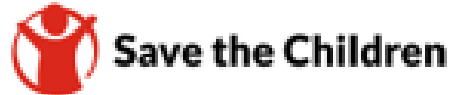**Forum: Agricultural Resilience and Nutrition**

**Session 3:** Addressing Climate Change and Nutrition
for Improving Health Outcomes

January 23, 2025

**Hosted by**:
The Child Health Task Force and Children Environmental Collaborative, UNICEF, Global Communities,
Save the Children

# Presenters

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# Agricultural Resilience and Nutrition

Engage with the moderators:

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Subgroup information, recordings and presentations from previous webinars are available on the subgroup page of the Child Health Task Force website:
www.childhealthtaskforce.org/subgroups/expansion

# Introduction to climate change and nutrition

**Chloe Angood, Nutrition Specialist**

**UNICEF Eastern and Southern Africa Regional Office (ESARO)**

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unicef ❤
for every ch

# The Climate Crisis is a child crisis

**Half of the world's children (1 billion)** live in extremely high-risk countries
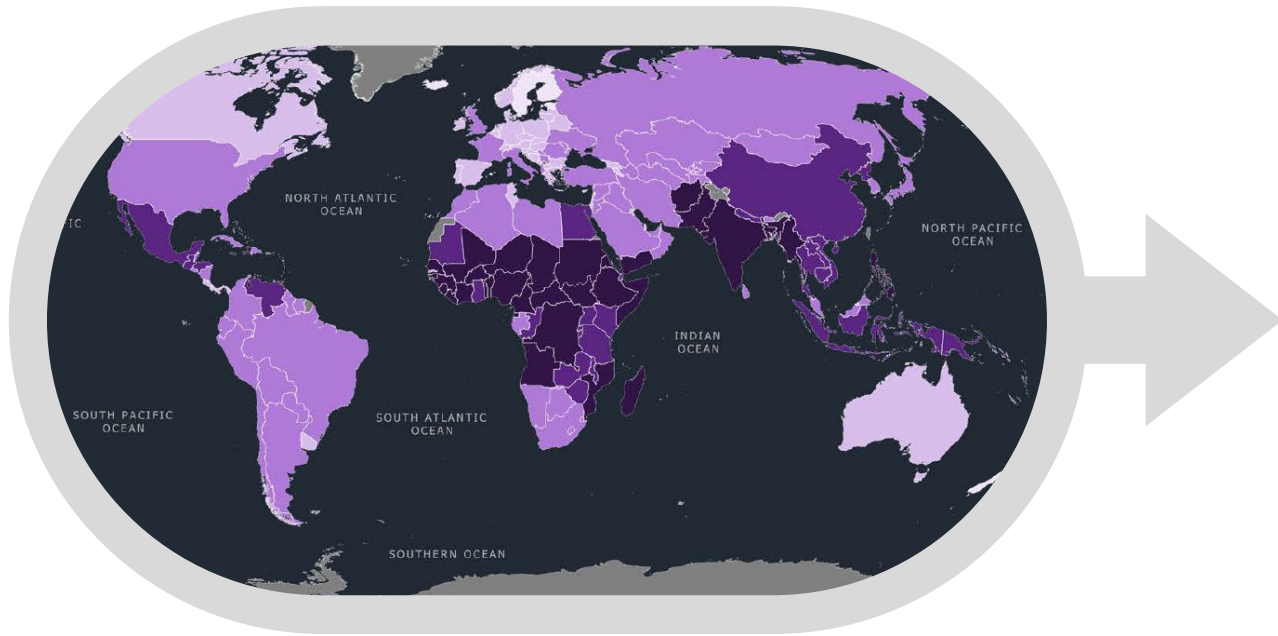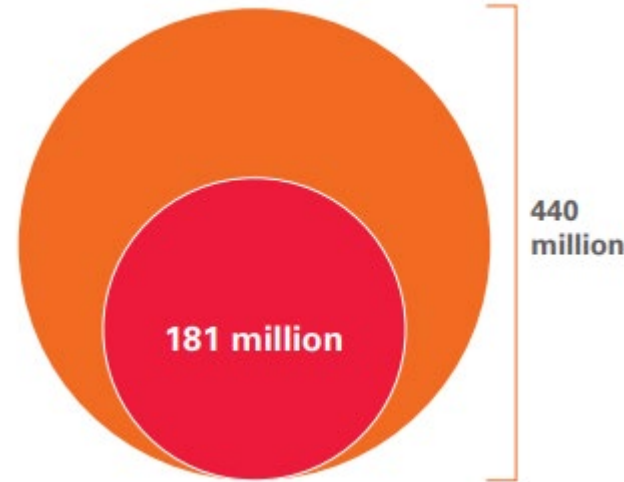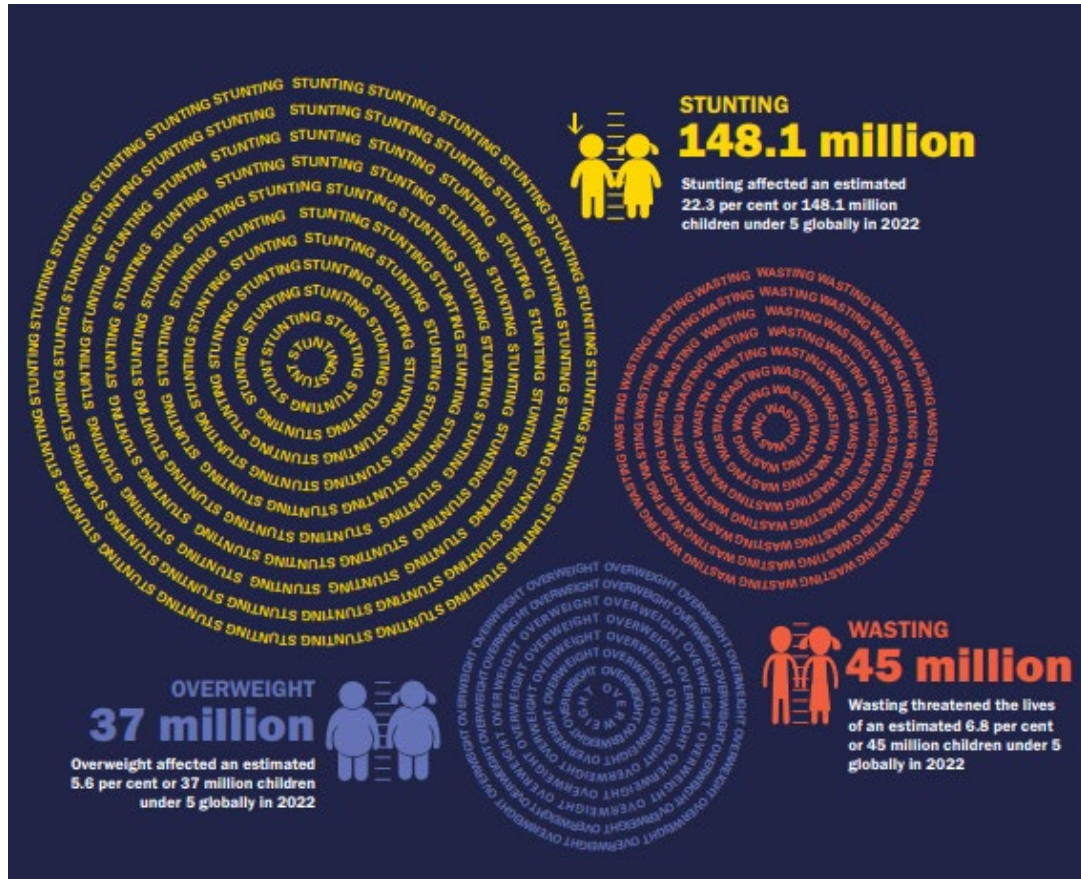


