UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

# Cleantech Innovation Policy Strategy Baseline

Cleantech Group

Global Cleantech Innovation Programme

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# Acknowledgments


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# I. Introduction

## Purpose of this document

**The Global Cleantech Innovation Programme (GCIP)** is designed to respond to the increasing global demand for environmental sustainability, climate action and to unleash the potential of cleantech innovation and entrepreneurship to help transform priority sectors and systems. Under GCIP's Theory of Change, the desired impact of the overall program is enabling innovative cleantech SMEs to significantly contribute to climate mitigation in order to attain low carbon development and job creation. Drivers which support this include sustainability, scaling up replication, ecosystem maturity, international linkage and market transformation. Four key climate change indicators - GHG concentration, sea level rise (SLR), ocean heat content and acidification - set new records in 2021 according to the World Meteorological Organization[1]. As the latest data shows, climate change continues to accelerate and while mitigation is still critical, there is growing acknowledgement that adaptation is also necessary.

This report is one of the first steps of the Pillar 2 activity addressing Cleantech Innovation and Entrepreneurship Ecosystem (CIEE) strengthening and connectivity. Pillar 2 will support the strengthening of national cleantech ecosystems of GCIP partner countries, the identification of synergies across national ecosystems, and the connection of different ecosystems for knowledge exchange and partnership building. The purpose of this report is to document A) climate transition readiness, defined as GCIP partner countries' ability to respond to mitigation, adaptation and resilience needs provoked by climate change and B) high-level climate and innovation/entrepreneurship policy in the countries. At this early stage in the project there is no attempt to make recommendations or identify specific policy gaps. For details of how this baseline report fits into the workplan of the GCIP Global Component 2 see **Appendix 1**.

## Methodology

### General Approach

In this section we describe our approach, scenarios, sources and key uncertainties and limitations. A full list of sources is included in the Bibliography.

The overall approach builds on the GCIP Theory of Change (see **Appendix 2**). Individual countries are vulnerable to a range of climate risk factors, creating challenges in industrial sectors ranging from agriculture to water. While all countries need to participate in the global efforts of mitigation, each country also needs to be able to respond to the very real and near-term need to adapt to climate change in a way that is unique to their own specific challenges, resources and capabilities.

Countries and leading economic engines (e.g., cities) should consider two basic facets of cleantech innovation: first, presence of technologies and business models needed to address local and national climate challenges, and second, the potential of those technologies to scale up to have an impact on the country level, the region and globally. Addressing these two innovation facets will require both policies responding to climate change and policies to support cleantech

1 ArcGIS StoryMaps. "State of the Global Climate 2021," August 26, 2022. https://storymaps.arcgis.com/stories/bbe6a05f6dae42f2a420cfdd7698e4b1.

innovation and entrepreneurship. The climate policy should address the necessary mitigation and adaptation efforts. Innovation and entrepreneurship policies should support multiple vectors of development: fostering local innovation to meet local needs, attracting international innovation to address unmet needs and connecting to local and international resources and/or demand owners that can support the scale up of effective innovation to create impact.

## Country context: indicators and strategic priorities

GCIP partner countries have set out their development priorities in national policies and strategies which lay out their main economic and development goals over the next 10-20 years. We have included these priorities in the general overview of each country profile, section a "Country overview and strategic priorities", as they provide important context for the country's mitigation and adaptation efforts, which must be balanced against the need for continued economic growth. Section a. also includes general overview information for each country, as well as priority sectors for mitigation and adaptation efforts, as defined by the country.

## Mitigation Potential

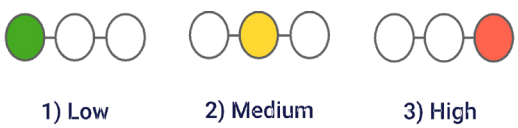
CO2 emissions in 2020 for each GCIP partner country are taken from Global Carbon Atlas and validated against other sources. Each country has prepared a Nationally Determined Contribution (NDC) document, and sectors with key mitigation potential were taken from these documents. It is useful to note that sectors identified by the country as having potential for mitigation are not always the sectors responsible for the greatest amount of emissions. Results are shown for each country in section b. Mitigation potential.

## Climate Vulnerability

We have used a two-step process to evaluate climate vulnerability. We start by identifying the physical risks created by climate change in the country's key demand centers (cities). We then analyze the projected impact on industrial sectors at country level. The results are shown for each country in section c. Physical climate risk analysis and adaptation needs.

### *Climate Risk*

We use *Sust Global's* climate analytics platform to model the evolution of physical risks associated with climate change for key cities in each of the GCIP partner countries[2]. Key cities are defined as largest population and demand centers and identified by the GCIP team in consultation with key national stakeholders. The model gives outputs categorizing overall risk as low, medium or high, for six climate-related hazards: wildfires, inland flooding, heatwaves, water stress, sea level rise and tropical cyclones.




Hazard risks are modeled over the period 2020 to 2100, for both high-emissions scenarios and strong mitigation scenarios. **Appendix 3** contains detailed information on these scenarios, and specific values for the ranges and parameters.

2 See Appendix 3 for more information on Sust Global's platform

Physical climate risk can point to specific adaptation needs, for example flooding or drought, which impacts crop harvests. These risks can also highlight wider societal impacts, for example higher temperatures or increased humidity, that could contribute to lower productivity or trigger health issues.

### *Sectors at Risk*

Building on the geospatial data from *Sust Global*, additional inputs to country-level adaptation risk are evaluated using NGAIN data3. This model allocates a numerical score to the vulnerability of key sectors: food, water, health, ecosystem services, human habitat, infrastructure, economic readiness, governance readiness, social readiness. We use this model to evaluate sectors to identify the demand for adaptation and the risk of not innovating. Sectors at risk are those sectors with the worst scores highlighted by NGAIN.

Each of these impact vectors leads to changing demand which should be met where possible by cleantech solutions. For example, heatwaves are likely to lead to increased demand for cooling. Policy can put cleantech solutions at the forefront, for example, by setting mandatory energy efficiency targets for buildings. Crop yields at risk from changing climatic conditions can be improved with resilient seed varieties, which may result from research collaborations. High levels of emissions from fossil fuel-powered vehicles can be mitigated with the help of carbon pricing and policies promoting EV usage.

## Climate and Innovation Policy Evaluation

Next, we conducted an initial high-level review to document Climate, Innovation and Entrepreneurship (CIEE) policies) already in place. Climate policies are those addressing both mitigation and adaptation. Innovation policies are those aiming to develop cleantech, general innovation and entrepreneurship, increase participation of women and youth in entrepreneurial activities, and sustainable finance. Exhibit 1 shows key policy areas and top-level policy responses.

## Exhibit 1. Cleantech Innovation & Entrepreneurship Policy Tracker

**Cleantech Innovation & Entrepreneurship Policy Tracker**

| | POLICY AREA | DETAILS |
|---|---|---|
| CLIMATE | Adaptation | • National Adaptation Plan<br>• Sector-specific adaptation strategies |
| | Mitigation | • Net zero target<br>• Sector-specific emissions reduction targets<br>• Carbon pricing<br>• Sustainable resource use (Circular Economy, waste management or other sustainable resource usage strategies and targets) |
| INNOVATION | Cleantech as a priority sector | • Initiatives which specifically address cleantech at national level |
| | Support for innovation / SMEs | • Programs to support R&D and early stage innovation, facilitate private sector innovation and entrepreneurship, build entrepreneurial culture |
| | Support for women & youth inclusion | • Policies which promote gender equality<br>• Policies which promote gender and youth participation in innovative and/or entrepreneurial activities |
| | Sustainable finance | • Government-issued green bonds or other sustainable finance mechanisms<br>• Initiatives which facilitate private investment in the cleantech sector |

3 Notre Dame Global Adaptation Initiative. "Country Index / University of Notre Dame." Accessed May 28, 2022. https://gain.nd.edu/our-work/country-index/.

## *Criteria for inclusion into the policy tracker*

**Adaptation**: the National Adaptation Plan forms the foundation of a country's adaptation response to climate change, by identifying medium and long-term adaptation needs and developing strategies and programs to address those needs. A more robust response includes specific strategies to address adaptation needs in those sectors identified as most vulnerable.

**Mitigation**: a net zero target signifies a clear intention to address country-level GHG emissions, and binding, sector-specific emissions reduction targets provide a means to achieve the overall target. Carbon pricing is also included in mitigation: as well as facilitating a shift from fossil fuel-based technologies, it promotes innovation by enhancing the ability of new technologies to compete with incumbents. Sustainable resource use-related policies promote better waste management and reduced use of natural resources including water, minerals, metals and hydrocarbons.

**Cleantech as a priority sector**: ecosystems where specific policy support for cleantech exists see faster growth of cleantech innovation and entrepreneurship. Policy may specify cleantech, green technologies or green economy, or address specific thematic areas such as circular economy, energy and other cleantech sectors.

**Support for innovation/SMEs:** policies to support general innovation in the country will indirectly support cleantech innovation and entrepreneurship, as well as help to create a wider entrepreneurial culture.

**Support for women and youth inclusion**: the foundation of gender and youth inclusion is laid by policies promoting equality generally. A higher level of impact is achieved by policies aimed specifically at increasing female, youth and vulnerable groups' participation in innovative, entrepreneurial or climate change response-related activities.

**Sustainable finance**: government-facilitated financing frameworks in the form of direct support, green bonds or other de-risking mechanisms can help channel more investment into clean technology innovation.

## *Policy Score*

The high-level assessment of each country's current baseline yields an evaluation of:

1) Limited: Inexistent or highly insufficient policy in this area
2) Developing: Some key policies exist, others are in development
3) Mature: policies have been implemented and are largely sufficient to address key challenges and/or meet targets


Scores for individual policy areas are combined to provide overall country scores for climate policy and innovation policy (see Exhibit 2). **Appendix 4** contains detailed scoring information for each country.

## Exhibit 2. Policy areas scoring

**Policy Areas Scoring**

| | POLICY AREA | SCORE: LIMITED | SCORE: DEVELOPING | SCORE: MATURE |
|---|---|---|---|---|
| CLIMATE | Adaptation | • National Adaptation Plan has not been implemented | • National Adaptation Plan has been implemented | • National Adaptation Plan has been implemented<br>• Sector adaptation strategies for key vulnerabilities have been implemented |
| CLIMATE | Mitigation | • No net zero target or policy addressing mitigation<br>• Waste management strategy | • Net Zero target and some policies to achieve it<br>• Carbon pricing in place<br>• Circular economy strategy implemented | • Net zero target and some policies to achieve it<br>• Carbon pricing in place<br>• Sectoral emissions reductions targets<br>• Sustainable resource use, including circular economy, waste management or other strategies and targets |
| INNOVATION | Cleantech as a priority sector | • No cleantech or green economy-specific policy | • Policy promoting cleantech | • Policy promoting cleantech<br>• Cleantech identified as a priority for the country |
| INNOVATION | Support for innovation / SMEs | • No innovation / entrepreneurship strategy exists | • SME / Innovation strategy has been implemented | • SME / Innovation strategy has been implemented<br>• Targeted initiatives to support e.g., R&D, commercialisation, small business creation |
| INNOVATION | Support for women & youth inclusion | • No policies promoting gender equality | • Policies which promote gender equality at national level | • Policies which promote gender equality at national level<br>• Policies aimed at increasing gender and youth participation in entrepreneurial activities |
| INNOVATION | Sustainable finance | • No sustainable finance initiative | • Green bonds or other mechanisms | • Green bonds or other mechanisms<br>• Initiatives facilitating private investment in cleantech |

## Country Groupings

In the Executive Summary we group GCIP partner countries into three broad categories. While the main inputs to these categories are climate policy and innovation policy scores, we also considered GDP per capita, results of interviews with GCIP partner country policy makers and other stakeholders, as well as an initial analysis of the CIEE in the countries, in terms of volume of startups, investors and entrepreneurial support organizations. Finally, we looked for coherence between implemented policy and the country's strategic, mitigation and adaptation objectives.

## Definitions

For definitions of key terms relevant to Cleantech and Cleantech Innovation and Entrepreneurship Ecosystems, see **Appendix 5**.

# II. Executive Summary

This report documents, at a high-level, the initial baseline of exposure to climate change and the policies addressing local response to climate change through innovation, either in terms of mitigation or adaptation, in nine Global Cleantech Innovation Programme (GCIP) partner countries: **Cambodia, Indonesia, Kazakhstan, Moldova, Morocco, Nigeria, South Africa, Turkey and Uruguay**.

Policy is a key driver of market and investment behavior. As countries around the world evaluate and plan their response to climate change, the policy framework is an essential tool to facilitate the innovation that will lead to breakthrough solutions, stimulate demand to enable commercial adoption and scale up of climate-friendly alternatives, and channel sufficient private investment to transform markets.

As climate change effects accelerate, countries must adjust their course: mitigation efforts must continue, while adjusting to incorporate adaptation needs. The intricate relationship between biodiversity loss and nature's ability to regulate GHG emissions is becoming clearer[4] and places increased emphasis on the preservation of natural resources and ecosystems. Global events compound the challenge: the ongoing COVID pandemic puts pressure on domestic healthcare systems which may also need to reconfigure to respond to climate emergencies. In some parts of the world supply chain issues are hindering deployment of clean technology solutions. Many countries are also experiencing repercussions from the war in Ukraine in the form of rapidly increasing food and energy prices or loss of a key customer segment.

There is a flip side: shifting demand patterns, supply chain realignments and an overarching need for alternative, low carbon, climate-resilient or circular solutions mean new opportunities for ecosystems which are organized to develop, commercialize and scale up supply of those solutions. This report documents projected climate effects on GCIP partner countries and the existing climate and innovation policy frameworks which will drive their ecosystem responses to these changing dynamics.

**GCIP partner countries face the dual challenge of balancing climate response with development goals for sustainable economic growth**. The nine partner countries participating in GCIP have their own strategic objectives and are characterized by innovation and entrepreneurship ecosystems at different stages of maturity. They are all developing and rely on continued economic growth to lift their populations out of poverty, promote equality among regions and provide inclusive, future-proof employment opportunities for all citizens. Mitigation, and adaptation initiatives must be designed with this in mind.

**GCIP partner countries already experience climate change effects and these are projected to accelerate, especially in the high emissions scenario**. Over the last century almost all GCIP partner countries have experienced rising temperatures and irregular or decreased precipitation, resulting in an increased risk of water stress and heatwaves. Localized risk from wildfires, flooding and sea level rise is also intensifying in certain countries. These effects are projected to continue or increase in both strong mitigation and high-emissions scenarios. In

4 United Nations Sustainable Development Press Release. "Tackling Biodiversity & Climate Crises Together and Their Combined Social Impacts.". June 10, 2021. https://www.un.org/sustainabledevelopment/blog/2021/06/tackling-biodiversity-climate-crises-together-and-their-combined-social-impacts/.

the high-emissions scenario, the risk of adverse climate events accelerates in most countries from 2040 onwards.

**Food and energy security are key concerns**. GCIP partner country economies may depend on fossil fuel revenues (Kazakhstan) or resource-intensive food production methods (Uruguay). They may face high investment costs related to transforming emissions-intensive energy systems to attain country-level net zero targets (South Africa). Countries which rely on imported energy (Moldova, Turkey, Morocco) face additional challenges due to global energy price increases. Likewise, climate effects on domestic crop yields (Cambodia, Indonesia, Nigeria, South Africa, Turkey, Uruguay) require an urgent adaptation response in the face of food security concerns exacerbated by the war in Ukraine.

**Policy climate transition readiness falls into three broad categories**:

- **Early ecosystems** (Cambodia, Moldova): these countries are addressing structural economic challenges. They have made impressive efforts in key policy areas but are largely waiting for the effects to be seen. In other areas, key policies are still in development. Supply side policy interventions will help these countries to boost early-stage cleantech innovation and entrepreneurship ventures; evaluation of shifting global demand patterns as well as internal mitigation and adaptation needs can help to determine the sectors where support can yield the greatest effects.

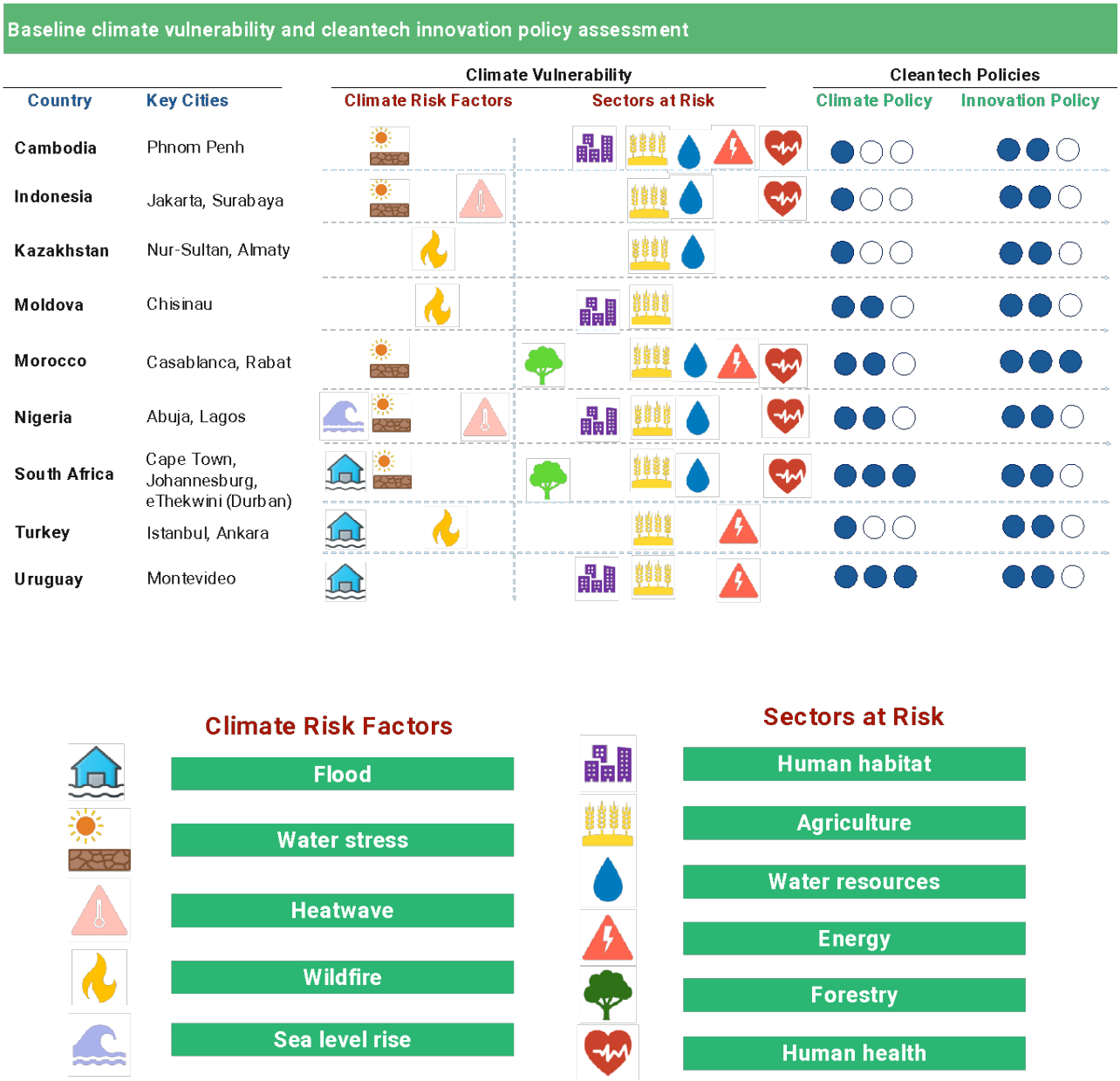
- **Poles of excellence** (Turkey, Morocco, Indonesia, Nigeria, Kazakhstan): these countries are seeing results from targeted initiatives to promote innovation and entrepreneurship. A more robust climate policy framework combined with cleantech-specific interventions would consolidate or extend achievements to the cleantech sector. Key areas of focus going forward should be to maintain successful initiatives while enhancing coherence between climate and innovation policy frameworks to support a robust CIEE capable of responding to climate needs and shifting global demand patterns.

- **Positioning for international success** (Uruguay, South Africa): Although some pillars still need to be developed or refined, these countries have fairly comprehensive climate and innovation policy frameworks which attempt to address specific mitigation and adaptation challenges the countries are facing. They are planning or implementing targeted initiatives which will support their CIEEs to respond to these challenges. These countries have CIEEs that are sufficiently mature to provide a foundation for the development of future industries and strategies connecting innovation supply with domestic, regional or international demand.

