

# INSIGHTS INTO CLIMATE RISK ANALYSIS & COSTING

## Geospatial Remote Sensing in 30 Settlements

### EXECUTIVE SUMMARY

#### ► Why Climate Risk Analysis?

The world witnessed a continuing increase in forced displacement, with 84% of refugees originating from countries highly vulnerable to climate change in 2022, compared to 61% in 2010. This statistic underscores the growing impact of the climate crisis on global displacement. Responding <sup>1</sup>to this challenge, UNHCR has collaborated with the United Nations Satellite Centre (UNOSAT) to conduct targeted geospatial and hydrological analyses at 30 displacement settlements in 15 countries affected by climate risks. This initiative, part of UNHCR's Operational Strategy for Climate Resilience and Environmental Sustainability (2022-2025), focuses on addressing key environmental concerns such as floods, drought, and deforestation. The ultimate goal is to utilize cutting-edge Remote Sensing and GIS technologies to refine UNHCR's response strategies, ensuring they are well-informed and effectively mitigate the risks associated with climate change.

#### ► Target Countries and Beneficiaries:

The 30 settlements assessed are located in countries identified by the ND Gain vulnerability index as highly susceptible to climate change impacts. These countries, including Bangladesh, Burundi, Chad, Ethiopia, Malawi, Mauritania, Mozambique, Nigeria, Rwanda, Somalia, South Sudan, Sudan, Uganda, Yemen, and Zambia, are collectively hosting around 1.1 million forcibly displaced people. The analysis carried out in 2022 - 2023 covered hydrology, flood modeling, water resources, land cover, settlement mapping, and elevation.

#### ► Climate-Related Risks & Trends:

The geospatial and hydrological analysis revealed significant climate change-related risks across the assessed settlements. This report focuses on three main risks and trends identified through the analysis: Flood risk, Drought Risk and Deforestation trends.

**40%** FLOOD RISK  
in analyzed  
settlements

The hydrological analysis has identified generated estimates for potential flood zones, utilizing data on Static Water Levels (SWL) and flood hazard mapping. **This initial determination of possible flood zones is instrumental in identifying critical areas needing mitigation strategies.**

**36%** DROUGHT RISK  
in analyzed  
settlements

The Drought assessment detects risks utilizing topography, evapotranspiration data, and precipitation data. Outputs include groundwater potential maps and water balance assessments to **prioritize groundwater exploitation and monitor water cycle trends.**

**47%** DEFORESTATION  
trend in analyzed  
settlements

The deforestation analysis investigates **changes in forest coverage over time, identifying trends**, pinpointing when they began, and evaluating their potential effects on the settlements.

## ► Flood Risk

Flood-prone areas within settlements pose immediate threats, leading to infrastructure vulnerability, displacement, loss of livelihoods, water contamination, agricultural losses, and decreased community resilience.

- Analyzing precipitation trends up to 2030 reveals that **26 settlements will experience increased precipitation**, with Kavumu and Nyankanda expecting **the highest rise at approximately 120mm/year**.
- Among the analyzed settlements, **40% exhibit diverse flood risks**. The actual flooding risk depends significantly on variations in rainfall intensity and frequency.

## ► Drought Risks

Changing climate patterns pose immediate risks such as water shortages, food scarcity, and conflicts, and long-term issues like soil degradation and reduced agriculture outputs.

- Of the settlements studied, **36% are at risk of drought**, with four in particular receiving **less than 300mm** of rainfall yearly, putting them at severe risk.
- By 2030, predictions indicate that **4 of these 30** settlements will experience further decreases in rainfall, with **Agadom I in Nigeria facing the largest drop, a decrease of 130mm/year**.
- Mostly for the East and horn of Africa region, exacerbated by the **El Niño weather phenomenon**, below-average rainfall for successive seasons is alarmingly **increasing drought risk**.

## ► Deforestation Trends

The analysis shows that deforestation, driven by the demand for firewood, building materials, and agricultural land, severely disrupts ecosystems. This disruption results in habitat loss, soil erosion, and contributes to long-term climate change effects.

- Since their establishment, the settlements surveyed and their surrounding areas have experienced a significant loss of tree cover, **totaling over 1,500 square kilometers**.
- Offsetting some of this loss, **847 square kilometers of reforestation were detected within these settlements** during the same timeframe. A notable **73% of this reforestation occurred in just one settlement**, Mayukwayukwa in Zambia,
- Despite reforestation efforts, **47% of the analyzed settlements and their surroundings have continued to show deforestation trends** since their establishment. Notably, **nine of the 30 settlements**, located in extremely arid regions, were excluded from the landcover analysis.

