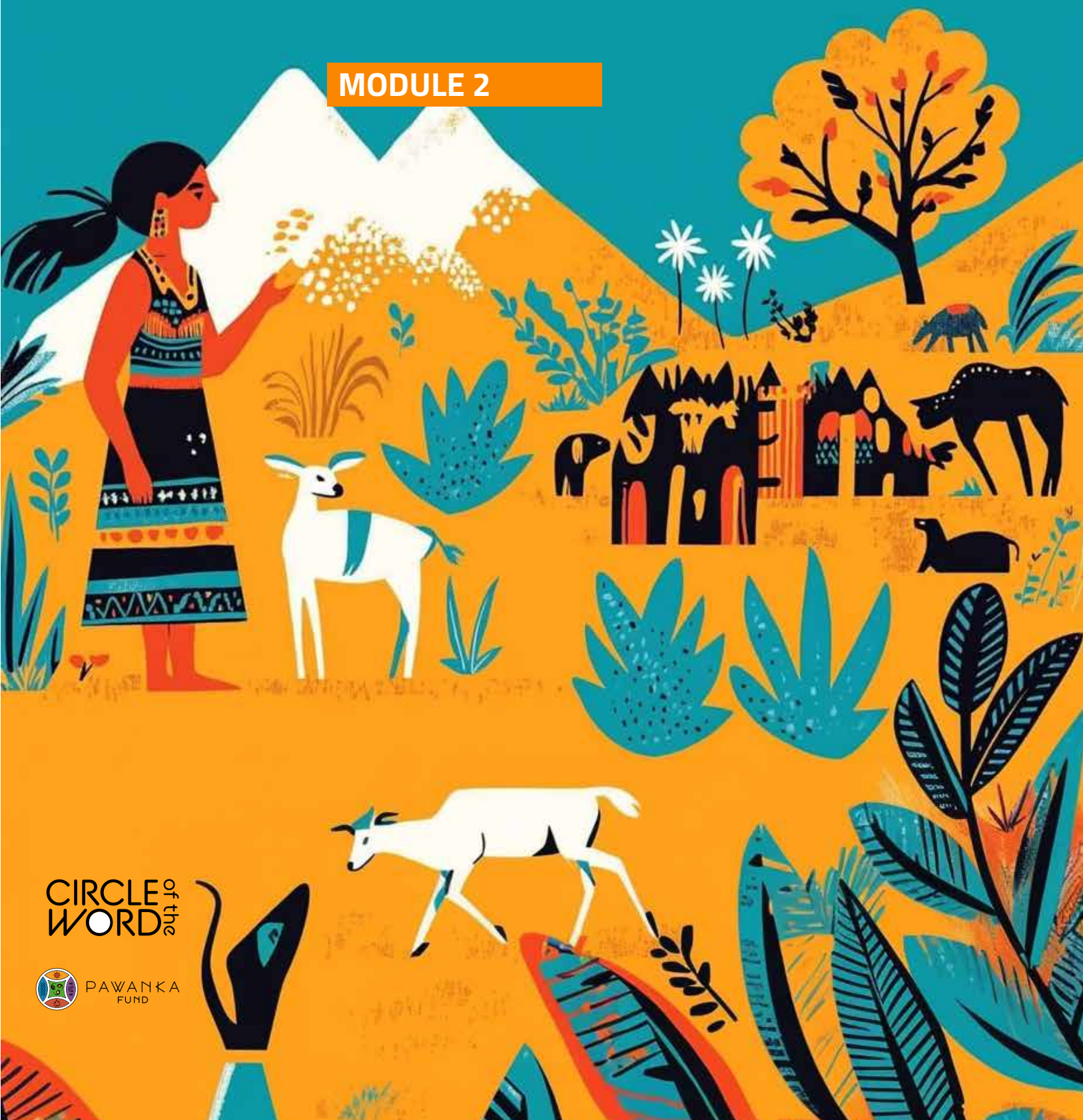
# Traditional Climate Change Adaptation and Mitigation Strategies

