	Coastal people and fishermen SDG 1: No poverty SDG 2: Zero hunger SDG 8: Decent work and economic growth SDG 11: Sustainable cities and communities SDG 14: Life below water

Weather	Social, economic and ecological impact	Impact level at 1.5°C	Impact level at 2°C	Most affected regions	People most at risk/SDG most at risk
Land ecosystems	Biome shift; biodiversity loss	 Moderate to high	 High to very high	(Mainly tropical) forests; peatlands; glacial and near-surface permafrost areas	Indigenous people SDG 1: No poverty SDG 8: Decent work and economic growth SDG 11: Sustainable cities and communities SDG 13: Climate action SDG 15: Life on land
Freshwater systems	Regional runoff reduction; regional water scarcity; regional loss of fish stock and biodiversity in rivers and lakes	 Moderate to high	 High to very high	Mediterranean region; Middle East; East Africa; West Africa; Southern Africa	Poor people; people dependent on agriculture SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 11: Sustainable cities and communities SDG 15: Life below water SDG 16: Peace, justice and strong institutions
Agricultural systems	Irregularity of weather patterns and partial shift of seasons, leading to maladaptation (early leaf unfolding and flowering); regional crop loss due to heat stress, water scarcity and salinity; biodiversity loss and land-use changes due to migration of agricultural land into forest land	 High	 Very high	Mediterranean region; Africa; tropical and subtropical Americas and Asia; Oceania	Poor people; people dependent on agriculture; Indigenous people; SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 8: Decent work and economic growth SDG 11: Sustainable cities and communities SDG 12: Responsible consumption and production SDG 13: Climate action SDG 15: Life on land SDG 16: Peace, justice and strong institutions
Health systems	Higher mortality due to heatwaves; further spread of vector-borne tropical diseases (e.g., malaria, dengue, chikungunya, Zika virus, yellow fever, West Nile virus)	Uncertain	Uncertain	Global	Vulnerable and disadvantaged people

Figure 1 provides a general overview of key impacts and trends. More specific research is needed at local, regional and global levels. Important knowledge gaps still exist and need to be closed, particularly regarding linkages with SDGs. Relations between natural and social systems are complex, impacts are usually multi-causal, co-stressors (like resource degradation, unsustainable production, environmental pollution, poverty or bad governance) must be considered, and impacts are difficult to quantify. Apart from the SDGs highlighted in Figure 1, each of the climate change impacts listed can have adverse consequences for further SDGs through direct and indirect impact cascades. In particular, the possible impact of a 1.5°C or 2°C global warming on SDG 5 (Gender equality) and 10 (Reduced inequalities) is not yet well understood. Therefore, governments should address these gaps proactively in their basic climate risk and vulnerability assessments, impact assessments for NDCs and 2050 Long-term Strategies (LTS), and gender action plans for National Adaptation Plans (NAP).

Costs of adaptation and mitigation for 1.5°C consistent pathways

In the context of sustainable development, costs of adaptation and mitigation vary among countries, depending on their circumstances. With regard to adaptation costs — and comparing the adaptation needs in a 1.5°C and 2°C scenario based on global exposure to 14 impact indicators — the IPCC Special Report concludes that the agricultural, water, energy and coastal sectors cost the most to become resilient, and that adaptation risks and costs increase 2.5 fold between 1.5°C and 3°C, with South Asia, Southern Europe and the Arab Peninsula disproportionately affected. Within a country, vulnerable people are usually exposed to climate risks much more directly; for instance, Indigenous people, whose livelihoods directly depend on a healthy environment. The risk exposure also increases with the level of poverty and inequity.

Adaptation planning and budgeting adaptation should therefore always build on thorough climate risk and vulnerability mapping, including clearly identifying and prioritizing the adaptation needs of the most vulnerable populations and communities. Only then can national adaptation goals and SDGs be effectively and cost-efficiently aligned. The same is true for alignment with disaster risk reduction goals. Altogether, Africa and Asia are projected to experience 75 percent of the global risk exposure, with 85 to 90 percent of the exposed population, approximately half of it in South Asia. This leads to the worrisome conclusion that the world's hot spots of hunger and poverty are almost identical to the hot spots of climate change, putting an extra burden on governments in those regions to achieve the SDGs. Providing international support is, therefore, an imperative of climate justice, and there is a clear case for the “polluter-pays principle”, given the globally unequally caused GHG emissions, with most of the disproportionately affected countries and populations being the smallest polluters.

So far, no robust cost calculation for adaptation and the compensation of unavoidable losses has been published, neither globally nor for a single country. It is also not yet possible to exactly calculate the different adaptation and risk-financing costs for a 1.5°C scenario as compared with a 2°C scenario. The estimated costs shown in figure 2, however, illustrate that the range of adaptation costs is broad, indicating that more ambitious emission reduction leading to a low warming scenario significantly reduces adaptation and risk financing/compensation costs. What also becomes clear is the concerning fact that adaptation and risk financing so far have fallen short of needs, particularly with a view of the low climate finance contributions of many industrialized countries and wealthy and highly carbon-intense states like the Gulf countries, in support of the poorest and most vulnerable nations. This funding shortfall is not only endangering the achievement of the climate goals. It is also a possible breach of commitments under SDG 17: Partnerships for the (sustainable development) goals.

Figure 2: Estimated costs of adaptation

Source: Data taken from WWF 2016, p.18

Area	Specification	Costs	Region	Data source quoted by WWF
Total costs	Cumulated costs of adaptation	56-73 billion US dollars per year by 2019 140-300 billion US dollars per year 2020-2030 280-500 billion US dollars per year 2031-2050	Global	UNEP 2016
Coastal protection	Protection against sea level rise and storm surges (flooding and erosion)	12-31 billion US dollars per year by 2100 in a low-warming scenario; 27-71 billion US dollars per year by 2100 in a high-warming scenario	Global	UNEP 2016
Protection against river flooding		1.7 billion euros per year by 2020s; 3.4 billion euros by 2050s; 7.9 billion euros by 2080s	European Union	Feyen/Watkiss 2011
Water sector	Additional infrastructure (reservoirs and irrigation)	11 billion US dollars per year by 2030	Global	IPCC 2014b
Fisheries	Adaptation of marine fisheries for a 2°C scenario	7-30 billion US dollars per year (2010-2050)	Global	IPCC 2014b

The argument is often made that climate change mitigation, i.e., the transition to renewable energies and a more energy-efficient demand and supply management, is too costly for poor countries, where energy poverty is predominant, where dependency on fossil fuels is high and where energy supply is inefficient, for instance, due to high transmission losses or energy-inefficient plants. While it is certainly true that the energy transition that is required to stay at 1.5°C depends on high upfront investments and that many poor countries are overburdened to shoulder these costs alone, it is also true that renewables and energy efficiency measures increasingly become profitable business cases due to very fast technology development and cost decrease going far beyond expectations.⁸

Therefore, strict risk management rules should be applied to all investments in carbon-intensive infrastructure, especially in the energy sector, to avoid stranded assets. At the same time, countries should carefully assess and compare possible future economic losses due to increasing climate risks in a 2°C world as compared to a 1.5°C scenario. While a more aggressive decarbonization requires higher upfront investments, the mid- and long-term costs for adaptation and compensation of climate-induced loss and damage will become lower (WWF 2016, p. 18ff.).

To conclude, investments in fast and deep emission cuts are not only necessary to stay at 1.5° global warming, they will also reduce climate adaptation and disaster risk reduction costs and the economic and non-economic costs of climate-induced losses and damages that cannot be avoided, as they are associated

⁸ In many countries, especially in the low latitudes, solar plants produce electricity at a lower price than new coal plants.

with impacts that go beyond the “limits to adaptation”.⁹ Therefore, each country should develop a clear long-term sustainable development vision, enshrined in its development planning and aligned with a concept of how to become climate resilient and how to decarbonize at a pathway consistent with 1.5°C, not using more than its own fair share of limited carbon space. A rich country, must financially contribute its fair share to those who need support to decarbonize, to become resilient and to achieve the SDGs and the SFDRR goals.

Without steep increases of mitigation targets, 1.5°C warming may be reached by 2030

Limiting global warming to 1.5°C or 2°C cannot be reached with the emission trajectories enshrined in the current NDCs. Temperature increase will overshoot to 2.7°C or even 3.5°C by the end of the century, and 1.5°C global warming may be reached by 2030.

All scientific models that simulate 1.5°C-consistent pathways rely on a steep emission reduction long before 2030, preferably no later than 2020. According to them, it won't be possible to delay aggressive emission cuts to the 2030s and still remain at 1.5°C.

There is also almost no scenario showing emission trajectories staying at 1.5°C with a chance of at least 50 percent that works without carbon dioxide removal (CDR) from the atmosphere, i.e., so-called negative emissions. CDR either takes place through the restoration of carbon sinks like forests, peatlands and soils; through afforestation; or through the use of bioenergy combined with carbon capture and storage (CCS) or use. Most 2°C pathway models rely on CDR, too, but usually at a lower degree, and with CDR being ramped up only in the second part of the century. The often-debated equipment of coal-fired power plants with CCS as a means to make coal “cleaner” will not achieve 1.5°C. It is too costly, and most scientists consider any delay of the rapid phase-out of coal counterproductive.

The remaining carbon budget allowing global warming to be limited to 1.5°C can be roughly calculated with about 420 Gt to 770 Gt CO₂.¹⁰ In view of the fact that the resulting annual emissions of current NDCs would be 49-56 Gt in 2030 — a significant increase from today's 42 Gt — five conclusions can be made:¹¹

- Without raising ambitions significantly by 2020, overshooting the 1.5°C carbon budget without any realistic chance of coming back to the 1.5°C is an unavoidable consequence.
- By 2030, emission levels should fall to 25-30 Gt for a 1.5°C-consistent pathway or 30 Gt for a 2°C-consistent pathway.
- Removing CO₂ from the atmosphere in future decades is realistically without alternative, even if very ambitious climate action is taken now.
- According to the current 1.5°C pathway models, it is very unlikely that 1.5°C can be achieved without at least temporarily overshooting it (i.e., surpassing the 1.5°C but coming back to it in the second half of the century).

9 Defined by the IPCC as a situation in which “adaptation action to avoid intolerable risks ... are not possible or are not currently available” (IPCC 2014, p.80)

10 IPCC 2018, Summary for Policymakers, p.16

11 See IPCC, 2018, chapter 2

- Whatever pathway is chosen, mitigation will shape future energy and land use massively, making them critically important for SDG implementation strategies. Seen from a justice angle, land-use footprints of mitigation strategies should be minimized to avoid negative impacts on agriculture, ecosystems and sustainable development.

The IPCC Special Report translates these conclusions into a number of mitigation elements that should be considered for ratcheting up mitigation action, including:

- Strong and fast carbon pricing (90-105 US dollars/t CO₂ for 1.5°C)
- A strong shift in investments from “brown” to “green” in the period 2018-2050:
 - 0.3-1.3 trillion US dollars per year in Asia
 - 0.3-0.8 trillion US dollars per year in OECD countries
 - 0.08-0.5 trillion US dollars per year in the Middle East and Africa
 - 0.07-0.2 trillion US dollars per year in Latin America
 - 0.05-0.2 trillion US dollars per year in Eastern Europe and the former Soviet Union
- Turning land, soils and forests from a carbon source to a carbon sink
- Fast electrification of energy end use, full decarbonization of electricity and decarbonization of the residual fuel mix as much as possible
- Increasing energy efficiency, including for heating, cooling and lighting
- Lowering energy demand
- Transportation: Electrification (15 percent of reduction potential), increased energy efficiency (29 percent of reduction potential), biofuels (36 percent of reduction potential) and behavioural change, i.e., switching from individual to public transportation, avoidance and digitalization of communication (20 percent of reduction potential)
- Agriculture, forests and other land use: Less but more intensively used agricultural land, less emission-intense production methods, less pasture land and less livestock (reduced meat consumption), more land and forest restoration, more land for biofuels, afforestation.

There is more than one pathway leading to these emission reductions. Food habits (e.g., meat consumption), land-use changes, technical innovation and many other factors shape these pathways, apart from mitigation choices. In terms of socio-economic pathways, the so-called sustainability scenario¹² has been found by the IPCC Special Report to be the most favourable one for staying at 1.5°C. It assumes low population growth, high per capita growth, high technical progress, low energy and food demand and environmental orientation.

To conclude: Placing 1.5°C pathways in a context of justice and sustainable development requires us to consider many linkages. Land-use changes, elimination of poverty, decent work and food security are elements of sustainable development that may benefit from decarbonization, but that could also become threatened by deep and fast mitigation strategies, depending on their specific conditionalities. Co-benefits between climate action and sustainable development are neither automatic nor assured, but highly dependent on conscious and carefully planned and implemented policies.

12 O'Neill et al., 2014; Rogelj et al., 2017

Scaling up NDCs is a humanitarian, human rights, development and justice imperative

The IPCC 1.5°C Special Report, based on the body of scientific knowledge and evidence, concludes that equity, fairness and increased ambition of climate adaptation and mitigation action are a prerequisite to achieving the goals of the Paris Agreement and the SDGs. We add that the full achievement of the disaster risk reduction goals of the SFDRR also largely depends on enhanced climate action.

It's a fundamental matter of justice, to be explicitly addressed by any NDC, that climate-induced risks of poor and vulnerable people losing their lives or being deprived of their fundamental human rights to be free from hunger, extreme poverty and an adequate standard of living are already higher today than for other people. World regions where most extremely poor and vulnerable people live today, namely Africa and Asia, are exactly those regions where future climate risks are projected to be highest and where global warming above 1.5°C, according to the IPCC, will make it impossible to achieve the SDGs and the overarching principle to leave no one behind. The IPCC also concludes that development pathways with prevailing high levels of poverty and inequality will further increase rather than reduce the share of vulnerable populations. Land-use changes that are unavoidable to stay at 1.5°C and even 2°C and that are not accompanied by targeted measures to protect the rights of Indigenous people and the rural poor will further increase conflicts, marginalization and human rights violations. It is, therefore, an imperative of justice to design climate and development policies in a transformative way that creates synergies, mobilizes climate and sustainable development co-benefits and minimizes trade-offs.

The same can be said with regard to achieving at least four of the seven goals of the SFDRR. Any additional level of global warming puts additional pressure on effective disaster risk management, and levels going beyond 1.5°C pose serious questions about achieving at least the following SFDRR goals:

- To substantially reduce global disaster mortality
- To substantially reduce the number of affected people globally
- To reduce direct disaster economic loss in relation to global Gross Domestic Product (GDP)
- To substantially reduce disaster damage to critical infrastructure and disruption of basic services

It is estimated that about 60,000 people are displaced every day due to climate-induced disasters, leading to rootlessness, deprivation, conflicts, manifold human rights violations and deepened gender discrimination and inequality. These challenges will also increase in an "Above 1.5°C scenario" and can only be minimized and addressed by enhanced climate action based on international cooperation and in a spirit of ethics and solidarity.

Global warming of more than 1.5°C will seriously undermine the right to exist of entire SIDS, and may completely destabilize already weak states, for instance, in the Horn of Africa or the Sahel region, putting human security in whole nations at risk.

All of these risks must be avoided, and all states must enhance their NDCs as a first step, following humanitarian, human rights, justice and precautionary principles.

2 Potentials and Benefits of Scaling Up Nationally Determined Contributions

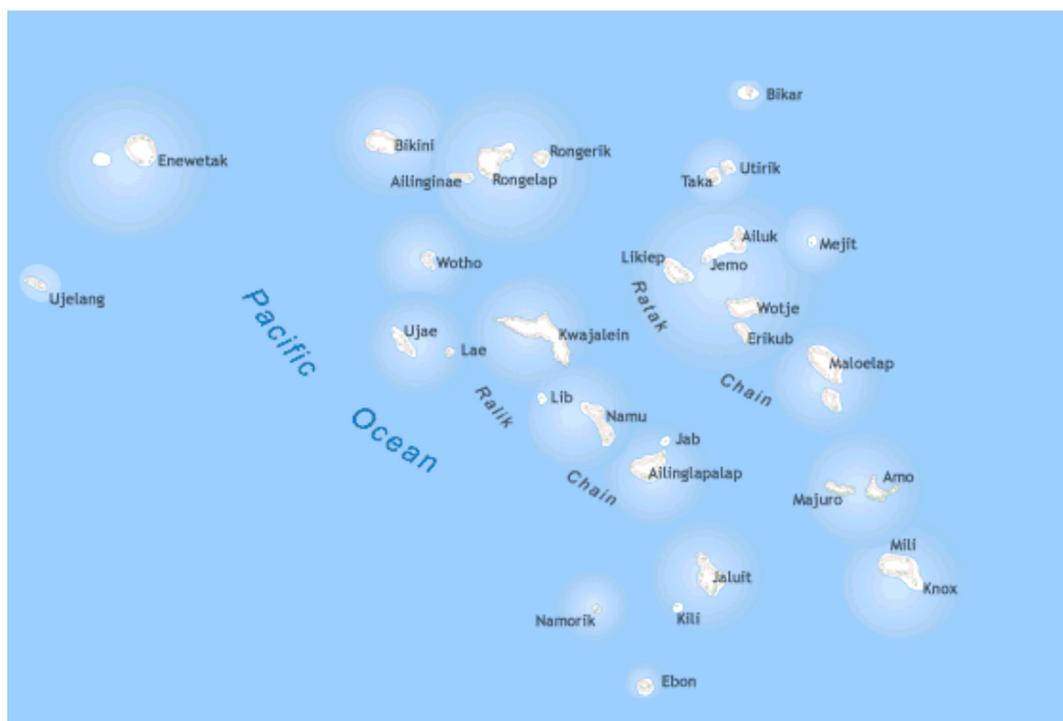
The Case of the Republic of the Marshall Islands

By Thomas Hirsch and Frances Namoumou

Climate risks for the RMI and the difference between 1.5°C and 2°C of global warming

The Republic of the Marshall Islands (RMI) is a SIDS consisting of two main archipelagos, the Ratak (Sunrise) chain and the Ralik (Sunset) chain. With 29 atolls and five islands and many more uninhabited atolls, isolated islands and reefs, the RMI has a total land mass of only 180 km², spread across 1,900,000 km² of the Pacific Ocean. The RMI is geographically located slightly north of the equator, halfway between Australia and Hawaii, sharing maritime boundaries with the island states of Kiribati and Nauru in the south and the Federated States of Micronesia in the west.

Figure 3: Map of the Republic of the Marshall Islands
Source: Government of the RMI



With an average elevation of only 2 m and a maximum elevation of 10 m, the RMI is extremely endangered by sea level rise and storm surges, with the latter occurring mostly in the context of especially high spring tides (King tides) or tropical storms and typhoons. King tides have been increasingly flooding huge parts of

the RMI's capital Majuro in recent years¹³, and shoreline erosion is already a significant problem. According to a study conducted by the US National Oceanic and Atmospheric Administration, sea level rise of 90 cm would lead to complete inundation of all atolls in case of a one-in-50-years storm, if traditional defense mechanisms are not scaled up.¹⁴ Sea level rise is a long-term process taking place at an above-average rate in the RMI of 3.9 mm per year during the past decade.¹⁵ If sea levels rise in global average by 1 m by the end of the century, as currently projected,¹⁶ the rise might be even higher in the RMI, putting its physical existence at severe risk. The benefit of keeping global warming at 1.5°C may be a reduced increase of 10 cm, and the benefit would become even bigger in the following centuries¹⁷, thus maintaining a chance to survive as a low-lying island state, if additional adaptive measures are also being taken.

Sea level rise–induced salinity and more frequent and severe droughts (partly resulting from more frequent El Niño events) severely impact the RMI and the outer atolls in the drier north, in particular, leading to water scarcity and increasing dependence on freshwater imports and reverse osmosis filters. Water availability is expected to decrease more severely in a 2°C scenario as compared with a 1.5°C global temperature increase, due to higher sea levels and more frequent El Niño events. The fragile island ecosystems and traditional agriculture will come under more severe threat, too. Water-borne diseases are likely to increase, and sanitation will become an even bigger concern, in particular in the extremely densely populated main islands like Majuro. Protecting the vulnerable groundwater lenses, increasing rainwater harvesting capacity and introducing reverse osmosis water filter systems are some adaptation options to address the water crisis.

Fish stocks and coral reefs are still under comparatively lower pressure than in many other Pacific Island states.¹⁸ They are the most important natural resources for the local economy, in particular fisheries and tourism. Accelerating ocean acidification puts these resources at severest risk, in particular the coral reefs, which are so important for marine biodiversity, coastal livelihoods and shoreline protection against coastal erosion and high waves. In a 1.5°C world, 70 to 90 percent of the corals are at risk to disappear, while in a 2°C scenario, corals are expected to be almost completely extinct. Together with the corals, coastal small-scale fisheries in the RMI, respective livelihoods, traditional ways of life and food security — in particular, on the outer islands — are threatened by ocean acidification. National adaptation planning should put a particular focus on these very vulnerable groups and ecosystems.

The Marshall Islands have to carry yet another burden. From 1946-1958, while held as a trust territory by the United States, the islands were used as nuclear testing grounds. Marshallese people were forcibly displaced by the nuclear tests; the physical, societal and environmental effects continue. The nuclear tests forever changed the nation and led to forced displacement of many islanders. On Runit Island on Enewetak Atoll, the United States buried a small portion of nuclear waste generated from the 43 atomic and thermonuclear weapon tests conducted at the atoll. A crater made by one of the bomb tests was filled with radioactive materials and covered with a concrete cap. A 2013 report by Terry Hamilton of Lawrence Livermore National Laboratory found that the dome is releasing radioactive contamination from below

13 <http://www.climatechangenews.com/2014/03/03/marshall-islands-capital-majuro-submerged-by-king-tides/> (accessed 1 August 2018)

14 http://sdwebx.worldbank.org/climateportal/countryprofile/home.cfm?page=country_profile&CCCode=MHL&ThisTab=RiskOverview (accessed 1 August 2018)

15 P. Kench, R. Ford et al., 2018. See <https://www.nature.com/articles/s41467-018-02954-1>.

16 <https://www.pik-potsdam.de/sealevel/> (accessed 15 August 2018)

17 Schleussner et al., 2011

18 <https://allislandscommittee.org/aboutaic/jurisdictions/rmi/> (accessed 1 August 2018)

through the groundwater and into the lagoon,¹⁹ putting the nearby resettled Enewetak people at risk. Land-based contaminants like those remaining from the nuclear tests — particularly plutonium and americium, a by-product of plutonium — not only make their way into groundwater through seepage like with Runit Dome but become airborne during drought and make their way to the ocean with coastal erosion and more frequent King tides and storm surges. If climate change continues and sea level further rises, Runit and other contaminated sites in the RMI may turn into time bombs. Rising sea levels may submerge the waste site, or a cyclone could rupture it.²⁰

The possible impact of 1.5°C or 2°C global warming on equality, human security, poverty eradication and the sustainable development aspirations of the RMI

The RMI archipelago, with a small population of about 53,000 people, has a very narrow economic base. It is very vulnerable to external shocks and highly dependent on external assistance (grants average 60 percent of the GDP), in particular, from the United States, to whom RMI has been closely tied since 1986 in the form of a Compact of Free Association, a treaty to alleviate harms stemming from the nuclear testing. The compact grants expire in 2023, at which point the RMI is expected to use earnings from the Compact Trust Fund to contribute to the long-term budgetary self-reliance of the RMI. However, a shortfall in distributions from the Compact Trust Fund is likely. Thus, the government seeks to mobilize other foreign sources in the future.²¹

The RMI is classified as an upper-middle-income country with a per capita GDP of 3448 US dollars (2016).²² Apart from a large public sector, accounting for approximately 40 percent of GDP and 41 percent of formal employment, fisheries, shipping, agriculture (coconuts) and retail trade are the most important economic sectors. Tourism has potential but is still in an infant stage. A US military base on Kwajalein Atoll plays a role in the island economy, too, but remittances from Marshallese living abroad are negligible. Due to a lack of employment opportunities in the outer islands, most Marshallese live on the densely populated urban islands Majuro and Ebeye. Unemployment is very high (estimated 36 percent for 2006),²³ and rates of poverty are, too, with about 20 percent of the population living on less than 1 US dollar a day.²⁴ A lack of employment opportunities undermines social development and affects the youth in particular. Relatively low levels of school attendance, very high levels of teenage pregnancy, drug abuse and low levels of female employment are some of the main challenges.²⁵

The government has shown commitment to reducing poverty, improving social inclusion, fostering sustainable development and enhancing climate resilience in its National Strategic Plan and its Vision 2018.²⁶ It has continuously stressed possible co-benefits of implementing the SDGs and its NDC in a number of documents, recently at the NDC Partnership Dialogue Forum in July 2018.²⁷

19 https://marshallislands.lni.gov/ccc/Hamilton_LLNL-TR-648143_final.pdf

20 https://mashable.com/2018/02/25/marshall-islands-nuclear-testing/?europa=true&utm_cid=hp-n-1#vepL5hBhwSqF

21 RMI, 2013

22 WHO, 2018

23 https://www.indexmundi.com/marshall_islands/unemployment_rate.html (accessed 1 August 2018)

24 http://sdwebx.worldbank.org/climateportal/countryprofile/home.cfm?page=country_profile&CCCode=MHL&ThisTab=ImpactsVulnerabilities (accessed 1 August 2018)

25 RMI, 2013

26 RMI, 2014

27 <http://sdg.iisd.org/news/partnership-dialogue-supports-implementation-of-marshall-islands-ndc/> (accessed 1 August 2018)

This approach is based on the analysis that climate change is the major factor exacerbating social and economic vulnerabilities in the RMI, and that continued warming will put at risk the very existence of the RMI. The 0.5°C difference between a 1.5°C scenario and a 2°C may define the decisive limit of having a future or not.

Apart from contributing to GHG mitigation through national and international climate action, the RMI should focus on minimizing and addressing foreseeable, country-specific climate risks, which otherwise will hamper the SDG achievement (Figure 4).

Figure 4: Linkages between climate risks, adaptation and SDGs in a 1.5/2°C scenario for the RMI.

Source: Authors, 2018

Risks and impacts	Driver	Co-stressor	Difference between 1.5°C and 2°C scenario	Measures	SDG affected
Storm surges/ typhoon	Warming of the ocean; sea level rise	Densely populated low-lying coastlines	Low by mid-century, increasingly high by end of century and beyond	Early warning; safe shelter; planned resettlement	SDG 3: Good health and well-being
Coastal erosion/ coastal flooding	Sea level rise	Degradation of mangroves and corals through environmental pollution and natural resource depletion	Low by mid-century, increasingly high by end of century and beyond	Coastal defence; planned resettlement	SDG 11: Sustainable cities and communities
Water scarcity/ drought	Salinity encroachment; El Niño/change of rainfall patterns	Dense population; groundwater contamination; insufficient rainwater harvesting	Rainfall likely to be significantly higher in a 1.5°C scenario	Improved water management and sanitation; rainwater harvesting; drip irrigation; reverse osmosis water filter	SDG 6: Clean water and sanitation
Coral bleaching	Ocean acidification; typhoons	Ocean pollution near urban islands and shipping routes	10-30 percent of coral reefs may survive in a 1.5°C scenario; almost complete extinction at 2°C warming	Marine protection (including sanctuaries) and controlled management of coral reefs	SDG 14: Life below water SDG 8: Decent work and economic growth
Decline of fish stock	Ocean warming; acidification; coral bleaching	Overfishing; ocean pollution	Projected global decline of fish catch by 1.5 percent at 1.5°C or three percent at 2°C as compared with today; decline in tropical RMI probably significantly higher, in particular for coastal fisheries	Marine protection (including sanctuaries) and more restricted management of fish stock	SDG 14: Life below water SDG 2: Zero hunger SDG 8: Decent work and economic growth SDG 12: Responsible consumption and production

Risks and impacts	Driver	Co-stressor	Difference between 1.5°C and 2°C scenario	Measures	SDG affected
Ecosystem degradation	Salinity encroachment; drought	Dense population; environmental pollution; natural resource depletion	Degradation of fragile ecosystems on low-lying islands likely to be lower at 1.5°C; extinction very likely in the long run unless coastal defence measures and protection of sweet water sources ensured	Environmental protection, water management and coastal defence	SDG 15: Life on land SDG 3: Good health and well-being SDG 2: Zero hunger
Spread of diseases	Solar radiation; heat; drought	Water scarcity; insufficient sanitation	Spread of vector-borne tropical diseases and skin diseases likely to be lower at 1.5°C	Quality health system; clean water and sanitation; sun protection	SDG 3: Good health and well-being
Economic losses, particularly in fisheries, agriculture and tourism	All aforementioned drivers/impacts		Significantly higher losses at 2°C are likely, unless adaptation measures are taken	All aforementioned measures plus additional risk reduction, risk financing and risk insurance	SDG 1: No poverty SDG 8: Decent work and economic growth
Non-economic losses of territory, culture, traditional knowledge and social cohesion, particularly in remote outer islands	All aforementioned drivers/impacts		Significantly higher losses at 2°C are likely, unless adaptation measures are taken	Enhance understanding; acknowledge, recognize and compensate non-economic loss and damage	SDG 16: Peace, justice and strong institutions

The response provided by the RMI's NDC to the challenges of 1.5°C or 2°C global warming

The RMI communicated its 10-page NDC to the United Nations Framework Convention on Climate Change (UNFCCC) on 21 July 2015. The RMI commits to an absolute economy-wide GHG emission reduction to 32 percent below 2010 levels by 2025. It further communicates an intentional GHG emission reduction to 45 percent below 2010 levels by 2030 and indicates its firm will to overachieve its targets.²⁸ These quantified emission reduction targets are in line with its long-term commitment to become GHG neutral by no later than 2050.²⁹ Thus, the RMI demonstrates a high level of ambition and leadership, consistent with a 1.5°C pathway, despite its negligible contribution to global emissions (< 0.00001 percent). In September 2019, the RMI announced it would further step-up its NDC.

Emissions covered by the target are carbon dioxide, methane and nitrous oxide, originating from the energy (54 percent) and waste sector (23 percent). Emissions from transport (12 percent) and the land sector are not included. Energy efficiency improvements and a massive uptake of renewable energy, replacing imported petroleum and thus also reducing the still high and very costly reliance on imported fossil fuels for the energy and transport sector, are key elements of the National Energy Policy (NEP 2014). This policy is aligned with the Micronesian Energy Initiative and the goals of the Sustainable Energy for All Initiative (SE4All). This translates into specific emission reduction targets for the electricity sector of 55 percent in 2025 and 66 percent in 2030; 16 percent in 2025 and 27 percent in 2030 for transportation, including domestic shipping; 20 percent in 2030 for waste; and 15 percent in 2030 for other sectors, including cooking with biofuels.

²⁸ RMI, 2015

²⁹ RMI, 2015; see also <http://sdg.iisd.org/events/partnership-dialogue-to-support-marshall-islands-on-ndc-implementation/> (accessed 15 August 2018)

The tentative plan of action, which is highly dependent on the availability of the necessary financial and technology support, includes ground and rooftop solar energy backed up with battery storage, demand and supply-side energy-efficiency improvements, micro wind turbines, expansion of coconut oil production to produce biodiesel, introduction of electric vehicles and solar-charged electric lagoon transportation, solar cook stoves and a replacement of kerosene lamps by solar lights in outer islands and improved waste management.³⁰

Improving resilience to safeguard human security and human rights, and to achieve the SDGs, is another key pillar of the NDC. “RMI commits to further developing and enhancing the existing adaptation framework to build upon integrated disaster risk management strategies, including through development and implementation of a NAP (and further integration into strategic development planning tools), protecting traditional culture and ecosystem resources, ensuring climate-resilient public infrastructure and pursuing facilitative, stakeholder-driven methods to increase resilience of privately owned structures and resources. RMI seeks to consider, as appropriate, the legal and regulatory means to best support these approaches.”³¹

The NDC explicitly refers to possible (development) co-benefits of mitigation and adaptation action, for instance, with regard to mangrove and agriculture rehabilitation programmes, protection of water resources and health. The National Climate Change Policy Framework (NCCPF, 2011)³² includes a series of priority areas for urgent response, addressing the aforementioned main climate risks and impacts, like sea level rise, storm surges and typhoons, drought, water and food insecurity, ocean acidification and health problems. Respective adaptation needs are further specified in the Joint National Action Plan for Climate Change Adaptation and Disaster Risk Management (JNAP) and the Disaster Risk Management National Action Plan (DRM NAP), including the institutional establishment of improved coordination of disaster risk management and adaptation, education and awareness raising on effective adaptation and disaster risk management from the local to the national level, enhanced emergency preparedness and response, enhanced local livelihood and community resilience for all Marshallese, and an integrated approach to climate-sensitive development planning.³³

The RMI commits to regularly update its climate vulnerability assessments and respective adaptation plans and emphasizes that “at all steps of the way, local stakeholders will be consulted to ensure community needs are best served.”³⁴

While the RMI considers its NDC “as a full national commitment to be undertaken without pre-conditions,”³⁵ international support for the implementation of both mitigation and adaptation action is critical for success.

