# Concept note on Private-Public Partnerships for irrigation infrastructures in Cambodia

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*August 2010*

## 1. Introduction

Following the request of MOWRAM and AFD, the International Technical Advisor (ITA) to MOWRAM Mr. Badre Lanedri, conducted bibliographical research on the subject and organised a number of field visits to assess existing experiences of private participation in irrigation infrastructures in Cambodia.

The ITA organized the field visits in close collaboration with the Director of the Department of Planning and International Cooperation and the Directors of the PDWRAMs of the Provinces of Kampong Thom, Takeo and Kandal.

The assessment helped in the identification of the conditions of emergence, benefits and risks of the private participation in irrigation infrastructure as alternative that would create win-win situation and benefit for both the government and the farmers.

The aim of this concept note is to resume the finding and conclusion of the assessment conducted by the ITA and outline of the next steps toward the development of an enabling framework of private sector participation in irrigation infrastructure and the preparation of pre-feasibility study of Project for Pro-poor1 development of Irrigation Infrastructure with Private investment and PPP.

## 2. The existing models of private sector participation in irrigation infrastructures in Cambodia

The ITA identified three models of pro-poor private sector participation in irrigation infrastructures in Cambodia:

1. ***The model of private irrigated land service provided by local private entrepreneur:*** This model is found in the Kampong Thom province and is found around the Tonle Sap. The size of the schemes under this model could range from 5 00 to 2 000 hectares. The private investment under this model is more linked to the land than irrigation. Indeed, under this model the private entrepreneurs build reservoir(s) to store water for irrigation which allows the valorization of the land for rice cultivation. After building the reservoir, the private entrepreneur can rent the land with an interesting price. The farmers would generally cultivate one crop per year only.
2. ***The model of private large & medium scale irrigation service provided by local private entrepreneur:*** This model is found in Takeo province along the tributaries of the Mekong River. The size of the schemes under this model is generally bigger than 500 hectares. The private investment under this model is allocated to the provision of an irrigation service to the farmers of the irrigation scheme. The private entrepreneur invests in the rehabilitation of the irrigation infrastructure and the installation of pumping station to pump and lift water for irrigation. After the rehabilitation of the infrastructures, the private ensure the water delivery to the farmers who would pay the irrigation service fees. The farmers under this model adopt double cropping thanks to irrigation and easy access to inputs and market.
3. ***The Preks model of private small scale irrigation service provided by local private entrepreneur:*** This model is found in Kandal province along the Mekong River. The size of the irrigation schemes under this model remains small and could range between 100 to 300 hectares. The private investment under this model is allocated to the provision of an irrigation service to the farmers of the irrigation scheme. The main service provided by the private entrepreneur under this model is operation and maintenance of the irrigation

[1] The term Pro-poor make a reference to the targeted group of poor farmers with low incomes.

system including pumping water from the river up to the cultivated fields. Depending on his contract, the private entrepreneur could also carry out rehabilitation of the infrastructure and maintenance of the access roads within the scheme. The farmers under this model adopt double cropping thanks to irrigation and easy access to inputs and market.

| **The identified Irrigation PPP model** | **The model of irrigated land service** | **The model of private large and medium scale irrigation service** | **The model of small scale irrigation service (Preks model)** |
|---|---|---|---|
| **The location of the visited scheme** | Around the Tonle Sap Lake (Kampong Thom) | South of Cambodia along the Mekong and its tributaries (Takeo) | South of Cambodia along the Mekong (Kandal) |
| **Type of irrigation infrastructure** | Reservoir | Gravitary with pumping | Gravitary with pumping |
| **Size of the irrigation scheme** | Large | Large to Medium | Small |
| **Service provided by the entrepreneur** | Irrigated land service | Irrigation service | Irrigation service and *post harvest* services |
| **Cropping model** | One crop | Double cropping | Double cropping |
| **Willingness of farmers to pay** | Low | High | Very high |

**Table 1:** The main characteristics of the models of private irrigation investment in Cambodia

## 3. The evaluation of the existing models of private sector participation in irrigation infrastructures in Cambodia

The table below presents a qualitative evaluation of the risks related to the different models of private investment developed under the umbrella of local private-public partnerships (formal or informal partnerships).

