



# The Tacaná Watersheds

Developing Untapped Potential: Strengthening Resilience through Cross-Sectoral Collaboration

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Resilience through Cross-Sectoral Collaboration

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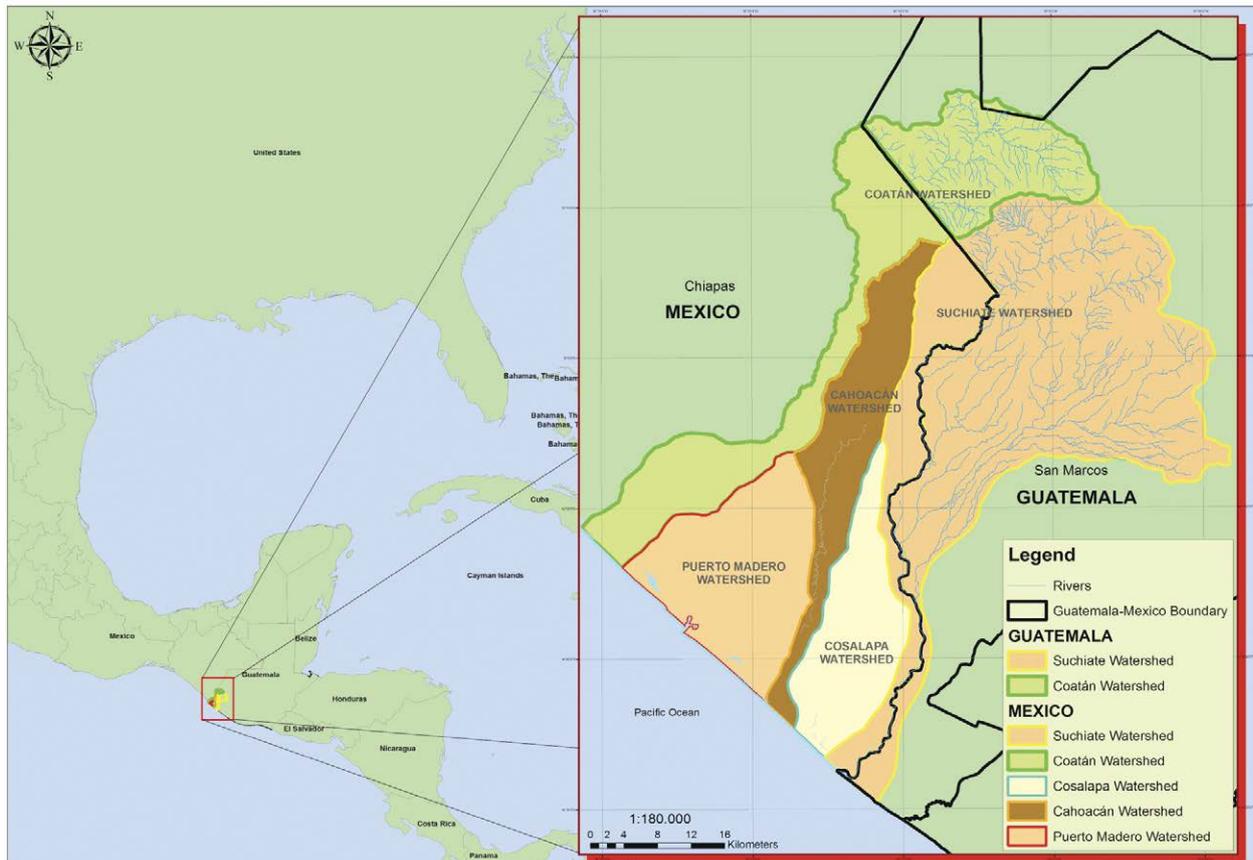
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## Background

The watersheds associated with the Tacaná volcano, which stands at an altitude of 4,093 m, cover a transboundary area of 3,170 km<sup>2</sup> right in the middle of the border area of the Department of San Marcos, Guatemala and the State of Chiapas, Mexico. This area comprises the Coatán, Suchiate, Cosalapa and Cahoacán rivers. The Coatán and Suchiate watersheds originate on the volcano, and are both shared by Guatemala and Mexico. Cahoacán and Cosalapa are subwatersheds of the Coatán River, within Mexico.



