

# Climate change and health in Ethiopia: To what extent have the health dimensions of climate change been integrated into the Climate-Resilient Green Economy?

Anand Bhopal<sup>1</sup>  | Haileselassie Medhin<sup>2</sup>  |  
Kristine Bærøe<sup>3</sup>  | Ole F. Norheim<sup>1</sup> 

<sup>1</sup>Bergen Centre for Ethics and Priority Setting, Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway

<sup>2</sup>Europe Regional Office, World Resources Institute, The Hague, The Netherlands

<sup>3</sup>Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway

## Correspondence

Anand Bhopal, University of Bergen, Department of Global Public Health and Primary Care, Årstadveien 217804, Bergen, Norway.

Email: [anand.bhopal@uib.no](mailto:anand.bhopal@uib.no)

## Abstract

Ethiopia is experiencing an increasing frequency and intensity of slow-onset and acute disasters caused by climate change, with significant health impacts. Understanding and addressing these impacts involves trade-offs, which are central to effective priority setting in health and overarching efforts to meet the Sustainable Development Goals. Despite minimal historic greenhouse gas emissions, Ethiopia has been at the forefront of climate action since launching the Climate-Resilient Green Economy (CRGE) in 2011, a low-carbon development strategy. To learn from the Ethiopian approach, this paper examines to what extent health has been integrated into the CRGE. We found that the early years of the CRGE prioritized developing the financial basis of the green economy, while the health impacts of climate change have only been tentatively considered to date and remain detached from broader health strategies. Further analysis of climate adaptation measures, “health co-benefits,” and reducing specific vulnerabilities of the health sector could help improve health and build climate resilience.

## Key Points

- Ethiopia has been at the forefront of climate action since launching the Climate Resilient Green Economy (CRGE) in 2011, a low-carbon development strategy.

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- Early years of CRGE prioritised the economic foundations while the health impacts of climate change have only been tentatively considered to date and remain detached from broader health strategies.
- Further analysis integrating adaptation measures, health co-benefits of non-health interventions and ways to reduce specific vulnerabilities of the health sector could help identify synergies and build resilience to climate change in Ethiopia.
- The current conflict in the Tigray region presents an ongoing risk of wider destabilisation across the country.
- Post-conflict reconstruction and development efforts to follow should seek to better integrate the climate resilience dimension into the health system.

#### KEYWORDS

climate change, Climate-Resilient Green Economy, sustainable development

## BACKGROUND

Climate change is a present and growing threat to health and wellbeing across the world (Hoegh-Guldberg et al., 2018; Watts et al., 2015). Ethiopia, located in the Horn of Africa, is considered by the Notre Dame Global Adaptation Initiative to be among the most vulnerable countries with a low capacity to adapt to the negative impacts of climate change (Notre Dame Global Adaptation Initiative, n.d.). There are several overlapping reasons for this, including the combination of landlocked geography, drought-prone weather systems, and the socioeconomic dimensions of rural poverty (Climate Security Expert Network, 2019). Climate change is already exacerbating the risks of acute and chronic food insecurity, internal displacement, poor sanitation, and conflict, undermining broader human, and economic development goals, which could help adapt to these challenges (Ethiopian Panel on Climate Change, 2015b; Federal Ministry of Health, 2018). Despite having had one of the world's fastest-growing economies and steadily increasing life expectancy—increasing almost 1 year, every year, for the last 20 years—avoidable mortality in Ethiopia remains high (Norheim et al., 2015) and also increasingly precarious in the face of the climate change, the COVID-19 pandemic, and geopolitical unrest, including the conflict in Tigray.

Ethiopia is a home to rapidly growing population of 110 million people, making it the second-most populous country in Africa and one of the youngest in the world, with a median age of only 19.5 years (United Nations, n.d.). The country has a federal government divided into ten regional states and two self-governing city-states. Development policy has been primarily the responsibility of the Federal Government, whereas regional governments have focused on implementation. Small-scale rain-fed farming remains a principal source of employment, which means food security remains intricately entwined with livelihoods, health, and the climate (Climate Security Expert Network, 2019; Robinson et al., 2013). Access to electricity remains a major challenge, especially in rural areas, and there is a continued reliance on biomass fuels for cooking, which has a direct health effect of indoor air pollution as well as a range of other indirect health effects (Medhin & Mekonnen, 2019).



Environmental risks have been increasingly recognized in the policies and laws of the country since the 1990s, not least because of the awareness created by the devastating 1984 drought. The Disaster Prevention and Preparedness Commission launched in 1995 included a comprehensive disease risk management approach, including social, economic, and food security, coordinated by a newly established high-level committee to oversee the implementation. Similarly, Ethiopia's first environmental policy (Federal Democratic Republic of Ethiopia, 1997) launched in 1997 articulated the interdependence of people and the environment, encapsulating the Rio Principles of Sustainable Development and laying the foundation for the country's poverty reduction strategy ever since (Ethiopian Environmental Protection Agency, 2012).

The Climate-Resilient Green Economy (CRGE) strategy, launched in 2011, is a multisectoral approach to developing a climate-resilient, middle-income economy within 15 years. The approach focuses on meeting the twin goals of human and economic development in a warming world through a net-zero growth in carbon emissions, to a large extent based on reversing deforestation and increasing forest cover (Federal Democratic Republic of Ethiopia, 2011).

The CRGE strategy had four key pillars focused on carbon mitigation from high-emission sectors (agriculture, forestry, and transport) together with the expansion of hydropower electricity. It received strong cross-governmental commitment, which has been sustained after a change in government (Federal Democratic Republic of Ethiopia, 2011, p. 20). The strategy mirrored the first 5-year Growth and Transformation Plan ("GTP I"), though it featured heavily in the second GTP ("GTP II"), thereby mainstreaming climate change into central planning. An overarching National Adaptation Plan was released in 2019 (Federal Government of Ethiopia, 2019). Health-specific resilience plans were first released in 2014–2015 (Federal Ministry of Health, 2014), followed by a broader National Adaptation Plan for Health in 2018 (Federal Ministry of Health, 2018).

Over the last 5 years, there has been increasing acknowledgment among Ethiopian policymakers of the need for parity between carbon mitigation and societal adaptation, with growing interest in health (Admasu & Debessa, 2015; Simane et al., 2016; United Nations Development Programme, 2015). To our knowledge, the health dimensions of the CRGE have not been systematically explored. Incorporating the trade-offs of different approaches to tackling climate change is central to effective health priority setting (Johansson et al., 2019) and meeting the overarching Sustainable Development Goals (Norheim et al., 2019). In the face of public health threats, such as undernutrition, food insecurity, and noncommunicable diseases, tackling climate change can have benefits—the 2015 Lancet Commission on Health and Climate Change described these synergies as “the greatest global health opportunity of the 21st century” (Watts et al., 2015). This paper will assess to what extent the health dimensions of climate change have been integrated into the Climate-Resilient Green Economy process, and report on which aspects have been incorporated and identify gaps in the research base.