It should be highlighted that this evaluation is based on limited number of field visits and observation. Therefore this evaluation should be considered as specific to the visited schemes and general evaluation would need deeper investigations. This evaluation is focused to the objective of identifying rapidly suitable intervention zones for particular project with PPP approach.

| **The identified Irrigation PPP model** | **The model of irrigated land service** | **The model of private large and medium scale irrigation service** | **The model of small scale irrigation service (Preks model)** |
|---|---|---|---|
| **The risk of Natural & Rural Conditions** | *Very high* | *Medium* | *Low* |
| **The risk of water demand** | *Low* | *Low* | *Low* |
| **The risk of water supply** | *Low* | *Medium (to high)* | *Low* |
| **The risk of cost recovery (financial risk)** | *Very high* | *Medium* | *Low* |

**Table 2:** The evaluation of the risks of the models of private irrigation investment in Cambodia

## 4. The regions with favorable conditions for irrigation project with PPPs

Two regions can be distinguished in Cambodia with regard to the experiences of private sector participation in irrigation infrastructures: The zone around the Lake Tonle Sap and the southern zones of Cambodia close to the Cambodia-Vietnam border.

The zone around the Lake Tonle Sap seems to have high risks due to the natural and rural conditions related to the access to inputs, the market, the farmers willingness to pay and the land property issues.

The south of Cambodia seems to have the most favorable conditions for private investment in Pro-poor irrigation infrastructures. The farmers have both the advantage of natural conditions close the Mekong River and its tributaries and the easy access to technologies, inputs and market in/from Phnom Penh and Vietnam. Thanks to irrigation, the farmers can grow two crops per year and obtain a high yield that range from 3 up to 6 T/ha which give them high incentive and enable them to pay back irrigation service fees high enough to attract investments from the private sector.

***The south of Cambodia seems to have the most favourable conditions for private investment in Pro-poor projects of irrigation infrastructures.***

## 5. Potential irrigation projects with Private-Public Partnerships

There are a number of irrigation schemes that were built during the seventies and which need infrastructure rehabilitation or upgrading to use them for irrigation. The cost of rehabilitation or upgrading of this infrastructure would be much lower than developing new irrigation schemes. Investments in this infrastructure could be more attractive for the private sector as the duration of capital cost recovery will be shorter than the one needed for the development of new irrigation scheme but also because the farmers can value the benefit of water and irrigation.

***Potential irrigation projects with Private-Public Partnerships***

The ITA identified the following projects/schemes that could be interesting for private irrigation investment with private-public partnerships:

1- **The "RumLike KroBay Korn" irrigation scheme project proposed by Canadia Bank.** The scheme is located in the Koh Thom District in Kandal province. The Candia submitted proposal for a phased investment of 1.5 million USD with first phase 0.5 million USD of investment for the irrigation of 3600 ha. The proposal has been submitted to the Government of Cambodia and its under study by MOWRAM.

2- **The "Sras Prambey" irrigation scheme identified by PDWRAM.** The scheme is located in the Koh Thom Distric in Kandal Province. The command area of this scheme is estimated by PDWRAM at about 2 500 hectares.

3- **The "Kbal Por" irrigation scheme.** There is already contract between the commune and private entrepreneur for the rehabilitation of the pumping station, the infrastructure and for the provision of the irrigation service to the farmers. This scheme is consdired to be under the responsibility of the Provincial Department of Agriculture. The private entrepreneur managed to provide irrigation for 800 hectares till 2005 but the potential of the irrigation scheme is much higher as the farmers said that the irrigation scheme covered four communes after its construction.

4- **The "Thmor Sor" irrigation scheme located in Borei Cholsar District.** There is already contract agreement between the farmers, the local administration and the private entrepreneur to ensure the irrigation service provision.