**Figure 1.** Map of the Tacaná Watersheds (Source: IUCN / Mario Rodríguez)

These watersheds are of great strategic importance for both countries since they supply water to a large number of residents in the cities located downstream and are the main source of irrigation water for agriculture. In the lower reaches, fishing is an important source of income. Consequently, ecosystem services are especially important assets for development in this region.

Despite this great potential, the area is vulnerable both ecologically and politically. The climate is tropical humid and there is high occurrence of hurricanes as well as volcanic activity. Deforestation and degradation of the upper watersheds and of river banks has led to erosion and flooding and reduced capacity of the watersheds to absorb water. Along with the effects of climate change and environmental degradation, the geology of the area is also unfavorable: formerly deep soils that originate from volcanic sand rocks. Unregulated land use change is especially damaging in steep catchments and deforestation has reduced the capacity of the landscape to retain water. The resultant increase in the volume and rate of runoff and the lost water storage capacity of the eroded soils exacerbates the risk of flooding caused by intense rainfall.

Water is primarily used for domestic purposes and small-scale irrigation in Guatemala, while in Mexico, 54% of surface water is used for irrigation, 26% for human consumption and 10% for agribusiness. Coffee production and export plays an essential part in the livelihoods strategies of communities. In the middle and lower parts of the catchment, water scarcity in the dry season is problematic for agricultural production, affecting community income generation as coffee production depends on water for processing coffee beans. In addition, intensive animal farming and a relatively dense population associated with poor waste and waste water management is contaminating rivers and affecting fisheries along the Pacific coast.

But ecosystem fragmentation, hydrological risk and water availability are not the sole causes of vulnerability in the Tacaná watersheds. The area is also exposed to a number of sociopolitical shortcomings such as lack of technical support between institutions, indigenous people marginalization, high illiteracy and mortality rates, very high population growth, and a complex land tenure rights situation. Unlike other places in Guatemala, the land plots in San Marcos are too small to be effectively managed and often have no user. Tenure rights in Guatemala are such that the government's land has to be registered to the municipality before it can be transferred to the citizens, though the population has little trust in this process.

As a result of severe poverty, especially at higher elevations, many young people migrate elsewhere in search of temporary employment. A large number of households in Guatemala rely on money transfers from workers that occasionally move to Mexico for the harvesting of seasonal crops such as coffee. In Mexico, farmers are entitled to have concessions because the traditional system is set up as to provide for communal land, although indigenous people are still largely excluded. The land is administered collectively but managed and worked on by individuals or families.

As the population tends to be distributed unevenly on this territory, urbanization and infrastructure development used to suffer from poor planning. Building of roads by municipalities to connect rural areas and dispersed populations has been at the source of severe landslides in the past. In this respect, corn growers in the lower watersheds are extremely vulnerable as strong rains combined with erosion can cause destruction of entire crops. The population is not generally aware of why there are risks, why they are vulnerable, what the issue is and why it is an issue and what can be done about it.

## Problem Statement

The hypothesis for the rapid resilience assessment of the Tacaná Watersheds was that environmental degradation such as deforestation and pollution combined with weak institutions and social challenges were undermining the resilience of the Tacaná Watersheds. Marginalised farmers have been forced to higher altitudes on the volcano and had cleared forests to make way for small farms. In the low and middle parts of the catchment, sugarcane, coffee, African palm and banana industries pollute the water and larger-scale farming has degraded the land. Soil erosion resulting from unregulated land use change has strongly increased the risk of floods and mudslides. Furthermore, lack of organization at the institutional level causes people to have trouble integrating knowledge of these risks into action.

Another hypothesis was that governmental authority was dispersed with little connection between local and national levels. This had led to weak institutional presence, inadequate laws and regulations, budgetary constraints, lack of technical coordination and mutual support among institutions, the absence of integrated policies, and limited stakeholder participation and transparency. Historically, there had been no coordination of basin management between Mexico and Guatemala for the Coatán and Suchiate rivers. This is despite the new water law in Mexico stated that local Water Councils are responsible for implementation of the law and policies on water resources. While the conceptual framework was in place, the Water Councils lacked the capacity to carry out these activities. Furthermore, marginalization of indigenous peoples, high illiteracy and mortality rates, very high population growth, and a complex land tenure rights system were also deemed major challenges in parts of the basin.