Overlaps geographically with the countries in the world with the highest rates of child malnutrition

**99% of all children**
are exposed to at least one major climate and environmental hazard, shock or stress

# The Climate Crisis is a child nutrition crisis



**STUNTING**
**148.1 million**

Stunting affected an estimated 22.3 per cent or 148.1 million children under 5 globally in 2022

**WASTING**
**45 million**

Wasting threatened the lives of an estimated 6.8 per cent or 45 million children under 5 globally in 2022

**OVERWEIGHT**
**37 million**

Overweight affected an estimated 5.6 per cent or 37 million children under 5 globally in 2022

440 million

181 million

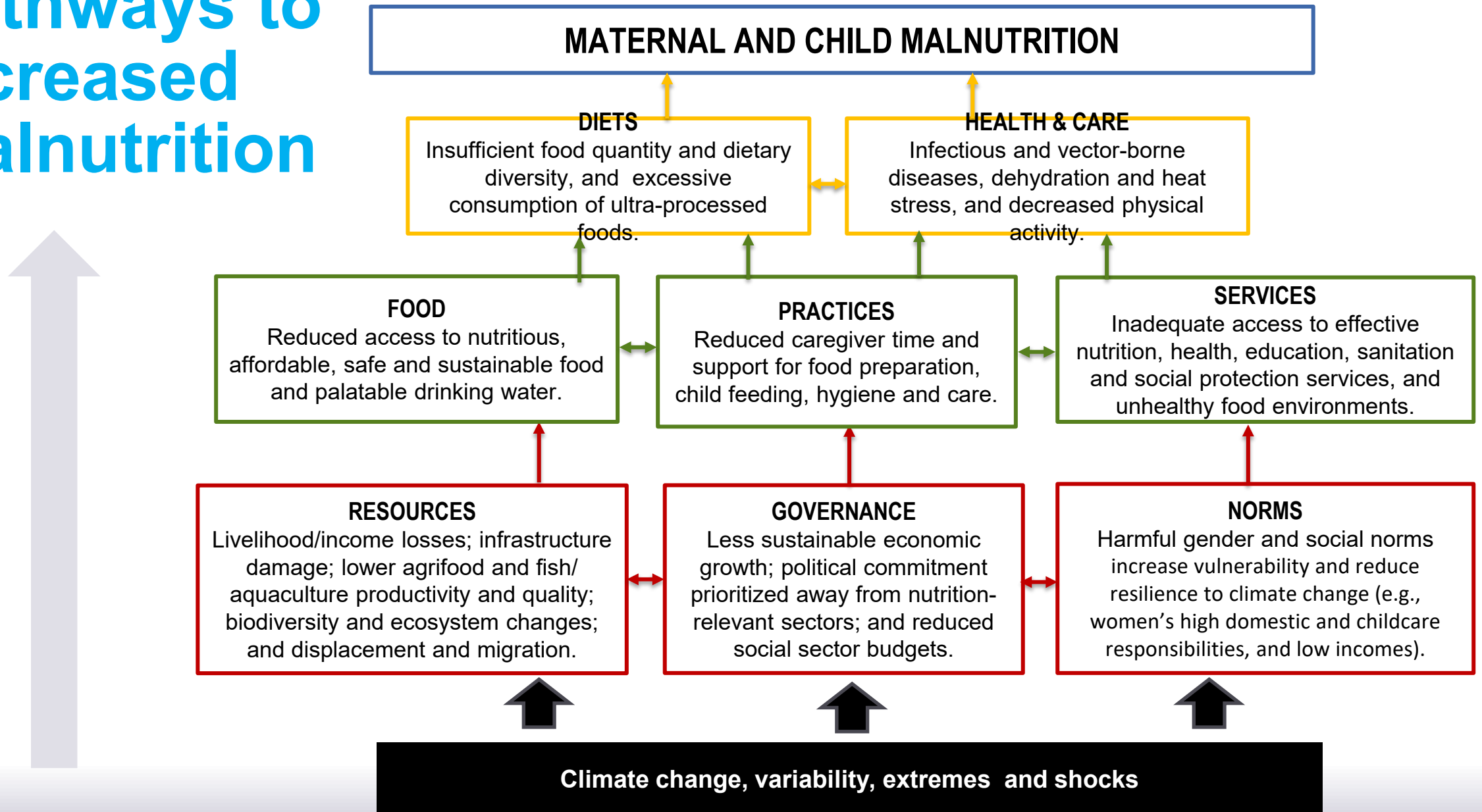440 million children < 5 live in child food poverty

181 million live in **severe child food poverty**

Climate change puts pressure on food, health, social protection, water and education systems that support child nutrition and malnourished populations are less resilient to climate change.

