

Implementation capacity of demonstration activities



Cambodia Climate Change Alliance (CCCA)

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Implementation capacity of demonstration activities

Working paper prepared by DHI under the
Coastal Adaptation and Resilience Planning (CARP) Component,
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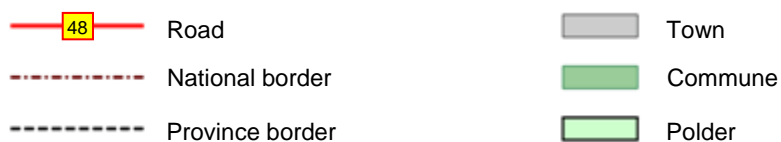
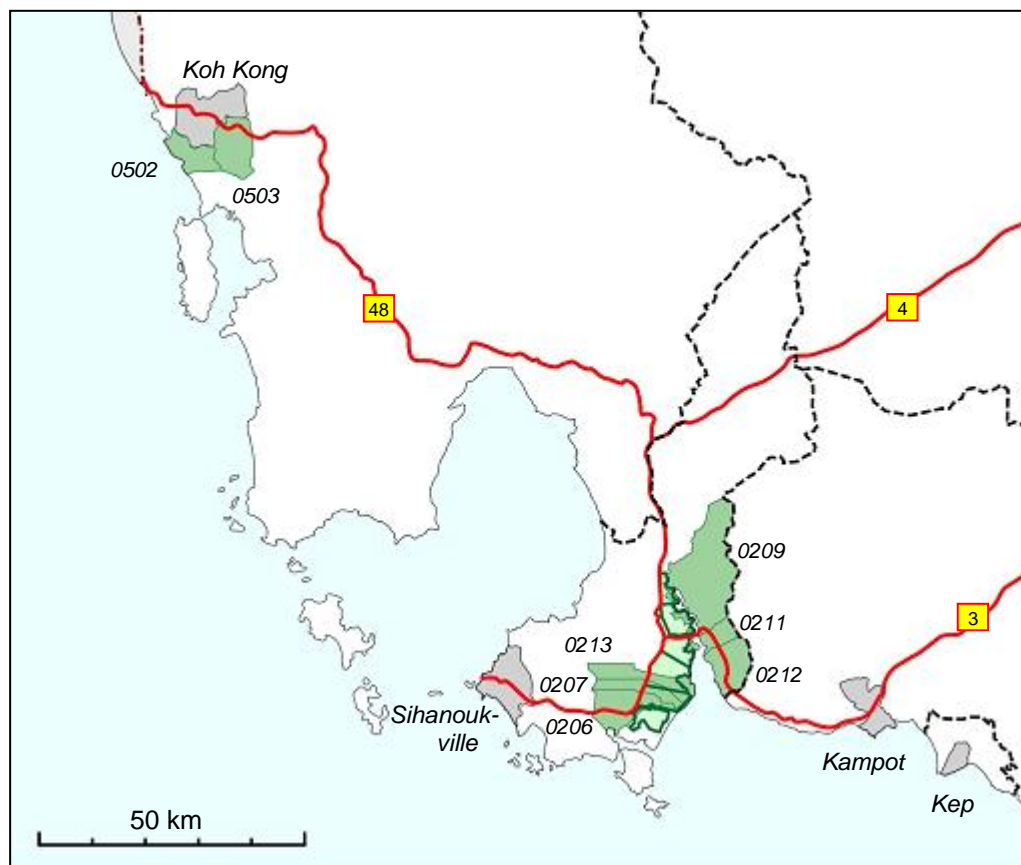
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Acronyms and abbreviations

CARP:	Coastal Adaptation and Resilience Planning
CBNRM:	Community-based natural resource management (a concept, and also a name of a network)
CC:	Climate change
CCCA:	Cambodia Climate Change Alliance
CR:	Climate resilience
CSO:	Civil service organization
DOE:	Department of Environment
DOWRAM:	Department of Water Resources and Meteorology
EIA:	Environmental impacts assessment
ENSO:	The El Niño Southern Oscillation (a weather phenomenon)
FWUC:	Farmers water users community (water user group)
GIS:	Geographic information system
IDRC:	International Development Research Centre
KK:	Koh Kong
LT:	Long-term (rice variety)
MOE:	Ministry of Environment
MOI:	Ministry of Interior
MOP:	Ministry of Planning
MOWRAM:	Ministry of Water Resources and Meteorology
MT:	Medium-term (rice variety)
SHV:	Sihanoukville
ST:	Short-term (rice variety)

Location map



Communes:	0502:	Peam Krasaob Commune, Mondol Seima District
	0503:	Tuol Kokir Commune, Mondol Seima District
	0206:	Ou Oknha Heng Commune, Prey Nob District
	0207:	Prey Nob Commune, Prey Nob District
	0209:	Sameakki Commune, Prey Nob District
	0211:	Tuek L'ak Commune, Prey Nob District
	0212:	Tuek Thla Commune, Prey Nob District
	0213:	Tuol Totueng Commune, Prey Nob District

Map compiled from different sources.

Administrative borders and English spelling of names is from NIS (March 2012)

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In Preah Sihanouk

Mr. Chea Saly, Chief of Agronomy Office, DOA; ms. Chim Kalyan, Deputy Director, DOE; mr. Chum Chanthol, Chief of Agricultural Extension Office, DOA; mr. Eng Samnang, Chief of Planning Office, DOP; mr. Heng Sophornrith, Deputy Director, DOWRAM; ms. Nay Saly, ICM-Assistant, SHV Municipality; mr. Ngoy Peng Chiv, Deputy Director, DORD; mr. Nu Ramy, Executive Director, Prey Nob FWUC; mr. Prak Visal, ICM-Coordinator, SHV Municipality; and mr. Yim Boy, Chief, Prey Nob FWUC.

