

# CHAPTER 5

## ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

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### 5.1 OVERVIEW OF THE PROPOSED PROJECT SITE (NATURAL AND SOCIAL ENVIRONMENT)

#### 5.1.1 Location

O Mon 3 combined cycled power plant project will be constructed within O Mon Power Complex, which is located at O Mon District, Can Tho City. O Mon 3 power plant is located at approximately 18 km on north-northwest from the center of Can Tho City. North-east side of the Complex faces Hau River, with O Mon Canal surrounding the west side and National Road No. 91 running the south-east side, which makes the project site being located at a convenient place in terms of transportation and infrastructure. The land has mainly been used for agriculture (O Mon 3 EIA 1.3, p.6).



Source: [http://www.jica.go.jp/environment/advice/pdf/giji/advice15\\_data.pdf](http://www.jica.go.jp/environment/advice/pdf/giji/advice15_data.pdf)

Source: <http://www.hotelVietnamonline.com/can Tho/index.html>

**Fig. 5.1-1** Location of the O Mon Power Complex

#### 5.1.2 Natural Environment

##### (1) Topography

O Mon Power Complex is encompassed by Hau River and Chanh - Vam arroyos. Hau River is straight in this area, flowing from north-west to south-east, 900m width and the maximum depth is 22 - 23m. River banks are stable without any landslide. O Mon District is located in the center of Mekong Delta, on the right bank of Hau River. The ground is generally flat, with average altitude of 1.2 - 1.4m above sea level, tilted toward the inland area (O Mon 3 EIA, p.33).

##### (2) Geology

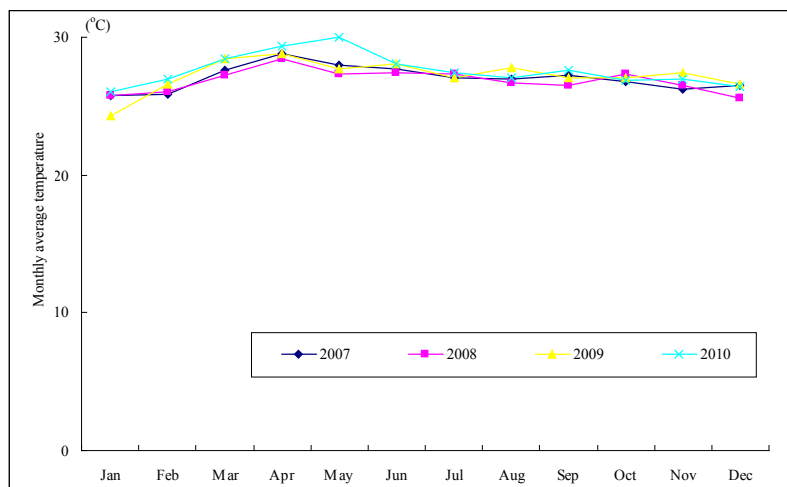
O Mon area has the geological feature of western region of Hau River, a stripped marsh deposit, associated with yearly sediment deposition of Hau River flood on the ancient deposit. The deposit layer is thinner in the inland area. The geology of the area consists of three layers: clay layer, clayed silt, and spotted clay. The clay layer is 1-2m thick and has the bearing capacity of 1.2kg/cm<sup>2</sup>. The clayed silt layer has the bearing capacity of 0.3kg/cm<sup>2</sup>, and the spotted clay layer has the highest thickness with the bearing capacity of 1.5kg/cm<sup>2</sup>, suitable for usage as the project basement (O Mon 3 EIA 3 2.2.2, p.33-34).

### (3) Climate

O Mon district is situated in the central Mekong Delta, in the typical tropical climate zone. The climate is strongly affected by two monsoon regimes: north-west monsoon and south-west monsoon, making two clearly distinct seasons (dry season and wet season). The meteorological survey result by Can Tho City Statistic Bureau is shown in Fig.5.1-2 (O Mon 3 EIA 2.2.3, p.34).

#### 1) Temperature

The annual average temperature in Can Tho City is 27°C, the lowest monthly average temperature being 26.2°C (December) and the highest monthly average temperature being 29°C (April). The highest temperature observed is 40.0°C, and the lowest temperature observed is 14.8°C. Fig.5.1-2 indicates the monthly average temperature in Can Tho City in 2007-2010 (O Mon 3 EIA 2.2.3, p.34).

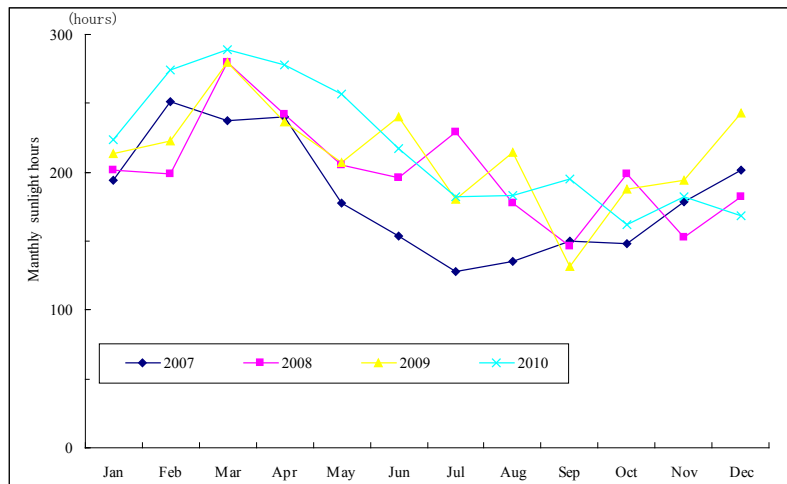


Prepared based on Cantho Statistic Bureau, 2011

**Fig. 5.1-2 Monthly Average Temperature in Can Tho City (2007-2010)**

#### 2) Solar Radiation

Can Tho City is located at low latitude, with constant solar altitude throughout the year and the solar radiation is also stable. The monthly average solar radiation quantity is about 430.6 cal/cm<sup>2</sup>, the maximum being 521 cal/cm<sup>2</sup> (March) and the minimum being 391 cal/cm<sup>2</sup> (September). Solar radiation quantity is relatively high in dry season (March to April) and low in rainy season (September to October). The annual average total radiation quantity is 5.17kcal/cm<sup>2</sup>. Fig. 5.1-3 shows the monthly average sunshine hours in Can Tho City in 2007-2010 (O Mon 3 EIA 2.2.3, p.35).



Prepared based on Cantho Statistic Bureau, 2011

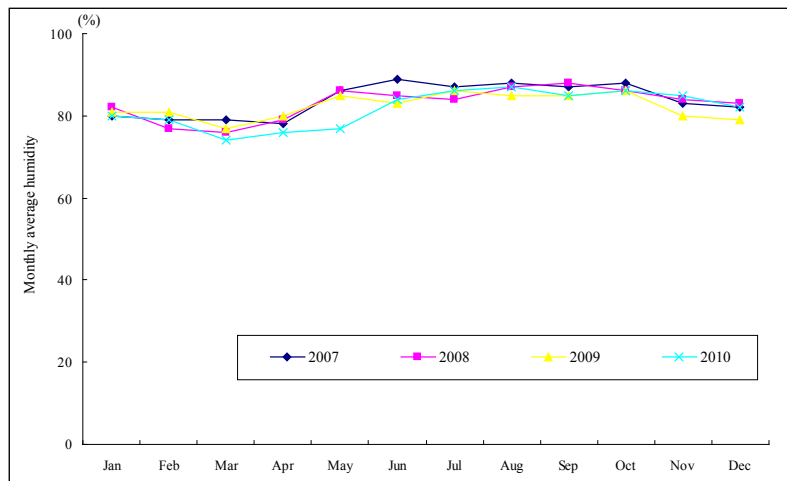
**Fig. 5.1-3 Monthly Average Sunlight Hours in Can Tho City**

**3) Air pressure**

Air pressure in the area fluctuates a bit, depending on the season. The annual average air pressure is 1009.6 hPa, the maximum monthly average is 1019.6 hPa, and the minimum monthly average is 1000.0 hPa (O Mon 3 EIA 2.2.3, p.35).

**4) Humidity**

The humidity of Can Tho City does not fall below 75%. The yearly average relative humidity is 82.3%. The humidity is high from July to November and low from February to April. Fig. 5.1-4 indicates the monthly average humidity in Can Tho City in 2007-2010 (O Mon 3 EIA 2.2.3, p.35-36).

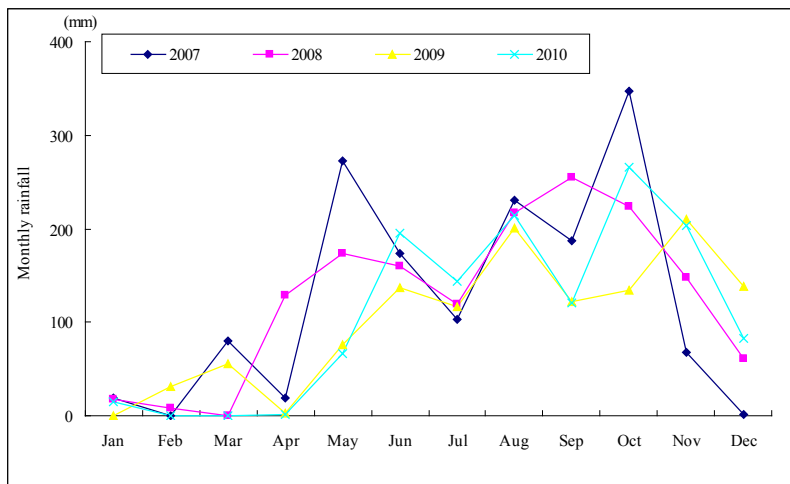


Prepared based on Cantho Statistic Bureau, 2011

**Fig. 5.1-4 Monthly Average Humidity in Can Tho City in 2007-2010**

### 5) Precipitation

The rainfall in Can Tho City is concentrated from May to September, accounting for about 80% of total annual rainfall. The average total rainfall in a year is 1,415.7mm. The average rainy days per year is 130 days, with the maximum rainy days of 171 days and the minimum of 111 days. The maximum monthly rainfall amount is 439mm in August, 1988. Fig. 5.1-5 indicates the monthly rainfall in Can Tho City from 2007 to 2010 (O Mon 3 EIA 2.2.3, p.35-36).



Prepared based on Cantho Statistic Bureau, 2011

Fig. 5.1-5 Monthly Rainfall in Can Tho City in 2007-2010

### 6) Evaporation

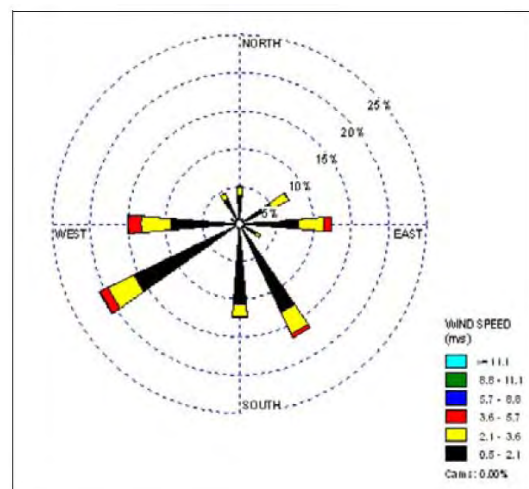
The annual average evaporation is 750mm. The monthly average evaporation is 50-55mm in rainy season and 60mm in dry season (O Mon 3 EIA 2.2.3, p.37).

### 7) Wind direction and wind speed

The annual average wind speed in Can Tho City is 3.5m/sec and the maximum wind speed is 31m/sec. The main wind direction in dry season is south-east, and in wet season south-west (Fig. 5.1-6). The area is rarely affected by tropical typhoon, but storm phenomenon occurs quit often (O Mon 3 EIA 2.2.3, p.37-38).

### 8) Atmospheric Stability

The atmosphere stability in the project area is A or B in sunny days with low wind speed (2-4m/sec), C or D in cloudy days and E or F at night (O Mon 3 EIA 2.2.3, p.38).



Source: O Mon 4 EIA Figure 36, p. 83

Fig. 5.1-6 Wind regimes in Can Tho City (2006)

### (3) Hydrology

#### 1) Ground water

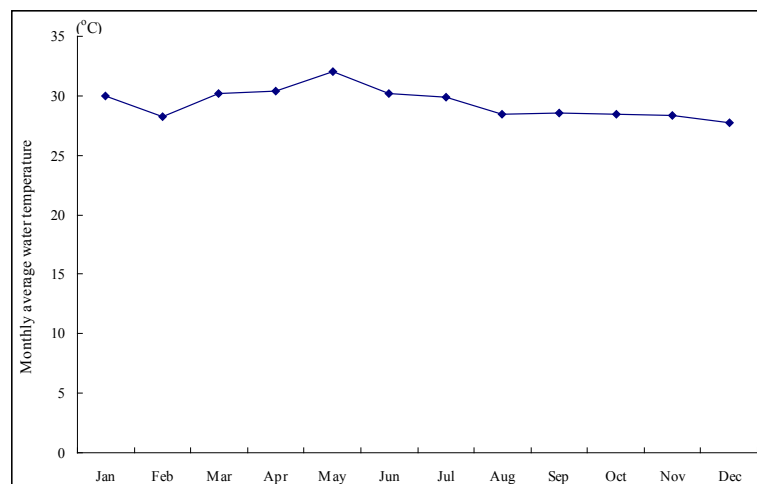
The ground water layer in the project area is rather shallow, about 2.5 ~ 2.9m depth under the ground level. The flux of the ground water is about 55 ~ 84m<sup>3</sup>/sec. The ground water has been exploited by the local people for domestic use. There is not a big project to exploit ground water in the area (O Mon 3 EIA 2.2.4, p.38-39).

#### 2) Hydrologic Features of Hau River

Hau River is one of the downstream branches of Mecong River and flows into the South China Sea by two estuaries named Dinh An and Tran De. Hau River has high amount of flow and is free from salinity, although it is a tidal river. The exploited water from the river is consumed and used mainly by Can Tho City for domestic and industrial purpose (O Mon 3 EIA 2.2.4, p.39).

##### (a) Water Temperature

The monthly average water temperature of Hau River does not fluctuate much with 27.7 ~ 32.0°C (Fig. 5.1-7) (O Mon 3 EIA Table 2.8, p.40).



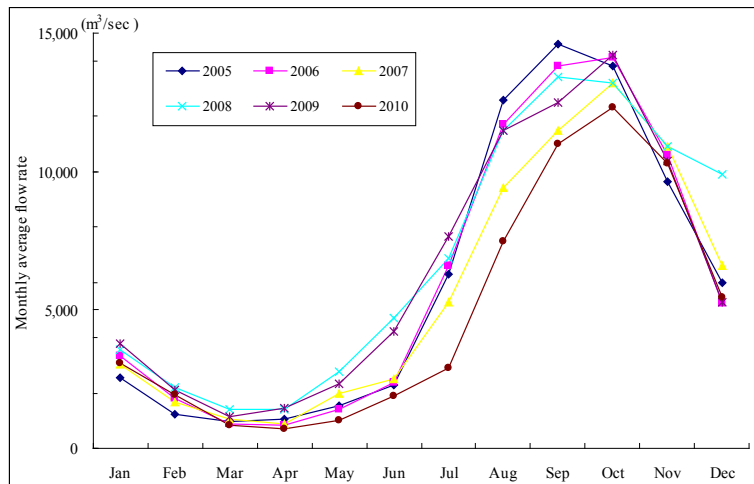
Prepared based on O Mon 3 EIA Table 2.8, p.40

**Fig. 5.1-7 Monthly Average Water Temperature of Hau River**

##### (b) Flow Rate

The average flow rate of Hau River in 2005 is 2,440m<sup>3</sup>/sec. The maximum flow rate reaches 18,000m<sup>3</sup>/sec, and the minimum is 800m<sup>3</sup>/sec (May). In rainy season where rainfall volume is at the maximum (September to November), the discharge of Hau River accounts for one half of the total annual discharge. The drainage capacity of the area is relatively low due to flat topography. The flood recorded at peak time in Can Tho City is 2.09m (25 October, 1961), 2.00m (26 October, 1991) and 2.12m (6 October, 1994) (O Mon 3 EIA 2.2.4, p.39-40).

Due to the inclined topographical condition by a little bit from north to south, from east to west, the flood water flows in one direction in rainy season with the maximum water velocity of 1.5 - 1.7m/sec in Hau River.



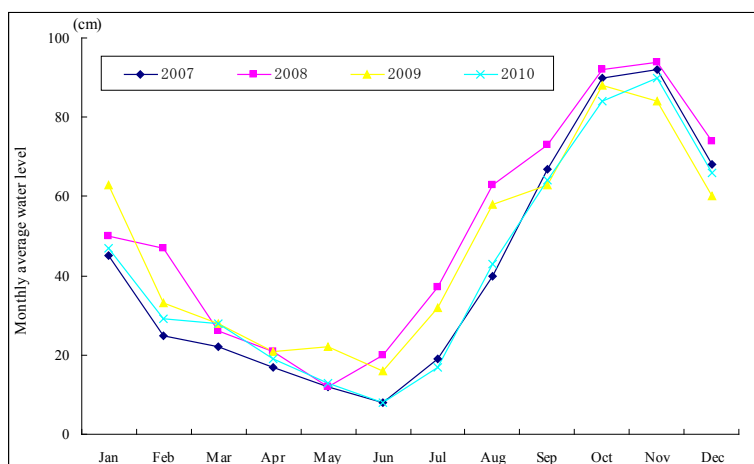
Prepared based on the data from Cuu Long Hydrographic Center

**Fig. 5.1-8 Monthly Average Flow Rate of Hau River in 2007-2010**

**(c) Water level of Hau River**

Hau River is a tidal river and water level fluctuates depending on the tidal level. In rainy season with high flow volume, the variation of water level is as small as 0.5m, whereas it is as large as 2.16m in dry season. The minimum water level is observed between March and June, whereas the maximum water level occurs between September and November (O Mon 3 EIA 2.2.4, p.39-40).

In the downstream of Mekong River, the rainy season lasts from June to November due to the influence of the South-west monsoon, resulting in increased water level in Hau River and other canals. The fluctuation of water level affected by tide is larger to the rivers and smaller to the inland canals. On the other hand, less amount of rainfall in dry season (from December to May) results in decreased water level in the canals, and its affects the agricultural production and daily life of the local people (O Mon 3 EIA 2.2.4, p.41). Thus, the average water level of the Howe river also has an about 1m seasonal variation (O Mon 3 EIA 2.2.4, p.39-40). Fig. 5.1-9 describes the monthly average water level of Hau River in 2007-2010.



Prepared based on Cantho Statistic Bureau, 2011

**Fig. 5.1-9 Monthly Average Water Level of Hau River in 2007-2010**

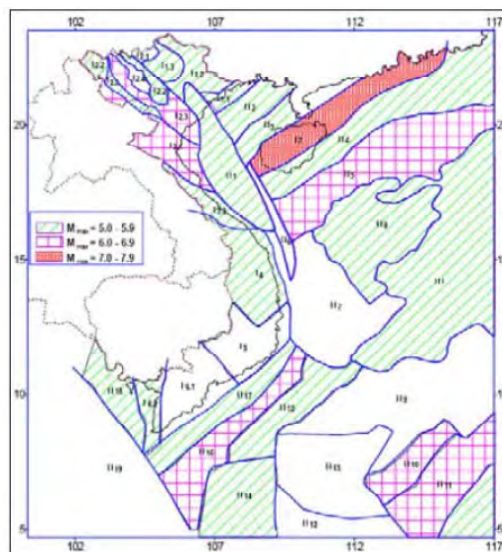
**(5) Earthquake**

Fig. 5.1-10 describes the maximum estimated earthquake zone. The highest magnitude of the estimated earthquake in the project area is below 4.9, belonging to the lowest risk category (O Mon 4 EIA 4.B.5.a, p.74).

**(6) Air Quality, Water Quality, and Soil****1) Air quality**

The air quality survey was conducted in and around the O Mon Power Complex in 5 locations in April 2008 (O Mon 3 EIA 2.3.3, p.53) and 10 locations in 2005 (O Mon 4 EIA 4.B.8.b, p.87). The result of the survey is shown in Table 5.1-1. The Vietnamese air quality standards (QCVN- 05/2009) and the guideline value (EHS: Environmental, Health, and Safety Guidelines) by International Finance Corporation (IFC) are also shown for reference.

The survey results, compared with 1 hr average value in the standards, do not exceed the air quality standards except for dust (TSP and PM<sub>10</sub>) measured in the survey point along the road.



Source: O Mon 4 EIA Figure 32, p.74

**Fig. 5.1-10 Maximum Estimated Earthquake Zones in Vietnam**

**Table 5.1-1 Air Quality Survey Result**

Parameter	Result(1 hr average value) (minimum value - maximum value)		QCVN-05/ 2009	EHS Guideline (General: 2007)
	April 2008	2005		
TSP (mg/m <sup>3</sup> )	0.10 - 0.28	0.100 - 0.310	0.30 (1 hr) 0.20 (24 hr) 0.14 (year)	-
PM <sub>10</sub> (µg/m <sup>3</sup> )	ND - 120	-	150 (24hr) 50 (year)	150 (24 hr, Interim*) -
CO (mg/m <sup>3</sup> )	2.3 - 4.8	1.0 - 6.2	30 (1 hr) 10 (8 hr) 5 (24 hr)	-
SO <sub>2</sub> (µg/m <sup>3</sup> )	39 - 69	17 - 92	- 350 (1 hr) 125 (24 hr) 50 (year)	500 (10 min) - 125 (24 hr, Interim*) -
NO <sub>2</sub> (µg/m <sup>3</sup> )	41 - 79	12 - 46	200 (1 hr) 100 (24 hr) 40 (year)	200 (1hr) - 40 (year)

\*: IFC Guideline quotes the value in WHO Guideline. WHO establishes their own interim target value for PM<sub>10</sub> and SO<sub>2</sub>.  
Source: O Mon 3 EIA Table 2.22, p.53, O Mon 4 EIA Table 30, p.87



## 2) Noise

Noise level was measured in April 2008 and 2005, at the same survey points as the air quality survey. The result is shown in Table 5.1-2. The Vietnamese noise standard (QCVN-26/ 2010) and the IFC/EHS guideline value are also shown for reference. The noise level exceeded the environmental standard in the roadside survey point, but only for a temporary period (O Mon 3 EIA 2.3.3, p.55).

**Table 5.1-2 Noise Survey Result**

Parameter	Survey period	Range(Minimum - Maximum)			QCVN-26/ 2010	EHS Guideline (General: 2007)
		LAeq	LAmin	LAmx		
Noise (dBA)	April 2008	52.4 - 62.2	41.6 - 52.7	67.7 - 78.2	Hospital and schools 06:00 - 21:00: <b>55</b> 21:00 - 06:00: <b>45</b>	Residential and educational area 07:00 - 22:00: <b>55</b> 22:00 - 07:00: <b>45</b>
	2005	57.8 - 73.2	46.3 - 54.2	80.3 - 100.1	Apartment and residence 06:00 - 21:00: <b>70</b> 21:00 - 06:00: <b>55</b>	Industrial and commercial area 07:00 - 22:00: <b>70</b> 22:00 - 07:00: <b>70</b>

Source: O Mon 3 EIA 2.23, p.55, O Mon 4 EIA Table 32, p.89

## 3) River water quality

Surface water quality analysis has been conducted around the project area: 5 points at the rivers (Hau River, Chanh Canal) (O Mon 3 EIA 2.3.1, p.44-48) in April 2008 (dry season); 14 points at Hau River near the project site in May 2007 (dry season); and 10 points at the channels around the Power Complex in August 2005 (rainy season) (O Mon 4 EIA 4.B.5.c, p.77). The survey result is shown in Table 5.1-3. The Vietnamese surface water quality standard (QCVN-08/ 2008) is also shown for reference. The surface water is classified into 4 categories based on the water usage, and Hau River corresponds to Category A2 (O Mon 4 EIA Table 6, p.24).

The survey result exceeding the environmental standard is highlighted in yellow. The value of E.Coli at certain survey points exceeds the environmental standard. From the high value of NH<sub>4</sub>-N, this may due to the domestic waste water, especially lavatory waste water, flowing into the environment. The low value of dissolved oxygen compared with the environmental standard in April 2008 may be attributed to high oxygen consumption due to eutrophication, considering the relatively high value of BOD and COD.

**Table 5.1-3 River Water Quality Analysis**

Parameter	Unit	Survey result (Minimum value – Maximum value)				QCVN-08/ 2008 (Category A2)
		April 2008(Dry season)		May 2007 (Dry season)	August 2005 (Wet season)	
		Hau River	Canals	Hau River	Canals	
pH	-	6.4 - 7.04	6.43	6.9 - 7.2	6.8 - 7.5	6 - 8.5
EC	µS/cm	185 – 187	225	162 - 199	84 - 147	-
Turbidity	NTU	16.01 - 28.82	100	12 - 28	-	-
SS	mg/L	8 – 25	98	7 - 67	81 - 128	30
TDS	mg/L	-	-	102 - 108	-	-
DO	mg/L	2.7 - 3.8	2.5	4.8 - 7.4	-	>5
BOD <sub>5</sub>	mg/L	6 – 13	17	1.0 - 8.0	2.0 - 4.2	6
COD	mg/L	11 – 22	26	3 - 13	-	15
NO <sub>3</sub>	mg/L	0.46 - 0.65	0.88	-	-	5
NO <sub>2</sub>	mg/L	0.009 - 0.014	0.007	-	-	0.02
NH <sub>4</sub>	mg/L	0.56 - 0.85	1.34	0.12 - 0.41	0.05 - 0.10	0.2
T-N	mg/L	1.69 - 2.85	3.36	-	-	-
T-P	mg/L	0.22 - 0.46	0.78	0.51 - 0.92	0.07 - 0.15	-
Cl <sup>-</sup>	mg/L	11.5 - 13.6	14.1	-	-	400
Fe	mg/L	0.29 - 0.82	0.43	0.11 - 0.61	0.34 - 0.74	1
Oil	mg/L	0.02 - 0.06	0.04	0.00 - 0.17	0.02 - 0.10	0.02
E.coli	MPN/100mL	630 – 21000	34000	430 - 2.4 × 10 <sup>6</sup>	3500 - 11000	5000
Coliform	MPN/100mL	-	-	0 - 11	-	50

Source: O Mon 3 EIA Table 2.16, p.46, O Mon 4 EIA Table 27, p.78

#### 4) Ground water quality

Ground water quality analysis has been conducted in: 5 points in and around the project area in April 2008 (O Mon 3 EIA 2.3.1, p.48-50), and 5 points around the O Mon Power Complex in 2007 (O Mon 4 EIA 4.B.2, p.71). The result is shown in Table 5.1-4. The Vietnamese ground water quality standard (QCVN-09/2008) is also shown for reference.

The survey result exceeding the environmental standard is highlighted in yellow. NH<sub>4</sub><sup>-</sup> exceeds the environmental standard at the survey point near the residential area, which is considered as due to the domestic waste water. Arsenic concentration, which is a common issue in South and South-east Asia, is below the environmental standard.

**Table 5.1-4 Ground Water Quality Analysis**

Parameter	Unit	Survey result (Minimum value – Maximum value)		QCVN-09/ 2008
		April 2008	2007	
Temperature	°C	-	28.88 - 29.53	-
pH	-	6.46 - 7.02	6.77 - 7.18	5.5 - 8.5
EC	µS/cm	586 - 988	570 – 1213	-
Turbidity	NTU	4.04 - 8.98	0.9 - 65.6	-
Salinity	-	-	57.0 - 401.8	-
SS	mg/L	7 - 23	-	-
BOD <sub>5</sub>	mg/L	1 - 6	-	-
NH <sub>4</sub> <sup>-</sup>	mg/L	0.047 - 1.054	0.6 - 3.1	0.1
NO <sub>3</sub> <sup>-</sup>	mg/L	0.06 - 0.16	0.02 - 0.02	15
NO <sub>2</sub> <sup>-</sup>	mg/L	ND - 0.010	0.008 - 0.008	1.0
Al	mg/L	-	0.027 – 0.071	-
As	µg/L	0.48 - 1.46	0.0 – 6	50
Cd	µg/L	-	0.012 - 0.012	5
Cr	µg/L	-	0.08 – 0.8	50 (Cr <sup>6+</sup> )
Fe	mg/L	0.05 - 0.16	0.063 - 3.77	5
Hg	µg/L	-	0.16 - 0.16	1
Mn	mg/L	-	0.059 - 0.14	0.5
Zn	mg/L	-	0.005 - 0.012	3.0
Cl <sup>-</sup>	mg/L	14.62 - 25.31	-	-
T-N	mg/L	0.29 - 3.25	-	-
T-P	mg/L	0.10 - 0.21	-	-
Oil & Grease	mg/L	-	0.016 - 0.016	-
Total Coliform	MPN/100mL	2 - 14	-	3

Source: O Mon 3 EIA Table 2.18, p.49, O Mon 4 EIA 25, p.76

## (7) Organisms

### 1) Vegetation

Due to the agricultural activities of the local people, the ecosystem of the O Mon Power Complex is a mixture of natural and agricultural vegetation. The inland ecosystem survey of the project area was conducted in April 2008. 157 species of flora were observed. 154 species belong to angiosperm, and 3 species belong to Polypodiophyta branch. Various flora species are observed in the area including 16 species of Fabaceae, 13 species of Poaceae, 11 species of Asteraceae, 8 species of Amaranthaceae, 7 species of Euphorbiaceae, and 6 species of Rutaceae, but fruit trees including mangoes and longans are dominant in number (O Mon 3 EIA 2.4.1, p.56-57).

According to the composition of flora in the area, 82 species of herbaceous species, 48 species of timber and 27 species of shrub, of which 110 species are the wild origin and 47 species are crop plants (O Mon 3 EIA 2.4.1, p.57).

Along the Hau River bank, one species of mangrove, water hyacinth and wild pineapple are distributed and they are playing roles of protecting the river bank from erosion. The ecosystem along the canals is a mixture of various flora including cybreass and water hyacinth (O Mon 3 EIA 2.4.1, p.57).

## 2) Terrestrial Fauna

The survey of the terrestrial fauna was conducted in 2007-2008 and 2010 at the project site. Results obtained from interviews with local residents in 2008 found that fauna in the Project area is similar to the one observed in other rural areas of Mekong Delta such as amphibian species (e.g. frogs and toads), reptiles (e.g. snakes and lizards), and birds (O Mon 4 EIA 4.A.c, p.55).

## 3) Aquatic organisms

The ecosystem in this area is established on the high water temperature environment in the tropical climate, typical of the downstream of Mekong River, and affected by domestic waste water (O Mon 3 EIA 2.4.2, p.60).

According to the survey of the aquatic ecosystem of the area in April 2008, 73 species of phytoplankton was collected, of which Bacillariophyta was the largest both in number of species (29 species) and in number of cells (2,500 - 8,800 cells/L) (O Mon 3 EIA 2.4.2, p.58-61). 29 species of zooplankton was collected, of which Cladocera and Copepoda were the largest in number of species (9 species). The quantity of Zooplankton in Hau River is 1500-6500 individuals/m<sup>3</sup> and 6,500 - 14,000 individuals/m<sup>3</sup> in Vam canal and Chanh canal, and Copepoda was the largest in number. 19 species of benthos were observed, and Bivalvia was the largest in species number (8 species) and individual number (90-900 individuals/m<sup>2</sup>) (O Mon 3 EIA 2.4.2, p.58-61).

There are many crustacean species living in the Hau River but only species of Green shrimps (genus *Machrobrachium*) have high economic value. The mother shrimps migrate to brackish water of the river close to sea for spawning. After metamorphosis, the larvae migrate back to freshwater areas of the Hau River (O Mon 4 EIA 4.A.2.b.iv, p.66).

## 4) Fish

The recent studies have defined, out of 217 species of fish in Hau River, Cyprinidae (67 species), Siluriformes (51 species), Gobiidae (10 species), Clupeidae (7 species), Anabantidae (6 species), Engraulidae (5 species), Mastacembelidae (4 species), and Ophiocephalidae (4 species). The species are classified into 3 groups: fresh water fish (*Puntius*, *Cirrhinus*, *Pangasius*, *Leptobarbus*, *Osteochilus*), field fish (eel, catfish, jewfish), and sea fish (Clupeidae, Mugilidae, Scaenidae, Soleidae) (O Mon 3 EIA 2.4.6, p.61-62). There are also some imported species (*Oreochromis mossambicus*, *O. niloticus*, *Helostoma teminckii*, *Osphronemus goramy*, *Cyprinus carpio*, *Aristichthys nobilis*) (O Mon 3 EIA 2.4.6, p.62).

In the 2007 survey, 55 species of stationary fish were observed, most of which belong to the taxonomic groups as Perciformes, Cypriniformes and Siluriformes. The shallow areas of the Hau River covered with water hyacinth are used as spawning and nursery areas for many fish species. The north side of the river has larger areas of shallow water covered with vegetation compared to the south side. Shallow areas in general, and especially on the north side of the river are important spawning and nursery areas for fish (O Mon 4 EIA 4.A.2.b.iv, p.65).

The survey found 21 migratory fish species, most of which belonging to the same taxonomic groups as Perciformes, Cypriniformes, Siluriformes as the stationary species. There are two groups of migratory species: the fresh water group migrating into the O Mon area from upstream areas in the Mekong River; and the brackish water group migrating from estuarine

areas in the Mekong Delta near the sea. Examples of the species from the fresh water group are *Pangasius*, *Labiobarbus lineate*, *L. siamensis*, *Cirrhinus jullieni*, *Osteochilus microcephalus*, while the species of brackish water group are *Plotosus canius*, *Nibea soldado*, *Lates calcarifer* (O Mon 4 EIA 4.A.2.b.iv, p.65-66).

The fish species in the Mekong River generally move upstream in the dry season and downstream in the rainy season. Thus, more migratory species are observed in the O Mon area of the Hau River during the rainy season. In particular during the rainy season, eggs, larvae and young fish belonging to the shark catfish (Pangasiidae) and minnows (Cyprinidae) are drifted toward downstream from the O Mon area. This passive drifting is important for the production of mature fish. Similar to the stationary fish species, shallow areas of the Hau River are important nursery areas for migratory species as well. Some of the migratory fish species also move to inland waters through the O Mon River and Chanh Creek (O Mon 4 EIA 4.A.2.b.iv, p.65-66).

## 5) Rare Species

### (a) Terrestrial organisms

#### - Flora

Flooding soil ecosystem of *Sonneratia* (mangrove) growing along Hau River is categorized as Vulnerable in Vietnam (O Mon 3 EIA 4.15, p.134), but is not observed around the project site (2nd field survey). Based on the ecological surveys conducted, one IUCN Red Listed plant species classified as VU (vulnerable) has been observed in the O Mon Power Complex, which is the Takian tree (Dipterocarpaceae). All of these species have been cultivated and not a wild species (O Mon 4 EIA 4.A.1.d, p.55-56).

#### - Fauna

Fauna in the O Mon Power Complex is similar to the one observed in other rural areas of Mekong Delta such as Amphibian (e.g. frogs and toads), Reptile (e.g. snakes and lizards), and Aves (O Mon 4 EIA 4.A.c, p.55).

### (b) Fish

The 2007 survey observed the six fish species listed in the Vietnamese Red List in the vicinity of the O Mon Power Complex (Table 5.1-5). Four species are listed as VU (vulnerable), which is the second highest risk category and a higher level than T (threatened). These species are the surface fishes, inhabiting below the temperature of 30°C. Their reproduction period is mainly during the rainy season (O Mon 4 EIA 4.A.2.b.v, p.67).

**Table 5.1-5 Rare Fish Species**

Family	Scientific name	English name	Category in Vietnam	IUCN 2011	CITES 2010/10
Notopteridae	<i>Chitala ornata</i>	Clown featherback	VU	-	-
Cyprinidae	<i>Labeo chrysophekadion</i>	Black sharkminnow	T	-	-
Datnioidide	<i>Datnioides microlepis</i>	Finescale tigerfish	VU	-	-
Datnioididae	<i>Datnioides polota</i>	Four-barred tigerfish	VU	-	-
Toxotidae	<i>Toxotes chatareus</i>	Spotted archerfish	VU	-	-
Channidae	<i>Channa micropeltes</i>	Giant snakehead	T	-	-

Note : VU=Vulnerable, T=Threatened

Source: O Mon 4 EIA Table 19, p.67

The giant barb (*Catlocarpio siamensis*) listed as EN (endangered; the highest risk category), the isok barb (*Probarbus jullieni*) and small scale mud carp (*Cirrhinus microlepis*) listed as VU are observed in a survey of a large area of Hau River. *Catlocarpio siamensis* is categorized as CR (Critically Endangered), *Probarbus jullieni* as EN (Endangered), and *Cirrhinus microlepis* as VU, according to IUCN Red List of 2011 (O Mon 4 EIA 4.A.2.b.v, p.67).

### 5.1.3 Socio-Economic Situation

#### (1) Population and Industry

Surround the O Mon Power Complex is a rural region. O Mon District has the area of 125.4 km<sup>2</sup> with the population of 128,000 habitants (estimated in 2005). The main local industry is not-mechanized aquaculture and agriculture. The productivity highly depends on the weather. The average per capita income is about 10,000,000 VND a year (O Mon 3 EIA 2.5.1, p.63).

Can Tho City has two industrial complexes (Tra Noc industrial complex with 300 ha and Hung Phu industrial complex with 488 ha) and a 150 ha of a center for industry and handicrafts in Thot Not district. In O Mon District, 2 cement factories, one pesticide factory (Tay Do garment industry), and one shipyard are operating. Besides, there are more than 3,600 small-scale enterprises operating in different activities: industry, service, and processing. The Tra Noc industrial complex is expanding into Phuoc Thoi ward, O Mon district (O Mon 4 EIA 4.C.5, p.91-92).

The economic situation of Phuoc Thoi Ward and Thoi An Ward in 2007, where the proposed O Mon Power Complex is located, is described in Table 5.1-6 (O Mon 3 EIA 2.5.2, p.65-71).

**Table 5.1-6 Economic Situation of Phuoc Thoi Ward and Thoi An Ward**

Item	Phuoc Thoi ward	Thoi An Ward
Industry	<ul style="list-style-type: none"> <li>- Total production of industry is 491,450million VND, consisting mainly small scale industry.</li> <li>- There are 195 businesses, including construction material, agricultural material, variety stores and mechanical repair service.</li> <li>- The local People's Committee is making efforts to improve power supply to the poor population.</li> </ul>	<ul style="list-style-type: none"> <li>- There are 1,007 enterprises with the total production of 202,758,000 VND.</li> <li>- The district has invested on 4 projects in the ward (road, market improvement, school, bridge).</li> </ul>
Agriculture (rice)	<ul style="list-style-type: none"> <li>- winter-spring: 1,169 ha, 7,014t (6t/ha)</li> <li>- summer-autumn: 612.4 ha, 2,572t (4.2t/ha)</li> <li>- autumn-winter: 975 ha, 3,510t (3.6t/ha)</li> </ul>	<ul style="list-style-type: none"> <li>- winter-spring: 1,000 ha, 6,693 t (6.69t/ha)</li> <li>- summer-autumn: 656 ha, 2,811t (4.5 t /ha)</li> <li>- autumn-winter: 950 ha, 3,895 t (4.1 t /ha)</li> </ul>
Agriculture (other products)	<ul style="list-style-type: none"> <li>- total farm land: 470.7 ha</li> <li>- products: soy beans, sesame seeds, etc</li> </ul>	<ul style="list-style-type: none"> <li>- total farm land: 616 ha</li> <li>- products: soy beans, sesame seeds, etc (1,278t)</li> </ul>
Aquaculture	<ul style="list-style-type: none"> <li>- Culture pond area:73 ha including 6 ha for shrimp feeding</li> </ul>	<ul style="list-style-type: none"> <li>- Culture pond area 324.1 ha</li> <li>- Total production:97.230t, 1,361million VND, profit: 376millionVND</li> </ul>
Livestock	<ul style="list-style-type: none"> <li>- Poultry: 18,188</li> <li>- Cow: 114</li> <li>- Pig: 4,674, including 374 for breeding</li> </ul>	<ul style="list-style-type: none"> <li>- Poultry: 29,653 including 25,056 ducks</li> <li>- Cow: 24 (milk cow: 3, beef cattle: 21)</li> <li>- Pig: 2,816, including 375 for breeding</li> <li>- Total production: 317t</li> </ul>
Finance	<ul style="list-style-type: none"> <li>- Ward's budget: 2,707,283,031 VND</li> <li>- Subsidies: 4,378,138,931 VND</li> </ul>	<ul style="list-style-type: none"> <li>- Ward's budget: 1,983,000,000 VND</li> <li>- Subsidies: 1,295,000,000 VND</li> </ul>

Source: O Mon 3 EIA 2.5.2, p.65-71

**(2) Land Use**

Table 5.1-7 describes the current land use of O Mon District, Phuoc Thoi ward, and Thoi An Ward (2006). There is almost no forest in the area (O Mon 4 EIA 4.C.4, p.90-91).

*Table 5.1-7 Current Land Use*

Land use type	O Mon District	Phuoc Thoi ward	Thoi An Ward
Total area (ha)	12,540	2,700	2,400
Agricultural land (ha)	9,300	1,500	1,700
- Forestry (ha)	0.14	-	-
Non agricultural land (ha)	3,250	1,200	700
- Residential land (ha)	550	58	150
- Special use land (ha)	1,300	800	75
- Others (ha)	1,400	310	

**(3) Public Health Care**

The public health care system around the O Mon Power Complex is generally well-organized around the project site. In 2007, 24,276 cases of medical examination and treatment took place. In 2006, 171 local officers worked for inoculation for prevention of infectious disease (O Mon 3 EIA 2.5.1, p.64).

In 2005, Can Tho City General Hospital, which has a capacity of 700 beds, and many private hospitals have started their operation. There are medical centers in each district and medical stations in each ward. Besides disease treatment tasks, these medical centers and stations are also responsible for free vaccination for infectious disease prevention (O Mon 4 EIA 4.C.3, p.90).

**(4) Transportation**

The main roads are National highway No.1, No.91B and No.61 connecting Can Tho City and other provinces in the region. These traffic ways are used for transporting goods and materials from Ho Chi Minh City. The national road No. 91 and 91B are connected with national road No.1, across O Mon district with a length of 20 km. The national road No.91 runs through four provinces (O Mon 4 EIA 4.C.6. p.92).

Can Tho port has a jetty with the capacity of 10,000 ton. Cai Cui port (coast) in the first phase has 3 jetties with the capacity of 10,000 ton, in which one dock is used for containers specifically, including a container yard of 28,000 m<sup>2</sup>, another commodity yard of 8,000 m<sup>2</sup> and a warehouse of 36,000 m<sup>2</sup> (O Mon 4 EIA 4.C.6. p.92).

There are plans to develop an international water transport system based on Hau River and a local waterways, linking Cai San, Can Tho, O Mon and Thot Not rivers. Tra Noc airport will be upgraded to have an international terminal (O Mon 4 EIA 4.C.6. p.92).

**(5) Electricity and Water Sources**

Tra Noc thermal power plant has a capacity of 200 MW supplying power to whole region. There are two water plants, supplying 7,000 m<sup>3</sup> per day. A new water plants with the total capacity of 200,000 m<sup>3</sup> per day will be built in Hung Phu Industrial Complex to provide clean water for



production and daily living (O Mon 4 EIA 4.C.7. p.92-93).

Electricity access on a household basis in O Mon district is over 99% according to the People's Committee annual report. The figures for Thoi An ward and Phuoc Thoi ward are 99% and 90%, respectively. Service water access on a household basis in O Mon district is over 88% according to the People's Committee annual report. The figures for Thoi An ward and Phuoc Thoi ward are 98% and 94%, respectively (O Mon 4 EIA 4.C.7. p.92-93).

#### (6) Heritage

There are no historical, cultural and/or religious monuments in the project site (O Mon 3 EIA 2.5.1, p.65).

#### (7) Fisheries

According to the price list of the fish products in the market, about 57 species of fish with economic value living in Hau River are defined, including 19 species of Cyprinidae family, 7 species of Schilbeidae and 4 species of Anabantidae. Most of those fish weigh 0.1-1.0kg at the age of 1 year. Some species such as *Ophiocephalus*, *Micropeltes*, *Pangasius pangasius*, *P. micronemus*, *Plotosus canius* weighs over 10kg, but most of the individuals fishes sold in the market are 1-3kg/unit. About 15 species of fish are cultivated in Hau River (O Mon 3 EIA 2.4.6, p.62-63).

#### (8) Fishing Ground

Chauphu district in Angiang province has the largest fish catch in the whole Hau River area. Angiang Province is located upstream of Hau River near the boundary with Cambodia (O Mon 1 EIA 3.3.3, p.64).

Although small scaled, private fishery is not prohibited in the front area of the O Mon Power Complex, large scale fishery may obstruct the water traffic and is prohibited. 10 fishermen are currently in operation in Hau River near the O Mon Power Complex. They move upstream and downstream depending on the season and the growing of fish, so they have no fixed fishing ground (2nd field survey).

O Mon 3 Environmental Impact Assessment (EIA) states that there is a "fishery operated mainly by women". Practically, in the common lifestyle of the local people living around the project site, the actual operation of fishing is mainly done by men, and women are only playing supporting roles (transportation and selling of fish), and "fishery operated mainly by women" has not been observed (2nd field survey).



## **5.2 INSTITUTIONS AND ORGANIZATIONS FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS IN VIETNAM**

### **5.2.1 Laws and Regulations regarding EIA**

Law on Environmental Protection was enforced in 1994 and environmental standards for air, water and waste were regulated. In 2002, Ministry of Natural Resources and Environment (MONRE) was established for the purpose of strengthening of national management of the environment and resources. In 2003, Environmental Protection Strategy of Vietnam (Decision 256/2003/QD-TTg) was prepared which indicates the environmental subjects to be tackled till the year of 2010 and the directions of solution to environmental problems for 2020. Thus, Vietnam has been establishing a system for environmental administration.

Environmental Protection Strategy of Vietnam states the basic principle for managing the environment including the important and long-term subjects in environmental field. However, the strategies including specific measures to accomplish such principles have not yet been indicated. Improvement of the system and managing organization has been preceded the specific strategies.

Amended Law on Environmental Protection (No.52/2005/QH11) mainly deals with regulation and management, though it states specific requirement for political instruments and polluted facilities. Management tool such as EIA, EPC or EPP certification that is regulated under the law is pointed out to get improved to make it more effective.

Table 5.2-1 shows the list of laws and regulations regarding environmental management in Vietnam.

**Table 5.2-1 Laws and Regulations regarding Environmental Management in Vietnam**

Category	Laws/Regulations	
General	Environmental Protection Strategy of Vietnam	Decision 256/2003/QD-TTg
	Law on Environmental Protection	No.52/2005/QH11
	Detailing and Guiding the Implementation of a Number of Articles of the Law on Environmental Protection	Decree No.80/2006/ND-CP
	Providing Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitment	Decree No.29/2011/ND-CP
	Sanctioning of Administrative Violations in the Domain of Environmental Protection	Decree No.81/2006/ND-CP
	Guideline for Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitments	Circular No.05/2008/TT-BTNMT
	Providing for the Environmental Protection at Stages of Elaboration, Evaluation, Approval and Implementation of Development Strategies, Plannings, Plans, Programs and Projects	Decree No.140/2006/ND-CP
	Amending and Supplementing a Number of Articles of the Government Decree No.80/2006/ND-CP	Decree No.21/2008/ND-CP
	Decree on River Basin Management	Decree No.120/2008/ND-CP
	Providing for Incentives and Supports for Environmental Protection Activities	Decree No.04/2009/ND-CP
	Detailing a number of articles of Decree No.29/2011/ND-CP	Circular No.26/2010/TT-BTNMT
Air quality	National Technical Regulation on Hazardous Substances in Ambient Air Quality	QCVN 05/2009/BTNMT
	National Technical Regulation on Hazardous Substances in Ambient Air	QCVN 06/2009/BTNMT
	National Technical Regulation on Industrial Emission of Inorganic Substances and Dusts	QCVN 19/2009/BTNMT
	National Technical Regulation on Industrial Emission of Organic Substances	QCVN 20/2009/BTNMT
	National Technical Regulation on Emission of Thermal Power Industry	QCVN 22/2009/BTNMT
Water quality	The Law on Water Resource	No.8/1998/QH10
	National Technical Regulation on Surface Water Quality	QCVN 08/2008/BTNMT
	National Technical Regulation on Underground Water Quality	QCVN 09/2008/BTNMT
	National Technical Regulation on Coastal Water Quality	QCVN 10/2008/BTNMT
	National Technical Regulation on Domestic Wastewater	QCVN 14/2008/BTNMT
	National Technical Regulation on Domestic Water Quality	QCVN 02/2009/BTNMT
	National Technical Regulation on Industrial Wastewater	QCVN 40/2011/BTNMT
Waste	Environmental Protection Charges for Solid Wastes	Decree 174/2007/ND-CP
	Promulgating the list of hazardous wastes	Decision 23/2006/QD-BTNMT
	Solid Waste Management	Decision 59/2007/ND-CP
	Guiding the practice conditions, procedures for compilation of dossiers, registration and licensing of practice and hazardous waste management identification numbers	Circular 12/2006/TT-BTNMT
	National Technical Regulation on Hazardous Waste Thresholds	QCVN 07/2009/BTNMT
Noise	National Technical Regulation on Noise	QCVN 26/2010/BTNMT
Vibration	National technical Regulation on Vibration	QCVN 27/2010/BTNMT
Soil	National Technical Regulation on the Allowable Limits of Heavy Metals in the Soils	QCVN 03/2008/TNMT
Forest	The Law on Forest Protection and Development	No.29/2004/QH11
	Implementation of the Law on Forest Protection and Development	Decree No.23/2006/ND-CP
Biodiversity	Law on Biodiversity	No.20/2008/QH12
Environmental Assessment	Providing Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitment	Decree No.29/2011/ND-CP
Land Use, Resettlement, Compensation	Law on Land	No.13/2003/QH11
	Providing for Implementation of Law on Land	Decree No.181/2004/ND-CP
	Compensation, Support and Resettlement When Land is Recovered by the State	Decree No.197/2004/ND-CP
	Additionally Stipulating the Grant of Land Use Right Certificates, Recovery of Land, Exercise of Land Use Rights, Order and Procedures for Compensation, Support and Resettlement upon Land Recovery by the State, and Settlement of Land-Related Complaints	Decree 84/2007
	Price Determination Methods and Price Frameworks for All Types of Land	Decree No.123/2007/ND-CP
	Decree: Additionally Providing for Land Use Planning, Land Prices, Land Recovery, Compensation, Support and Resettlement	Decree No.69/2009/ND-CP

Source : Website of Ministry of the Environment, Government of Japan (Retrieved on November, 21<sup>st</sup>, 2011) etc.

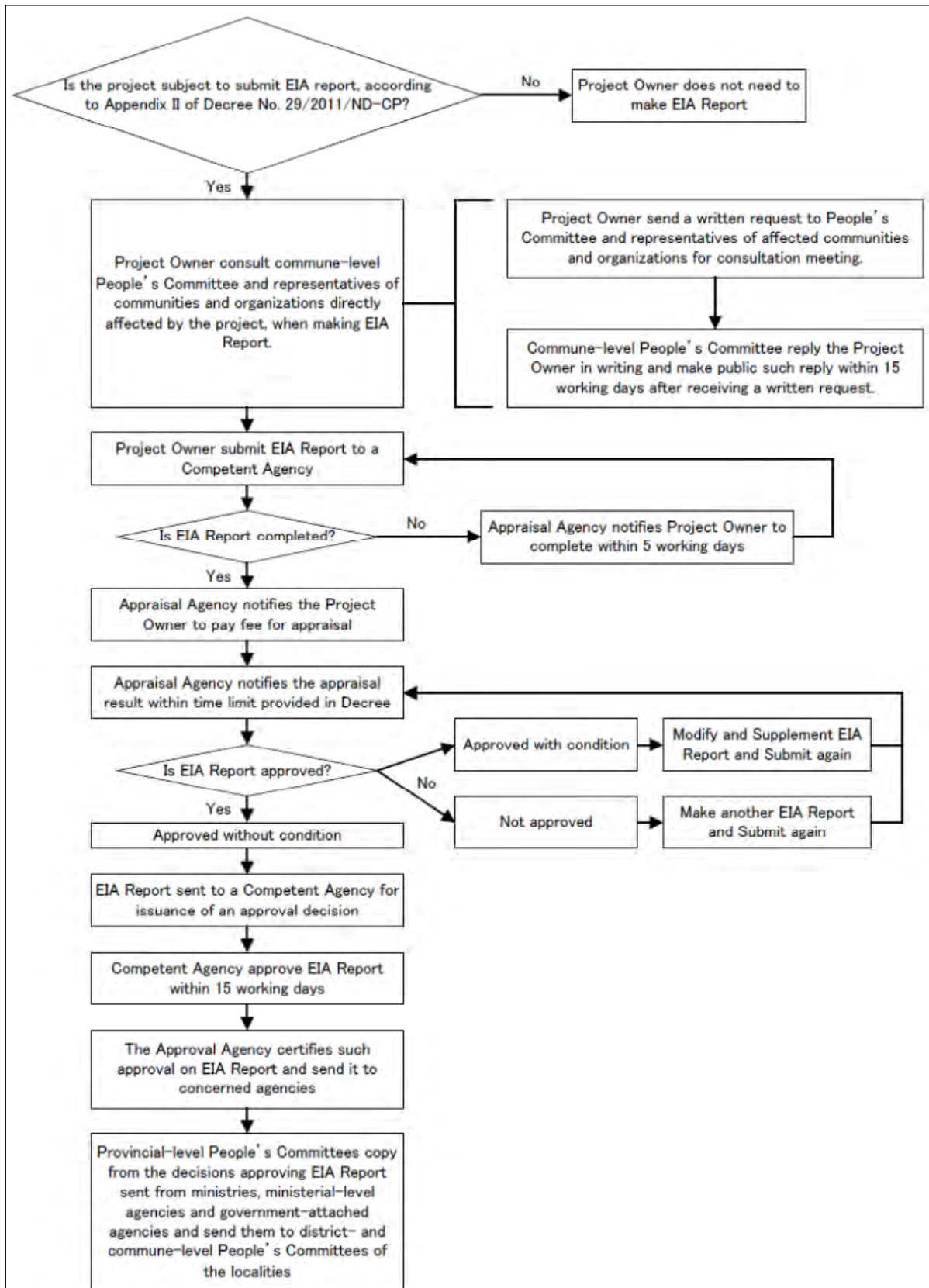
## **5.2.2 EIA-related Organizations and Process**

Decree No.80/2006/ND-CP Appendix-II indicates the list of the projects that require EIA. Provincial People's Committee usually approves EIA, but for nuclear power plant and large scale (more than 600MW) thermal power plant (like this project), it is MONRE role to approve the EIA.

Decree No.29/2011/ND-CP that became effective on June 5th, 2011 was partly amended from Decree No.80/2006/ND-CP. This Decree indicates the EIA approval process as well, and Fig. 5.2-1 was made based on this Decree. The project owner conducts consultation meetings with the representatives of People's Committee and Further Front Committee at commune-level. After that, EIA report is prepared and submitted to the competent agency. Appraisal agency notifies the project owner to complete and resubmit the EIA report, if it is found to be incomplete. If EIA report is evaluated as complete, appraisal agency notifies the project owner to pay fee for appraisal before examining the EIA report. Then the EIA report is examined, if conditions which some part of the EIA report should be changed are given, the project owner submits supplemental EIA. If EIA is not approved, another EIA report needs to be prepared and submitted again.

## **5.2.3 Diversion from JICA Guidelines for Environmental and Social Considerations (April, 2010)**

Circular No.05/ 2008/ TT-BTNMT stipulates the contents of EIA. Table 5.2-1 shows the comparison among JICA Guidelines for Environmental and Social Considerations, World Bank (OP 4.01 Annex B) and Vietnamese Guideline (Circular No. 05/2008) on the contents of EIA report. In accordance with this Circular, EIA report for O Mon III Power Plant Project was finalized in January, 2011 by taking into account the comments from MONRE made on November 17th, 2008.



Prepared based on Decree No.29/2011/ND-CP

**Fig. 5.2-1 Flow of EIA Process**

**Table 5.2-2 Comparison among JICA Guideline, World Bank (OP 4.01) and Vietnamese Guideline (Circular No. 05/2008) on the Contents of EIA Report**

Content	JICA Guideline on Environmental and Social Consideration	World Bank (OP4.01, Annex B)	Circular No.05/2008(Guideline for Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitments)	Gap between JICA Guideline and Vietnamese Guideline/ Action to be taken
Executive Summary	This concisely discusses significant findings and recommended actions.	Concisely discusses significant findings and recommended actions.	N/A	There is a gap.
Policy, legal, and administrative framework	This is the framework within which the EIA report is to be carried out.	Discusses the policy, legal, and administrative framework within which the EA is carried out. Explains the environmental requirements of any co-financiers. Identifies relevant international environmental agreements to which the country is a party.	oN/A	There is a gap. We will prepare for Vietnamese policy, legal and administrative framework.
Project Description	This describes the proposed project and its geographic, ecological, social and temporal context, including any off-site investments that may be required (e.g. dedicated pipelines, access roads, power plants, water supply, housing, or raw material and product storage facilities). It also indicates the need for any resettlement or social development plan. It normally includes a map showing the project site and the area affected by the project.	Concisely describes the proposed project and its geographic, ecological, social, and temporal context, including any offsite investments that may be required (e.g., dedicated pipelines, access roads, power plants, water supply, housing, and raw material and product storage facilities). Indicates the need for any resettlement plan or indigenous peoples development plan. Normally includes a map showing the project site and the project's area of influence.	<p><b>Chapter 1: BRIEF DESCRIPTION OF PROJECT</b></p> <p>1.1 Name of project Name must be the same as the name that is indicated in the Investment report/ economic-technical report or equivalent document of project.</p> <p>1.2 Project owner Full and accurate names, addresses and contacts of owner; and full names and working titles of head of owner.</p> <p>1.3 Location of project Detail description of geographical configuration (including co-ordinates, boundaries.... in case of natural resource exploitation projects, use VN2000 coordinate system to reflect angular coordinates) of the project location in relation with natural factors (road network; system of rivers, streams, lakes and water ponds; mountains and hills...) , social and economic factors (resident areas, urban living squares, production- business- service activities, cultural and religious constructions, historical relics...) and other factors around the project location; and attached by a geographical map with details of above factors and clear legends.</p> <p>1.4 Main contents of project</p> <ul style="list-style-type: none"> <li>- Full list of details, describing scale and scope (spatial and temporal) of all construction components that need to be done during project implementation, attached by an overall ground map locating all components or individual maps of each component. Components are classified into 2 following types: <ul style="list-style-type: none"> <li>+ Main components: Those serve the main objectives of project: production, business, or services;</li> <li>+ Auxiliary components: that support and supplement the main components, such as: transportation, telecommunication, power supply, water supply, rain water drainage, waste water drainage, resident removing and resettlement, green coverage for environmental protection, waste water treatment stations, solid waste collection points or treatment stations (if there are) and other constructions.</li> </ul> </li> <li>- Detail and specific description of production and operational technologies of project, and of individual components of project, attached by an illustrated diagram. In this diagram, there must be clear indication of environmental issues, which could occur, such as: wastes and other impacts (if there are).</li> <li>- Full list of machinery and equipment that are needed for project, attached by instructions of producers showing the country they are made in, year of manufacture, current condition (remaining percentage or new).</li> <li>- Full list of compound, nature of materials, fuels, input substances and instruction of trade mark and chemical formulas (if there are).</li> <li>- Detailed description of implementation process of project's construction items from commencement to completion and operation.</li> <li>- Total investment and funding of project, specifying the sum for environmental protection activities.</li> <li>- Organization of project management and implementation.</li> </ul>	There is no gap. We will add the most recent information in the Final Report.
Baseline Data	This assesses the dimensions of the study area and describes relevant physical, biological, and socio-economic conditions, including all changes anticipated to occur before the project commences. Additionally, it takes into account current and proposed development activities within the project area but not directly connected to the project. Data should be relevant to decisions about project site, design, operation, or mitigation measures, and it is necessary to indicate the accuracy, reliability, and sources of the data.	Assesses the dimensions of the study area and describes relevant physical, biological, and socioeconomic conditions, including any changes anticipated before the project commences. Also takes into account current and proposed development activities within the project area but not directly connected to the project. Data should be relevant to decisions about project location, design, operation, or mitigatory measures. The section indicates the accuracy, reliability, and sources of the data.	<p><b>Chapter 2:NATURAL, ENVIRONMENTAL, ECONOMIC AND SOCIAL CONDITIONS</b></p> <p>2.1 Natural and environmental condition:</p> <ul style="list-style-type: none"> <li>- Geographical and geological condition: Indication and description of only objects, phenomena, and processes that are impacted by project (for projects that make changes of geographical factors, landscapes; mining projects and others that relate to underground constructions, description needs to be more detail); and indicating what data sources and documents would be used or referred to.</li> <li>- Meteorological and hydrographical condition: Indication and description of only objects, phenomena, and processes that are impacted by project (for projects that make changes of meteorological and hydrographical factors, description needs to be more detail); and indicating what data sources and documents would be used or referred to.</li> </ul>	There is no gap. We will add the most recent information in the Final Report.

