Reconciling Multiple Demands with Basin Management Organizations

The Government of Cambodia is looking at basin-wide management of the largest freshwater lake in Southeast Asia. By means of extensive investigations, it has nurtured agreement in principle on organizational form and function in the Tonle Sap basin.¹ The intention is to better drive, coordinate, and streamline infrastructure development and natural resource management to benefit all. Since the structure being formulated also preserves connection to Cambodia’s involvement in efforts to manage the Mekong River Basin, the steps now being taken can inform other basin-wide approaches.

The Great Lake

The Tonle Sap is fed by 12 main tributaries draining higher ground on all sides of a basin enclosing 44% of Cambodia’s land area. Discharge is through a southeastward gateway via the Tonle Sap River, which joins the Mekong River about 110 kilometers (km) away near Phnom Penh.

In the dry season (December–April), the Tonle Sap is 160 km long and 35 km wide, has a depth of 1–2 meters (m), and extends over 250,000–300,000 hectares (ha). Each year, however, flow in the Mekong River rises as the large river accepts melting runoff in its distant upper reaches. With further swelling that follows the onset of the rainy season (May–November), the Mekong River’s surface elevation at the confluence near Phnom Penh rises until it blocks and then reverses the Tonle Sap’s southeastward flow. Water flows back into the Tonle Sap, submerging the surrounding swamp forest and shrub lands to provide seasonal breeding and nursery grounds and forage areas for fish that subsequently migrate to the Mekong River. Remarkably, the inundation in a typical year raises the Tonle Sap’s surface by about 10 m and spreads the lake in flood over about 1.2 million ha, almost five times the dry season’s coverage. Flooding over up to 1.6 million ha has been recorded.

The inrush of nutrient-rich water from the Mekong River and slow flushing as the flood recedes each year is a gift of nature that has set rhythm for life over many centuries. The yearly cycle makes the Tonle Sap and its floodplains an

¹ The Tonle Sap basin is, strictly speaking, a sub-basin of the Mekong River basin. However, in conformity with international practice for a watershed system of such a large size, the term Tonle Sap basin is used here.
amazingly rich ecological system that supports fertile agriculture and a freshwater fishery of grand scale, both refreshed every year.

The Tonle Sap and its floodplains are home to about 10% of Cambodia’s population. Many plant and harvest on the floodplains in dry months, but all join in pursuit of the fishing bounty when the lake rises in flood each year. The fishery is a high-value resource, producing three quarters of the animal protein consumed each day, year-round, by the national population of about 13.0 million. It occupies a deep-rooted place in life and culture, reflecting the lake’s long-term economic importance, but springing from what remains today a powerful act of nature.

But fisheries the world over are a fragile resource that has not fared well over the last 150 years. The forces that militate against them include

- rising populations and growing demand for animal protein;
- escalating extraction capability and scale, tracing technological change that serves primarily the harvester groups and ignores the need to conserve;
- unrestrained pursuit of narrowly defined interests, in the chase for larger and more frequent catches;
- environmental degradation associated with casual waste disposal practices in a crowding world;
- lack of appreciation of the many ways in which uninformed development within or near a fishery can also degrade its performance and prospects; and

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2 About 35% of Cambodia’s people live within the Tonle Sap basin, some 4.5 million inhabitants by recent estimate. Almost 30% of them live on the lake and its floodplains.
• ineffective cooperative efforts to see a fishery as a single resource requiring concerted action at many levels for continued use by present and future generations.

Ecological systems such as the Tonle Sap are surprisingly adaptable and resilient but they do have limits beyond which irreversible damage can be caused. The annual total yield has shown slow decline, so far, but the catch per fisher each year has fallen fast and contains an increasing share of smaller fish. The swamp forest and shrub lands, which promote biodiversity of many aquatic organisms besides fish, are being decimated by conversion to agriculture and collection of fuel wood. The consequences for Cambodia and its people of an abrupt contraction of the lake’s most valuable resource are not easy to contemplate and have led policy makers to the wisdom of trying to manage the Tonle Sap Basin as a whole.

The Tonle Sap Initiative

Efforts to meet the threats to the Tonle Sap began 5 years ago, when the Government and the Asian Development Bank (ADB) agreed that their long-standing collaboration should be intensified. This led to joint announcement of the Tonle Sap Initiative in 2002.