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Summary

This study addresses the capacity of various government bodies to implement demonstration activities under the Coastal Adaptation and Resilience Planning (CARP) component of the Cambodia Climate Change Alliance (CCCA). It is based on consultations with sub-national authorities in Preah Sihanouk and Koh Kong Provinces, as well as the Prey Nob Water User Community.

The demonstration activities have not yet been selected (as the implementation capacity is one among other considerations in this connection). They are expected to include general support to production systems and livelihoods; support to farmer, fishery and water user communities; and support directly to farmer households; with sustainable production systems and livelihoods as a common perspective.

The institutional capacity is related to the skills, tools and other resources available to an organization to implement (or support) to implement such activities. This includes:

- Staffing; human skills;
- facilities (such as computer hardware and software, transport, equipment for monitoring and analysis);
- tools: Guidelines; decision-support tools;
- availability of relevant data and information, including maps and weather data;
- financial resources: (1) for routine operation and maintenance; and (2),for implementation of development initiatives according to plans;
- networking modalities (for dialogue with other management levels and with other agencies at the same level); and

- relations with (1) the service users; (2) the private sector; and (3) other stakeholders.

It has been observed that timely and appropriate decision-making is affected by a *severe lack of data and information* (or lack of access to such data where they exist). This is the case for basic sea level, rainfall and wind data, as well as sunlight radiation, and information about the extent of sea water intrusion and soil quality. Maps are often in short supply (if they exist). This causes uncertainties and risks to choice of crop varieties; cultivation planning; irrigation system operation; and feasibility assessment and design of irrigation and drainage infrastructure.

Capacity-building activities can support the implementation of demonstration activities, while, at the same time, serve highly useful purposes in their own right.

Some suggestions are provided below, in random order. These suggestions include ones that are beyond the scope of the CARP (because of their time horizon). Still, they are retained on the list, because they may add value and contribute to dissemination and consolidation of initiatives under the CARP:

Examples of climate-related capacity-building include:

- Inter-disciplinary CC training at province and district level;
- knowledge base consolidation and expansion: Support to dissemination of existing data; guidance on improved monitoring (of rainfall, salinity, land subsidence, cultivation practices, and more); promotion of the use of maps, and better accessibility of existing maps: as well as guidance on the use of satellite data and imagery, including resources readily available from the Internet;
- capacity-building in soil quality analysis and soil management;
- a bridging programme, possibly involving exchange visits by farmers and salinity control operators with peers in the Cuu Long (Mekong) Delta in Viet Nam (where a substantial experience has been achieved within cultivation in areas exposed to sea water intrusion);
- a '*Climate Change Atlas*' for the coastal zone, including mapping of present (normal and extreme) rainfall and sea level, and flood risk;
- a national MSc-level education in environmental management (including the climate perspective);
- formation of a national professional organization in support of networking and knowledge-sharing among practitioners;
- publication of policy briefs/case studies, including success stories; and
- support to national networking about drought preparedness and drought mitigation.

1 Introduction

This paper is related to Outcome 2 of the CARP: *'Increased resilience of coastal communities and coastal ecosystem buffers to climate change and improved livelihoods'*.

Specifically, it is related to Output 2.1:

'Assessment of implementation capacity of demonstration activities'.

The work included a series of consultations with sub-national government bodies in Preah Sihanouk and Koh Kong in May 2012, as detailed in Appendix A.

2 Background

Demonstration sites have been selected as follows:

- Ou Oknha Heng, Prey Nob and Tuol Totueng Communes (covering parts of the Prey Nob Polder), as well as Sameakki, Tuek L'ak and Tuek Thla Communes, all in Prey Nob District, Preah Sihanouk Province; and
- Peam Krasaob Commune and Tuol Kokir Commune, Mondol Seima District, Koh Kong Province.

Large parts of these areas have low elevations above sea level and a particular vulnerability to climate change. They feature agriculture (mostly paddy cultivation); fisheries (mostly small-scale); and mangrove ecosystems.

The selection of these two provinces was endorsed by the stakeholders present at the national consultation workshop on 16 March 2010 which included stakeholders from all provinces.¹

The areas represent frontiers in Cambodia's exposure to climate change. Lessons learnt and achievements made would serve as examples for replication elsewhere in Cambodia, as well as in other countries.

3 Climate-related governance challenges

The new implications imposed by climate change interact with existing and well-known challenges related to national and sub-national socio-economic development. Institutional capacity is a cornerstone in this connection.

Accordingly, capacity building and human resource development is specified as one of the four strategic *'growth rectangles'* of Cambodia's *Rectangular Strategy for Growth*,

¹

Employment, Equity and Efficiency, Phase II, presented by Prime Minister, Samdech Hun Sen, on 26 September 2008.²

One important aspect of institutional capacity is that it is manageable - as compared with the weather itself. Therefore, capacity-building is among the attractive entry points to improved climate resilience.

Capacity-building will almost always serve a range of good purposes that reach beyond the climate perspective.

In the coastal zone, as elsewhere in the country, a distinction can be made between immediate, medium-term and long-term aspects:

- Immediate concerns include public health (safe water and sanitation); livelihoods and production systems; and environmental health of coastal and marine habitats, including the mangroves.
- Medium- and long-term concerns include the smooth transition to a society that is visibly different from today's. In the future, most people will live in towns, rather than in rural areas. Agriculture will remain an important sector but will employ far less people than today, and the national economy will be supported by manufacturing, industries and the service sector - including tourism. This development is in full swing and is desirable in many ways. The challenge is a smooth transition, without excessive adverse social side effects, where a part of the population is left behind during the transition.
- Another important challenge is the continued strengthening of the national education system (from primary schools to the universities), and the consolidation of the national resource base of government officials and professional practitioners.

Good governance relies on adequate and responsive institutional capacity, and any efforts in this respect will inevitably contribute to a healthy and prosperous society.