*By 2050, it is predicted that an additional 40 million children will be stunted and 28 million wasted due to climate change.*

# Pathways to increased malnutrition

**MATERNAL AND CHILD MALNUTRITION**

**DIETS**
Insufficient food quantity and dietary diversity, and excessive consumption of ultra-processed foods.

**HEALTH & CARE**
Infectious and vector-borne diseases, dehydration and heat stress, and decreased physical activity.

**FOOD**
Reduced access to nutritious, affordable, safe and sustainable food and palatable drinking water.

**PRACTICES**
Reduced caregiver time and support for food preparation, child feeding, hygiene and care.

**SERVICES**
Inadequate access to effective nutrition, health, education, sanitation and social protection services, and unhealthy food environments.

**RESOURCES**
Livelihood/income losses; infrastructure damage; lower agrifood and fish/ aquaculture productivity and quality; biodiversity and ecosystem changes; and displacement and migration.

**GOVERNANCE**
Less sustainable economic growth; political commitment prioritized away from nutrition-relevant sectors; and reduced social sector budgets.

**NORMS**
Harmful gender and social norms increase vulnerability and reduce resilience to climate change (e.g., women's high domestic and childcare responsibilities, and low incomes).

**Climate change, variability, extremes and shocks**

# Food systems contribute to climate change

**More than one-third (34%) of global greenhouse gas emissions caused by human activity can be attributed to the way we produce, process and package food.**

Through…

**Food production** especially fertilizers, methane from livestock and rice cultivation, and food processing and packaging

**Land use** especially deforestation and soil erosion that reduce carbon sinks
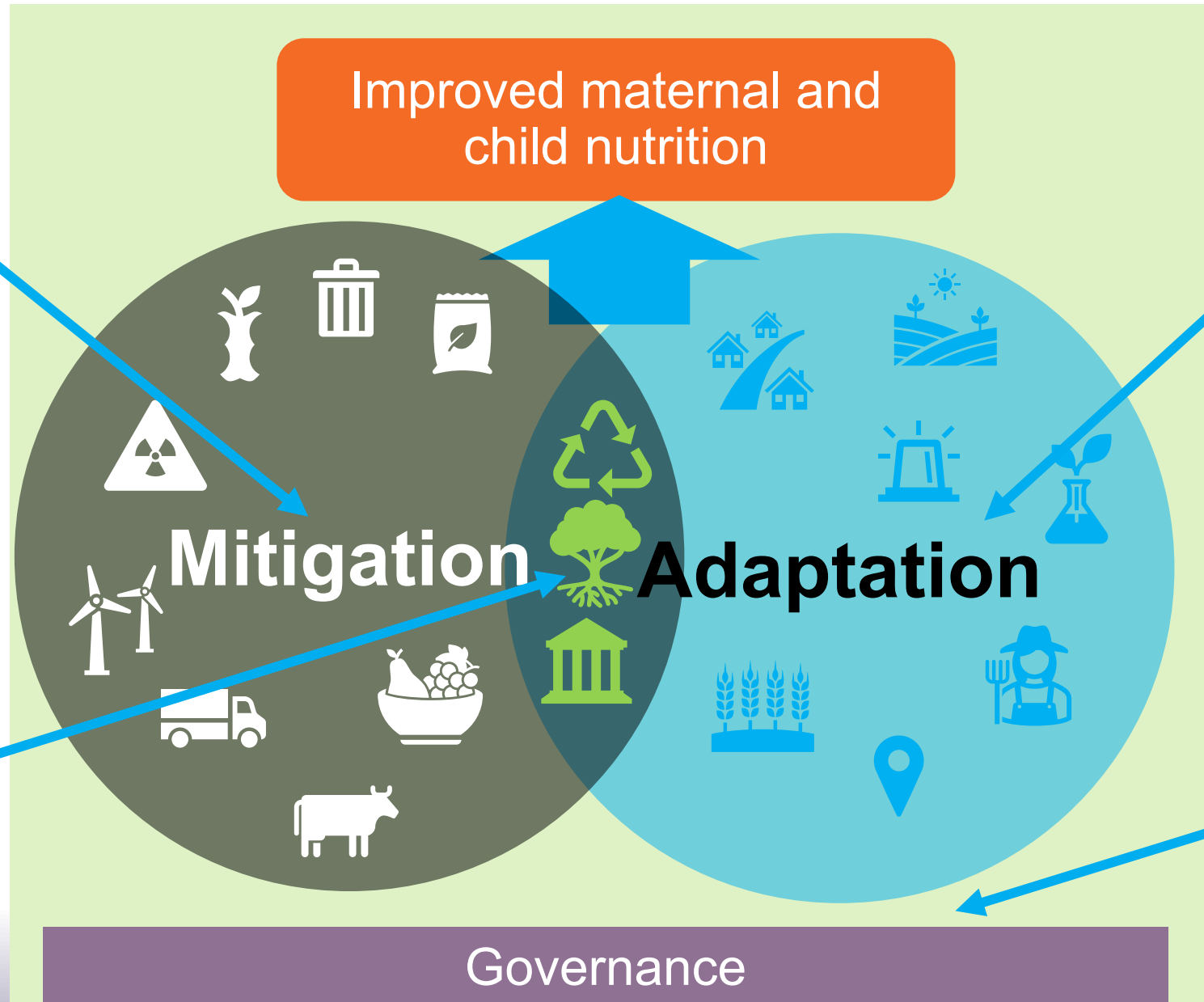
**Food distribution**

# Climate nutrition action



**Mitigation actions** that reduce the sources or enhance the sinks of greenhouse gases from systems that support nutrition

**Synergies** simultaneously mitigate GHG emissions, adapt to climate change **and improve nutrition.**

Improved maternal and child nutrition

**Mitigation**

**Adaptation**

Governance

**Adaptation actions** to moderate impacts of climate change on nutrition by reducing vulnerability and strengthening climate resilience

**Governance actions** that create an enabling environment for climate nutrition action

# Climate nutrition adaptation actions

**Protect children's diets, nutrition services and nutrition practices from climate change**

Adapting **<u>food systems</u>** to increase the availability of nutritious foods for children through climate-adaptive and resilient food supply chains.

