EXECUTIVE SUMMARY

The EIA comprises ten chapters which provide a comprehensive picture of how the EIA for the Lower Sesan 2 Hydropower Plant Project was undertaken and its findings including the environmental and social impacts of the proposal along with a number of recommended mitigation measures should the project proceed. The structure of the EIA follows ADB EIA guidelines and draft EIA guidelines produced by the MoE.

1 - Introduction

The Lower Sesan 2 Hydropower Plant Project (Lower Sesan 2 HPP) is a large scale project which requires an Environmental Impact Assessment (EIA) to be prepared under Cambodian Law. The EIA screens the potential environmental and social impacts and develops mitigation measures for each negative impact during project pre-construction, construction and operation stages to reduce the impacts as much as possible.

The EIA has been prepared by Key Consultants Cambodia (KCC) under a contract from Power Engineering Consulting Company No.1 (PECC 1) which is undertaking the overall feasibility study for the project for Electricity of Vietnam (now is EVNI), the Vietnamese company that will invest in the project. An MoU between EVN and the Ministry for Industry, Mines and Energy (MIME) was signed in June 2007 for EVN to undertake the feasibility study. The EIA was prepared from January – July 2008.

A key objective of the Lower Sesan 2 HPP is to fulfil the medium and long term energy demand of the Kingdom of Cambodia as well as exporting any surplus energy. The project also responds to the third mandate of the Government's Rectangular Strategy which relates to the development of the energy sector to meet the needs for low cost electricity. Another key objective is to ensure that the energy generation and its positive impacts to the nation are carefully weighed up against the negative environmental and social impacts it will cause particularly on the areas up and downstream of the project area.

Information gathered for the EIA was through primary and secondary sources including wildlife, fish and social surveys, community interviews/meetings and existing literature and reports particularly on previous wildlife, fish and social surveys in the area.

2 – Legislation and Regulations Framework

The proposed hydropower plant is directly under the control of the Cambodian Electrical Authority and MIME. A number of other agencies are closely involved with the proposal including the Ministry of Environment (MoE), Ministry of Agriculture, Forestry and Fisheries (MAFF), Ministry of Economics and Finance (MEF), Ministry of Land Management Urban Planning and Construction (MLMUPC), and the Ministry of Water Resources and Meteorology (MoWRAM).

The relevant legislation and guidelines for the project include:

- *Constitution of Kingdom of Cambodia, 1993*
- *Law on Environmental Protection and Natural Resources Management (1996)*
- *Preah Reach Kret (Royal Decree) on Natural Protected Areas (1993)*
- *Sub-Decree on Environmental Impact Assessment Process (1999)*
- *Sub-Decree on Water Pollution Control (1999)*
- *Sub-Decree on Solid Waste Management (1999)*
- *Land Law (2001)*
- *Forestry Law (2002)*
- *Law of Water Resources Management (2007)*
- *National Water Resources Policy (2004)*

3. Project description

The Lower Sesan 2 HPP is a hydro-electric power project located on the Sesan River in four communes in the Sesan District (Phluk, Srekor, Talat, and Kbal Romeas communes), Stung Treng Province about 1.5km downstream of the confluence of the Sesan and Srepok Rivers and about 25km upstream of Stung Treng provincial centre. The project will have an installed capacity of 400MW to supply electricity to surrounding provinces as well as for export to Vietnam. It will also involve a construction period of four years and employ a peak workforce of 3000 people. The project is **BOT type** and the investment cost is **US$ 816.23million**.

The key components of the dam are:

- Main dam: homogenous earth-fill dam with a total length of 8km, dam crest 83m above mean sea level or about 40m above the river bed with a top width of 8m;
- Powerhouse on the left bank, equipped with 5 units of turbines with capacity of 80MW each;
- Spillway in a rectangular shape with dimensions 15m x 16m and 12 bays in accordance with a hydrological regime analysis of the river flow;
- Reservoir with storage capacity of 1.79 billion cubic meters and flooded area of 335km^2 when the water level in the reservoir reaches 75m (requiring the resettlement of 1059 families in six resettlement areas); and
- Other auxiliary items including intake, penstock, switch yard 220Kv, tailrace channel, administrative and operation buildings.

There are three main stages to the project: preparation (current stage from 2008-2009); construction (from 2010-2014); and operation (from 2015 onwards). The dam is expected to have a 100 year operating life span.