The Tonle Sap Initiative is a partnership of organizations and people working to meet the poverty and environment challenges of the Tonle Sap. The partnership rests on three propositions. First, it affirms that progress can best be addressed by recognizing the importance of the Tonle Sap Basin for what it has always been. Next, the linked interests of the millions of people living in the basin require that it be recognized as an organic whole. Then, unless this occurs, there can be no confidence that any forward path will lead to sustainable gains.

In 2003, the Tonle Sap Basin Strategy gave a geographical focus to ADB’s

<table>
<thead>
<tr>
<th>Completed Assistance</th>
<th>1998 Protection and Management of Critical Wetlands in the Lower Mekong Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2002 Improving the Regulatory and Management Framework for Inland Fisheries</td>
</tr>
<tr>
<td></td>
<td>Chong Kneas Environmental Improvement</td>
</tr>
<tr>
<td></td>
<td>Capacity Building of the Inland Fisheries Research and Development Institute</td>
</tr>
<tr>
<td></td>
<td>2003 Establishment of the Tonle Sap Basin Management Organization</td>
</tr>
<tr>
<td></td>
<td>Living with Floods on the Tonle Sap</td>
</tr>
<tr>
<td></td>
<td>Tonle Sap Sustainable Livelihoods</td>
</tr>
<tr>
<td></td>
<td>2004 Developing and Testing Methodologies and Tools for Environmental Education and Awareness</td>
</tr>
<tr>
<td></td>
<td>Establishment of the Tonle Sap Basin Management Organization II</td>
</tr>
<tr>
<td></td>
<td>2005 Sustainable Rural Water Supply and Sanitation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ongoing Assistance</th>
<th>2002 Tonle Sap Environmental Management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2003 Participatory Poverty Assessment of the Tonle Sap</td>
</tr>
<tr>
<td></td>
<td>2004 Capacity Building for the Tonle Sap Poverty Reduction Initiative</td>
</tr>
<tr>
<td></td>
<td>2005 Improving the Access of Poor Floating Communities on the Tonle Sap to Social Infrastructure and Livelihood Activities</td>
</tr>
<tr>
<td></td>
<td>Tonle Sap Rural Water Supply and Sanitation Sector</td>
</tr>
<tr>
<td></td>
<td>Tonle Sap Sustainable Livelihoods</td>
</tr>
<tr>
<td></td>
<td>Capacity Building of the Inland Fisheries Research and Development Institute II</td>
</tr>
<tr>
<td></td>
<td>Study of the Influence of Built Structures on the Fisheries of the Tonle Sap</td>
</tr>
<tr>
<td></td>
<td>Tonle Sap Lowland Stabilization</td>
</tr>
<tr>
<td></td>
<td>2006 Enhancing the Role of Women in Inland Fisheries in Cambodia</td>
</tr>
</tbody>
</table>
Country Strategy and Program, 2005–2009 and its annual updates. It marked the introduction of basin-level strategic planning in Cambodia to foster, promote, and facilitate pro-poor, sustainable economic growth; access to assets; and management of natural resources and the environment. Because the threats to the lake cannot all be tackled at the same time, the Tonle Sap Basin Strategy favored geographical and temporal phasing of interventions, working on the core areas of the lake to the upper catchments over an 8-year period, aiming to repeat this cycle as may be needed to build on accomplishments and embed lessons learned from the first iteration.

The Tonle Sap Basin Strategy identified early the imperative to develop better institutional arrangements for basin management. It specified that natural resource management plans developed in partnership by communities and the Government would outline a transparent and equitable process of resource management over the next 10 years. The plans would incorporate community aspirations regarding natural resources and contain the necessary rules relating to their management. They would need to provide both a period of security to natural resource users, such as fishers, and permit changes in planning over time to adapt as information becomes available. Individual plans might include water management plans, regional vegetation management plans, and fisheries management plans. There would be regular reporting between the Government and communities on the extent to which the plans are being effective in achieving their objectives. In this way, there would be more accountability to communities to ensure that all efforts and investments are best placed to deliver on results. A Tonle Sap Basin blueprint would incorporate and integrate individual natural resource management plans.

