Terms of Reference

CONSULTING SERVICES FOR IMPROVEMENT OF DETAIL SURVEY, DETAIL TECHNICAL DESIGN OF SMALL-SCALE IRRIGATION SCHEME IN THE SELECTED PRIORITY SITES

(Consulting Services – Local Commercial Firms/NGOs Selection)

I. Background:

Contexts:

The Bank-assisted LASED Project and associated Japan Social Development Fund (JSDF) grant-funded project activities have been a cornerstone of Cambodia's Social Land Concession (SLC) Program. In addition to the "civilian" SLC Program, the government is also implementing a large-scale land distribution to retired soldiers of the armed forces and their families. The program aims to transfer several hundred thousand hectares of private state land through SLCs to landless and land poor. Recipients are selected using the established poverty identification process (ID Poor), with beneficiaries being within the bottom 40% of the population. The government has recognized the significant and potential contribution of SLCs to poverty reduction and is committed to scaling up the program.

The process for updating the Land Policy is ongoing and initial drafts highlight the importance of SLCs for poverty reduction and development. The land and services link is recognized, emphasizing the need for infrastructure development and (agriculture) livelihood support services. A renewed approach of state land identification and mapping has also been announced, in line with the objective to secure state assets. This would, in the medium and long term, open the door for new land allocation approach, including SLCs of different forms.

Sustainability is at the center of government, as well as of the LASED Project. SLC projects do not only allocate land but are expected to provide the required infrastructure and deliver the necessary support services to ensure benefits from the land allocated. These key features are reflected in the government's extension policy and the attention and support that agriculture cooperatives and related savings and credit groups receive. The project would reinforce these and further improve the sustainability measures in the beneficiary sites.

Project description:

The project development objective (PDO) is to help improve access to agriculture resources and selected infrastructure and social services in project communities.

The PDO would be achieved by: (a) strengthening community groups to better identify and prioritize technology and infrastructure investments; (b) financing priority productive and social community infrastructures; and (c) scaling up agricultural and livelihood support activities.

The project would cover a total of 15 SLC sites in the six provinces of Kratie, Kampong Cham, Kampong Thom, Kampong Chhnang, Kampong Speu and Battambang. These sites include the eight (8) sites under the LASED Project, six (6) sites funded under the Bank-administered Japan Social Development Fund (JSDF) and one (1) new site in Kampong Thom Province. The total area to be covered is approximately 17,000 hectares, benefitting some 5,400 families.

The project would have two following components and would be implemented over a five-year period:

Component 1: Infrastructure and Livelihood Systems (total estimated cost US$22.45 million; to be fully financed by IDA Credit)

Sub-component 1.1: Social Land Concession Investment Planning and Prioritization (total estimated cost US$3.18 million; to be fully financed by IDA Credit). This would support the: (a) participatory preparation and updating of SLC plans for the new and existing sites, respectively; (b) identification, prioritization and planning of appropriate technology and infrastructure investments, including the overall project baseline data and monitoring requirements; and (c) processing of land titles for eligible land recipients in the existing sites.

Sub-component 1.2: Land Preparation and Infrastructure Development (total estimated cost US$14.81 million; to be fully financed by IDA Credit). This would support the settling-in requirements as well as the required land preparation and prioritized infrastructure investments in the SLC sites.

Sub-component 1.3: Agriculture and Livelihood Development (total estimated cost US$4.46 million; to be fully financed by IDA Credit). This would support the consolidation and further improvement of agricultural production systems, livelihoods and food security and nutrition status of land recipients, including facilitation and provision of support services and technical assistance.

Component 2: Project Management (total estimated cost of US$4.15 million; of which about US$2.88 million of IDA Credit).This component would support project administration and coordination activities.

II. Assignment objectives

The Development Objective of this assessment is to: (i) conduct survey and collect necessary information for technical design: (ii) develop detailed technical design of the small-scale irrigation scheme in the selected priority sites, including technical design drawing and report; and (iii) prepare bidding document for the construction of the small-scale irrigation scheme in the selected priority sites.

III. Scope of works

A rapid assessment has been conducted to prioritize the sites to be financed for construction of the small-scale irrigation scheme by the project, considering the availability of water source, potential irrigated command area, number of beneficiaries, economic benefit and availability of the financing resource. As a results 8 out of 14 target communes has been initially selected for the detailed survey and technical design. List of the 8 priority communes are provided in Annex 1.

Therefore, scope of the detailed survey and technical design is limited in this 8 priority communes. Area to be surveyed in each priority commune is proposed in Annex 2. However, during the survey, consultant may propose the change in terms of location of the potential water storage and survey area in the priority communes, in the agreement with the Project Management Unit and the World Bank Task Team. Detailed survey can only be then undertaken accordingly.

