



Ecological Threat Report COP29 Edition



Where next?

Climate Finance - A Development & Security Lens for COP29

Chairman's Foreword

Climate change and ecological degradation have become fundamental global stress factors, therefore the focus on climate finance has never been more critical. While the media headlines often spotlight trillion-dollar commitments and complex funding mechanisms, new research by the Institute for Economics & Peace reveals that targeted investments of a much smaller scale could yield transformative results in preventing ecological degradation and its cascade of consequences.

The Ecological Threat Report 2024 identifies 50 countries, home to 1.3 billion people, facing severe ecological threats. These challenges, ranging from water scarcity to food insecurity, are not merely environmental concerns – they are multipliers of social tension and catalysts for conflict. However, amidst these sobering findings, we have identified clear, actionable solutions.

Our research shows that an annual investment of USD \$15 billion in water capture and agricultural enhancement initiatives could increase food production in sub-Saharan Africa by 50% by 2050. To put this figure in perspective, this figure represents less than 2% of Africa's historical annual Foreign Direct Investment inflows. For a relatively modest sum, food security, business growth, local resilience, levels of conflict and forced migration across the entire continent could be improved.

This leads us to an important insight; climate finance must be viewed through the lens of development and security. The relationship between ecological degradation and conflict is clear and documented. In regions where environmental pressures intersect with weak governance, we see a compounding cycle of instability. Our analysis revealed that this pattern is particularly acute in 27 'hotspot' countries where severe ecological risks combine with low societal resilience, creating potential for increased fragility.

This briefing, prepared specifically ahead of COP29, distills the key findings of the Ecological Threat Report into actionable insights. It demonstrates how targeted investments in ecological resilience can yield outsized returns in stability and security. Most importantly, it shows how relatively modest investments, properly directed, can help to prevent the cascade of consequences that flow from ecological degradation – from extreme poverty to resource competition to forced migration and conflict.

The choice before us is clear. We can invest now in proven solutions like micro water capture and agricultural enhancement, or we can pay many times over in addressing the consequences of inaction. As you engage in-person, online or around the world during COP29, I urge you to consider how the insights from this briefing might inform your approach to climate finance. The solutions are within our reach – we need only the collective wisdom and will to implement them.

Steve Killelea AM, HC Univ. Brad
Founder & Executive Chairman
Institute for Economics & Peace

Executive Summary

At COP29, nations will set a new global climate finance target (New Collective Quantified Goal) for the first time in 15 years. This presents a rare opportunity to rethink not just the amount of funding, but how it can best support practical climate solutions. While the NCQG alone cannot address all climate finance challenges, it will fundamentally influence how countries can implement and strengthen their Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs) over the next decade.

The briefing covers three key themes relevant to COP29's focus on climate finance:

1. The opportunity for targeted climate finance to yield transformative results
2. The critical role of water capture and agricultural enhancement in preventing conflict
3. The compelling economic case for preventive investment

The evidence in this briefing demonstrates that relatively modest investments, properly directed, could yield significant returns in both climate resilience and stability.

Ecological Threat Report 2024

By the numbers:

27: Number of ecological hotspot countries facing extreme risks and low resilience

1.8%: Sub-Saharan Africa's irrigated farmland - the world's lowest rate

1.3BN: People currently living in high-risk ecological threat zones

\$15B: Annual investment needed for water and agriculture improvements

2050: Year when at-risk populations could surge to 2 billion people

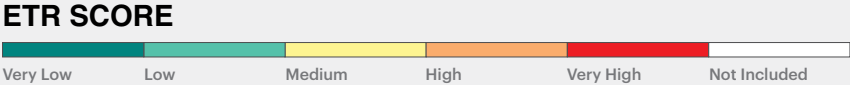
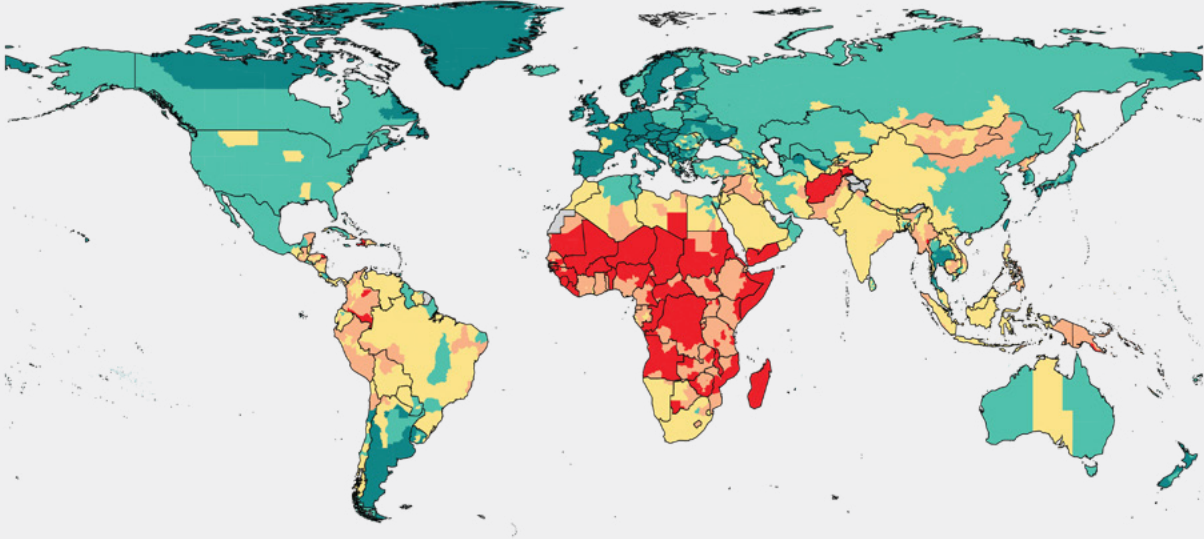
50%: Potential increase in Sub-Saharan African food production with proper investment