The initial assumption for the rapid resilience assessment was that the demonstration in the Tacaná Watersheds was set up to combine pilot projects with bottom-up integrated governance of water resource management as a response to these vulnerabilities. The numerous community pilot projects were implemented to improve livelihoods through environmental conservation actions. At the same time, these interventions contributed to a culture of selforganization which facilitated the development of Microwatershed Councils as resilience-supportive institutions in an adaptive governance framework. At this stage, the role of the private sector in strengthening resilience was assumed to be most relevant for developing:

- A) A small-business enterprise to later implement most of the livelihoods and environmental conservation interventions, and
- B) A Payment for Watershed Services (PWS) scheme that would include the larger commercial farms in one of the most degraded microwatersheds of the Suchiate basin around San Pedro municipality.

## Methodology

The resilience framework used to analyze the experience of the Tacaná Watersheds was a precursor of the one currently proposed for this project that addresses six critical questions on systems knowledge, learning from practice and options for policy and strategy. It is based on the cumulative field experience from the Tacaná Watersheds and several other demonstration projects within the Water And Nature Initiative (WANI). The original framework was most concerned with providing guidance in exploring the wide range of issues connecting ecosystems, human well-being and resilience from a system perspective. It did so by focusing on key results from the projects in terms of four components of resilience, i.e. diversity, sustainable infrastructure and technology, self-organisation, and learning. In turn, these provided a lens to look at any potential shift in resilience undergone by the system.

The rapid resilience assessment did not look at feedback mechanisms between private, public and civil society. No monitoring was in place to identify thresholds for vulnerable social-ecological systems. No analysis was done of the implications for policy of business strategies such as on the nature of collaborations or pathways that reduce business risk and create a resilient society. The following sections of this case study will offer some insights on these. Not all the steps of an operational methodology were implemented either. Some practical applications of the framework were later developed that provide for a management cycle revolving around a visioning, assessing, strategizing, planning, implementing, and reflecting phase. The rapid resilience assessment performed on the Tacaná Watersheds project is retroactive, learning from practice as achieved during the reflection phase, and focusing on the operationalization of the original framework through the four resilience components.

## Intervention

Management actions around Tacaná have always tended to focus more strongly on ecosystems in the upper watersheds and on people in the lower watersheds. It was therefore natural that new pilot activities to effect change in the area would target maintenance of ecosystem services alongside improving livelihoods. Increased collaboration through change in water governance was also an explicit objective of this demonstration project. This was mobilized through supporting the organization and development of Microwatershed councils. Through WANI, the Tacaná project developed a water planning and community management model based on:

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1. broad community participation and recognition of microwatersheds as a planning unit,
  2. the involvement of local political authorities in environmental management,
  3. building community capacity in integrated water resource management, and
  4. forging strategic collaborations with government and nongovernmental organisations.
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Fourteen Microwatershed councils were formed in Guatemala and nine Committees in Mexico, comprising local governments and communities living within the Tacaná Watersheds. In Guatemala, microwatershed councils encompass 10 to 20 communities who share water resources in the watersheds of tributary streams. The councils are organized to coordinate resource management of shared water and land resources and, critically, how this can be integrated with community development.

The Councils were recognized by local governments from the start as town mayors participated in the organizational process. The Microwatershed councils in Guatemala join each other together and therefore expand their actions to include watershed management at different scales. In Mexico, at least two of the Microwatershed committees are now responsible for the implementation of regulations under the new water law.

## Stakeholders

The Microwatershed model is inclusive, highly participatory and based on strategic collaborations that facilitate tackling and resolving more complex environmental and social problems. To demonstrate the appropriateness and robustness of the Microwatershed approach, the Tacaná project provided training for water managers in the planning offices of the Ixchiguan, Tajumulco, and San Pablo municipalities in the department of San Marcos, Guatemala. These

three have since used the microwatershed approach to form the new municipal development plans. The municipality of Ixchiguan is the head town of three very important watersheds, those of the Suchiate, Coatán and Cuilco rivers, which are water recharge zones. In order to make the best of efforts toward more comprehensive management of water and the natural resources available in these municipality, the Microwatershed-based community water planning and management model was adopted.