Altogether, the NDC of the RMI can be considered an ambitious response to the significant challenges to stay at 1.5°C and to deal with the enormously challenging risks for the Marshall Islands as an extremely low-lying SIDS. This is true with regard to both the enabling institutional framework described, the participatory and people-centred approach and the ambitious targets and action priorities. What is needed next for successful implementation are more specific short-, medium- and long-term

30 RMI, 2015

31 RMI, 2015, p. 8

32 RMI, 2011

33 RMI, 2015

34 *Ibid.*

35 RMI, 2015, p. 9

climate action and investment plans, defining all the measures to be taken, in consultation with national stakeholders and development partners. The timing is right, considering that most of the RMI's climate policy frameworks and plans need an update (NCCPF is dated 2011 and JNAP 2014), and that a NAP, as well as a Long-Term 2050 Climate Strategy are currently under development.

The Partnership Dialogue to support implementation of the RMI's NDC, co-hosted in Majuro by the government and the NDC Partnership on 23 July 2018, strongly indicated that the RMI, with the support of its development partners, has the potential to turn into a best practice example of how to ambitiously implement the NDC consistent with a 1.5°C pathway.

The NDC Partnership Plan identified six priority areas for co-operation, namely:

- Mitigation of emissions and reduced dependence on fossil fuels
- Adaptation and resilience
- Fully integrating gender and human rights measures into the country's climate strategy (which is a very positive step, considering that gender and human rights, including those of future generations, got relatively little attention in the NDC and NCCPF)
- Capacity building so that all can contribute to the country's NDC (which is an important step to mainstream and align climate action and sustainable development in a participatory and inclusive manner according to the principle of a whole-of-society and whole-of-government approach)
- Coordinated climate policy, climate finance and climate data
- Global leadership and ambition³⁶

These priority areas are quite consistent with many of the recommendations for the NDC Partnership, published in 2017 by Bread for the World, in cooperation with ACT Alliance.³⁷

When it comes to implementing the NDC, the RMI should follow the guiding principle, outlined in its NCCPF, of focusing “on direct implementation (not just policies and plans); and mainstream climate change considerations into core social development goals and the development and implementation of sectoral plans and programmes.”³⁸

Proposed measures to ambitiously implement the NDC coherent with 1.5°C pathways and in alignment with the SDGs and the goals of the SFDRR

Implementation has an **institutional**, **procedural** and **thematic** dimension. We will look at these dimensions and propose measures for improvement.

At the **institutional** level, the RMI has set up a management framework, coordinated by the Office of the Environment, Planning and Policy Coordination, which sits directly under the office and serves as secretariat and vice-chair of the National Climate Change Committee (NCCC). The NCCC is the main linkage to other governmental and non-governmental stakeholders, who are important for implementing and mainstreaming climate action. This set-up reflects very well the NCCPF principle of “strong political commitment and demonstration of ‘climate leadership’ at the highest levels of government, including

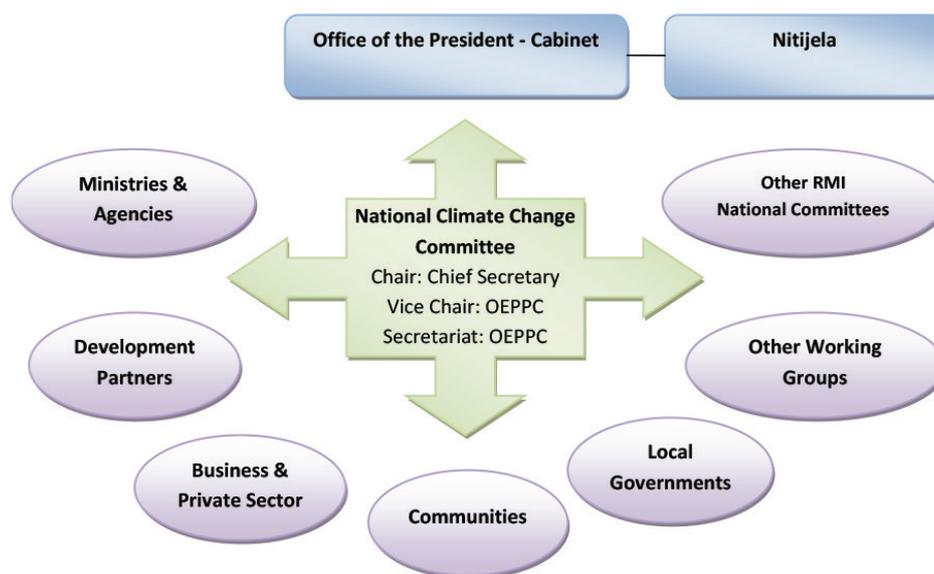
36 <http://sdg.iisd.org/news/partnership-dialogue-supports-implementation-of-marshall-islands-ndc/> (accessed 3 August 2018)

37 https://www.brot-fuer-die-welt.de/fileadmin/mediapool/2_Downloads/Fachinformationen/Analyse/2017-0512_Ambition_en_web.pdf (accessed 2 August 2018)

38 RMI NCCPF, January 2011, p. 15

the President, the Cabinet and the Nitijela (the Lower House of Parliament), and Traditional Leaders and non-governmental partners.”³⁹ It seems to be well suited for coordinated climate policy in a whole-of-government approach.

Figure 5: Institutional framework for managing the National Climate Change Policy
Source: RMI NCCPF, January 2011, p. 25



At the **procedural** and legal/policy level, legal frameworks and policies need an upgrade to ensure a proper NDC implementation, well aligned with the SDG implementation roadmap, and in view of the expected NAP and the new 2050 LTS. This should include guidelines on how to ensure the full integration of gender and human rights measures into the country’s climate strategy, as promised at the NDC Partnership Dialogue. Recommended tools are human rights impact assessments and a gender action plan in the contexts of the NAP and the 2050 LTS.

Regarding participation, according to the whole-of-society principle for NDC and SDG implementation, guidelines also should be established. Related ACT recommendations to the NDC Partnership may be interesting to consider.⁴⁰ The NCCPF principle for inclusiveness, “take into account and address the unique characteristics and priorities of both the population centres and the outer islands” is a good entry point.⁴¹

Intergenerational justice is another important element, and an integral part of climate justice, that should be addressed. Responsibility toward future generations, and a strong pledge to safeguard the islands, is enshrined in the RMI constitution: “All we have and are today as a people, we have received as a sacred heritage which we pledge ourselves to safeguard and maintain, valuing nothing more clearly than our

39 *Ibid.*, p.25

40 See https://www.brot-fuer-die-welt.de/fileadmin/mediapool/2_Downloads/Fachinformationen/Analyse/2017-0512_Ambition_en_web.pdf (accessed 2 August 2018)

41 RMI NCCPF, January 2011, p. 16

rightful home on the islands, within the traditional boundaries of this archipelago.”⁴² This commitment should serve as an important reference for future climate action.

At the level of **thematic** priorities, the NCCPF includes the following, which are broadly consistent with the NDC, the NDC Partnership Plan and the aforementioned key challenges.

Figure 6: Climate change national priority areas in the RMI

Source: RMI NCCPF, January 2011

- Strengthen the enabling environment for climate change adaptation and mitigation, including sustainable financing
- Strengthen coordination across government and streamline entry points for accessing and managing climate change funds
- Adaptation and reducing risks for a climate-resilient future in the following sectors:
 - Food and water security
 - Energy security and conservation
 - Biodiversity and ecosystem management
 - Human resources development, education, and awareness
 - Health
 - Urban planning and infrastructure development
 - Disaster risk management
 - Land and coastal management, including land tenure
 - Transport and communication
 - Aiming at
 - Developing effective adaptation and risk reduction responses and capacities
 - Promoting and implementing adaptation programmes that support and improve communities' livelihoods
 - Improving and strengthening climate data availability, risk assessments, and monitoring
- Energy security and low-carbon future through the implementation of the 2009 NEP with its quantitative targets, and is supported through access to international finance
- Disaster preparedness, response, and recovery through the implementation of the RMI DRM NAP, with a strong focus on strengthening the preparedness of communities, including through people-focused early warning systems and prioritizing the needs of the most vulnerable groups in cases of emergencies
- Building education and awareness and community mobilization — while being mindful of culture, gender and youth — including through the integration of climate change into education, enhanced use of climate data in decision making and planning and the promotion of gender-sensitive strategies and traditional knowledge in adaptation.

What has yet to be done, however, is to further develop these thematic priorities into more specific flagship programmes for action, including related investment plans. It is further recommended to identify lighthouse projects under each of the programmes for action, which demonstrate step-by-step

42 *Ibid.*, p. 17

how the flagship programmes for action turn into reality. Each of them should include clearly visible sustainable development co-benefits and linkages to the RMI's Vision 2018 or any successor.

In view of the proposed measures in Figure 4, it is recommended to set up six national and two regional flagship programmes for action, which are interconnected, in line with the NDC and the climate change national priority areas (and may replace the latter in future), which fulfill the requirements for a 1.5°C scenario and which contribute to the achievement of the SDGs and the SFDRR.

Proposed National Flagship Programmes for Action

1. Develop a country-wide **Climate Risk Map and a Vulnerability Assessment** covering all islands and communities and their specific risks and vulnerabilities to inform the NAP, the DRM NAP and the 2050 LTS. Cooperating with Fiji could be helpful.⁴³
2. Set up a **Coastal Defence Programme** to protect all people and infrastructure against sea level rise, storm surges, typhoons and drought; support could be provided in the form of a partnership with specialized institutions from a country such as The Netherlands or Germany.⁴⁴
3. Set up an integrated **Marine Conservation and Eco-Tourism Programme**, including marine sanctuaries, fish stock management and coral reef conservation, combined with the development of guided eco-tourism. Cooperating with Ecuador could be helpful, taking the lessons learnt from the Galapagos Islands.
4. Set up a **Water Management Programme**, including the protection of water resources, improved capacity for rainwater harvesting and filtering (in particular in outer islands), sanitation, irrigation in agriculture and demand-side improvement of water efficiency.
5. Set up a **Climate-Resilient Traditional Livelihoods Programme**, targeting in particular communities in the outer islands, combining awareness raising, use of traditional knowledge, disaster risk reduction⁴⁵, resilience building and the promotion of traditional and alternative livelihoods, linked with eco-tourism.⁴⁶

43 The Climate and Vulnerability Assessment of Fiji can be found at <https://cop23.com.fj/wp-content/uploads/2018/02/Fiji-Climate-Vulnerability-Assessment-.pdf> (accessed 15 August 2018)

44 The Trilateral Master Plan for the protection of the Wadden Sea can be found at www.waddensea-secretariat.org/tgc/documents/master-plan-coastal-protection-main-land

45 A good and gender-sensitive understanding of community needs in the RMI in times of disasters is provided by B. Takala (without year) Focused Assessment of Community Needs During iien idiñ (time of disaster).

46 Similar approaches have been successfully tested and introduced by many NGOs around the world, including members of ACT Alliance, as, for example, under the so-called Lighthouse Project Program funded by Bread for the World and implemented in Bangladesh, Ethiopia and Indonesia, among others. The project in Bangladesh — implemented by the Christian Commission for Development in Bangladesh in coastal provinces, centred around the formation of Community Centres for Climate Resilience in remote low-lying communities — could be instructive for the RMI, too. See https://www.dropbox.com/s/e8pmz1gub3bvf/Final_Being_Resilient.pdf?dl=0 (accessed 15 August 2018).

6. Create a **Marshall Islands 100 Percent Renewable Energy for All Programme**, covering electricity, cooking, processing and lagoon transportation. Technology and cost breakthroughs for solar or micro wind electricity generation, backed up by battery storage systems, are technically viable and economically attractive. Lessons learnt by the Philippines or other Pacific Island States may be taken.⁴⁷

Proposed regional flagship programmes for action

7. Set-up a **Pacific Documentation and Research Centre for Non-Economic Loss and Damage** to enhance understanding of non-economic loss and damage and how to minimize and address it. Non-economic loss and damage (NELD) will be far-reaching for SIDS, with the potential to severely shape their environmental, cultural and socio-economic systems. So far there are knowledge gaps with regard to NELD. Such a centre could become a pioneering institution to systematically document NELD and close these gaps, in order to inform appropriate strategies to minimize and address NELD. Cooperation with UNFCCC (particularly the Warsaw International Mechanism), UNESCO, UNEP and the UN Council of Indigenous Affairs would be an option. Such a centre could build on the experiences with economic and cultural losses caused by nuclear weapon tests, and it could use the established systems of remediation in the Pacific regarding the loss of Indigenous homelands.
8. Set up a **Pacific Climate Change Resettlement Initiative** to enhance the understanding of and preparedness for resettlement. It is very likely that planned resettlement of people and communities will become an important element of adaptation in the Pacific Island States. Resettlement is a complex, often hidden and potentially conflictive issue, and international cooperation and support is needed. The initiative could provide a forum to address these issues properly, enabling migration in dignity.⁴⁸

Figure 7:
Overview of proposed flagship programmes and related lighthouse projects for the RMI
 Source: Authors, 2018

Flagship programme for action	Possible lighthouse projects	Possible international support and cooperation	Relevance to stay at 1.5°C and to deal with its consequences	Contribution to achieving SDGs and SFDRR goals
Climate Risk Map and Vulnerability Assessment	Country-wide consultations and agreement on an assessment methodology	Fiji and donor community	High	Substantially increase the availability of and access to disaster risk information and assessments (SFDRR) SDG 13: Climate action; SDG 5: Gender equality
Coastal Defence Programme	Early warning; coastal protection measures; safe shelter; planned resettlement	The Netherlands, Germany, Denmark	Very high	Substantially increase the availability of and access to multi-hazard early warning systems (SFDRR); SDG 11: Sustainable cities and communities

47 See <http://ieefa.org/ieefa-report-electricity-sector-opportunity-philippines> or <https://www.greenclimate.fund/-/pacific-islands-renewable-energy-investment-program> (accessed 15 August 2018)

48 See also <https://www.migrationpolicy.org/article/no-retreat-climate-change-and-voluntary-immobility-pacific-islands> (accessed 26 September 2018)

Marine Conservation and Eco-Tourism Programme	Marine protection, including sanctuaries, and controlled management of coral reefs and fish stock	Ecuador and international donor community	Very high	SDG 14: Life below water SDG 15: Life on land SDG 8: Decent work and economic growth
Water Management Programme	Improved water management and sanitation; rainwater harvesting; drip irrigation; reverse osmosis water filter	International donor community	Very high	SDG 6: Clean water and sanitation SDG 3: Good health and well-being
Climate-Resilient Traditional Livelihoods Programme	Consultations on outer islands and identification of action priorities; skills training; diversification of livelihoods	NGOs and international donor community	Very high	SDG 1: No poverty SDG 2: Zero hunger SDG 8: Decent work and economic growth SDG 10: Reduced inequalities SDG 12: Responsible consumption and production
Marshall Islands' 100 Percent Renewable Energy for All Programme	Country-wide feasibility study; pilot projects on selected islands	Philippines, neighbouring island states and international donor community	Very high	SDG 7: Affordable and clean energy
Pacific Documentation and Research Centre for Non-Economic Loss and Damage	Scoping; taking stock of and mapping actors in the region; consultations with specialized agencies and experts	Pacific Island States, UNFCCC/WIM, UNEP, UNESCO	Medium	SDG 16: Peace and justice and strong institutions
Pacific Climate Change Resettlement Initiative	Scoping; taking stock and mapping of actors in the region; consultations with specialized agencies and experts; identification of pilot projects	Pacific Island States and international donor community	Medium	SDG 16: Peace, justice and strong institutions

Concluding policy recommendations

Due to both their tremendous vulnerability to climate change and their resulting envisioned leadership for ambitious climate action, the Marshall Islands have huge potential to provide an enabling policy and legal framework to guide climate action consistent with 1.5°C pathways in alignment with sustainable development planning and disaster risk reduction. Building on existing frameworks, policies and the NDC, and in line with the 2050 LTS and the NAP yet to be finalized, it is recommended to develop six national and two regional flagship programmes and related lighthouse projects, comprehensively addressing the most pressing climate risks and impacts in a targeted and inclusive way. Programmes would cover climate risk assessments, coastal protection, marine conservation combined with eco-tourism, water management, climate resilient livelihoods, renewable energies, non-economic loss and damage, and resettlement. They should be designed and implemented in a participatory way, creating triple wins of adaptation, GHG mitigation, and sustainable development, and with the mobilization of international cooperation and support.

The Case of the Republic of the Philippines

By Sara Jane Ahmed

Climate risks for the Philippines and the difference between 1.5°C and 2°C of global warming

As an archipelagic country with a population of more than 100 million, the Philippines remains highly vulnerable to the impacts of climate change and natural hazards. In the Global Climate Risk Index of Germanwatch (Germanwatch 2018) the Philippines ranked fifth with respect to the long-term Climate Risk Index for the period 1994-2014.

Key findings from a report⁴⁹ released by Philippine Atmospheric, Geophysical and Astronomical Services Administration on observed climate trends and projected climate change in the Philippines include:

- Temperature: 0.1°C/decade average increase rate
- Rainfall: +/- 40 percent projected changes; projected rainfall reduction particularly in Central Mindanao
- Tropical cyclones: Continued high year-to-year variations in frequency and intensity
- Sea level rise: Nearly double the global average sea level rise rate over certain parts of the Philippines between 1993 and 2015.

Existing climate risks in the Philippines include

- Inevitable sea level rise. Since 1901 the Philippines has had one of the highest at 60 cm versus the global average of 19 cm. Sixty-four coastal provinces, 822 coastal municipalities, and 25 major coastal cities are at risk. Between 2016 and 2100, there will be 13.6 million Filipinos requiring relocation.
- Coral reef degradation. In a 1.5°C scenario, the Philippines will suffer 90 percent reef degradation by 2020 and an improvement to 70 percent degradation by 2050. The 2°C scenario will cause 98 percent coral reef degradation by 2050 and 99 percent coral reef degradation by 2100.
- Decline in fish stock. Fish harvest is expected to decline by 50 percent by 2060.
- Change in wet and dry tendencies. Increasing trends in annual and seasonal total rainfall were found in the central parts of Luzon, the eastern section of Visayas and the northeastern and southwestern sections of Mindanao while drying trends were observed over northern sections of Luzon, western sections of Visayas and central and western sections of Mindanao.
- Change in seasonal rainfall. An increasing trend has been observed in most parts of the country, with a pronounced increase in eastern parts of the country during the NE- monsoon season (Dec-Feb), which coincides with the wet season over these areas. On the other hand, a drying trend over the northern portion of Luzon, Panay Mindoro and Palawan is projected. There is an increasing trend during the dry season (March-May), except in central Mindanao. There is a decreasing trend

49 https://pubfiles.pagasa.dost.gov.ph/iaas/FINAL_observed_climate_trends_and_projected_climate_change_in_the_Philis_2018.pdf

during the SW-monsoon (June- August) in most parts of the country, except in central Luzon, Mindoro, eastern Visayas, and northern and southern Mindanao.

- Change in the number of hot days. Increasing number of hot days and decreasing cold days.
- Change in the frequency of rainfall events. Increasing frequency of extreme rainfall events.
- Change in the intensity of tropical cyclones. Increasing number of intense tropical cyclones with maximum sustained winds >170kph.

The Philippine government has outlined the following warming risks.

Figure 8: Associated Risks of Climate Change in the Philippines

Source: Impact Assessment and Application Section, Climatology and Agrometeorology Division, Department of Science and Technology, Philippine Atmospheric, Geophysical, and Astronomical Services Administration

<p>Coastal</p> <ul style="list-style-type: none"> • Intrusion of salt water in agriculture areas • Higher risks to lives and damage to coastal areas • Increased erosion of beaches and cliffs • Impacts on marine ecosystems (reefs, corals etc.) • More frequent episodes of toxic red tides • Migration of fish to areas with more favorable conditions leading to diminished harvest (coastal fishing = 40-60 percent of total fish catch) • Coral bleaching leading to loss of fish breeding and nursery grounds and hence fish stocks • Increasing acidity of the seas leads to a loss of calcification capacities — impacts on coral reef and shellfish growth 	<p>Health</p> <ul style="list-style-type: none"> • Vector-borne diseases • Water-borne diseases • Disaster-related illnesses, e.g., leptospirosis, schistosomiasis • Disruptions of environmental health services and infrastructures (water supply, public sanitation etc.) during disasters • Algal blooms causing red tides • Cholera • Diarrhea • Skin cancer • Heat stress and heat stroke • Respiratory illnesses
<p>Freshwater</p> <ul style="list-style-type: none"> • Present usage: <ul style="list-style-type: none"> • 80 percent - agriculture • 16 percent - industrial • four percent - domestic • Higher temperature = higher irrigation demand from agriculture due to higher evaporation rate • Saltwater intrusion due to prolonged droughts 	<p>Biodiversity</p> <ul style="list-style-type: none"> • Extinction rate of some species may be hastened, leading to a decrease in ecosystem stability that will threaten life itself • Distribution patterns of many species and communities that are determined largely by climatic parameters will change • Vegetation zones may move toward higher latitudes or higher altitudes • Rising sea temperatures affect the distribution and survival of particular marine resources

The possible impact of 1.5°C or 2°C global warming on equality, human security, poverty eradication and the sustainable development aspirations of the Philippines

According to the Asian Development Bank (ADB), inaction in South-East Asia, including the Philippines, “could result in a loss equivalent to more than six percent of GDP annually by 2100, more than double the global average loss while adaptation at a cost of just 0.2 percent of GDP for investment in such things as seawalls and drought- and heat-resistant crops could avoid damages amounting to 1.9 percent of GDP, on an annual basis”.⁵⁰

50 Janet Arlene Amponin and James Warren Evans (August 2016) “Assessing the Intended Nationally Determined Contributions of ADB Developing Members”. In ADB Sustainable Development Working Paper Series, no. 44; see <https://www.adb.org/sites/default/files/publication/189882/sdwp-044.pdf>.

Therefore, it is essential for the region to limit global warming to 1.5°C and at the same time, fosters resilience to minimize negative impacts as much as possible. This would lead to a considerable sustainable development co-benefits, as shown in the following figure.

Figure 9: 1.5°C benefits v. 2°C and above in the context of the Philippines

Source: Climate Analytics, CVF and UNDP. "Pursuing the 1.5° C Limit: Benefits & Opportunities", 2016 Low Carbon Monitor.

<http://climateanalytics.org/files/lowcarbonmonitor-nov2016-medres.pdf>

Category	1.5°C Benefits v. 2°C
Physical impacts	<ul style="list-style-type: none"> • Lowest risks of extreme weather of any temperature limit considered feasible, protecting populations and infrastructure • Avoids much of the virtual (99 percent) disappearance of coral reefs at 2°C and associated marine ecosystem and coastal livelihoods crises • Reduces heatwaves by approximately one month per year versus 2°C of warming • Lessens the increase in extreme precipitation for SE Asia from 10 percent to seven percent compared with 2°C
Economic risks	<ul style="list-style-type: none"> • Avoids 0.4 percent of losses to annual GDP growth of the Philippines economy by 2040 versus current policies
Air pollution	<ul style="list-style-type: none"> • SE Asia has 1.63 million annual deaths related to air pollution that more stringent 1.5°C-consistent emissions controls would help address • Reduces toxic stresses for key crops, such as rice, from ground-level air pollution, boosting agricultural production and resilience
Employment	<ul style="list-style-type: none"> • Minimizes losses caused by extreme heat to total national work hours of one percent compared to two percent at 2°C. • Doubles the level of job creation between now and 2050 compared with a 2°C scenario because of higher employment intensity of renewables, while adding more higher quality jobs
Energy independence	<ul style="list-style-type: none"> • Takes advantage of the high domestic energy self-sufficiency of the Philippines on renewable energy resources for power, which exceeds total primary energy requirements by up to 20 percent
Balance of payments and price stability	<ul style="list-style-type: none"> • Reduces an up to 17 percent of GDP inflationary exposure to oil, the primary internationally commoditized and price-volatile fuel that represents as much as 20-30 percent of the total value of all imported goods and services into the Philippines (1960s-2014)
Energy access	<ul style="list-style-type: none"> • 1.5°C scenarios have greatest emphasis on renewables with off-grid advantages for accelerated provision of electricity to 21 million people or 21 percent of the population with no access
Globalizing climate action	<ul style="list-style-type: none"> • Expands and internationalizes renewable energy capacity, which will further reduce the costs of installations globally following radical cost reductions for renewables, now competitive on cost with all other forms of energy production, despite persistent fossil fuel subsidies on a significantly larger scale than total international climate finance • Enhanced international cooperation toward a higher climate goal of 1.5°C accelerates globalizing access to emissions abatement opportunities at attractive marginal costs in developing countries with deforestation prevention and land-use change potential, including SE Asia and the Philippines

The response provided by the Philippines' NDC to the challenges of 1.5°C or 2°C global warming

The Paris Agreement (and its overarching objective of pursuing low carbon and climate-resilient development) is one of the key declarations linking the NDCs and the rest of the development plans in each sector. The Philippines' NDC has anchored itself on the following:

- National Framework Strategy on Climate Change (NFSCC)
- National Climate Change Action Plan (NCCAP)
- Philippine Development Plan (2017-2022)
- Ambisyon Natin 2040 (Development Vision)
- Sectoral ("AWIT-FE") Policy and Planning Frameworks
- CC/Sustainability initiatives of "sub-national" and "non-state" actors

- Climate Change Act (and the amended RA 10174 People's Survival Fund)
- Green Jobs Act of 2016
- Environmental Laws (Clean Air Act and Clean Water Act)

A crucial cornerstone for the climate policy of the Philippines is the NFSCC, with both a mitigation objective to facilitate the transition toward low GHG emissions for sustainable development and an adaptation objective to build the adaptive capacity of communities and increase the resilience of natural ecosystems to climate change. The main elements of the NFSCC are shown in the following figures.

Figure 10: NFSCC mitigation result areas

Source: Office of the President of the Philippines, Climate Change Commission, "National Framework Strategy on Climate Change 2010-2022". www.neda.gov.ph/wp-content/uploads/2013/10/nfscs_sgd.pdf

NFSCC mitigation result area	Programme/project outputs	Performance indicators
Energy efficiency and conservation	Reduced emissions from buildings, cities, industries and appliances	Annual energy savings (GWh) (Paris performance indicators b & d)
Renewable energy	Reduced emissions through increased low-emission energy access and power generation	Level of capacity (MW) from low emission sources
Environmentally sustainable transport	Reduced emissions through increased access to low-emission transport	Emissions levels from vehicles (Paris performance indicator c)
Sustainable infrastructure	Reduced emissions from buildings, cities, industries, and appliances	Annual energy savings (GWh) (Paris performance indicators b & d)
National REDD+ Strategy	Reduced emissions from land use, deforestation, forest degradation and through sustainable forest management and conservation and enhancement of forest carbon stocks	tCO ₂ e _q reduced from forest/land use (Paris performance indicator g)
Waste management	Reduced emissions from buildings, cities, industries, and appliances	Annual energy savings (GWh) (Paris performance indicators b & d)

Figure 11: NFSCC adaptation result areas

Source: Office of the President of the Philippines, Climate Change Commission, "National Framework Strategy on Climate Change 2010-2022". www.neda.gov.ph/wp-content/uploads/2013/10/nfscs_sgd.pdf

NFSCC adaptation result area	Programme/project outputs	Performance indicators
Enhanced vulnerability and adaptation assessments	Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions	Number (percentage) of households adopting a wider variety of livelihood strategies/coping mechanisms
Integrated ecosystem-based management	Increased resilience of ecosystems and ecosystem services	Area (ha) of habitat or kilometres of coastline rehabilitated (e.g., reduced external pressures such as overgrazing and land degradation through logging/collecting), restored (e.g., through replanting) or protected (e.g., through improved fire management; flood plain/buffer maintenance); number and area of agroforestry projects, forest-pastoral systems or ecosystems-based adaptation systems established or enhanced
Water governance and management	Increased resilience of health and well-being and food and water security	Percentage of households with year-round access to adequate water (quality and quantity for household use)
Climate-responsive agriculture	Increased resilience of health and well-being, and food and water security	Percentage of food-secure households (reduced food gaps)
Climate-responsive health sector	Increased resilience of health and well-being and food and water security	Climate-induced disease incidence in areas where adaptation health measures have been introduced (percent of population)
Climate-proofing infrastructure	Increased resilience of infrastructure and the built environment to climate change threats	Value of infrastructure made more resilient to rapid-onset events (e.g., floods, storm surges, heatwaves) and slow onset-processes (e.g., sea level rise); number of new infrastructure projects or physical assets strengthened or constructed to withstand conditions from climate variability and change (e.g., to heat, humidity, wind velocity and floods)
Disaster risk reduction	Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions	Percentage reduction in the number of people affected (c.f. CRED definition) by climate-related disasters, including the differences between vulnerable groups (women, elderly etc.) and the population as a whole

The second very important basis for climate policies in the Philippines is the NCCAP 2011-2028. Its key priorities, outcomes, and performance indicators are shown in the following figure.

Figure 12: NCCAP Priorities and Outcomes⁵¹

Source: National Climate Action Plan 2011-2018, Government of the Philippines

	Food security priorities	Immediate outcomes	Intermediate outcomes	Programme/project outputs	Performance indicators
1	Food security	Enhanced climate change resilience of agriculture and fisheries production and distribution systems; enhanced resilience of agriculture and fishing communities from climate change.	Availability, stability, accessibility, and affordability of safe and healthy food amidst climate change	Increased resilience of health and well-being and food and water security	Percentage of food-secure households (reduced food gaps)

	Water sufficiency priorities	Immediate outcomes	Intermediate outcomes	Programme/project outputs	Performance indicators
2	Water sufficiency	Water governance restructured toward integrated water resources management in watersheds and river basins; sustainability of supplies and access to safe water ensured; knowledge and capacity for climate change adaptation in water sector enhanced.	Water resources sustainability managed and equitable access ensured	Increased resilience of health and well-being and food and water security	Percentage of households with year-round access to adequate water (quality and quantity for household use)

	Ecological and environmental stability priorities	Immediate outcomes	Intermediate outcomes	Programme/project outputs	Performance indicators
3	Ecological and environmental stability	Ecosystems protected and rehabilitated and ecological services restored	Enhanced resilience and stability of natural systems and communities	Increased resilience of ecosystems and ecosystem services; reduced emissions from land use, deforestation, forest degradation and through sustainable forest management and conservation and enhancement of forest carbon stocks (Paris result areas g, h and i)	Area (ha) of habitat or kilometres of coastline rehabilitated (e.g., reduced external pressures such as overgrazing and land degradation through logging/collecting), restored (e.g., through replanting) or protected (e.g., through improved fire management; flood plain/ buffer maintenance) tCO ₂ eq reduced from forest/land use (Paris performance indicator g)

51 Although these cannot be compared laterally as they are applied sequentially (and iteratively), it is important that we aim for aggressive industrialization, as per the Philippines' NDC.