4 Institutional capacity implications

4.1 Basics

For the purpose of this paper, *'institutional capacity'* is taken as the skills, tools and other resources available to an organization to undertake its responsibilities in general or a specific task in particular. This includes:³

- Staffing; human skills;
- availability of relevant data and information, including maps and weather data;
- facilities (such as computer hardware and software, transport, equipment for monitoring and analysis);
- tools: Guidelines; decision-support tools;

² The strategy has *'good governance'* as its core priority. The other 3 growth rectangles are (1) enhancement of the agricultural sector; (2) further rehabilitation and construction of the physical infrastructure; and (3) private sector development and employment

³ Other characteristics, not included in this list, are formal mandate; informal recognition; leadership; operational and procedural modalities; and attitudes to service/ innovation

- financial resources: (1) for routine operation and maintenance; and (2), for implementation of development initiatives according to plans;
- networking modalities (for dialogue with other management levels and with other agencies at the same level); and
- relations with (1) the service users; (2) the private sector; and (3) other stakeholders.

4.2 Specific capacity needs

Staffing, human skills

Human skills are important, not least because the requirements are evolving under the impression of added pressures imposed by climate change. A summary of climate-related needs is provided in the following table.

Table 1: Overview of human skills requirements

Impacts	Sea water intrusion control
	ENSO impacts
	Coastal erosion control
	Drainage, flood control
	Drought preparedness and mitigation
Resilience	Mangrove health
	Safe water & sanitation
	Water resources management, water efficiencies
	Rice cultivation technology, production efficiency, and related threats
	Livestock breeding, production efficiency, and related threats
	Other production systems, production efficiency, and related threats
Knowledge base	Soil quality and soil improvement
	Data management

Source: Consultations in May and July 2012

Many valuable skills development efforts have been made in the past, while others are in progress or being planned. Dialogue, and perhaps a bit of gentle coordination, could add value to the efforts at a marginal extra cost. This could include exchange of courseware, and perhaps, in due time, some sort of accreditation of the training, perhaps in collaboration with one or several universities. (Inspiration can be obtained from Singapore, where the Professional Engineers Board (PEB) operates a practical (and non-intrusive) accreditation of postgraduate vocational courses offered by a variety of service providers).⁴

Data and information

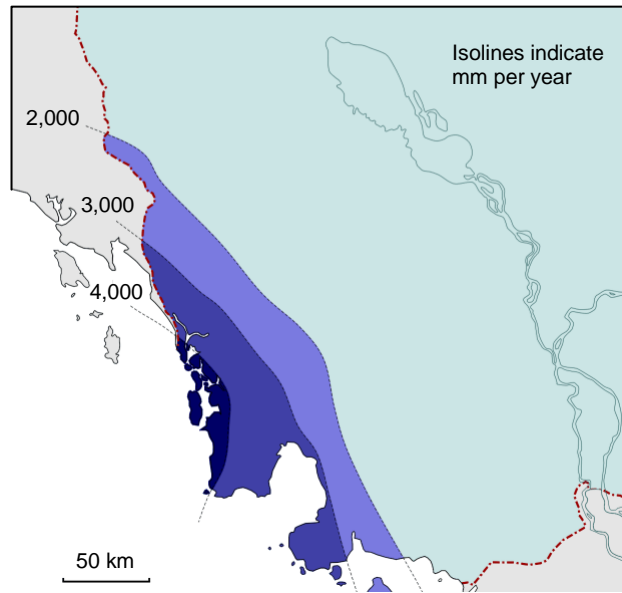
Data and information are needed for timely and appropriate decision-making.

Much of Cambodia's recent, impressive infrastructural development has taken place on a basis of less than perfect knowledge, because data do either not exist, or are not easily accessible. A good basis for feasibility studies and design will increase the cost-benefit ratio of infrastructural developments, reduce the risks, and add to a good investment climate.

⁴ PEB was formed in 1971 as a statutory board under Ministry of National Development. For information, please refer to www.peb.gov.sg

The rainfall has a pronounced seasonal variation, as well as random short-term variations. In the coastal zone, the rainfall varies significantly from one location to another. The annual average rainfall can vary by 1 m per year over distances of less than 50 km (see figure below). Often, data from one station are merely indicative for conditions at nearby locations.

Figure 1: Distribution of normal rainfall along the coast



Knowledge about normal and extreme rainfall is needed for cultivation planning; irrigation system operation; and feasibility assessment and design of irrigation and drainage infrastructure.

Some data exist, but they are fragmented and not readily accessible (for example, monthly rainfall statistics are not available from Koh Kong Province). A combination of ground monitoring and satellite data (free from the internet) would provide a much better coverage. A better dissemination will provide large benefits for a negligible cost.

Information about *monthly mean sea level, tidal heights and storm surge heights* is required for risk assessment of floods and saline intrusion, and for feasibility assessment and design of dyke heights and drainage capacity.

Data about *evaporation and sunlight radiation* are sporadic or non-existent, but would be useful in connection with selection of new and better seeds.

Land subsidence seems to be an issue in low-lying drained areas, notably the Prey Nob polders in Preah Sihanouk Province. Good quantitative evidence would highly facilitate appropriate and timely decisions, feasibility assessment and design of sea walls and drainage infrastructure.

Socio-economic data, important for development planning and progress monitoring, are available at commune level from National Institute of Statistics, Ministry of Planning.

Facilities

Facilities (for the purpose of this paper) include basic office equipment (printers, photo copiers); computer hardware and software; vehicles; cameras; and equipment for positioning, monitoring and analysis.

Today, in the coastal zone, there is a visible scope for upgrading of facilities across nearly all province- and district-level government bodies. This is due to lack of funds. Even in the frequent case that some facilities were provided in the past, they may be idle due to lack of funds for operation and maintenance.