The Tonle Sap Basin Strategy contended also that responsibility for preparing basin blueprints is usually given to a basin management organization constituted to take on this role or to play a major part in it. Such organizations transcend administrative boundaries and are best placed to understand the implications of competing or conflicting use of a basin’s natural resources.

And so investigations identified that progress would require modes of deliberation allowing the 4.5 million inhabitants of the basin to take part in its management. They should have the opportunity to do so both as a means of preserving their livelihoods and as an opportunity to escape from poverty. This called for new links that span distances separating communities from governmental structures.

**Tonle Sap Initiative Assistance Projection**

**Planned Assistance**

<table>
<thead>
<tr>
<th>Year</th>
<th>Assistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>Establishment of the Tonle Sap Basin Management Organization III Study of Inland Aquatic Resource Trade Patterns</td>
</tr>
<tr>
<td>2007</td>
<td>Capacity Building for the Tonle Sap Poverty Reduction Initiative II Establishment of the Tonle Sap Basin Management Organization IV</td>
</tr>
<tr>
<td>2008</td>
<td>Tonle Sap Watershed Management Establishment of the Tonle Sap Basin Management Organization V</td>
</tr>
<tr>
<td>2009</td>
<td>Inland Fisheries Fish Processing Enterprise Development</td>
</tr>
</tbody>
</table>

Note: All assistance is indicative and subject to the approval of authorities in ADB.
The Tonle Sap Biosphere Reserve

How to protect the ecological base of the Tonle Sap was put to investigations as long ago as 1993, when a royal decree designated the Tonle Sap as a multiple-use protected area. Furthermore, the lake was nominated as a biosphere reserve in 1997 under the Man and the Biosphere Program of the United Nations Educational, Scientific, and Cultural Organization, when it joined other wonders of the world holding that status. Nomination led to the definition of ecological zones that were susceptible to current or foreseeable threat and that justifiably should be protected from certain forms of neglect or intrusion. This action stands as a first recognition of the critical importance of the Tonle Sap and a rare major step to protect its attributes.

Accountability for the Tonle Sap Biosphere Reserve was lodged with the Cambodia National Mekong Committee and a small secretariat to support the committee was created and placed within it. In 2002, ADB extended support to establish a coordination framework and information dissemination mechanisms. Support to provide the committee and the new secretariat with the tools needed to make biosphere reserve management more effective continues today and the systems and their application improve every year.

Basin-wide Management

As management of the Tonle Sap Biosphere Reserve was being made more effective, the Government continued to search for an organizational model for basin management. Although the design of organizations must rely on careful assessment, the process remains an art and is not a science. Matters of existing context must always be taken into account and the object is to tie what new forms are needed to what exists, in ways that account for what is possible. This consideration is especially important where the exercise applies to the public sector.

But organizational design for basin management can also be particularly complicated. This is so because basins are ecological, communal, commercial, and political realities that shape events well beyond their boundaries. Like it or not, basins react—to neglect, exploitation, policy, as well as natural events and trends. With these concerns in mind, several things became clear.

The first of these was the requirement to involve communities in shaping and applying methods to address the threats to the Tonle Sap. Communities would have to be linked to district, provincial, and national agencies. Between and among these levels, channels of communication would be needed.

The second was the need to assure that organizational design can both enable response to the need to protect the Tonle Sap and promise the delivery of sustainable development. In simple terms, the choice lay between two options: one would be to establish an organization empowered to prepare and execute natural resource management plans; the other would be to make it possible to rely instead on existing institutions to carry the course forward under current legislative mandates, while complying with the

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3 The Tonle Sap Biosphere Reserve stretches over 1.5 million ha, not far off the maximum extent of flooding. It is made up of three core areas, a buffer zone, and a transition area.
imperative of treating the Tonle Sap Basin as an organic whole.

The alternatives were fleshed out and debated with due reference to organizational models in use elsewhere in the world. The existing institutions had not shown themselves as inattentive to the missions mandated to them, even though by observing mandate boundaries they were leaving problems within the basin unaddressed and, in some cases, allowed new harm. An entirely new organization, on the other hand, might cause duplication and competition or distort and weaken budget allocations. Its establishment would also call for financial resources. In the end, the existing institutions were left with their current missions—subject, however, to the requirement in the future to adjust plans as necessary to comply with needs arising from basin-wide assessments that, up to that time, has been left out of consideration.