This baseline study details country by country climate impacts and high-level policy frameworks. Subsequent phases of GCIP Pillar 2 will seek to identify best practices in different aspects of CIEE strengthening, resulting in a series of reports (framework documents). We will look globally for examples of standout ecosystems at different stages of maturity, to examine and demonstrate the impact of different interventions, in terms of policy strategy, gender and youth inclusion, regional cluster development and capacity building. These global benchmarks will be used to compare GCIP partner countries and combined with detailed feedback collected from within each country on efforts to develop cleantech innovation and entrepreneurship systems strengthened at national levels and connected at the global level.

Exhibit 3 summarizes climate vulnerability and climate and innovation policies across nine GCIP partner countries.

## Exhibit 3. Baseline climate vulnerability and cleantech innovation policy assessment



# III. Country Profiles

## Cambodia

### a. Country overview and strategic priorities

Cambodia's country-level development objectives are to reduce poverty and ensure stable economic growth, reaching middle income status by 2030. National priority areas set by the government include investment in rural areas, decentralization of national governance and further integration into the ASEAN and international communities.


### Table 1. Cambodia: General Characteristics

| Key Indicators: Cambodia | |
|---|---|
| **Region** | Southeast Asia |
| **Population (2020)** | 16.71 million |
| **Median age of population** | 26 years |
| **GDP per capita (2020)** | US $1,543 |
| **Key cities** | Phnom Penh |
| **Key sectors with mitigation potential** | Energy; Agriculture; Food & Land use |
| **Key sectors for adaptation** | Agriculture; Coastal zones; Energy; Human health; Industry; Infrastructure (including roads, buildings and urban land use planning); Livelihoods, poverty and biodiversity; Tourism, Water resources. |

### b. Mitigation potential

Cambodia's 2020 GHG emissions were 15Mt CO2e, and emissions are increasing as the country develops. Almost half of Cambodia's emissions originate from Food and Land Use (FOLU), with a further 22% from the energy sector.

Cambodia's Nationally Determined Contribution (NDC) projects a 41.7% emissions reduction compared with the Business As Usual (BAU) case by 2030. The main sectoral focus for emissions reduction is the FOLU sector, with contributions from energy, agriculture, industry and waste sectors.

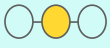
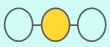
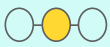
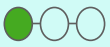
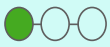
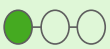
## c. Physical climate risk analysis and adaptation needs

Cambodia is highly vulnerable to extreme weather events and is already experiencing adverse effects and reduced economic growth due to climate change, since large parts of the population depend on agriculture and/or live in flood-prone areas[5].

At the country level, key effects are rising temperatures, frequent flooding and irregular rainfall[6]. Climate risk modelling for Phnom Penh shows medium risk of wildfires and flooding in both high-emissions and strong mitigation scenarios, with medium risk of heatwaves in the high emissions scenario.

Sectoral risk from climate change includes food (agriculture capacity and projected yields of cereal crops) and human habitat.

### Table 2. Phnom Penh Climate Risk Assessment, 2022-2051

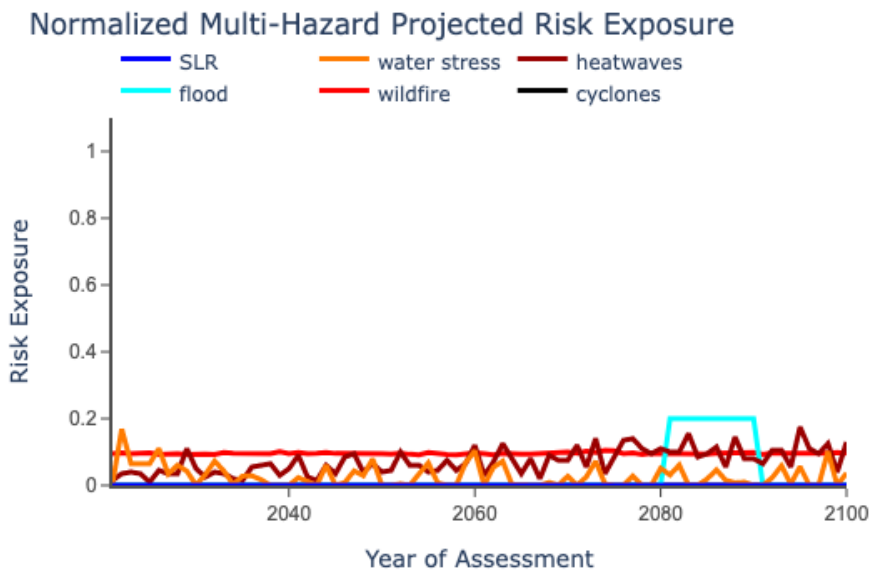
| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| High Emissions |  |  |  |  |  |  |
| Strong Mitigation |  |  |  |  |  |  |

Longer term localized projections for Phnom Penh show increased risk of flooding from 2080 in both scenarios, whereas in the high emissions scenario risk of heatwaves increases from 2060 onwards.

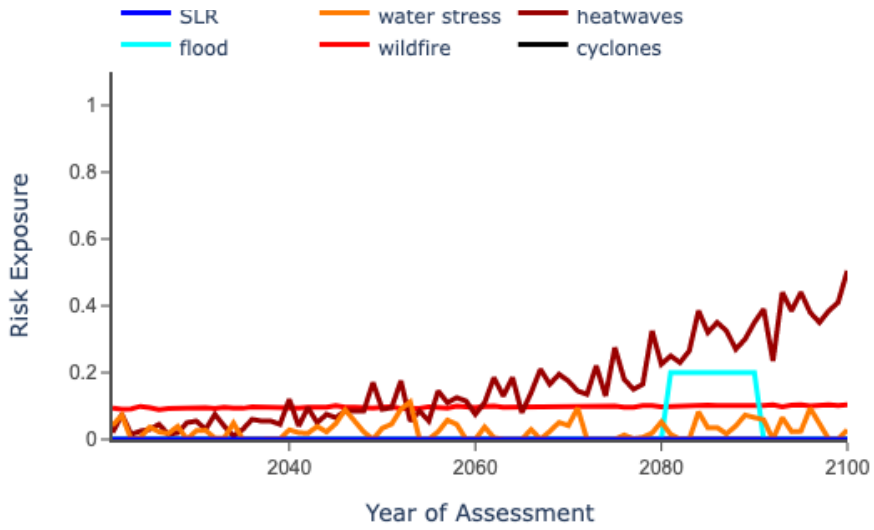
5 United Nations in Cambodia. "Information Note #16: Climate Change." Accessed May 28, 2022. https://cambodia.un.org/en/164901-information-note-16-climate-change.

6 United Nations Climate Change Nationally Determined Contributions Registry. "All NDCs." Accessed May 28, 2022. https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx.

## Graph 1. Phnom Penh projected hazard risk: Strong Mitigation Scenario




## Graph 2. Phnom Penh projected hazard risk: High Emissions Scenario



## d. Policies and commitments

Cambodia has submitted a National Adaptation Plan, but sector-specific strategies or plans have not been developed. On mitigation, Cambodia recently ratified the Kyoto protocol but has not set a net zero target, although some sector-specific emissions reductions targets are included in Cambodia's NDC, Cambodia's Circular Economy Strategy and Action plan is still under development.

Little cleantech-specific support exists, and existing policy has not been updated. Cambodia has implemented limited policies aimed at SMEs and entrepreneurship; a more comprehensive policy framework would certainly deliver increased impact. Likewise, while some sector-specific policies targeting gender and youth inclusion exist, they do not specifically target participation in entrepreneurial activities. Finally, the Climate Change Financing Framework is a first step, providing guidance but no concrete support to facilitate financing of clean technology investments.

**Adaptation Policy Score "Developing":** Some key policies exist, others are in development

- Cambodia has submitted a National Adaptation Plan
- Sector-specific strategies and/or plans have not been developed

**Mitigation Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- Cambodia does not have a formal net zero target
- Cambodia does not have a carbon pricing scheme
- Cambodia's NDC includes some sector-specific emissions reduction targets
- Cambodia doesn't have waste management strategy
- Cambodia doesn't have policies targeting circular economy commitments
- Circular Economy Strategy and Action plan is still under development

**Cleantech as a priority sector Policy Score "Developing"**: some key policies exist, others are in development

- Cambodia has implemented a national strategic plan on green growth
- Cambodia hasn't identified cleantech as a priority for the country

**Support for innovation / SMEs Policy Score "Developing"**: some key policies exist, others are in development

- Cambodia has adopted National Programme for the Greening of SMEs
- Cambodia has established government trust fund "Entrepreneurship Development Fund"
- Cambodia doesn't have targeted initiatives to support e.g., R&D, commercialisation, small business creation

**Support for women & youth inclusion Policy Score "Developing"**: some key policies exist, others are in development

- Cambodia has established Gender and Climate Change Committee
- Cambodia has had Gender Mainstreaming Policy and Strategy in Agriculture and Gender and Climate Change Action Plan
- Cambodia doesn't have policies aimed at increasing gender and youth participation in entrepreneurial activities

**Sustainable finance Policy Score "Limited"**: inexistent or highly insufficient policy in this area Cambodia doesn't have green bonds or other sustainable finance mechanisms in place.

## Table 3. Cambodia: Cleantech Innovation & Entrepreneurship Policy Tracker

| Cambodia: Cleantech Innovation & Entrepreneurship Policy Tracker | | | CLIMATE POLICY: ●○○<br>INNOVATION POLICY: ●●○ |
|---|---|---|---|
| | POLICY AREA | COUNTRY EVALUATION | DETAILS |
| CLIMATE | Adaptation | ●●○ | • National Adaptation Plan submitted in October 2021<br>• In 2018 National Environmental Strategy and Action Plan until 2023 was implemented to strengthen cross-sectoral collaboration |
| | Mitigation | ●○○ | • Cambodia has ratified key UNFCCC agreements, including the Kyoto Protocol in 2002 and the Paris Agreement in 2017; no formal net zero target<br>• Committed to reducing deforestation by half by 2030 and to zero emissions in forestry sector by 2040<br>• National REDD+ Strategy 2017 –2026<br>• No carbon pricing scheme<br>• The Circular Economy Strategy and Action Plan is under development |
| INNOVATION | Cleantech as a priority sector | ●●○ | • The National Strategic Plan on Green Growth (NSPGG) 2013-2030 (2013) was prepared to move Cambodia towards a green economy |
| | Support for innovation / SMEs | ●●○ | • Adopted National Programme for the Greening of SMEs<br>• In 2019, Entrepreneurship Development Fund (EDF) was established as a government trust fund |
| | Support for women & youth inclusion | ●●○ | • Gender and Climate Change Committee sits under the Ministry of Women's Affairs<br>• Gender Mainstreaming Policy and Strategy in Agriculture 2006–2010 (MAFF 2006)<br>• Gender and Climate Change Action Plan (2014-2018) passed in 2016 includes pilot measures focused on gender aspects and the role of women in coping with climate change |
| | Sustainable finance | ●○○ | • 2015 Climate Change Financing Framework provides guidance to improve management of climate finance from domestic and international sources |

# Moldova

## a. Country overview and strategic priorities

Moldova has put sustainability at the center of its economic development, with the goal of achieving sustainable social and economic development, resilient to climate change impacts. Moldova has also committed to aligning its climate policies with those of the EU. Moldova experienced a steep economic decline following independence in 1991, due to challenges associated with transitioning from a centralized to a market economy. Despite recent and steady recovery - 2020 GDP per capita was $4,547 - its poverty rate remains high[7], with 60% of the population living in rural areas, and heavily dependent on agriculture[8]. A lack of domestic energy and raw materials makes Moldova dependent on imports.


### Table 4. Moldova: General Characteristics

| Key Indicators: Moldova | |
|---|---|
| **Region** | Europe |
| **Population (2020)** | 2.6 million |
| **Median age of population** | 38 years |
| **GDP per capita (2020)** | US $4,547 |
| **Key cities** | Chisinau |
| **Key sectors with mitigation potential** | Energy; Agriculture; Waste |
| **Key sectors for adaptation** | Agriculture; Water Resources; Forestry; Human Health; Transport; Energy |

## b. Mitigation potential

In 2020, Moldova generated 5.1 Mt of CO2[9], with the energy sector as the main source of emissions and highest emissions reduction potential. Other sectors with high potential for emissions reduction are transport, agriculture and waste.

7 Global Environment Facility. "Clean Technology Innovation Programme for SMEs and Start-Ups in the Republic of Moldova." Accessed May 28, 2022. https://www.thegef.org/projects-operations/projects/10457.

8 World Bank. "World Bank Climate Change Knowledge Portal." Accessed May 28, 2022. https://climateknowledgeportal.worldbank.org/.

9 Global Carbon Atlas. "CO2 Emissions." Accessed May 28, 2022. http://www.globalcarbonatlas.org/en/CO2-emissions.

## c. Physical climate risk analysis and adaptation needs

Moldova experiences droughts, severe weather and flooding around the major rivers, with increased flood incidence since 2000. Chisinau, home to 26% of Moldova's population, faces moderate risk from wildfires, heatwaves and water stress over the period 2022 to 2050 in both high emissions and strong mitigation scenarios.

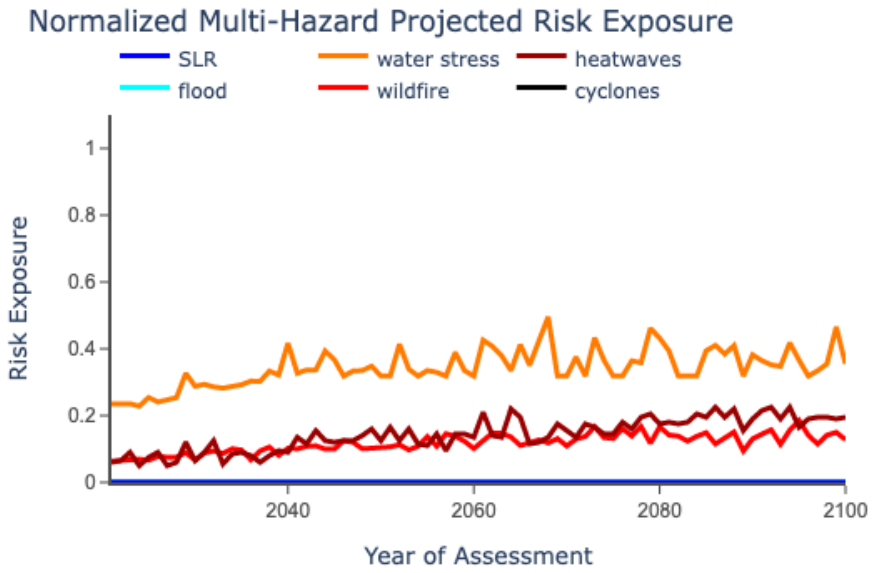
Projected hazard risks to 2100 show that risk of water stress and heatwaves remain constant, while both occurrences show steady increase from 2040 onwards in the high emissions scenario.

Key sector vulnerabilities are water and dependence on imported energy, with agricultural production at risk from reduced rainfall, and these are addressed in the country's NDC and National Adaptation Plan.

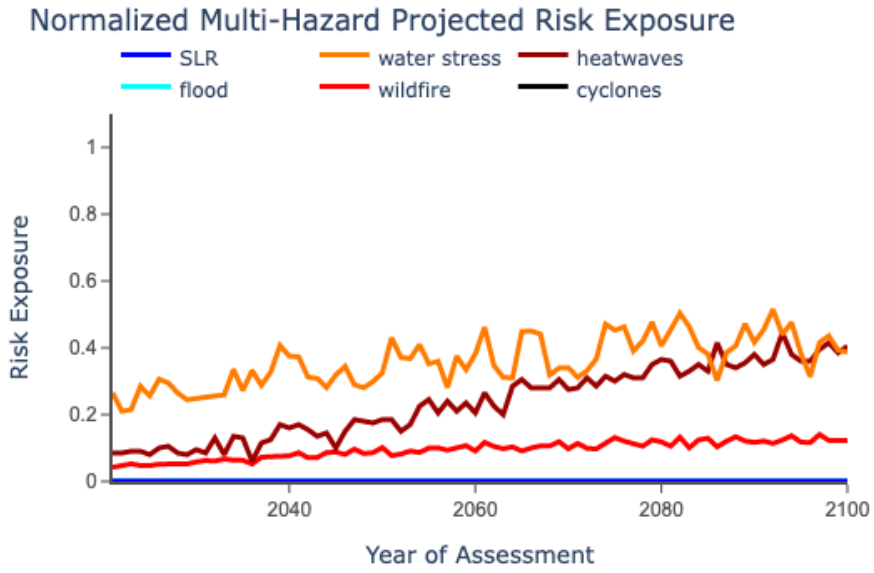
### Table 5. Chisinau Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| High Emissions | | | | | | |
| Strong Mitigation | | | | | | |

### Graph 3. Chisinau projected hazard risk: Strong Mitigation Scenario



## Graph 4. Chisinau projected hazard risk: High Emissions Scenario




## d. Policies and commitments

Moldova's climate policy score is a high 2: Although Moldova has no formal net zero target, it has adopted sector-specific emissions reduction policies and adaptation plans. The National Waste Management Strategy aims to improve the regulatory framework around waste management; as yet this is the only policy step towards sustainable resource usage. Innovation policy is less well-established. There are comprehensive measures to support SMEs, and some measures to promote commercialization of R&D. The National Program for the Greening of SMEs addresses the challenges of SMEs, but does not actively promote cleantech innovation. Sustainable financing strategies are still in development.

**Adaptation Policy Score "Developing"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Moldova has adopted Climate Change Adaptation Strategy
- Moldova has established National Commission on Climate Change
- Moldova is developing NAP on a country level but and will cover a set of sectors including resources, human health, forestry, energy & transport, agriculture

**Mitigation Policy Score "Developing"**: some key policies exist, others are in development

- Moldova doesn't have formal net zero commitment
- Moldova has approved Low Emissions Development Strategy
- Moldova has published National Waste Management Strategy
- Moldova doesn't have circular economy strategy or policies targeting circular economy commitments

**Cleantech as a priority sector Policy Score "Developing"**: some key policies exist, others are in development

- Moldova has Adopted National Programme for the Greening of SMEs
- Moldova hasn't identified cleantech as a priority for the country

**Support for innovation / SMEs Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Moldova has a dedicated National SME Agency that implements SME-related policy and offers nationally and internationally funded support schemes for SMEs
- Moldova has the Small and Medium Enterprise Sector Development Strategy and associated action plan
- Moldova has National Program for Research and Innovation
- Moldova has Law that regulates the process of creation and functioning of scientific and technological parks and innovation incubators

**Support for women & youth inclusion Policy Score "Developing"**: some key policies exist, others are in development

- Moldova has adopted the National Strategy on Ensuring Equality between women and men and the Action Plan for its implementation
- Moldova doesn't have policies aimed at increasing gender and youth participation in entrepreneurial activities

**Sustainable finance Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- Moldova doesn't have green bonds or other sustainable finance mechanisms in place

## Table 6. Moldova: Cleantech Innovation & Entrepreneurship Policy Tracker

| | Moldova: Cleantech Innovation Policy Tracker | | CLIMATE POLICY: ●●○<br>INNOVATION POLICY: ●●○ |
|---|---|---|---|
| | **POLICY AREA** | **COUNTRY EVALUATION** | **DETAILS** |
| **CLIMATE** | Adaptation | ●●● | • Climate Change Adaptation Strategy by 2020 was adopted in 2014<br>• National Commission on Climate Change established in 2020 as an inter-institutional body to coordinate and promote measures and actions for the application of the provisions of the UNFCCC and Paris Agreement<br>• National Adaptation Plan covers water resources, human health, forestry and energy & transport. A separate adaptation plan covers the agricultural sector |
| | Mitigation | ●○○ | • Moldova ratified Paris Agreement in 2017, no formal net zero commitment<br>• Low Emissions Development Strategy to the year 2030 was approved in 2017; update to increase ambition and set sector targets in progress<br>• The 2013-2027 National Waste Management Strategy of the Republic of Moldova has aimed to develop infrastructure and services |
| **INNOVATION** | Cleantech as a priority sector | ●●○ | • Adopted National Programme for the Greening of SMEs |
| | Support for innovation / SMEs | ●●● | • The National SME Agency implements SME-related policy and offers nationally and internationally funded support schemes for SMEs, including training, guarantees for loans and business consultancy<br>• The Small and Medium Enterprise Sector Development Strategy 2012-2020, and associated 2012-2020 action plan, serves as a major framework for long- and short-term policies aimed at the development of microenterprises and SMEs<br>• The National Program for Research and Innovation 2020-2023 aims to increase the effectiveness of research and innovation systems and ensure the optimal conditions in order to generate new knowledge<br>• Law no. 226 of 01.11.2018 regarding scientific and technological parks and innovation incubators regulates their process of creation and functioning |
| | Support for women & youth inclusion | ●○○ | • Moldova adopted the National Strategy on Ensuring Equality between women and men (2017-2021) in the Republic of Moldova and the Action Plan for its implementation |
| | Sustainable finance | ●○○ | • Green bonds are not established in the country; no specific initiatives to promote cleantech investments |

# Turkey

## a. Country overview and strategic priorities

Turkey's 11th development plan aims to transform the economic structure for long term stability and sustainability, and to boost productivity and international competitiveness through breakthroughs in education, technology and innovation capacity. The country is undergoing rapid industrialization and urbanization, and its NDC prioritizes sustainable growth.