Content	JICA Guideline on Environmental and Social Consideration	World Bank (OP4.01, Annex B)	Circular No.05/2008(Guideline for Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitments)	Gap between JICA Guideline and Vietnamese Guideline/ Action to be taken
			<ul style="list-style-type: none"> <li>+ Meteorology: Specify average data of months in many years in project site, for example, air temperature, humidity, speed, direction and frequency of wind, sun and radiation, rainfall, storm and other conditions;</li> <li>+ Hydrography: Specify hydrographical parameters in project site such as water flow, water speed, level and other conditions.</li> <li>- Current condition of natural environmental factors: Indication and description of only environmental factors that are directly impacted by project, such as: air pollution or air waste emission of project (attention should be paid to areas that locate behind the project in the main wind direction), water sources that get waste water directly from project, land, sediment and animal environment that is impacted direct by wastes or other factors of project.</li> </ul> <p>2.2. Economic and social condition:</p> <ul style="list-style-type: none"> <li>- Economic condition: Indication of only economic activities (industry, agriculture, transportation, mining, tourism, trade, services and others) in the project areas and neighboring areas; indication of data sources and documents for reference and use.</li> <li>- Social condition: Indication of only cultural, social, religious, belief constructions, historical relics, resident areas, urban living squares and other relating constructions in the project areas and neighboring areas; indication of data sources and documents for reference and use.</li> </ul>	
Environmental Impacts	This predicts and assesses the project's likely positive and negative impacts in quantitative terms, to the extent possible. It identifies mitigation measures and any negative environmental impacts that cannot be mitigated, and explores opportunities for environmental enhancement. It identifies and estimates the extent and quality of available data, essential data gaps and uncertainties associated with predictions, and it specifies topics that do not require further attention.	Predicts and assesses the project's likely positive and negative impacts, in quantitative terms to the extent possible. Identifies mitigation measures and any residual negative impacts that cannot be mitigated. Explores opportunities for environmental enhancement. Identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions, and specifies topics that do not require further attention.	<p>Chapter 3:ASSESSMENT OF ENVIRONMENTAL IMPACTS</p> <p>3.1 Causes of impacts Assessment on project's impacts on natural and socio-economic environment is conducted by project stages (preparation, construction and operation) and must be specific on each source of impacts and each subject to be impacted. Each impact must be assessed in details in terms of level and volume of space and timing (detailed and specific assessments, not general theories as curriculum, procedure, regulation or guideline).</p> <ul style="list-style-type: none"> <li>- Impacts that relocate to waste: Detail list of all possibilities of producing solid, liquid, air wastes and other wastes during project implementation. Quantitative calculation and detail classification (on spatial and temporal aspects) all individual possibilities. Comparisons and matching with current criteria, norms and regulation (if there are).</li> <li>- Impacts that do not relate to wastes: Detail list of all impacts that do not relate to wastes, such as: eroded, slide, collapsed, sunk land; erosion of river, stream, lake and sea banks; raised level of river, stream, lake and sea bed; changes of surface water level and underground water; salt water invasion; alum water invasion; changes of micro climate; degrading of environmental factors; changes of bio-diversification and other causes. Detail estimation of extension, time and location of impacts. Comparisons and matching with current criteria, norms and regulation (if there are).</li> <li>- Forecasting environmental risks that project may take: Only risks that project may take during implementation and operation.</li> <li>- Subjects to be impacted: all natural, economic, cultural, social, religious subjects and historical monuments and others in project site and surrounding areas which are affected by sources relating/not relating to waste and by risks of environmental incidents in project stages (preparation, construction and operation).</li> <li>- Forecast of risks of environmental incidents by project: Only mention possible risks in stages of construction and operation.</li> </ul> <p>3.2 Remarks on detailed level and reliability of assessments Objective remarks on detailed level and reliability of assessments on environmental impacts and risks of environmental incidents that likely occur in project implementation and not implementation. In case of insufficient reliability, raise objective and subjective reasons (shortage of information, data, material; obsolete data; inaccurate date; limited reliability of assessment methodology; limited capacity of EIA staffs; and other reasons.)</p> <p>3.3 Impact assessment</p> <ul style="list-style-type: none"> <li>- Impact assessment must concretized by causes of impacts and objects of impacts. Each impact should be assessed at very detail extent in term of degree, scope, time and location.</li> <li>- Impact assessment of one project should be made detail and concretized; it must not be a general or theoretical assessment like textbooks, guidebooks or regulations.</li> </ul> <p>3.4 Methodology assessment Assessment on reliability of EIA. methods used, reliability of available assessments; uncertain points in assessments and the reasons, what recommendation is needed.</p> <p>Chapter 4:SOLUTIONS AND MEASURES TO MINIMIZE NEGATIVE IMPACTS, TO PREVENT AND COPE WITH ENVIRONMENTAL PROBLEMS</p> <p>Measures to mitigate negative impacts, prevent and respond to environmental incidents must be presented in each project</p>	There is no gap. We will add the most recent information in the Final Report.

Content	JICA Guideline on Environmental and Social Consideration	World Bank (OP4.01, Annex B)	Circular No.05/2008(Guideline for Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitments)	Gap between JICA Guideline and Vietnamese Guideline/ Action to be taken
			<p>stage (preparation, construction and operation) and each subject to be impacted as mentioned in item 3.3. Measures should be specific and feasible to be applied during project implementation.</p> <p>4.1 For negative impacts:</p> <ul style="list-style-type: none"> <li>- Each negative impact on natural, socio-economic objects that is already identified should go with relevant solutions to minimize it, with clear explanation of strength, weakness, feasibility, efficiency/ effectiveness of the solutions. If there are no solutions or there is but infeasible, reasons should be explained and recommendation should be made so that relating agencies can have consideration and decisions.</li> <li>- It needs to prove that after solutions have been applied to what extent the negative impacts are minimized, comparisons and matching with current criteria, norms and regulations. If it does not match with criteria, norms and regulations, reasons should be explained and recommendation should be made so that relating agencies can have consideration and decisions.</li> </ul> <p>4.2 For environmental problems: Proposing a general solution to prevent and to cope with problems, in which the follows should be clearly indicated:</p> <ul style="list-style-type: none"> <li>- Contents and measures that project owners can proactively realize and implement within their capacity; evaluation on feasibility and effectiveness;</li> <li>- Contents and measures that project owners need cooperation and assistance of government agencies and other partners;</li> <li>- Unavoidable problems and proposed solutions.</li> </ul>	
Analysis of Alternatives	This systematically compares feasible alternatives to the proposed project site, technology, design, and operation including the "without project" situation in terms of the following: the potential environmental impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements. For each of the alternatives, it quantifies the environmental impacts to the extent possible, and attaches economic values where feasible. It also states the basis for selecting the particular proposed project design, and offers justification for recommended emission levels and approaches to pollution prevention and abatement.	Systematically compares feasible alternatives to the proposed project site, technology, design, and operation--including the "without project" situation--in terms of their potential environmental impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements. For each of the alternatives, quantifies the environmental impacts to the extent possible, and attaches economic values where feasible. States the basis for selecting the particular project design proposed and justifies recommended emission levels and approaches to pollution prevention and abatement.	N/A	There is a gap. We will add information in the Final Report.
Environmental Management Plan	This describes mitigation, monitoring, and institutional measures to be taken during construction and operation in order to eliminate adverse impacts, offset them, or reduce them to acceptable levels.	Covers mitigation measures, monitoring, and institutional strengthening; see outline in OP 4.01, Annex C.	<p>Chapter 5:PROGRAMME TO MANAGE AND MONITOR ENVIRONMENT</p> <p>5.1. Environmental management programme Work out a programme to manage environmental protection issues in process of preparation and construction of project and during project's operation. Environmental management programme is developed on the basis of Chapter 1, 3, 4 in forms of tables, including information about: project activities in preparation, construction and operation, environmental impacts, measures to mitigate negative impacts (waste management and treatment works together with detailed instructions on categories and technical specifications, treatment of non-waste factors; measures to prevent environmental incidents and to recover environment if any, environmental education programmes and measures to mitigate other harmful impacts), funding for implementation, timetable, implementing agency and monitoring agency of environmental management programmes.</p> <p>5.2 Environmental monitoring programme Propose programme to monitor wastes produced in process of preparation, construction and operation of project.</p> <p>5.2.1 Waste monitoring: It requires monitoring waste flow/volume and other specific parameters of waste disposals according to current criteria, norms and regulation of Vietnam, at a minimum frequency of one time every 03 (three) months. Monitoring points or stations must be mapped with clear legends.</p> <p>5.2.2 Monitoring surrounding environment: Only monitoring specific parameters of waste disposals according to current criteria, norms and regulation of Vietnam if there are no monitoring points or stations of State in the project areas, at a minimum frequency of one time every 06 (six) months. Monitoring points or stations must be mapped with clear legends.</p> <p>5.2.3 Other monitoring: Only monitoring such factors as: eroded, slide, collapsed, and sunk land, erosion of river, stream, lake and sea banks, raised level of river, stream, lake and sea bed; changes of surface water level and</p>	There is no gap. In the Final Report, we will add information that we got from our discussion with the project owner.

Content	JICA Guideline on Environmental and Social Consideration	World Bank (OP4.01, Annex B)	Circular No.05/2008(Guideline for Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitments)	Gap between JICA Guideline and Vietnamese Guideline/ Action to be taken
			underground water; salt water invasion, alum water invasion; changes of micro climate; degrading of environmental factors; changes of bio-diversification and other causes (if there are) if there are monitoring points or stations of State in the project areas, at an appropriate frequency to monitor spatial and temporal changes of these factors. Monitoring points or stations must be mapped with clear legends.	
Community Consultation	This includes a record of consultation meetings (date, venue, participants, procedures, opinions of major local stakeholders and responses to them, and other items), including consultations for obtaining the informed views of the affected people, local NGOs, and regulatory agencies.	N/A (It is stated in Appendix)	Chapter 6: COMMUNITY CONSULTATION  6.1. Consultation with communal level People's Committees  6.2. Consultation with communal level National Father Front Committees (Point 6.1 and 6.2 are presented according to the requirement mentioned in Point 2 of Part III of this Circular).  6.3. Feedbacks and commitments by project owner to opinions by commune-level People Committee and Fatherland Front. Regarding each content commented, requested by commune-level people's committee, Fatherland front committee, project owner must clearly state viewpoints to agree/disagree to every opinion. In case of agreeing, express commitments to meet requirements and present in which contents (chapter, item) of project. In case of disagreeing, provide reasons.	There is no gap. We will add the most recent information in the Final Report.
Conclusion, Recommendation, Commitments	N/A	N/A	CONCLUSION, RECOMMENDATION AND COMMITMENT  1. Conclusion There must be conclusion on: impacts are fully recognized and assessed or not, what remains; overall assessment on scope and scale of identified impacts; feasibility of measures and solutions to minimize impacts and prevent environmental incidents and risks; what negative impacts cannot be minimized or have no solutions due to exceeding project owner's capacity, and what recommendation.  2. Recommendation Recommendation should be made to relating authorities and agencies, asking assistance to solve problems that exceed project owner's capacity.  3. Commitments Project owner makes commitments to implementation of environmental management and monitoring programmes as mentioned in Chapter 5 (composed of environmental standards and norms which project must comply with); realize commitments as stated in item 6.3 in Chapter 6; comply with general regulations on environmental protection in project stages: - Commitments to environmental protection are realized and completed in stages of preparation and construction prior to project's official operation; - Commitments to environmental protection are carried out in operation stage from project's commencement to finalization; - Commitments to environment recovery in compliance with law on environmental protection after project terminate.	JICA Guideline does not have any requirements for this section.
Appendix	N/A	(i) List of EA report preparers --individuals and organizations. (ii) References --written materials both published and unpublished, used in study preparation. (iii) Record of interagency and consultation meetings, including consultations for obtaining the informed views of the affected people and local nongovernmental organizations (NGOs). The record specifies any means other than consultations (e.g., surveys) that were used to obtain the views of affected groups and local NGOs. (iv) Tables presenting the relevant data referred to or summarized in the main text. (v) List of associated reports (e.g., resettlement plan or indigenous peoples development plan).	- Copies of legal documents relevant to project. - Diagrams (drawings, maps) relevant to project but not yet be presented in EIA report. - Analysis result papers of environmental parameters (air, noise, water, soil, sediment, bio-resources...) with signature, name, title of Head of analysis agency and stamps. - Copies of documents relating to community consultation and sociology questionnaires (if any). - Pictures of project site (if any). - Other relevant documents (if any).	JICA Guideline does not have any requirements for this section.



#### 5.2.4 Effectiveness of EIA Report for O Mon 3 Power Plant Project

Decree No.29/2011/ND-CP Article 12 3.b states “An environmental impact assessment report shall be made when the project is not implemented within 36 months after the issuance of a decision approving the environmental impact assessment report”. This project might have conflict with this regulation, since 36 months from the approval date of the EIA report, which is July 31st, 2009, is June 30th, 2012.

MONRE does not have a set definition of “the beginning of the project implementation” that determines the expiration date of EIA report, but MONRE made a comment at the meeting with the Study Team that the project implementation is considered as “begun” if any construction activities has started. As for this project for O Mon 3 power plant, MONRE judged that the project implementation has already begun because the construction of the access road was already started.

Decree No.29/2011/ND-CP Article 12 3.c states “An environmental impact assessment report shall be made when the size, capacity or technology of the project is changed, resulting in increased adverse environmental impacts or scope of impacts” This project may have conflict with this regulation if the capacity of gas turbine is to be increased from 876MW (ISO base), since the EIA for this project was approved with 750 - 876MW (ISO base).

According to MONRE, the project owner is expected to submit an official letter to MONRE if the project owner increases the capacity after EIA approval. By responding to the official letter from the project owner, MONRE makes an official judgment if additional EIA with the capacity increase is necessary or not. The project owner is expected to follow with the MONRE’s instructions.

#### 5.2.5 Role of the Relevant Organizations

With the reorganization of the Government of Viet Nam, MONRE was established in 2002 to centralize the environmental administration. VEPA, in charge of environmental policy making at national level, was established under MONRE. In 2008, VEPA became VEA to strengthen the role of the organization. The reorganization of the local government was also conducted and Department of Natural Resource and Environment (DONRE), in charge of environmental administration at regional level, was established at provincial government<sup>1</sup>.

Table 5.2-3 shows the list of the organizations other than MONRE that is related to environmental administration and their roles<sup>2</sup>.

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1 Retrieved from <http://www.soci.ous.ac.jp/gs/study/files/I08VM05.pdf>

2 Environmental measures social responsibility of business entities in Viet Nam: Global Environmental Forum (2007)

**Table 5.2-3 Environment-related Organizations except for MONRE**

Organizations	Role
MARD: Ministry of Agriculture and Rural Development	MARD is a governmental agency performing state management functions in the fields of agriculture, forestry and rural development nationwide. Department of Water Resource Management that was belonged to this Ministry was transferred to MONRE in 2002, but water resource management of irrigation dams and reservoirs for agricultural production is still under the control of MARD.  MARD is also in charge of regulating and managing the preserved areas of the specific-purpose forest and protecting the precious and endangered species, though the tasks relating to international treaties such as the Ramsar Convention and Convention on Biological Diversity are under MONRE.
MOFI: Ministry of Fishery	MOFI examines and researches on fishing resources as well as establishes and manages the marine protected areas.
MOC: Ministry of Construction	MOC performs the administration of water and sanitary facilities.
MOIT	MOIT establishes nation-wide industrial development plan. Department of Industry and Trade at provincial government supervises the registration and pollutant discharges of each factory from the perspective of environmental preservation and pollution control. Also, Department of Industry and Trade assesses the environmental impacts caused by production activities at factories, reports to MOIT and take measures to solve the issues.
MOH: Ministry of Health	MOH performs the supervision of the spread of medical services and the administration regarding the public awareness for improvement of environmental sanitation.
MOST: Ministry of Science and Technology	MOST was a section of science and technology of the former Ministry of Science, Technology and Environment (MOSTE). MOST supervises and guides the administration and research of domestic science and technology including social science, in addition to the natural science.

### 5.2.6 Environment-related Licenses other than EIA needed for this Project

Table 5.2-4 shows the list of the environment-related licenses other than EIA that is needed for this project. At latest update in 28 February 2012, the approval date for these licenses is still unknown because the time to apply for these permits is depending on the progress of the project. The future submission and acquirement of the required environmental approvals at an appropriate timing must be checked and ensured.

**Table 5.2-4 Environment-related Licenses other than EIA**

Permit	Authority	Approval Date/ Schedule	Remarks
Environmental License for the Entire Project	MONRE or DONRE	Before Plant Operation	
Environment Approval for Surface Water Exploitation and Water Discharge	MONRE	Before taking or discharge cooling water	According to Article 13 of Decree No.149/ 2004/ ND-CP, the approval for water use of 50,000 m <sup>3</sup> /day and more and water discharge of 5,000 m <sup>3</sup> /day and more is given by MONRE, and for less quantity of use and discharge is approved by DONRE or PC of Can Tho City
Approval for Using Deep Well Water (for construction purpose)	MONRE or DONRE	Before construction operation of O Mon 3	According to Article 13 of Decree No.149/ 2004/ ND-CP, the approval for underground water use of 3,000 m <sup>3</sup> /day or more is given by MONRE., and for less quantity use id approved by DONRE of PC ofCan Tho City.
Permission for Toxic Chemical/ Gas Application	Competent Agency authorized under MOIT	Before using of any device.	
Final License for Whole Fire Fighting System	Fire Police Headquarter (Hanoi)	Before starting the Reliability Test	

## 5.2.7 Environmental Standards applied for this Project

### (1) Air Quality

#### 1) Ambient air quality

**Table 5.2-5 Ambient Air Quality Standard**

Pollutant	Average time	Vietnam (QCVN-05/ 2009/ BTNMT)	IFC/EHS Guideline (General:2007)
TSP	1hr	0.30 mg/m <sup>3</sup>	-
	24hr	0.20 mg/m <sup>3</sup>	
	year	0.14 mg/m <sup>3</sup>	
PM <sub>10</sub>	24hr	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup> (Interim*)
	year	50 µg/m <sup>3</sup>	-
CO	1hr	30 mg/m <sup>3</sup>	-
	8hr	10 mg/m <sup>3</sup>	
	24hr	5 mg/m <sup>3</sup>	
SO <sub>2</sub>	10min	-	500 µg/m <sup>3</sup>
	1hr	350 µg/m <sup>3</sup>	-
	24hr	125 µg/m <sup>3</sup>	125 µg/m <sup>3</sup> (Interim*)
	year	50 µg/m <sup>3</sup>	-
NO <sub>2</sub>	1hr	200 µg/m <sup>3</sup>	200 µg/m <sup>3</sup>
	24hr	100 µg/m <sup>3</sup>	-
	year	40 µg/m <sup>3</sup>	40 µg/m <sup>3</sup>

\*: General EHS Guidelines refers to WHO Air Quality Guidelines 2005. WHO sets Interim for PM<sub>10</sub> and SO<sub>2</sub>.

## 2) Air emission

**Table 5.2-6 Air Emission Standards for Thermal Power Plants**

(Unit : mg/m<sup>3</sup>)

Pollutant	Vietnam (QCVN-22/ 2009/ BTNMT)Kp=0.85, Kv=0.6		EHS Guideline (Thermal Power Plant: 2008)	
	Diesel	Gas	Diesel	Gas
SOx	350 (500)	153 (300)	0.5 - 1%	-
NOx	420 (600)	127.5 (250)	152	51
Dust	105 (150)	25.5 (50)	30 - 50	-

Note: I) In Air Emission Standards, coefficient is multiplied to the regulation value, depending on Kp and Kv.  
 II) In EHS Guideline, the regulation value is different, depending on the air environment.  
 III) It is applied when the plant operates more than 500 hours/year.

## (2) Noise and Vibration

### 1) Noise

**Table 5.2-7 Noise Level Standards**

Parameter	Vietnam (QCVN-26/ 2010/ BTNMT)	EHS Guideline (General: 2007)
Noise	Hospital, School etc 06:00 - 21:00: 55 dBA 21:00 - 06:00: 45 dBA	Residential area, School etc 07:00 - 22:00: 55 dBA 22:00 - 07:00: 45 dBA
	Apartment, Residential areas etc. 06:00 - 21:00: 70 dBA 21:00 - 06:00: 55 dBA	Commercial area, Industrial area 07:00 - 22:00: 70 dBA 22:00 - 07:00: 70 dBA

Note: This noise level standard is not applied for factory, construction site and shopping district area.

### 2) Vibration

**Table 5.2-8 Vibration Level Standards**

Parameter	Vietnam (QCVN-27/ 2010/ BTNMT)	
	Construction	Manufacturing Industry
Vibration	Hospital, School etc. 06:00 - 18:00: 75 dB 18:00 - 06:00: <b>BG</b>	Hospital, School etc 06:00 - 21:00: 60 dB 21:00 - 06:00: 55 dB
	Apartment, Residential areas etc. 06:00 - 18:00: 75 dB 18:00 - 06:00: <b>BG</b>	Apartment, Residential areas etc. 06:00 - 21:00: 70 dB 21:00 - 06:00: 60 dB

Note: **BG** indicates the value of the background.

**(3) Water Quality****1) Surface water****Table 5.2-9 Surface Water Quality Standards**

Parameter and Substance	Unit	QCVN-08/ 2008/ BTNMT			
		A1	A2	B1	B2
pH	-	6 - 8.5	6 - 8.5	5.5 - 9	5.5 - 9
DO	mg/L	>6	>5	>4	>2
TSS	mg/L	20	30	50	100
COD	mg/L	10	15	30	50
BOD <sub>5</sub> (20°C)	mg/L	4	6	15	25
NH <sub>4</sub> -N	mg/L	0.1	0.2	0.5	1.0
Cl <sup>-</sup>	mg/L	250	400	600	-
F	mg/L	1	1.5	1.5	2
NO <sub>3</sub> -N	mg/L	2	5	10	15
NO <sub>2</sub> -N	mg/L	0.01	0.02	0.04	0.05
PO <sub>4</sub> -P	mg/L	0.1	0.2	0.3	0.5
CN	mg/L	0.005	0.01	0.02	0.02
As	mg/L	0.01	0.02	0.05	0.1
Cd	mg/L	0.005	0.005	0.01	0.01
Pb	mg/L	0.02	0.02	0.05	0.05
Cr <sup>3+</sup>	mg/L	0.05	0.1	0.5	1
Cr <sup>6+</sup>	mg/L	0.01	0.02	0.04	0.05
Cu	mg/L	0.1	0.2	0.5	1
Zn	mg/L	0.5	1.0	1.5	2
Ni	mg/L	0.1	0.1	0.1	0.1
Fe	mg/L	0.5	1	1.5	2
Hg	mg/L	0.001	0.001	0.001	0.002
Surfactants	mg/L	0.1	0.2	0.4	0.5
Oil & Grease	mg/L	0.01	0.02	0.1	0.3
Phenol	mg/L	0.005	0.005	0.01	0.02
Pesticide: organic chlorine					
Aldrin+Dieldrin	µg/L	0.002	0.004	0.008	0.01
Endrin	µg/L	0.01	0.012	0.014	0.02
BHC	µg/L	0.05	0.1	0.13	0.15
DDT	µg/L	0.001	0.002	0.004	0.005
Endosulfan	µg/L	0.005	0.01	0.01	0.02
Lindan	µg/L	0.3	0.35	0.38	0.4
Chlordane	µg/L	0.01	0.02	0.02	0.03
Heptachlor	µg/L	0.01	0.02	0.02	0.05
Pesticide: organic phosphorus					
Parathion	µg/L	0.1	0.2	0.4	0.5
Malathion	µg/L	0.1	0.32	0.32	0.4
Herbicides					
2,4D	µg/L	100	200	450	500
2,4,5T	µg/L	80	100	160	200
Paraquat	µg/L	900	1200	1800	2000
Total Radiation α	Bq/L	0.1	0.1	0.1	0.1
Total Radiation β	Bq/L	1.0	1.0	1.0	1.0
E. coli	MPN/100mL	20	50	100	200
Total Coliform	MPN/100mL	2500	5000	7500	10000

Note: The definition of each category is as follows. A2 is applied for Hau River.

- (i) A1 is suitable for domestic water supply and other purpose such as A2, B1 and B2;
- (ii) A2 is used for domestic water supply with the suitable treatment technology; preserve the aquatic flora and fauna or other purpose such as B1 and B2;
- (iii) B1 is used for the irrigation or other purpose which required the same water quality or the purpose such as B2; and
- (iv) B2 is used for transportation and other purpose which required low water quality.

## 2) Underground water

**Table 5.2-10** *Underground Water Quality Standards*

Parameter	Unit	QCVN-09/ 2008/ BTNMT
pH	-	5.5 - 8.5
CaCO <sub>3</sub>	mg/L	500
Total residue	mg/L	1500
COD	mg/L	4
NH <sub>4</sub> -N	mg/L	0.1
Cl <sup>-</sup>	mg/L	250
F <sup>-</sup>	mg/L	1.0
NO <sub>2</sub> -N	mg/L	1.0
NO <sub>3</sub> -N	mg/L	15
SO <sub>4</sub> <sup>2-</sup>	mg/L	400
CN <sup>-</sup>	mg/L	0.01
Phenol	mg/L	0.001
As	mg/L	0.05
Cd	mg/L	0.005
Pb	mg/L	0.01
Cr <sup>6+</sup>	mg/L	0.05
Cu	mg/L	1.0
Zn	mg/L	3.0
Mn	mg/L	0.5
Hg	mg/L	0.001
Fe	mg/L	5
Se	mg/L	0.01
Total Radiation α	Bq/L	0.1
Total Radiation β	Bq/L	1.0
E. Coli	MPN/100mL	ND
Total Coliform	MPN/100mL	3

## 3) Industrial wastewater

Table 5.2-11 Industrial Wastewater Standards

Parameter and Substance	Unit	QCVN-40/ 2011/ BTNMT		EHS Guideline (Thermal Power Plant: 2008)
		A (Kq=1.2, Kf=0.9)	B	
Temperature	°C	40	40	* <sup>3</sup>
pH	-	6 - 9	5.5-9	6 - 9
Colour	Pt/Co	50	150	-
BOD <sub>5</sub> (20 <sup>0</sup> C)	mg/l	32.4 (30)	50	-
COD	mg/l	81 (75)	150	-
Suspended solids (TSS)	mg/l	54 (50)	100	50
As	mg/l	0.054 (0.05)	0.1	0.5
Hg	mg/l	0.0054 (0.005)	0.01	0.005
Pb	mg/l	0.108 (0.1)	0.5	-
Cd	mg/l	0.054 (0.05)	0.1	-
Cr <sup>6+</sup>	mg/l	0.054 (0.05)	0.1	0.5 (T-Cr)
Cr <sup>3+</sup>	mg/l	0.216 (0.2)	1	-
Cu	mg/l	2.16 (2)	2	0.5
Zn	mg/l	3.24 (3)	3	1.0
Ni	mg/l	0.216 (0.2)	0.5	-
Mn	mg/l	0.54 (0.5)	1	-
Fe	mg/l	1.08 (1)	5	1.0
Cyanide	mg/l	0.0758 (0.07)	0.1	-
Phenol	mg/l	0.108 (0.1)	0.5	-
Mineral Oil and fat	mg/l	5.4 (5)	10	10
Chloroine residual	mg/l	1.08 (1)	2	0.2
PCBs	mg/l	0.00324 (0.003)	0.01	-
Pesticide: organic phosphrous	mg/l	0.324 (0.3)	1	-
Pesticide: organic chlorine	mg/l	0.054 (0.05)	0.1	-
Sunfide	mg/l	0.216 (0.2)	0.5	-
Fluoride	mg/l	5.4 (5)	10	-
Chloride (not apply discharged into sea and brackish waetr)	mg/l	540 (500)	1000	-
Ammonia (as N)	mg/l	5.4 (5)	10	-
Total Nitrogen	mg/l	21.6 (20)	40	-
Total Phosphorous	mg/l	4.32 (4)	6	-
Total Coliform	MPN/100ml	3000	5000	-
Total Radiation α	Bq/l	0.1	0.1	-
Total Radiation β	Bq/l	1.0	1.0	-

Note: I) The definition of each category is as follows. Category A is applied for Hau River.

II) In the standards, coefficient is multiplied to the regulation value, depending on Kq and Kf.

\*A: discharge to water bodies used for water supply purposes

\*B: discharge to water bodies used for domestic water supply purposes

※ No value is shown in the EHS Guideline. However, regarding the environmental impact to aquatic organisms by thermal effluent around the outlet, the facility design is required to reduce effluent temperature and diffusion range as much as possible.

#### 4) Domestic wastewater

**Table 5.2-12 Domestic Wastewater Standards**

Parameter and Substance	Unit	Vietnam (QCVN-14/ 2008/ BTNMT)		EHS Guideline (General: 2007)
		A(K=1.0)	B	
pH	-	5- 9	5 - 9	6 - 9
BOD <sub>5</sub> (20 <sup>0</sup> C)	mg/l	30	50	30, (COD: 125)
Suspended solids (TSS)	mg/l	50	100	150
Total residue	mg/l	500	1000	
H <sub>2</sub> S	mg/l	1.0	4.0	
NH <sub>4</sub> -N	mg/l	5	10	
NO <sub>3</sub> -N	mg/l	30	50	10 (T-N)
Animal-vegetable oil and fat	mg/l	10	20	10
Surfactants	mg/l	5	10	
PO <sub>4</sub> -P	mg/l	6	10	2 (T-P)
Total Coliform	MPN/100ml	3000	5000	400

Note: I) The definition of each category is as follows. Category A is applied for Hau River.  
 II) In the standards, coefficient is multiplied to the regulation value, depending on Kq.  
 \*A: Water bodies defined as A1 or A2 in the surface water quality standards  
 \*B: Water bodies defined as B1 or B2 in the surface water quality standards



### 5.3 SCOPING OF ENVIRONMENTAL IMPACT

Table 5.3-1 shows the scoping result about the expected environmental impacts, which was conducted in accordance with JICA Guideline on Environmental Social Consideration.

**Table 5.3-1 Scoping Result**

No.	Item	Evaluation				Reason
		Construction Phase		Operation Phase		
		Positive	Negative	Positive	Negative	
<b>[ Pollution ]</b>						
1	Air Pollution	N	A	N	A	<ul style="list-style-type: none"> <li>- Dust will be generated from the removal of vegetation and heavy earthmoving activities, giving an impact on air quality. As leveling time with only about 1 month, the impact will be small and can be reduced.</li> <li>- Air pollution can also occur due to the gas emission from the machinery, equipment and heavy trucks. However, the value of the parameters of pollution is still lower than the Vietnamese emission standard (except for dust).</li> <li>- In the construction phase of the project, 100 workers are expected to work at the construction site and burn fuel such as oil, gas and charcoal for cooking. If a person uses fuel at the average of about 0.5kg fuel/person/day, the total use of fuel is expected to be about 500kg/day. The process of burning fuel mainly create ash, dust, SO<sub>2</sub>, CO<sub>2</sub>, etc, but their impacts will be limited to the area of the construction area only.</li> <li>- In the course of pre-construction activity, 10 ton truck will be operating at the frequency of 33-36 trips/week.</li> <li>- In the course of construction, 10 ton truck will be operating at the frequency of 20 trips/hour for transporting construction materials and 24-30 trips/week for transporting waste (2 trips/week for domestic waste only).</li> <li>- According to the prediction of the diffusion of air pollution substances for O Mon 3 only, gas emission will not exceed the Vietnamese emission standard (QCVN-05/ 2009). Even if the gas turbine capacity increases, the quality of the gas emission will not exceed the Vietnamese standard.</li> <li>- It is expected that maximum ground concentration of NO<sub>x</sub> at the average of 1 hour exceeds the Vietnamese air quality standards when all the power plants operate at the same time.</li> </ul>
2	Water Pollution	N	A	N	A	<ul style="list-style-type: none"> <li>- According to the estimate, the total amount of excavation soil and rock is about 65,100m<sup>3</sup>. This impact is considered small because the scope of the pollution is only about a few dozen meters around the project area and only last for about 1 month period of the excavation.</li> <li>- The wastewater containing concrete and waste oil will be generated.</li> <li>- It is assumed that the pre-construction activities would require 100 workers respectively, generating 15m<sup>3</sup>/day of domestic wastewater. The number of workers in the project's area at the peak time is estimated about 1000 workers, generating 150m<sup>3</sup>/day of domestic wastewater.</li> <li>- Leakage of the fuel from the construction machinery causes the underground water pollution.</li> <li>- The thermal effluent from O Mon 3 only will be discharged at 18m<sup>3</sup>/sec with the temperature of +6°C at the outlet. If the gas turbine capacity increases, the amount of the thermal effluent will be 18.4m<sup>3</sup>/sec, which remains as almost same.</li> <li>- The amount of the thermal effluent will be 78.4m<sup>3</sup>/sec when all the power plants in O Mon Power Complex operate at the same time.</li> <li>- 719m<sup>3</sup>/day of plant wastewater and 195m<sup>3</sup>/day of oily wastewater will be generated.</li> <li>- Domestic wastewater and human waste generated by 191 workers on site is estimated to be 35m<sup>3</sup> per day</li> <li>- Leakage of the diesel fuel from the construction machinery causes the underground water pollution.</li> </ul>
3	Waste	N	A	N	B	<ul style="list-style-type: none"> <li>- General waste and hazardous waste are generated during construction phase.</li> <li>- General waste and hazardous waste are generated from the O Mon 3 Power Plant.</li> </ul>
4	Noise and Vibration	N	A	N	B	<ul style="list-style-type: none"> <li>- Noise level decreases of 6dB as the distance from noise source doubles. It is known that noise level becomes 75 dBA at the distance of 38-121m from the heavy equipments and 45dB at the distance of 2-5km. The temporary noise effect in residential area may be occurred during construction period (1 month).</li> <li>- The truck is estimated to serve this phase of the project which circulates on the Nation Road 1 about 35-70 trips/hours (to ton's truck) in the rush hour. According to Canter (1996), the noises</li> </ul>

No.	Item	Evaluation				Reason
		Construction Phase		Operation Phase		
		Positive	Negative	Positive	Negative	
						caused by the heavy-duty trucks can reach 90 dBA at 15 meters from the noise source and range of the area affected by the noise can reach hundreds of meters from the noise source. - Noise from the turbine, motor and fan will be generated.
5	Land Subsidence	N	N	N	N	- In the course of construction for O Mon 1-A, 10m <sup>3</sup> /hour of the underground water was used, since it was difficult to take water from Hau river, but land subsidence was not occurred. As for the construction of O Mon 3, the fire-fighting facility will have been completed and the water from this facility will be able to be used for the O Mon 3 construction, so the amount of underground water to be used will be much lower. - The domestic water for the employees at the power plant will be taken from Hau River..
6	Odor	N	N	N	N	- De-NOx system (SCR and etc.), which uses ammonia, will not be installed at O Mon 3 Power Plant.
<b>[ Natural Environment ]</b>						
1	Hydrology	N	N	N	N	- Cooling water will be taken from the Hau River with 18m <sup>3</sup> /sec. The flow amount of the Hau River is 1,000 ~ 20,000m <sup>3</sup> /sec. Thus, the impact caused by the water intake will not be significant.
2	Underground Water	N	N	N	N	- As for the construction of O Mon 1-A, 10m <sup>3</sup> /hour of the underground water was used, but impact to the residents was not seen. The amount of underground water to be used for O Mon 3 construction will be much lower. Thus, the impact will not be significant. - The total amount of the domestic water needed for 191 employees for O Mon 3 Power Plant will be 35m <sup>3</sup> /day.
3	Protected Area	N	N	N	N	- There are no protected areas or special use forests in the project area or in O Mon district. The closest protected area to the site is the Ngoc Hoang valley, located at 40km southeast of the site. No impact on the water quality is expected, since Ngoc Hoang valley is not located at any basin of Hau River. - Ground concentration of the pollutants will become one tenth of the maximum ground concentration at the distance of 10km from the O Mon Power Complex. Ground concentration of the pollutants will be much lower at the distance of 40km from O Mon Power Complex. Thus, the impact will not be significant at all.
4	Terrestrial Ecosystem	N	B	N	N	- Air and noise pollution caused by construction activities have impacts on the terrestrial ecosystem. - There is no ecological sensitive place such as primeval forest at the O Mon 3 Power Plant. The land use of O Mon 3 site is a mix of weeds and field crops. - The size of the farmland of Phuoc Thoi ward and Thoi An ward is 3,200 ha in total. Of those, 95.5 ha of the farmlands have been acquired by the project for the purpose of constructing O Mon 3 to O Mon 5 and auxiliary facilities. (26.6 ha of them are for O Mon 3). Thus, the impact of alternation of farmlands by this project is not considered as significant.
5	River Ecosystem	N	B	N	B	- Water pollution caused by construction activities has impacts on the aquatic creatures. - Aquatic creature will be taken with the intake of cooling water. - At average, 719 m <sup>3</sup> /day of plant wastewater, 195 m <sup>3</sup> /day of oily wastewater and 35 m <sup>3</sup> /day of domestic wastewater will be generated. - Spawning and nursing ground of fishes are mainly located at the north bank of the Hau River (the opposite side from O Mon Power Complex), but thermal effluent from O Mon 3 will not reach the opposite side of the Hau River. Moreover, the thermal effluent will not reach the other side even if all the power plants in O Mon Power Complex operate at the same time.
6	Rare Species	N	B	N	B	- There is flooding soil ecosystem of sonnertia along Hau River, which is very vulnerable, but the strip of sonnertia in the project area has already been disappeared. - Air and noise pollution caused by construction activities have impacts on the terrestrial ecosystem. - Water pollution caused by construction activities has impacts on the aquatic creatures. - At average, 719 m <sup>3</sup> /day of plant wastewater, 195 m <sup>3</sup> /day of oily wastewater and 35 m <sup>3</sup> /day of domestic wastewater will be generated. - The 2007 survey found indications of six fish species that have some species of listing in the Vietnamese Red List in the vicinity of the project site and the survey found three additional species in a large area of the Hau River.
<b>[ Social Environment ]</b>						
1	Resettlement	A	A	N	N	- The 95.5 ha of land have been acquired for O Mon 3 and 4 as well as some auxiliary facilities,

No.	Item	Evaluation				Reason
		Construction Phase		Operation Phase		
		Positive	Negative	Positive	Negative	
	(O Mon Power Complex)					<ul style="list-style-type: none"> <li>and 226 households were relocated out of the 601 affected households.</li> <li>- Land acquisition for O Mon 3 only was 26.6 ha, the number of the affected household was 128, and the relocating household was 57.</li> </ul>
2	Employment and Livelihood	B	B	B	B	<ul style="list-style-type: none"> <li>- About 300 people will usually be employed in the course of construction and about 1000 people will be engaged in construction at the peak time.</li> <li>- The employment opportunity and creation of companies to the local resident will be promoted</li> <li>- An important change is expected to local economical structure due to the creation of employment and companies.</li> <li>- O Mon 3 Power Plant will plan to employ 191 people.</li> <li>- The employments opportunity and creation of enterprises to the local resident will be promoted</li> <li>- An important change is expected to local economical structure due to the creation of employment and companies.</li> </ul>
3	Regional Community	A	A	B	A	<ul style="list-style-type: none"> <li>- The influx of the workers increases the risk of social evils as a drug addict, harlotry, thief, the risks of transmitting epidemic diseases and occurring conflict with worker and local inhabitant.</li> <li>- The influx of the big number of workers will increase the demand of public health and environmental sanitation facilities.</li> <li>- Construction activities increase the traffic density on Nation Road 91 and internal roads in O Mon District leading to the increase of accidents on these roads.</li> <li>- Transporting activities can damage the roads in the area (National highway 91 and internal roads).</li> <li>- The 30 tons is the maximum weight for one overland transporting truck. Any heavy equipment or materials that are more than 30 tons will be transported by water.</li> <li>- There is a possibility that non-equal relations in the income difference between the local residents and power plant employees will arise.</li> <li>- Increase of the traffic may lead to the increase of the traffic accident and the damage of the road.</li> </ul>
4	Cultural Heritage	N	N	N	N	<ul style="list-style-type: none"> <li>- There are no historical, cultural and/or religious monuments in the project area.</li> </ul>
5	Landscape	N	B	N	B	<ul style="list-style-type: none"> <li>- Construction activities of the plant and ancillary facilities, transporting of construction material and equipments, etc during construction stage of the project may affect landscape of the project area and road (national road No91 etc )</li> <li>- Environmental pollution including air pollution, water pollution and solid waste disposal, etc. caused by operation of the O Mon 3 Power Plant may affect landscape of the project area.</li> </ul>
6	Minorities	N	N	N	N	<ul style="list-style-type: none"> <li>- The composition structure of the local people is rather multiform but mainly is Kinh ethnic group, otherwise there are some Cham ethnic (about some tens of households). However, most of the life activities and productivity forms of Cham ethnic group are very similar to that of the Kinh ethnic group.</li> <li>- Most of the affected people of the O Mon Power Complex are Kinh ethnic group. Some of the Cham and Khmer ethnic groups are also included in the affected people, but their lives and livelihoods are almost same as the Kinh's one. Also, there has not been any traditional function conducting inside O Mon Power Complex. Thus, the impact on those minority ethnic groups is not considered as significant and special consideration to them is not considered to be necessary.</li> </ul>
7	Working Environment	B	B	B	B	<ul style="list-style-type: none"> <li>- There is a high possibility that accidents would occur in the course of construction.</li> <li>- The influx of the workers increases the risks of transmitting epidemic diseases.</li> <li>- There is a possibility that workers would experience work-related accidents.</li> <li>- There is a possibility that the security guards would violate the safety of the residents.</li> </ul>
<b>[ Others ]</b>						
1	Global Climate Change	N	B	N	B	<ul style="list-style-type: none"> <li>- CO<sub>2</sub> will be generated from O Mon 3 Power Plant, contributing to the global climate change, but speaking of the capacity of the project, the impact will not be significant.</li> </ul>

Note) Blue-colored items indicate the construction phase only.

The definitions of the category are as follows:

A: Significant impact is expected

B: Impact is expected to some extent

N: No impact is expected

### 5.3.1 Items that Negative Impact is expected

Table 5.3-2 shows the list of items that negative impacts are expected based on the above scoping results.

**Table 5.3-2 Items that Negative Impacts is expected**

Item	Construction Phase	Operation Phase
Item categorized as “significant impact is expected”	<p><b>[ Pollution Abatement ]</b></p> <ul style="list-style-type: none"> <li>- Air Pollution</li> <li>- Water Pollution</li> <li>- Waste</li> <li>- Noise and Vibration</li> </ul> <p><b>[ Social Environment ]</b></p> <ul style="list-style-type: none"> <li>- Resettlement</li> <li>- Regional Community</li> </ul>	<p><b>[ Pollution Abatement]</b></p> <ul style="list-style-type: none"> <li>- Air Pollution</li> <li>- Water Pollution</li> </ul> <p><b>[ Social Environment ]</b></p> <ul style="list-style-type: none"> <li>- Regional Community</li> </ul>
Item categorized as “Impact is expected to some extent”	<p><b>[ Natural Environment ]</b></p> <ul style="list-style-type: none"> <li>- Terrestrial Ecosystem</li> <li>- River Ecosystem</li> <li>- Endangered Species</li> </ul> <p><b>[ Social Environment ]</b></p> <ul style="list-style-type: none"> <li>- Labor and Livelihood</li> <li>- Landscape</li> <li>- Working Environment</li> </ul> <p><b>[ Others ]</b></p> <ul style="list-style-type: none"> <li>- Global Climate Change</li> </ul>	<p><b>[ Pollution Abatement ]</b></p> <ul style="list-style-type: none"> <li>- Waste</li> <li>- Noise and Vibration</li> </ul> <p><b>[ Natural Environment ]</b></p> <ul style="list-style-type: none"> <li>- Hydrology</li> <li>- River Ecosystem</li> <li>- Endangered Species</li> </ul> <p><b>[ Social Environment ]</b></p> <ul style="list-style-type: none"> <li>- Labor and Livelihood</li> <li>- Landscape</li> <li>- Working Environment</li> </ul> <p><b>[ Others ]</b></p> <ul style="list-style-type: none"> <li>- Global Climate Change</li> </ul>

### 5.3.2 Items that Negative Impacts are not expected

Table 5.3-3 shows the list of items that negative impacts are NOT expected.

**Table 5.3-3 Items that Negative Impacts are NOT expected**

Item	Reason
Land Subsidence	<b>Construction period;</b> In the course of construction for O Mon 1-A, 10m <sup>3</sup> /hour of the underground water was used, since it was difficult to take water from Hau river, but land subsidence was not occurred. As for the construction of O Mon 3, the fire-fighting facility will have been completed and the water from the facility will be able to be used for the O Mon 3 construction, so the amount of underground water to be used will be much lower.
	<b>Operation phase;</b> The domestic water for the employees at the power plant will be taken from Hau River.
Odor	<b>Construction period;</b> Any substances that causes odor will not be handled.
	<b>Operation phase;</b> Any substances that causes odor will not be handled.
Hydrology	<b>Construction period;</b> Large amounts of intake and discharge water will not be conducted.
	<b>Operation phase;</b> Cooling water will be taken from the Hau River with 18m <sup>3</sup> /sec. The flow amount of the Hau River is 1,000~20,000m <sup>3</sup> /sec. Thus, the impact caused by the water intake will not be significant.
Underground Water	Same as Land Subsidence
Protected Area	<b>Construction period;</b> There are no protected areas or special use forests in the project area or in O Mon district.
	<b>Operation phase;</b> The closest protected area to the site is the Ngoc Hoang valley, located at 40km southeast of the site. No impact on the water quality is expected, since Ngoc Hoang valley is not located at any basin of Hau River. Ground concentration of the pollutants will become one tenth of the maximum ground concentration at the distance of 10km from the O Mon Power Complex. Ground concentration of the pollutants will be much lower at the distance of 40km from O Mon Power Complex. Thus, the impact will not be significant at all
Terrestrial Ecosystem	<b>Construction period;</b> There is no ecological sensitive place such as primeval forest at the O Mon 3 Power Plant. The land use of O Mon 3 site is a mix of weeds and field crops. The size of the farmland of Phuoc Thoi ward and Thoi An ward is 3,200 ha in total. Of those, 95.5 ha of the farmlands have been acquired by the project for the purpose of constructing O Mon 3 to O Mon 5 and auxiliary facilities. (26.6 ha of them are for O Mon 3). Thus, the impact of alternation of farmlands by this project is not considered as significant.
Resettlement	<b>Construction period;</b> Resettlement has already been completed before the construction.
Cultural Heritage	<b>Construction period;</b> There are not any historical, cultural and religious monuments in the project area.
	<b>Operation phase;</b> Same as Construction period
Minorities	<b>Construction period;</b> Most of the affected people of the O Mon Power Complex are Kinh ethnic group. Some of the Cham and Khmer ethnic groups are also included in the affected people, but their lives and livelihoods are almost same as the Kinh's one. Also, there has not been any traditional function conducting inside O Mon Power Complex. Thus, the impact on those minority ethnic groups is not considered as significant and special consideration to them is not considered to be necessary.
	<b>Operation phase;</b> Same as Construction period

## 5.4 ENVIRONMENTAL IMPACT REVIEW AND ASSESSMENT FOR O MON POWER COMPLEX

### 5.4.1 Calculation of Air Pollutant Diffusion for O Mon 3

#### (1) Environmental Impact of O Mon 3 (750 MW)

Table 5.4-1 indicates the concentration of pollutants in the exhaust gas and emission standard for O Mon 3 (EIA 3.4.4.1, p108). The emission standards and Environmental, Health, and Safety (EHS) guideline of International Finance Corporation are also shown. As shown in the table, the emission standard in Vietnam as well as EHS Guideline, will be satisfied.

**Table 5.4-1 Concentration of Pollutant and Dust in Exhaust Gas in O Mon 3**

Parameter	Concentration (mg/Nm <sup>3</sup> )			Emission standard for power plant (QCVN-22/ 2009) Kp=0.85, Kv=0.6		EHS Guideline (Thermal power plant; 2008)	
	GT only	Gas fired	Oil fired	Gas	Oil	Gas	Oil
SOx	3.2	7.3	209.59	153 (300)	255 (500)	-	0.5 - 1%
NOx	16.16	37.9	98.85	127.5 (250)	306 (600)	51	152
Dust	1.62	3.69	6.6	25.5 (50)	76.5 (150)	-	30 - 50

Note: In emission standard calculation, coefficient is multiplied depending on power generation capacity (Kp) and region (Kv). In EHS Guideline, different guideline value is applied depending on the atmospheric environment. The guideline value is applied for the power plant operating 500 hrs and more per year.. SOx concentration means sulfur concentration in fuel.

Other parameters are shown in Table 5.4-2 (EIA 3.4.3.1, p.108, Appendix 3-1).

**Table 5.4-2 Parameter for Simulation of Air Pollutants Diffusion**

Parameter	Case 1: GT only (Gas-fired: 500MW)	Case 2: Combined cycle (Gas-fired: 750MW)	Case 3: Combined Cycle (Oil-fired: 750MW)
Height of stack	30 m (Bypass Stack)	40 m (Main Stack)	40 m (Main Stack)
Inner diameter of stack	6.8m	6.8m	6.8m
Flue gas flow	1564.6 m <sup>3</sup> /sec	685.39 m <sup>3</sup> /sec	747.49 m <sup>3</sup> /sec
Flue gas velocity	42.9 m/sec	18.8 m/sec	20.5 m/sec
Flue gas temperature	594°C	97°C	141°C
SOx	5.0 g/sec	5.0 g/sec	156.67 g/sec
NOx	25.29 g/sec	25.96 g/sec	73.89 g/sec
Dust	2.53 g/sec	2.53 g/sec	4.93 g/sec

Table 5.4-3 shows the result of Gaussian-model short-term diffusion model of air pollutants in O Mon 3 based on the meteorological data in Can Tho City. It shows the maximum ground concentration (EIA 3.4.3.1, p107-113).

The O Mon 3 power plant will be normally operated in gas-fired combined cycle (Case 2), and the table indicates that the maximum ground concentration for SO<sub>2</sub> and PM<sub>10</sub> is 1/100 of the Vietnamese environmental standard (QCVN-05/ 2009), NOx also being 1/10. In case of oil-fired

combined cycle (7 days of operation per year is anticipated for emergency case), the maximum ground concentration is also well below the environmental standard for each pollutant (EIA 3.4.3.1, p107-113, Appendix3.1, EIA 4.3.4, p148).

**Table 5.4-3 Results of Simulation of Air Pollutants Diffusion**

*Rainy season (Wind direction: East, Wind velocity; 2.5m/s, Temperature; 30 °C, Atmospheric stability; B)*

Parameter	Case 1	Case 2	Case 3	Air quality standards (QCVN-05/ 2009)	EHS Guideline (General: 2007)
SOx	- 0.7 (1 hr)** 0.4 (24 hr)**	- 3.6 (1 hr)** 1.9 (24 hr)**	- 66.3 (1 hr) 35.2 (24 hr)	- 350 (1 hr) 125 (24 hr)	500 (10 min) - 125 (24 hr: Interim*)
NOx	3.5 (1 hr) 1.9 (24 hr) -	18.6 (1 hr) 9.8 (24 hr) -	31.1 (1 hr) 16.6 (24 hr) -	200 (1 hr) 100 (24 hr) -	200 (1 hr) - 40 (year)
PM <sub>10</sub>	0.186 (24 hr)	0.96 (24 hr)	1.1 (24 hr)	150 (24 hr)	150 (24 hr: Interim*)

\* IFC/EHS Guideline quotes the value in WHO Guideline. WHO establishes their own interim target value for PM<sub>10</sub> and SO<sub>2</sub>.

\*\* As diffusion modeling for SOx has not been conducted in O Mon 3 EIA, SOx diffusion was calculated in proportion to NOx.

*Dry season (Wind direction: South-West, Wind velocity; 2.7m/s, Temperature; 30 °C, Atmospheric stability; B)*

Parameter	Case 1	Case 2	Case 3	Air quality standards (QCVN-05/ 2009)	EHS Guideline (General: 2007)
SOx	- 0.7 (1hr)** 0.4 (24hr)**	- 3.7 (1hr)** 1.9 (24hr)**	- 68.1 (1h) 36.1 (24h)	- 350 (1 hr) 125 (24 hr)	500 (10 min) - 125 (24 hr: Interim*)
NOx	3.6 (1h) 1.9 (24h) -	19.0 (1h) 10.0 (24h) -	32.1 (1h) 17.0 (24h) -	200 (1 hr) 100 (24 hr) -	200 (1 hr) - 40 (year)
PM <sub>10</sub>	0.190 (24h)	0.98 (24h)	7.8 (24h)	150 (24 hr)	150 (24 hr: Interim*)

## (2) In the Case of increasing the Output of O Mon 3 (958.8 MW)

The above cited calculation was based on the generation capacity of 750 MW as estimated in the O Mon 3 EIA. However, as a result of the recent improvement of gas turbine technology, the turbine of much higher capacity will be installed for O Mon Power Complex, and consequently, the gas emission will also need to be modified. Additionally, as the composition of fuel gas has been also changed since the EIA preparation, air pollutant emission should be modified as well. The estimated emission of air pollutant is calculated on the assumption that the turbine of maximum generation capacity currently available is introduced. Table 5.4-4 shows the result of the estimated emission compared to the estimation in O Mon 3 EIA. Although the output of O Mon 3 will be increased, the emission of air pollutant will not exceed of the emission standards for thermal power plant.

**Table 5.4-4 Comparison of Air Pollutant Emission (Gas-Fired Combined Cycle)**

(unit: g/sec)

Parameter	O Mon 3 EIA	Result of JICA survey	Emission standard for power plant (QCVN-22/ 2009) Kp=0.85, Kv=0.6
SOx	5.0 g/sec (7.3 mg/Nm <sup>3</sup> )	2.6 g/sec (4.1 mg/Nm <sup>3</sup> )	153 mg/Nm <sup>3</sup>
NOx	25.96 g/sec (37.9 mg/Nm <sup>3</sup> )	32.5 g/sec (50.9 mg/Nm <sup>3</sup> )	127.5 mg/Nm <sup>3</sup>
Dust	2.53 g/sec (3.69 mg/Nm <sup>3</sup> )	6.3 g/sec (9.9 mg/Nm <sup>3</sup> )	25.5 mg/Nm <sup>3</sup>
Flue gas flow	18.8 m/sec	19.2 m/sec	-
Flue gas velocity	97 °C	98 °C	-

As the temperature and emission rate of the emission gas are almost similar to the O Mon 3 EIA calculation result, the maximum ground concentration may be calculated by simple proportional calculation. Background value concentration of pollutants is quoted from O Mon 4 EIA (O Mon 4 EIA Table 45, p.128) and the maximum ground concentration and the estimated maximum concentration was calculated as cited in the table below. This result suggests no exceeding of the environmental standard. Consequently, the pollutant emission, even after the increase of output, will not exceed the environmental standard and the environmental impact will be insignificant.

**Rainy season**

(unit: µg/m<sup>3</sup>)

Parameter	Max. Concentration	Back-ground	Max. Conc. + Back-ground	Air quality standards (QCVN-05/ 2009)	EHS Guideline (General: 2007)
SOx	- 3.6 -> 1.9 (1 hr) 1.9 -> 1.0 (24 hr)	- 38.7 (1 hr) 22.1 (24 hr)	- 40.6 (1 hr) 23.1 (24 hr)	- 350 (1 hr) 125 (24 hr)	500 (10 min) - 125 (24 hr: Interim*)
NOx	18.6 -> 23.3 (1 hr) 9.8 -> 12.3 (24 hr)	27.7 (1 hr) 18.5 (24 hr)	51.0 (1 hr) 30.8i (24 hr) -	200 (1 hr) 100 (24 hr) -	200 (1 hr) - 40 (year)
PM <sub>10</sub>	0.96 -> 2.4 (24 hr)	79.4 (24 hr)	81.8 (24 hr)	150 (24 hr)	150 (24 hr: Interim*)

**Dry Season**

(unit: µg/m<sup>3</sup>)

Parameter	Max. Concentration	Back ground	Max. Conc. + Back-ground	Air quality standards (QCVN-05/ 2009)	EHS Guideline (General: 2007)
SOx	- 3.7 -> 1.9 (1 hr) 1.9 -> 1.0 (24 hr)	- 38.7 (1 hr) 22.1 (24 hr)	- 40.6 (1 hr) 23.1 (24 hr)	- 350 (1 hr) 125 (24 hr)	500 (10 min) - 125 (24 hr: Interim*)
NOx	19.0 -> 23.8 (1 hr) 10.0 -> 12.5 (24 hr)	27.7 (1 hr) 18.5 (24 hr)	51.5 (1 hr) 31.0 (24 hr) -	200 (1 hr) 100 (24 hr) -	200 (1 hr) - 40 (year)
PM <sub>10</sub>	0.98 -> 2.4 (24 hr)	79.4 (24 hr)	81.8 (24 hr)	150 (24 hr)	150 (24 hr: Interim*)



## 5.4.2 Calculation of Thermal Effluent Diffusion for O Mon 3

### (1) Environmental Impact of O Mon 3 (750 MW)

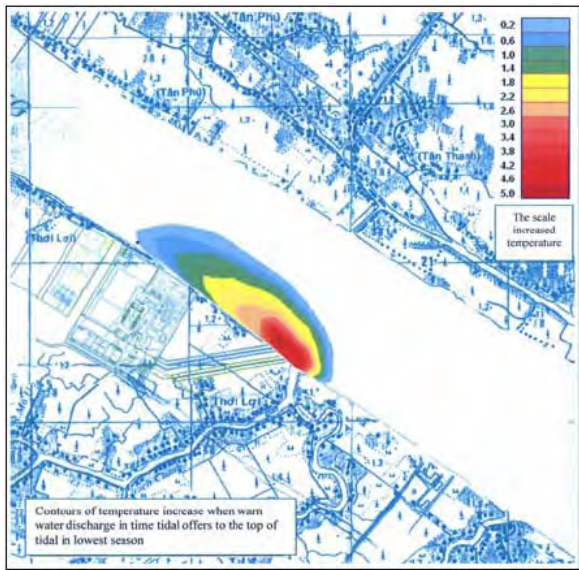
Cooling water is intake at  $18\text{m}^3/\text{sec}$  from Hau River (EIA 3.4.3.3, p114-115). The temperature of thermal effluent will be  $+7^\circ\text{C}$  compared to intake water, but since its heat will be radiated in the cooling water discharge channel, the water temperature will be  $+6^\circ\text{C}$  at the discharge outlet in Hau River. In dry season (river water temperature:  $30 - 31^\circ\text{C}$ ), river water temperature will still below  $40^\circ\text{C}$  as permitted by Vietnam standard QCVN-40/ 2011 (EIA 3.4.3.3, p114).

The diffusion of the thermal effluent was calculated by the 2D Surface Water Flow and Solute Transport Program. In calculation, it carried out on condition of the dry season of which the influence of thermal effluent is larger than the rainy season because of the river flow. As the results, the diffusion extent of thermal effluent ( $1^\circ\text{C}$  of temperature rise) is approximately 1,000m up and down-stream from the discharge outlet, and 300m toward the middle of the river (EIA 3.4.3.3, p115-126, Appendix-3.2, Appendix-4).

The northern bank of Hau River is more vegetated than the southern bank on which O Mon power complex is located, and constitutes a main spawning and nursery area for fish. The 2-D surface layer diffusion calculation takes into account only the diffusion of thermal waste water on surface layer and thus the resulted diffusion area tends to be more extended than the actual diffusion, but it indicates that the thermal water still does not reach the opposite bank. Additionally, fishermen move upstream and downstream to fish depending on the season and the growing of fish, so they have no fixed fishing place (2nd field survey), and therefore there is no specific place in which fishes gather. Thermal effluent diffuses on a surface layer and will not affect the benthic fish and animals and surface fish can also avoid thermal effluent. Since fishermen move the fishing ground depending on the movement of fish, the impact of thermal effluent to fishery is not significant.

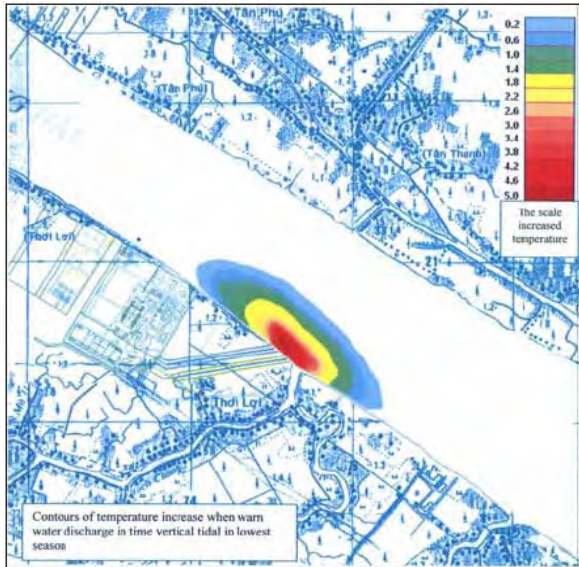
### (2) In the Case of increasing the Output of O Mon 3 (958.8 MW)

An introduction of a turbine of much higher capacity is anticipated for O Mon Power Complex, which will bring higher generation capacity of the steam turbine and increased thermal waste water compared to the time of the EIA preparation. However, in the case where the turbine of maximum generation capacity currently available is introduced, the estimated temperature of thermal effluent is  $+7^\circ\text{C}$  ( $+6^\circ\text{C}$  at the outlet of the discharge channel), similar to the case of O Mon 3 EIA, and the estimated thermal effluent discharge is  $18.4\text{ m}^3/\text{sec}$ , slightly higher than  $18\text{ m}^3/\text{sec}$  at the O Mon 3 EIA preparation (calculation based on the similar waste water temperature:  $7^\circ\text{C}$  higher than intake water). Consequently, the diffusion area of thermal effluent will remain almost unchanged. Therefore, it is not necessary to review the impact forecast and significant impact is not anticipated.