The project is essentially needed in response to the current and future electrical demand of the country which is predicted to rise in the coming years and to connect with other supply systems in the country and the region as a whole.

4. Baseline environment

a) Physical environment

The landscape in and around the project area is gently rising ground towards the plateau of Ratanakiri Province which comprises mainly forest and rivers but also some land for settlement and agriculture. The Sesan River bed at the dam site has an average elevation of 40m m.s.l and the river bed in the upper reservoir area has an elevation of 60m m.s.l. The climate is typically monsoonal with dry and wet seasons of around 6 months each from November to April and May to October respectively. The air quality is generally good except near dirt roads in the dry season.

The Sesan and Srepok Rivers which flow through the project area are main tributaries to the Mekong River and both rise in the central highlands of Vietnam. The Sesan and Srepok Rivers have total lengths of 462km (with 252km in Cambodia) and 520km (with 245km inside Cambodia) respectively with total catchment areas of 18,888km^2 and 30,942km^2 respectively. The mean flows of the Sesan and Srepok Rivers near the project site are 633m^3/sec and 667m^3/sec respectively. The water quality of the rivers in and around the project site is reasonable and the groundwater levels are around 8m in the dry season. Sediment levels in both rivers are high. Several geological faults are present near the project site and in 1973 an earthquake registering 5.2 on the Richter Scale occurred in the area.

b) Ecological environment

The existing ecological environment in and around the project site comprises some areas of relatively intact forest (typically deciduous dipterocarp), and riverine habitat which may contain some rare and endangered fauna species (such as Gaur, Bantang, Eld's Deer and a number of bird species). Some relatively degraded areas however also exist from past logging and settlement impacts and a level of hunting, selective logging and NTFP collection still occurs in and around the project area. Approximately 30,000 ha of the project area (including the proposed resettlement areas) is currently forested.

The project area lies within the Lower Mekong Dry Forest Eco-region (LMDFE), an internationally recognised area of global importance for biodiversity conservation and also within several Important Bird Areas identified by BirdLife International. It is considered that a number of rare and endangered species inhabit the LMDFE including Tiger, Asian Elephant, Gaur, Banteng, Wild Water Buffalo, Eld's Deer, Golden Cat, Fishing Cat, Black Bear and Gibbons as well as a number of bird species including Sarus Cranes and various vulture species.

A wildlife study undertaken by KCC during the 2008 dry season found that in general there is uncertain data existing in relation to the surveys/researches within the project area. The study found from KCC's own field observations and through dialogue with village elders and local hunters that the presence of large animals, such as Banteng,

Gaur, Asian Elephant, Bear and primates are rarely seen but birds and small animals like wild-pigs, mouse-deer and reptiles such as monitor lizards and turtles are quite often seen.

There are significant natural stocks of fish in both the Sesan and Srepok Rivers though fish populations have been decreasing over recent years caused from development activities, increasing populations, and types of fishing gears being used. There are over 100 species of fish present in both rivers of which it is around 66% are migratory. It has been identified that some fish regularly migrate from the Tonle Sap Lake and Mekong River to/from the Sesan and Srepok Rivers with one species coming from as far as the Mekong Delta.

c) Social resources and economic development

Sesan District where the project area is principally located comprises four communes with a total population of 12,961 people. Upstream of the project area there are a large number of villages along both the Sesan and Srepok Rivers (though many more along the Sesan) with a total population of around 40,000 people. Downstream of the project area there are a number of small villages and the Provincial centre of Stung Treng with a total population of around 45,000 people.

Fishing and rice growing are the main activities of villagers living along the rivers. They also grow a variety of other crops. The agricultural area of the Sesan District (the district where most of the reservoir will be located) is 5160ha.

Using figures from a fish study undertaken by KCC during the 2008 dry season and secondary documents it is estimated that the amount of fish caught in the Sesan and Srepok Rivers (in Cambodia) totals of 647 tons per year.

The villages along the Sesan and Srepok Rivers comprise a range of ethnicities and have limited infrastructure including schools, health care facilities and roads. A number of people travel by small boats up and down the rivers. There is little employment and most people survive on subsistence living. There are a few tourism sites near the project area notably the cascades a few kilometres downstream of the dam site. There are no known historical or cultural sites in the project area.