Without concerted international action, ecological degradation will continue to accelerate, intensifying a range of social issues, including malnutrition, and forced migration. When combined with further stressors, such as demographic pressure and poor governance, the likely result will be an increase in conflict. However, with appropriate action, involving micro water capture, enhanced agricultural yields and better local governance, the effects can be substantially mitigated.

One of the key findings of this year's report is that, through improvements in water capture for food production, an economically viable model can be developed that shows attractive returns on investment. This has the potential to reduce hunger and poverty and substantially boost economic activity in sub-Saharan Africa. For sub-Saharan Africa to meet its basic food needs by 2050, it will need to more than double its production of cereals, which represent the foundation of the region's diet.

Subnational Ecological Threat Report scores, 2024

Sub-Saharan Africa has the highest average level of ecological threat.



Source: IEP

Security & Conflict Prevention



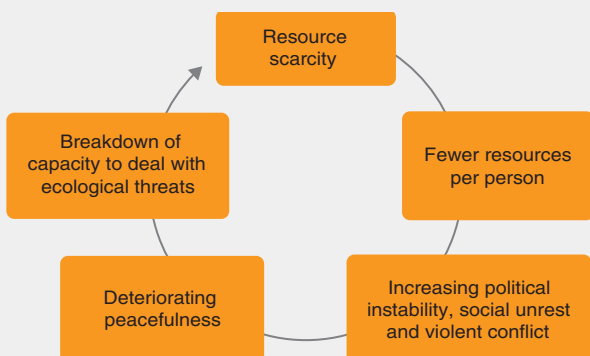
COP29 Insight: Ecological degradation acts as a multiplier of social tension and a catalyst for conflict. Evidence shows how targeted investments in ecological resilience can help prevent this cascade of consequences.

The relationship between peacefulness, food insecurity, water risk and demographic pressure is complex. If multiple ecological threats occur simultaneously, they can converge and amplify each other, causing a multiplier effect. For example, the combination of water stress and a rapidly growing population may exacerbate food insecurity, causing other effects, such as higher inflation, unplanned migration or increases in crime. Climate is and will increasingly act as a stress multiplier.

Multiple stressors are also more likely to lead to negative societal outcomes, such as political instability, social unrest and violent conflict. In turn, this may cause more damage to physical infrastructure and further deplete already scarce resources, thus creating further food insecurity and water stress. The interplay between ecological threats and socio-economic dynamics may lead a country into a vicious cycle of progressively greater adversity.

The vicious cycle of increasing resource scarcity

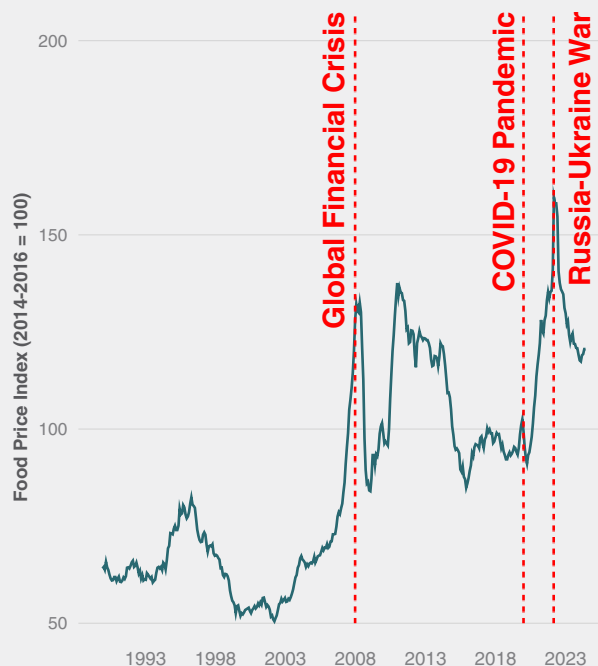
Increased stress on resources can lead to a deterioration in peacefulness.