*e.g.*

*Using climate smart agriculture in the local production of nutritious, safe, affordable, sustainable foods for children.*

*Social marketing of these foods.*

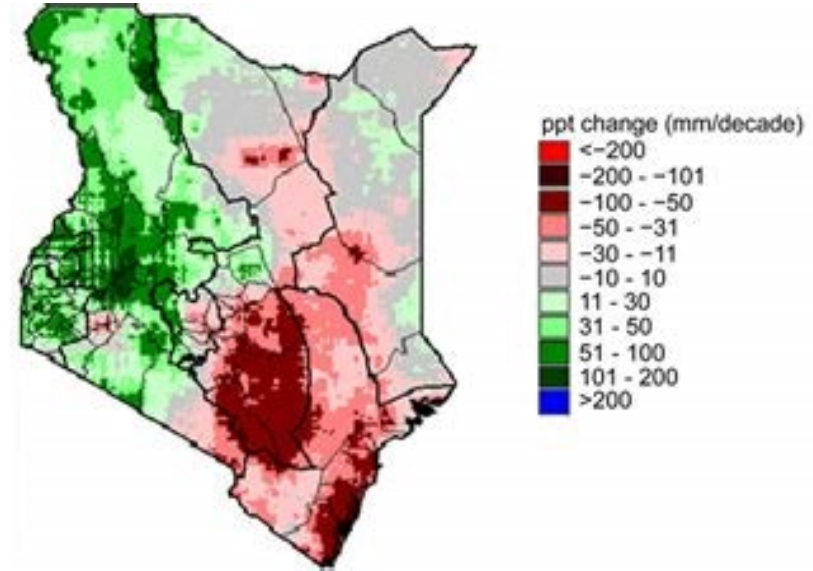*Large scale food fortification of staple foods using climate resilient food supply chains.*

# Climate nutrition adaptation actions

Strengthening the adaptability and resilience of **health systems** to deliver essential nutrition services in the face of climate change.

*e.g.*

*Use climate data to adapt the design and delivery of nutrition services and trigger anticipatory responses.*

*Adapt nutrition service platforms to address changing needs (mobile health clinics, tele-nutrition, community-based services)*



ppt change (mm/decade)
<-200
-200 - -101
-100 - -50
-50 - -31
-30 - -11
-10 - 10
11 - 30
31 - 50
51 - 100
101 - 200
>200

# Climate nutrition mitigation actions

**Promote nutritious diets, nutrition services and practices that are beneficial for the planet**

Promoting **low-carbon food supply chains** that supply nutritious, safe, affordable and sustainable foods for children.

Building **healthy food environments** to reduce consumption of ultra-processed foods and beverages by children and young people.

Promote and support **feeding and dietary practices** beneficial for nutrition and the planet e.g. breastfeeding and clean cooking.

# Positioning nutrition in climate agendas

Nationally Determined Contributions (NDCs)

National Adaptation Plans (NAPs)

Long term strategies

And in global and regional climate finance agendas

Thank you!
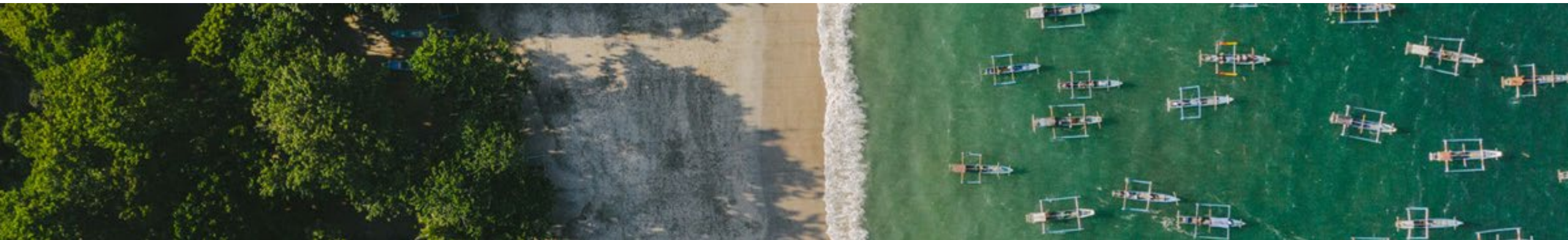
# Our mission

The NBI Global Resource Centre aims to:

- bring together key partners to establish an **investment case** for Nature-Based Infrastructure (NBI).

- encourage and facilitate the widespread use of NBI to help address **climate change**, **biodiversity loss** and the **global infrastructure gap**.

# What is NBI?

**Nature-Based Infrastructure (NBI)** is a subset of Nature-Based Solutions (NbS) and is sometimes referred to as Natural Infrastructure or Green/Blue Infrastructure.

It describes landscapes or ecosystems that harness nature to provide infrastructure services for people, the economy, and the environment.

The combination of traditional "grey" infrastructure with NBI, such as rain gardens, green roofs, sustainable urban drainage systems and porous pavements, are referred to as hybrid solutions.
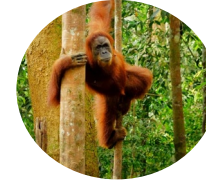
**Forest**
Forests, street trees

**Coastal**
Coral reefs, mangrove forests, sand dunes, salt marshes, sea grass

**Urban**
Rain gardens, green roofs, sustainable urban drainage systems
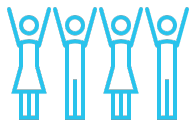
**River**
Rivers and floodplains

**Wetland**
Peatland, constructed or natural wetland, lakes

# What if we invest in NBI where possible?
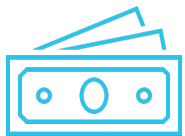
**Insights from IISD's economic valuations**

NBI is up to 50% cheaper than conventional built infrastructure that delivers the same infrastructure services

NBI provides about 28% more value through added benefits and avoided costs

Swapping 11% of investments from grey infrastructure to NBI could save USD 248 billion each year, and create additional benefits worth USD 489 billion every year

# NUTRITION SENSITIVE AGRICULTURE CAPACITY STRENGTHENING IN ETHIOPIA (NSA CASE) Project

**Project area:** Ethiopia MoA, Amhara, Oromia and Somali region BOAs

**Project grant:** 6,042,902 USD

**Donor:** Bill & Melinda Gates Foundation

**Project Period:** 2019-2024

## Key Issues

- Nutrition less financed and less prioritized by Ministry of Agriculture

- MOA M&E was weak with no uniform reporting formats, indicators, and digital system to manage nutrition and other Agri data

- The MOA did not have the technical capacity to coordinate nutrition both internally and across sectors

- There was weak organizational capacity in terms of human resource to operationalize NSA strategy of MOA

## Overview of the grant

- The NSA CASE project aimed to strengthen the agriculture sector capacity by addressing systemic bottlenecks: finance, human resource, M&E system and coordination capacity.