## METHODS

We undertook a scoping review exploring the health dimensions of Ethiopia's CRGE initiative. A scoping review aims to identify research gaps and including different sources and types of evidence are especially valuable in mapping out the key concepts in areas, which have not been comprehensively reviewed (Arksey & O'Malley, 2005). A scoping review is therefore appropriate because the health dimension of climate change policies is in general poorly understood. We followed the five-stage Arksey and O'Malley's (2005) framework outlined below.



## Identifying the research question

To what extent have the health dimensions of climate change been integrated into the CRGE? This study question formed a starting point for the search strategy, which was narrowed as the overview of the field was improved.

## Identifying relevant studies

The scoping review aims to identify all relevant literature, regardless of study design or data source (Arksey & O'Malley, 2005). This study draws on government policy documents, published articles, and nongovernmental reports from large published literature databases (Pubmed, Embase, Web of Science and Google Scholar), gray literature databases (Gray literature report, Worldcat), and relevant websites, including the United Nations Framework Convention on Climate Change (unfccc.int), the Ethiopian government ([Ethiopia.gov.et](http://Ethiopia.gov.et)), Prevention Web ([preventionweb.net](http://preventionweb.net)) and the Global Green Growth Institute ([gggi.org](http://gggi.org)).

The literature search, undertaken in May 2020, combined search terms relating specifically to Ethiopia, climate change, and health impacts:

- (climate change [Title/Abstract] OR (Global warming[Title/Abstract] OR (climate resilient green economy[Title/Abstract] OR (CRGE[Title/Abstract])).
- **AND** (health[Title/Abstract] OR disease[Title/Abstract] OR nutrition[Title/Abstract]).
- **AND** (Ethiopia[Title/Abstract]).

Extensive use of “snowballing” (the examination of citation lists) was used to identify additional policy documents and relevant unpublished literature.

## Study selection

Establishing the relevance criteria is an iterative process, refined with increasing familiarity with the literature (Arksey & O'Malley, 2005). This review is primarily interested in policy documents from within the Ethiopian CRGE. However, as the CRGE is a broad, multisectoral initiative, not all documents are relevant; conversely, many relevant health documents are aligned to, but not part of the CRGE. We, therefore, included material within the Ethiopian CRGE initiative and Ethiopian government policy documents relevant to the CRGE published since 2010, a year before the formal launch, during which time preparatory documents, such as regional assessments, were being prepared. We included external articles and nongovernmental reviews, which were published after 2011 and directly addressed the CRGE, with no restrictions on study design. The review excluded material that was not available in English. Our reliance on English language searches and databases may be one factor limiting our ability to locate all the regional policy documents.

## Charting the data

Using a descriptive-analytic method, data were collected on author, year, document type, stated purpose, and health dimensions in line with our study aims.

## Collating, summarizing, and reporting the results

We mapped our findings against the analytic framework used in the 2019 report of the Lancet Countdown on health and climate change (Watts et al., 2019), a leading, international, multi-disciplinary research initiative tracking the impact of climate change on health and ways to prevent these harms. “Health threats” correlates with Section 1 of the Lancet Countdown (“Climate change impacts”), which includes health impacts and health sector vulnerability (i.e., infrastructure, electricity supply, transportation). “Health opportunities” correlates with Sections 2 and 3 of the Lancet Countdown (“Adaptation” and “Mitigation and Health Co-benefits”), which include adaptations to improve health and health co-benefits (i.e., health gains from nonhealth interventions). To help understand the relevance for health, the author, title, stated aim, and priority CRGE sector is given for each item included in the results.

## RESULTS

### Overall profile of documents identified

The literature search identified 25 government policy documents, five published articles, and seven nongovernmental reports, of which 15 government policy documents, one published article, and six reports were included in the review. Out of the 15 included government policy documents, four (27%) were Federal Government documents, three (20%) were regional government documents, five (33%) were from the health ministry, and three (20%) were from other government ministries. We included one (33%) of the published articles and four (57%) of the nongovernmental reports, all of which were released between 2013 and 2016. Regional adaptation plans were all published in 2010, national policies were published throughout the period 2011–2019, and sectoral-specific policies (including health) were published between 2014 and 2018. The key findings are in Tables 1–4.

### Policy documents—National Government

As shown in Table 1, seven diverse national policy documents were included in this review: the ‘*CRGE Vision*’ (Federal Government of Ethiopia, 2011), laying out the ambitions of the CRGE, which was launched at the Conference of Parties climate change summit in 2011; the *CRGE Strategy* (Federal Democratic Republic of Ethiopia, 2011), a blueprint for implementing the Green Economy (which explicitly does not cover climate resilience); GTP II (National Planning Commission, 2016, p. 93)—an economic strategy, which aimed to mainstream the CRGE strategy, Sustainable Development Goals (SDGs) and Agenda-2063 relevant to health (National Planning Commission, 2016, p. 190); the National Adaptation Plan (NAP) (Federal Government of Ethiopia, 2019), an intersectoral assessment of measures to build climate resilience and reduce vulnerability to climate change; and climate-resilient plans from the agriculture and forestry, water and energy and transport sectors, outlining adaptation and mitigation measures and financing plans.

### Health threats

Health impacts of climate change are described in six out of seven documents with a focus on the increased spread of vector and water-borne diseases, flooding incidents, and impacts



TABLE 1 Federal government policy documents

Overview		Health threats		Health opportunities		
Title/Author	Aim	Stated CRGE priority sectors	Health impacts	Health sector vulnerability	Adaptations to improve health	Health co-benefits of non-health interventions
CRGE Vision, 2011 (Federal Government of Ethiopia, 2011)	"Roadmap for achieving a climate-resilient green economy"	"Vulnerable sectors" Agriculture, Transport, Industry, Energy, Health, Environment	<ul style="list-style-type: none"> <li>• Vector-borne diseases</li> <li>• Non-vector-borne diseases</li> <li>• Poorer food and water supply</li> <li>• Air pollution</li> <li>• Floods and storms</li> <li>• Heat-related mortality</li> </ul>	Not specified (but mentions close links between rainfall, GDP growth, and wellbeing due to reliance on agriculture)	<ul style="list-style-type: none"> <li>• Expand health extension program</li> <li>• Strengthen health systems</li> <li>• Introduce early warning systems</li> </ul>	<ul style="list-style-type: none"> <li>• Cleaner energy sources → reduce air pollution</li> </ul>
CRGE Strategy, 2011 (Federal Democratic Republic of Ethiopia, 2011)	"Protect against the adverse effects of climate change and build a green economy"	"Key pillars" Agriculture, Forestry, Power, Transport	Not specified	Not specified	Not specified	<ul style="list-style-type: none"> <li>• Fuel-efficient stoves (indoor air quality)</li> <li>• Decreased exhaust fumes → less outdoor air pollution</li> <li>• Improved road safety</li> <li>• Improved water quality</li> </ul>
Growth and Transformation Plan II (GTP II), 2016 (National Planning Commission, 2016)	"Spring-board toward the national vision of being a low-to a middle-income country by 2025"	Not specified	<ul style="list-style-type: none"> <li>• "Spread transmitted diseases in the form of epidemic"</li> <li>• "Aggravate food insecurity"</li> </ul>	Not specified	<ul style="list-style-type: none"> <li>• Up to date early warning systems</li> <li>• Strengthened safety net programs to improve food security</li> </ul>	<ul style="list-style-type: none"> <li>• Fuel-efficient stoves (indoor air pollution)</li> <li>• Clean water and sanitation → range of health benefits</li> </ul>