## MODULE 2



CIRCLE of the WORD

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Module 2

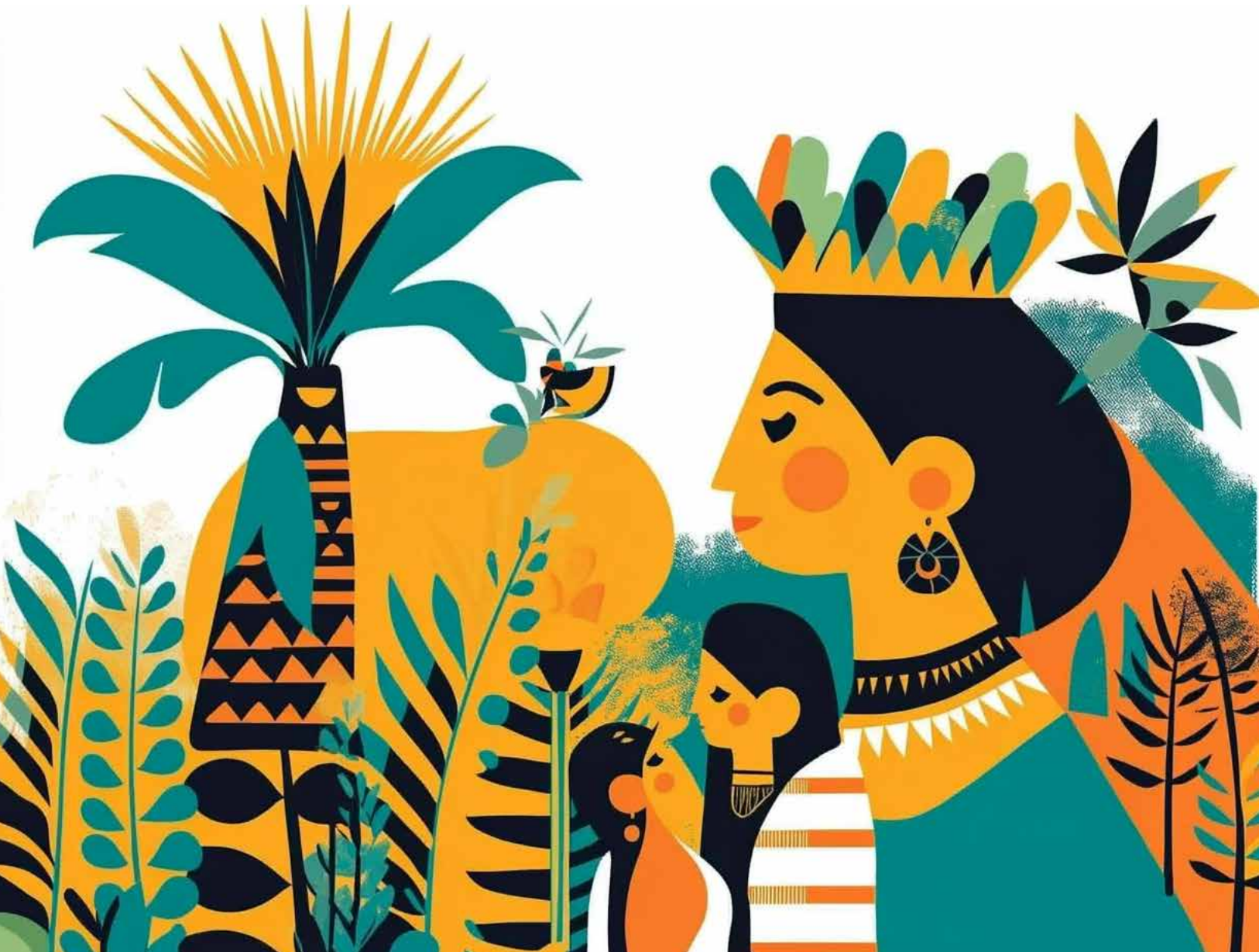
## To learn

- Traditional food preservation and production systems
- Water management and ecosystem restoration
- Disaster prevention and community resilience

## To make

- We share knowledge
- We developed the guide let's talk

# To Learn



**In this document you will find these symbols that represent:**

## TIPS

Particular advice on the subject under discussion.

## REMEMBER

Key issues that need to be remembered.

## GET TO KNOW

Extra help to research and learn more about the topic.

# Introduction

*"Our knowledge not only tells the stories of the past, but also sows paths for the future."*

Taita Querubín

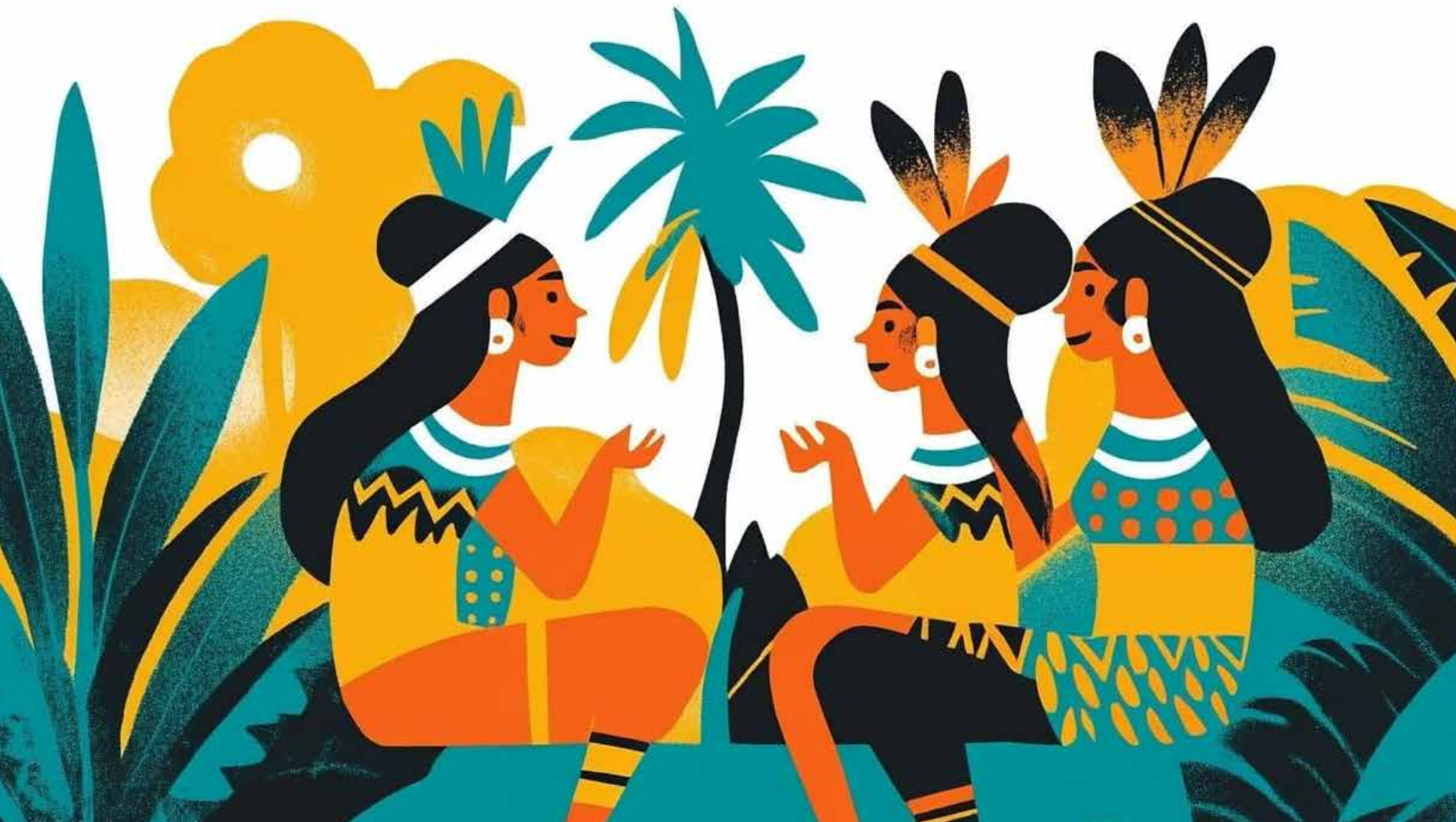
Climate change is transforming our territories: rains no longer come when expected, rivers change their course, crops do not grow as they used to, and some medicinal plants disappear. These changes threaten the life, health, food, water and spirituality of our peoples. But it is also true that our grandfathers and grandmothers have lived through other changes, other threats, and have known how to adapt with wisdom, creativity and unity. This module seeks to recognize, value and strengthen those ancestral strategies that Indigenous Peoples have used for centuries to adapt to their environment. Strategies that do not destroy nature, but rather dialogue with it. Practices that do not separate human beings from the forest, the water or the hills, but rather recognize them as part of the same family. When we speak of adaptation, we refer to how Indigenous Peoples have known how to read the signs of the Earth, modify their ways of planting, conserving water, building their homes or preventing diseases, without losing their identity.
And when we talk about mitigation, we refer to the actions that communities take to reduce environmental damage, conserve ecosystems and reestablish the natural balance, such as reforestation, the use of clean energy, or chemical-free agriculture.