	Human security priorities	Immediate outcomes	Intermediate outcomes	Programme/project outputs	Performance indicators
4	Human security	Climate change adaptation and disaster risk reduction practiced by all sectors at national and local levels; health and social sector delivery systems are responsive to climate change; climate change-adaptive human settlements and services developed, promoted and adopted	Reduced risks of the population from climate change and disasters	Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions; increased resilience of health and well-being and food and water security; increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions	Number (percentage) of households adopting a wider variety of livelihood strategies/coping mechanisms; climate-induced disease incidence in areas where adaptation health measures have been introduced (percent of population); number (percentage) of households adopting a wider variety of livelihood strategies/coping mechanisms

	Climate-smart industries and services priorities	Immediate outcomes	Intermediate outcomes	Programme/project outputs	Performance indicators
5	Climate smart industries and services	Climate-smart industries and services promoted, developed and sustained; sustainable livelihoods and jobs created from climate-smart industries and services; green cities and municipalities developed, promoted and sustained	Climate-resilient, eco-efficient and environment-friendly industries and services developed, promoted and sustained	Increased resilience of infrastructure and the built environment to climate change threats; reduced emissions from buildings, cities, industries and appliances (Paris result areas b and c)	Value of infrastructure made more resilient to rapid-onset events (e.g., floods, storm surges, heatwaves) and slow-onset processes (e.g., sea level rise) Annual energy savings (GWh) (Paris performance indicators b and d)

	Sustainable energy priorities	Immediate outcomes	Intermediate outcomes	Programme/project outputs	Performance indicators
6	Sustainable energy	Nationwide energy efficiency and conservation promoted and implemented; sustainable renewable energy development enhanced; environmentally sustainable transport promoted and adopted; energy systems and infrastructure climate-proofed rehabilitated and improved	Sustainable renewable energy and ecologically efficient technologies adopted as major components of sustainable development	Reduced emissions through increased low-emission energy access and power generation (Paris result areas e and f); reduced emissions through increased access to low-emission transport (Paris result area d); increased resilience of infrastructure and the built environment to climate change threats	Level of capacity (MW) from low emission sources (Paris performance indicators e, f and h); emissions levels from vehicles (Paris performance indicator c); value of infrastructure made more resilient to rapid-onset events (e.g., floods, storm surges, heatwaves) and slow-onset processes (e.g., sea level rise); number of new infrastructure projects or physical assets strengthened or constructed to withstand conditions from climate variability and change (e.g., to heat, humidity, wind velocity and floods)

	Knowledge and capacity development priorities	Immediate outcomes	Intermediate outcomes	Programme/project outputs	Performance indicators
7	Knowledge and capacity development	Knowledge of science of climate change enhanced; capacity for climate change adaptation and mitigation at the national and local level enhanced; climate change knowledge management established and accessible to all sectors at the national and local levels.	Enhanced knowledge of and capacity to address climate change	Strengthened institutional and regulatory systems for climate-responsive planning and development; increased generation and use of climate information in decision-making; strengthened awareness of climate threats and risk-reduction processes.	Degree of integration/ mainstreaming of climate change in national and sector planning and coordination in information sharing and project implementation; evidence that climate data is collected, analyzed and applied to decision-making in climate-sensitive sectors at critical times by the government, private sector and men/women; perception of men, women, vulnerable populations and emergency response agencies of the timeliness, content and reach of early warning systems; extent to which vulnerable households, communities, businesses and public-sector services use improved tools, instruments, strategies and activities to respond to climate variability and climate change; percent of target population aware of the potential impacts of climate change and range of possible responses

The NDC priorities (as of 2017) for the Philippines can be tentatively grouped as follows:

- Sustainable transport systems
- Energy efficiency, clean/renewable energy, and resilient infrastructures
- Solid waste management and wastewater treatment
- Strengthened resilience of agricultural and forest ecosystems

Figure 13: Priorities in the current NDC of the Philippines

Source: Republic of the Philippines, 2016, Nationally Determined Contributions

<p>Mitigation</p> <p>The aspirational commitment target for the Philippines is a 70 percent reduction of GHG by 2030 based on a 2000 business as usual (BAU) scenario covering the sectors of energy, waste, transport, and industry. This target is subject to the availability of climate mitigation resource support (finance, technology, and services) from the developed countries.</p>	<p>Adaptation</p> <p>The Philippines will focus on building its institutional capacities in the following areas:</p> <ul style="list-style-type: none"> • Institutional and system strengthening for downscaling climate change models, climate scenario-building, climate monitoring, and observation • Rollout of a science-based climate/disaster risk and vulnerability assessment process as the basis for mainstreaming climate and disaster risk reduction in development plans, programmes, and projects • Development of climate- and disaster-resilient ecosystem(s) • Enhancement of climate- and disaster-resilience of key sectors — agriculture, water and health • Systematic transition to climate- and disaster-resilient social and economic growth • Research and development on climate change, extremes and impacts for improved risk assessment and management
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Proposed measures to ambitiously implement the NDC coherent with 1.5°C pathways and in alignment with the SDGs and the goals of the SFDRR

According to Climate Action Tracker, the Philippines' climate commitments are rated "medium" as they are at the least ambitious end of what would be a fair contribution.⁵² Both implemented and planned policies are not sufficient to achieve the NDC target. It is not consistent with limiting warming to 1.5°C unless other countries make much deeper reductions and comparably greater effort. Emissions growth will be predominantly driven by increased emissions from transport and coal-fired electricity generation. Without the renewable energy and energy efficiency targets, emissions under current policies — excluding land use, land-use change, and forestry (LULUCF) — are expected to increase. If all coal power plants that were announced are constructed, total emissions will likely evolve in line with the high end of current policy projections.

It has to be noted that the grouping or framing of adaptation/mitigation actions in the Philippines' provisional NDC may be updated in the final NDC. For example, it may be revised according to major objectives or priority areas in the NCCAP, such as:

- Climate change- and disaster-resilient development (includes ecosystem-based adaptation and forestry/agriculture, which have both adaptation and mitigation components and benefits) and resilience of the built environment, which covers resiliency of energy/transport infrastructures and buildings
- Low-carbon development, which covers sustainable energy, sustainable transport, and climate-resilient industries and services, including manufacturing and waste management
- Climate governance, which may include cross-cutting measures such as institutional strengthening and capacity building, monitoring and evaluation and measurement, reporting and verification systems, information and knowledge management and international cooperation and partnerships. Again, this is unofficial and subject to decision/further discussion by the Philippine Climate Change Commission (CCC) with other government agencies.

Figure 14: Updated mitigation/adaptation areas by sector (to be finalized in updated NDC)

Source: Climate Change Commission of the Philippines, 2018

Sector	Mitigation/adaptation area
Energy	<ul style="list-style-type: none"> • Renewable energy • Energy efficiency (residential/commercial/street lighting)
Transport	<ul style="list-style-type: none"> • Improve road transport efficiency • Promotion of mass transit (rail system and LRT/MRT) • Shift to electric vehicles • Aviation/maritime — green airports and ports
Industry	<ul style="list-style-type: none"> • Energy efficiency/fuel switching (energy-intensive industries) • Energy efficiency and HFC substitution in air conditioning and refrigeration
Waste	<ul style="list-style-type: none"> • Solid waste management • Wastewater treatment (domestic and industrial)
Forestry	<ul style="list-style-type: none"> • Forest protection and management • Forest restoration and rehabilitation
Agriculture	<ul style="list-style-type: none"> • Improved management of fertilizers • Alternate wetting and drying in rice production • Crop diversification • Use of bio-digester

52 <https://climateactiontracker.org/countries/philippines> (accessed 20 August 2018)

Such an update would imply significant co-benefits for SDGs, as shown in the following table.

Figure 15: Potential sustainable development co-benefits of a more ambitious NDC
 Source: Screening and Evaluation Tool, WRI-UNEP-UNDP Readiness Programme, 2018

Co-Benefit	Description
Health	<ul style="list-style-type: none"> • Reduced risk of premature death from exposure to air pollution • For the transport sector, these are based on reduced emissions of fine particles from vehicle tailpipes • For the energy sector, these are based on reduced power plant emissions of SO₂, fine particulates, and NO_x
Congestion	<ul style="list-style-type: none"> • Less time wasted on congested roadways; specific to the transport sector
Income generation	<ul style="list-style-type: none"> • Economic co-benefits from the creation of new markets and/or expansion of productive capacity • For forestry, these include timber and fruit production from reforested areas • For waste, these include recyclables and composting from waste diverted from landfills
Increased energy security	<ul style="list-style-type: none"> • The country's energy system is more resilient to a variety of shocks (e.g., global economic crises, international conflicts, spikes in individual fuel costs) • This can result from several changes in the energy sector, such as increasing combinations of fuel diversity, transport diversity, import diversity, energy efficiency and infrastructure reliability • Indicators used: <ul style="list-style-type: none"> ◦ Energy intensity (energy consumption per unit of GDP) ◦ GHG intensity (CO₂e emissions per unit of GDP) ◦ Percentage share of imports in total energy supply ◦ Percentage share of renewable energy in energy supply

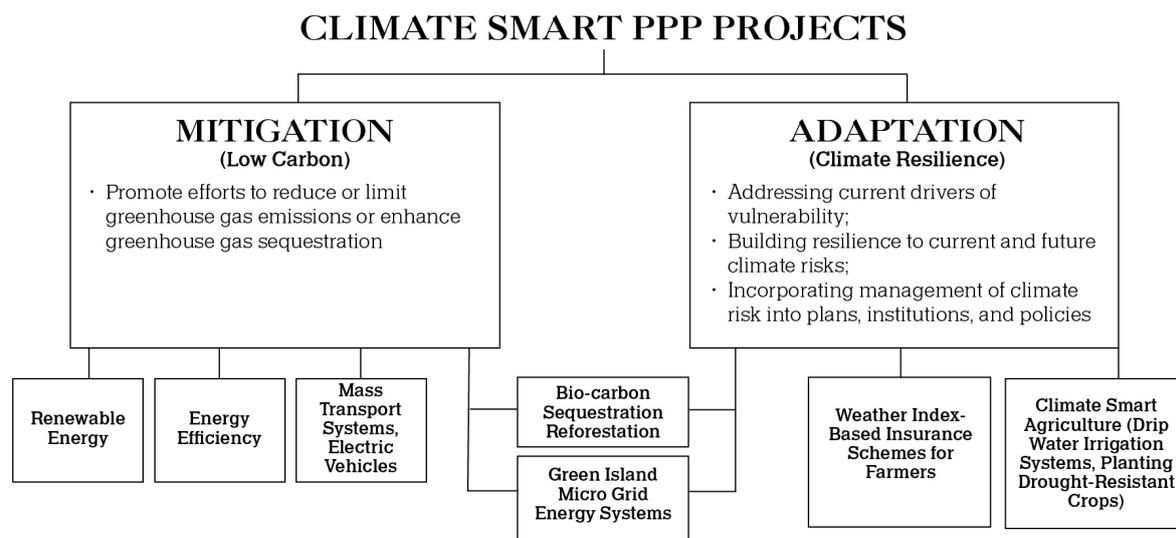
As the National Economic and Development Authority, Department of Finance, CCC and Department of Environment and Natural Resources look to translate and put the Philippines' NDC on track to ensuring the 1.5°C limit, national planning and action advances considerably. Though regulatory inertia has hindered progress, planning agencies need supportive policy and control levers to take into account the imminent economic consequences of breaching the 1.5°C threshold, as well as the benefits of keeping to it.

Future investment plans can be anchored on the goals of the NDC by supporting the specific adaptation and mitigation actions that the NDC commits to pursue. For example, for mitigation in particular, the NDC consists of a combination or package of policies or policy-relevant actions that would lead to an emissions trajectory that will enable the country to meet a specific economy-wide GHG reduction target against a BAU scenario while realizing non-GHG benefits that would contribute toward meeting the country's economic and sustainable development goals. The package of mitigation actions would translate to net economic benefits if they are implemented in an integrated or coherent manner while also avoiding overestimation of emission reduction impact by taking into account the interactions and synergies among the individual mitigation actions. As an example, energy efficiency measures would have less GHG reduction impact with higher renewable energy share in on-grid electricity generation.

The Philippines has firmly anchored climate finance in its NDC as the country is looking to maintain aggressive industrialization for economic growth and economic resilience. The Philippines is looking not only to survive the detrimental impacts of climate change through adaptation and mitigation, but also to modernize the economy and enhance the resilience of the economy. Examples of potential climate finance projects are seen in the figure below.

Figure 16: Climate Smart Local Public Private Partnership Projects

Source: Climate Smart Network, Presentation in COP23, 2017



To put this in context, a renewable energy transition in small island grids, where often the most marginalized reside, can save the Philippine government 200 million US dollars in diesel subsidies per year. In addition to public savings, a shift to renewable energy and storage can reduce electricity prices for ratepayers residing in small islands and main islands. The reduction in electricity prices overall can spur the growth of private enterprises.

Shifting toward a low-carbon trajectory can also protect the Philippine financial system and public from stranded asset risk of coal plants. Stranded asset risk is the hazard of an asset suffering from an unanticipated write-down, devaluation or conversion to liability. Stranded assets or costs in power generation arise for a variety of reasons, including fuel and/or technology becoming uneconomical or obsolete, excess capacity due to inaccurate demand forecasts or a surplus of reserve power and operational inefficiency of the power plant.

In other words, renewable energy technology and storage are cannibalizing the demand for expensive imported coal. This fact is widely understood by the world’s largest institutional investors, that renewable energy is deflationary and will only get cheaper over time. Adding renewable energy to any electricity system will erode utilization rates of coal power because renewable energy is cheaper than coal, and with a curtailment clause, this means that the stranded asset risk is passed on to the owner of the plant, which is typically project financed at 80 percent debt from local banks and 20 percent equity.

Banks in the Philippines do not incorporate stranded asset risk in project finance underwriting, either by negligence or by design, based on policies of the past, ensuring risks are transferred to ratepayers and/or taxpayers instead. However, this may no longer be the case. The Philippines has 10,423 megawatts (MW) of largely imported coal expansion in its current pipeline, a 20.8 billion US dollar stranded risk potential. This runs on top of a total of 7,419 MW of existing coal-fired capacity. As such, a low-carbon trajectory in energy can save the Philippine financial system and public from stranded asset risk.

In addition to economic and financial risk, the Philippines realizes its need to address huge information gaps by integrating research into the planning and policy discussions. Research should no longer be a “project”, it should be programmatic and recommendatory in nature. It needs to be more participatory, enable direct access and ensure accountable finance flows for climate action and development (i.e., “greening” the national budget and introducing more accessible and scalable financing instruments).

As a response to the challenges and damages of climate change, the Philippines created its own national adaptation fund called the People’s Survival Fund (PSF), created under Republic Act 10174 as an amendment to the Climate Change Act of 2009. The PSF seeks to enable the government to address the problem of climate change by funding adaptation efforts from Local Government Units (LGU) and Local Community Organizations (LCO) across the Philippines. The PSF as a grant facility strives to build and invest in climate-resilient communities. By law, the PSF has a mandated allocation of at least the equivalent of 20 million US dollars annually, which can be augmented and supplemented by other sources. Although all LGUs and LCOs can access the PSF, its board has set a prioritization: poverty incidence (40 percent), exposure to climate risks (30 percent) and presence of key biodiversity areas (30 percent).

Concluding policy recommendations

In the face of climate change risks and climate change–induced destruction, the Philippines’ national budget is the “national survival fund”. Thus, it is important to ensure that the investments made over the next five years will enable the best chance of survival and economic growth for the next three decades. A key step in turning a country’s climate action aspirations into reality is identifying investment plans for short-term and long-term projects and programs.

The Philippines can take advantage of the NDC by blending existing funds with international funding sources. A more ambitious NDC can translate to more ambitious funding and international support. To enable economic growth and resilience, there is a need to upgrade existing market structures and infrastructure, including, but not limited to:

- supply chains
- infrastructure (i.e., power transmission line upgrades to enable uptake of affordable renewable energy)
- logistics
- urban services
- food supply

This means more investment from the both public and private sector, which enables more jobs and more growth. However, the Philippines’ climate finance landscape remains complex. It is evident that a few key people are informed, but institutions themselves have not had their capacities built. This has led to access to financing without well-designed projects and programmes to be allocated to. While progress is seen in some capacity of certain agencies, and legislative support from the Senate and Congress is strong, more work needs to be done in terms of comprehensively integrating the benefits of low-carbon pathways in developing medium-term national economic policy, incubating a whole-of-government approach to transformational strategies, institutional strengthening of sub-national implementing agencies and improving the efficiency of inter-agency coordination. These

are key to ensuring capacity and scaling up the level of ambition so that Philippine climate action actually results in transformational initiatives.

Access to affordable, secure and reliable energy and disaster risk reduction are key factors in combating the wide-ranging effects of climate change. In the Philippines, transforming the electricity sector is also a key strategy to advance inclusive and modern development. The Philippines is now committed to speeding up this transition through appropriate financing and de-risking programmes, thereby allowing market forces to effect modernization and savings through advances in renewable energy. The transition to a low-carbon economy starts with affordable, secure and reliable energy and will continue to transforming transportation networks.

The transformation via impact on poverty incidence and vulnerability is absolutely critical to the approach that the Philippines intends to pursue toward achieving economic growth and resilience. In other words, the goal is to transform vulnerability to resilience and prosperity. This can be achieved through technology-driven or sectoral initiatives with concrete, measurable outcomes that can be scaled up or replicated across a wider geographic area or segment of the population and thus have a lasting and more significant impact on the economy.

The Case of the People's Republic of Bangladesh

By Md Shamsuddoha

Climate risks for Bangladesh and the difference between 1.5°C and 2°C of global warming

With 1115.62 people per km², Bangladesh is the tenth most densely populated country in the world. Geographically, Bangladesh is characterized as an active deltaic floodplain of three mighty rivers, the Ganges, the Brahmaputra and the Meghna, that cover 80 percent of the country's territory. At the interface of two different environments, the Bay of Bengal to the south and the Himalayas to the north, Bangladesh is troubled by the inherited catastrophic ravages of natural disasters.

Already with 1°C warming from the pre-industrial level, weather events have become more frequent and intense, causing both economic and non-economic loss and damages to households, communities, infrastructures and the productive sectors (CPRD, 2018). Since 1998, five major sudden-onset extreme events together caused an estimated 15 percent loss in GDP, while the residual costs of sudden-onset events, slow-onset events (like sea level rise) and so-called "frequent unusual weather-related disasters" are supposed to be even higher (*ibid*). Bangladesh has been repeatedly cited as a hot spot of climate change and is being ranked as highly vulnerable by Maple Croft (2013) and in the Global Climate Risk Index (Germanwatch 2018).

In the coming years, Bangladesh is going to face increasingly adverse risks (IPCC 2014b), which include too much precipitation during monsoon and too little water during dry season (Government of Bangladesh Ministry of Environment and Forests, 2012), more intense and more frequent cyclones, the move of the saline front further upstream (CEGIS, 2006) and massive coastal erosion (Practical Action, 2008). This is projected to lead to secondary impacts such as food and health insecurity, loss of lives and livelihoods, loss of ecosystem services, forced displacement and migration, damage to infrastructure, loss of productive assets and damage to the economy (Government of Bangladesh Ministry of Environment and Forests, 2012). These forecasts may be realized faster than thought, as observed changes, trend analysis and newest modeling results indicate:

- Since 1950 the land surface temperature rose by approximately 0.74°C (Mondal/Islam/Madhu, 2013), with a higher increase during the drier periods. Singhvi et al. (2010) reported increasing trends in the country's average minimum and maximum temperature at the rate of 0.0094 and 0.007°C/year respectively from 1961-2004. By the end of this century, the minimum temperature rise is projected to about 2-2.5°C and 5°C, respectively under RCP 4.5 and RCP 8.5 emission scenario of the IPCC⁵³ (Government of Bangladesh Planning Commission, 2015a).
- The volume of pre-monsoon rainfall is increasing in a range of 2.0-7.4 mm per year, with the highest increase (4-7.4 mm per year) in the north-western and south-eastern regions (Shahid, 2010; Mondal/Islam/Madhu, 2013). Mirza (1997, 2002) predicted a rise of average monsoon rainfall of 11 percent by 2030 and 28 percent by 2050, with a corresponding temperature increase of 0.7 and 1.1°C. Winter temperature would increase by 1.3°C (2030) and 1.8°C

53 On the basis of GHG concentration trajectories, the IPCC AR5 in 2014 adopted four Representative Concentration Pathways (RCPs); they are RCP 2.6, RCP 4.5, RCP 6 and RCP 8.5. The RCP 4.5 pathway assumes global annual GHG emissions peak around 2040, then decline. The RCP 8.5 pathway assumes continued anthropogenic GHG emissions throughout the 21st century.

(2050) with, respectively, three percent and 37 percent decrease in rainfall. Increased monsoon rainfall — even in a 1.5°C scenario — may lead to a more frequent occurrence of high-intensity floods and early flash floods, which may then affect additional geographical areas with prolonged inundation.⁵⁴ On the other hand, reduction in rainfall during the drier months (November to March) coupled with increased surface desiccation, will aggravate drought-like conditions, especially in drier northern and western regions, affecting 3 to 4 million hectares of land every year and causing seasonal hunger of subsistence smallholders.

- The Bay of Bengal, one of the most rapidly warming large marine ecosystems, is currently warming up at 0.04°C per year (Belkin, 2009), as compared to rates between 0.01°C and 0.02°C per year in the period 1985-1990 (CPRD, 2012). It is assumed that the currently observed warming trend would increase cyclone frequency from 5.48 per year at the present day to 7.94 cyclones per year by 2050 (*ibid.*). The IPCC (2013) reported that the rise of sea surface temperature also leads to significantly higher wind speed. Ali (1996) projected storm surge increase by 21 percent and 49 percent, with a corresponding rise of sea surface temperature by 2°C and 4°C and direct effects on 8.3 million people living in the cyclone high-risk areas. The number of affected people is expected to massively grow to 20.3 million by 2050 due to the projected intensification of cyclones (WHO, 2015). According to the World Bank (2011), 60 percent of worldwide deaths caused by cyclones in the last 20 years occurred in Bangladesh.
- The sea level is rising at 6-21 mm per year, significantly faster than the global average (Government of Bangladesh Ministry of Environment and Forests, 2016). The World Bank (2014a) projected 30 cm (2030) to 50 cm (2050) of sea level rise. It is estimated that sea level rise may lead to the displacement of almost 7 million people by 2025 and 13 million by 2050, with 25500 km² of inundated land, if the population growth continues at a rate of 1.4 percent and if no massive corrective action is taken (Karim/Mimura, 2008).
- Sea level rise, in combination with geological depression of 2.2 mm per year (Pethick/Orford, 2013), may completely destroy the Sundarbans as the world's largest mangrove **forest** and UNESCO heritage site.
- Rising seas — along with other triggers like cyclones, storm surges, decreases in upstream freshwater flow, variability of rainfall and unsustainable infrastructure development — trigger salinity intrusion in coastal Bangladesh. Observed changes in 10 selected coastal districts indicate that saline areas have increased by 27 percent between 1973 and 2009 (Government of Bangladesh Ministry of Environment and Forests, 2016). The World Bank (2014b) has projected a reduction of freshwater river areas (salinity level 0-1 ppt) by 59 percent by 2050 in 13 coastal districts. Salinity intrusion is perceived as the major threat to agricultural production and food security (Government of Bangladesh Ministry of Agriculture, 2010).

54 Climate Change Cell, 2017. See www.climatechange-cell-bd.org.

The possible impact of 1.5° or 2°C global warming on equality, human security, poverty eradication and sustainable development aspirations of Bangladesh

In the last years, despite adverse impacts of climate change, Bangladesh has achieved constantly high, increasing GDP growth of 6.3 percent annually (CPD, 2018), making it likely to become a middle-income country soon. The poverty rate has constantly decreased from close to 60 percent in the early 1990s to 31.5 percent in 2010 and an estimated 23.2 percent in 2016 (BBS, 2017a; Government of Bangladesh Ministry of Finance, 2016). The human development performance, however, is still very low. In 2015, Bangladesh ranked 139th out of 188 countries in the Human Development Index (UNDP, 2016).

Inequality is increasing. Based on a comparison of data from a household income and expenditure survey, Bhattacharya et al. (2017) showed that the share in total wealth (in terms of value) of the richest one percent and five percent of people rose respectively from 24 percent in 2005 to 29 percent in 2010 and from 48 percent to 51.3 percent. The income disparity between urban (21.3 percent) and rural areas (35.2 percent) is also significant (BBS, 2017b). In recent years, this situation has been aggravated by declining growth in employment generation from 2.7 percent during 2005-2010 to 1.9 percent during 2010-2016.

The challenge of the coming decades will be to move to a pathway of sustainable, climate-resilient, low-carbon economic growth, in view of a high climate risk exposure of large populations and major economic sectors. Agriculture, for instance, is highly sensitive and dependent on weather parameters, and at the same time, still employs 47 percent of the total labour force, with 70 percent of the population directly or indirectly involved in agricultural activities (BBS, 2017a). It is estimated that climate-induced disasters will cause GDP losses of 1.5 percent (Government of Bangladesh Ministry of Environment and Forests, 2012), with poverty again increasing by 15 percent by 2030 (IPCC, 2014b), ultimately leading to non-achievement of key SDGs.

Changes in seasonal and geographical distributions of precipitation are already affecting people's lives and livelihoods. In 2017, 125 people died in landslides caused by torrential rainfalls, which affected the livelihoods of several million people (*Dhaka Tribune*, 2017). Losses of rice yield on 290,000 ha of land due to flash floods in March 2017 are estimated at 1.6 million tons, leaving many subsistence farmers bankrupt and threatened by hunger (Sadique/Bari, 2017).

Climate change causes severe risks for development, widens inequality, provokes competition and conflict over scarce resources, leads to domestic and international tensions on displacement and migration and hinders the SDG implementation. Figure 17 shows the likely impact chain of climate-induced risks to Bangladesh's development aspiration and SDGs in particular.

Figure 17: Climate change impacts in Bangladesh and their likely implication on the SDGs

Source: Author, 2018

Risks and anomalies	Impacts	Co-stressors	Impact levels at 1.5°C and 2°C of warming	Implication for development aspiration	SDGs most affected
Tropical cyclone	Damages to ecosystems, agriculture, communities, and infrastructure; water logging, contamination of fresh water	Low-lying, densely populated coastal areas; fragile coastal infrastructure and defense	Already high at present-day on coastal fishers' communities; very high on agricultural production, ecology, and ecosystem services at 1.5°C; high-very high on forced displacement and migration; difference between 1.5°C and 2°C uncertain	Increasing loss of livelihoods, crops, assets, ecosystem services; increasing spread of water-borne diseases; very likely to increase food and water insecurity, poverty and inequality; very likely to increase population pressure in urban areas; likely negative implications on urban governance and security; likely increase of child labor and early marriage	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 5: Gender equality SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 9: Industry, innovation, and infrastructure SDG 10: Reduced inequalities SDG 11: Sustainable cities and communities
Tidal surge	Periodic inundation of agricultural lands and settlements; contamination of freshwater sources	Low-lying coastline and fragile coastal protection and infrastructure	Already high on yields of agriculture; very high at 1.5°C; the difference between 1.5°C and 2°C will widen beyond 2050	Loss of and livestock; water and food insecurity	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 9: Industry, innovation, and infrastructure SDG 10: Reduced inequality
Sea level rise and salinity intrusion	Permanent inundation of territory, agricultural land, infrastructure, and settlements; loss of biodiversity	Low-lying coastline and fragile coastal protection; reduced freshwater flow from upstream, especially in the winter; malpractice and mal-governance in the management of water regulators, e.g., sluice gates and drainage canals; expansion of shrimp aquaculture and agriculture	Sea level rise has already accelerated in previous years; high at 1.5°C; the difference between 1.5°C and 2°C will widen beyond 2050	High loss of crops, vegetation and livestock already at 1.5°C; likely to increase food and water insecurity, disease outbreak, poverty, hunger and inequality; very high implication on women's reproductive health; very high implication on the communal peace and harmony due to likely conflict on the use of and control over public commons	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 5: Gender equality SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 9: Industry, innovation, and infrastructure SDG 10: Reduced inequalities SDG 11: Sustainable cities & communities

Anomalies in rainfall and flooding More heavy monsoon rainfalls, floods, and flash floods Drought/ dry spells	Floods and flash floods; drying of agricultural land and forests	Insufficient urban drainage; malpractice and mal-governance in the management of water regulators, e.g., sluice gates and drainage canals; lacking irrigation and water storage	High at 1.5°C Very high at 2°C	Very high implication for agricultural production; loss of crops, assets, soil fertility, and ecosystem services; spread of water-borne diseases; very high implication on rural seasonal life and work cycles; increased migration; very high implication for agricultural production; loss of crops	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 9: Industry, innovation, and infrastructure SDG 10: Reduced inequalities SDG 11: Sustainable cities and communities SDG 17: Global partnership
Damage of ecosystems	Impact factors	Co-stressors	Impact levels at 1.5°C and 2°C of warming	Implication for development aspiration	Implication on specific SDGs
Coral ecosystem (Saint Martin Island)	Ocean acidification; sea level rise	Water pollution; unregulated tourism	Very high at 1.5°C: massive destruction of corals very likely; extremely high at 2°C: complete extinction of corals very likely; also significantly higher risks for fisheries at 2°C	Very likely revenue income will decline from fisheries production; very likely income from tourism will decline	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 14: Life below water
Mangrove forest	Sea level rise, tidal surge, and salinity intrusion	Exploitation of natural resources; industrial pollution; shipping routes	Very high at 1.5°C: severe degradation of mangroves; extremely high at 2°C: almost complete destruction of mangrove forests	Very likely to severely hamper livelihoods at 1.5° and more, leading to severe water and food insecurity, more conflicts over resources, displacement and non-economic loss and damage	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 14: Life below water SDG 15: Life on land SGG16: Peace, justice and strong institutions
Haor ⁵⁵	Flash floods	Lack of early warning Insufficient protection measures Natural resource dependency	High at 1.5°C; very high at 2°C	Severe crop loss affecting local and national food security; severe spread of water-borne diseases; significantly higher drop-out rate from primary and secondary education and rise of child labor; severely higher displacement and migration; very high likelihood of resource conflicts	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 4: Quality education SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SGG16: Peace, justice and strong institutions

55 The northeastern part of Bangladesh is characterized by its unique geophysical features of shallow depressions called haors spread over an area of 25,000 km².

The response provided by Bangladesh’s NDC to the challenges of 1.5°C or 2°C global warming

Though being one of the most climate-vulnerable countries, Bangladesh puts more emphasis on adaptation. However, the government has also developed a number of sectoral plans and policies on energy and low carbon development, as reflected in the

- Power System Master Plan 2010 (updated in 2016)⁵⁶
- Renewable Energy Policy 2008⁵⁷
- Energy Efficiency and Conservation Master Plan up to 2030⁵⁸.

They are aligned with the country’s overarching Vision 2021, to become a middle-income country, and the successive Vision 2041, to become a developed country by 2041. While these plans and policies predominantly prioritize more power generation to fuel industrial development, all of them also include renewable energy targets.

Figure 18: Energy sector plan and policies and their relevance to SDG

Source: Author, 2018

Policy directives	Plans and targets	SDG relevance
Renewable Energy Policy, supported by Renewable Energy Act	Renewable energy target of 10 percent, i.e., 2000 MW by 2020 and 4000 MW by 2030	SDG 7: Target 7.2: Increase substantially the share of renewable energy in the energy mix by 2030.
Action Plan for Clean Cook Stoves	Sets target for providing 100 percent clean cooking solutions by 2030	SDG 7: Target 7.1: Increase access to clean fuels and technology
Power System Master Plan 2010 (updated in 2016)	Sets target for increasing power generation: 24 000 MW by 2021, 40,000 MW by 2030 and 60,000 MW by 2041	SDG 7: Target 7.1, Indicator 7.1.1: Ensure energy access to all citizens at an affordable price by 2021
Energy Efficiency and Conservation Master Plan (2015-2030)	Sets target to conserve power in the range of 1000 MW	SDG 7: Target 7.3: Double the global rate of improvement in energy efficiency by 2030

In its NDC, Bangladesh commits to both unconditional and conditional mitigation pledges, as shown in Figure 18. Apart from mitigation, the NDC includes a number of adaptation actions to build the resilience of the already-identified climate-vulnerable communities and sectors (see Figure 19). For both, mitigation and adaptation targets costs also are provided (see Figure 20).

56 Government of the People’s Republic of Bangladesh Ministry of Power, Energy and Mineral Resources, September 2016. See <https://drive.google.com/open?id=0B5U58g3xLD-NOXRCZ01PRG1EZHc>.

57 Government of the People’s Republic of Bangladesh Ministry of Power, Energy and Mineral Resources, 18 December 2008. See www.sreda.gov.bd/d3pbs_uploads/files/policy_1_rep_english.pdf.

58 Government of the People’s Republic of Bangladesh Sustainable and Renewable Energy Development Authority, May 2016. See www.sreda.gov.bd/d3pbs_uploads/files/policy_2_energy_efficiency_and_conservation_master_plan_up_to_2030.pdf.

Figure 19: Projected emissions reductions in the power, transport and industry sector by 2030

Source: Government of Bangladesh NDC, 2015

Sector	Base year (2011) (MtCO ₂ e)	BAU scenario (2030) (MtCO ₂ e)	BAU change from 2011–2030	Unconditional contribution scenario (2030) (MtCO ₂ e)	Difference to BAU	Conditional contribution scenario (2030) (MtCO ₂ e)	Difference to BAU
Power	21	91	336 percent	86	-five percent	75	-18 percent
Transport	17	37	118 percent	33	-nine percent	28	-24 percent
Industry (energy)	26	106	300 percent	102	-four percent	95	-10 percent
Total	64	234	264 percent	222	-five percent	198	-15 percent

Figure 20: Adaptation and mitigation targets and their estimated cost

Source: Government of Bangladesh NDC, 2015

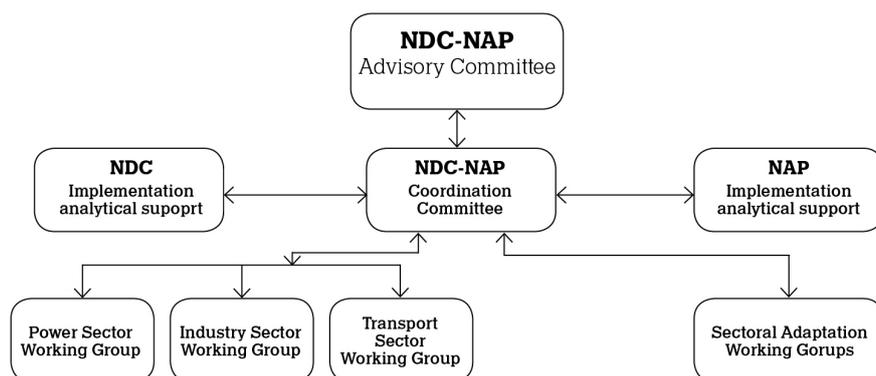
Adaptation measures	Estimated cost in billion US dollars (2015-2030)	
Food and water security, livelihood and health protection	8.0	
Comprehensive disaster management	10.0	
Salinity intrusion and coastal protection	3.0	
River flood and erosion protection	6.0	
Building climate-resilient infrastructure	5.0	
Rural electrification	3.0	
Urban resilience	3.0	
Ecosystem-based adaptation (including forestry co-management)	2.5	
Community-based conservation of wetlands and coastal areas	1.0	
Policy and institutional capacity building	0.5	
Total	42	
Mitigation measures (conditional)		
Switching to 100 percent super-critical coal power generation	16.50	
Developing utility-scale solar energy	1.30	
Scaling up wind energy	.60	
Repowering steam turbine with CCGT	.63	
Expanding the Solar Homes Programme	1.20	
Other solar	Solar irrigations pumps	.60
	Solar mini-grids	.25
	Solar nano-grids	.27
	Pico-solar	.10
Scaling up biomass production from sugar	.20	
Building an elevated express highway in Dhaka for decongestion of the main urban traffic arteries	2.65	
Dhaka mass rapid transit system	2.70	
Total: 36 MtCO ₂ e by 2030 or 15 percent below BAU emissions from the power, transport and industry sectors (conditional)	27	
Unconditional: 12 MtCO ₂ e by 2030 or five percent below BAU emissions from the power, transport and industry sectors		

In the meantime, Bangladesh prepared its NDC Implementation Roadmap for the period 2016-2025, which is aligned with the overarching Bangladesh Climate Change Strategy and Action Plan 2009 (BCCSAP),⁵⁹ currently managed by the Climate Change Secretariat in the Ministry of Environment, Forests and Climate Change. The NDC implementation is also considered complementary to the implementation of the NAP and vice versa under one umbrella.