TABLE 1 (Continued)

Overview	Health threats			Health opportunities		
	Aim	Stated CRGE priority sectors	Health impacts	Health sector vulnerability	Adaptations to improve health	Health co-benefits of non-health interventions
National Adaptation Plan (NAP), 2019 (Federal Government of Ethiopia, 2019)	Strategy to "reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience"	"Vulnerable sectors" Agriculture, Forestry, Health, Transport, Power, Industry, Water, Urban	<ul style="list-style-type: none"> <li>• Vector-borne diseases</li> <li>• Water-borne diseases</li> <li>• Severe malnutrition</li> <li>• Increase in flood incidence and displacement</li> </ul>	<i>Not specified</i>	<ul style="list-style-type: none"> <li>• Improved access to potable water</li> <li>• Environmental health surveillance.</li> <li>• Developing technologies and research</li> <li>• Climate-sensitive disease prevention</li> <li>• Improved basic health services</li> </ul>	Minimize flood risk → protect health
Climate Resilience Strategy: Agriculture & Forestry, 2015 (Federal Democratic Republic of Ethiopia, 2015a)	Identify challenges related to climate change, adaptations, and financing	"Key pillars" Agriculture, Forestry, Power, Transport	<ul style="list-style-type: none"> <li>• Droughts and water stress</li> <li>• Floods</li> <li>• Heat stress</li> </ul>	<i>Not specified</i>	<ul style="list-style-type: none"> <li>• Enhancing weather warning systems</li> <li>• Social protection for high priority groups, including women and children</li> </ul>	<i>Not specified</i>
Climate Resilience Strategy: Water and Energy, 2015 (Federal Ministry of Water Irrigation and Energy, 2015)	Identify the economic and social impacts of climate variability and prioritize interventions	Agriculture	<ul style="list-style-type: none"> <li>• Poor water access</li> </ul>	<ul style="list-style-type: none"> <li>• Reliance on vulnerable surface water → diarrhea, malnutrition, and neglected tropical diseases</li> </ul>	<ul style="list-style-type: none"> <li>• Universal access to water, sanitation, and hygiene (WASH) → "saves 946,032 maternal and child deaths"</li> </ul>	<ul style="list-style-type: none"> <li>• Access to energy and water "could prevent 1.2 m lives"</li> <li>• Fuel-efficient stoves (indoor air pollution – "72,400 deaths annually")</li> </ul>

(Continues)



TABLE 1 (Continued)

Overview	Health threats			Health opportunities	
	Stated CRGE priority sectors	Health impacts	Health sector vulnerability	Adaptations to improve health	Health co-benefits of non-health interventions
Title/Author	Aim	Health impacts	Health sector vulnerability	Adaptations to improve health	Health co-benefits of non-health interventions
Ethiopia's Climate-Resilient Transport Sector Strategy, 2017 (Federal Ministry of Transport of Ethiopia, 2017,2010)	Explore 'transport synergies and cost-efficiencies while increasing GHG emission reduction gains'	<ul style="list-style-type: none"> <li>• Direct temperature mortality</li> <li>• Damaged transport infrastructure from adverse weather events → increased road accidents</li> </ul>	<ul style="list-style-type: none"> <li>• Climate resilience of health infrastructure</li> <li>• Access points to health facilities are 'critical road corridors'</li> </ul>	<ul style="list-style-type: none"> <li>• Enhanced standards for buildings, transport, bridges</li> <li>• Health and safety assessments</li> <li>• Long-term emergency preparedness, including health infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce air and noise pollution → public health benefits</li> <li>• Encourage active transport → improve mental and physical health</li> </ul>

Abbreviation: CRGE, Climate-Resilient Green Economy.



TABLE 2 Regional government policy documents

Overview			Health threats		Health opportunities	
Title/Author	Aim	Health impacts	Health sector vulnerability	Adaptations to improve health (indicators)	Health co-benefits of non-health interventions	
Dire Dawa Program of adaptation to Climate Change, 2011 (Dire Dawa Environmental Protection Agency, 2011)	Assess climate change vulnerabilities in sectors important for livelihood, the ecosystem, and natural resource of the area	<ul style="list-style-type: none"> <li>Malnutrition</li> <li>Malaria at higher altitudes</li> <li>Water-borne diseases</li> </ul>	<ul style="list-style-type: none"> <li>Population growth outstripped expansion of health sector</li> </ul>	<ul style="list-style-type: none"> <li>Strengthen malaria prevention and control service</li> <li>Increase community awareness</li> <li>Communication equipment</li> <li>Sufficient trained staff in all health centers</li> <li>Early warning systems</li> </ul>	Not specified	
Oromia Program of Plan on Adaptation to Climate Change, 2011 (Oromia National Regional State Task Force, 2011)	Identify the major vulnerable sectors to climate change and their adaptive capacity and response measures	<ul style="list-style-type: none"> <li>Malnutrition and famine</li> <li>Malaria at higher altitudes</li> <li>Water-borne diseases</li> </ul>	<ul style="list-style-type: none"> <li>Low availability of social services and schooling for pastoralist communities</li> <li>Poorly functioning health facilities and low vaccination coverage</li> <li>Pre-existing food insecurity</li> </ul>	<ul style="list-style-type: none"> <li>Awareness-raising on health</li> <li>Mobile health service provisions</li> <li>Health insurance systems</li> <li>Strengthen health extension workers</li> <li>Increase access to household level sanitary services</li> </ul>	Not specified	
Afar National Programme of Plan on Adaptation to Climate Change, 2010 (Afar National Regional State Task Force, 2010)	Identify the major vulnerable sectors to climate change and their adaptive capacity and response measures	<ul style="list-style-type: none"> <li>Malnutrition</li> <li>Poor child development</li> <li>Vector-borne diseases</li> <li>Water-borne diseases</li> <li>Heat stress</li> </ul>	<ul style="list-style-type: none"> <li>Inadequate health services, often far from main roads</li> <li>Low-quality infrastructure.</li> <li>Rural poverty and lack of alternative incomes</li> <li>Low health literacy and widely practiced harmful traditional practices</li> </ul>	<ul style="list-style-type: none"> <li>Malaria protection and prevention campaigns</li> <li>Improve health facilities</li> <li>Integrated disaster risk reduction and early warning system systems</li> <li>Improve water sources (boreholes, springs, wells)</li> <li>Solar power drilling system → reliable water supply</li> </ul>	<ul style="list-style-type: none"> <li>Switch fuelwood for clean fuels → reduced physical impacts of carrying wood and reduced indoor air pollution</li> </ul>	