For example, there is a broad demand of *soil analyses*. Some farmers use inorganic fertilizers today; and more will do so in the time to come, in support of new and better rice varieties, as well as crops other than rice. But the choice of fertilizer - the N-P-K mix ⁵ - depends on the contents of nutrients already available in the soil and in the water. If a less than optimal mix is applied, it may well have a certain, visible positive effect; but still, the farmer pays for unnecessary fertilizer components, and the environment will be polluted by the surplus. Knowledge about nutrients in the soil and water would support the farmers and the environment at the same time. Analyses could for example be provided by the Department of Agriculture, or by a private operator (possibly a fertilizer supplier), against a moderate fee. The farmers will quickly learn whether this is worthwhile or not.

Tools

A frequent suggestion during consultations in May 2012 was provision of *guidelines* on climate-related matters.

Guidelines can be useful in connection with (1) knowledge base development; and (2) planning:

- Monitoring and documentation of climate-related vulnerabilities and impacts, including minimalistic (and low-cost) but systematic and targeted monitoring efforts;
- screening of climate-related opportunities and risks, possibly coordinated (or integrated) with EIA screening; and
- mainstreaming of climate resilience into sub-national planning (including the commune level).

Several initiatives in this respect have been made recently, while others are planned or in progress, under MOI, MOP and MOE (and possibly others).

In the medium term, *decision-support tools* can provide a cost-effective means to strengthen analyses of impacts and feasibility, and decisions on investments and other development initiatives. This can add to the benefits (and reduce the risks) of physical and land use interventions, which are in progress or being planned across the coastal zone. Examples of analyses are environmental implications; surface runoff and drainage (including, but not limited to urban areas); and coastal erosion and accretion.

⁵ N = nitrogen, P = phosphorous, K = potassium

Applications of data, knowledge and decision-support tools

- Infrastructural feasibility studies and structural design;
- environmental impact analysis (EIA) and strategic environmental assessment (SEA);
- water quality management;
- analyses of present and future water utilization and water availability;
- operation of irrigation systems;
- salinity control;
- flood forecasting;
- drought management;
- hydropower plants and storage reservoirs (feasibility, design and operation);
- urban drainage (design and operation);
- morphological management (including bank erosion and accretion in rivers and along the coast); and
- port development, dredging and reclamation (feasibility and impacts).

This includes ***climate-related implications***, as relevant from case to case:

- Sea level rise;
- weather irregularities (storms, rain storms, dry spells); and
- changed patterns of 'normal' rainfall and temperature.

GIS tools can highly facilitate both monitoring and planning, but require expensive hardware and software, and a '*critical mass*' of embodied skills for routine application.

Such tools can, in the course of time, be implemented for in-house application by various government bodies, and/or within the private sector or universities, who can make the tools (and the embodied expertise) available on demand.

Financial resources

Financial resources are needed for basic routine operation and maintenance. Additional resources (for non-routine activities) are needed for implementation of development initiatives according to plans, and would facilitate timely response to urgent and/or obviously beneficial development needs, for example as identified at the commune level.

Financial resources are broadly inadequate in the study area.

A small step in the right direction could be made by introducing cost recovery where this is appropriate and can be done without adverse side effects. A water fee is already applied for fields served by irrigation and is intended to recover operation and maintenance costs (but not capital costs, because this would seldom be feasible). Perhaps fees could be charged for construction permits; for routine environmental inspections of factories and land concessions; for water abstractions (including groundwater); and for sewage disposal licences.

Networking modalities

The networking capacity is an important characteristic of a public administrative body involved in service delivery. Networking comprises

- vertical liaison with other management levels (for example between a ministry, a province department, and the communes);
- horizontal liaison with other agencies at the same level; and
- external relations with (1) the service users; (2) the private sector; (3) other stakeholders, such as CSOs; and (4) the newsmedia.

At the province level, a formalized networking is in place under the auspices of the provincial governor. For example, the provincial development plans and public investment plans are prepared with active participation by the various departments. This works well in the study area, but could presumably be further consolidated in different ways.

Also, the networking between the province level, the district level and the communes works well in many cases. This networking is important, because some development needs and opportunities are identified at the commune level, but may be better suited for implementation (and financing) at a higher level. Even if it works well, any support to consolidation would be valuable.

5 Suggestions on capacity-building activities

Capacity-building activities can support the implementation of demonstration activities, while, at the same time, serve highly useful purposes in their own right. Some suggestions are provided below, in random order.

These suggestions include ones that are beyond the scope of the CARP (because of their time horizon). Still, they are retained on the list, because they may add value and contribute to dissemination and consolidation of initiatives under the CARP.

Inter-disciplinary CC training at province and district level, aiming at identification of entry points for introducing the CR in the development planning, and promotion of sharing data and information. Some training was done in the past and was well received.

Support to **dissemination of existing data** (rainfall, wind, sea level); and guidance on improved monitoring (including inland surface water salinity and sunlight radiation) and data processing oriented towards scheme operation, choice of seeds, and structural design.

A **'CC Atlas'** for the coastal zone, including mapping of present (normal and extreme) rainfall and sea level, and flood risk. *'Safe (evacuation) areas'* could be included if practical.

Promotion of **the use of maps**, and support to better accessibility of existing maps, as well as guidance on the use of satellite data and imagery, including resources readily available from the Internet.

Capacity-building in **soil quality** analysis and management, in support of guidance on selection of crop varieties, appropriate use of fertilizer and compost, and the prospects for alternative crops. In many places in the study area, soils are not readily suited for crops other than rice.

A **bridging programme**, possibly involving exchange visits by farmers and salinity control operators with peers in the **Cuu Long (Mekong) Delta** in Viet Nam, where a substantial experience has been achieved within cultivation in areas exposed to sea water intrusion.

A national MSc-level education in environmental management (including the climate perspective). (This is not available at present).