### Table 7. Turkey: General Characteristics

| Key Indicators: Turkey | |
|---|---|
| **Region** | Western Asia |
| **Population (2020)** | 84.33 million |
| **Median age of population** | 31.5 years |
| **GDP per capita (2020)** | US $8,536 |
| **Key cities** | Istanbul, Ankara |
| **Key sectors with mitigation potential** | Energy; Waste; Agriculture |
| **Key sectors for adaptation** | Water resources management; Agricultural sector and food security; Ecosystem services, Biodiversity and forestry; Natural disaster risk management; Public health |

## b. Mitigation potential

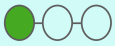
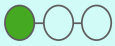
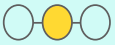
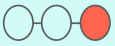
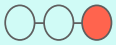
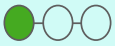
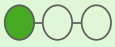
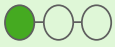
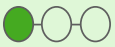
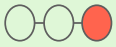
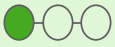
Turkey's GHG emissions rose steeply from 216 Mt CO2e in 2000 to 393 Mt in 2020. The energy sector accounts for 70.2% of total emissions: in spite of abundant renewable potential, a large part of Turkey's energy consumption comes from imported fossil fuels. Further mitigation potential comes from industrial processes, waste and agriculture. Turkey's NDC also includes specific mitigation plans for forestry, transport and buildings.

## c. Physical climate risk analysis and adaptation needs

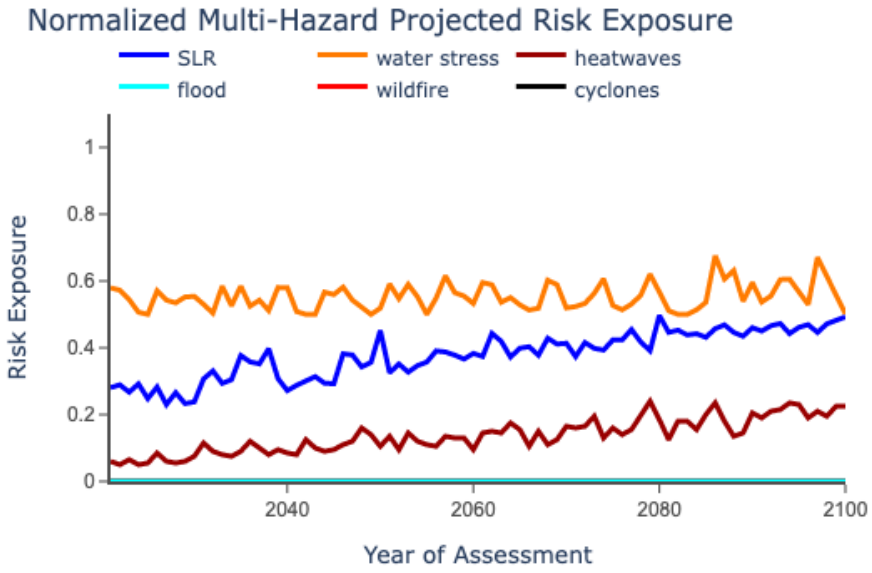
Turkey is already experiencing increased temperatures, irregular precipitation and extreme weather events. At-risk sectors include agriculture (change in cereal yields), ecosystem (change in marine biodiversity) and dependence on imported energy.

Istanbul faces high risk of sea level rise in both scenarios. In the high emissions scenario, there is also high risk of water stress, and medium risk of heatwaves. The strong mitigation scenario carries medium risk of water stress. Longer term projections show the risk of sea level rise and heatwaves increases from 2040 onwards in the strong mitigation scenario, while both hazards increase on a linear trajectory in the high emissions scenario. Risk of water stress also increases in the high emissions scenario, although more slowly.

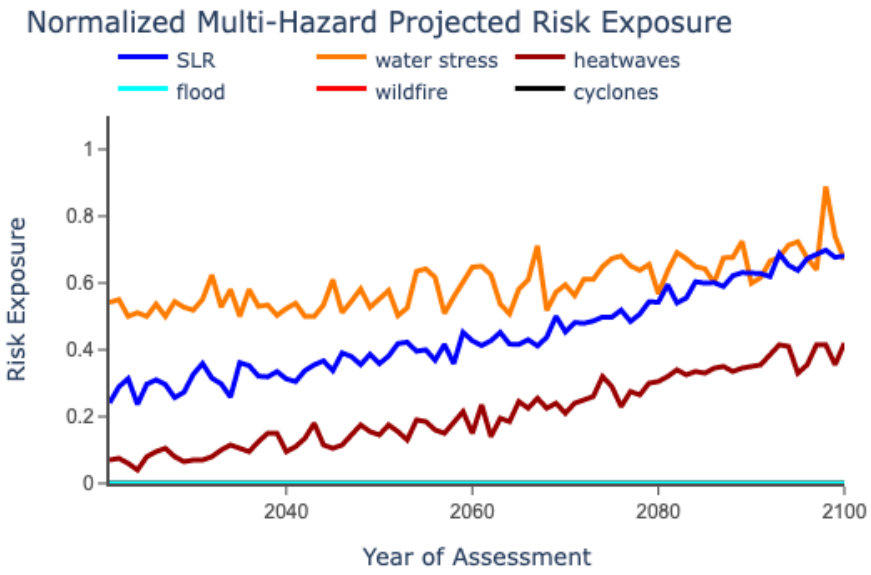
## Table 8. Istanbul Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| High Emissions |  |  |  |  |  |  |
| Strong Mitigation |  |  |  |  |  |  |

## Graph 5. Istanbul projected hazard risk: Strong Mitigation Scenario



## Graph 6. Istanbul projected hazard risk: High Emissions Scenario

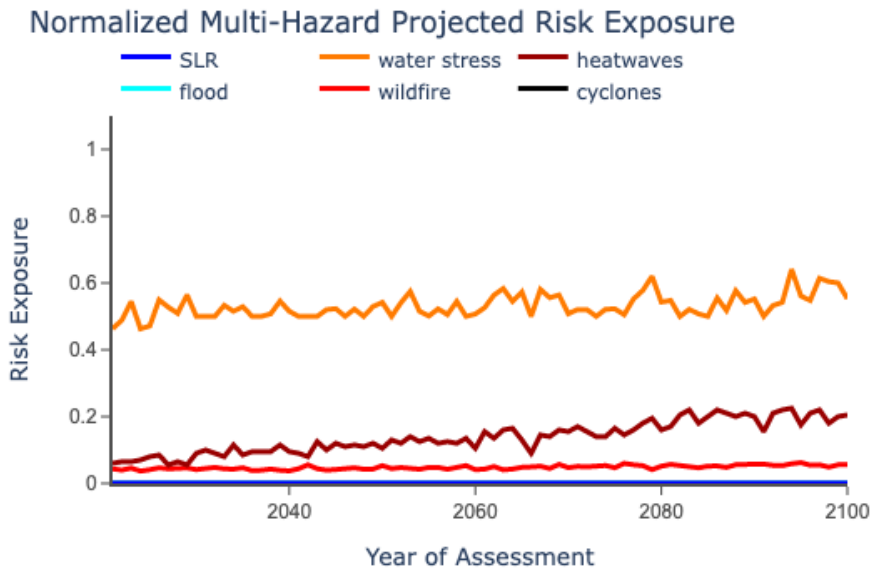



On a 2051 horizon, Ankara faces medium risk of fire and water stress in the strong mitiga tion scenario, with high risk of water stress and medium risk of fire and heatwaves in the high emissions scenario. Longer term projections show risk of heatwaves increases from 2040 in both scenarios, more steeply in the high emissions scenario and gradually in the strong mitigation scenario. Water stress increases gradually in the high emissions scenario, while remaining stable in the high mitigation scenario.

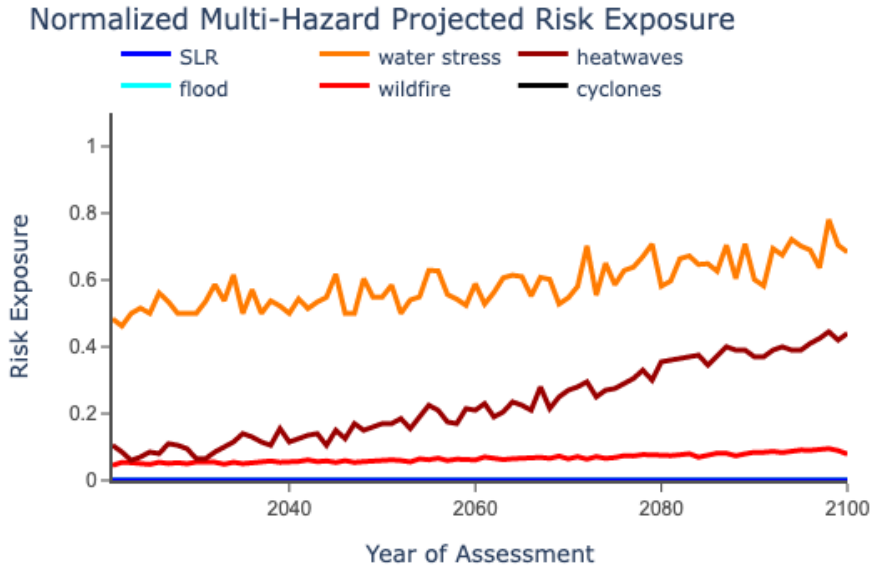
## Table 9. Ankara Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| **High Emissions** | | | | | | |
| **Strong Mitigation** | | | | | | |

## Graph 7. Ankara projected hazard risk: Strong Mitigation Scenario




## Graph 8. Ankara projected hazard risk: High Emissions Scenario



## d. Policies and commitments

Turkey has committed to limited mitigation efforts, which are not sufficient to combat rising emissions. It has not submitted a National Adaptation Plan; although it has specified strategies regarding adaptation response and sustainable resources management, these need to be translated into policy. Innovation policy pertaining to SMEs has not been updated, and there is no specific cleantech policy. The country's strategic development plan to 2023 includes ambition to increase participation of women in economic and entrepreneurial activities, and plans to implement green bonds and an ESG framework are still under development.

**Adaptation Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- Turkey has National Climate Change Adaptation Strategy and Action Plan
- Turkey hasn't submitted NAP and doesn't have sector adaptation strategies

**Mitigation Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- Turkey has net zero goal but few details are available; Turkey didn't ratify Paris Agreement
- No other policies established
- Turkey has National Strategy and Action Plan on Recycling;
- Turkey runs Zero Waste Project to contain waste under sustainable development principles
- No circular economy strategy or long-term renewable electricity generation target

**Cleantech as a priority sector Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- Turkey doesn't have clear policies to support SMEs in relation to cleantech and, furthermore, there is insufficient understanding of the policies that would enhance market development

**Support for innovation / SMEs Policy Score "Developing"**: some key policies exist, others are in development

- Turkey has new tax tariffs and tax bracket for SMEs
- Turkey has a dedicated agency KOSGEB (Small and Medium Enterprises Development Organization) for executing SME policies
- Turkey doesn't have strategic plan for innovation

**Support for women & youth inclusion Policy Score "Developing"**: some key policies exist, others are in development

- Turkey has the Action Plan on Combating Violence and Women and the National Action Plan on Women's Employment
- Turkey's 11th Development Plan includes strategies to strengthen women's participation in economic and entrepreneurial activities
- Turkey was the first country to ratify the Istanbul Convention (The Council of Europe's Convention on Preventing and Combating Violence Against Women and Domestic Violence), but withdrew from it on July 1, 2021, which sets the country backwards on violence against women
- Turkey hasn't implemented policies aimed at increasing youth participation in entrepreneurial activities

**Sustainable finance Policy Score "Developing"**: some key policies exist, others are in development

- Turkey has green/sustainable bond issued in international debt capital markets
- Turkey has announced the Economic Reform Package, which aims to promote the issuance of more green bonds
- Turkey's Treasury is working on an ESG framework that will allow it to sell bonds abroad

## Table 10. Turkey: Cleantech Innovation & Entrepreneurship Policy Tracker

| Turkey: Cleantech Innovation Policy Tracker | | | CLIMATE POLICY: ●○○ INNOVATION POLICY: ●●○ |
|---|---|---|---|
| | POLICY AREA | COUNTRY EVALUATION | DETAILS |
| CLIMATE | Adaptation | ●○○ | • National Climate Change Adaptation Strategy and Action Plan (2011-2023) provides guidelines, framework goals and sectoral targets for adaptation |
| | Mitigation | ●○○ | • Didn't ratify Paris Agreement<br>• Recently announced Net zero goal for 2053, few details available<br>• No long term renewable electricity generation target or explicit regulation to support shift from fossil to green fuels<br>• National Strategy and Action Plan on Recycling; Zero Waste Project (initiated in 2017) aims to contain waste under sustainable development principles |
| INNOVATION | Cleantech as a priority sector | ●○○ | • The SME environment is lacking clear policies to support it in relation to cleantech and, furthermore, there is insufficient understanding of the policies that would enhance market development |
| | Support for innovation / SMEs | ●●○ | • New tax tariffs were introduced with the amendments to the Income Tax Law and a new tax bracket was introduced for those whose annual income is more than TRY600,000<br>• KOSGEB is the main body for executing SME policies in Turkey. It provides several different support programmes and supports collateral costs for SMEs with considerable outreach throughout Turkey |
| | Support for women & youth inclusion | ●●○ | • Turkey adopted the National Strategy and Action Plan on Women's Empowerment (2018-2023), the National Action Plan on Combating Violence and Women (2016 -2020) and the National Action Plan on Women's Employment (2016-2018)<br>• 11th Development Plan (2019-2023) includes strategies to strengthen women's participation in economic and entrepreneurial activities<br>• Turkey was the first country to ratify the Istanbul Convention (The Council of Europe's Convention on Preventing and Combating Violence Against Women and Domestic Violence), but withdrew from it on July 1, 2021, which sets the country backwards on violence against women |
| | Sustainable finance | ●●○ | • Efforts to green the financial system have been relatively slow, with limited evidence of uptake. In March 2021, the Turkish Government announced the Economic Reform Package, which aims to promote the issuance of more green bonds<br>• Turkey's Treasury is working on an environmental, social, and governance (ESG) framework that will allow it to sell bonds abroad for the first time, with pricing tied to environmental and social goals |

# Morocco

## a. Country overview and strategic priorities

Morocco's New Model of Development sets five development priorities: prosperity, empowerment, inclusion, sustainability and regional leadership. It emphasizes the need to preserve natural resources and biodiversity, and outlines ambitions in digitalization, low carbon energy and finance. This approach is reinforced by Morocco's NDC reinforces this approach, integrating sustainable water resource and land management with a regional development plan aiming to promote local potential as well as solidarity between regions.


### Table 11. Morocco: General Characteristics

| Key Indicators: Morocco | |
|---|---|
| **Region** | North Africa |
| **Population (2020)** | 36.91 million |
| **Median age of population** | 30 years |
| **GDP per capita (2020)** | US $3,059 |
| **Key cities** | Casablanca, Rabat |
| **Key sectors with mitigation potential** | Agriculture, Industry, Housing; Energy |
| **Key sectors for adaptation** | Agriculture; Water; Forests; Fisheries and Aquaculture |

## b. Mitigation potential

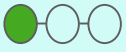
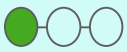
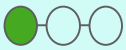
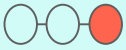
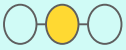
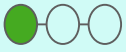
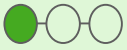
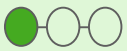
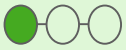
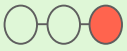
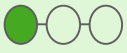
In 2020, Morocco generated 65 Mt of CO2; this amount has almost doubled over the last ten years, with the increase largely due to energy demand. The energy sector accounts for the majority of emissions. Other sectors with high mitigation potential are agriculture, industry and housing.

## c. Physical climate risk analysis and adaptation needs

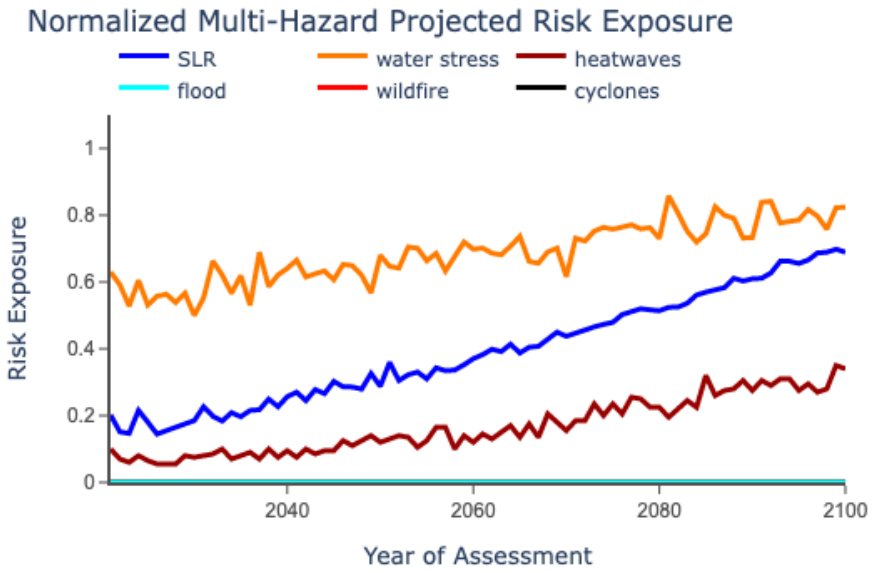
Morocco is experiencing increased temperatures and decreased precipitation, resulting in increased water stress. Principal sectors at risk from climate change effects are agriculture and water. Dependency on imported energy is also an issue.

In both scenarios Rabat sees continued high risk from water stress over the short to mid-term, and medium risk of sea level rise. On a 2100 timeframe, multi-hazard projections show that Rabat faces increasing risk from water stress, particularly in the high emissions scenario. There is increased flood risk after 2070.