IV. Detailed tasks:

Task 1: Information collection and survey

Topographic survey: has to be compliant with the exiting technical standards and norms on geographical survey. Key tasks includes:

- Collect all surveys that are available in the selected sites and propose the additional survey as needed. The additional survey needs to be agreed with the PMU and Bank team before deployment.
- Review the previous reports and liaise with relevant authorities to locate National grid points or secondary permanent and reliable established points to act as a start point. Use triangulation method to establish permanent detailed control network

within the project communes for further referencing of detailed surveys for technical design in later stage.

- Collect the topographic contour map at a scale of at least 1:10,000, which should show all roads, houses, agricultural lands (irrigable and commanded areas, agro-industrial areas), residential areas, streams, rivers, lakes, utility lines (if existed) and water supply wells on the macro-scale topographic map. Permanent benchmarks shall be constructed at appropriate sites and referenced to the datum shall be carried out using automatic level. The permanent benchmarks must be named with detailed information on elevation and coordinates. In case the map is not available, consultant needs to undertake a quick assessment and survey to identify the potential area that would be inundated/submerged, and the area that would be irrigated by scheme once the headwork is built.
- Undertakedetail survey in order to serve the detailed technical design. At selected sites, establish detailed topographic contour map with at least 0.5-meter contour intervals for the proposed water storage and planned irrigated areas. The perimeter boundary survey coordinates shall be mapped together with the 0.5-meter topographic contours. All roads, surface waters, irrigation areas, agroindustrial areas and major landmarks shall be indicated on the map, as well as survey benchmarks. Identify all structures, including embankment tanks, water discharge gates, spillways, canals, pumping stations (if required), etc. The map shall be at a scale of at least 1:500. Topographic maps of the selected sites shall be drawn in AutoCAD, and also include spot heights, contour lines, location of horizontal control points; and benchmarks. Please note that the areas to be potential submerged including registered land and forest, etc. by the water storage shall be benchmarked.
- Establish longitudinal and cross sections of the proposed irrigation schemes, including embankment, water storage/submerged area and primary cannels. The longitudinal sections shall be established at a scale of at least 1:100 verticals and 1:500 horizontal using the total station. The cross section shall be established at a scale of at least 1:200.

Geological survey or Boring (if required)

- Borings shall be drilled through the soil column to unweather bedrock, or to 30 meters depth, whichever is less for the entire proposed sites. Conduct soils analysis and testing to classify and evaluate the load bearing strength, slope stability and settlement properties of the soil types encountered, as well as the permeability and attenuated properties of the soils to act as a barrier to leachate generation and groundwater contamination. Analysis and testing shall be conducted on disturbed and undisturbed soil samples in accordance with the existing Cambodian standards. All investigations and analysis shall comply with guidelines and standards for soils surveys and testing. Classification, by particle size, plasticity, moisture content, liquid limit, etc., shall be adequate to name each soil and indicate whether it's mixture of silt, clay, sand, gravel, etc. There shall be no less than 2 boreholes for each upstream structure, and 4-5 boreholes in each 1km length of irrigation canal. (for soil properties map development there shall be at least one boring for every 10 hectares per available site).

Investigation of the borrow pit areas for construction materials

- Identify location, supply capacity and quality of materials. Calculation of exact transport access and distance between borrow pits and construction sites.
- Conduct a simple environmental impacts assessment in the borrow pit areas due to the material extraction in following the existing guidelines and norms.

Gathering of all other information that necessitates for the prioritization analysis and technical design.

- Review available reports and technical designs of the similar small-scale irrigation schemes in the country as well as assessment of the irrigation performance of these existing systems.
- Collect all available information relating meteorology, hydrology in the studied area, water catchment and stream characteristic (including area, topographical condition, current flow, water levels and discharge in the dry and rainy seasons, and flood duration, etc.). Meeting with responsible agencies and interview with local peoples shall be conducted.
- Collect all information regarding population, livelihoods, land-use plan, irrigation areas and crop types to be irrigated by the proposed water storage, crops development plans, and other socio-economic development plans (if available).

Task 2: Development of detailed technical design report of the small-scale irrigation scheme in the selected sites.

Small irrigation scheme design and water engineering: Design should be appropriate with the given topographical conditions, water demand for irrigation, water availability and local setting to conserve water and maximize water use efficiency (use of the technology that will be appropriate to the specific condition of the sites – using a participatory approach), and presented in a design report accompanied by ready for construction digital engineering drawing, preferably in AutoCad.