The organizational innovation would thus be limited to introducing coordinative mechanisms to work both laterally and vertically in ways respectful of basin management. Planning methods and

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A Comparison of Basin Realities

<table>
<thead>
<tr>
<th>Developed Countries</th>
<th>Developing Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperate climates; higher river-stream densities</td>
<td>Low rainfall; climatic extremes; higher mean temperatures; lower river-stream densities; water scarcity is an emerging constraint</td>
</tr>
<tr>
<td>Population is concentrated in valleys</td>
<td>High population densities in both valleys and uplands; high population densities both upstream and downstream of dams</td>
</tr>
<tr>
<td>Water rights are based on riparian doctrine and prior appropriation</td>
<td>Water rights are based on rights to rainfall or groundwater; notions of ownership relate more easily to rain than to large-scale public diversions</td>
</tr>
<tr>
<td>The focus is on blue surface water: water is found in rivers and lakes</td>
<td>The focus is on green water: water is stored in the soil profile; blue water is stored in aquifers</td>
</tr>
<tr>
<td>Most water users obtain water from service providers; most water provision is in the formal sector, making water resources governance feasible</td>
<td>Most water users obtain water directly from rainfall and from private or community storage without much mediation from public agencies or organized service providers; most water provision is in the informal sector, making it difficult to pass enforceable legislation</td>
</tr>
<tr>
<td>Small numbers of large-scale stakeholders</td>
<td>Large numbers of small-scale stakeholders</td>
</tr>
<tr>
<td>Low transaction costs for monitoring water use and collecting water charges</td>
<td>High transaction costs for monitoring water use and collecting water charges</td>
</tr>
</tbody>
</table>

instruments would be the means to this end. The staff assembling and disseminating information would also measure subsequent progress, report on the direction and pace of changes in the basin, and apply persuasive recommendation to good effect wherever required.

Form and Function

The inclination to look first to coordinative mechanisms is a thoroughly Cambodian turn. This approach avoids the play of the divisive influences that might arise if a new organization were attempted. Instead, the adopted approach leaves existing authorities, mandates, and programs in place but requires their modulation. Only a people comfortably sure of its place and its ways would act on the perceived advantage of doing less rather than more to achieve equal or even better net result with less potential disruption, delay, and cost.

Other advantages are also peculiar to Cambodia, for those who might want to transfer the knowledge and experience being acquired in this instance to another setting. Cambodia is a small country, without significant differentiation of climate, land forms, culture, or economic prospect, and having few people. Public administrative practice there spans relatively small lateral distances within and between line agencies and much business can be, and is, resolved face-to-face in meetings. The chance to work through coordinated modulations can be effective because the country’s characteristics conduce to this.

After discussion of practicable options and the arguments for and against them, determinations were reached that the main vehicle for basin-wide management of the Tonle Sap should not be a new special-purpose organization. Neither should it be the assignment of new authority to an existing institution. Instead it would be a committee, established through new legislation requiring that it exercise broad vision and accept formal obligations and mandates.

The Tonle Sap Basin Coordination Committee to be set up would have permanent ex-officio membership comprising heads of all existing line agencies of the Government touching or likely to touch the basin and the Governors of the provinces lying entirely or partially within it. Other stakeholders invited as needed to join in discussions would provide ad hoc representation for donors, community leaders, project investors, and other groups. The committee would thus have the strong virtues of committees anywhere that are given formal establishment and authority, as well as the flexibility to adjust membership and agenda to meet changing needs.

The intended functions of the Tonle Sap Basin Coordination Committee, to be recognized in legislation, include

- measurement of conditions and needs in the basin for baseline definition;
- assembly and organized consolidation of data describing the basin for use by the committee, line agencies, and others;
- general planning at the regional scale, to encourage protective action and directed development supporting the basin by others, and to measure

4 The provinces are Banteay Meanchey, Oddar Meanchey, Siem Reap, Preah Vihear, Kompong Thom, Kompong Chhnang, Pursat, and Battambang.
Tonle Sap Basin Management Organization

**Tonle Sap Basin Coordination Committee**
- National Line Agencies
- Provincial Governors
- Others by Nomination

**Provincial Committees**
- Provincial Governors
- Provincial Departments
- Municipal Entities

**District Task Forces**
- District Executives
- District Bureaus
- Community Leaders

**Stakeholders Advisory Committee**

**Shared Sub-Basin Committee**
- Provincial Committee
- District Task Forces

**Tonle Sap Sub-Basin**
- Water Users
- Community Leaders
- Land Ho...
Cambodia National Mekong Committee

Secretary General

Deputy Secretary General
Policy and Planning Department

Deputy Secretary General
Projects Development Department

Deputy Secretary General
Finance and Administration Department

Professionals... Others...

