A quarterly magazine of WWF-Pakistan

Natura

Vol 52, issue2, 2026



THE GREEN CONNECTION

HOW PLANTS SUSTAIN PEOPLE, WILDLIFE AND PLANET

EDITORIAL

Plants may be among the quietest forces in our lives, yet they are fundamental to sustaining the world around us.

From forests that protect our soils and watersheds, to mangroves that shield our coasts, plants are woven into the systems that sustain life. They form the unseen thread running through our landscapes, linking human lives with wildlife, water, and climate from the city centers to the coasts. This issue of Natura, themed 'The Green Connection - How Plants Sustain People, Wildlife and Planet', explores these connections through a range of voices and experiences from across Pakistan.

The stories in this issue move beyond the simple idea of planting trees.

They ask what it means to restore an ecosystem, why native species matter, how plants can help cities become more liveable, and how forests, wetlands, mangroves and agricultural landscapes contribute to climate resilience. They also remind us that conservation is deeply connected to people: farmers who manage land, communities living alongside mangroves, researchers observing changing birdlife, and practitioners working to bring nature-based solutions into our water and climate responses.

Across these articles, one message emerges clearly: plants are not merely scenery. They are living infrastructure. They filter water, store carbon, support biodiversity, protect soils, regulate temperatures and sustain livelihoods.

Protecting these connections is not only an investment in nature. It is an investment in a healthier, more resilient future for Pakistan.

Editorial by Shahgan Hummayoun Butt, Manager Communications, WWF-Pakistan.

Natura QUARTERLY MAGAZINE

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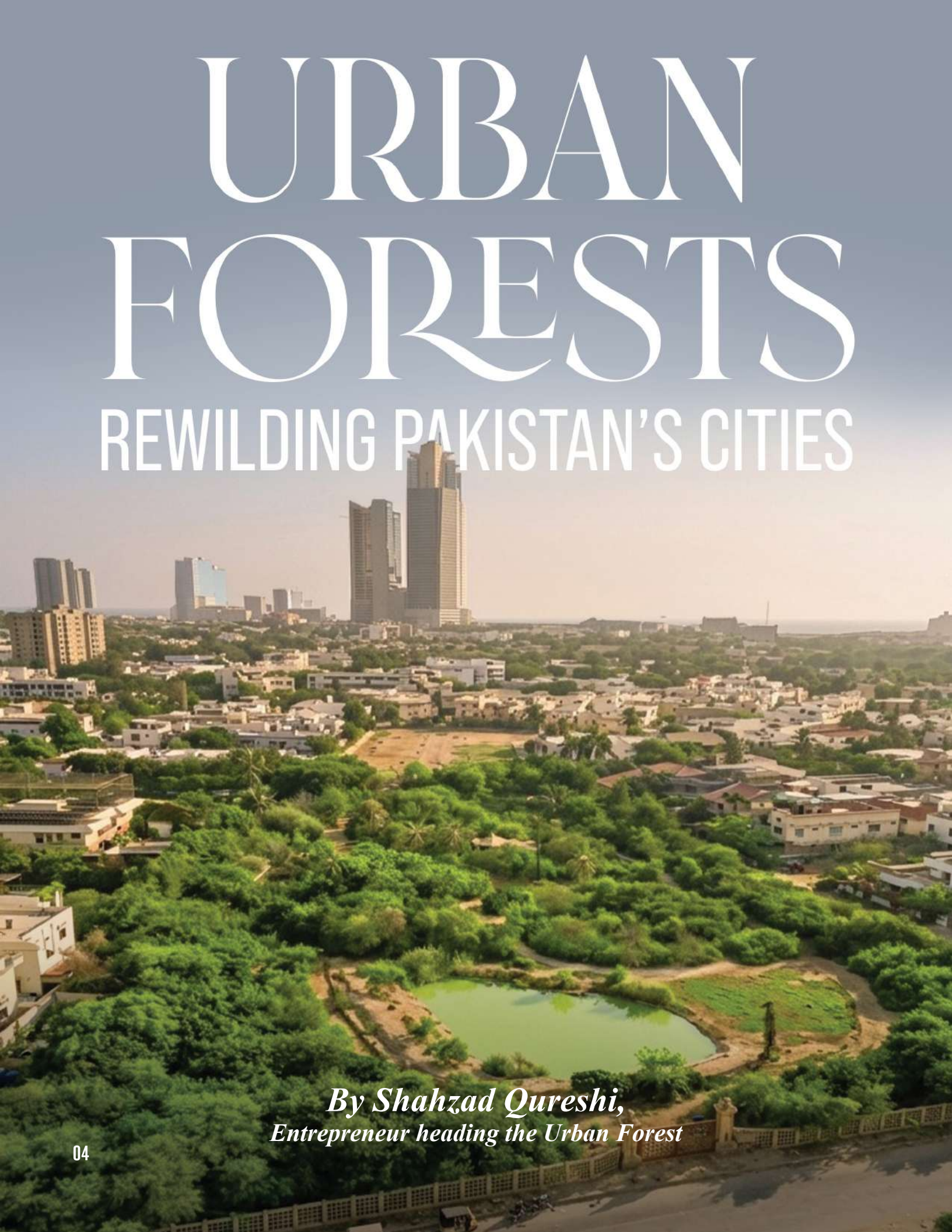
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URBAN FORESTS

REWILDING PAKISTAN'S CITIES



By Shahzad Qureshi,
Entrepreneur heading the Urban Forest



In the summer of 2015, Karachi felt like it was on fire. Temperatures soared past 45°C; the concrete held the heat long after sunset, and precious lives were lost. I lived through it.

Like many others, I kept asking the same question: how did our city become this hostile? One clear answer kept coming back—almost no green cover left. Studies later confirmed what we already felt on our skin: Karachi's tree canopy was under one per cent. We had turned a coastal city into an urban heat island.

That year I also watched a TED talk by Shubhendu Sharma about growing small, dense forests of native plants using a method developed by the Japanese botanist Akira Miyawaki. The idea was simple and bold: plant many different local species close together, in layers—shrubs, small trees, taller trees, canopy trees—so they compete for light and shoot up fast. Within two or three years you can have a self-sustaining patch of forest that needs almost no chemicals or constant care. I messaged him. He came to Karachi. We started with a pilot on a former garbage dump next to Nehr-e-Khayyam in Clifton Block 5. A few hundred square metres.

About 1,200 saplings of roughly 40–45 native species, neem, keekar, sukhchain, peelu, goondi and others that belong here.



© Shahzad Qureshi

It worked. The plants grew. Birds returned. Insects arrived. The temperature inside that little patch felt noticeably cooler—four to five degrees lower on some afternoons, something visitors kept remarking on. We expanded it across the park. Over the years more than 9,000 people came and planted. Schools brought students to see native species and understand why they matter.

We added a vegetable patch that fed the neighborhood, a composting corner that took kitchen waste from nearby homes, and pathways that let people walk through without destroying the undergrowth. Later we did similar projects in other spots in Karachi and a couple in Lahore. The method travels well if you respect the local soil and species.

People sometimes ask why not just plant neat rows of the usual roadside trees. Those have their place, but they do not create a natural living system. A real forest is messy in the best way. Leaves fall, insects chew, birds nest and soil improves. When someone once complained about caterpillars eating leaves, I told them I would rather have a buffet for the bugs than plastic greenery. Everything is connected. Research from places that have monitored these dense plantings shows they can cool the air by several degrees—Earthwatch data from Tiny Forests in Europe recorded up to 6°C cooler inside three-year-old plots.

The multi-layered canopy shades the ground, and the plants release moisture. In a city where heat kills, that difference is not small.



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Water is another quiet benefit. Dense root systems and improved soil structure help rain soak in instead of rushing off into drains that already struggle. Monitoring of similar forests has found water infiltration rates roughly 25–30 per cent faster than surrounding ground. In Karachi, where water is a precious resource and rainfall is increasingly unpredictable, every patch that holds water matters. Biodiversity returns too.

What started as bare ground soon hosted birds, lizards, bees and butterflies that had nowhere else to go.

Studies of Miyawaki-style plantings often report far higher numbers of species than single-species plantations of the same size. Carbon is locked away faster in the early years because the trees put on biomass quickly as they compete for light. One recent assessment of young urban Miyawaki forests in South India found sequestration rates rising sharply within five years.

None of this is magic, and none of it is free. Preparing the soil properly—mixing organic matter so roots can breathe—takes effort and money. In our coastal conditions salinity can be a problem; some species simply do not thrive near the sea. But when it works, the forest largely looks after itself after the first couple of years. No pesticides. No endless watering once established. Just a small piece of wildness in the middle of the city.

I handed the original Clifton park back to the Karachi Metropolitan Corporation in 2023. It was always meant to be public. The point was never to own a forest; it was to show that we can grow one. Pakistan's cities are still expanding, still heating up, still losing the last scraps of native vegetation. We do not need one giant forest.

We need hundreds of small ones—in leftover corners of parks, school grounds, factory yards, along nullahs, beside mosques. Each one cools its immediate surroundings, holds a little water, feeds a few birds, and gives children a place to see what a real tree looks like up close.

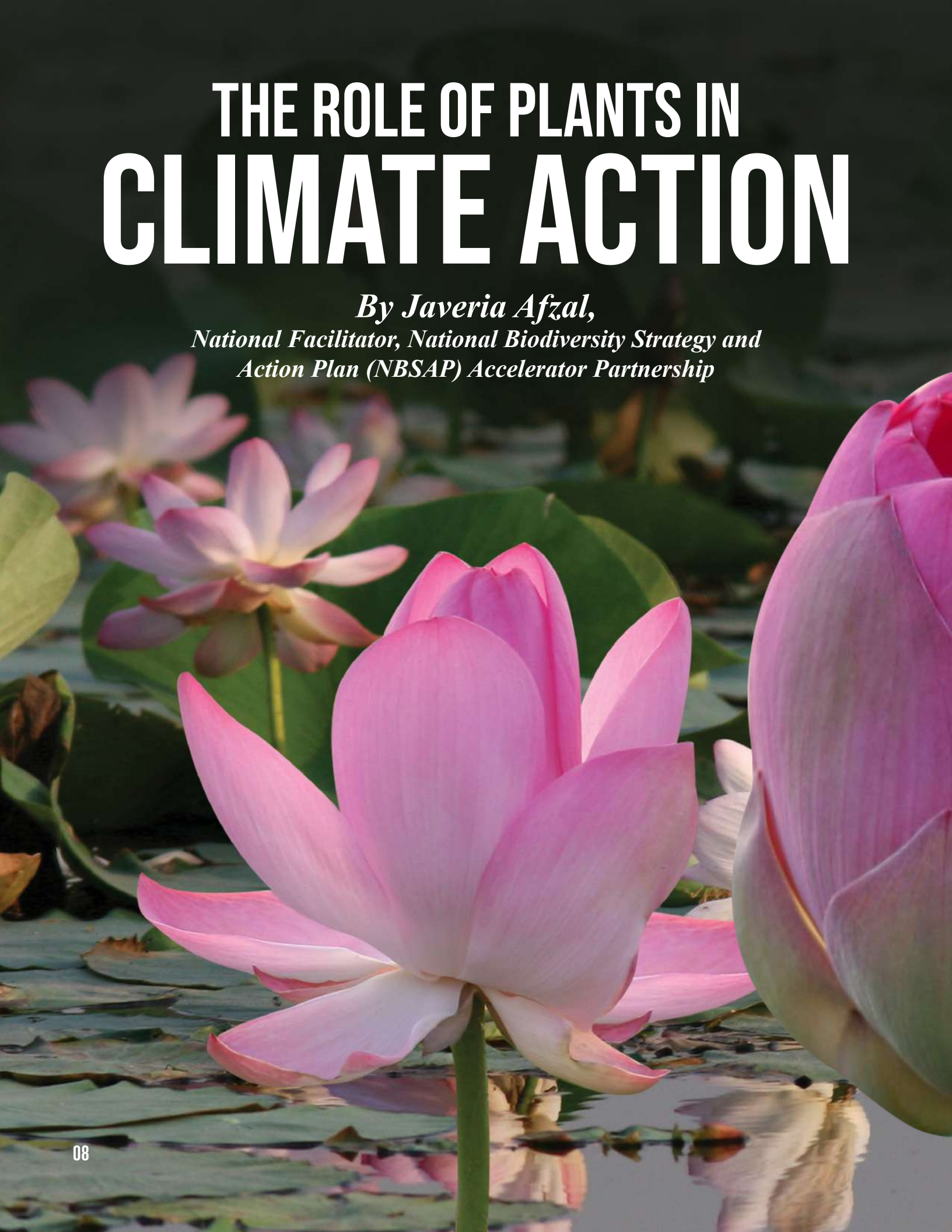
Rewilding does not mean turning cities back into wilderness. It means weaving native flora back into the places where people live so that life becomes a little more bearable and a little more connected. The green threads are still there. We just have to plant them densely, protect them for a few seasons, and then step back and let them work.