This module focuses on three fundamental axes:

- How Indigenous Peoples produce food while caring for life: using agricultural techniques that respect the soil, seeds and climate cycles.
- How they protect water and restore ecosystems, knowing that without water there is no future.
- How they organize and prepare to face climate disasters, based on community wisdom and observation of nature.

We are not here to teach anything new: we are here to look with different eyes at what our communities already know. To share experiences between territories. To recognize that the answer to climate change is not always in modern technology, but also in the heart of the hearth, in the memory of the elders, in the strength of collective work and in the wisdom that lives in the bush, in the puna or in the jungle.

# Traditional food preservation and production systems



# Agroecological systems and climate-resilient crops

Many Indigenous Peoples have developed sustainable agricultural systems adapted to their local environments. For example, the Mayan milpa, practiced in Mesoamerica for millennia, rotates crops on the same piece of land and intersperses various species (corn, beans, squash, chili peppers, among others) while allowing previously cultivated plots to regenerate with natural vegetation. This mosaic produces true "forest gardens" that preserve soil fertility and biodiversity, while providing varied food all year round. In fact, studies highlight the milpa as a model of sustainable agriculture that balances the relationship between nature and human activity, taking advantage of the complementarity of species and respecting ecological cycles.

In West Africa, peoples such as the Mossi or Bambara integrate trees with their crops (traditional agroforestry); for example, they maintain native trees such as shea or baobab in their fields, which protect the soil from erosion, provide shade and organic matter, and their fruits complement the diet. This type of agroecological system improves soil fertility and diversifies production, reducing the risk of total loss in the face of drought, pests or extreme rains.

In Asia, there are notable cases such as the Ifugao rice terraces in the Philippines, an ancestral agricultural landscape at an altitude of 1500 meters that combines communal forests on the summits (muyong), flooded rice terraces and shifting cultivation areas. These terraces, built centuries ago cooperatively, take advantage of ingenious irrigation channels and gravity to cultivate steep slopes, demonstrating successful adaptation to the mountainous terrain and variable monsoon climates.

# Indigenous soil management and biodiversity practices

Traditional techniques emphasize soil care and coexistence with wildlife. Many communities use organic fertilizers (composts, manures), periodic fallowing of plots (letting them rest) and crop rotation so as not to deplete the soil of nutrients. They also tend to maintain strips of natural vegetation or polycultures that attract pollinators and control pests naturally, avoiding the need for chemicals. A prime example occurs in the South American Andes, one of the world's richest centers of agrobiodiversity: there, Quechua-Aymara families have conserved thousands of native varieties of potato, quinoa, maize and other crops over generations.

This agricultural diversity acts as a buffer against climate variations - if a frost or pest affects a certain variety, others can survive - and is the result of a deep ecological knowledge of their land. Thus, indigenous soil management goes hand in hand with the conservation of cultivated and wild biodiversity, maintaining productive but heterogeneous landscapes (mosaics of farms, pastures, forests and wetlands) that are more resilient to extreme climatic events.

## Seed banks and crop diversification:

Indigenous food security has been based on the conservation of their own seeds adapted to the local environment. Many communities have community or family seed banks where they store selected grains and tubers from the best harvest for the next planting. This ancestral practice ensures the availability of seeds even after difficult years and preserves genetic lines adapted to specific microclimates.

For example, the women of the Wayúu Indigenous Peoples in La Guajira (northern Colombia) select and save the largest beans of the guajiro bean (a local drought-resistant variety of Vigna unguiculata) in glass jars, as a reserve for planting when the rains come. Thanks to this selection ritual, they always have viable seeds even during periods of extreme drought, ensuring the next planting. In addition, the Wayúu plant a mixture of traditional crops - such as corn, auyama (pumpkin) and melon - in gardens called apain along with guajiro beans, diversifying their diet and reducing dependence on a single product.

