



## Strengthening Community Fish Refuges for Climate-Resilient Food Systems and Integrated Water-Fisheries-Agriculture Governance in Cambodia

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### KEY MESSAGES

- Cambodia's inland fisheries contribute an estimated 8–12 percent of the national gross domestic product (GDP), while Community Fish Refuges (CFRs) contribute 30 percent of Cambodia's inland fishery production and provide the primary source of animal protein for most rural households.
- Evidence from six CFRs in Kampong Thom and Prey Veng provinces demonstrates that CFRs serve as ecological refugia during the dry season, facilitate seasonal fish migration across ricefields, floodplains, and river systems, and contribute to integrated, decentralised governance of water, fisheries, and agriculture. It significantly enhances aquatic biodiversity, ricefield fisheries productivity, and household nutrition.
- However, systemic challenges remain, including weak hydrological coordination with irrigation systems. Most CFRs rely on short-term external donor support, with no direct allocation from Commune Development Funds or provincial budgets.
- This policy brief recommends: (1) embedding CFRs in formal water and irrigation planning; (2) upgrading their legal and institutional status at provincial levels; (3) establishing sustainable public financing mechanisms; and (4) strengthening gender-responsive governance.

### BACKGROUND

Cambodia's inland fisheries contribute an estimated 8–12 percent of national GDP and provide the primary source of animal protein for most rural households, while ricefield fisheries, particularly the CFRs, contribute 30 percent of total inland fish production (Joffre et al. 2012). These systems are therefore central to national food security, household nutrition, micronutrient intake, and rural livelihood diversification, particularly for floodplain and agrarian communities that rely simultaneously on rice and fish for subsistence and income.

The ecological foundations sustaining Cambodia's inland and ricefield fisheries are increasingly undermined by altered hydrological regimes, weakened flood pulses, sedimentation, and the loss of river–floodplain–ricefield connectivity. These changes disrupt fish migration routes, spawning cycles, and habitat quality, contributing to declining productivity

in one of the world's most important inland fisheries systems (Kummu et al. 2014). Pressures are intensified by irrigation expansion, upstream hydropower development in the Mekong Basin, overfishing, and habitat degradation, while climate change amplifies risks through more frequent droughts and floods, increasing water scarcity and hydrological uncertainty (IPCC 2023). Inland fisheries provide an estimated 60–70 percent of Cambodia's animal protein intake, highlighting the severe food-security implications of these ecological stresses (Hortle 2009). Without integrated water–fisheries–agriculture governance and climate-adaptive management, the sustainability of rural food systems faces accelerating decline.

Within this context, CFRs emerged as a community-based conservation response. Although initially lacking a dedicated legal framework, CFRs are grounded in the Fisheries Law (2006) and the Sub-Decree on Community Fisheries (2007) and

supported by decentralisation reforms and Commune Development Planning and Investment Programmes. Their expansion was politically endorsed through a Prime Ministerial policy statement, but without specific regulatory provisions, resulting in practice-led diffusion and donor-supported implementation rather than legally codified mandates (Joffre et al. 2012). Under the “One Commune One CFR” strategy, 893 CFRs have been established across 24 provinces (FiA 2023). CFRs operate as dry-season conservation zones enabling stock recovery, while wet-season flooding supports breeding and migration.

This study examined six CFRs across two contrasting floodplains—the Mekong Delta (Prey Veng) and Tonle Sap Lake (Kampong Thom)—using a mixed qualitative–quantitative approach. Methods combined secondary reviews of policy and technical records with key informant interviews, focus group discussions (7–9 participants per CFR), and site-level analysis of hydrological, ecological, and governance connectivity. Despite strong political support, persistent governance constraints—weak integration with irrigation planning, limited provincial budgeting, donor dependence, irregular leadership renewal, and low gender participation—leave CFRs operational but structurally vulnerable as long-term climate-adaptive food-system infrastructure.

## KEY FINDINGS

### *Ecological and hydrological functions*

All six CFRs function as vital dry-season refugia, providing permanent or semi-permanent aquatic habitats that sustain fish populations during prolonged droughts. In the rainy season, CFRs expand dramatically as floodwaters reconnect them to wetlands and agricultural landscapes, with four sites increasing from less than one hectare to over 30 hectares. This seasonal expansion creates extensive spawning and feeding habitats that support fish growth, reproduction, and dispersal across floodplain–ricefield systems.

Through these seasonal dynamics, CFRs enhance ecological connectivity between rivers, floodplains, rice fields, and irrigation canals. They act as hydrological and biological nodes enabling fish migration and nutrient exchange, sustaining fish recruitment into rice fields and supporting household food security and incomes. However, reduced flood pulses, sedimentation, and intensive dry-season irrigation pumping increasingly threaten water retention, habitat depth, and ecological quality.