Source: IEP

Global Food Price Index, 1990–2023

Average food prices are still almost 25 per cent higher than at the start of the COVID-19 pandemic.



Source: FAO

Population Growth & Urban Demands



COP29 Insight: We face a closing window of opportunity for action. Population projections and urbanisation trends demonstrate why investment in water and agricultural infrastructure is urgently needed now.

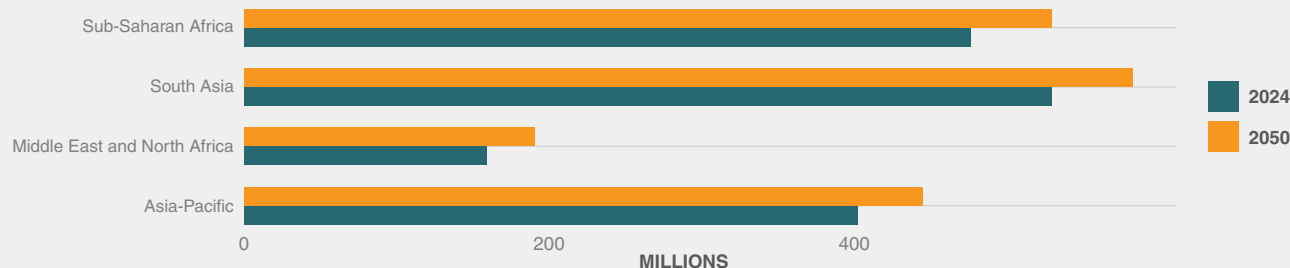
In the next 26 years, the population of sub-Saharan Africa is projected to nearly double, from 1.2 billion in 2024 to 2.1 billion in 2050. In contrast, the population of the rest of the world is projected to grow by only about 10 per cent.

Sub-Saharan Africa's growth will shift its current rural-urban balance. At present, 44 per cent of the population live in urban settings, making it one of just two regions in the world that continues to be predominantly rural. However, by 2050 it will be majority urban, with 58 per cent of the population projected to live in towns and cities.

Despite this sizeable shift, the overall demographic expansion in sub-Saharan Africa will be so large that its rural population will also grow markedly. While rural populations in all other regions of the world will either shrink or remain virtually unchanged, sub-Saharan Africa's rural population will grow by 32 per cent in the next two and a half decades.

Projected number of people facing very high food insecurity, 2024 to 2050

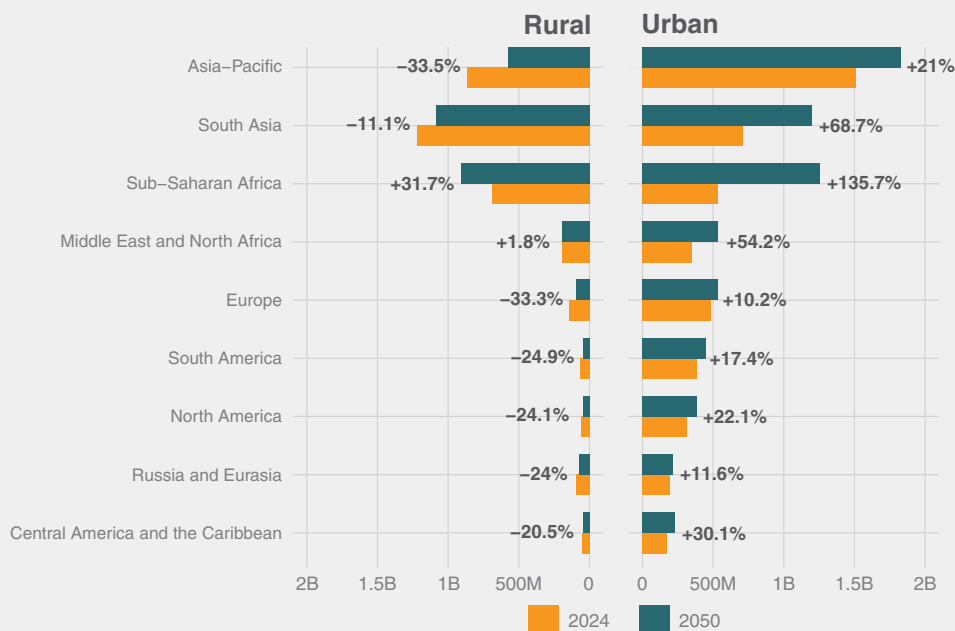
The number of people experiencing insufficient food consumption may reach over 1.7 billion people in the next 26 years.