## 6. The way forward

The investment analysis of irrigation project with PPP could be divided into 3 decision points: The initial investment decision, the intermediate or pre-final investment decision and the final investment decision. Based on this, the expert proposes to organize the work in three phases:

1. ***The initial investment analysis (Initial Phase)*** would characterize the existing models of PPP irrigation investments, identify the different potential project sites within favorable intervention region

and proceed to an initial evaluation of their respective cost, benefit, payback period and risks. The expert has already initiated this analysis by collecting existing data and organizing field visits in collaboration with MOWRAM/PDWRAM staff.

2. ***The intermediate or pre-final investment analysis (Intermediate Phase)*** would define the suitable framework and the best model for PPP irrigation investment and it would, in addition, carry-out pre-feasibility studies of the most suitable sites for PPP irrigation investment.
3. ***The final investment analysis (final phase)*** would develop the detailed plan and final requirements for the implementation of the suitable framework and the best model for PPP irrigation investment. In addition, it would produce the feasibility study and detailed design of the irrigation scheme with PPP irrigation investment.

So far and thanks to the pro-active collaboration of MOWRAM/PDWRAM staff, the expert were able to determine existing models of PPP irrigation investment and their characteristics. On the basis of risk analysis, favorable intervention zones were identified in the southern region of Cambodia. (paragraph 3 and 4). Some potential project sites in the south of Cambodia were also identified.

However, there is still need to identify more sites and collect from the field further information and data that would be necessary for preliminary cost/benefit and investment payback analysis. To finalize the initial investment analysis***, the expert suggests conducting diagnostic using the CISIS tool and its methodology***. Indeed, this option would allow the mobilization of the MOWRAM/PDWRAM to help in the identification of potential project sites and collect data that is necessary for initial evaluation of their respective, cost, benefit, payback period and risks. This would also reduce the costs of the consultancy of the second phase and provide valuable data for the pre-feasibility studies of the potential projects with PPP irrigation investment.


## 7. Next steps

The next steps would be carried out to finalize the initial investment analysis (Initial phase). The next steps under the initial phase would as follow:

a. **CISIS Diagnostic:** The CISIS tool and methodology will be used to identify and collect data on potential PPPR irrigation projects in the provinces of the southern region of Cambodia (Takeo, Kanda,...).

   The CISIS Diagnostic would cover25 irrigation schemes including the following schemes:

   - ✓ The ”RumLike KroBay Korn” irrigation scheme in Koh Thom Disctrict in Kandal Province.
   - ✓ The “Sras Prambey” irrigation scheme identified by PDWRAM and located in Koh Thom Disctrict in Kandal Province .
   - ✓ The “Thmor Sor” irrigation scheme located in Borei Cholsar District in Takeo Province.

- ✓ The “Kbal Por” irrigation scheme located in Treang District in Takeo Province.

b. **Bibliographical research:** The expert would collect recent feasibility studies that will help the expert to refine the initial analysis by providing additional data based on real cases.

c. **Preparation of the consultancy of the intermediate phase of this work:** This consultancy would study the context and the possibilities for developing “*Private Public Partnerships for irrigation development in Cambodia*”. This would include the following sub-tasks:

- ✓ Preparation of request of no objection from MOWRAM to AFD concerning this consultancy.
- ✓ Preparation of the Terms of References for the consultancy and its validation by MOWRAM and AFD.
- ✓ Preparation of request of no objection from MOWRAM to AFD for the ToRs and the draft contract

# Annex 1

## A. REFLECTION ON THE PPP INVESTMENT MODEL

As stated in paragraph 6 of this note, an initial investment decision would request a preliminary evaluation of the costs, benefits, payback period and the risks of the investment. This reflection would focus on the key issue of the capital cost recovery. The payback period (or payback amount) amount would depend on the annual (or seasonal) irrigation service fees to be paid by the farmers, the percentage of the cost recovery, the capital invested in the rehabilitation/construction of the irrigation infrastructures and its O&M annual costs.