Support to **a national professional organization** in support of networking and knowledge-sharing among practitioners.⁶ The organization could collaborate with one or several universities and/or alumni networks. It could arrange seminars and workshops, facilitate exchange visits and secondments, and perhaps publish a small newsletter (or even a scientific journal).

Publication of **policy briefs/case studies**, including success stories (for example about innovative cultivation techniques, niche products, and private sector involvement).

Support to national networking about **drought preparedness and drought mitigation** - not a problem today in the coastal area, but it could well emerge as a new CC-related challenge. National expertise is available and could be shared with peers in the coastal area.

⁶ There is already a Cambodia Climate Change Network (of NGOs)

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Appendix A: Provincial department profiles

DOE, SHV

23 technical staff, including 3 in districts.

DOE operates a laboratory, sponsored by Partnership for Environmental Management of the Seas of SE Asia (PEMSEA).

Only coastal waters are monitored; inland waters and groundwater cannot be monitored, due to lack of consumables for analysis.

Lack of orderly solid waste disposal.

Little information is available about agricultural pollution; there is some evidence of irregular import of pesticides from neighbouring countries.

Swallow's nest harvesting has been practised since 2010/2011, (in buildings constructed for the purpose, provided with music to attract the birds, also in housing areas). This causes some noise and smell.

Post-harvest preservation is a source of concern, but little information is available.

No information about pollution from livestock and prawn farming.

Blocking of surface flow (drainage) occurs, partly due to landfill activities and unsustainable land use changes.

Staff training would be useful - for monitoring, and other tasks, including pesticides - as well as climate change (CC) and climate resilience; coastal management; water pollution control; noise pollution and bad smell; data collection and data management; and proposal writing.

Guidelines would be useful.

DOE needs maps for its work, but cannot produce them by inhouse capacity.

CC-related data and information are limited, for example regarding sea level rise.

EIAs are conducted by MoE for projects above 2 MUSD. For smaller projects, no EIA, but sometimes a memorandum of understanding between the developer and DoE. Practices differ from one province to another.

Land use zoning would be useful for confinement of pollution and to prevent encroachment of protected areas.

Financial resources are inadequate.

Limited dialogue with the private sector, except for regular contact with Cintri (a solid waste contractor). Liaison also takes place in connection with occasional complaints about waste disposal and noise.

DOWRAM, SHV

12 technical staff, covering irrigation and meteorology; none at district level. There is a scope for consolidation of in-house irrigation expertise.

A main task of this department is maintenance of the 90 km dyke protecting the 6 Prey Nob polders with their about 10,000 ha of rice fields. The dyke continues to sink year after year. It was constructed 0.8 m above sea level but has subsidised about 0.3-0.4 m in 6 years. Parts of Polders 5 and 6 are below sea level.

Yields in the polders vary from one place to another, from 1.5 t/ha to 2-3 t/ha.

Rainfall above 30 mm/hour prompts a stand-by at the dyke. On one occasion, in late September 2011, the rainfall was 140 mm/12 hours at Polder 6.

Funding is inadequate for routine operation and maintenance, not to speak of non-routine development initiatives. In 2003, the Japanese Embassy donated 60-70,000 USD for repair of 6-7 km of dykes. A proposal has been submitted to the Japanese Embassy for financial support to repair of dyke and water gate at Ou Oknha Heng in Prey Nob district.

Groundwater is not used in the province, due to high salinity.

Rainfall data are communicated daily by mobile telephone.

Dialogue/collaboration is maintained with the Prey Nob Polder Water User Community.

Training is needed about topographical mapping; GIS; weather forecasting; and irrigation technology and operation.

No relations with the private sector.

DOP, SHV

The department employs 29 government officials plus 9 officers in the districts.

National and sub-national planning

National

- 5-years sequential development plan; present one covers 2009-13 (synchronized with the mandate of the government)
- 3-years rolling Public Investment Plans (PIPs), revised annually

Province level

- 5-years sequential development plan; the present one covers 2011-15 (synchronized with the mandate of the government)
- 3-years rolling Public Investment Plans (PIPs), revised annually

District level

- 5-years sequential development plan
- 3-years rolling Public Investment Plans (PIPs), revised annually

Commune level

- 5-years sequential development plan; the present one covers 2008-12, synchronized with the mandates of the commune councils. A new plan will be prepared after the commune elections on 3 June 2012)
- 1-years rolling Public Investment Plans (PIPs), revised annually

The province-level 5-years plans take around 3 months to prepare. The work is prepared by a technical drafting group (which also compiles basic planning data). It has representatives by relevant departments. The plan is edited by a 24-members committee and is reviewed by another, 49-members committee. All 3 committees are headed by the provincial governor.

The PIPs take around 1.5 months to prepare.

The district-level plans are based on the commune-level ones. The process includes a district-level workshop for harmonization and integration of the commune plans.

The commune plans are prepared by a committee in each commune.

The entire process is assisted by guidelines and commune questionnaires. Climate change issues are being introduced (and will be addressed in a new guideline for commune planning, in preparation by MOP, expected in late June 2012). An important source of data is the Commune Database (CDB), which is updated every year in December-March. This year's survey questionnaire include questions about climate-related concerns.

The sub-national planning process is the same all over the country, but the scope and emphasis of the plans vary from one province to another.

The private sector was invited to participate in the process, but only one company joined this year.

In Preah Sihanouk, the 5-years and 3-years plans encourage the private sector to participate in development of agriculture and development of dykes, flood protection, irrigation and water management, strengthening the FWUC, and rehabilitation of dykes and reservoirs.

One goal is to increase livestock breeding in response to the population growth, and to reduce import of meat from neighbouring countries.

Funds are inadequate. NCDD supplies 4-5,000 USD per year, but this year only 3,000 USD. No budget for specific development initiatives.