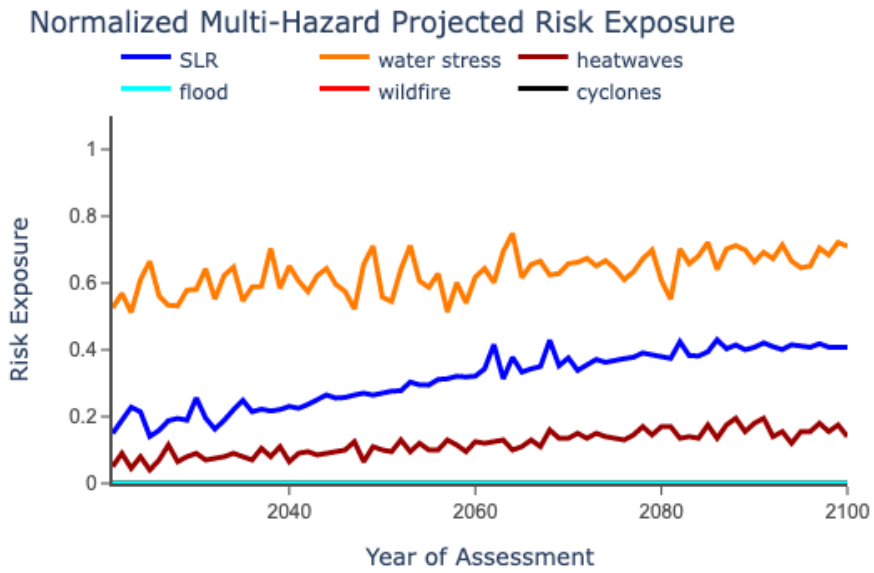
### Table 12. Rabat Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| **High Emissions** |  |  |  |  |  |  |
| **Strong Mitigation** |  |  |  |  |  |  |

### Graph 9. Rabat projected hazard risk: Strong Mitigation Scenario



## Graph 10. Rabat projected hazard risk: High Emissions Scenario

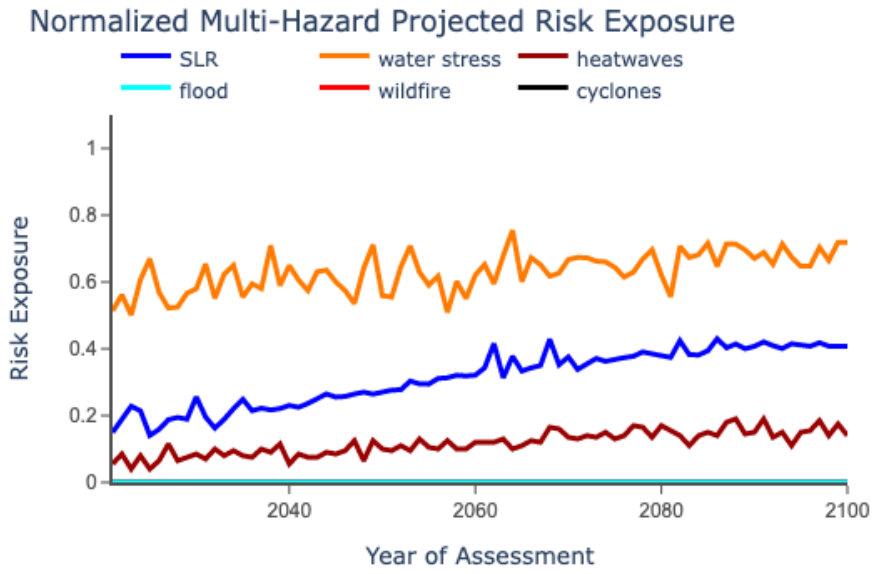



Casablanca faces medium risk of water stress and sea level rise in both scenarios, with medium risk of heatwaves in the high emissions scenario. In the strong mitigation scenario risk of sea level rise increases slowly after 2050; increasing more steeply in the high emissions scenario. Heatwaves and water stress also increase in the high emissions scenario, although more slowly.

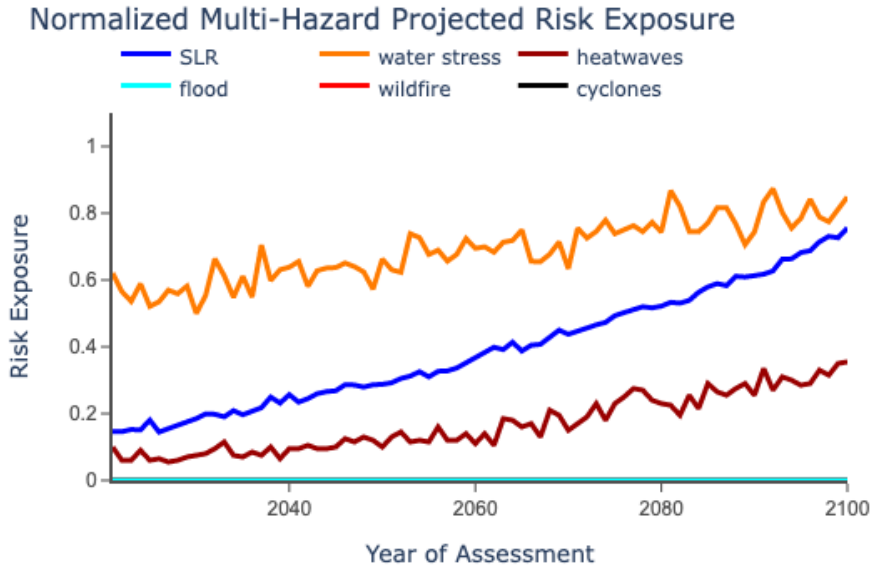
## Table 13. Casablanca Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| **High Emissions** | | | | | | |
| **Strong Mitigation** | | | | | | |

## Graph 11. Casablanca projected hazard risk: Strong Mitigation Scenario




## Graph 12. Casablanca projected hazard risk: High Emissions Scenario



## d. Policies and commitments

Morocco's adaptation plan is still in development, but it has set sector and subsector emissions reduction targets in key sectors. It also has policies dedicated to circular economy, waste recovery and biodiversity. Morocco's industrial acceleration plan is in its second iteration, and targets MSME ecosystems. There is also a policy specifically directed at clean technology. The sustainable finance framework is also well developed. On gender and youth inclusion, policy specifically encouraging entrepreneurial participation is lacking.

**Adaptation Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- Morocco has adaptation planning in progress since 2016
- Morocco has developed National Climate Change Policy

**Mitigation Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- Morocco does not have a net zero target, but has committed to 45.5% conditional reduction by 2030
- Updated NDC includes sector and subsector emissions reduction targets
- Morocco's National Strategy for Sustainable Development 2030 identified circular economy as a strategic axis
- Morocco has Plan Vert strategy for climate change with commitments to producing over half of its energy by renewables by 2030
- Morocco has identified circular economy and waste recovery as key enablers of green, inclusive economy and new job creation

**Cleantech as a priority sector Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Morocco has the industrial policy that promotes clean technology transfer and the development of sustainable technology industries in the country

**Support for innovation / SMEs Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Morocco has published Second Industrial Acceleration Plan to further strengthen MSME ecosystems
- Morocco's digital strategy targeted connection of 20% Moroccan SMEs
- Morocco has created The Institute for Research in Solar Energy and New Energies that develops applied R&D infrastructures and plays the role of a research fund

**Support for women & youth inclusion Policy Score "Developing"**: some key policies exist, others are in development

- Morocco has adopted new law on public limited companies to promote balanced representation of women and men in corporate governance bodies
- Morocco doesn't have policies aimed at increasing gender and youth participation in entrepreneurial activities

**Sustainable finance Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Morocco has well-established green bond market
- Morocco has launched Sustainable Finance Module

## Table 14. Morocco: Cleantech Innovation & Entrepreneurship Policy Tracker

| | Morocco: Cleantech Innovation Policy Tracker | | CLIMATE POLICY: ●●○<br>INNOVATION POLICY: ●●● |
|---|---|---|---|
| | **POLICY AREA** | **COUNTRY EVALUATION** | **DETAILS** |
| **CLIMATE** | Adaptation | ●○○ | • Adaptation planning in progress since 2016<br>• National Climate Change Policy developed in 2014 to coordinate climate change measures and initiatives |
| | Mitigation | ●●○ | • Morocco does not have a net zero target, but has committed to 45.5% conditional reduction by 2030<br>• No carbon pricing scheme<br>• Updated NDC includes sector and subsector emissions reduction targets<br>• National Strategy for Sustainable Development 2030 identified circular economy as a strategic axis<br>• Plan Vert strategy for climate change with commitments to producing over half of its energy by renewables by 2030, removing subsidies of fossil fuels, committing to green employment, focusing on ocean resource management and preserving aquifers<br>• Circular economy and waste recovery identified as key enablers of green, inclusive economy and new job creation |
| **INNOVATION** | Cleantech as a priority sector | ●●○ | • Morocco's industrial policy promotes clean technology transfer and the development of sustainable technology industries in the country |
| | Support for innovation / SMEs | ●●● | • Second Industrial Acceleration Plan (2021-2025) aims to further strengthen MSME ecosystems, competitiveness, and to structure high impact business models and investment opportunities through all Moroccan regions<br>• Maroc digital 2020 targeted connection of 20% Moroccan SMEs<br>• The Institute for Research in Solar Energy and New Energies (IRESEN) was created, which assumes the development of applied R&D infrastructures and plays the role of a research fund |
| | Support for women & youth inclusion | ●●○ | • In 2021 Morocco adopted new amended law on public limited companies to promote balanced representation of women and men in corporate governance bodies |
| | Sustainable finance | ●●● | • Sustainable Finance Module launched 2018<br>• Well-established green bond market (top 3 in Africa) |

# Indonesia

## a. Country overview and strategic priorities

Indonesia is experiencing continuous, stable economic growth, with projected GCIP growth of 5.5% in 2022, however 11% of the population still live below the poverty line. Strategic development goals must balance climate change response with development and poverty reduction goals. Specific development priorities include: economic resilience, regional development to address inequality among regions and environment and resilience to natural disaster and climate change impacts.


### Table 15. Indonesia: General Characteristics

| Key Indicators: Indonesia | |
|---|---|
| **Region** | Southeast Asia, and Oceania |
| **Population (2020)** | 273.5 million |
| **Median age of population** | 27.6 years |
| **GDP per capita (2020)** | US $3,870 |
| **Key cities** | Jakarta, Surabaya |
| **Key sectors with mitigation potential** | Food and land use; Energy |
| **Key sectors for adaptation** | Energy resources; Agriculture; Health; Coastal and marine ecosystems |

## b. Mitigation potential

Indonesia's 2020 GHG emissions were 590Mt CO2e, making it the 10th highest-emitting country worldwide10. Emissions are still on an upward trend, increasing by 7.5% between 2012 and 201711. The highest emitting sectors are FOLU and energy, and these are also the sectors with highest emissions reduction potential as identified in the country's updated Nationally Determined Contribution (NDC). Waste, agriculture and industry are smaller sources of GHG emissions, with the waste sector growing fastest (6.3% p.a. in the business-as-usual scenario).

10 Global Carbon Atlas. "CO2 Emissions." Accessed May 28, 2022. http://www.globalcarbonatlas.org/en/CO2-emissions.

11 Climate Transparency. "The Climate Transparency Report 2020," November 18, 2020. https://www.climate-transparency.org/g20-climate-performance/the-climate-transparency-report-2020.

## c. Physical climate risk analysis and adaptation needs

Indonesia is already experiencing temperature increases and shifts in rainfall patterns: declining rainfall in the southern regions, and overall increase in rainfall coupled with decreased dry season rainfall in the northern regions.

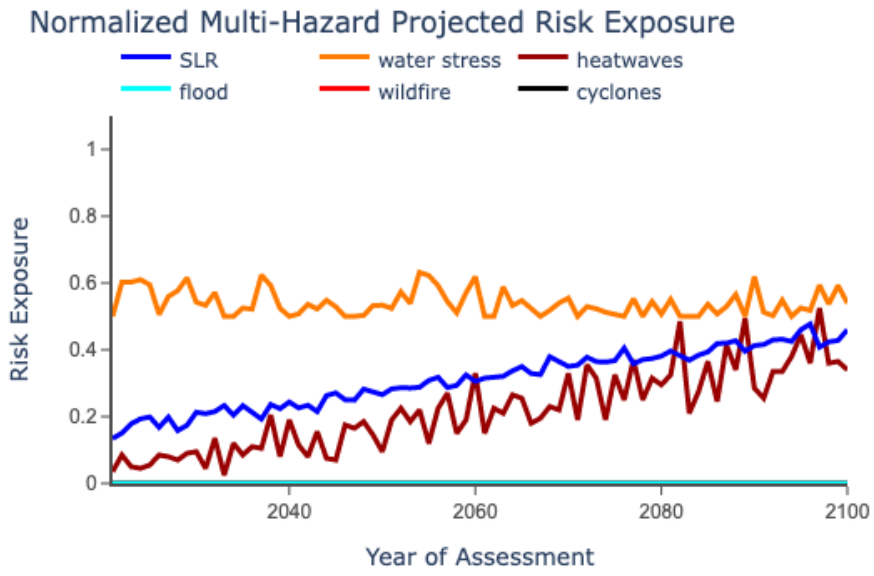
At-risk sectors which should be addressed in adaptation planning include food (cereal yields and agricultural capacity) and water (dam capacity).

Jakarta is at high risk of water stress in the strong mitigation scenario, and both water stress and heatwaves in the high emissions scenario. There is medium risk of sea level rise in both scenarios.
Both scenarios show a steady increase in frequency of water stress, heatwave and sea level rise risks between 2022 and 2100. The rate of increase is markedly steeper in the high emissions scenario.

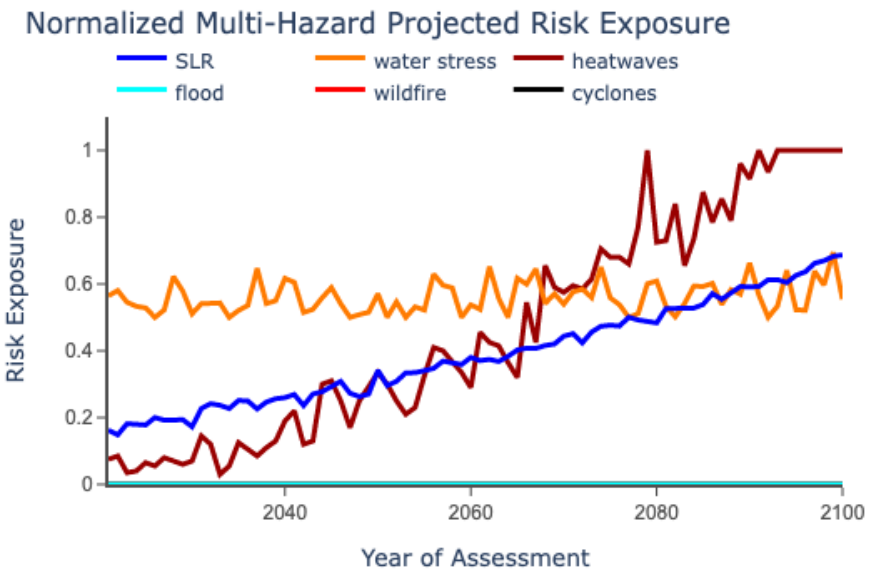
### Table 16. Jakarta Climate Risk Assessment, 2022-51

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| High Emissions | | | | | | |
| Strong Mitigation | | | | | | |

### Graph 13. Jakarta projected hazard risk: Strong Mitigation Scenario



## Graph 14. Jakarta projected hazard risk: High Emissions Scenario

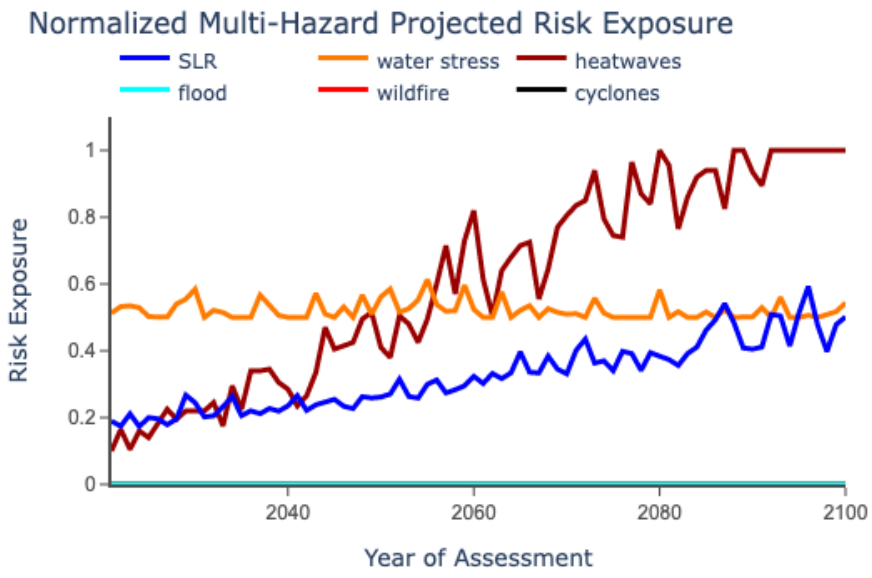



Surabaya, located south-east of Jakarta, is at high risk of heatwave and sea level rise in both scenarios. The high emissions scenario also brings high risk of water stress; medium in the strong mitigation scenario. Longer term projections show steeply increasing risk of heatwaves after 2040 in the strong mitigation scenario. Risk of sea level rise also increases. In the high emissions scenario risk sea level rise rises from 2040, accelerating after 2060. Risk of heatwaves rises sharply from 2040 onwards.

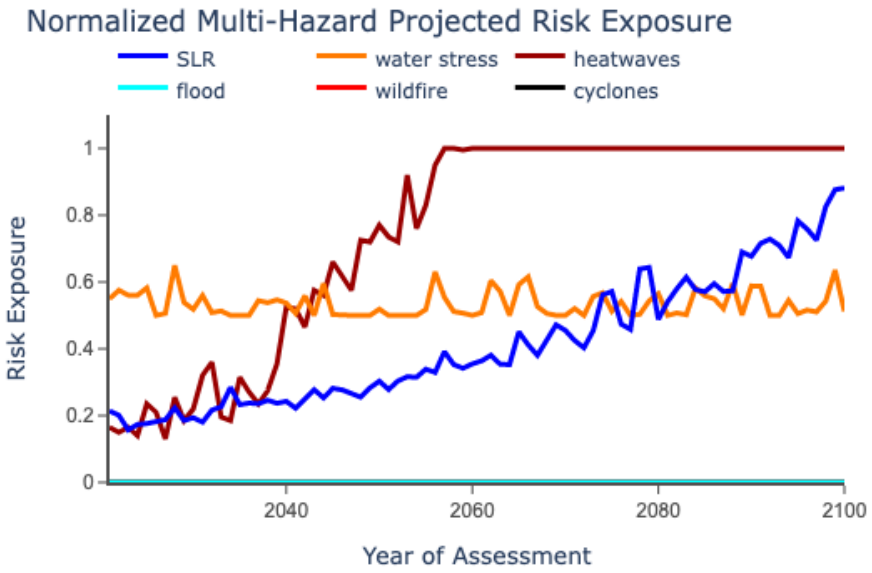
## Table 17. Surabaya Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| **High Emissions** | | | | | | |
| **Strong Mitigation** | | | | | | |

## Graph 15. Surabaya projected hazard risk: Strong Mitigation Scenario




## Graph 16. Surabaya projected hazard risk: High Emissions Scenario



## d. Policies and commitments

Indonesia's climate policy is largely insufficient: the net zero target only applies to the energy sector, and key mitigation and adaptation plans and policies are still in the development phase. A national strategy on solid waste management has been implemented.

Innovation policies are focused on funding or fiscal incentives; the Clean Technology Fund specifically supports cleantech ventures around energy efficiency and renewable energy. The National Resources for Development program specifically targets marginalized groups. There is also a comprehensive range of sustainable finance initiatives, raising Indonesia's overall innovation score.