During the field visit, the expert found that the irrigation service fees applied in the visited irrigation schemes could range from 30 to 90 USD/ha in both Kandal and Takeo provinces. In the case of the Kbal Por irrigation scheme attested that he invested 150 000 USD to rehabilitate the irrigation infrastructure and its pump station. This investment is equivalent to an average capital cost of 270 USD/ha. Nevertheless, at this stage, solid information concerning the real investment costs are still missing. Further investigation is needed to determine the real capital costs for the rehabilitation of schemes like the Kbal Por irrigation scheme or the construction of new small irrigation schemes similar to the Preks.

A brood estimation could be based on the average irrigation investments in Cambodia which was recently estimated by the World Bank at 800 USD/ha. An irrigation investment of 800 USD/ha with payback period of 10 years would require an annual capital cost recovery of 80 USD/ha/year. In the case of double cropping the capital cost recovery would be 40 USD/ha / season. The farmers will have also to pay the O&M costs (including energy in case of pumping). The O&M of the irrigation infrastructure may cost up to 60 USD/ha/season which means that the farmers would have to pay a total irrigation service fee of about 100 USD/ha /season or 200 USD/ ha / year in case of double cropping.

An irrigation service fee of 100 USD/ha/season may cause a problem as the farmers may resist to the payment of an irrigation service as high as 100 USD/ha. Therefore it would be more realistic to have a partial capital cost recovery instead of full capital cost recovery which will allow the reduction of the irrigation service fees to the level that the farmers are willing to pay after negotiations of the Irrigation Service fee. Partial cost recovery would also allow the private entrepreneur to have acceptable level of profit.

Therefore it would more realistic that an irrigation project with PPP would be financed through hybrid public-private investment as in the figure below.

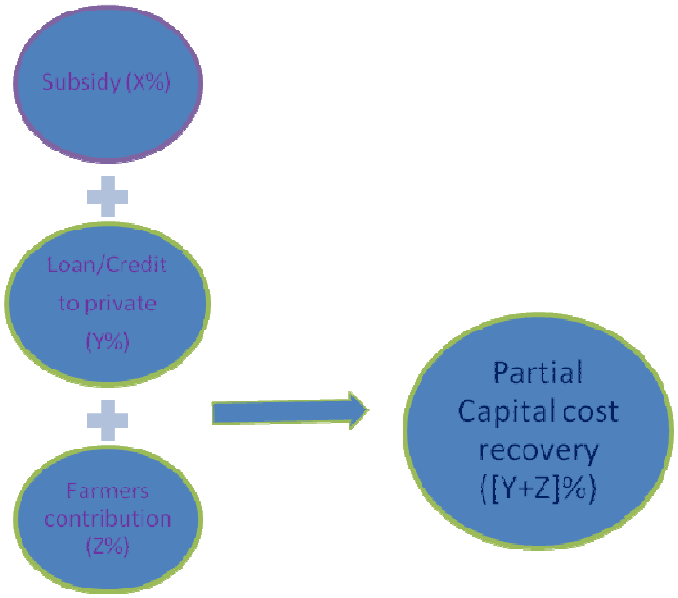



**Figure 1:** The proposed investment model for an irrigation project with Public-Private Partnership (PPP)

Further investigation is needed to have preliminary data on the capital costs, profits and payback period. This information will be used for investment simulations with different scenarios of hybrid irrigation capital

investments and irrigation service fees. The CISIS diagnostic would help collecting the preliminary data that will be used for the initial payback investment simulations. The main idea remains that an irrigation project with private sector participation should consider the possibility of mobilizing external subsidy to the capital investment which may come from the Government or the International Donors.