## Ground Realities



-In Sudan, settlements like Jourie and Alagaya appeared to be amongst the most at risk of floods due to factors like flat topography and proximity to water bodies.

-Alganaa refugee camp in Sudan's White Nile State was submerged in 2021, leaving 35,000 South Sudanese refugees in urgent need of assistance.

## Ground Realities



-Settlements like Kobe and Serdo in Ethiopia face heightened drought risks due to erratic rainfall patterns, arid topography, and consequent water scarcity.

-The 2020–2023 Horn of Africa drought, the most severe in over 40 years, affected Somalia, Ethiopia, and Kenya, leading to widespread food insecurity, with an estimated 43,000 in Somalia only dying in 2022.

## Ground Realities











-Meheba Camp in Zambia and Rhino Camp in Uganda showed significant deforestation trends losing 481 and 251 square kilometers of their canopy tree cover respectively, impacting biodiversity, soil erosion, and livelihoods.

-In Contrast, Mayukwayukwa in Zambia and Nyabiheke in Rwanda witnessed a notable increase in canopy cover of 621 and 112 square kilometers of tree canopy cover respectively.

## Financial Requirements

Mitigating climate change risks and enhancing environmental sustainability requires significant financial investment, often also outside extending beyond refugee settlement boundaries and in the area. The UNHCR has estimated that to improve climate resilience and environmental sustainability across 25 refugee settlements housing one million people, a total of \$860 million is needed. This investment would cover eight interventions aimed at reducing vulnerability to climate shocks and improving community resilience.

**25 refugee settlements**  
**1 million people**  
**Climate Resilient and Environmentally Sustainable** **\$860M**

	DURABLE SHELTER, AND UPGRADES	<b>\$292M</b>	<b>33.94%</b>
	CLEAN COOKING	<b>\$204M</b>	<b>23.71%</b>
	REFORESTATION	<b>\$129M</b>	<b>14.99%</b>
	FLOOD AND SOIL EROSION MITIGATION	<b>\$119M</b>	<b>13.83%</b>
	CLIMATE-SMART WASH SYSTEMS	<b>\$87.8M</b>	<b>10.21%</b>
	SOLARIZATION OF FACILITIES & BOREHOLES	<b>\$19.60M</b>	<b>2.28%</b>
	PLANTING	<b>\$6.80M</b>	<b>0.79%</b>
	BASIC INFRASTRUCTURE UPGRADE	<b>\$2.15M</b>	<b>0.25%</b>

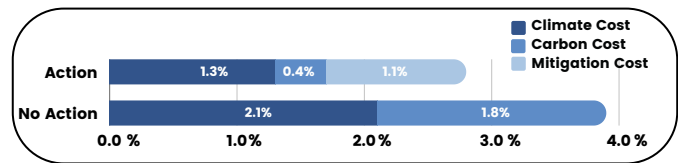
## The Cost of Climate Inaction

Without substantial efforts to adapt and manage climate change and environmental degradation related risks, displacement trends and humanitarian needs will worsen.

**In the bleakest outlook, the financial burden of meeting the growing needs triggered by climate change is projected to surge from \$4 billion in 2022 to \$24 billion by 2025.<sup>2</sup>**

However, the encouraging aspect is that, the cost of acting remains lower than the cost of inacting.<sup>3</sup>

Global climate costs and mitigation costs relative to GDP



To address the external threat posed by climate change, it is essential to transition from a purely reactive stance to an approach that encompasses both immediate and long-term preventive measures. This involves adopting "climate smart" initiatives in our planning, which prepare us for predictable climate shocks and stresses, and aim to reduce our environmental footprint. Investing in climate resilience is both a cost-effective and strategic response. This analysis acts as a pivotal first step towards understanding the risks and formulating suitable actions.

**Addressing the risks and trends highlighted in this analysis is crucial for enhancing the protection, well-being and resilience of displaced populations. The financial requirements outlined provide insights into targeted investments needed to respond to climate-change, emphasizing the imperative of proactive measures to mitigate climate change related challenges in refugee settlements. Leveraging these findings, UNHCR aims at further establishing strategic partnerships with experts and institutions in climate resilience to foster tailored strategies and implementation plans.**

1. <https://www.unhcr.org/what-we-do/build-better-futures/climate-change-and-displacement>

2. IFRC, 2023, The Cost of doing Nothing <<https://www.ifrc.org/sites/default/files/2021-07/2019-IFRC-CODN-EN.pdf>>

3. <https://www.airclim.org/acidnews/costs-climate-change>

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**Read the full report on "Insights on climate risk analysis and costing" [here](#)**  
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