The key tasks are as follows:

- Review of available reports and technical designs of the similar small-scale irrigation schemes in the country as well as assessment of the irrigation performance of these existing systems.
- Collection of all available information relating meteorology, hydrology in the studied area, water catchment and stream characteristic (including area, topographical condition, current flow, water levels and discharge in the dry and rainy seasons, and flood duration, etc.). Meeting with responsible agencies and interview with local peoples shall be conducted.
- Collection of all information regarding population, livelihoods, land-use plan, irrigation areas and crop types to be irrigated by the proposed water storage, crops development plans, and other socio-economic development plans (if available).
- Assessment of qualitative and quantitative of water resources in the project communes by (i) analyzing available hydrological data to determine available water, critical flow levels, flood frequency and design flood studies; (ii) carrying out water quantity and quality validation measurement exercises; (iii) carry out supply-demand analysis (water balance) of water availability for other uses including environmental flows.
- Determination of suitable sites that will determine the volumes of water that will be available as well as the risks of sedimentation, flooding and possible specific environmental impacts.
- Analysis of available meteorological data to determine cropping cycles and crops water demand.
- Assessment of the extent of the land that can be irrigated on each site. Analysis of land tenure and current land use activities and levels of production – this should include use for agricultural activities, livestock, forestry or other and how they will be affected by proposed irrigation interventions.

- Determination of canals plan for the identified irrigation areas
- Development all necessary detailed technical design drawings of the recommended main and associated structures. The drawing includes but not limited to bird-view plan of the entire irrigation scheme, longitudinal and cross sections of the recommended main and associated structures.
- Determination of construction costs, including materials, labors, management and supervision costs, and contingencies.

Environmental and social impacts assessment: Although the small-scale irrigation scheme is not trigged to the Bank policy on dam safety. However, a simpler environmental and social impacts assessment is required for the design. The simpler environmental and social planning process will be fully integrated into the technical feasibility study options by (i) identifying and analyzing the potential environmental and social impacts (direct, indirect, induced and cumulative) of the considered options; (ii) identifying and quantifying the costs of the corresponding mitigation measures; and (iii) incorporating these costs into the economic and financial analysis.

Economic and financial analysis covers (i) cost benefit analysis of the final scheme in the economic and financial terms (Net Present Value); (ii) B/C (benefit cost analysis), and economic/financial IRR (Internal Rate of Return); (iii) project cost budget tables including the construction phase and operational phase separately; (iv) the costs of the environmental management/mitigation measures and resettlement.

Construction and management plan will cover but not limited to:

- Overall construction plan and implementation schedule
- Construction methodologies and procedures
- Flow diversion works during construction period (if required)
- Preconstruction activities, including construction camps, access and transportation route, communication, water, electricity, etc.
- Location of borrow pit areas for construction materials
- Operators housing office facilities, other related facilities
- Assessment of required contractors' capacity and labor force requirements.
- The critical activities and the critical path of activities in the schedule shall be illustrated.

O&M procedures for the irrigation scheme is necessary, and will cover but not limited to:

- Short description of the system
- Detailed procedures for operation, maintenance and management of the system as the whole and each unit;
- Required technical skills and O&M team set up
- Estimate annual cost for O&M (used for cost benefit analysis above)

Task 3: Preparation of bidding documents for construction of the small-scale irrigation scheme in the selected sites

- Develop detailed technical design and drawings, technical specifications, BoQ and works program of the small-scale irrigation scheme in the selected priority sites

- Prepare the Technical Specifications to make a basis for preparing bidding documents, which extract detailed information from the technical design report.
- Construction/implementation plan, including construction supervision plan, coordination among parties, etc.

Task 4: Stakeholder consultantation and finalization of the bidding document

As the small-scale structure will benefit directly to the communities. Thus, consultant is required to conduct the close consultation process with local authorities at all levels in all stages, technical design, construction plan development, supervision plan, etc. The consultations must be recorded and incorporate all suggestions and comments to be given by local authorities, villages and the Bank team in the analyses and reports, and pursue the government approval process for the site selection prioritization and detailed technical design.

V. Deliverables

The consulting firm will work closely with relevant government agencies at all levels and the Bank team under the direct supervision of Central PMU in NCDD to deliver the following deliverables in a quality control and timely manner. Consultant will also be supported by the provincial PMU-based hydraulic engineer hired by the project.