However, the main challenge of successful NDC implementation is to set up an enabling institutional arrangement. The Ministry of Environment, Forests and Climate Change, as the focal point to the UNFCCC, has a significant role to play in preparing and monitoring the implementation of the NDC and the NAP.

Figure 21: Governance arrangements for NDC-NAP implementation framework

Source: Bangladesh NDC



However, due to its cross-cutting nature, mitigation and adaptation mainstreaming cannot be the sole mandate of a single ministry, but should rather become a shared responsibility of all concerned ministries, especially the Ministry of Planning that is mandated to assure integration of adaptation and mitigation in the government's planning mechanism. While the BCCSAP implementation modalities should be applied for all climate change-related issues, including NAP and NDC implementation, coordination so far has been inadequate. This has been a major limitation since the very beginning (see Government of Bangladesh Ministry of Environment and Forests, 2009) that needs to be urgently addressed to make the institutional set-up fit for purpose.

Proposed measures to ambitiously implement the NDC coherent with 1.5°C pathways and in alignment with the SDGs and the goals of the SFDRR

As one of the 10 fastest-growing economies in the world (IMF, 2017), with expected GDP growth rates of at least seven percent in the coming decade (The Linde Group, 2017), Bangladesh needs to substantially increase power production. For achieving Vision 2021, total installed power generation capacity has already increased by almost two-fold from 8523 MW in 2015 to 15000 MW in 2017. If future power demand — expected to increase to almost 30,000 MW in 2030 and 50,000 MW in 2040 — is covered in a BAU fuel mix, emissions will go through the roof. GHG emissions from energy-intensive sectors are expected to increase by 150 percent by 2030 from 2011 levels, an increase from 136.14 MtCO_{2e} in 2011 to 339.69 MtCO_{2e} in 2030 (Government of Bangladesh, 2018). Figure 22 shows projected GHG emissions by 2030 by sectors.

59 Government of the People's Republic of Bangladesh Ministry of Environment and Forests, September 2009. See <https://moef.gov.bd/site/page/97b0ae61-b74e-421b-9cae-f119f3913b5b/BCCSAP-2009>.

Figure 22: Bangladesh's BAU emissions by 2030 for all sectors included in the NDC analysis

Source: Government of Bangladesh, 2018: The Third National Communication (draft), Department of Environment, Ministry of Environment and Forests

Sector	GHG emission (MtCO ₂ e)		Percentage change
	2011	2030 BAU	
Power	20.98	91.42	335.75
Transport	15.78	36.61	132.00
Industry (energy)	26.46	105.73	299.54
Households	11.25	21.26	88.93
Commercial buildings	0.45	3.35	637.94
Energy use in agriculture	3.01	4.70	56.46
Waste	13.38	21.42	60.13
Non-energy emissions from agriculture	39.20	43.96	12.14
Industrial process emissions	5.61	10.97	95.42
F-gases	0.01	0.28	1907.14
Total	136.14	339.69	149.52

The NDC primarily targets only three sectors, i.e., the power, industry, and transport sectors, with an aggregated target of only five percent GHG emission reduction as compared with BAU by 2030. This target is not in line with a 1.5°C-coherent decarbonization pathway by 2050 and doesn't reflect properly the 100 percent renewable energy commitment (by 2050 at the latest) that Bangladesh endorsed as a member of the CVF. Bangladesh could considerably enhance its targets for the power, industry and transport sectors. It also could include other sectors like agriculture, households, waste, and buildings (domestic and commercial), considering the urgency of limiting global warming to 1.5°C.

On adaptation, the NDC embarks largely on the NAP process, provided that the NDC Implementation Roadmap and the accompanying NDC Sectoral Action Plans for power, industry, and transport take account of adaptation by prioritizing measures and actions that will have mitigation and adaptation co-benefits.

In 2015, Bangladesh prepared a NAP Development Roadmap and initiated measures to model future climate scenarios, update projections of key parameters (e.g., population, employment growth, economic growth) and undertake country-wide vulnerability assessments, both by districts and by hot spots (specific vulnerable areas).

So far, technical adaptation options are still the most common adaptive responses. The NDC, in contrast, emphasizes ecosystem-based adaptation actions embedded with institutional and social measures for those who are most vulnerable. Along these lines, 16 adaptation measures have been prioritized in the NDC. Figure 23 shows these priority measures and indicates their relevance for both necessary resilience building for 1.5°C and SDG achievement.

Figure 23: Significance of adaptation actions in the context of a 1.5°C scenario and the relevance for SDGs

Source: Author, 2018

Adaptation actions	Relevance to stay at 1.5°C and to deal with its consequences	Relevance in achieving SDGs
Improved early warning system for tropical cyclone, flood, flash flood and drought	 Very high	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 9: Industry, innovation, and infrastructure SDG 10: Reduced inequalities SDG 11: Sustainable cities and communities
Disaster preparedness and construction of flood and cyclone shelters	 Very high	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 9: Industry, innovation, and infrastructure SDG 10: Reduced inequalities SDG 11: Sustainable cities and communities
Tropical cyclone and storm surge protection	 Very high	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 9: Industry, innovation, and infrastructure SDG 10: Reduced inequalities SDG 11: Sustainable cities and communities
Inland monsoon flood-proofing and protection	 High	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 9: Industry, innovation, and infrastructure SDG 10: Reduced inequalities SDG 11: Sustainable cities and communities
Climate-resilient infrastructure and communication	 Very high	SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 9: Industry, innovation, and infrastructure SDG 10: Reduced inequalities SDG 11: Sustainable cities and communities
Climate-resilient housing	 Very high (especially in cyclone-prone areas)	SDG 3: Good health and well-being SDG 9: Industry, innovation, and infrastructure SDG 11: Sustainable cities and communities
Repair and rehabilitate existing infrastructures (including coastal embankment, river embankments, and drainage systems, urban drainage systems)	 Very high	SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 9: Industry, innovation, and infrastructure SDG 11: Sustainable cities and communities
Plan, design, and construction of urgently needed new infrastructures (various types of shelters, low-cost disaster-resilient housing, protection schemes, water management)	 Very high	SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 9: Industry, innovation, and infrastructure SDG 11: Sustainable cities and communities
Improvement of urban resilience through improvement of drainage system to address urban flooding	 High	SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 9: Industry, innovation, and infrastructure SDG 11: Sustainable cities and communities

River draining and dredging (including excavation of water bodies, canals, and drains)	 High	SDG 6: Clean water and sanitation SDG 9: Industry, innovation, and infrastructure
Stress tolerant (salinity, drought, and flood) variety improvement and cultivation (including livestock and fisheries)	 Very high	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 8: Decent work and economic growth SDG 10: Reduced inequalities SDG 11: Sustainable cities and communities
Research and knowledge management	 High	SDG 17: Partnerships for the goals
Local area adaptation	 Very high	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 9: Industry, innovation, and infrastructure SDG 10: Reduced inequalities SDG 11: Sustainable cities and communities
Adaptation to climate change impacts on health	 Very high	SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth
Biodiversity and ecosystem conservation	 High	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 14: Life below water SDG 15: Life on land SDG 16: Peace, justice and strong institutions
Capacity building at individual and institutional level to plan and implement adaptation programmes and projects in Bangladesh	 Very high	SDG 17: Partnerships for the goals

The identified adaptation actions should be developed as flagship programmes, including investment plans and prioritized actions according to their significance and sustainable development co-benefits. As stated in the NDC, the development of an investment plan for adaptation activities will not be a stand-alone process, but rather will be based on the forthcoming NAP, while taking input from the National Sustainable Development Strategy, the Perspective Plan (Vision 2021), the Seventh Five-Year-Plan, the National Disaster Management Plan, the Disaster Management Act and the Country Investment Plan of Bangladesh on Environment, Forestry and Climate Change. Bangladesh also will look for funding from sources like the Green Climate Fund, the UN Adaptation Fund and the Least Developed Countries Fund to meet the financial needs to implement the identified adaptation measures. However, successful leverage of climate finance for NDC implementation would require a clear and robust mechanism for ensuring transparency and accountability.

Concluding policy recommendations

The Bangladesh NDC is being considered a “living” document and a high-level communication to the international community on Bangladesh’s overall approach to climate change action on both mitigation and adaptation. As one of the most climate-vulnerable nations, Bangladesh provided due focus on adaptation actions, but also echoed the voice of the Small Island Developing Country Group to limit global

warming at 1.5°C. As one of the leading members of the CVF, Bangladesh also endorsed a declaration to decarbonize its power sector to 100 percent renewable energies by 2050 at the latest. However, the current substantial capital investment in fossil fuel-based power generation and the future power generation projection would lead Bangladesh in the opposite direction, not only failing to achieve the 100 percent renewable energy target but also turning Bangladesh into a country with GHG emissions well above the global average. This is inconsistent with both the country's earlier positioning and 1.5°C-consistent pathways. Thus, it is recommended, that:

- In view of the GHG emission scenario as communicated by the Third National Communication to the UNFCCC, Bangladesh should increase its emission reduction targets, including through expanding the coverage of the current NDC to other sectors; true participation of all relevant stakeholders, including the people most at climate risk, should be ensured; the ratcheting-up process should become a due process, not an ad hoc exercise with time pressure and resource constraints.
- Unlike BCCSAP implementation, the NDC-NAP implementation should create a cohesive and coordinated mechanism to integrate both mitigation and adaptation into the national development planning and budgeting system, most importantly to the country's Five-Year Development Plan, accompanied by a national accounting system to track the allocations to NDC-NAP implementation. This would require a clearer distinction between NDC-NAP formulation process (resulting in a well-elaborated plan) and the actual mainstreaming and implementation process. This should not be considered a stand-alone approach, but rather an initial phase of a long-term alignment of regional, national and global goals for mitigation and adaptation.

The Case of The Hashemite Kingdom of Jordan

By Hamzeh Bany Yasin

Climate risks for Jordan and the difference between 1.5°C and 2°C of global warming

Jordan is located at the heart of the Middle East, shaped mainly by its scarcity of natural resources, most notably, an annual per capita water share of only around 130 m³, making Jordan one of the most water-scarce countries worldwide. Jordan is a relatively small country that occupies an area of approximately 90,000 km². However, it enjoys a landscape with four main bio-geographic regions: the Mediterranean, Irano-Turanian, Saharo-Arabian and Sudanian region (IUCN-ROWA, 2014). Jordan's climate is characterized by cool and short winters and hot, dry and long summers, resulting from the country's location between the humid eastern Mediterranean and the arid Arabian Desert.

According to the last residential census in 2015, the population reached more than 9.5 million. Forced migrations increased the population almost tenfold over the past 55 years. The largest increase has taken place during the last decade, especially since 2011 following the Syrian Crisis. Syrian refugees represent half of the 30 percent non-Jordanians population (Government of Jordan Department of Statistics, 2015).

Figure 24: Map of Jordan

Source: Worldatlas



Jordan can be divided into three main climate areas⁶⁰:

1. The Jordan Valley, in Arabic "Ghor", is Jordan's food basket, characterized by warmer weather, higher rainfall, and soil suitable for farming. The Jordan River crosses the Jordan Valley from the northern border down to the Dead Sea.

60 Government of Jordan Ministry of Environment and UNDP, 2017: "Jordan's First Biennial Update Report to the United Nations Framework Convention on Climate Change". See https://unfccc.int/files/national_reports/non-annex_i_parties/biennial_update_reports/application/pdf/jordan_bur1.pdf.

2. The Eastern Desert or Badia Region comprises around 75 percent of Jordan's territory. It is part of what is known as the North Arab Desert that crosses the border to Saudi Arabia, Iraq and Syria. Temperatures vary from day to night and from summer to winter. Daytime summer temperatures can reach 40°C, while night winter temperatures can go down to below 0°C.
3. The Mountain Heights Plateau is the highland of Jordan, extending through the entire length of the western part of the country. This area, where most big cities are located, receives the highest rainfalls.

The Third National Communication report (Government of Jordan, 2014) points to the fact that the mean, maximum and minimum air temperature is increasing significantly by 0.02, 0.01, and 0.03°C/year, respectively. Also, the relative humidity tends to increase significantly by an average of 0.08 percent/year. Dynamic projections predict more likely extreme heatwaves and likely drought events, dry days and higher evaporation.

The government addresses poverty and unemployment as the major challenges for sustainable development. A temperature increase of 1.5-2°C will make it more challenging for Jordan to meet its SDGs. Resource scarcity and its management is a crucial issue for the country, most notably scarcity of water, energy and arable land. The economy is already very vulnerable to external shocks, which severely undermines the country's food security. Moreover, the demographic characteristics have changed massively during the last decades due to high numbers of refugees, resulting, among other things, in increasingly high demand for energy, water, and food. Jordan currently imports almost all of its energy, making the energy mix a key factor for Jordan's pathway toward reducing GHG emissions.

Jordan is proven to have excellent natural conditions for a rapid expansion of renewable energies, which could make the country a role model for other countries in the region. Sustainable energy resources in Jordan, if properly used, have the potential to enhance energy security, improve access to affordable energy, create jobs and mitigate GHG emissions.

The possible impact of 1.5°C or 2°C global warming on equality, human security, poverty eradication and the sustainable development aspirations of Jordan

Jordan is an upper middle-income economy (World Bank, 2018) with "high human development" (UNDP 2018). GDP per capita in 2017 was slightly above 4,000 US dollars, which is still less than half the global average. The service sector contributes more than 70 percent to the GDP, and the country's industrial base is still narrow. In 2015, the government launched Jordan's 2025 National Vision and Strategy, which is the reference for all development pathways and sets a holistic economic and social framework based on equal opportunities for all. It contains more than 400 policies, including environmental policies. However, the country is highly vulnerable to climate change, and overshooting the 1.5°C climate threshold would seriously undermine sustainable development aspirations, as projections show:

1. Freshwater systems: Climate change, in combination with co-stressors like population growth, leads to the decline of the country's freshwater resources. For decades, Jordan has been facing a deepening water crisis, with an annual per capita water availability that decreased dramatically from 3600 m³ in 1946 to 135 m³ in 2014 (Al-Ansari, 2014), putting the country under the 500 m³ annual threshold, categorized as an "absolute scarcity" (Falkenmark, 1989). Water demand is projected to overshoot the available resources by more than 26 percent by the year 2025. The Red Sea-Dead Sea project is

expected to narrow this gap to six percent⁶¹. Making the potable water infrastructure in Jordan more efficient would be another solution — 55 percent of the daily domestic consumption is lost, according to reports (Merayyan, 2014). Groundwater has been overused, too, which hastens its depletion. Groundwater is projected to reach the non-economic pumping level by the end of this century (Government of Jordan Ministry of Water and Irrigation, 2004). A study showed that the groundwater levels in six main basins were declining on an annual average of about 1 m (Goode et al., 2013). Moreover, Jordan is negatively affected by unilateral Syrian water projects in the Upper Yarmouk basin as well as by Israeli projects in the Upper Jordan River and the Golan Heights.

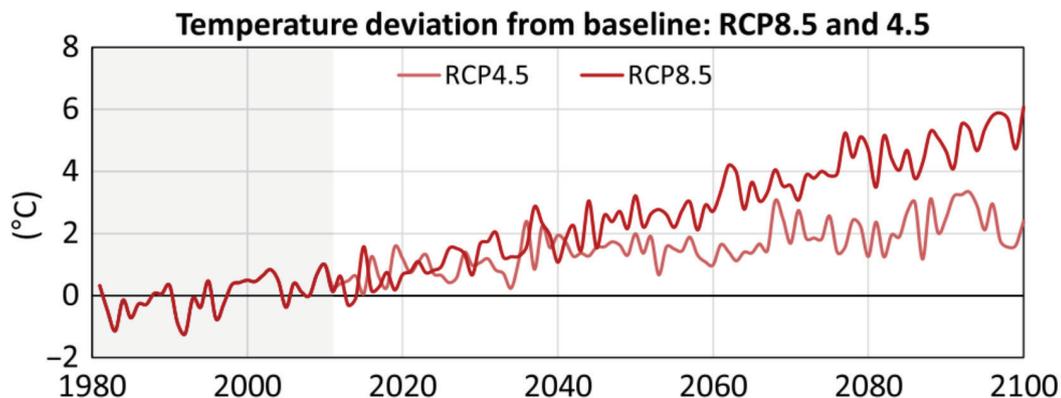
2. Rainfall: In the period 1970-2013, Jordan’s annual rainfall levels dropped by two thirds, particularly since 1995. During these 43 years, the rate of annual decline is 0.41 mm (Rahman et al., 2015).

Jordan is located in a region that is being scientifically described as a “potential hot spot for increased changes in precipitation patterns” (Evans, 2009). Both short- and long-term projections show alarming trends of exponential decline in precipitation levels. According to projections for the national climate change policy 2013-2020, Jordan will continue to suffer from a long-term decline in rainfall, with precipitation levels expected to decrease by 15-60 percent by 2099 (Freiwan et al., 2015). Decreasing precipitation will accelerate the shortage of water.

3. Heat/heatwaves: Mean temperature is expected to rise by at least 1°C by 2020⁶² and by 2°C (RCP 4.5) to 4.5°C (RCP8.5) by 2071–2100⁶³.

Figure 25: Temperature deviation from baseline: RCP4.5 and RCP8.5 scenarios

Source: Rajsekhar, Deepthi, and Steven M. Gorelick. “Increasing drought in Jordan: Climate change and cascading Syrian land-use impacts on reducing transboundary flow.” *Science advances* 3.8 (2017): e1700581.



61 Jordan Ministry of Water and Irrigation, 2016: National Water Strategy 2016-2025. See [www.mwi.gov.jo/sites/en-us/Documents/National%20Water%20Strategy\(%202016-2025\).pdf](http://www.mwi.gov.jo/sites/en-us/Documents/National%20Water%20Strategy(%202016-2025).pdf)

62 National Climate Change Policy of Jordan 2013-2020

63 *Ibid.* form 13

4. Droughts/Dryness: The Middle Eastern region is generally characterized by a large climate variability related to meteorological drought, particularly due to La Niña impacts (Barlow et al., 2016). With continuous climate change, the probability of multiple drought-type occurrences is expected to increase by more than threefold, from eight droughts to 25 droughts every 30 years. Droughts in Jordan will directly lead to poor reproduction of livestock, as well as to decreasing crop yield.
5. Health consequences: Negative impacts of climate change on health have become increasingly evident in terms of increasing air-borne and respiratory diseases, water- and food-borne diseases, vector-borne diseases, nutrition, heatwaves and occupational health (Government of Jordan, 2012), resulting in malnutrition, skin diseases and a higher mortality rate of chronic respiratory diseases.
6. Agricultural system: The contribution of agriculture to GDP declined sharply from 20 percent in 1974 to 3.8 percent in 2011. Even though the absolute terms have increased from 57 million Jordanian dinars in 1974 to 713 million Jordanian dinars. Jordan imports more than 80 percent of its food, making the country highly sensitive to international price fluctuations. The agricultural sector is important, not only for staple food production but also for export. Moreover, 25 percent of the poor population in rural areas work mostly in agriculture (Government of Jordan, 2014), mainly in the Jordan Valley areas. Therefore, climate adaptation in agriculture should become a high priority, particularly with regard to the scarcity of water and more frequent droughts.

To conclude: Apart from contributing to GHG mitigation through national and international climate action, Jordan should focus on minimizing and addressing foreseeable, country-specific climate risks, which will hamper the SDG achievement. The following figure summarizes some of the key linkages between climate risks, adaptation, and SDGs in a 1.5/2°C scenario for Jordan.

Figure 26: Linkages between climate risks, adaptation, and SDGs in a 1.5/2°C scenario for Jordan

Source: Authors, 2018

Risks and impacts	Driver	Co-stressor	Difference between 1.5°C and 2°C scenario	Measures	SDG affected
Water scarcity/drought	Precipitation decrease; temperature increase	Rapid population growth; inefficient harvesting and storage technologies; no seawater desalination; high losses in water network; inefficient irrigation technologies; moderate public awareness	High at 1.5C, very high at 2°C	Rainwater harvesting; spring rehabilitation; increasing the efficiency of irrigation; enhance water storage efficiency; awareness programmes	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 8: Decent work and economic growth SDG 11: Sustainable cities and communities SDG 15: Life below water SDG 16: Peace, justice and strong institutions

Food security	Shift in rainfall season; increase in average annual temperature; decrease in average annual precipitation; increase in frequency of droughts	No comprehensive drought monitoring or early warning system; little research on agricultural adaptation	Moderate at 1.5°C, high at 2°C	Application of conservation agriculture; modification of planting and harvesting dates; use of supplemental irrigation	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 8: Decent work and economic growth SDG 11: Sustainable cities and communities SDG 12: Responsible consumption and production SDG 13: Climate action SDG 15: Life on land SDG 16: Peace, justice and strong institutions
Biodiversity loss	Change in maximum temperature; change in precipitation and length of dry season	Land use change; violation on protected areas	Moderate at 1.5°C, high at 2°C	Restoration of degraded forests and encouraging the establishment of community forests to control soil erosion; using diverse conservation governance; protecting and enhancing ecosystem services in conservation areas	SDG 15: Life on land SDG 2: Zero hunger
Spread of diseases	Rising temperature (food-borne diseases), drought (wash-related diseases); dust or sand storms (chronic respiratory diseases); decreasing precipitation (increasing incidence of diarrhea from bacterial sources)		Likely to be higher at 2°C	Establishment of early warning system; enhancing sanitation; including climate change in the curriculum of schools and universities; developing water safety plans	SDG 3: Good health and well-being SDG 6: Clean water and sanitation
Economic losses due to the high dependence on climate-sensitive resources, leading to threatened livelihoods, increasing poverty, shifting from agriculture to less sensitive employment sectors, excessive consumption of natural resources (e.g., wood)	All aforementioned			Building public-private partnerships to improve income diversification; building on social capital. awareness raising programmes and engagement of local leaders on climate change topics and enhancement of women's rights	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 16: Peace, justice and strong institutions
Non-economic losses of land, culture, traditional knowledge and social cohesion	All aforementioned drivers/ impacts		Significantly higher losses at 2°C are likely, unless adaptation measures are taken	Enhance understanding; acknowledge, recognize and compensate non-economic loss and damage	SDG 16: Peace, justice and strong institutions

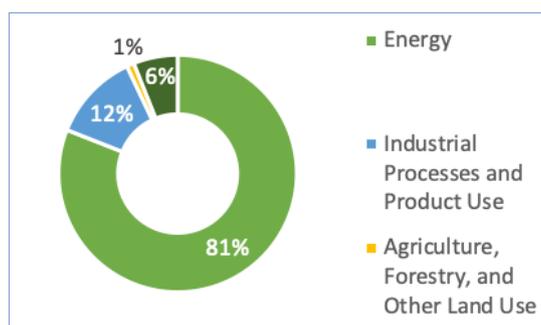
The response provided by Jordan's NDC to the challenges of 1.5°C or 2°C global warming

In September 2015, Jordan submitted its 18-page NDC and pledged to reduce GHG emissions by 14 percent by 2030 compared to BAU. The unconditional commitment is a mitigation target of 1.5 percent, while another 12.5 percent is conditional on securing the necessary financial support, estimated at about 5.16 billion US dollars.

Jordan submitted its Initial National Communication on Climate Change in 1997, followed by the Second National Communication in 2009, the Third National Communication in 2014 and recently, Jordan's First Biennial Update Report (FBUR) to the UNFCCC in November 2017. NDC baseline scenarios were reviewed and modified in the FBUR, based on the current policies, strategies and trends in the different sectors, including the new energy strategy 2015-2025. The overall baseline and mitigation scenarios cover the period 2015-2040.

Jordan conducted a national GHG inventory in 2012, which was submitted to the UNFCCC in the FBUR. According to the inventory, Jordan currently emits 27.99 million tons (Mt) CO₂eq of GHGs per year. The sectoral breakdown is shown in Figure 27. Jordan is not considered a big emitter, and accordingly, the government's priority in climate action is on adaptation rather than mitigation.

Figure 27: Sectoral breakdown of Jordan's total emissions of GHGs Gg of CO₂eq in 2012
Source: Jordan FBUR



The NDC includes more than 70 adaptation and mitigation projects that will be implemented as part of the overall Climate Change Policy 2013-2020. Some of these projects had already started before the NDC was submitted. Altogether, 39 GHG mitigation projects cover the fields of primary energy, renewable energy, energy efficiency, waste and agriculture. However, the government clearly prioritizes adaptation over mitigation, due to the national circumstances of Jordan as a small emitter facing high climate risks. Figure 28 summarizes NDC priorities for targets, adaptation and mitigation.

Figure 28: Climate policy priorities in terms of targets and overall mitigation and adaptation strategies

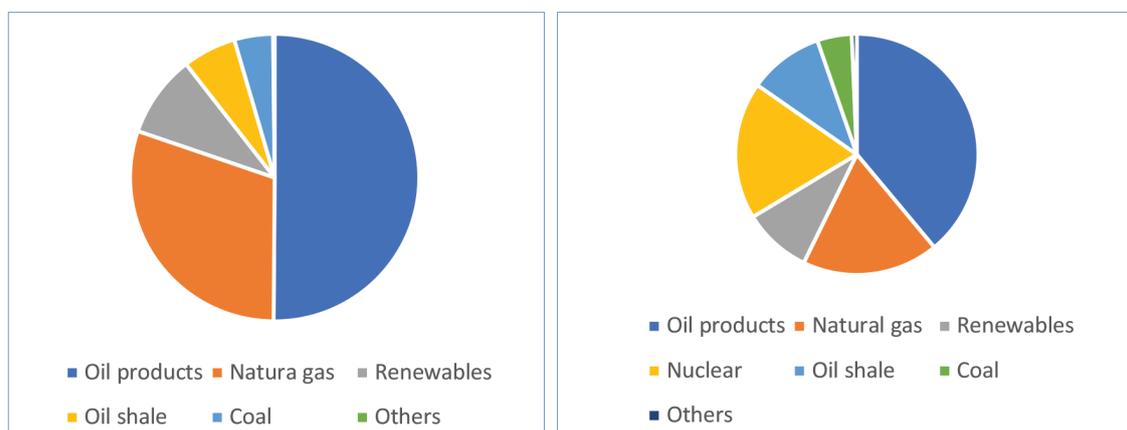
Source: EBRD, 2017

Priority targets	Mitigation strategies	Adaptation strategies
<ul style="list-style-type: none"> Renewable energy share of 10 percent in 2020 Improve energy efficiency by 20 percent by 2020 Reduce percentage of solid waste that is deposited in landfills from 80 percent to 60 percent in 2025, and increase percentage of treated and re-used solid waste from 20 percent to 40 percent in 2025 Land use: Improve the agricultural sector's contribution to adaptation (address production losses, water scarcity and climate crop vulnerability) and afforest 25 percent of barren forest areas in the rain-belt areas Water: Adopt adaptation measures and programmes for the water sector (irrigation, water quality/pricing/saving, desalination) Transport: Improve public transport and deploy infrastructure to support a renewable energy-powered zero-emissions fleet 	<ul style="list-style-type: none"> Encourage development of renewable energies Rationalize energy consumption in all sectors and improve energy efficiency Increase use of zero-emission public transport Reduce disposal of solid waste 	<ul style="list-style-type: none"> Secure access to improved water supply sources (groundwater protection, surface water development, demand management, water resources monitoring system); set up and implement a sustainable agricultural policy

Jordan imports 97 percent of its energy supply. While the energy sector was responsible for more than 80 percent of the country's emissions in 2012, its share is planned to decrease to 69 percent by 2040. In 2007, the government launched the Master Strategy of the Energy Sector, setting a renewable energy target of seven percent by 2015 and 10 percent by 2020. The updated strategy for the period 2015-2025 foresees 1350 MW of renewable energy, covering 20 percent of generated electricity. Figure 29 shows the planned energy mix for 2020 and 2040. Jordan also launched a nuclear strategy, aiming at producing 30 percent or 2000 MW by 2030 from nuclear power plants.

Figure 29: Jordan's primary energy mix 2020 (left), and 2040 (right)

Source: Jordan FBUR



The energy sector is the key sector to mitigate GHG emissions. However, the NDC also includes mitigation scenarios for other sectors. The second-biggest emitter is the industrial sector, which accounts for 12 percent of GHG emissions. This share is expected to increase slightly by 2040 due to industrial development. The agriculture, forestry and other land use sector was insignificant for Jordan's GHG

emissions in Jordan in 2012 but is expected to increase to seven percent by 2040. The transportation sector is very energy inefficient and is expected to grow by more than 10 percent annually.

In terms of adaptation, Jordan commits to regularly updating its climate vulnerability assessments and respective adaptation plans. The NAP is currently being developed by the Ministry of Environment through a national consultation process.

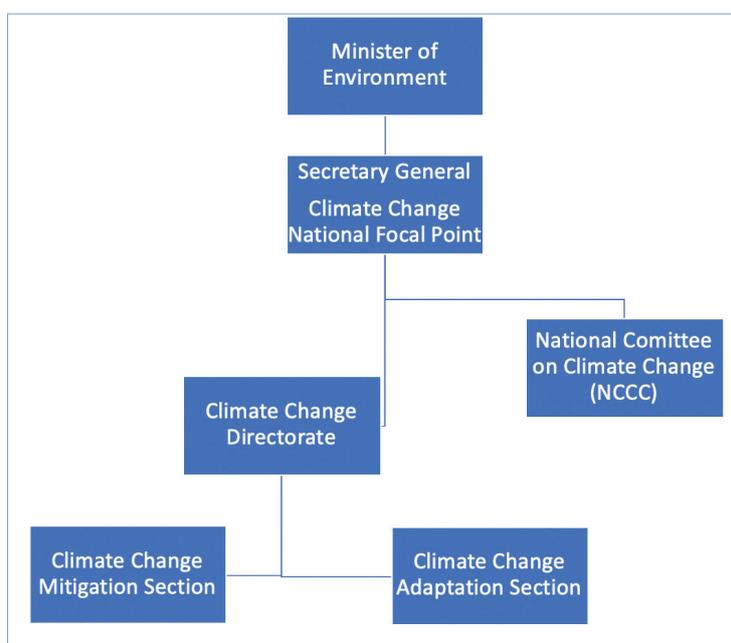
For NDC implementation, a planning process and progress-tracking strategy has been set. Triggered by the NDC, the government has started to realize explicitly the socio-economic co-benefits of climate action. However, adaptation and mitigation in line with the country's green growth are challenging and still highly conditional on the availability of financial means. Increased energy efficiency, for instance, can stimulate economic growth, reduce energy dependency, boost technical innovation and reduce poverty.

Proposed measures to ambitiously implement the NDC coherent with 1.5°C pathways and in alignment with the SDGs and the goals of the SFDRR

Implementation has an **institutional**, **procedural** and **thematic** dimension. In the following, we will look at these dimensions and propose measures for improvement.

Institutional: The National Climate Change Committee (NCCC) was established in 2001 by decision of the prime minister. It includes stakeholders from different sectors. The NCCC is the highest climate policy coordination body. The Ministry of Environment was established in 2003 and became the focal point for international climate treaties, including the UNFCCC. UNFCCC-related coordination is conducted by the Directorate of Climate Change, established in 2014 (see Figure 30).

Figure 30: The institutional framework for climate change in Jordan
Source: GIZ, 2015



However, the NDC implementation is likely to face some cross-sectoral challenges:

1. **Inter-institutional conflicts:** Overall policies developed by governmental units are not necessarily aligned with the NDC. The strong call for policies that are comprehensive and well-aligned with the NDC must come from the highest levels of the Parliament. More guidance and momentum are needed for the Members of Parliament to harmonize and update policies that reflect the country's political priority of fighting climate change.

In terms of fostering political coordination, including the NCCC, the Ministry of Environment is currently finalizing its climate change bylaw, which will make a higher level of representation at the NCCC mandatory (i.e., at the level of general secretaries). The new bylaw also foresees extending participation in the NCCC to non-state actors like academia and the private sector.

2. **MRV:** A Monitoring, Reporting, and Verification (MRV) tool is now being implemented by the Ministry of Environment on sectoral and activity levels. This system will allow specific tracking for the GHG inventory and to assess NDC progress and direction. However, there is an essential need to provide increased institutional capacity to extract, collect and manage data.
3. **Lack of finance:** Jordan suffers from a chronic general budget deficit, mainly caused by poor access to natural resources and high dependency on external aid. This deficit must be overcome by adopting new measures to attract investors and stakeholders. Green investors need planning security and guarantees that protect their investments, including loan guarantees to reduce the risk of borrowing.