There are a number of approved forest and land concessions within the project area and 31% of the proposed reservoir area is currently covered by approved concessions.

5. Potential impacts

a) Impacts on Environmental Resources

The key impacts are the loss of flora and fauna habitats, which contain some rare and endangered species, as a combined result of the flooded reservoir area, resettlement areas and diversion of National Route 78. Around 30,000ha of forested area will be destroyed significantly impacting any wildlife, endangered or otherwise, in these areas.

Impacts on fish will be severe as many species are migratory (around 66%) and their passageway through the project area will be blocked by the dam. This will also have

impacts downstream of the dam into the Mekong River and potentially also the Tonle Sap Lake as this is where some fish migrate to/from. The impacts on fish will occur whatever the dam size as it will block fish passage through the dam site, some species may disappear or change and there shall be potentiality of natural fish yield's reduction.

Though existing land/forest concessions already cover some of these areas the impacts will still be significant as such large land and riverine areas will be destroyed. The impact on the forest and wildlife habitat will be significant due to the loss of many thousands of hectares of forest and wildlife habitat because of the project.

The water quality and quantity of the Sesan River downstream of the dam site will also change impacting both on people and fish and wildlife. The river flows will lose the natural fluctuations of the wet and dry seasons and the water quality will likely deteriorate particularly during the first years of operations due to decomposing organic matter in the water. The Stung Treng water supply comes from the Sekong River to which the Sesan River flows into about 10km upstream of the town and a deterioration of the Sesan River water supply could impact the town's water supply as well as the water supply for the villages located along the Sesan River downstream of the dam. Erosion resulting in increased sediment and waste resulting in water contamination could be an impact particularly during the construction phase.

The dam location lies in an area of geological faults and a earthquake registering 5.2 on the Richter Scale occurred in the region in 1978. This means the area is susceptible to earthquakes which could cause impacts on the dam or associated structures if they occur.

The project will also add to the cumulative impacts of dams in the Sesan and Srepok River catchments particularly in terms of impacts on water quality and quantity, on people and wildlife, particularly fish and aquatic biology.

b) Impacts on Socio-economic development

Many of the impacts outlined above that will affect the environment will also have direct social impacts. The project will impact on the livelihoods, particularly in terms of loss of land , effects to fish, water quality and quantity and roads.

The reservoir will result in the involuntary resettlement of 4785 people comprising 1059 families (2007) or 6507 people comprising 1579 household (focus in 2011) from seven villages in four communes into six new resettlement areas.

It is recognised that many of the proposed resettlement areas are already located in approved forest/land concession areas which will likely be subject to considerable disturbance now and in the future.

It has been identified that fish are importance protein sources of villagers along the Sesan and Srepok Rivers (approximately 40,000 people). It is considered that the socio-economic impact from the consequent loss of fish will be one of the single largest impacts of the dam.

The existing agricultural area of the Sesan District is 5220ha. The loss of agricultural land as a result of the reservoir is 1216.8 ha or 24% of total agricultural land in the Sesan District. Though this land is proposed to be replaced in the resettlement areas (requiring clearing of forest land) any loss of agricultural land has economic, social and environmental impacts particularly in terms of loss of income, livelihoods and forest areas...

The project may impact to local water supply and people health due to poor water quality in construction and first stage of operation.

The dam will also prevent people travelling through the dam site by boat once the dam is built. A number of people still travel by boat between villages above and below the dam site and some still travel as far as Stung Treng.

During project construction there will be a peak workforce of three thousand people which will live in on-site worker camps. If the project workers are not properly managed there will be social impacts particularly on local cultures and nearby villages in terms of social interactions and outside influences such as drug use.

Traffic may also cause social impacts particularly in terms of health through traffic accidents involving project personnel with local people and increased dust for people living near roads, particularly during the construction phase. This will impact on both the condition of the roads (which are currently still poor) and safety of workers and people.

Some cascades exist not far below the dam site which is a tourist attraction particularly locally. Changes in river flow may make this area less attractive to tourists and potentially dangerous during dam water releases.

The project construction activities will risk with bomb or UXO remaining in the ground from the past war.