**Adaptation Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- National Adaptation Plan is not yet formulated

**Mitigation Policy Score "Developing"**: some key policies exist, others are in development

- Net zero goals only apply to energy sector
- Indonesia has submitted Long-Term Strategy for Low Carbon and Climate Resilience 2050
- Indonesia is in the process of developing carbon pricing and a market for carbon trading
- Indonesia has National Policy and Strategy on Solid Waste Management
- Indonesia has Long-term strategy for carbon neutrality by 2060 which aims to increase use of renewable energy in key sectors
- Indonesia doesn't have circular economy strategy implemented

**Cleantech as a priority sector Policy Score "Developing"**: some key policies exist, others are in development

- Indonesia has Clean Technology Fund that supports initiatives for promotion of energy efficiency and renewable energy
- Indonesia has promoted clean energy R&D and innovation, but funding is below commitment levels

**Support for innovation / SMEs Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Indonesia has fiscal incentives for SMEs in manufacturing, agriculture, water, and other sectors
- Indonesia has tax deductions for manufacturers establishing a vocational school or training centre
- Indonesia has launched Masterplan "Making Indonesia 4.0" with the aim of revitalizing Indonesia's manufacturing industry

**Support for women & youth inclusion Policy Score "Developing"**: some key policies exist, others are in development

- Indonesia has launched National Action Plan with the goal to protect and empower women and children during conflicts
- Indonesia has established Natural Resources for Development Program with an emphasis on marginalized groups, including women
- Indonesia doesn't have policies aimed at increasing gender and youth participation in entrepreneurial activities

**Sustainable finance Policy Score "Developing"**: some key policies exist, others are in development

- Indonesia plans to develop Climate Change Fiscal Framework
- Indonesia has Sustainable Finance Roadmap that covers development of financial services and products
- Indonesia doesn't have green bonds or other mechanisms in place

## Table 18. Indonesia: Cleantech Innovation & Entrepreneurship Policy Tracker

| Indonesia: Cleantech Innovation Policy Tracker | | | | CLIMATE POLICY: ●○○ INNOVATION POLICY: ●●○ |
|---|---|---|---|---|
| | POLICY AREA | COUNTRY EVALUATION | DETAILS | |
| CLIMATE | Adaptation | ●○○ | • National Adaptation Plan not yet formulated<br>• National Action Plan on Climate Change Adaptation adopted in 2018 sets adaptation strategies for 2020-2045 | |
| CLIMATE | Mitigation | ●●○ | • Net zero goal to be achieved by 2060, only applies to energy sector<br>• Long-Term Strategy for Low Carbon and Climate Resilience 2050 submitted July 2021<br>• Regulation to develop carbon pricing and a market for carbon trading is in progress<br>• National Policy and Strategy on Solid Waste Management (2017) targets 30% waste reduction and recycling by 2025<br>• Long-term strategy for carbon neutrality by 2060, aims to increase use of renewable energy in power, transport and industry | |
| INNOVATION | Cleantech as a priority sector | ●○○ | • The Clean Technology Fund (CTF) aims to accelerate Indonesian initiatives to promote energy efficiency and renewable energy<br>• The government has promoted clean energy Research & Development (R&D) and innovation, but funding is below commitment levels, and majority of energy R&D activities remain focused on fossil fuel technologies | |
| INNOVATION | Support for innovation / SMEs | ●●○ | • New fiscal incentives for SMEs in manufacturing, agriculture, water, and other sectors<br>• 200% tax deduction for manufacturers establishing a vocational school or training centre in the country<br>• Masterplan “Making Indonesia 4.0” was launched in 2018 with the aim of revitalizing Indonesia’s manufacturing industry and readying it for the opportunities and challenges in the Fourth Industrial Revolution | |
| INNOVATION | Support for women & youth inclusion | ●●○ | • Indonesia launched its first National Action Plan (NAP) in 2014 for the period 2014-2019 with the goal to protect and empower women and children during conflicts<br>• Natural Resources for Development (NR4D) Program aims to strengthen Indonesia’s natural resource management and governance, with an emphasis on marginalized groups, including women | |
| INNOVATION | Sustainable finance | ●●○ | • In July 2020, the Indonesian Fiscal Policy Agency of the Ministry of Finance, along with the UNDP, announced plans to develop a Climate Change Fiscal Framework<br>• Indonesia’s Sustainable Finance Roadmap helps in resetting the country’s finance ecosystem, strengthening the implementation of ESG considerations and supporting innovation as well as development of financial services and products<br>• Support for renewable energy investment (including tax incentives) has improved in recent years; forthcoming Presidential Regulation on renewables should facilitate market growth | |

# Kazakhstan

## a. Country overview and strategic priorities

Kazakhstan's GDP per capita grew rapidly following independence in the early 1990s, to reach $9,122 in 2020. The government's primary economic goal is to increase GDP per capita growth to reach OECD development level by 2030.


## Table 19. Kazakhstan: General Characteristics

| Key Indicators: Kazakhstan | |
|---|---|
| **Region** | Europe |
| **Population (2020)** | 18.7 million |
| **Median age of population** | 31 years |
| **GDP per capita (2020)** | US $9,122 |
| **Key cities** | Almaty, Nur Sultan |
| **Key sectors with mitigation potential** | Energy; Agriculture; Waste; Land Use; Forestry |
| **Key sectors for adaptation** | Agriculture (crops and livestock); Water resources; Human health; Social and economic development |

## b. Mitigation potential

Kazakhstan's 2020 emissions were 291Mt. The country's NDC does not calculate emissions reduction potential by sector.

## c. Physical climate risk analysis and adaptation potential

Kazakhstan has experienced a rise in average temperatures during the 20th century, particularly since 1990, and experiences droughts and flooding12.

Key country-level areas affected by climate change include food (agriculture capacity) and human habitat (increased flood risk).

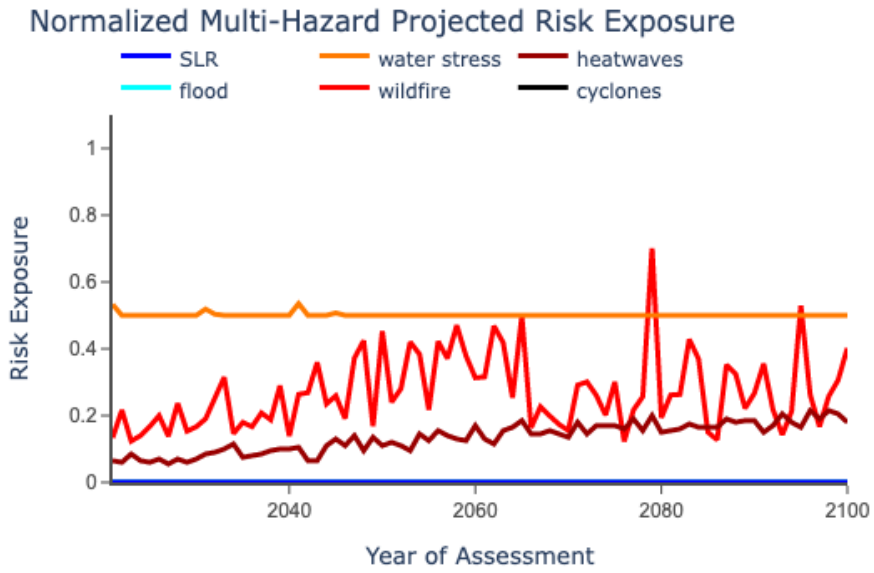
12 Climatelinks. "Kazakhstan." Accessed May 28, 2022. https://www.climatelinks.org/countries/kazakhstan.

Climate risk assessment of the two key population centers shows that Almaty has high risk of wildfires in both strong mitigation and high emissions scenarios. The high emissions scenario carries medium risk of heatwaves, and both scenarios face medium risk of water stress. Longer term projections show constant risk of water stress in the strong mitigation scenario, with variable risk of wildfires and slightly increasing heatwaves. In the high emissions scenario both wildfires and heatwaves increase from 2040 onwards.

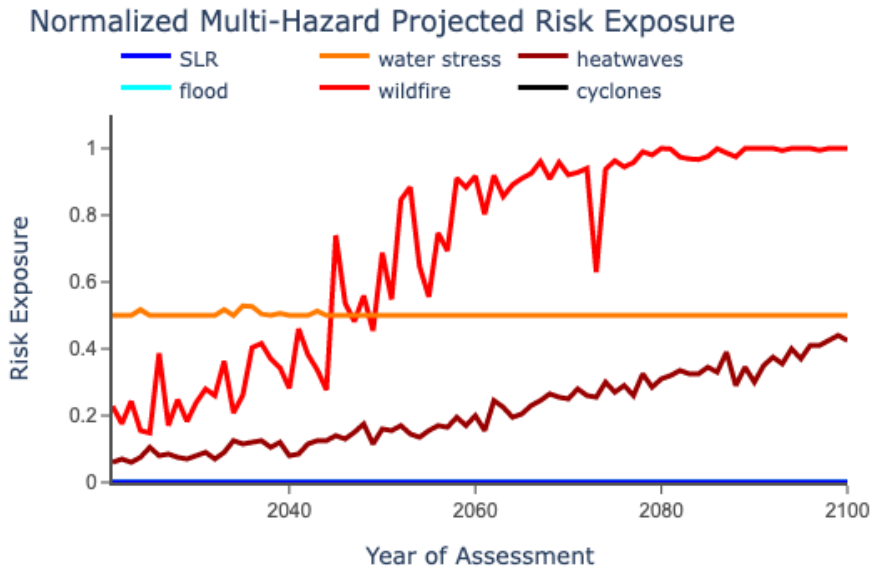
## Table 20. Almaty Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| High Emissions | | | | | | |
| Strong Mitigation | | | | | | |

## Graph 17. Almaty projected hazard risk: Strong Mitigation Scenario



## Graph 18. Almaty projected hazard risk: High Emissions Scenario

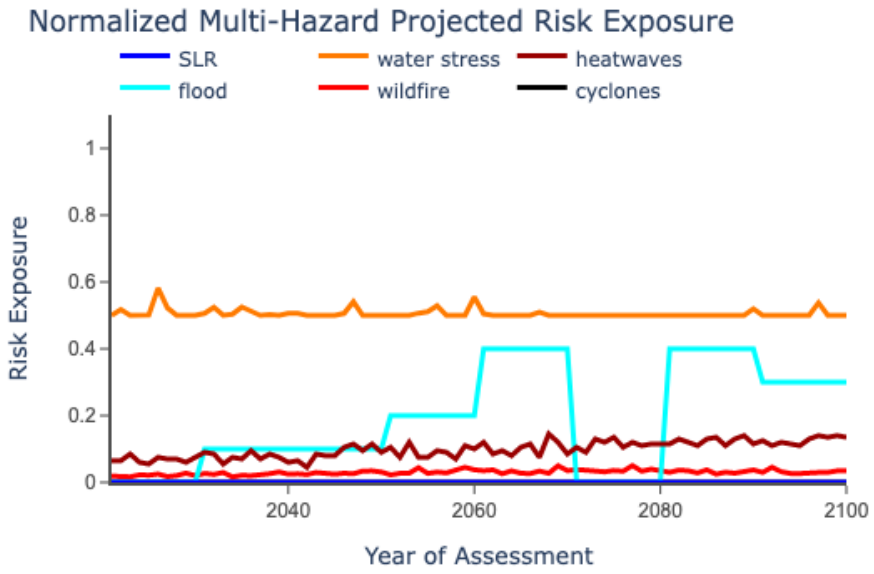



Nur Sultan faces medium risk of fire, flood and water stress in both scenarios. Flood risk increases after 2050 in both scenarios, while in the high emissions scenario risk of heatwaves increases steadily from 2060, and risk of wildfires increases more steeply, again from 2060 onwards.

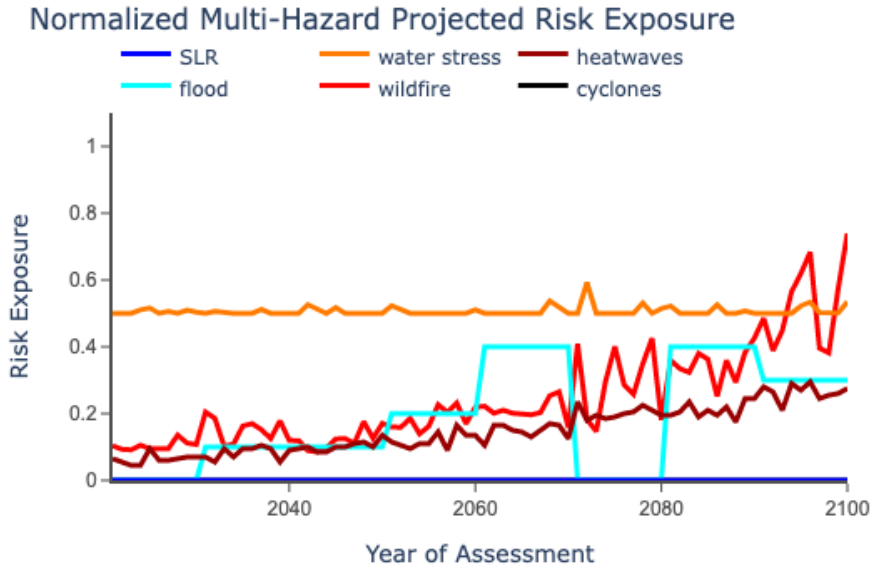
## Table 21. Nur-Sultan Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| **High Emissions** | | | | | | |
| **Strong Mitigation** | | | | | | |

## Graph 19. Nur-Sultan projected hazard risk: Strong Mitigation Scenario




## Graph 20. Nur-Sultan projected hazard risk: High Emissions Scenario



## d. Policies and commitments

Key climate policies, including a National Adaptation Plan and Circular Economy strategy, are still under development. An Emissions Trading System is in place, but the net zero strategy has not yet been implemented. Kazakhstan is stronger on innovation policy than climate policy. There is specific regulation for commercialization of scientific research as well as venture funding, and various financial instruments aimed at directing investment into innovation and attracting foreign talent.

**Adaptation Policy Score "Limited":** inexistent or highly insufficient policy in this area

- Kazakhstan's NAP has been initiated recently but not published yet
- No sector adaptation strategies

**Mitigation Policy Score "Developing":** some key policies exist, others are in development

- Kazakhstan has draft "net-zero carbon emissions by 2060" strategy
- Kazakhstan has implemented Emissions Trading System and thus has carbon pricing in place
- Kazakhstan has state programme on waste management is under preparation
- A Circular Economy Strategy was implemented as a pilot project for Almaty city
- No policies targeting circular economy commitments in key sectors

**Cleantech as a priority sector Policy Score "Developing":** some key policies exist, others are in development

- Kazakhstan has adopted multi sectoral strategy The Green Economy Concept and its action plan to increase efficiency in resources utilization
- Cleantech isn't identified as a priority for the country

**Support for innovation / SMEs Policy Score "Mature":** policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Kazakhstan has Law "On the commercialization of the results of scientific and (or) scientific and technical activities"
- Kazakhstan has Law on issues of venture financing
- Kazakhstan has extended business support programs through 2022 – the Economy of Simple Things and the Business Roadmap
- Kazakhstan has made Amendments to the Tax Code of the Republic of Kazakhstan (2018) to include regulation of Astana Hub, legal framework for venture capital investments, work visa for up to 5 years, exemption of Hub participants from foreign worker quotas and various tax advantages

**Support for women & youth inclusion Policy Score "Developing":** some key policies exist, others are in development

- Kazakhstan has adopted an Act on State Guarantees of Equal Rights and Opportunities for Men and Women
- Kazakhstan has set up a national entity to promote gender equality
- Kazakhstan has approved the Concept of Family and Gender Policy
- Kazakhstan doesn't have policies aimed at increasing gender and youth participation in entrepreneurial activities

**Sustainable finance Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- Kazakhstan's Environmental Code lists that the state guarantees funding for the commercialization of technologies in priority sectors of the economy
- Kazakhstan doesn't have green bonds or other mechanisms

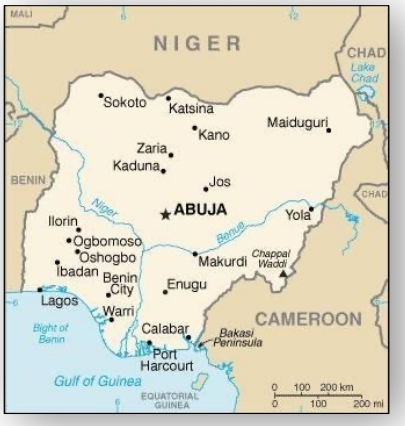
## Table 22. Kazakhstan: Cleantech Innovation & Entrepreneurship Policy Tracker

| | Kazakhstan: Cleantech Innovation Policy Tracker | | CLIMATE POLICY: ●○○ INNOVATION POLICY: ●●○ |
|---|---|---|---|
| | POLICY AREA | COUNTRY EVALUATION | DETAILS |
| CLIMATE | Adaptation | ●○○ | ▪ Currently initiating the development of its National Adaptation Plan process, financed by the Green Climate Fund |
| CLIMATE | Mitigation | ●●○ | ▪ Signed and ratified Paris agreement in 2016<br>▪ Draft "net-zero carbon emissions by 2060" strategy presented in September 2021, not yet implemented<br>▪ Implemented Emissions Trading System (ETS)<br>▪ The State programme on waste management is under preparation<br>▪ A Circular Economy Strategy was implemented as a pilot project for Almaty city |
| INOVATION | Cleantech as a priority sector | ●●○ | ▪ In May 2013, Kazakhstan adopted The Green Economy Concept to transition to a "green economy" and set a goal to generate 50 percent of its electricity from alternative and renewable energy sources by 2050 |
| INOVATION | Support for innovation / SMEs | ●●● | ▪ Law "On the commercialization of the results of scientific and (or) scientific and technical activities" dated December 28, 2015<br>▪ Law of the Republic of Kazakhstan on issues of venture financing from 4 July 2018<br>▪ Extended business support programs through 2022 – the Economy of Simple Things and the Business Roadmap that will together receive one trillion tenge (US$2.3 billion) from the budget<br>▪ Amendments to the Tax Code of the Republic of Kazakhstan (2018) include regulation of Astana Hub, legal framework for venture capital investments, work visa for up to 5 years, exemption of Hub participants from foreign worker quotas and various tax advantages |
| INOVATION | Support for women & youth inclusion | ●●○ | ▪ In 2009 the government adopted an Act on State Guarantees of Equal Rights and Opportunities for Men and Women<br>▪ The first Central Asian country to set up a national entity to promote gender equality, Kazakhstan approved in 2016 the Concept of Family and Gender Policy up to 2030, to prevent gender-based discrimination and imbalances |
| INOVATION | Sustainable finance | ●○○ | ▪ Environmental Code 2020 lists that the state guarantees funding for the commercialization of technologies in priority sectors of the economy in the manner prescribed by the legislation of the Republic of Kazakhstan |

# Nigeria

## a. Country overview and strategic priorities

Nigeria's top-level priorities are economic growth, fighting poverty and ensuring food security. Economic diversification and especially transitioning away from dependence on oil revenues are essential to achieve these goals and to create future-proof jobs for Nigeria's large youth population.




### Table 23. Nigeria: General Characteristics

| Key Indicators: Nigeria | |
|---|---|
| **Region** | Sab-Saharan Africa |
| **Population (2020)** | 206.13 million |
| **Median age of population** | 18 years |
| **GDP per capita (2020)** | US $2.097 |
| **Key cities** | Lagos, Abuja |
| **Key sectors with mitigation potential** | Energy; Agriculture; Forestry and other land use; Waste |
| **Key sectors for adaptation** | Agriculture; Water resources; Energy; Tourism; Ecosystems |

## b. Mitigation potential

In 2020, Nigeria generated 126 Mt of CO2, according to the Global Carbon Atlas. The country's updated 2021 NDC includes updated emissions estimates, putting 2018 emissions at 347 MT CO2e. The energy sector is responsible for around 60% of those emissions. Priority sectors for mitigation are agriculture, industry, power, oil and gas and transport.

## c. Physical climate risk analysis and adaptation needs

Average temperatures in Nigeria are rising at the rate of 0.19 degrees per decade. Overall precipitation is decreasing, and seasonal rainfalls are becoming less predictable13.
Sectors vulnerable to climate change effects include food (change in cereal yields and agricultural capacity), water resources, forestry, and health.

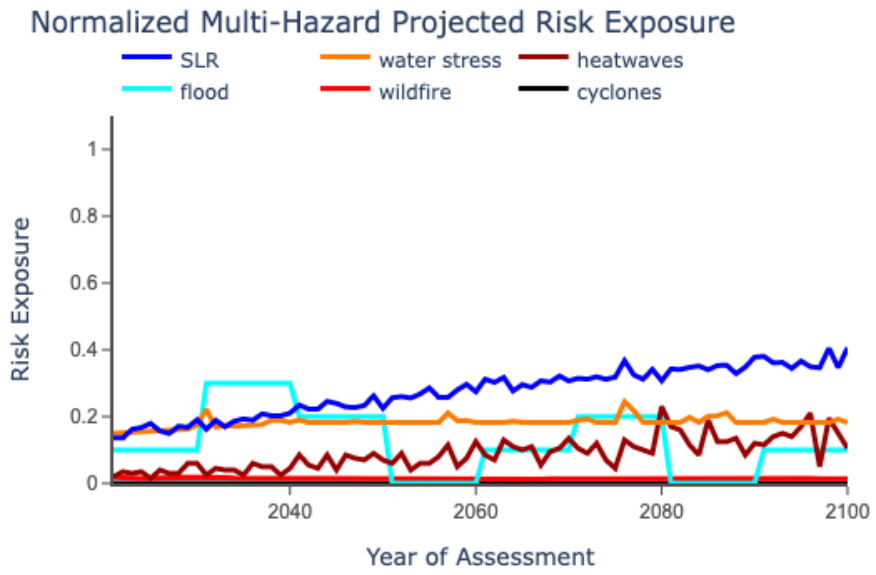
13 World Bank. "World Bank Climate Change Knowledge Portal." Accessed May 28, 2022. https://climateknowledgeportal.worldbank.org/.