THE ROLE OF PLANTS IN CLIMATE ACTION

By Javeria Afzal,
National Facilitator, National Biodiversity Strategy and Action Plan (NBSAP) Accelerator Partnership



On a visit to an urban forest in Clifton, Karachi, one thing stayed with me: sewage water pooling around the roots, trees managing to survive it anyway. It raised an uncomfortable question about urban planning: untreated sewage water is running into forests and ultimately into the sea, with seemingly no thought given to where our waste ends up.

And yet, if plants can hold on even here, imagine what they could do for a city with a little more care.

When we talk about climate action, the conversation often turns quickly to renewable energy, electric vehicles and cleaner industries. All of these are essential. But some of our most valuable climate infrastructure is already around us. A tree shading a street in Lahore, mangroves buffering coastal communities in Sindh, vegetation holding together a mountain slope in the north, or native grasses protecting soil in Pakistan's rangelands may look very different from one another. Yet each is doing the same essential work: storing carbon, cooling surroundings, regulating water, and holding ecosystems together.

As Pakistan works to build climate resilience into national planning, plants deserve to be understood as core green infrastructure, not scenery.

More Than Carbon

Forests' ability to absorb and store carbon is probably their most familiar contribution to climate action but focusing on carbon alone can obscure much of what these ecosystems actually do for us. Take Pakistan's mangroves. Their value isn't just the carbon locked in their vegetation and soils; they are nurseries for fish, support coastal livelihoods, stabilise shorelines, and buffer communities against coastal hazards. Protecting a stretch of mangrove forest is, at once, climate mitigation, climate adaptation, biodiversity conservation and a direct investment in people's livelihoods. The same logic runs through the country's other landscapes. Native vegetation across drylands and rangelands protects fragile soils while sustaining livestock and wildlife. Diverse agricultural landscapes support the pollinators that food systems depend on. Programmes like the Ten Billion Tree Tsunami have helped put nature firmly into Pakistan's climate conversation. The next step is looking more closely at what gets restored, where, and why. A healthy ecosystem isn't simply a count of trees; it's a living system of soil, water, wildlife and people, with relationships that take years to rebuild once lost.





Shade as Infrastructure

Pakistan's cities are getting hotter, and the heatwaves of recent years, Karachi and Jacobabad chief among them, are a preview of what unmanaged urban growth looks like in a warming climate. Concrete and asphalt absorb and radiate heat; tree canopy does the opposite. Through shade and transpiration, urban greenery can noticeably lower local temperatures, easing pressure on both public health and power grids during peak summer months. In dense, low-income neighborhoods with the least access to cooling infrastructure, a few streets of mature trees can be the difference between a bearable summer and a dangerous one. Urban greening in Pakistan has tended to be treated as beautification projects like parks, roundabouts rather than a climate adaptation strategy. That framing needs to shift as city master plans are revised and new housing schemes approved with barely a tree in sight.



From Planting Trees to Restoring Ecosystems

This is a distinction that matters more than it might seem: the success of a restoration effort can't be measured only by the number of seedlings planted. What counts is whether those plants survive, whether the right species went into the right places, whether ecological functions are actually recovering, and whether local communities have a stake in keeping them alive. Sometimes the most effective intervention isn't planting at all but protecting an existing forest, letting degraded vegetation regenerate naturally, restoring a wetland, or improving how a rangeland is managed can deliver greater and longer-lasting benefits than establishing new plantations. It asks us to think less about individual trees and more about landscapes and ecosystems as a whole.

Biodiversity: The Foundation Everything Else Stands On

This is where the climate conversation and the biodiversity conversation converge, and where a lot of my own work sits. Through my work with the NBSAP Accelerator Partnership in Pakistan, this interconnectedness comes up constantly whether the discussion is about protected areas, spatial planning, ecosystem restoration or biodiversity finance, the underlying question is much the same: how do we ensure nature is considered early enough in development decisions, rather than restored only after it has already been lost?

Facilitating stakeholder consultations across the country has made one thing very clear: communities don't experience biodiversity loss as an abstract statistic. They experience it as fewer pollinators visiting their orchards, fodder plants disappearing from grazing lands, medicinal plants becoming harder to find. As Pakistan works towards implementing its biodiversity commitments under the Kunming-Montreal Global Biodiversity Framework through its NBSAP, one thing is increasingly clear: climate change and biodiversity loss cannot be addressed as separate conversations. The ecosystems that store carbon are very often the same ecosystems that provide habitat, regulate water, sustain livelihoods and protect communities from climate impacts.



Holding Water in Place

Pakistan is already one of the most water-stressed countries in the region, and vegetation is central to how that stress plays out. Plant roots bind soil and slow runoff, letting water infiltrate and recharge aquifers rather than washing away topsoil during monsoon flooding. Watershed forests in the north regulate the timing and volume of river flows that the entire Indus basin depends on, while wetlands act as natural buffers storing floodwater during monsoons and releasing it slowly through dry spells. Deforestation and land degradation upstream is a direct contributor to the flood-then-drought cycles that have battered downstream communities in recent years. Investing in vegetation cover upstream is, quite literally, investing in water security downstream.



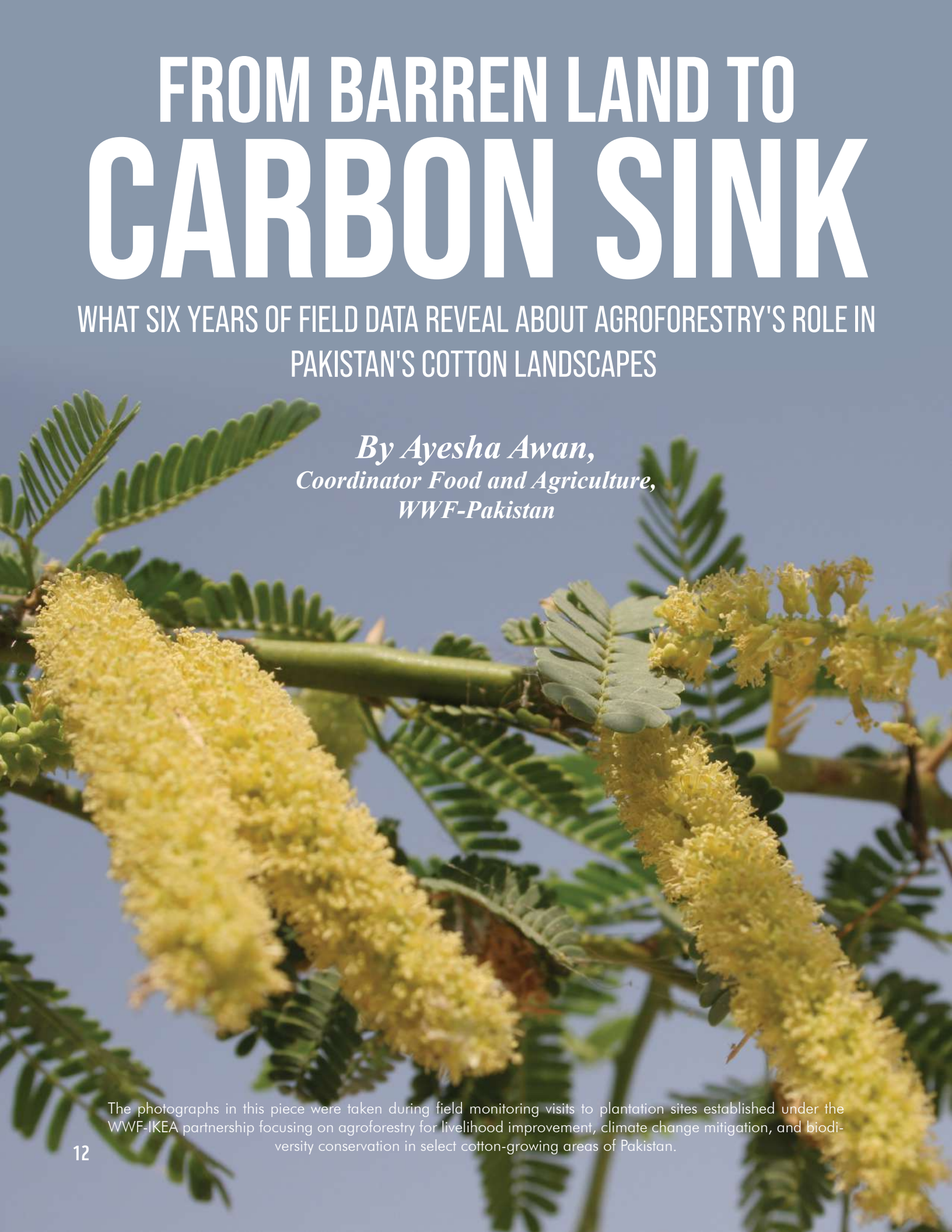
Putting Plants at the Centre of Biodiversity and Climate Planning

Plants have always been part of our response to a changing climate. What needs to change is the way we value them not simply as trees to be counted, but as interconnected ecosystems to be protected, restored and managed for the long term. Carbon storage, urban cooling, biodiversity and water security are not four separate benefits of plants; they are four expressions of the same underlying function, and strengthening those threads, deliberately and at scale, is some of the most important climate work Pakistan can do.