- The project operates through a grant under grant approach with close follow up and support to the subgrantee from SCI ET.

## Outcomes of the project

- Increased financing for and prioritization of the implementation of the NSAS in three regions

- Increased capacity of MOA staff to regularly use NSA data for decision-making

- Improved capacity within the MOA and regional bureaus to coordinate NSA activities

- Sustained human resource capacity for nutrition-sensitive agriculture at regional, zonal and *woreda* levels

## Results/Achievements to date

- A heightened commitment to nutrition created both at the federal and regional level with agri-sector policies & strategies streamlining nutrition objectives

- NSA indicators, standardizing reporting formats and AGMIS introduced

- Strong NSA coordination platforms via established forums at federal & regional level

- Strong organizational structure created:

  - Food and Nutrition office at federal MOA

  - Nutrition Directorates at project regions

  - 958 nutrition positions created

## Key Lessons learned

- Grant-Under-Grant mechanism helps creates capacity, ownership and accountability within MOA to lead implementation of a system-based NSA project

- Strong NSA organizational structures positioned strategically at the MOA and regional BOAs ensure accountability and stronger alignment with lower administrative structures.

- Digital data management guides agriculture sector nutrition initiatives by providing firsthand information in real-time.

- Strong NSA governance and leadership of a sector can be achieved through targeted advocacy, strengthening sectoral coordination, and exposing sector high level officials to best practices.

# Map of the regions

# Project context

Ethiopia, a landlocked nation in Northeast Africa, is marked by its **diverse climates and landscapes**. This diversity in geography makes Ethiopia highly **vulnerable to the effects of climate change**.

Since 1960, the country's average **temperature has risen** by 1°C, with the most significant warming occurring from July to September. Alongside increasingly erratic precipitation patterns, this has led to **severe droughts and floods** that affect livelihoods and **food security**.

Rising temperatures and unpredictable rain patterns are causing **soil erosion**, **reducing agricultural productivity**, shortening growing seasons, and creating ideal conditions for crop diseases and pests.

# The proposed solution

In response to these challenges, the Nutrition Sensitive Agriculture Capacity and System Strengthening Project (NSA CASE project) was designed to enhance food security and climate resilience in Ethiopia's most vulnerable regions. This 5-year project (2019–2024) has been implemented in three regions of Ethiopia with the goal of enhancing

(i)   access,

(ii)  availability, and

(iii) consumption of nutritious foods

# Agroforestry and sustainable agriculture

**What is the approach?**

The project targets three key regions—Oromia, Amhara, and Somali—where interventions include:

- planting drought-tolerant perennial fruit trees (nature-based infrastructure)
- introducing improved seed varieties
- utilizing moisture-harvesting technologies

The assessment used the outcomes of the NSA CASE project to estimate the full impacts of investments for food resilience under the National Nutrition Sensitive Agriculture Strategy.

# Assessment objectives

Evaluate the social, environmental, and economic impacts of agroforestry and sustainable agriculture

Quantify the costs, benefits, and financial performance of the scenarios

# Sustainable Asset Valuation methodology (SAVi)

**Simulation**

Based on systems thinking, system dynamics simulation, spatial modeling, and project finance modeling.

**Valuation**

Developed by giving a financial value to economic, social and environmental externalities and risks.

**Customization**

Customized to reflect local conditions and needs.

Co-created through a multi-stakeholder approach that allows for the identification of material risks and opportunities that are unique to the project.

# SAVi Model

Social data    Environmental data    Economic data

**Qualitative analysis**

**Systems mapping**
causal loop diagram (co-creation process)

**Quantitative analysis**

Location-specific data

Spatially explicit analysis

Climate data and forecasts

Literature review

System dynamics model    OR    Excel-based model

**Integrated cost-benefit analysis**
(social, environmental, economic)

# Causal Loop Diagram (CLD)

- Visual tool used to represent the feedback loops and cause-and-effect relationships within a system

- Tells the story of the problem

- Generates a common understanding of the system

- Created with a multidisciplinary team and different stakeholders

- First step on the identification of indicators for cost-benefit analysis and basis for the quantitative model

# Integrated CBA Indicators

## Direct Costs

- Capital Costs (CAPEX)

- Operation and maintenance costs (OPEX)

## Added Benefits

- Income creation from implementation and O&M jobs

- Revenues from additional agriculture production

- Carbon storage

## Avoided Costs

- Flood damages to properties

- Flood damages to agriculture

- Drought damages to agriculture

- Value of loss of life from flooding

- Cost of malnutrition

# Scenario Definitions

## Overview of scenarios modelled

### Business as Usual scenario

No-action scenario where no interventions are implemented to either improve the food security situation or increase climate resilience in Oromia, Amhara, and Somali regions.

### Nature-based infrastructure scenario 1

The NBI scenario includes all the CBA indicators for the following interventions:
- planting of perennial fruit trees (agroforestry)
- increasing access to improved seed varieties
- introduction of drought-tolerant crops, and
- use of moisture-harvesting technologies

### Nature-based infrastructure scenario 2

Includes the same interventions of the NBI scenario 1 but takes into account only the externalities directly related to the agriculture sector:
(i) job creation in implementation and O&M, (ii) revenues from additional agriculture, (iii) flood damages to agriculture, and (iv) drought damages to agriculture.