TABLE 3 Ministry of health policy documents

Overview		Health threats		Health opportunities	
Title/Author	Aim	Health impacts	Health sector vulnerability	Adaptations to improve health (indicators)	Health co-benefits of nonhealth interventions
National Framework of Climate-Resilient Health Sector, 2014 (Federal Ministry of Health, 2014)	"Serve as policy guidance and provide roadmap for the realization of Health National Adaptation Plan"	<ul style="list-style-type: none"> <li>• Malnutrition</li> <li>• Water-borne diseases</li> <li>• Vector-borne diseases</li> <li>• Meningitis</li> <li>• Heat mortality</li> <li>• Asthma</li> </ul>	<ul style="list-style-type: none"> <li>• Health facilities ill-equipped (equipment, staff) and lacking water/power/phone to respond to disasters and outbreaks</li> </ul>	<ul style="list-style-type: none"> <li>• Integrated environmental health surveillance</li> <li>• Public health capacity building</li> <li>• Community-based social security fund for disaster victims</li> <li>• Health development army</li> </ul>	<ul style="list-style-type: none"> <li>• Reducing diesel exhaust → decreased asthma</li> </ul>
Vulnerability and Adaptation Assessment of Health to Climate Change in Ethiopia, 2015 (Federal Ministry of Health, 2015b)	Assess health vulnerabilities to climate change and their interlinkages	<ul style="list-style-type: none"> <li>• Malnutrition</li> <li>• Water-borne diseases</li> <li>• Vector-borne diseases</li> <li>• Meningitis</li> <li>• Heat stress</li> <li>• Extreme weather events</li> <li>• Food-borne diseases</li> </ul>	<ul style="list-style-type: none"> <li>• Infrastructure at risk from flooding</li> <li>• Limited electricity</li> <li>• Basic medical equipment</li> <li>• Poor water and sanitation</li> <li>• Unsustainable health financing</li> <li>• Structural social problems (e.g., widespread poverty)</li> </ul>	<ul style="list-style-type: none"> <li>• Improve public health surveillance systems</li> <li>• Strengthen early warning systems</li> <li>• Human resource for health development</li> <li>• Establish health and climate data system</li> <li>• Improve public health services</li> <li>• Improve water, sanitation, and hygiene system</li> <li>• Advocacy to raise public awareness</li> </ul>	<ul style="list-style-type: none"> <li>• Adaptation measures → reduce gender inequities</li> </ul>
Review of Policy Documents On Climate Change, WASH & Public Health in	Examine sensitivity of WASH policy documents to	<ul style="list-style-type: none"> <li>• Vector-borne diseases</li> <li>• Nonvector-borne diseases</li> </ul>	<ul style="list-style-type: none"> <li>• Health infrastructure at risk of flood damage</li> </ul>	<ul style="list-style-type: none"> <li>• Integrate climate data and early warning data with WASH/health sectors.</li> </ul>	<ul style="list-style-type: none"> <li>• Integration of interventions controlling diseases sharing</li> </ul>

TABLE 3 (Continued)

Overview		Health threats		Health opportunities		
Title/Author	Aim	Formal part of CRGE?	Health impacts	Health sector vulnerability	Adaptations to improve health (Indicators)	Health co-benefits of nonhealth interventions
Ethiopia, 2015 (Federal Ministry of Health, 2015a)	climate change and vice versa.		<ul style="list-style-type: none"> <li>• Extreme events compromising routine health programs and development goals</li> <li>• Heat stress</li> <li>• Drinking water contamination</li> </ul>		<ul style="list-style-type: none"> <li>• Capacity building and technical training to mainstream health into climate change adaptation</li> </ul>	<ul style="list-style-type: none"> <li>• climatic risk factors</li> </ul>
Health Sector Transformation Plan, 2015 (Federal Democratic Republic of Ethiopia, 2015b)	Five-year plan to reach Universal Health Coverage	No: In line with GTP II	High deaths from infectious diseases, obesity, diabetes, and heart disease if climate change not mitigated	Not specified	<ul style="list-style-type: none"> <li>• Strong public health emergency management system, including an early warning system</li> <li>• Strengthen health development army</li> <li>• Develop climate resilience and adaptability framework</li> </ul>	Not specified
National Health Adaptation Plan to Climate Change (2018–2020), 2018 (Federal Ministry of Health, 2018)	Blueprint for a climate-resilient health system	Yes	<ul style="list-style-type: none"> <li>• Malnutrition</li> <li>• Water-borne diseases</li> <li>• Vector-borne diseases</li> <li>• Heat stress</li> <li>• Respiratory tract infections</li> </ul>	<ul style="list-style-type: none"> <li>• Health centers: not attached to the national electric grid, lack clean water, paved road access, phones</li> <li>• Latrines at risk from flooding</li> </ul>	<ul style="list-style-type: none"> <li>• Integrated disease surveillance and strengthen early warning systems</li> <li>• Community health insurance scheme</li> <li>• Develop and adopt climate-proof latrine design</li> <li>• Improve access to safe drinking water</li> <li>• Promote family planning</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced indoor and outdoor air pollution</li> <li>• Active transport</li> </ul>

Abbreviations: CRGE, Climate-Resilient Green Economy; GTP, growth and transformation plan.

**TABLE 4** Scientific articles and non-governmental reports

Overview		Health dimensions of CRGE	
Title	Aim	Key findings	Recommendations
Making Growth Green and Inclusive: The Case of Ethiopia, OECD 2013 (Bass et al., 2013)	Showcase progress and prospects for green growth and clarify the added value of the CRGE strategy	<ul style="list-style-type: none"> <li>Health sector adaptation measures will be added in the next phase of CRGE</li> </ul>	<ul style="list-style-type: none"> <li>Develop a set of inclusive green growth principles, including health</li> </ul>
Integration of Poverty and Sustainability into National Development Planning: Ethiopia Report, 2015 (United Nations Development Programme, 2015)	Assess integration of development processes and transition to a more inclusive greener economy	<i>Health not included in the analysis</i>	<ul style="list-style-type: none"> <li>Institutionalization of CRGE within Ministries at national and regional levels</li> </ul>
Ethiopian Panel on Climate Change (Health & Settlement), 2015 (Ethiopian Panel on Climate Change, 2015a)	Present known effects of climate change on human health, including population vulnerability and co-benefits	<ul style="list-style-type: none"> <li>Systematic review of the evidence</li> <li>Criteria presented for identifying key vulnerabilities, key risks, emergent risks</li> </ul>	<ul style="list-style-type: none"> <li>Strategies to respond to climate change (adaptation, mitigation, finance, capacity-building) should take health impacts into account</li> </ul>
Ethiopian Panel on Climate Change, summary for policymakers, 2015 (Ethiopian Panel on Climate Change, 2015b)	Summary of the report for the policymakers	<ul style="list-style-type: none"> <li>Health impacts are direct, ecosystem-related, and mediated through institutions. Effective short-term solutions are strengthening basic public health services and disaster preparedness and poverty alleviation.</li> </ul>	<ul style="list-style-type: none"> <li>The Government could make health a priority area in the current climate change activities</li> </ul>
Review of Climate Change and Health in Ethiopia: Status and Gap Analysis, 2016 (Simane et al., 2016)	Assess environment, climate change, and health and identify research, training, and capacity gaps	<ul style="list-style-type: none"> <li>Lack of Ethiopia-based research hindering effective adaptation and mitigation strategies within the CRGE.</li> <li>Limited intersectoral collaboration regionally and nationally</li> <li>Lack of coordination between academia, NGOs, and policy makers</li> </ul>	<ul style="list-style-type: none"> <li>Establish climate and health research centers and update policies.</li> <li>Specialized training to develop research capacity</li> <li>Combine health and climate data to monitor climate-sensitive diseases</li> <li>Establish multistakeholder fora for climate change and health</li> </ul>
Review of current and planned adaptation action in Ethiopia, International	Outline efforts to increase climate adaptation on	<ul style="list-style-type: none"> <li>"There are gaps in adaptation action addressing</li> </ul>	<i>Not specified</i>