Source: WFP

Rural and urban population projections by region, 2024 to 2050

Sub-Saharan Africa is the only region projected to experience sizeable growth in both urban and rural settings.



Source: UN; IEP calculations

Agricultural Production Gap



COP29 Insight: Modest, targeted investments could dramatically improve food security and economic development. Current agricultural yields in vulnerable regions are less than half of their potential.

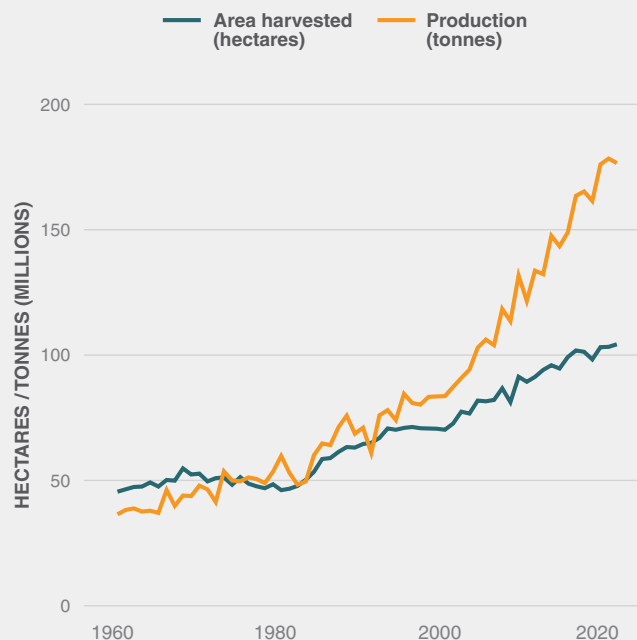
Regional improvements in agricultural output relative to inputs, as measured by the total factor productivity (TFP), have lagged efficiency gains in other parts of the world. While global agricultural TFP has increased by about 84 per cent since the 1960s, in sub-Saharan Africa it has only increased by about 27 per cent.

Sub-Saharan Africa has the lowest crop yields of any region in the world. Farms in the region produce an average of about 1.7 tonnes of cereals per hectare each year, less than a third of the global average of 5.4 tonnes per hectare. Moreover, 15 of the 20 least productive countries in the world are in sub-Saharan Africa.

Poor infrastructure further exacerbates the challenges faced by sub-Saharan African farmers. In many areas, low-quality roads and transportation infrastructure hinder access to markets, undermining farmers' ability to profit from their crops and invest in better farming practices. Additionally, inadequate storage facilities contribute to high post-harvest losses, reducing incentives to increase production. Limited access to credit and financial resources prevents investment in productivity-enhancing technologies, while insecure land tenancy discourages long-term investments in land improvement.

Total area harvested and tonnage of cereal production in Sub-Saharan Africa, 1961–2022

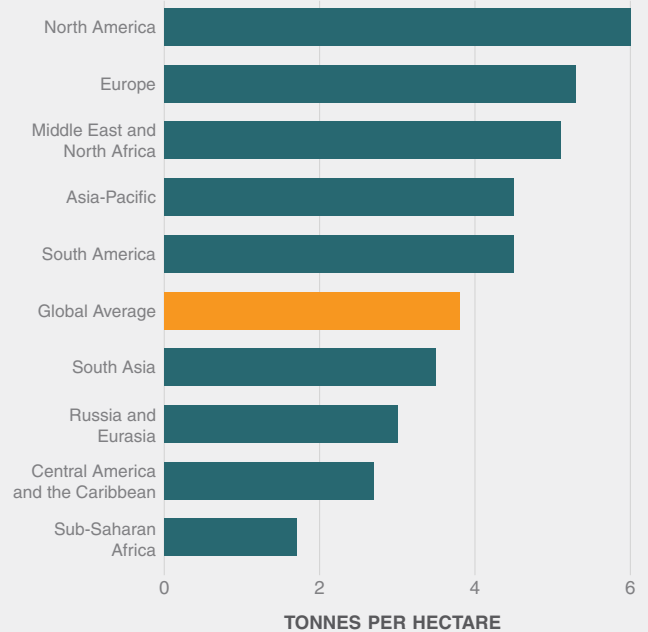
The total volume of cereals produced in the region has increased nearly fivefold.



Source: FAO

Tonnes of cereal produced by hectare, regional averages 2018–2022

Farms in sub-Saharan Africa produce less than half of the global average.