FROM BARREN LAND TO CARBON SINK

WHAT SIX YEARS OF FIELD DATA REVEAL ABOUT AGROFORESTRY'S ROLE IN PAKISTAN'S COTTON LANDSCAPES

By Ayesha Awan,
Coordinator Food and Agriculture,
WWF-Pakistan



The photographs in this piece were taken during field monitoring visits to plantation sites established under the WWF-IKEA partnership focusing on agroforestry for livelihood improvement, climate change mitigation, and biodiversity conservation in select cotton-growing areas of Pakistan.



South Punjab's cotton-growing districts (Multan, Khanewal, and Bahawalpur) sit at the intersection of two converging pressures: agricultural decline and climate vulnerability.

Decades of unsustainable irrigation have left significant tracts of farmland salt-affected and low-yielding; an estimated 6.3 million hectares nationwide are now affected by some level of salinity or waterlogging, with Punjab absorbing a substantial share of that burden. Smallholders, who constitute many of Pakistan's farming families, have limited buffering capacity to absorb these losses. Pakistan contributes less than one percent of global greenhouse gas emissions yet ranks among the ten most climate-vulnerable countries on the German Watch Long-Term Climate Risk Index.

Agroforestry systems documented higher potential to sequester carbon relative to conventional cropping, which has allowed it to emerge, over the past eight years, as a practical response rather than an experimental one. Beyond carbon storage, tree-crop integration measurably improves soil organic matter and microclimate through litter fall and root turnover, generating soil-conservation and watershed co-benefits that extend well beyond the carbon ledger alone.

A Decade-Long Partnership: From Pilot to Portfolio

A plantation in the village named 84/15-L in district Khanewal, is not an isolated initiative; it sits within a WWF-IKEA partnership now in its third decade, working to improve the sustainable land use systems of small holder farmers. Between 2018 and 2020 (Phase-6 of the WWF-IKEA partnership), planted the first proof of concept, just over 100,000 Acacia nilotica trees, rooted into South Punjab's salt-scarred, low-value farmland and boundary strips, quietly testing whether a working cotton landscape could hold trees and crops side by side without displacing either.

It not only worked but what followed was a tenfold leap that few agroforestry initiatives attempt inside a live commercial cropping system. Phase-7 of the WWF-IKEA partnership (2020–2025) scaled that pilot into 1 million trees, planted across the cotton belts of Punjab and Sindh in just five years.

A million trees is not simply a bigger number than a hundred thousand, it is hundreds of individual farmers' decisions, to trust a model that was barely proven a few seasons earlier, compounding into standing biomass, measurable carbon storage, and a shifting microclimate across two provinces, making this project, the moment this agroforestry model stopped being a pilot and became a landscape-scale reality.

Across both phases, the partnership's guiding aim held steady, climate-resilient farming practices, water stewardship, soil health, biodiversity enhancement, and reduced greenhouse gas emissions, woven into a more sustainable cotton supply chain.

The current project of integration of agroforestry for removal and storage enhancement of carbon carries that groundwork forward with cotton farmers across Multan, Khanewal, and Bahawalpur districts of South Punjab. Its objectives sharpen the earlier ambition into four explicit targets: developing agroforestry as a replicable land-use model, generating better economic returns per unit area for smallholders, increasing measurable carbon removal and storage, and strengthening landscape restoration and biodiversity; the foundation on which the feasibility work toward VM0047-aligned carbon crediting is now being built. It is this progression, from pilot project's plantation not as an isolated success story, but as six years of field evidence within a much longer institutional commitment.

Agroforestry as a Livelihood and Mitigation Strategy

In 2021, a four-acre (1.6 hectares) block at Village 84/15-L, Khanewal, was planted with Acacia nilotica on land the farmer had largely abandoned because of salinity. The plantation followed a compact 10×5 ft layout typical of the agroforestry block plantation model. Over six years, the site has moved from bare, tilled soil to a structurally complex, canopy-closing stand, a transition consistent with what forestry science terms the stem exclusion phase of stand development, in which biomass accumulation accelerates and natural self-thinning begins. This transformation carries meaning beyond the visual. Litter accumulation from the nitrogen-fixing Acacia canopy is building soil organic matter and microbial biomass, a below-ground carbon pool frequently undercounted in agroforestry inventories.





What the Satellite Record Confirms

Satellite imagery is helping confirm what field visits have shown: the plantation in a village of Khanewal is developing into a thriving green landscape. A Landsat 8 satellite analysis of the site, covering 2021 to 2026, tracks changes in vegetation through the Normalised Difference Vegetation Index (NDVI), a measure used to assess the density and health of green vegetation.

When the trees were first planted, NDVI readings were low, at 0.25–0.30, reflecting freshly tilled soil and sparse vegetation. Between 2022 and 2023, the readings rose steadily and began showing clearer seasonal variations, as the young trees established roots and their canopies developed.

From 2023 onwards, NDVI readings settled into a higher range of approximately 0.5–0.65, with regular seasonal fluctuations. This pattern is consistent with a developing plantation of deciduous trees, which shed and regrow their leaves each year. The highest recorded values occurred during 2025–2026, providing satellite-based evidence of the plantation's continued growth and development.









This pattern constitutes more than supplementary illustration. Because NDVI is generated independently of internal project reporting, it functions as a third-party, temporally continuous dataset capable of verifying claims of vegetation gain over time. Such independently scalable, longitudinal evidence is directly relevant to the additionality and permanence criteria specified under Verified Carbon Standard methodologies, including VM0047. When considered alongside corresponding aerial imagery, documenting exposed soil in 2021, partial canopy cover in 2023, and closed canopy by 2026, the NDVI trend converts a descriptive visual record into a quantifiable growth signal and establishes a methodological template that can be extended across the wider plantation portfolio for baseline characterization and ongoing monitoring purposes.

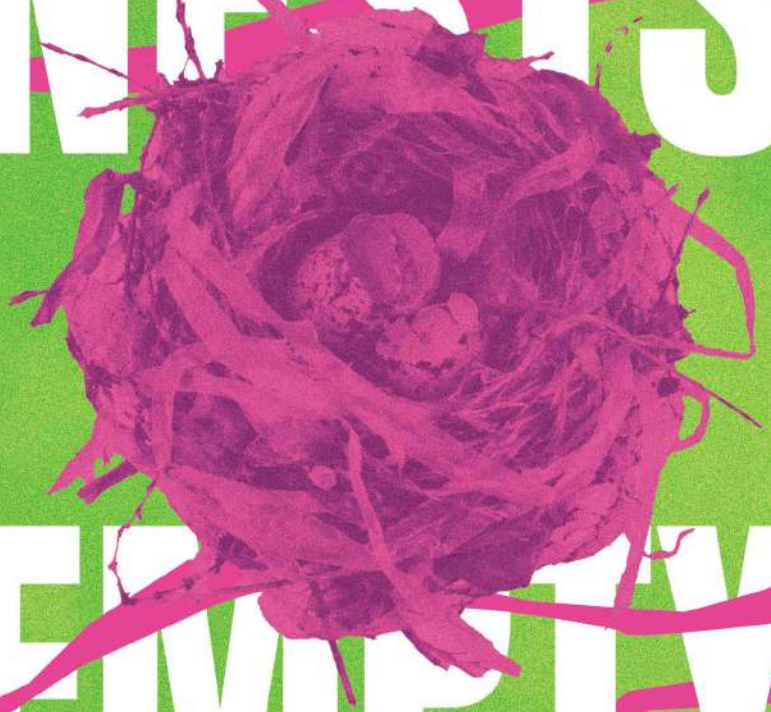
From Field Evidence to Carbon Stewardship: A Hope for South Punjab's Farmers

What began as a response to degraded, unproductive land is now positioned to become something more consequential: a mechanism through which smallholder farmers can be formally recognised and compensated for an ecological service they have quietly provided for years. The current feasibility phase of this project is now underway building the methodological and institutional foundation required to translate this field-level evidence into a credible, verifiable carbon asset. Six years of satellite data independently confirm the underlying trajectory from cracked, salt-affected soil to a closed-canopy stand, and that record offers a strong basis to build on.

As this methodological groundwork advances, the farmers of South Punjab stand to gain something they have rarely been afforded: a role beyond that of price-takers in the markets they depend on. They could instead become carbon stewards; formally recognised, and compensated, for the atmospheric service their land is already quietly performing.



PLASTIC NESTS EMPTY SKIES



LAHORE'S BIRDS ADAPT TO AN UNNATURAL WORLD

By Dr Bushra Nisar Khan,

Assistant Professor and her student Arshia Mukhtar, Department of Zoology, University of Punjab

Lahore was once celebrated as the City of Gardens. Peepal, banyan, jamun and mulberry trees grew thickly on the canals, in the old parks and orchards, providing a living matrix for a rich bird life. Their nests were attached to their branches, their fruit was eaten by pigeons and barbets, their holes were used by owls. Today those same skies feel quieter.

Today, concrete, asphalt and tidy ornamental plantings have taken the place of mature trees, and they lack any ecological value. Many of the nests that are left behind are made of plastic bags, fabric scraps and abandoned wire. This isn't just about the style. This is an immediate consequence of the hurried and ill-planned urbanisation and of the removal of trees, which once gave the city its natural texture.

Lahore's population has increased from 3.9 million in 1990 to over 14 million in the last 30 years. The urban area has been steadily growing, and the green areas have been shrinking. Satellite data indicates that total vegetated cover has been in decline from roughly 1,453 sqkm in the early 1990s to about 788 sqkm in the last 10 years. In the city, tree canopy now exceeds only one per cent, which is exceptionally low compared to other cities in Asia and is insufficient for ecological maintenance. Former agricultural land and peri-urban orchards have been invaded by housing societies.

Thousands of mature trees have been lost to road-widening schemes, signal-free corridors and metro lines and underpasses along the Lahore Canal and other main arteries. The city has lost hundreds of hectares of tree cover since 2001.

In many instances the native trees cut down were replaced by fast-growing or ornamental exotic species which offer few of the structural complexity, fruit or insect life native birds need.