TABLE 4 (Continued)

Overview		Health dimensions of CRGE	
Title	Aim	Key findings	Recommendations
Development Research Centre/UK Aid, 2016 (Echeverria & Terton, 2016)	national and subnational levels	vulnerabilities in specific sectors, notably health”	
Ethiopia's Country Planning, 2016–2020, 2016 (Global Green Growth Institute, 2016)	“Detail how GGGI will support Ethiopia in planning and implementing the CRGE vision”	<ul style="list-style-type: none"> <li>• Non-health sector climate resilience strategies indicate benefits for public health</li> <li>• Investment in health will be essential to meeting the CRGE goals</li> </ul>	<ul style="list-style-type: none"> <li>• Complete outstanding CRGE analysis for health</li> <li>• Greater attention to interlinkages between sectors and initiatives</li> </ul>

Abbreviation: CRGE, Climate-Resilient Green Economy.

on nutrition. Nonhealth sectoral plans describe some health impacts and identify specific vulnerabilities of the health sector from climate change.

## Health opportunities

Adaptations to improve health are outlined in six out of seven documents, focusing on the health system, improving access to health services, and developing early warning systems. The health co-benefits of nonhealth interventions were mentioned in six out of seven of documents, though not systematically or as in depth as has been done elsewhere (Haines et al., 2009; Scovronick et al., 2019). Reduced indoor air pollution from the use of fuel-efficient stoves and improved access to clean water were the most frequently described. The NAP noted the historical omission of health from the priority CRGE sectors (Federal Government of Ethiopia, 2019) and mentioned the health dimensions of a range of inter-sectoral initiatives, including integrated health and environmental surveillance (see *Annex 2* in Federal Government of Ethiopia, 2019, for further information).

## Policy documents—Regional governments

We included three regional plans on climate change resilience as outlined in Table 2. All identified health as especially vulnerable to climate change and focused primarily on adaptations to improve health. For more details on regional plans see Federal Government of Ethiopia (2019).

## Health threats

Health impacts of climate change were discussed in all regional plans and common themes were malnutrition, the spread of malaria at higher altitudes, and water-borne diseases. In contrast to the national policies (Table 1), regional policies discussed some specific vulnerabilities of the health sector to climate change, focusing on poverty, education, and poor access to health services.



## Health opportunities

All documents identified several adaptations to improve health. The main themes were the need for increased awareness, early warning systems, and improved basic health services. One document mentioned health co-benefits (reduced indoor air pollution from switching firewood for clean fuels).

## Policy documents—Health ministry

Health sector-specific policy documents, shown in Table 3, were first released in 2014, 3 years after the CRGE launch. The National Framework of Climate-Resilient Health Sector (Federal Ministry of Health, 2014) began the process of developing a comprehensive health sectoral response, strengthened a year later in the Health Vulnerability and Adaptation Assessment (Federal Ministry of Health, 2015b). In 2015, the CRGE was mainstreamed into GTP II on which the Health Sector Transformation Plan (HSTP) is based—the HSTP is, therefore, included here.

## Health threats

All CRGE-related documents describe a wide range of health impacts from climate change, including malnutrition, water-borne diseases, and vector-borne diseases, and heat mortality. The HSTP states that the risk of higher obesity, diabetes, and heart disease-related deaths if climate change is not mitigated but does not substantiate upon the causes or interventions needed.

Specific vulnerabilities of the health sector identified to focus on equipment and staffing and the physical integrity of buildings limiting sectoral resilience. Structural social problems, such as poverty and access to clean water and sanitation, are included in the vulnerability and adaptation assessment but not substantiated in either the HSTP or the National Health Adaptation Plan. The HSTP does not discuss specific vulnerabilities of the health sector and makes no reference to either the Vulnerability and Adaptation Assessment or the CRGE initiative.

## Health opportunities

All documents included in this review identified a range of adaptations to improve health, including investing in public health infrastructure, staffing, and data systems, and developing early warning systems. Other specific adaptations include developing community social security schemes, improving access to clean water and sanitation, and increasing awareness of climate change. The interrelationship between health and the wider social and environmental context was not a clear narrative within these documents. Health co-benefits of public health interventions outside the health sector received scant attention and no detailed analysis to indicate the potential benefits of interventions mentioned, such as promoting active transport or decreasing air pollution.

## Reviews—Scientific articles and reports

Outlined in Table 4 are published review articles and nongovernmental reports. The articles (the Ethiopian Panel on Climate Change chapter on health, the accompanying summary for



policymakers, and a “status gap and analysis”) focus on health and climate change in Ethiopia, though not specifically on the CRGE. The nongovernmental reports are not health-focused, although two reports highlight the centrality of health analysis to delivering the aims of the CRGE.

An article (“status gap and analysis”) suggested establishing climate and health research centers to monitor the impacts and build capacity, alignment of climate, and health data to monitor climate-sensitive diseases and increase intersectoral collaboration. The Ethiopian Panel on Climate Change (2015) highlighted the need to incorporate health into broader climate change strategies.

This is echoed in the nongovernmental reports—which highlight gaps in health sector analysis and the importance of health to achieving CRGE goals. Recommendations within the nongovernmental reports include developing a broad set of green growth principles, including health, and greater attention to interlinkages between sectors and initiatives.

## DISCUSSION

This review investigated to what extent health is integrated into the Ethiopian CRGE. We found that the CRGE identified priority areas (Table 1) on the basis of the economic importance of sectors and the potential for reduced emissions (Federal Democratic Republic of Ethiopia, 2011). Though health and climate resilience were central to the regional adaptation plans (see Table 3) compiled a year before the CRGE launch, the first 5 years of the CRGE were characterized by a focus on building the Green Economy.