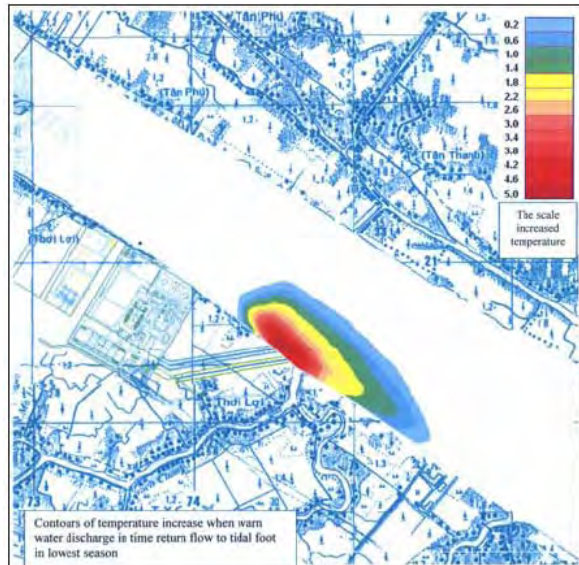
**Flood tide**

Source; O Mon 3 EIA Figure 3.6, p.117



**Slack tide**

Source; O Mon 3 EIA Figure 3.10, p.121



**Ebb tide**

Source; O Mon 3 EIA Figure 3.9, p.119

**Fig. 5.4-1 Results of Thermal Effluent Diffusion of 750 MW (2-D Surface Layer Model)**

### 5.4.3 Calculation of Air Pollutant Diffusion in the Operation Phase of All the Thermal Plants in O Mon Power Complex

In O Mon 4 EIA report, the diffusion of air pollutants was calculated in case that all the power plants in O Mon Complex (including O Mon 5) are in operation. In this case that all power plants operate by gas fired, O Mon 1 is the conventional power plant and O Mon 2 to 4 are the combined power plant. The calculation was made using U.S Environmental Protection Agency recommended CALPUFF modeling system, 8,760 times using hourly meteorological data of 2006. Table 5.4-5 shows the input parameters (O Mon 4 EIA 6.C.3, p.123-141).

**Table 5.4-5 Parameters for Air Pollution Diffusion Modeling**

Parameter	O Mon 1	O Mon 2 - O Mon 5
Stack height	140 m	40 m
Stack inner diameter	6.4 m	6.6 m
Flue gas flow	20.0 m/sec	19.3 m/sec
Flue gas temperature	90°C	95.3°C
Emission concentration and rate		
Nox	51.3 mg/Nm <sup>3</sup> (109.4 g/sec)	50 mg/Nm <sup>3</sup> (24.4 g/sec)
SOx	1.3 mg/Nm <sup>3</sup> (0.6 g/sec)	0.44 mg/Nm <sup>3</sup> (0.6 g/sec)
PM <sub>10</sub>	10.32 mg/Nm <sup>3</sup> (0.2 g/sec)	10.32 mg/Nm <sup>3</sup> (5.0 g/sec)

As described above, construction of O Mon 5 is not planned, and O Mon 3 will be equipped with a gas turbine of considerably higher power. Table 5.4-6 shows the comparison of air pollutant emission of the power plant with high-power gas turbine (estimation based on the calculation in Section 5.4.1) with the emission calculated for the EIA preparation. As SOx value varies depending on the gas type, SOx emission in O Mon 1 is assumed to be similar to O Mon 2 to 4. The result indicates that the total pollutant emission at the full operation of the power complex is lower than at the time of O Mon 4 EIA preparation except for SOx.

**Table 5.4-6 Comparison of Air Pollutant Emission**

(Unit : g/sec)

Parameter	O Mon 4 EIA			Result of JICA survey		
	Total Emission Rate	O Mon 1	O Mon 2 - O Mon 5	Total Emission Rate	O Mon 1	O Mon 2 - O Mon 4
SOx	3.0	0.6	0.6	10.4	2.6	2.6
NOx	207.5	109.4	24.4	206.9	109.4	32.5
PM <sub>10</sub>	20.5	0.2	5.0	19.1	0.2	6.3
Flue gas flow	-	20.0 m/sec	19.3 m/sec	-	20.0 m/sec	19.2 m/sec
Flue gas temperature	-	90 °C	95.3 °C	-	90 °C	98 °C

As the temperature and the emission rate of gas emission is approximate to the O Mon 4 EIA, the maximum ground concentration may be calculated by simple proportional calculation, as cited in Table 5.4-7.

The summary of diffusion model is shown in Table 5.4-7. No exceedance of air quality standard

is predicted in yearly average and 24 hrs average. Exceedance of NO<sub>x</sub> concentration in 1-hour is predicted a maximum of 2 hours per year on 2 separate days, which is a very rare case (O Mon 4 EIA 6.C.3.e.4, p.127-128).

The indirect environmental impact of the construction of O Mon Power Complex, such as potential change in atmospheric environment resulting from the industrialization of the surrounding area, is another issue to be carefully handled, and it should be noted that O Mon Power Complex will still be the largest emission source of air pollutant. The survey team proposes that regular environmental monitoring of atmosphere should be conducted frequently, and if any sign of worsening of air pollution is recognized, appropriate countermeasure should be taken in consultation with Can Tho City DONRE, such as operation control of O Mon 1 which causes heavy environmental load.

**Table 5.4-7 Results of Air Pollutant Diffusion in the Operation Phase of All the Thermal Plants in O Mon Power Complex**

(Unit : µg/m<sup>3</sup>)

Parameter	Max. Concentration	Back-ground	Max. Conc. + Back-ground	Air quality standards (QCVN-05/ 2009)	EHS Guideline (General: 2007)
SO <sub>x</sub>	-	-	-	-	500 (10 min)
	10.9 -> 37.8 (1 hr)	38.7 (1 hr)	76.5 (1 hr)	350 (1 hr)	-
	1.0 -> 3.5 (24 hr)	22.1 (24 hr)	25.6 (24 hr)	125 (24 hr)	125 (24 hr: Interim <sup>*</sup> )
	0.08 -> 0.3 (year)	5.5 (year)	5.8 (year)		
NO <sub>x</sub>	198 -> 197.4 (1 hr)	27.7 (1 hr)	225.1 (1 hr)	200 (1 hr)	200 (1 hr)
	38 -> 37.9 (24 hr)	18.5 (24 hr)	56.4 (24 hr)	100 (24 hr)	-
	4.3 -> 4.3 (year)	10.3 (year)	14.6 (year)	-	40 (year)
PM <sub>10</sub>	9.2 -> 8.6 (24 hr)	79.4 (24 hr)	88.0 (24 hr)	150 (24 hr)	150 (24 hr: Interim <sup>*</sup> )
	0.7 -> 0.7 (year)	41.7 (year)	42.4 (year)	-	-

#### 5.4.4 Calculation of Thermal Effluent Diffusion in the Operation Phase of All the Thermal Plants in O Mon Power Complex

In O Mon 4 EIA report, it calculated the diffusion of the thermal effluent in case that all the power plants in O Mon Complex (including O Mon 5) are in operation. In this case, the thermal effluent (38.6m<sup>3</sup>/sec) from O Mon 1 and O Mon 2 is discharged from the Cooling water discharge channel 1, and the thermal effluent (46.2m<sup>3</sup>/sec) from O Mon 3 to 5 is discharged from the Cooling water discharge channel 2 (PPTA4845 EIA Table 36, p.75). The water temperature is +6°C (the temperature at water intake is 31.5°C and the temperature at discharge outlet is 37.5°C). The calculation was made using 3D model (MIKE 3 model). The condition of the calculation is in dry season and 28 days as one cycle of tidal (O Mon 4 EIA 6.C1.c.i, p.115).

Table 5.4-8 shows the comparison of thermal waste water discharge of the power plant with high-power gas turbine (estimation based on the calculation in Section 5.4.2) with the discharge calculated for the EIA preparation.

**Table 5.4-8 Comparison of Thermal Waste Water Discharge**(Unit : m<sup>3</sup>/sec)

Discharge channel	Parameter of O Mon 4 EIA		Result of JICA study	
	Amount of thermal effluent	Power plant	Amount of thermal effluent	Power plant
No.1	38.6 m <sup>3</sup> /sec	O Mon 1 (23.2 m <sup>3</sup> /sec) O Mon 2 (15.4 m <sup>3</sup> /sec)	41.6m <sup>3</sup> /sec	O Mon 1 (23.2 m <sup>3</sup> /sec) O Mon 2 (18.4 m <sup>3</sup> /sec)
No.2	46.2 m <sup>3</sup> /sec	O Mon 3 (15.4 m <sup>3</sup> /sec) O Mon 4 (15.4 m <sup>3</sup> /sec) O Mon 5 (15.4 m <sup>3</sup> /sec)	36.8m <sup>3</sup> /sec	O Mon 3 (18.4 m <sup>3</sup> /sec) O Mon 4 (18.4 m <sup>3</sup> /sec)

The water discharge from the discharge channel No.1 and No.2 slightly varies, but the total thermal water discharge is 78.4m<sup>3</sup>/sec, which is lower than 85m<sup>3</sup>/sec of O Mon 4 EIA case. Consequently, the diffusion area of thermal water discharge will not exceed the diffusion modeling of O Mon 4 EIA (as described below).

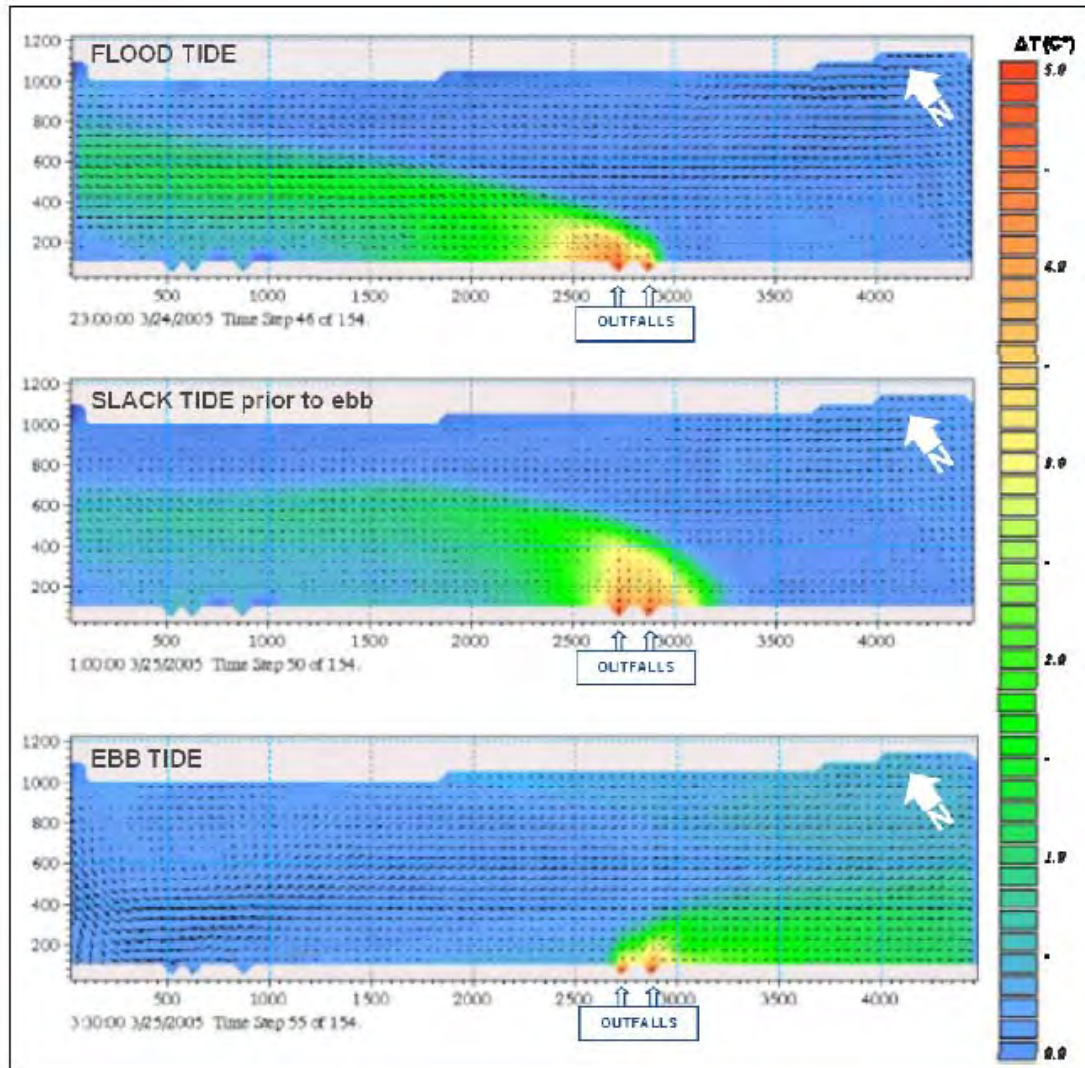
In flood tide, thermal water horizontally extends upstream toward the river center, with the 1°C warming area extending 2km upstream of the outfall and 600m toward river center. In slack tide prior to ebb, thermal water extends to the river center in upstream direction, with the area of 1°C warming area extending 1km upstream of the outfall and 600m toward river center. In ebb tide, thermal water extends along the bank toward downstream, with the 1°C warming area extending 1km downstream of the outfall and 400m toward river center (Appended Figure-3(1)).

Thermal water vertically extends to 3m deep around the outlet of the cooling water discharge channel 2, maintaining the depth up to 150m toward the river center, slightly extending toward the deeper area. The same occurs in channel 1, only with smaller extension toward the center and the deeper area of the river, as discharge rate is smaller (Appended Figure-3(2)).

In O Mon 4 EIA report, the diffusion of the thermal effluent is calculated: 38.6m<sup>3</sup>/sec in channel No.1, 46.2m<sup>3</sup>/sec in channel No.2. In the JICA survey, the result was 41.6m<sup>3</sup>/sec in channel No.1, 36.8m<sup>3</sup>/sec in channel No.2. From the fact that the gradient at the outfall of the channel No.1 and No.2 is approximately the same, although the thermal water discharge of channel No.1 and No.2 is reversed in the latest survey result, the vertical diffusion of thermal waste water will not significantly change.

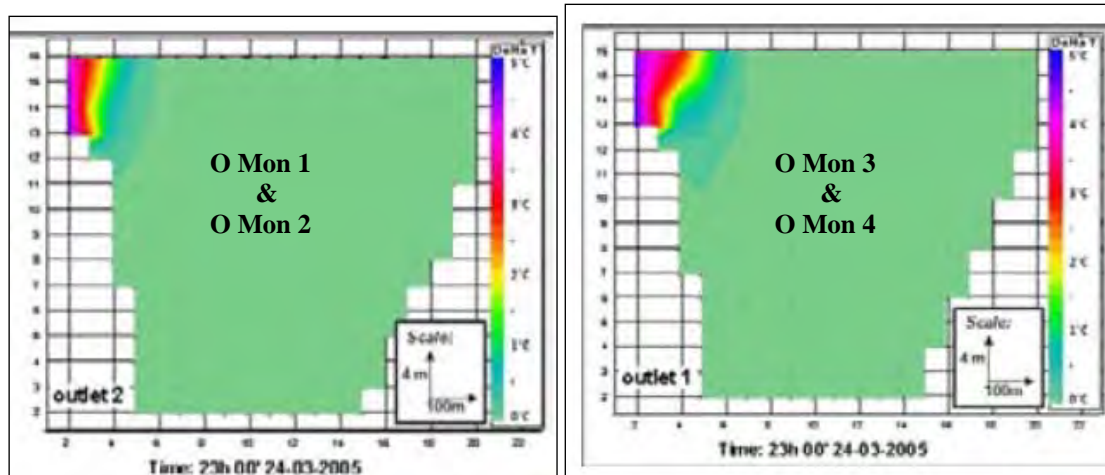
In this manner, thermal waste water extends 150m toward the river center with layer of 3m thick, but at the point distant from the outfall, thermal water extends only on the surface layer and not in deeper layer. Accordingly, benthic fish and organisms will not be affected. In addition, thermal water will not reach the main spawning and nursery area for fish located on the opposite bank even in dry season. On the other hand, the river water is abundant in wet season which is a high season for fish spawning and nursing. Consequently, the impact of thermal water to river organisms will be insignificant. Moreover, as the fishers in Hau River have no fixed fishing place, the thermal water will not adversely affect the fishery.





Source: O Mon 4 EIA Figure 40, p.118

**Fig. 5.4-2 (1) Result of Thermal Effluent Diffusion (Horizontal Chart)**



Source: O Mon 4 EIA Figure 42, p.120

**Fig.5.4-2 (2) Result of Thermal Effluent Diffusion (Vertical Chart)**

### 5.4.5 EIA for O Mon 3 and Alternative Analysis including Zero Option

#### (1) Environmental Assessment

The Table 5.4-9 shows the result of EIA for O Mon 3 Power Plant. The details are described in the Table 5.9-1.

**Table 5.4-9 Result of Environmental Assessment**

No.	Item	Impact Assessment at Scoping		Impact Assessment based on the Study Result		Reason
		C	O	C	O	
<b>[ Pollution ]</b>						
1	Air Pollution	A <sup>-</sup>	A <sup>-</sup>	A <sup>-</sup>	B <sup>-</sup>	<ul style="list-style-type: none"> <li>- Dust will be generated from the removal of vegetation and heavy earthmoving activities, giving an impact on air quality. As leveling time with only about 1 month, the impact will be small and can be reduced.</li> <li>- Air pollution can also occur due to gas emission from the machinery, equipment and heavy trucks. However, the value of the parameters of pollution is still lower than the Vietnamese emission standard (except for dust).</li> <li>- In the construction phase of the project, 100 workers are expected to work at the construction site and burn fuel such as oil, gas and charcoal for cooking. If a person uses fuel at the average of about 0.5kg fuel/person/day, the total use of fuel is expected to be about 500kg/day. The process of burning fuel mainly create ash, dust, SO<sub>2</sub>, CO<sub>2</sub>, etc, but their impacts will be limited to the area of the construction area only.</li> <li>- In the course of pre-construction activity, 10 ton truck will be operated at the frequency of 33-36 trips/week.</li> <li>- In the course of construction, 10 ton truck will be operated at the frequency of 20 trips/hour for transporting construction materials and 24-30 trips/week for transporting waste (2 trips/week for domestic waste only).</li> <li>- Emission gas from O Mon III will meet the Vietnamese gas emission standard (QCVN-22/2009) and IFC Guideline. According to the prediction of the pollutant diffusion, maximum ground concentration of the pollutant will not exceed the gas emission standard (QCVN-5, 2009) and IFC Guideline, even if the capacity of gas turbine increases. When all the power plants in O Mon Power Complex operate at the same time, the concentration of NO<sub>x</sub> for 1 hour value may possibly exceed the air quality standard. However, the degree of air pollution from O Mon 1-A is still much higher.</li> </ul>
2	Water Pollution	A <sup>-</sup>	A <sup>-</sup>	A <sup>-</sup>	B <sup>-</sup>	<ul style="list-style-type: none"> <li>- According to the estimate, the total amount of excavation soil and rock is about 65,100m<sup>3</sup>. This impact is considered small because the scope of the pollution is only about a few dozen meters around the project area and only last for about 1 month period of the excavation.</li> <li>- The wastewater containing concrete and waste oily will be generated.</li> <li>- It is assumed that the pre-construction activities would require 100 workers respectively, generating 15m<sup>3</sup>/day of domestic wastewater. The number of workers in the project's area at the peak time is estimated about 1000 workers, generating 150m<sup>3</sup>/day of domestic wastewater.</li> <li>- Leakage of the fuel from the construction machinery causes the underground water pollution.</li> <li>- Temperature of the thermal effluent from O Mon III will be 7°C higher than the temperature of intake water, but will be decreased by 1°C by the time that the effluent is discharged into Hau River due to heat radiation at discharge channel. The diffusion range of the thermal effluent (defined as 1°C higher than the river water temperature) will be 1000m to the up and downstream and 300m to the center, and will not reach the opposite side of Hau River. The diffusion range will remain the same even with the capacity increase of gas turbine. When all the power plants in O Mon Power Complex operate at the same time, diffusion range will be 2km to the upstream, 1.5km to the downstream and 600m to the center, and will not reach the opposite side even in the dry season, resulting in not giving any impacts on spawning and nursing ground of fishes. Also, the thermal effluent does not give significant impact on fishery, since there is no designated fishing ground along Hau River.</li> <li>- Industrial wastewater and domestic wastewater will be treated at the central wastewater treatment facility to meet the discharge standard prior to be discharged.</li> <li>- Leakage of the diesel fuel causes the underground water pollution.</li> </ul>

No.	Item	Impact Assessment at Scoping		Impact Assessment based on the Study Result		Reason
		C	O	C	O	
3	Waste	A <sup>-</sup>	A <sup>-</sup>	A <sup>-</sup>	A <sup>-</sup>	<ul style="list-style-type: none"> <li>- General waste and hazardous waste are generated during construction phase.</li> <li>- General waste and hazardous waste are generated from the O Mon 3 Power Plant.</li> </ul>
4	Noise and Vibration	A <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	N	<ul style="list-style-type: none"> <li>- Noise level decreases of 6dB as the distance from noise source doubles. It is known that noise level becomes 75 dBA at the distance of 38-121m from the heavy equipments and 45dB at the distance of 2-5km. The temporary noise effect in residential area may be occurred during construction period (1 month).</li> <li>- The truck is estimated to serve this phase of the project which circulate on the Nation Road 1 about 35-70 trips/hours (to ton's truck) in the rush hour. According to Canter (1996), the noises caused by the heavy-duty trucks can reach 90 dBA at 15 meters from the noise source and range of the area affected by the noise can reach hundreds of meters from the noise source.</li> <li>- The closest residential area from O Mon 3 is located at about 300m away from the power plant. Noise level is decreased by 50dBA at the distance of 300m. If the level of noise source is 90dBA, the noise level at the residential area will be 40dBA, which is not considered as significant impact.</li> </ul>
<b>[ Natural Environment ]</b>						
4	Terrestrial Ecosystem	B <sup>-</sup>	N	B <sup>-</sup>	N	<ul style="list-style-type: none"> <li>- Air and noise pollution caused by construction activities have impacts on the terrestrial ecosystem.</li> <li>- There is no ecological sensitive place such as primeval forest at O Mon 3 Power Plant. The land use of O Mon 3 site is a mix of weeds and field crops.</li> <li>- The size of the farmland of Phuoc Thoi ward and Thoi An ward is 3,200 ha in total. Of those, 95.5 ha of the farmlands have been acquired by the project for the purpose of constructing O Mon 3 to O Mon 5 and auxiliary facilities. (26.6 ha of them are for O Mon 3). Thus, the impact of alternation of farmlands by this project is not considered as significant.</li> </ul>
5	River Ecosystem	B <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	<ul style="list-style-type: none"> <li>- Water pollution caused by construction activities has impacts on the aquatic creatures.</li> <li>- Aquatic creature will be taken with the intake of cooling water.</li> <li>- At average, 719 m<sup>3</sup>/day of plant wastewater, 195 m<sup>3</sup>/day of oily wastewater and 35 m<sup>3</sup>/day of domestic wastewater will be generated.</li> <li>- The thermal effluent is diffused at the surface of the river, so that the impact on benthic organisms is not expected. When all the power plants in O Mon Power Complex operate at the same time, the diffusion range of the thermal effluent is 2km to the upstream, 1.5km to the downstream and 600m to the center, and will not reach the opposite side even in the dry season, resulting in not giving any impacts on spawning and nursing ground of fishes. Impact caused by the thermal effluent will also not significant since spawning and nursing season of the fishes are mainly in rainy season where the river water volume is abundant.</li> </ul>
6	Rare Species	B <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	<ul style="list-style-type: none"> <li>- There is flooding soil ecosystem of sonnertia along Hau River, which is very vulnerable, but the strip of sonnertia in the project area has already been disappeared.</li> <li>- Air and noise pollution caused by construction activities have impacts on the terrestrial ecosystem.</li> <li>- Water pollution caused by construction activities has impacts on the aquatic creatures.</li> <li>- At average, 719 m<sup>3</sup>/day of plant wastewater, 195 m<sup>3</sup>/day of oil wastewater and 35 m<sup>3</sup>/day of domestic wastewater will be generated.</li> <li>- The 2007 survey found indications of six fish species that have some species of listing in the Vietnamese Red List in the vicinity of the project site and the survey found three additional species in a large area of Hau River.</li> </ul>
<b>[ Social Environment ]</b>						
1	Resettlement (O Mon Power Complex)	A <sup>±</sup>	N	A <sup>±</sup>	N	<ul style="list-style-type: none"> <li>- The 95.5 ha of land have been acquired for O Mon 3 and 4 as well as some auxiliary facilities, and 226 households were relocated out of the 601 affected households.</li> <li>- The life level of the affected people improve by compensation</li> </ul>
2	Labor and Livelihood	B <sup>±</sup>	B <sup>±</sup>	B <sup>±</sup>	B <sup>±</sup>	<ul style="list-style-type: none"> <li>- About 300 people will usually be employed in the course of construction and about 1000 people will be engaged in construction at the peak time.</li> <li>- The employment opportunity and creation of companies to the local resident will be promoted</li> <li>- An important change is expected to local economical structure due to the creation of employment and companies.</li> <li>- O Mon 3 Power Plant will plan to employ 191 people.</li> <li>- The employments opportunity and creation of enterprises to the local resident will be</li> </ul>



No.	Item	Impact Assessment at Scoping		Impact Assessment based on the Study Result		Reason
		C	O	C	O	
						<p>promoted</p> <ul style="list-style-type: none"> <li>- An important change is expected to local economical structure due to the creation of employment and companies.</li> </ul>
3	Regional Community	A <sup>+</sup> , B <sup>-</sup>	A <sup>±</sup>	A <sup>+</sup> , B <sup>-</sup>	A <sup>±</sup>	<ul style="list-style-type: none"> <li>- The influx of the workers increases the risk of social evils as a drug addict, harlotry, thief, the risks of transmitting epidemic diseases and occurring conflict with worker and local inhabitant.</li> <li>- The influx of the big number of workers will increase the demand of public health and environmental sanitation facilities.</li> <li>- Construction activities increase the traffic density on Nation Road 91 and internal roads in O Mon District leading to the increase of accidents on these roads.</li> <li>- Transporting activities can damage the roads in the area (National highway 91 and internal roads).</li> <li>- The 30 tons is the maximum weight for one overland transporting truck. Any heavy equipment or materials that are more than 30 tons will be transported by water.</li> <li>- Local economy is improved by creation of employment and starting a business around the area.</li> <li>- There is a possibility that non-equal relations in the income difference between the local residents and power plant employees will arise.</li> <li>- Increase of the traffic may lead to the increase of the traffic accident and the damage of the road.</li> </ul>
5	Landscape	B <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	<ul style="list-style-type: none"> <li>- Construction activities of the plant and ancillary facilities, transporting of construction material and equipments, etc during construction stage of the project may affect landscape of the project area and road (national road No91 etc )</li> <li>- Environmental pollution including air pollution, water pollution and solid waste disposal, etc. caused by operation of the O Mon 3 Power Plant may affect landscape of the project area.</li> </ul>
7	Working Environment	B <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	<ul style="list-style-type: none"> <li>- There is a high possibility that accidents would occur in the course of construction.</li> <li>- The influx of the workers increases the risks of transmitting epidemic diseases.</li> <li>- There is a possibility that workers would experience work-related accidents.</li> <li>- There is a possibility that the security guards would violate the safety of the residents.</li> </ul>
<b>[ Others ]</b>						
1	Global Climate Change	B <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	B <sup>-</sup>	<ul style="list-style-type: none"> <li>- CO<sub>2</sub> will be generated from O Mon III Power Plant, contributing to the global climate change, but speaking of the capacity of the project, the impact will not be significant.</li> </ul>

Note) Blue-colored items indicate the construction phase only.

The definition of the category is as follows:

A: Significant positive/negative impact is expected (+: positive, -: negative)

B: Positive/negative impact is expected to some extent (+: positive, -: negative)

N: No impact is expected

## (2) Comparison of Alternative Technologies including a Zero Option

### 1) Selection of the project site

The O Mon Power Complex will play important roles in providing the necessary power supply to meet national socio-economic development goals, especially in the southern parts of Viet Nam. Without implementation of the O Mon Power Complex, the current shortfall of 1,100 MW in the power system as well as the electricity demand growing at 15% to 17% per annum will not be met. If O Mon 3 is not to be constructed, another power plant should be constructed in southern Vietnam.

If a hydraulic power station with generation capacity equivalent to O Mon 3 is to be constructed, installation of huge dam and reservoir will be essential and cause significant environmental alteration and large scale of resettlement of the local inhabitants (Son La Hydro Power Station (2,400 MW) in northern Vietnam has the reservoir of 224.2km<sup>2</sup> in total

causing resettlement of more than 90 thousand people.)

The project plan of O Mon Power Complex has been developed in 1996. O Mon district was selected as the power complex project site for various reasons (Table 5.4-10) (O Mon 4 EIA 5.G, p.100-101). The construction plan of the O Mon 3 and 4 power plants in O Mon Power Complex has been approved by the MOIT (PPTA-4845 SIA 5.1, p.22), and O Mon Power Complex is the only alternative construction site conceivable for the new power plant around O Mon district.

**Table 5.4-10 Advantage of Construction of Power Station in O Mon District**

Technical	Geographical	Social and environmental
<ul style="list-style-type: none"> <li>- sufficient area for a 750 MW CCGT and associated facilities</li> <li>- access to reliable gas source</li> <li>- access to road and water transportation networks</li> <li>- access to national power grid</li> <li>- access to existing O Mon I infrastructure</li> <li>- available water supply</li> <li>- available cooling water</li> <li>- proposed use is in compliance with relevant land use plans and regulations</li> </ul>	<ul style="list-style-type: none"> <li>- geologically stable, low earthquake risk</li> <li>- reasonable site leveling and compaction costs</li> <li>- reasonable foundation construction costs</li> </ul>	<ul style="list-style-type: none"> <li>- not located close to any sensitive environmental receptors (communities, hospitals, schools, etc).</li> <li>- no physical cultural resources on site</li> <li>- relatively low resettlement and socioeconomic impacts</li> </ul>

## 2) Consideration of fuel (F/S Chapter 5)

The fuel generally used in a major thermal power station is coal, natural gas, and oil. The reasons for not using coal, LNG, or domestic oil in O Mon 3 are shown in Table 5.4-11. Additionally, coal-fired power generation requires coal storage site and ash disposal site, and as O Mon Power Complex is designed as a gas-fired power plant, introduction of coal fuel will need additional site for those purposes.

**Table 5.4-11 Reasons for not using Coal, LNG, or Domestic Oil in O Mon 3**

Coal	LNG	Oil
<ul style="list-style-type: none"> <li>- Coal development takes time and cost.</li> <li>- There is a construction plan of coal-fired power plant in northern Vietnam near coal mine in energy strategy in Vietnam.</li> </ul>	<ul style="list-style-type: none"> <li>- LNG plant needs high cost, and acceptance of the site and construction of storage facility is necessary.</li> </ul>	<ul style="list-style-type: none"> <li>- Domestic oil contains low sulfur. Export price of domestic oil is 1.5 times higher than import price of heavy oil, and oil export is economically more valuable than consuming as fuel for power generation.</li> </ul>

As described above, coal is not appropriate as fuel used in O Mon 3. LNG should also be excluded for high cost, and natural gas and oil (light oil or heavy oil) may be considered for use as fuel in O Mon 3. Table 5.4-12 describes the comparison of gas, DO and HO.

**Table 5.4-12 Comparison of Gas, DO (Light Oil) and HO (Heavy Oil)**

Items	Gas	DO	HO
Atmospheric impact	Base	Significant	Very significant
Cost of fuel	Base	Expensive	Expensive

Consequently, gas is the most feasible fuel to be used for O Mon 3.

### 3) Comparison of electricity generation techniques (F/S Chapter 6.2)

Power generation technology using natural gas includes conventional steam-power generation and combined-cycle power generation. The comparison of the two technologies is shown in Table 5.4-13.

**Table 5.4-13 Comparison of Electricity Generation Techniques**

Items	Combined Cycle	Conventional
Fuel	Gas, DO, (HO) HO need pretreatment.	Gas, DO, HO
Efficiency	51 ~ 60%	39 ~ 44%
Development cost (Calculation by F/S; 2009)	650 ~ 850 US\$/kW	800 ~ 1,200US\$/kW (Gas, Oil) 1,000 ~ 1,400US\$/kW (Coal)
Running cost (O&M) (Calculation by F/S; 2009)	12 US\$/kW/year	9 US\$/kW/year
Total area of the plant	70 ~ 80%	Base (100%)
Operating life	25 years	30 years
Construction period	Base	10 ~ 12 months longer
Cooling water	Base	1.5 ~ 1.8 times more needed

Combined cycle thermal power generation, despite high running cost and short life compared to conventional power generation, has the advantage of low development cost and short construction period. In addition, it generates less NO<sub>x</sub> (air pollutant), which is not noted in F/S. It needs less cooling water and accordingly generates less thermal waste water. As a consequence, the environmental impact is significantly smaller than thermal power generation.

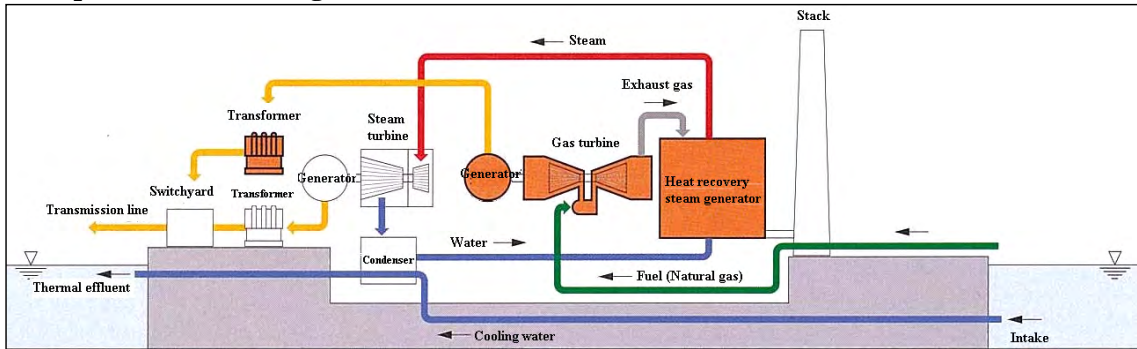
From the above reasons, combined cycle power generation should be adopted to for O Mon 3.

### 4) Consideration of cooling method (F/S Chapter 7.6)

Steam used for power generation is cooled and return to water in the condenser, then sent back to the boiler. There are plural cooling methods of steam, such as heat release into water or air, and use of vaporization heat. Five cooling method including water-intake method are considered in the F/S.

In one-through method, the steam is cooled by releasing heat into water. Cooling water is taken from the sea or river, and discharged again to sea or river after passing through the condenser.

**Option 1: One-through method**



Source: "Outline of an environmental impact assessment", The Chugoku Electric Power Co., Inc.

**Option 2: Cooling method using pond or lake**

An artificial pond is constructed to temporarily store water, and cooling water is taken from/discharged into the pond. The scale of the artificial pond is determined depending on the capacity of the power plant, climate of the area, and the shape of the pond. In case of O Mon 3, a pond of 2.5km<sup>2</sup> will be needed, which is not a feasible option.



Source: <http://www.nucpros.com/node/6083>

**Option 3: Natural circulation cooling tower method**

In cooling tower method, temperature of cooling water is decreased by vaporization inside the tower. Here, air warmed by steam rises from the upper part of the tower, and cool air naturally flows in from the lower part of the tower to fill the space. The size of the cooling tower is determined depending on the climate and the expected heat removal efficiency. In case of O Mon 3, a significantly large cooling tower will be needed.



Source: [http://www.wort.lu/wort/web/en/europe\\_and\\_world/articles/2011/12/169293/index.php](http://www.wort.lu/wort/web/en/europe_and_world/articles/2011/12/169293/index.php)

**Option 4: Forced-circulation Cooling tower method**

A similar cooling tower is used as that of "natural-circulation method", but with a fan installed at the lower part of the tower to mechanically force air into the tower.

**Option 5: Air-cooling condenser method**

In air-cooling condenser method, wind of a fan is used for cooling steam. A cooling tower is not necessary, which is convenient in the area where supply of cooling water is not assured, in desert area for example. As the fan is operated with electricity generated in the power plant, it will decrease certain amount of electricity supply. Cooling water supply is abundant in O Mon Power Complex and this method is not an appropriate option.

As a result of the comparison of the above-described 5 options, Option 2 and Option 5 are not feasible. Option 3 and Option 4 require construction cost for installation of cooling tower, and are lower in power generation efficiency compared to One-through method. Consequently, Option 1 “One-through method” is the most feasible and appropriate option.

### 5) Zero option

Here, the alternative in which construction of O Mon 3 is not conducted within the scope of O Mon Power Complex is considered as “zero option” and the environmental load is compared with the option of O Mon 3 construction.

#### (a) Air pollution

The estimated air pollutant diffusion in case of “zero option” and O Mon 3 construction is compared (Table 5.4-14).

**Table 5.4-14 Results of Simulation of Air Pollutants Diffusion in “Zero Option” and in the case of Construction of O Mon 3**

Items	Zero option		Case of O Mon 3 construction		Air quality standard (QCVN-05/ 2009)	EHS Guideline (General: 2007)
	Total emission of O Mon Power Complex (g/sec)	Max, ground concentration ( $\mu\text{g}/\text{m}^3$ )	Total emission of O Mon Power Complex (g/sec)	Max. Ground concentration ( $\mu\text{g}/\text{m}^3$ )		
SO <sub>x</sub>	7.8	- 67.4 (1hr) 24.7 (24hr) 5.7 (year)	10.4	- 76.5 (1hr) 25.6 (24hr) 5.8 (year)	- 350 (1hr) 125 (24hr) 50 (year)	500 (10min) - 125 (24hr) -
NO <sub>x</sub>	177.4	197.0 (1hr) 51.0 (24hr) 14.0 (year)	206.9	225.1 (1hr) 56.4 (24hr) 14.6 (year)	200 (1hr) 100 (24hr) 40 (year)	200 (1hr) - 40 (year)
PM <sub>10</sub>	12.8	85.1 (24hr) 41.7 (year)	19.1	88.0 (24hr) 42.4 (year)	150 (24hr) 50 (year)	150 (24hr) -

The maximum ground concentration in case of “zero option” does not exceed the air quality standard, but is close to the upper limit thereof. The industrialization of the surrounding area may affect the atmospheric environment and induce exceedance of air quality standard in future. It should be noted that O Mon Power Complex will remain the largest emission source of air pollutant.

#### (b) Thermal effluent

The temperature of thermal waste water will be +7°C compared to intake water (+6°C at the outlet of the discharge channel) in both the zero option case and O Mon 3 construction. The estimated total thermal waste water discharge from O Mon Power Complex in the case of zero option is 60.0 m<sup>3</sup>/sec, and 78.4 m<sup>3</sup>/sec if O Mon 3 is constructed, 30% higher than the zero option (Table 5.4-15).

**Table 5.4-15 Thermal Waste Water Discharge in “Zero Option ” and in the case of Construction of O Mon 3**

Discharge channel	Zero option		O Mon 3 construction	
	Total thermal wastewater discharge	Thermal effluent discharge from the power plant	Total thermal wastewater discharge	Thermal effluent discharge from the power plant
No.1	41.6 m <sup>3</sup> /sec	O Mon O Mon 2 (18.4 m <sup>3</sup> /sec)	41.6 m <sup>3</sup> /sec	O Mon 1 (23.2 m <sup>3</sup> /sec) O Mon 2 (18.4 m <sup>3</sup> /sec)
No.2	18.4 m <sup>3</sup> /sec	O Mon 3 (not constructed) O Mon 4 (18.4 m <sup>3</sup> /sec)	36.8 m <sup>3</sup> /sec	O Mon 3 (18.4 m <sup>3</sup> /sec) O Mon 4 (18.4 m <sup>3</sup> /sec)

Next, the diffusion of the thermal effluent is estimated. As thermal waste water barely diffuses in a vertical direction, it is estimated that the water temperature rise area (1°C) in horizontal direction extends simply at a rate proportional to thermal effluent discharge. Even though the temperature rise area extends, the distance from the water discharge outlet to the end of 1°C rise area will increase only 15% (Table 5.4-16).

**Table 5.4-16 Estimated Diffusion of Thermal Waste Water Discharge in “Zero Option ” and in the case of Construction of O Mon 3**

Tide	Direction of diffusion	Zero option	O Mon 3 construction
Flood tide	Upstream and downstream	Approx. 1.7km upstream	Approx. 2km upstream
	Toward center	Approx. 520m	Approx.600m
Slack tide prior to ebb	Upstream and downstream	Approx. 0.87km upstream	Approx. 1km upstream
	Toward center	Approx. 520m	Approx.600m
Ebb tide	Upstream and downstream	Approx. 1.3km downstream	Approx. 1.5km downstream
	Toward center	Approx.350m	Approx.400m

**(c) Natural environment**

Land acquisition for O Mon 3 is conducted as a part of land acquisition for O Mon Power Complex, and alteration of terrestrial flora occurs regardless of the construction of O Mon 3.

The extent of thermal effluent diffusion scarcely changes by construction of O Mon 3.

**(d) Social environment**

Land acquisition for O Mon Power Complex is carried out regardless of construction of O Mon 3, and no change in resettlement and compensation plan of the residents is involved.

191 workers will work in O Mon 3, of which 170 workers (about 90%) will be hired from the local area. No employment will be conducted in case of “zero option”.

As described above, the adoption of the zero option in the scope of construction plan for O Mon Power Complex will scarcely affect the environmental impact of air pollutant and thermal waste water. Also, the site has been acquired as a part of the O Mon Power Complex and construction of O Mon 3 does not affect the impact to the terrestrial flora and compensation and resettlement plan.

#### **5.4.6 Result of Consideration of Environmental Mitigation Measures**

The result of consideration of environmental mitigation measures is described in Table 5.5-1.

## **5.5 ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING PLAN**

### **5.5.1 Environmental Management Plan**

Environmental Management Plan (EMP) for O Mon 3 has been prepared and specified in the EIA report for O Mon 3. EMP for O Mon 4 has also been prepared, but it is not the same as the EMP for O Mon 3. Considering that O Mon 3 Power Plant and O Mon 4 Power Plant are very similar in design and capacity, it would be better to make the EMP for O Mon 3 same as the one for O Mon 4. Thus, any effective environmental management measures, which specified in EMP for O Mon 4 and not specified in EMP for O Mon 3, are to be recommended as “proposal for addition” as shown in the Table 5.5-1.

Table 5.5-2 shows the frequency, responsible organization and cost for the environmental management plan. This plan has been understood by the project owner through the discussion with them (3rd field survey).



**Table 5.5-1 Proposal for Addition to Environmental Management Plan**

Item	Environmental Management Plan (EIA for O Mon 3)	Proposal for Addition
<b>Construction Phase</b>		
Air Pollution	<ul style="list-style-type: none"> <li>- Spraying water at construction area and disposal site.</li> <li>- Minimizing size and occupied time of disposal heap.</li> <li>- Covering vehicle during transportation time.</li> <li>- Limiting operation of vehicle at daytime if possible.</li> <li>- Ensuring vehicles running in the project area in good condition.</li> <li>- Sodding and planting of grasses that grow strongly on disposal heaps.</li> </ul>	<ul style="list-style-type: none"> <li>- Using modern equipment that is in compliance with relevant Vietnamese vehicle emissions regulations (TCVN-6438/ 2001).</li> <li>- Developing vegetation cover for the soil piles that are not going to be used in the short-term.</li> </ul>
Water Pollution	<ul style="list-style-type: none"> <li>- Preparing and implementing a land erosion control plan.</li> <li>- Preparing and implementing a Construction Phase Erosion and Runoff Control Plan (ERCP)</li> <li>- Prohibiting disposal of waste into Hau River as well as surroundings of the project area.</li> <li>- Storing chemicals at area with roof and concrete floor.</li> <li>- Installing temporary toilets at a rate of one for every twenty workers on site.</li> <li>- Collecting and treating the effluent from portable toilets by an appropriately licensed company in accordance with relevant Vietnamese regulations.</li> <li>- Installing septic tanks at the construction areas for treating domestic wastewater.</li> <li>- Constructing temporary rain drainage ditches to prevent accumulating water in the leveling area in the course of construction. Maintaining this water drainage system regularly to increase rain discharge capacity of the region.</li> <li>- Installing setting basin of overflow rainwater at outlet prior to discharge into Hau River.</li> <li>- Minimizing all petroleum and lubricant leakages and dropped construction materials and collecting them daily in order to prevent sweeping them away to the arroyos and changing flows.</li> <li>- Implementing sedimentation and oil collection (oil separation system) from waste water prior to discharge to environment.</li> <li>- Training workers on cleaning measures in case of chemical spill accident.</li> <li>- Reducing the restoration of ground water artery by a layer of waterproofing materials such as concrete and asphalt after construction.</li> </ul>	<ul style="list-style-type: none"> <li>- Treating the wastewater from supply ships in accordance with the local regulations, not discharging into the river.</li> </ul>
Waste	<ul style="list-style-type: none"> <li>- Designing and constructing of temporary disposal area at camp area of workers.</li> <li>- Installing solid waste refuses receptacles at a rate of one for every twenty workers on site and having solid waste collected regularly and disposed at a licensed waste disposal facility.</li> <li>- Using information of solid waste treatment for training program of construction workers including classification of harmful waste and possibly harmful waste.</li> <li>- Classifying waste into harmful waste and normal waste prior to transport for re-usage or burying.</li> <li>- Contracting with Urban Works Enterprise of Can Tho City on collection of construction waste from project site to the disposal area of district at least one time in a week.</li> </ul>	<ul style="list-style-type: none"> <li>- Requiring all the supply ships to maintain good hazardous waste management practices and have spill response plans in place.</li> </ul>
Noise and Vibration	<ul style="list-style-type: none"> <li>- Announcing widely the time period and construction plan of the project to the community</li> <li>- Restricting all transport means to operate from 21:00pm to 6:00am of the next day.</li> <li>- Repairing and maintaining regularly construction machines, equipment and vehicles.</li> <li>- Implementing high noise activities in the daytime.</li> <li>- Restricting pile-driving to week-days and daytime hours (6am to 6pm).</li> <li>- Constructing a noise wall or installing noise reducer at noise affected area.</li> </ul>	None
Terrestrial Ecosystem	<ul style="list-style-type: none"> <li>- Taking mitigation measures for the impacts of air pollution, noise and vibration.</li> </ul>	None
River Ecosystem	<ul style="list-style-type: none"> <li>- Mitigating impacts to the aquatic creature by taking mitigation measures for water pollution.</li> </ul>	None
Rare Species	<ul style="list-style-type: none"> <li>- Mitigating impacts on the rare species by taking mitigation measures for water pollution, since the rare species around the O Mon Power Complex is only fishes.</li> </ul>	None
Resettlement	<ul style="list-style-type: none"> <li>- Conducting monitoring activities on the resettled residents.</li> <li>- Providing adequate compensation and support for livelihood restoration.</li> <li>- Establishing grievance mechanism.</li> </ul>	Corrective Action Plan (2011) by ADB
Employment and Livelihood	<ul style="list-style-type: none"> <li>- Employing local people, especially project affected people on construction activities.</li> </ul>	None

Item	Environmental Management Plan (EIA for O Mon 3)	Proposal for Addition
Local Community	<ul style="list-style-type: none"> <li>- Propagandizing and educating the construction workers to establish relations with inhabitants.</li> <li>- Organizing exchange meeting with People's Committee of wards and O Mon District on matters related to the relation between workers and inhabitants.</li> <li>- Installing light and sign system on section of National highway 91 crossing over the project site. Repairing the damaged road section by the contractor after construction completion, since National highway 91 could be damaged by operation of heavy trucks.</li> <li>- Maintaining environmental sanitation and living conditions and ensuring community health on workers' camp area.</li> <li>- Supplying sufficient fresh water and sanitary food to workers.</li> <li>- Supplying sufficient garbage can and periodical collection of garbage.</li> <li>- Improving awareness of construction workers on environmental sanitation at camp area.</li> <li>- Constructing or providing suitable sanitary equipment such as removable WCs, waste bins, etc at the worker's camps by the construction contractor. Constructing one septic tank system at each camping area to treat domestic sewage water.</li> <li>- Classifying waste into harmful waste and normal waste prior to transport for re-usage or burying.</li> <li>- Contracting with Urban Works Enterprise of Can Tho City on collection of construction waste from project site to the disposal area of district at least one time in a week.</li> </ul>	<ul style="list-style-type: none"> <li>- Prior to the commencement of civil works, developing a Occupational Health and Safety Plan (OHSP) that is consistent with the relevant requirements of Vietnamese law and with good international practice as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines.</li> <li>- Having Community Health and Safety Plan (CHSP) included procedures for posting warning signs and fences as required to protect local community members from dangerous work areas.</li> </ul>
Landscape	None.	None
Working Environment	<ul style="list-style-type: none"> <li>- Building clinics at the construction site and nurses and providing timely all medicines, health care services and first aid to the workers when they are sick or involved in industrial accidents. Establishing a system where the construction contractor coordinates closely with clinic of Phuoc Thoi ward.</li> </ul>	<ul style="list-style-type: none"> <li>- Prior to the commencement of civil works, developing a Occupational Health and Safety Plan (OHSP) that is consistent with the relevant requirements of Vietnamese law and with good international practice as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines.</li> </ul>
Global Climate Change	None	<ul style="list-style-type: none"> <li>- Minimizing the number of machine operation and material transportation by making an efficient construction schedule.</li> </ul>
<b>Operation Phase</b>		
Air Pollution	<ul style="list-style-type: none"> <li>- Designing and installing stack in accordance with the standards.</li> </ul>	<ul style="list-style-type: none"> <li>- Complying gas emissions with QCVN 22: 2009/BTNMT emission standards and EHS Guidelines. Monitoring the compliance through CEMS (Continuous Emission Monitoring System).</li> <li>- In the case that the monitoring results indicate non-compliance with QCVN 22: 2009/BTNMT emission standards, scaling down the capacity of the power plant operation and identifying meteorological conditions around O Mon Power Complex.</li> </ul>
Water Pollution	<ul style="list-style-type: none"> <li>- Determining potential oil spill area. Collecting rainwater overflowing through that area to the oil separation system before treating directly or discharging into receipt source.</li> <li>- Treating all domestic waste water by the domestic waste water treatment facility, the waste water will be conveyed to the general waste water treatment facility.</li> <li>- Treating all the wastewater properly by the general waste water treatment facility to meet the industrial wastewater standard (QCVN-24/2009, Type-A) prior to discharge to the environment.</li> <li>- Separating rainwater running through polluted area from rainwater drainage system of the power plant.</li> <li>- The oily water should be directed to a gravity-type oil-water separator. The oil-water separator will remove up to 99% of waste oil, which should be collected, stored and either reused, reprocessed, or sold. Sludge from the oil-separator should be dredged periodically and land-filled by a private waste contractor. The treated effluent from the oil-water separator should be directed to the general waste water treatment system for further treatment.</li> <li>- Implementing an operation phase spill control plan (SPC) to deal with the risk of fuel spills.</li> </ul>	<ul style="list-style-type: none"> <li>- Putting DFO tanks within a secondary containment system consisting of a 1.5m high reinforced concrete oil-proof containment wall (bund).</li> <li>- Treating wastewater from all the supply ships at facilities on land in accordance with the regulations, not discharging into the river.</li> </ul>
Waste	<ul style="list-style-type: none"> <li>- Designing collection system of domestic waste and transporting domestic waste periodically to the general local disposal area.</li> <li>- Classifying wastes into harmful waste and normal waste prior to transport and dumping it to the general disposal area of district.</li> <li>- Selecting a waste disposal contractor by bid for every waste type every year. The selected contractor deals with the disposal of the specific waste type generated from the whole O Mon Power Complex.</li> </ul>	<ul style="list-style-type: none"> <li>- Including a hazardous waste management system in the operation phase OHS plan.</li> <li>- Requiring all supply ships to maintain good hazardous waste management practices and having spill response plans in place.</li> </ul>
Noise and Vibration	<ul style="list-style-type: none"> <li>- In case of noise in the power plant or local surrounding residential areas exceeding permit standard due to operation of power plant, installing noise reducer and noise wall, etc. around the big noise sources.</li> </ul>	<ul style="list-style-type: none"> <li>- Selecting equipment with lower sound power levels</li> <li>- Installing silencers for fans or suitable mufflers on engine exhausts and compressor components.</li> <li>- Installing acoustic barriers without gaps.</li> </ul>
River Ecosystem	<ul style="list-style-type: none"> <li>- Mitigating impacts on the rare fish species by taking mitigation measures for water pollution.</li> <li>- Installing mesh and river-return system for aquatic creature at inlet.</li> <li>- Arranging cooling water outlet far away from cooling water inlet in order to ensure temperature of water flow below 40°C prior to discharge into river.</li> <li>- Considering the feasibility of increasing pump speed in order to decrease flow velocity of cooling water in waste canal.</li> </ul>	None

Item	Environmental Management Plan (EIA for O Mon 3)	Proposal for Addition
Rare Species	- Mitigating impacts on the rare species by taking mitigation measures for water pollution, since the rare species around the O Mon Power Complex is only fishes.	None
Employment and Livelihood	- Creating job in the power plant for local people.	None
Regional Community	- Supplying sufficient fresh water, safety food and electricity to staffs building area. - Collecting and transporting domestic wastes from workers' building area once a week - Equipping building area of workers with sufficient lavatory and other sanitary equipment. - Preventing epidemic diseases.	- Prior to the commencement of plant operation, preparing operation phase OHS and CHS plans by the EHS Team in accordance with relevant requirements of Vietnamese law and with good international practice as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines.
Landscape	None.	None
Working Environment	- Providing noise-protective capsules and plugs to the engineers and workers working at workplace with noise exceeding 90dBA. - Providing specialized clothing, shoes, gloves and cap to the engineers and workers working in high and medium voltage areas to prevent electric shock. - Taking measures for fires. - Placing equipment of protection and fire-fighting and other first aid at fuel tank area in accordance with regulations.	- Prior to the commencement of plant operation, preparing operation phase OHS and CHS plans by the EHS Team in accordance with relevant requirements of Vietnamese law and with good international practice as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines.
Global Climate Change	- Reducing the emission amount of CO <sub>2</sub> per power generation unit by applying the combined-cycle power.	