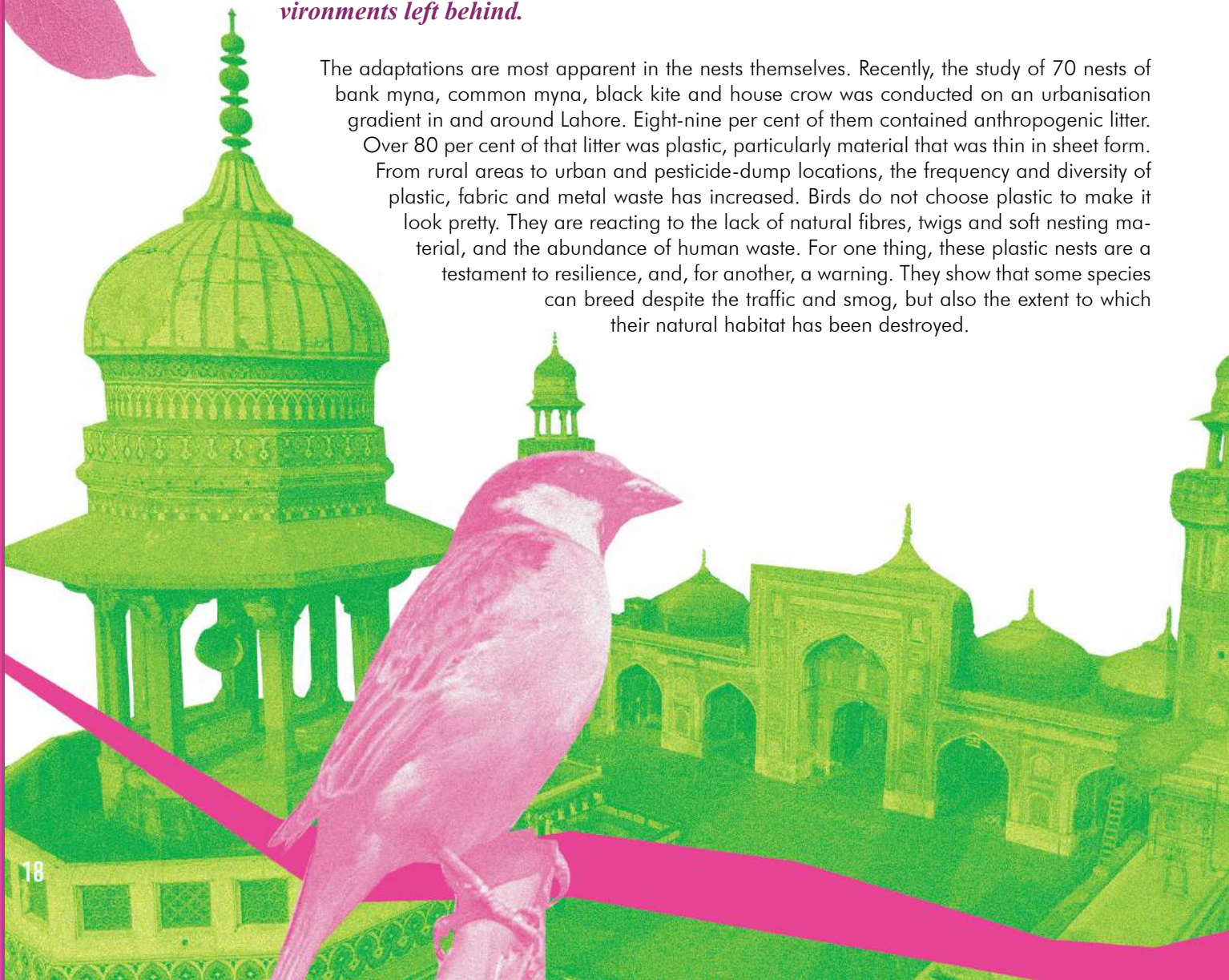
The forces that underlie this change are interdependent and are well known. The traffic and construction schedules are always given greater importance than continuity of green corridors in infrastructure projects. The enforcement of tree protection orders is weak, with illegal felling and encroachment continuing. Land on the outskirts of the city is being taken up as housing projects as it is cheaper and less controlled than building up the existing urban core.

Planting of trees is often done for aesthetic reasons rather than for the ecological benefits they may provide. Ultimately it leads to habitat fragmentation, the homogenisation of what remains of the green space, and to a landscape that becomes increasingly inhospitable to specialised wildlife.

Kidnapped in predictable and sobering ways, bird communities have reacted. According to history, there are over 200 species in and around Lahore. Numerous surveys have been conducted on campus and throughout the city in recent years, an average of 65 species found has been accompanied by conspicuous reductions in many specialists. The Yellow-footed green pigeon, grey hornbill, barbets and some parakeets are less abundant in the trees now. As the availability of cavity-nesting areas and insect food becomes scarce, insectivores and cavity-nesters such as owls, woodpeckers, some warblers, and white-eyes must struggle.

In their place, scavengers and generalists have come to dominate. In urban surveys, house crows, common mynas and black kites often constitute over 50 per cent of the birds counted. More specialised birds disappear as adaptable species flourish in the human-altered environments left behind.

The adaptations are most apparent in the nests themselves. Recently, the study of 70 nests of bank myna, common myna, black kite and house crow was conducted on an urbanisation gradient in and around Lahore. Eight-nine per cent of them contained anthropogenic litter. Over 80 per cent of that litter was plastic, particularly material that was thin in sheet form. From rural areas to urban and pesticide-dump locations, the frequency and diversity of plastic, fabric and metal waste has increased. Birds do not choose plastic to make it look pretty. They are reacting to the lack of natural fibres, twigs and soft nesting material, and the abundance of human waste. For one thing, these plastic nests are a testament to resilience, and, for another, a warning. They show that some species can breed despite the traffic and smog, but also the extent to which their natural habitat has been destroyed.





The impact is more than just on individual nests. Loss of specialised birds leads to loss of ecological services such as insect control, seed dispersal and support of pollination networks. Chronic noise, artificial light and very high levels of air pollution add to the stress, further decreasing reproductive success in the remaining populations.

Surviving green spaces are frequently small, with limited gene flow and recolonization. The once complex avian community is moving toward a reduced, scavenger-dominated community that is dependent upon man's trash instead of an "ecosystem". The younger generations hear mostly the shrill caws of crows and mynas.

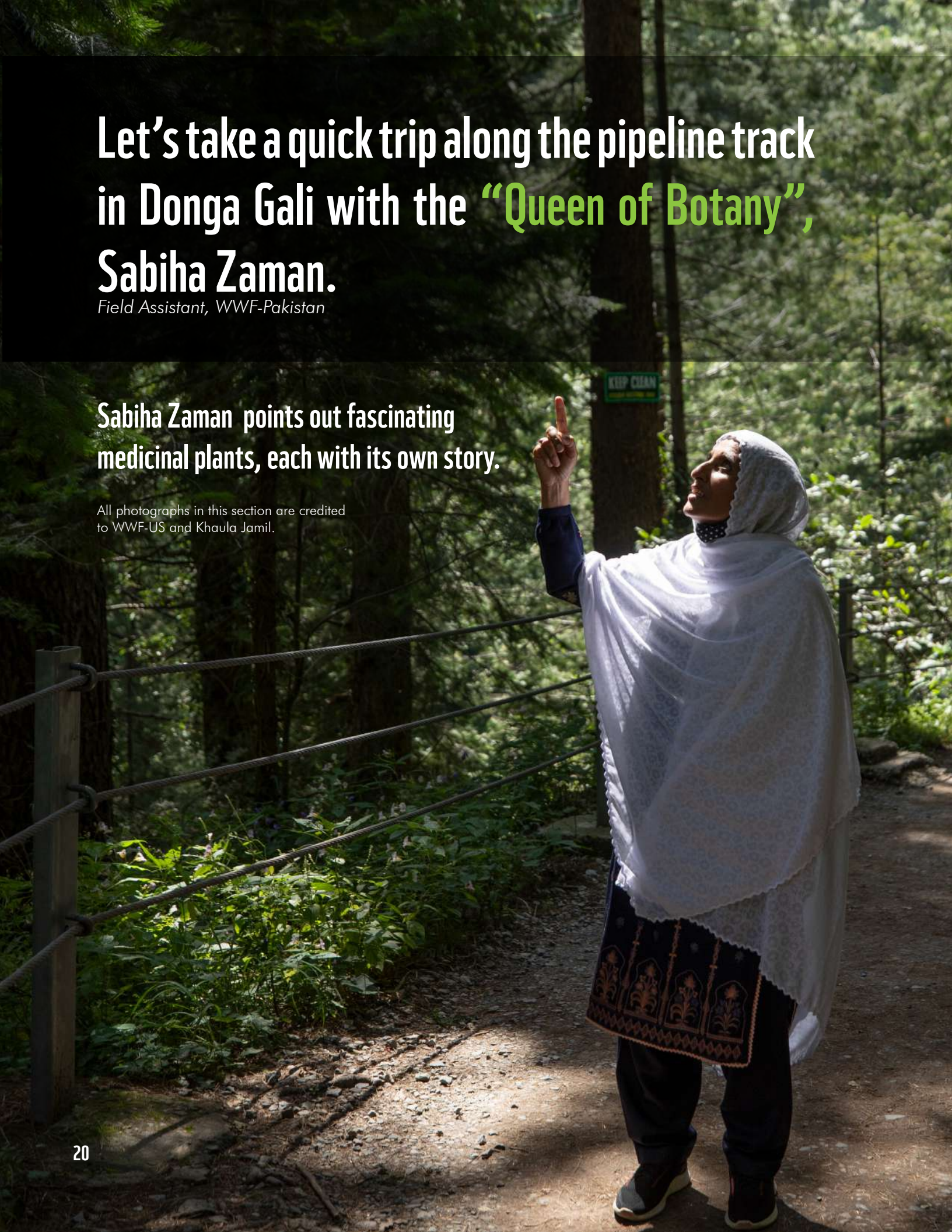
But there is still hope that it's not too late. There are still ways to safeguard the remaining indigenous trees with the proper implementation of court rulings and a sincere commitment by politicians. Public and private plantation programmes can be based on native species as these are able to recreate the structural layers required by birds: peepal, banyan, jamun, shisham, native figs and fruiting trees. Ecological corridors and minimum canopy targets can be a condition for housing schemes and infrastructure projects, and not an add-on. Improved waste handling can help decrease the amount of plastic leaked that is used as nesting material as a last resort. When parks and remnants of woodland are isolated from one another, wildlife can move and recolonize if they are linked to create functional networks.

The birds of Lahore are still learning to cope. Some use plastic in their nests and breed near highly travelled streets. Others have just gone for the cantonment areas or to the remaining older gardens, where a few large trees remain. The plastic nests are a temporary creation of the birds.

There must be a solution from the people who have remodeled the city. Re-introducing the living architecture of native trees and limiting the loss of productive land and incorporating urban biodiversity into the planning agenda as an essential element of planning, instead of an amenity, would start to change the emptying of the skies.

Let's take a quick trip along the pipeline track in Donga Gali with the "Queen of Botany", Sabiha Zaman.