Source: FAO; IEP calculations

Water Resources & Solutions

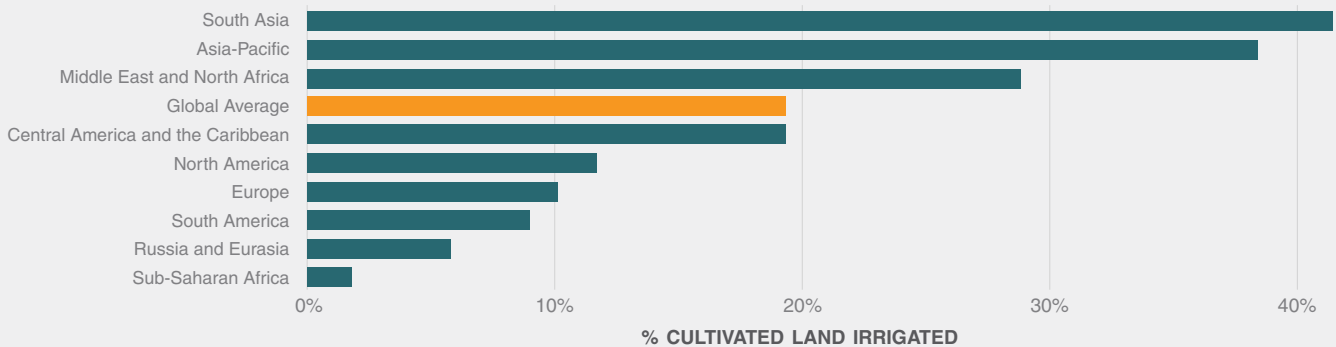


COP29 Insight: Water capture represents a solution with immediate returns. Technical analysis shows that many at-risk regions have sufficient water resources but lack the infrastructure to utilise them effectively.

Water risk is not strongly correlated with water resources. The greatest obstacle to increased water utilisation for agriculture in sub-Saharan Africa is the lack of infrastructure to effectively capture and distribute water, particularly during dry seasons. Currently, only two per cent of the region's renewable water resources are used in agriculture, less than one third of the global rate of 6.7 per cent and substantially less than the 47.7 per cent used in the Middle East and North Africa.

Percentage of cultivated lands that are irrigated, by region, 2021

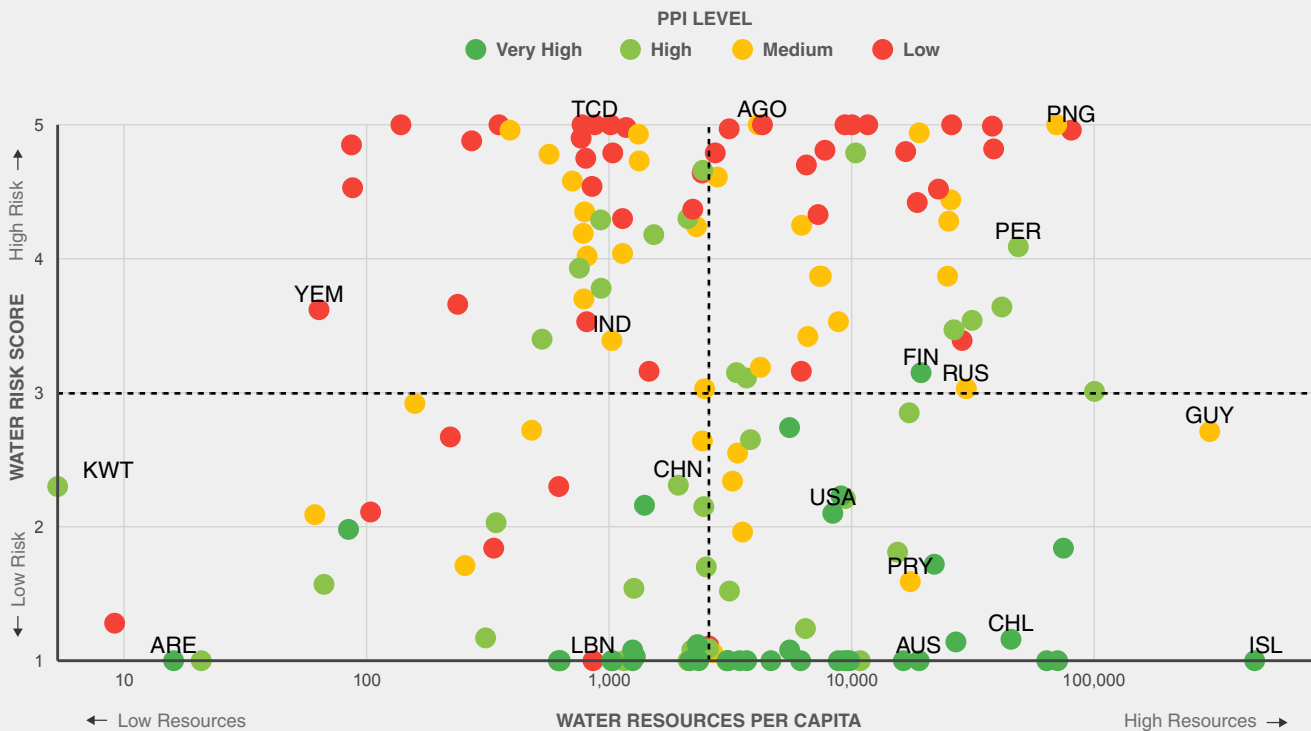
Only 1.8 per cent of the lands under cultivation in sub-Saharan Africa are irrigated.