**Table 5.5-2 Frequency, Responsible Organization and Cost for the Implementation of Environmental Management Plan**

Item	Environmental Management Plan	Frequency	Responsible Organization	Cost
<b>Construction Phase</b>				
Air Pollution	<ul style="list-style-type: none"> <li>- Spraying water at construction area and disposal site.</li> <li>- Minimizing size and occupied time of disposal heap.</li> <li>- Covering vehicle during transportation time.</li> <li>- Limiting operation of vehicle at daytime if possible.</li> <li>- Ensuring vehicles running in the project area in good condition.</li> <li>- Using modern equipment that is in compliance with relevant Vietnamese vehicle emissions regulations (TCVN-6438/ 2001).</li> <li>- Sodding and greening that grow strongly on disposal heaps. (Not necessary because grasses can be grown naturally.)</li> <li>- Developing vegetation cover for the piles that are not going to be used in the short-term.</li> </ul>	To be implemented whenever construction activities occur	Implementer: EPC Contractor Supervisor: CTTTP	<p>Included in EPC contract costs to be done by EPC contractor.</p> <ul style="list-style-type: none"> <li>- Cost of sprinkler for spraying water</li> </ul> <p>Note:</p> <ul style="list-style-type: none"> <li>- Cost of sprinkler for spraying water (Lease): 160M VND (US\$ 7,619) (O Mon 3 EIA 7.1.1, p.179)</li> </ul>
Water Pollution	<ul style="list-style-type: none"> <li>- Preparing and implementing a land erosion control plan.</li> <li>- Preparing and implementing a Construction Phase Erosion and Runoff Control Plan (ERCP)</li> <li>- Prohibiting disposal of waste into Hau River as well as surroundings of the project area.</li> <li>- Storing chemicals at area with roof and concrete floor.</li> <li>- Installing temporary toilets at a rate of one for every twenty workers on site.</li> <li>- Collecting and treating the effluent from temporary toilets by an appropriately licensed company in accordance with relevant Vietnamese regulations.</li> <li>- Installing septic tanks at the construction areas for treating domestic wastewater.</li> <li>- Constructing temporary rain drainage ditches to prevent accumulating water in the leveling area in the course of construction. Maintaining this water drainage system regularly to increase rain discharge capacity of the region.</li> <li>- Installing setting basin of overflow rainwater at outlet prior to discharge into Hau River.</li> <li>- Minimizing all petroleum and lubricant leakages and dropped construction materials, and collecting them daily in order to prevent sweeping them away to the arroyos and changing flows.</li> <li>- Implementing sedimentation and oil collection (oil separation system) from waste water prior to discharge to environment.</li> <li>- Training workers on cleaning measures in case of chemical spill accident.</li> <li>- Reducing the restoration of ground water artery by a layer of waterproofing materials such as concrete and asphalt after construction.</li> <li>- Treating the wastewater from supply ships in accordance with the local regulations, not discharging into the river.</li> </ul>	To be implemented whenever construction activities occur	Implementer: EPC Contractor Supervisor: CTTTP	<p>Included in EPC contract costs to be done by EPC contractor.</p> <ul style="list-style-type: none"> <li>- Cost of temporary toilets.</li> <li>- Cost of contract with the licensed company.</li> <li>- Cost of septic tank <ul style="list-style-type: none"> <li>- Cost of setting temporary rain drainage and basin.</li> </ul> </li> <li>- Cost of oil separation system</li> <li>- Cost of training workers</li> </ul> <p>Note:</p> <ul style="list-style-type: none"> <li>- Cost of temporary toilet: 50M VND/unit (O Mon 3 EIA 7.1.1, p.179)</li> <li>- Amount (50units): 2,500M VND (US\$ \$119,048 )</li> <li>- Cost of setting temporary rain drainage and basin: 1,200M VND (US\$ 57,143) (O Mon 3 EIA 7.1.1, p.179)</li> <li>- Cost of training workers: VND 4,400,000/time (US\$ 210) (O Mon 3 EIA 6.2.1, p.171)</li> </ul>
Waste	<ul style="list-style-type: none"> <li>- Designing and constructing of temporary disposal area at camp area of workers.</li> <li>- Installing solid waste refuses receptacles at a rate of one for every twenty workers on site and having solid waste collected regularly and disposed at a licensed waste disposal facility.</li> <li>- Using information of solid waste treatment to training program of construction workers including classification of harmful waste and possibly harmful waste.</li> <li>- Classifying waste into harmful waste and normal waste prior to transport for re-usage or burying.</li> <li>- Contracting with Urban Works Enterprise of Can Tho City on collection of construction waste from project site to the disposal area of district at least one time in a week.</li> <li>- Requiring all the supply ships to maintain good hazardous waste management practices and have spill response plans in place.</li> </ul>	To be implemented whenever construction activities occur	Implementer: EPC Contractor Supervisor: CTTTP	<p>Included in EPC contract costs to be done by EPC contractor.</p> <ul style="list-style-type: none"> <li>- Cost of waste refuses receptacle.</li> <li>- Cost of training workers: Included in the cost under “water pollution” section.</li> <li>- Cost of contract with Urban Works Enterprise</li> </ul> <p>Note:</p> <ul style="list-style-type: none"> <li>- Cost of waste refuses receptacle: VND 500,000/unit (O Mon 3 EIA 7.1.1, p.179) Amount (50 units): 25M VND (US\$ 1,190)</li> </ul>
Noise and Vibration	<ul style="list-style-type: none"> <li>- Announcing widely the time period and construction plan of the project to the community.</li> <li>- Restricting all transport means to operate from 21:00pm to 6:00am of the next day.</li> <li>- Repairing and maintaining regularly construction machines, equipment and vehicles.</li> <li>- Implementing high noise activities in the daytime.</li> <li>- Restricting pile-driving to week-days and daytime hours (6am to 6pm).</li> <li>- Constructing a noise wall or installing noise reducer on construction machines at noise affected area.</li> </ul>	To be implemented whenever construction activities occur	Implementer: EPC Contractor Supervisor: CTTTP	<p>Included in EPC contract costs to be done by EPC contractor.</p> <ul style="list-style-type: none"> <li>- Cost of constructing a noise wall.</li> </ul>
Terrestrial Ecosystem	<ul style="list-style-type: none"> <li>- Taking mitigation measures for the impacts of air pollution, noise and vibration.</li> </ul>	To be implemented whenever construction activities occur	Implementer: EPC Contractor Supervisor: CTTTP	-
River Ecosystem	<ul style="list-style-type: none"> <li>- Mitigating impacts to the aquatic creature by taking mitigation measures for water pollution.</li> </ul>	To be implemented whenever construction activities occur	Implementer: EPC Contractor Supervisor: CTTTP	-

Item	Environmental Management Plan	Frequency	Responsible Organization	Cost
Rare Species	- Mitigating impacts on the rare species by taking mitigation measures for water pollution, since the rare species around the O Mon Power Complex is only fishes.	To be implemented whenever construction activities occur	Implementer: EPC Contractor Supervisor: CTTP	-
Resettlement	- Conducting monitoring activities on the resettled residents. - Providing adequate compensation and support for livelihood restoration. - Establishing grievance mechanism.	To be implemented whenever construction activities occur	CTTP (Discuss with Can Tho City People's Committee)	-
Employment and Livelihood	- Employing local people, especially project affected people on construction activities.	To be implemented whenever construction activities occur	Implementer: EPC Contractor Supervisor: CTTP	Included in EPC contract costs to be done by EPC contractor.
Local Community	- Prior to the commencement of civil works, developing a Occupational Health and Safety Plan (OHSP) that is consistent with the relevant requirements of Vietnamese law and with good international practice as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. - Having OHSP included procedures for posting warning signs and fences as required to protect local community members from dangerous work areas. - Propagandizing and educating the construction workers to establish relations with inhabitants. - Organizing exchange meeting with People's Committee of wards and O Mon District on matters related to the relation between workers and inhabitants. - Installing light and sign system on section of National highway 91 crossing over the project site. Repairing the damaged road section by the contractor after construction completion, since National highway 91 could be damaged by operation of heavy trucks. - Maintaining environmental sanitation and living conditions and ensuring community health on workers' camp area. - Improving awareness of construction workers on environmental sanitation at camp area. - Supplying sufficient fresh water and sanitary food to workers. - Supplying sufficient garbage can and periodical collection of garbage. - Constructing or providing suitable sanitary equipment such as removable toilets, waste bins, etc at the worker's camps by the construction contractor. Constructing one septic tank system at each camping area to treat domestic sewage water. - Contracting with Urban Works Enterprise of Can Tho City on collection of construction waste from project site to the disposal area of district at least one time in a week.	To be implemented whenever construction activities occur	Implementer: EPC Contractor Supervisor: CTTP	Included in EPC contract costs to be done by EPC contractor. - Cost of light and sign system. - Cost of repairing the damaged road.
Landscape	-	-	-	-
Working Environment	- Building clinic at the construction site and nurses and providing timely all medicines, health care services and first aid to the workers when they are sick or involved in industrial accidents. Establishing a system where the construction contractor coordinates closely with clinic of Phuoc Thoi ward. - Prior to the commencement of civil works, developing a Occupational Health and Safety Plan (OHSP) that is consistent with the relevant requirements of Vietnamese law and with good international practice as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines.	To be implemented whenever construction activities occur	Implementer: EPC Contractor Supervisor: CTTP	Included in EPC contract costs to be done by EPC contractor.  Note: - Cost of building clinic: VND 100,000,000 / unit (US\$ 47,600) (CTTP Document)
Global Climate Change	- Minimizing the number of machine operation and material transportation by making an efficient construction schedule.	Before Construction	Implementer: EPC Contractor Supervisor: CTTP	-
<b>Operation Phase</b>				
Air Pollution	- Complying gas emissions with QCVN 22: 2009/BTNMT emission standards and EHS Guidelines. Monitoring the compliance through CEMS (Continuous Emission Monitoring System).	Continuously (Stack)	Researcher: CTTP (O Mon 4 EIA Table 51, p.174-179)	Included in EPC contract costs to be done by EPC contractor. - Cost of Setting CEMS.
		Semi-annually (Sampling)	Sampling: CTTP Analysis: Environmental Consultant (O Mon 4 EIA Table 51, p.174-179)	- Cost of sampling and analysis: US\$ 2,000 (Table 5.5-5) (Included in Monitoring Cost) (O Mon 4 EIA Table 51, p.174-179)
	- In the case that the monitoring results indicate non-compliance with QCVN 22: 2009/BTNMT emission standards, scaling down the capacity of the power plant operation and identifying meteorological conditions around O Mon Power Complex.	On-going	Researcher: CTTP	- Cost of monitoring equipment: US\$ 30,000 (Table 5.5-5) (Included in Monitoring Cost) - Maintenance and calibration: US\$ 3,000 (Table 5.5-?) (Included in Monitoring Cost) (O Mon 4 EIA Table 51, p.174-179)

Item	Environmental Management Plan	Frequency	Responsible Organization	Cost
Air Pollution	- Designing and installing stack in accordance with the standards.	At the designing stage	CTTP	Included in EPC contract costs to be done by EPC contractor. - Construction of stack. - Maintenance of stack.  Note: - Construction of stack: US\$ 2,200,000 (Included in Construction Cost) - Maintenance of stack: US\$ 99,000 (O Mon3 EIA 7.1.2, p.179)
Water Pollution	- Treating all the wastewater properly by the general waste water treatment facility to meet the industrial wastewater standard (QCVN-40/2011, Type-A) prior to discharge to the environment - Treating all domestic waste water by the domestic waste water treatment facility, the waste water will be conveyed to the general waste water treatment facility.	On-going	CTTP	Included in EPC contract costs to be done by EPC contractor. - Construction of general waste water treatment facility. - Operation of general waste water treatment facility. - Construction of domestic waste water treatment facility. - Operation of domestic waste water treatment facility.  Note: - Construction of general waste water treatment facility: S\$ 1,897,986 (O Mon3 EIA 7.1.2, p.179) (Included in Construction Cost) - Operation of general waste water treatment facility: US\$ 85,409 (O Mon3 EIA 7.1.2, p.179) - Construction of domestic waste water treatment facility: US\$ 1,097,900 (O Mon3 EIA 7.1.2, p.179) (Included in Construction Cost) - Operation of domestic waste water treatment facility: US\$ 49,405 (O Mon3 EIA 7.1.2, p.179)
	- Separating rainwater running through polluted area from rainwater drainage system of the power plant. - Determining potential oil spill area. Collecting rainwater overflowing through that area to the oil separation system before treating directly or discharging into receipt source. - Putting DFO tanks within a secondary containment system consisting of a 1.5m high reinforced concrete oil-proof containment wall (bund). - The oily water should be directed to a gravity-type oil-water separator. The oil-water separator will remove up to 99% of waste oil, which should be collected, stored and either reused or disposed by licensed waste contractor. Sludge from the oil-separator should be dredged periodically and land-filled by a private waste contractor. The treated effluent from the oil-water separator should be directed to the general waste water treatment system for further treatment. - Implementing an operation phase spill control plan (SPC) to deal with the risk of fuel spills. - Treating wastewater from all the supply ships at facilities on land in accordance with the regulations, not discharging into the river.	On-going	CTTP	-
Waste	- Including a hazardous waste management system in the operation phase OHS plan. - Requiring all supply ships to maintain good hazardous waste management practices and having spill response plans in place. - Designing collection system of domestic waste and transporting domestic waste periodically to the general local disposal area. - Classifying wastes into harmful waste and normal waste prior to transport and dumping it to the general disposal area of district.	On-going	CTTP	-
	- Selecting a waste disposal contractor by bid for every waste type every year. The selected contractor deals with the disposal of the specific waste type generated from the whole O Mon Power Complex.	On-going	CTTP	- Cost of waste disposal contractor: Not decided at this moment.
Noise and Vibration	- In case of noise in the power plant or local surrounding residential areas exceeding permit standard due to operation of power plant, installing noise reducer, etc. around the big noise sources. - Selecting equipment with lower sound power levels - Installing silencers for fans or suitable mufflers on engine exhausts and compressor components. - Installing acoustic barriers without gaps.	At the designing stage	CTTP	Included in EPC contract costs to be done by EPC contractor. - Construction of acoustic barrier.

Item	Environmental Management Plan	Frequency	Responsible Organization	Cost
River Ecosystem	- Installing mesh and river-return system for aquatic creature at inlet.	At the designing stage	CTTP	Included in EPC contract costs to be done by EPC contractor. - Construction of mesh.  Note: - Construction of mesh: US\$ 20,000 (O Mon 3 EIA Table 4.5, p.153-167)
	- Mitigating impacts on the rare fish species by taking mitigation measures for water pollution. - Arranging cooling water outlet far away from cooling water inlet in order to ensure temperature of water flow below 40°C prior to discharge into river. - Considering the feasibility of increasing pump speed in order to decrease flow velocity of cooling water in waste canal.	On-going	CTTP	Included in EPC contract costs to be done by EPC contractor. - Cost of setting thermistor.
Rare Species	- Mitigating impacts on the rare species by taking mitigation measures for water pollution, since the rare species around the O Mon Power Complex is only fishes.	On-going	CTTP	-
Employment and Livelihood	- Creating job in the power plant for local people.	On-going	CTTP	-
Local Community	- Supplying sufficient fresh water, safety food and electricity to staffs building area. - Collecting and transporting domestic wastes from workers' building area once a week. - Equipping building area of workers with sufficient lavatory and other sanitary equipment. - Preventing epidemic diseases. - Prior to the commencement of plant operation, preparing operation phase OHS and CHS plans by the EHS Team in accordance with relevant requirements of Vietnamese law and with good international practice as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines.	On-going	CTTP	
Landscape	-	-	-	-
Working Environment	- Providing noise-protective capsules and plugs to the engineers and workers working at workplace with noise exceeding 90dBA. - Providing specialized clothing, shoes, gloves and cap to the engineers and workers working in high and medium voltage areas to prevent electric shock. - Taking measures for fires. - Placing equipment of protection and fire-fighting and other first aid at fuel tank area in accordance with regulations. - Prior to the commencement of plant operation, preparing operation phase OHS and CHS plans by the EHS Team in accordance with relevant requirements of Vietnamese law and with good international practice as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines.	On-going	CTTP	Included in EPC contract costs to be done by EPC contractor. - Cost of safety device. - Cost of fire-fighting device.
Global Climate Change	- Reducing the emission amount of CO <sub>2</sub> per power generation unit by applying the combined-cycle power.	At the designing stage	CTTP	-



## 5.5.2 Monitoring Plan

Table 5.5-3 shows the monitoring plans for O Mon 3 and 4 that are mentioned in the EIA reports. Monitoring plan for O Mon 4 covers most of the categories of the monitoring plan for O Mon 3. In addition, the monitoring plan for O Mon 4 states even more details. Sharing the equipment and staff, O Mon 3 will be able to conduct the same monitoring as the O Mon 4.

As for the waste disposal, the project owner has been requested by the Study Team to submit manifest of hazardous waste, which is regulated by Vietnamese law, to JICA as well as visit treatment facilities to confirm if the generated waste is properly treated.

Through the discussion with the project owner, the monitoring plan shown in Table 5.5-4 has been understood by the project owner. Table 5.5-5 shows the budget for the monitoring plan.

**Table 5.5-3 Monitoring Plan for O Mon 3 and 4**

Item	Monitoring plan for O Mon 3 (O Mon 3 EIA 6.3, p.173-178)	Monitoring plan for O Mon 4 (O Mon 4 EIA Table 51, p.174-179)
<b>Construction phase</b>		
Air pollutant	<ul style="list-style-type: none"> <li>- Ambient air quality (9 points)</li> <li>Parameter: CO, CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>, TSP, Temperature, Moisture, Noise</li> <li>Location: DO Storage, Boiler area, Power Plant boundary by wind direction, Intake, Residential area surrounding power plant as wind direction, (500m, 1000m, 1500m, 2000m, 2500m from plant)</li> <li>Frequency: ?</li> <li>Notes: Detail plan will be made by EPC contractor</li> </ul>	<ul style="list-style-type: none"> <li>- Ambient air quality (4 points)</li> <li>Parameter: PM<sub>10</sub></li> <li>Location: Within 500m of construction area. 16 sampling points. Continuously for a week per 4 points</li> <li>Frequency: The monitors will be rotated among 4 sampling points on a weekly basis such that there is at least one week of continuous</li> </ul>
Water pollutant	<ul style="list-style-type: none"> <li>- Ground water (2 points)</li> <li>Parameter: pH, SS, Heavy metals (Fe), NH<sub>3</sub>, NO<sub>3</sub>, NO<sub>2</sub>, Coliforms</li> <li>Location: Two wells at residential area surrounding power plant</li> <li>Frequency: ?</li> </ul>	<ul style="list-style-type: none"> <li>- Ground water (2 points)</li> <li>Parameter: Heavy metals (Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Total fecal coliform, NH<sub>4</sub><sup>+</sup>, T-N, T-P, TDS, TSS, Conductivity, pH, DO, Salinity</li> <li>Location: Two existing wells</li> <li>Frequency: Quarterly (Heavy metals, Total fecal coliform, NH<sub>4</sub><sup>+</sup>, T-N, T-P, TDS, TSS) Monthly (Conductivity, pH, DO, Salinity)</li> </ul>
	<ul style="list-style-type: none"> <li>- River water (3 points)</li> <li>Parameter: pH, Turbidity, BOD<sub>5</sub>, COD, Lubricate, Heavy metal, Temperature, Coliforms</li> <li>Location: Discharge outlet, 100m from discharge outlet, Pump station</li> <li>Frequency: ?</li> <li>Notes: Detail plan will be made by EPC contractor</li> </ul>	<ul style="list-style-type: none"> <li>- River water (6 points and 12 points)</li> <li>Parameter: Heavy metals (Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Total fecal coliform, NH<sub>4</sub><sup>+</sup>, T-N, T-P, TDS, TSS, Conductivity, pH, DO, Salinity</li> <li>Location: 6 points (Heavy metals, Total fecal coliform, NH<sub>4</sub><sup>+</sup>, T-N, T-P, TDS, TSS) 12 points (Conductivity, pH, DO, Salinity)</li> <li>Frequency: Quarterly (Heavy metals, Total fecal coliform, NH<sub>4</sub><sup>+</sup>, T-N, T-P, TDS, TSS) Monthly (Conductivity, pH, DO, Salinity)</li> </ul>
Noise	<ul style="list-style-type: none"> <li>Including the parameter of air pollutant</li> <li>Notes: Detail plan will be made by EPC contractor</li> </ul>	<ul style="list-style-type: none"> <li>- Noise (2 points)</li> <li>Parameter: Noise level</li> <li>Location: Power Complex boundary, Nearest residences</li> <li>Frequency: Daily for three days during start of new stage of construction</li> </ul>
Resettlement	None	None. However, implementation of CAP will be reported to ADB, (RDDR, p.45)
Local community	- Planning by Community health and safety plan	<ul style="list-style-type: none"> <li>- As defined in Community health and safety plan</li> <li>- Grievance</li> <li>Parameter: Grievance from resident</li> </ul>



Item	Monitoring plan for O Mon 3 (O Mon 3 EIA 6.3, p.173-178)	Monitoring plan for O Mon 4 (O Mon 4 EIA Table 51, p.174-179)
		Location: Villages around Power Complex Frequency: To be implemented when grievance occurs
Working Environment	- Planning by Occupational health and safety plan	- As defined in Occupational health and safety plan
<b>Operation phase</b>		
Air pollutant	Emission concentration (4 point) Parameter: CO, SO <sub>2</sub> , NO <sub>x</sub> , TSP, Noise Location: Top of stack Frequency: Semi-annually	- Emission concentration (1 point) Parameter: NO <sub>x</sub> , SO <sub>2</sub> , PM <sub>10</sub> Location: Top of stack Frequency: Continuously (CEMS: Continuous Emission Monitoring System)
	- Ambient air quality (9 points) Parameter: CO, CO <sub>2</sub> , SO <sub>2</sub> , NO <sub>x</sub> , TSP, Temperature, humidity, Noise Location: DO Storage, Boiler area, Power Plant boundary by wind direction, Intake, Residential area surrounding power plant as wind direction, (500m, 1000m, 1500m, 2000m, 2500m from plant) Frequency: Semi-annually	- Ambient air quality (4 points) Parameter: NO <sub>x</sub> , SO <sub>2</sub> , PM <sub>10</sub> Location: 4 sampling points surrounding Power Complex. One week of continuous monitoring at every sampling point every month Frequency: The monitors will be rotated among 4 sampling points on a weekly basis such that there is at least one week of continuous
Water pollutant	- Ground water (2 points) Parameter: pH, SS, Fe, NH <sub>3</sub> , NO <sub>2</sub> , Coliforms Location: Local houses surrounding power plant Frequency: Semi-annually	- Ground water (2 points) Parameter: Heavy metals (Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Total fecal coliform, NH <sub>4</sub> <sup>+</sup> , T-N, T-P, TDS, TSS Location: Two existing wells Frequency: Semi-annually
	- River water (3 points) Parameter: pH, Turbidity, BOD <sub>5</sub> , COD, Oil & grease, Heavy metals, Water temperature, Coliforms Location: Discharge Channel Outlet, 100m from Discharge Outlet. Pump station Frequency: Semi-annually	- River water (12 points) Parameter: Water temperature, Conductivity, pH, Do, Salinity Location: 3 points each along 3 lines perpendicular the shoreline (at 0, 150, and 500m from shore), and 3 around the mixing plume boundary Frequency: Monthly
	- Waste water (2 points) Parameter: pH, Turbidity, BOD <sub>5</sub> , COD Location1: Before general waste water treatment system Parameter: Lubricate, Heavy metal, Temperature, Coliforms Location2: Terminal point between coolingwater system and common discharge pit of the plant Frequency: Semi-annually	- Waste water (1 point) Parameter: Water temperature, Chlorine, pH, BOD <sub>5</sub> , COD, Oil & grease, Heavy metals (Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Pesticides, Total fecal coliforms Location: Discharge channel outlet Frequency: Quarterly
	-	- Cooling water (2 points) Parameter: Water temperature Location: Intake and discharge channel outlet Frequency: Continuous
Noise	Including the parameter of air pollutant	- Noise (2 points) Parameter: Noise level Location: Power Complex boundary adjacent to the power plant, nearest residences at different directions from the power plant Frequency: Quarterly (night)
River Ecosystem	None	- Fisheries (3 points) Parameter: Species, Fish catches Location: Water Intake, outlet and Hau River

Item	Monitoring plan for O Mon 3 (O Mon 3 EIA 6.3, p.173-178)	Monitoring plan for O Mon 4 (O Mon 4 EIA Table 51, p.174-179)
		Frequency: Quarterly (During the first 2 years of operation. Results to be evaluated at the end of 2 years and a decision will be made at that time if additional monitoring is required)
Local community	None	<ul style="list-style-type: none"> <li>- As defined in Community health and safety plan</li> <li>- Grievance Parameter: Grievance from resident Location: Villages around Power Complex Frequency: To be implemented when grievance occurs</li> </ul>
Working Environment	None	- As defined in Occupational health and safety plan
Global Climate Change	None	None

**Table 5.5-4 Parameter, Location, Method, Frequency, Responsible Organization and Cost of Environmental Management Plan**

Items	Parameter	Location	Method	Frequency	Responsible Organization	Cost for O Mon 3 Only
<b>Construction phase</b>						
Meteorological condition	- Temperature, Humidity, Wind direction, Wind speed	- Same as the monitoring points for air pollutants and noise.	- Assman's aspiration psychometer, Anemometer	- Same time with air pollutant and noise monitoring	- EPC Contractor	US\$ 2,000 (Table 5.5-5)
Air pollutant	- PM <sub>10</sub>	- Within 500m of construction area. 4 sampling points. One week of continuous monitoring at every sampling point every month	- Automatic mobile ambient air quality analyzers	- Continuous	- EPC Contractor	US\$ 7,500 US\$ 250-500 (C&M) (Table 5.5-5)
Water pollution	- Ground water pH, Heavy metals (Fe, Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Total fecal coliform, NH <sub>4</sub> <sup>+</sup> , NO <sub>3</sub> <sup>-</sup> , NO <sub>2</sub> <sup>-</sup> , T-N, T-P, TDS, TSS	- Two existing wells surrounding construction area	- Analysis by sampling	- Quarterly	- Sampling: EPC Contractor - Analysis: Environmental Consultant	US\$ 260 (Table 5.5-5)
	- Ground water Conductivity, pH, DO, Salinity	- Same as above	- Portable water quality analyzer	- Monthly	- EPC Contractor	US\$ 1,750 (Table 5.5-5)
	- River water Water temperature, Oil & grease, Heavy metals (Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Total fecal coliform, NH <sub>4</sub> <sup>+</sup> , T-N, T-P, TDS, TSS, pH, COD, BOD <sub>5</sub> , Turbidity	- 3 points along the lines perpendicular the shoreline (at 150m from shore), and 3 points at other	- Analysis by sampling	- Quarterly	- Sampling: EPC Contractor - Analysis: Environmental Consultant	US\$ 900 (Table 5.5-5)
	- River water Water temperature, Conductivity, pH, DO, Salinity	- 3 points each along 3 lines perpendicular the shoreline (at 0, 150, and 500m from shore), and 3 points at other	- Portable water quality analyzer	- Monthly	- EPC Contractor	Using the analyzer of "Ground water"
Noise	- Noise	- 2 points (Power Complex boundary, Nearest residences)	- Sound-level meter	- Daily for three days during start of new stage of construction	- EPC Contractor	US\$ 750 (Table 5.5-5)
Waste	- Hazardous waste	- Power complex	- Provide the manifest from the licensed company	- Yearly	- Contract: EPC Contractor - Supervisor: CTTTP	-
	- Domestic waste	- Treatment sites	- Provide the contract with the company			
Resettlement	- Implementation of CAP	- Villages around Power Complex	-	- On going	- CTTTP	-
Local community	- As defined in Community health and safety plan	- Villages around Power Complex	- As defined in Community health and safety plan	- As define in the construction phase OHS plan	- CTTTP	-
	- Grievance	- Villages around Power Complex	- Grievance from resident	- To be implemented when grievance occurs	- CTTTP	-
Working environment	- As defined in Occupational health and safety plan	- Construction area	- As defined in Occupational health and safety plan	- As define in the construction phase OHS plan	- CTTTP	-
<b>Operation phase</b>						
Meteorological condition	- Temperature, Humidity, Wind Direction, Wind Speed	- Same as the monitoring points for air pollutants and noise.	- Assman's aspiration psychometer, Anemometer	- Same time with air pollutant and noise monitoring	- CTTTP	Using the meter from construction phase
Air pollution	- Emission concentration NOx, SO <sub>2</sub> , PM <sub>10</sub>	- Top of stack	- CEMS: Continuous Emission Monitoring System	- Continuously	- CTTTP	To be calculated by EPC Contractor
	- Ambient air quality NO <sub>2</sub> , SO <sub>2</sub> , PM <sub>10</sub>	- 4 sampling points surrounding Power Complex. One week of continuous monitoring at every sampling point every month	- Automatic mobile ambient air quality analyzer	- Yearly	- Environmental consultant	US\$ 2,000 (Table 5.5-5)
Water pollution	- Ground water pH, Heavy metals (Fe, Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Total fecal coliform, NH <sub>4</sub> <sup>+</sup> , NO <sub>3</sub> <sup>-</sup> , NO <sub>2</sub> <sup>-</sup> , T-N, T-P, TDS, TSS	- Two existing wells	- Analysis by sampling	- Semi-annually (Dry and rainy season)	- Sampling: CTTTP - Analysis: Environmental Consultant	US\$ 260 (Table 5.5-5)
	- River water Water temperature, Conductivity, pH, Do, Salinity	- 3 points each along 3 lines perpendicular the shoreline (at 0, 150, and 500m from shore), and 3 points at other	- Portable water quality analyzer	- Monthly	- CTTTP	Using the analyzer from construction phase

Items	Parameter	Location	Method	Frequency	Responsible Organization	Cost for O Mon 3 Only
	- Waste water Water temperature, Chlorine, pH, BOD <sub>5</sub> , COD, Oil & grease, Heavy metals (Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Pesticides, Total fecal coliforms	- Discharge channel outlet	- Analysis by sampling	- Quarterly	- Sampling: CTPP - Analysis: Environmental Consultant	US\$ 320 (Table 5.5-5)
	- Cooling water	- Intake and discharge channel outlet	- Thermistor	- Continuous	- CTPP	To be calculated by EPC Contractor
Noise	- Noise level	- Power Complex boundary adjacent to the power plant, nearest residences at different directions from the power plant	- Sound-level meter	- Nightly during start-up	- CTPP	Using the analyzer from construction phase
Waste	- Hazardous waste	- Power complex	- Provide the manifest from the licensed company	- Yearly	- CTPP	-
	- Domestic waste	- Treatment sites	- Provide the contract with the company			
Local community	- As defined in Community health and safety plan	- Villages around Power Complex	- As defined in Community health and safety plan	- As defined in Community health and safety plan	- CTPP	-
	- Grievance	- Villages around Power Complex	- Grievance from resident	- To be implemented when grievance occurs	- CTPP	-
Working environment	- As defined in Occupational health and safety plan	- Construction area	- As defined in Occupational health and safety plan	- As defined in Community health and safety plan	- CTPP	-
Global Climate Change	- CO <sub>2</sub> gas yield	-	- CO <sub>2</sub> gas yield is calculated by fuel consumption per a year.	- Yearly	- CTPP	-

**Table 5.5-5 Budget for Monitoring Plan**

Year		2013	2014	2015	2016	2017	2018	....
O Mon 3		-	Construction			Operation		
O Mon 4		Construction			Operation			
<b>Ambient Air</b>								
Meteorological Condition (Assman's aspiration psychometer, Anemometer)	Total	-	2,000	-	-	-	-	-
	O Mon 3	-	2,000	-	-	-	-	-
	O Mon 4	-	-	-	-	-	-	-
Continuous NOx, SO <sub>2</sub> , PM <sub>10</sub> , CO Monitors (Primary + Backup)	Total	-	60,000	-	-	-	-	-
	O Mon 3	-	30,000	-	Need 1set (Lease)	-	-	-
	O Mon 4	-	30,000	-	-	-	-	-
Calibration and Maintenance	Total	-	-	6,000	12,000	6,000	6,000	....
	O Mon 3	-	-	3,000	6,000	3,000	3,000	....
	O Mon 4	-	-	3,000	6,000	3,000	3,000	....
<b>Stack CEMS</b>								
Install	Total	-	-	-	?	?	-	-
	O Mon 3	-	-	-	-	?	-	-
	O Mon 4	-	-	-	?	-	-	-
Verification	Total	-	-	-	-	2,000	4,000	....
	O Mon 3	-	-	-	-	-	2,000	....
	O Mon 4	-	-	-	-	2,000	2,000	....
<b>Portable Noise Monitor</b>								
Measure	Total	-	1,500	-	-	-	-	-
	O Mon 3	-	750	-	Need 1set (Lease)	-	-	-
	O Mon 4	-	750	-	-	-	-	-
<b>Groundwater</b>								
Portable water quality analyzer	Total	-	3,500	-	-	-	-	-
	O Mon 3	-	1,750	-	Need 1set (Lease)	-	-	-
	O Mon 4	-	1,750	-	-	-	-	-
Quarterly sampling and analysis	Total	-	520	520	520	520	520	....
	O Mon 3	-	260	260	260	260	260	....
	O Mon 4	-	260	260	260	260	260	....
<b>River Water</b>								
Portable water quality analyzer (Using analyzer of "Ground water")	Total	-	-	-	-	-	-	-
	O Mon 3	-	-	-	-	-	-	-
	O Mon 4	-	-	-	-	-	-	-
Quarterly analysis	Total	-	1,800	1,800	1,800	1,800	1,800	....
	O Mon 3	-	900	900	1,800	1,800	1,800	....
	O Mon 4	-	900	900	-	-	-	-
<b>Wastewater</b>								
Quarterly sampling and analysis	Total	-	-	-	320	640	640	....
	O Mon 3	-	-	-	-	320	320	....
	O Mon 4	-	-	-	320	320	320	....
<b>Aquatic Ecology</b>								
Fish fauna	Total	-	-	-	4,000	4,000	4,000	-
	O Mon 3	-	-	-	-	2,000	4,000	-
	O Mon 4	-	-	-	4,000	2,000	-	-
<b>Supporting Equipment</b>								
Zodiac boat and 40 hp outboard	Total	-	25,000	-	-	-	-	-
	O Mon 3	-	12,500	-	-	-	-	-
	O Mon 4	-	12,500	-	-	-	-	-
Handheld Geographic Positioning Systems (GPSs)	Total	-	500	-	-	-	-	-
	O Mon 3	-	250	-	-	-	-	-
	O Mon 4	-	250	-	-	-	-	-
<b>3rd party environmental consultant</b>								
Consultant Fee	Total	-	6,000	6,000	6,000	6,000	6,000	....
	O Mon 3	-	3,000	3,000	3,000	3,000	3,000	....
	O Mon 4	-	3,000	3,000	3,000	3,000	3,000	....
<b>Total</b>								
	Total	-	100,820	14,320	24,640	20,960	22,960	....
	O Mon 3	-	51,410	7,160	11,060	10,380	14,380	....
	O Mon 4	-	49,410	7,160	13,580	10,580	8,580	....

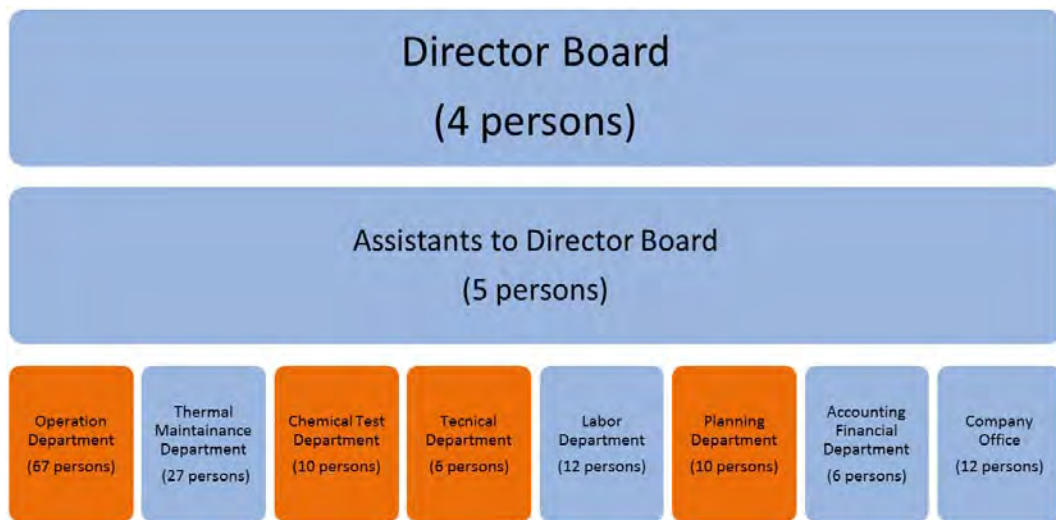
Notes: The 3 party environmental consultant will be responsible for providing environmental monitoring technical assistance, including laboratory analysis and other assistance as required.

Source: O Mon 4 EIA Table 52, p.190

### 5.5.3 Implementation System

As per the actual organization in CTTP, Technical & Planning Department will take charge of environment & social issues in which experts of this department will plan, inspect, monitor all environment & social consideration; Operation Department will take charge of operation of all environmental monitoring equipment/ systems; Chemical Test Department will take charge of testing, analyzing all environmental parameters (Fig.5.5-1).

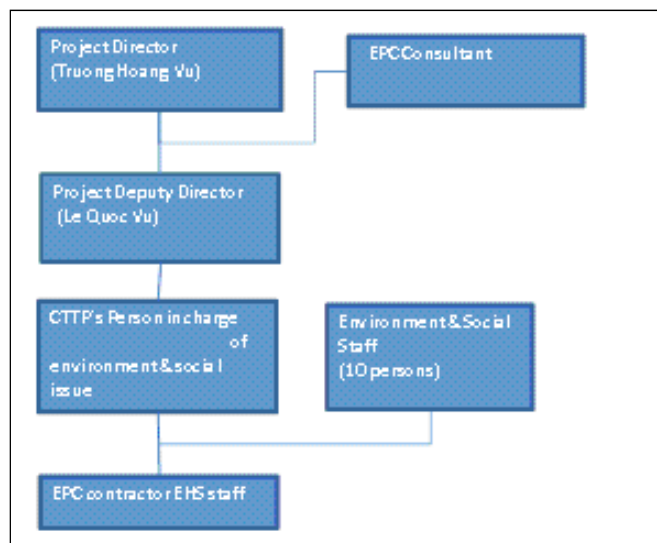
Organization chart for responsible of environmental social issues in construction phase is shown Fig. 5.5-2.



Notes: Responsible department for environmental and social issues are in brown boxes  
One lower belongs to Company Office, within Admin Department

Source; CTTP

**Fig. 5.5-1 Organization Chart for Operation Phase**



Source; CTTP

**Fig. 5.5-2 Organization Chart for Construction Phase**

## 5.6 ASPECT OF RESETTLEMENT OF LOCAL PEOPLE

### 5.6.1 Resettlement Process

The development plan of O Mon Power Complex has been planned in 1996, and the starting of operation of O Mon 1 and 2 power plants (1,200MW in total) and the development of transmission and transformation facility was planned in the Master Plan No.5 (2nd field survey). The land acquisition for O Mon 1 and 2 power plants was conducted as a consequence. The land acquisition for O Mon 1, O Mon 2 and the related facilities (access road No.1 and discharge channel No.1) has been started in November 1999, affects 112 households and 1 company, with the scope of 47.7 ha, and has been completed on June 29, 2000 (PPTA-4845 SIA 5.1, p.22).

The construction plan of the thermal power plants O Mon 3 and 4 power plants in the O Mon Thermal Power Complex has been approved on 27 September 2004 by the MOIT (Decision No.2523/ QD/ NLDK). The process of the land acquisition for O Mon 3, O Mon 4 and the related facilities (access road No.2 and discharge channel No.2) is described in Table 5.6-1.

**Table 5.6-1 Process of Land Acquisition for O Mon Power Complex (O Mon 3& 4)**

No.	Date	Events
1	27/ September/ 2004	The construction plan of the thermal power plant O Mon 3 and 4 power plants in the O Mon Power Complex has been approved on 27 September 2004 by the MOIT (Decision No.2523/ QD/ NLDK).
2	11/ April/ 2005	The policy for resettlement, compensation and allowance on land acquisition in Can Tho City was determined by Can Tho City People's Committee Decision No. 53/2005QD-UB (RRP 8.1.1, p.44-46).
3	23/ July/ 2005	Public meeting was held concerning the construction of O Mon Power Complex (40 Mon 4 EIA Chp.7, p.147).
4	23& 26/ December/ 2005	Public meetings were held concerning the compensation of acquired land (RRP 4.1, p.29).
5	March/ 2006	Compensation and Land Clearance Council (hereinafter referred to as "Compensation Committee" was established (Decision No.1026/ QD-UBND) (PPTA-4845SIA 5.1.2, p.24).
6	Form March/ 2006	The evaluation teams of the Compensation Committee set about assessing and evaluating the plot of land, houses and constructions, crops and trees (PPTA-4845SIA 5.1.2, p.24).
7	4/ April/ 2006 - 11/ May/ 2007	The compensation plan of O Mon 3, O Mon 4, Access road No.2 and Discharge channel No.2 was sequentially approved by Can Tho City People's Committee (approval was segmented to 19 times: 4 times for O Mon 3 from 4 April 2006 to 14 August 2006).
8	5/ May/ 2006	Start of land acquisition (transfer).of the site prepare for O Mon 3
9	June/ 2007	Socio-economical survey was conducted by Vattenfall Power Consultant (Consultant company for ADB: Asian Development Bank) for 105 households (RRP 3.3, p.21).
10	9/ October/ 2007	Vattenfall Power Consultant sent a letter to Can Tho City People' Committee requesting modification of resettlement process (follow-up letter of the former meeting) (RRP Annex-5, p.81-83).
11	7/ January/ 2008	Answer letter from Can Tho City People' Committee to the follow-up letter from VPC (RRP Annex-6, p.84).
12	April/ 2008	Preparation of Retrofit Resettlement Plan (Resettlement Due Diligence Report 2007)
13	26/ October/ 2009	Completion of land acquisition (transfer) of the site prepared for O Mon 3.
14	December/ 2009	Special assistance cash grant of 15 ~ 20MVND was provided to poor or vulnerable people (RDDR p.22 & p.33).
15	March - September/ 2010	Household survey was conducted for 145 compensated households (24%) for carrying out due diligence (RDDR, p.13).
16	February/ 2011	Preparation of resettlement Due Diligence Report and Corrective Action Plan.
17	25/ November/ 2011	The board approval was issued to ADB financing for O Mon 4.

Table 5.6-2 describes the content of the compensation plan approved by the Can Tho City People's Committee. The content is divided by land section, and inhabitants owning land in plural sections are over wrapped in counting. The table suggests that land acquisition plan for O Mon 3 was the earliest to be developed in the Power Complex.

**Table 5.6-2 Decision on Compensation of Acquired Land for the O Mon Power Complex**

Items	Number of affected household	Compensation plan	Date
O Mon 3 (No.1)	33	No.1038 /QD-UBND	4 / April/2006
O Mon 3 (No.2)	52	No.1279 /QD-UBND	9/ May/ 2006
O Mon 3 (No.3)	37	No.1536 /QD-UBND	22/ June/ 2006
O Mon 3 (No.4)	29	No.1831 /QD-UBND	14/ August/ 2006
Affected household	151		
O Mon 4 (No.1)	46	No.1605 /QD-UBND	5/ July/ 2006
O Mon 4 (No.2)	58	No.1792 /QD-UBND	8/ August/ 2006
O Mon 4 (No.3)	36	No.2098 /QD-UBND	20/ September/ 2006
O Mon 4 (No.4)	22	No.2552 /QD-UBND	28/ November/ 2006
O Mon 4 (No.5)	32	No.134 /QD-UBND	23/ January/ 2007
O Mon 4 (No.6)	9	No.1156 /QD-UBND	11/ May/ 2007
Affected household	203		
Access road No.2 (No.1)	33	No.2554 /QD-UBND	12/ September/ 2006
Access road No.2 (No.2)	23	No.2554 /QD-UBND	28/ November/ 2006
Access road No.2 (No.3)	21	No.2764 /QD-UBND	18/ December/ 2006
Access road No.2 (No.4)	2	No.134 /QD-UBND	23/ January/ 2007
Affected household	79		
Discharge channel No.2 (No.1)	50	No.1606 /QD-UBND	5/ July/ 2006
Discharge channel No.2 (No.2)	65	No.1631 /QD-UBND	10/ July/ 2006
Discharge channel No.2 (No.3)	40	No.1791 /QD-UBND	8/ August/ 2006
Discharge channel No.2 (No.4)	32	No.2555 /QD-UBND	28/ November/ 2006
Discharge channel No.2 (No.5)	31	No.2766 /QD-UBND	18/ December/ 2006
Discharge channel No.2 (No.6)	3	No.134 /QD-UBND	23/ January/ 2007
Discharge channel No.2 (No.7)	5	No.773 /QD-UBND	28/ March/2007
Affected household	226		
Total affected household	659		

Green-colored area in Fig.5.6-1 shows the site prepared for O Mon3. Compensation to the land acquisition for O Mon 3 was also conducted based on the green-colored area. However, the red-colored rectangle describes the actual planned site for O Mon 3 power generation facilities (specified as KV1 in Section 4.2.1 in this Final Report).





## 5.6.2 Compensation Content

### (1) Selection of Project Site

The plan of O Mon Thermal Power Complex was developed in 1996 (2nd field survey). The construction plan of the thermal power plant O Mon 3 and 4 power plants in the O Mon Power Complex has been approved by the MOIT (PPTA-4845 SIA chp.5, p.22-25). Consequently, O Mon Power Complex is the only alternative construction site conceivable for the new power plant around O Mon district.

The site for O Mon Power Complex was selected for the reason that, in addition to topographical reason, not being located close to any sensitive environmental receptors (communities, hospitals, schools, etc), no physical cultural resources exist on site, relatively small number of resettled people and socioeconomic impacts (O Mon 4 EIA 5.G, p.100-101). The project site is selected to minimize the number of resettled inhabitants.

The Table 5.6-3 shows the “Area Size of the Land prepared for O Mon 3”, the Table 5.6-4 shows the “Structure in the Land prepared for O Mon 3”, and the Table 5.6-5 shows the “Affected Households and People in the Land prepared for O Mon 3” (Confirmed by Fact Finding Mission). And, there are 5 industries that have received compensation (RRP 2.1 p.14).

**Table 5.6-3 Area Size of the Land prepared for O Mon 3**

(Unit: m<sup>2</sup>)

Land	Size
Agriculture	132,145.3
Garden/Perennial tree land	90,052.9
Fish pond	3,601.5
Forest/woodland	0
Residential	7,660.5
Non-agricultural	0
Burial Land (Cemetery)	1,237.7
Land for transportation	4,405.5
Others	17,379.2
<b>Total</b>	<b>256,482.6</b>

Source: CTPP, based on actual compensation plan

**Table 5.6-4 Structure in the Land prepared for O Mon 3**

Structure	Number
Residential land	
Legal structure	134
Illegal structure	0
Agriculture	
Legal structure	0
Illegal structure	18
Public land	
Legal structure	0
Illegal structure	0
<b>Total</b>	<b>152</b>

Source: CTPP, based on actual compensation plan

**Table 5.6-5 Affected Households and People in the Land prepared for O Mon 3**

Item	N. of HH's (No. of people)
Affected households and people	128 (511)
Legal households (people)	110 (468)
Illegal households (people)	18 ( 43)
Relocating households and people	50 (231)
Cash compensation	45
Land compensation	5

Source: CTP, based on actual compensation plan

**(2) Entitlement and Policy for Compensation**

Table 5.6-6 describes the legal documents concerning the compensation process of land and houses and the compensation target.

**Table 5.6-6 Legal Documents concerning the Compensation and the Compensation Target**

Laws/Regulations	Issued Date	Contents
Amendment of Land Law (1993)	October 15th, 1993	Regulates the protection of the Land Use Right Certificate by government as the right of the land user (Article 3-1) as well as regulates the right of the exchange, transfer, lease and succession of the Land Use Right Certificate.
Amendment of Land Law and Construction Law (2004)	July 1st, 2004	Regulates the requirement of changing the land use category from “farm land” to “residential land” if building structures on farm lands (RRP, p.31).
Decree No.197/2004/ND-CP	December 3rd, 2004	Regulates resettlement and compensation to the land acquisition for public.
Decision No.53/2005/QĐ-UB (People’s Committee of Can Tho City)	August 11th, 2005	Regulates the details of compensation price for structure and crop, based on Decree No. 197.
Decision No.104/2005/QĐ-UBND (People’s Committee of Can Tho City)	December 23rd, 2005	A decision of the unit price for land, which is a basis for compensation price for land
Official letter No.02/2008/VPUB-QH (People’s Committee of Can Tho City)	January 2nd, 2008	A decision for providing cash assistance to settlers on state land who had settled before 1 July 2004 (65 M.VND in cash or plot of land in the resettlement areas) was taken.

According to the amended Land Law in 1993, people who settled before Oct 15, 1993, have received compensation for the land as well as for the house. Households who have settled on river bank before 15 October 1993 without land use right certificate (LURC) are considered as illegal and not eligible for compensation for both land and house (RRP 4.2, p.31).

In this manner, the initial condition for compensation of households without LRCU was whether household had settled before or after 15 October, 1993. As per Official letter No.02/2008/VPUB-QH issued by PC Can Tho, a decision for providing cash assistance to settlers on state land who had settled before 1 July 2004 with out LRCU (65 M.VND in cash or plot of land in the resettlement areas) was taken (Fact Finding Mission). Additionally, people who had settled illegally on river bank were not eligible for compensation (RRP Table 25, p.44-46), but finally those people became eligible for compensation for their lands and structures (Fact Finding Mission).

According to the revision of Land Law and Construction Law on 2003, building a house on a land registered as farm land is prohibited since July 1st, 2004, and if one wishes to build a house, farm land should be re-registered as residential land upon payment of a fee (RRP 4.2, p.31). Initially, the structures built before July 1st, 2004 on the farm lands were not eligible for compensation. However, those structures became eligible for compensation if the residents make a late payment of the tax that was needed to be paid for the land registered as residential land. The Table 5.6-7 shows the eligibility of compensation of land and structures.

According to ADB, people, who learned the case of Tra Noc Industrial Complex located nearby, built simple houses within one night in order to receive compensation for the houses (RRP, p.31).

There were 78 grievances from the local residents regarding the land prepared for O Mon 3, of which 62 were the grievances about the structures. Out of the 62 grievances about the structures, 12 of them were approved, and 50 of them were not approved. It is unknown when the structures of which the grievances were approved was built; however, all the structures of which the grievances were not approved, were built in the year of 2005. This shows that there were many structures built just for compensation, as ADB pointed out.

For this reason, the structures built after July 1st, 2004 was considered illegal according to Construction Law, and became not eligible for compensation.

**Table 5.6-7 Eligibility of Compensation of Land and Structure**

Items	Agricultural Land		Residential Land		River Bank
	With LURC (or in the process of acquiring LURC)	No LURC	With LURC (or in the process of acquiring LURC)	No LURC	
<b>Before 1,July 2004</b>					
LAND	O	*	O	*	O
STRUCTURE	Δ	\$	O	\$	O
<b>After 1,July 2004</b>					
LAND	-	X	-	X	X
STRUCTURE	-	X	-	X	X

- Note: 1. "LURC" means "Land Use Right Certificate (i.e. Red Book)". According to ADB, no residents applied for the acquisition of LURC after July 1st, 2004 (RRP 8.3, p.48-49).
- "O" indicates Eligible
  - "X" indicates Not Eligible
  - "\*" indicates Not Eligible, but eligible for receiving resettlement benefit (65 MVND in cash or plot of land in the resettlement areas).
  - "Δ" indicates that see Appended Table 3(2) of the check list make a late payment of the tax that was needed to be paid for the land registered as residential land.
  - "\$" indicates eligible for cash compensation of VND 15,000,000 as resettlement benefit.

According to Decree No.147/ 2004/ ND-CP stipulating the basic policy of land acquisition, the compensation includes land, house, temporarily- affected property, trees and crops. Based on the Decree, the Can Tho City People’s Committee established a Decision stipulating resettlement, compensation and allowance for land expropriation within Can Tho City (Decision No.53/ 2005/ QD-UB) (RRP 8.1.1, p.44-46). In Vietnam, compensation payment includes the options of “land to land”, “partly land and partly cash”, “cash only”, “cash and job training”, and the people to be compensated have the choice. Most of the 50 relocating households from O Mon 3 site selected cash payment, and only 5 households selected relocation to the designated resettlement area (Fact Finding Mission). O Mon district authority has acquired 100 sections of land in Phuoc Thoi ward

in 2009, of which 30 sections has been obtained by the project owner as a resettlement land for O Mon Power Complex. The organization bought the land use right certificate for 9 relocating households from the local People's Committee and handed it to them to allow them for building house and relocation at their convenience. The resettlement land is located 500m from school and 3km from a hospital (1st field survey).

### (3) Cut-Off Date

Public consultation meetings regarding compensation to land acquisition were conducted on December 23rd and 26th, 2005 (RRP 4.1 p.29). Therefore, in term of information disclosure, December 23rd, 2005 was set as the cut-off date. However, as mentioned above, the structures built after July 1st, 2004 was recognized as illegal according to Construction Law and became not eligible for compensation. Consequently, the actual cut-off date was July 1st, 2004 (Fact Finding Mission).

### (4) Implementation System

Table 5.6-8 indicates the role of the relevant organizations for implementing compensation process (RRP Table 26, p.47).

**Table 5.6-8 Actors in the Compensation and Resettlement Process**

Organization	Responsibilities
EVN	<ul style="list-style-type: none"> <li>- Provide of funds for compensation</li> <li>- Participate in the O Mon District Compensation Committee (DCC)</li> </ul>
TPPMU3*	<ul style="list-style-type: none"> <li>- A subsidiary of EVN.</li> <li>- Delegated by EVN to sit on DCC. Information sharing, compensation payment and internal supervision.</li> </ul>
People's Committee of Can Tho City	<ul style="list-style-type: none"> <li>- Approve the RP, and assign responsibilities for its implementation to relevant institutions.</li> <li>- Approve and decide on compensation prices, allowances.</li> <li>- Establishment of Resettlement and Compensation Committee at local administrative levels.</li> <li>- Approve land recovery and transfer within the province.</li> <li>- Redress complaints and grievances.</li> </ul>
PECC2, PECC3	<ul style="list-style-type: none"> <li>- Consultancy companies, subsidiaries of EVN.</li> <li>- To carry out community consultation, and coordinate with the Resettlement and Compensation Committee</li> </ul>
Department of Finance of Can Tho City	<ul style="list-style-type: none"> <li>- Investigation and assessment of compensation prices, in conjunction with Dept of Construction, Dept. of Natural Resources, Dept. of Agriculture and Rural development, People's Committees of districts.</li> </ul>
People's Committee of O Mon District	<ul style="list-style-type: none"> <li>- Guiding compensation and resettlement activities, implement loss investigation, public consultation, dissemination of information on RP and policies.</li> <li>- Establishment of district Resettlement and Compensation Committee.</li> <li>- Resolving complaints and queries of affected people.</li> </ul>
O Mon District Compensation Committee (DCC)	<ul style="list-style-type: none"> <li>- Manage and organize census, inventory of assets, implementation of affected people</li> <li>- Issuing Detailed Measurement Survey (DMS) document for each affected person.</li> <li>- Checking compensation prices.</li> <li>- Organizing meetings with affected people, local authorities.</li> <li>- Disseminating entitlement forms DMS results and resettlement schedule to affected people.</li> <li>- Prepare detailed implementation plan.</li> <li>- Settling complaints and grievances.</li> <li>- Proposing solutions to solving problems.</li> </ul>
People's Committee of the affected wards	<ul style="list-style-type: none"> <li>- Provide information for surveys and census.</li> <li>- Cooperate with Compensation Committee in organizing public meetings, information dissemination etc.</li> <li>- Resolve complaints and propose solutions, communicate to Compensation Committee</li> </ul>
Affected People	<ul style="list-style-type: none"> <li>- Provide relevant information and documents on ownership of property.</li> <li>- Clearing land and moving in a timely manner.</li> </ul>

Note : \* The responsibilities are now being taken over by Can Tho Power Company



A Compensation Committee of O Mon District was established to take the formal responsibility for resettlement and compensation, consisting of 1 chairman, 2 deputy chairmen, 1 permanent commissioner, 11 commissioners and 3 persons invited to represent the Fatherland Front Committee, the Women's Organization and the Farmers' organization (PPTA-4845 SIA 5.1.2, p.24).

### (5) Compensation and Rehabilitation of Livelihood

Price for land compensation was based on Decision No.104/2005/QD-UBND, house and crop compensation were based on Decision No.53/2005/QD-UB of the Can Tho City People's Committee (Confirmed with CTPP).

The contents of cash compensation are as follows.

#### - Land

* Land for planting annual trees	: 126,000 VND/m <sup>2</sup>
* Land for planting perennial trees	: 126,000 VND/m <sup>2</sup>
* Rural living land	: 400,000 VND/m <sup>2</sup>
* Non-agriculture land	: 200,000 VND/m <sup>2</sup>
* Land for living at Road 934 area	: 1,000,000 VND/m <sup>2</sup>
	(from the power plant to Thoi An ward)
* Public land or alluvial ground	: 108,000 VND/m <sup>2</sup>
* Agriculture land inside 50m from the protection slope of Road 934: in addition to compensation for agriculture land, 50% of living land cost was paid.	
* Cultural Pond	: 108,000 VND/m <sup>2</sup>

#### - Structure

* Grade 1 (Villa)	: no cases
* Grade 2 (Concrete floor, high quality of materials)	: no cases
* Grade 3 (Concrete floor, average quality of materials)	: 1,400,000 VND/m <sup>2</sup>
* Grade 4 (Brick wall, concrete frame with tiled roof)	: 990,000 VND/m <sup>2</sup>
* Grade 5 (Wooden frame with palm roof)	: 150,000 VND/m <sup>2</sup>

#### - Secondary structures

* Kitchen, toilet	: classified as the rates of houses
* Tomb: Normal 1,000,000 VND/unit; Cement	: 3,000,000 VND/Unit
* Water tank	: 380,000/m <sup>3</sup>

#### - Crops

The Table 5.6-9 shows the unit price of crop compensation.

**Table 5.6-9 Unit Price of Crop Compensation**

English name	Unit	Compensation rate		
		Grade A	Grade B	Grade C
Orange	VND/tree	360,000	252,000	72,000
Mango	VND/tree	600,000	420,000	120,000
Jack-fruit	VND/tree	192,000	134,000	38,000
Banana	VND/tree	14,000	7,000	2,000
Longan	VND/tree	300,000	210,000	60,000
Kumquat	VND/tree	96,000	67,000	19,000
Calaba tree	VND/tree	120,000	72,000	24,000
Rambutan	VND/tree	360,000	252,000	72,000
Starberry	VND/tree	96,000	67,000	19,000
Bamboo	VND/tree	14,000	10,000	2,900
Star apple	VND/tree	480,000	336,000	96,000
Durian	VND/tree	720,000	504,000	144,000
Lemon	VND/tree	120,000	84,000	24,000
Tamarind	VND/tree	180,000	126,000	36,000
Water apple	VND/tree	144,000	101,000	29,000
Grapefruit	VND/tree	240,000	168,000	48,000
Custard apple	VND/tree	96,000	67,000	19,000
Kapok	VND/tree	72,000	50,000	14,000
Eucalyptus	VND/tree	36,000	25,000	7,000
Pink shower cassia	VND/tree	180,000	96,000	36,000
One species of Tamarind	VND/tree	180,000	96,000	36,000
Pineapple	VND/m <sup>2</sup>	2,600	1,850	530
Agati	VND/tree	24,000	17,000	5,000
Coconut	VND/tree	300,000	210,000	60,000
Jamun	VND/tree	96,000	67,000	19,000
Sapodilla	VND/tree	300,000	210,000	60,000
Mandarin	VND/tree	300,000	210,000	60,000
Beadtree	VND/tree	120,000	72,000	24,000
San(One species of Jamun)	VND/tree	120,000	72,000	24,000
Dipper	VND/tree	120,000	72,000	24,000
Arecanut	VND/tree	120,000	84,000	24,000
Starfruit	VND/tree	96,000	67,000	19,000
Trambau(One species of Jamun)	VND/tree	120,000	72,000	24,000
Guava	VND/tree	96,000	67,000	19,000
Cajuput	VND/tree	8,000	6,000	1,800
Cypress	VND/tree	120,000	72,000	24,000
Citronella	VND/m <sup>2</sup>	2,400	1,680	480
Sugar cane	VND/m <sup>3</sup>	2,600	1,850	530
Queen's crape-myrtle	VND/tree	120,000	72,000	24,000
Acerola	VND/tree	96,000	67,000	19,000
Poplar	VND/tree	120,000	72,000	24,000
Sapotaceae	VND/tree	120,000	84,000	24,000
Tropical almond	VND/tree	120,000	72,000	24,000

Source : CTPP

Eligibility and contents of other compensation are shown in the Table 5.6-10.

**Table 5.6-10 Eligibility and Contents of Other Compensation**

Allowance	Eligibility	Payment	
<b>Transportation Allowance</b>	Households, individuals who have to relocate	<b>Transitional Support (permanently relocated within a province or city)</b>	
		Multi-stories, concrete houses	3 MVND/household
		Brick houses	2 MVND/household
		Others	1 MVND/household
		<b>Transitional Support (Permanently relocated to another province or city)</b>	
		Multi-stories, concrete houses	5 MVND
		Brick houses	4 MVND
		Others	3 MVND
<b>Allowance for timely moving</b>	The PAPs who have to be relocated and voluntarily hand the affected land to the project in accordance of the time regulated and announced by the project	Being entitled to a bonus of 5 % of the total compensation amount, but not more than 5 MVND.	
<b>Supports for job change and job creation</b>	Households, individuals directly engaged in agricultural production have over 30 % of their assigned agricultural land areas expropriated, and being still within the working age	In case a vocational training course cannot be held, the support will be paid in cash, at a level of 1 MVND/person in labor age.	
<b>Temporary relocation allowance</b>	Persons who have their residential land expropriated and have no other residences; pending the time of creating new residences	Less than 4 persons	0.5 MVND/household/month
		From 5-6 persons	0.6 MVND/household/month
		From 7-8 persons	0.7 MVND/household/month
		From 9-10 persons	0.8 MVND/household/month
		More than 11 persons	1 MVND/household/month
<b>Others: For "Policy" households who have to be relocated</b>	Households with the person such as the ones being showed at right	Military Heroes, Vietnamese Hero Mothers, Labor Hero	5 MVND/household/month
		Wounded soldiers, relatives of military soldiers	3 MVND/household/month
		Revolutionaries, retired civil servants, households who are currently receiving other social assistance	1 MVND/household/month
<b>Resettlement site or Resettlement benefit</b>	Household required to relocate due to the project, and has the legal rights and titles to land and property. Also households without legal rights. But their permanent use of land was certified by local government.	Houses whose owners do not agree to receive new land on resettlement site	Resettlement benefit is 65 MVND
<b>Supports for subsistence and production stabilization</b>	Households or individuals directly not engaged in agricultural production have over 30 % of their assigned agricultural land areas expropriated.	Without relocation	Life stabilization supports for 3 months 0.36 MVND/person/month
		With relocation	Life stabilization supports for 6 months 0.72 MVND/person/month
		Relocation with difficult socio-economic conditions	Life stabilization supports for 12 months 1.44 MVND/person/month

Source : CTPP



- Job training course is proposed for livelihood rehabilitation (RRP 12.1, p.59-61). The job training course provided or planned in 2007-2008 is listed below (RRP Annex 4, p.79-80).

### **In 2007**

- Total established courses : 12.
- Total students : 435.

Among them:

- Small scale industry (60 days/course) has 5 courses consist of hair dressing, household electric, motorbike repairing and household tailoring.
- Industry (15 days/course) has 7 courses, consist of aquaculture, livestock and veterinary, cultivation.

### **In 2008**

O Mon district has proposed to Department of Labour, Invalids and Social Affairs (DOLISA) of Can Tho City to fund for organizing 19 courses as follows:

- Cultivation : 02 courses.
- Livestock and veterinary : 02 courses.
- Aquaculture : 02 courses.
- Motorbike repairing : 02 courses.
- Household electric : 02 courses.
- Household tailoring : 04 courses.
- Diesel engine repairing : 01 course.
- Industrial tailoring : 01 course.
- Hair dressing : 03 courses

According to the government regulation, (1) informal business, and (2) workers having no labor contract shall not be eligible for compensation or support. No workers corresponded to (1) informal business workers, but those working in the brick kiln have no labor contract and are not eligible for compensation. Those brick kiln employees (7 households, RDDR Table 22, p.56) will be given priority in employment in construction site or in the power plant (RDDR, p.49).

As described above, the building owners regarded as illegal in Vietnamese law, as well as land users, are allowed for compensation or resettlement support. All the affected people will be provided with compensation or any other form of living support, such as brick kiln employees who are not to be compensated according to the regulation but will be employed in either construction site or the power plant.

## **(6) Compensation Price**

ADB, when preparing Resettlement Action Plan (RAP), determines the compensation price (i.e. replacement) based on the market price. However, in the due diligence step after the affected inhabitants have resettled, the basic compensation policy should focus on “assuring a living standard equal or even better than before resettlement for relocated people”, and the interview survey was conducted to collect data on the change in incomes from as many relocated people as possible. The result shows that most of the relocated people think that their incomes are “equal to the life standard before relocation” or “even better than the former life level” (see Appended Table 3(2) of the check list) (2nd field survey).

On the other hand, 7 households (about 5% of the total) answered “incomes became lower than before resettlement”. CTTTP visited these households in April, 2012 and interviewed them. As a result, CTTTP confirmed that the incomes of all of those households have become better compared to the incomes before resettlement. The reasons why their incomes decreased at the time of resettlement were that they invested on lands or they conducted active consumption activities since they received cash compensation ([Fact Finding Mission](#)).

The land price survey was also conducted by ADB around O Mon District, and it became clear that it is possible with the compensation payment to purchase an equal grade of land with equal or even larger area than the former land. Consequently, it is determined that the compensation payment satisfies the “replacement cost” ([2nd field survey](#)).

In addition, there were not any grievances regarding the compensation price for the land prepared for O Mon 3. Therefore, it is concluded that compensation price for land is appropriate.

As for structure, 95% of the relocated households have bigger size of the structure area than the ones before resettlement, and even the 5% of the relocated households have better grade of the structures than the ones before resettlement (see Appended Table 3(2) of the check list). Therefore, the compensation price for structure is appropriate.

#### (7) Total Compensation Amount

Table 5.6-11 shows “Compensation Price for Land”, Table 5.6-12 shows “Compensation Price for Structure” and Table 5.6-13 shows “Compensation Price for Crops”.