Provincial Sub-Basin Committees

Shared Sub-Basins
- Stung Mongkol Borei
- Stung Sreng
- Stung Chinit
- Stung Boribo

Provincial Sub-Basins
- Stung Siem Reap
- Stung Chikreng
- Stung Staung
- Stung Sen
- Stung Pursat
- Stung Dauntri
- Stung Sangker

Provincial Committees secretariat functions by Provincial Departments of Water Resources and Meteorology.

District Task Forces secretariat functions by District Bureaus of Water Resources and Meteorology.
foreseeable net public benefit from improvement in basin management effectiveness;
• continuing measurement and transparent public reporting on the progress of efforts to redress undesirable trends and bring new basin improvements;
• persuasive defense of and support for basin-wide management in all decisions affecting the basin, at every level, public or private; and
• preservation of effective communications everywhere, to facilitate the functions recited here above.

In fact, the listed functions do presage a writ of broad scope for the Tonle Sap Basin Coordination Committee, which would meet only at intervals and rely initially on modest staff support. Importantly, however, none of these functions would have the committee monitoring short-term uses of the basin’s natural resources or enforcing protective policy. Neither would the committee take on development program execution, site or alignment planning, project or system design, construction, operation and maintenance, or financing of new facilities in the basin. These activities would remain where they are today, newly subject to the committee’s imperatives and cognizance.

To facilitate this, the Tonle Sap Basin Coordination Committee should be properly placed in relation to other elements of the Government, especially those sharing concern for management of natural resources. After deliberation, the recommended placement for the committee is one beneath and reporting to the Cambodia National Mekong Committee, a similar body created to coordinate Cambodia’s contributions and response to matters arising from the international collaboration addressing the Mekong River Basin. With similar outlooks and sizeable overlap of ex-officio composition, the reporting relationship between the two committees can be easily managed to good effect for both.

The Cambodia National Mekong Committee plays a coordinative role in many ways similar to what is needed for the Tonle Sap basin, except that it can have no unitary scope of authority for the whole of the Mekong River basin and must work through international negotiation to secure benefit for Cambodia or defend against actions anywhere that could be injurious to Cambodia’s interests.

The Mekong River traverses territory lying well inside Cambodia. It runs for about 320 km north and 80 km south of Phnom Penh to borders with the Lao People’s Democratic Republic and Vietnam. This is a long stretch of the Mekong River, important for Cambodia and germane to the concerns of the adjoining countries, but it accounts even so for less than 10% of the Mekong River’s estimated length of about 4,200 km. In this international setting, the Cambodia National Mekong Committee is supported by a secretariat consisting of a Secretary General providing senior direction and three offices of Deputy Secretary General that are variably responsible for policy and planning, project development, and finance and administration, all in relation to Mekong River Basin programs.

The Tonle Sap Basin Coordination Committee will also need support to help the committee discharge its mandate and preserve continuity between meetings. These requirements differ significantly from the secretariat functions attached to the Cambodia National Mekong Commit-
tee, and it has not seemed reasonable to burden that committee’s offices at working level with new and different activities to support the Tonle Sap. It has also not seemed reasonable at this point, however, to create secretariat activities for the Tonle Sap Basin Coordination Committee that would in part duplicate functions that the Cambodia National Mekong Committee’s secretariat can easily provide.