Field Assistant, WWF-Pakistan

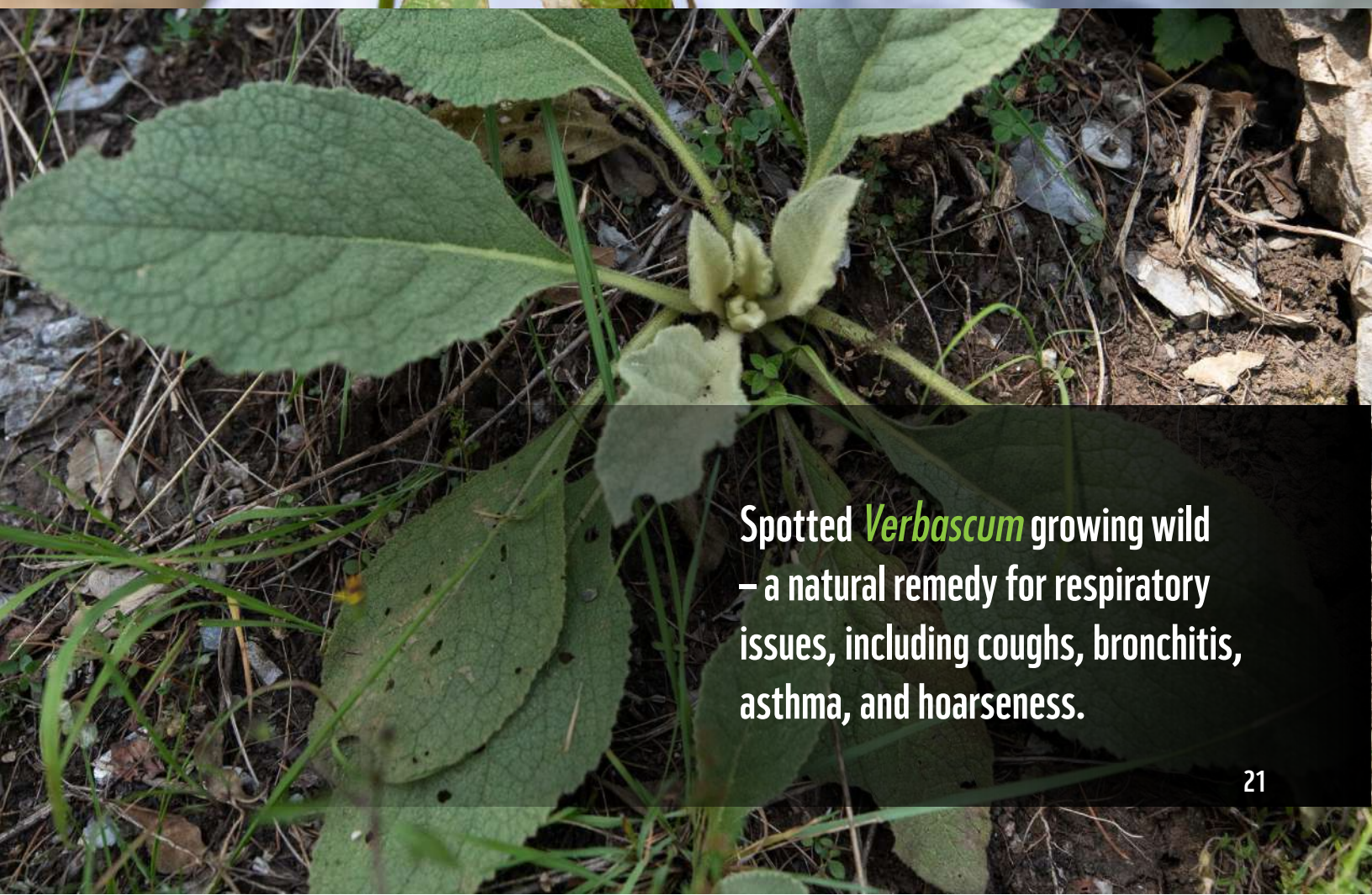


Sabiha Zaman points out fascinating medicinal plants, each with its own story.

All photographs in this section are credited to WWF-US and Khaula Jamil.



Holding *Podophyllum* – used for skin conditions like warts and rashes.



Spotted *Verbascum* growing wild – a natural remedy for respiratory issues, including coughs, bronchitis, asthma, and hoarseness.



Holding *Plectranthus* – a versatile plant used for respiratory problems, digestive disorders, skin infections, and rheumatism.

Here is *Adiantum* – treats respiratory, skin, and hair concerns.



Have a look at *Hedera helix* – supports respiratory health, helping with bronchitis and coughs.

Spotted *Mikania micrantha* – valued for wound healing, pain relief, antimicrobial, and anti-inflammatory benefits.

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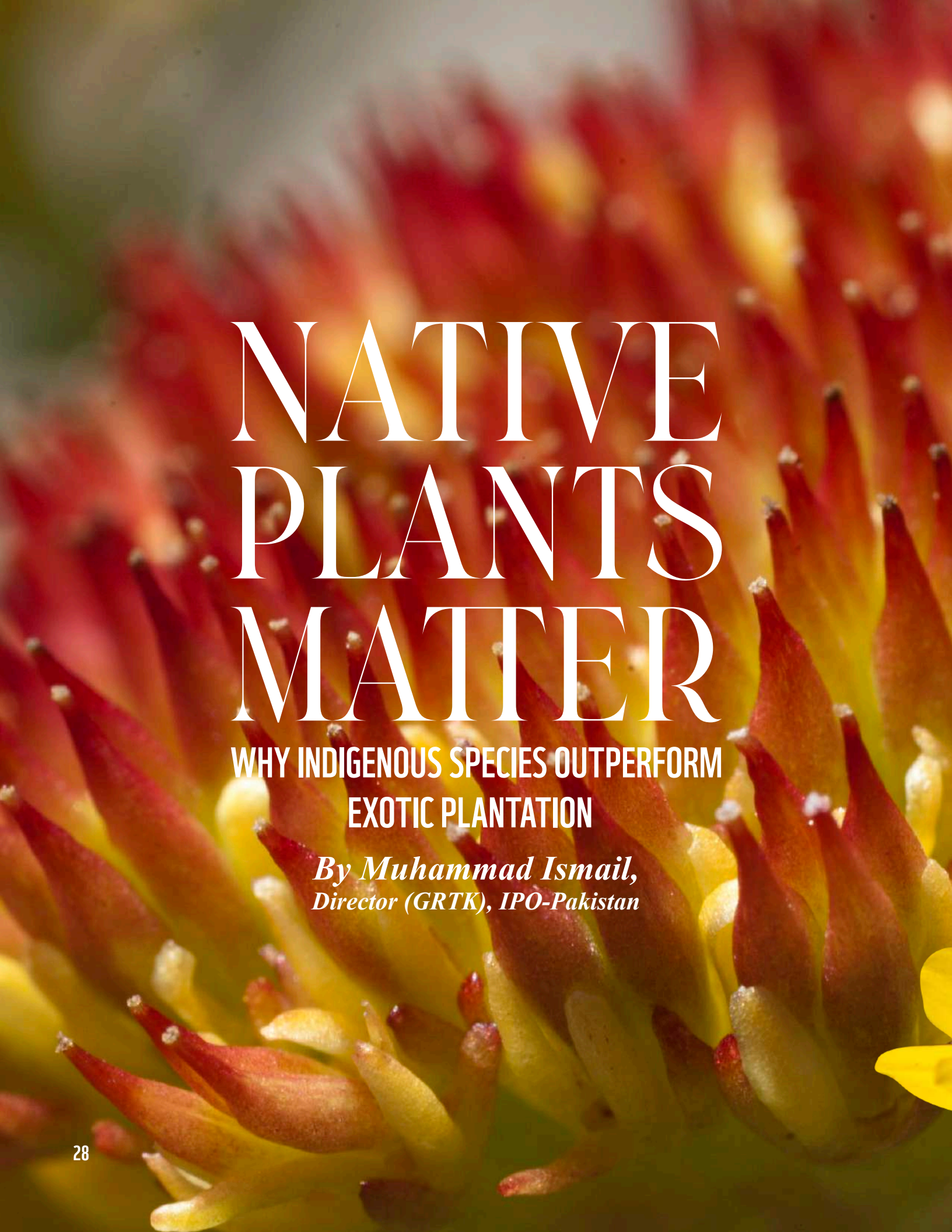
برمی



Taxus spp

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TOXIC BY NATURE. LIFE-SAVING BY SCIENCE.



NATIVE PLANTS MATTER

WHY INDIGENOUS SPECIES OUTPERFORM EXOTIC PLANTATION

By Muhammad Ismail,
Director (GRTK), IPO-Pakistan

Allah Almighty; when set the stage of our earth, placed everything according to its natural habitat where there it was fittest to be fit.

When human intervention increased to disturb nature, everything was affected including biotic and abiotic factors, and ecosystem, terrestrial and aquatic environments.

Here I would like to mention only one example, i.e. the marvelous city among the capitals in the world "Islamabad the beautiful". Islamabad and the surrounding Margalla Hills sit on the edge of the Potohar Plateau, and once hosted a rich variety of native subtropical and dry temperate plant species suited to the local rugged terrain and climate. Prominent among these plant species were Phulai Acacia modesta: A hardy, drought-resistant native tree common on dry slopes; Kachnar Bauhinia variegata: famous for its edible buds and striking purple-pink spring blooms; Amaltas Cassia fistula: known commonly as the golden shower tree, featuring bright yellow hanging flowers; Shisham Dalbergia sissoo: the native rosewood, valued for durable timber and dense shade; and Wild Olive/Kahu (Olea ferruginea): an important evergreen constituent of the native Margalla landscape.

Everything was going according to the plan of nature.

Islamabad and surrounding areas were home to over 100 resident bird species, heavily concentrated around the Margalla Hills. Common resident bird species included the Himalayan Bulbul, Blue-throated Barbet, Black Kite and White-throated Kingfisher.





Meanwhile Paper mulberry *(Broussonetia papyrifera)* was introduced to Islamabad by the Capital Development Authority (CDA) during the 1960s and 1970s as a fast-growing, non-native species imported from China and Southeast Asia to rapidly landscape and green the newly declared capital city. Planting was even executed via aerial seeding across barren patches.

During the initial years in 1970s and 1980s, the lush green view of Islamabad looked fascinating and the CDA management received appreciation from the Federal Government.

But later on, from the late 1980s and early 1990s onward, nature started to take its revenge. The resident species of friendly insects and birds started to disappear from the area. The aggressive root systems choked natural streams (nullahs), cracked underground water pipes, and outcompeted native flora. The heavy airborne pollen from these trees eventually accounted for up to 94 per cent of Islamabad's pollen burden, causing widespread seasonal asthma and rhinitis among residents.

The government took emergency measures and on the advice of the Federal Government, CDA launched extensive removal drives to replace the remaining paper mulberry trees with native, eco-friendly species like Kachnar, Amaltas, and Pilkan. The issue was highlighted in the national and international media, Islamabad High Court and Supreme Court-appointed expert committees, the CDA and the Prime Minister's Office initiated large-scale removal drives targeting tens of thousands of paper mulberry trees specially around Shakarparian and sector green belts.

This is one story among hundreds from Pakistan and thousands from other countries in the world.

It is evident that native tree species consistently outperform exotic species in long-term survival, ecosystem integration, and environmental benefits. One research study has shown that native species thrive with 85 per cent higher survival rates and require 60 per cent less maintenance compared to exotic alternatives. This makes them the natural choice for sustainable reforestation efforts. Indigenous species create stronger, more resilient ecosystems. Native trees have evolved over thousands of years to adapt perfectly to local soil, climate, and wildlife conditions. They form symbiotic relationships with local fauna and support biodiversity in ways that exotic species simply cannot match.





Native plants are called by many environmentalists the unsung heroes, providing support to an entire ecosystem. They provide essential habitat and food for wildlife such as insects, birds and mammals.