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### *Local collaborations*

At the community level in Guatemala, WANI facilitated the development of collaborations with the Community Development Committees (COCODES) and coordinated with Municipal and National Development Councils to enable integration of micro watershed planning and management with community-led action on development. Project implementation has demonstrated that projects formulated by the communities rather than external institutions respond to the real demands of communities, not just institutional goals.

### *Sub-national collaborations*

At the Department level in San Marcos, in Guatemala, an alliance was created with 16 government and non-governmental organizations, to form CORNASAM (the Inter-Institutional Coordination for Natural Resources and the Environment of San Marcos). CORNASAM has adopted the microwatershed as the unit of planning for water and the environment and, together, these groups have coordinated outreach and training in the micro-watershed approach.

### *National institutions*

As a result of the success of the Microwatershed model at the local level, the National Microwatershed Commission of Guatemala has been established at the national level, comprising several government ministries and nongovernmental or intergovernmental organizations (Action Against Hunger, FAO and IUCN) to lead application of governance reform through microwatershed management country-wide. This National Commission will facilitate the preparation of national public water policies that outline management plans. A methodological guide for community engagement in the establishment of microwatershed management plans has been produced.

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## **Results**

### *Small-business enterprise*

In Guatemala, WANI was instrumental in supporting the emergence of a youth-run cooperative enterprise called 'Jóvenes en la Misión' (Youth in Mission, JEM). JEM began as a Catholic environmental education initiative run by a group of young volunteers promoting sustainable water use and watershed restoration. This initiative has since grown into an entrepreneurial enterprise supporting income generations and governance approaches. Presently, Jóvenes en la Misión (Youth in Mission, JEM) has 200 members actively involved within the municipality of San Marcos and a total of 2,000 youth working together on water issues in Guatemala. JEM's motto is 'United for Water' and most of its activities have an environmental component. JEM has been influential on local policy.

With assistance from the Tacaná Project, JEM became a registered NGO in July 2005. A year later, JEM received a loan which helped them to build 19 greenhouses with drip irrigation that produced flowers and vegetables such as tomatoes, peppers and cucumbers. There is a potential for exports of organic tomatoes to the United States since agreements are being negotiated with the Non Traditional Products Exporters' Association of Guatemala AGEX-PRONT and USAID. Community economic development is fundamental to environmental conservation to also avoid emigration.

Today, JEM continues to campaign and advocate for water issues, helping to improve livelihoods through the use of appropriate technologies and support community development by building capacity for water governance. A Strategic Plan was developed to further guide its activities. Among its achievements of the last 6 years, JEM has supported reforestation to improve water supply which has helped more than 800 people in the Esquiche micro-watershed and has established a virtual platform for dialogue to strengthen projects along the borders of Guatemala and Mexico. JEM now has a strong national presence and is involved in a national youth movement participating in many activities related to climate change and water at both local and national levels.

WANI and partners such as JEM supported the design of numerous community pilot projects which addressed water, soil and environmental conservation. Eighty six pilot projects were carried out by community groups in Guatemala and 21 in Mexico:

- 18 forestry and soil conservation demonstrations and 122 management plans for conservation of community forests;
- 10 pilot projects in Chiapas facilitating development and networking of community enterprises and cooperatives working, including beekeeping, fish farming and butterfly farm ecotourism;
- Community gardens, organic farming and soil conservation projects, including organic fertilizer production at composting centres;
- Construction of septic systems to improve sanitation and water quality in the Suchiate River;
- Protection of springs for domestic water supply and installation of piped distribution;
- The establishment of a demonstration and training centre in Chiapas for integrated management of watersheds;
- Supported the building of a water treatment plant and advised on how water can be recycled in the processing of the coffee beans to reduce wastewater;
- Production of eatable mushrooms has contributed to improve food security and livelihoods.