On the other hand, Jordan is encouraged to control its public budget and potentially introduce environmental taxation. Such a taxation system should be based on environmental impacts and economic revenue. There is already an example of such a practice in the transport law — The Passenger Support Fund is sourced by a small surcharge on the gasoline price.

In terms of **procedural** and legal frameworks, the following challenges need to be addressed to successfully implement the NDC.

Figure 31: Likely procedural and legal gaps for NDC implementation and measures to overcome them

Source: Building on EBRD, 2017

Sector	Legal gaps	Potential legal reform
Renewable energy investments	Lengthy technical and administrative process to get a license for renewable energy projects; private-to-private transmission is not allowed; lack of awareness about available incentives	Clear and transparent administration practices; law reform to allow private-to-private (domestic or international) energy trade; clear communication about current incentives, e.g., through regional gatherings and the media
Energy efficiency	Weak monitoring mechanism for energy efficiency regulations Lack of awareness of the economic benefits of energy efficiency regulations	Strengthen the monitoring mechanisms by working in coordination with local regulators; regularly check for energy-intensive appliances; use more efficient communication tools to promote the benefits of energy efficiency
Public transport	Incomprehensive legal policies fragmented between different ministries and units No regulations for establishing a zero-emission public transport	Establish a high coordination mechanism between all these actors where the Ministry of Transport can take the lead; provide tax incentives for zero-emission public vehicles
Water	Not enough budget to implement proper wastewater and irrigation systems Weak water management regulations	Private sector partnerships to establish wastewater and irrigation systems; amendments on the water management law to prevent unsafe groundwater and aquifers usage; develop regulations related to greywater hazards
Agriculture	High overlap and inconsistency between the Agriculture Law and the Environmental Protection Law regarding land degradation	Harmonize Agriculture Law and Environmental Protection Law, and differentiate their mandates

From a **thematic** viewpoint, climate action in Jordan lacks guiding principles. This is the case, for example, with the projects listed in the NDC. Some are derived from Jordan's Third National Communication to the UNFCCC, and others have been selected from sectoral strategies, without guiding principles that would ensure strategic prioritization and the targeted mobilization of co-benefits between adaptation, mitigation and sustainable development. It is therefore recommended that guiding principles should be specified when the NDC is updated.

Moreover, even though a risk assessment mechanism was used in the Third National Communication to identify priorities, which were then translated into the NDC, this mechanism fell short in properly identifying all relevant climate risks (e.g., for the agriculture, water and health sector). Thus it is recommended to improve the quality, scale and scope of climate risk assessments.

Concluding policy recommendations

Jordan has the potential to serve as a bridge-building country for ambitious climate and energy policies and actions in the Middle East. The country has a high potential for renewable energies and investments, and technology development in this sector has started to boom in Jordan. The government showed a high commitment to international climate diplomacy and is considered very progressive in the region. However, the climate change agenda hasn't yet become the priority it deserves in order to bring the country on track of a 1.5°C-consistent pathway, including managing the climate risks that will accelerate with every additional level of warming. The majority of policy makers still don't see climate change as a threat, and most of them are not well aware of

its consequences. Thus, it is highly recommended to provide a cost-benefit assessment to policy makers as an entry for policy transformation. Moreover, policy makers should become aware of the scientifically proven fact that delays in formulating and implementing more ambitious climate action will result in increased humanitarian, economic and social losses.

The NCCC is the highest coordination mechanism of the climate agenda, and the concept of sectoral interdependence should be mainstreamed when designing policies for mutually interdependent sectors, such as water, energy, and food. The NCCC should also be institutionally strengthened, underlining a strong policy commitment toward ambitious NDC implementation. It is recommended that the Ministry of Environment be given a veto right for all policies being discussed in the NCCC.

Currently, the Ministry of Environment is working on a MRV tool. It is recommended that public access be granted to this tool in the form of an open-source portal that allows experts, academia, NGOs and other interested stakeholders to access emission inventories and track the NDC implementation. Such a portal would not only ensure and demonstrate transparency and governmental accountability, but it would also provide data to academia that can be used in simulation models, and that helps to identify and close gaps in the NDC.

The Case of the Federal Democratic Republic of Ethiopia

By Sophia Gebreyes

Climate risks for Ethiopia and the difference between 1.5°C and 2°C of global warming

Ethiopia is a LDC located in the North East Africa region, the Horn of Africa. It is bordered by Eritrea to the north, Djibouti and Somalia km2 to the east, Sudan, and South Sudan to the west and Kenya to the south. Ethiopia is a landlocked country and occupies an area of 1,104,300 km². Ethiopia has a tremendous diversity of climatic and biophysical settings, ranging from the equatorial rainforest in the south and southwest, which is characterized by high rainfall and humidity, to Afro-Alpine ecosystems on the summits of the Semen and Bale mountains and desert-like conditions in the north-east, east and south-east lowlands. Altitudinal gradient ranges from 126 m below sea level at the Kobar sink in the Dallol Depression to about 4,620 m at Ras Dajen in the Semien Mountains, where temperatures are below freezing for most of the year. The resulting annual rainfall varies from about 3,000 mm at Masha in the Baro–Akobo Basin to barely 200 mm along the Ethiopia–Djibouti, and Ethiopia–Somali border in the Ogaden and Aysha Basins. The variation in the biophysical characteristics of Ethiopia ranging from hot, arid desert to mountain ranges accounts for the variation in climate, soil type and cultural practices across the country.

Figure 32: Map of Ethiopia

Source: <http://ontheworldmap.com/ethiopia/ethiopia-road-map.jpg>



Ethiopia is located within the Inter-Tropical Convergence Zone (ITCZ), and its associated atmospheric movements drive seasonal rainfall. The movements of the ITCZ are sensitive to variations in the Indian Ocean's sea surface temperatures and vary from year to year, making the onset and duration of the rainy seasons vary considerably annually, causing frequent droughts. The best-documented cause of this variability is the El Niño Southern Oscillation (ENSO). Warm phases of ENSO have not only been associated with reduced rainfall in the main wet season, causing severe drought and famine in the north and central Ethiopia, but also with enhanced rainfalls in the earlier February–April rainy season, which mainly affects southern Ethiopia.⁶⁴

64 See <https://unfccc.int/resource/docs/natc/ethnc2.pdf> (accessed 13 September 2018)

It is expected that the mean annual temperature in Ethiopia will increase in the range of 0.9-1.1°C by 2030, in the range of 1.7-2.1°C by 2050 and in the range of 2.7-3.4 °C by 2080 compared to the 1961-1990 norm. A scenario with temperature increase of 1.5-2°C would translate into frequent droughts and floods leading to an increase in the vulnerability of Ethiopia to climate change, particularly of its rural regions and peoples, as agriculture is the backbone of Ethiopia's economy.

Socio-economic trends — including population growth, the agricultural sector (contributing 54 percent of the total emissions of the country), technological advancement, energy demand, and fuel mix — are critical factors that will either reduce or increase Ethiopia's emission pathways in the same period.

The possible impact of 1.5° or 2°C global warming on equality, human security, poverty eradication and the sustainable development aspirations of Ethiopia

Ethiopia's economy experienced strong, broad-based growth averaging 10.3 percent a year from 2005-2006 to 2015-2016, compared to a regional average of 5.4 percent. The expansion of agriculture, construction and services accounted for most of this, with modest manufacturing growth. Ethiopia's is the second largest nation in Africa, with a population of 105 million driving the demand-side growth. Higher economic growth has led to positive trends in poverty reduction in both urban and rural areas. At the beginning of the millennium, 55.3 percent of Ethiopians lived in extreme poverty. By 2014, the number of people living in extreme poverty was slashed to 29.6 percent.

Although it is the fastest growing economy in the region, and Ethiopia aims to reach lower middle-income status by 2025, it is still one of the poorest countries of the world, with a per capita income of approximately 863 US dollars (2017).

The government is implementing the second phase of its Growth and Transformation Plan (GTP II), which will run to 2020. GTP II aims to continue work on physical infrastructure through public investment projects and to transform Ethiopia into a manufacturing hub. Growth targets are an annual average GDP growth of 11 percent. In line with the manufacturing strategy, Ethiopia seeks growth of the industrial sector by an average of 20 percent, creating jobs.⁶⁵

Ethiopia's main challenges are sustaining its positive economic growth and accelerating poverty reduction, which requires progress in job creation and improved governance. Key challenges relate to land tenure, limited competitiveness, and political instability.

Agriculture represents a large portion of the Ethiopian economy. Therefore, the risks of increased magnitude and frequency of droughts and floods due to climate change threaten to roll back decades-long development progress. More than 70 percent of Ethiopia's population is still employed in the agricultural sector, contributing 35.8 percent of the country's GDP. Seventy-six million people directly or indirectly depend on agriculture for their livelihoods⁶⁶. Thus any adverse impact on agriculture will significantly affect the Ethiopian economy. Recurrent droughts and floods will reduce the amount of land that can be used for agriculture and lead to decreasing crop productivity. Lowered productivity will affect export commodities such as coffee, oilseeds, meat, and live animals, representing 27 percent, 17 percent, seven percent and three percent of the total export value, respectively. Of particular concern is the possible impact

65 See http://siteresources.worldbank.org/INTAFRICA/Resources/Ethiopia_Country_Note.pdf (accessed 18 August 2018)

66 See <https://www.cia.gov/library/publications/the-world-factbook/geos/et.html>. (accessed 18 August 2018)

on Ethiopia's coffee, Arabica variety, which is exported all over the world and is very susceptible to the effects of climate change.

Supply of fresh water is projected to decline substantially in a 2°C scenario. Curbing that temperature rise by half a degree would significantly limit the loss of water that feeds rivers and streams in Ethiopia. The Government of Ethiopia has shown commitment to reduce poverty, improve social inclusion, foster sustainable development and enhance climate resilience in its GTP II. It has continuously stressed the possible co-benefits of implementing the SDGs, its Climate Resilient Green Economy strategy (CRGE) and its NDC.

This approach is based on the analysis that climate change is the major factor exacerbating social and economic vulnerabilities in Ethiopia, and that continued warming will multiply the adverse effects already being felt. The difference between a 1.5°C and a 2°C scenario would make a huge difference in terms of water scarcity, large decreases in staple cereal crops and increased vulnerability to diseases.

Apart from contributing to GHG mitigation through national and international climate action, Ethiopia should focus on minimizing and addressing foreseeable, country-specific climate risks, which will hamper the SDG achievement (see Figure 33).

Figure 33: Linkages between climate risks, adaptation and SDGs in a 1.5/2°C scenario for Ethiopia

Source: Author, 2018

Risks and impacts	Driver	Co-Stressor	Difference between 1.5°C and 2°C scenario	Measures	SDG affected
Droughts; reduced yields and/or crop failure; reduced soil moisture availability; increased evapotranspiration and water stress; biodiversity loss and land degradation Food insecurity; increased incidence of pests and diseases; reduced feed and water sources; increased livestock mortality	El Niño/La Niña/ erratic rainfall patterns; erratic, unpredictable rain patterns; dependence on rain-fed agriculture	Rapid population growth; land tenure system; lack of early warning systems	High at 1.5°C, very high at 2°C	Improved soil, water management, and sanitation, rainwater harvesting, drip irrigation, reforestation; land reform; investments in early warning and irrigation Improve/focus on animal health and vet extension services	SDG 2: Zero hunger SDG 1: No poverty SDG 15: Life on land SDG 3: Good health and well-being
River flooding	Heavy rainfall	Land degradation; soil erosion	High at 1.5°C, high/very high at 2°C	Afforestation; improved early warning systems; flood protection systems	SDG 1: No poverty SDG 3: Zero hunger SDG 6: Clean water and sanitation SDG 11: Sustainable cities and communities
Water scarcity; drying of wetlands and freshwater sources	Erratic, unpredictable rain patterns	Poor water management	High at 1.5°C, very high at 2°C	Water management	SDG 6: Clean water and sanitation SDG 3: Good health and well-being

Ecosystem degradation and deforestation	Erratic rainfalls, drought and heat	Rapid population growth; environmental pollution; natural resource depletion; fuelwood and charcoal production	Moderate to high at 1.5°C, high to very high at 2°C	Environmental protection and water management; promote fuel-efficient stoves; leapfrog to renewable energy sources/ alternatives	SDG 15: Life on land SDG 3: Good health and well-being SDG 7: Affordable and clean energy SDG 2: Zero hunger
Loss of biodiversity	Mono cropping; land degradation	Loss of indigenous knowledge; rapid population growth and growing demand for land for agriculture	Moderate at 1.5°C, high at 2°C	Community seed banks; preservation of plant genetic resources; family planning campaigns	SDG 15: Life on land SDG 2: Zero hunger SDG 5: Gender equality
Spread of diseases	Drought; floods; changing ranges of vector-borne diseases; increased risk from water-borne diseases	Water scarcity; insufficient sanitation	Spread of vector-borne tropical diseases and skin diseases likely to be lower at 1.5°C	Quality health system; clean water and sanitation; sun protection	SDG 3: Good health and well-being SDG 6: Clean water and sanitation
Economic losses, particularly in agriculture	All aforementioned drivers/impacts		Significantly higher losses at 2°C are likely unless adaptation measures are taken	All aforementioned measures plus additional risk reduction, risk financing and risk insurance	SDG 1: No poverty SDG 2: Zero hunger SDG 8: Decent work and economic growth
Non-economic losses of land, culture, traditional knowledge and social cohesion	All aforementioned drivers/ impacts		Significantly higher losses at 2°C are likely, unless adaptation measures are taken	Enhance understanding, acknowledge, recognize and compensate non-economic loss and damage	SDG 16: Peace, justice and strong institutions

The response provided by Ethiopia's NDC to the challenges of 1.5°C or 2°C global warming

The two main strategies for reducing the threat climate change poses are mitigation and adaptation. Ethiopia has shown a commitment to mitigate national GHG with the launching of its CRGE strategy, which links with the agreement on a long-term, low-emission development strategy. Given adequate international support, Ethiopia has expressed its political will to take practical action to contribute to the global effort in combatting climate change. Sector-wise, Ethiopia's GHG emissions are dominated by agriculture, which contributes 80 percent of the total GHG emissions.

Even though Ethiopia commits to mitigation action, significant adaptation work remains the key national priority. Ethiopia's legacy of variable and unpredictable rainfall is undermining national food and water security, with implications for economic growth and poverty reduction efforts. The uncertainty and risks associated with future climate change represent an additional challenge for sustainable development. Not surprisingly, climate risk reduction and adaptation to climate change have become important issues on Ethiopia's national policy agenda.

The need for support in implementing the adaptation and mitigation actions has been clearly stipulated in the Intended National Determined Contribution of Ethiopia. This support must translate into improved access to climate finance, adequate technology transfers, and capacity building to enhance implementation capability.

Ethiopia has been engaging with development partners both at multilateral and bilateral dimensions to access such support to fully implement the Climate Resilient Green Economy Strategy.

Ethiopia communicated its 13-page NDC to the UNFCCC on 3 March 2017. Ethiopia commits to reduce its per capita net GHG emission by at least 64 percent by 2030. These quantified emission reduction targets are in line with Ethiopia's long-term commitment to become carbon neutral and a middle-income country by 2025. Thus Ethiopia demonstrated a high level of ambition and consistent leadership, in keeping with a 1.5°C pathway, despite its negligible contribution to global emissions.

Emissions covered by the target are CO₂, methane (CH₄) and nitrous oxide (N₂O), originating from livestock (42 percent), deforestation (37 percent), crop cultivation (12 percent), electric power sector, transport sector, industrial and building sectors at three percent each, respectively.

Key elements of the NDC and the CRGE implementation strategies are improving crop and livestock production practices for higher food security and farmer income while reducing emissions; protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks; expanding electricity generation from renewable sources of energy for domestic and regional markets; and leapfrogging to modern and energy-efficient technologies in transport, industrial sectors and buildings. These translate into specific emission reduction targets by 2030.

Reducing vulnerability and building resilience to safeguard human security and to achieve the SDGs is another key pillar of the NDC. An important component of Ethiopia's contribution includes actions to build resilience and enhance adaptation to the impact of climate change. Given that 80 percent of the population depends on agriculture for their livelihoods increasing the resilience of agriculture is a priority for Ethiopia. This includes addressing the high vulnerability of the sector to droughts and floods.

The NDC explicitly refers to co-benefits of mitigation and adaptation actions in regards to forestry and agriculture by maximizing the synergies between adaptation and mitigation. Many of the measures involving forestry and agriculture can provide substantial economic and livelihood benefits to Ethiopians. Respective adaptation needs are further specified in the CRGE and the National Adaptation Programs of Action (NAPA), including the institutional establishment of improved coordination of disaster risk management and adaptation; education and awareness raising on effective adaptation and disaster risk management from the local to the national level; enhanced emergency preparedness and response; enhanced local livelihood and community resilience for all Ethiopians; and an integrated approach to climate-sensitive development planning.

Ethiopia commits to regularly update its climate vulnerability assessments and respective adaptation plans. The NAP is currently being revised.

While Ethiopia considers its NDC a full national commitment to be undertaken without pre-conditions, international support for the implementation of both mitigation and adaptation action is critical for success. Altogether, Ethiopia's NDC can be considered an ambitious response to the significant challenges to stay at 1.5°C and to deal with the enormously challenging risks for Ethiopia as a LDC. This is true with respect to the enabling institutional framework described, the inter-ministerial approach and the ambitious targets and priority actions.

What is needed now for successful implementation are more specific climate action and investment plans and an enhanced vertical cooperation between international, national, regional and local levels.

Proposed measures to ambitiously implement the NDC coherent with 1.5°C pathways and in alignment with the SDGs and the goals of the SFDRR

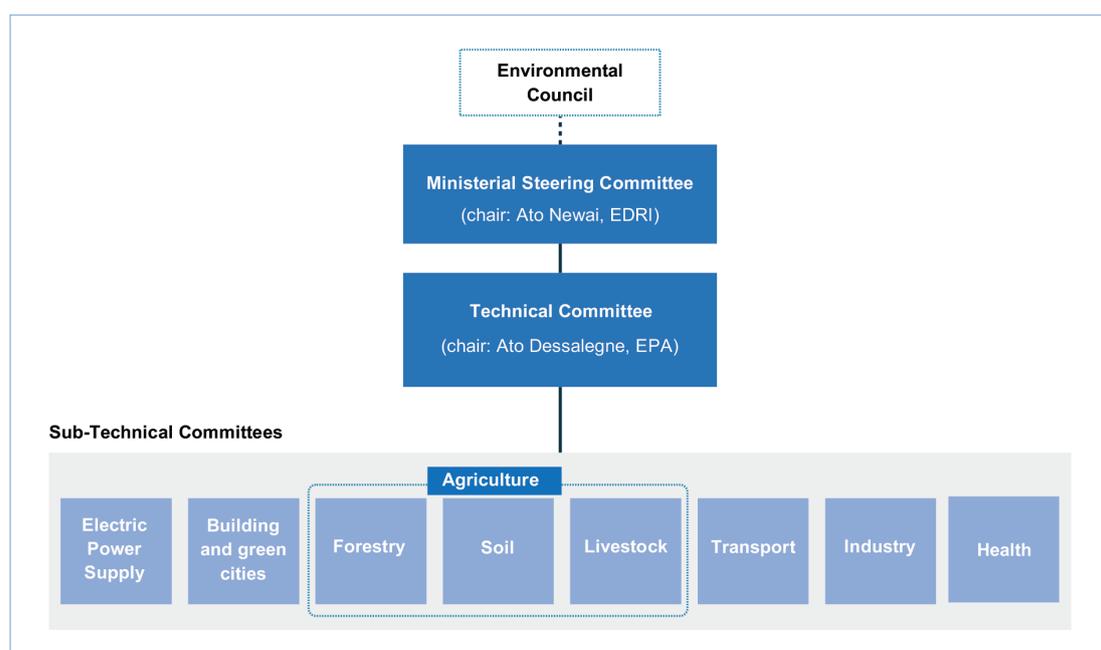
Implementation has **institutional**, **procedural** and **thematic** dimensions. In the following, we will look at these dimensions and propose measures for improvement.

At the **institutional level**, Ethiopia has set up a management framework for the CRGE. The inter-ministerial approach ensures national commitment and alignment across the government. The inter-ministerial management framework is led by the Environmental Council and the Technical Committee, which oversees the implementation of the strategy through six technical committees (Agriculture, Electric power supply, Building and green cities, Transport, Industry, and Health) to meet its ambitious growth targets while keeping GHG emissions low.

This set-up reflects very well Ethiopia's strong commitment and demonstration of climate leadership at the highest levels of the government, including the Office of the Prime Minister and the concerned line ministries.

Figure 34: National commitment and alignment across the government

Source: CRGE, September 2011



At the **procedural** and legal/policy level, legal frameworks and policies need an upgrade to ensure proper NDC implementation, well aligned with the SDG implementation roadmap and the NAPA. This should include the revised NAP and revised guidelines and a checklist to ensure the mainstreaming of the CRGE as well as the full integration of gender and human rights measures into the country's climate strategy. Ethiopia may also benefit from continuous intense cooperation with international partners and services provided by the NDC Partnership.

The general objective of the CRGE is to improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through the sound management and use

of natural, human-made and cultural resources and the environment as a whole so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. At the level of **thematic** priorities, the CRGE includes the following, which are broadly consistent with the NDC, the NAPA and the aforementioned key challenges:

- Strengthen the enabling environment for climate change adaptation and mitigation, including sustainable financing
 - Strengthen inter-ministerial coordination across the government, and streamline entry points for accessing and managing climate change funds and CRGE facility
- Adaptation and reducing risks for a climate-resilient future in the following sectors:
 - food and water security
 - energy security and conservation
 - biodiversity and ecosystem management
 - human resources development, education and awareness
 - health
 - urban planning and infrastructure development
 - disaster risk management
 - soil and water management
 - transport and communication
- Aim to
 - develop effective adaptation and risk reduction responses and capacities
 - promote and implement adaptation programmes that support and improve communities' livelihoods
 - improve and strengthen climate data availability, risk assessments, and monitoring
- Energy security and low-carbon future through implementing the 2011 CRGE strategy with its quantitative targets, being supported through access to international finance.
- Disaster preparedness, response, and recovery through the implementation of the Ethiopia National Policy and Strategy on Risk Management (2013) with a strong focus on reducing disaster risk and potential damage caused by a disaster through the establishment of a comprehensive and coordinated disaster risk management system in the context of sustainable development.⁶⁷
- Building education and awareness and community mobilization, being mindful of culture, gender and youth, including integrating climate change into education, enhanced use of climate data in decision making and planning and promoting gender-sensitive strategies and traditional knowledge in adaptation.

What is yet to be done, however, is to further develop these thematic priorities into more specific flagship programmes for action, including related investment plans. It is further recommended to identify lighthouse projects under each of the programmes for action, which demonstrate step-by-step how programmes turn into reality. Each should include clearly visible sustainable development co-benefits and linkages to Ethiopia's GTP II/CRGE.

67 See <https://www.preventionweb.net> (accessed 2 September 2018)

In view of the proposed measures in figure 35, it is recommended to set up the following 12 flagship programmes for action, which are interconnected, in line with the NDC, fulfill the requirements for a 1.5°C scenario and contribute to the achievement of the SDGs and the SFDRR.

Proposed national flagship programmes for action

Food security for all

Invest in irrigation and watershed management to reduce farmers' dependence on rain-fed agriculture and to improve/increase food production. As much as possible, use renewable energy for water pumping and irrigation.

Climate drought/crop insurance

Explore climate/crop insurance for vulnerable farmers in drought-prone areas as part of a disaster risk reduction strategy. A cooperation with InsuResilience could be helpful.

Preservation of biodiversity

One of the world centres for crop evolution and origin, Ethiopia has long been recognized as an important area of diversity for several major and various minor crops. Plant genetic diversity in Ethiopia is of vital importance in breeding new varieties of crops with desirable characteristics, such as increased resistance to pests and diseases and greater adaptation to heat and drought.⁶⁸

Soil and water conservation

Promote biological and physical soil and water conservation measures for ecosystem regeneration, including an increase in groundwater recharge.

Water management

Increase water storage capacity to reduce Ethiopia's dependence on unreliable rainfall patterns and improve technical and management capacity.

Climate-resilient livelihoods

Diversify livelihood opportunities and create job opportunities by tapping into and leapfrogging to renewable energy sources, including solar, wind, geothermal and hydro.

National sustainable afforestation

Raise Ethiopia's forest coverage on degraded land for carbon capture and sequestration. Partnership with REDD + Initiative would be helpful.

Ethiopia 100 percent renewable energy for all

Redouble efforts to reduce dependency on biomass and fossil fuels and switch to renewable energy sources for cooking, lighting and generating power. Collaboration with international NGOs would be helpful.

Effective early warning system and disaster risk management

Empower community-based disaster risk reduction committees to liaise with the government's Disaster Risk Management Commission for enhanced civil protection and disaster preparedness and risk reduction. Collaboration with NGOs and churches that work at the grassroots' level could be useful.

68 J. M. M. Engels, J. G. Hawkes, M. Worede, 1991: *Plant Genetic Resources of Ethiopia*. Cambridge, UK: Cambridge University Press.

Climate-resilient infrastructure

Promote the systematic enforcement of building/construction codes for promoting green, sustainable cities.

Health

Invest in disease vector control systems and increased surveillance of existing and emerging threats in areas affected by climate variability and climate change.⁶⁹

Climate change public awareness

Create public awareness for collective climate action. Churches, NGOs and other civil society actors' role is critical in engaging the public in this topic.

Climate service

Enhance the role of climate service through developing short-, medium- and long-term weather forecasts, seasonal outlooks and inter-seasonal climate predictions to regularly update the NDC, NAP and other national plans.

Figure 35: Overview of proposed flagship programmes and related lighthouse projects in Ethiopia

Source: Authors, 2018

Flagship programme for action	Possible lighthouse projects	Possible international support and cooperation	Relevance to stay at 1.5°C and to deal with its consequences	Contribution to achieving SDGs and SFDRR goals
Food security for all	Expansion of irrigation schemes for sustainable water use and management	Ethiopia and international donor community	Very high	SDG 2: Zero hunger SDG 3: Good health and well-being
Climate drought/crop insurance programme	Promotion of climate risk insurance nationwide	R4 Rural Resilience Initiative; InsuResilience; African Risk Capacity	High	Enhancing disaster risk preparedness (SFDRR)
Preservation of biodiversity	Promotion of community seed banks and conservation of Ethiopia's plant genetic resources; institutional reinforcement of biodiversity conservation; recognize and promote indigenous knowledge and science; family planning	Ethiopia international donor community, NGOs and churches	Very high	SDG 15: Life on land SDG 5: Gender equality
Soil and water conservation	Promotion of conservation agriculture	Ethiopia; NGOs	Very high	SDG 2: Zero hunger SDG 6: Clean water and sanitation
Water management	Clean water and sanitation for all	Ethiopia International donor community; NGOs/ CSOs	Very high	SDG 6: Clean water and sanitation SDG 3: Good health and well-being

⁶⁹ http://siteresources.worldbank.org/INTAFRICA/Resources/Ethiopia_Country_Note.pdf

Climate-resilient livelihoods programme	Skills training in the renewable energy sector; diversification of livelihoods, opportunities in agriculture, service and climate-resilient manufacturing/industry	Ethiopia; international donor community	High	SDG 1: No poverty SDG 2: Zero hunger SDG 8: Decent work and economic growth SDG 10: Reduced inequalities SDG 12: Responsible consumption and production
National sustainable afforestation programme		Ethiopia; international donors; REDD + Initiative; NGOs/ CSOs	Very high	SDG 15: Life on land SDG 13: Climate action
Ethiopia 100 percent renewable energy for all programme	Investment in solar, hydro, wind, natural gas and reforestation for biofuel	Ethiopia; international donor community	Very high	SDG 7: Affordable and clean energy SDG 13: Climate action
Effective early warning systems and disaster risk management	Capacity building of community-level disaster risk reduction committees and government civil protection	Ethiopia	Very high	Multi-hazard early warning systems (SFDRR)
Climate-resilient infrastructure	Enforcement of building codes and safety standards	Ethiopia	Very high	SDG 11: Sustainable cities and communities
Health	Malaria containment programme	Ethiopia; international donors	High	SDG 3: Good health and well-being
Climate change public awareness programme	Promoting recycling; waste management; climate change in schools' curricula	Ethiopia	Very high	SDG 17: Partnerships for the goals SDG 11: Sustainable cities and communities SDG 3: Good health and well-being
Climate service	Develop short-, medium- and long-term weather forecasts, seasonal outlooks and inter-seasonal climate predictions to regularly update the NDC, NAP and other national plans.	National Meteorology Agency	High	Enhancing disaster risk preparedness (SFDRR)

Concluding policy recommendations

Due to both its high vulnerability to climate change and its envisioned leadership for ambitious climate action, Ethiopia has a huge potential to provide an enabling policy and legal framework to guide climate action consistent with 1.5°C pathways in alignment with sustainable development planning and disaster risk reduction. Building on existing frameworks, policies and the NDC, it is recommended to develop a number of national flagship programmes and related lighthouse projects, comprehensively addressing the most burning climate risks and impacts in a targeted and inclusive way. Programmes would cover food security, water management, climate-resilient livelihoods, renewable energies, and non-economic and economic loss and damage. They should be designed and implemented in a participatory way, creating triple wins of adaptation, GHG mitigation, and sustainable development, and mobilizing international cooperation and support.

The Case of the Republic of Kenya

By Arnold Ambundo and Isaiah Kipyegon Toroitich

Climate risks for Kenya and the difference between 1.5°C and 2°C of global warming

The Republic of Kenya covers 581,309 km² and has a population of approximately 48 million people. It is bordered by Tanzania to the south and southwest, Uganda to the west, South Sudan to the northwest, Ethiopia to the north and Somalia to the northeast. Approximately 85 percent of Kenya's land is classified as arid and semi-arid land. Kenya's geographical location makes the country inherently prone to cyclical droughts and floods, landslides, lightning-thunderstorms, wildfires and strong winds. Livelihoods and economic activities are thus highly vulnerable to climatic fluctuations in space and time. The arid and semi-arid lands are also more prone to harsh weather conditions, making the communities within this region vulnerable to natural hazards.

The country's inland and the southern, eastern and northern corridors are largely arid, with two thirds of the country receiving less than 500 mm of rainfall per year, limiting the potential for agriculture. In recent years, Kenya has had its share of climate-related risks — prolonged droughts, frost in some of the productive agricultural areas, hailstorms, extreme flooding, receding lake levels, drying of rivers and other wetlands — leading to large economic losses and adversely impacting food security. Many of these extreme climate events have led to the displacement of communities and migration of pastoralists into and out of the country, resulting in conflicts over natural resources. Slow-onset events associated with climate change also lead to competition over scarce resources, resulting in human-wildlife conflicts. Other climate change impacts include widespread tropical disease epidemics, sea level rise and depletion of glaciers on Mount Kenya.

Climate change in Kenya has become statistically evident. Temperatures have risen throughout the country. Rainfalls have become irregular and unpredictable, and when it rains, the downpour is intense. Since the early 1960s, both minimum night and maximum day temperatures have been increasing. The minimum temperature has risen generally by 0.7-2°C and the maximum by 0.2-1.3°C, depending on the season and the region. In areas near large water bodies, the maximum temperatures have risen much like in other areas, but the minimum temperatures have either not changed or become slightly lower. In a 1.5°C scenario, the number of hot days will go up to 50 – 80 days and in a 2°C scenario to 85 – 130, according to the IPCC Special Report "Global Warming of 1.5°C" (IPCC, 2018, chapter 3).

Risks of climate change, in combination with local environmental degradation, are profound. According to the National Climate Change Response Strategy (NCCRS, 2010), the observed and projected climate change risks include:

- **Desertification:** Seventeen percent of Kenya's land mass is arable, while 83 percent consists of semi-arid and arid land. Due to climate change and other human factors, desertification, (the extent of arid and semi-arid land) is increasing.
- **Water scarcity:** The natural endowment of fresh water is low, and water resources are unevenly distributed in both time and space. With temperature above 1.5°C or even 2°C degrees, this will further worsen the already precarious situation as it affects the main hydrological components, precipitation and run-off.
- **Floods:** More heavy rainfall events are projected for the future, leading to increasing flood risks.

- **Drought:** Serious droughts have increasingly occurred in Kenya over the last decades, leading to reduced production of both staple food crops like maize and also major cash crops like tea, sugarcane and wheat. Drought risks are expected to increase further with every additional level of temperature increase.