## B. Reflection on the case of first Prek of Kam Samnar Krowm village in kandal Province (Preks model)

The table below presents the estimation of the annual capital cost recovery of the investment of the private entrepreneur. To recover its capital investment, the private entrepreneur would have to collect 4USD/ha/year from the farmers for a payback period of 5 years and annual cultivated area of 190 hectares.

| Capital investment (USD) | Investment payback period (years) | Annual cost recovery (USD/year) |
|---|---|---|
| 4000 | 5 | *800* |
| Area cultivated during the wet season (ha) | Area Cultivated during the early wet season (ha) | Total cultivated area (ha/year) |
| 120 | 70 | *190* |
| | Unit cost recovery (USD/ha) | **4** |

**Table 1:** Estimation of the investment cost recovery for the Prek of Kam Samnar Krowm village in kandal Province

The contract between the private entrepreneur and the private entrepreneur stipulate that the farmers will have to pay 120 kg of rice per hectare and 55 iters of Gasoline for every cultivation season. The table below gves an estimation of the irrigation service fees that have to be paid during every rice season to receive irrigation water. The ISF is estimated at about 65 USD/hectares for every rice cultivation season (table below). It should be highlighted that the farmers practice double cropping and they to pay an annual irrigation service of 130 USD per hectare if they cultivate rice 2 times per year and 65 USD/ha/ year if they cultivate only rice one time per year.

| Amount of Gasoline paid by the farmers (l/ha) | Unit cost of Gasoline (USD/l) | Energie costs paid by the farmers (USD/ha) |
|---|---|---|
| 55 | 0.76 | *41.9* |
| Amount of rice paid by the farmers (kg/ ha) | Unit cost of rice (USD/kg) | Irrigation rice costs paid by the farmers (USD ha) |
| 120 | 0.19 | *22.9* |
| | Total ISF paid by the farmers (USD/ha) | **64.8** |

**Table 2:** Estimation of the irrigation service fees paid by the farmers in the prek of Kam Samnar Krowm village

The table below presents a simulation of the gross benefit and the net benefit of the private entrepreneur that he will get from his investment for payback period of 5 years. The table below presents the scenario would have no additional energy costs from year 2 to year 5.

| Cost/ Benefit analysis | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total |
|---|---|---|---|---|---|---|
| Annual Capita cost recovery (USD) [a] | 800 | 800 | 800 | 800 | 800 | 4,000 |
| Annual energie cost paid by the entrepreneur (USD) [b] | 2,286 | 0 | 0 | 0 | 0 | 2,286 |
| Annual Energie cost paid by the farmers (USD) [c] | 7,962 | 7,962 | 7,962 | 7,962 | 7,962 | 39,810 |
| Annual irrigated rice fees (USD) [d] | 4,343 | 4,343 | 4,343 | 4,343 | 4,343 | 21,714 |
| **Annual benefit (USD) [d-b]** | 2,057 | 4,343 | 4,343 | 4,343 | 4,343 | **19,429** |
| **Annual net benefit (USD) [d-b-a]]** | 1,257 | 3,543 | 3,543 | 3,543 | 3,543 | **15,429** |
| **Cumulative net benefit (USD)** | **1,257** | **4,800** | **8,343** | **11,886** | **15,429** | |

**Table 3:** Estimation of the gross and net benefit made by the private entrepreneur

This simulation has been recalculated for different scenarios of additional energy cost that the private entrepreneur has to pay every year as follow:

- **Scenario 1:** From year 2 to 5, the private entrepreneur would have to pay an energy cost equal to 100% of the additional energy cost of the first year.
- **Scenario 2:** From year 2 to 5, the private entrepreneur would have to pay an energy cost equal to 75% of the additional energy cost of the first year.
- **Scenario 3:** From year 2 to 5, the private entrepreneur would have to pay an energy cost equal to 50% of the additional energy cost of the first year.
- **Scenario 4:** From year 2 to 5, the private entrepreneur would have to pay an energy cost equal to 25% of the additional energy cost of the first year.
- **Scenario 5:** From year 2 to 5, the private entrepreneur would have to pay an energy cost equal to 0% of the additional energy cost of the first year.