**Table 5.6-11 Compensation Cost for Land**

Item	Area (m <sup>2</sup> )	Unit Price (VND/m <sup>2</sup> )	Total Compensation Price for O Mon 3 (VND)
Farm Land for Annual Crop	132,145.3	126,000	16,650,307,800
Farm Land for Perennial Crop (Orchard)	90,052.9	126,000	11,346,665,400
Residential Land in rural area	7,660.5	400,000	3,064,200,000
Culture Pond	3,601.5	200,000	388,962,000
Other	23,022.4	108,000	2,486,419,200
<b>Total</b>	<b>256482.6</b>	<b>-</b>	<b>33,936,554,400</b>

Created based on documents provided by CTTTP

**Table 5.6-12 Compensation Cost for Structure**

Item	Unit Price	Total Compensation Price for O Mon 3 (VND)
Grade 1	N/A	-
Grade 2	N/A	-
Grade 3	1,400,000 VND/m <sup>2</sup>	1,122,400,920
Grade 4	990,000 VND/m <sup>2</sup>	7,079,566,152
Grade 5	150,000 VND/m <sup>2</sup>	1,534,840,016
Secondary Structure (Toilet, Kitchen)	depending on the grades of the main structure	76,563,440
Grave (Regular)	1,000,000 VND/m <sup>2</sup>	85,000,000
Grave (Concrete)	3,000,000 VND/m <sup>2</sup>	171,000,000
Water Tank	380,000 VND/m <sup>3</sup>	77,336,840
<b>Total</b>	<b>-</b>	<b>10,146,707,368</b>

Created based on documents provided by CTTTP

**Table 5.6-13 Compensation Cost for Crops**

English name	Total compensation	English name	Total compensation
Orange	16,058,336,000	Agati	3,132,000
Mango	2,241,200,000	Coconut	18,420,000
Jack-fruit	16,532,000	Jamun	7,320,000
Banana	5,722,000	Sapodilla	9,120,000
Longan	293,820,000	Mandarin	12,000,000
Kumquat	155,545,000	Beadtree	1,440,000
Calaba tree	2,928,000	San (Ones pecies of Jamun)	1,440,000
Rambutan	72,000	Dipper	1,248,000
Star berry	192,000	Arecanut	204,000
Bamboo	16,911,700	Starfruit	96,000
Star apple	120,720,000	Trambau (One species of Jamun)	18,024,000
Durian	2,844,000	Guava	969,000
Lemon	1,440,000	Cajuput	1,641,000
Tamarind	180,000	Cypress	120,000
Water apple	8,026,000	Citronella	14,400
Grapefruit	336,000	Sugarcane	13,000
Custard apple	892,000	Queen's Crape-myrtle	24,000
Kapok	11,764,000	Acerola	3,148,000
Eucaluptus	44,054,000	Poplar	48,000
Pink shower cassia	13,596,000	Sapotaceae	240,000
One species of Tamarind	960,000	Tropical almond	288,000
Pineapple	13,000	<b>Total</b>	<b>19,075,033,100</b>

Created based on documents provided by CTPP

Table 5.6-14 shows the compensation amount budgeted in compensation plan for the site prepared for O Mon 3, which was approved by People's Committee of Can Tho City, and the actual compensation amount paid for O Mon 3.

The budget for public consultation meetings were paid from the budget of the whole O Mon Power Complex.

**Table 5.6-14 Total Compensation Amount for the Land prepared for O Mon 3**

(Unit : VND)

	Amount Budgeted in Compensation Plan	Actual Compensation Amount for O Mon 3	Compensation Amount for the Whole O Mon Power Complex
Land	29,808,533,000	33,936,554,400	
Structure	9,029,432,250	10,146,707,368	
Crop	19,259,320,580	19,075,033,100	
Allowance	1,013,060,000	638,560,000	
Allowance for timely relocation	531,479,690	-	
Preparation of resettlement site	-	400,000,000*	2,400,000,000
Contingency (10%)	5,964,182,000	-	
Cost for Compensation Committee	806,681,000	-	
Cost for Valuation Committee	34,543,000	-	
Working Expenditure	-	-	5,055,648,000
Public Consultation Meeting	-	-	2,593,025,000
Monitoring	-	-	357,010,000
<b>Total</b>	<b>66,447,231,520</b>	<b>64,196,854,868</b>	<b>272,189,911,000</b>
Paid Amount until March, 2012	-	-	271,863,497,000
Remaining	-	-	326,413,000

Note: Total prepared resettlement site is for 30 households, and 5 households from O Mon 3 site is resettled in the resettlement site. Therefore, the cost for preparation of resettlement site for O Mon 3 is 1/6 of the total

Created based on documents provided by CTPP

### (8) Public Consultation Meeting

Public consultation meeting was held on 23 and 26/ December/ 2005 to explain the extension plan of O Mon Power Complex. The basis for calling these meetings was the decision No 4066/QD-UBND dated 8 Dec 2005 by the People's Committee of Can Tho City and notified through the press and Phuoc Thoi ward and Thoi An ward People's Committee. The meetings were primarily focused on resettlement and compensation issues (O Mon 4 EIA 7.B, p.145, RRP Table 13, p.30, RRP 6.1, p.39).

Date	Venue	Participants
23/ December/ 2005; 2:00 PM	Loi Villege, Phoc Thoi ward	Unknown, numerous
26/ December/ 2005; 8:00 AM	Loi Villege, Phoc Thoi ward	Unknown, numerous

Following the public meeting in December 2005, public consultations were held as described below for the local people and stakeholders as a part of "Project Preparation Technical Assistance (PPTA)" by ADB (RRP 6.2, p.39).

Date	Object person	Venue	Participants
21/ July/ 2007	Affected peoples	Thoi An ward	130
22/ July/ 2007	Affected peoples	Phoc Thoi ward	232
14/ September/ 2007	Organizations and institutions (Stakeholder)	Can Tho city	40
8/ October/ 2007	Can Tho people's committee	Can Tho city	10
4/ January/ 2008	Stakeholder	O Mon district people's committee	14

During the public participation meetings in July 2007, several representatives of the AP's felt poorly treated by lack of compensation for houses that were built on farm land in violation of the construction law of 2004. There are also complaints against the fairness, transparency and speed of the process (RRP 6.2, p.39-40).

The meeting with People's Committee of Can Tho City on 8th October 2007 was to request certain modifications to the resettlement process as observed by Vattenfall Power Consultant. This was followed up by a letter on 9th October from Vattenfall Power Consultant to Can Tho City People's Committee (RRP 6.2, p.40).

At the stakeholder workshop in O Mon on 4th January 2008, the main issues discussed were related to the capacity, proficiency and usefulness of vocational training for income restoration. At the meeting, some issues were raised (RRP 6.2, p.40):

- \* Farmer's Union: Young people do not want to continue farming. They need training to find other jobs, but training has to be organized near their place of stay. The main issue is what is a useful training, job consultancy is necessary on an individual basis.
- \* Women's Union and Youth union have organized vocational classes especially for people in working age. They are ready to gather affected people for careers consultancy.
- \* Vocational training center of O Mon is directly under O Mon Domestic Affairs. It is funded by DOLISA to hold classes at wards. According to DOLISA's policy, they provide students with a tool set after graduating course instead of daily allowance.
- \* O Mon domestic affairs have previously planned courses, but there have been problems in raising funds to meet the costs of courses.
- \* There are 4 classes in Thoi An majoring in home electricity and sewing-machine consisting of 20 participants per class for the duration of 2 months with the cost of 48 - 50 million VND/class. In order for participants to perform well, prequalification classes are required in some cases. So, ADB (or the project owner) should support for organizing advance classes. With 80 persons eligible for training, this means for 4 classes, local government offer 200 million VND for basic knowledge. The remaining 300 MVND need to be supported for advanced level.
- \* The type of training that can be given includes: Seamstress, Diesel engine maintenance, Motorbike repair, Construction, Electrician, and Electronics. Motorbike repair trainees are given a toolbox at a value of 10 million VND in order to start their own business.
- \* There is a need for small loans especially to women for starting small business. But there is a problem with collateral.

As described above, the public hearing has been held several times to collect local people's opinion and concern, and we believe that the scope of compensation is well understood by them. Vocational training has been provided since establishment of O Mon district in 2004, and extended from 4 initial courses to 19 courses in 2008 (RRP Annex 4, p.79-80).

#### **(9) Support to Vulnerable People**

Vulnerable people are defined as people who might suffer disproportionately or face the risk of being further marginalized by the effects of resettlement and specifically include: (i) female headed households with dependents, (ii) disabled household heads, (iii) households falling under the generally accepted indicator for poverty, (iv) children and the elderly households who are landless and with no other means of support, and (v) landless households, (vi) indigenous people or ethnic minorities . 8 vulnerable households inhabit the O Mon 3 site and are affected by land acquisition, of which 4 households are "(iii) poor households, 2 are "(iv) children and elderly households", and 2 are "(v) landless households" (RRP 4.5, p.33).

The total number of poor or unemployed vulnerable households in O Mon Power Complex was 17 in 2010, which decreased from 64 households at the time of survey in 2005. However, the resettlement committee did identify 24 households who are still vulnerable. The 17 or 24 vulnerable households were provided with special support of 15 MVND per household from the project owner (RDDR, p.22 & p.30). There were two displaced vulnerable households who had moved in to the project area after December, 2005 and set up temporary houses along the river bank, and they had been provided the assistant of 20MVND/household by CTTTP from their company charity fund to build the permanent house (RDDR, p.21).

Many people appear to have moved away from the immediate area after receiving compensation and not all of the households could be identified. If within 3 months of disclosure of the CAP (Corrective Action Plan attached with Resettlement Due Diligence Report) addition vulnerable DPs are identified and requested by the relevant local People's Committees and referred to the CTTTP by the O Mon District People's Committee then additional assistance will be provided as needed (RDDR, p.22).

As described above, vulnerable households are appropriately taken care of, including provision of additional support.

#### **(10) Monitoring and a Grievance Redress Mechanism (GRM)**

A grievance redress mechanism (GRM) has been established as a local administrative system (O Mon 4 EIA 8.B, p.149-150).

##### **Stage 1 - District Level - CTTTP and O Mon District People's Committee**

- The AP lodges an oral or written complaint with either CTTTP or the O Mon District People's Committee. CTTTP will identify a focal point for receiving complaints.
- If the complaint is received by CTTTP, the GRM procedure will be explained to the complainant, and the complaint will be recorded and forwarded to the O Mon District People's Committee.
- If the complaint is received by the O Mon District People's Committee, the complaint will be recorded. In order to assess the nature and validity of the complaint the O Mon District People's Committee will consult with CTTTP and other relevant parties, fact-find and investigate, and within 15 days of receipt of the complaint will issue a decision:

- \* if the O Mon District People's Committee agrees in favor of the complainant, then in consultation with CTPP and in compliance with relevant decrees, circulars and stipulations, a course of action and/or compensation to address the complaint will be agreed upon;
- \* if the O Mon District People's Committee does not agree in favor of the complainant, and the complainant is satisfied and does not wish to proceed further, then the process ends; and,
- \* if the O Mon District People's Committee does not agree in favor of the complainant, and the complainant is not satisfied, the complainant has 45 days from the date of issuance the O Mon District People's Committee decision to take his/her complaint to either the Can Tho People's Committee (Stage 2) or the Can Tho People's Court of Justice (Stage 3).

### **Stage 2 - Province Level – Can Tho City People's Committee**

- If the complainant is not satisfied with the decision in Stage 1, the complainant has 45 days from the date of issuance the O Mon District People's Committee decision to take his/her complaint to the attention of the Inspection Department of the Can Tho People's Committee.
- In order to assess the nature and validity of the complaint the Can Tho People's Committee will consult with the O Mon District People's Committee, CTPP and other relevant parties; fact-find and investigate; and, within 15 days of receipt of the complaint will issue a decision:
  - \* If the Can Tho People's Committee agrees in favor of the complainant, then in consultation with CTPP and in compliance with relevant decrees, circulars and stipulations, the decision of the O Mon District People's Committee will be overturned, and a course of action and/or compensation to address the complaint will be agreed upon.
  - \* If the Can Tho People's Committee does not agree in favor of the complainant, then the process ends.

### **Stage 3 -Court Case - Tho People's Court of Justice**

- If the complainant is not satisfied with the decision in Stage 1, he/she can also bring a case to the Can Tho People's Court of Justice. The Court shall consider the complaint in accordance with laws on civil procedures and shall render a decision:
  - \* If the Can Tho People's Court of Justice agrees in favor of the complainant, the court will request the Can Tho People's Committee to overturn the decision of the O Mon District People's Committee, and a course of action and/or compensation to address the complaint will be agreed upon.
  - \* If the Can Tho People's Court of Justice does not agree in favor of the complainant, then the process ends.

A sign will be erected at the Project site that summarizes the Grievance Redress Mechanism and provide contact details (address, phone number, fax, and email address) for the CTPP grievance focal point, the O Mon District People's Committee, the Can Tho People's Committee, and the Can Tho People's Court of Justice. CTPP will instruct the EPC contractor as to the Grievance Redress Mechanism such that they can inform any person who might approach them directly as to the appropriate steps to file a grievance (O Mon 4 EIA 8, C, p.152).

The project owner also handles complaints at the Company Office having a lawyer, with assistance of Labor Department in supporting role (2nd field survey). In fact, 400 complaints have been expressed until 2000, and it is judged that the Grievance Mechanism which it is suitable and easy to use is built.

Monitoring system consists of internal and external monitoring. At present, the internal monitoring activities include only decision letters and minutes of meetings issued by the authorities, and which are not generally made public. The DCC is an executive body, and applies the decisions, rules and regulations issued by the People's Committee of Can Tho City (RRP, p.67). External monitoring can be made only of the part of the process that is governed by ODA agreements. It includes restoration of livelihood, providing training and other supports to affected people and vulnerable groups (RRP, p.67).

The monitoring is planned by Project Implementation Consultant in ADB, and the result will be reported to ADB (RDDR, p.45).

### 5.6.3 Comparison of Compensation of the Project with JICA Guideline

Table 5.6-15 describes the comparison of compensation of the project with JICA Guideline. Table 5.6-16 describes the comparison of compensation if the project with World Bank OP 4.12 Annex A.

Land acquisition process was initially carried out following the Vietnamese regulation and the survey for a preparation of the list of households to be relocated and the compensation plan have been developed in this context. Also, Can Tho City People's Committee has developed a rehabilitation measures for livelihood. In this manner, the compensation plan has been focused on determination of the compensation target and the compensation method (only 5 out of 50 households wished relocation) and provision of supporting measures for livelihood rehabilitation (provision of assistance cash and job training), and we believe that the project compensation plan is pursuant to the principle of JICA guideline and WB OP 4.12 saying "assuring a living standard equal or even better than before resettlement for relocated people".

The result of ADB's survey indicates that the life of the compensated households after compensation has improved (compared to around 2005), and that they own larger farm land than they used to have before compensation. We believe that the compensation was appropriately implemented.

ADB has carried out socio-economical survey and Retrofit Resettlement Plan (2007) as a part of PPTA that has proposed the modification of entitlement for receiving compensation.



**Table 5.6-15 Comparison of Compensation of the Project with JICA Guideline**

No.	JICA Guidelines	Compensation implemented in O Mon Project	Gap with JICA Guideline	Judgments
1.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	<ul style="list-style-type: none"> <li>- The project plan of O Mon Power Complex has been developed in 1996 (2nd field survey). The construction plan of the O Mon 3 and O Mon 4 power plants in O Mon thermal power complex has been approved on 27<sup>th</sup> September by the MOIT (Decision No.2523/ QD/ NLDK) (PPTA-4845 SIA 5, p.22-25), and O Mon Power Complex is the only alternative construction site conceivable for the new power plant around O Mon district.</li> <li>- The site for O Mon Power Complex was selected for the reason that, in addition to topographical reason, not being located close to any sensitive environmental receptors (communities, hospitals, schools, etc), no physical cultural resources exist on site, relatively small number of resettled people and socioeconomic impacts (O Mon 4 EIA 5.G p.100-101).</li> </ul>	None.	O Mon Power Complex site, where O Mon 3 will be constructed, was selected as the project site in consideration that the potential number of inhabitants to be resettled is less than other location, in addition to topographic reason. The minimization of the affected people is given sufficient consideration in this manner, as well as the appropriate compensation for land, house, trees and crops.
2.	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	<ul style="list-style-type: none"> <li>- The basic policy of land acquisition is stipulated by Decree No.147/ 2004/ ND-CP. The compensation includes land, house, temporarily- affected property, trees and crops. Based on the Decree, the Can Tho City People's Committee established a Decision stipulating resettlement, compensation and allowance for land expropriation within Can Tho City (Decision No.53/ 2005/ QD-UB) (RRP Table 25, p.44-46).</li> <li>- Price for land compensation was based on Decision No.104/2005/QD-UBND, structure and crop compensation were based on Decision No.53/2005/QD-UB of the Can Tho City People's Committee (RDDR, p.16).</li> <li>- According to the amended Land Law in 1993, people who settled before Oct 15, 1993, have received compensation for the land as well as for the house. Households who have settled on river bank before 15 October 1993 without land use right certificate (LURC) are considered as illegal and not eligible for compensation for both land and house (RRP 4.2, p.31). In this manner, the initial condition for compensation of households without LRCU was whether household had settled before or after 15 October, 1993. As per Official letter No.02/2008/VPUB-QH issued by PC Can Tho, a decision for providing cash assistance to settlers on state land who had settled before 1 July 2004 with out LRCU (65 MVND in cash or plot of land in the resettlement areas) was taken (Fact Finding Mission). Additionally, people who had settled illegally on river bank were not eligible for compensation (RRP Table 25, p.44-46), but finally those people became eligible for compensation for their lands and structures (Fact Finding Mission).</li> <li>- According to the national government regulation, (1) informal business, (2) workers having no labor contract shall not be eligible for compensation or support. Those working in the brick kiln have no labor contract and are not eligible for compensation. Those brick kiln employees (7 households; RDDR Table 22, p.56) will be given priority in employment in construction site or in the power plant (RDDR, p.49).</li> </ul>	None	Land, structures and farm crops were compensated. All the affected people will be provided with compensation or any other form of living support, such as brick kiln employees who are not eligible for compensation according to the regulation but will be preferentially employed in either construction site or the power plant.
3.	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	<ul style="list-style-type: none"> <li>- Price for land compensation was based on Decision No.104/2005/QD-UBND, structure and crop compensation were based on Decision No.53/2005/QD-UB of the Can Tho City People's Committee (RDDR, p.16).</li> <li>- The land price survey was conducted by ADB around O Mon District, and it became clear that it is possible with the compensation payment to purchase an equal grade of land with equal or even larger area than the former land. Consequently, it is determined that the compensation payment satisfies the "replacement cost" (2nd field survey).</li> <li>- Those working in the brick kiln have no labor contract and are not eligible for compensation. Those brick kiln employees (7 households) will be given priority in employment in construction site or in the power plant (RDDR, p.49).</li> <li>- The households losing farm land will be provided with a vocational training course or support in cash, at a level of 1 MVND/person (RDDR, p.21).</li> </ul>	None	Land, houses and crops will be compensated according to the decision of People's Committee, and the compensation is appropriately carried out. The households losing farm land will be provided with a vocational training course or support in cash, and the brick kiln employees not compensated according to the government regulation will be given priority in employment in construction site or in the power plant. These measures assure a living standard equal or even better than before resettlement for relocated people
4.	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	<ul style="list-style-type: none"> <li>- The land price survey was also conducted by ADB around O Mon District, and it became clear that it is possible with the compensation payment to purchase an equal grade of land with equal or even larger area than the former land. Consequently, it is determined that the compensation payment satisfies the "replacement cost" (2nd field survey).</li> <li>- The survey showed that the compensated households purchased larger rice field than they used to have before compensation with compensation money. This is because of limited availability of replacement land to buy in the immediate vicinity, and that garden and orchard land was valued much higher than paddy land (RDDR, p.17).</li> <li>- Resettled households are entitled to receive moving allowance, transitional support, job training (RDDR, p.15-16).</li> </ul>	None	The land price survey was conducted by ADB in the context of due diligence around O Mon District, and it became clear that it is possible with the compensation payment to purchase an equal grade of land with equal or even larger area than the former land. The survey showed that the compensated households purchased larger rice field than they used to have before compensation with compensation money. Consequently, it is determined that the compensation payment satisfies the "replacement cost". Resettled households are provided, other than land, moving allowance, transitional support, job training and compensation based on the replacement cost is appropriately carried out.
5.	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	At the time of land transfer, the certificate of land transfer should be signed in the attendance of the person to be resettled, the project owner, land use right registration office, and the People's Committee. The land use right certificate for O Mon 3 was verified and it was confirmed that payment was conducted prior to land transfer.	None	Payment of compensation was conducted prior to land transfer.
6.	For projects that entail large-scale involuntary resettlement, RAPs must be prepared and made available to the public. (JICA GL)	<ul style="list-style-type: none"> <li>- The compensation plan of O Mon 3, O Mon 4 and related facilities was sequentially approved by Can Tho City People's Committee (approval was segmented to 19 times: 4 times for O Mon 3 from 4 April to 14 August, 2006).</li> <li>- Resettlement Due Diligence Report has been prepared in 2008 and 2011. CAP was prepared as well in 2011. The documents are available on ADB website. The CAP will be disclosed to the public at People's Committee of O Mon District when EPC contractor for O Mon 4 is determined (The timing is expected to be July 2013) (Fact Finding Mission).</li> </ul>	None	Land acquisition process was initially carried out following the Vietnamese regulation and the survey for a preparation of the list of households to be relocated and the compensation plan have been developed in this context. Later, ADB has carried out socio-economical survey and Retrofit Resettlement Plan (2007) as a part of PPTA (Project Preparation Technical Assistance) that encourages modification of

No.	JICA Guidelines	Compensation implemented in O Mon Project	Gap with JICA Guideline	Judgments
				entitlement for receiving compensation. The comparison of the compensation policy with OP4.12 Annex A of WB safeguard policy is shown in Table 5.6-16. The survey of the households to be compensated was conducted prior to resettlement. Socio-economical survey was conducted in the process of land acquisition. The gap is being filled although it may take some time.
7.	In preparing a RAP, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	<ul style="list-style-type: none"> <li>- Public consultation meeting was held on 23 and 26 December, 2005 to explain the extension plan of O Mon Power Complex. The basis for calling these meetings was the Decision No 4066/QD-UBND dated 8 Dec 2005 by the People's Committee of Can Tho City and notified through the press and Phuoc Thoi ward and Thoi An ward People's Committee. The meetings were primarily focused on resettlement and compensation issues (O Mon 4 EIA 7.B, p.145, RRP Table 13, p.30, RRP 6.1, p.39).</li> <li>- A Compensation and Land Clearance Council (DCC) of O Mon district was established to take the formal responsibility for resettlement and compensation, consisting of 1 chairman, 2 deputy chairmen, 1 permanent commissioner, 11 commissioners and 3 persons invited to represent the Fatherland Front Committee, the Women's Organization and the Farmers' organization (PPTA-4845 SIA 5.1.2, p.24).</li> </ul>	None	As land acquisition process was initially carried out following the Vietnamese regulation, the compensation plan was developed. Public meeting was held prior to the land acquisition and the cut-off date was set. The public hearing has been held several times to collect local people's opinion and concern, and we believe that the scope of compensation is well understood by them. A Compensation and Land Clearance Council (DCC) of O Mon district consists of 1 chairman, 2 deputy chairmen, 1 permanent commissioner, 11 commissioners and 3 persons invited to represent the Fatherland Front Committee, the Women's Organization and the Farmers' organization, and the opinion of the local people as well as the local government is reflected.
8.	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	<ul style="list-style-type: none"> <li>- Public consultation meeting was held on 23 and 26 December, 2005 to explain the extension plan of O Mon Power Complex. The basis for calling these meetings was the decision No 4066/QD-UBND dated 8 Dec 2005 by the People's Committee of Can Tho City. It was notified through the press and Phuoc Thoi ward and Thoi An ward People's Committee. The meetings were primarily focused on resettlement and compensation issues (O Mon 4 EIA 7.B, p.145, RRP Table 13, p.30, RRP 6.1, p.39).</li> <li>- When holding the public meeting, the project owner submits the project summary to the local People's Committee, and the People's Committee notifies the meeting on the public notice board for the local people to view freely. The local people may express their opinion and concern to the project owner through the People's Committee (2nd field survey).</li> </ul>	None	The opening of the first public meeting was notified through the press. In Vietnam, when holding the public meeting, the project owner submits the project summary to the local People's Committee, and the People's Committee notifies the meeting on the public notice board for the local people to view freely. The local people may express their opinion and concern to the project owner through the People's Committee. In this manner, the opening of public meeting is appropriately notified to the local people.
9.	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of RAPs. (JICA GL)	A Compensation and Land Clearance Council (DCC) was established to take the formal responsibility for resettlement and compensation, consisting of 1 chairman, 2 deputy chairmen, 1 permanent commissioner, 11 commissioners and 3 persons invited to represent the Fatherland Front Committee, the Women's Organization and the Farmers' organization (PPTA-4845 SIA 5.1.2, p.24).	None	A Compensation and Land Clearance Council (DCC) of O Mon district consists of 1 chairman, 2 deputy chairmen, 1 permanent commissioner, 11 commissioners and 3 persons invited to represent the Fatherland Front Committee, the Women's Organization and the Farmers' organization, and the opinion of the local people as well as the local government is reflected.
10.	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	<ul style="list-style-type: none"> <li>- A grievance redress mechanism (GRM) has been established as a local administrative system (O Mon 4 EIA 8.B, p.149-150).</li> <li>- A sign board will be erected at the Project site that summarizes the GRM and provide contact details (address, phone number, fax, and email address) for the CTTT grievance focal point, the O Mon District People's Committee, the Can Tho People's Committee, and the Can Tho People's Court of Justice. CTTT will instruct the EPC contractor as to the GRM such that they can inform any person who might approach them directly as to the appropriate steps to file a grievance (O Mon 4 EIA Chap.8, C, p.150).</li> <li>- The project owner also handles complaints at the Company Office having a lawyer, with assistance of Labor Department in supporting role (2nd field survey).</li> <li>- 400 complaints have been expressed until 2000, many of which relate to compensation of houses (RDDR, p.22).</li> </ul>	None	A grievance redress mechanism (GRM) has been established as a local administrative system. The project owner also establishes a department to handle complaints and a sign board will be installed in the project site. 400 complaints have been expressed until 2000, and we believe that an appropriate and accessible GRM is established.
11.	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advantage of such benefits. (WB OP4.12 Para.6)	<ul style="list-style-type: none"> <li>- The evaluation teams of the District Compensation Committee set about assessing and evaluating the plot of land, houses and constructions, crops and trees from March 2006, prior to land acquisition (PPTA-4845 SIA 5.1.2, p.24).</li> <li>- In June 2007, during the process of land acquisition, socio-economical survey was conducted by Vattenfall Power Consultant (VPC, consultant company for ADB) for 105 households (RRP 3.3, p.21).</li> <li>- The current resettlement due diligence study was conducted in 2010. The interview included questionnaire on current income, livelihood, assets other than house, housing area, water supply and sewage system, sanitation, and change in fuel in comparison with 2005. The survey sample represented 24% of the DP population. A total of 145 DP households were interviewed (RDDR, p.24-30).</li> </ul>	Socio-economical survey of the households to be compensated has not been conducted before land acquisition.	Land acquisition process was initially carried out following the Vietnamese regulation and the survey of compensation target was conducted, whereas socio-economical survey was not conducted. ADB has carried out socio-economical survey as a part of PPTA (Project Preparation Technical Assistance). Also, the household survey before and after compensation was carried out at the end of land acquisition and the status of the compensated inhabitants is appropriately understood.
12.	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB	<ul style="list-style-type: none"> <li>- The compensation is implemented under the principle and conditions following the Decree No.197/ 2004/ ND-CP and Decision No.53/ 2005/ QD-UB of Can Tho City People's Committee (RDDR, p.15).</li> <li>- According to the amended Land Law in 1993, people who settled before Oct 15, 1993, have received compensation for the land as well as for the house. Households who have settled on river bank before 15 October 1993 without land use right certificate (LURC) are considered as illegal and not eligible for compensation for both land and house (RRP 4.2, p.31). In this manner, the initial condition for compensation of households without LRCU was whether household had settled before or after 15 October, 1993. As per Official letter No.02/2008/VPUB-QH issued by PC Can Tho, a decision for providing cash</li> </ul>	None	The building owners regarded as illegal in Vietnamese law, as well as land users, are allowed for compensation or resettlement support. All the affected people will be provided with compensation or any other form of living support, such as brick kiln employees who are not to be compensated according to the regulation but will be employed in either construction site or the power plant.

No.	JICA Guidelines	Compensation implemented in O Mon Project	Gap with JICA Guideline	Judgments
	OP4.12 Para.15)	assistance to settlers on state land who had settled before 1 July 2004 with out LRCU (65 MVND in cash or plot of land in the resettlement areas) was taken ( <a href="#">Fact Finding Mission</a> ). Additionally, people who had settled illegally on river bank were not eligible for compensation ( <a href="#">RRP Table 25, p.44-46</a> ), but finally those people became eligible for compensation for their lands and structures ( <a href="#">Fact Finding Mission</a> ). - Brick kiln employees who are not to be compensated according to the regulation will be preferentially employed in either construction site or the power plant ( <a href="#">RDDR, p.49</a> ).		
13.	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	In Vietnam, compensation payment includes the options of “land to land”, “partly land and partly cash”, “cash only”, “cash and job training”, and the people to be compensated have the choice. They will have consultation with the district level People’s Committee as many times as necessary to come to agreement on compensation condition. Land price on which compensation payment is calculated will be determined by state level People’s Committee (PC Can Tho) ( <a href="#">1st field survey</a> ).	None	Most of the 226 relocating households selected cash payment, and only 9 households selected resettlement. Accordingly, compensation in this project is mainly paid in money at the request of affected households.
14.	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	- The survey result suggests that the standard of living and income of the relocated households has improved. Livelihood support measures are also prepared ( <a href="#">RDDR, p.21</a> ). - The households losing farm land will be provided with a vocational training course or support in cash, at a level of 1 MVND/person ( <a href="#">RDDR, p.21</a> ). - Resettled households are entitled to receive moving allowance, transitional support, job training ( <a href="#">RDDR, p.15-16</a> ).	None	Resettled households are entitled to receive job training in addition to cash payment, and we believe that the support was appropriately implemented.
15.	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	- The total number of poor or unemployed vulnerable households in O Mon Power Complex was 17 in 2010, which decreased from 64 households at the time of survey in 2005. However, the resettlement committee did identify 24 households who are still vulnerable. The 17 or 24 vulnerable households were provided with special support of 15 MVND per household ( <a href="#">RDDR p.30</a> ). - If within 3 months of disclosure of the CAP addition vulnerable DPs are identified and requested by the relevant local People’s Committees and referred to the CTPP by the O Mon District People’s Committee then additional assistance will be provided as needed ( <a href="#">RDDR, p.22</a> ). - Most of the compensated people belong to Kinh group, but some belong to Cham or Khmer troops. As their lifestyle and livelihood are similar to Kinh group, they are not considered as minority groups ( <a href="#">1st field survey</a> ).	None	Socially vulnerable people in the area consist of poor households, and they are provided with special allowance. In addition, if within 3 months of disclosure of the CAP addition vulnerable DPs are identified, additional assistance will be provided as needed. In this manner, consideration for vulnerable people has been appropriately carried out.
16.	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25)	N/A	None	N/A

**Table 5.6-16 Comparison of Compensation of the Project with WB OP 4.12 Annex A**

Requirement specified in OP 4.12 Annex A	Implemented compensation	Gap
Project summary	The project owner submits the project summary to the local People's Committee, and the People's Committee notifies the meeting on the public notice board for the local people to view freely. The local people may express their opinion and concern to the project owner through the People's Committee ( <a href="#">2nd field survey</a> ).	None
Potential impact of resettlement	The site for O Mon Power Complex was selected for the reason that, in addition to topographical reason, not being located close to any sensitive environmental receptors (communities, hospitals, schools, etc), no physical cultural resources exist on site, relatively small number of resettled people and socioeconomic impacts. The project site is selected to minimize the number of resettled inhabitants ( <a href="#">O Mon 4 EIA 5.G p.100-101</a> ).	None
The aim of developing RAP	The aim is included in the project summary.	None
Socio-economical survey	<ul style="list-style-type: none"> <li>- The evaluation teams of the District Compensation Committee set about assessing and evaluating the plot of land, houses and constructions, crops and trees from March 2006, prior to land acquisition (<a href="#">PPTA0 4845 SIA 5.1.2, p.24</a>).</li> <li>- In June 2007, during the process of land acquisition, socio-economical survey was conducted by Vattenfall Power Consultant (VPC, consultant company for ADB) for 105 households (<a href="#">RRP 3.3, p.21</a>).</li> </ul>	The comparison of the compensation policy with OP4.12 Annex A of WB safeguard policy is shown in Table 5.6-8. The survey of the households to be compensated was conducted prior to resettlement. Socio-economical survey was conducted in the process of land acquisition. The gap is being filled although it may take some time.
Legal framework	<ul style="list-style-type: none"> <li>- The basic policy of land acquisition is stipulated by Decree No.147/ 2004/ ND-CP.</li> <li>- Price for land compensation was based on Decision No.104/ 2005/ QD-UBND, house and crop compensation was based on Decision No.53/ 2005/ QD-UB of the Can Tho City People's Committee (<a href="#">RDDR, p.16</a>).</li> <li>- A grievance redress mechanism (GRM) has been established as a local administrative system (<a href="#">O Mon 4 EIA 8.B, p.149-150</a>).</li> </ul>	None
Implementation framework	See Table 5.6-4.	None
Requirement of eligibility (compensation)	<ul style="list-style-type: none"> <li>- The requirement of eligibility (compensation) is described in Article 5.6.2(2).</li> <li>- Brick kiln employees who are not to be compensated according to the regulation will be preferentially employed in either construction site or the power plant (<a href="#">RDDR, p.49</a>).</li> </ul>	None
Compensation calculation	<ul style="list-style-type: none"> <li>- Price for land compensation was based on Decision No.104/ 2005/ QD-UBND, house and crop compensation was based on Decision No.53/ 2005/ QD-UB, of the Can Tho City People's Committee (<a href="#">RDDR, p.16</a>).</li> <li>- In Vietnam, compensation payment includes the options of "land to land", "partly land and partly cash", "cash only", "cash and job training", and the people to be compensated have the choice. They will have consultation with the district level People's Committee as many times as necessary to come to agreement on compensation condition. Land price on which compensation payment is calculated will be determined by state level People's Committee (PC Can Tho) (<a href="#">1st field survey</a>).</li> <li>- The land price survey was also conducted by ADB around O Mon District, and it became clear that it is possible with the compensation payment to purchase an equal grade of land with equal or even larger area than the former land. Consequently, it is determined that the compensation payment satisfies the "replacement cost" (<a href="#">2nd field survey</a>).</li> <li>- The households losing farm land will be provided with a vocational training course or support in cash, at a level of 1 MVND/person (<a href="#">RDDR, p.21</a>).</li> </ul>	None
Compensation of lost property, compensation basis, livelihood rehabilitation	<ul style="list-style-type: none"> <li>- Price for land compensation was based on Decision No.104/ 2005/ QD-UBND, house and crop compensation was based on Decision No.53/ 2005/ QD-UB of the Can Tho City People's Committee (<a href="#">RDDR, p.16</a>).</li> <li>- The land price survey was also conducted by ADB around O Mon District, and it became clear that it is possible with the compensation payment to purchase an equal</li> </ul>	None



Requirement specified in OP 4.12 Annex A	Implemented compensation	Gap
	<p>grade of land with equal or even larger area than the former land. Consequently, it is determined that the compensation payment satisfies the “replacement cost” (2nd field survey).</p> <ul style="list-style-type: none"> <li>- Resettled households are entitled to receive (RDDR, p.15-16): <ul style="list-style-type: none"> <li>* Transportation allowance</li> </ul> </li> </ul> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Permanently relocated within a province or city:</p> <ul style="list-style-type: none"> <li>* Multi-stories, concrete houses: 3 MVND/household</li> <li>* Brick houses: 2 MVND/household</li> <li>* Others: 1 MVND/household</li> </ul> <p>Permanently relocated to another province or city</p> <ul style="list-style-type: none"> <li>* Multi-stories, concrete houses: 5 MVND/household</li> <li>* Brick houses: 4 MVND/household</li> <li>* Others: 3 MVND/household</li> </ul> </div> <ul style="list-style-type: none"> <li>* Temporary relocation allowance</li> <li>* Supports for subsistence and production stabilization</li> <li>* Supports for job change and job creation</li> <li>* Allowance for timely moving(5% of the total compensation, up to 5 MVND)</li> </ul> <ul style="list-style-type: none"> <li>- Brick kiln employees who are not to be compensated according to the regulation will be preferentially employed in either construction site or the power plant (RDDR, p.49).</li> <li>- When households or individuals directly engaged in agricultural production have over 30% of their assigned agricultural land areas expropriated, they shall receive life stabilization supports for 3 months if they must not be relocated and for 6 months if they must be relocated; where they must be relocated to places with difficult socio-economic conditions, they shall receive supports for 12 months at most (RRP 12.1, p.59-61).</li> </ul>	
<p>Selection and development of resettlement land, and transfer of land use right</p>	<p>O Mon district authority has acquired 100 sections of land in Phuoc Thoi ward in 2009, of which 30 sections has been obtained by the implementing organization as a resettlement land for O Mon Power Complex. The organization bought the land use right certificate for 5 relocating households from the local People’s Committee and handed it to them to allow them for building house and relocation at their convenience (1st field survey).</p>	<p>None</p>
<p>Housing and social infrastructure in the resettlement area</p>	<ul style="list-style-type: none"> <li>- The resettlement land is still farm land and the land owner is also subject to compensation of O Mon Project. The resettlement land is located 500m from school and 3km from a hospital (1st field survey).</li> <li>- People relocated to resettlement area make contract with electricity company to purchase electricity, and the transmission system is installed by the electricity company based on Electricity Law. As for water supply, the main water pipe will be installed by the water supply company (2nd field survey).</li> </ul>	<p>None</p>
<p>Environmental conservation and management of the resettlement area</p>	<p>O Mon district authority has acquired 100 sections of land in Phuoc Thoi ward in 2009, of which 30 sections has been obtained by the implementing organization as a resettlement land for O Mon Power Complex. The resettlement land is currently a flat farm land and natural forest, primary forest, or ecologically valuable habitat are not included (In Checklist Appended Figure-5, Photos) (1st field survey).</p>	<p>None</p>
<p>Resident participation</p>	<p>A Compensation and Land Clearance Council (DCC) of O Mon district was established to take the formal responsibility for resettlement and compensation, consisting of 1 chairman, 2 deputy chairmen, 1 permanent commissioner, 11 commissioners and 3 persons invited to represent the Fatherland Front Committee, the Women’s Organization and the Farmers’ organization (PPTA 4845 SIA 5.1.2, p.24).</p>	<p>None</p>
<p>Integration of the resettled people and the existing inhabitants of the resettlement area</p>	<ul style="list-style-type: none"> <li>- O Mon district authority has acquired 100 sections of land in Phuoc Thoi ward in 2009, of which 30 sections has been obtained by the implementing organization as a resettlement land for O Mon Power Complex (1st field survey).</li> <li>- The land owner is also subject to compensation of O Mon Project (1st field survey).</li> </ul>	<p>None</p>
<p>Grievance redress mechanism</p>	<ul style="list-style-type: none"> <li>- A grievance redress mechanism (GRM) has been established as a local administrative system (O Mon 4 EIA 8.B, p.149-150).</li> <li>- A sign board will be erected at the Project site that summarizes the GRM and provide contact details (address, phone number, fax, and email address) for the CTTP grievance focal point, the O Mon District People’s Committee, the Can Tho People’s Committee, and the Can Tho People’s Court of Justice. CTTP will instruct the EPC contractor as to the GRM such that they can inform any person who might approach them directly as to the appropriate steps to file a grievance (O Mon 4 EIA chp.8, C, p.150).</li> </ul>	<p>None</p>

Requirement specified in OP 4.12 Annex A	Implemented compensation	Gap
	<ul style="list-style-type: none"> <li>- The project owner also handles complaints at the Company Office having a lawyer, with assistance of Labor Department in supporting role (2nd field survey).</li> <li>- About 400 complaints have been expressed until 2000, many of which relate to compensation of houses (RDDR, p.22).</li> </ul>	
Responsibility of the project owner	See Table 5.6-8.	None
Implementation schedule	See Table 5.6-1.	None
Budget and financial resource	All the compensation cost was paid by EVN (see Table 5.7-4).	None
Monitoring and assessment	<ul style="list-style-type: none"> <li>- The measures required under the Corrective Action Plan are to be monitored and reported on by the Project Implementation Consultant and be included within their regular reporting to ADB (RDDR, p.45).</li> <li>- The issue about the submission of the Report of Grievance and the monitoring result of life and livelihood of relocated household was consulted to ADB, and ADB required to consult CTPP, the project owner (2nd field survey).</li> <li>- The current resettlement due diligence study was conducted in 2010. The interview included questionnaire on current income, livelihood, assets other than house, housing area, water supply and sewage system, sanitation, and change in fuel in comparison with 2005. The survey sample represented 24% of the DP population. A total of 145 DP households were interviewed (RDDR, p.24-30).</li> <li>- According to the household survey there has been a significant overall improvement in livelihood stability and incomes of the affected households. Livelihood support measures are also prepared (RDDR, p.21).</li> </ul>	None

## 5.7 ASSOCIATED FACILITIES

### 5.7.1 Consideration of Associated Facilities

The indivisibility of the associated facilities related to O Mon Power Complex was reviewed (Table 5.7-1). The facilities include the power plants in O Mon Complex excluding O Mon 3, the substation (500 kV), the switch yard, access roads, discharge channels, transmission line, gas pipeline, administration building, cooling water intake system, power for construction, and DFO unloading jetty.

**Table 5.7-1 Consideration of Associated Facilities**

No.	Facility	Result	Reason
1	O Mon Power Plant 1 & 2	Not associated facility	O Mon 1-A is already in operation in O Mon Power Complex. O Mon 1-B is scheduled for construction and O Mon 2 is still in a planning stage. These will be constructed regardless of O Mon 3.
2	O Mon Power Plant 4	Not associated facility	O Mon 4 will also be constructed regardless of O Mon 3. The acquisition of the construction site was processed at the same time as O Mon 3 as part of O Mon Power Complex.
3	O Mon Stage 5	Not associated facility	Construction of O Mon 5 is not yet determined, and has no relation with O Mon 3 plan. The acquisition of the construction site was processed at the same time as O Mon 3 as part of O Mon Power Complex.
4	Substation (500kV)	Not associated facility	It is already in operation and connected to O Mon 1-A. Not only O Mon 3 but other power plants will also be connected. The acquisition of the construction site was processed at the same time as O Mon 3 as part of O Mon Power Complex.
5	Switchyard	Not associated facility	It is already in operation and connected to O Mon 1-A. Not only O Mon 3 but other power plants will also be connected. The acquisition of the construction site was processed at the same time as O Mon 3 as part of O Mon Power Complex.
6	Access Road No.1	Not associated facility	It has been constructed for O Mon 1 and O Mon 2 which are not associated with O Mon 3, and is already in use.
7	Access Road No.2	Not associated facility	It will be used for O Mon 4 as well as O Mon 3, and the substation which are not associated with O Mon 3. The acquisition of the construction site will be processed at the same time as O Mon 3 as part of O Mon Power Complex.
8	Discharge channel No.1	Not indivisible	It was constructed for O Mon 1 and O Mon 2 which are not associated with O Mon 3, and is already in use.
9	Discharge channel No.2	Not associated facility	It is constructed for common use of O Mon 3 and O Mon 4 which is not associated with O Mon 3. The acquisition of the construction site will be processed at the same time as O Mon 3 as part of O Mon Power Complex.
10	500KV Transmission Line	Not associated facility	It is connected to the switchyard, the substation, and transmission line which are not associated with O Mon 3. Construction plan depends on the electricity demand and not on O Mon 3.
11	Gas pipeline	Not associated facility	It supplies gas to O Mon Thermal Power Complex, which includes Mon 1, O Mon 2, and O Mon 4 which are not associated with O Mon 3.
12	Gas Distribution Complex	Not associated facility	Same as above.
13	Administration building	Not associated facility	It will be used for not only O Mon 3 but O Mon 4.
14	CW Intake & CW Pump Station	Not associated facility	It will be used for not only O Mon 3 but O Mon 4.
15	Power for Construction	Not associated facility	Electricity will be supplied from O Mon 1 which is associated with O Mon 3. Installation of a new power supply facility is not planned.
16	DFO Unloading Jetty	Not associated facility	A jetty constructed for O Mon 1 which is not associated with O Mon 3 will be used.

### 5.7.2 Result of Confirmation of Socio-Economical Consideration of the Common Facilities

Through the above discussion, there is no facility in O Mon power plant 1, 2 and 4 which are considered as associated facilities of O Mon 3 power plant. The status of EIA for the common facilities of O Mon Power Complex is as shown in Table 5.7-2.

**Table 5.7-2 Status of the EIA for the Common Facilities of O Mon Power Complex**

No.	Facility	Status of the EIA
1	O Mon Power Plant 1 & 2	The EIA report for O Mon 1 Power Plant has been completed in August 1988 and approved by MOSTE in October 1988. In terms of O Mon 2 Power Plant, EIA has not been conducted since the project is still being making a plan.
2	O Mon Power Plant 4	The Feasibility Study for O Mon 4 Power Plant has been conducted in 2007. Based on this study, EIA has been conducted by ADB scheme. The EIA report has been completed in January, 2011.
3	O Mon Stage 5	The plan for O Mon 5 Power Plant has not yet been made.
4	Substation (500kV)	The EIA for the substation of O Mon 1 Power Plant was not needed according to the law of Vietnam for the construction of O Mon Power Plant 1 time. However, it seemed that the EIA has been implemented because it was the loan requirements of the international financial institutions.
5	Switchyard	Switchyard was handled in the EIA for O Mon 1 Power Plant.
6	Access Road No.1	Unknown
7	Access Road No.2	Access Road No.2 was handled in the EIA for O Mon 3 Power Plant.
8	Discharge channel No.1	Discharge channel No.1 was handled in the EIA for O Mon Power Plant 1.
9	Discharge channel No.2	Discharge channel No.2 was handled in the EIA for O Mon Power Plant 3.
10	500KV Transmission Line	Unknown. According to the law of Vietnam, construction of more than 50km transmission line is required the EIA approval.
11	Gas pipeline	The EIA for gas pipeline has not been yet conducted since the route has not yet decided.
12	Gas Distribution Complex	The EIA for Gas Distribution Complex has been approved in 2009, leveling activity has been already done.
13	Administration building	Administration building was handled in the EIA for O Mon 3 Power Plant.
14	CW Intake & CW Pump Station	CW Intake & CW Pump Station was handled in the EIA for O Mon 3 Power Plant.
15	Power for Construction	Electricity for construction use will be provided from O Mon 1 Power Plant. There is no plan for setting new power supply.
16	DFO Unloading Jetty	The EIA for DFO Unloading Jetty of O Mon 1 Power Plant has been conducted separately from the EIA for O Mon 1 Power Plant itself.



## 5.8 STAKEHOLDER MEETINGS

After the construction approval was issued by the Ministry of Industry, public consultation meetings were held a number of times for the inhabitants living around the O Mon Power Complex.

**Table 5.8-1 Public Meeting and Consultation related to O Mon Thermal Power Complex**

No.	Date	Venue	Type	No. of participant
(i)	23/ July/ 2005	Thoi An Ward People's Committed office	Public participation meeting	AM:43, PM:28
(ii)	23/ December/ 2005, 26/ December/ 2005	Phuoc Thoi Ward	Public participation meeting	Many
(iii)	21/ July/ 2007	Thoi An Ward	Public participation meeting	130
(iv)	22/ July/ 2007	Phuoc Thoi Ward	Public participation meeting	232
(v)	14/ September/2007	Can Tho City	Workshop	40
(vi)	April/ 2008	-	Information disclosure through official document and opinion hearing	All the inhabitants of the affected area
(vii)	April/ 2008	Project site area	Personal interview	10 households of potential serious impact

The basis for calling (ii) was the decision No 4066/QD-UBND dated 8 December 2005 by the People's Committee of Can Tho City and notification was made through the press and Phuoc Thoi ward and Thoi An ward People's Committee. The meetings were primarily focused on resettlement and compensation issues ([O Mon 4 EIA 7.B, p.145](#)).

(iii) - (v) were held based on PPTA (Project Preparation Technical Assistance) by ADB ([O Mon 4 EIA 7, D, p.148](#)).

### 5.8.1 Implementation Process

In Vietnam, when holding the public meeting, the project owner submits the project summary to the local People's Committee, and the People's Committee notifies the meeting on the public notice board for the local people to view freely. The local people may express their opinion and concern to the project owner through the People's Committee ([2nd field survey](#)). The public meeting is held in Vietnamese language, as well as the records of the meeting ([O Mon 3 EIA Appendix13-A, 2nd field survey](#)).

### 5.8.2 Implementation Result

#### (1) Public Participation Meeting held in 23 July 2005 prior to EIA Preparation .....(i)

The Thermal Power Project Management Unit No 3 (TPPMU3) of EVN and their consultants undertook public consultations in relation to the O Mon IV Project in July 2005. Participants included persons to be displaced by the expansion of the complex, ward and district People's Committees, and women, farmer, youth and veterans organizations ([O Mon 4 EIA Appendix 13-A p.257](#)).

Comments received in the meeting and its responses from the project owner are as follows.

Comments from Residents	Response from the Project Owner
The resettlement area for the affected people will be located in what place.	O Mon district authority has acquired 100 sections of land in Phuoc Thoi ward in 2009, of which 30 sections has been obtained by the project owner as a resettlement land for O Mon Power Complex (1st field survey).
During the construction period, it is expected by the people to construct the access road for their transportation, the speaker hoped construction of a new road which the local people could use.	Access road No.2 is being newly constructed (1st field survey).
The displace allowance of VND 8,000,000 proposed by the compensation committee is rather low and the speaker hoped to receive a higher rate.	If a household is required to relocate due to the project, and has the legal rights and titles to land and property, they will be compensated for that property, and they will be eligible to move to a resettlement area. If the household selects not to go to the resettlement area, a monetary payment of 65 MVND will be paid (RRP 12.1, p.59-61).
A speaker requested to be granted with land in the case that some households could not buy land lot in the resettlement area.	In Vietnam, compensation payment includes the options of “land to land”, “partly land and partly cash”, “cash only”, “cash and job training”, and the people to be compensated have the choice. They will have consultation with the district level People’s Committee as many times as necessary to come to agreement on compensation condition. Land price on which compensation payment is calculated will be determined by state level People’ s Committee (PC of Can Tho City) (1st field survey).  The land price survey was also conducted by ADB around O Mon District, and it became clear that it is possible with the compensation payment to purchase an equal grade of land with equal or even larger area than the former land. Consequently, it is determined that the compensation payment satisfies the “replacement cost” (2nd field survey).
A speaker requested for reasonable rate of compensation.	According to Decree No.147/ 2004/ ND-CP stipulating the basic policy of land acquisition, the compensation includes land, structure, temporarily- affected property, trees and crops.
A speaker requested for compensation in case of trees, crops.	According to Decree No.147/ 2004/ ND-CP stipulating the basic policy of land acquisition, the compensation includes land, structure, temporarily- affected property, trees and crops.

**(2) Public Participation Meetings held in April 2008 after EIA Preparation ..... (vi and vii)**

According to the provision of the Circular No.08/ 2000/ BTNMT08 by MONRE, the project owner of O Mon 3 thermal power plant had issued Official Letter No.1282/ CV-NDCT-AOM on 18 April 2008 to People’s Committee and Fatherland Front Committees of Phuoc Thoi Ward and Thoi An Ward. The Official Letter No.1282 was attached the EIA summary describing the environmental impact survey result and environmental management plan ([O Mon 3 EIA 8, p.181](#)).

Official letter No.14/ UBND-NC on 09 May 2008 issued by People’s Committee and Fatherland Front Committees of Phuoc Thoi Ward, official letter No.16/ CV-UBND on 22 May 2008 by People’s Committee and Fatherland Front Committees of Thoi An Ward, Official Letter No.03/ CV-MT.VT of 12 May 2008 by Fatherland Front Committee of Thoi An Ward, sent in reply to

the Official Letter No.1282 (O Mon 3 EIA 8, p.181), require the implementation of the following measures (O Mon 3 EIA 8, p.182).

- a To manage labor effectively to preserve security and social order as well as spiritual life of the inhabitants.
- b The project owner has to implement adequately all measures of environmental protection, noise and vibration generated during construction and operation of the project, to ensure water drainage and avoid obstacles to production and daily activities of inhabitants.
- c If it is allowable, the project should provide work opportunities and make use of local labor force.
- d The project owner shall responsible for compensating and settling satisfactorily in accordance with the laws of Social Republic of Vietnam in case of environment pollution during project implementation.

In response to the requirement of the People's Committee and Fatherland Front Committee, the project owner (EVN) submitted the following answer in the EIA (O Mon 3 EIA 8.4, p.182-183).

- To commit to implement perfectly all measures of environmental protection, waste treatment from the project. At the same time, technical methods and management should be executed to prevent and minimize negative effects on natural and socio-economic environments of the local area as forecasted in this EIA Report.
- To commit to comply with all provisions on environmental protection as regulated in the law on environmental protection passed by National Assembly, Session XI, 8th meeting on 29 November 2005 and declared on 12 December 2005 according to Order No.29/ 2005/ L/ CTN by President.
- To commit to comply with all Vietnam standards on environment issued together with Decision No.22/ 2006/ QD-BTNMT on 18 December 2006 by MONRE on compulsory to apply Vietnam standards.
- To commit to take full responsibility before the Laws of the Socialist Republic of Vietnam for occurrence of environmental pollution affecting to the health of local inhabitants in the course of project implementation.

In the personal interview of the inhabitants in April 2008(vii), there were questions concerning compensation and re-employment, and no complaints regarding environmental issue or living environment were posed (2nd field survey).

### **5.8.3 Result of Consideration on the Gap with JICA Guideline and the Implementation of the Stakeholders' Meeting in Future**

JICA Guideline stipulates that the stakeholders' meeting should be held at the stage of: (1) completion of the draft scoping document preparation, and (2) completion of the draft report. At the stage of completion of the draft scoping document (1), the meeting shall discuss the understanding of the needs of the local people and other stakeholders concerning the project, and the alternative plan. At the stage of completion of the draft report reflecting the result of socio-environmental consideration survey, the meeting should discuss the survey result and reflect it to the final report.

In this project, the EIA has been completed by the project owner, and the public consultation was held prior to the preparation of the EIA (i) and after the preparation of the draft EIA (vi and vii).

The time and frequency of public meeting satisfy the JICA Guideline.

The main concern of the affected people before preparation of the EIA is compensation for land acquisition. There were questions concerning compensation and employment in the personal interview of the inhabitants carried out for EIA explanation, and no complaints regarding environmental issue or living environment were posed. Requests concerning environmental issues were proposed from ward-level People's Committee and Fatherland Front Committee, and they are appropriately addressed in the EIA. In addition, public consultation is frequently held and the project implementation agency understands well the local people's opinion. Consequently, it is determined that there is no gap between the implementation of public consultation concerning this project and JICA Guideline.

Once the model of gas turbine is fixed, the project owner will submit the official documents to MONRE. After the submission, the project owner will follow the MONRE's instructions. The project owner recognizes that they have to organize stakeholders' meetings, if required by MONRE.

## **5.9 OTHERS**

### **5.9.1 Environmental Checklist**

Table 5.9-1 shows the result of environmental and social consideration reviewed according to the checklist attached to JICA Guideline.