The compromise is to establish a fourth office of Deputy Secretary General reporting to the Secretary General. This gives surety that the Cambodia National Mekong Committee will be kept informed of developments in the Tonle Sap Basin, in parallel with the direct reporting line between the two committees that would keep the overlapping memberships informed too. The Deputy Secretary General would guide new staff to support the Tonle Sap Basin Coordination Committee. The existing Tonle Sap Biosphere Reserve’s secretariat would also be placed beneath the fourth office of Deputy Secretary General. To facilitate support for the Tonle Sap Basin Coordination Committee and other branches of government then became the next focus of attention. The need for these elements had been cogently drawn in prior investigations. Vertical deployments of line agencies presented an established pattern that, however, offered little on its own to fire imagination, energize involvement, or raise expectations for sustainable development. The answer was to return to basin-wide management principles and the flexibilities built in the design of the committee, both applied now, however, to the sub-basins draining to the Tonle Sap.5

Each tributary to the lake defines a sub-basin presenting its own opportunities and constraints. Organizing a committee backed by legislation at the sub-basin level and task forces at the district level, within and for each sub-basin, would allow the organizational logic for the Tonle Sap Basin as a whole to be fitted gracefully to each watershed. The needs and differences specific to each could be flexibly addressed, without loss of general coherence.

Once the structure is in place and charged with activity, however, basin-wide management would begin over time to approximate the sum of deliberations and decisions relevant at the sub-basin level, and less so ideas or schemes originated and passed down from above. Moreover, since communities are likely to identify more positively with local watersheds than with administrative boundaries, the enlistment of their knowledge and enthusiasm to drive sustainable development becomes a more realistic possible result than alternative structures can hold out.

To make certain effective performance

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5 The sub-basins are Stung Mongkol Borei, Stung Sreng, Stung Siem Reap, Stung Chikreng, Stung Staung, Stung Sen, Stung Chinit, Stung Boribo, Stung Pursat, Stung Dauntri, and Stung Sangker.
Tonle Sap Sub-Basin Profiles

The Tonle Sap electronic atlas is a stand-alone and easy-to-use electronic databank on the social and physical features of the Tonle Sap basin. The information is compiled as maps and graphs for such features as administration and population, digital elevation, flood extent and duration, dry season irrigation area, rivers and their hydrology, land use, roads, and soil classifications. The atlas (available: www.adb.org/projects/tonle_sap/atlas) is part of and informs ADB’s basin-wide approach to reconciling multiple demands on the lake’s natural resources, in the context of the Tonle Sap Basin Strategy.
through the transitions that may occur over time, the new legislation would provide for direct reporting lines rising from District Task Forces to the relevant Provincial Sub-Basin Committee and from each Provincial Sub-Basin Committee to the Tonle Sap Basin Coordination Committee.

Where a sub-basin extends into more than one province, the structure would anticipate committees at provincial level to address issues within each, for ratification or consolidated reconciliation by a shared sub-basin committee set above them. The composition of the Shared Sub-Basin Committee would include the Governors of the adjoining provinces and designated heads of provincial departments from each province. The Shared Sub-Basin Committee would have recourse to appropriate ad hoc representations from the adjoining provinces to reconcile differences. Options could also be kept open under legislation for the provinces to simplify this structure by other forms of agreement, so long as a single Shared Sub-Basin Committee has balanced, authoritative composition and reports to the Tonle Sap Basin Coordination Committee.

The composition of the District Task Forces would include the District Executives and the heads of District Bureaus touching or likely to touch the portion of the sub-basin lying within the district, plus ad hoc participation by leaders and others drawn from communities within or near the

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**Tonle Sap Sub-Basin Profiles**

<table>
<thead>
<tr>
<th>Stung Mongkol Borei</th>
<th>Stung Siem Reap</th>
<th>Stung Chikreng</th>
<th>Stung Staung</th>
<th>Stung Sen</th>
<th>Stung Chinit</th>
<th>Stung Boribo</th>
<th>Stung Pursat</th>
<th>Stung Dauntri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (sq km)</td>
<td>10,858</td>
<td>9,933</td>
<td>3,619</td>
<td>2,714</td>
<td>4,357</td>
<td>16,344</td>
<td>8,237</td>
<td>7,154</td>
</tr>
<tr>
<td>Perimeter (km)</td>
<td>596</td>
<td>636</td>
<td>277</td>
<td>335</td>
<td>365</td>
<td>898</td>
<td>606</td>
<td>492</td>
</tr>
<tr>
<td>No. of villages</td>
<td>957</td>
<td>549</td>
<td>449</td>
<td>131</td>
<td>214</td>
<td>487</td>
<td>505</td>
<td>1,149</td>
</tr>
</tbody>
</table>