The table below summarizes the results of the simulation based on the scenarios above.

| | | Cumulative Net benefit (USD) | | | | |
|---|---|---|---|---|---|---|
| **Scenario** | **Capital investment (USD)** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| Scenario 1 (100%) | 4 000 | 1 257 | 2 514 | 3 771 | 5 029 | **6 286** |
| Scenario 2 (75%) | 4 000 | 1 257 | 3 086 | 4 914 | 6 743 | **8 571** |
| Scenario 3 (50%) | 4 000 | 1 257 | 3 657 | 6 057 | 8 457 | **10 857** |
| Scenario 4 (25%) | 4 000 | 1 257 | 4 229 | 7 200 | 10 171 | **13 143** |
| Scenario 5 (0%) | 4 000 | 1 257 | 4 800 | 8 343 | 11 886 | **15 429** |

**Table 4:** Estimation of the net benefit made by the private entrepreneur under different scenarios of O&M costs

For a capital investment of 4 000 USD and over payback period of 5 years, the private entrepreneur would have a net benefit of about 6 300 USD even if the additional energy cost remains as high as the exceptional year of 2009/2010. The best scenario with no additional energy costs starting from the next year shows a net benefit of about 15 500 USD for the private entrepreneur which is five times the initial investment made by the private entrepreneur. Overall, the table shows that would make a net benefit of more than 150% of his initial investment.

However, this investment analysis does not allow calculating the net benefit in case the private entrepreneur would have to invest in the rehabilitation or the construction of new irrigation infrastructure for the Prek. The CISIS Diagnostic would help in the collection of data that would be necessary for an initial investment analysis in the case of preks model investment.

## C. REFLECTION ON THE SPECIAL CASE OF KBAL POR

The irrigation scheme of Kbal Por is locat in Takeo province which is one the province targeted by the CAVAC project financed by Ausaid. Therefore, the possibility to mobilize financial resources from the CAVAC project needs to be prospected. The CAVAc financial resources would be used to recover the sssidy part of the capital irrigation investment.

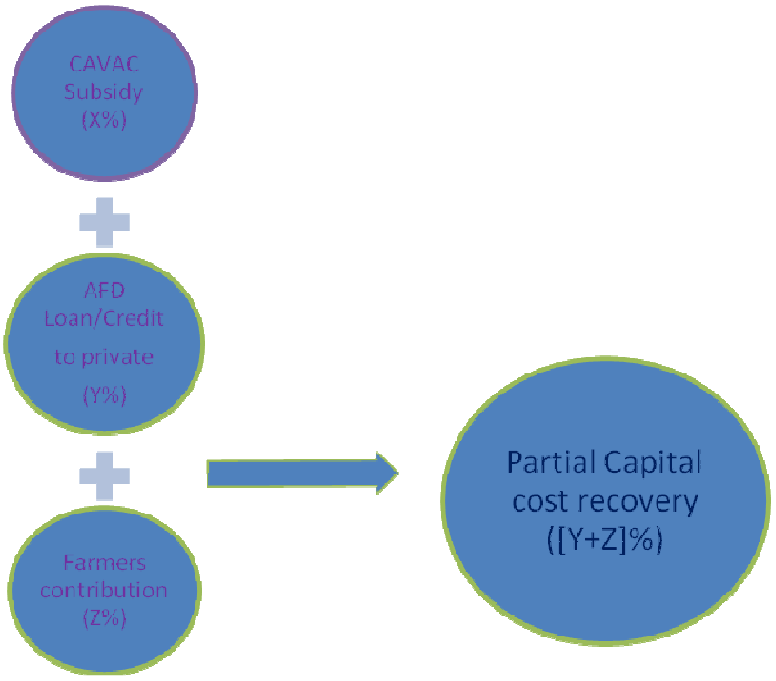



**Figure 2:** The proposed investment model for the Kbal Por irrigation project with Public-Private Partnership

However, issue of Kbal Por is not only financial but also institutional, Indeed the Kbal Por project is under the responsibility of the Minsitry of Agriculture and the Takeo Provincial Department of Agriculture. The PDWRAM seems to have no mandate over the Kbal Por irrigation project. This institutional arrangement contributes to the crystallization of the problems in the Kbal Por irrigation scheme. The resolution of the case of Kbal Por would need to develop new institutional set up that would involve both the Ministry of Agriculture and the Ministry of Water Resources and their respective provincial Departments in Takeo. The new institutional may be an inter-Ministerial steering Committee at national level and Joint Technical Working Group with experts from both the Provincial Department of Agriculture and the PDWRAM of Takeo.