### Nature-based infrastructure scenario 3

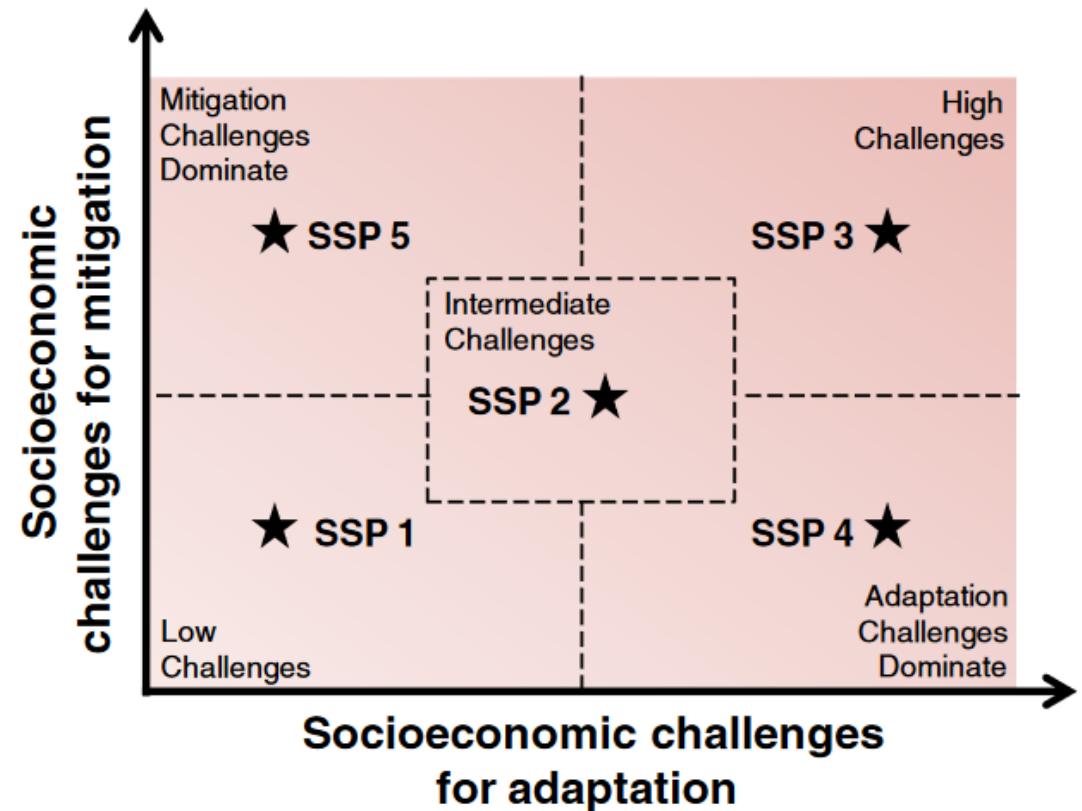Includes the same interventions of the NBI scenario 1 but narrows down the analysis only to:
(i) revenues generated by the agriculture sector due to the interventions and the (ii) job creation in construction and O&M from the interventions.
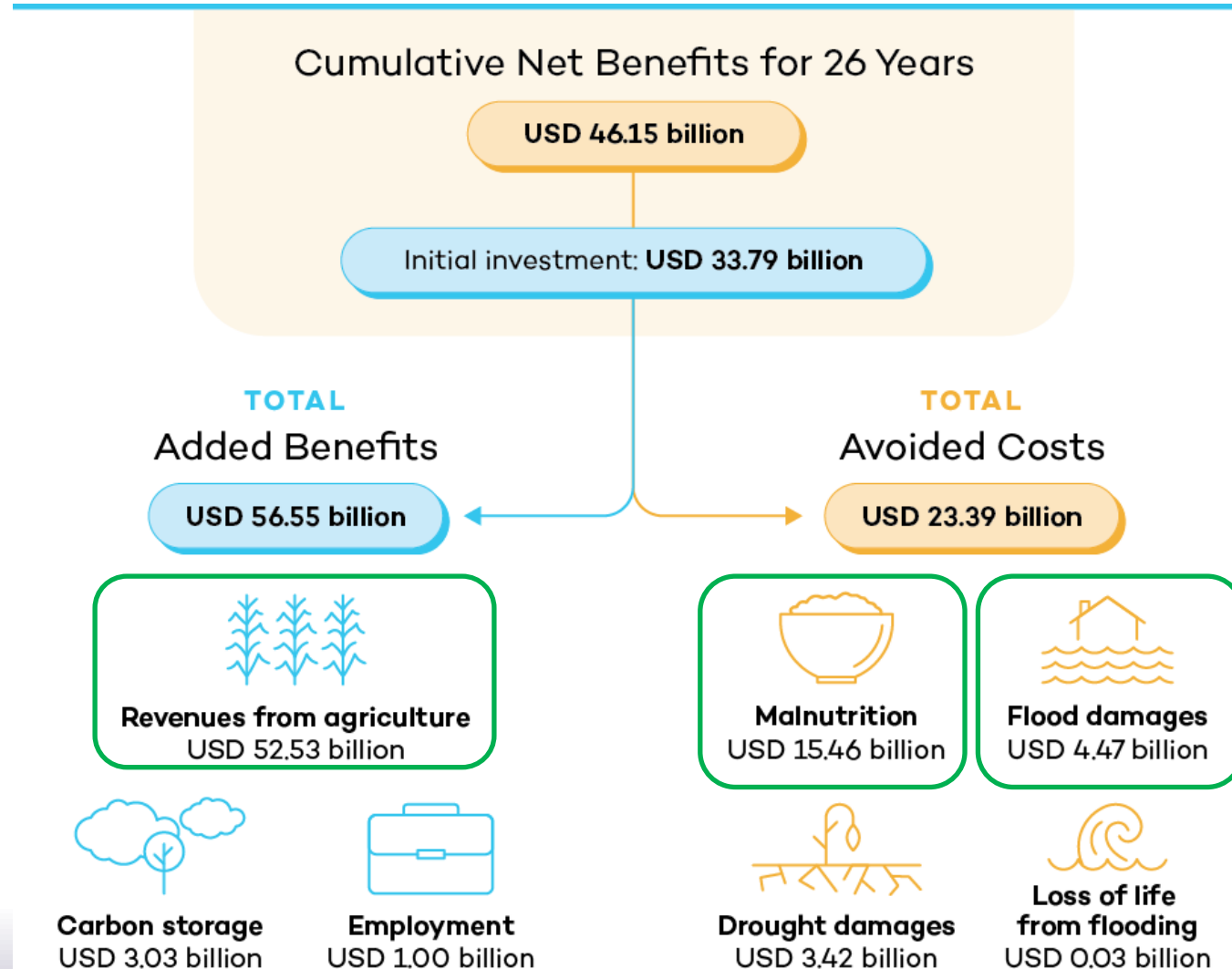
# Scenario Definitions