Table 5.9-1 Result of Environment Social Consideration

Main Check Items	Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)
<b>(1) EIA and Environmental Permits</b>	
(a) Have EIA reports been officially completed?	<p><b>Review: The EIA report was completed.</b></p> <ul style="list-style-type: none"> <li>- The EIA report was prepared on January, 2009 by PECC2. This report was edited according to the comments of the assessment Council of MONRE on 17th November, 2008 (<a href="#">EIA Report Cover</a>).</li> </ul>
(b) Have EIA reports been approved by authorities of the host country's government?	<p><b>Review: The EIA report and other related documents have been approved by the Vietnamese government. MONRE has an understanding that the project has already started operation and that a new EIA is not necessary. In case the generation capacity of O Mon 3 is to be increased, the project owner should, as soon as the new output is determined, notify MONRE of the modification by official document and ask whether an additional EIA is required. If an additional EIA is needed, the modified part of the project should not be constructed/operated until the additional EIA is approved, according the relevant regulation in Vietnam (Decree No.29/2011 and Circular No.26/2011).</b></p> <ul style="list-style-type: none"> <li>- The EIA report was approved by MONRE on 31th July, 2009 (<a href="#">Decision No.1492/ QD-BTNMT</a>).</li> <li>- According to the Decree No.29/ 2011/ND-CP issued on 5th June, 2011, Article 12.3.b, if the project is not undertaken within 36 months after the EIA approval, a new EIA should be prepared. However, MONRE does not have any specific definition for determining the start of the project. MONRE recognizes the start of the project when any construction activity is started. (<a href="#">1st Field Survey</a>).</li> <li>- It happened in several power stations that the generating power is increased after EIA approval as a result of engineering design change from F/S. In that case, the official document is revised including the recalculation of gas emission and others and submitted from EVN to MONRE, if no fundamental change in engineering (from gas-fired to coal-fired, for example ) is involved. MONRE reviews the document as to whether the EIA has to be corrected, and sends the official document to EVN in response (<a href="#">1st Field Survey</a>).</li> <li>- If MONRE judged an additional EIA is needed, the modified part of the project should not be operated until the additional EIA is approved, according the relevant regulation in Vietnam (Decree No.29/2011 and Circular No.26/2011) (<a href="#">2nd field survey</a>).</li> <li>- In O Mon Power Complex, heavy oil-fired O Mon 1 A Power Plant is currently in operation. The heavy oil will be replaced by natural gas once gas supply is in operation, which will reduce impact by gas emission. Additionally, the EIA result indicates that the environmental effect of gas emission from gas-fired O Mon 3 is insignificant, and MONRE considers that no significant environmental impact will occur even after a certain degree of increase in power generation (<a href="#">1st Field Survey</a>).</li> <li>- In case NOx exceeds Standards, O Mon 1 will change from oil-firing to gas firing or reduce the operating hours by oil firing (<a href="#">Confirmed by Fact Finding Mission</a>).</li> </ul>
(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?	<p><b>Review: Twelve requirements were determined as a condition for EIA approval, all of which have to be complied with by the project owner</b></p> <ul style="list-style-type: none"> <li>- According to Article 2 in <a href="#">Decision No.1492/ QD-BTNMT dated July 31, 2009</a>, The Project Owner shall be responsible for implementing exactly the contents stated in the EIA report and the following obligatory requirements (<a href="#">Decision No.1492/ QD-BTNMT</a>): <ol style="list-style-type: none"> <li>1. Cooperate with the local authorities to carry out the compensation and resettlement according to the current regulations in order to stabilize life of the affected households in the project area.</li> <li>2. Apply appropriate measures of management and technique during construction phase, in order to limit as much as possible the adverse impacts on aquatic life in the project area; to collect and treat mud, soil and waste of construction activities and other wastes during construction and operation phases in order to meet environmental sanitation requirements.</li> <li>3. Design, construct and operate the exhausted gas treatment system for boiler in order to meet TCVN 7440:20054 with <math>K_p = 0.7</math>, <math>K_v = 1</math>, TCVN 5937:20055 and other related mandatory Vietnamese Standards and Technical Regulations applied to the gas emitted into the environment.</li> <li>4. Design, construct and operate the wastewater collection and treatment system (domestic wastewater, productive wastewater) in order to meet TCVN 5945:20056 in column A with <math>K_f = 1.1</math>, <math>K_f = 1.0</math>.</li> <li>5. Take suitable solutions in cooling water intake and discharging so that there is no adverse impact on aquatic life and the river water source.</li> <li>6. Strictly implement the current regulations on licensing of water resources exploitation, extraction and utilization and waste water discharge to the surrounding water sources.</li> <li>7. Design, construct and operate the receiving systems of gas, oil and other material, which are supplied to O Mon III plant, in accordance with the technical regulations and ensure that these systems are safe and will not cause any pollution on the surrounding area.</li> <li>8. Manage and control waste discharge of ships and carriers at the jetty entrance and exit in order to ensure that water resource shall not be polluted.</li> <li>9. Fully and strictly implement technical procedures of operation of pipeline, valves and equipment system to ensure that there is no leakage of organic substances, dust and flue gas to the environment.</li> <li>10. Strictly comply with regulations on navigation, fire prevention and fighting against fire, immediate rescue, labor safety and other related technical stipulations in the process of the project implementation.</li> <li>11. Install the automatic monitoring system to control the dust, SO<sub>2</sub>, NO<sub>x</sub>, CO<sub>2</sub> compositions before these substances emits out of the stack.</li> <li>12. Comply with Decree No. 149/2004/ND-CP dated July 27, 2004 from the Government on stipulations of granting permits to exploit and use the water resource and discharge the waste water to the river and Circular No.02/2005/TT-BTNMT of June 24, 2005 by MONRE to instruct the implementation of this decree.</li> </ol> </li> </ul>

4 The standards has been changed into QCVN-22/ 2009 ( $K_p=0.7$ ,  $K_v=1$ )

5 The standards has been changed into QCVN-05/ 2009

6 The standards has been changed into QCVN-40/ 2011 (Column A,  $K_q=1.2$ ,  $K_f=0.9$ )

Main Check Items	Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)																								
<p>(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?</p>	<p><b>Review: Environmental approvals other than EIA have not been obtained yet, and when these will be approved is unknown as of 10 May 2012, because the time to apply for these permits is depending on the progress of the project. The future submission and acquirement of the required environmental approvals at an appropriate timing must be confirmed.</b></p> <p>- The table below shows the environmental licenses required in addition to EIA (1st Field Survey).</p> <table border="1"> <thead> <tr> <th>Permit</th> <th>Authority</th> <th>Approval Date/Schedule</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>Environmental License for the Entire Project</td> <td>MONRE or DONRE</td> <td>Before Plant Operation</td> <td></td> </tr> <tr> <td>Environment Approval for Surface Water Exploitation and Water Discharge</td> <td>MONRE</td> <td>Before taking or discharging cooling water</td> <td>According to Article 13 of Decree No.149/2004/ND-CP, the approval for water use of 50,000m<sup>3</sup>/day and more and water discharge of 5,000m<sup>3</sup>/day and more is given by MONRE, and for less quantity of use and discharge is approved by DONRE or PC of Can Tho City.</td> </tr> <tr> <td>Approval for Using Deep Well Water (for construction purpose)</td> <td>MONRE or DONRE</td> <td>Before using the construction water</td> <td>According to Article 13 of Decree No.149/2004/ND-CP, the approval for groundwater use of 3,000m<sup>3</sup>/day or more is given by MONRE, and for less quantity of use is approved by DONRE or PC of Can Tho City.</td> </tr> <tr> <td>Permission for Toxic Chemical/ Gas Application</td> <td>Competent Agency authorized under MOIT</td> <td>Before using of any device.</td> <td></td> </tr> <tr> <td>Final License for Whole Fire Fighting System</td> <td>Fire Police Headquarter (Hanoi)</td> <td>Before starting the Reliability Test</td> <td></td> </tr> </tbody> </table> <p>- Since the time to apply for these permits is depending on the progress of the project, the situation of acquiring these permits is unknown as of 10 May 2012. (1st Field Survey).</p>	Permit	Authority	Approval Date/Schedule	Remarks	Environmental License for the Entire Project	MONRE or DONRE	Before Plant Operation		Environment Approval for Surface Water Exploitation and Water Discharge	MONRE	Before taking or discharging cooling water	According to Article 13 of Decree No.149/2004/ND-CP, the approval for water use of 50,000m <sup>3</sup> /day and more and water discharge of 5,000m <sup>3</sup> /day and more is given by MONRE, and for less quantity of use and discharge is approved by DONRE or PC of Can Tho City.	Approval for Using Deep Well Water (for construction purpose)	MONRE or DONRE	Before using the construction water	According to Article 13 of Decree No.149/2004/ND-CP, the approval for groundwater use of 3,000m <sup>3</sup> /day or more is given by MONRE, and for less quantity of use is approved by DONRE or PC of Can Tho City.	Permission for Toxic Chemical/ Gas Application	Competent Agency authorized under MOIT	Before using of any device.		Final License for Whole Fire Fighting System	Fire Police Headquarter (Hanoi)	Before starting the Reliability Test	
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<p><b>(2) Explanation to the Stakeholder</b></p> <p>(a) Are contents of the project and the potential impacts adequately explained to the stakeholder based on appropriate procedures, including information disclosure? Is understanding obtained from the stakeholder? (1/2)</p>	<p><b>Review: According to the regulation in Vietnam, the public consultation shall be conducted only prior to EIA preparation. In the case of O Mon Power Complex, the public consultation was held before and after the EIA preparation, providing the local people the opportunity to discuss and understand various issues of the project, such as social-environmental impact of the project and the mitigation measures. The public meeting is held in Vietnamese language, and its date and place is notified through the local People's Committee, according to the regulation in Vietnam. In this manner, we believe that understanding of the local people on the matter of the environmental and social impact of the project and the mitigation measures was achieved.</b></p> <p><u>Prior to EIA</u></p> <p>- After the construction approval was issued by MOIT, public consultations were held prior to making the EIA report (EIA Appendix 13 A p.261, 2nd field survey).</p> <table border="1"> <thead> <tr> <th>Date</th> <th>Venue</th> <th>Form</th> <th>Participant</th> </tr> </thead> <tbody> <tr> <td>July/ 2005</td> <td>Office of People's Committee of Thoi An Ward</td> <td>Public Consultation</td> <td>AM: 43 person PM: 28 person</td> </tr> <tr> <td>23/ December/ 2005 26/ December/ 2005</td> <td>PhucThoi Ward</td> <td>Public Consultation</td> <td>Unknown, numerous Unknown, numerous</td> </tr> </tbody> </table> <p>- In Vietnam, when holding the public meeting, the project owner submits the project summary to the local People's Committee, and the People's Committee notifies about the meeting on the public notice board for the local people to view freely. The local people may express their opinions and concerns to the project owner through the People's Committee (2nd field survey).</p> <p>- The public meeting is held in Vietnamese language, and also the records of the meeting are kept in Vietnamese language (EIA Appendix 3-A, 2nd field survey).</p> <p>- The Thermal Power Project Management Unit No 3 (TPPMU3) of EVN and their consultants undertook public consultations in relation to the O Mon Power Complex in July 2005. Participants included persons to be displaced by the expansion of the complex, ward and district People's Committees, women, farmer, youth and veterans organizations (O Mon 4 EIA 7.A, p.147).</p> <p>- Public consultation meeting was held on 23 and 26 December, 2005 to explain the extension plan of O Mon Power Complex. The basis for calling these meetings was the decision No 4066/QD-UBND dated 8 Dec 2005 by the People's Committee of Can Tho City and notified through Phuoc Thoi ward and Thoi An ward People's Committee. The meetings were primarily focused on resettlement and compensation issues (O Mon 4 EIA 7.B, p.145, RRP Table 13, p.30, RRP 6.1, p.39).</p> <p><u>After EIA</u></p> <p>- After making EIA report, public consultations were held (EIA 8, p.181).</p> <table border="1"> <thead> <tr> <th>Data</th> <th>Venue</th> <th>Form</th> <th>Participant</th> </tr> </thead> <tbody> <tr> <td>April/ 2008</td> <td>-</td> <td>Information disclosure through official document and opinion hearing</td> <td>All the inhabitants of the affected area</td> </tr> <tr> <td>April/ 2008</td> <td>Project site area</td> <td>Personal interview</td> <td>10 households of potential serious impact</td> </tr> </tbody> </table>	Date	Venue	Form	Participant	July/ 2005	Office of People's Committee of Thoi An Ward	Public Consultation	AM: 43 person PM: 28 person	23/ December/ 2005 26/ December/ 2005	PhucThoi Ward	Public Consultation	Unknown, numerous Unknown, numerous	Data	Venue	Form	Participant	April/ 2008	-	Information disclosure through official document and opinion hearing	All the inhabitants of the affected area	April/ 2008	Project site area	Personal interview	10 households of potential serious impact
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1 Permits and Explanation



Main Check Items	Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)																
<p>(a) Are contents of the project and the potential impacts adequately explained to the stakeholder based on appropriate procedures, including information disclosure? Is understanding obtained from the stakeholder? (2/2)</p>	<ul style="list-style-type: none"> <li>- According to the provision of the Circular No.08/ 2006/ BTNMT by MONRE, the project owner of O Mon 3 thermal power plant had issued Official Letter No.1282/ CV-NDCT-AOM on 18 April 2008 to People’s Committee and Fatherland Front Committees of Phuoc Thoi Ward and Thoi An Ward. The Official Letter No.1282 had attachment, which is the EIA summary describing the environmental impact survey result and environmental management plan (EIA 8, p.181).</li> <li>- Official letter No.14/ UBND-NC on 09 May 2008 issued by People’s Committee and Fatherland Front Committees of Phuoc Thoi Ward, official letter No.16/ CV-UBND on 22 May 2008 by People’s Committee and Fatherland Front Committees of Thoi An Ward, and Official Letter No.03/ CV-MT.VT of 12 May 2008 by Fatherland Front Committee of Thoi An Ward, which were sent in reply to the Official Letter No.1282 (EIA 8, p.181), have required the implementation of the following measures (EIA 8.3.1, p.182).                         <ul style="list-style-type: none"> <li>(a) To manage labor force effectively to preserve security and social order as well as spiritual life of the inhabitants.</li> <li>(b) The project owner has to implement adequately all measures of environmental protection, noise and vibration generated during construction and operation of the project, to ensure water drainage and avoid obstacles to production and daily activities of inhabitants.</li> <li>(c) If it is allowable, the project should provide work opportunities and make use of local labor force.</li> <li>(d) The project owner shall be responsible for compensating and settling satisfactorily in accordance with the laws of Socialist Republic of Vietnam in case of environment pollution during project implementation.</li> </ul> </li> <li>- At the same time as sending of the Official Letters, PECC2 conducted the interview individually to 10 households of potential serious impact, to explain the environmental impact of the O Mon Power Complex (especially socio-economic field) based on the results of the EIA (2nd field survey).</li> <li>- In the personal interview of the inhabitants in April 2008, there were questions raised concerning compensation and re-employment, but no complaints regarding environmental issue or living environment were raised (2nd field survey).</li> </ul> <p><b>Other</b></p> <ul style="list-style-type: none"> <li>- In addition to the public meetings above, public consultations relating to environment and social influence were held in Thoi An ward and Phuoc Thoi ward on 21 and 22 July 2007, a stakeholder workshop was held at the O Mon Power Complex on 14 September 2007. They were held based on PPTA (Project Preparation Technical Assistance) by ADB (O Mon 4 EIA 7, D, p.148).</li> </ul> <table border="1"> <thead> <tr> <th>Date</th> <th>Venue</th> <th>Form</th> <th>Participant</th> </tr> </thead> <tbody> <tr> <td>21/ July/ 2007</td> <td>Thoi An Ward</td> <td>Public Consultation</td> <td>130 persons</td> </tr> <tr> <td>22/ July/ 2007</td> <td>Phuoc Thoi Ward</td> <td>Public Consultation</td> <td>232 persons</td> </tr> <tr> <td>14/ September/ 2007</td> <td>Can Tho City</td> <td>Workshop</td> <td>40 persons</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- In the meeting on 21th and 22th July, 2007, most of the attendants were representatives of households affected by the Project. The meetings included a presentation on the O Mon Power Complex construction, an address by the DCC regarding the status of the compensation process, and disclosure by the consultant of the social assessment survey. Discussion groups were subsequently formed to discuss these issues in detail (O Mon 4 EIA 7, D, p.147-148).</li> <li>- In the stakeholder workshop on 14th September, 2007, involved 40 representatives from the People’s Committees of Can Tho City, O Mon District, and Thoi An and Phuoc Thoi wards; the Department of Foreign Affairs, Can Tho City; the Department of Planning and Investment, Can Tho City; the Fatherland Front of Can Tho; the Women’s Union of Can Tho; the Farmer’s Union of Can Tho; affected peoples of Thoi An and Phuoc Thoi wards; the Belgian NGO Leader Voor Allen (IVA); and representatives from TPPMU3, PECC2 and PECC3. The interest in environmental issues was stronger in this meeting, and specific environmental and technical issues were raised (Appended Table 1). Nonetheless, resettlement and compensation issues are continued to have a very prominent role in the meeting, and representatives of the DCC explained the process in detail (O Mon 4 EIA 7, D, p.150).</li> </ul>	Date	Venue	Form	Participant	21/ July/ 2007	Thoi An Ward	Public Consultation	130 persons	22/ July/ 2007	Phuoc Thoi Ward	Public Consultation	232 persons	14/ September/ 2007	Can Tho City	Workshop	40 persons
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<p>(b) Are proper responses made to comments from the stakeholder and regulatory authorities? (1/2)</p>	<p><b>Review: The comments of the local people collected at the public consultation before and after the EIA preparation were properly addressed and reflected to the project plan.</b></p> <p><b>Public Consultation prior to EIA</b></p> <ul style="list-style-type: none"> <li>- The Thermal Power Project Management Unit No 3 (TPPMU3) of EVN and their consultants undertook public consultations in relation to the O Mon IV Project in July 2005. Participants included persons to be displaced by the expansion of the complex, ward and district People’s Committees, women, farmer, youth and veterans organizations. Below are the opinions and concerns raised by the participants (O Mon 4 EIA Appendix 13-A p.261-269).                         <ul style="list-style-type: none"> <li>* Where the resettlement area for the affected people will be located at.</li> <li>* During the construction period, it is expected by the people to construct the access road for their transportation, the speaker has requested the project owner to construct a new road which the local people can use.</li> <li>* The displace allowance of VND 8,000,000 proposed by the compensation committee is rather low and the speaker hoped to receive a higher rate.</li> <li>* A speaker requested to be granted with land in the case that some households could not buy land lot in the resettlement.</li> <li>* A speaker requested for reasonable rate of compensation for trees and crops.</li> </ul> </li> <li>- Of these, two separate places of resettlement area was specified (and eventually one place was specified), and the access road No.2 is being constructed. The compensation was carried out by the compensation committee of O Mon district. The compensation for trees and crops was made (2nd field survey).</li> </ul>																

1 Permits and Explanation



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<p>(b) Are proper responses made to comments from the stakeholder and regulatory authorities? (2/2)</p>	<p><b>Public Consultation after EIA</b></p> <ul style="list-style-type: none"> <li>- The project owner (EVN) explained to the above-mentioned requirements made by the Official Letter No.14/ UBND-NC (Phuoc Thoi Ward People’s Committees; 9th May 2008) , the Official Letter No.16/ CV-UBND (Thoi An Ward People’s Committees; 22th May 2008), and the Official Letter No.03/ CV-MT.VT (Thoi An ward Fatherland Front Committees; 22th May 2008) as follows (EIA 8.4, p.182-183);</li> <li>* To commit to implement perfectly all measures of environmental protection, waste treatment from the project. At the same time, technical methods and management should be executed to prevent and minimize negative effects on natural and socio-economic environments of the local area as forecasted in this EIA report.</li> <li>* To commit to comply with all provisions on environmental protection as regulated in the law on environmental protection passed by National Assembly, Session XI, 8th meeting on 29 November 2005 and declared on 12 December 2005 according to Order No.29/ 2005/ L/ CTN by President.</li> <li>* To commit to comply with all Vietnam standards on environment issued together with Decision No.22/ 2006/ QD-BTNMT on 18 December 2006 by MONRE on compulsory to apply Vietnam standards.</li> <li>* To commit to take full responsibility before the Laws of the Socialist Republic of Vietnam for occurrence of environmental pollution affecting to the health of local inhabitants in the course of project implementation.</li> </ul>												
<p><b>(3) Alternatives</b></p>													
<p>(a) Were any alternatives of the project plan, including the environmental social items, examined? (1/3)</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>1 Permits and Explanation</b></p>	<p><b>Review: Although consideration of the alternative plan is not a requirement for the EIA in Vietnam, O Mon 3 F/S Report provides consideration of alternatives concerning the zero option, fuel, power generation technology, cooling system, etc.</b></p> <p><b>1) Selection of the project site</b></p> <ul style="list-style-type: none"> <li>- The O Mon Power Complex will play important roles in providing the necessary power supply to meet national socio-economic development goals, especially in the southern parts of Viet Nam. Without implementation of the O Mon Power Complex, the current shortfall of 1,100 MW in the power system as well as the electricity demand growing at 15% to 17% per annum will not be met. If O Mon 3 is not be constructed, another power plant should be constructed in southern Viet Nam.</li> <li>- If a hydraulic power station with generation capacity equivalent to O Mon 3 is to be constructed, installation of huge dam and reservoir will be essential and cause significant environmental alteration and large scale of resettlement of the local inhabitants (Son La Hydro Power Station (2,400 MW) in northern Viet Nam has the reservoir of 224.2km<sup>2</sup> in total causing resettlement of more than 90 thousand people.)</li> <li>- The project plan of O Mon Power Complex has been developed in 1996. O Mon district was selected as the power complex project site for various reasons (O Mon 4 EIA 5.G, p.100-101). The construction plan of the O Mon 3 and 4 power plants in O Mon Power Complex has been approved by the MOIT (PPTA-4845 SIA 5.1, p.22), and O Mon Power Complex is the only alternative construction site conceivable for the new power plant around O Mon district.</li> </ul> <table border="1"> <thead> <tr> <th>Technical</th> <th>Geographical</th> <th>Social and environmental</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>- sufficient area for a 750 MW CCGT and associated facilities</li> <li>- access to reliable gas source</li> <li>- access to road and water transportation networks</li> <li>- access to national power grid</li> <li>- access to existing O Mon I infrastructure</li> <li>- available water supply</li> <li>- available cooling water</li> <li>- proposed use is in compliance with relevant land use plans and regulations</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>- geologically stable, low earthquake risk</li> <li>- reasonable site leveling and compaction costs</li> <li>- reasonable foundation construction costs</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>- not located close to any sensitive environmental receptors (communities, hospitals, schools, etc).</li> <li>- no physical cultural resources on site</li> <li>- relatively low resettlement and socioeconomic impacts</li> </ul> </td> </tr> </tbody> </table> <p><b>2) Consideration of fuel (F/S Chapter 5)</b></p> <ul style="list-style-type: none"> <li>- The fuel generally used in a major thermal power station is coal, natural gas, and oil. The reasons for not using coal, LNG, or domestic oil in O Mon 3 are shown in the Table below. Additionally, coal-fired power generation requires coal storage site and ash disposal site, and as O Mon Power Complex is designed as a gas-fired power plant, introduction of coal fuel will need additional site for those purposes.</li> </ul> <table border="1"> <thead> <tr> <th>Coal</th> <th>LNG</th> <th>Oil</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>- Coal development takes time and cost.</li> <li>- There is a construction plan of coal-fired power plant in northern Vietnam near coal mine in energy strategy in Vietnam.</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>- LNG plant needs high cost, and acceptance of the site and construction of storage facility is necessary.</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>- Domestic oil contains low sulfur. Export price of domestic oil is 1.5 times higher than import price of heavy oil, and oil export is economically more valuable than consuming as fuel for power generation.</li> </ul> </td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- As described above, coal is not appropriate as fuel used in O Mon 3. LNG should also be excluded for high cost, and natural gas and oil (light oil or heavy oil) may be considered for use as fuel in O Mon 3. Table below describes the comparison of gas, DO and HO.</li> </ul>	Technical	Geographical	Social and environmental	<ul style="list-style-type: none"> <li>- sufficient area for a 750 MW CCGT and associated facilities</li> <li>- access to reliable gas source</li> <li>- access to road and water transportation networks</li> <li>- access to national power grid</li> <li>- access to existing O Mon I infrastructure</li> <li>- available water supply</li> <li>- available cooling water</li> <li>- proposed use is in compliance with relevant land use plans and regulations</li> </ul>	<ul style="list-style-type: none"> <li>- geologically stable, low earthquake risk</li> <li>- reasonable site leveling and compaction costs</li> <li>- reasonable foundation construction costs</li> </ul>	<ul style="list-style-type: none"> <li>- not located close to any sensitive environmental receptors (communities, hospitals, schools, etc).</li> <li>- no physical cultural resources on site</li> <li>- relatively low resettlement and socioeconomic impacts</li> </ul>	Coal	LNG	Oil	<ul style="list-style-type: none"> <li>- Coal development takes time and cost.</li> <li>- There is a construction plan of coal-fired power plant in northern Vietnam near coal mine in energy strategy in Vietnam.</li> </ul>	<ul style="list-style-type: none"> <li>- LNG plant needs high cost, and acceptance of the site and construction of storage facility is necessary.</li> </ul>	<ul style="list-style-type: none"> <li>- Domestic oil contains low sulfur. 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The comparison of the two technologies is shown in the Table below.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Items</th> <th>Combined Cycle</th> <th>Conventional</th> </tr> </thead> <tbody> <tr> <td>Fuel</td> <td>Gas, DO, (HO) HO need pretreatment.</td> <td>Gas, DO, HO</td> </tr> <tr> <td>Efficiency</td> <td>51 ~ 60%</td> <td>39 ~ 44%</td> </tr> <tr> <td>Development cost (Calculation by F/S; 2009)</td> <td>650 ~ 850 US\$/kW</td> <td>800 ~ 1,200US\$/kW (Gas, Oil) 1,000 ~ 1,400US\$/kW (Coal)</td> </tr> <tr> <td>Running cost (O&amp;M) (Calculation by F/S; 2009)</td> <td>12 US\$/kW/year</td> <td>9 US\$/kW/year</td> </tr> <tr> <td>Total area of the plant</td> <td>70 ~ 80%</td> <td>Base (100%)</td> </tr> <tr> <td>Operating life</td> <td>25 years</td> <td>30 years</td> </tr> <tr> <td>Construction period</td> <td>Base</td> <td>10 ~ 12 months longer</td> </tr> <tr> <td>Cooling water</td> <td>Base</td> <td>1.5 ~ 1.8 times more needed</td> </tr> </tbody> </table> <p>- Combined cycle thermal power generation, despite high running cost and short life compared to conventional power generation, has the advantage of low development cost and short construction period. In addition, it generates less NOx (air pollutant), which is not noted in F/S. It needs less cooling water and accordingly generates less thermal waste water. As a consequence, the environmental impact is significantly smaller than thermal power generation.</p> <p>- From the above reasons, combined cycle power generation should be adopted to for O Mon 3.</p> <p><b>4) Consideration of cooling method (F/S Chapter 7.6)</b></p> <p>Steam used for power generation is cooled and return to water in the condenser, then sent back to the boiler. There are plural cooling methods of steam, such as heat release into water or air, and use of vaporization heat. Five cooling method including water-intake method are considered in the F/S (Appended Figure-1).</p> <p><b>Option 1:</b> One-through method In one-through method, the steam is cooled by releasing heat into water. Cooling water is taken from the river, and discharged again to river after passing through the condenser.</p> <p><b>Option 2:</b> Cooling method using pond or lake An artificial pond is constructed to temporarily store water, and cooling water is taken from/discharged into the pond. The scale of the artificial pond is determined depending on the capacity of the power plant, climate of the area, and the shape of the pond. In case of O Mon 3, a pond of 2.5km<sup>2</sup> will be needed, which is not a feasible option.</p> <p><b>Option 3:</b> Natural circulation Cooling tower method In cooling tower method, temperature of cooling water is decreased by vaporization heat of water inside the tower. Here, air warmed by steam rises from the upper part of the tower, and cool air naturally flows in from the lower part of the tower to fill the space. The size of the cooling tower is determined depending on the climate and the expected heat removal efficiency. In case of O Mon 3, a significantly large cooling tower will be needed.</p> <p><b>Option 4:</b> Forced-circulation cooling tower method A similar cooling tower is used as that of “natural-circulation method”, but with a fan installed at the lower part of the tower to mechanically force air into the tower.</p> <p><b>Option 5:</b> Air-cooling condenser method In air-cooling condenser method, wind of a fan is used for cooling steam. This method is applied in the area where supply of cooling water is not assured, in desert area for example. As the fan is operated with electricity generated in the power plant, it will decrease certain amount of electricity supply. Cooling water supply is abundant in O Mon Power Complex and this method is not an appropriate option.</p> <p>As a result of the comparison of the above-described 5 options, Option 2 and Option 5 are not feasible. Option 3 and Option 4 require construction cost for installation of cooling tower, and are lower in power generation efficiency compared to One-through method. Consequently, Option 1 “One-through method” is the most feasible and appropriate option.</p>	Items	Gas	DO	HO	Atmospheric impact	Base	Significant	Very significant	Cost of fuel	Base	Expensive	Expensive	Items	Combined Cycle	Conventional	Fuel	Gas, DO, (HO) HO need pretreatment.	Gas, DO, HO	Efficiency	51 ~ 60%	39 ~ 44%	Development cost (Calculation by F/S; 2009)	650 ~ 850 US\$/kW	800 ~ 1,200US\$/kW (Gas, Oil) 1,000 ~ 1,400US\$/kW (Coal)	Running cost (O&M) (Calculation by F/S; 2009)	12 US\$/kW/year	9 US\$/kW/year	Total area of the plant	70 ~ 80%	Base (100%)	Operating life	25 years	30 years	Construction period	Base	10 ~ 12 months longer	Cooling water	Base	1.5 ~ 1.8 times more needed
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<p>(a) Were any alternatives of the project plan, including the environmental social items, examined? (3/3)</p>	<p><b>5) Zero option</b></p> <ul style="list-style-type: none"> <li>- Here, the alternative in which construction of O Mon 3 is not conducted within the scope of O Mon Power Complex is considered as “zero option” and the environmental load is compared with the option of O Mon 3 construction.</li> </ul> <p><b>(a) Air pollution</b></p> <ul style="list-style-type: none"> <li>- The estimated air pollutant diffusion in case of “zero option” and O Mon 3 construction is compared.</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Items</th> <th colspan="2">Zero option</th> <th colspan="2">Case of O Mon 3 construction</th> <th rowspan="2">Air quality standard (QCVN-05/ 2009)</th> <th rowspan="2">EHS Guideline (General: 2007)</th> </tr> <tr> <th>Total emission of O Mon Power Complex (g/sec)</th> <th>Max. ground concentration (µg/m<sup>3</sup>)</th> <th>Total emission of O Mon Power Complex(g/sec)</th> <th>Max. 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The industrialization of the surrounding area may affect the atmospheric environment and induce exceedance of air quality standard in future. It should be noted that O Mon Power Complex will remain the largest emission source of air pollutant.</li> </ul> <p><b>(b) Thermal effluent</b></p> <ul style="list-style-type: none"> <li>- The temperature of thermal waste water will be +7°C compared to intake water (+6°C at the outlet of the discharge channel) in both the zero option case and O Mon 3 construction. The estimated total thermal waste water discharge from O Mon Power Complex in the case of zero option is 60.0m<sup>3</sup>/sec, and 78.4m<sup>3</sup>/sec if O Mon 3 is constructed, 30% higher than the zero option.</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Discharge channel</th> <th colspan="2">Zero option</th> <th colspan="2">O Mon 3 construction</th> </tr> <tr> <th>Total thermal wastewater discharge</th> <th>Thermal effluent discharge from the power plant</th> <th>Total thermal wastewater discharge</th> <th>Thermal effluent discharge from the power plant</th> </tr> </thead> <tbody> <tr> <td>No.1</td> <td>41.6 m<sup>3</sup>/sec</td> <td>O Mon O Mon 2 (18.4 m<sup>3</sup>/sec)</td> <td>41.6 m<sup>3</sup>/sec</td> <td>O Mon 1 (23.2 m<sup>3</sup>/sec) O Mon 2 (18.4 m<sup>3</sup>/sec)</td> </tr> <tr> <td>No.2</td> <td>18.4 m<sup>3</sup>/sec</td> <td>O Mon 3 (not constructed) O Mon 4 (18.4 m<sup>3</sup>/sec)</td> <td>36.8 m<sup>3</sup>/sec</td> <td>O Mon 3 (18.4 m<sup>3</sup>/sec) O Mon 4 (18.4 m<sup>3</sup>/sec)</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- Next, the diffusion of the thermal effluent is estimated. As thermal waste water barely diffuses in a vertical direction, it is estimated that the water temperature rise area (1°C) in horizontal direction extends simply at a rate proportional to thermal effluent discharge. Even though the temperature rise area extends, the distance from the water discharge outlet to the end of 1°C rise area will increase only 15%.</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Tide</th> <th>Direction of diffusion</th> <th>Zero option</th> <th>O Mon 3 construction</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Flood tide</td> <td>Upstream and downstream</td> <td>Approx. 1.7km upstream</td> <td>Approx. 2km upstream</td> </tr> <tr> <td>Toward center</td> <td>Approx. 520m</td> <td>Approx. 600m</td> </tr> <tr> <td rowspan="2">Slack tide prior to ebb</td> <td>Upstream and downstream</td> <td>Approx. 0.87km upstream</td> <td>Approx. 1km upstream</td> </tr> <tr> <td>Toward center</td> <td>Approx. 520m</td> <td>Approx. 600m</td> </tr> <tr> <td rowspan="2">Ebb tide</td> <td>Upstream and downstream</td> <td>Approx. 1.3km downstream</td> <td>Approx. 1.5km downstream</td> </tr> <tr> <td>Toward center</td> <td>Approx. 350m</td> <td>Approx. 400m</td> </tr> </tbody> </table> <p><b>(c) Natural environment</b></p> <ul style="list-style-type: none"> <li>- Land acquisition for O Mon 3 is conducted as a part of land acquisition for O Mon Power Complex, and alteration of terrestrial flora occurs regardless of the construction of O Mon 3. The extent of thermal effluent diffusion scarcely changes by construction of O Mon 3.</li> </ul> <p><b>(d) Social environment</b></p> <ul style="list-style-type: none"> <li>- Land acquisition for O Mon Power Complex is carried out regardless of construction of O Mon 3, and no change in resettlement and compensation plan of the residents is involved. 191 workers will work in O Mon 3, of which 170 workers (about 90%) will be hired from the local area. No employment will be conducted in case of “zero option”.</li> <li>- As described above, the adoption of the zero option in the scope of construction plan for O Mon Power Complex will scarcely affect the environmental impact of air pollutant and thermal waste water. Also, the site has been acquired as a part of the O Mon Power Complex and construction of O Mon 3 does not affect the impact to the terrestrial flora and compensation and resettlement plan.</li> </ul>	Items	Zero option		Case of O Mon 3 construction		Air quality standard (QCVN-05/ 2009)	EHS Guideline (General: 2007)	Total emission of O Mon Power Complex (g/sec)	Max. ground concentration (µg/m <sup>3</sup> )	Total emission of O Mon Power Complex(g/sec)	Max. Ground concentration (µg/m <sup>3</sup> )	SO <sub>x</sub>	7.8	- 67.4 (1hr) 24.7 (24hr) 5.7 (year)	10.4	- 76.5 (1hr) 25.6 (24hr) 5.8 (year) <b>225.1 (1hr)</b>	- 350 (1hr) 125 (24hr) 50 (year)	500 (10min) - 125 (24hr) -	NO <sub>x</sub>	177.4	197.0 (1hr) 51.0 (24hr) 14.0 (year)	206.9	56.4 (24hr) 14.6 (year)	200 (1hr) 100 (24hr) 40 (year)	200 (1hr) - 40 (year)	PM <sub>10</sub>	12.8	85.1 (24hr) 41.7 (year)	19.1	88.0 (24hr) 42.4 (year)	150 (24hr) 50 (year)	150 (24hr) -	Discharge channel	Zero option		O Mon 3 construction		Total thermal wastewater discharge	Thermal effluent discharge from the power plant	Total thermal wastewater discharge	Thermal effluent discharge from the power plant	No.1	41.6 m <sup>3</sup> /sec	O Mon O Mon 2 (18.4 m <sup>3</sup> /sec)	41.6 m <sup>3</sup> /sec	O Mon 1 (23.2 m <sup>3</sup> /sec) O Mon 2 (18.4 m <sup>3</sup> /sec)	No.2	18.4 m <sup>3</sup> /sec	O Mon 3 (not constructed) O Mon 4 (18.4 m <sup>3</sup> /sec)	36.8 m <sup>3</sup> /sec	O Mon 3 (18.4 m <sup>3</sup> /sec) O Mon 4 (18.4 m <sup>3</sup> /sec)	Tide	Direction of diffusion	Zero option	O Mon 3 construction	Flood tide	Upstream and downstream	Approx. 1.7km upstream	Approx. 2km upstream	Toward center	Approx. 520m	Approx. 600m	Slack tide prior to ebb	Upstream and downstream	Approx. 0.87km upstream	Approx. 1km upstream	Toward center	Approx. 520m	Approx. 600m	Ebb tide	Upstream and downstream	Approx. 1.3km downstream	Approx. 1.5km downstream	Toward center	Approx. 350m	Approx. 400m
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1 Permits and Explanation

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Even if a higher-power gas turbine is introduced, the gas emission will not exceed the environmental standard or IFC guideline.</p> <p>On the other hand, in the case all of the power plants in O Mon power complex are in operation, NO<sub>x</sub> concentration in 1-hour exceeds the environmental standard, but in a very rare case. Regarding the NO<sub>x</sub> emission of the respective power plant, emission from O Mon 1, which is a conventional-type thermal plant, is three times higher than O Mon 3. Accordingly, the development of environmental mitigation measure for O Mon 1 power plant will be the most effective option.</p> <p>[ Environmental impact of 750 MW ]</p> <p>&lt;Parameter&gt;</p> <p>- The table below indicates the input data and emission standard for O Mon 3 (EIA 3.4.3.1, p108). The emission standards and EHS (Environmental, Health, and Safety Guidelines) guideline of IFC (International Finance Corporation) are also shown. As shown in the table, the emission standard in Vietnam, as well as EHS Guideline, will be satisfied.</p> <p style="text-align: center;"><b>Concentration of pollutant and dust in flue gas</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="3">Parameter</th> <th colspan="3">Concentration (mg/Nm<sup>3</sup>)</th> <th colspan="2">Emission standard for power plant (QCVN-22/ 2009) Kp=0.85, Kv=0.6</th> <th colspan="2">EHS Guideline (Thermal power plant; 2008)</th> </tr> <tr> <th rowspan="2">GT only</th> <th rowspan="2">Gas fired</th> <th rowspan="2">Oil fired</th> <th>Gas</th> <th>Oil</th> <th>Gas</th> <th>Oil</th> </tr> <tr> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>SO<sub>x</sub></td> <td>3.2</td> <td>7.3</td> <td>209.59</td> <td>153 (300)</td> <td>255 (500)</td> <td>-</td> <td>0.5 - 1%</td> </tr> <tr> <td>NO<sub>x</sub></td> <td>16.16</td> <td>37.9</td> <td>98.85</td> <td>127.5 (250)</td> <td>306 (600)</td> <td>51</td> <td>152</td> </tr> <tr> <td>Dust</td> <td>1.62</td> <td>3.69</td> <td>6.6</td> <td>25.5 (50)</td> <td>76.5 (150)</td> <td>-</td> <td>30 - 50</td> </tr> </tbody> </table> <p>Note: In emission standard calculation, coefficient is multiplied depending on power generation capacity (Kp) and region (Kv). In EHS Guideline, different guideline value is applied depending on the atmospheric environment. The guideline value is applied for the power plant operating 500 hrs and more per year..SO<sub>x</sub> concentration means sulfur concentration in fuel.</p> <p>- Other parameters are shown in the table below (EIA 3.4.3.1, p.108, Appendix 3-1).</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Parameter</th> <th>Case 1: GT only (500MW)</th> <th>Case 2: Gas fired (750MW)</th> <th>Case 3: Oil fired (750MW)</th> </tr> </thead> <tbody> <tr> <td>Height of stack</td> <td>30m (Bypass Stack)</td> <td>40m (Main Stack)</td> <td>40m (Main Stack)</td> </tr> <tr> <td>Inner diameter of stack</td> <td>6.8m</td> <td>6.8m</td> <td>6.8m</td> </tr> <tr> <td>Flue gas flow</td> <td>1564.6 m<sup>3</sup>/sec</td> <td>685.39 m<sup>3</sup>/sec</td> <td>747.49 m<sup>3</sup>/sec</td> </tr> <tr> <td>Flue gas velocity</td> <td>42.9 m/sec</td> <td>18.8 m/sec</td> <td>20.5 m/sec</td> </tr> <tr> <td>Flue gas temperature</td> <td>594 °C</td> <td>97 °C</td> <td>141 °C</td> </tr> <tr> <td>SO<sub>x</sub></td> <td>5.0 g/sec</td> <td>5.0 g/sec</td> <td>156.67 g/sec</td> </tr> <tr> <td>NO<sub>x</sub></td> <td>25.29 g/sec</td> <td>25.96 g/sec</td> <td>73.89 g/sec</td> </tr> <tr> <td>Dust</td> <td>2.53 g/sec</td> <td>2.53 g/sec</td> <td>4.93 g/sec</td> </tr> </tbody> </table> <p>&lt;Result and review&gt;</p> <p>- The table below shows the result of Gaussian-model short-term dispersion model of air pollutants in O Mon 3 based on the meteorological data in Can Tho City. It shows the maximum ground concentration. (EIA 3.4.3.1, p107-113).</p> <p style="text-align: center;"><b>Rainy season</b> (Wind direction: East, Wind velocity; 2.5m/s, Temperature; 30°, Atmospheric stability; B) (Unit; µg/m<sup>3</sup>)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Parameter</th> <th>Case 1</th> <th>Case 2</th> <th>Case 3</th> <th>Air quality standards (QCVN-05/ 2009)</th> <th>EHS Guideline (General: 2007)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">SO<sub>2</sub></td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>500 (10 min)</td> </tr> <tr> <td>0.7 (1 hr)** 0.4 (24 hr)**</td> <td>3.6 (1 hr)** 1.9 (24 hr)**</td> <td>66.3 (1 hr) 35.2 (24 hr)</td> <td>350 (1 hr) 125 (24 hr)</td> <td>- 125 (24 hr: Interim*)</td> </tr> <tr> <td rowspan="2">NO<sub>2</sub></td> <td>3.5 (1 hr) 1.9 (24 hr)</td> <td>18.6 (1 hr) 9.8 (24 hr)</td> <td>31.1 (1 hr) 16.6 (24 hr)</td> <td>200 (1 hr) 100 (24 hr)</td> <td>200 (1 hr) -</td> </tr> <tr> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>40 (year)</td> </tr> <tr> <td>PM<sub>10</sub></td> <td>0.186 (24 hr)</td> <td>0.96 (24 hr)</td> <td>1.1 (24 hr)</td> <td>150 (24 hr)</td> <td>150 (24 hr: Interim*)</td> </tr> </tbody> </table> <p>* IFC/EHS Guideline quotes the value in WHO Guideline. WHO establishes their own interim target value for PM<sub>10</sub> and SO<sub>2</sub>. **: As diffusion modeling for SO<sub>x</sub> has not been conducted in O Mon 3 EIA, SO<sub>x</sub> diffusion was calculated in proportion to NO<sub>x</sub>.</p>	Parameter	Concentration (mg/Nm <sup>3</sup> )			Emission standard for power plant (QCVN-22/ 2009) Kp=0.85, Kv=0.6		EHS Guideline (Thermal power plant; 2008)		GT only	Gas fired	Oil fired	Gas	Oil	Gas	Oil					SO <sub>x</sub>	3.2	7.3	209.59	153 (300)	255 (500)	-	0.5 - 1%	NO <sub>x</sub>	16.16	37.9	98.85	127.5 (250)	306 (600)	51	152	Dust	1.62	3.69	6.6	25.5 (50)	76.5 (150)	-	30 - 50	Parameter	Case 1: GT only (500MW)	Case 2: Gas fired (750MW)	Case 3: Oil fired (750MW)	Height of stack	30m (Bypass Stack)	40m (Main Stack)	40m (Main Stack)	Inner diameter of stack	6.8m	6.8m	6.8m	Flue gas flow	1564.6 m <sup>3</sup> /sec	685.39 m <sup>3</sup> /sec	747.49 m <sup>3</sup> /sec	Flue gas velocity	42.9 m/sec	18.8 m/sec	20.5 m/sec	Flue gas temperature	594 °C	97 °C	141 °C	SO <sub>x</sub>	5.0 g/sec	5.0 g/sec	156.67 g/sec	NO <sub>x</sub>	25.29 g/sec	25.96 g/sec	73.89 g/sec	Dust	2.53 g/sec	2.53 g/sec	4.93 g/sec	Parameter	Case 1	Case 2	Case 3	Air quality standards (QCVN-05/ 2009)	EHS Guideline (General: 2007)	SO <sub>2</sub>	-	-	-	-	500 (10 min)	0.7 (1 hr)** 0.4 (24 hr)**	3.6 (1 hr)** 1.9 (24 hr)**	66.3 (1 hr) 35.2 (24 hr)	350 (1 hr) 125 (24 hr)	- 125 (24 hr: Interim*)	NO <sub>2</sub>	3.5 (1 hr) 1.9 (24 hr)	18.6 (1 hr) 9.8 (24 hr)	31.1 (1 hr) 16.6 (24 hr)	200 (1 hr) 100 (24 hr)	200 (1 hr) -	-	-	-	-	40 (year)	PM <sub>10</sub>	0.186 (24 hr)	0.96 (24 hr)	1.1 (24 hr)	150 (24 hr)	150 (24 hr: Interim*)
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(2/3)</p>	<p style="text-align: center;"><b>Dry season</b> (Wind direction: South-West, Wind velocity; 2.7m/s, Temperature; 30 °C, Atmospheric stability; B) (Unit; µg/m<sup>3</sup>)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Parameter</th> <th>Case 1</th> <th>Case 2</th> <th>Case 3</th> <th>Air quality standards (QCVN-05/ 2009)</th> <th>EHS Guideline (General: 2007)</th> </tr> </thead> <tbody> <tr> <td>SO<sub>2</sub></td> <td>- 0.7 (1hr)** 0.4 (24hr)**</td> <td>- 3.7 (1hr)** 1.9 (24hr)**</td> <td>- 68.1 (1h) 36.1 (24h)</td> <td>- 350 (1 hr) 125 (24 hr)</td> <td>500 (10 min) - 125 (24 hr: Interim*)</td> </tr> <tr> <td>NO<sub>2</sub></td> <td>3.6 (1h) 1.9 (24h)</td> <td>19.0 (1h) 10.0 (24h)</td> <td>32.1 (1h) 17.0 (24h)</td> <td>200 (1 hr) 100 (24 hr)</td> <td>200 (1 hr) - 40 (year)</td> </tr> <tr> <td>PM<sub>10</sub></td> <td>- 0.190 (24h)</td> <td>- 0.98 (24h)</td> <td>- 7.8 (24h)</td> <td>- 150 (24 hr)</td> <td>- 150 (24 hr: Interim*)</td> </tr> </tbody> </table> <p>- The O Mon 3 power plant will be normally operated in gas-fired combined cycle (Case 2), and the table indicates that the maximum ground concentration for SO<sub>2</sub> and PM<sub>10</sub> is 1/100 of the Vietnamese environmental standard (QCVN-05/ 2009), NO<sub>x</sub> also being 1/10. In case of oil-fired combined cycle (7 days of operation per year is anticipated for emergency case), the maximum ground concentration is also well below the environmental standard for each pollutant.</p> <p><b>[ In the case of increasing the output of O Mon 3 ]</b></p> <p>- The calculation was based on the generation capacity of 750 MW as estimated in the O Mon 3 EIA. However, as a result of the recent improvement of gas turbine technology, the turbine of much higher capacity will be installed for O Mon Power Complex, and consequently, the gas emission will also need to be modified. Additionally, as the composition of fuel gas has been also changed since the EIA preparation, air pollutant emission should be modified as well. The estimated emission of air pollutant is calculated on the assumption that the turbine of maximum generation capacity currently available is introduced. Table below shows the result of the estimated emission compared to the estimation in O Mon 3 EIA. Although the output of O Mon 3 will be increased, the emission of air pollutant will not exceed the emission standards for thermal power plant.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Parameter</th> <th>O Mon 3 EIA</th> <th>Result of JICA survey</th> <th>Emission standard for power plant (QCVN-22/ 2009) Kp=0.85, Kv=0.6</th> </tr> </thead> <tbody> <tr> <td>SO<sub>x</sub></td> <td>5.0 g/sec (7.3 mg/Nm<sup>3</sup>)</td> <td>2.6 g/sec (4.1 mg/Nm<sup>3</sup>)</td> <td>153 mg/Nm<sup>3</sup></td> </tr> <tr> <td>NO<sub>x</sub></td> <td>25.96 g/sec (37.9 mg/Nm<sup>3</sup>)</td> <td>32.5 g/sec (50.9 mg/Nm<sup>3</sup>)</td> <td>127.5 mg/Nm<sup>3</sup></td> </tr> <tr> <td>Dust</td> <td>2.53 g/sec (3.69 mg/Nm<sup>3</sup>)</td> <td>6.3 g/sec (9.9 mg/Nm<sup>3</sup>)</td> <td>25.5 mg/Nm<sup>3</sup></td> </tr> <tr> <td>Flue gas flow</td> <td>18.8 m/sec</td> <td>19.2 m/sec</td> <td>-</td> </tr> <tr> <td>Flue gas velocity</td> <td>97 °C</td> <td>98 °C</td> <td>-</td> </tr> </tbody> </table> <p>- As the temperature and emission rate of the emission gas are almost similar to the O Mon 3 EIA calculation result, the maximum ground concentration may be calculated by simple proportional calculation. Background value concentration of pollutants is quoted from O Mon 4 EIA (O Mon 4 EIA Table 45, p.128) and the maximum ground concentration and the estimated maximum concentration was calculated as cited in the table below. This result suggests no exceeding of the environmental standard. Consequently, the pollutant emission, even after the increase of output, will not exceed the environmental standard and the environmental impact will be insignificant.</p> <p style="text-align: center;"><b>Rainy season</b> (unit; µg/m<sup>3</sup>)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Parameter</th> <th>Max. Concentration</th> <th>Back-ground</th> <th>Max. 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2 Mitigation Measures



Main Check Items	Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)																																																																																																													
<p>(a) Do air pollutants, such as sulfur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), and soot and dust emitted by power plant operations comply with the country's emission standards? Is there a possibility that air pollutants emitted from the project will cause areas that do not comply with the country's ambient air quality standards? (3/3)</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>2 Mitigation Measures</b></p>	<p><b>Dry Season</b> (unit; µg/m<sup>3</sup>)</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Max. Concentration</th> <th>Back ground</th> <th>Max. 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In this case that all power plant operate by gas fired, O Mon 1 is the conventional power plant and O Mon 2 to 4 are the combined power plant. The calculation was made using US Environmental Protection Agency recommended CALPUFF modeling system, 8760 times using hourly meteorological data of 2006. The table below shows the input parameters (O Mon 4 EIA 6.C.3, p.123-141).</p> <p style="text-align: center;"><b>- Parameter -</b></p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>O Mon 1</th> <th>O Mon 2 – O Mon 5 (as per 1 unit)</th> </tr> </thead> <tbody> <tr> <td>Stack height</td> <td>140m</td> <td>40m</td> </tr> <tr> <td>Stack inner diameter</td> <td>6.4m</td> <td>6.6m</td> </tr> <tr> <td>Flue gas flow</td> <td>20.0 m/sec</td> <td>19.3 m/sec</td> </tr> <tr> <td>Flue gas temperature</td> <td>90 °C</td> <td>95.3 °C</td> </tr> <tr> <td colspan="3" style="text-align: center;">Emission concentration and rate</td> </tr> <tr> <td>NO<sub>x</sub></td> <td>51.3 mg/Nm<sup>3</sup> (109.4 g/sec)</td> <td>50 mg/Nm<sup>3</sup> (24.4 g/sec)</td> </tr> <tr> <td>SO<sub>x</sub></td> <td>1.3 mg/Nm<sup>3</sup> (0.6 g/sec)</td> <td>0.44 mg/Nm<sup>3</sup> (0.6 g/sec)</td> </tr> <tr> <td>PM<sub>10</sub></td> <td>10.32 mg/Nm<sup>3</sup> (0.2 g/sec)</td> <td>10.32 mg/Nm<sup>3</sup> (5.0 g/sec)</td> </tr> </tbody> </table> <p>- As described above, construction of O Mon 5 is not planned, and O Mon 3 will be equipped with a gas turbine of considerably higher power. Table below shows the comparison of air pollutant emission of the power plant with high-power gas turbine (estimation based on the calculation above) with the emission calculated for the EIA preparation. As SO<sub>x</sub> value varies depending on the gas type, SO<sub>x</sub> emission in O Mon 1 is assumed to be similar to O Mon 2-4. The table below shows that the total pollutant emission rate calculated by JICA survey team are lower than the emission rate stated on O Mon 4 EIA, except for SO<sub>x</sub>.</p> <p style="text-align: center;">(Unit; g/sec)</p> <table border="1"> <thead> <tr> <th rowspan="2">Para meter</th> <th colspan="3">O Mon 4 EIA</th> <th colspan="3">Result of JICA survey</th> </tr> <tr> <th>Total Emission Rate</th> <th>O Mon 1</th> <th>O Mon 2 - O Mon 5</th> <th>Total Emission Rate</th> <th>O Mon 1</th> <th>O Mon 2 - O Mon4</th> </tr> </thead> <tbody> <tr> <td>SO<sub>x</sub></td> <td>3.0</td> <td>0.6</td> <td>2.4</td> <td>10.4</td> <td>2.6</td> <td>7.8</td> </tr> <tr> <td>NO<sub>x</sub></td> <td>207.0</td> <td>109.4</td> <td>97.6</td> <td>206.9</td> <td>109.4</td> <td>97.5</td> </tr> <tr> <td>PM<sub>10</sub></td> <td>20.2</td> <td>0.2</td> <td>20.0</td> <td>19.1</td> <td>0.2</td> <td>18.9</td> </tr> <tr> <td>Flue gas flow</td> <td>-</td> <td>20.0 m/sec</td> <td>19.3 m/sec</td> <td>-</td> <td>20.0 m/sec</td> <td>19.2 m/sec</td> </tr> <tr> <td>Flue gas Temperature</td> <td>-</td> <td>90 °C</td> <td>95.3 °C</td> <td>-</td> <td>90 °C</td> <td>98 °C</td> </tr> </tbody> </table> <p>&lt; Result and Review &gt;</p> <p>- As the temperature and the emission rate of gas emission is approximate to the O Mon 4 EIA, the maximum ground concentration may be calculated by simple proportional calculation, as cited in Table blow.</p> <p>- The summary of dispersion model is shown in the table below. No exceedance of air quality standard is predicted in yearly average and 24 hrs average. Exceedance of NO<sub>x</sub> concentration in 1-hour is predicted a maximum of 2 hours per year on 2 separate days, which is a very rare case (O Mon 4 EIA 6.C.3.e.4, p.127-128).</p>	Parameter	Max. Concentration	Back ground	Max. Conc. + Back-ground	Air quality standards (QCVN-05/ 2009)	EHS Guideline (General: 2007)	SO <sub>x</sub>	-	-	-	-	500 (10 min)	3.7 -> 1.9 (1 hr) 1.9 -> 1.0 (24 hr)	38.7 (1 hr) 22.1 (24 hr)	40.6 (1 hr) 23.1 (24 hr)	350 (1 hr) 125 (24 hr)	- 125 (24 hr: Interim <sup>*</sup> )	NO <sub>x</sub>	19.0 -> 23.8 (1 hr) 10.0 -> 12.5 (24 hr)	27.7 (1 hr) 18.5 (24 hr)	51.5 (1 hr) 31.0 (24 hr)	200 (1 hr) 100 (24 hr)	200 (1 hr) - 40 (year)			-	-		PM <sub>10</sub>	0.98 -> 2.4 (24 hr)	79.4 (24 hr)	81.8 (24 hr)	150 (24 hr)	150 (24 hr: Interim <sup>*</sup> )	Parameter	O Mon 1	O Mon 2 – O Mon 5 (as per 1 unit)	Stack height	140m	40m	Stack inner diameter	6.4m	6.6m	Flue gas flow	20.0 m/sec	19.3 m/sec	Flue gas temperature	90 °C	95.3 °C	Emission concentration and rate			NO <sub>x</sub>	51.3 mg/Nm <sup>3</sup> (109.4 g/sec)	50 mg/Nm <sup>3</sup> (24.4 g/sec)	SO <sub>x</sub>	1.3 mg/Nm <sup>3</sup> (0.6 g/sec)	0.44 mg/Nm <sup>3</sup> (0.6 g/sec)	PM <sub>10</sub>	10.32 mg/Nm <sup>3</sup> (0.2 g/sec)	10.32 mg/Nm <sup>3</sup> (5.0 g/sec)	Para meter	O Mon 4 EIA			Result of JICA survey			Total Emission Rate	O Mon 1	O Mon 2 - O Mon 5	Total Emission Rate	O Mon 1	O Mon 2 - O Mon4	SO <sub>x</sub>	3.0	0.6	2.4	10.4	2.6	7.8	NO <sub>x</sub>	207.0	109.4	97.6	206.9	109.4	97.5	PM <sub>10</sub>	20.2	0.2	20.0	19.1	0.2	18.9	Flue gas flow	-	20.0 m/sec	19.3 m/sec	-	20.0 m/sec	19.2 m/sec	Flue gas Temperature	-	90 °C	95.3 °C	-	90 °C	98 °C
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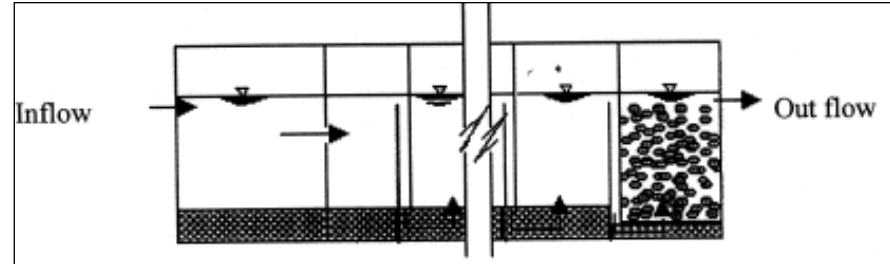
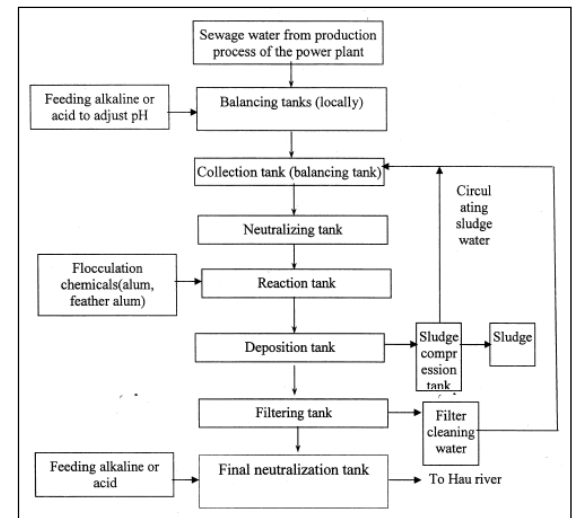
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<p>(a) Do air pollutants, such as sulfur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), and soot and dust emitted by power plant operations comply with the country's emission standards? Is there a possibility that air pollutants emitted from the project will cause areas that do not comply with the country's ambient air quality standards? <b>(3/3)</b></p>	<p>- Regarding the NO<sub>x</sub> emission of the respective power plant, emission from O Mon 1, which is a conventional-type thermal plant, is three times higher than O Mon 3. Accordingly, the development of environmental mitigation measure for O Mon 1 power plant will be the most effective option. The realistic measure can consider reduction of operation of O Mon 1 in which it is inefficient and an environmental impact is larger than O Mon 3, when NO<sub>x</sub> concentration around the O Mon Power Complex exceeds the air quality standards.</p> <p style="text-align: right;"><b>The simulation result of the dispersion model in case all the power plants are in operation</b> (µg/m<sup>3</sup>)</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Max. Concentration</th> <th>Back-ground</th> <th>Max. Conc. + Back-ground</th> <th>Air quality standards (QCVN-05/ 2009)</th> <th>EHS Guideline (General: 2007)</th> </tr> </thead> <tbody> <tr> <td rowspan="3">SO<sub>x</sub></td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>500 (10 min)</td> </tr> <tr> <td>10.9 -&gt; 37.8 (1 hr)</td> <td>38.7 (1 hr)</td> <td>76.5 (1 hr)</td> <td>350 (1 hr)</td> <td>-</td> </tr> <tr> <td>1.0 -&gt; 3.5 (24 hr)</td> <td>22.1 (24 hr)</td> <td>25.6 (24 hr)</td> <td>125 (24 hr)</td> <td>125 (24 hr: Interim*)</td> </tr> <tr> <td rowspan="3">NO<sub>x</sub></td> <td>198 -&gt; 197.4 (1 hr)</td> <td>27.7 (1 hr)</td> <td><b>225.1 (1 hr)</b></td> <td>200 (1 hr)</td> <td>200 (1 hr)</td> </tr> <tr> <td>38 -&gt; 37.9 (24 hr)</td> <td>18.5 (24 hr)</td> <td>56.4 (24 hr)</td> <td>100 (24 hr)</td> <td>-</td> </tr> <tr> <td>4.3 -&gt; 4.3 (year)</td> <td>10.3 (year)</td> <td>14.6 (year)</td> <td>-</td> <td>40 (year)</td> </tr> <tr> <td rowspan="2">PM<sub>10</sub></td> <td>9.2 -&gt; 8.6 (24 hr)</td> <td>79.4 (24 hr)</td> <td>88.0 (24 hr)</td> <td>150 (24 hr)</td> <td>150 (24 hr: Interim*)</td> </tr> <tr> <td>0.7 -&gt; 0.7 (year)</td> <td>41.7 (year)</td> <td>42.4 (year)</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Parameter	Max. Concentration	Back-ground	Max. Conc. + Back-ground	Air quality standards (QCVN-05/ 2009)	EHS Guideline (General: 2007)	SO <sub>x</sub>	-	-	-	-	500 (10 min)	10.9 -> 37.8 (1 hr)	38.7 (1 hr)	76.5 (1 hr)	350 (1 hr)	-	1.0 -> 3.5 (24 hr)	22.1 (24 hr)	25.6 (24 hr)	125 (24 hr)	125 (24 hr: Interim*)	NO <sub>x</sub>	198 -> 197.4 (1 hr)	27.7 (1 hr)	<b>225.1 (1 hr)</b>	200 (1 hr)	200 (1 hr)	38 -> 37.9 (24 hr)	18.5 (24 hr)	56.4 (24 hr)	100 (24 hr)	-	4.3 -> 4.3 (year)	10.3 (year)	14.6 (year)	-	40 (year)	PM <sub>10</sub>	9.2 -> 8.6 (24 hr)	79.4 (24 hr)	88.0 (24 hr)	150 (24 hr)	150 (24 hr: Interim*)	0.7 -> 0.7 (year)	41.7 (year)	42.4 (year)	-	-
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2 Mitigation Measures