We have modelled physical climate risks for Lagos and Abuja, as key Nigerian demand centers (Abuja is not big in terms of population but has significant purchasing power). In both high emissions and strong mitigation scenarios Lagos faces high risk of flooding, with medium risk of wildfires and sea level rise. Multi-hazard risks to 2100 show constant water stress and moderately increasing risk of heatwave and sea level rise in the strong mitigation scenario. The high emissions scenario leads to steep increases in heatwave and sea level rise.

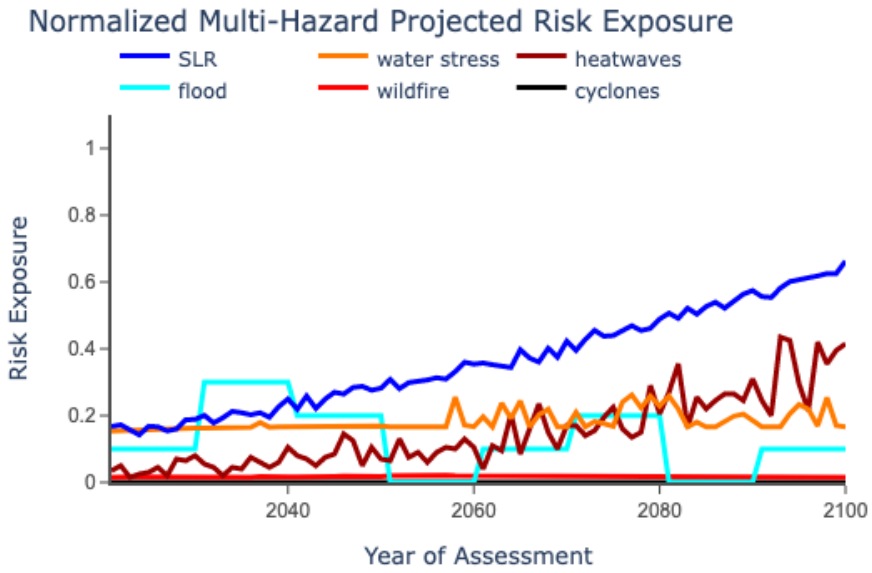
## Table 24. Lagos Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| High Emissions | | | | | | |
| Strong Mitigation | | | | | | |

## Graph 21. Lagos projected hazard risk: Strong Mitigation Scenario



## Graph 22. Lagos projected hazard risk: High Emissions Scenario

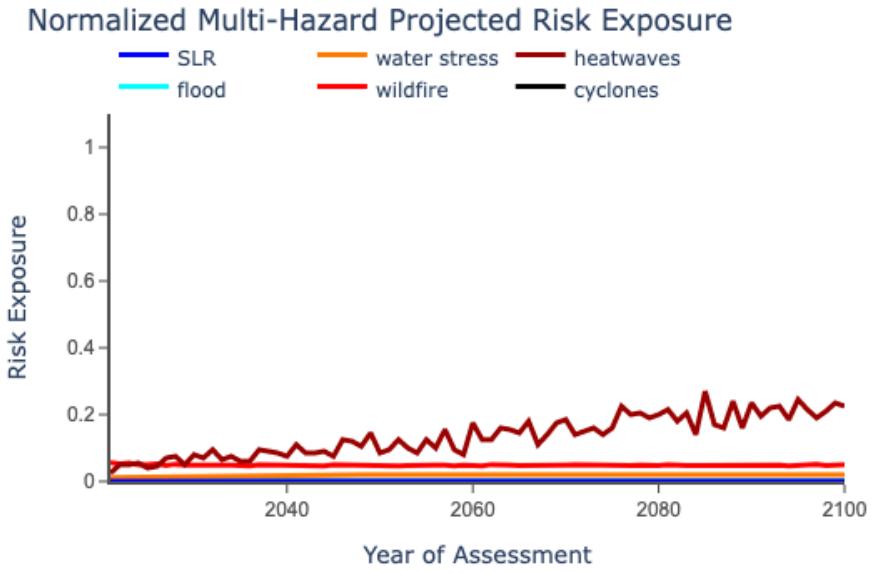



Abuja faces medium risk of wildfires in both scenarios, and medium risk of heatwave in the high emissions scenario. In the strong mitigation scenario risk of heatwave increases slightly to 2100, whereas in the high emissions scenario it rises steeply from 2060.

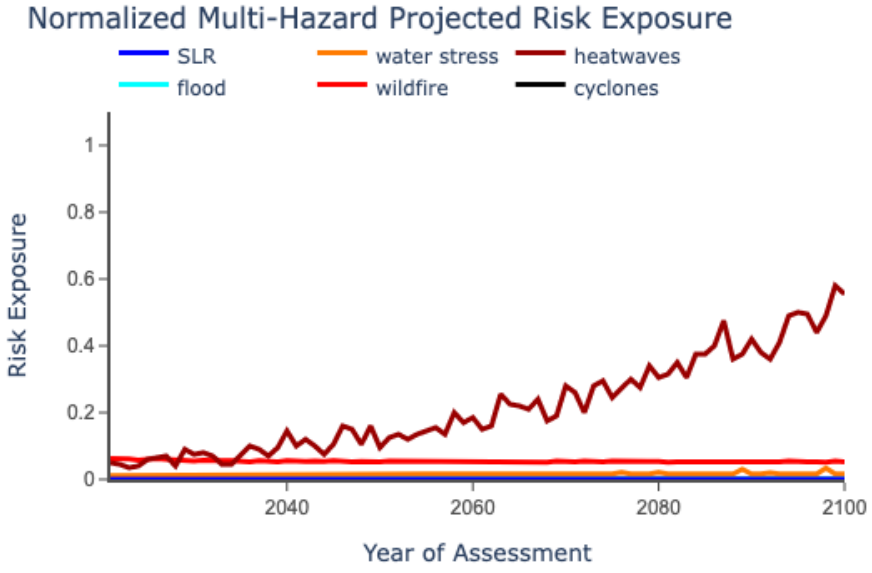
## Table 25. Abuja Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| **High Emissions** | | | | | | |
| **Strong Mitigation** | | | | | | |

## Graph 23. Abuja projected hazard risk: Strong Mitigation Scenario




## Graph 24. Abuja projected hazard risk: High Emissions Scenario



## d. Policies and commitments

Nigeria has committed to a net zero target and published sector-specific sub targets for emissions reductions to 2030. Its National Adaptation Plan is still a work in progress, however the NDC lists key sector priorities for adaptation. For sustainable resource usage beyond waste management, a wider circular economy plan and roadmap is still in development.

Specific policies aim to spur innovation in certain sectors, but there is no specific policy relating to cleantech. Nigeria scores highly on the last two innovation criteria, with climate change action plans addressing both gender and youth, and a well-developed green finance framework which has succeeded in attracting private investment into innovation.

**Adaptation Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- Nigeria has NAP Framework and in the process of developing NAP itself
- Nigeria doesn't have sector adaptation strategies

**Mitigation Policy Score "Developing"**: some key policies exist, others are in development

- Nigeria's Climate Change Bill includes 2050-2070 net zero target
- Nigeria has approved a revised National Climate Change Policy with sectoral targets and plans for a carbon tax and emissions trading
- Nigeria promulgated 2021 Climate Change Act
- Nigeria has adopted National Renewable Energy and Energy Efficiency Policy to foster renewable energy development
- Nigeria has adopted National Policy on Solid Waste Management to reduce/ eliminate solid waste heaps
- Nigeria has established Circular Economy Working Group to develop circular economy program and roadmap but hasn't implemented circular economy strategy

**Cleantech as a priority sector Policy Score "Limited"**: inexistent or highly insufficient policy in this area

- Nigeria lacks cleantech specific policy and regulation

**Support for innovation / SMEs Policy Score "Developing"**: some key policies exist, others are in development

- Nigeria has National Digital Economy Policy and Strategy 2020-2030 that aims to support SMEs and foster innovation
- Nigeria's Ministry of Science, Technology and Innovation rebranded October 2021 to focus on future trends including nano-tech, space technology and biotech

**Support for women & youth inclusion Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Nigeria has adopted NAP on women, peace and security
- Nigeria has published NAP on Gender and Climate Change
- Nigeria has developed a Youth Action Manual on climate change

**Sustainable finance Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Nigeria has issued first sovereign green bond in Africa
- Regulatory framework has also catalyzed private sector-issued bonds in Nigeria

## Table 26. Nigeria: Cleantech Innovation & Entrepreneurship Policy Tracker

### Nigeria: Cleantech Innovation Policy Tracker

CLIMATE POLICY: ●●○

INNOVATION POLICY: ●●○

| | POLICY AREA | COUNTRY EVALUATION | DETAILS |
|---|---|---|---|
| CLIMATE | Adaptation | ●○○ | • National Adaptation Plan currently in preparation: NAP Framework (2020) aims to guide the approach and align NAP process with existing policies |
| | Mitigation | ●●○ | • Signed and ratified Paris Agreement in 2017; 2021 Climate Change Bill includes 2050-2070 net zero target<br>• In June 2021, the government approved a revised National Climate Change Policy (NCCP) with sectoral targets for the period 2021-2030<br>• NCCP includes plans for a carbon tax and emissions trading<br>• National Renewable Energy and Energy Efficiency Policy (2015) aims to foster renewable energy development<br>• National Policy on Solid Waste Management (2020) aims to reduce/eliminate solid waste heaps<br>• Nigeria Circular Economy Working Group was established to develop circular economy program and roadmap |
| INNOVATION | Cleantech as a priority sector | ●○○ | • Lack of cleantech specific policy and regulation |
| | Support for innovation / SMEs | ●●○ | • National Digital Economy Policy and Strategy 2020-2030 aims to support SMEs and foster innovation<br>• Ministry of Science, Technology and Innovation rebranded October 2021 to focus on future trends including nano-tech, space technology and biotech |
| | Support for women & youth inclusion | ●●● | • Nigeria adopted its most recent National Action Plan (NAP) on women, peace and security in 2017 for the period 2017-2020<br>• In 2020 Nigeria published National Action Plan on Gender and Climate Change<br>• In 2020, a Youth Action Manual on climate change was developed |
| | Sustainable finance | ●●● | • Government of Nigeria issued first sovereign green bond in Africa; third issuance aimed at financing mitigation and resilience projects under NDC strategy. Regulatory framework has also catalyzed private sector-issued bonds |

# South Africa

## a. Country overview and strategic priorities

South Africa's overriding development priorities are to eliminate poverty and eradicate inequality, through sustainable economic development, access to education, health and social welfare, and access to other basic needs. Its response to climate change must incorporate these priorities as well as dealing with the challenge of a heavily coal-dependent energy sector.


### Table 27. South Africa: General Characteristics

| Key Indicators: South Africa | |
|---|---|
| **Region** | Sab-Saharan Africa |
| **Population (2020)** | 59.3 million |
| **Median age of population** | 27.6 years |
| **GDP per capita (2020)** | US $5,656 |
| **Key cities** | Johannesburg, Cape Town, eThekwini (Durban) |
| **Key sectors with mitigation potential** | Energy; Industrial processes and product use; Agriculture; Forestry and other land use; Waste |
| **Key sectors for adaptation** | Agriculture; Forestry; Health; Water; Biodiversity |

## b. Mitigation potential

South Africa's 2020 emissions were 452Mt (a 47.7% increase on 1990) and its NDC projects that GHG emissions must peak and then plateau before declining. The large majority of emissions mitigation potential is in energy supply and consumption, with lesser mitigation potential for industry, agriculture and land use.

## c. Physical climate risk analysis and adaptation needs

Average, maximum and minimum temperatures have increased since the 1960s. Temperature extremes have also increased, and rainfall has become more variable[14].

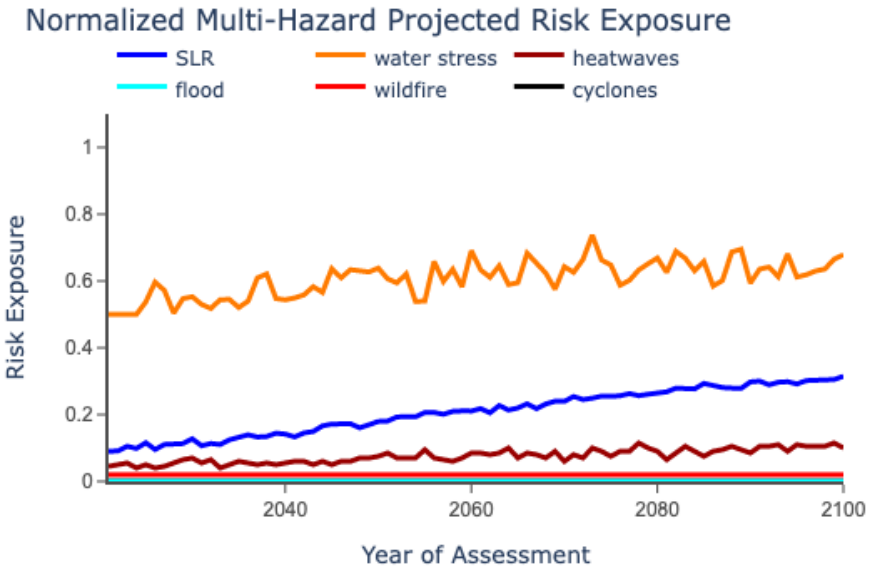
Food and water are the sectors most at risk from climate change effects. Rising temperatures may also alter future demand for electricity, increasing peak load demands during hotter summers.

Cape Town's climate risk model shows high risk of water stress and sea level rise in the high emissions scenario, and medium risk of fire. In the high mitigation scenario there is high risk of water stress, with medium risk of sea level rise and fire. On a 2100 horizon all three hazards increase in both scenarios, more steeply (ie expected to occur with higher frequency) in the high emissions case.

### Table 28. Cape Town Climate Risk Assessment, 2022-2051

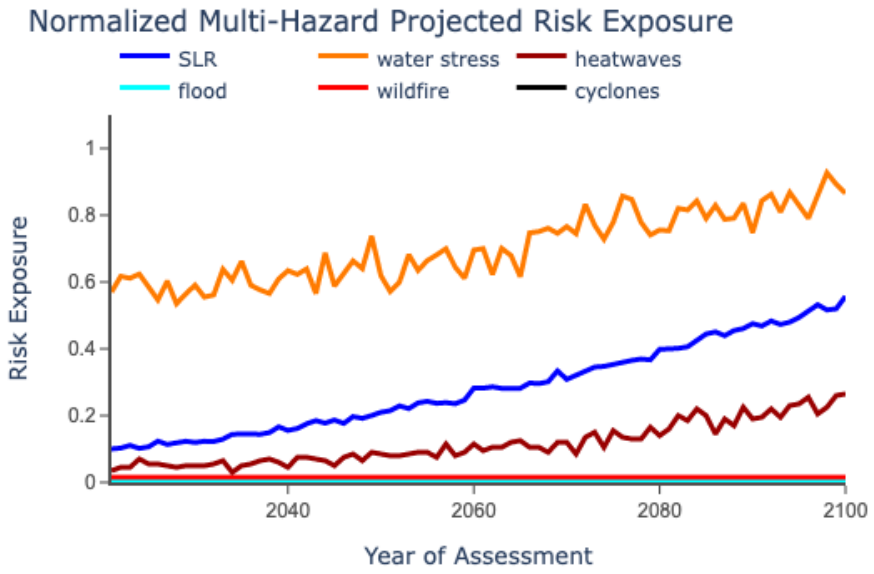
| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| High Emissions | | | | | | |
| Strong Mitigation | | | | | | |

### Graph 25. Cape Town projected hazard risk: Strong Mitigation Scenario




14 World Bank. "World Bank Climate Change Knowledge Portal." Accessed May 28, 2022. https://climateknowledgeportal.worldbank.org/.

## Graph 26. Cape Town projected hazard risk: High Emissions Scenario

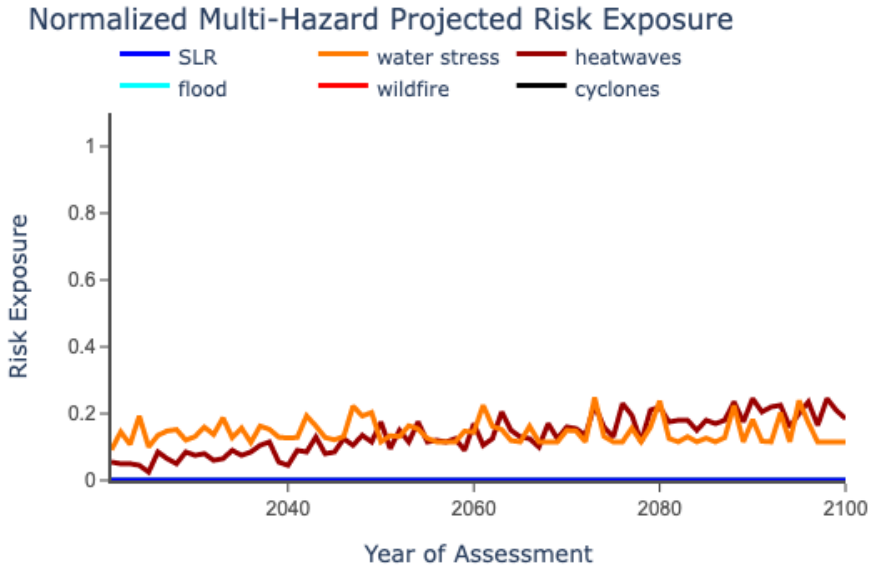



Johannesburg has medium risk of water stress and heatwave in both scenarios. Both hazards remain stable in the high mitigation scenario, with risk of heatwave increasing steadily in frequency from 2040 in the high emissions scenario.

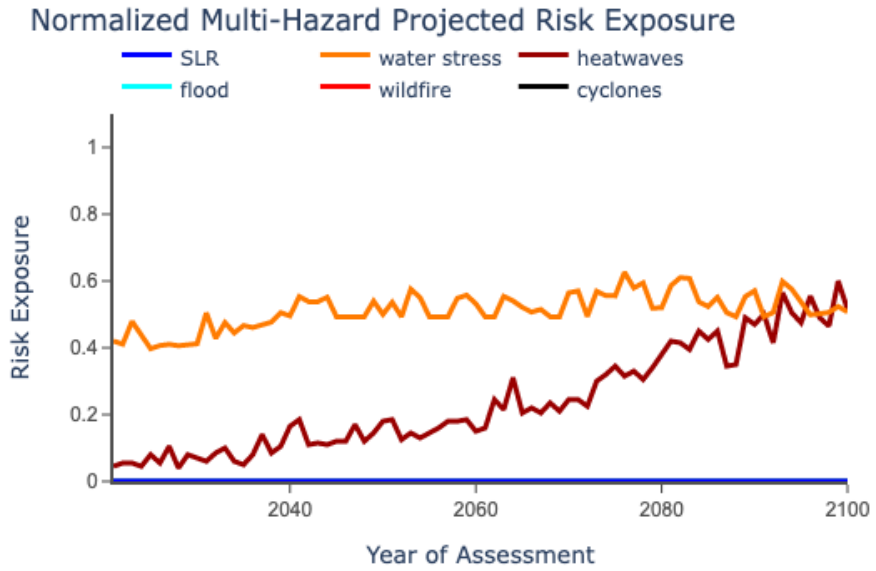
## Table 29. Johannesburg Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| **High Emissions** | | | | | | |
| **Strong Mitigation** | | | | | | |

## Graph 27. Johannesburg projected hazard risk: Strong Mitigation Scenario

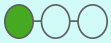
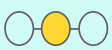
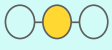
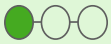
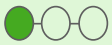



## Graph 28. Johannesburg projected hazard risk: High Emissions Scenario

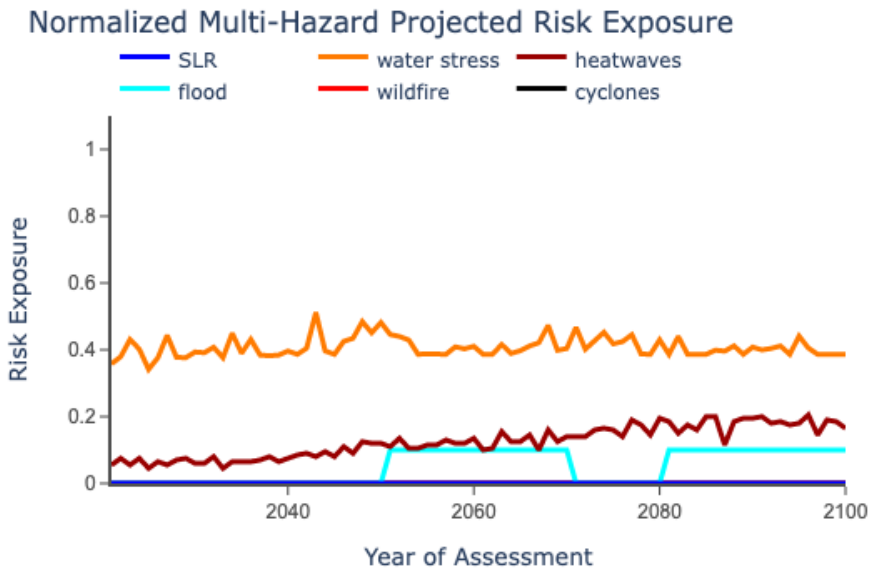


eThekwini (Durban) has medium risk of water stress in both scenarios and medium risk of heatwave in the high emissions scenario. Over the long term the strong mitigation scenario shows ongoing risk of water stress, with slightly increasing incidence of heatwave and intermittent risk of flooding after 2050. Frequency of heatwaves follows an upward trajectory from 2040 in the high emissions scenario.