They are an important component in creating a harmoniously balanced and biodiverse ecosystem. Biodiversity is crucial to a resilient ecosystem, particularly in the face of climate change and increasing urbanisation. Native plants are helpful to support wildlife and reduce loss of habitat. Native tree plantations provide sustainable livelihood opportunities for local communities. Traditional knowledge about native species management creates employment in seed collection, nursery operations, and forest maintenance. These activities preserve cultural heritage while generating income.

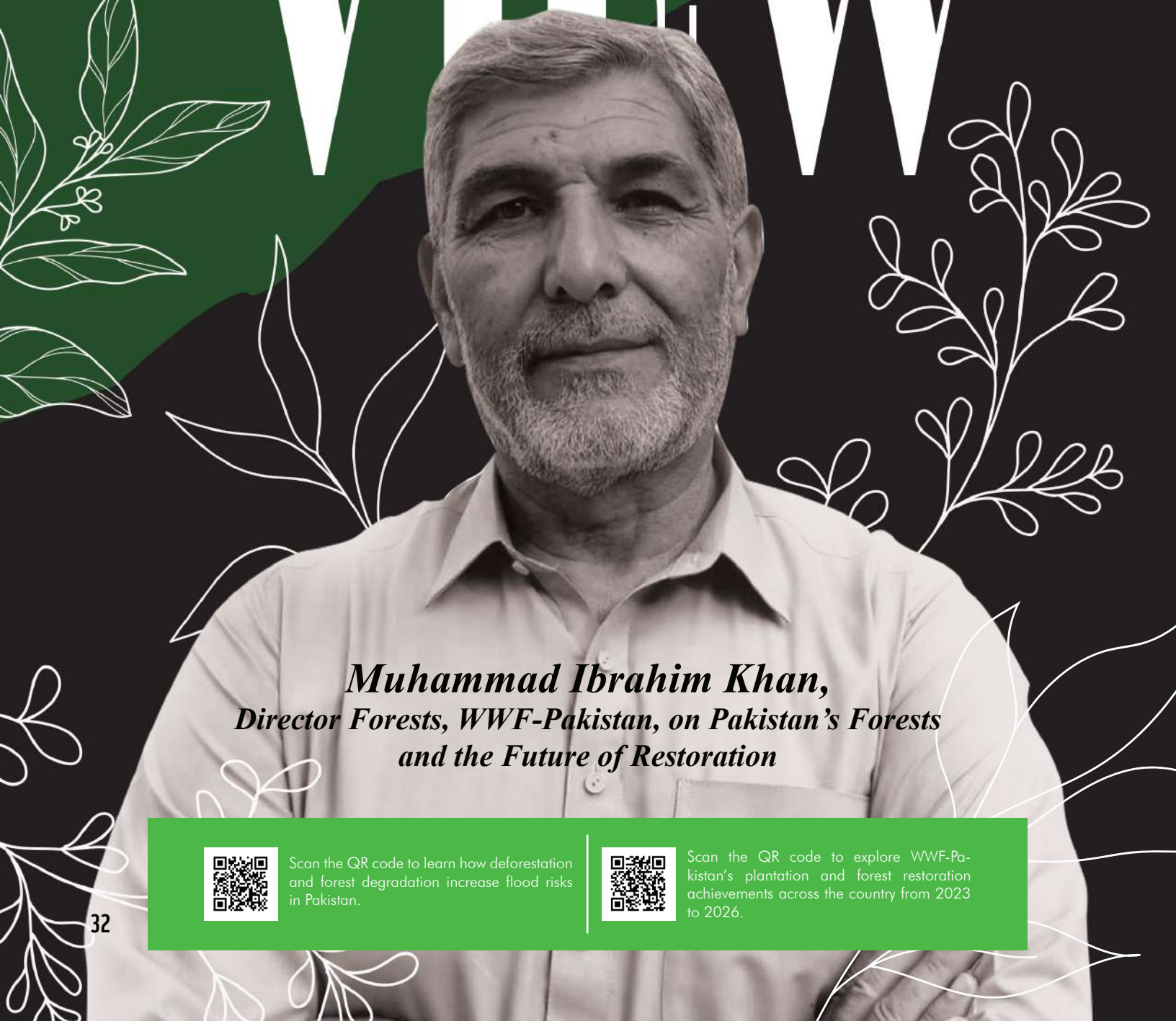
Food and medicine production from native trees supports community health and nutrition. Many indigenous species provide fruits, nuts, leaves, and bark that have traditional uses in local diets and healthcare systems. This adds nutritional and medicinal value to reforestation projects.

On the other hand, exotic plants do not support native insects and pollinators to the same extent. Native insects have no evolutionary history with exotic plants and often they don't have the ability to overcome the toxins those plants produce to deter predation. According to research, 25 per cent of our native bee species need pollen from a small group of native plants to thrive. Many studies have found caterpillar numbers are greater on native plants, thus supporting a stronger ecosystem.

Based on the above deliberations, it is recommended that the Government of Pakistan should take effective measures in the light of National Biodiversity Strategy and Action Plan (NBSAP) to protect natural habitats, manage resources sustainably, and safeguard ecosystems spanning from northern mountain ranges to coastal mangroves. All players including the Federal and Provincial Governments, private sector, civil society and indigenous people and local communities (IPLCs) should be actively involved to implement targets set under NBSAP in letter and spirit as per the given timeline of 2030.

The use of AI and modern technologies is also recommended to enhance the plantation of native species. The use of latest technologies for precise monitoring and management; geo tagging and tracking individual tree growth, survival rates, and health indicators to optimize forest management practices; data-driven approach to improve production of native plants; soil analysis technology to match native species to optimal growing conditions; and weather monitoring systems and automated irrigation systems should be introduced to enhance production of native plants in all areas of the country.

THE EXPERT VIEW



Muhammad Ibrahim Khan,
Director Forests, WWF-Pakistan, on Pakistan's Forests and the Future of Restoration

Scan the QR code to learn how deforestation and forest degradation increase flood risks in Pakistan.

Scan the QR code to explore WWF-Pakistan's plantation and forest restoration achievements across the country from 2023 to 2026.

HOW WOULD YOU ASSESS THE CURRENT STATE OF PAKISTAN'S FORESTS AND TREE COVER, AND WHAT ARE THE KEY TRENDS WE SHOULD BE CONCERNED ABOUT?

Pakistan remains a forest-deficit country, with around five per cent of its land under forest. The trajectory is mixed: farm forestry, plantations, mangrove restoration and assisted natural regeneration are increasing tree cover in some landscapes, while natural forests continue losing area, canopy density, biomass and ecological integrity.

The combined provincial and territorial forest inventories for 2016–2020 indicate 44,000 ha of deforestation and 634,000 ha of gross canopy-density degradation. Pressures occur in dry and moist temperate, chir-pine, subtropical scrub and juniper forests of Khyber Pakhtunkhwa, Gilgit-Baltistan, Balochistan and the Potohar–Murree landscape. Sindh shows a contrasting trend: mangrove cover has expanded, but natural riverine forests suffered severe loss. Azad Jammu and Kashmir recorded a positive net canopy trend.

These findings show that gains from plantations and restoration can coexist with losses in the quality and connectivity of indigenous forest ecosystems. Evidence suggests increasing farm and planted trees, but Pakistan lacks a harmonized, repeated national inventory of trees outside forests. Longer-term studies documented extensive degradation across northern Pakistan and rapid forest loss in parts of the Hindu Kush Himalaya. Monitoring must therefore report natural forests, plantations and trees outside forests separately.

WHAT ARE THE MAIN DRIVERS BEHIND FOREST DEGRADATION AND LOSS OF TREE COVER IN PAKISTAN, AND HOW ARE THESE PRESSURES CHANGING WITH CLIMATE CHANGE AND RAPID URBANISATION?

Pakistan's forest degradation has direct and underlying drivers. Direct drivers include unsustainable legal harvesting and illegal timber cutting, fuelwood collection, overgrazing, uncontrolled fires, agricultural expansion, mining, infrastructure development, settlement encroachment, and conversion of forest land. Timber extraction and fuelwood collection are recognised as leading degradation pressures in Asia. In Pakistan's northern mountains, weak enforcement, contested tenure and limited community participation have accelerated forest loss.

At the same time, underlying drivers include population growth, poverty, dependence on biomass energy, insecure land rights, inadequate forest management, limited institutional capacity and insufficient livelihood alternatives.

Climate change amplifies these pressures. Rising temperatures, prolonged droughts and irregular rainfall weaken trees, reduce seed viability and regeneration, and increase susceptibility to fire, pests and disease. Extreme rainfall, floods, cloudbursts, hill torrents and glacial-lake outburst floods damage forests and young regeneration, across Pakistan's mountain and arid regions. Slow-growing taxus, juniper, birch and chilgoza populations are particularly difficult to restore after disturbance; Shisham is affected by dieback.

Rapid urbanisation compounds these risks by converting and fragmenting forests around cities, roads and housing schemes. This is evident around Islamabad and Rawalpindi and across Potohar, where urban growth is reducing and fragmenting subtropical scrub vegetation.

PAKISTAN HAS SEEN SEVERAL LARGE-SCALE TREE-PLANTING AND RESTORATION INITIATIVES IN RECENT YEARS. HOW IMPORTANT HAVE THESE PROGRAMMES BEEN, AND WHAT DOES MEANINGFUL RESTORATION LOOK LIKE BEYOND SIMPLY PLANTING TREES?

Pakistan's large-scale programmes like the KP Billion Tree Tsunami Afforestation Project, Green Pakistan Programme, Ten Billion Tree Tsunami Programme and Upscaling of the Green Pakistan Programme have mobilised finance and placed restoration high on the political agenda. They combined plantations, direct sowing, dry-afforestation, assisted natural regeneration (ANR) and farm forestry. WWF-Pakistan's third-party monitoring of BTTAP Phases I and II assessed plantation and ANR activities, survival and implementation quality; and the programme was subsequently recognised as bringing approximately 350,000 ha of degraded forest landscapes under restoration.

However, meaningful restoration is not measured by seedlings distributed or hectares treated. It requires survival, ecological functionality and benefits for people. This means first protecting natural forests; removing pressures such as illegal harvesting, fire, grazing and encroachment; prioritising ANR where seed sources remain; and planting diverse, native species only where natural recovery is insufficient. Restoration must also safeguard water, soil, biodiversity, habitat connectivity and community livelihoods, supported by secure tenure and benefit-sharing.

Long-term monitoring should assess survival, regeneration, canopy recovery, species diversity, carbon and management effectiveness and Pakistan must complement mass planting with protection and community-based management of threatened ecosystems.

HOW IMPORTANT IS IT TO PRIORITISE NATIVE AND ECOLOGICALLY APPROPRIATE SPECIES IN FOREST RESTORATION AND URBAN TREE-PLANTING, AND WHAT CAN HAPPEN WHEN THE WRONG SPECIES ARE PLANTED IN THE WRONG PLACES?