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However, in the case where the turbine of maximum generation capacity currently available is introduced, the estimated thermal waste water discharge is 18.4m<sup>3</sup>/sec, slightly higher than 18m<sup>3</sup>/sec at the O Mon 3 EIA preparation (calculation based on the similar waste water temperature: 7°C higher than intake water). Consequently, the diffusion area of thermal waste water will remain almost unchanged.</li> </ul> <p><b>[ The cumulative environmental impact by all power plant operated ]</b></p> <ul style="list-style-type: none"> <li>- In O Mon 4 EIA report, it calculated the diffusion of the thermal effluent in case that all the power plants in O Mon Complex (including O Mon 5) are in operation. In this case, the thermal effluent (38.6m<sup>3</sup>/sec) from O Mon 1 and O Mon 2 is discharged from the cooling water discharge channel 1, and the thermal effluent (46.2m<sup>3</sup>/sec) from O Mon 3 to 5 is discharged from the cooling water discharge channel 2 (PPTA4845 EIA Table 36, p.75). The water temperature is +6°C (the temperature at the intake is 31.5°C and the temperature at the discharge outlet is 37.5°C). The calculation was made using 3D model (MIKE 3 model). The condition of the calculation is in dry season and 28 days as one cycle of tidal (O Mon 4 EIA 6.C1.c.i, p.115).</li> <li>- Table below shows the comparison of thermal waste water discharge of the power plant with high-power gas turbine (estimation based on the calculation above) with the discharge calculated for the O Mon 4 EIA preparation.</li> </ul> <p style="text-align: right;">(Unit; m<sup>3</sup>/sec)</p> <table border="1"> <thead> <tr> <th rowspan="2">Discharge channel</th> <th colspan="2">Parameter of O Mon 4 EIA</th> <th colspan="2">Result of JICA study</th> </tr> <tr> <th>Amount of thermal effluent</th> <th>Power plant</th> <th>Amount of thermal effluent</th> <th>Power plant</th> </tr> </thead> <tbody> <tr> <td>No.1</td> <td>38.6 m<sup>3</sup>/sec</td> <td>O Mon 1 (23.2 m<sup>3</sup>/sec) O Mon 2 (15.4 m<sup>3</sup>/sec)</td> <td>41.6m<sup>3</sup>/sec</td> <td>O Mon 1 (23.2 m<sup>3</sup>/sec) O Mon 2 (18.4 m<sup>3</sup>/sec)</td> </tr> <tr> <td>No.2</td> <td>46.2 m<sup>3</sup>/sec</td> <td>O Mon 3 (15.4 m<sup>3</sup>/sec) O Mon 4 (15.4 m<sup>3</sup>/sec) O Mon 5 (15.4 m<sup>3</sup>/sec)</td> <td>36.8m<sup>3</sup>/sec</td> <td>O Mon 3 (18.4 m<sup>3</sup>/sec) O Mon 4 (18.4 m<sup>3</sup>/sec)</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- The water discharge from the discharge channel No.1 and No.2 slightly varies, but the total thermal water discharge is 78.4m<sup>3</sup>/sec, which is lower than 85m<sup>3</sup>/sec of O Mon 4 EIA case. Consequently, the diffusion area of thermal water discharge will not exceed the diffusion modeling of O Mon 4 EIA (as described below).</li> <li>- In flood tide, thermal water horizontally extends upstream toward the river center, with the 1°C warming area extending 2km upstream of the outfall and 600m toward river center. In slack tide prior to ebb, thermal water extends to the river center in upstream direction, with the area of 1°C warming area extending 1km upstream of the outfall and 600m toward river center. In ebb tide, thermal water extends along the bank toward downstream, with the 1°C warming area extending 1km downstream of the outfall and 400m toward river center (Appended figure-3(1)).</li> <li>- Thermal water vertically extends to 3m deep around the outlet of the cooling water discharge channel 2, maintaining the depth up to 150m toward the river center, slightly extending toward the deeper area. The same occurs in channel 1, only with smaller extension toward the center and the deeper area of the river, as discharge rate is smaller (Appended figure-3(2)).</li> <li>- In this manner, thermal waste water extends 150m toward the river center with layer of 3m thick, but at the point distant from the outfall, thermal water extends only on the surface layer and not in deeper layer. Accordingly, benthic fish and organisms will not be affected. In addition, thermal water will not reach the main spawning and nursery area for fish located on the opposite bank even in dry season. On the other hand, the river water is abundant in wet season which is a high season for fish spawning and nursing. Consequently, the impact of thermal water to river organisms will be insignificant. Moreover, as the fishers in Hau River have no fixed fishing place, the thermal water will not adversely affect the fishery.</li> </ul> <p><b>[ Mitigation measures ]</b></p> <ul style="list-style-type: none"> <li>- The discharge channel is 2 km long (open ditch; around 1 km). Thermal effluent takes around 2 hours and a half before thermal effluent comes out to Hau River because the flow velocity of the thermal effluent is 0.2 m/sec or less (18m<sup>3</sup>/sec/ (26.6m*4m)). Thereby, the heat of thermal effluent radiates heat to the atmosphere, and the thermal effluent goes down about 1 °C (EIA 4.3.2.1, p138, EIA 4.3.2.2, p139).</li> </ul> <p><b>Waste water</b></p> <p>[ Prediction and design]</p> <ul style="list-style-type: none"> <li>- The kind and its amount of assumed discharge of the waste water with operation of the O Mon 3 power plant are as follows (EIA Table 4.1, p.140-141).</li> </ul>	Discharge channel	Parameter of O Mon 4 EIA		Result of JICA study		Amount of thermal effluent	Power plant	Amount of thermal effluent	Power plant	No.1	38.6 m <sup>3</sup> /sec	O Mon 1 (23.2 m <sup>3</sup> /sec) O Mon 2 (15.4 m <sup>3</sup> /sec)	41.6m <sup>3</sup> /sec	O Mon 1 (23.2 m <sup>3</sup> /sec) O Mon 2 (18.4 m <sup>3</sup> /sec)	No.2	46.2 m <sup>3</sup> /sec	O Mon 3 (15.4 m <sup>3</sup> /sec) O Mon 4 (15.4 m <sup>3</sup> /sec) O Mon 5 (15.4 m <sup>3</sup> /sec)	36.8m <sup>3</sup> /sec	O Mon 3 (18.4 m <sup>3</sup> /sec) O Mon 4 (18.4 m <sup>3</sup> /sec)
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	<p>- Chlorine will be added to cooling water to prevent the biofouling. Chlorine inject into intake water in front of bar screens. Its concentration is 4 mg/L. The chlorine effluent after the condenser is less than 1.0 mg/L which is the waste water standards of Vietnam. Although O Mon 1-A has same chlorine dosing system, the concentration of chlorine is less than 1.0 mg/L at the inlet discharge channel. Moreover, chlorine decreases while flowing through the discharge channel. No residual chlorine was detected by the monthly water monitoring survey at the water outlet on Hau River at O Mon 1-A (2nd field survey).</p> <p>[ Mitigation measures ]</p> <p>- All residual solution and chemical contaminated washing water is collected into neutralizing pit for primary treatment, and then the preliminarily treated waste water is conveyed to the general waste water treatment station (F/S 10.3.2.2., p.10-10).</p> <p>- Oil polluted waste water shall separate oil at oil separator with capacity of 10m<sup>3</sup>/hour, then the preliminarily treated waste water shall be conveyed to the general waste water treatment station (EIA 4.3.3.6, p.144). The oil separated by waste water is retained as waste oil. (F/S 10.3.2.3, p.10-10). Recycling the waste oil will be conducted by mixing it with the heavy oil. The oily sedimentation that cannot be recycled is disposed appropriately by a licensed company (Confirmed with CTTP on 2012.03.21).</p> <p>- Domestic wastewater and human waste produced by 191 workers on site is estimated to be 35m<sup>3</sup> per day (200L/person. day). Domestic wastewater is treated in BASTAF (Baffled Septic Tank with Anaerobic Filter). In BASTAF, the wastewater is first settle by a precipitation chamber and a supernatant fluid is sent to the decomposition chamber of anaerobic bacteria. Sludge occurs at thi time. Neutralization processing is made with acid and alkali after that (EIA 4.3.3.5, p142-143).</p> <p>- The concentration of domestic wastewater after processing of BASTAF is as follows. The preliminarily treated waste wate processed by BASTAF is conveyed to the general waste water treatment station (EIA 4.3.3.5, p.143).</p> <p style="text-align: right;">(unit; mg/L)</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Prior to BASTAF</th> <th>After treatment</th> <th>Domestic wastewater standards (QCVN 14/ 2008)</th> </tr> </thead> <tbody> <tr> <td>BOD</td> <td>294.7</td> <td>103.1</td> <td>30</td> </tr> <tr> <td>COD</td> <td>645.9</td> <td>229.2</td> <td>-</td> </tr> <tr> <td>SS</td> <td>791.3</td> <td>276.9</td> <td>50</td> </tr> <tr> <td>T-N</td> <td>65.5</td> <td>22.9</td> <td>-</td> </tr> <tr> <td>T-P</td> <td>21.8</td> <td>7.64</td> <td>-</td> </tr> </tbody> </table>	Parameter	Prior to BASTAF	After treatment	Domestic wastewater standards (QCVN 14/ 2008)	BOD	294.7	103.1	30	COD	645.9	229.2	-	SS	791.3	276.9	50	T-N	65.5	22.9	-	T-P	21.8	7.64	-	 <p style="text-align: center;">Diagram of BASTAF</p>  <p style="text-align: center;">Diagram of the general waste water treatment station</p>																																																											
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	<p>(b) In the case of coal-fired power plants, do leachates from coal piles and coal ash disposal sites comply with the country's effluent standards?</p>	<p><b>Review: O Mon 3 is not a coal-fired power plant.</b></p>																																																																																			

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<p>(c) Are adequate measures taken to prevent contamination of surface water, soil, groundwater, and seawater by the effluents?</p>	<p><b>Review: Waste water will be appropriately treated by introducing a treatment system or other mitigation measure and serious water pollution is not predicted.</b></p> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- All the wastewater will be properly treated by the general waste water treatment station with capacity of 50m<sup>3</sup>/hour to meet the industry wastewater standard before discharge to environment (EIA 4.3.3, p141-147).</li> <li>- Drain system will be introduced to gather rain water and prevent overflow (EIA 3.4.3.6, p129).</li> <li>- Prepare and implement “Operation Phase Spill Control Plan (SPC)” to cope with the light oil leakage.</li> </ul>																																																							
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<p>(a) Are wastes, (such as waste oils, and waste chemical agents), coal ash, and by-product gypsum from flue gas desulfurization generated by the power plant operations properly treated and disposed of in accordance with the country’s standards?</p>	<p><b>Review: Industrial waste generated from the power plant operation will be correctly collected and treated by authorized treatment business according to the Vietnamese regulation, so no significant environmental impact is predicted.</b></p> <p>[Type and Generating Source of Waste ]</p> <ul style="list-style-type: none"> <li>- Table below shows the type and generating source of waste during operation phase (EIA Table 3.6, p.85-86).</li> </ul> <table border="1"> <thead> <tr> <th></th> <th>Type</th> <th>Generation Source</th> <th>Physical and Chemical Property</th> <th>Generation Amount</th> </tr> </thead> <tbody> <tr> <td>①</td> <td>Domestic waste from power plant</td> <td>Employee of 191people</td> <td>Organic Matter (about 50%), Kitchen Refuse, Paper, Plastic etc</td> <td>152.8 kg/day (0.8kg/person/day)</td> </tr> <tr> <td>②</td> <td>Sludge from waste water treatment facility</td> <td>Septic tank and Activated carbon filtration</td> <td>Organic Matter (E Coli, BOD, COD)</td> <td>1~2m<sup>3</sup>/ day (dry base)</td> </tr> <tr> <td>③</td> <td>Waste that chemical substances are attached with</td> <td>Washing/rinsing of the equipment and handling of the chlorine and chemical substances</td> <td>Chemical Substance, Chlorine etc</td> <td>Unknown, but it will be very little.</td> </tr> <tr> <td>④</td> <td>Waste from office</td> <td>Employee of about 50 people</td> <td>Paper, Plastic, Other</td> <td>40 kg/day (0.8kg/person/day)</td> </tr> <tr> <td>⑤</td> <td>Waste collected by cleaning activity</td> <td>Cleaning inside the power plant complex</td> <td>Paper, Plastic, Grass etc</td> <td>Unknown, but it will be very little.</td> </tr> <tr> <td>⑥</td> <td>Waste collected by intake of water</td> <td>Screen installed at the intake point</td> <td>Grass, Paper, Plastic, Dead Fish etc</td> <td>Unknown, but it will be very little.</td> </tr> <tr> <td>⑦</td> <td>Oily sedimentation</td> <td>Oil separation tank, washing/rinsing and maintenance of the equipment</td> <td>Oil</td> <td>Unknown, but it will be very little.</td> </tr> </tbody> </table> <p>[Segregation]</p> <ul style="list-style-type: none"> <li>- As for the waste of ①, ④, ⑤ and ⑥, power plant employees segregate domestic waste and hazardous waste (battery and used fluorescent light), and dispose them into waste receptacles.</li> <li>- As for the waste of ②, sludge from the domestic waste water treatment facility is handled as domestic waste, and the sludge from general waste water treatment facility is handled as hazardous waste.</li> <li>- As for the waste of ③ and ⑦, the waste are already segregated from other waste, so that handled as hazardous waste.</li> <li>- As mentioned above, domestic waste and hazardous waste are segregated properly and disposed by a licensed company.</li> </ul> <p>[Disposal Method]</p> <ul style="list-style-type: none"> <li>- Waste type and disposal method in operation phase are as follows (2nd field survey, Confirmed with CTPP on 20120321)</li> <li>- A waste disposal services is selected by bid for every waste type every year. Selected services contracts out for the waste disposal in the whole O Mon Power Complex (2nd field survey).</li> </ul> <table border="1"> <thead> <tr> <th>Category</th> <th>Waste Type</th> <th>Disposal Method</th> </tr> </thead> <tbody> <tr> <td rowspan="2">General Waste</td> <td>Kitchen Waste, Paper etc</td> <td>Collected and delivered to the final disposal site by Urban Facilities Enterprise (①, ④, ⑤, ⑥)</td> </tr> <tr> <td>Sewage Sludge</td> <td>Appropriate sanitation and waste collection facilities shall be equipped for collecting regularly. Disposed at a final disposal site by an licensed company after sewage sludge being fully treated by natural microbiological condition or by microbiological chemicals. 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2 Mitigation Measures

Main Check Items		Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)	
2 Mitigation Measures	<b>(4) Noise and Vibration</b>		
	(a) Do noise and vibrations generated by the power plant operations comply with the country's ambient standards, and occupational health and safety standards?	<b>Review: Mitigation measures for noise will be conducted. In addition, the residential area is located distant from the project site, and the impact of noise will be insignificant.</b> [ Prediction and review ] - Noise from the turbine, motor and fan will reach 80-90dBA. According to the similar case (Phu My 3 power plant), noise can be decreased to 75dBA or less near the boundary fence by an appropriate noise-controlling measure. In this project, gas turbines will be put within the building equipped with insulation cover, and low-noise pumps will be introduced. Thus, noise level at 100m from noise generation source will be kept to 60 dBA (EIA 3.4.3.2, p114, 4.3.5, p148). - The noise source of O Mon 3 is located more than 300m from the residential area (EIA 3.4.3.2, p114) and the noise level will be decreased to 50dBA, causing very little impact.	
	<b>(5) Subsidence</b>		
	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	<b>Review: There is no possibility that land subsidence may arise.</b> [ Prediction ] - River water from Hau River will be taken to use as domestic water during operation (Fact Finding Mission), and ground water will not be used during operation phase; therefore, land subsidence is not expected.	
3 Natural Environment	<b>(6) Odor</b>		
	(a) Are there any odor sources? Are adequate odor control measures taken?	<b>Review: Odor source is ammonia, but O Mon 3 power plant will not install de-nitrification equipment, which uses ammonia.</b> [ Design ] - Gas turbine applies the low-NOx combustion technology. Generation of NOx from gas-fired plant will be below the air emission standard. Also, NOx generation will be reduced by water injection even when operating by DO fired in the emergency case. Therefore, O Mon 3 power plant will not install de-nitrification equipment in which ammonia, the source of odor, will be used (1st field survey).	
	<b>(1) Protected Areas</b>		
	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	<b>Review: The closest protected area from O Mon Power Complex is 40km away, and the adverse effect of the project is not assumed to reach there.</b> [ Current status ] - There are no protected areas or special use forests in O Mon district. The closest protected area to the site is at the Ngoc Hoang valley, 40 km southeast of the site (O Mon 4 EIA 4.A.1.e, p.56). - No impact on the water quality is expected, since Ngoc Hoang valley is not located at any basin of Hau River - Ground concentration of the pollutants will become one tenth of the maximum ground concentration at the distance of 10km from the O Mon Power Complex. Ground concentration of the pollutants will be much lower at the distance of 40km from the O Mon Power Complex. Thus, the impact will not be significant at all.	
3 Natural Environment	<b>(2) Ecosystem and biota</b>		
	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	<b>Review: The O Mon Power Complex does not encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats).</b> [ Current status ] - The flora in the project site is a mixture of many types of biosystems. The biosystems of perennial fruit trees, in which dominant species are special product plants such as orange, lemon and coconut. The biota of flooding area, in which <i>Sonneratia Caeseonilis</i> is dominant, is developing alongside the Hau River. <i>Sonneratia Caeseonilis</i> is big wood tree, forming a coastline defensive belt together other species such as water Hyacinth and wild pineapple, etc. They reduce the pressure of wave on the banks (O Mon 1 EIA 3.3.1, p.43). - Due to the agricultural activities of the local people, the vegetation of the O Mon Power Complex was the mixture of wild flora and agricultural plants prior to the land acquisition around 2004 (EIA 2.4.1, p.57). - The project site has been cleared and leveled (as of December, 2011) (1st field survey).	
	(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (1/2)	<b>Review: One vulnerable plant species listed in the international regulations or convention is observed in and around the project site, but it is a cultured species and has no specific environmental value. Some valuable fish species are also found in the area, but, as explained later, the impact of the thermal waste water is insignificant. The water pollution mitigation measure will be taken as well, and the serious effect of the project is not predicted.</b> [ Current status ] - There grows mangrove species, such as <i>Sonneratia</i> , in the flooding soil ecosystem along Hau River (EIA 4.15, p.134), but it has not grown in and around the O Mon Power Complex (2nd field survey). - Takian trees, IUCN (International Union for Conservation of Nature and Natural Resources) Red Listed, VU-listed (vulnerable) plant species, are observed in and around the O Mon Power Complex. But they are all cultivated and do not form a part of natural ecosystem, and they are very rare (O Mon 4 4.A.1.d, p.55-56). - Four VU (vulnerable) -listed fish species and Two T(Threatened)-listed species are observed in the rivers around the O Mon Power Complex. Also, One EN(Endangered)-listed (CR in IUCN) species and Two VU species (EN or VU in IUCN) are observed in the larger area of Hau River (O Mon 4 EIA 4.A.2.b.v, p.67).	

Main Check Items	Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)
(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (1/2)	<p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- Numbers of precious fish species are observed within the project area. Fish are sensitive to water quality degradation and implementation of mitigation measure against water pollution is essential (1st field survey).</li> </ul>
(c) If significant ecological impacts are anticipated, are adequate environmental protection measures taken to reduce the impacts on ecosystem?	<p><b>Review: The agricultural land in Phuoc Thoi ward and Thoi An ward where O Mon Complex will be constructed has the total area of 3,200ha, of which 95.5ha has been altered for the construction of O Mon power complex (26.6ha for O Mon 3). The altered area accounts for a very small area of the total farm, and consequently, the environmental impact is very limited.</b></p> <p>[ Current status ]</p> <ul style="list-style-type: none"> <li>- Due to the agricultural activities of the local people, the vegetation of the O Mon Power Complex was the mixture of wild flora and agricultural plants prior to the land acquisition around 2004 (EIA 2.4.1, p.57).</li> <li>- The project site has been cleared and leveled (as of December, 2011) (1st field survey).</li> </ul>
(d) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	<p><b>Review: The main spawning and nursery area for fish is located on the Hau River bank opposite of the O Mon power complex. As the river water is abundant in wet season which is a high season for fish spawning and nursing, the impact of water intake will be insignificant. Other mitigation measures will be taken such as installation of a screen and lowering of the water intake rate, and the environmental impact of water intake will be insignificant.</b></p> <p>[ Prediction ]</p> <ul style="list-style-type: none"> <li>- Since the main spawning and nursery area for fish is located on the Hau River bank opposite of the O Mon power complex, the impact of thermal effluent will be insignificant (O Mon 4 EIA 4.C.c.3, p.121). The season for breeding and growing of fry fish is primarily in rainy season (May to July) with abundant river flow, suction of young fish will be insignificant (EIA 3.4.3.3, p.115).</li> <li>- The abundance of fish larvae and eggs are highest during wet season when the area affected by discharge of cooling water should be insignificant (O Mon 4 EIA 4.C.c.3, p.121).</li> </ul> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- In order to reduce suction of young fish and prawns with cooling water intake, intake water velocity is as slow as possible (less than 0.2m/sec) (F/S, p.10-7).</li> <li>- In order to prevent suction of young fish and prawns with cooling water, movable trash rack will be installed. The system, which is successfully functioning in some power plants, consists of small cells of 1cm×1cm, preventing small organisms from entering the cooling pump. The trash rack is periodically withdrawn and washed with water from front and back (EIA 4.3.1.1, p.138).</li> </ul>
(e) Is there a possibility that discharge of thermal effluents, intake of a large volume of cooling water or discharge of leachates will adversely affect the ecosystem of surrounding water areas? (1/2)	<p><b>Review: Thermal effluent diffuses on a surface layer and will not affect the benthic fish and animals. In the operation phase of all of the power plants in O Mon power complex, thermal water extends 2km upstream, 1.5km downstream, and 600m toward river center, and thermal water will not reach the main spawning and nursery area for fish located on the opposite bank even in dry season. Moreover, as the river water is abundant in wet season which is a high season for fish spawning and nursing, the impact of water intake will be insignificant. Waste water will be appropriately treated by introducing a treatment system or other mitigation measure and serious water pollution is not predicted.</b></p> <p>[ Prediction ]</p> <ul style="list-style-type: none"> <li>- Since the diffusion extent of the thermal effluent is limited and the abundance of phyto- and zoo- plankton is rich, the impact to phyto- and zoo- plankton due to cooling water intake and thermal effluent diffusion is not significant (O Mon 4 EIA 4.C.c.3, p.120-121).</li> <li>- No increase in the abundance of toxic blue green algae is expected because a temperature exceeding 30 oC is unfavorable for these organisms. Since the thermal effluent diffuses the surface layer, benthos lived on the bottom of the river not affected by the thermal effluent (O Mon 4 EIA 4.C.c.3, p.121).</li> <li>- The abundance of fish larvae and eggs are highest during wet season when the area affected by discharge of cooling water should be insignificant. In addition, juvenile and adult fishes have the ability to swim away from the heated water (O Mon 4 EIA 4.C.c.3, p.121).</li> <li>- Migration fish mainly occurs in the rainy season. Since main spawning and nursery area is the northern side of the Hau River (opposite side of the O Mon Power Complex) without the influence of thermal wastewater, the impact of the thermal effluent is not significant (O Mon 4 EIA 4.C.c.3, p.121)</li> <li>- There is only a maximum decrease of 0.54 mg/L in content of dissolved oxygen, and such area is limited around the outlet of the the cooling water discharge channel. Therefore, the impact of the thermal effluent is not significant (O Mon 4 EIA 4.C.c.3, p.121)</li> <li>- Chlorine will be added to cooling water to prevent the biofouling. Chlorine inject into intake water in front of bar screens. Its concentration is 4 mg/L. The chlorine effluent after the condenser is less than 1.0 mg/L which is the waste water standards of Vietnam. Although O Mon 1-A has same chlorine dosing system, the concentration of chlorine is less than 1.0 mg/L at the discharge channel. Moreover, chlorine decreases while flowing through the discharge channel. No residual chlorine was detected by the monthly water monitoring survey at the water outlet on Hau River at O Mon 1-A (2nd field survey).</li> </ul> <p>[ Mitigation measure ]</p> <ul style="list-style-type: none"> <li>- The discharge channel is 2 km long (open ditch; around 1 km). Thermal effluent takes around 2 hours and a half before thermal effluent comes out to Howe River because the flow velocity of the thermal effluent is 0.2 m/sec or less (18m<sup>3</sup>/sec/ (26.6m*4m)). Thereby, the heat of thermal effluent radiates heat to the atmosphere, and the thermal effluent goes down about 1 °C (EIA 4.3.2.1, p138, EIA 4.3.2.2, p139).</li> </ul>



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<p><b>(1) Resettlement</b></p> <p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? <b>(1/2)</b></p> <p>(b) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? <b>(1/2)</b></p>	<p><b>Review: O Mon Power Complex, where O Mon 3 will be constructed, was selected as the project site in consideration that the potential number of inhabitants to be resettled is less than other location, in addition to topographic reason. The minimization of the affected people is given sufficient consideration in this manner, as well as the appropriate compensation for land, house, trees and crops.</b></p> <p>[ Plan ]</p> <ul style="list-style-type: none"> <li>- The development plan of O Mon Power Complex has been planned in 1996, and the starting of operation of O Mon 1 and 2 power plants (1,200MW in total) and the development of transmission and transformation facility was planned in the Master Plan No.5 (2nd field survey). The land acquisition for O Mon 1 and 2 power plants was conducted as a consequence. The land acquisition for O Mon 1, O Mon 2 and the related facilities (access road No.1 and discharge channel No.1) has been started in November 1999, affects 112 households and 1 company, with the scope of 47.7ha, and has been completed on June 29, 2000 (PPTA-4845 SIA 5.1, p.22).</li> <li>- The approval of the master plan for O Mon Power Complex by the Ministry of Industry (Decision No.2523/ QD/ NLDK) was dated on 27th September 2004 (PPTA-4845 SIA 5, p.22-25). The progress of land acquisition is shown on Appendix Table-2.</li> <li>- The site for O Mon Power Complex was selected for the reason that, in addition to topographical reason, not being located close to any sensitive environmental receptors (communities, hospitals, schools, etc), no physical cultural resources exist on site, relatively small number of resettled people and socioeconomic impacts (O Mon 4 EIA 5.G, p.100-101). The project site is selected to minimize the number of resettled inhabitants.</li> <li>- Figure 4 shows the layout of the site prepared for O Mon 3. Compensation to the land acquisition for O Mon 3 was conducted based on this site layout (3rd filed survey).</li> <li>- The tables below shows the area size of the land by category, the number of structures, affected households and people in the site prepared for O Mon 3 (Fact Finding Mission).</li> </ul> <p style="text-align: center;">(Unit; m<sup>2</sup>)</p> <table border="1"> <thead> <tr> <th>Land</th> <th>Size</th> </tr> </thead> <tbody> <tr><td>Agriculture</td><td>132,145.30</td></tr> <tr><td>Garden/Perennial tree land</td><td>90,052.90</td></tr> <tr><td>Fish pond</td><td>3,601.50</td></tr> <tr><td>Forest/woodland</td><td>0</td></tr> <tr><td>Residential</td><td>7,660.50</td></tr> <tr><td>Non-agricultural</td><td>0</td></tr> <tr><td>Burial Land (Cemetery)</td><td>1,237.70</td></tr> <tr><td>Land for transportation</td><td>4,405.50</td></tr> <tr><td>Others</td><td>17,379.20</td></tr> <tr><td>Total</td><td>256,482.60</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Structure</th> <th>Number</th> </tr> </thead> <tbody> <tr><td>Residential land</td><td></td></tr> <tr><td>Legal structure</td><td>134</td></tr> <tr><td>Illegal structure</td><td>0</td></tr> <tr><td>Agriculture</td><td></td></tr> <tr><td>Legal structure</td><td>0</td></tr> <tr><td>Illegal structure</td><td>18</td></tr> <tr><td>Public land</td><td></td></tr> <tr><td>Legal structure</td><td>0</td></tr> <tr><td>Illegal structure</td><td>0</td></tr> <tr><td>Total</td><td>152</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Item</th> <th>N. of HH's (No. of people)</th> </tr> </thead> <tbody> <tr><td>Affected households and people</td><td>128 (511)</td></tr> <tr><td>Legal households (people)</td><td>110 (468)</td></tr> <tr><td>Illegal households (people)</td><td>18 ( 43)</td></tr> <tr><td>Relocating households and people</td><td>50 (231)</td></tr> <tr><td>Cash compensation</td><td>45</td></tr> <tr><td>Land compensation</td><td>5</td></tr> </tbody> </table> <p>[ Compensation ]</p> <ul style="list-style-type: none"> <li>- According to Decree No.147/ 2004/ ND-CP stipulating the basic policy of land acquisition, the compensation includes land, house, temporarily- affected property, trees and crops.</li> <li>- Based on the Decree, the Can Tho City People's Committee established a Decision stipulating resettlement, compensation and allowance for land expropriation within Can Tho City (Decision No.53/ 2005/ QD-UB) (RRP 8.1.1, p.44-46)</li> <li>- Of the 100 land sections acquired by Can Tho Education Union Project to Phuoc Thoi Ward in 2009, CTPP has obtained 30 sections. 5 households out of 50 to be relocated wished to move there, and CTPP acquired "Land Use Certificate" from Can Tho City's People's Committee and provided to them. Currently, the resettlement land is still farm land, as the landowner is also subject for compensation of the O Mon project. The elementary school is located in 500m, a hospital 3km from the resettlement area (Appended Figure-4, Photos) (Confirmed by Fact Finding Mission).</li> <li>- With regard to compensation for the building materials of the structures, transmission line and other electrical facilities such as electric meter attached to the residential house are the assets of the transmission company, not the individual resident. Therefore, those are not subject to compensation. As the relocated residents resettled in the resettlement area and have a contract on purchase of electricity with the transmission company, transmission company is responsible for installing transmission line and other electrical facility including electric meter, following with the Electricity Law. Regarding water service, water company is also responsible for constructing and installing water pipeline upon the contract on purchase of water (2nd field survey)</li> </ul> <p><b>Review: Public consultations were held prior to the start of land acquisition and cutoff date was settled. The public hearing has been held several times thereafter to collect local people's opinion and concern, and we believe that the scope of compensation is well understood by them.</b></p> <ul style="list-style-type: none"> <li>- The compensation in Vietnam has four options such as "land to land", "partly land and partly money", "money only", and "money and job training", the choice of which is left to the affected people. In the compensation procedure, the People's Committee of the district level takes charge of negotiation with the affected people. The compensation plan should be corrected until compensation condition comes to an agreement. The compensation price for land and others are determined by province-level People's Committee (1st field survey).</li> <li>- Additional information on plans to extend the O Mon Thermal Power Complex was given to the inhabitants of the area in two meetings held on 23 and 26/ December/ 2005. The basis for calling these meetings was the decision No.4066/ QD-UBND dated 8/ December/ 2005 by the People's Committee of Can Tho City, the meeting were announced in the press and through the People's Committees of Thoi An and PhuocThoi wards. The meetings were primarily focused on resettlement and compensation issues (O Mon 4 EIA 7.B, p.147, RRP Table 13, p.30, 6.1, p.39).</li> </ul>	Land	Size	Agriculture	132,145.30	Garden/Perennial tree land	90,052.90	Fish pond	3,601.50	Forest/woodland	0	Residential	7,660.50	Non-agricultural	0	Burial Land (Cemetery)	1,237.70	Land for transportation	4,405.50	Others	17,379.20	Total	256,482.60	Structure	Number	Residential land		Legal structure	134	Illegal structure	0	Agriculture		Legal structure	0	Illegal structure	18	Public land		Legal structure	0	Illegal structure	0	Total	152	Item	N. of HH's (No. of people)	Affected households and people	128 (511)	Legal households (people)	110 (468)	Illegal households (people)	18 ( 43)	Relocating households and people	50 (231)	Cash compensation	45	Land compensation	5
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4 Social Environment

Main Check Items	Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)																																	
(b) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? (2/2)	<table border="1"> <thead> <tr> <th>Date</th> <th>Venue</th> <th>Participants</th> </tr> </thead> <tbody> <tr> <td>23/ December/ 2005; 2:00 PM</td> <td>Loi Villege, Phoc Thoi ward</td> <td>Unknown, numerous</td> </tr> <tr> <td>26/ December/, 2005; 8:00 AM</td> <td>Loi Villege, Phoc Thoi ward</td> <td>Unknown, numerous</td> </tr> </tbody> </table> <p>           - Summary of key articles from Decision No.4066/ QD-UBND is as follows (O Mon 4 EIA 7.B, p.145).            Article 1: Agree to plan the area of 99 ha for construction investment O Mon Power Complex, Can Tho City. Land position shown in Map No.3 of Thoi An Ward, and Map No.7, 8 of Phuoc Thoi Ward            Article 2: TPPMU3, owned by EVN, has to contact PC of O Mon and related Departments for carrying out compensation, ground clearance and resettlement for land users as stipulated.            - The meeting on 23/ December/ 2005 was the effective cut-off date for compensation for property legally entitled to compensation. This was also the opinion of the affected people, confirmed though interviews (RRP 4.1, p.29). However, the structures built after July 1<sup>st</sup>, 2004 was recognized as illegal according to Construction Law and became not eligible for compensation. Consequently, the actual cut-off date was July 1<sup>st</sup>, 2004 (Confirmed by Fact Finding Mission).            - Following the public meeting in December 2005, public consultations were held as described below for the local people and stakeholders as a part of "PTA:Project Preparation Technical Assistance" by ADB (RRP 6.2, p.39)         </p> <table border="1"> <thead> <tr> <th>Date</th> <th>Object person</th> <th>Venue</th> <th>Participants</th> </tr> </thead> <tbody> <tr> <td>21/ July/ 2007</td> <td>Affected peoples</td> <td>Thoi An ward</td> <td>130</td> </tr> <tr> <td>22/ July/ 2007</td> <td>Affected peoples</td> <td>Phoc Thoi ward</td> <td>232</td> </tr> <tr> <td>14/ September/ 2007</td> <td>Organizations and institutions (Stakeholder)</td> <td>Can Tho City</td> <td>40</td> </tr> <tr> <td>8/ October/ 2007</td> <td>Can Tho people's committee</td> <td>Can Tho City</td> <td>10</td> </tr> <tr> <td>4/ January/ 2008</td> <td>Stakeholder</td> <td>O Mon district people's committee</td> <td>14</td> </tr> </tbody> </table> <p>           - At the meeting in July 2007, several representatives of the affected people felt poorly treated by lack of compensation for houses that were built on farm land in violation of the construction law of 2004. There was also concern that information dissemination and participation by the affected people have been inadequate, and that there are complaints against the fairness, transparency and speed of the process (RRP 6.2, p.39-40).            - At the meeting with People's Committee of Can Tho on 8th October 2007, request of certain modifications regarding the resettlement process was made as observed by Vattenfall Power Consultant (VPC). On 9/ January/ 2008, and VPC sent a letter (follow up) to Can Tho people's committee on the next day (RRP 6.2, p.39-40).            - At the stakeholder workshop in O Mon on 4th January 2008, the main issues discussed were related to the capacity, proficiency and usefulness of vocational training for income restoration. At the meeting, some issues were raised (RRP 6.2, p.40);            * Farmer's Union: Young people do not want to continue farming. They need training to find other jobs, but training has to be organized near their place of stay. The main issue is what a useful training is. Job consultancy is necessary on an individual basis.            * Women's Union and Youth union have organized vocational classes especially for people in working age. They are ready to gather affected people for careers consultancy.            * Vocational training center of O Mon is directly under O Mon Domestic Affairs. It is funded by DOLISA to hold classes at wards. According to DOLISA's policy, they provide students with a tool set after graduating course instead of daily allowance.            * O Mon domestic affairs have previously planned courses, but there have been problems in raising funds to meet the costs of courses.            * There are 4 classes in Thoi An majoring in home electricity and sewing-machine consisting of 20 participants per class for the duration of 2 months with the cost of 48 - 50 million VND/class. In order for participants to perform well, prequalification classes are required in some cases. So, ADB (or the project owner) should support for organizing advance classes. With 80 persons eligible for training, this means for 4 classes, local government offer 200 million VND for basic knowledge. The remaining 300 MVND need to be supported for advanced level.            * The type of training that can be given includes: Seamstress, Diesel engine maintenance, Motorbike repair, Construction, Electrician, and Electronics. Motorbike repair trainees are given a toolbox at a value of 10 million VND in order to start their own business.            * There is a need for small loans especially to women for starting small business. But there is a problem with collateral.            - As mentioned, public consultation has been held several times, and it can be said that compensation policy and plan are fully informed to the residents (RRP Annex 4, p.79-80).            - Since establishing of the O Mon District in 2004, vocational training has been focused as one of solutions for employment creating, hunger erasing and poverty reducing. Three courses of the vocational training were opened in 2004, and expanded to 19 courses in 2008 (RRP Annex 4, p.79-80).         </p>	Date	Venue	Participants	23/ December/ 2005; 2:00 PM	Loi Villege, Phoc Thoi ward	Unknown, numerous	26/ December/, 2005; 8:00 AM	Loi Villege, Phoc Thoi ward	Unknown, numerous	Date	Object person	Venue	Participants	21/ July/ 2007	Affected peoples	Thoi An ward	130	22/ July/ 2007	Affected peoples	Phoc Thoi ward	232	14/ September/ 2007	Organizations and institutions (Stakeholder)	Can Tho City	40	8/ October/ 2007	Can Tho people's committee	Can Tho City	10	4/ January/ 2008	Stakeholder	O Mon district people's committee	14
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Main Check Items	Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)
<p>(c) Is the resettlement plan, including compensation by the replacement cost, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?</p>	<p><b>Review: Land acquisition was initially conducted following with the Vietnamese regulation, and compensation price was also determined following with the Vietnamese regulations. And later, based on the land price survey of the O Mon area by ADB, it became clear that it is possible with the compensation fee to purchase an equal grade of land with equal or even larger area than the former land. Also, there were not any grievances from the residents regarding the compensation price for land. Consequently, it is determined that the “replacement cost” is satisfied. Additionally, most of the relocated households have bigger size of the structure area than the ones before resettlement, and even the rest of the relocated households have better grade of the structures than the ones before resettlement. Therefore, the compensation price for structure is appropriate.</b></p> <p>[ Survey ]</p> <ul style="list-style-type: none"> <li>- After the DCC establishment in March 2006, the evaluation team of the compensation committee set about assessing the land and property in the O Mon Power Complex. This process was very detailed, with each plot of land, each house and construction, and all crops and trees determined and evaluated (PPTA 4845 SIA 5.1.2, p.24-25).</li> <li>- In June 2007, during the process of land acquisition, socio-economical survey was conducted by Vattenfall Power Consultant for 105 households (the results shown in Appended Table-3(1)) (RRP 3.3, p.21).</li> <li>- The current resettlement due diligence study was conducted in 2010. The interview included questionnaire on current income, livelihood, assets other than house, housing area, water supply and sewage system, sanitation, and change in fuel in comparison with 2005. The survey sample represented 24% of the DP population. A total of 145 DP households were interviewed (the results shown in Appended Table-3(2)) (RDDR, p.24-30).</li> <li>- According to the survey in 2010, the resettled households tend to purchase paddy land much larger than their former land. One reason is they purchase the replacement land away from the project area, the other reason is that orchard and garden land was valued much higher so that these are replace by paddy land (RDDR, p.17).</li> </ul> <p>[ Compensation ]</p> <ul style="list-style-type: none"> <li>- Price for land compensation is based on Decision No.104/2005/QD-UBND dated December 23, 2005 issued by Can Tho City People’s Committee, price for structures and crops is based on Decision No.53/2005/QD.UB (RDDR, p.16).</li> </ul> <p>&lt; Cash compensation &gt;</p> <ul style="list-style-type: none"> <li>- The contents of cash allowance are shown in Appended Table-4(1) (RDDR, p.16, RRP 12.1, p.59-61).</li> </ul> <p>&lt; Household rehabilitation &gt;</p> <ul style="list-style-type: none"> <li>- According to the government regulation, (1) informal business, and (2) workers having no labor contract shall not be eligible for compensation or support. No workers corresponded to (1) informal business workers, but those working in the brick kiln have no labor contract and are not eligible for compensation. Those brick kiln employees (7 households, RDDR Table 22, p.56) will be given priority in employment in construction site or in the power plant (RDDR, p.49).</li> <li>- Some vocational training courses for rehabilitation of livelihood are established. The courses which were conducted and planned in 2007 and 2008 are shown in Appended Table-4(2) (RRP 12.1, p.59-61).</li> </ul> <p>&lt;Compensation to fisherfolks&gt;</p> <ul style="list-style-type: none"> <li>- There were 11 fisherfolks around the O Mon Power Complex. All of them have built the new houses by their own compensation or shared from parent’s compensation. In the future, when the fishery gets affected by power plant, they hope to receive loan to buy the boat for trading service (RRP 11, p.57)</li> </ul> <p>&lt;Compensation price&gt;</p> <ul style="list-style-type: none"> <li>- ADB, when preparing RAP, determines the compensation price (i.e. replacement price) based on the market price. However, in the due diligence step after the affected inhabitants have resettled, the basic compensation policy should focus on “assuring a living standard equal or even better than before resettlement for relocated people”, and the interview survey was conducted to collect data on the change in living and livelihood standard from as many relocated people as possible. The result shows that most of the relocated people think the standard of their life and livelihood is “equal to the life standard before relocation” or “even better than the former life level” (Appended Table 2(2)) (2nd field survey).</li> <li>- The land price survey was also conducted by ADB around O Mon district, and it became clear that it is possible with the compensation payment to purchase an equal grade of land with equal or even larger area than the former land. Consequently, it is determined that the compensation payment satisfies the “replacement cost” (2nd field survey).</li> <li>- In addition, there were not any grievances regarding the compensation price for the land prepared for O Mon 3. Therefore, it is concluded that compensation price for land is appropriate.</li> <li>- As for structure, 95% of the relocated households have bigger size of the structure area than the ones before resettlement, and even the remaining 5% of the relocated households have better grade of the structures than the ones before resettlement (see Appended Table 3(2) of the check list). Therefore, the compensation price for structure is appropriate.</li> </ul>
<p>(d) Is payment of compensation made prior to resettlement?</p>	<p><b>Review: Compensation payment for land was done prior to the transfer of the land.</b></p> <ul style="list-style-type: none"> <li>- At the time of land transfer, the certificate of land transfer should be signed in the attendance of the person to be resettled, the project owner, land use right registration office, and the People’s Committee. The land use right transfer certificate for O Mon 3 was verified and it was confirmed that payments were conducted prior to land transfer.</li> </ul>

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<p>(e) Is the compensation plan formulated in documents? (1/2)</p>	<p><b>Review: The compensation policy is regulated under the related law, and the content of the compensation is specified in the Decisions.</b></p> <p>- The Table below shows the legal documents concerning the land acquisition and compensation for O Mon Power Complex.</p> <table border="1"> <thead> <tr> <th>Laws/Regulations</th> <th>Issued Date</th> <th>Contents</th> </tr> </thead> <tbody> <tr> <td>Amendment of Land Law (1993)</td> <td>October 15th, 1993</td> <td>Regulates the protection of the Land Use Right Certificate by government as the right of the land user (Article 3-1) as well as regulates the right of the exchange, transfer, lease and succession of the Land Use Right Certificate</td> </tr> <tr> <td>Amendment of Land Law and Construction Law (2004)</td> <td>July 1st, 2004</td> <td>Regulates the requirement of changing the land use category from “farm land” to “residential land” if building structures on farm lands(RRP, p.31).</td> </tr> <tr> <td>Decree No.197/2004/ND-CP</td> <td>December 3rd, 2004</td> <td>Regulates resettlement and compensation to the land acquisition for public.</td> </tr> <tr> <td>Decision No.53/2005/QĐ-UB (People’s Committee of Can Tho City)</td> <td>August 11th, 2005</td> <td>Regulates the details of compensation price for structure and crop, based on Decree No. 197.</td> </tr> <tr> <td>Decision No.104/2005/QĐ-UBND (People’s Committee of Can Tho City)</td> <td>December 23rd, 2005</td> <td>A decision of the unit price for land, which is a basis for compensation price for land</td> </tr> <tr> <td>Official letter No.02/2008/VPUB-QH (People’s Committee of Can Tho City)</td> <td>January 2nd, 2008</td> <td>A decision for providing cash assistance to settlers on state land who had settled before 1 July 2004 (65 MVND in cash or plot of land in the resettlement areas) was taken.</td> </tr> </tbody> </table> <p>- The compensation plan of O Mon 3, O Mon 4 and related facilities was sequentially approved by Can Tho City People’s Committee (approval was segmented 19 times: 4 times for O Mon 3 from 4 April 2006 to 14 August 2006, Appended Table-5).</p> <p>- According to the amended Land Law in 1993, people who settled before Oct 15, 1993, have received compensation for the land as well as for the house. Households who have settled on river bank before 15 October 1993 without land use right certificate (LURC) are considered as illegal and not eligible for compensation for both land and house(RRP 4.2, p.31).</p> <p>- In this manner, the initial condition for compensation was whether household had settled before or after 15 October, 1993. As per Official letter No.02/2008/VPUB-QH issued by PC Can Tho, a decision for providing cash assistance to settlers on state land who had settled before 1 July 2004 (65 MVND in cash or plot of land in the resettlement areas) was taken (Confirmed by Fact Finding Mission). Additionally, people who had settled illegally on river bank were not eligible for compensation (RRP Table 25, p.44-46), but those people became eligible for compensation for their lands and structures (Fact Finding Mission).</p> <p>- According to the revision of Land Law and Construction Law on 2003, building a house on a land registered as farm land is prohibited since July 1<sup>st</sup>, 2004, and if one wishes to build a house, farm land should be re-registered as residential land upon payment of a fee. In case of O Mon Power Complex, re-registration was permitted until the cut-off date (23 December, 2005) (RRP 4.2, p.31). Therefore, the structures on the farm lands were not eligible for compensation. However, those structures became eligible for compensation if the residents make a late payment of the tax that was needed to be paid for the land registered as residential land. The Table 5.6-7 shows the eligibility of compensation of land and structures.</p> <p>- The table below shows eligibility of compensation of land and structure.</p> <table border="1"> <thead> <tr> <th rowspan="2">Items</th> <th colspan="2">Agricultural Land</th> <th colspan="2">Residential Land</th> <th rowspan="2">River Bank</th> </tr> <tr> <th>With LURC (or in the process of acquiring LURC)</th> <th>No LURC</th> <th>With LURC (or in the process of acquiring LURC)</th> <th>No LURC</th> </tr> </thead> <tbody> <tr> <td colspan="6"><b>Before 1,July 2004</b></td> </tr> <tr> <td>LAND</td> <td>O</td> <td>*</td> <td>O</td> <td>*</td> <td>O</td> </tr> <tr> <td>STRUCTURE</td> <td>Δ</td> <td>\$</td> <td>O</td> <td>\$</td> <td>O</td> </tr> <tr> <td colspan="6"><b>After 1,July 2004</b></td> </tr> <tr> <td>LAND</td> <td>-</td> <td>X</td> <td>-</td> <td>X</td> <td>X</td> </tr> <tr> <td>STRUCTURE</td> <td>-</td> <td>X</td> <td>-</td> <td>X</td> <td>X</td> </tr> </tbody> </table> <p>Note: 1. "LURC" means "Land Use Right Certificate (i.e. Red Book)". According to ADB, no residents applied for the acquisition of LURC after July 1<sup>st</sup>, 2004 (RRP 8.3, p.48-49).                  2. "O" indicates Eligible                  3. "X" indicates Not Eligible                  4. "*" indicates Not Eligible, but eligible for receiving resettlement benefit (65 MVND in cash or plot of land in the resettlement areas).                  5. "Δ" indicates that see Appended Table 3(2) of the check list make a late payment of the tax that was needed to be paid for the land registered as residential land.                  6. "\$" indicates eligible for cash compensation of VND 15,000,000 as resettlement benefit.</p> <p>- According to ADB, people, who learned the case of Tra Noc Industrial Complex located nearby, built simple houses within one night in order to receive compensation for the houses (RRP, p.31).</p> <p>- There were 78 grievances from the local residents regarding the land prepared for O Mon 3, of which 62 were the grievances about the structures. Out of the 62 grievances about the structures, 12 of them were approved, and 50 of them were not approved. It is unknown when the structures of which the grievances were approved was built; however, all the structures of which the grievances were not approved, were built in the year of 2005. This shows that there were many structures built just for compensation, as ADB pointed out.</p> <p>- For this reason, the structures built after July 1<sup>st</sup>, 2004 was considered illegal according to Construction Law, and became not eligible for compensation.</p>	Laws/Regulations	Issued Date	Contents	Amendment of Land Law (1993)	October 15th, 1993	Regulates the protection of the Land Use Right Certificate by government as the right of the land user (Article 3-1) as well as regulates the right of the exchange, transfer, lease and succession of the Land Use Right Certificate	Amendment of Land Law and Construction Law (2004)	July 1st, 2004	Regulates the requirement of changing the land use category from “farm land” to “residential land” if building structures on farm lands(RRP, p.31).	Decree No.197/2004/ND-CP	December 3rd, 2004	Regulates resettlement and compensation to the land acquisition for public.	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4 Social Environment



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<b>4 Social Environment</b>	(f) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?	<p><b>Review: Vulnerable households are appropriately taken care of, including provision of additional support.</b></p> <ul style="list-style-type: none"> <li>- Vulnerable people are defined as people who might suffer disproportionately or face the risk of being further marginalized by the effects of resettlement and specifically include: (i) female headed households with dependents, (ii) disabled household heads, (iii) households falling under the generally accepted indicator for poverty, (iv) children and the elderly households who are landless and with no other means of support, and (v) landless households, (vi) indigenous people or ethnic minorities . 8 vulnerable households inhabit the O Mon 3 site and are affected by land acquisition, of which 4 households are “(iii) poor households, 2 are “(iv) children and elderly households”, and 2 are “(v) landless households” (RRP 4.5, p.33).</li> <li>- The total number of poor or unemployed vulnerable households in O Mon Power Complex was 17 in 2010, which decreased from 64 households at the time of survey in 2005. However, the resettlement committee did identify 24 households who are still vulnerable. The 17 or 24 vulnerable households were provided with special support of 15 MVND per household from the project owner (RDDR, p.22 &amp; p.30).</li> <li>- There were two displaced vulnerable households who had moved in to the project area after the cut-off date and set up temporary houses along the river bank. The CTTP used their own funds from their company charity fund to resettle these families in Thoi An Ward giving them secure tenure (but not ownership) of land and houses. Additional two displaced vulnerable households had been provided the assistant of 20,000,000 VND/household by CTTP from their company charity fund to build the permanent house (RDDR, p.21).</li> <li>- Many people appear to have moved away from the immediate area after receiving compensation and not all of the households could be identified. If within 3 months of disclosure of the CAP (Corrective Action Plan) addition vulnerable DPs are identified and requested by the relevant local People’s Committees and referred to the CTTP by the O Mon District People’s Committee then additional assistance will be provided as needed (RDDR, p.22).</li> <li>- Most of the compensated people belong to Kinh group, but some belong to Cham or Khmer troops. As their lifestyle and livelihood are similar to Kinh group, they are not considered as minority groups (1st field survey).</li> </ul>																				
	(g) Are agreements with the affected persons obtained prior to resettlement?	<p><b>Review: The agreement for receiving compensation was achieved prior to land acquisition.</b></p> <ul style="list-style-type: none"> <li>- At the time of land transfer, the certificate of land transfer should be signed in the attendance of the person to be resettled, the project owner, land use right registration office, and the People’s Committee. The land use right transfer certificate for O Mon 3 was verified and it was confirmed that agreements were conducted prior to land transfer.</li> </ul>																				
	(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (1/2)	<p><b>Review: Compensation was conducted by the Compensation committee of O Mon district cooperating with relevant organizations. The amount of compensation was approved and determined by Can Tho City People’s Committee, and all the compensation fund was provided by EVN.</b></p> <ul style="list-style-type: none"> <li>- Actors in the compensation and resettlement process is as follows (RRP Table 26, p.47).</li> <li>- All the compensation fund was provided by EVN.</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Organization</th> <th style="width: 50%;">Responsibilities</th> </tr> </thead> <tbody> <tr> <td>EVN</td> <td> <ul style="list-style-type: none"> <li>• Provide funds for compensation</li> <li>• Participate in the DCC</li> </ul> </td> </tr> <tr> <td>TPPMU3 (The responsibilities are now being taken over by Can Tho Power Company)</td> <td> <ul style="list-style-type: none"> <li>• A subsidiary of EVN.</li> <li>• Delegated by EVN to sit on DCC. 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(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (2/2)	<ul style="list-style-type: none"> <li>- The compensation committee is consisted of 1 chairman, 2 deputy chairmen, 1 permanent commissioner, 11 commissioners and 3 persons invited to represent the Fatherland Front Committee, the Women’s organization and the Famer’s organization (PPTA-4845 SIA 5.1.2, p.24).</li> <li>- The budget relating to land acquisition for O Mon Power Complex approved by MOIT was 188,892 million VND (US\$ 10,214,796). Among these, the gross expenditure as of November 2010 was 111,273,421,267 VND (US\$ 6,017,382), and the remainder was 77,618,578,733 VND (US\$ 4,197,414) (RDDR Table 20, p.44).</li> </ul>
(i) Is a plan developed to monitor the impacts of resettlement?	<p><b>Review: Environmental monitoring will be conducted (the monitoring items and details is being confirmed by the implementing organization)</b></p> <ul style="list-style-type: none"> <li>- Internal monitoring: Compensation activities were monitored continuously by District Compensation Committees (DCC) until the compensation was finished (Fact Finding Mission).</li> <li>- External monitoring: Implementation of compensation was monitored by inspectors from O Mon District and Can Tho City People’s Committee and Council (Fact Finding Mission).</li> <li>- The project owner (EVN/CTTP) and ADB agreed CAP for bridging the gaps between ADB’s safeguard policy and the actual compensation, which are revealed in DDR (2011). The CAP includes PAPs of the Project (Fact Finding Mission).</li> </ul>
(j) Is the structure of grievance mechanism established? (1/2)	<p><b>Review: A grievance redress mechanism is established as a local administrative system. The project owner also handles complaints at the department having a lawyer.</b></p> <ul style="list-style-type: none"> <li>- The Grievance Redress Mechanism is established as part of administration (O Mon 4 EIA 8.B, p.151-152).</li> </ul> <p><b>Stage 1 - District Level - CTTP and O Mon District People’s Committee</b></p> <ul style="list-style-type: none"> <li>- The AP lodges an oral or written complaint with either CTTP or the O Mon District People’s Committee. CTTP will identify a focal point for receiving complaints.</li> <li>- If the complaint is received by CTTP, the GRM procedure will be explained to the complainant, and the complaint will be recorded and forwarded to the O Mon District People’s Committee.</li> <li>- If the complaint is received by the O Mon District People’s Committee, the complaint will be recorded. In order to assess the nature and validity of the complaint the O Mon District People’s Committee will consult with CTTP and other relevant parties, fact-find and investigate, and within 15 days of receipt of the complaint will issue a decision: <ul style="list-style-type: none"> <li>* If the O Mon District People’s Committee agrees in favor of the complainant, then in consultation with CTTP and in compliance with relevant decrees, circulars and stipulations, a course of action and/or compensation to address the complaint will be agreed upon;</li> <li>* if the O Mon District People’s Committee does not agree in favor of the complainant, and the complainant is satisfied and does not wish to proceed further, then the process ends; and,</li> <li>* if the O Mon District People’s Committee does not agree in favor of the complainant, and the complainant is not satisfied, the complainant has 45 days from the date of issuance the O Mon District People’s Committee decision to take his/her complaint to either the Can Tho People’s Committee (Stage 2) or the Can Tho People’s Court of Justice (Stage 3).</li> </ul> </li> </ul> <p><b>Stage 2 - Province Level – Can Tho City People’s Committee</b></p> <ul style="list-style-type: none"> <li>- If the complainant is not satisfied with the decision in Stage 1, the complainant has 45 days from the date of issuance the O Mon District People’s Committee decision to take his/her complaint to the attention of the Inspection Department of the Can Tho People’s Committee.</li> <li>- In order to assess the nature and validity of the complaint the Can Tho People’s Committee will consult with the O Mon District People’s Committee, CTTP and other relevant parties; fact-find and investigate; and, within 15 days of receipt of the complaint will issue a decision: <ul style="list-style-type: none"> <li>* If the Can Tho People’s Committee agrees in favor of the complainant, then in consultation with CTTP and in compliance with relevant decrees, circulars and stipulations, the decision of the O Mon District People’s Committee will be overturned, and a course of action and/or compensation to address the complaint will be agreed upon.</li> <li>* If the Can Tho People’s Committee does not agree in favor of the complainant, then the process ends.</li> </ul> </li> </ul> <p><b>Stage 3 -Court Case - Tho People’s Court of Justice</b></p> <ul style="list-style-type: none"> <li>- If the complainant is not satisfied with the decision in Stage 1, he/she can also bring a case to the Can Tho People’s Court of Justice. The Court shall consider the complaint in accordance with laws on civil procedures and shall render a decision: <ul style="list-style-type: none"> <li>* If the Can Tho People’s Court of Justice agrees in favor of the complainant, the court will request the Can Tho People’s Committee to overturn the decision of the O Mon District People’s Committee, and a course of action and/or compensation to address the complaint will be agreed upon.</li> <li>* If the Can Tho People’s Court of Justice does not agree in favor of the complainant, then the process ends.</li> </ul> </li> <li>- A sign will be erected at the Project site that summarizes the Grievance Redress Mechanism and provide contact details (address, phone number, fax, and email address) for the CTTP grievance focal point, the O Mon District People’s Committee, the Can Tho People’s Committee, and the Can Tho People’s Court of Justice. CTTP will instruct the EPC contractor as to the Grievance Redress Mechanism such that they can inform any person who might approach them directly as to the appropriate steps to file a grievance (O Mon 4 EIA 8, C, p.152).</li> <li>- Company Office to which the lawyer belongs in CTTP will accept complaints mainly. Labor Department is responsible for supporting (2nd field survey).</li> <li>- By 2010, 400 grievance having been submitted regarding various issues covering O Mon 3 (91), O Mon 4 (118), Discharge Channel (147) and Road No. 2 (17); At the time the due diligence survey was completed it was noted that there was one grievance pending resolution. The majority of grievances appear related to eligibility for housing compensation (RDDR, p.22).</li> </ul>

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<p><b>(2) Living and Livelihood</b></p>																				
<p>(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?</p>	<p><b>Review: The loss of agricultural land in O Mon project site did not affect the livelihood of local people remaining on their land. The local people will have the priority in employment to the possible extent. The employment activity will be conducted through public labor center to assure fairness of job opportunity, and the conflict with local people will be prevented</b></p> <p>[ Prediction ]</p> <ul style="list-style-type: none"> <li>- The operation of the O Mon project will cause significant change in the local economy. The workers will obtain higher income than the average local people, which may cause conflict due to inequality and contradiction between project workers and the local people (EIA 3.4.3.8, p.129)</li> </ul> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- Employing local people, especially project affected people on construction activities (EIA Table 4.5, p.153-167).</li> <li>- Having good management measure for workers in construction period (EIA Table 4.5, p.153-167)</li> <li>- Creating job in the power plant for local people in operation phase (EIA Table 4.5, p.153-167).</li> <li>- Employing local residents at the rate of about 90% of the total number of 225 workers just like O Mon 1-A, following with the government policy (1st field survey).</li> <li>- Recruiting workers through public recruitment center established under People’s Committee of Can Tho City and O Mon district (2nd field survey).</li> </ul>																			
<p>(b) Is sufficient infrastructure (e.g., hospitals, schools, roads) available for the project implementation? If existing infrastructure is insufficient, is a plan developed to construct new infrastructure or improve existing infrastructure?</p>	<p><b>Review: Local people will be given the maximum priority in employment to minimize hiring external people. The residential area of workers coming from outside of the area will be separated, and the problem with social infrastructure such as hospitals and schools will not be an issue.</b></p> <p>[ Planning and mitigation measure ]</p> <ul style="list-style-type: none"> <li>- The transportation construction plan in Phou Toi ward and Thoi An ward is as follows (EIA 2.5.2, p.66-67, p.70):</li> </ul> <table border="1"> <thead> <tr> <th>Item</th> <th>Phou Toi ward</th> <th>Thoi An ward</th> </tr> </thead> <tbody> <tr> <td>Road</td> <td>- 3 roads (7km) were under improvement in 2008. The one in Thoi Trinh was invested by the district authorities, and those in Thoi Nguon Barea and Binh Phuoc area have just started for construction. The repairmen of the remaining 4,650m of road are funded by the local people.</td> <td>- Gravel road of 11km will be constructed in early 2008 by contribution from local people. - In the District, 4.0km from Vam Channel to Ba Diem bridge will be paved.</td> </tr> <tr> <td>Bridge</td> <td>- 3 bridges are under construction (Binh Lap area, between Binh Phuoc and Binh Hoa A zone, between Thoi Binh and Thoi Nguon A zone), 3 bridges under improvement, and canal and 2 channels under construction.</td> <td>14 concrete bridges, with the total length of 331m is under construction. The local people contributed in most of the construction expenditure and construction work as well.</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- The table below shows the estimated number of workers in the power plant in operation phase (1st field survey).</li> </ul> <table border="1"> <thead> <tr> <th>Power plant</th> <th>No. of workers</th> </tr> </thead> <tbody> <tr> <td>O Mon 1-A + 1-B</td> <td>341 workers</td> </tr> <tr> <td>O Mon 2</td> <td>191 workers</td> </tr> <tr> <td>O Mon 3</td> <td>191 workers</td> </tr> <tr> <td>O Mon 4</td> <td>186 workers</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- Local people will be hired in the project site to the possible extent following the government policy. The policy of priority employment of local people will be respected as of the case in O Mon 1-A where 90% of 225 workers are local people. Workers coming from outside of the area will be settled separately in Can Tho City and other area, and there will be no serious issue on social infrastructure such as hospital and schools (1st field survey)</li> </ul>	Item	Phou Toi ward	Thoi An ward	Road	- 3 roads (7km) were under improvement in 2008. The one in Thoi Trinh was invested by the district authorities, and those in Thoi Nguon Barea and Binh Phuoc area have just started for construction. The repairmen of the remaining 4,650m of road are funded by the local people.	- Gravel road of 11km will be constructed in early 2008 by contribution from local people. - In the District, 4.0km from Vam Channel to Ba Diem bridge will be paved.	Bridge	- 3 bridges are under construction (Binh Lap area, between Binh Phuoc and Binh Hoa A zone, between Thoi Binh and Thoi Nguon A zone), 3 bridges under improvement, and canal and 2 channels under construction.	14 concrete bridges, with the total length of 331m is under construction. The local people contributed in most of the construction expenditure and construction work as well.	Power plant	No. of workers	O Mon 1-A + 1-B	341 workers	O Mon 2	191 workers	O Mon 3	191 workers	O Mon 4	186 workers
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<p>(c) Is there a possibility that large vehicle traffic associated with the project will affect road traffic in the surrounding areas? Are adequate measures considered to reduce the impacts on traffic, if necessary?</p>	<p><b>Review: Mitigation measures for traffic issue will be introduced.</b></p> <p>[ Prediction ]</p> <ul style="list-style-type: none"> <li>- Increased traffic and traffic accident caused by transport of materials and fuel oil for the project may occur along the National Road No.91 and river way (EIA 3.2.2.3, p.89).</li> <li>- National Road No.91 may be damaged by traffic of many trucks (EIA 3.3.2, p.91).</li> </ul> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- The construction contractor shall coordinate with Transport and Public Works Department, Police Department of Can Tho City to execute measures such as installation of light and sign system on section of National Road No.91 at potential accident places (EIA 4.2.5, p.137).</li> <li>- The maximum speed shall be specified on the sign at each road section (EIA 4.2.5, p.137).</li> <li>- Transport police shall control strictly traffic safety along the road when transporting materials and equipment for the project (EIA 4.2.5, p.137).</li> <li>- The contractor shall undertake the repairmen of the damaged road section (EIA 4.2.5, p.137).</li> </ul>																			