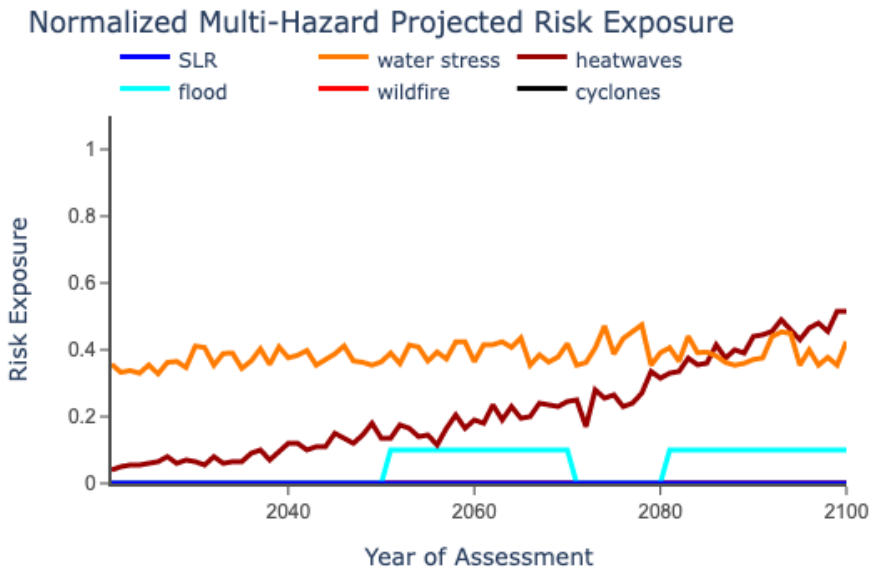
## Table 30. eThekwini (Durban) Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| High Emissions |  |  |  |  |  |  |
| Strong Mitigation |  |  |  |  |  |  |

## Graph 29. eThekwini (Durban) projected hazard risk: Strong Mitigation Scenario



## Graph 30. eThekwini (Durban) projected hazard risk: High Emissions Scenario




## d. Policies and commitments

South Africa's policy strategy is to catalyze financing of the transition to a low carbon society. Climate policy is comprehensive, including sector-specific mitigation plans, adaptation plans, a carbon tax and a waste management strategy. Timelines to transition away from fossil fuels could be more ambitious.

On innovation, there is some innovation and cleantech-specific policy which could benefit from more coordination. Policies to increase the participation of women and other minority groups are in place. South Africa's sustainable finance framework is well developed.

**Adaptation Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- South Africa has submitted National Adaptation Plan
- South Africa has adopted guidance to integrate environmental management with climate change adaptation strategies

**Mitigation Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- South Africa has established net zero goals
- South Africa has established the Presidential Climate Change Coordination Commission, along with South Africa's Low-Emission Development Strategy 2050 that focused on low-carbon development, mitigation options affected by adaptation measures
- South Africa has adopted carbon tax
- South Africa has approved National Waste Management Strategy 2020
- South Africa has proposed an expansion of renewable energy capacity
- South Africa has Circular Economy Guideline for the Waste Sector
- South Africa doesn't have policies targeting circular economy commitments in key sectors

**Cleantech as a priority sector Policy Score "Developing"**: some key policies exist, others are in development

- South Africa has some cleantech supporting policies and regulations; however, lack of coherence between them

**Support for innovation / SMEs Policy Score "Developing"**: some key policies exist, others are in development

- South Africa has published White Paper on Science, Technology and Innovation for economic development and inclusive growth
- South Africa has published the Integrated Strategy on the promotion of SMEs
- South Africa lacks targeted initiatives to support e.g., R&D, commercialisation, small business creation

**Support for women & youth inclusion Policy Score "Developing"**: some key policies exist, others are in development

- South Africa has adopted National Policy Framework for Women's Empowerment and Gender Equality
- South Africa will be implementing National Action Plan on Women, Peace and Security
- South Africa doesn't have policies aimed at increasing gender and youth participation in entrepreneurial activities

**Sustainable finance Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- South Africa has launched green bond in 2017
- South Africa's Green Outcomes Fund was designed to incentivise and support local catalytic finance partners to invest in green businesses and track verifiable greenmetrics

## Table 31. South Africa: Cleantech Innovation & Entrepreneurship Policy Tracker

| South Africa: Cleantech Innovation Policy Tracker | | | CLIMATE POLICY: ●●● INNOVATION POLICY: ●●○ |
|---|---|---|---|
| | POLICY AREA | COUNTRY EVALUATION | DETAILS |
| CLIMATE | Adaptation | ●●● | • National Adaptation Plan submitted October 2021<br>• Adopted guidance to integrate environmental management with climate change adaptation strategies, in line with the country's social and economic development targets |
| CLIMATE | Mitigation | ●●● | • Signed and ratified Paris agreement in 2016<br>• Approved a goal to reach net zero by 2050<br>• In September 2020, the Cabinet approved the establishment of a Presidential Climate Change Coordination Commission, along with South Africa's Low-Emission Development Strategy 2050 that focused on low-carbon development, mitigation options affected by adaptation measures and establishes targets across different sectors<br>• Carbon tax adopted in February 2019, implemented June 2019 covering fossil fuel combustion emissions, industrial processes, product use emissions and fugitive emissions<br>• South Africa's IRP2019 proposes an expansion of renewable energy capacity from a current total of about 6,600 MW (excluding large hydro) to a total of 26,700 MW (plus a projected 6,000 MW in distributed PV) in 2030<br>• Approved National Waste Management Strategy 2020 |
| INNOVATION | Cleantech as a priority sector | ●●○ | • Some cleantech supporting policies and regulations; however, lack of coherence between them |
| INNOVATION | Support for innovation / SMEs | ●○○ | • White Paper on Science, Technology and Innovation (adopted 2019) sets policy direction for economic development and inclusive growth<br>• Integrated Strategy on the promotion of SMEs was approved in 2005 |
| INNOVATION | Support for women & youth inclusion | ●●○ | • National Policy Framework for Women's Empowerment and Gender Equality was adopted in 2002<br>• National Action Plan on Women, Peace and Security will be implemented for the period 2020-2025 |
| INNOVATION | Sustainable finance | ●●● | • SA Green bond launched in 2017, with an amount of USD$389 million investment will be used to fund the green industry and energy efficiency sectors<br>• The Green Outcomes Fund was designed to incentivise and support local catalytic finance partners to invest in green businesses and track verifiable green metrics |

# Uruguay

## a. Country overview and strategic priorities

Uruguay's national strategic priority is to facilitate continued development and economic growth with the lowest possible emissions intensity, and to promote resilient communities, equity and social inclusion.


### Table 32. Uruguay: General Characteristics

| Key Indicators: Uruguay | |
|---|---|
| **Region** | Latin America and the Caribbean |
| **Population (2020)** | 3.47 million |
| **Median age of population** | 36 years |
| **GDP per capita (2020)** | US $15,438 |
| **Key cities** | Montevideo |
| **Key sectors with mitigation potential** | Land Use, Land-Use Change and Forestry; Energy; Agriculture |
| **Key sectors for adaptation** | Agriculture; Biodiversity; Health; Coastal, water and fishing resources; Energy; Tourism |

## b. Mitigation potential

2020 emissions were 5.6 Mt CO2e, with no significant change since 2000. Key sectors for CO2 mitigation potential are LULUCF, energy and industrial processes, with beef production presenting potential for mitigation of other emissions (CH4 and N2O).

## c. Physical climate risk analysis and adaptation needs

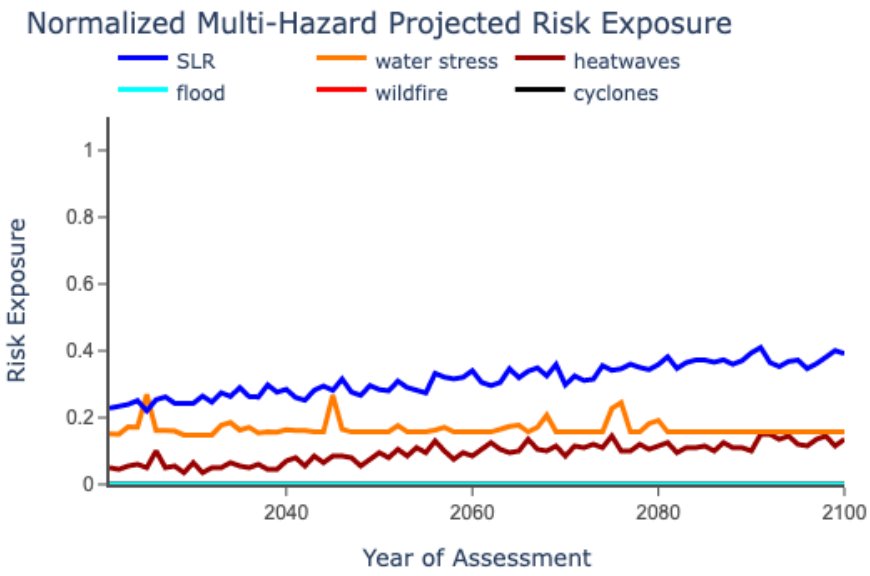
Key country level risks are food (decreased cereal yields) and human habitat (due to a high rate of urbanization).

Uruguay is already experiencing warmer temperatures, heatwaves and significantly increased rainfall. Climate projections for Montevideo (home to almost 50% of Uruguay's population) shows medium risk from sea level rise in both high emissions and strong mitigation scenarios. Incidence of water stress and heatwaves remains stable to 2100 in the strong mitigation scenario, with a slight increase in risk of sea level rise. In the high emissions scenario, risk of water stress again remains stable, while risk of heatwaves and sea level rise increases, especially after 2060.

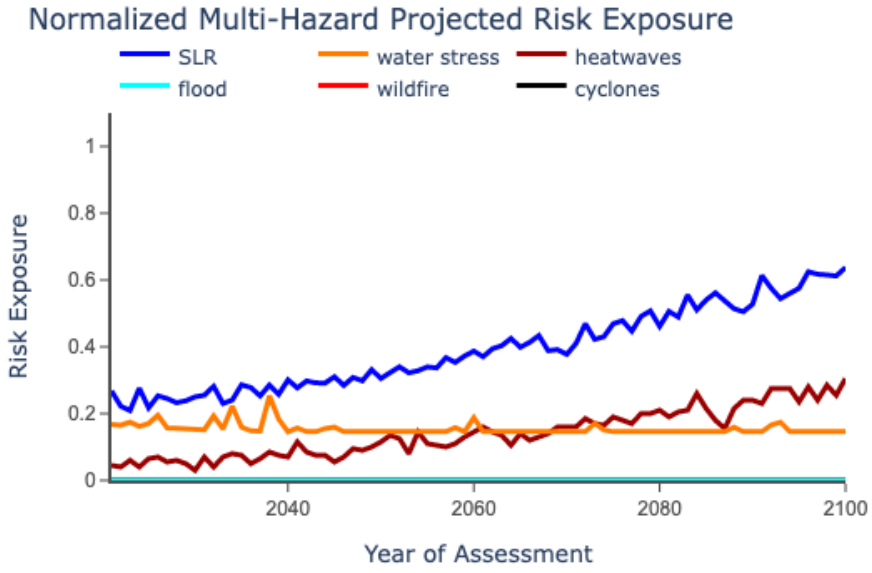
## Table 33. Montevideo Climate Risk Assessment, 2022-2051

| Climate Scenario | Fire | Flood | Heatwave | Water stress | Sea level rise | Cyclone |
|---|---|---|---|---|---|---|
| High Emissions | | | | | | |
| Strong Mitigation | | | | | | |

## Graph 31. Montevideo projected hazard risk: Strong Mitigation Scenario




## Graph 32. Montevideo projected hazard risk: High Emissions Scenario



## d. Policies and commitments

Uruguay has developed sector-specific adaptation plans for its key adaptation challenges, and has committed to a 2025 emissions reduction target, with specific mitigation targets for power generation and beef production. A circular economy action plan and long-term energy plans are also in place.

Transforma Uruguay was created in 2016 to promote productive innovation and economic development. The program is responsible for circular economy initiatives as well as general innovation and internationalization. The GEF7 project includes initiatives which address the key mitigation opportunities. Possibly the weakest area is gender and youth inclusion, with policy still in development. The sustainable finance framework includes public funding for cleantech innovation, and a climate bond is in development.

**Adaptation Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Uruguay has published sector specific National Adaptation Plans for the agricultural sector, cities and infrastructure, and coastal zone

**Mitigation Policy Score "Developing"**: some key policies exist, others are in development

- Uruguay's NDC outlines emissions reduction targets
- Uruguay does not have an explicit carbon tax, nor a CO2 emissions trading system, but collects energy taxes, including excise taxes on fuel and electricity consumption
- Uruguay has published "Bioeconomy Strategy: towards a circular and sustainable economy"
- Uruguay has approved Circular Economy Action Plan
- Uruguay has National Energy Policy

**Cleantech as a priority sector Policy Score "Developing"**: some key policies exist, others are in development

- Uruguay has published Transforma Uruguay National Plan for Productive Transformation and Competitiveness that aims to boost the circular economy within the sustainable development plan framework
- Cleantech isn't identified as a priority for the country

**Support for innovation / SMEs Policy Score "Developing"**: some key policies exist, others are in development

- Uruguay has published Transforma Uruguay National Plan for Productive Transformation and Competitiveness that includes innovation and internationalization as key themes
- Uruguay lacks targeted initiatives to support e.g., R&D, commercialisation, small business creation

**Support for women & youth inclusion Policy Score "Developing"**: some key policies exist, others are in development

- Uruguay has ratified Equal Opportunities and Rights Plan
- Uruguay has The National Plan for Equal Opportunities and Rights to mainstream a gender-based approach within the state
- Uruguay is developing a National Gender Equality Policy
- Uruguay doesn't have policies aimed at increasing gender and youth participation in entrepreneurial activities

**Sustainable finance Policy Score "Mature"**: policies have been implemented and are largely sufficient to address key challenges and/or meet targets

- Uruguay has launched a sovereign bond linked to climate targets
- Uruguay has Renewable Energy Innovation Fund to trigger large-scale financing for emerging renewable energy technologies
- Uruguay has Bioeconomy / technology funds in place, as well as Farm Reconstruction and Development Fund

## Table 34. Uruguay: Cleantech Innovation & Entrepreneurship Policy Tracker

### Uruguay: Cleantech Innovation Policy Tracker

CLIMATE POLICY: ●●●

INNOVATION POLICY: ●●○

| | POLICY AREA | COUNTRY EVALUATION | DETAILS |
|---|---|---|---|
| CLIMATE | Adaptation | ●●● | • National Adaptation Plan for the agricultural sector submitted in 2019<br>• National Adaptation Plan for cities and infrastructure published November 2021 |
| | Mitigation | ●●● | • NDC outlines 20% CO2 intensity emissions reduction target by 2025 and commits to an unconditional CO2 emissions reduction target of 24% per GDP unit by 2025, relative to 1990 base levels<br>• Uruguay does not have an explicit carbon tax, nor a CO2 emissions trading system, but collects energy taxes, including excise taxes on fuel and electricity consumption<br>• "Bioeconomy Strategy: towards a circular and sustainable economy" proposal defines the strategic axes and action lines for the development of the bioeconomy in Uruguay<br>• Circular Economy Action Plan approved<br>• Uruguay has a comprehensive, long-term energy plan - the National Energy Policy 2005-2030 - with the overall objective to diversify the energy mix, reduce dependency from fossil fuels, improve energy efficiency, and increase the use of endogenous resources, mostly renewables |
| INNOVATION | Cleantech as a priority sector | ●●○ | • Transforma Uruguay aims to boost the circular economy within the sustainable development plan framework |
| | Support for innovation / SMEs | ●●○ | • Transforma Uruguay National Plan for Productive Transformation and Competitiveness for the period 2017-2021 includes innovation and internationalization as key themes |
| | Support for women & youth inclusion | ●●○ | • The first Equal Opportunities and Rights Plan was ratified and put into effect in 2002<br>• The National Plan for Equal Opportunities and Rights (2007-2011) mainstreamed a gender-based approach within the state<br>• Uruguay is developing a National Gender Equality Policy |
| | Sustainable finance | ●●○ | • In 2021 Uruguay launched a sovereign bond linked to climate targets<br>• Renewable Energy Innovation Fund aims to trigger large-scale financing for emerging renewable energy technologies<br>• Bioeconomy / technology funds are in place, Farm Reconstruction and Development Fund created in 2002 |

# Appendix 1: Project Work Plan

Cleantech Group is responsible for the Pillar 2 of GCIP. This pillar includes the following outputs between 2022 and 2026:

- 2.1.1 GCIP tools and guidelines for national capacity building for technology innovation and entrepreneurship institutions, industry associations and business platforms developed and disseminated
- 2.1.2 Policy recommendations and gender responsive strategies for cleantech innovation and entrepreneurship developed and disseminated at national and global levels
- 2.1.3 Knowledge creation, exchange and dissemination across GCIP countries to promote learning

The baseline data collected in this report form a reference point to identify starting point policies, and can be used to define and measure future impact of GCIP. It also provides an input to the second part of activity 2.1.2, the development of a global cleantech innovation policy strategy. This will take place in July and August of 2022.