The involvement of the CAVAC project would be very strategic because CAVAC is the only project that is far implemented jointly by the Ministry of Agriculture and the Ministry of Water Resources and Meteorology and the project is therefore well positioned to implement a new institutional set up for the Kbal Por irrigation scheme. This is extremely important as the resolution of the case Kbal Por would not be possible without th the organisation of the Water Users in FWUC which would not be possible without the involvement of the PDWRAM and MOWRAM.

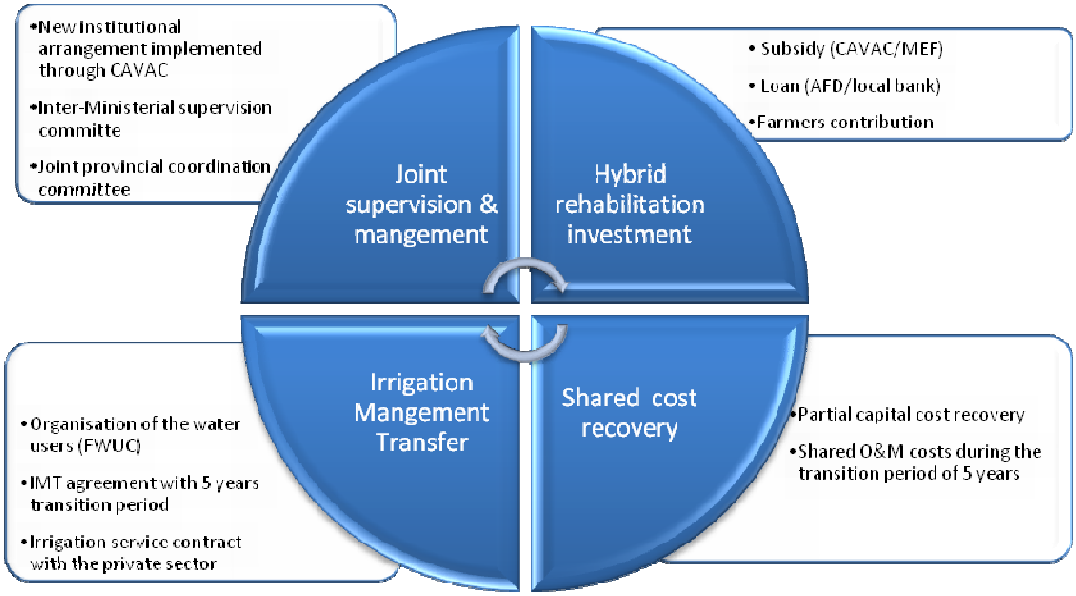



**Figure 3:** The design of new financial and institutional arrangement for the Kbal Por irrigation scheme

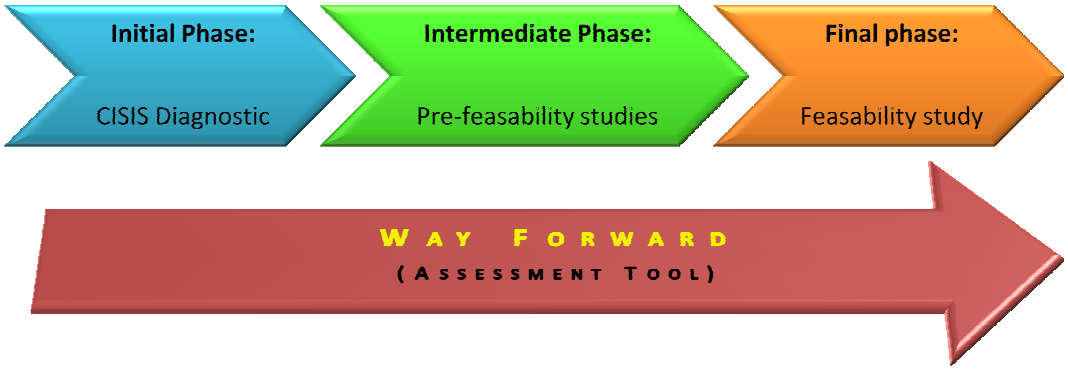
# Annex 2

***Proposal of the CISIS Diagnostic***

***For the preparation of an irrigation project with PPP***

## 1. Introduction

As explained in paragraph 6 of this note, the CISIS Diagnostic would help in the identification of number of potential irrigation schemes that would be interesting for irrigation investment project with PPP. The CISIS Diagnostic would allow the collection of information and data that are necessary for an initial investment evaluation.




The CISIS Diagnostic would also help the collection of data for the future consultancy that would carried out during the intermediary phase. The CISIS Diagnostic would also reduce the costs of the pre-feasibility studies in the second phase.

## 2. The activities of the CISIS Diagnostic

The CISIS Diagnostic would use the same diagnostic tools used in CISIS including the questionnaire and the mapping of the scheme. The CISIS data collection is normally supervised and coordinated by the MOWRAM CISIS team and the international technical advisor (ITA) to MOWRAM.

The potential irrigation project that will be assessed during the CISIS diagnostic would be identified jointly by MOWRAM and PDWRAM staff. The data collection itself is carried out by the PDWRAM staff have good experience in CISIS data collection.

In addition, to the standard questionnaire of MOWRAM, the ITA will develop an additional specific questionnaire to collect the data that would be needed for the initial investment evaluation.