Women make up 90% of these groups, empowering them to take a more proactive role in the development of their communities which was formerly the exclusive domain of men. Through an ecosystems approach, which focuses on environmental restoration for livelihood security, these small scale initiatives have energised the communities to self-organise and has enhanced their development opportunities.

### *Payments for Watershed Services (PWS)*

Change in water governance in Tacaná was mobilized through supporting the organization and development of Microwatershed councils. Microwatershed management plans are the instrument through which communities recognise, prioritise, and plan projects for sustainable use of water resources in the areas where they live. In this way, these plans also help to improve local water governance. For example, in the midsection of the Suchiate River, the process incorporated small coffee producers with whom projects have been planned to reduce water use at coffee-processing facilities and to improve organic plantations. Through conservation projects in the middle and upper watersheds, the Living Water Partnership seeks to protect and restore the area's water resources

The Living Water Partnership is composed of six associations that seek to implement revenue mechanisms to feed an environmental fund dedicated solely to conservation work in the Tacaná watersheds. Through this Partnership, a payment for ecosystem services process was established in 2008 in the municipality of San Pablo, Guatemala called FOGESHIP (for "Fondo de Gestión Hídrica Participativa"), to protect and restore the area's natural resources, especially water resources. As well as a demonstration project named "Water for the Future" (Agua para el Futuro) in the Tacaná town.

As of 2012, outcomes of the work included systematization of national information on payment for ecosystem services, the preparation of a glossary of payment for ecosystem services terminology, and training for technicians in the theme. Having gone through a process of confirming its legal status in 2011, FOGESHIP was ready to begin implementation as a water fund. The scheme was going to be financed through an adjustment in water rates charged in urban areas, with the support of the municipal utilities. In addition, a training course on payment for ecosystem services was developed during 2010 and it is now available online.



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## Analysis

The rapid resilience assessment methodology contributed to a better understanding of how the actions implemented by the Tacaná Project helped build resilience through the four different components. The following synopsis includes some selected examples of actions for the collaborations presented above.

<b>Tacaná Watersheds</b>	<i>Lower resilience (before intervention)</i>	<i>Higher resilience (after intervention)</i>
<i>Diversity</i>	<ul style="list-style-type: none"> <li>• Intensive production of cash crops meant for the national market or export exacerbating hindrance of agricultural diversity</li> <li>• Emigration of young people in pursue of seasonal jobs and reliance of households on money transfers from abroad</li> <li>• Deforestation reducing the water retention capacity of the landscape</li> </ul>	<ul style="list-style-type: none"> <li>• Reforestation with native tree species enabling agro-forestry on farms, with fruit and mushroom production</li> <li>• Diversification of agricultural practices improving nutrition and generating income</li> <li>• Greenhouse production and mushroom growing along with rehabilitation of the irrigation system improving access to food and employment</li> </ul>
<i>Sustainable infrastructure &amp; technology</i>	<ul style="list-style-type: none"> <li>• Intensive animal farming, dense population and poor waste and waste water management contaminating rivers and affecting coastal fisheries</li> <li>• Poor planning for urbanization and infrastructure development along with unregulated land use change damaging stability of slopes in steep catchments</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable organic technologies, livestock management, use of greenhouses and solid waste recycling helping with soil conservation and water pollution control</li> <li>• Chlorine-based water purification and wastewater treatment such as from coffee pulp processing improving access to drinking water</li> </ul>
<i>Self-organisation</i>	<ul style="list-style-type: none"> <li>• Complex land tenure system causing delays in the transfer of rights from municipality to private citizens and marginalization of indigenous people</li> <li>• Lack of technical support between institutions leading to difficulties in integrating knowledge of hydro-geological risk into action</li> </ul>	<ul style="list-style-type: none"> <li>• Adoption of micro-watershed council as units of management empowering communities with participatory institutions</li> <li>• Groundwater recharge zone protection improving access to drinking water and natural resources management in general</li> </ul>
<i>Learning</i>	<ul style="list-style-type: none"> <li>• Limited exchange of knowledge of hydro-geological risk across multiple levels of governance</li> <li>• High illiteracy coupled with mortality rates and population growth</li> </ul>	<ul style="list-style-type: none"> <li>• Generation of local knowledge leading to disaster preparedness</li> <li>• Gender and age-dependent training to help diversify household income and curb migration</li> </ul>

## Reflections

Beginning with a grassroots approach to water management, increased knowledge and information and the improvement of environmental health and livelihoods, the Tacaná region has shown the way forward in scaling up local level approaches to national level initiatives building adaptive capacity. Overall, by 2011, a total of 107 projects had been implemented in all microwatersheds, covering the areas of conservation and environmental restoration, food security, income generation and basic social services and cutting across the private, public and civil sectors of society.