**Population**

<table>
<thead>
<tr>
<th>Year</th>
<th>Stung Mongkol Borei</th>
<th>Stung Siem Reap</th>
<th>Stung Chikreng</th>
<th>Stung Staung</th>
<th>Stung Sen</th>
<th>Stung Chinit</th>
<th>Stung Boribo</th>
<th>Stung Pursat</th>
<th>Stung Dauntri</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>830,444</td>
<td>271,213</td>
<td>412,232</td>
<td>83,173</td>
<td>144,652</td>
<td>318,705</td>
<td>466,158</td>
<td>648,831</td>
<td>175,064</td>
</tr>
<tr>
<td>2003</td>
<td>1,037,020</td>
<td>346,836</td>
<td>449,702</td>
<td>92,445</td>
<td>165,851</td>
<td>359,084</td>
<td>502,751</td>
<td>690,516</td>
<td>193,007</td>
</tr>
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</table>

**Growth (%)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Stung Mongkol Borei</th>
<th>Stung Siem Reap</th>
<th>Stung Chikreng</th>
<th>Stung Staung</th>
<th>Stung Sen</th>
<th>Stung Chinit</th>
<th>Stung Boribo</th>
<th>Stung Pursat</th>
<th>Stung Dauntri</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
<td>5.6</td>
<td>1.8</td>
<td>2.2</td>
<td>2.9</td>
<td>2.5</td>
<td>1.6</td>
<td>1.3</td>
<td>2.1</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**Annual rainfall (mm)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Stung Mongkol Borei</th>
<th>Stung Siem Reap</th>
<th>Stung Chikreng</th>
<th>Stung Staung</th>
<th>Stung Sen</th>
<th>Stung Chinit</th>
<th>Stung Boribo</th>
<th>Stung Pursat</th>
<th>Stung Dauntri</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,191</td>
<td>1,260</td>
<td>1,290</td>
<td>1,340</td>
<td>1,461</td>
<td>1,542</td>
<td>1,638</td>
<td>1,286</td>
<td>1,436</td>
<td>1,411</td>
</tr>
</tbody>
</table>

**Mean flow (m³/s)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Stung Mongkol Borei</th>
<th>Stung Siem Reap</th>
<th>Stung Chikreng</th>
<th>Stung Staung</th>
<th>Stung Sen</th>
<th>Stung Chinit</th>
<th>Stung Boribo</th>
<th>Stung Pursat</th>
<th>Stung Dauntri</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>39</td>
<td>3</td>
<td>10</td>
<td>29</td>
<td>273</td>
<td>69</td>
<td>13</td>
<td>24</td>
<td>17</td>
</tr>
</tbody>
</table>

**Flow distribution (%)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Stung Mongkol Borei</th>
<th>Stung Siem Reap</th>
<th>Stung Chikreng</th>
<th>Stung Staung</th>
<th>Stung Sen</th>
<th>Stung Chinit</th>
<th>Stung Boribo</th>
<th>Stung Pursat</th>
<th>Stung Dauntri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet season</td>
<td>88.1</td>
<td>89.1</td>
<td>72.2</td>
<td>81.1</td>
<td>88.2</td>
<td>90.0</td>
<td>85.9</td>
<td>87.5</td>
<td>83.3</td>
</tr>
<tr>
<td>Dry season</td>
<td>11.9</td>
<td>10.2</td>
<td>27.8</td>
<td>18.8</td>
<td>11.8</td>
<td>10.0</td>
<td>14.1</td>
<td>12.6</td>
<td>16.8</td>
</tr>
</tbody>
</table>

**Irrigation area (ha)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Stung Mongkol Borei</th>
<th>Stung Siem Reap</th>
<th>Stung Chikreng</th>
<th>Stung Staung</th>
<th>Stung Sen</th>
<th>Stung Chinit</th>
<th>Stung Boribo</th>
<th>Stung Pursat</th>
<th>Stung Dauntri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing dry season</td>
<td>4,738</td>
<td>7,580</td>
<td>9,766</td>
<td>1,145</td>
<td>149</td>
<td>4,193</td>
<td>8,913</td>
<td>10,187</td>
<td>910</td>
</tr>
<tr>
<td>Potential dry season</td>
<td>5,111</td>
<td>12,557</td>
<td>10,686</td>
<td>2,649</td>
<td>3,703</td>
<td>5,810</td>
<td>14,190</td>
<td>10,187</td>
<td>910</td>
</tr>
<tr>
<td>Agricultural land (ha)</td>
<td>417,916</td>
<td>177,423</td>
<td>146,495</td>
<td>43,347</td>
<td>77,528</td>
<td>165,420</td>
<td>183,809</td>
<td>263,571</td>
<td>79,901</td>
</tr>
</tbody>
</table>

ha = hectares; km = kilometers; m³/s = cubic meters per second; mm = millimeters; sq km = square kilometers.