Deliverables	**Timing** (From contract signing)
Survey proposal with detailed survey plan and cost estimate breakdown	week 2
Data collection and geographical and geotechnical survey reports	Week 12
Technical design report, including detailed technical design drawing, and report	week 18
Biding document	week 20

VI. Payment schedule

The assignment is expected to start on November 2017. The consulting firm will be paid, upon timely submission of agreed deliverables in the following:

Deliverables	**Payment conditions**	**Percentage of payment**
Survey proposal	Proposal finalized and approved by the Central PMU	20%
Data collection and geographical and geotechnical survey reports	Data collection and geographical and geotechnical survey reports submitted to the Central PMU.	30%
Detailed technical design	The final report, including plan, drawing, impact analysis, construction plan, cost estimate breakdown, etc. submitted and approved by the Central PMU.	30%
Bidding documents	Final biding documents approved by NCDD and Procurement Review Committee.	20%

VII. Supporting resources for the assignment

The Consulting firm will be responsible for all necessary arrangements to facilitate work. The Consulting firm will also be responsible for office space, accommodation, communications, data collection, workshop, travel and other incidental costs.

The Central PMU will provide support in introducing the assignment and consultant firm to relevant agencies and other stakeholder, and in implementation of the assignment if necessary. The Central PMU will be responsible for all necessary arrangements for their team to monitor and supervise the implementation of the assignment.

VIII. Qualification Criteria

Consultant firms are encouraged to develop their own methodology, staffing plan, level of effort and work approach to accomplish the TORs. The firms shall have a track record in water resource management and hydraulic engineering, hydrology, economics and project management, and shall have proven experience in design, construction and management of the hydraulic and irrigation scheme in Cambodia.

Staff to be engaged in this assignment shall have qualifications and/or experience in water resources science, hydraulic engineering (including design construction and management of headworks, irrigation canal), river morphology and meteo-hydrology or a related field. They should also have experience in implementing similar projects. Team composition should include but not limited to hydraulic engineer (team leader), civil engineer, hydrologist, geologist/geotechnical specialist, environmental scientist, economist and GIS specialist.

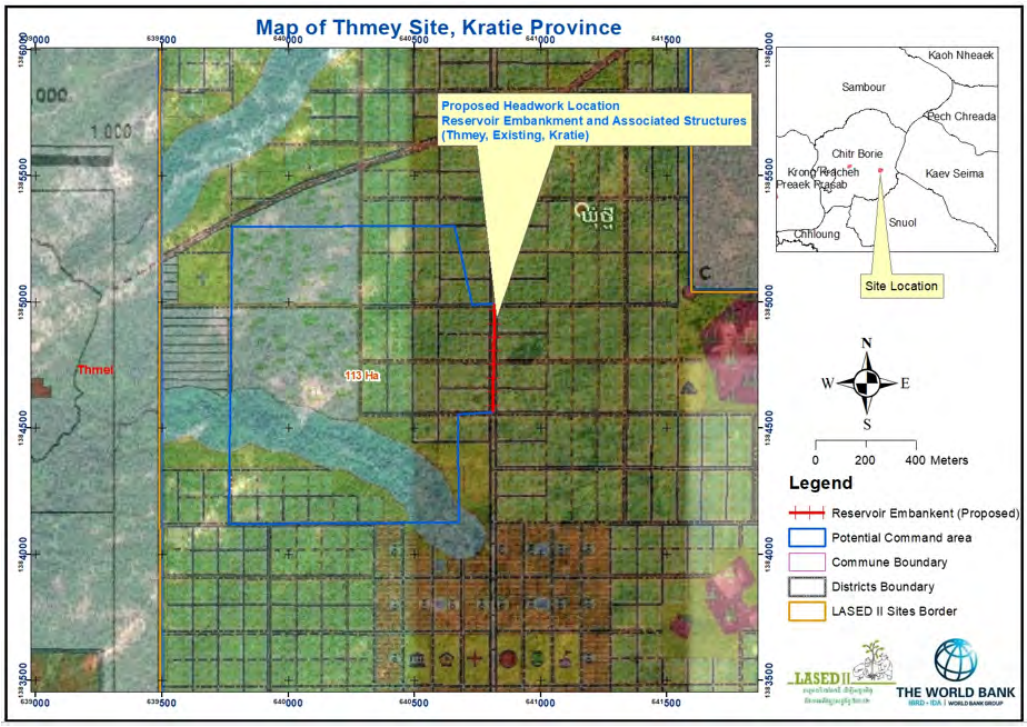
Team-leader should have master decree and at least 15 year of experience in the required areas, and will play a role as the chief communication partner for the client and other external parties, to coordinate and manage the implementation of the assignment including all necessary personnel deployment, purchases, and project administration, to supervise the work of all team members and guide them as necessary, to carry out those tasks for which no professional specialist will be deployed, to manage the dialog and interface with primary counterparts and the Bank team, to compile and submit the deliverables stated above and ensure quality control and timely delivery of all deliverables. Other team members should have university degree and at least 5-year experience in the required areas respectively.