## Climate scenarios

The **Shared Socioeconomic Pathways (SSPs)** describe five possible future scenarios :

- **SSP1:** Sustainable development; low inequality; rapid technological change leads to low carbon energy sources and high land productivity

- **SSP2:** Intermediate between SSP1 and SSP3

- **SSP3:** Unmitigated emissions from moderate economic growth; high population growth; slow technological change; large inequality; reduced trade flows due to a regionalized world

- **SSP4:** Rapid technological change in key emitting regions; slow development in other areas with large inequality and isolated economies

- **SSP5:** High energy demand is met with fossil fuels; rapid economic development with investments in human capital leads to equitable resource distribution and slower population growth

# Results Nbi scenario 1



Cumulative Net Benefits for 26 Years

USD 46.15 billion

Initial investment: **USD 33.79 billion**

**TOTAL**
Added Benefits

USD 56.55 billion

**TOTAL**
Avoided Costs

USD 23.39 billion

Revenues from agriculture
USD 52.53 billion

Malnutrition
USD 15.46 billion

Flood damages
USD 4.47 billion

Carbon storage
USD 3.03 billion

Employment
USD 1.00 billion

Drought damages
USD 3.42 billion

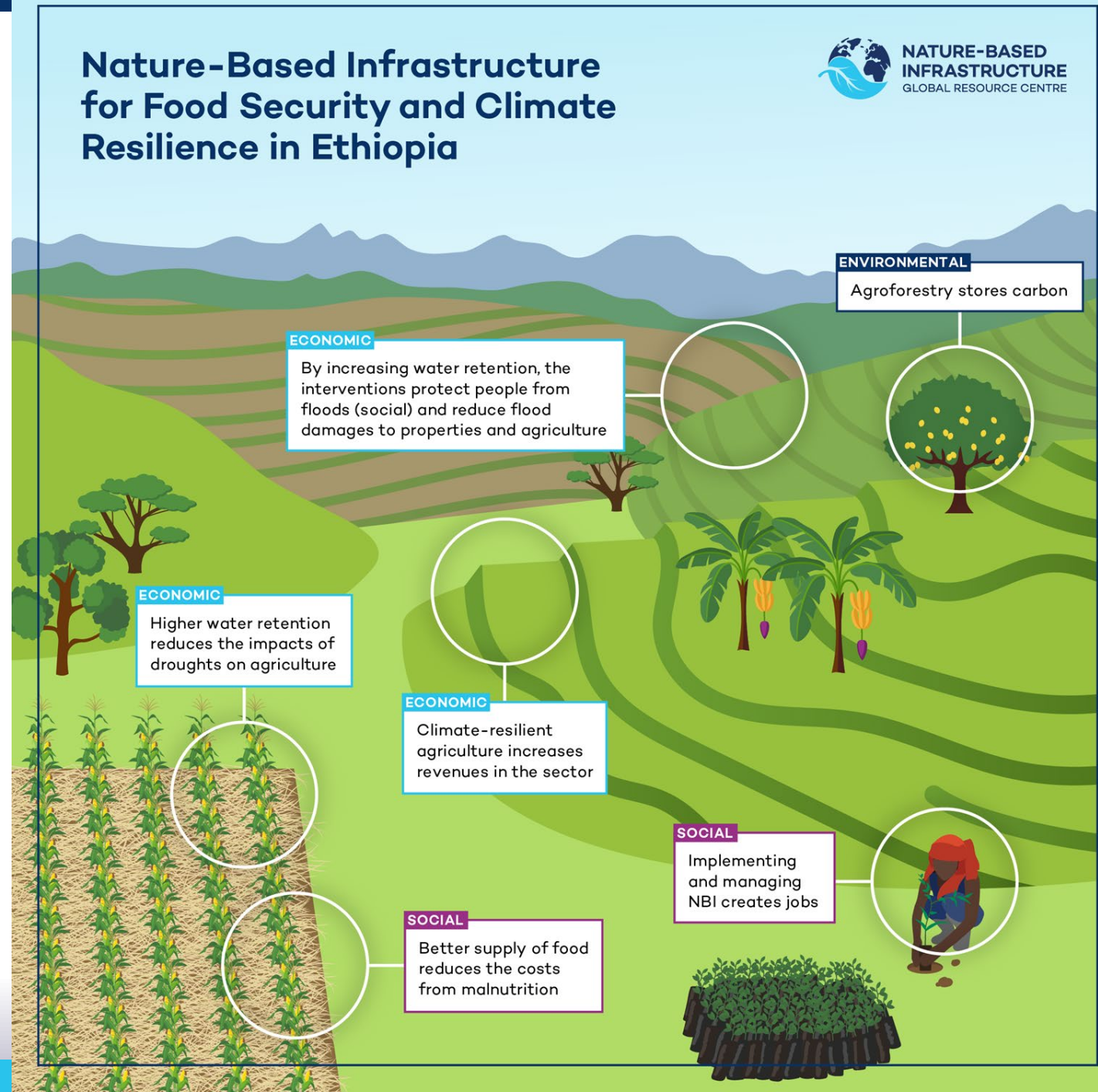Loss of life
from flooding
USD 0.03 billion

# Integrated Cost-Benefit Analysis (CBA)

Values in USD billion cumulative over 26 years, discounted at a 10% rate.