Similarly, in many Indigenous Peoples in North America, seed guardians keep alive ancestral varieties of corn, beans, squash, pumpkins, wild rice, etc., exchanging them in local networks to prevent their loss. Crop diversification not only enriches diets, but increases resilience: different roots, grains and fruits have varying tolerances to flood, frost or drought, and by growing a variety of crops, communities ensure that at least some food will thrive under changing conditions.

# Water management and ecosystem restoration

# Traditional water management in different regions

Indigenous cultures have developed numerous ways to capture, conserve and distribute water according to their climates. In the Peruvian Andes, for example, high Andean communities are recovering the amunas, pre-Inca stone channels designed to infiltrate rainwater into the mountains. During the rainy season, the amunas divert part of the flow inland so that it slowly seeps into the subsoil; months later, in the dry season, the same water reappears in springs and streams, prolonging the availability of water. Recent studies in San Pedro de Casta (Lima) show that up to 32% of the water that supplies the community during the dry season comes from restored amunas, illustrating the enormous potential of these ancestral techniques for modern adaptation. In semi-arid regions of Africa, such as the Sahel, farmers resort to rainwater harvesting through infiltration pits called zaï. This traditional practice (originating in Burkina Faso and neighboring countries) consists of digging small pits or bowls in the hardened soil and filling them with compost; when it rains, the water collects in the pits instead of running off, gradually wetting the surrounding soil and providing it with nutrients.

**TIPS**

*If your community faces flooding seasons, you can build floating gardens using water hyacinth and other natural materials. This ancestral technique will allow you to continue planting vegetables on the water, taking care of your family's food and strengthening your relationship with your territory.*

The Zai have managed to recover degraded soils that were previously unproductive, turning them into green orchards even under scarce rainfall, and serve as an example of how indigenous knowledge combats desertification. In the Pacific islands and other drought-prone areas, many communities build traditional shallow reservoirs and wells to collect rainwater; for example, on Micronesian atolls they dig wells in sandy soil to capture the freshwater "lens" that forms over the salty groundwater. And as illustrated in the picture, in the Ganges delta (Bangladesh) villages have revitalized floating gardens known as baira, made from rafts of interwoven water hyacinths where they plant hardy vegetables. These cultivation islands rise with the tide, preventing the plants from drowning during floods and allowing crops to be harvested in the midst of flooding. All these ingenious devices - canals, wells, ridges, chinampas, floating gardens - are evidence of water management adapted to local variability, which is now relevant in the face of events such as intense droughts or torrential rains aggravated by climate change.

# Restoration of rivers, mangroves and forests for adaptation

The recovery of degraded ecosystems is part of traditional strategies to mitigate climate risks. Various Indigenous Peoples carry out community reforestation to restore native forests that regulate the water cycle and sequester carbon.
For example, Kichwa communities in the Ecuadorian Amazon have led reforestation projects combining ancestral knowledge and modern techniques: they have planted cedar, mahogany and other native species in areas where the forest had been cleared, restoring extensions of degraded forest. This effort not only sequesters carbon and recovers biodiversity, but also strengthens social cohesion and generates sustainable livelihoods (nurseries, local employment) by keeping alive their cultural practices of forest management. In Mesoamerica, Mayan communities in the Yucatan Peninsula also reforest with local trees (such as ramón or chicozapote) around cenotes and eroded areas, with the double objective of protecting their water sources and rescuing their biocultural heritage.

On the other hand, in coastal regions, mangroves - transition ecosystems between land and sea are recognized by local communities as living barriers against storms and coastal erosion.

**REMEMBER**

*By raising crops above the water level, Indigenous Peoples ensure food security even in flooded areas, demonstrating an ingenious indigenous adaptation to the flood regime. This ancestral method, recently revitalized in the face of increased flooding, reflects how local knowledge can provide resilient solutions to extreme weather.*

Many traditional fishing communities have historically protected mangroves for their value in fish, timber and protection, and now participate in their active restoration. An exemplary case is the island of Barú on Colombia's Caribbean coast, where the local Afro-descendant community (Comité de Cultura y Ambiente de Barú) promoted an environmental education and mangrove reforestation project: they collected red mangrove propagules (seedlings), built a community nursery and planted hundreds of saplings in the most degraded areas of the mangrove. In doing so, they seek to restore the health of the mangrove, which in turn protects the town from storm surges and provides habitat for fish and crabs essential to their livelihoods. Reforested mangroves can absorb up to 5 times more carbon than terrestrial forests of the same size and reduce the height of storm waves by up to 50 cm per kilometer of mangrove, underscoring their importance for both climate mitigation and adaptation. Similarly, river and wetland restoration is practiced by Indigenous Peoples who understand their protective role: in certain Andean watersheds, Quechua Indigenous Peoples maintain gallery forests (trees along rivers) and manually clear riverbeds to prevent flooding; in North America, native nations such as the Yurok and Karuk of California engage in dam removal and reintroduction of controlled fire to revitalize salmon rivers and riparian forests, reducing risks of catastrophic fires and enhancing the resilience of their territories. All these actions demonstrate that ecological restoration based on traditional knowledge is a powerful tool for community adaptation.

# Disaster prevention and community resilience

# Indigenous knowledge on climate prediction and extreme phenomena

Long before the existence of satellites or meteorologists, Indigenous Peoples were fine-tuning their observation of nature to anticipate the weather. In the Andes, for example, Quechua and Aymara farmers traditionally predict the arrival of rain, frost or drought by observing local bio-indicators: the early or late flowering of certain wild plants, the behavior of birds and animals (such as the migration of parihuanas or flamingos, or whether toads croak more than usual), and even the clarity of the night sky. A well-known Andean lore is the observation of the Pleiades (a cluster of stars): if they appear bright and clear in June, they herald a rainy year; if they appear dim or "twinkling", it is a sign of possible drought, which allows them to adjust planting and food storage.