ANNEX 1: List of priority communes

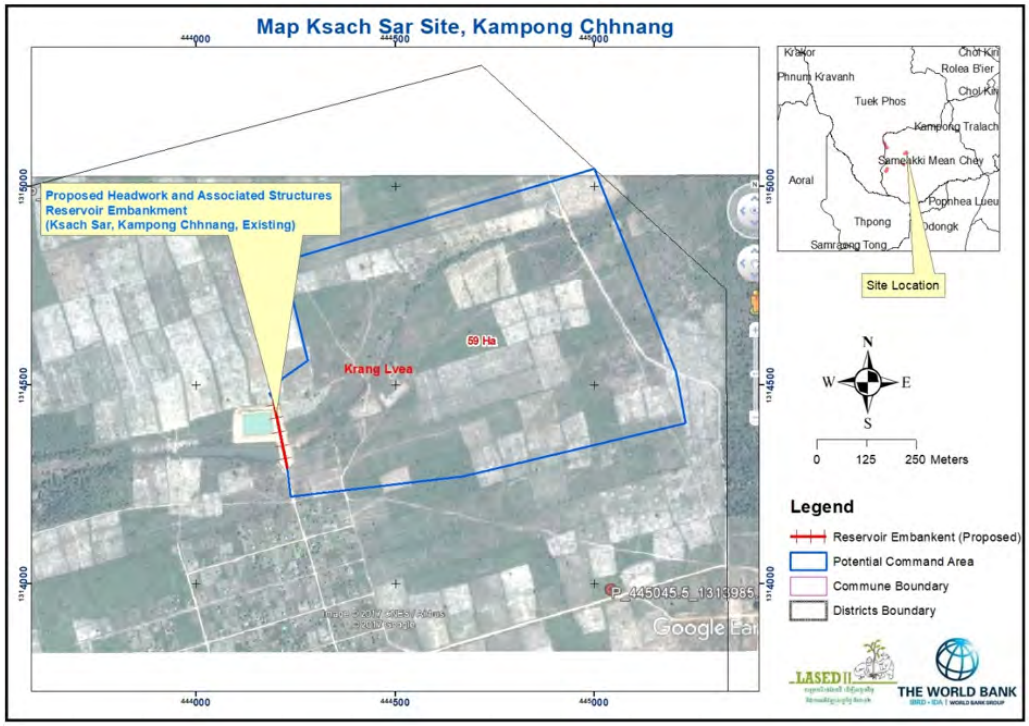
Prio. Rank	LASED Sites	Province	Sources	Proposed Irrigation System	Potential Command Area (Ha)	Proposed technical dimension of the heardwork	Estimate Investment Cost (USD)			Cost per Ha (USD)
							Head work	Distribution Network	Total	
Priority Communes					**225**		**865,000**	**120,000**	**985,000**	
1	Thmey	Kratie	Stream	Reservoir	30	Earthen emk, L= 500m, w= 5m, h = 1.5m One Spillway, L= 10m One under sluice gate 2 head regulators	140,000	15,000	155,000	4,667
2	Khsach Sar	Kg. Chhnang	Stream	Reservoir	20	Earthen emk, L= 150, w= 5m, h = 2m One Spillway, L= 10m One under sluice gate 2 head regulators (Improvement of existing res. Emk.)	120,000	10,000	130,000	6,000
3	Prey Thom	Kg. Speu	Stream	Reservoir	60	Earthen emk, L= 300, w= 5m, h = 2m One Spillway, L= 10m One under sluice gate 2 head regulators	140,000	15,000	155,000	2,333
4	Chambak	Kratie	Stream	Reservoir	30	Earthen emk, L= 200, w= 5m, h = 2m One Spillway, L= 6m One under sluice gate 2 head regulators	85,000	20,000	105,000	2,833
5	Sabok Kriel	Kg. Chhnang	Stream	Reservoir	10	Earthen emk, L= 100, w= 5m, h = 2m One Spillway, L= 6m One under sluice gate 2 head regulators	70,000	10,000	80,000	7,000
6	Tipor 1	Kg Thom	Stream	Reservoir	50	Earthen emk, L= 100, w= 5m, h = 2m One Spillway, L= 10m One under sluice gate 2 head regulators	110,000	25,000	135,000	2,200
7	Sok Senchey	Kg. Chhnang	Stream	Reservoir	15	Earthenemk, L= 70, w= 5m, h = 2m One Spillway, L= 10m One under sluice gate 2 head regulators	65,000	15,000	80,000	4,333
8	Kiri Aphevath	Kg. Chhnang	Reservoir	Reservoir	10	Earthen emk, L= 70, w= 5m, h = 3m One Spillway, L= 10m One under sluice gate 1 head regulators	135,000	10,000	145,000	13,500
Non-priority commnues										
9	Dar	Kratie	Groundwate	Solar Pump	50	One groundwater well (150mm dia, 100m) Solar Pumping System	85,000	45,000	130,000	1,700
10	Cham Kravien	Tbong Khmon	Stream	Groundwater						
11	Dong	Thom	Reservoir	Distribution Cana	170	7 Kilometers of total length for distribution Canals	140,000	824		824
12	Sambok	Kratie	Stream	Ponds						
13	Tipor 2	Kg Thom	Stream	Groundwater						
14	Changkrang	Kratie	Stream	Ponds						