Prioritising native and ecologically appropriate species is fundamental because restoration should recover ecosystem composition, biodiversity, resilience and services, not merely increase tree numbers. Native species are better adapted to local soils, rainfall and wildlife. Conversely, unsuitable species can become invasive, suppress regeneration, consume scarce water and create public-health problems.

The Margalla Hills National Park illustrates these risks. Lantana camara has spread through scrub vegetation, occupying the shrub and ground layers, restricting the regeneration of native plants. Paper mulberry *(Broussonetia papyrifera)*, introduced into Islamabad's green spaces, has spread. Its pollen is associated with seasonal allergy and asthma exacerbations in Islamabad.

Similarly, Eucalyptus can provide timber, fuelwood and rapid biomass production on suitable waterlogged or saline sites. However, plantations in water-scarce landscapes may have high water demand and should not replace native scrub, grassland or riparian ecosystems.

So restoration and urban planting should follow the principle of the right species, from suitable genetic stock, in the right place, for the right ecological and social purpose, supported by long-term maintenance and monitoring.

FORESTS AND HEALTHY ECOSYSTEMS ARE OFTEN DESCRIBED AS NATURAL INFRASTRUCTURE. HOW CAN THEY HELP PAKISTAN REDUCE THE IMPACTS OF FLOODS, HEATWAVES, DROUGHTS AND OTHER CLIMATE-RELATED DISASTERS?

Forests and healthy ecosystems are natural infrastructure for Pakistan. Important natural forests occur in the Himalaya, Hindu Kush, Karakoram, Sulaiman Range and Potohar watersheds that feed the Indus and its tributaries. Forest canopies intercept rainfall, while litter, roots and soils increase infiltration, slow overland flow and reduce erosion and sediment entering rivers, reservoirs, roads and irrigation systems. At the same time, root networks also stabilize slopes, lowering the probability of shallow landslides.

Forests generally reduce the peaks of moderate floods, although they cannot prevent catastrophic flooding caused by exceptional monsoon rainfall, cloudbursts or glacial-lake outburst floods. Their protection must therefore complement, not replace, early warning, floodplain planning and resilient infrastructure.

Forests and wetlands retain floodwater and protect riverbanks, while mangroves dissipate waves and storm surges. In cities, trees provide shade and evapotranspirative cooling, reducing heat exposure and energy demand.

Degraded forests lose many of these functions. Pakistan should prioritise protection and restoration of upper watersheds, riparian corridors, wetlands, mangroves and urban green networks within disaster-risk planning.

WHAT ARE THE BIGGEST GAPS IN PAKISTAN'S CURRENT APPROACH TO FOREST CONSERVATION AND RESTORATION, WHETHER IN TERMS OF POLICY, GOVERNANCE, IMPLEMENTATION, MONITORING OR COMMUNITY PARTICIPATION?

A major gap is the separation between policy commitments and implementation. Forest working plans remain timber-oriented and outdated, rather than addressing biodiversity, watersheds, climate resilience and livelihoods at landscape scale. FAO found that over half of Pakistan's forests lacked working plans and that plans relied on incomplete inventories, with weak implementation and monitoring (FAO, 2020).

A second gap is the emphasis on plantation targets over protection, natural regeneration and management of existing forests, alongside inadequate operational funding. Governance is fragmented among forestry, wildlife, mining, tourism, agriculture, irrigation and local-government institutions. Poor land-use zoning and weak enforcement allow encroachment, infrastructure and resource extraction in ecologically sensitive landscapes. Sectoral legislation and development approvals are not aligned with forest, biodiversity and environmental safeguards.

Monitoring remains project based. Pakistan needs periodic national and subnational inventories, permanent sample plots where appropriate, updated GIS baselines, regular change detection, field verification, transparent reporting and independent audits of management-plan implementation.

Finally, communities are often treated as labourers or beneficiaries rather than rights-holders and decision-makers. Unclear tenure, inequitable benefit-sharing and limited participation weaken stewardship. Evidence from northern Pakistan shows that secure rights, community-based management, effective monitoring and law enforcement produce better conservation outcomes.

LOOKING AHEAD, WHAT SHOULD PAKISTAN PRIORITISE OVER THE NEXT DECADE TO PROTECT ITS FORESTS, RESTORE DEGRADED LANDSCAPES AND ENSURE THAT TREES AND ECOSYSTEMS CONTINUE TO SUPPORT BOTH PEOPLE AND NATURE?

Over the next decade, Pakistan should place protection of existing natural forests ahead of simply increasing plantation numbers. Temperate, subtropical scrub, riverine, mangrove, juniper and chilgoza forests require stronger protection from illegal harvesting, fire, overgrazing, mining, encroachment and poorly planned infrastructure.

Second, restoration should follow landscape-level ecological plans. Assisted natural regeneration should be prioritized where seed sources remain, while planting should use diverse native species matched to local soils, climate, water availability and community needs. Forests, rangelands, wetlands, riparian corridors and watersheds must be managed as connected ecosystems rather than isolated projects.

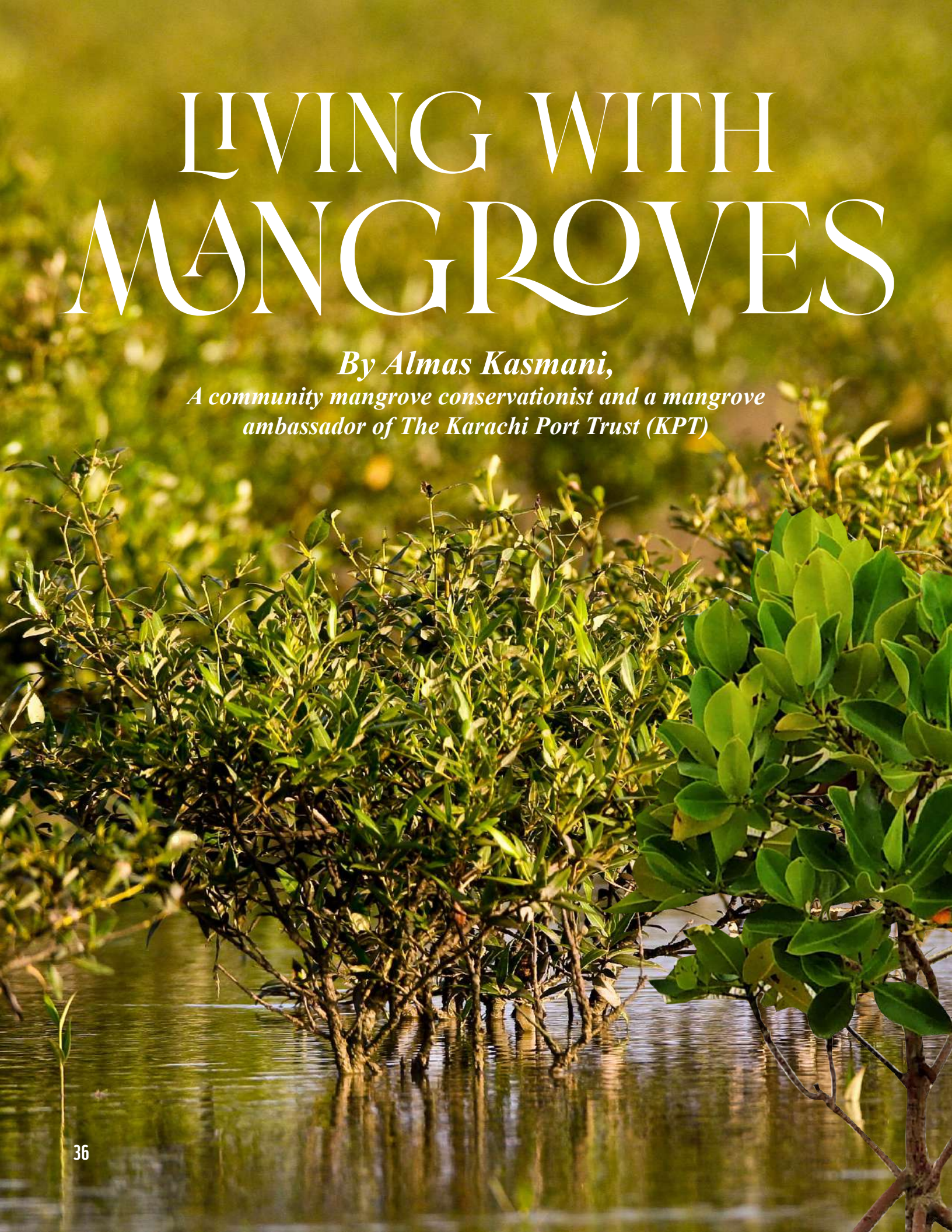
Third, Pakistan needs updated forest inventories, permanent sample plots where appropriate, satellite-based regular change detection, transparent public reporting and independent verification. Success should be measured through survival, regeneration, canopy condition, biodiversity, water, carbon and livelihood benefits, not seedlings distributed.

Fourth, communities should become genuine partners through clear tenure and resource-use rights, participatory planning, equitable benefit-sharing, women's inclusion and sustainable enterprises based on non-timber products, agroforestry, carefully managed ecotourism and high-integrity carbon finance.

Finally, forestry needs adequate, predictable budgets, stronger technical staffing, research and fire-management capacity. Forest, mining, tourism, agriculture and infrastructure policies should be aligned through binding land-use zoning, environmental safeguards and climate-resilient development planning.

LIVING WITH MANGROVES

By Almas Kasmani,
A community mangrove conservationist and a mangrove ambassador of The Karachi Port Trust (KPT)



I grew up in Rehri Goth, a coastal fishing community in Karachi, where the sea has always been part of everyday life. Fishing boats, tides, creeks and mangroves were all around me. As a child, I never thought of them as something extraordinary. They were simply part of home.

I never imagined that years later, I would build my work and much of my purpose around those same mangroves.

My connection with them began with curiosity. I wanted to understand what was happening along our coast and why these forests were disappearing in some places. The more time I spent around mangroves, the more I began to notice the life they supported and the connection they had with the communities living along the coast.

At some point, I stopped asking myself why mangroves were important and started asking a different question: What can I do?

That question eventually led to the beginning of Saltwater Marina. I founded Saltwater Marina because I wanted to create something that connected people with the coastal environment I had grown up around while contributing to its restoration.

What started as a personal effort slowly became a growing initiative involving mangrove plantation, community engagement, a nursery, mangrove experiences and a team of people who have become an important part of the story.

Working with mangroves has been very different from what I imagined in the beginning. From the outside, a plantation drive can look simple: people arrive, saplings are planted and photographs are taken. But there is much more to it. There is planning, arranging transportation, reaching the site, understanding the conditions and making sure the plants are placed where they have a chance to survive.

Some saplings survive beautifully. Some struggle. Some disappear completely.



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In the beginning, I found it difficult when a plant I had personally planted did not make it. But slowly, I understood that restoration is not about expecting every plant to survive. It is about observing, learning from what happened and improving the next time. That has been one of my biggest lessons from working with mangroves: nature does not always follow our plans, and sometimes the best thing we can do is learn to work with it.