Figure 36: Kenya's main climate risks and vulnerabilities

Source: Kenya's National Climate Change Adaptation Plan 2018-2022, p. 28

Climate risks	Key sources of vulnerability
<ul style="list-style-type: none"> • Rising temperatures • Uncertain change in rainfall patterns • Rising sea levels and stronger storm surges • Great risks of extreme weather events (floods, droughts and landslides) • Melting glaciers • Ocean acidification 	<ul style="list-style-type: none"> • High levels of multi-dimensional poverty, particularly in the arid and semi-arid lands • Gender inequality • Environmental degradation, including loss of forest cover • High reliance of the national economy and local livelihoods on rain-fed agriculture • High level of water scarcity and mismanagement of water resources • Insecure land tenure and land fragmentation • Population growth and migration to urban areas • Heavy disease burden and limited access to quality health care, particularly in rural and remote areas

The possible impact of 1.5°C or 2°C degrees global warming on equality, human security, poverty eradication and the sustainable development aspirations of Kenya

Climate change poses one of the greatest challenges for Kenya to realize its vision to eradicate poverty, avoid humanitarian catastrophes, achieve the SDGs and become a prosperous country. Agriculture is the backbone of the Kenyan economy, contributing 24 percent to the GDP (including all industries at basic prices) in 2012.⁷⁰ The sector accounts for 65 percent of informal employment in rural areas. Kenya faces major food security challenges due to an over dependence on climate-vulnerable, rain-fed agriculture for food production. Pastoral and marginal agricultural areas are particularly vulnerable to the impacts of climate change.

Extended periods of drought and increasing floods erode livelihood opportunities and community resilience. Crop failure puts Kenyans at risk of malnutrition, hunger and starvation. The need for food imports will increase and tea exports decrease, weakening the country's balance of payments. By 2050, floods and droughts are projected to cost Kenya 2.4 percent of GDP annually and another 0.5 percent resulting from degraded water resources (IPCC, 2018, chapter 3). Every additional level of warming will further increase the risk of leaving increasing populations behind and not achieving the country's development vision and the SDGs, for instance, SDG 1 (No poverty), SDG 2 (Zero hunger), SDG 6 (Clean water and sanitation) and SDG 10 (Reduced inequalities).

Similarly, the tourism sector plays an important economic role, with 27 percent of the foreign exchange earnings and 12 percent of the GDP.⁷¹ Kenya's tourism industry is largely nature-based, and ecosystems, as well as wildlife, are highly sensitive to climate variability and change. Global warming is likely to disrupt and even destroy some of the tourist attractions, such as the snow caps of Mount Kenya, the coastal rainforests and fragile marine ecosystems. Coral reefs are bleached, and along the coastline, some of the popular beaches could eventually disappear as the sea level rises. Hotels along the Kenyan

70 See <https://www.knbs.or.ke/download/statistical-abstract-2013/> (table 26a) (accessed 14 September 2018)

71 See <https://www.knbs.or.ke/download/statistical-abstract-2013/> (accessed 14 September 2018)

coastline have already been forced to construct sea walls as protection against stronger sea tides. With decreasing tourism, the SDG 8 (Decent work and economic growth) would be hampered.

The energy sector, too, is largely dependent on hydro power, which contributes about 50 percent of the total national energy production. This sector has been impacted by droughts and erratic rainfall. With the projected increasing drought risk (IPCC, 2018, chapter 3), SDG 7 (Affordable and clean energy) is at risk.

The poor infrastructure in the country is also under more severe risk in case of floods. A high percentage of Kenya's roads are mud roads. Floods cut off links and destroy the limited infrastructure, not only hampering SDG 9 (Industry, innovation and infrastructure) and 11 (Sustainable cities and communities), but also putting pressure on achieving the disaster risk reduction goals of the SFDRR, namely the targets to reduce disaster mortality, the number of affected people and economic damage to infrastructure. The continued annual burden of the extreme climatic events could cost the economy as much as 500 million US dollars a year,⁷² which is equivalent to approximately 2.6 percent of the country's GDP, with implications for long-term growth. For example, the overall effects of the 2008-2011 drought in Kenya have been estimated at 12.1 billion US dollars, including 805.5 million US dollars in direct and 11.3 billion US dollars in indirect losses.⁷³

In terms of climate change impacts on health, malaria, cholera, tuberculosis, yellow fever, and Lyme disease are some of the diseases that are expected to spread with rising temperatures and changing precipitation patterns. During floods, diseases such as typhoid, cholera, and bilharzia reach epidemic levels.

The combination of these factors increases Kenya's vulnerability to climate change. The adverse impacts of climate change are accelerated by local environmental degradation caused by illegal settlements, logging, and livestock grazing, which leads to further aggravated deforestation and land degradation. Forest cover in Kenya, for instance, has fallen from 12 percent in the 1960s to less than two percent. This has considerably affected the ability of Kenya's five main water towers to act as water catchments for major rivers and lakes, which are the main source.

The response provided by Kenya's NDC to the challenges of 1.5°C or 2°C global warming

Transitioning to a low-GHG, climate-resilient development pathway should address future risks, thereby improving Kenya's ability to prosper under a changing climate while reducing the emissions intensity of a growing economy.

Kenya's Vision 2030 sets out a development path aimed at creating a prosperous country with a high quality of life. Kenya's Climate Change Action Plan aims at supporting efforts toward attaining Vision 2030 and encouraging people-centered sustainable development:

- **Sustainable development:** Achieving sustainable development should be at the forefront of all climate actions; climate change and development are intrinsically linked.
- **Adaptation:** Reducing vulnerability to avoid or reduce the impacts of climate change and enable people to respond to climate risks by moving toward a climate-resilient society

72 <https://www.knbs.or.ke/download/statistical-abstract-2013/> (accessed 14 September 2018)

73 Government of Kenya, 2012: Kenya Post Disaster Needs Assessment. Nairobi.

- **Mitigation:** Taking actions, where possible, to encourage GHG emissions that are lower than BAU practice and to move toward a resource-efficient economy that is zero carbon by 2050

Kenya mitigation commits to abate its GHG emissions by 30 percent by 2030 relative to the BAU scenario of 143Mt CO₂e and in line with its sustainable development agenda. This target is subject to international support in the form of finance, investment, technology development, and transfer and capacity building. Kenya's NDC includes both mitigation and adaptation components and is in line with decisions 1/CP.19 and 1/CP.20.

Kenya's total GHG emissions are relatively low, standing at 73 MtCO₂e in 2010, out of which 75 percent result from LULUCF and agriculture, mainly due to reliance on biomass by a large proportion of the population, coupled with increasing demand for agricultural land and urban development. The other significant emissions are from the energy and transport sectors, with waste and industrial processes contributing negligible amounts. Kenya strives to become a newly industrialized MIC by 2030. This development is expected to increase emissions from the energy sector. The current energy mix, however, is mainly clean, with deliberate efforts by the government toward enhancing geothermal, wind, solar and other renewable energies.

Figure 37:
Kenya's emission reduction potential and the NDC targets by sector (MtCO₂e per year)
 Source: Government of Kenya, 2015: Second National Communication

Sector	GHG emission reduction potential (MtCO ₂ e)				NDC target (MtCO ₂ e)
	2015	2020	2025	2030	2030
Forestry	2.71	16.24	29.76	40.2	20.10
Electricity generation	0.28	2.24	8.61	18.63	9.32
Energy demand	2.74	5.16	7.92	12.17	6.09
Transportation	1.54	3.52	5.13	6.92	3.46
Agriculture	0.63	2.57	4.41	5.53	2.77
Industrial processes	0.26	0.69	1.03	1.56	0.78
Waste	0.05	0.33	0.5	0.78	0.39
Total emission reduction potential				85.79	42.90
Total emissions in 2030	8.21	30.75	56.86	143.00	143.00
Percent of total emissions in 2030				60 percent	30 percent

The figure shows the range of projected NDC emission reduction per sector relative to the baseline. The lower target is aligned with the proportional contribution that the sector would need to make to reach a high level of certainty that the overall target would be achieved if all other sectors also meet their low target reduction. The high target is intended to guide responsible ministries and agencies in terms of what they should objectively plan and prepare for should the sector require additional emission reductions.

Figure 38: Kenya's projected emission reductions relative to baseline
 Source: Government of Kenya, 2015, Second National Communication and Government of Kenya, 2017: NDC Sector Analysis Report

Sector	Total Emissions MtCO ₂ e	Emission reductions relative to baseline (MtCO ₂ e)			
		High range*	Low range*	Technical potential	NDC target
	2030	2030	2030	200	2030
Forestry	22	20.1	11.3	40.2	20.10
Electricity generation	41	12.6	7.5	18.63	9.32
Energy demand	10	-	-	12.17	6.09
Transportation	21	3.5	2.0	6.92	3.46
Agriculture	39	2.8	1.6	5.53	2.77
Industrial processes	6	1.3	1.0	1.56	0.78
Waste	4	0.4	0.4	0.78	.39
Total	143	40.1	23.8	85.8	42.9

In terms of adaptation and climate risk management, Kenya follows a proactive approach, aiming at ensuring that disasters are curtailed, do not result in emergencies and build up the capacity of people to cope with the impacts of climate change. Priority actions include:

- The establishment of early warning systems for flood and drought, including at the community level
- Implementation of flood management plans, including water reservoirs, drainage networks, reforestation and rehabilitation of riparian areas, construction of dams and land use restrictions
- Improved social protection programs for chronically food insecure populations
- A County Climate Change Fund for locally identified priority adaptation actions
- Community-level capacity building to raise awareness and disaster management capacity. Particularly women, as central players in disaster response, are provided with resources and support to carry out these roles effectively.

Some of the climate actions will be implemented under the National Disaster Risk Management Policy, approved by the cabinet in 2018, and the National Drought Emergency Fund. This fund was established in 2018 with an annual allocation of 2 billion Kenyan shillings to support action against climate-induced risks.

Proposed measures to ambitiously implement the NDC coherent with 1.5°C pathways and in alignment with the SDGs and the goals of the SFDRR

For Kenya, the conundrum of choosing between action on climate change and action on development is a false one: The two are interlinked and will become increasingly so over the coming decades. Building climate resilience, or increasing the ability to adapt to climate change in a low-carbon way, will help Kenya to achieve sustainable development and Vision 2030 goals. This will also contribute to the implementation of the Kenya Constitution 2010 that guarantees every Kenyan the right to a clean and healthy environment

under the Bill of Rights. In Kenya, emission-reduction actions should be considered priority actions only if they also have climate resilience or sustainable development co-benefits.

A 1.5°C-consistent climate-resilient development pathway should be tailored to the country's unique circumstances and the urgent need to adequately address climate change at all levels. While Kenya has little historical or current responsibility for global climate change, and emissions are low relative to global emissions, its future sustainability will depend on how it adjusts its development agenda. A low and preferably zero GHG climate-resilient development pathway is not only feasible but also indispensable for Kenya based on its sustainable development agenda and its commitments under the Paris Agreement, SDGs, SFDRR, as well as the visions of the CVF. Kenya must recognize that national emissions will increase with population and economic growth and therefore mitigate this with robust investments in renewable energy. The current Kenyan NDC, however, while ambitious in the context of current circumstances, is inadequate because it is conditional to support. Kenya needs to consider a pathway that can help ensure that Kenya remains a low emitter as the country develops and takes steps to reduce vulnerability to climate change by also adjusting its national development planning and budgeting to include a strong mitigation agenda, irrespective of external support.

Enhanced coherence in politics and practice is still required. Kenya's NDC, national development blueprint Vision 2030 and NAP cover all the important development sectors of the country and include the relevant climate change imperatives. Continuous work needs to be done to ensure coherence of these, not only at the national levels but also at county levels.

Recent developments, such as exploration of oil and coal in the country, risk locking Kenya's development into carbon-intensive pathways, and therefore these trends should be reconsidered.

Ambitious NDC implementation has **institutional**, **procedural** and **thematic** dimensions. In the following, we will look at these dimensions and propose measures of improvement.

At the **institutional** level, policy, legislative and regulatory frameworks for climate change response provide legitimacy, set goals, regulate conduct, provide incentives for action, promote investment and establish sanctions that can ensure compliance. In Kenya, climate change affairs are coordinated by the Climate Change Directorate, which is the lead agency of the Kenyan government under the Ministry of Environment and Forestry. The Climate Change Directorate develops national climate change plans, delivers operational coordination, provides analytical support on climate change issues, provides a registry for mitigation actions, serves as a knowledge and information centre and optimizes the country's efforts to mobilize climate finance. It also serves as the secretariat for the National Climate Change Council. In terms of legislative framework, the country has functioning parliamentary climate change groups at national and sub-national levels. Kenya's links to the climate change finance architecture and other platforms are established through its National Designated Authorities and other entities.

The National Climate Change Council, established under an act of Parliament in 2016, further allows the participation of civil society in the climate change affairs of the country. This institutional arrangement, which links to county/local level government if well implemented and coordinated, has a huge potential for higher ambition. This will further enhance Kenya's robust engagement with the UNFCCC through the African Group, the G77 and China, and other mechanisms within the global climate change regime. More needs to be done to ensure effective operationalization of Kenya's climate change council mandate.

At the **procedural** and legal/policy level, climate change action in Kenya is guided by the Climate Change Act (Number 11 of 2016), which provides a framework for mainstreaming climate change across sectors.

The act obliges the cabinet secretary responsible for climate change affairs to formulate a five-year National Climate Change Action Plan (NCCAP) that addresses all sectors of the economy and provides mechanisms for mainstreaming climate change into all sectors and the sub-national, i.e. county integrated development plans. The NCCAP is to be approved by the National Climate Change Council, consisting of nine members, including civil society representation, and being chaired by the of Kenya. The council provides overarching national climate change coordination and has an advisory function and power to impose climate change obligations on public and private entities.

However, there has never been a meeting of the council due to membership challenges to the council. Going forward, to implement key climate change action plans and policies, the council needs to be constituted for it to undertake its main tasks as stipulated in the Climate Change Act of 2016.

At the level of **thematic** priorities, Kenya's National Climate Change Action Plan (NCCAP 2018-2022) aims to further Kenya's sustainable development by providing mechanisms and measures to achieve low-carbon, climate-resilient development in a manner that prioritizes adaptation. It takes note of the impacts of climate change on Kenya's socio-economic sectors. It identifies strategic areas where climate action is linked to the Government of Kenya's Big Four agenda, recognizing that climate change is likely to limit the achievement of these pillars.

For example, food security is threatened through climate change–driven declines in agricultural productivity; health is impacted by an increase in vector-borne diseases, including malaria and cholera; housing and manufacturing are impacted by damage to infrastructure, including homes, business, schools and hospitals, caused by flooding and storm events.

The seven priority climate action areas identified include

- **Disaster (drought and floods) risk management:** reduce risks to communities and infrastructure resulting from climate-related disasters, such as droughts and floods
- **Food and nutrition security:** increase food and nutrition security through enhanced productivity and resilience of the agricultural sector in as low-carbon a manner as possible
- **Water and blue economy:** enhance resilience of the blue economy and water sector by ensuring access to and efficient use of water for agriculture, manufacturing, domestic, wildlife and other uses
- **Forestry, wildlife and tourism:** increase forest cover to 10 percent of total land area; rehabilitate degraded lands, including rangelands; increase resilience of wildlife and tourism sector
- **Health, sanitation and human settlements:** mainstream climate change adaptation into the health sector, and increase the resilience of human settlements, including improved solid waste management in urban areas
- **Manufacturing:** improve energy and resource efficiency in the manufacturing sector
- **Energy and transport:** climate-proof energy and transport infrastructure, encourage electricity supply based on renewable energy, encourage the transition to clean cooking and develop sustainable transport systems

Adaptation actions are prioritized in NCCAP because of the devastating impacts of droughts and floods and the negative effects of climate change on vulnerable groups in society, including women, older people, persons with disabilities, children, youth and members of minority or marginalized communities.

These actions are undertaken, where possible, in a way to limit GHG emissions to ensure that the country achieves its mitigation NDC. The climate change actions will be mainstreamed in the Third Medium-Term Plan and in country integrated development plans, ensuring that strategic climate change actions are taken up across the country and in all sectors. The updated NCCAP will guide Kenya on the prioritized adaptation and mitigation climate change actions and will lead to Kenya achieving its NDC targets. The NCCAP 2018-2022 will cover Kenya's climate actions over the five-year period ending in 2022.

In addition, Kenya has developed a number of main policies, plans and frameworks that influence and guide climate change actions in Kenya. These are briefly described in the following figure.

Figure 39: Climate change–related frameworks and policies in Kenya

Source: Authors, 2018

National framework	Description
Kenya Vision 2030 (2008) and its Medium-Term Plans	Kenya Vision 2030, the country's development blueprint, recognized climate change as a risk that could slow the country's development. Climate change actions were identified in the Second Medium-Term Plan (2013-2017). The Third Medium-Term Plan (2018-2022) recognized climate change as a cross-cutting thematic area and mainstreamed climate change actions in sector plans.
National Climate Change Response Strategy (2010)	Kenya's National Climate Change Response Strategy was the first national policy document on climate change. It aimed to advance the integration of climate change adaptation and mitigation into all government planning, budgeting and development objectives.
National Climate Change Action Plan (2018-2022)	Kenya's National Climate Change Action Plan 2013-2017 was a five-year plan that aimed to further Kenya's development goals in a low carbon climate- resilient manner. The plan set out adaptation, mitigation and enabling actions.
National Adaptation Plan (2015-2030)	Kenya's National Adaptation Plan 2015-2030 was submitted to the UNFCCC in 2017. The NAP provides a climate hazard and vulnerability assessment and sets out priority adaptation actions in the 21 planning sectors in Second Medium-Term Plan.
Kenya's (NDC) (2016)	Kenya's NDC under the Paris Agreement of the UNFCCC includes mitigation- enhanced resilience to climate change toward attaining Vision 2030 by mainstreaming climate change into the Medium-Term Plans (MTPs) and implementing adaptation actions. The mitigation contribution seeks to abate its GHG emissions by 30 percent by 2030 relative to the BAU scenario of 143 MtCO ₂ e. Achievement of the NDC is subject to international support in the form of finance, investment, technology development and transfer and capacity development.
Climate Change Act (No. 11 of 2016)	The Climate Change Act is the first comprehensive legal framework for climate change governance for Kenya. The objective of the act is to "enhance climate change resilience and low carbon development for sustainable development of Kenya." The act establishes the National Climate Change Council (Section 5), Climate Change Directorate (Section 9) and Climate Change Fund (Section 25).
Kenya Climate Smart Agriculture Strategy (2017-2026)	The objectives of the Kenya Climate Smart Agriculture Strategy are to adapt to climate change and build resilience of agricultural systems while minimizing GHG emissions. The actions will lead to enhanced food and nutritional security and improved livelihoods.

National framework	Description
Climate Risk Management Framework (2017)	The Climate Risk Management Framework for Kenya integrates disaster risk reduction, climate change adaptation and sustainable development so that they are pursued as mutually supportive rather than stand-alone goals. It promotes an integrated climate risk management approach as a central part of the policy and planning at national and county levels.
National Climate Change Framework Policy (2018)	The National Climate Change Framework Policy aims to ensure the integration of climate change considerations into planning, budgeting, implementation and decision-making at the national and county levels and across all sectors.
National Climate Finance Policy (2018)	The National Climate Finance Policy promotes the establishment of legal, institutional and reporting frameworks to access and manage climate finance. The goal of the policy is to further Kenya's national development goals through enhanced mobilization of climate finance that contributes to low-carbon, climate-resilient development goals.
Big Four agenda (2018-2022)	The Government of Kenya's Big 4 agenda establishes priorities areas for 2018–2022 for ensuring food security, affordable housing, increased manufacturing and affordable healthcare. Sector plans and budgets are to be aligned with the Big Four priorities.

Concluding policy recommendations

It is undeniable that climate change is currently affecting Kenya. Droughts and floods have become frequent and intense, and the country has also seen an increase in average temperatures, hotter days, successive crop failures and the spread of vector-borne diseases such as malaria to places where the disease is not known to be endemic. These changes affect resources critical to the health and prosperity of Kenya.

As global GHG emissions are continuing unabated, climate change impacts are likely to worsen an already precarious situation in the future. If no action is taken to reduce or minimize expected impacts from climate change, the costs to society and the economy will be immense.

Kenya's long-term development blueprint, Vision 2030 — which aims to transform the country into a newly industrializing MIC providing a high quality of life to all its citizens by 2030 in a clean and secure environment⁷⁴ — will be shaped significantly by the challenge of climate change and how the country responds to it. The economic, social and political pillars of Kenyan development are inextricably linked to the SDGs, DRR and climate action, and therefore, and in accordance with Kenya's National Climate Change Response Strategy, climate policy and action should be aligned with national development planning and implementation.

Kenya's vulnerability to climate change is closely related to its potential for climate action, both in terms of resilience building as well as mitigation potential. To achieve climate change action that simultaneously advances economic and sustainable development objectives, the NCCAP is guided by the following principles:

- Apply a human rights-based approach to ensure that the interests of youth, the poor and vulnerable and marginalized communities are prioritized through an inclusive approach to climate change action.

74 Kenya Vision 2030. See <http://vision2030.go.ke/>.

- Effect implementation of actions through consultation and cooperation between the national government and county governments as well as unique linkages, including with civil society and local government institutions and through public–private partnerships.
- Achieve national growth objectives through a qualitative change in direction that enhances climate resilience and leads to the mitigation of GHG emissions.
- Deploy appropriate technologies for both adaptation and mitigation at an accelerated pace.

The transformation of Kenya's energy sector toward geothermal energy is a positive step, which must be supplemented by even more efforts toward solar and wind energies, given the natural abundance of the two. This mitigation approach, to be further spelled out in a 100 percent Renewable Energy Strategy for Kenya, in line with the country's commitment as part of the CVF, would have further positive poverty reduction and resilience co-benefits and provides a positive step toward SDG implementation.

Further, Kenya should develop a robust LTS in line with the Paris Agreement in order to fulfill its encouraging decarbonisation commitments as a member of the CVF and use this opportunity to strategically identify adaptation, mitigation and sustainable development synergies and co-benefits.

Given its vast geographic coverage, climate impacts in Kenya range from those affecting the Indian Ocean coastal region, the low- and highlands of the Rift Valley to the mountainous ranges. Given the projections of 1.5°C and 2°C scenarios, Kenya's adaptive capacity across the country and sectors will need to be augmented even more. Risk management, including risk transfer, are already taken into consideration, including through cooperation with African Risk Capacity, but much more needs to be done to provide the population with affordable access to climate risk insurance, particularly considering the needs of the most vulnerable people, who cannot afford to pay for insurance policies.

The Case of the CA4 in Central America: El Salvador, Guatemala, Honduras and Nicaragua

By Elena Cedillo and Carlos Rauda

Climate risks for CA4 and the difference between 1.5°C and 2°C of global warming

In the following, we will explore the climatic risks for Central America, with a particular focus on the so-called CA4 countries, i.e., Honduras, Guatemala, Nicaragua and El Salvador. Of the four, only Guatemala is an upper-middle-income country, while Nicaragua, Honduras and El Salvador are middle-income countries⁷⁵.

Figure 40: Map of Central America
Source: Google maps



Some 38,443,526 million people live in CA4 in a total area of 372,972 km². The following table shows the main characteristics of these countries.

75 <http://databank.worldbank.org/data/download/GNIPC.pdf>

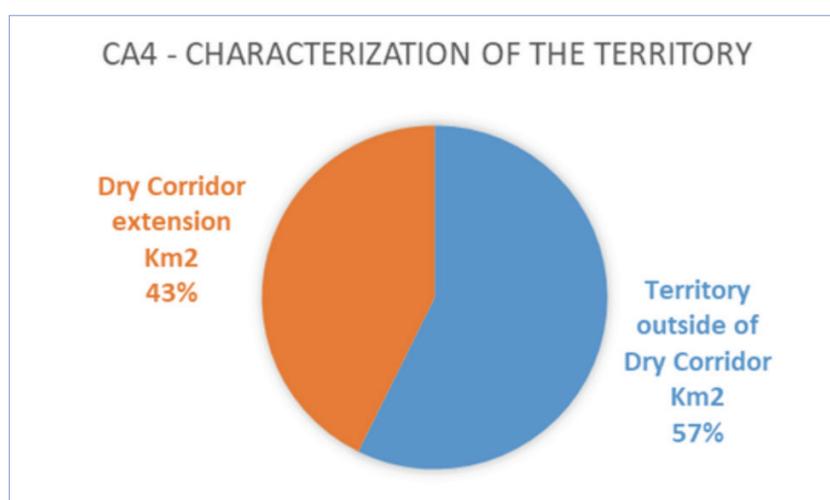
Figure 41: Main characteristics of CA4 countries

Source: Authors, 2018

Honduras	Nicaragua
<ul style="list-style-type: none"> • Territorial extension is 112,492 km². • 67,068 km² are part of the Dry Corridor, 60 percent of its territory. • The population is 8,866,351 inhabitants (2017)⁷⁶. • The country is formed by 298 municipalities divided into 18 departments. 	<ul style="list-style-type: none"> • Territorial extension is 130,373.4 km². • 33,948 km² are part of the Dry Corridor, 26 percent of its territory. • The population is 6,071,045 inhabitants (2015)⁷⁷. • The country consists of 153 municipalities divided into 15 departments.
Guatemala	El Salvador
<ul style="list-style-type: none"> • Territorial extension of 108,889 km². • 38,407 km² are part of the Dry Corridor, 35 percent of its territory⁷⁸. • The population is 16,924,190 inhabitants (2017)⁷⁹. • The country is made up of 331 municipalities divided into 22 departments. 	<ul style="list-style-type: none"> • Territorial extension is 21,041 km² • 19,759 km² are part of the Dry Corridor, 94 percent of its territory. • The population is 6,581,940 inhabitants (2017)⁸⁰. • The country consists of 262 municipalities divided into 14 departments.

Figure 42: The Central American Dry Corridor

Source: Authors, 2018



Approximately 10.5 million people live in the Dry Corridor. Some 159,182.71 km², i.e., 43 percent of the total CA4 territory, belongs to the Dry Corridor, and more than half of it (58 percent) is classified as highly drought-prone, putting the people who live there at high climate risk. These populations are mostly poor and mainly dependent on small-scale agriculture, which makes them very vulnerable to climate change.

76 National Institute of Statistics, INE, 2015.

77 INIDE – Estimated population 2015. The projections are made in five-year periods; the closest to the analysis is 2015.

78 Characterization of the Central American Dry Corridor. FAO, 2012

79 INE – Estimated population 2017.

80 According to estimates and projections of national population 2005-2050, General Directorate of Statistics and Censuses – DIGETYC

According to the United Nations Office for the Coordination of Humanitarian Affairs (OCHA)⁸¹, in 2016, more than 3.5 million people in Central America faced a prolonged drought that put their lives and development at risk, representing 33.3 percent⁸² of the population living in the Dry Corridor, of which 65 percent have been classified as poor or extremely poor.

The drought has caused significant socio-economic impacts, particularly in agricultural areas highly dependent on the rainy season, which has resulted in losses or reduction of harvests, food insecurity and increased prices of the basic food basket, directly affecting the livelihoods of families dependent on agriculture.

According to the global climate risk index (Germanwatch 2017) for the period 1997-2016, Honduras is the country bearing the highest climate risks in the world, Nicaragua ranks fourth, Guatemala eleventh, and El Salvador sixteenth.

The index scores exposure and vulnerability of countries to extreme weather events (based on data provided by the reinsurer Munich Re), leading to a ranking that should be taken as a serious alert on possible future risks, and thus a strong call for better disaster preparedness.

For the period 1992-2016, Honduras is scored as the country with the highest climate risks in the world. Nicaragua, Guatemala and El Salvador are all classified as high-risk countries, too, as shown in the following graph.

Figure 43: Climate Risk Index of CA4 countries
Source: Global Climate Risk Index - Germanwatch

Country	1998-2007	1990-2008	1990-2009	1991-2010	1992-2011	1993-2012	1994-2013	1995-2014	1996-2015	1997-2016
El Salvador	30	37	17	23	15	13	12	14	15	16
Guatemala	11	24	20	12	11	10	9	10	9	11
Honduras	1	3	3	3	1	1	1	1	1	1
Nicaragua	3	5	4	4	3	4	4	4	4	4

The IPCC Fifth Report, which confirmed the human influence in climate change, also affirms that climate risks for Central America will very likely increase, leading to lower water availability, more frequent floods and landslides, less quality and quantity of food production and continuous spread of vector-borne tropical diseases. The temperature increases for Central America by 2100 are forecasted between +1.6°C to +4°C. This will in any case cause very drastic changes in lives, livelihoods and biodiversity.

Lastly, the 2012 Climate Vulnerability Monitor, which uses slightly different indicators to measure adverse impacts of climate change and the carbon economy in economic, environmental and health terms, also shows the significant climate vulnerability of the CA-4, ranging from severe vulnerability for Nicaragua, to high vulnerability for Honduras and moderate vulnerability for El Salvador and Guatemala.

81 One year at a glance 2016, Regional Office for Latin America and the Caribbean, OCHA.

82 Around 10.5 million people live in the Dry Corridor.

The possible impact of 1.5° or 2°C global warming on equality, human security, poverty eradication and the sustainable development aspirations of CA4

The economy of the region is based on agricultural production, mainly the production of basic grains like corn and beans. According to CEPAL (2015), Central America has already suffered from an average temperature increase of 0.5°C. According to the IPCC, regional temperature increase by the end of the century is projected in the range of 2.1-3.3°C in the most optimistic scenario (B2)⁸³, and between 3.7-4.6°C in the most pessimistic scenario (A2)⁸⁴.

The IPCC also projects massive changes in rainfall patterns. In the best-case scenario B2, rainfall will decrease by seven percent in Guatemala, between 10-13 percent in El Salvador and Honduras and by 17 percent in Nicaragua. The worst-case scenario A2 predicts a decrease in rainfall between 27-32 percent in Guatemala, El Salvador and Honduras; and by 35 percent in Nicaragua.

According to observations, extreme events have increased by six percent annually during the last three decades, as compared to the 1970s. Floods have grown by more than three times in the CA4 as compared to the period 1978-1998, while drought has become a general phenomenon in the entire region.

Droughts are seriously affecting livelihoods, particularly in El Salvador with 94 percent of the territory being located in the Dry Corridor. In 2015, El Salvador experienced the worst drought in 44 years⁸⁵, leading to severe losses in the production of basic grains worth more than 77 million US dollars⁸⁶ or 33 percent of the total production of basic grains. The cumulated losses of five agricultural cycles of consecutive drought have been calculated as 312 million US dollars.

FAO (2013) states that 47 out of 57 areas characterized for livelihoods in Central America are in the Dry Corridor, where productive activities such as agriculture are carried out. One hundred percent of the characterized areas for livelihoods in El Salvador and Honduras are in the Dry Corridor, while Guatemala and Nicaragua have approximately 75 percent of their livelihood zones within this corridor.

Climate change impacts on main basic grains like corn⁸⁷, beans and coffee are very concerning. Both IPCC scenarios B2 and A2 project serious decreases in terms of quality and quantity for these products toward the end of the century, thus accentuating food insecurity.

According to CEPAL (2015), the yield of beans will decrease by 26 percent in Nicaragua, 20 percent in Honduras and 17 percent in El Salvador by the end of the century in the best-case scenario. For corn yield (representing 31 percent of the average calories intake per person), the best-case scenario predicts a yield drop of 26 percent in Nicaragua, 24 percent in Honduras, seven percent in Guatemala and 16 percent in El Salvador. In the worst-case scenario, the yield of beans is projected to drop in a range of 17 percent (Guatemala) to 54 percent (Nicaragua). In the case of corn, yield losses could reach up to 45 percent (Nicaragua).

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- 83 B2: World dominated by local solutions to economic, social and environmental sustainability, intermediate level of economic development and technology change. It is the scenario that maintains an upward trend, but is smaller than the A2 (IPCC, 2000).
- 84 A2: Very heterogeneous, self-sufficient world and conservation of local entities. It is the scenario of the largest emissions by 2100.
- 85 88 Central Reserve Bank of El Salvador
- 86 According to a report on results of the Survey of Estimation of Losses and Damages in the Production of Basic Grains (maize and beans) of the zones with deficit of rain, caused by the meteorological drought (CENTA, 2015)
- 87 Sixty percent of subsistence producers are dedicated to the cultivation of basic grains, including corn.

**Figure 44: Evolution of the returns of main products of the basic basket in the region.
Scenarios B2 and A2 (according to the IPCC panel)**
Source: CEPAL. CAC/SICA, 2013-2014

Country	Average yield 2001-2009 (t/ha)			Projection of yields to 2100 (in percent)		
	Corn	Beans	Coffee	Corn	Beans	Coffee
Best-case scenario B2						
El Salvador	2,79	0,9	0,54	-16,18	-17,26	-37,88
Guatemala	1,91	0,7	0,92	-7,07	0,94	-21,27
Honduras	1,49	0,7	0,72	-23,69	-20,39	-29,72
Nicaragua	1,55	0,7	0,65	-26,00	-26,11	-47,64
Worst-case scenario A2						
El Salvador	2,79	0,9	0,54	-37,40	-48,92	-57,92
Guatemala	1,91	0,7	0,92	-21,77	-17,44	-35,57
Honduras	1,49	0,7	0,72	-42,28	-42,04	-32,76
Nicaragua	1,55	0,7	0,65	-45,01	-54,39	-53,07

It is important to mention that the future availability of water also would be seriously reduced if no action is taken. In the less pessimistic B2 scenario, water availability would be reduced by 79 percent for El Salvador, 88 percent in Honduras, 82 percent in Guatemala and 84 percent in Nicaragua (CEPAL, 2015). In the more pessimistic A2 scenario, water availability is projected to go down by 93 percent in El Salvador, 96 percent in Honduras, 88 percent in Guatemala and 97 percent in Nicaragua. Taking Nicaragua as an example, the per capita availability of water, which was calculated with 23,486m³/inhabitant/year for 2005, would decrease to 3,852 m³/inhabitant/year in scenario B2 and 765 m³/inhabitant/year in the most pessimistic scenario. Altogether, the achievement of SDGs is seriously threatened by climate change (see figure 45).