Source: FAO Aquastat; IEP

Water risk vs per capita water resources

Many countries have substantial water resources but are unable to effectively access them due to lower levels of institutional capacity and infrastructure development.



Source: FAO

Note: Only includes countries included in the GPI.

Untapped Potential



COP29 Insight: Despite the severe stresses on water access, sub-Saharan Africa has substantial untapped capacity to increase its agricultural output through the expansion of agricultural water use.

According to FAO data, sub-Saharan Africa has about 34.2 million hectares of farmland that is not irrigated, meaning it has substantially underutilised productive capacity. IEP estimates that providing adequate water to fully utilise these lands would cost about US\$9.2 billion per annum and result in average yield increases of about 80 per cent, which would have a total annual value of at least US\$12.3 billion.

The region also has approximately 200 million hectares of uncultivated arable land, representing about 60 per cent of the global total, providing further valuable land. Sensitivity will need to be applied as there are social and ecological trade-offs. By focusing on increasing yields further benefits can be derived.

Innovation & Technology: Sand Dams & Beyond



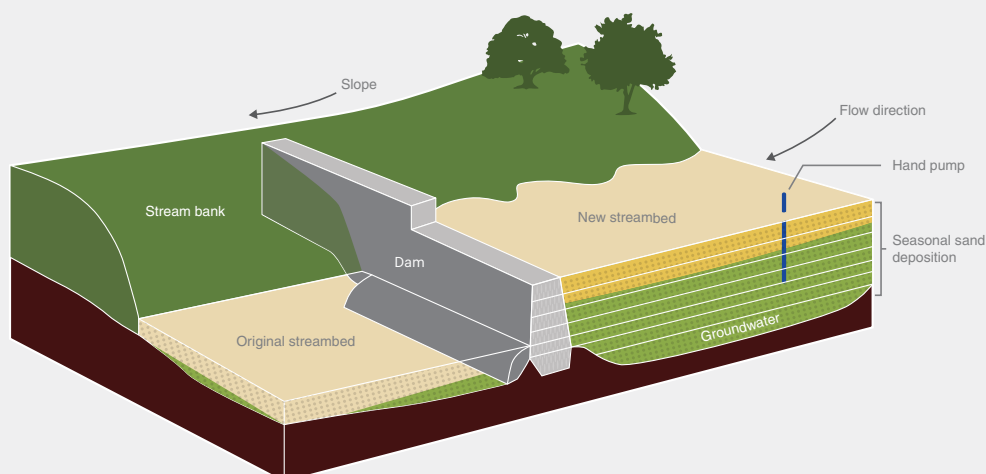
COP29 Insight: Practical solutions are ready for immediate implementation. Case studies of successful water capture projects demonstrate scalable approaches that can be rapidly deployed.

There are many examples of micro water capture techniques. They can range from tapping into artesian basins to rock run-off capture to earthen dams. One type of technology is sand dams, which are not well-known and are not suitable for all locations but do provide a cost effective mechanism to capture and store water.

A very large sand dam can hold 71,000 cubic metres of water, which when amortised over 10 years will yield water for US\$0.29 per thousand litres. This indicates that around six to nine hectares of land could be fully irrigated from a single dam.

Schematic diagram of a sand dam in Kenya

For the cost of US\$35,000, a sand dam can capture water with a return on investment value of US\$180,000.

