

GLACIERS, FORESTS & WATER SECURITY



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Glaciers as water towers, forest as secondary storage tanks - two connected planetary systems at a tipping point of becoming institutionalised infrastructure assets

THE ALPS & THE HIMALAYAS: EUROPE'S AND ASIA'S WATER TOWERS

The Villars Institute's Ocean event convened by Keith Tuffley, Johan Rockström, and Victoria Attwood Scott this week in Villars, Switzerland is putting the ocean, poles, and glaciers at the centre of planetary tipping point conversations, reminding us that the finance and technology solutions needed to act already exist. The geopolitics of the poles has certainly drawn attention to these regions in the past two years. It's however important not to forget glaciers – which are the silent water towers of our world - storing freshwater through winter and releasing it during the driest months, sustaining rivers, farms, and cities across continents.

The Alps: Alpine glaciers feed five major watersheds - the Danube, Rhine, Rhône, Po, and Adige - supplying water to over 145 million people, roughly 20% of Europe's entire population. The Alps are facing measurable rapid glacial retreat, with serious consequences for hard infrastructure, regional water systems, and tourism economies.

The Himalayas: Known as the 'Third Pole', the Himalaya-Hindu Kush region supplies freshwater to a substantial portion of humanity - with more than 1.9 billion people relying on meltwater for drinking, agriculture, and energy. The Indus River alone, fed by Himalayan glaciers, supplies the world's largest irrigated agricultural system and supports an estimated 319 million people across Pakistan, India, Afghanistan and China.

KILIMANJARO: AFRICA'S VANISHING WATER TOWER

In East Africa, scientists have calculated that Kilimanjaro's ice sheet has shrunk by more than 85% since 1912, with the rate of loss accelerating sharply in recent decades. This matters enormously downstream: more than two million people in Tanzania and Kenya depend on waters fed by Kilimanjaro, which form the headwaters of the Pangani Basin - supporting drinking water, agriculture, and livelihoods across an entire region.

"Glaciers, forests, and communities are inextricably linked. We cannot protect one without the other."

The Byrd Polar Research Center at Ohio State University has made pivotal contributions to understanding this crisis. Through ice-core drilling and long-term glacier monitoring, the Byrd team demonstrated that Kilimanjaro's remaining glaciers record over 11,700 years of African climate history. Their research revealed a critical nuance: glacial meltwater is not the primary direct water supply to Pangani communities. Instead, large-volume springs feeding agricultural irrigation are recharged by deep groundwater flow - water stored from glacial periods that is no longer being replenished. Communities may be drawing on an ancient glacial legacy that will not refill.

This makes forest restoration not merely an environmental act - it is essential water infrastructure. Research has shown that deforestation on Kilimanjaro has already reduced dew capture by an estimated 25%, equivalent to the annual drinking water supply of one million people.

FORESTS AS SECONDARY WATER TANKS: THE WORK OF KIJANI PAMOJA

When glaciers retreat, forests must do more. Forests regulate the water cycle in three powerful ways: their canopies intercept rainfall and fog, slowing runoff and allowing water to percolate into soils and aquifers; their root systems hold soils together, preventing erosion that silts rivers and reservoirs; and through transpiration, trees release water vapour that sustains rainfall patterns hundreds of kilometres downwind - what scientists call "biotic pumping." As glaciers shrink, intact forests become the last functioning water tower.

The mission of Kijani Pamoja (also known as The Kilimanjaro Project) works to restore degraded ecosystems on the foothills of Mount Kilimanjaro and Mount Meru, with the audacious vision to roll out across the entire Pangani Water Basin, including the West Usambaras Mountains. The project directly addresses the collapse of rivers flowing from Kilimanjaro that now affect over five million people in the Pangani Basin.

The project uses a community-rooted model of restoration: trees grown and traced through robust monitoring technology (Tree-tracker and MyFarmTrees), funding models that are blended and innovative requiring catalytic philanthropy for project readiness that unlock investments into carbon and nature credit programmes; farmers and local communities who are the stewards and caretakers that depend on healthy ecosystems for their wellbeing and livelihoods. This is science, finance, and community partnerships working in tandem - a model that is rapidly being scaled globally as technology and traceability improve.

A heartfelt shout-out to the founder Sarah Scott and the entire Kijani Pamoja team and growing partner base evidencing that the finance and technology needed to act already exist. The project provides a strong signal to ecological infrastructure investors that the African continent presents scalable community centred models, and one that provide equitable returns and measurable nature positive outcomes.

Scientific References

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