Figure 45: Linkages between climate risks, adaptation and SDGs in a 1.5/2°C scenario for CA4
Source: Authors, 2018, building on CEPAL, 2015

Risks and impacts	Driver	Co-stressor	Difference between 1.5°C and 2°C scenario	Measures	SDG affected
Droughts and water scarcity	Erratic and unpredictable climate patterns	Deforestation; growth of population; degradation of land	Drought will increase on average by 30 percent at 1.5°C and by 82 percent at 2°C	Water management; land management and land use planning	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 15: Life on land
Floods	Heavy rainfall	Land degradation; mismanagement of large dams	Loss and damage will increase at 1.5°C and will become unmanageable at 2°C	Improve flood protection and early warning systems; reforestation	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 11: Sustainable cities and communities SDG 15: Life on land

Deforestation	Drought and increasing temperatures in combination with extensive monoculture plantations Population and city growth	Poverty and land degradation	Loss of resilience of carbon sinks at 1.5°C At 2°C, forests in Central America will be significantly weakened, creating disruptions in the CO2 cycle	Reforestation with native species Land use planning Water management	SDG 1: No poverty SDG 13: Climate action SDG 15: Life on land
Food insecurity	Heavy rainfall and drought	Land degradation; monoculture	On average, at 1.5° crop yield projected to decline by 20 percent; at 2°C, crop yield projected to decline by 37-45 percent; food quality will be negatively affected, too	Irrigation management; urban agriculture; climate resilient agriculture	SDG 1: No poverty SDG 2: Zero hunger SDG 3: Good health and well-being SDG 5: Gender equality SDG 10: Reduced inequalities
Economic losses	All aforementioned	All aforementioned	Critical at 1.5°C and beyond adaptive capacity at 2°C	Decarbonization; adaptation; compensation of loss and damage	SDG 1: No poverty SDG 8: Decent work and economic growth SDG 10: Reduced inequalities SDG 12: Responsible consumption and production
Loss of biodiversity and ecosystem degradation	Drought; changing rainfall patterns and floods; hurricanes	Deforestation; monoculture; infrastructure and urban development	Biodiversity loss at 1.5° projected with 18 percent by in 2100; at 2°C, biodiversity loss projected with 58-70 percent.	Land planning; protection strategy for native species; promotion of renewable energies	SDG 2: Zero hunger SDG 3: Good health and well-being SDG 13: Climate action SDG 15: Life on land
Non-economic loss and damages of land, culture, traditional knowledge, displacement and social cohesion	All aforementioned, but drought in particular	All aforementioned	At 2°C, a far-reaching loss of cultural and social capital, as well as of fertile land, is very likely	GHG emission reduction; climate resilience building; enhanced understanding of non-economic loss and damage; stakeholder participation in climate action	SDG 1: No poverty SDG 4: Quality education SDG 10: Reduced inequalities SDG 16: Peace, justice and strong institutions
Spread of diseases	Drought and flood	Insufficient sanitation; vectors spreading new diseases	At 1.5°, health rates will slightly decrease, but at 2°C, eradicated diseases will reappear, showing new variants or mutations	Improved water and sanitation management; improved quality health systems	SDG 1: No poverty SDG 3: Good health and well-being SDG 6: Clean water and sanitation
Salinization and coral bleaching	Evaporation; ocean acidification	Land degradation and deforestation; sea pollution; loss of mangroves	At 2°C, severe salinization, severe destruction of life in shorelines and extinction of corals	Afforestation; coral protection; coastal defence	SDG 6: Clean water SDG 14: Life below water SDG 15: Life on land
Overburdening of the civil defence and land rehabilitation capacity in case of extreme events	Extreme climate events like droughts, floods and hurricanes	Lack of early warning systems and protection; poor land planning; soil erosion	At 1.5°, loss of land and resilience capacity; at 2°C, massive climate migration, high territorial loss and damage	Strengthening Sendai Framework; innovative partnerships to address vulnerability	SDG 8: Decent work and economic growth SDG 10: Reduced inequalities SDG 11: Sustainable cities and communities

The response provided by Nicaragua, Honduras, Guatemala and El Salvador – CA4's NDCs to the challenges of 1.5°C or 2°C global warming

Given the effects that climate change would have on the region, adaptation strategies are a necessity for survival; mitigation strategies provide great opportunities.

The responses provided so far by the CA4 countries, ranging from climate policies, strategies and national action plans to the NDCs, cover adaptation and mitigation. It is important to highlight that this also includes measures aiming at mobilizing adaptation and mitigation co-benefits, as in the case of El Salvador. The following provides an overview of the most important approaches.

Figure 46: Guiding documents in CA4 countries to respond to the challenges of climate change

Source: Authors, 2018

<p style="text-align: center;">Honduras</p> <ul style="list-style-type: none"> • National Climate Change Strategy⁸⁸ • Water, Forest and Soil Master Plan⁸⁹ • National Action Plan to Combat Desertification and Drought⁹⁰ • National Adaptation Plan to Climate Change 	<p style="text-align: center;">Nicaragua</p> <ul style="list-style-type: none"> • National Environmental and Climate Change Strategy 2010-2015⁹¹ • National Action Plan for Climate Change⁹² • Adaptation Plan for Variability and Climate Change in the Agricultural, Forestry and Fisheries Sector in Nicaragua⁹³ • National Climate Change Policy (in consultation)
<p style="text-align: center;">Guatemala</p> <ul style="list-style-type: none"> • National Climate Change Policy⁹⁴ • Energy Policy 2013-2027⁹⁵ • National Action Plan on Climate Change⁹⁶ • National K'atun Development Plan 2032⁹⁷ • National Energy Plan 2017-2032⁹⁸ 	<p style="text-align: center;">El Salvador</p> <ul style="list-style-type: none"> • National Energy Policy 2010-2024⁹⁹ • National Environmental Policy¹⁰⁰ • National Policy on Integrated Management of Water Resources¹⁰¹ • Forest Policy of El Salvador 2016-2036¹⁰² • Climate Change Policy for the Agricultural, Forestry, Fisheries and Aquaculture Sector¹⁰³ • National Climate Change Strategy¹⁰⁴ • National Climate Change Plan¹⁰⁵ • Action Plan to restore ecosystems and landscapes in El Salvador with a mitigation approach based on adaptation 2018-2022¹⁰⁶

All these policies, strategies and action plans represent efforts of being better prepared for climate change challenges that already negatively affect the population and their livelihoods at the present day.

88 <http://icf.gob.hn/wp-content/uploads/2015/08/Estrategia-de-Cambio-Climatico-Tomadores-de-Decisiones.pdf>

89 <https://cuencasgolfodefonseca.org/wp-content/uploads/2017/11/Plan-Maestro-Agua-Bosque-y-Suelo-UV.pdf>

90 <https://acchonduras.files.wordpress.com/2014/10/fao-plan-de-accion-nacional.pdf>

91 http://www.cac.int/sites/default/files/Estrategia_Nacional_Ambiental_y_del_Cambio_Climático_Plan_de_Acción_2010-2015..pdf

92 https://www.paho.org/els/index.php?option=com_docman&view=download&category_slug=documentos-varios-1&alias=478-plan-de-accion-nacional-ante-el-cambio-climatico-managua&Itemid=364

93 <http://extwprlegs1.fao.org/docs/pdf/nic148691.pdf>

94 <http://www.marn.gob.gt/Multimedios/56.pdf>

95 <http://www.mem.gob.gt/wp-content/uploads/2013/02/PE2013-2027.pdf>

96 <http://www.segeplan.gob.gt/nportal/index.php/biblioteca-documental/file/480-plan-de-accion-de-cambio-climatico>

97 http://www.undp.org/content/dam/guatemala/docs/publications/undp_gt_PND_Katun2032.pdf

98 <http://www.mem.gob.gt/wp-content/uploads/2017/11/Plan-nacional-de-energia.pdf>

99 <http://energiasrenovables.cne.gob.sv/downloads/1.PoliticaNacionaldeEnergia20102024.pdf>

100 <http://www.marn.gob.sv/descarga/politica-nacional-del-medio-ambiente-2012-2/>

101 <http://www.marn.gob.sv/descargas/Documentos/2018/Pol%C3%ADtica%20Nacional%20de%20Gesti%C3%B3n%20Integrada%20del%20Recurso%20H%C3%ADrico.pdf>

102 <https://www.transparencia.gob.sv/institutions/mag/documents/otros-documentos-normativos>

103 <http://centa.gob.sv/docs/unidad%20ambiental/PCC%20MAG.pdf>

104 <http://www.marn.gob.sv/descarga/estrategia-nacional-de-cambio-climatico-2/>

105 <http://www.marn.gob.sv/wp-content/uploads/PNCC.pdf>

106 <http://www.marn.gob.sv/descarga/plan-de-accion-de-restauracion-de-ecosistemas-y-paisajes-de-el-salvador-con-enfoque-de-mitigacion-basada-en-adaptacion-proyecto-2018-2022>

In terms of mitigation action, the energy sector has been identified as a common priority in CA4 countries. Apart from that, mitigation also covers land use and forestry in Guatemala and Nicaragua, and the agricultural sector in El Salvador and Guatemala. Historically, the contributions of GHG from the CA4 countries are minimal. However, according to the principle of common but differentiated responsibilities, they propose to make reductions in their projected emissions by 2030.

Guatemala commits to an unconditional GHG reduction of 11.2 percent as compared to the BAU scenario, and up to 22.6 percent given that international support is provided.

Honduras commits to 15 percent emission reduction as compared to a BAU scenario, mainly focusing on the energy, industrial, agricultural and waste sectors.

El Salvador has set a very ambitious unconditional GHG reduction target for the energy sector of 46 percent, and a conditional target of 61 percent by diversifying the country's energy matrix, prioritizing and promoting the use of renewable energies. In 2017, new accountability rules for the energy sector were introduced. Over the last three years, the implementation of the new National Energy Policy has led to the additional generation of energy exclusively in the form of renewable energies. However, it is important to now also start thinking about steps that can be taken to boost the generation of renewable energies in a decentralized way, and in the hands of the people, be it through respectively designed legal frameworks and feed-in tariffs, through the promotion of energy cooperatives or other means of implementation.

Nicaragua submitted its NDC only in August 2018, committing to limit its growth of GHG emissions by 2030, as compared to 2010, to a range between 33-55 percent, and aiming at reaching net zero emissions in the best case in 2051. Nicaragua commits to increase the share of renewable energies in the energy supply to 60 percent by 2030, amended by both a conditional and unconditional target for the forest and land-use sector.¹⁰⁷

To achieve GHG reduction goals in the upper range of the aforementioned NDCs, or to even go beyond that, all CA4 countries would depend on technical as well as on new and additional financial support, both international, public, and private.

Although most countries have adopted a GHG emission reduction policy, they are still overshooting 1.5°C-consistent pathways, given that the targets are by far not ambitious enough, and despite the fact that the regional socio-economic and humanitarian risks of overshooting the 1.5°C threshold are considerably high. Thus, in addition to ratcheting up migration targets, adaptation must be considered as a priority to reduce the vulnerability of the population, to safeguard human and regional security and human rights, including through integrated disaster risk management and through new mechanisms to compensate for loss and damage. In case this is not going to happen, climate-induced mass migration and displacement is very likely to become unavoidable.

Proposed measures to ambitiously implement the NDC coherent with 1.5°C pathways and in alignment with the SDGs and the goals of the SFDRR

The proposed measures to implement the NDC vary, depending on the level of ambition and specific national circumstances. Some of them could serve as regional good practice examples.

¹⁰⁷ <http://www4.unfccc.int/ndcregistry/PublishedDocuments/Nicaragua%20First/Contribucion%20Nacionalmente%20Determinada%20Nicaragua.pdf>

El Salvador has established the broadest and most enabling normative and legal framework, with the National Energy Policy 2010-2024, the National Climate Change Plan and the Ecosystem and Landscape Restoration Action Plan with its adaptation-based mitigation approach, as the most outstanding elements. Also at the institutional level there is a good practice established with a so-called inter-ministerial Cabinet of Environmental Sustainability and Vulnerability, coordinated by the Ministry of Environment and Natural Resources and under participation of the Secretary for Vulnerability Affairs and Director of Civil Protection, the Minister of Governance and Territorial Development, the Deputy Minister of National Defense, the Minister of Agriculture, the Minister of Tourism, the Minister of Public Works, the President of CEL¹⁰⁸, the President of the National Administration of Aqueducts and Sewers, the Vice Minister of Cooperation for Development and the Advisor of the Vice President of El Salvador. Thus, this cabinet ensures regular high-level political all-government engagement on climate adaptation and risk management across all relevant sectors, on energy and energy efficiency, on sustainable land-use, agriculture and forestry issues and on climate finance and international cooperation.

In terms of thematic priorities, the currently most advanced process is the fast transition to renewable energies, under the guidance of the National Energy Council.

In the case of **Honduras**, the Directorate for Climate Change under the Secretariat of MiAmbiente, as the unit responsible for sustainability at the Ministry for Energy, Natural Resources, Environment and Mining, serves as the focal point for the NDC implementation. It will be supported by the Observatory of Sustainable Development and Climate Change through knowledge management, public information and periodic monitoring of climate indicators. In May 2018, the Presidential Office on Climate Change and the Ministry for Energy, Natural Resources, Environment and Mining approved a NDC Roadmap,¹⁰⁹ identifying 21 activities that will be carried out over the next three years to prepare the NDC implementation.

In **Guatemala**, a Framework Law on Climate Change was elaborated by the National Council on Climate Change and specialized technical units in the Ministries of Environment, Agriculture, Energy and Mines, Finance, and Foreign Affairs. Through the framework law, a National Information System on Climate Change has been set up that contains all relevant information on mitigation and adaptation issues. Furthermore, a Policy for the Comprehensive Management of Coastal Areas has been designed that is aligned with the National Policy on Climate Change.

Another good practice of Guatemala's NDC is the alignment with the national biodiversity strategy that includes an action plan by 2022. This plan aims at integrating biodiversity issues in the adaptation and mitigation actions. It also includes the appraisal and integration of ancestral knowledge of Indigenous peoples in climate adaptation, recognizing the role of peasants' and Indigenous cultural heritage and socio-economic approaches.

In the case of **Nicaragua**, the NDC implementation process is still in a very initial stage, currently with a focus on consultations with the different sectoral stakeholders on their commitments in the NDC implementation.

In all CA4 countries procedures, legal and policy frameworks still need to be updated to ensure that they are aligned with the roadmaps for SDG implementation. In 2017, **Guatemala, Honduras** and **El Salvador** undertook the voluntary national review of the implementation of the 2030 Agenda. The review focused

108 Comisión Ejecutiva hidroeléctrica del Rio Lempa

109 <http://ndcpartnership.org/news/honduras-lanza-el-primer-plan-de-acci%C3%B3n-clim%C3%A1tica-del-ndc-partnership>

on SDG 1 (No poverty), SDG 2 (Zero hunger), SDG 3 (Good health and well-being), SDG 5 (Gender equality) and Goal 9 (Industry, innovation and infrastructure). In the reports, the effects of climate change are considered as a cross-cutting issue proposing actions to achieve the goals, due to the recognition that we cannot achieve the SDGs if we do not take a series of actions related to adaptation and mitigation to climate change. For example, Goal 2 should ensure not only enough food, but also its quality.

Altogether, some progress has been made, but much more remains to be done. Given Central America's huge vulnerability and lasting poverty, resources provided by national budgets are insufficient to adequately address current and future effects of climate change, ambitiously implement the NDCs and achieve the goals of the Agenda 2030. Thus it is crucial to have efficient instruments for channelling national and international financial resources and, at the same time, identify so-called flagship programmes with specific lighthouse projects that have the potential to mobilize triple wins, i.e., co-benefits of adaptation, mitigation and sustainable development. If done the right way, they could help to meet the requirements of a 1.5°C scenario and contribute to the achievement of SDGs and the SFDRR.

Figure 47: Overview of proposed flagship programmes and related lighthouse projects

Source: Authors, 2018

Flagship programme for action	Possible lighthouse projects	Possible international support and cooperation	Relevance to stay at 1.5°C and to deal with its consequences	Contribution to achieving SDGs and SFDRR goals
Flagship programme "Just Energy Transition": Changing the energy mix toward solar, hydro, geothermal and wind energy	People-owned renewable energy programme: Incentivizing decentralized energy production by communities, families and marginalized societal sectors	Germany; international donor community; IDB; World Bank; faith-based donor agencies	High: Significant reduction of emissions in any of the scenarios	SDG 1: No poverty SDG 7: Affordable and clean energy SDG 9: Industry, innovation and infrastructure
Flagship programme "Sustainable Technology Transfer": boosting triple wins (mitigation, adaptation and SDG co-benefits)	Selection of suitable technologies (innovation contest) followed by design of strategic investment plan in most suitable climate and renewable energy technologies	Developed countries; China; private sector	High	SDG 9: Industry, innovation and infrastructure SDG 12: Responsible consumption and production SDG 13: Climate action
Flagship programme "Sustainable Water Management"	Strengthening legal frameworks for the right to water and implementation of an integrated management of water sources and production	International donor community	High	SDG 3: Good health and well-being SDG 6: Clean water and sanitation SDG 13: Climate action SDG 14: Life below water
Flagship programme "Climate-smart and Resilient Agriculture4Food Security"	Pilots with low-emission and climate-resilient agricultural production systems based on sustainable agriculture; pilots with parametric climate risk insurance	IDB; World Bank; InsuResilience; Germany; faith-based donor agencies; international donor community	High	SDG 2: Zero hunger SDG 3: Good health and well-being

Flagship programme "Access to Climate Finance Innovation and Adaptation of Most Vulnerable Populations"	Creating a specific budget line for innovative adaptation projects of most vulnerable populations; small business initiatives with high social impact for resilience	UN Adaptation Fund; international donor community; faith-based donor agencies	High	SDG 1: No poverty SDG 8: Decent work and economic growth SDG 10: Reduced inequalities SDG 12 Responsible consumption and production SDG 13: Climate action
Flagship programme "Sustainable Reforestation and Restoration of Biodiversity"	Promotion of native plants; development of regional sustainable development plans for greening provinces, communities, cities and agriculture	European Union; IUCN; faith-based donor agencies	High	SDG 11: Sustainable cities and communities SDG 13: Climate action SDG 15: Life on land
Flagship programme "Sensitization, Participation and Advocacy of CSO4Climate Solutions"	Innovation contest "Climate campaigns"; inter-sectoral meetings to discuss and propose joint climate solutions	Faith-based donor agencies; international donor community	High	SDG 12: Responsible consumption and production SDG 13: Climate action SDG 16: Peace, justice and strong institutions SDG 17: Partnerships for the goals
Flagship programme "Gender justice and climate resilience"	Research and information campaign "Climate change effects on women"; promoting gender equity in NDCs	Faith-based donor agencies; international donor community; IDB	High	SDG 4: Quality education SDG 5: Gender equality SDG 13: Climate action
Flagship programme Comprehensive DRR and Adaptation4Local Level Resilience Building"	Local risk reduction programmes; promotion of the decentralization agenda for effective community participation	Faith-based donor agencies; international donor community	High	SDG 1: No poverty SDG 10: Reduced inequalities SDG 13: Climate action
Flagship Programme "Regional Centre for Climate Resilience, Knowledge and Good Practices"	Strengthening capacities and knowledge through a regional competence center; building in-region capacity and cooperation on good practices	Faith-based donor agencies; international donor community	High	SDG 10: Reduced inequalities SDG 12: Responsible consumption and production SDG 13: Climate action SDG 16: Peace, justice and strong institutions SDG 17: Partnerships for the goals

Concluding policy recommendations

1. The current NDC commitments of the CA4 countries should become more ambitious to contribute effectively to maintaining the 1.5°C climate threshold, with a particular view to involving the industrial, transport and construction sectors more effectively.
2. More concrete adaptation actions should be included in NDCs, specifically targeting the most vulnerable sectors, both socially and environmentally, without sacrificing but rather stimulating mitigation goals through mobilizing mitigation, adaptation and SDG co-benefits.
3. More international financial cooperation and support is urgently needed, specifically for increasing climate resilience in the CA4 countries.
4. A regional climate knowledge hub urgently needs to be set up to collect data, conduct research, build in-region capacity for action and disseminate good practices.
5. Gender sensitivity and gender justice need to be incorporated more effectively in the NDCs of CA4 countries to understand, address and minimize adverse effects of climate change that disproportionately hamper women and increase rather than reduce gender inequality.

6. Economic and non-economic loss and damage need to be addressed explicitly and effectively by NDCs as an integral part of comprehensive climate action.
7. More strategic sensitization and mobilization of a broad range of civil society is a prerequisite to effectively advocate governments and large corporations to more seriously taking into account the needs and rights of the population, communities and Indigenous people who are not yet sufficiently included or heard in climate negotiations.
8. To boost climate innovation is not only a prerequisite for the business sector and large projects, but should also be promoted with the poorest and most vulnerable populations, generating new skills and capacities that are necessary to deal with climate challenges.
9. The targeted promotion of a just and inclusive energy transition is an important element to implement more ambitious NDCs and to mobilize mitigation, adaptation and sustainable development co-benefits.
10. Climate-related disaster risk reduction should be better aligned with and integrated with NDCs and long-term planning to avoid silo approaches and costly inefficiencies.
11. Long-term decarbonization and climate resilience building strategies must be aligned with national and regional (development) planning and investment strategies.
12. Faith-based organizations should become more active in advocating for more ambitious NDCs and long-term strategies, monitoring compliance with commitments, supporting the implementation of NDCs and collaborating in national climate action.

The Case of the European Union

By Bruno Nicostrate and Martin Vogel

Climate risks for the European Union and the difference between 1.5°C and 2°C of global warming

The year 2016 was the hottest on record globally, followed by records hit in 2015 (second) and 2017 (third)¹¹⁰. In Europe, the warmest year was 2014, while the entire decade of 2007-2016 was the region's warmest period on record¹¹¹. Given this year's extremely dry and hot summer, it is possible that 2018 will become another record-breaking year.

The impacts and consequences of climate change across Europe vary from region to region, with different sectors and ecosystems disproportionately affected, depending on geographical location and exposure to risk¹¹². Impacts vary from increased rainfall and storms in some regions to more frequent coastal and river flooding and sea level rise in other regions. Some parts of Europe will suffer severe decreases in rainfall, leading to drought and exposure to extreme heat, such as the case of the Lucifer heatwave in summer 2017 that affected all southern European regions.

A 2017 report from the European Court of Auditors¹¹³ points out that by 2071-2100, under a scenario of a global average temperature increase of 2°C, Europe will experience temperature increases by far more than 2°C in certain regions, compared with 1961-1990 temperatures.

In an average summer in a 1.5°C world, it is projected that 11 percent of the continent's population would experience a summer warmer than previously recorded in history every other year. In a 2°C world, in two of every three years, this figure would almost double to 20 percent of the population¹¹⁴.

Winter temperatures could also increase by an average of 5-8°C in some parts of Scandinavia, while summer temperatures could increase by an average of 3-4°C in most of Spain and northern Scandinavia¹¹⁵.

Two-thirds of the European population will be at risk of being severely affected by weather-related disasters annually by the year 2100, mainly due to climate change¹¹⁶. High northern latitudes are expected to see some of the biggest increases in heavy rainfall — approximately +seven percent in a scenario of +2°C warming, compared to +five percent for + 1.5°C.

At the same time, water scarcity in the Mediterranean regions is likely to be twice as severe at 2°C as at 1.5°C, with climate-induced water shortages of -17 percent compared to -nine percent (relative to 1986-2005 levels)¹¹⁷. The number of consecutive dry days will increase by seven percent and 11 percent,

110 <https://climate.nasa.gov/vital-signs/global-temperature/>

111 <http://ec.europa.eu/eurostat/documents/3217494/8461633/KS-04-17-780-EN-N.pdf/f7694981-6190-46fb-99d6-d092ce04083f>

112 <https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016/key-findings>

113 https://www.eca.europa.eu/Lists/ECADocuments/LR17_01/LR_ENERGY_AND_CLIMATE_EN.pdf

114 <https://www.carbonbrief.org/guest-post-unprecedented-summer-heat-europe-1-5c-warming>

115 <https://www.eca.europa.eu/en/Pages/NewsItem.aspx?nid=8787>

116 Giobani Forzieri, Alessandro Cescatti et al., 1 Aug. 2017. Increasing risk over time of weather-related hazards to the European population: a data-driven prognostic study. *The Lancet*, vol. 1, issue 5. See [www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(17\)30082-7/fulltext](http://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(17)30082-7/fulltext).

117 https://www.nature.com/articles/nclimate3096.epdf?author_access_token=RexikyN5vxy3ugz-flUY7NRgN0jAjWel9jnR3ZoTv00ZIUAYrJekwZ4HMq3DtbGkVcyLY2h9bp31usCfC_u2h2g9dVxNGp7x5wx9RnALdQbHs8mUKSwWRZf1ZPg9tzH

respectively, for a scenario of 1.5°C and 2°C global warming. This indicator does not give information about drought level; nevertheless, it informs on the phenomenon of desertification, which is already happening in the south of Europe.

A significant number of studies predict global sea level rising of 50 cm to 1 m by 2100 with 2°C of warming, compared to 40-90 cm for 1.5°C¹¹⁸. This 10-cm difference between a 1.5°C and a 2°C scenario will lower adaptation costs in all low-lying areas of Europe in this century and even more so in future. Long-term differences in sea level rise in the two scenarios will increase steadily over the next centuries.

The agricultural sector will also be affected by climate change. However, crop yields will be impacted differently from one region to another. The south of Europe will face a reduction of six percent under a 1.5°C scenario and eight percent under a 2°C scenario in, for example, wheat production, while in the higher-latitude regions, production might increase with a warmer climate¹¹⁹. Wheat production in Europe is by far the most common crop in agriculture. Production changes may therefore have enormous societal and economic impacts.

Health also will be strongly affected by every additional level of temperature increase. With heatwaves, potable water scarcity and the projected spread of tropical diseases, climate-induced mortality is projected to increase, too, specifically affecting vulnerable people and the southern part of Europe.

To conclude: In the European Union (EU), coastal areas of the Atlantic and the North Sea and the entire Mediterranean region are projected to be most at climate risk, with sea level rise and higher storm surges along the northern and western coasts, and drought, heat and water scarcity in the Mediterranean as the main stressors. Other parts of Europe might also be badly impacted. The EU has fast-increasing adaptation needs and the necessary adaptation options, but with higher costs and more long-term challenges (sea level rise, drought and heat) if the 1.5°C climate threshold is overshoot. So far, however, not enough adaptation is taking place across Europe. To take one example, many local governments continue to urbanize areas that are at high risk of flooding during heavy rainfall events.

The possible impact of 1.5° or 2°C global warming on the sustainable development aspirations of the EU

Climate change impacts are already observed in Europe, leading to societal and economic consequences. The European Environment Agency (EEA) estimates reported economic losses caused by extreme weather and other extreme climate-related events in the EEA member countries at 433 billion euros for the period 1980-2015. Between 2010 and 2015, the average annual loss amounted to 13.3 billion euros¹²⁰.

In 1997-2016, France has been the EU member state that has been affected the most by extreme weather events, closely followed by several Western European countries such as Spain, Italy and Germany¹²¹. Despite belonging to the wealthiest countries in the world, their vulnerability toward climate change is relatively high.

118 <https://www.earth-syst-dynam.net/7/327/2016/esd-7-327-2016.pdf>

119 <https://www.nature.com/articles/nclimate2470>

120 <https://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment-1>

121 <https://germanwatch.org/sites/germanwatch.org/files/publication/20432.pdf>

While these figures give a glimpse into Europe's given vulnerability to climate change, the increase in temperature will multiply economic and social risks and costs. The EEA estimates incremental costs of up to 120 billion euros per year under a 2°C scenario and up to 200 billion euros per year under 3°C.¹²² Climate impacts will fall disproportionately on public infrastructure (SDG 11: Sustainable cities and communities) and the business sector, including disrupting business operations, property damage, disruption to supply chains and infrastructure leading to increased costs of maintenance and materials, and raising prices (SDG 8: Decent work and economic growth; SDG 12: Responsible consumption and production). The agricultural, tourism, water and energy sector may bear the highest adaptation costs or losses, with the Mediterranean region being considered the hot spot within Europe. Unevenly shared economic losses are likely to have serious consequences on the cohesion of economic policies across the EU, with potentially new needs for regions that have become impoverished in the wake of climate change, or with an additional risk of increased rather than reduced inequality within the EU (SDG 10: Reduced inequalities).

Looking at the manifold current challenges of cohesion policy and solidarity among European states, additional climate-induced stress may create even greater tensions and has the potential to undermine the SDG 16 (Peace, justice and strong institutions). Furthermore, and due to more frequent and intense heatwaves affecting cities, in particular, and the likely migration of tropical diseases to southern, central, western and eastern Europe, the SDG 3 (Good health and well-being) will be hampered, since temperature-induced mortality is projected to increase.

Beyond these economic losses and societal challenges and the related risks to fully achieving the SDGs within the EU member states, the fulfillment of the SDG 17 (Partnerships for the goals) might be hampered, too. Steep increase of costs, social tensions and a less dynamic economy may hamper the EU's willingness to fulfill its international commitments toward countries that are more affected by climate change.

The commitment of the EU to provide climate finance to developing countries in light of the necessary contribution to stay at 1.5°C

The EU, together with the other developed countries, committed to mobilize 100 billion US dollars annually by 2020 onward to support poor and vulnerable countries around the world in their efforts to deal with climate change. The Paris Agreement states that this support should be balanced between mitigation and adaptation.¹²³

EU climate finance provided to developing countries is both delivered by EU member states directly as well as by various EU institutions. Approximately three quarters of EU climate finance comes from the member states' national budgets and finance institutions. The rest is channelled via the various programmes of the EU budget, the external European Development Fund and the European Investment Bank (EIB). The biggest EU climate support programmes are the Global Climate Change Alliance+ and the External Investment Plan.

According to EU reporting on climate finance aid¹²⁴, the European Commission and the European

122 <https://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment-1>

123 See Paris Agreement, para 9.4 at: https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf

124 <https://actalliance.eu/wp-content/uploads/2018/04/Analysis-of-the-climate-finance-reporting-of-the-EU.pdf>

Development Fund have made progress on providing more support to poor countries, as well as on reaching a balance between the support provided for adaptation and mitigation. On the other hand, the EIB falls short of providing adequate support to vulnerable countries' adaptation to climate change, missing its own target of 35 percent of aid toward developing countries to be climate financed, with current levels at 27 percent. Furthermore, the support from the EIB strongly favors mitigation in MICs to the detriment of adaptation support for the most vulnerable countries. Altogether, so far only one-third of the EU's total climate finance was spent on adaptation.

Figure 48: EU Climate finance contributions (2013-2016)

Source: ACT EU, 2018

Climate finance based on CRS and EIB data- Commitments, EUR millions		Year				2013- 2016 aver.
		BR2		BR3		
		2013	2014	2015	2016	
European Commission (EC) + European Development Fund (EDF)	Mitigation	30%	29%	35%	33%	32%
	Adaptation	33%	28%	35%	44%	38%
	Cross-cutting	37%	44%	30%	24%	30%
European Investment Bank (EIB)	Mitigation	92%	95%	92%	96%	94%
	Adaptation	1%	1%	8%	4%	4%
	Cross-cutting	7%	3%	0%	0%	3%
Total (EC+EDF+EIB)	Mitigation	80%	86%	75%	66%	75%
	Adaptation	20%	14%	25%	34%	25%

The Paris Agreement emphasizes that support for mitigation and adaptation should have a special emphasis on and concern for countries most in need of support. From 2013-2016, merely 19 percent of EU's level climate aid was provided to LDCs, while a similar amount was provided solely to Turkey. Turkey, by far, has become the largest recipient country of climate finance from the EU. Among the top 10 recipient countries, Bangladesh comes seventh and is the only LDC on that list. Of course, there are many countries in need of support, but the poorest and most vulnerable countries should be prioritized. With limited possibilities to attract private investments, they depend mostly on support from developed countries.

One explanation of why Turkey, a MIC, is on the top 10 of recipients of EU climate finance is that the climate finance of the EIB, most of which is provided as loans, is fully counted as EU climate finance contribution. In MICs like Turkey, it is generally easier to attract private investments and loans, which should not necessarily be counted as climate finance. There is no doubt that there is need for climate change activities in Turkey, but when UN agreements about climate finance were adopted, most countries assumed that the support should preferentially go to the poorest countries facing the biggest difficulties and funding gaps.

The response provided by the EU's NDC to the challenges of 1.5°C or 2°C global warming

For the next decade, from 2020 onward, the EU has adopted a new, integrated approach to deal with climate change and energy, called the Energy Union. It is a new system of governance aimed at better coordinating climate policies to decarbonize all economic sectors, ensuring energy security and supply, increasing energy efficiency, integrating fully the internal energy market and stimulating research, innovation and competitiveness.