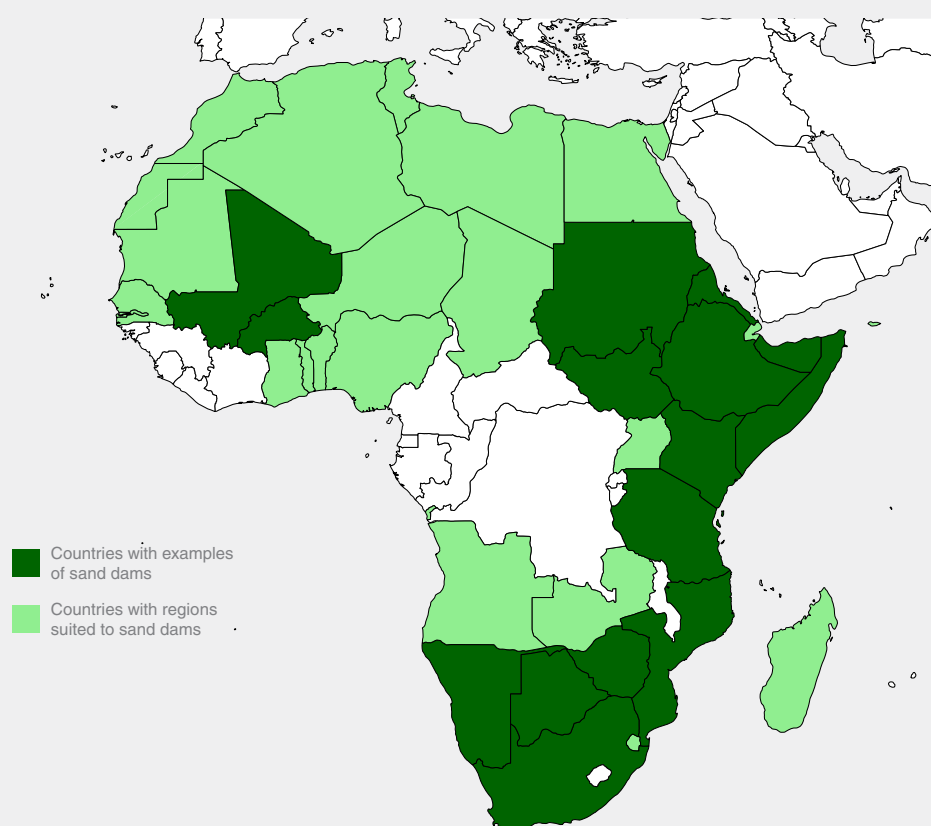


A study on sand dams in Kenya commissioned by The Charitable Foundation, IEP's sister organisation, estimated that the increases in yields from lands irrigated from such a dam would have a value of around 20 million Kenyan shillings (US\$180,000). The return on investment will vary depending on the crops and price of staples at the time.

Advances in irrigation technology will make water use in agriculture more efficient in the years and decades ahead. Irrigated land in low- and middle-income countries will increase by 34 per cent by 2030, but the amount of water used by agriculture will only increase by 14 per cent. This is owing to improved irrigation management and practices, which include increased use of drip irrigation systems, advanced sensors and automation for precise water application, soil moisture monitoring, and scheduled irrigation based on crop needs.

African countries suitable for sand dam implementation

With the exception of Central Africa and some parts of coastal West Africa, most countries in sub-Saharan Africa would benefit from the implementation of sand dams.



Source: Sustainable Sanitation and Water Management

Non-Input-Based Enhancements



COP29 Insight: A comprehensive approach to ecological resilience delivers the strongest returns. Evidence shows how technological and practical innovations can complement infrastructure investments.

While significant investments are essential for sub-Saharan Africa to meet its food production needs by 2050, inputs like water and fertilisers alone have limited effectiveness in helping the region's agricultural sector reach its full potential.

To bridge this gap, experts often stress the importance of localised, context-specific practices, innovations, and technologies that enable farmers to maximise the productivity of the lands and inputs they already have. These include:

- Adopting improved seed varieties
- Precision agriculture
- Better pest and disease management
- Conservation agriculture techniques
- Crop rotation
- Minimal tillage
- Use of cover crops to enhance soil health and fertility
- Strengthening agricultural extension services through training and information

Economic Returns & Investment Case



COP29 Insight: Small-scale water capture projects present compelling investment opportunities. Detailed financial analysis shows potential returns of up to three times the initial investment.

IEP estimates that annual investments totalling about US\$15 billion by 2050 in irrigation systems, new water capture projects, increased use of fertilisers, and expanded grain storage infrastructure could help the region increase its cereal production by more than 50 per cent.

This model assumes that these systems and resources would not be made available in all areas immediately, but rather would progressively expand over the next 26 years. Based on a linear expansion of the strategies involving annual fixed costs or ongoing mid-term costs (such as fertiliser use and irrigation system installation and maintenance), this would entail a total cost of US\$220.9 billion by 2050. While the annualised and total sums in the model may appear high, they are comparable with the levels of foreign aid that sub-Saharan Africa receives at present. This figure represents less than 2% of annual historical foreign direct investment into Africa

Based on a median cereal price of about US\$450 per tonne, a farmer growing grains on a one-hectare farm in the region would currently generate around US\$770 in revenue per year. With investments costing between about US\$290 and US\$440, however, the average per-hectare yield could be raised 162 per cent, from 1.7 tonnes to 4.5 tonnes, a moderate estimate compared to other assessments of comparable yield-boosting strategies. This would result in a new total yield value of around US\$2,000, representing US\$1,240 in new income and a net profit of US\$800-US\$950.