Training needs include climate change issues, as a basis for guiding the communes.

DOA, SHV

The department has 41 staff + 5 at district level.

The province has 8 agriculture communities (including 5 in Prey Nob). One more was established in February this year (in Toeuk Thla commune).

Since 2009, the department has encouraged ST rice varieties, starting with small demonstration initiatives, using the following seeds: Chul'sa; IR 66; Sen Pidao; CAR 6 and Phka Rumduol. Seeds are in short supply, though.

Rice is sown at the end of May, to be transplanted in June-July.

The rice crops are vulnerable to storms.

Farmers are in need of education related to shift from LT to ST varieties; and also related to processing and marketing; growing vegetables; and CC adaptation.

Drought is a particular potential vulnerability; but it is not clear what to do about this. In the last 3 years, the rainfall has been around 2,200-2,300 mm/year, which is well below the normal level of above 3,000 mm/year.

A new dyke has been proposed east of Prey Nob (near National Road 3), to protect against sea water intrusion, but the scheme is opposed by fishermen and aquaculture producers.

The department needs additional expertise within agriculture and water resources, and expertise in CC adaptation.

DRD, SHV

The department has 23 government officers in the main department. There are no officers in the districts.

There is one village development committee in Prey Nob.

In August 2011, some officers participated in a workshop on climate change organized by MRD.

CC is damaging laterite roads, culverts, bridges and other infrastructure. Damages are reported to the Ministry, but there is no capacity for mitigation.

The department maintains 20-30 km of roads with a budget of 25,000 USD per year.

UNICEF has provided financial support for sanitation and repair of wells (from 2008 to 2012). There is no arsenic in the groundwater.

SHV Provincial Hall

Sihanouk Province has 3 districts, 1 municipality, and 26 communes/sangkats.

Several activities are conducted in partnership with in Environmental Management for the Seas of East Asia (PEMSEA) under the Integrated Coastal Management (ICM) project, such as

- Community-based solid waste management, collaborating with Cintri (a private operator)
- Tourism development
- Resource conservation, including mangrove replanting
- Community-based fisheries management

Good relations are maintained with MOE, communities, NGOs, and the academic community. A survey on solid waste is made in collaboration with the Royal University.

Coastal zoning is piloted in collaboration with private developers. At Ocheu Teal Beach, zoning has been implemented for swimming, vendors and touring boats.

Impacts of climate change include

- Coastal erosion (caused by storms and sea level rise)
- Loss of livelihoods within agriculture, fisheries and tourism. The number of fishing days is reduced due to storms from July to August
- Damage to the paddy fields (caused by sea level intrusion and sea level rise)
- Damage to coral reefs
- Impacts to human health

Flooding in 2009 damaged rice in Prey Nob district, and damaged rice and livestock in Kampong Seila district.

The storm frequency has escalated over the last 5 years. Today, storm damages occur every year, affecting property, rice, vegetable and fruit trees in Sameakki, Tuek L'ak and Tuek Thlar communes, Prey Nob district.

Public awareness must be built at community-level, because of the various new climate-related challenges. This, in turn, requires training in CC adaptation.

Financial capacity: The budget is inadequate for routine operation; no budget is available for support to a (much needed) dike construction at Prey Nob.

DOA, KK

This department has 46 officers

Peam Krasaob: Most people earn their living from fishing, with some vegetable cultivation and small areas of paddy. Before, LT rice was grown, but now mostly MT, due to sea water intrusion.

Tuol Kokir: Most farmers grow one crop per year. Before, the yield was 1 t/ha, but today, it is up to 3 t/ha in areas far from the sea, and 1.2 t/ha in areas near the sea. The province average is 2.6 t/ha.

Cultivation starts in late May/early June, depending on the rainfall, with transplanting after 30 days. One farmer in Tuol Kokir is piloting 2 crops per year, the 1st one starting in January/February, depending on the rain, and the 2nd one in May/June. The 1st crop is sown directly, while the 2nd one is transplanted.

3 types of ST rice (105 days) are promoted to farmers: Sen Pidao, IR66 and Chul'sa. These varieties need less water to cultivate. The farmers are unfamiliar with ST rice, however.

Salt-tolerant varieties are under consideration, with inspiration from Bangladesh. One new MT variety, Phka Rom Dual, has been successfully introduced since 2011 on a 2 ha area (and more this year), using seeds from CARDI. This variety is salt-tolerant. It is transplanted after 15-25 days. It is photo-sensitive, maturing in November, typically after 5 months. It is well suited for export.

LT rice is harvested 6 months after transplanting.

Farmers have a tendency to use too much seeds (60-70 kg/ha rather than 20 kg/ha).

Cultivation is under threat from (1) sea water intrusion; and (2) increasing rainfall (now 3,800-4,000 mm/year) (heavy rain is a threat during transplanting). Other threats are insects (including a new kind), wild birds and rats that damage the rice. Storms occur in the area, but mostly early in the cultivation cycle, when the impact is moderate, or after harvest. Drought is not a problem in this area.

Natural pest control and natural fertilizers are promoted.

A reservoir is in need of rehabilitation.

Livestock: The most common livestock is buffalos for use in the fields. The owners just keep them during the cultivation period and release them to the forest after the cultivation season. This can be risky, however. Vaccines are applied twice per year (but the farmers do not trust them).

Care, an NGO, has promoted chicken; but most people prefer fishing. This is because meat is sold at a low price (facing competition from cheap imports from Thailand), while the price of chicken and pig fodder increases year by year.

Fisheries: The fishermen operate close to the coast, because of small boats. There is some mariculture in the dry season, using 3m x 3 cages. The yield is 20 t/year for the two communes combined. Species cultivated are barramundi (?) Lates Calcarifer (?), fast-growing, fingerlings imported from Thailand; and humpback grouper (?) (Cromileptes Altivelis (?)) and some related species, with fingerlings caught locally. They are fed on sponge fish and try tok ke (?). The fish cultivation is impeded by a parasite (gill lice (?)), affecting 70-80 % of the stock this year.