Health remains at a less developed stage than other aspects of the strategy. This perhaps reflects delays initiating the health technical subcommittee and undertaking health-specific analysis—it was 3 years before a preliminary analysis was undertaken and 7 years until a comprehensive national health adaptation plan was launched. It may, with sound reasons, not have been a priority. For example, the Ethiopian health Minister in 2015 wrote that the health co-benefits of interventions to tackle climate change “cannot be over-emphasized” but agriculture and energy security are the keys to broader development goals (Admasu & Debessa, 2015).

Another barrier to incorporating health into the CRGE earlier may have been the indirect nature of the relationship between climate change and health (Watts et al., 2019, Section 4). It has traditionally been difficult to directly quantify the health impacts of climate change (McMichael et al., 2003, chap. 7). The World Bank report on the economics of adaptation to climate change in Ethiopia, partly informing the CRGE, explicitly did not consider the health-related implications (World Bank, 2010). Incorporating emerging evidence—for example, the health co-benefits of interventions to improve air quality (Markandya et al., 2018; Vandyck et al., 2018), low-carbon urban transport systems (Shaw et al., 2014), and uptake of a planetary diet (Willett et al., 2019)—through an overarching public health approach could strengthen the CRGE.

The Health Sector Transformation Plan states in the foreword that “Climate change is the greatest global health threat of the 21st century” (Federal Democratic Republic of Ethiopia, 2015b) though does not follow up with coherent actions to mitigate the risks. This mismatch is far from unique to Ethiopia (Ethiopian Panel on Climate Change, 2015b; Watts et al., 2015). However, this challenge may be compounded by a lack of technical expertise (Mitike et al., 2016)—addressing deficits in country-specific, localized data remain a major challenge for designing effective policies across the world.

As indicated by the Ethiopian public health community (Simane et al., 2016), independent reviews (Echeverria & Terton, 2016; Global Green Growth Institute, 2016), and by the government itself (Admasu & Debessa, 2015), health has been somewhat



fragmented within the CRGE. The potential public health benefits of pursuing a green economic development path have been underutilized. Ultimately, many of the health impacts of climate change are dependent on how human systems respond (16); building climate resilience is key to avoid losing hard-won progress in health (Smith et al., 2014). Ethiopia's 5-year HSTPs present ongoing opportunities to develop synergies between these agendas.

## LIMITATIONS

Within this review, we were unable to satisfactorily explore the relationship between national policy making and regional implementation. This paper is intended to form the basis for future in-depth qualitative interviews exploring the implementation of the CRGE. However, given the growing importance of effective integration between health and climate policy across the world (Watts et al., 2015), we believe this study provides useful insights for policymakers engaged in this urgent challenge.

## Conclusion and policy implications

Understanding and addressing the health impacts of climate change on health are essential for effective priority setting in health and meeting the overarching SDGs. This study set out to evaluate to what extent the health dimensions of climate change have been integrated into the CRGE of Ethiopia. We found that the early years of the CRGE prioritized developing the financial basis of the green economy, whereas the potential health impacts—and benefits—of climate change mitigation and adaptation have only been tentatively considered within the CRGE to date and are not currently coordinated in the health-specific analysis or broader health strategies. Further analysis integrating the necessary adaptation measures, health co-benefits of nonhealth interventions and steps to reduce specific vulnerabilities of the health sector could help identify synergies and build resilience. Updating regional adaptation plans may facilitate this process. Fuller's integration of the health dimensions of climate change is key to its success.

A key factor we must acknowledge impeding the successful implementation of the CRGE vision is the conflict in the Tigray region with the ongoing risk of wider destabilization across the country. Tigray's health system has been a major casualty of the violence, with widespread damage and looting of facilities, a lack of remaining health personnel, and occupation by armed soldiers jeopardizing the safe access to health care and compounding the conflict's human toll (MSF, 2021). Post-conflict reconstruction and development efforts to follow should seek to better integrate the climate resilience dimension into the health system.

The Ethiopian CRGE program remains a leading example of a transformational, low-carbon, climate-resilient economic development agenda, which offers insights for countries across sub-Saharan Africa pursuing a similar path, such as Kenya, Uganda, Ghana, Rwanda, and South Africa (see Green Growth Knowledge Platform, n.d.). The sub-Saharan Africa region faces the dual challenge of improving the health and welfare of citizens through the as yet little tested green developmental path—that is, renewable energy-led socio-economic development, rather than fossil fuels—while contending with, and building resilience to, climate risks, such as extreme weather events. Well-informed, medium- to long-term decision-making is, therefore, essential to prepare for this uncertain future.

As the then Prime Minister of Ethiopia, Meles Zenawi, said at the launch of the CRGE in 2011: “While we did not cause climate change, we must protect ourselves from its impact. We have the opportunity to demonstrate that in the 21st century a new form of green growth



is possible” (United Nations Development Programme, n.d.). One way the research community, both in sub-Saharan Africa and across the world, can support this effort is through undertaking national and cross-country comparative research on health and the green economy agenda to refine policy development, disseminate best practice and fulfill the greater mission of a climate-resilient society for all.

## CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

## ETHICS STATEMENT

Ethical approval was not required for this scoping review. This article is entirely the authors' own original work, which has not been previously published in any form elsewhere.