Similarly, the Aymara have for centuries used systematic astronomical observation -movement of stars, lunar phases, position of the sun- to draw up agricultural calendars and forecast dry or wet seasons with remarkable accuracy. In Mesoamerica, the Maya developed complex agricultural calendars based on solar and lunar cycles, and even today Maya farmers in Yucatán use signs such as the direction of the prevailing winds (Ik') or certain constellations to predict the intensity of the rainy season. In Africa, pastoralists such as the Borana of Ethiopia-Kenya have incorporated stargazing (the Borana Gadaa system has 12 key constellations) to anticipate when to start their seasonal migrations with cattle before the grass is scarce.

**REMEMBER**

*In the Andes, for example, Quechua and Aymara farmers traditionally predict the arrival of rains, frosts or droughts by observing local bioindicators.*

In addition to weather signals, many peoples have oral memories of disasters that act as traditional warning systems. A dramatic example occurred in 2004 during the Indian Ocean tsunami: the Moken people, sea nomads in the Andaman Islands (Southeast Asia), recognized the unusual signals from the sea (the rapid drop in water level and the agitated behavior of animals) as what their legends described as the "great all-devouring wave". Thanks to this knowledge passed on by their elders, almost all the Moken were able to flee in time to higher ground before the tsunami arrived, saving their lives. Aboriginal communities in Australia are also cited as recalling accounts of tsunamis that occurred centuries ago and, like the Moken, were able to evacuate internally during that 2004 event, unlike many of their non-indigenous neighbors. These examples show how traditional knowledge about climate and extreme events - albeit expressed in the form of stories, rituals or cultural practices - is empirically grounded and remains relevant to risk management today.

# Reforestation and conservation strategies to reduce disaster risks:

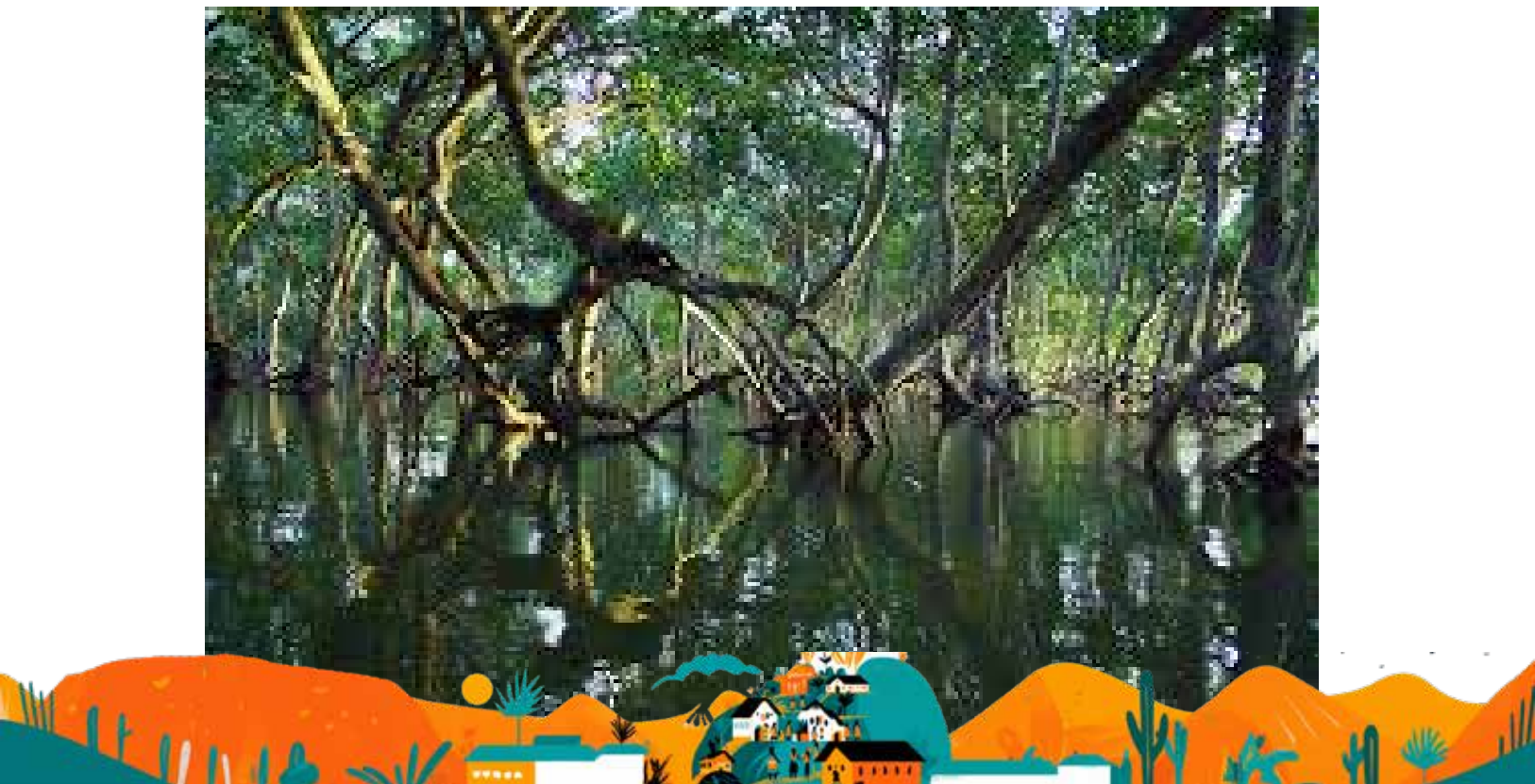
Ecosystem protection is not only important for productive reasons, but also because it acts as a natural barrier against disasters. By maintaining forests, mangroves, coral reefs, grasslands and wetlands, Indigenous Peoples reduce their communities' exposure to climate hazards. For example, maintaining forests in upper watersheds mitigates landslides and mudslides during heavy rains, as the roots hold the soil and the trees regulate runoff. Understanding this, communities such as the Ngäbe-Buglé in Panama protect their riparian forests as a way to prevent flooding downstream. In the case of forest fires, several indigenous cultures around the world apply traditional fire management: periodic, low-intensity controlled burns that eliminate dry grasses and flammable brush, drastically reducing the likelihood of disastrous fires. The Napaljarri Aborigines of central Australia, for example, conduct mosaic burns at different times of the year ("cold" burns during cooler hours) to create natural firebreaks and promote the renewal of certain edible plants.