| Cost-Benefit Analysis, cumulative discounted values from 2024 to 2050 | NBI scenario 1 | NBI scenario 2 | NBI scenario 3 |
|---|---|---|---|
| **Total costs** | **33.79** | **33.79** | **33.79** |
| Capital cost | 3.57 | 3.57 | 3.57 |
| Operations & Maintenance costs | 30.21 | 30.21 | 30.21 |
| **Total added benefits** | **56.55** | **53.53** | **53.53** |
| Job creation from implementation | 0.70 | 0.70 | 0.70 |
| Job creation from O&M | 0.30 | 0.30 | 0.30 |
| Revenues from additional agriculture production | 52.53 | 52.53 | 52.53 |
| Carbon storage | 3.03 | - | - |
| **Total avoided costs** | **23.39** | **7.77** | **-** |
| Flood damages to properties | 0.12 | - | - |
| Flood damages to agriculture production | 4.35 | 4.35 | - |
| Drought damages to agriculture production | 3.42 | 3.42 | - |
| Value of loss of life from flooding | 0.03 | - | - |
| Cost of malnutrition | 15.46 | - | - |
| **Net profit** | **46.15** | **27.51** | **19.74** |
| Benefit-to-cost ratio | 2.37 | 1.81 | 1.58 |
| Internal rate of return | 153.89 % | 93.97 % | 85.77 % |

# Benefits of NBI

- Social:
  - Reduction of malnutrition
  - Job creation
  - Reduction of loss of life from flooding

- Environmental:
  - Carbon storage

- Economic:
  - Increased agriculture revenues
  - Reduced flood damages
  - Reduced drought damages



**Nature-Based Infrastructure for Food Security and Climate Resilience in Ethiopia**

NATURE-BASED INFRASTRUCTURE GLOBAL RESOURCE CENTRE

**ENVIRONMENTAL**
Agroforestry stores carbon

**ECONOMIC**
By increasing water retention, the interventions protect people from floods (social) and reduce flood damages to properties and agriculture

**ECONOMIC**
Higher water retention reduces the impacts of droughts on agriculture

**ECONOMIC**
Climate-resilient agriculture increases revenues in the sector

**SOCIAL**
Implementing and managing NBI creates jobs

**SOCIAL**
Better supply of food reduces the costs from malnutrition

# Conclusions

**Economic Viability:**
All modeled scenarios show positive returns on investment, with Scenario 1 yielding the highest Benefit-Cost Ratio (2.37) and Internal Rate of Return (153.89%).

**Health and Nutrition Co-Benefits:**
Significant reduction in malnutrition costs (USD 15.46 billion avoided under Scenario 1) underscores NBI's impact on improving public health and reducing stunting in children.

**Environmental Sustainability:**
Carbon sequestration (USD 3.03 billion under Scenario 1) and reduced flood and drought damages highlight long-term environmental resilience.

**Nature-Based Infrastructure (NBI) as a Game Changer:**
NBI integrates ecological restoration and sustainable agricultural practices, offering a viable path to address climate change while enhancing food security and public health.

**Comprehensive Accountability for Externalities:**
Scenarios that include a full spectrum of social and environmental impacts yield the highest economic and societal benefits, emphasizing the necessity of addressing both direct (e.g. food production) and indirect (e.g. malnutrition) externalities.
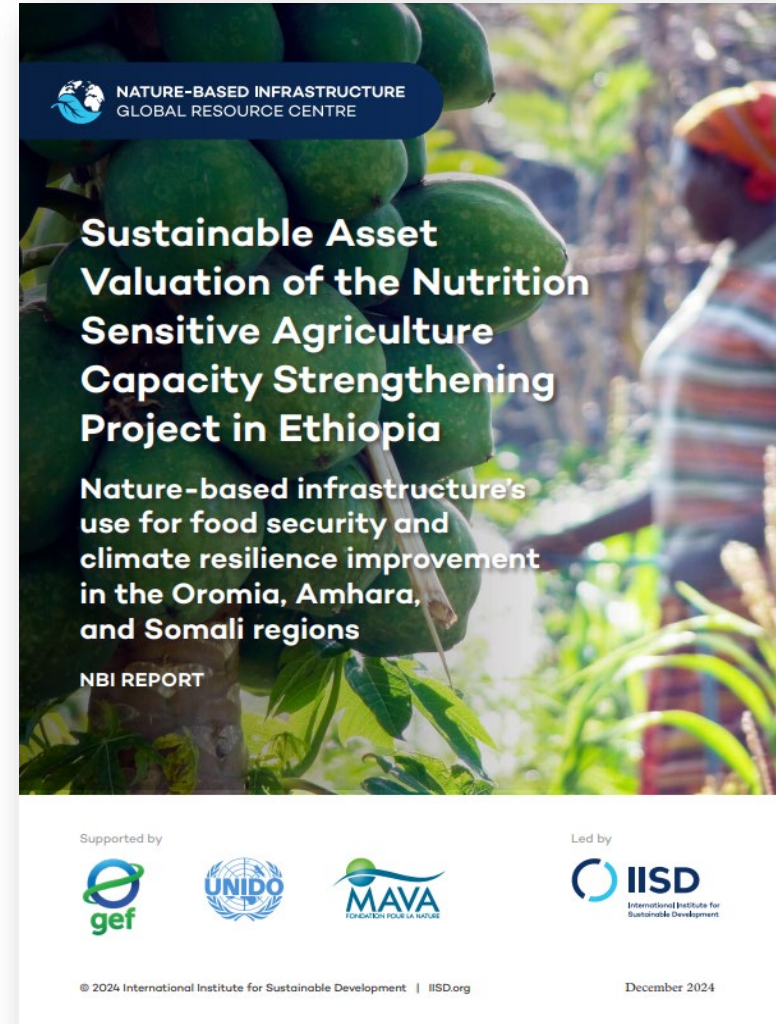
**Multi-faceted Benefits:**
NBI scenarios demonstrate the ability to mitigate climate-induced challenges such as droughts, floods, and soil degradation, directly impacting agricultural resilience and food systems.

# How the assessment findings will be used by the project/ MOA

Informing Policy and Planning

- Prioritize NBI investments

- Integrate NBIs into sectoral policies

- Develop NBI guidelines and standards

Securing Funding and Investment

- Attract public and private investment for NBI

- Advocate policy makers/government for funding NBI

Implementing and Scaling Up NBIs

- Scale up successful NBIs

# Thank you!

**For more information, please contact:**

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