ANNEX 2: Proposed potential location of headwork in the 8 priority communes

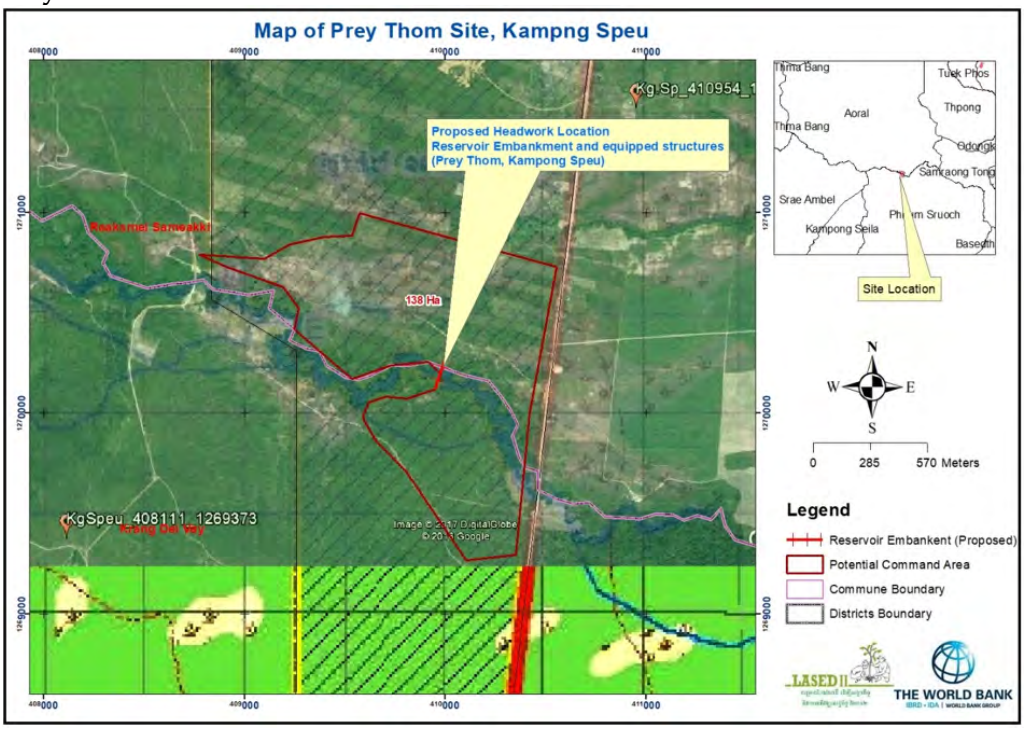
1. Thmey commune



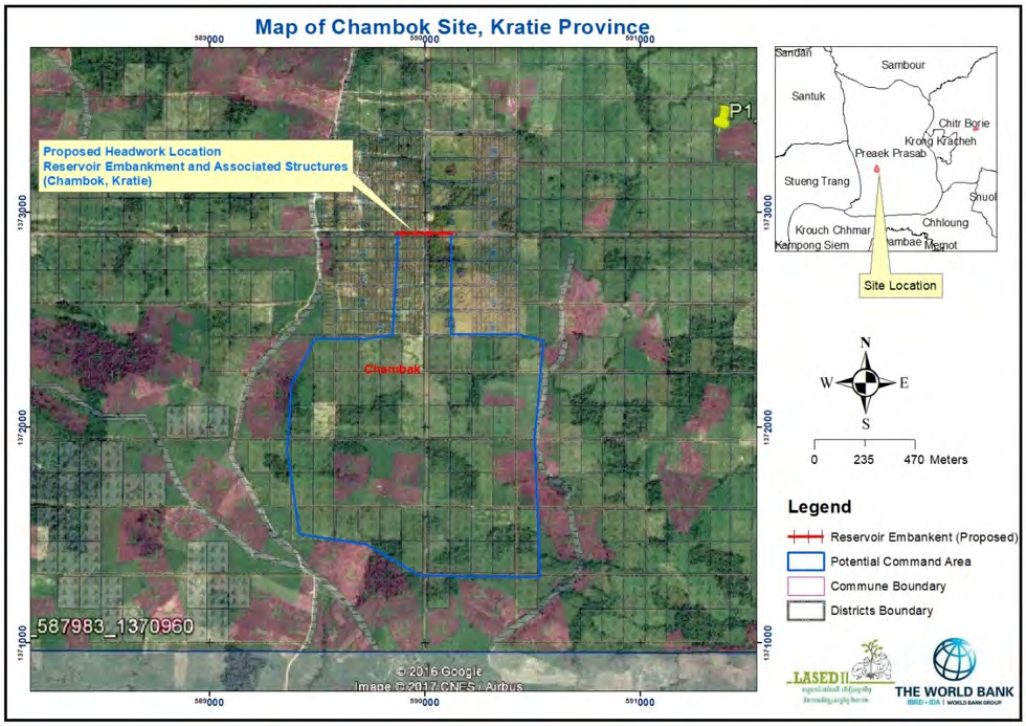