This practice, known as "cultural burning," has recently been adopted by Australian authorities in fire management plans, recognizing that indigenous techniques kept the landscape in balance for generations. Similarly, North American tribes such as the Yurok and Karuk in California have revived their prescribed burning rituals to prevent mega-fires in redwood and pine forests, with positive results in the reduction of combustible material and the return of native flora and fauna.

**CONSEJOS**

*La conservación de bosques en cuencas altas mitiga deslizamientos de tierra y deslaves durante lluvias intensas, ya que las raíces sujetan el suelo y los árboles regulan la escorrentía.*

In coastal areas, as mentioned, mangrove restoration by local communities acts as a natural defense against hurricanes and storm surges, preventing waves from directly impacting villages. Studies have confirmed that during events such as the 2004 tsunami or cyclones in the Indian Ocean, areas with healthy mangroves and reefs suffered less damage than those that were deforested. In sum, by combining reforestation, traditional fire management practices and protection of key ecosystems, Indigenous Peoples reduce the intensity and frequency of natural disasters in their territories, increasing community resilience.



# Community organization and local governance for resilience.

The capacity of Indigenous Peoples to cope with climate crises lies not only in ecological practices, but also in their forms of social organization. In many indigenous peoples, critical resources (land, water, forests) are managed collectively under principles of solidarity and reciprocity, which facilitates a united response to emergencies. For example, after a flood it is common to organize mingas or tequios -collective community work- to rebuild houses, clean canals or rehabilitate damaged roads, without waiting for external help. This immediate collective action reduces the long-term impact of the disaster and ensures that no one is left behind in the recovery.

Traditional governance also plays a preventive role: communities, through their councils of elders or communal assemblies, draw up local contingency plans based on past experience - deciding, for example, not to establish houses in historically flood-prone areas, to maintain communal granaries for food emergencies, or to agree on shared irrigation systems in times of drought.

An emblematic example is community forest management in parts of Mexico and Central America, where ejido or indigenous assemblies regulate logging and ensure forest surveillance; as a result, their forests remain in a better state of conservation and with a lower incidence of fires than surrounding lands under corporate management. This community environmental governance reduces risks and has also proven to be effective in protecting biodiversity and the ecosystem services (water, fertile soil) that sustain the community. Another dimension is the intergenerational transmission of knowledge: by raising young people in values of respect for nature and teaching them the signs of the environment, communities ensure that future generations are better prepared for an uncertain climate..

Finally, many Indigenous Peoples are establishing partnerships and participating in broader networks (regional or international) to exchange traditional knowledge on adaptation. Global initiatives such as the Local Communities and Indigenous Peoples Platform of the UNFCCC seek precisely to integrate this knowledge into climate policy, recognizing that climate goals cannot be achieved without the full participation of Indigenous Peoples.

In conclusion, Indigenous community resilience to climate change comes from an integral combination of ancestral knowledge, sustainable land management, and strong ties of social and cultural organization. These traditional strategies - from seed banks to water channels, from climate calendars to burning rituals - offer valuable lessons in adaptation and mitigation that benefit not only the communities themselves, but the planet as a whole.

# Traditional Water Knowledge in Indigenous Peoples of Mountain Lakes in Kyrgyzstan: Documenting Local Indicators of Climate Change.

Climate change poses significant challenges to mountain and coastal ecosystems around the world, especially affecting Indigenous Peoples who depend on these environments. In Kyrgyzstan, mountain lakes - including Issyk-Kul, a unique high-altitude lake surrounded by indigenous communities - face serious challenges. These communities have accumulated a wealth of traditional ecological knowledge (TEK) from generations of observation, providing local indicators of climate change that often go unnoticed by modern scientific methods. Despite the potential of this knowledge to enrich existing climate models and guide adaptation strategies, it remains largely ignored by the scientific community and policy makers.

The Suuchulars ("The Waterbearers"), a group of young researchers dedicated to preserving and promoting the ETC, have mobilized. With support from the Pawanka Fund and in collaboration with Aigine CRC, they are bringing this invaluable knowledge to the heart of efforts to strengthen resilience to climate change.

The team has focused on documenting local indicators of changing climate patterns around Lake Issyk-Kul and analyzing existing models to assess their relevance in the Kyrgyz context. They also conducted workshops to disseminate traditional water-related knowledge in the Indigenous Peoples of Mountain Lakes, highlighting how the socio-cultural dimensions of these communities have been affected by climate change. The Suuchular team developed a research methodology and conducted field studies around Lake Issyk-Kul. They designed a structured questionnaire with 106 questions, in collaboration with members of the Indigenous Peoples.