6. Key Mitigation Measures

The project Owner shall apply following mitigation measures for negative impacts environmentally and socially:

- Minimisation of land areas affected by the reservoir and resettlement areas by minimisation of the dam height as much as possible.
- Resettlement areas and National Road 78 detour route are located in areas of least environmental impact and construction cost is born from investment fund.
- Resettlement occurs in accordance with a Relocation Management Plan and the land and infrastructure provided must be the same as, if not better than, the land and infrastructure the resettled villagers will leave behind. Compensation will be provided and through negotiation with affected villages and also following the resettlement framework plan that approved by IRC/MEF and lines ministries.
- An Environmental Fund shall be provided for Cambodia Government for unestimated impacts and Environmental Management Plan including

reforestation or protecting forest program and wildlife conservation in the area and others.

- Agreement between the Project Owner and concessionaires must be reached on the approved land/forest concession areas which will be flooded by the reservoir before dam construction.
- The dam shall be designed and constructed to withstand major seismic events.
- De-mining in resettlement areas, construction areas and quarry site is required, to avoid health risk with the residue of bomb/UXO.
- Finding and treat toxic chemicals.
- Work together with inline ministry and local authorities to establish a plan collecting valuable trees at forest within reservoir for other purposes before water filling.
- Appropriate erosion and sediment control and waste management practices shall be employed particularly during the construction phase.
- Water quality and quantity monitoring will be continuously undertaken above and below the dam site and any deteriorations shall be quickly remedied.
- Any road damage caused by project traffic shall be promptly repaired at the cost of the project Owner.
- A code of conduct is to be developed by the Project Owner for project workers to adhere to particularly in terms of respect for the culture and traditions of the local communities in the area. The code shall also address the issue of road conduct in that all road rules are strictly to be obeyed particularly adhering to speed limits.
- Health facilities shall be provided on the project site for project workers to assist with the spread of disease particularly into the local communities.
- Properly manage of construction and human waste from construction site and camp.
- Provide agricultural support programs such as (i) animal feeding such as cattle, chicken, duck, and other animal; (ii) agricultural extension projects including rice, vegetables, and other crop production to upstream villagers who live along the Sesan and Srepok in Ratanak Kiri and Mondul Kiri province.

7. Public consultation

The public was consulted about the dam proposal on three main occasions during the preparation of the EIA. The first occasion was through some public meetings held by KCC in early February 2008 in the five communes which would be most affected by the project (Phluk, Kbal Romeas, Srekor, Talat and Sre Angkrong communes). The meetings provided the local community with information about the project and a review of environmental issues which could occur as a result of the proposed project. After the information had been presented the villagers who attended the meetings were asked their opinion of the proposed development and 85% said they disagreed with the proposal.

The second consultations were held by PECC 1 during April 2008 and this was directed at the people who would be directly affected by the dam project and would need to be relocated. Some commune and village chiefs as well as some provincial department representatives visited a resettlement site in Vietnam which had been constructed because of the Yali Dam development on the Sesan River there. In addition, affected householders were told of the areas which would be lost due to the project and were informed about the proposed compensation measures for their resettlement. Following these consultations a survey was made by PECC 1 of the affected households which asked if the affected people now agreed or disagreed with the project. PECC 1 reports that 94% of all affected persons were in agreement with the project.

The third consultation was a stakeholder meeting in which was held in Stung Treng town in early May 2008. The stakeholders invited included representatives of the affected communities in Stung Treng Province, all government departments of Stung Treng Province, local NGOs, private sector interests and the MoE and MIME. The Governor of Stung Treng province was also in attendance. A PowerPoint presentation was given to the meeting by KCC and PECC 1 which provided engineering and environmental details. Some comments/questions were asked by only a few of the participants which PECC 1 indicated would be taken into consideration in the EIA.

Some other consultations were carried out during the social and wildlife surveys undertaken by KCC in early 2008 with some local authorities, commune chiefs and NGOs.

8. Conclusions

Sesan 2 HPP project will produce a large amount of energy (1953.9 GWh per year) for North-east province in Cambodia and export to Vietnam (if remain from demand in Cambodia). These energy sources will be engine force pushing economic development of the Cambodian Nation.

However, the project proceed will cause some significant environmental and social impacts namely loss of forest, reduction of natural_ fish yield in Sesan river, Srepok river, as well as in Mekong downstream and Tonle Sap Lake, and involuntary resettlement of 1579 households.

Effective mitigation measures shall minimize almost negative impacts caused by projects.

The EIA is useful documents helping decision maker during balance gains (economic benefits) and losses (environmental impacts) in the approval process.