## REFERENCES

- Admasu, K., & Debessa, K. (2015). Action to protect human health from climate change: An African perspective. *The Lancet*, 386(10006), e31–e33. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)61139-4/abstract](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)61139-4/abstract)
- Afar National Regional State Task Force. (2010). *Afar National Regional State: Programme of plan on adaptation to climate change*.
- Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19–32. <https://doi.org/10.1080/1364557032000119616>
- Bass, S., Wang, S., Ferede, T., & Fikreyesus, D. (2013). *Making growth green and inclusive: The case of Ethiopia, OECD Green Growth Papers*. OECD Publishing. <https://www.oecd-ilibrary.org/docserver/5k46dbzhrkh-en.pdf?expires=1620200647&id=id&accname=guest&checksum=CE3A67A8CC484FE1308D9AB98680728C>
- Climate Security Expert Network. (2019). Climate-fragility risk brief: Ethiopia. [https://climate-security-expert-network.org/sites/climate-security-expert-network.com/files/documents/csen\\_climate\\_fragility\\_risk\\_brief\\_-\\_ethiopia\\_0.pdf](https://climate-security-expert-network.org/sites/climate-security-expert-network.com/files/documents/csen_climate_fragility_risk_brief_-_ethiopia_0.pdf)
- Dire Dawa Environmental Protection Agency. (2011). Dire Dawa Administration Program of Adaptation to Climate Change.
- Echeverria, D., & Terton, A. (2016). *Review of current and planned adaptation action in Ethiopia* (CARIAA Working Paper No. 8). International Development Research Centre. [www.idrc.ca/cariaa](http://www.idrc.ca/cariaa), <https://www.iisd.org/system/files/publications/idl-55864-ethiopia.pdf>
- Ethiopian Environmental Protection Agency. (2012). United Nations Conference on Sustainable Development (Rio20): National Report of Ethiopia. <https://sustainabledevelopment.un.org/content/documents/973-ethiopia.pdf>
- Ethiopian Panel on Climate Change. (2015a). *First assessment report – Working Group II Health and Settlement*. Ethiopian Academy of Sciences. <http://publication.eiar.gov.et:8080/xmlui/bitstream/handle/123456789/2424/Ethiopia%20Panel%20on%20climate%20change.pdf%20pCCC.pdfab%20bbbyyyyyy.pdf?sequence=1&isAllowed=y>
- Ethiopian Panel on Climate Change. (2015b). *First assessment report, Summary of reports for policy makers*. Ethiopian Academy of Sciences. <http://publication.eiar.gov.et:8080/xmlui/handle/123456789/2430>
- Federal Democratic Republic of Ethiopia. (1997). Environmental policy. <http://archive.basel.int/legalmatters/natleg/documents/ethiopia01.pdf>
- Federal Democratic Republic of Ethiopia. (2011). Ethiopia's Climate-resilient Green Economy: Green economy strategy. [https://www.preventionweb.net/files/61504\\_ethiopiacrge.pdf](https://www.preventionweb.net/files/61504_ethiopiacrge.pdf)
- Federal Democratic Republic of Ethiopia. (2015a). Climate Resilience Strategy: Agriculture and forestry. <http://gggi.org/site/assets/uploads/2017/11/2015-08-Sectoral-Climate-Resilience-Strategies-for-Ethiopia-1-Agriculture-and-Forestry-Climate-Resilience-Strategy.pdf>
- Federal Democratic Republic of Ethiopia. (2015b). Health Sector Transformation Plan (2015/16–2019/20). <https://ehia.gov.et/sites/default/files/Resources/HSTP%20Final%20Print%202015-11-27%20Print%20size.pdf>
- Federal Government of Ethiopia. (2011). Climate Resilient Green Economy: Vision. [https://www.preventionweb.net/files/24317\\_24317crgegevision40pagesforprinting.pdf](https://www.preventionweb.net/files/24317_24317crgegevision40pagesforprinting.pdf)
- Federal Government of Ethiopia. (2019). CRGE National Adaptation Plan. <https://www4.unfccc.int/sites/NAPC/Documents/Parties/Final%20Ethiopia-national-adaptation-plan%20%281%29.pdf>
- Federal Ministry of Health. (2014). National framework of climate-resilient health sector. <https://www.who.int/globalchange/resources/wash-toolkit/national-framework-of-climate-resilient-health-sector.pdf?ua=1>
- Federal Ministry of Health. (2015a). Review of policy documents on climate change, WASH, and public health in Ethiopia. <https://www.who.int/globalchange/resources/wash-toolkit/review-of-policy-documents-on-climate-change-wash-and-public-health-in-ethiopia.pdf?ua=1>



- Federal Ministry of Health. (2015b). Vulnerability and adaptation assessment of health to climate change in Ethiopia. <https://www.who.int/globalchange/resources/wash-toolkit/vulnerability-and-adaptation-assessment-of-health-to-climate-change-in-ethiopia.pdf>
- Federal Ministry of Health. (2018). National health adaptation plan to climate change. <https://www.who.int/globalchange/resources/wash-toolkit/national-health-adaptation-plan-to-climate-change.pdf?ua=1>
- Federal Ministry of Transport of Ethiopia. (2017). Ethiopia's climate-resilient transport sector strategy. [https://www.mofed.gov.et/media/filer\\_public/15/31/153174c3-b472-4339-b3bb-fb2c48cad629/transport\\_cr.pdf](https://www.mofed.gov.et/media/filer_public/15/31/153174c3-b472-4339-b3bb-fb2c48cad629/transport_cr.pdf)
- Federal Ministry of Water, Irrigation, and Energy. (2015). Ethiopia's Climate Resilient Green Economy. Climate resilience strategy: Water and energy. <http://gggi.org/wp-content/uploads/2015/08/2015-08-10-FINAL-CR-Strategy-Water-and-Energy.compressed.pdf>
- Global Green Growth Institute. (2016). Ethiopia Country Planning 2016–2020. <https://www.greengrowthknowledge.org/national-documents/ggis-ethiopia-country-planning-framework-2016-2020>
- Green Growth Knowledge Platform. (n.d.). Africa. <https://www.greengrowthknowledge.org/region/africa>
- Haines, A., McMichael, A. J., Smith, K. R., Roberts, I., Woodcock, J., Markandya, A., Armstrong, B. G., Campbell-Lendrum, D., Dangour, A. D., Davies, M., Bruce, N., Tonne, C., Barrett, M., & Wilkinson, P. (2009). Public health benefits of strategies to reduce greenhouse-gas emissions: Overview and implications for policy makers. *The Lancet*, 374(9707), 2104–2114. <https://www.sciencedirect.com/science/article/pii/S0140673609617591>
- Hoegh-Guldberg, O., Jacob, D., Taylor, M., Bindi, M., Brown, S., Camilloni, I., Diedhiou, A., Djalante, R., Ebi, K., Engelbrecht, F., Guiot, J., Hijjoka, Y., Mehrotra, S., Payne, A., Seneviratne, S. I., Thomas, A., Warren, R., ... Zhou, G. (2018). Impacts of 1.5°C global warming on natural and human systems. Global warming of 1.5°C: An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. <https://research-repository.uwa.edu.au/en/publications/impacts-of-15%C2%BAc-global-warming-on-natural-and-human-systems>
- Johansson, K. A., Tolla, M. T., Memirie, S. T., Miljeteig, I., Habtemariam, M. K., Woldemariam, A. T., Verguet, S., & Norheim, O. F. (2019). Country contextualisation of cost-effectiveness studies: Lessons from Ethiopia. *BMJ Global Health*, 4(6), e001320. <https://gh.bmj.com/content/4/6/e001320>
- Markandya, A., Sampedro, J., Smith, S. J., van Dingenen, R., Pizarro-Irizar, C., Arto, I., & González-Eguino, M. (2018). Health co-benefits from air pollution and mitigation costs of the Paris Agreement: A modelling study. *The Lancet Planetary Health*, 2(3), e126–e133.
- McMichael, A. J., Campbell-Lendrum, D. H., Corvalán, C. F., Ebi, K. L., Githeko, A., Scheraga, J. D., & Woodward, A. (2003). *Climate change and human health: Risks and responses*. World Health Organization.
- Medhin, H. A., & Mekonnen, A. (2019). Green and climate-resilient transformation in Ethiopia, *The Oxford handbook of the Ethiopian economy*. Oxford University Press.
- Mitike, G., Motbainor, A., Kumie, A., Samet, J., & Wipfli, H. (2016). Review of policy, regulatory, and organizational frameworks of environment and health in Ethiopia. *The Ethiopian Journal of Health Development*, 30(1 Spec Iss), 42–49.
- MSF. (2021). Health facilities targeted in Tigray Region, Ethiopia. *Médecins Sans Frontières (MSF) International*. <https://www.msf.org/health-facilities-targeted-tigray-region-ethiopia>
- National Planning Commission. (2016). Growth and transformation plan II (GTP II) (2015/16-2019/20). Vol. I: Main text. <https://ethiopia.un.org/sites/default/files/2019-08/GTPII%20%20English%20Translation%20%20Final%20%20June%2021%202016.pdf>
- Norheim, O. F., Ezekiel, J. E., & Millum, J. (2019). *Global Health Priority-Setting: Beyond Cost-Effectiveness*. Oxford University Press.
- Norheim, O. F., Jha, P., Admasu, K., Godal, T., Hum, R. J., Kruk, M. E., Gómez-Dantés, O., Mathers, C. D., Pan, H., Sepúlveda, J., Suraweera, W., Verguet, S., Woldemariam, A. T., Yamey, G., Jamison, D. T., & Peto, R. (2015). Avoiding 40% of the premature deaths in each country, 2010–30: Review of national mortality trends to help quantify the UN Sustainable Development Goal for Health. *The Lancet*, 385(9964), 239–252. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(14\)61591-9/abstract](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)61591-9/abstract)
- Notre Dame Global Adaptation Initiative. Notre Dame Global Adaptation Initiative—Country Index. <https://gain.nd.edu/our-work/country-index/rankings/>
- Oromia National Regional State Task Force. (2011). Oromia National Regional State: Program of plan on adaptation to climate change. [https://www.academia.edu/32904711/Oromia\\_National\\_Regional\\_State\\_Program\\_of\\_Plan\\_on\\_Adaptation\\_to\\_Climate\\_Change\\_Team\\_Members\\_Participated\\_in\\_this\\_Document\\_Preparation\\_Regional\\_Task\\_force\\_Members](https://www.academia.edu/32904711/Oromia_National_Regional_State_Program_of_Plan_on_Adaptation_to_Climate_Change_Team_Members_Participated_in_this_Document_Preparation_Regional_Task_force_Members)
- Robinson, S., Strzepak, K., & Cervigni, R. (2013). *The cost of adapting to climate change in Ethiopia: Sector-wise and macro-economic estimates* (ESSP Working Paper 53). International Food Policy Research Institute.