This questionnaire was based on an analysis of climate change indicators drawn from both local Indigenous Peoples and other communities globally, along with records documented by the Aigine Research Center on sacred sites and traditional ecological sanctuaries in the seven regions of Kyrgyzstan. After applying the questionnaire, qualitative interviews were conducted to further explore the socio-cultural aspects of climate change. To ensure that the questions were easily understood by local communities, the Suuchular team created the survey in Kyrgyz. This decision was made in response to the fact that most climate change surveys are conducted in Russian, the predominant language of academia in Kyrgyzstan. By developing and implementing the research in his native language, Suuchular sought to obtain more accurate data while contributing to the decolonization of knowledge production.

The team interviewed 220 people from more than 20 Indigenous Peoples and settlements around Issyk-Kul, comprehensively documenting a broad set of local indicators of climate change, ranging from ecological changes to cultural and spiritual effects.

The research went beyond environmental observations, as Indigenous Peoples described climate change as a social-ecological process. They linked climate change to cultural and spiritual transformations, demonstrating that Indigenous Peoples perceive it as an integral part of a broader social-ecological process. This perspective, informed by traditional ecological knowledge (TEK), contrasts with conventional models of climate change, which often focus solely on natural processes and their socioeconomic and ecological consequences.

An interesting observation arose regarding the use of sacred sites as indicators of socio-ecological changes, such as climate change. Some community members believed that neglect of these sites may have contributed to environmental changes. The Kyrgyz people's particular view of climate resilience, shaped by their deep connection to nature, culture and spirituality, highlighted the need for further research through interviews and qualitative data collection.

To broaden the scope of their findings, the Suuchular team worked with communities in Bishkek, Karakol and Naryn, organizing workshops that brought together scientists, decision-makers and residents.

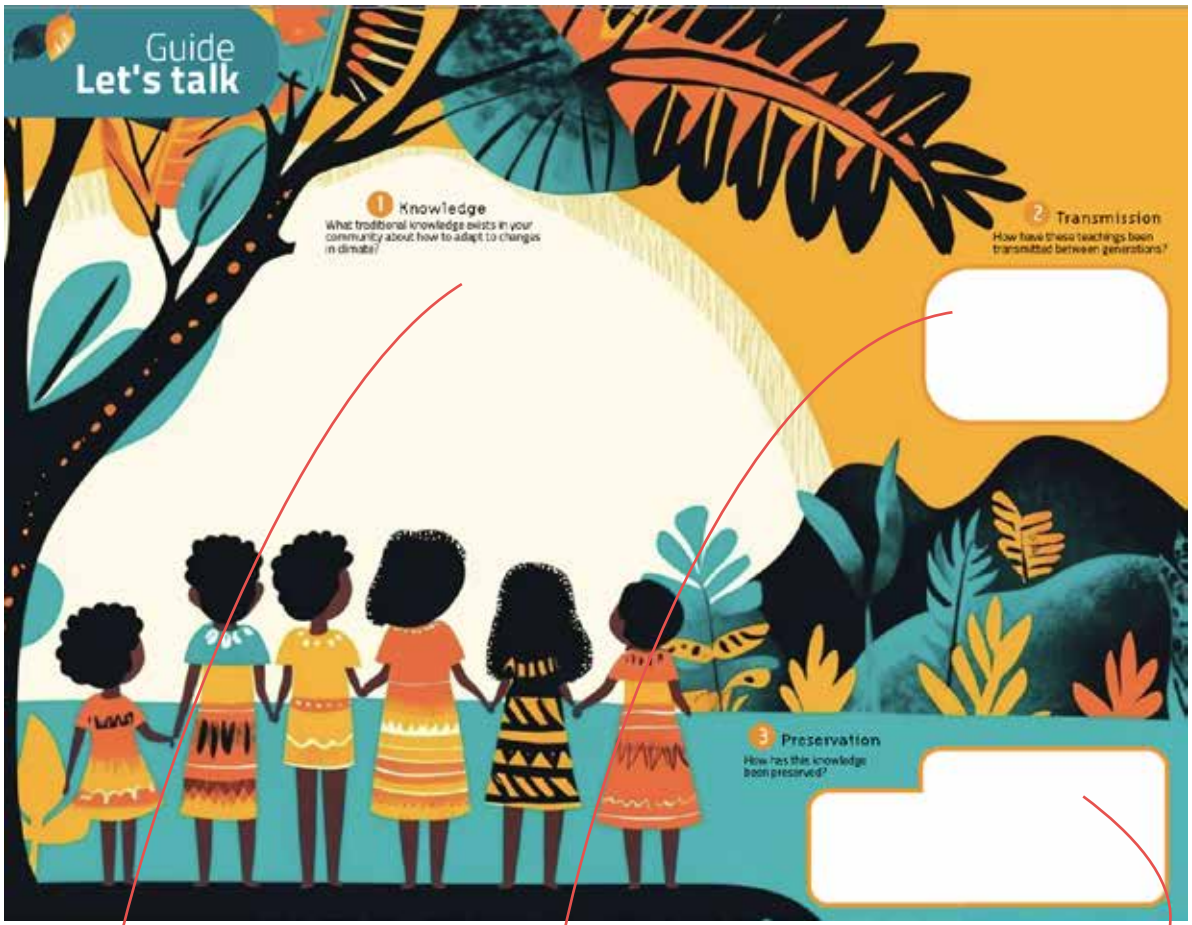
These sessions brought together scientists, decision makers and residents. During the initial workshop phase, the Suuchular team presented their research methodology, explaining in detail the design of the survey questionnaire, data collection techniques and the challenges they faced. They emphasized the importance of respecting the rights of communities through free, prior and informed consent (FPIC) when working with Indigenous Peoples. Team members also shared their experiences obtaining FPIC from respondents during fieldwork.