The CISIS Diagnostic would cover a total of 20 irrigation schemes over three provinces (Kandal, Takeo and the third province is to be determined later). The CISIS activity could be divided into 2 phases, the first phase would assess 15 schemes and the second phase would cover 10 schemes.

The CISIS Diagnostic activity could be implemented jointly with the activity related to the CISIS rapid irrigation inventory.

## 3. The tentative budget of the CISIS Diagnostic

| Activity /Item | Units | Number of units | | Unit cost (USD) | Cost (USD) | |
|---|---|---|---|---|---|---|
| **National Team** | | | | | | |
| | | **Phase 1** | **Phase 2** | **Phase 1 & 2** | **Phase 1** | **Phase 2** |
| Campaign supervision and coordination | CISIS Questionnaire | 15 | 10 | 20 | 300 | 200 |
| **Provincial Teams** | | | | | | |
| Data collection | CISIS Questionnaire | 15 | 10 | 150 | 2,250 | 1,500 |
| **Technical experts** | | | | | | |
| Data Entry Assisstant | Staff month | 0.5 | 0.5 | 450 | 225 | 225 |
| | **Phase budget** | | | | ***2,775*** | ***1,925*** |
| | **Total Budget** | | | | **4,700** | |

## 4. The tentative work plan

| | Month 1 | | | Month 2 | | | Month 3 | |
|---|---|---|---|---|---|---|---|---|
| **Activity** \ **decade** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| **Preparatory phase** | | | | | | | | |
| Organization of Work and Selection of schemes | | | | | | | | |
| **Implementation first phase (1)** | | | | | | | | |
| signature of MOWRAM-PDWORAM agreement for CISIS data collection from 15 schemes | | | | | | | | |
| Data collection | | | | | | | | |
| Creation of GIS maps and sketchs | | | | | | | | |
| Data entry and processing | | | | | | | | |
| Preparation of an interim report | | | | | | | | |
| **Impelementation final phase (2)** | | | | | | | | |
| signature of MOWRAM-PDWORAM agreement for CISIS data collection from 10 schemes | | | | | | | | |
| Data collection | | | | | | | | |
| Creation of GIS maps and sketchs | | | | | | | | |
| Data entry and processing | | | | | | | | |
| Preparation of a final report with an intial investment evaluation and the ToRs for the prefeasabiliy studies | | | | | | | | |