Suggestions:

- Create farmer communities (for knowledge-sharing and introduction of new technology). One exists today; but different thematic ones would be better.
- Train the farmers in using less seeds.
- Livestock should be kept at home, rather than in the forest. Farmers should be trained in producing fodder from materials around their villages.
- Promote the use of vaccines.

DOWRAM, KK

The department has 6 officers, none at the districts.

It operates 4 rainfall stations. There is no equipment for salinity measurements.

MOWRAM operates a national Cambodian Irrigation Scheme Information System. There is an annual report on weather events.

There are two FWUCs in this province (Kandoul and Phom Khlong) (outside the CARP target area). The one in Kandoul works well, but the one in Phom Khlong faces occasional problems with sea water seepage through the bottom of the water gate (due to a lost rubber sealing ring).

Tuol Kokir Commune has an old dike which was constructed during the Khmer Rouge Regime. It normally works, but sometime there is flooding over the dyke, and there are problems with 3 wooden watergates (the ones made of steel were stolen). There is also an old canal built by the commune itself.

An application for support to repairs was submitted to the Japanese Embassy in 2011 (but is not yet approved, due to the Japanese earthquake and tsunami disaster).

AFD provides technical support to DOWRAM on mapping and GIS (2010 to 2012).

No collaboration with the private sector.

The department informs the districts and the radio stations about storms, heavy rain or storm surge by mobile phone or e-mail. Most farmers get their weather information from Thai TV and radio.

The department needs expertise and training in irrigation and meteorology.

Suggestions:

- Repair dyke in Tuol Kokir Commune (which supports more than 100 ha of paddy).

DOE, KK

There are 23 government officers (at the main office and the districts),

22 rangers are employed in Peam Krasaob and Tuol Kokir Communes, who monitor the multiple use areas of Dong Peng, Bottum Sakor Wildlife Sanctuaries and Som Kos. There are more rangers elsewhere in the province. They are employed by DOE on 1-years contracts that are often extended from year to year.

Peam Krasaob and Tuol Kokir Communes: The rainfall is a bit different from elsewhere in Cambodia. The rainy season starts in April. Drought is not a problem; but sea water intrusion affects rice fields, vegetables, fruit trees and household water supplies. Also, drainage of the paddy fields is a problem during heavy rains.

Floods occurred in October 2011.

The paddy area in Peam Krasaob is smaller than in Tuol Kokir. Tuol Kokir has vacant land where trees could be planted; but the ownership is unknown (probably either the communes or DOF).

Choice of well suited varieties is a challenge.

Paddy farmers in Tuol Kokir apply chemical fertilizers and pesticides. No problems have been reported with the fertilizers, but the pesticides can affect the crops.

In the last 4-5 years, rice crops in Tuol Kokir have been exposed to red snails eating the rice plants. This species (incidentally imported from Thailand by a curious farmer) is spreading fast. Farmers try to use pesticides to kill the snail, but this also kills crabs and fish in the paddies.

The paddy fields as such are not suited for other crops, but some can be cultivated near the homes.

Fisheries is a livelihood in both communes. Most fishermen operate near the mangroves and the coast, because their boats are small (a few ones with bigger boats can operate further offshore). Catches include fish, shrimps, crabs and snails.

The villagers in both communes use well water (typically in the dry season, and typically in Tuol Kokir Leu Village) and rain harvesting (typically in the rainy season, and typically in Tuol Kokir Krom Village). There are two types of dug wells: With and without concrete (precast pipe) lining. The groundwater is saline in some places, and some households buy vended water (at 4,000 riel per 200 litres). In some cases, water for uses other than drinking and cooking is available from ponds. Water for households on islands is supplied by boat.

Sanitation is another concern, managed with some support from DRD.

Suggestions

- New dykes and watergates are needed in both communes to protect against flooding and to control sea water intrusion and drainage.
- Technical support is needed for seed selection; and use of fertilizers and pesticides.
- Support to household water supplies: Plastic containers for rainwater harvesting, and/or ponds for freshwater storage.
- Zoning of community forest; planting more trees and mangroves.
- Creating a new community for solid waste management, and related training and awareness-building.
- Support to microcredit/savings groups. A (successful) one exists in Peam Krasaob.

Capacity building needs include

- Training on climate change in general
- Training on climate-related evaluation and impacts assessment
- Facilities: Computers, printers, photocopier, furniture, vehicles (a speedboat and 2 motorcycles donated by Danida are now defunct)

Both department staff and rangers need training in CC implications.

After the 2011 floods, rangers were unprepared for appropriate damage assessment and reporting.

The Coastal Resources Centre needs comprehensive repairs.

DOP, KK

The planning process

The provincial 5-years plan is produced by a committee, headed by the governor, and with representatives from all departments. There are working groups for compilation and assessment of basic planning data; and for compilation of the plan and the associated 3-years PIP.

The draft is reviewed by the Provincial Council's Technical Coordination Committee (PCTCC)⁷. The PCTCC is chaired by the provincial governor; the vice chair is the provincial deputy governor, and the provincial administration are permanent members. Other members are all district governors, two provincial councils, and all provincial department directors. This committee is responsible to provide comments and recommendations to the Committee of the Provincial Council (CPC).

The communes produce 5-years sequential development plans and 1-year investment programmes. The districts and the provincial town produce sequential 5-years plans and rolling 3-years investment programmes, updated each year.

The rolling 3-years investment programmes (at province and district level) are uncertain in the last 1-2 years of the 5-years plans, to the extent that they reach into a period that is not covered by any 5-years plan.