In October 2014, EU leaders agreed on a 2030 climate and energy policy framework, putting forward a legally binding EU target of at least 40 percent reduction in domestic emissions by 2030 in comparison to 1990, in line with its adopted long-term objective of cutting emissions by 80-95 percent by 2050. In contrast to the period before 2020, the EU will no longer make use of international carbon credits to offset domestic emissions in other parts of the world. The overall mitigation target was accompanied by two more specific 2030 targets of at least 27 percent share for renewable energy and at least 27 percent improvement in energy efficiency. In the first half of 2018, the EU adopted revised targets for energy efficiency and renewable energy, increasing them both by five per cent.

To achieve the 2030 mitigation target, the EU has adopted a series of legislation, such as the EU Emission Trading System (EU ETS), the Effort Sharing Directive, the Energy Efficiency Directive and a wide range of other EU-wide regulations influencing GHG emissions, such as the Renewable Energy Directive¹²⁵.

The EU ETS is a market-based instrument and enforces emissions reductions by introducing a carbon price through an emissions trading mechanism. Economic sectors covered by the EU ETS would have to cut emissions by 43 percent compared to 2005. ETS-covered sectors are power and heat generation, energy-intensive industry and commercial aviation in the European Economic Area.

Non-ETS sectors, such as transport, buildings, agriculture and waste, would need to cut emissions by 30 percent compared to 2005. This target must be translated into individual binding targets for member states through the so-called Effort Sharing Regulation (ESR). More than half of the EU's GHG emissions come from these sectors. Unlike the EU ETS, as a market-based mechanism with an overall EU emission limit, the ESR is a governance tool, providing an overarching target of reductions for the EU but assigning individual targets to member states. National targets are differentiated on the basis of the members' GDP per capita, with some cost-effectiveness adjustments.

In 2017, the EU adopted a regulation regarding the inclusion of emissions and removals from LULUCF in the EU 2030 climate and energy framework. It allows the utilization of credits from removals from that sector to meet the emissions reduction target in the non-ETS sectors. Since the removals have not been included in 1990 emissions levels, this approach is a potential weakening of the 2030 emission reduction target by 28 MtCO₂ or 0.8 percent.

These targets are currently subject to legal challenge for their inadequacy in dealing with existing climate impacts, as well as their disregard of what is needed in future to limit further and more dangerous consequences of inadequate climate action.

Until now, adaptation to climate change in Europe has not been treated by governments with the same

125 https://climatepolicyinfohub.eu/sites/default/files/picture2_refreshed.png

level of attention as other climate-related issues, such as mitigation and energy efficiency. The EU policies to address adaptation to climate change are both new and weak. There is no obligation for member states to develop their own adaptation strategy. Only 21 member states developed a national adaptation strategy. Furthermore, this resulted in important disparities among European countries regarding their own adaptation plans, policies and funding.

The first EU adaptation strategy was adopted in 2013. In addition, to encourage member states to develop their own strategy, it only consists of an online platform (Climate-ADAPT) to exchange information and knowledge, as well as a series of actions to promote adaptation in key vulnerable sectors through agriculture, fisheries and infrastructure by improving and promoting resilience norms, practices and financial instruments, such as insurances. Finally, the EU adaptation strategy is only supported financially by a vague target for its multi-annual budget, of which 20 percent of its expenditures must be “climate-proofed”, i.e., enhancing climate mitigation and adaptation.

The concerning figures and data available regarding Europe’s vulnerability to climate change and the multiple costs that the EU economy is projected to face in case of additional levels of warming, should be a wake-up call to better prepare and adapt to current and future climate impacts. The European Court of Auditors, for instance, in 2017 reported a number of challenges regarding EU action on energy and climate change, including stating that there is a need for enhanced auditing of climate risks to major sectors, e.g., agriculture and manufacturing. The report also states that although the EU has made progress toward making its energy sector more sustainable, the transition of the EU energy sector to a low-carbon energy model still faces many challenges, and that there is a need for EU member states to rapidly start planning for climate adaptation to avoid high costs¹²⁶. For the new EU adaptation strategy to be meaningful, the next update has to be better institutionalized, with greater involvement of relevant stakeholders, and combined with a more coherent ecosystem-based approach.

Proposed measures to ambitiously implement the NDC coherent with 1.5°C pathways and in alignment with the SDGs and the goals of the SFDRR

The EU is on track to significantly overachieve its 2020 GHG reduction target, possibly even reaching -30 percent by 2020, confirming NGO arguments at the time of the adoption of these targets that they were deeply inadequate and non-transformative. Nevertheless, several EU member states are not on track to achieve their national targets for emissions in the non-ETS sectors. The same can be said for the efforts needed to achieve the binding renewable energy and non-binding energy efficiency targets.

The EU’s 2030 climate and energy targets are far from compatible with the agreed objective of the Paris Agreement to pursue efforts to limit the temperature rise to 1.5°C. In fact, they should be ratcheted up to at least 65 percent GHG emission reductions, at least 45 percent renewable energy and at least 40 percent energy savings.

It would also be important to guarantee that the rules that still need to be developed to ensure implementation of the targets do not contain loopholes that will allow European countries to continue to invest in fossil power plants or other polluting industries. Instead, Europe should ensure it moves to a pathway leading to full decarbonization by 2050.

126 www.eca.europa.eu/Lists/ECADocuments/LR17_01/LR_ENERGY_AND_CLIMATE_EN.pdf

The discretionary obligation of states to develop such zero carbon pathways is another outcome of the Paris Climate Summit. As a group of countries committed to phasing out GHG emissions early in the second half of this century, all European countries should develop zero carbon roadmaps.

The EU member states agreed in 2009 that they would reduce their emission by 80-95 percent by 2050. Subsequently, the European Commission developed a 2050 low-carbon roadmap that contains a proposal for reducing the EU's domestic emissions by at least 80 percent by 2050. With the Paris Agreement calling for meeting the 1.5°C warming limit, these numbers are no longer sufficiently ambitious. Thus, the EU needs to substantially ratchet up its long-term pathway and achieve zero emissions well before 2050.

The revised 2050 roadmap that is currently being discussed should therefore include specific sectoral targets, time horizons and reference scenarios in line with keeping global temperature rise this century to 1.5°C. Robust monitoring and reviewing requirements must be put in place to regularly assess EU member states' own strategies and allow quick adjustments.

The need for and the opportunity to foster the EU's resilience to climate change — particularly in vulnerable sectors such as agriculture, fisheries, infrastructure, energy, biodiversity, water, coastal protection, urbanization and tourism — is evident for many cross-cutting and reinforcing EU policies, where adaptation should be mainstreamed.

In addition to the review and revision of the EU Adaptation Strategy, the design of the post-2020 Multiannual Financial Framework, the upcoming Action Plan for sustainable financing, as well as the reform of the Common Agricultural Policy can greatly improve the integration of adaptation needs and measures through their policy direction, operational support and plans.

The EU Adaptation Strategy is the leading framework to guarantee EU-wide adaptation. In addition, there are other key frameworks that can complement and improve coherence across national and EU-level planning; for example, the Energy Union Governance Framework, the Multiannual Financial Framework and the EU Civil Protection Mechanism. Mainstreaming adaptation across numerous policies and programmes ensures that the EU will be more prepared to address its vulnerability to current and future climate shocks.

Adaptation in the EU, through the EU Adaptation Strategy and related policies and measures, should build on its existing efforts and measures to ensure that the EU, its member states and key public and private services and sectors play a more active and responsible role in adaptation to climate change. By taking these measures, the next EU Adaptation Strategy

- Should guarantee that all authorities and actors are adequately equipped to limit their vulnerability to climate impacts, for example, through including prevention and preparedness measures within policies and investment plans
- Should also ensure that exposed actors have both the support and capacity to implement the appropriate measures to deal with any climate-related event and impacts that occur. It is a humanitarian and human rights imperative to prioritize resilience building of the most vulnerable sectors and communities across the EU.

Concluding policy recommendations

The EU falls short on a number of areas to be able to take suitable action to keep global warming at 1.5°C. Given the great risk posed by climate change to European cohesion and economic policy, ecosystem survival and general health, the EU has every reason to put adaptation high on the agenda, together with mitigation efforts.

There is even a momentum to take bold action, creating enabling technological and policy frameworks for combatting climate change and for taking more international leadership. In order to do so, the following policy recommendations should be taken up by the EU:

Transforming the European energy sector: The EU energy sector needs to be transformed rapidly in order to be fossil-fuel-free by 2030. This entails an immediate end to all fossil fuel subsidies, including public grants or loans to gas infrastructure projects, while ensuring that the next EU budget is a fossil-free budget.

The EU and its member states **should halt support for all fossil fuel projects**, including LNG terminals and gas pipelines, and transform the projects of common interest to support only the infrastructure necessary to deliver a fossil-free future. The EU should also stop any new exploration for oil, gas and coal, while putting a ban on unconventional fossil fuels such as tar sands and shale gas.

The EU should urgently aim to **reduce its energy demand** by moving toward energy sufficiency and investing in energy savings, in particular through the efficiency-first principle that systematically prioritizes efficiency solutions to new investments in energy supply. Reducing overall energy consumption would make it easier and cheaper to reduce the EU's GHG emissions, and a significant unrealized energy efficiency potential exists.

The EU **should plan for a 100 percent renewable, decentralized energy system**. For the energy transition to proceed at the speed required, it is vital that citizens and communities have ownership of it and that the necessary legal framework is put in place to enable it.

The EU should not divert vital funds and resources to false solutions such as CCS for coal, unsustainable forms of bioenergy or other unreliable solutions, but rather significantly increase natural carbon-storing solutions as well as putting the focus on innovative solutions to ending use of fossil energy while enhancing renewable solutions.

Enhancing EU adaptation measures: The next adaptation strategy of the EU should be a legally binding instrument that guarantees greater prioritization, transparent integration and coherent implementation of adaptation in all EU policies.

The EU Adaptation Strategy should require all EU member states to have in place national adaptation strategies based on the latest scientific research and evidence on projected impacts related to climate change. Those strategies should then, within a specific timeframe, be converted into action plans or NAPs ready for implementation.

The **National Energy and Climate Plans** (NECPs) under the Energy Union Governance Regulation will form the template through which EU member states report their efforts and progress toward

meeting both national climate and energy targets and the EU-wide climate and energy framework. NECPs should also include adaptation implementation progress reporting.

The next **multi-annual EU budget** for the period 2021-2027 must focus its support for policies and actions that genuinely contribute to climate mainstreaming with a 40 percent climate-specific spending target and with the whole EU budget to be 100 percent climate-proofed. A transparent and robust climate-proofing assessment of programmes and project proposals submitted to the European Commission and on the national and regional level should be implemented.

Further, there must be a vertical coherence between NAPs and EU funding. Recipients of EU funds for infrastructure projects in transport, energy, agriculture and rural development and digitalization should be required to have both an adaptation strategy and actionable adaptation plans prior to receiving the resources.

Increasing the provision of financial support to countries most in need: The EU needs to provide adequate finance, technology transfer and capacity building for developing countries in line with its fair share of historical responsibility for the climate crisis.

The EU and its member states as a group are the largest **provider of international climate finance, but the support provided lacks transparency** when it comes to reporting and disbursements. The EU has the potential to seriously step up efforts on climate finance and to make a meaningful impact for countries relying on financial support. The financial flows provided from the EU need to be **reported in a transparent way that enables monitoring and verification in a way that ensures accountability in relation to the targets set by the Paris Agreement**. The EU should make sure that financial support does not increase debt burdens in developing countries and that adaptation action is adequately financed, particularly in the LDCs.

There should be a **common, universally agreed on methodology** based on a specific assessment for each co-funded project/programme, using a full scale 0-100 percent (granularity or reduction factor) **to indicate the degree of climate finance** in each project/programme.

Following the recommendations from the UNFCCC Standing Committee on Finance in its 2016 biennial assessment, only funding in addition to existing ODA must be counted as climate finance. Apart from grants, only concessional loans should be eligible as climate finance, following the same practice as for development aid. Furthermore, the EU should promote rules and accounting guidelines to ensure that countries report the grant equivalent value of loans and other non-grant instruments to the UNFCCC.

3 ACT Alliance Policy Recommendations — How to Enable NDCs in line with 1.5°C

Permanently overshooting average global warming of 1.5°C means crossing the line, risking irreversible losses causing a “Hothouse Earth” with unstoppable climate change for millennia. In other words, the 1.5°C climate threshold is the “new 2°C temperature goal”, originally set to define, based on science, the fine line between climate change and what has been called “dangerous climate change”, i.e., levels of warming that could result in unacceptably high risks of unmanageable consequences for humankind. This is what we understand as the first main message of the IPCC Special Report “Global Warming of 1.5°C”.

The good news is that it is still possible to limit global warming to 1.5°C — if vigorous and immediate action is taken. It is worth pursuing every effort to stay at 1.5°C. Failure to limit global warming to 1.5°C, according to the IPCC, would not only lead to large changes in our climate and the environment we rely on, it also implies — and this is the second main message of the IPCC — massive threats to lives, livelihoods, societal well-being, peace, security and economic development aspirations. The key promise of the Agenda 2030 and its 17 SDGs, that no one will be left behind, and that the SDGs will be achieved no later than 2030, depends on staying at or below 1.5°C. Equity and justice, including gender justice and inter-generational justice, would be severely violated in a 2°C world, and the goals of the SFDRR, to reduce mortality and economic losses caused by natural disasters, very likely would be out of reach, too.

Taking climate action by strengthening the NDCs and by setting up and implementing the 2050 LTS for climate-resilient, zero-emission, sustainable development for all countries is without alternative if the goals of the Paris Agreement, the SFDRR and the SDGs should be achieved. Inaction or delayed action would increase the risks for human well-being and livelihoods, food, water and ecosystem security, which are already significant today, disproportionately affecting vulnerable people and communities.

It is not only important to agree *by when* to transform our societies and economies. It is as important, or even more important, to agree *to start now* and to avoid any further delay, since the remaining window of opportunity to achieve the 1.5°C is closing very fast. The big shift has to take place in the next five years, and the course of action has to be agreed to before 2020.

In view of these scientific findings, ACT Alliance calls on all governments to take 10 steps, which provide a pathway to limit global warming to 1.5°C, which can build necessary mutual trust for ambitious climate action.

1. **Accountability:** Agree at COP 24 in 2018 on a single set of mandatory and robust accounting rules for GHG emission reduction *and* for the mobilization and provision of climate finance, accomplished by discretionary rules for measuring, reporting and verifying climate resilience building. Developing countries with limited technical capacity should get a transitional phase until 2025 to introduce mandatory accounting rules for mitigation, given that support is provided by developed countries. Without robust accounting for mitigation and finance, the Paris Agreement will be massively undermined to the benefit of free riders, while at the same time disincentivizing the political will of champions to continue to take the lead.

2. **Gap analysis:** Undertake national level analysis of existing gaps in current NDCs and climate policies in 2019, based on the agreed accounting rules and with a view to ratchet up commitments to switch to 1.5°C-consistent pathways in terms of mitigation, adaptation, loss and damage and (in the case of developed countries and other capable countries) the provision of financial and technical support.
3. **Ratchet up mitigation:** Based on the gap analysis, ratchet up mitigation commitments in the NDCs and other climate policies in 2019 to rapidly transform to a 1.5°C-consistent pathway, acknowledging different national circumstances.
4. **Foster resilience-building:** Revisit and prioritize national adaptation planning and implementation in 2019, given the results of the IPCC Special Report and the national gap analysis, to effectively reduce risks, especially for the most vulnerable women and men and sectors like food, water, health, coasts and life below water.
5. **Fast-start flagship projects with co-benefits:** By 2020, develop so-called fast-start flagship projects that reflect national climate action priorities, that contribute directly and to the fast achievement of enhanced targets that are designed in a way to mobilize important co-benefits between mitigation, adaptation and sustainable development.
6. **Scale up climate finance and investment in low GHG development:** Developed countries — based on the agreed transparency rules, staying firm to the 100 billion US dollar commitment and willingness to support enhanced national action as reflected in the revised NDCs and fast-start flagship projects — step up financial commitments and collectively achieve at least the 100 billion US dollar floor of climate finance in 2020. All countries should establish the necessary rules and incentives to shift private investments to support low GHG and sustainable development.
7. **Reduce climate-induced loss and damage:** Develop approaches to reduce potential losses, including through disaster risk reduction, social protection and climate risk transfer/financing, with a view to make use of the “polluter-pays principle”, based on the gap analysis, which should identify sectors, businesses, institutions and groups of people facing high climate risks, including to their lives, livelihoods and material/non-material assets.
8. **Align climate and development planning and action in the context of SDGs and the Paris Agreement:** Ensure full alignment and coherence of climate and development planning by no later than 2020, mobilizing, wherever possible, synergies and co-benefits.
9. **Inclusion and ownership:** As a prerequisite for a sustainable transition, justice and equity, ensure non-discriminatory, participatory processes and institutional set-ups that reflect not only a whole-of-government but also a whole-of-society approach.
10. **Deepened multilateral cooperation:** As Parties to the Paris Agreement, renew strong support for the full implementation of the Paris Agreement as the only realistic approach to successfully limit global warming to 1.5°C in the context of sustainable development, and deepen international cooperation and support as envisioned in SDG 17: Partnerships for the Goals.

Bibliography

- ACT Alliance EU. (2018) An analysis of the climate finance reporting of the EU. Brussels.
- Al-Ansari, N. et al. (2014) Water Demand Management in Jordan. *Engineering*, vol. 6, no. 1, pp. 19-26.
- Alianza Clima y Desarrollo. (2014) El quinto reporte de evaluación del IPCC ¿Qué implica para Latinoamérica?
- Barlow, M. et al. (2016) A review of drought in the Middle East and southwest Asia. *Climate* 29, 8547-8574.
- BBS. (2018) National account statistics (Provisional Estimates of GDP, 2017-18 and Final Estimates of GDP, 2016-17). Dhaka.
- BBS. (2017a) Statistical Year Book of Bangladesh 2017. Dhaka.
- BBS. (2017b): Report of the household income and expenditure survey. Dhaka
- Belkin, I. M. (2009) Rapid warming of large marine ecosystems. *Progress in Oceanography* 81(1-4), 207-213.
- Bhattacharya, D. et al. (2017) *Quest for Inclusive Transformation of Bangladesh: Who Not to Be Left Behind*. Centre for Policy Dialogue (CPD) and Citizen's Platform for SDGs, Bangladesh (eds.). Dhaka.
- Bread for the World/ACT Alliance/Lutheran World Federation/World Council of Churches. (2017) Non-economic Loss and Damage. Discussion Paper. Berlin and Geneva.
- Bread for the World/ACT Alliance/Friedrich Ebert Foundation. (2017) Ambition, Participation and Effectiveness: Using the NDC Partnership as a Catalyst for NDC Implementation in Developing Countries. Discussion Paper. Berlin.
- Center for Environmental and Geographic Information Services (CEGIS). (2006) Impacts of Sea Level Rise in the Southwest region of Bangladesh. Dhaka.
- Central Intelligence Agency. (2018) *The World FactBook: Ethiopia*. Washington, DC.
- CEPAL - Comisión Económica para América Latina y El Caribe. (2015) Cambio Climático en Centroamérica, Impactos Potenciales y Opciones de Políticas Pública. Mexico City.
- Cheung, W. et al. (2016) Structural uncertainty in projecting global fisheries fish catches under climate change. *Ecological Modelling* 325, pp. 57-66.
- Consejo Nacional de Cambio Climático (CNCC), Secretaría de Planificación Y Programación de la Presidencia (Seglepan). (2016) Plan de Acción Nacional de Cambio Climático. Guatemala City.
- Consejo Nacional de Energía, El Salvador. (2016) Contribución Determinada a Nivel Nacional de El Salvador en el Marco de la Política Energética Nacional y la Estrategia de Eficiencia Energética. San Salvador.
- CPD. (2018) State of the Bangladesh Economy in FY2017-18 – First Reading. Available at <https://cpd.org.bd/wp-content/uploads/2018/01/IRBD-FY2018-First-Reading-Presentation-final-13012017.pdf> (accessed 14 September 2018)
- CPRD. (2012) Coastal fishers' livelihood in peril: Sea surface temperature and tropical cyclones in Bangladesh. Dhaka.
- CPRD. (2018) Troubled Journey towards Climate Justice: Tackling manifest climate injustice in the Loss and Damage negotiations. Dhaka.
- Dhaka Tribune*. (2017) Landslide latest update: Death toll now 152. Dhaka.
- European Bank for Reconstruction and Development (EBRD). (November 2017) Assessment of Key Policy, Legal and Institutional Mechanisms Required for the Development and Implementation of the Nationally Determined Contributions. London.
- Evans, J. P. (2009) 21st century climate change in the Middle East. *Climate Change* 92(3-4), 417-432.
- Falkenmark, M. (December 1989) Macro-scale water scarcity requires micro-scale approaches: Aspects of vulnerability in semi-arid development. *National Resource Forum* 13, 258-267.
- Food and Agriculture Organization of the United Nations (FAO) (2012). Estudio de Caracterización del Corredor Seco Centroamericano, Tomo 1 (Países CA4). Rome.

- Federal Democratic Republic of Ethiopia. (2011) Climate Resilient Green Economy.
- Federal Democratic Republic of Ethiopia. (2015) National Adaptation Programs of Action.
- Federal Democratic Republic of Ethiopia. (2017) Nationally Determined Contributions.
- Feyen, L. and P. Watkiss (2011) River floods: the impacts and economic costs of river floods in the European Union, and the costs and benefits of adaptation. Technical Policy Briefing Note Series. Stockholm Environment Institute, Oxford.
- Freiwan, M. (March 2008) Spatial and temporal analysis of climatological data in Jordan. *International Journal of Climatology* 28.4, 521-535.
- Germanwatch. (2017) The Global Climate Risk Index 2018. Bonn.
- GIZ. (2015) Climate Change Governance in Jordan. Amman.
- Global Policy Forum et al. (2018) Spotlight on Sustainable Development 2018. New York. Available at <https://www.2030spotlight.org/en>.
- Global Water Partnership. (2016) Análisis socioeconómico del impacto sectorial de la Sequía de 2014 en Centroamérica.
- Gobierno de El Salvador Ministerio de Medio Ambiente y Recursos Naturales. (2015) Contribución Prevista y Determinada a Nivel Nacional de El Salvador. San Salvador.
- Gobierno de la Republica de Guatemala. (2015) Contribución Prevista y Determinada a Nivel Nacional. Guatemala City.
- Gobierno de la Republica de Honduras. (2015) Contribución Prevista y Determinada a Nivel Nacional (INDC) de Honduras. Tegucigalpa.
- Gobierno de la Republica de Nicaragua. (2018) Contribución Nacionalmente Determinada. Managua.
- Goode, D.J. et al. (2013) Groundwater-level trends and forecasts, and salinity trends, in the Azraq, Dead Sea, Hammad, Jordan Side Valleys, Yarmouk, and Zarqa groundwater basins, Jordan. Open File Report 2013-1061, U.S. Geological Survey, Reston, VA.
- Government of Bangladesh. (2015) Nationally Determined Contribution. Dhaka.
- Government of Bangladesh. (2018) The Third National Communication (draft). Dhaka.
- Government of Bangladesh Ministry of Agriculture. (2010) Saline Soils of Bangladesh. Available at http://srdi.portal.gov.bd/sites/default/files/files/srdi.portal.gov.bd/publications/bc598e7a_df21_49ee_882e_0302c974015f/Soil%20salinity%20report-Nov%202010.pdf (accessed 14 September 2018)
- Government of Bangladesh Ministry of Environment and Forests. (2009) Bangladesh Climate Change Strategy and Action Plan 2009. Dhaka.
- Government of Bangladesh Ministry of Environment and Forests. (2012) Second National Communication of Bangladesh to the United Nations Framework Convention on Climate Change. Dhaka.
- Government of Bangladesh Ministry of Environment and Forests. (2016) Assessment of Sea Level Rise on Bangladesh Coast through Trend Analysis. Available at http://gobeshona.net/wp-content/uploads/2016/08/SLR-Report_final_July-2016.pdf (accessed 14 September 2018).
- Government of Bangladesh Ministry of Finance. (2016) Bangladesh Economic Review 2016. Dhaka.
- Government of Jordan. (2012) National Climate Change and Health Adaptation Strategy and Action Plan. Amman.
- Government of Jordan. (2013) National Climate Change Policy of Jordan 2013-2020. Amman.
- Government of Jordan. (2014) Jordan's Third National Communication on Climate Change. Available at <http://www.undp.org/content/dam/jordan/docs/Publications/Enviro/TNC%20jordan%20pdf.pdf>
- Government of Jordan. (2017) Jordan First Biennial Update Report (FBUR). Available at https://unfccc.int/files/national_reports/non-annex_i_parties/biennial_update_reports/application/pdf/jordan_bur1.pdf
- Government of Jordan Department of Statistics. (2015) General Population and Housing Census 2015. Amman.
- Government of Jordan Ministry of Water and Irrigation. (2004) Environmental and social assessment of the Disi-Mudawarra to Amman Water Conveyance System. Amman.
- Government of Jordan Ministry of Water and Irrigation. (2016) National Water Strategy of Jordan 2016-2025. Available at [http://www.mwi.gov.jo/sites/en-us/Hot%20Issues/Strategic%20Documents%20of%20The%20Water%20Sector/National%20Water%20Strategy\(%202016-2025\)-25.2.2016.pdf](http://www.mwi.gov.jo/sites/en-us/Hot%20Issues/Strategic%20Documents%20of%20The%20Water%20Sector/National%20Water%20Strategy(%202016-2025)-25.2.2016.pdf).

- Government of Kenya. (2010) National Climate Change Response Strategy. Nairobi.
- Government of Kenya. (2013) National Climate Change Action Plan (NCCAP) 2013-2017. Nairobi.
- Government of Kenya. (2015) Second National Communication. Nairobi.
- Government of Kenya. (2017) Nationally Determined Contribution sector analysis report. Nairobi.
- Holland, G. and C.L. Bruyere. (2014) Recent intense hurricane response to global climate change. *Climate Dynamics* 42, pp. 617-627.
- Internal Displacement Monitoring Centre (IDMC). (20 July 2015) Global estimates 2015: People displaced by disasters. Geneva.
- International Monetary Fund (2017): IMF Annual Report 2017: Promoting Inclusive Growth. Washington, DC. Available at <http://www.imf.org/external/pubs/ft/ar/2017/eng/pdfs/IMF-AR17-English.pdf> (accessed 14 September 2018).
- Intergovernmental Panel on Climate Change (IPCC). (2013) Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva.
- IPCC. (2014) Climate Change 2014: Impacts, Adaptation, and Vulnerability. Geneva.
- IPCC. (2014b) The Fifth Assessment Report of IPCC. Geneva.
- IPCC. (2018) Special Report "Global Warming of 1.5°C". Geneva.
- International Union for Conservation of Nature Regional Office for West Asia (IUCN-ROWA). (2014) The Fifth National Report on the Implementation of the Convention on Biological Diversity. Amman.
- Karim, M and N. Mimura. (2008) Impacts of Climate Change and Sea-Level Rise on Cyclonic Storm Surge Floods in Bangladesh. In *Global Environmental Change*, 18 (3), 490-500.
- Maplecroft. (2013) Climate change vulnerability index 2012. Bath.
- Merayyan, S. (2014) Jordan's Water Resources: Increased Demand with Unreliable Supply. *Computational Water, Energy, and Environmental Engineering*, 3.02.
- Ministerio de Energía y Minas, Ministerio de Ambiente y Recursos Naturales, Secretaria de Planificación y Programación de la Presidencia (Segeplan). (2017) Plan Nacional de Energía 2017-2032. Guatemala City.
- Ministerio del Ambiente y los Recursos Naturales (MARENA), Oficina Nacional de Desarrollo Limpio y Cambio Climático (ONDL). (2003) Plan de Acción Nacional ante el Cambio Climático. Managua.
- Ministerio de Medio Ambiente y Recursos Naturales (MARN). (2015) Plan Nacional de Cambio Climático de El Salvador. San Salvador.
- Mirza, M.M.Q. (1997) Modeling the Effects of Climate Change on Flooding in Bangladesh. D.Phil. thesis, International Global Change Institute (IGCI), University of Waikato, Hamilton.
- Mirza, M.M.Q. (2002) Global Warming and Changes in the Probability of Occurrence of Floods in Bangladesh and Implications. *Global Environmental Change*, vol. 12, 127-138.
- Mondal, M. S. et al. (2013) Development of Four Decade Long Climate Scenario and Trend: Temperature, Rainfall, Sunshine and Humidity. Comprehensive Disaster Management Programme (CDMP II), Ministry of Disaster Management and Relief. Dhaka.
- Mora, J. et al. (2010) Efectos del Cambio Climático sobre la agricultura. Mexico City.
- O'Neill, B.C. (2017) The roads ahead: Narratives for shared socioeconomic pathways describing world futures in the 21st century. In *Global Environmental Change* 42, pp. 28-37.
- Pethick, J. and J. D. Orford. (2013) Rapid rise in effective sea-level in southwest Bangladesh: Its causes and contemporary rates. *Global and Planetary Change*, 111, 237-245.
- Practical Action. (2008) Assessment of Vulnerability to Climate Change and Adaptation Options for the Coastal People of Bangladesh. Available at https://practicalaction.org/docs/region_bangladesh/climate-change-assessment-coastal-bangladesh.pdf (accessed 14 September 2018).
- Rahman, K. et al. (2015) Declining rainfall and regional variability changes in Jordan. *Water Resources Research*, 51, 3828-3835.
- Rasmussen, D.J. et al. (2017) Coastal flood implications of 1.5°C, 2°C, and 2.5°C temperature stabilization targets in the 21st and the 22nd century. In American Geophysical Union, Fall Meeting 2017, abstract #GC51H-08.

- Republic of the Marshall Islands. (2011) National Climate Change Policy Framework. Majuro.
- Republic of the Marshall Islands. (2013) National Report for the Third International Conference on Small Islands' States. Majuro.
- Republic of the Marshall Islands. (2014) Republic of the Marshall Islands Joint National Action Plan for Climate Change Adaptation and Disaster Risk Management 2014 b- 2018, Majuro.
- Republic of the Marshall Islands. (2014b) National Strategic Plan 2015-2017, Majuro.
- Republic of the Marshall Islands. (2015) Intended Nationally Determined Contribution, Majuro.
- Rogelj, J. et al. (2018) Scenarios towards limiting global mean temperature increase below 1.5 °C. *Nature Climate Change*.
- Sadique, M. Z. and E. Bari. (9 October 2017) Flood 2017: Assessing Damage and Post-flood Management [Powerpoint Slides]. Centre for Policy Dialogue. Available at <https://cpd.org.bd/wp-content/uploads/2017/10/Flood-2017-Assessing-Damage-and-Post-flood-Management.pdf> (accessed 14 September 2018)
- Schleussner, C.F. et al. (September 2011) Emulating Atlantic overturning strength for low-emission scenarios: Consequences for sea-level rise along the North American east coast. In *Earth System Dynamics* 2, 191-200.
- Secretaria de Recursos Naturales y Ambiente (SERNA), (2010) Estrategia Nacional de Cambio Climático Honduras (ENCC). Tegucigalpa.
- Shahid, S. (September 2010) Recent trends in the climate of Bangladesh. *Climate Research*, 42(3), 185-193.
- Steffen, W., J. Rockström et al. (6 August 2018) Trajectories of the earth system in the Anthropocene. In Proceedings of the National Academy of Science of the United States of America.
- Takala, B. (without year) Focused Assessment of Community Needs During iien idiñ (time of disaster). The Republic of the Marshall Islands and the International Organization for Migration, Majuro.
- The Linde Group. (2017) Financial Report 2017: Compelling Perspectives. Available at https://www.the-linde-group.com/en/images/Linde_Annual_2017_EN_tcm14-461295.pdf (accessed 14 September 2018).
- United Nations Development Programme (UNDP). (2016) Human Development Report 2016: Human Development for Everyone. Available at http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf (accessed 14 September 2018)
- UNDP (5 April 2017) Bangladesh Improves in Human Development Index. Available at <http://www.bd.undp.org/content/bangladesh/en/home/presscenter/pressreleases/2017/031/5/221.html> (accessed 14 September 2018)
- UNDP. (2018) Human Development Indices and Indicators: 2018 Statistical Update, available at http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/JOR.pdf (accessed 14 September 2018)
- United Nations Energy Program (UNEP). (2016) The Adaptation Gap Finance Report. Nairobi.
- USAID. (2012) Bangladesh: Climate vulnerability profile. Available at https://www.climatelinks.org/sites/default/files/asset/document/bangladesh_climate_vulnerability_profile_jan2013.pdf (accessed 14 September 2018)
- USAID. (2018) Ethiopia Vulnerability Index.
- World Health Organization. (2018) UHC and SDG country profile 2018 Marshall Islands. Manila
- Worldatlas. Jordan. Available at <https://www.worldatlas.com/webimage/countrys/asia/jo.htm>.
- World Bank. (2014a) Bangladesh Climate Change Resilience Fund (BCCRF) Annual Report 2014. Dhaka.
- World Bank. (2014b) River Salinity and Climate Change: Evidence from Coastal Bangladesh. Available at <https://openknowledge.worldbank.org/bitstream/handle/10986/17735/WPS6817.pdf> (accessed 14 September 2018)
- World Wide Fund for Nature (WWF). (2016) Science of a 1.5 °C temperature limit. London.



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November 2018

Image: The human face of climate change

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