2. KsachSar commune



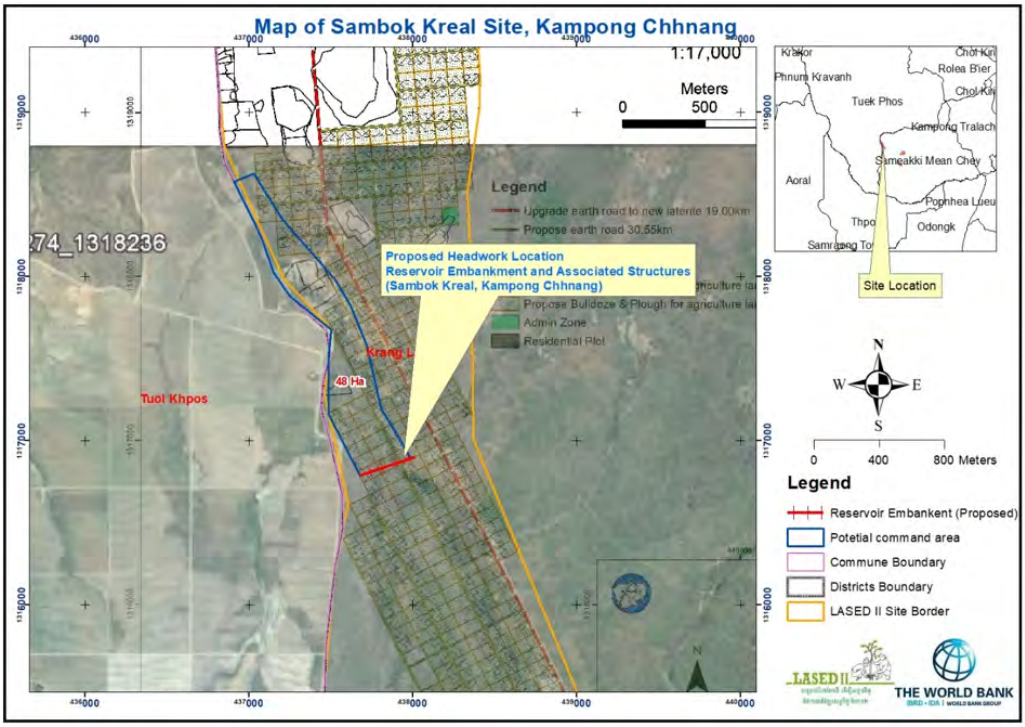
3. **Prey Thom Commune**



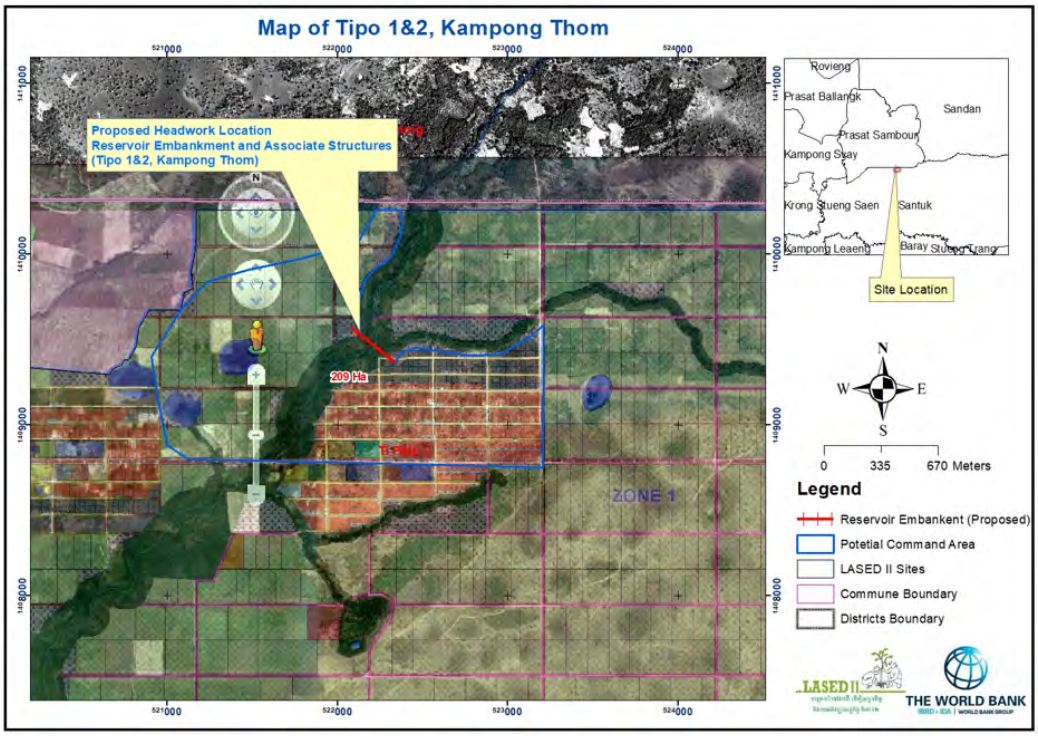