- Scovronick, N., Budolfson, M., Dennig, F., Errickson, F., Fleurbaey, M., Peng, W., Socolow, R. S., & Wagner, F. (2019). The impact of human health co-benefits on evaluations of global climate policy. *Nature Communications*, 10(1), 1–12. <https://www.nature.com/articles/s41467-019-09499-x>
- Shaw, C., Hales, S., Howden-Chapman, P., & Edwards, R. (2014). Health co-benefits of climate change mitigation policies in the transport sector. *Nature Climate Change*, 4(6), 427–433. <https://www.nature.com/articles/nclimate2247>
- Simane, B., Beyene, H., Deressa, W., Kumie, A., Berhane, K., & Samet, J. (2016). Review of climate change and health in Ethiopia: Status and gap analysis. *Ethiopian Journal of Health Development*, 30(1), 28–41. <https://www.ajol.info/index.php/ejhd/article/view/147317>
- Smith, K. R., Campbell-Lendrum, D., Chadee, D. D., Honda, Y., Liu, Q., Olwoch, J. M., Revich, B., & Sauerborn, R. (2014). Climate Change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, *Human Health: Impacts, Adaptation, and Co-Benefits* (pp. 709–754). Cambridge University Press.
- United Nations Development Programme. (n.d.). Ethiopia launches strategy for low-emission climate-resilient development. <https://www.undp.org/content/undp/en/home/presscenter/articles/2011/12/08/ethiopia-launches-strategy-for-low-emission-climate-resilient-development.html>
- United Nations Development Programme. (2015). Integration of poverty and sustainability into National Development Planning: Ethiopia Report. [https://www.un-page.org/files/public/page\\_ethiopia\\_scoping\\_study\\_2015.pdf](https://www.un-page.org/files/public/page_ethiopia_scoping_study_2015.pdf)
- United Nations, Department of Economic and Social Affairs, Population Division. (2019). World Population Prospects 2019, Volume I: Comprehensive Tables (ST/ESA/SER.A/426). [https://population.un.org/wpp/Publications/Files/WPP2019\\_Volume-I\\_Comprehensive-Tables.pdf](https://population.un.org/wpp/Publications/Files/WPP2019_Volume-I_Comprehensive-Tables.pdf)
- Vandyck, T., Keramidias, K., Kitous, A., Spadaro, J. V., van Dingenen, R., Holland, M., & Saveyn, B. (2018). Air quality co-benefits for human health and agriculture counterbalance costs to meet Paris Agreement Pledges. *Nature Communications*, 9(1), 4939.
- Watts, N., Adger, W. N., Agnolucci, P., Blackstock, J., Byass, P., Cai, W., Chaytor, S., Colbourn, T., Collins, M., Cooper, A., Cox, P. M., Depledge, J., Drummond, P., Ekins, P., Galaz, V., Grace, D., Graham, H., Grubb, M., Haines, A., ... Costello, A. (2015). Health and climate change: Policy responses to protect public health. *The Lancet*, 386(10006), 1861–1914. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)60854-6/abstract](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)60854-6/abstract)
- Watts, N., Amann, M., Arnell, N., Ayen-Karlsson, S., Belesova, K., Boykoff, M., Byass, P., Cai, W., Campbell-Lendrum, D., Capstick, S., Chambers, J., Dalin, C., Daly, M. E., Dasandi, N., Davies, M., Drummond, P., Dubrow, R., Ebi, K. L., Eckelman, M., ... Taylor, J. (2019). The 2019 report of The Lancet Countdown on Health and Climate Change: Ensuring that the health of a child born today is not defined by a changing climate. *The Lancet*, 394(10211), 1836–1878. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(19\)32596-6/abstract](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)32596-6/abstract)
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J. A., de Vries, W., Sibanda, L. M., ... Murray, C. J. L. (2019). Food in the anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170), 447–492. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(18\)31788-4/abstract](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)31788-4/abstract)
- World Bank. (2010). *Ethiopia—Economics of adaptation to climate change*. <http://documents.worldbank.org/curated/en/310391468340238724/Main-report>

## AUTHOR BIOGRAPHIES

**Anand Bhopal**, MBChB, MA, is a PhD Research Fellow at the Bergen Centre for Ethics and Priority Setting, Department of Global Health and Primary Care, University of Bergen, Bergen, Norway.

**Haileselassie Medhin**, PhD, is the Director of Strategy and Partnerships, Africa at the World Resources Institute, The Hague, The Netherlands.

**Kristine Børøe**, PhD, is a Professor of Medical Ethics and Philosophy of Science at the Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway.



**Ole F. Norheim**, PhD, is a Professor of Medical Ethics and the Director of the Bergen Centre for Ethics and Priority Setting, Department of Global Health and Primary Care, University of Bergen, Bergen, Norway.

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