The value of FPIC was recognized by workshop attendees, although some noted that Indigenous Peoples are often portrayed as "research subjects" only, and it was suggested that Indigenous Peoples should play a more active role in knowledge generation. It was suggested that Indigenous Peoples should play a more active role in knowledge generation.

During the second part of the workshop, the focus was on local indicators of climate change. Experts from the Suuchular Initiative Group presented existing climate models for Central Asia and discussed how the indicators used in these models could be improved. Participants worked in small groups to identify additional local climate indicators that could be integrated into these models. Project leader Aibek Samakov shared the results of the field study, which were well received by the attendees.

# To Make

# Guide
# **Let's talk**




1

**Knowledge**

What traditional knowledge exists in your community about how to adapt to changes in climate?

2

**Transmission**

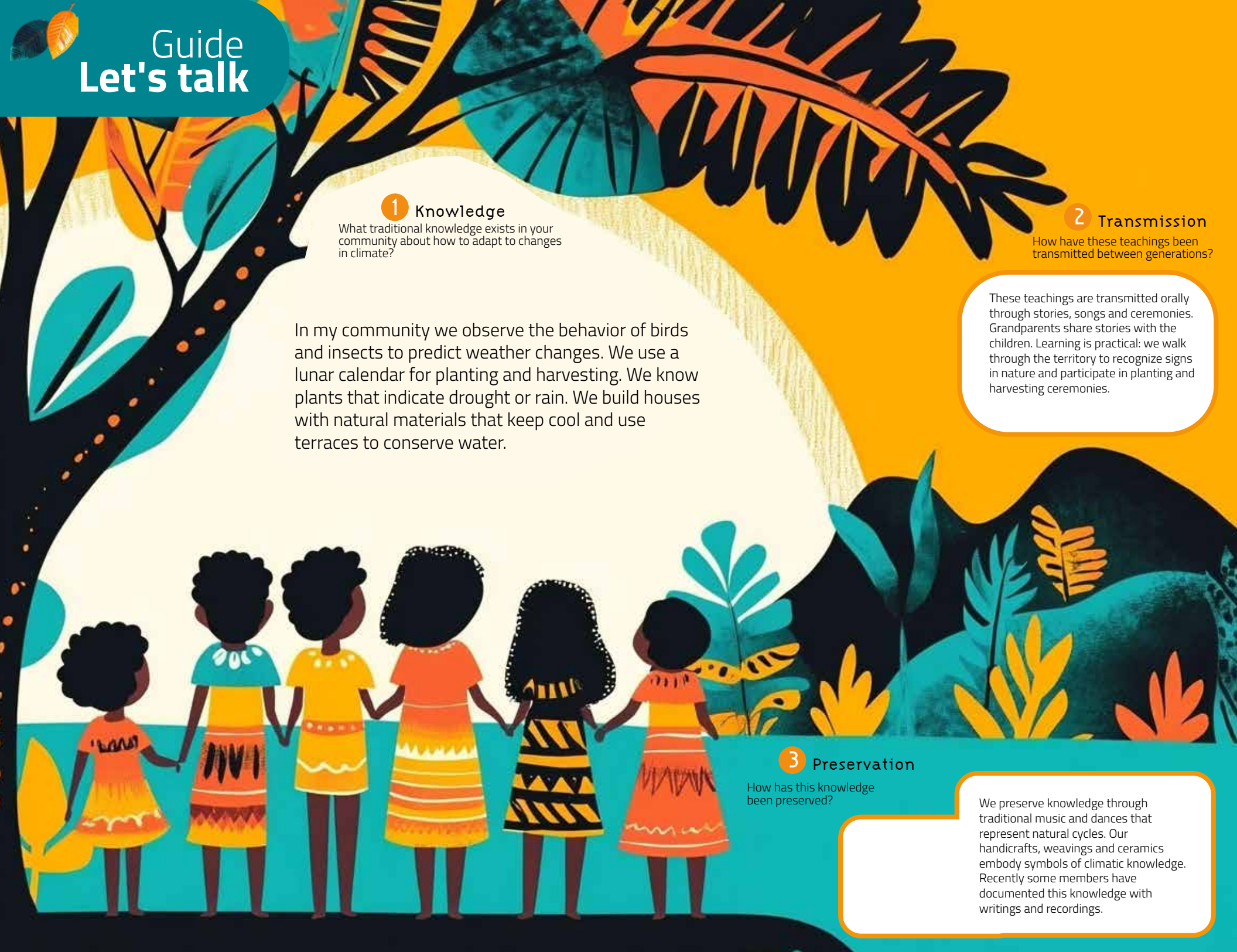
How have these teachings been transmitted between generations?

3

**Preservation**

How has this knowledge been preserved?

# Guide
# Let's talk



## 1 Knowledge

What traditional knowledge exists in your community about how to adapt to changes in climate?

In my community we observe the behavior of birds and insects to predict weather changes. We use a lunar calendar for planting and harvesting. We know plants that indicate drought or rain. We build houses with natural materials that keep cool and use terraces to conserve water.

## 2 Transmission

How have these teachings been transmitted between generations?

These teachings are transmitted orally through stories, songs and ceremonies. Grandparents share stories with the children. Learning is practical: we walk through the territory to recognize signs in nature and participate in planting and harvesting ceremonies.

## 3 Preservation

How has this knowledge been preserved?

We preserve knowledge through traditional music and dances that represent natural cycles. Our handicrafts, weavings and ceramics embody symbols of climatic knowledge. Recently some members have documented this knowledge with writings and recordings.

Guide
# Let's talk

## 1 Knowledge

What traditional knowledge exists in your community about how to adapt to changes in climate?

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How have these teachings been transmitted between generations?

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