In a region in which 52 per cent of the labour force is dedicated to agriculture and the vast majority are smallholders operating farms smaller than two hectares, income increases of this kind would be transformational.

Average annual cost of implementing cereal yield-boosting strategies

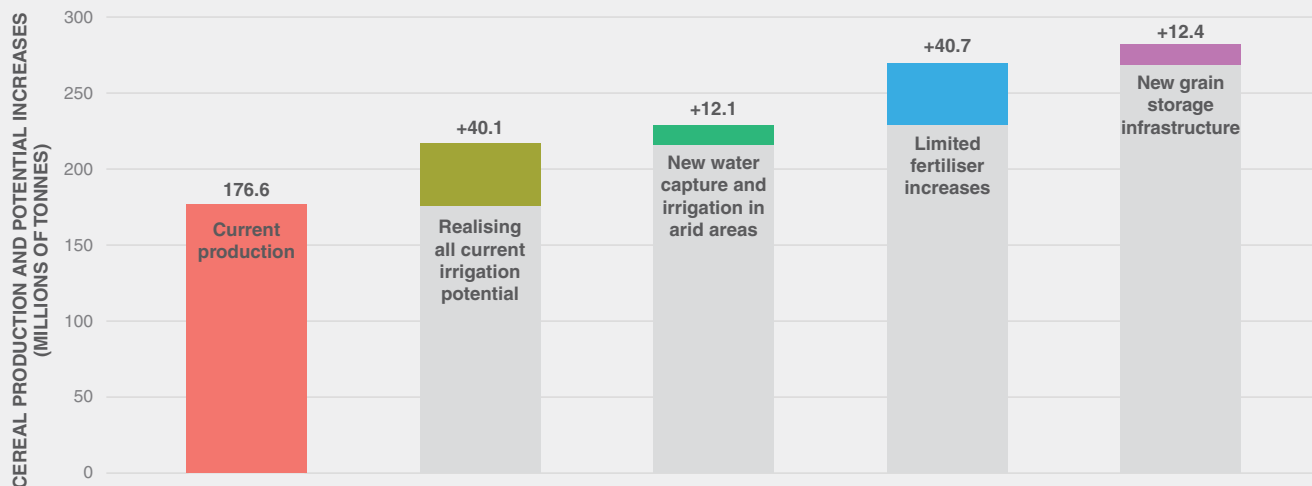
Irrigation expansion and new water capture would account for nearly 90 per cent of the cost.

Strategy	Calculation
Developing and maintaining new irrigation systems on lands with irrigation potential	\$270 per year on 34.2 million hectares
One million new small-scale water capture projects and the development and maintenance of new irrigation systems on surrounding lands	\$34.6 billion over 26 years and \$270 per year on 8.9 million hectares
Raising median fertiliser use to 20 kgs per hectare on cereal croplands	\$14.2 per year on 104.3 million hectares
New grain storage facilities	\$12 billion over 26 years
Total	\$14.7 billion

Source: IEP

Potential gains in cereal production

Sub-Saharan Africa could potentially produce 281.9 million tonnes of cereals each year by 2050.



Source: IEP

Conclusion - A Practical Step Forward



COP29 Insight: While the global climate crisis requires many solutions at different scales, investment in water infrastructure represents one practical step that could yield immediate and measurable results.

The evidence presented in this brief demonstrates one clear opportunity for climate finance at COP29:

The Context

- Climate change is and will increasingly act as a stress multiplier
- 1.3 billion people live in countries facing severe ecological threats
- Multiple, interconnected challenges require a range of solutions
- Water security represents one critical piece of the puzzle
- Small-scale, practical solutions can yield significant results

The Economic Case

- USD\$15 billion annual investment could transform regional food security
- Returns of up to three times the initial investment
- Comparable to current aid flows to the region
- Transformational impact for smallholder farmers

Proven Solutions

- Micro water capture technologies can yield immediate results
- Tapping artesian basins, rock run-off, earthen dams and sand dams are examples of micro capture
- Small-scale projects demonstrate strong returns on investment
- Improved irrigation could increase yields by up to 162%
- Modern technology enables efficient water use

Broader Impact

- Contributes to reduced conflict risk
- Enhances local climate resilience
- Improves community stability
- Demonstrates effective use of climate finance

As COP29 considers the complex challenge of climate finance, this analysis presents one practical opportunity for immediate action. While water capture and agricultural enhancement alone cannot solve the climate crisis, they represent the kind of tangible, proven intervention that could make a meaningful difference to millions of lives.

With an investment of USD\$15 billion annually - less than 2% of current foreign direct investment in Africa - we can demonstrate how targeted climate finance can deliver measurable results. This model of practical, focused intervention could inform similar initiatives across other aspects of climate adaptation and resilience.



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