The main form of enhanced collaboration that was central to initiating a feedback loop working across these sectors and building adaptive capacity was clearly the Microwatershed councils. In particular, the process for setting up Microwatershed plans was the essential selforganization piece that helped overcome certain governance roadblocks. In this way, a strategic area is defined for implementing actions that other nearby communities or microwatersheds can replicate. Guidelines for the Development of Micro Watershed Management Plans have been promoted by the National Micro Watershed Commission and integrated by the

Ministry of Agriculture, Husbandry and Food (MAGA), Presidential Coordination Executive Secretary (Secretaría de Coordinación Ejecutiva de la Presidencia-SCEP), FAO and IUCN amongst others, in academic spheres and in political and technical institutions in Guatemala.

## Lessons Learned

Many lessons have been identified from WANI's work carried out in the Tacaná Watersheds. The main lessons for factors that enable collaboration across sectors are:

1. Strengthening community-based alliances and integrating them with municipal and national development institutions increases coordination between administrative levels. This promotes integrated and coordinated water resource planning across the watershed and shared experiences with other community groups and networks;
2. Poverty reduction and increased livelihood opportunities are major concerns at both local and national levels. The challenge is to combine livelihood benefits whilst maintaining environmental sustainability. A range of options combining income generation and environmental conservation initiatives that fully integrates the community can be achieved. Both technical and business training is required, in order for pilot projects to be viable and sustainable.

Some follow-up actions have also been identified as a way forward to further building of resilience in the Tacaná watersheds:

1. A first step will be engagement of different level institutions to activate the top-down technical support between agencies that has been lacking as well as facilitate bilateral cooperation between the Guatemalan and Mexican sector of the catchment. Other areas of work that have been recognized as shortfalls are media relations and communications, adoption of an integrated approach to landscape management, and reaching out to higher level natural resources managers. There is now an understanding that, if high-profile officials do not make the connection between resource management and ecosystem services, real action towards systemic change is hardly taken. The project area was too small and limited to few areas for increased resilience to be experienced on a significant scale.
2. The scope of the project could have been wider in terms of stakeholder partnerships. The private sector was included in payments for watershed services schemes in the middle part of the catchment but only for smaller scale holders so far. In the lower part, large palm and banana tree growers from Guatemala use large amounts of water with no compensation for water retention services upstream. The design of a payment scheme for larger farming is currently under development that implies establishing area-specific payments for environmental services. Also, meetings have been held with the Guatemalan Chamber of Industry to present the Microwatershed approach and seek partnerships to replicate this in other basins. These are regarded as important measures to mitigate water risk for business.

With the support from the Tacaná Project, communities built Microwatershed councils to lead watershed restoration and development that met their priorities. Empowerment of community-owned institutions is making watersheds more secure and livelihoods less vulnerable to climate change.

## Conclusions

The WANI Tacaná Watersheds demonstration project has built a platform for wider influencing of regional and national water management. Successful local models can be scaled up to national level and lead to the formation of national institutions or processes, which can then extend the model to other watersheds. The concerns about managing support and making decisions to avoid and reduce future environmental damages are moving from municipality to higher levels of governance.

Also, the promotion of resilience at the local, national and regional level has continued with other projects which mostly focus on governance through microwatershed councils and climate change adaptation through integrated water resource management. The continued livelihoods work is also a strong component in these complementary projects.

Among the characteristics of governance, finance and resources that enhance collaboration and can be replicated to other situations, integration of local communities and their social structures into the Microwatershed councils led to greater cohesion and unity. These councils give members control over their resources and as more are formed, the influence spreads across the basin. After a few years of project implementation, the actors become members of the formal process and take charge to define and realize their own goals.











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