district. Secretariat functions for the Shared Sub-Basin Committees would be set at provincial level by drawing on staff of the relevant Departments of Water Resources and Meteorology. At the district level, secretariat support for task forces would be provided by staff drawn from the relevant Bureaus of Water Resources and Meteorology.

Community Participation

The vertical structure described is focused on the sub-basins feeding the Tonle Sap. It is flexible at levels closest to the sub-basin populations. Leaders and members of communities with informed interest in sub-basin problems or special knowledge concerning them would interact first at the level of the District Task Force, but also as required at the level of the Sub-Basin Committee. Where appropriate, such persons would take active part in task force or committee deliberations as ad hoc participants for defined purposes and periods. Through this process, knowledge and experience would be shared and sub-basin reporting would be sharpened.

Nominations to the Stakeholders Advisory Committee would be drawn from any level in the structure, but with special attention to the knowledge and experience of local persons familiar with conditions in the sub-basins. The Stakeholders Advisory Committee would be free to organize its own secretariat, rely on support that the Tonle Sap Basin Coordination Committee’s secretariat would provide, or both.

Turning Point

Legislation to establish the Tonle Sap Basin Coordination Committee is currently under draft for deliberation. When it is finalized, adopted, and publicly announced, the Government will have reached a turning point. From a start 5 years ago with a felt sense of incomplete response to evident threats to the Tonle Sap, the Government will have moved to professional identifications of needs in various areas, to an elaborated strategy for response, to an orderly plan of organization for addressing problems, and to having formal authorization in hand to act.

The steps taken from that point onward will no longer be exclusively diagnostic, investigative, or preparatory. Each will directly or indirectly close the distance to objectives associated with managing the Tonle Sap, lifting its people to new aspirations and successes, improving its basin to strengthen economic foundations in the country, and sustaining such development over time. From the conceptual arena, attention will have turned to practical realms of policy, program execution, and progress.
Pilot Testing

There are 5,200 villages, 490 communes, 95 administrative districts, and 8 provinces in the Tonle Sap Basin. The judgment behind the organizational design described here rests in part on these numbers. The villages and communes are too numerous for effective formal interface and lack a critical mass of professional support in most cases. For basin management, the bridging to more formal administrative apparatus thus becomes as important as the involvement of communities. But it must occur close to the ground, which is why pilot testing is a desirable and practical next step.

Pilot testing will try out the organizational design recommended for legislation in a selected provincial setting, bringing the turn closer to the practical. Under a proposal drawn for approval and implementation, the Cambodia National Mekong Committee will introduce basin-wide management principles in Pursat Province. Pilot testing will help disclose how effectively the proposed design can work in practice, the more quickly to introduce the scheme successfully to other locations when the Tonle Sap Basin Coordination Committee is established.

Pursat Province has a number of advantages as a platform for pilot testing. From the standpoint of measuring administrative practicability under different hydrological regimes, it presents conditions suitable for testing and fitted well to later replication in the Tonle Sap basin. They include

- an entire sub-basin shared between two provinces, in the Dauntri River passing through Pursat Province and Battambang Province to its outlet at the Tonle Sap;
- a well-articulated administrative structure, with ad-hoc working groups an accepted practice, performing well within several policy areas;
- good coverage of administrative districts, many having active working relationships with local communes, often with more than one;
- more than 38 of 49 communes having well-developed participatory relationships with governmental offices and working groups;
- population density among the higher ranked in Cambodia, explaining the sophistication displayed in the relationships described above; and
- development projects of significant scale pending, presenting need for effective planning to counter potential impact on natural resources important to Pursat Province and the Tonle Sap.

Acknowledgments

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