4. **Chambok commune**



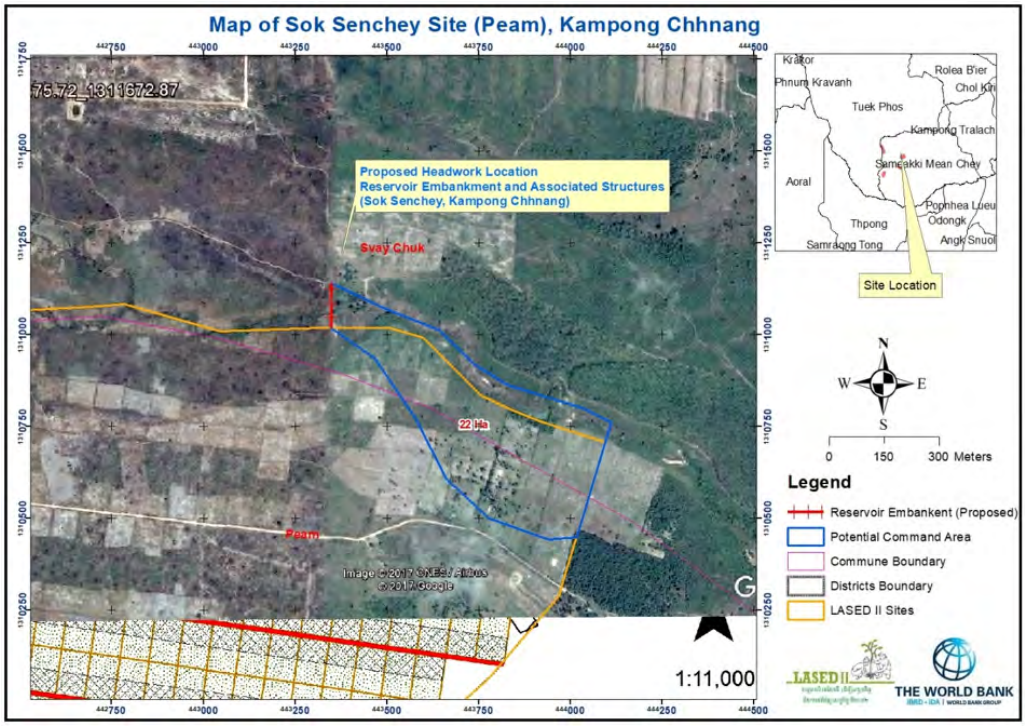
5. SambokKreal Commune



6. Tipo 1 Commune



7. Sok Senchey Commune



8. Kiri Aphivath Commune