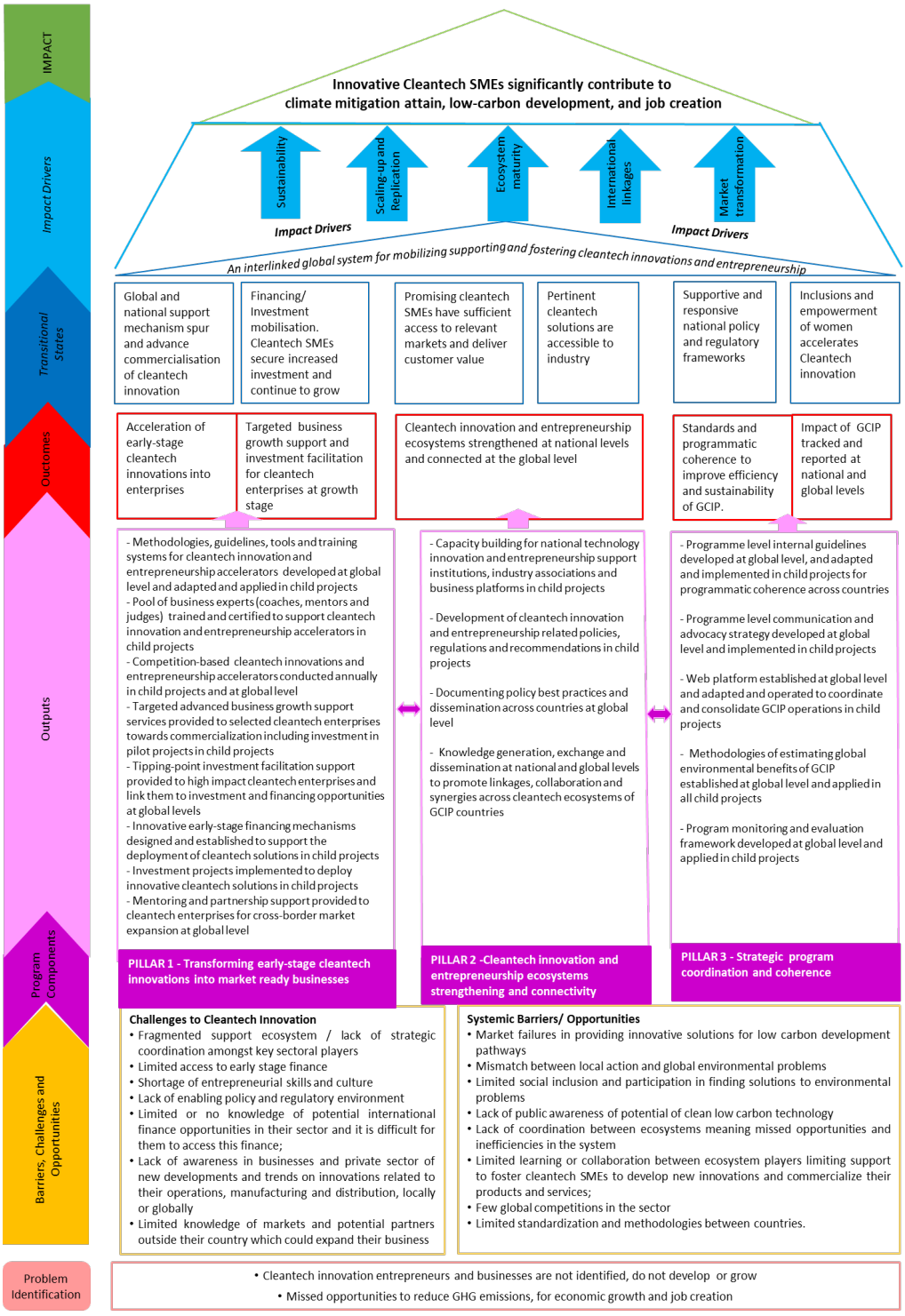
### Table 35. Policy Scoring Criteria

| Report Output | Input to activity | Output of subsequent activity |
|---|---|---|
| Sectors in GCIP countries with highest mitigation potential | 2.1.2.b | • Best practice policies targeting emissions reductions in priority sectors<br>• Best practice policies to address changing demand in priority sectors |
| Sectors in GCIP countries most vulnerable to climate change effects | National child project | • Innovation responses to new local demand profiles necessitated by climate change effects |
| Physical risks related to climate change in key population (demand) centers in GCIP countries | National child project | • Innovation responses to new local demand profiles necessitated by climate events |
| High level policies in place to address mitigation, adaptation and sustainability | 2.1.2.b | • Gap analysis of best practice climate policy strategy |
| High level policies in place to promote cleantech innovation, entrepreneurship and participation by women and youth in innovative and entrepreneurial activities | 2.1.2.b | • Gap analysis of best practice gender responsive cleantech innovation and entrepreneurship policy |

# Appendix 2:

# GCIP Theory of Change and Project overview – 3 pillars

Cleantech Group is responsible for the Pillar 2 of GCIP that aims to strengthen CIEEs in GCIP countries. Appendix 2 shows the GCIP Theory of Change and relationship between the three Pillars.



# Appendix 3:
# Sust Scenario and Risk Parameters

## Sust Global Platform

Sust Global uses geospatial data to bias-correct global climate models. It takes data from 80 different climate models as inputs to model future climate risk on a 2100 horizon across three emissions-based scenarios.

## High Emissions and Strong Mitigation Scenarios

Climate scenario analysis follows definitions set forth from the Intergovernmental Panel for Climate Change - Coupled Model Intercomparison Project-Phase 6 IPCC CMIP6. The IPCC AR6/CMIP6 combines frontier climate science from world leading scientific institutions with realistic climate scenario modeling.

## Sust covers the following climate scenarios:

Strong Mitigation: This scenario covers the optimal sustainable path, also referred to as the Green Road (SSP1-RCP2.6). It encompasses socioeconomic and representative emissions pathways consistent with a gradual and pervasive global shift towards a more sustainable future. Carbon emissions begin to decline around 2020 and global mean temperatures rise approximately 1.8°C by 2100, a key goal of the Paris Climate Agreement.
High Emissions: This scenario covers a future where the world continues on its current trajectory, also referred to as Fossil-Fueled Growth (SSP5-RCP8.5). Global markets are increasingly integrated and both total population and per-capita consumption increase. Emissions peak around 2090 and global mean temperatures rising approximately 4.3°C by 2100.

## Covered Hazards

Sust Global's data product provides asset level exposure to specific climate related hazards. Those hazards include wildfire, heatwave, inland flood, sea level rise, water stress, and cyclone.

Wildfire includes 4 indicators: observed wildfire, burned area fraction, wildfire susceptibility and unified wildfire exposure.

1. **Observed Wildfire:** Sust uses satellite derived observations to provide asset level exposure to active wildfires. The observations are made using NASA MODIS satellites and processed using an active fire algorithm to produce the MCD64A. This covers the historical period of 2001 to present. This indicator shows the years in which a wildfire occurred within 1 kilometer of an asset.

2. **Burned Area Fraction:** Sust represents annual fire risk by ensembling CMIP6 model simulations of monthly wildfire burned area [% of grid cell]. CMIP6 Wildfire models incorporate factors such as temperature, precipitation, land cover type, and population to simulate fire occurrence and the associated area burned. For example, wildfire occurrence includes both lightning and human-induced ignitions, and high temperatures and drought lead to drier fuels and increased likelihood of fire. Sust uses Sust Global's proprietary methodologies for wildfire super resolution (NeurIPS2020 technical reference) on top of the model ensemble to enable high resolution wildfire projections. These projections are further processed using the latest satellite-derived land cover maps, filtering for the urban-wildland interface to further refine the projections.

3. **Wildfire Susceptibility:** This indicator relates to wildfire weather and the probability of wildfire under various weather conditions using the Keetch-Byram Drought Index (KBDI). This approach has several advantages for modeling fire dynamics as previously demonstrated. Weather has been previously shown to be a major determinant of fire probability, and changing weather patterns are the primary reason wildfires will be a major hazard of climate change. Thus, in contrast to the Burned Area Fraction Indicator, this indicator does not use direct CMIP6 simulations of wildfire occurrence. Instead, the Wildfire susceptibility estimates future fire risk using simulations of fire weather, combined with millions of historic observations of how weather affects fire risk.

4. **Unified wildfire exposure:** This indicator combines the projections from the burned area fraction and the susceptibility score, benchmarked against the observed wildfire indicator to create a unified measure of wildfire probability at a specific location. It can be interpreted as the probability of wildfire occurring within one kilometer of an asset location within a given year. The unified wildfire indicator when aggregated over a period of time (10 yrs) provides for a measure of probability of wildfire occurrence within 1 kilometer of the asset over the next 10 years.

Inland flood includes two indicators: observed flooding and flood potential.

1. **Observed floods:** Indicates whether anomalous standing water (i.e., a flood) was observed in a given year by satellites at the location of an asset. It is derived from NASA MODIS data, for the period 2012 to present.

2. **Flood potential:** Indicates the potential of the asset to get exposed to flooding over the coming years expressed as a probability. A value of 0.1 indicates that we could expect a flooding event in one of the next 10 years at this asset location.

Tropical cyclones include two indicators, one for observed cyclone exposure and another for projected cyclone frequency.

1. **Observed tropical cyclones:** Sust uses cyclone tracks from the International Best Track Archive for Climate Stewardship (IBTrACS). The IBTrACS archive combines tropical cyclone datasets from global agencies and harmonizes them into a single dataset. It is endorsed by the World Meteorological Organization as the official data source for cyclone track data. For observed tropical cyclones, Sust filters points to only include Category 3, 4, and 5 storm points. Sust then assumes a constant 'impact radius' of 150 miles/ 241km.

2. **Forward looking Cyclone Projections:** Sust quantifies current and forward-looking cyclone exposure by focusing on the frequency of extreme tropical cyclones. Extreme tropical cyclones, referred to as Category 3, 4, and 5 storms on the Saffir-Simpson hurricane scale, are defined as having maximum sustained winds above 110mph/178km/h. Sust focuses on these extreme storms because of their heightened destructive potential relative to weaker storms. Since the number represents a frequency, it indicates the expected number of CAT3/4/5 cyclones over a year. By aggregating the values over a time range of 15 years, the user can arrive at a projected number of cyclones exposed to the asset over the 15 year window.

Sea level rise indicator refers to the change in sea level from the changing climate across different climate scenarios. Sust bases our modeling of projected sea level rise on both climate model simulations and an asset's distance to the coast. Projected sea level rise from CMIP6

climate models incorporates the effects of thermal expansion from warming of the ocean, since water expands as it warms, which is expected to be the primary component of future sea level rise. The models do not incorporate the secondary contributions of melting glaciers and ice caps since they cannot reliably simulate them, so the sea level simulations are conservative estimates of total sea level rise. The sea level rise is calculated by combining the monthly CMIP6 local sea level fluctuations due to ocean dynamics and global sea level rise from thermal expansion. Sust centers the sea level rise over the baseline period 1980-2010.

Water stress includes four indicators: historic water stress, projected droughts, projected water stress score, projected unified water stress.

1. **Water stress score indicator**: Sust models current and forward-looking water stress scores using the World Resource Institute's Aqueduct model. The state-of-the-art Aqueduct model has been extensively used by researchers in academia and industry to assess portfolio water risk. The water stress score is indicative of competition for local water resources. It is calculated as the ratio of water withdrawal to renewable water availability.

2. **Drought indicator**: This indicator is based on a drought index derived from CMIP6 monthly simulations of precipitation and temperature. The drought index, also referred to as the standardized precipitation evapotranspiration index, represents the magnitude of precipitation deficits (negative magnitude) or surplus (positive magnitude) over the preceding 12-month period, after accounting for temperature-driven effects on evapotranspiration. Our selection of a 12-month period reflects long-term precipitation patterns and better relates to reservoirs, groundwater, and streamflow.

3. **Unified water stress indicator:** This indicator combines the water stress score and the drought indicator to one single indicator for water stress, using a weighting methodology designed by the World Resources Institute in their Global Aqueduct Methodology. This provides a comparable 0.0 to 1.0 range to indicate exposure to water stress.

4. **Historic water stress indicator:** Sust uses the same methodology as the unified water stress indicator, except with observed rather than modeled datasets of water stress and drought.

Heatwave indicators are calculated by the number of days per year exceeding a temperature threshold. The temperature threshold at a given location is based on the 98th percentile of daily conditions during a baseline period between 1980 and 2100. Because this temperature threshold varies spatially, the heatwave metric indicates anomalously high temperatures relative to what is typical at the local level.

## Hazard occurrence

Hazard occurrence modelling provides a normalized view of forward-looking risk exposure of a specific selected asset in the multi-hazard heatmap view across all hazard types for the High Emissions and Strong Mitigation climate scenarios. Risk calculation parameters are based on benchmark areas for each specific hazard. In general, the benchmarked region is across the populated regions of the world, excluding regions like Saharan Africa and Siberia.

The specific values for the ranges are below:

| Hazard | Unit | Range (Low) | | Range (Medium) | | Range (High) | |
|---|---|---|---|---|---|---|---|
| **Wildfire** | Probability | 0.0 | 0.01 | 0.01 | 0.05 | 0.05 | 1.0 |
| **Heatwave** | Number of days in year | 0 | 30 | 30 | 50 | 50 | 366 |
| **Inland Flood** | Number of years with probability exceeding threshold | 0 | 0 | 1 | 3 | 3 | 30 |
| **Sea Level Rise** | Relative change in meters | 0.0 | 0.1 | 0.1 | 0.3 | 0.3 | 3.0 |
| **Water Stress** | Probability | 0.0 | 0.3 | 0.3 | 0.6 | 0.6 | 1.0 |
| **Cyclone** | Probability | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 | 1.0 |

# Appendix 4.

# Detailed policy scoring methodology

Policy scores are allocated as follows:

1. Limited: Inexistent or highly insufficient policy in this area
2. Developing: Some key policies exist, others are in development
3. Mature: policies have been implemented and are largely sufficient to address key challenges and/or meet targets


Scores for individual policy areas are combined to provide overall country scores for climate policy and innovation policy (**Exhibit 4**).

## Exhibit 4. Policy areas scoring

**Policy Areas Scoring**

| | POLICY AREA | SCORE: LIMITED | SCORE: DEVELOPING | SCORE: MATURE |
|---|---|---|---|---|
| CLIMATE | Adaptation | • National Adaptation Plan has not been implemented | • National Adaptation Plan has been implemented | • National Adaptation Plan has been implemented<br>• Sector adaptation strategies for key vulnerabilities have been implemented |
| CLIMATE | Mitigation | • No net zero target or policy addressing mitigation<br>• Waste management strategy | • Net Zero target and some policies to achieve it<br>• Carbon pricing in place<br>• Circular economy strategy implemented | • Net zero target and some policies to achieve it<br>• Carbon pricing in place<br>• Sectoral emissions reductions targets<br>• Sustainable resource use, including circular economy, waste management or other strategies and targets |
| INNOVATION | Cleantech as a priority sector | • No cleantech or green economy-specific policy | • Policy promoting cleantech | • Policy promoting cleantech<br>• Cleantech identified as a priority for the country |
| INNOVATION | Support for innovation / SMEs | • No innovation / entrepreneurship strategy exists | • SME / Innovation strategy has been implemented | • SME / Innovation strategy has been implemented<br>• Targeted initiatives to support e.g., R&D, commercialisation, small business creation |
| INNOVATION | Support for women & youth inclusion | • No policies promoting gender equality | • Policies which promote gender equality at national level | • Policies which promote gender equality at national level<br>• Policies aimed at increasing gender and youth participation in entrepreneurial activities |
| INNOVATION | Sustainable finance | • No sustainable finance initiative | • Green bonds or other mechanisms | • Green bonds or other mechanisms<br>• Initiatives facilitating private investment in cleantech |

# Appendix 5. GCIP Definitions

**Cleantech** is defined as a broad range of solutions (technologies, processes, services, business models, and their combinations) that lead to an increase in positive impact or a decrease in negative impact on climate change through mitigation and adaptation, transition to a low-emission economy, sustainable energy systems, circular resource usage and other dimensions of environmental sustainability. Climate technology, clean energy technology etc. are subsets of cleantech. Co-benefits of a robust cleantech sector include creation of green jobs, women and youth entrepreneurship, and sustainable income generation.

**Cleantech innovation and entrepreneurship ecosystem (CIEE)** is defined as the network and interactions among innovation and entrepreneurship stakeholders and the social, economic and policy environment, and their combined influence on the development and commercialisation of cleantech solutions.

**Innovation** is defined as the development of new, adapted, or alternative technology and/or business model solutions; the novel, original application of existing, new, adapted or alternative solutions; and/or improvements to existing processes.

**Entrepreneurship** Is defined as willingness and ability to turn an innovation into a profitable business model through identifying or creating a market opportunity.

# Bibliography


ArcGIS StoryMaps. “State of the Global Climate 2021,” August 26, 2022. https://storymaps.arcgis.com/stories/bbe6a05f6dae42f2a420cfdd7698e4b1.

Carbon Brief. “The Carbon Brief Profile: Nigeria,” August 21, 2020. https://www.carbonbrief.org/the-carbon-brief-profile-nigeria/.

Central Intelligence Agency. “The World Factbook”. May 25, 2022. https://www.cia.gov/the-world-factbook/

Climate Action Tracker. “Countries.” Accessed May 28, 2022. https://climateactiontracker.org/countries/.

Climate Change Performance Index. “Ranking.” November 9, 2021. https://ccpi.org/ranking/.

Climate Scorecard. “Nigeria Listed as One of the 10 Most Climate Vulnerable Countries.” Climate Scorecard (blog), November 28, 2018. https://www.climatescorecard.org/2018/11/nigeria-listed-as-one-of-the-10-most-climate-vulnerable-countries/.

Climate Transparency. “The Climate Transparency Report 2020,” November 18, 2020. https://www.climate-transparency.org/g20-climate-performance/the-climate-transparency-report-2020.

Climatelinks “Kazakhstan.” Accessed May 28, 2022. https://www.climatelinks.org/countries/kazakhstan.

Climatelinks. “Where we work. Cambodia.” Accessed May 28, 2022. https://www.climatelinks.org/countries/cambodia.

GIS Geography. “Home.” Accessed May 28, 2022. https://gisgeography.com/.

Global Carbon Atlas. “CO2 Emissions | Global Carbon Atlas.” Accessed May 28, 2022. http://www.globalcarbonatlas.org/en/CO2-emissions.

Global Environment Facility. “Clean Technology Innovation Programme for SMEs and Start-Ups in the Republic of Moldova.” Accessed May 28, 2022. https://www.thegef.org/projects-operations/projects/10457.

Global Environment Facility. “Projects.” Accessed May 28, 2022. https://www.thegef.org/projects-operations/database.

Grantham Research Institute at LSE and the Sabin Center at Columbia Law School. “Climate Change Laws of the World.” Accessed May 28, 2022. https://www.climate-laws.org/.

Notre Dame Global Adaptation Initiative. “Country Index / University of Notre Dame.” Accessed May 28, 2022. https://gain.nd.edu/our-work/country-index/.

Middle East Institute. “Confronting Climate Change, Turkey Needs ‘Green’ Leadership Now More than Ever.” Accessed May 28, 2022. https://www.mei.edu/publications/confronting-climate-change-turkey-needs-green-leadership-now-more-ever.

Nestpick. “2050 Climate Change City Index.” Accessed May 28, 2022. https://www.nestpick.com/2050-climate-change-city-index/.

ReliefWeb. “INFORM Report 2019 - Shared Evidence for Managing Crises and Disasters - World.” Accessed May 28, 2022. https://reliefweb.int/report/world/inform-report-2019-shared-evidence-managing-crises-and-disasters.

ReliefWeb. “Integrated Disaster Risk Management in Morocco: Managing Risk by Rewarding Results - Morocco.” Accessed May 28, 2022. https://reliefweb.int/report/morocco/integrated-disaster-risk-management-morocco-managing-risk-rewarding-results.

Ritchie, Hannah, Max Roser, and Pablo Rosado. “$CO_2$ and Greenhouse Gas Emissions.” Our World in Data, May 11, 2020. https://ourworldindata.org/co2/country/uruguay.

Ritchie, Hannah, Max Roser. “$CO_2$ and Greenhouse Gas Emissions.” Our World in Data, May 11, 2020. https://ourworldindata.org/co2/country/morocco.

Roberts, Malcolm John, Joanne Camp, Jon Seddon, Pier Luigi Vidale, Kevin Hodges, Benoît Vannière, Jenny Mecking, et al. “Projected Future Changes in Tropical Cyclones Using the CMIP6 HighResMIP Multimodel Ensemble.” Geophysical Research Letters 47, no. 14 (July 28, 2020). https://doi.org/10.1029/2020GL088662.

Sust Global | Validated Climate Analytics and APIs. “Sust Global | Validated Climate Analytics and APIs.” Accessed May 28, 2022. https://www.sustglobal.com.

The Economist. “The World Ahead 2022.” Accessed May 28, 2022. https://www.economist.com/the-world-ahead-2022.

United Nations Climate Change Nationally Determined Contributions Registry. “All NDCs.” Accessed May 28, 2022. https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx.

United Nations in Cambodia. “Information Note #16: Climate Change.” Accessed May 28, 2022. https://cambodia.un.org/en/164901-information-note-16-climate-change.

United Nations Sustainable Development Press Release. “Tackling Biodiversity & Climate Crises Together and Their Combined Social Impacts.”. June 10, 2021. https://www.un.org/sustainabledevelopment/blog/2021/06/tackling-biodiversity-climate-crises-together-and-their-combined-social-impacts/.

WIPO. “Global Innovation Index 2021: Which Are the Most Innovative Countries?” Accessed May 28, 2022. https://www.wipo.int/global_innovation_index/en/2021/index.html.

World Bank Open Data “Data.” Accessed May 28, 2022. https://data.worldbank.org/.

World Bank. “Morocco’s Economic Update — April 2022.” Accessed May 28, 2022. https://www.worldbank.org/en/country/morocco/publication/economic-update-april-2022.

World Bank. “Nigeria Economic Update: Resilience through Reforms.” Accessed May 28, 2022. https://www.worldbank.org/en/country/nigeria/publication/nigeria-economic-update-resilience-through-reforms.

World Bank. “World Bank Climate Change Knowledge Portal.” Accessed May 28, 2022. https://climateknowledgeportal.worldbank.org/.

Worldometer. “Worldometer - Real Time World Statistics.” Accessed May 28, 2022. http://www.worldometers.info/.