The provincial planning addresses CC, but to a basic extent, merely listing floods, drought, sea level rise and storm frequency. This is due to lack of knowledge and tools for analysis. Guidance on CC implications is needed from the national level. The survey questionnaire for the 5-years plans (provided by NCDD) included a table about CC causes and effects, but there were no replies.

Weather- and climate-related challenges include frequent storm surges; drought; increased temperature; changed rainfall pattern; and high rainfall. One issue is safe areas for flood evacuation, under impression of experience from the 2011 flood. Development goals in Koh Kong province related to climate change and natural disasters include better preparedness for search and rescues; and motivation to adapt to climate change.

Maps are available at the Provincial Hall (but are not widely used). DOP has a census map. GIS is not applied.

Agriculture and livestock

Rice yield in this province is less than 1.8 t/ha, because farmers still implement traditional cultivation. There is limited use of chemical fertilizers, and limited capacity for selecting appropriate seeds. Some paddy fields are exposed to sea water intrusion, and there are attacks by insects.

The land use is changing, with some paddy areas abandoned, some used for construction, and some located in protected areas.

Farmer breed livestock as draught animals for cultivation, for surplus income, and to provide protein in rural communities. Issues include the use of traditional feeding; limited knowledge and availability of quality breeds; limited access to veterinarian services in remote areas; and scepticism to the benefits of vaccination.

⁷ The PCTCC was created by Sub Decree 218 adopted on 14 December, 2009. Its work is guided by Guideline No 036 adopted on 28 December 2010 by Ministry of Interior

Development goals in Koh Kong province related to agriculture and livestock: Generally increased capability and human resources development; better marketing; strengthened legal framework; strengthened management of sustainable agricultural land use; and improved livestock feeding. There is lack of knowledge about appropriate seeds. This would be facilitated by better data.

Fisheries

There are 13 Fisheries Communities in Koh Kong (based on a royal decree on 29 May 2005 and a sub-decree dated 10 June 2005).

The fish catch declined slightly from 35,700 t in 2008 to 34,900 t in 2010. The decline is ascribed to overfishing (modern equipment and increasing number of fishermen); degradation of marine ecosystems; and climate change.

Aquaculture is slightly increasing, both inland and marine. The sector needs technical strengthening, and access to food processing and packing (which are unavailable in Cambodia at present).

Inland fish catches were 150 t in 2010 and 210 t in 2011. Marine fish catches were 34,750 t in 2010 and 41,700 t in 2011. Mariculture produced 350 t in 2010 and 96 t in 2011 (check!), and inland aquaculture 58 t in 2010 and 56 t in 2011. Another 887 t were produced of green mussels, other shellfish, shrimps and crabs in 2010, and 712 t in 2011.

There are 5 fish nurseries in the province, producing 1,000,000 fingerlings.

Development goals in Koh Kong province related to the fisheries sector: Increased production (to serve the market demand); encouragement of manufacturing and fish food processing; strengthened resource management and sustainable resource utilization.

Water resources and meteorology

There are 6 estuaries in Koh Kong Province, with high potentials for hydropower, navigation and tourism.

There is a clear scope for expanded irrigation.

There are two FWUCs, in Srey Ambil and Bottom Sakor districts.

Development goals in Koh Kong province related to water resources and meteorology: Better use of the potential of areas that are or can be cultivated; rehabilitation of seawater dikes; strengthening of FWUCs; and improved management of meteorology stations.

Good weather forecasts would make life easier for the fishermen.

Protected areas

Healthy mangroves are decisive for the fisheries yield.

Koh Kong covers a land area of 568,450 ha, almost 50% of which are protected areas:

- Bottom Sakor National Park 171,250 ha (50% of which is along the coast)
- Peam Krasoab Wildlife Sanctuary: 23,750 ha in Mondul Seymar district
- Samkoh Wildlife Area: 333,750 ha
- Ramsar wetlands: 12,000 ha

Suggestions

- CC training is required. So is better knowledge about the weather.
- Better seeds must be applied to adapt to climate change.
- Mangroves must be protected.
- CC data and information are requested from MOE/DOE.

KK Provincial Hall

Koh Kong Province

The province has 6 districts and 1 municipality, with 26 communes and 3 sangkats.

It has a University of Management and Economy (UME) with some 50 students, who pay 320 USD per year.

The rain pattern has changed since 1987. In the past, the rain started in July; but now it starts from May - usually with some rain in May and heavy rains in July.

The Provincial Hall is concerned about the increased temperature, change in rainfall, and frequent thunderstorms.

The Province recognizes that climate change is a new issue, which is difficult to integrate into the 5-years development planning.

Relations with the private sector

There is good cooperate with LYP Group Ltd. in connection with sugar cane cultivation and road construction; and with U Yean Development Co. Ltd within road construction in Kirisakor.

The private sector participates in the planning, not as formal committee members, but as dialogue partners - for example owners of restaurants along the coast; sugar cane growers; and land concession holders.

Suggestions

CC training (inter-disciplinary) is needed in general,

Training is needed to floating villagers (to adapt to CC) in particular.

Training in marketing (of fish, fruit and vegetables) would be useful.

Farmers should be educated to increase the agricultural production.

Brand marketing of some well-known niche products could be promoted - such as banana wine in Thmar Bang District, and Kapi (a kind of shrimp paste) in Peam Krasaob.

DRD, KK

The department has 10 offices with 22 government officers. There are no district officers.

The rainfall is changing in the province. This year, it started to rain in February.

The majority of villagers in Peam Krasaob are fishing; less are paddy farmers. In Tuol Kokir, villagers are fishing and cultivating. In the floating villages, fisheries is the predominant livelihood. Most fishing is from small boats (that can only operate in fair weather). The larger boats that operate in the area are from Thailand.

Now, some fishermen in Peam Krasaob change their occupation from fishing to become boat operators or souvenir vendors, because the fish catch is declining.