The study identified three ecological typologies of CFRs: perennial deep refuges, seasonally expanding refuges, and ephemeral refuges. Perennial CFRs retain water year-round, providing critical dry-season sanctuaries for fish and allowing active water-level management through irrigation canals and control structures. Seasonally expanding CFRs fluctuate widely, spreading during floods to support spawning, feeding, and nursery functions but contracting in the

dry season, making them highly dependent on flood connectivity. Ephemeral CFRs appear only in the wet season and dry out completely, yet provide short-lived, highly productive habitats for fish reproduction and juvenile growth. Together, these typologies demonstrate the functional diversity of CFRs in sustaining fisheries, supporting seasonal ecological processes, and strengthening climate resilience across floodplain and irrigated landscapes.

### *Institutional recognition and governance*

Across all study sites, each CFR has obtained formal recognition from both commune councils and the Fisheries Administration Cantonments (FiACs). This universal recognition at the local administrative and technical levels demonstrates that CFRs are well embedded within Cambodia’s decentralised natural resource governance framework and possess strong legitimacy among local authorities and fisheries regulators.

At higher administrative levels, institutional recognition is less consistent. The result of the study of CFRs by CDRI (forthcoming) shows that only 83 percent of CFRs have been formally recognised by district administrations and the Provincial Department of Agriculture, Forestry and Fisheries (PD AFF). While this reflects a relatively strong level of sub-national endorsement, the remaining gaps indicate uneven administrative integration and delays in formalisation procedures across provinces.

Notably, none of the CFRs have yet received formal recognition from provincial administration. This absence of provincial-level endorsement highlights a critical governance gap, indicating strong bottom-up institutionalisation but weak vertical integration into provincial planning and budgeting systems. As a result, CFRs remain largely excluded from provincial investment frameworks, limiting their access to public financing, inter-sectoral coordination, and long-term sustainability support.

### *Community participation and membership*

Across the six CFRs, the combined population of associated villages totals 19,471 people, with women comprising an average of 51 percent of the population. A total of 4,789 households are engaged in fishing-related activities, while the active fishing population reaches 3,086 individuals. On average, 16 percent of the total population across the six sites directly depends on fisheries for livelihoods, demonstrating the continued socio-economic importance of inland fisheries within these rural landscapes.

Fishing dependence is particularly high in floodplain-based CFRs such as Ang O’Ktom CFR, Sangke Chrum CFR, and Boeng Ream CFR, where aquatic resources remain a primary source of food and income. In these locations, fishing is not merely a supplementary activity but a central livelihood strategy that buffers households against seasonal agricultural risks, climate variability, and income shocks.

The analysis further indicates that physical distance between villages and CFRs strongly shapes participation, governance engagement, and enforcement strength. Communities located closer to CFRs tend to exhibit higher levels of direct involvement in management, monitoring, and patrolling activities, while more distant villages face greater logistical constraints in daily oversight. This spatial factor significantly influences the effectiveness of community-based fisheries governance and the sustainability of CFR management outcomes.

#### ***CFR management committees and leadership***

All six CFRs have formally established management committees, confirming the existence of institutional structures for community-based fisheries governance across all study sites. In total, the six committees comprise 59 members, of whom 16 are women, representing 27 percent female participation. This indicates that while basic governance structures are in place, women remain underrepresented in leadership and decision-making roles within CFR management.

Currently, five of the six committees are operational, reflecting strong local capacity for organising conservation, enforcement, and management activities. The Ang O'Ktom CFR committee is inactive, highlighting localised institutional fragility and risks associated with leadership fatigue, limited technical support, and weak financial resources. In contrast, more active CFRs, such as Boeng Ream CFR, demonstrate greater organisational continuity and enforcement capacity.

Despite the widespread establishment of committees, regular democratic renewal through elections is largely absent, with Boeng Ream (2021) being the only CFR reporting a recent formal election. In most sites, documentation of leadership renewal is weak or missing, and committee mandates often extend informally beyond their intended terms. This combination of strong institutional presence but weak democratic renewal and poor record management exposes CFR governance to risks of declining accountability, reduced community trust, and long-term sustainability challenges.

#### ***Management plans and implementation***

All CFRs in the study have formal management plans, reflecting a strong foundation for structured and participatory fisheries governance. Of these, 83 percent have implemented their plans, indicating solid local commitment, organisational capacity, and technical support from authorities and partners. This widespread presence of management plans marks important progress in institutionalising community-based fisheries management.

Implemented activities include habitat rehabilitation and desilting, fish-passage repair, fencing and guard posts, shoreline stabilisation, tree planting, and fingerling releases to enhance fish stocks. Some CFRs have also adopted solar-powered

monitoring and enforcement systems, improved surveillance while reducing costs. These interventions have strengthened habitats, connectivity, and rule enforcement. However, implementation remains uneven. Sangke Chrum CFR has not implemented its plan due to funding constraints, highlighting the need for sustainable financing to translate plans into outcomes.