My team has made this journey even more meaningful. There is something incredibly motivating about seeing people show up because they genuinely care. We have had difficult days, long days and days when things did not go as planned, but having a team that continues to believe in the work keeps me moving forward.

Some of my favourite memories are not necessarily of large plantation drives. Those moments are why I believe conservation must be experienced, not just explained.

Over time, my work also gave me an opportunity to learn beyond Pakistan. I had the chance to connect with people from different countries like Kenya, Indonesia, India, Bangladesh and the Philippines, where mangrove forests are an important part of coastal life. Learning from young people who are working on conservation in their own countries gave me a much wider perspective.

What inspired me most was seeing that young people in different parts of the world are taking ownership of the ecosystems around them.

Those connections reminded me that the work we are doing in Pakistan is part of a much bigger story.

Another memorable moment in my journey was being recognised as a Mangrove Ambassador by Karachi Port Trust. It was an honour, especially because this journey had started from something very personal. But I did not see the recognition simply as a title.

For me, it came with a sense of responsibility to continue learning, to keep speaking about the importance of mangroves and to represent the communities and coastline that shaped me.


© Almas Kasmani

I did not start this work with all the answers. I am still learning.

Every site teaches us something different. Every plantation gives us another experience. Sometimes we get things right, and sometimes we realise that there is a better way to do something. That process of learning has become one of the most valuable parts of the work for me.

The more I understand mangroves, the more I understand that their story is also a human story. For coastal communities, the environment is not something separate from daily life. People depend on the sea for their livelihoods, and generations have grown up with knowledge of its changing conditions. Mangroves are part of that living system.

They provide habitat for marine life, support biodiversity and help strengthen the natural resilience of coastal areas. But beyond all the facts, what stays with me are the people.

A community member looking at a newly planted sapling with pride. A young volunteer getting excited about seeing a crab among the roots. Someone who arrived knowing almost nothing about mangroves and left wanting to learn more. These moments make the work feel personal.

My dream for Saltwater Marina is ambitious. I want to contribute towards the restoration of 10 million mangroves. I know that is a very big goal, but I have learnt not to be overwhelmed by the size of a dream. A forest does not appear overnight. It begins with one plant, then another, and another.

For me, that is what this journey has been a collection of small efforts that slowly became something much bigger than I imagined.

When I look back, I think about the girl from Rehri Goth who grew up surrounded by the sea without knowing where it would eventually take her. Today, mangroves have taken me to different communities, different coastlines and conversations with people from around the world. They have given me a team, a purpose and a reason to keep learning.

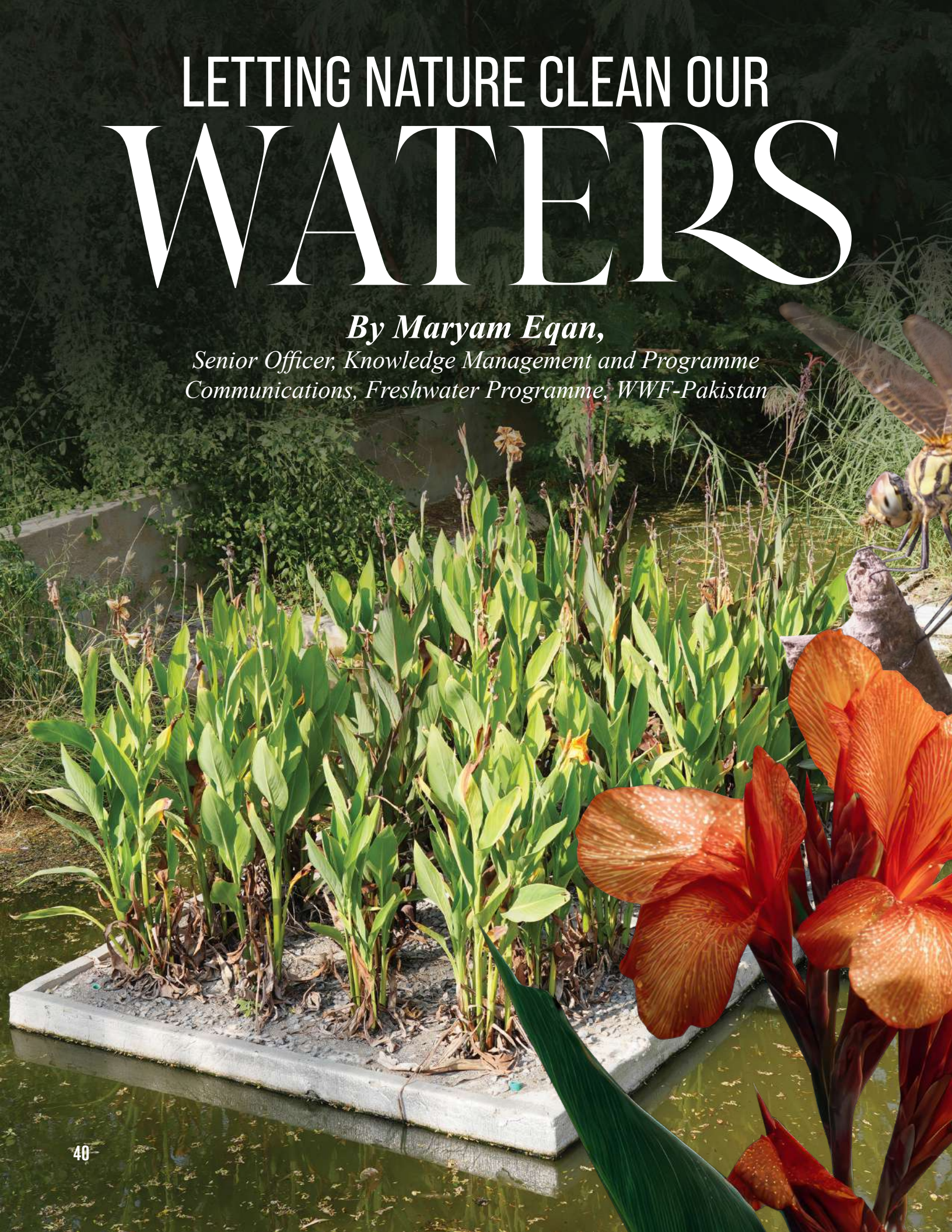
There is still a long way to go. More saplings to grow. More places to restore. More people to bring closer to the coast. And a very big goal ahead.

Saltwater in my hair, mangrove soil under my feet.


© Almas Kasmani

LETTING NATURE CLEAN OUR WATERS

By Maryam Eqan,
Senior Officer, Knowledge Management and Programme Communications, Freshwater Programme, WWF-Pakistan





On a quiet morning, a dragonfly hovers above a pond. Beneath the water's surface, tiny turtles dart between roots, while birds search for insects among the reeds. To many, this scene is simply a beautiful glimpse of nature. Yet hidden within it is one of the most powerful environmental services on Earth: plants are quietly working to sustain life.

Plants are often celebrated for providing food, oxygen, and shade, but their role extends far beyond what we see. They form the foundation of ecosystems, support biodiversity, regulate climate, protect water resources, and improve human well-being. In many ways, flora are the green threads that connect all living things.

Pakistan's freshwater ecosystems are under growing pressure from untreated wastewater, industrial discharges, agricultural runoff, solid waste pollution, and the impacts of climate change. Rivers, lakes, ponds, canals, wetlands, and urban water bodies are experiencing declining water quality, threatening biodiversity, ecosystems, and human health. Addressing these challenges requires effective water and wastewater management, but conventional treatment systems can demand significant financial investment, technical expertise, and long-term operational costs. While such infrastructure remains essential, nature-based solutions can complement these efforts, particularly in areas where resources and treatment infrastructure are limited.

One such approach is Floating Treatment Wetlands (FTWs), an innovative nature-based solution that harnesses the natural capacity of plants and microorganisms to improve water quality.

Imagine a floating garden drifting on the surface of a polluted lake, pond, or canal. At first glance, it appears to be a cluster of plants growing on water. However, beneath the surface lies a living filtration system.

Floating Treatment Wetlands are artificial floating platforms planted with carefully selected native vegetation, including *Phragmites australis, Canna indica, Cyperus alternifolius, Typha augustifolia*, and *Typha latifolia*. While the plants remain above water, their roots extend deep below the surface, creating a dense underwater network. This root system becomes home to beneficial microorganisms that work in conjunction with the plants to remove pollutants from the water.

As water flows around the roots, excess nutrients, suspended particles, heavy metals, and certain contaminants are captured, broken down, or absorbed.

The result is cleaner water and a healthier aquatic environment, all without the need for expensive infrastructure or energy-intensive treatment systems.

The effectiveness of floating treatment wetlands lies in the remarkable abilities of plants and the ecosystems they create. Plant roots act as natural filters, trapping sediments and reducing turbidity. They absorb excess nitrogen and phosphorus, nutrients that often enter water bodies through agricultural runoff, sewage, and urban waste. When these nutrients accumulate in large quantities, they can trigger algal blooms that deplete oxygen and harm aquatic life.

At the same time, beneficial bacteria colonizing the roots break down organic pollutants and transform harmful compounds into less damaging forms. Together, plants and microorganisms form a natural treatment system that continuously improves water quality.

What makes this process even more remarkable is that it mimics the functions of natural wetland ecosystems that have been purifying and regulating water for thousands of years.

The treated water can then be safely reused for irrigation, reducing reliance on groundwater abstraction for agricultural purposes and helping conserve precious freshwater resources.





The benefits of floating treatment wetlands extend far beyond pollution control.

The floating vegetation creates habitat for fish, insects, amphibians, and birds, helping restore biodiversity in degraded freshwater ecosystems. Pollinators are attracted to flowering plants, while submerged roots provide shelter and breeding grounds for aquatic species.

These floating ecosystems can also contribute to climate resilience. By increasing green cover, they help regulate local temperatures and support ecosystem health during periods of environmental stress.

In urban areas, they can transform neglected water bodies into vibrant green spaces that improve aesthetics and community well-being.

For WWF-Pakistan, this is more than an experiment with plants; it is an effort to demonstrate what is possible when we work with nature rather than against it. Since 2019, the Freshwater Programme, with support from government departments and the private sector, has installed 16 Floating Treatment Wetlands, comprising 1,476 floating mats and 19,356 plants, covering a total treatment area of 171,308 m^2 and providing an estimated annual treatment capacity of 502,414 m^3 of water. These nature-based treatments can treat the wastewater easily and remove the pollutants and convert the degraded water bodies into more functional living ecosystems while creating opportunities for communities to engage in their restoration and stewardship.

"These kinds of approaches are helpful for the private sector to achieve their SDGs, nature-positive, and net-positive water impact (NPWI) targets."

Sohail Ali Naqvi, Director Freshwater Programme, WWF-Pakistan

The journey, however, is about more than numbers. It is about changing the way we think about environmental solutions. Floating Treatment Wetlands remind us that some of the answers to our most complex challenges are already around us, in roots, leaves, wetlands, and the intricate relationships that sustain ecosystems.

As Pakistan confronts increasing water stress, pollution, and climate uncertainty, investing in nature-based solutions can help us build resilience while restoring the ecosystems on which people and biodiversity depend.

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