#### ***Scaling CFRs as a model for integrated land–water–fisheries–ricefield–irrigation governance***

CFRs lie at the heart of Cambodia's river–floodplain–ricefield landscape, functioning as ecological integration nodes linking land, water, fisheries, and irrigation. The six CFRs studied in Prey Veng and Kampong Thom show strong hydrological connectivity with rivers, canals, and rice fields. They expand during floods to enable fish migration and spawning, and act as dry-season refugia sustaining broodstock and fish recruitment.

Institutionally, CFRs operate as governance platforms linking community institutions with decentralised state systems. Local CFR committees coordinate with Commune Councils, community fisheries, and Farmer Water User Communities (FWUCs), while District Technical Working Groups (DTWGs) align fisheries, irrigation, and agriculture. In Santuk District, CFRs linked to the Taing Krasaing system synchronise irrigation, fish breeding, and rice cultivation.

From a food-systems perspective, CFRs enhance water security, stabilise fisheries, and buffer climate shocks. Yet weak provincial recognition, limited financing, and incomplete irrigation integration constrain scaling. Where governance is strong, CFRs function as an integrated land–water–food infrastructure.

#### ***Financial sustainability***

Of the six CFRs assessed, four have received financial support from NGOs and development partners in recent years, enabling habitat rehabilitation, infrastructure development, patrolling, and capacity building. Without this assistance, most CFRs would have been unable to implement basic management plans. However, none of the CFRs received funding from Commune Development Funds or provincial or national budgets, indicating continued exclusion from formal government investment frameworks despite their roles in fisheries, food security, and climate adaptation.

As a result, CFR financing remains short-term and project-based, driven by donor cycles rather than sustained public investment. This heavy donor dependence poses the greatest risk to CFR sustainability, weakening management continuity, institutional resilience, and long-term planning for ecological restoration and climate adaptation.

## GOVERNANCE CHALLENGES AND CLIMATE RISKS FACING CFRs

Despite their proven ecological and livelihood value, CFRs remain constrained by governance and water management weaknesses that limit their role as long-term, climate-adaptive food system infrastructure. CFRs are not formally integrated into national water and irrigation planning, which prioritises rice production with limited attention to ecological flow needs. As a result, dry-season pumping, canal rehabilitation, and water regulation frequently disrupt CFR water levels, fish migration, and habitat quality, weakening fisheries productivity and biodiversity.

These ecological stresses are compounded by institutional and financial gaps. CFRs lack dedicated public financing and rely on short-term donor support, while weak provincial recognition excludes them from formal planning and inter-sectoral investment. At the community level, irregular elections, weak documentation, limited leadership renewal, and low women's participation undermine governance and continuity. These weaknesses persist as climate risks—droughts, floods, and hydrological variability—intensify faster than adaptive investments can keep pace, eroding the effectiveness of CFRs and threatening inland fisheries, rural livelihoods, and Cambodia's food and nutrition security.

## POLICY RECOMMENDATIONS

CFRs have evolved beyond localised conservation initiatives into strategic climate infrastructure for Cambodia's national food system. By serving as dry-season refugia, flood-season spawning habitats, and hydrological connectors linking rivers, floodplains, and rice fields, CFRs stabilise inland fisheries under growing climate variability. As droughts, floods, and hydrological uncertainty intensify, CFRs buffer food availability, nutrition, and rural livelihoods. With legal recognition, predictable public financing, integration into irrigation and provincial planning, and stronger institutional coordination, CFRs can shift from project-based interventions to permanent development infrastructure. Supported by inclusive, accountable, and gender-responsive governance, CFRs offer a scalable model for climate-resilient development, biodiversity conservation, and rural livelihood security.

- The Royal Government of Cambodia (RGC) should formalise provincial recognition of all CFRs by mandating their inclusion in Provincial Development Plans, standardising PDAFF registration, and improving legal certainty, accountability, and access to public financing.
- The RGC should integrate CFRs into Provincial Department of Water Resources

and Meteorology's irrigation plans, mandate fish passages in projects near CFRs, and institutionalise joint CFR–FWUC water management agreements at the district level to ensure coordinated water allocation, ecological connectivity, and climate-resilient agriculture–fisheries integration.

- The RGC should secure CFR financing by allocating Commune Development Funds, establishing provincial conservation budgets, piloting payments for ecosystem services (PES) schemes, and encouraging private-sector corporate social responsibility (CSR) investment.
- The RGC should mandate 30–40 percent female representation, regular elections every 3–5 years, and targeted capacity building to strengthen CFR governance and equity.
- The RGC should scale up the DTWG model nationwide and position CFRs as core units for integrated, climate-resilient land–water–food governance.

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