4 Social Environment

	Main Check Items	Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)
<b>4 Social Environment</b>	<p>(d) Is there a possibility that diseases (including communicable diseases, such as HIV) will be introduced due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?</p>	<p><b>Review: Sanitation plan including medical checkup and sanitation program for workers will be conducted to minimize epidemics.</b>            [ Mitigation measure ]            - Project workers should have medical checkup every year. Sanitation plan should be established compliant to the policy of MOLISA (Ministry of Labour, Invalids and Social Affairs) (<a href="#">1st field survey</a>).</p>
	<p>(e) Is there a possibility that the amount of water used (e.g., surface water, groundwater) and discharge of thermal effluents by the project will adversely affect existing water uses and uses of water areas (especially fishing)?</p>	<p><b>Review: The main spawning and nursery area for fish is located on the opposite bank of the O Mon Power Complex. As the river water is abundant in wet season which is a high season for fish spawning and nursing, the impact of water intake will be insignificant. Thermal effluent diffuses on a surface layer and will not affect the benthic fish and animals. Waste water will be appropriately treated by introducing a treatment system or other mitigation measure and serious water pollution is not predicted. Additionally, there is no specific fixed fishing place in Hau River in front of the complex, and the adverse effect of thermal and normal waste water for fishery is not predicted.</b></p> <p>[ Prediction ]            - Quality of local water may be affected by increased temperature, turbidity, oil/grease, chlorine caused by wastewater and cooling water from the power plant. This may affect the aquaculture of the local area (<a href="#">EIA 3.3.2, p.91</a>).            - The abundance of fish larvae and eggs are highest during wet season when the area affected by discharge of cooling water should be insignificant. In addition, juvenile and adult fishes have the ability to swim away from the heated water (<a href="#">O Mon 4 EIA 4.C.c.3, p.121</a>).            - Migration fish mainly occurs in the rainy season. Since main spawning and nursery area is the northern side of the Hau River (opposite side of the O Mon Power Complex) without the influence of thermal wastewater, the impact of the thermal effluent is not significant (<a href="#">O Mon 4 EIA 4.C.c.3, p.121</a>)            - Although small scaled, private fishery is not prohibited in the front area of the O Mon Power Complex, large scale fishery may obstruct the water traffic and is prohibited. 10 fishermen are currently in operation in Hau River near the O Mon Power Complex. They move upstream and downstream depending on the season and the growing of fish, so they have no fixed fishing ground (<a href="#">2nd field survey</a>).</p> <p>[ Mitigation Measures ]            - The discharge channel is 2 km long (open ditch; around 1 km). Thermal effluent takes around 2 hours and a half before thermal effluent comes out to Howe River because the flow velocity of the thermal effluent is 0.2 m/sec or less (18m<sup>3</sup>/sec/ (26.6m*4m)). Thereby, the heat of thermal effluent radiates heat to the atmosphere, and the thermal effluent goes down about 1 °C (<a href="#">EIA 4.3.2.1, p138, EIA 4.3.2.2, p139</a>).            - Eventually industrial waste water and domestic waste water is processed with the general waste water treatment station, and waste water after treatment is comply with waste water discharged standards.</p>
	<b>(3) Heritage</b>	
	<p>(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?</p>	<p><b>Review: There is no historical, cultural, religious monument in the O Mon Power Complex.</b>            [ Current status ]            - There is no historical, cultural, religious monument in the O Mon Power Complex (<a href="#">EIA 2.5.1, p.65</a>).</p>
	<b>(4) Landscape</b>	
	<p>(a) Is there a possibility that the project will adversely affect the local landscape, if there is any aesthetic landscape near the site? Are necessary measures taken?</p>	<p><b>Review: The serious influence on a scene is not assumed</b>            [ Current status ]            - There is no scenic site around the O Mon Power Complex (<a href="#">1 field survey</a>)</p> <p>[ Prediction and mitigation measures ]            - Environmental pollution including air pollution, water pollution and solid waste disposal may affect the landscape of the area (<a href="#">EIA 3.2.2.3 p. 89</a>), but the mitigation measures will be conducted to minimize environmental impact.            - Surround the O Mon Power Complex is a rural region, and there is no aesthetic landscape. During the construction phase, 11.1% of the construction area of O Mon 3 power plant is planned to greening. While in operation phase, more size of the area in the O Mon Power Complex is planned to greening (<a href="#">2nd field survey</a>).</p>



Main Check Items		Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)
<b>4 Social Environment</b>	<b>(5) Ethnic Minorities and Indigenous Peoples</b>	
	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	<p><b>Review: There are some minority groups living in O Mon district. However, their lifestyle and livelihood are similar to Kinh group and no traditional event takes place in the project area. Accordingly, the project will not affect their life and culture and they are not necessarily to be taken care as minority groups.</b></p> <p>[ Current status ]</p> <ul style="list-style-type: none"> <li>- The composition structure of the local people is rather multiform but mainly is Kinh ethnic group, otherwise there are some Cham ethnic (some tens of households). Life activities, productivity form are similar to the Kinh group (EIA 2.5.1, p.64).</li> <li>- Most of the local people belong to Kinh group, but some belong to Cham or Khmer group. Their life activities are similar to Kinh group (1st field survey).</li> <li>- There are no known current use of lands by Indigenous Peoples in the Project area (O Mon 4 EIA 4.C.8, p.93).</li> </ul>
	(b) Are the rights about the land and resources of an ethnic minority and indigenous people respected?	<p><b>Review: There are some minority groups living in O Mon district. However, their lifestyle and livelihood are similar to Kinh group and no traditional event takes place in the project area. Accordingly, It is understood that they do not possess their own land or right for resources in the O Mon project site.</b></p> <p>[ Current status ]</p> <ul style="list-style-type: none"> <li>- There are no known current use of lands by Indigenous Peoples in the Project area (O Mon 4 EIA 4.C.8, p.93).</li> </ul>
	<b>(6) Working conditions</b>	
	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	<p><b>Review: Laws and ordinances associated with the working conditions of the country will be enforced.</b></p> <ul style="list-style-type: none"> <li>- The power plant will conform to the standards on working environment issued by MOH on light, air ventilation, temperature, noise, humidity, etc (EIA 4.3.9, p.152).</li> <li>- Safety measures during operation phase will be conducted by the project owner, CTPP, following with the safety management document issued by MOIT (2<sup>nd</sup> field survey).</li> </ul>
	(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	<p><b>Review: Measures to individuals involved in the project on tangible safety considerations will be developed and conducted.</b></p> <p>[Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- Engineers, workers working at workplace with noise exceeding 90dBA will be equipped with noise-protective capsules and plugs (EIA 4.3.9, p.152) ).</li> <li>- Engineers, workers working in high and medium voltage areas or subject to electric shock will be equipped with special clothing, shoes, gloves, cap to prevent electric shock (EIA 4.3.9, p.152).</li> <li>- The following measures will be applied to eliminate fire and explosion (EIA 4.2.6, p.137). <ul style="list-style-type: none"> <li>* To plan fuel storage area with guard, protection and water spraying in the hot days.</li> <li>* To inspect and maintain regularly and prevent leakage.</li> <li>* To plan and make available of fire and explosion fighting and response means and materials in case of fire and explosion events.</li> <li>* To raise awareness of workers and train hazard response.</li> <li>* To follow labor principles and regulations on labor safety.</li> </ul> </li> <li>- Design of protection and fire-fighting system shall comply with Vietnamese and international standards on fire prevention as well as the provision issued by Can Tho City fire agency (EIA 4.3.8.4, p.152).</li> </ul>
	(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public sanitation) for workers etc.?	<p><b>Review: Measures to individuals involved in the project on intangible safety considerations will be planed and conducted.</b></p> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- The labor safety will be promoted following labor principles and regulations on labor safety (EIA 4.2.6, p.137).</li> <li>- Measures will be taken to raise awareness of workers and train hazard response (EIA 4.2.6, p.137).</li> <li>- The contractor organize training course on labor safety for the construction workers (EIA 4.2.4, p.136).</li> <li>- Prior to the commencement of plant operation, preparing operation phase OHS and CHS plans by the EHS Team in accordance with relevant requirements of Vietnamese law and with good international practice as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines.</li> </ul>
	(d) Are appropriate measures being taken to ensure that security guards involved in the project do not violate safety of other individuals involved, or local residents?	<p><b>Review: O Mon Power Complex site will be separated from outer area by a fence, and security guards will be placed from the security company under the control of Can Tho City Police and City authority.</b></p> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- The fence will be installed around the project site to strictly separate the project site and the surrounding area prior to construction activity. Security guards will be hired from the security company under the control of Can Tho City Police and City authority throughout the construction and operation phase (1st field survey).</li> </ul>

Main Check Items	Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)
<p><b>(1) Impacts during Construction</b></p> <p>(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? <b>(1/3)</b></p>	<p><b>Review: Adequate measures are provided during construction period.</b></p> <p><b>[ Air quality ]</b></p> <p>[ Prediction ]</p> <p>&lt; Construction area &gt;</p> <ul style="list-style-type: none"> <li>- Construction activity including vegetation removal or land clearance may generate dust pollution higher than the standard value of 0.3mg/m<sup>3</sup> (QCVN-05/ 2009). The construction work will be in a limited period (about 1 month) and environmental impact of dust may be minimized by conducting mitigation measures such as limiting the area of construction work as much as possible, watering the construction site, etc (EIA 3.4.13, p.94).</li> <li>- Generation of air pollutant (Sox, NOx, and others) from operation of heavy machines and trucks is predicted, but the emission amount is low (except dust) and environmental impact to the area will be insignificant (EIA 3.4.13, p.94).</li> <li>- About 1000 workers will work during construction phase and consume 500kg per day of fossil fuel, generating air pollutant such as SOx and NOx. The affected area will be only around the construction area (EIA 3.4.2.2, p.104).</li> </ul> <p>&lt; Traffic route &gt;</p> <ul style="list-style-type: none"> <li>- Along National Road No.91, about 20 trips per day of 10t trucks for material transportation, and 2 trips per day of 10t trucks for waste transportation is predicted (4,000-5,000 trips in 16 months) (EIA 3.4.2.2, p.104).</li> </ul> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- During the ground leveling process, attention should be paid to balance the excavated and filled volumes to minimize disposal quantity (EIA 4.1.4, p.133).</li> <li>- To spray water at construction area and disposal site (EIA Table 4.5, p.153-167).</li> <li>- To minimize size and occupied time of disposal heap (EIA Table 4.5, p.153-167).</li> <li>- Sodding and planting of tree that grow strongly on disposal heaps (EIA Table 4.5, p.153-167).</li> <li>- Covering vehicle during transportation time (EIA Table 4.5, p.153-167).</li> <li>- Limiting operation of vehicle at daytime if possible (EIA Table 4.5, p.153-167).</li> <li>- Maintaining vehicle in the best operation condition and ensuring vehicles running in the construction area in good condition (EIA Table 4.5, p.153-167).</li> <li>- Rock and material transporting trucks shall be covered during travel in order to eliminate dust. The construction unit shall have suitable plan avoiding concentration of vehicles at one place and at same time in order to eliminate dust (EIA 4.2.1, p.134).</li> <li>- Spraying water in construction and disposal areas in dry and sunny days (EIA Table 4.5, p.153-167).</li> </ul> <p><b>[ Noise ]</b></p> <p>[ Prediction ]</p> <p>&lt; Construction area &gt;</p> <ul style="list-style-type: none"> <li>- Noise level decreases 6dB as the distance from noise source doubles. It is known that noise level becomes 75 dBA at the distance of 38-121m from the heavy equipments and 45dB at the distance of 2-5km. The temporary noise effect in residential area may be occurred during construction period (1 month) (EIA 3.4.14, p.97).</li> </ul> <p>&lt; Traffic route &gt;</p> <ul style="list-style-type: none"> <li>- 35-70 trips per hour of 10t trucks for material transportation are predicted. The noise level at 15m from the heavy machine is 90dBA, noise-affected distance being several hundreds of meters (EIA 3.4.2.3, p.104).</li> </ul> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- Announce widely in community the time period and construction plan of the project (EIA Table 4.5, p.153-167).</li> <li>- Traffic of trucks will be prohibited in night time to early morning (21PM to 6 AM) (EIA 4.2.1, p.134).</li> <li>- Repairing and maintaining regularly construction machines, equipment and vehicles (EIA Table 4.5, p.153-167).</li> <li>- Implementing high noise activities in the daytime (EIA Table 4.5, p.153-167).</li> <li>- Restricting pile-driving to week-days and daytime hours (6am to 6pm) (EIA Table 4.5, p.153-167).</li> <li>- Constructing a noise wall or installing noise reducer on construction machines at noise affected area (EIA Table 4.5, p.153-167).</li> <li>- Use heavy equipment that is complied with the standard (EIA4.1.4, p.133, 4.2.1, p.134).</li> <li>- Since 30 tons per a track on roads are the maximum weight, heavier machines and materials than 30 tons will be delivered by river transportations. Therefore, the impact on the noise from construction vehicles is decreased (2nd field survey).</li> </ul>

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<p>5 Others</p> <p>(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (2/3)</p>	<p><b>[ Water quality ]</b></p> <p>[ Prediction ]</p> <ul style="list-style-type: none"> <li>- Excavation work (65,100m<sup>3</sup>) will increase the content of suspended solid in river and valley water around the project site. Total of TSS content will exceed the standards QCVN-08/ 2008 (regulation SS=50mg/l) on waste water. However, excavation activity will last only 1 month and the affected area will be only dozens of meters from the construction area (EIA 3.4.15, p.98). Besides, wastewater from concrete fabrication line and oil-containing wastewater may be generated (EIA 3.4.15, p.98-99).</li> <li>- Since the workers is estimated 100 persons for the earth work and 1,000 persons for the highest construction period, volume of domestic waste water may be 15m<sup>3</sup>/day during the earth work and 150m<sup>3</sup>/day during the highest construction period (EIA 3.4.2.4, p105).</li> </ul> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- Preparing and implementing land erosion control plan at construction area (EIA Table 4.5, p.153-167).</li> <li>- Prohibiting disposal of waste into Hau River as well as surroundings of the O Mon 3 power plant (EIA Table 4.5, p.153-167).</li> <li>- Installing temporary toilets at a rate of one for every twenty workers on site (EIA Table 4.5, p.153-167).</li> <li>- Collecting and treating the effluent from portable toilets by an appropriately licensed company in accordance with relevant Vietnamese regulations (EIA Table 4.5, p.153-167).</li> <li>- Installing septic tanks at the construction areas for treating domestic wastewater (EIA Table 4.5, p.153-167).</li> <li>- In construction phase, temporary rain drainage ditches will be constructed and slopes around the project area will be reinforced to eliminate rock and soil sliding into rivers. All waste petroleum and lubricant will be treated on the day to the possible extent (EIA 4.2.2, p135).</li> <li>- Installing setting basin of overflow rainwater at outlet prior to discharge it into Hau River (EIA Table 4.5, p.153-167).</li> <li>- Treating oil polluted waste water by oil separation system (EIA Table 4.5, p.153-167).</li> <li>- Storing chemicals at area with roof and concrete floor (EIA Table 4.5, p.153-167).</li> <li>- Training workers on cleaning measures in case of chemical spill accident (EIA Table 4.5, p.153-167).</li> <li>- In construction period, chemical substances (Chlorine, HCl, NaOH, NaClO, Organic acid etc) are kept by closed storage tanks. Paying attention not to have them leaked out when using them. And after use they are treated at a waste water treatment system (2nd Field survey).</li> <li>- After construction, alayer of waterproofing materials such as concrete or asphalt shall prevent corrosion and reduce the restoration of ground water artery (EIA 4.2.3, p135).</li> </ul> <p><b>[ Solid waste ]</b></p> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- Designing and constructing temporary disposal area at camp area of workers (EIA Table 4.5, p.153-167).</li> <li>- Classifying waste into harmful waste and normal waste prior to transport for reusage or burying (EIA Table 4.5, p.153-167).</li> <li>- Arranging garbage can surrounding construction and workers camp (EIA Table 4.5, p.153-167).</li> <li>- Using information of solid waste treatment to training program of construction workers including classification of harmful waste and waste possibly harmful waste (EIA Table 4.5, p.153-167)</li> <li>- Everyday, solid waste shall be collected from construction area and worker's camp (EIA 4.3, p.136).</li> <li>- Contracting with Urban Work Enterprise of Can Tho City on collection of construction waste at least in a week (EIA Table 4.5, p.153-167).</li> <li>- Waste type and disposal method during construction period are as follows (2nd field survey);</li> </ul>												
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	Hazardous Waste	Waste Oil	Waste Oil can be re-used by the contractor and a construction phase spill control plan (SPC) to be implemented by the contractor, including the following key elements: - A hard surface parking protected by berms should be established. Runoff from the parking lot should be collected and treated in a bioswale prior to discharge. - A roofed fuel, oil and chemical storage area should be established that includes an impermeable floor, a protective berm to contain any spills, and an oil-water separator. - Oil absorbents should be readily accessible in marked containers. - Good housekeeping procedures should be established to avoid the risk of spills in the first place. Spills should be dealt with immediately, and personnel should be trained and tasked with this responsibility.									
Construction Waste		Construction waste which cannot be used should be collected by an appropriately licensed company for final disposal in a licensed waste facility (e.g. for non-recyclable materials such as hazardous wastes).										
(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	<p><b>Review: The agricultural land in Phuoc Thoi ward and Thoi An ward where O Mon Complex will be constructed has the total area of 3,200ha, of which 95.5ha has been altered for the construction of O Mon power complex (26.6ha for O Mon 3). The altered area accounts for a very small area of the total farm, and consequently, the adverse effect to terrestrial ecosystem will be insignificant. The environmental impact to river ecosystem will also be minimized by implementing water pollution mitigation measures.</b></p> <p>[ Terrestrial ecosystem ]</p> <ul style="list-style-type: none"> <li>- Due to the agricultural activities of the local people, the vegetation of the project site is the mixture of wild flora and agricultural plants. No adverse effect to environment predicted (<a href="#">EIA 2.4.1, p.57</a>).</li> </ul> <p>[ River ecosystem ]</p> <ul style="list-style-type: none"> <li>- River biota are sensitive to water quality degradation and implementation of mitigation measure against water pollution is essential (<a href="#">1st field survey</a>).</li> </ul>											
(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? <b>(1/2)</b>	<p><b>Review: Local inhabitants will be given priority to the maximum extent for simple work employment. The employment activity will be conducted through public labor center to assure fairness of job opportunity. The social impact of migration of workers will be minimized through implementation of appropriate education and management plan of the workers and cooperation with the local Police. An appropriate traffic operation plan shall be developed to reduce the adverse effect for the access road, as well as installation of traffic signs and light, and repairing the damaged road section caused by operation of heavy trucks. Sanitation, landscape, and safety of the area will be also protected with appropriate consideration.</b></p> <p><b>[ Employment ]</b></p> <p>[ Prediction ]</p> <ul style="list-style-type: none"> <li>- About 300 workers, 1000 workers at maximum time, will be gathering during construction period (<a href="#">EIA 4.2.4, p.135, EIA 3.4.2.6, p.105</a>).</li> </ul> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- To employ local inhabitants to the maximum extent for simple work (<a href="#">EIA 4.2.4, p.136</a>).</li> <li>- Can Tho City and O Mon district have Public Employment Security Offices, and when the project owner is looking for talented people, it carries out through the Offices (<a href="#">2nd field survey</a>).</li> </ul> <p><b>[ Local community ]</b></p> <p>[ Prediction ]</p> <ul style="list-style-type: none"> <li>- The increased number of workers will cause social problems such as drug addict, epidemics, and social conflict with local inhabitants (<a href="#">EIA 3.4.1.8, p.102</a>).</li> <li>- O Mon 3 EIA states that women are engaged in aquaculture and fishery around the O Mon 3 Power Complex, therefore the construction work may have significant impact on their job and income (<a href="#">EIA 3.4.1.8, p.102</a>). Practically, in the common lifestyle of the local people living around the project site, the actual operation of fishing is mainly done by men, and women are only playing supporting roles (transportation and selling of fish), and “fishery operated mainly by women” has not been observed (<a href="#">2nd field survey</a>).</li> </ul> <p>[ Mitigation measures ]</p> <ul style="list-style-type: none"> <li>- To educate the construction workers to establish good relation with local people (<a href="#">EIA 4.2.4, p.136</a>).</li> <li>- To organize exchange meeting with People’s Committee of wards and O Mon District on matters related to the relation between workers and inhabitants (<a href="#">EIA 4.2.4, p.136</a>).</li> <li>- Workers are managed appropriately and complication with a local resident will be prevented (<a href="#">EIA 3.4.1.8, p.102</a>).</li> </ul>											



Main Check Items	Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)
<p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (2/2)</p>	<p><b>[ Transportation ]</b>                      [ Prediction ]                      - Increased traffic and traffic accident may occur along the National Road No.91 and roads in O Mon district (EIA 3.2.2.2 p. 87).                      - National Road No.91 and the surrounding roads may be damaged by traffic of many trucks during construction (EIA 3.4.1.8, p.103)                      - During construction phase, increase of traffic accident resulted from increased waterway traffic is predicted. Especially during 1 month of foundation work, the vessel traffic of Hau River is predicted with about 34 trips per hours of vessel (EIA 3.4.1.7, p.101). However, although the vessel increased for river transportation during the construction of O Mon 1-A, accidents did not occur (2nd field survey).                      - In order to transport solid waste in foundation work, 33-36 trips of 10t trucks per week are predicted (EIA 3.4.1.7, p.101). Since the traffic volume in surrounding road is a little, it is not expected that traffic congestion and a traffic accident increase (2nd field survey).                      [ Mitigation measures ]                      - Traffic management plan which consider surrounding traffic is established, and a signal and a sign board are installed on intersections of National Road No.91 and access road. The contractor undertakes to repair the damaged road section (EIA 4.2.5, p.137).</p> <p><b>[ Sanitation ]</b>                      [ Prediction ]                      - The migration of workers will increase the needs for social infrastructure including local medical facility, water, and sanitation facility (EIA 3.4.1.8, p.102-103).                      - The migration of more than 1,000 workers may cause to spread epidemic diseases (EIA 3.4.2.6, p.105-106).                      [ Mitigation measures ]                      - Improving awareness of construction workers on environmental sanitation at camp area (EIA Table 4.5, p.153-167).                      - Maintaining environmental sanitation and living conditions and ensuring community health on camp area of workers (EIA Table 4.5, p.153-167).                      - Supplying sufficiently fresh water and sanitary food to workers (EIA Table 4.5, p.153-167).                      - Supplying sufficiently garbage can and periodical collection of garbage (EIA Table 4.5, p.153-167).                      - Installation of movable toilet and dust box, and septic tank in the worker's camp (EIA 4.2.4, p.136).                      - The construction contractor shall sign contract with Urban Facilities Enterprise of can Tho City to collect waste periodically (at least once a week) at worker's camp and transport to the local disposal site. Domestic waste and construction waste, hazardous waste (oil and chemicals) should be separated (EIA 4.2.4, p.136).                      - Workers should be provided with education of epidemics preventive measure (EIA 4.2.4, p.136).                      - Clinics and nurses should be arranged on the project site to enable timely first aid and medical care. The construction contractor should organize close cooperation system with the clinic in Phuoc Thoi ward (EIA 4.2.4, p.136).</p> <p><b>[ Landscape ]</b>                      [ Prediction ]                      - The increased number of workers will cause social problems such as drug addict, epidemics, and social conflict with local inhabitants. Application of appropriate management plan for workers will mitigate the problem (EIA 3.2.2.2 p. 87).                      [ Mitigation measures ]                      - Preparing and implementing landscape rehabilitation plan of the O Mon 3 power plant will be established (EIA Table 4.5, p.153-167).                      - Surround the O Mon Power Complex is a rural region, and there is no aesthetic landscape. In O Mon 3 power plant, 11.1% of construction area is planed to greening during the construction phase (2nd field survey).</p> <p><b>[ Safety ]</b>                      - With regard to the safety measures during construction phase, EPC contractor is required to include safety management document and the selected EPC contractor will conduct construction following the safety management document that they proposed (2nd field survey).</p>
<p><b>(2) Accident Prevention Measures</b></p>	
<p>(a) In the case of coal-fired power plants, are adequate measures planned to prevent spontaneous combustion at the coal piles? (e.g., sprinkler systems).</p>	<p><b>Review: O Mon 3 power plant is not a coal-fired power plant.</b></p>

5 Others

Main Check Items		Confirmation of Environmental Considerations (Reason, Justify, Counter Measures, etc.)
<b>5 Others</b>	<b>(3) Monitoring</b>	
	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	<b>Review: Environmental Monitoring Plan (Item, Method, Frequency etc) was discussed between the project owner and the Study Team.</b> - Environmental Monitoring Plan (Item, Method, Frequency etc) was discussed between the project owner and the Study Team (Appended Table 6) (3 <sup>rd</sup> field survey).
	(b) How are the item of a monitoring plan, a method, frequency, etc. defined?	<b>Review: Environmental Monitoring Plan (Item, Method, Frequency etc) was discussed between the project owner and the Study Team.</b> - Environmental Monitoring Plan (Item, Method, Frequency etc) was discussed between the project owner and the Study Team (Appended Table 6) (3 <sup>rd</sup> field survey).
	(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	<p><b>Review: It is determined that the framework for conducting the monitoring has been established by the project owner.</b></p> <ul style="list-style-type: none"> <li>- Figures below shows the organization charts of O Mon 3 power plant for environmental and social management both in construction and operation phase (Confirmed by Fact Finding Mission).</li> <li>- Technical &amp; Planning Department is in charge of the environmental and social issues of O Mon 3 Power Plant in which experts of this department will plan, inspect, monitor all environment &amp; social consideration. Operation Department will take charge of operation of all environmental monitoring equipment/ systems. Chemical Test Department will take charge of testing, analyzing all environmental parameters (Confirmed by Fact Finding Mission).</li> </ul> <div style="text-align: center;"> <p>(Operation Phase)</p> <p>Organization chart of O Mon 3 power plant for Environmental Management</p> </div> <ul style="list-style-type: none"> <li>- Environmental Monitoring Plan (Item, Method, Frequency etc) was discussed between the project owner and the Study Team. Most of the monitoring items are common among O Mon 3 and 4, so the monitoring cost will be equally shared by the two power plants. The monitoring cost is included in the project investment cost (EIA 6.3.2.3, p.178).</li> </ul>
(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	<b>Review: The reporting scheme and frequency of the monitoring result to the relevant authorities has been established.</b> - Summary of the monitoring result shall be reported to Can Tho City's DONRE. (EIA 6.2.3, p.172). - The monitoring report should be conducted 4 times per year in construction phase, and twice a year in operation phase, as with the monitoring activity (EIA 6.2.3, p.172).	
<b>6 Note</b>	<b>Reference to Checklist of Other Sectors</b>	
	(a) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	O Mon 3 power plant will be connected through existing transmission line network (1 <sup>st</sup> field survey).
	(b) Where necessary, pertinent items described in the Ports and Harbors checklist should also be checked (e.g., projects including construction of port and harbor facilities).	The DO unload jetty will be used in common for O Mon 1 power plant.
	<b>Note on Using Environmental Checklist</b>	
(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, and global warming).	Waste is treated and disposed appropriately. Air pollutant which causes acid rain and CO <sub>2</sub> which leads to global warming will be generated, but considering the scale of the project, cross-boundary or global environmental impact is not predicted	

## 5.9.2 Monitoring Form

Items that require monitoring shall be decided on according to the sector and nature of the project, with reference to the following list of items (Table 5.9-2).

**Table 5.9-2 Monitoring Form**

### (1) Environmental Permits

Permit	Authority	Approval Date/ Schedule
Environmental License for the Entire Project	MONRE	
Environment Approval for Surface Water Exploitation and Water Discharge	MONRE	
Approval for Using Deep Well Water (for construction purpose)	MONRE or DONRE	
Permission for Toxic Chemical/Gas Application	Competent Agency authorized under MOIT	
Final License for Whose Fire Fighting System	Fire Police Headquarter (Hanoi)	

### (2) Construction phase

#### 1) Air pollution

Location:

(Parameter: PM<sub>10</sub>, Unit µg/m<sup>3</sup>)

Date	Measured Value (24hr Average)	Ambient air quality standards (QCVN-05/2009)	IFC/ EHC Guideline (General; 2007)	Remarks
		150	150	
		-	-	
		-	-	
		-	-	
		-	-	
		-	-	

Meteorological Condition

Location:

Date	Time		Temperature (°C)		Moisture (%)	Wind	
			Dry	Wet		Direction	Speed
	AM	:					m/sec
	PM	:					m/sec
	AM	:					m/sec
	PM	:					m/sec
	AM	:					m/sec
	PM	:					m/sec
	AM	:					m/sec
	PM	:					m/sec
	AM	:					m/sec
	PM	:					m/sec

## 2) Water pollutant

### a. Ground water

#### Sampling

(Date: )

Parameter	Unit	Well No.1 (Place; )	Well No.2 (Place; )	Ground water quality standards (QCVN-09/2008)	Remarks (Measurements method)
pH	-			5.5 - 8.5	
TDS	mg/L			1500	
TSS	mg/L			-	
NO <sub>3</sub> <sup>-</sup>	mg/L			15	
NO <sub>2</sub> <sup>-</sup>	mg/L			1.0	
NH <sub>4</sub> <sup>+</sup>	mg/L			0.1	
T-N	mg/L			-	
T-P	mg/L			-	
Fe	mg/L			5	
Zn	mg/L			3.0	
Cd	mg/L			0.005	
As	mg/L			0.05	
Pb	mg/L			0.01	
Hg	mg/L			0.001	
Cr	mg/L			0.05 (Cr <sup>6+</sup> )	
Cu	mg/L			1.0	
Mn	mg/L			0.5	
Total fecal coliform	MPN/100mL			3	

#### Portable water quality analyzer

(Date: )

Parameter	Unit	Well No.1 (Place; )	Well No.2 (Place; )	Ground water quality standards (QCVN-09/2008)	Remarks
Conductivity	mS/cm			-	
pH	-			5.5 - 8.5	
DO	Mg/L			-	
Salinity	PSU			-	

**b. River water quality****Sampling**

(Date: )

Parameter	Unit	Average (6 points)	Max (St. )	River water quality standards (QCVN-08/2008: A2)	Remarks (Measurements method)
Water temperature	°C		(St. )	-	
pH	-		(St. )	6 - 8.5	
Turbidity			(St. )		
BOD <sub>5</sub>			(St. )	6	
COD			(St. )	15	
Oil & Grease	mg/L		(St. )	0.02	
TDS	mg/L		(St. )	-	
TSS	mg/L		(St. )	30	
NH <sub>4</sub> <sup>+</sup>	mg/L		(St. )	0.2	
T-N	mg/L		(St. )	-	
T-P	mg/L		(St. )	-	
Zn	mg/L		(St. )	1.0	
Cd	mg/L		(St. )	0.005	
As	mg/L		(St. )	0.02	
Pb	mg/L		(St. )	0.02	
Hg	mg/L		(St. )	0.001	
Cr	mg/L		(St. )	0.1 (Cr <sup>3+</sup> ) 0.02 (Cr <sup>6+</sup> )	
Cu	mg/L		(St. )	0.2	
Mn	mg/L		(St. )	-	
Total fecal coliform	MPN/100mL		(St. )	5000	

**Portable water quality analyzer**

(Date: )

Parameter	Unit	Average (9 points)	Max (St. )	River water quality standards (QCVN-08/2008: A2)	Remarks
Water temperature	°C		(St. )		
Conductivity	mS/cm		(St. )	-	
pH	-		(St. )	6 - 8.5	
DO	Mg/L		(St. )	≥ 5	
Salinity	PSU		(St. )	-	

**3) Noise**

Date;

(Unit: dBA)

Place	Average	Max (St. )	Noise standards (QCVN-26/2010)	IFC/ EHC Guideline (General; 2007) Industrial / Commercial	Remarks
Power Complex boundary		(St. )	06:00-21:00: 70 21:00-06:00: 55	07:00-22:00: 70 22:00-07:00: 70	
Nearest residences		(St. )			

Meteorological Condition

Location:

Time	Temperature (°C)		Moisture (%)	Wind	
	Dry	Wet		Direction	Speed
:					m/sec

**(3) Operation phase**

**1) Air pollution**

**a. Emission concentration**

Gas fired (Date: from            to            )

Parameter	Unit	Excess period of the standard	Emission gas standards (QCVN-22/2009) Kp=0.785, Kv=10.6	IFC/ EHC Guideline (Thermal Power Plant; 2008)	Remarks
SO <sub>2</sub>	mg/Nm <sup>3</sup>		153	-	Gas
NO <sub>x</sub>	mg/Nm <sup>3</sup>		127.5	51	Gas
PM <sub>10</sub>	mg/Nm <sup>3</sup>		25.5	-	Gas

DO fired (Date: from            to            )

Parameter	Unit	Excess period of the standard	Emission gas standards (QCVN-22/2009) Kp=0.85, Kv=10.6	IFC/ EHC Guideline (Thermal Power Plant; 2008)	Remarks
SO <sub>2</sub>	mg/Nm <sup>3</sup>		255	-	DO
NO <sub>x</sub>	mg/Nm <sup>3</sup>		306	152	DO
PM <sub>10</sub>	mg/Nm <sup>3</sup>		76.5	50	DO

**b. Ambient air quality**

Location: St- (Date: from            to            )

Parameter	Unit	Measured Value (1hr and 24hr Average)	Ambient air quality standards (QCVN-05/2009)	IFC/ EHC Guideline (General; 2007)	Remarks (Measurements method)
SO <sub>2</sub>	µg/m <sup>3</sup>	( 1hr) (24hr)	350 ( 1hr) 125 (24hr)	- 125 (24hr)	
NO <sub>2</sub>	µg/m <sup>3</sup>	( 1hr) (24hr)	200 ( 1hr) 100 (24hr)	200 ( 1hr) -	
PM <sub>10</sub>	µg/m <sup>3</sup>	(24hr)	150 (24hr)	150 (24hr)	

Meteorological Condition

Location:

Date	Time	Temperature (°C)		Moisture (%)	Wind	
		Dry	Wet		Direction	Speed
	AM	:				m/sec
	PM	:				m/sec
	AM	:				m/sec
	PM	:				m/sec
	AM	:				m/sec
	PM	:				m/sec
	AM	:				m/sec
	PM	:				m/sec
	AM	:				m/sec
	PM	:				m/sec

**2) Water pollutant****a. Ground water****Sampling**

(Date: )

Parameter	Unit	Well No.1 (Place; )	Well No.2 (Place; )	Ground water quality standards (QCVN-09/2008)	Remarks (Measurements method)
pH	-			5.5 - 8.5	
TDS	mg/L			1500	
TSS	mg/L			-	
NO <sub>3</sub> <sup>-</sup>	mg/L			15	
NO <sub>2</sub> <sup>-</sup>	mg/L			1.0	
NH <sub>4</sub> <sup>+</sup>	mg/L			0.1	
T-N	mg/L			-	
T-P	mg/L			-	
Fe	mg/L			5	
Zn	mg/L			3.0	
Cd	mg/L			0.005	
As	mg/L			0.05	
Pb	mg/L			0.01	
Hg	mg/L			0.001	
Cr	mg/L			0.05 (Cr <sup>6+</sup> )	
Cu	mg/L			1.0	
Mn	mg/L			0.5	
Total fecal coliform	MPN/100mL			3	

**b. River water quality****Portable water quality analyzer**

(Date: )

Parameter	Unit	Average (12 points)	Max (St. )	River water quality standards (QCVN-08/2008: A2)	Remarks
Water Temperature	°C		(St. )		
Conductivity	mS/cm		(St. )	-	
pH	-		(St. )	6 - 8.5	
DO	Mg/L		(St. )	≥ 5	
Salinity	PSU		(St. )	-	

**c. Waste water**

**Sampling**

(Date: )

Parameter	Unit	Average (12 points)	Max (St. )	Industrial wastewater standards (QCVN-40/2011) Kq=1.2, Kf=0.9	IFC/ EHC Guideline (Thermal Power Plant; 2008)	Remarks (Measurements method)
Temperature	°C		(St. )	40	-	
Chlorine	mg/L		(St. )	1.08	0.2	
pH	-		(St. )	6 - 9	6 - 9	
BOD <sub>5</sub>	mg/L		(St. )	32.4	-	
COD	mg/L		(St. )	81	-	
Oil & Grease	mg/L		(St. )	5.7	5	
Zn	mg/L		(St. )	3.24	-	
Cd	mg/L		(St. )	0.054	-	
As	mg/L		(St. )	0.054	0.5	
Pb	mg/L		(St. )	0.108	-	
Hg	mg/L		(St. )	0.0054	0.005	
Cr	mg/L		(St. )	0.054 (Cr <sup>6+</sup> ) 0.216 (Cr <sup>3+</sup> )	0.5	
Cu	mg/L		(St. )	2.16	0.5	
Mn	mg/L		(St. )	-0.54	-	
Pesticides	mg/L		(St. )	0.324(Org-Phos.) 0.054 (Org-Chlo.)	-	
Total fecal coliform	MPN/ 100mL		(St. )	3000	-	

**d. Cooling water**

(Date: )

Parameter	Unit	Intake	Discharge channel outlet	Industrial wastewater standards (QCVN-40/2011)	IFC/ EHC Guideline (Thermal Power Plant; 2008)	Remarks
Water Temperature	°C			40	-	

**3) Noise**

Date; (Unit: dBA)

Place	Average	Max (St. )	Noise standards (QCVN-26/2010)	IFC/ EHC Guideline (General; 2007) Industrial / Commercial	Remarks
Power complex boundary		(St. )	06:00-21:00: 70	07:00-22:00: 70	
Nearest residences		(St. )	21:00-06:00: 55	22:00-07:00: 70	

Meteorological Condition

Location:

Time	Temperature (°C)		Moisture (%)	Wind	
	Dry	Wet		Direction	Speed
:					m/sec



**(4) Other****1) Waste**

- Manifest from the licensed company (Hazardous waste)
- Contract with the company (Domestic waste)
- Visiting of treatment sites

**2) Local community**

- Implementation of Community health and safety plan
- Grievance

**3) Working environment**

- Implementation of Occupational health and safety plan

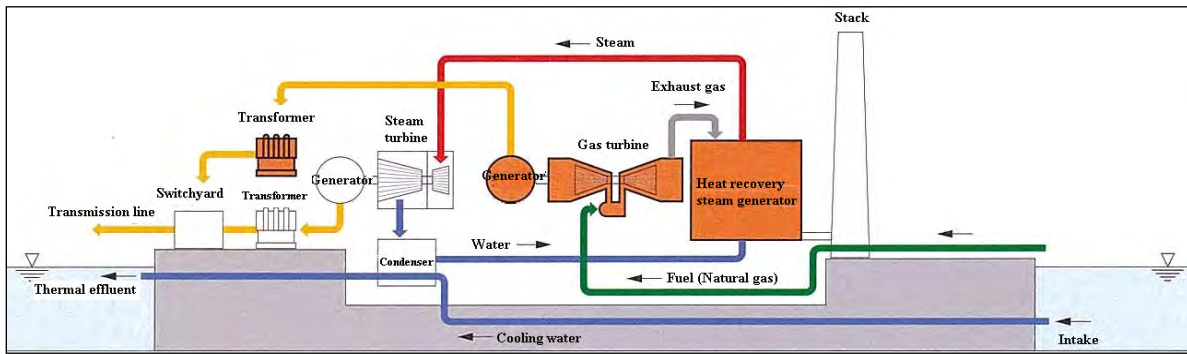
**4) Resettlement**

- Implementation of CAP

# CHAPTER 5

# APPENDIX





Source: "Outline of an environmental impact assessment", The Chugoku Electric Power Co., Inc.

**Option 1: One-through method**



Source: <http://www.nucpros.com/node/6083>

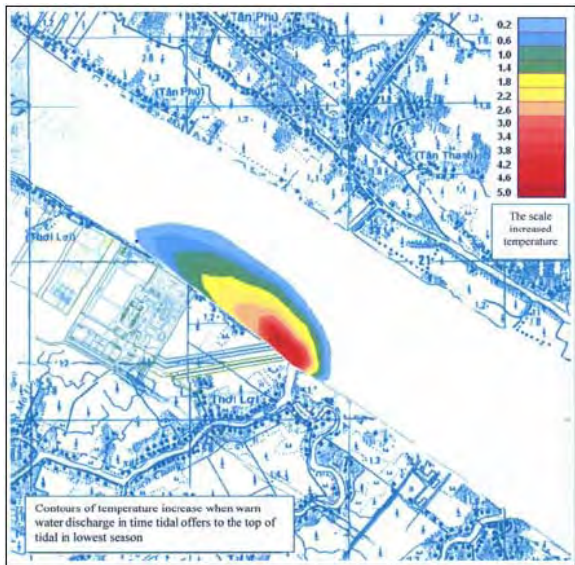
**Option 2: Cooling method using pond or lake**



Source: [http://www.wort.lu/wort/web/en/europe\\_and\\_world/articles/2011/12/169293/in dex.php](http://www.wort.lu/wort/web/en/europe_and_world/articles/2011/12/169293/in dex.php)

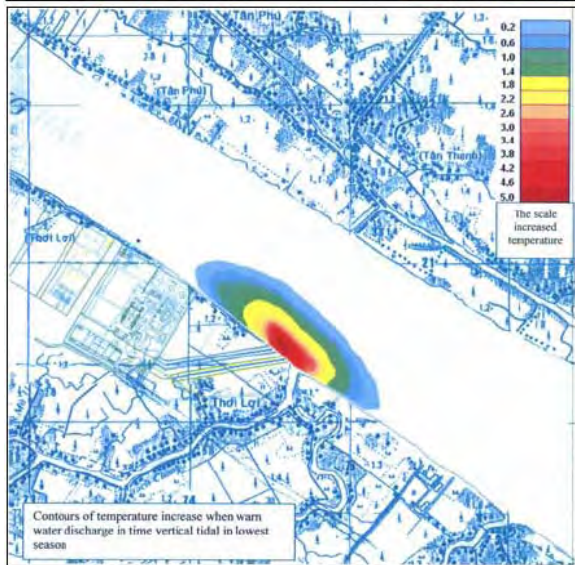
**Option 3: Natural circulation air-cooling tower method**

**Figure-1 Overview of Cooling Method**



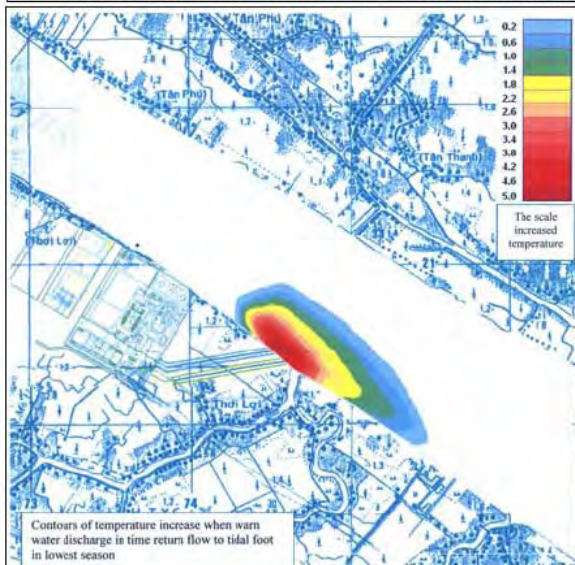
Source; O Mon 3 EIA Figure 3.6, p.117

**Flood tide**



Source; O Mon 3 EIA Figure 3.10, p.121

**Slack tide**

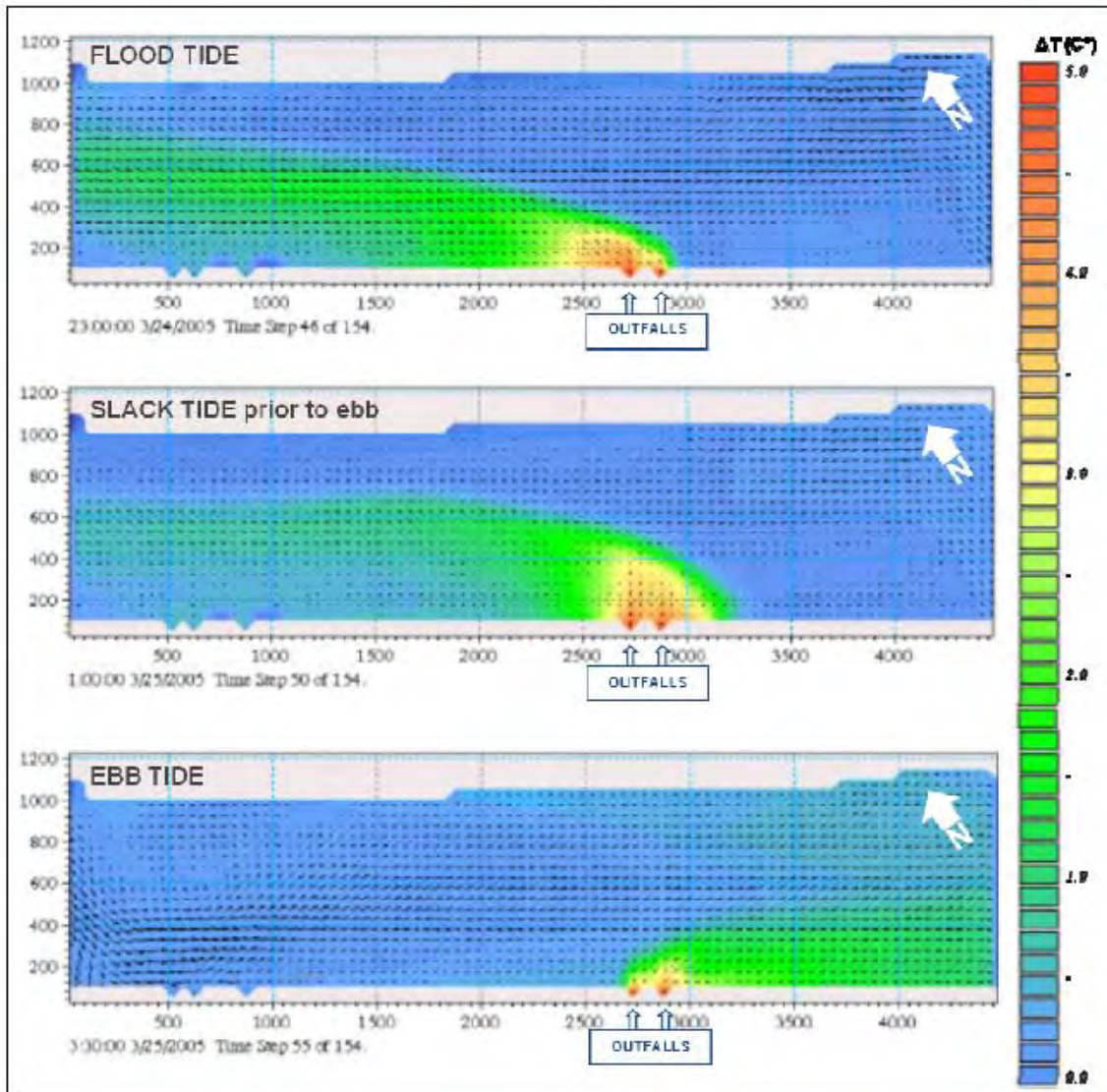


Source; O Mon 3 EIA Figure 3.9, p.119

**Ebb tide**

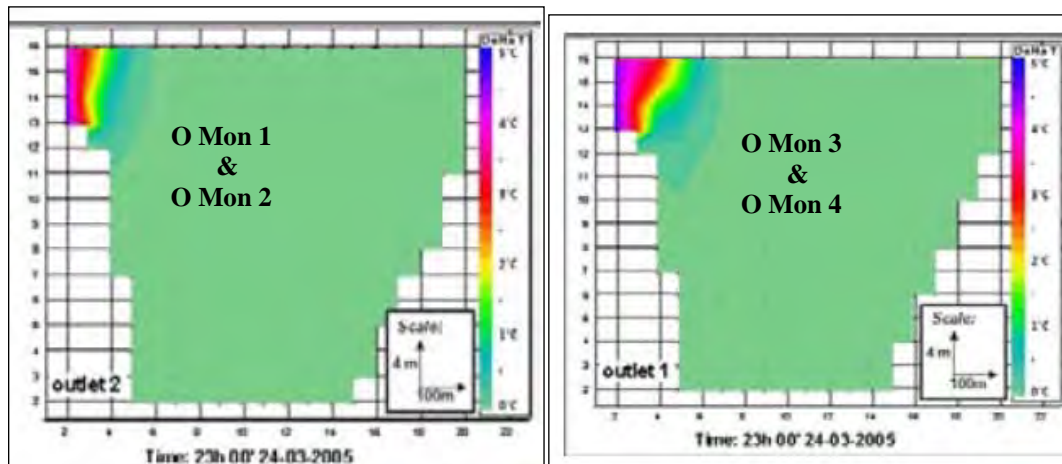
**Figure-2 Results of Thermal Effluent Diffusion of 750 MW (2-D Surface Layer Model)**





Source: O Mon 4 EIA Figure 40, p.118

**Figure-3(1) Result of Thermal Effluent Diffusion (Horizontal Chart)**



Source: O Mon 4 EIA Figure 42, p.120

**Figure-3(2) Result of Thermal Effluent Diffusion (Vertical Chart)**

**Table 1 Questions/Answers at the Stakeholder Workshop (September 14<sup>th</sup>, 2007)**

Question	Answer
Why did you take the data of Can Tho Air quality in 2004, but not 2005 and 2006. Did you review the data provided in EIA report of O Mon IV?	We reviewed all available data, and the data of 2004 is the best set.
Why did you consider the aspect of “Eutrophication” that is used only for water pollution?	We use it because NO <sub>x</sub> emission could create nitrogenous pollution of water, i.e. eutrophication.
Is it necessary to increase the stack height while the pollution from all the 4 power plants still below the standard of Viet Nam and World Bank?	We will consider this matter in cooperation with the technical experts.
It is very important that in the final report all the concrete calculations for each scenario should be presented. Also, the contour maps from modeling shows only the values that are not representative of the most common concentration on the ground. So it could create a misunderstanding on the pollution level. Please give the data with 98 percentile and mean data in the final report. In the final report, please provide all the input data for modeling work in both air and water pollution calculation.	In this workshop, we presented only the worst case, and in the final report all these calculations will be included and described.
For air pollution abatement beside the increased stack height option, there may be other solutions such as modification of combustion process for reducing NO <sub>x</sub> generation or SCR de-NO <sub>x</sub> facilities.	EVN confirms that they will select the best technology for NO <sub>x</sub> reduction, so it is not necessary to increase the stack height from 60 to 100m (In Phu My Power Plant case, the stack height is only 40m).
On the cooling system, please make clear all the measures to keep temperature of water in Hau river within the standard without using cooling tower. We agree that cooling tower is the last solution.	Agree. We will make it clear by draft final report.



**Table 2 Process of Land Acquisition for O Mon Power Complex (O Mon 3& 4)**

No.	Date	Events
1	27/ September/ 2004	The construction plan of the thermal power plant O Mon 3 and 4 power plants in the O Mon Power Complex has been approved on 27 September 2004 by the Ministry of Industry and Trade (Decision No.2523/ QD/ NLDK).
2	11/ April/ 2005	The policy for resettlement, compensation and allowance on land acquisition in Can Tho City was determined by Can Tho City People's Committee Decision No. 53/2005QD-UB (RRP 8.1.1, p.44-46).
3	23/ July/ 2005	Public meeting was held concerning the construction of O Mon Power Complex (4O Mon 4 EIA Chp.7, p.147).
4	23& 26/ December/ 2005	Public meetings were held concerning the compensation of acquired land, and the cut-off date was set to 23 December, 2005 (RRP 4.1, p.29).
5	March/ 2006	Compensation and Land Clearance Council (hereinafter referred to as "Compensation Committee" was established (Decision No.1026/ QD-UBND) (PPTA-4845SIA 5.1.2, p.24).
6	Form March/ 2006	The evaluation teams of the Compensation Committee set about assessing and evaluating the plot of land, houses and constructions, crops and trees (PPTA-4845SIA 5.1.2, p.24).
7	4/ April/ 2006 - 11/ May/ 2007	The compensation plan of O Mon 3, O Mon 4, Access road No.2 and Discharge channel No.2 and related facilities was sequentially approved by Can Tho City People's Committee (approval was segmented to 19 times: 4 times for O Mon 3 from 4 April 2006 to 14 August 2006).
8	5/ May/ 2006	Start of land acquisition (transfer).of the site prepare area for O Mon 3
9	June/ 2007	Socio-economical survey was conducted by Vattenfall Power Consultant (Consultant company for ADB) for 105 households (RRP 3.3, p.21).
10	9/ October/ 2007	Vattenfall Power Consultant sent a letter to Can Tho City People' Committee requesting modification of resettlement process (follow-up letter of the former meeting) (RRP Annex-5, p.81-83).
11	7/ January/ 2008	Answer letter from Can Tho City People' Committee to the follow-up letter from VPC (RRP Annex-6, p.84).
12	April/ 2008	Preparation of Retrofit Resettlement Plan (Resettlement Due Diligence Report 2007)
13	1626/ October/ 2009	Completion of land acquisition (transfer) of the site prepared area for O Mon 3.
14	December/ 2009	Special assistance cash grant of 15 ~ 20MVND was provided to poor or vulnerable people (RDDR p.22 & p.33).
15	March - September/ 2010	Household survey was conducted for 145 compensated households (24%) for carrying out due diligence (RDDR, p.13).
16	February/ 2011	Preparation of resettlement Due Diligence Report and Corrective Action Plan.
17	25/ November/ 2011	The board approval was issued to ADB financing for O Mon 4.







**Table-3(1) Living Conditions of Affected People (June, 2007)**

**Source of income**

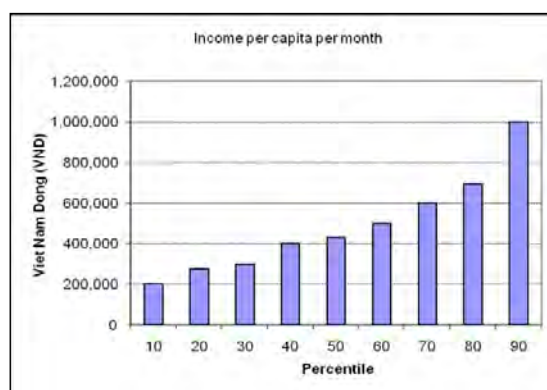
Day labour is the main source of income in the households, while the dependence on agriculture income is only 21 % (RRP 3.3, p.21).

**Source of income**

Job category	Percent of Respondents (%)
Day labour	37
Agriculture	21
Formal employment	15
Business and service	15
Other	12
Source: Socio-economic survey, June 2007	

**Monthly income**

About 10 % of the respondents have income of less than 200,000 VND per month, about 10% of income per month is higher than 1,000,000 VND. The median is about 420,000 VND in (RRP 3.3, p.22). 10-20% of the population would be considered as poor according to the criteria at the time 2007 (earning less than VND 220,000 per person per month) (RRP 3.3, p.22).



**Monthly income**

**House wealth**

The literary interest is very low, with on 6% of households having anything to read, but with a great interest in television. In spite of only 72% (see below) of households being connected to the electricity grid, 85% have a television set (RRP 3.3, p.22-23).

**House wealth**

Durable items	Percent of Respondents (%)
Television set	85
Motorcycle	80
Bicycle	61
Mobile phone	36
Telephone	34
Boat	26
Room where nobody sleeps	15
Glass windows	8
Books/ newspapers	6
Sofa in house	4
Source: Socio-economic survey, June 2007	

**Table-3(2) Changes in the Living Conditions of the Affected People before and after Compensation (2010)****Changes in the household income**

Most (95%) of household respondents reported their overall income levels being higher (66%) or the same (29%) as before the compensation with 5% reporting lower household income levels (RDDR, p.24). On the other hand, 7 households (about 5% of the total) answered “incomes became lower than before resettlement”. CTPP visited these households in April, 2012 and interviewed them. As a result, CTPP confirmed that the incomes of all of those households have become better compared to the incomes before resettlement. The reasons why their incomes decreased at the time of resettlement were that they invested on lands or they conducted active consumption activities since they received cash compensation.

Household Income	# Respondents	% Respondents
Lower	7	5%
Same	41	29%
Higher	93	66%

Source: Household Survey 2010

**Changes in Livelihoods**

There were increases in non-farm employment, while there were decreases in agriculture and owner-operated manufacturing (RDDR, p.24).

Livelihood Type	2005	As % (2005)	2010	As % (2010)	Change in % Persons
Casual Daily labour	23	6%	36	8%	3%
Full Time Wage Employment (Private)	42	11%	81	19%	8%
Part time Waged Employment (Private)	14	4%	15	3%	0%
Full Time Waged Employment (State)	34	9%	51	12%	3%
Trade/service (Owner)	34	9%	50	12%	3%
Manufacturer (Business Owner)	11	3%	5	1%	-2%
Farmer	230	58%	156	36%	-22%
House wife	7	2%	38	9%	7%
Total	395	100%	432	100%	0%

Source: Household Survey 2010

**Change in Incidence of Poverty**

Poverty in the area is currently based on an average monthly per capita income of 250,000 VND to be classed as poor and 350,000 VND to be classed as near poor. This standard is based on criteria provided by the Ministry of Labour, War Invalids and Social Affairs at the time 2010. Based on this standard there was a 66% overall decrease in the number of poor households (RDDR, p.25).

Poverty Category	2005	2010	% Change
Poor	11	4	-64%
Near Poor	1	4	400%
Total	12	8	-66%

Source: Household Survey 2010



### **Ownership of Household Assets**

There were increases in all asset types with the exception of boats which is attributable to households either moving away from near the river/canal or are no longer reliant on boats (RDDR, p.25).

Household Asset Item	2005	2010	Total
Bicycle	68%	68%	0%
Small boat	37%	30%	-7%
Telephone set	17%	48%	31%
Rice- cooker	51%	90%	39%
Motorcycle	57%	90%	34%
Boat	4%	6%	2%
TV	76%	97%	21%
Fan	69%	94%	26%
CD/DVD player	47%	83%	37%
Car			0%
Truck	0%	1%	1%
Mobile phone	24%	87%	63%
Refrigerator	9%	46%	37%
Computer	2%	19%	17%
Sofa	22%	64%	42%
Separate living room	35%	71%	36%

Source: Household Survey 2010

### **Housing Standards**

There has been an overall increase in housing standards with 88% now having permanent structures with an average floor area of 170m<sup>2</sup>. There was a small change in total floor area of 9.5m<sup>2</sup> (5% decrease) attributable to those upgrading their house standards. Also as noted below most houses now have toilets (RDDR, p.26-27).

Structure Area/Category	2005	2010	% Change
Ave Floor Area (m2)	180	170.59	-9.46
Structure Category			0.00
• 1			0.00
• 2			0.00
• 3	0	1%	1%
• 4	61%	88%	27%
• 5 (Temporary)	39%	11%	-28%

Source: Household Survey 2010

**Change in Water Sources -Drinking**

There is now a greater reliance on safer water sources with increased use of piped water (35% from 8%); drilled well (50% from 40%) and decreased use of surface water (5% from 46%) (RDDR, p.27).

Water Source	2005	2010	HH Change as %
Rain	8%	19%	10%
Dug Well	3%	1%	-1%
Drilled well	40%	50%	10%
Canal, pond, lake..	46%	5%	-41%
Purchase	0	4%	4%
Public tap	1%	0%	-1%
Piped system	8%	35%	28%
Other	0%	0%	0%

Source: Household Survey 2010

**Change in Water Sources -Washing**

Water Source	2005	2010	HH Change as %
Rain water	5%	7%	2%
Dug Well water	3%	1%	-2%
Drilled well water	42%	55%	13%
Canal, pond, lake..	56%	16%	-40%
Bought water	0%	1%	1%
Public tap	1%	6%	6%
Piped water system	5%	24%	19%
Other	0%	0%	0%

Source: Household Survey 2010

**Change in Sanitation**

Type of Sanitation (Toilet)	2005	2010	HH Change as %
Pit latrine	1%	0%	-1%
Pond, river, canal..	66%	11%	-54%
Toilet in house	19%	70%	51%
Other	13%	14%	1%

Source: Household Survey 2010

"Other": most of these respondents reported using toilet of relative or neighbour



### Change in Energy

There is significant decreases in use of firewood and charcoal in favour of gas as a cooking fuel source (77% compared to 46%). For sanitation 70% of households now have toilets in their homes (RDDR, p.29).

Energy Source	2005	2010	HH Change as %
Network Electricity	91%	97%	6%
Generator	0	0	0%
Battery	1%	0%	-1%
Petroleum	5%	0%	-5%
Candle	0%	0%	0%
Firewood	92%	70%	-22%
Charcoal	0%	1%	1%
Gas	31%	77%	46%

Source: Household Survey 2010

### Vulnerable households

In 2010, there were 17 vulnerable households which did not have regular work poverty. This is a decrease when compared with 64 households in 2005. Apart from this, according to official investigation of O Mon Compensation Committee and approved by Can Tho people's Committee, there are 24 DP households who are still vulnerable. They were provided the special assistant of 15,000,000 VND/household by project owner (RDDR, p.30).

#### Vulnerable households at the time of 2010

	Commune	Name	Classification	Gender	Occupation 2010	Occupation 2005	Notes
1	Thoi Loi -Thoi An	Nguyen Van Tho	Poor	M	Retired	Daily labor	Used compensation to buy land- paid a half and will pay the rest when the seller provide LURC. They are living in the house has not finished building. All member of this family is working as daily laborers-
2	Phuoc Thoi- Thoi loi	Do Thi Dien	Poor	M	Daily labor	Daily labor	Work is not available every day, had a house built on land affected before 2004- Village Captain had certified, but her case has not been resolved- now have a house (cat. 5) given by parents
3	Phuocthoi	Nguyen thi Nhuong	Poor	F	Elderly	Elderly	93 years Elderly mother looking after disable son- no incomes
4	Phuoc Thoi- Thoi Loi	Vo Van Hai	Near poor	M	Daily labor	Daily labor	Living in a tin house on parents land- lending this land to them to live not permanently
5	Thoi Loi- Thoi An	Huynh Mai Phuong	Poor	F	Brick Kiln worker	Brick Kiln worker	The family had to move out from the brick kiln and now living in Dong Thap- Homeless and very poor- Going back and forth to Dong Thap then come back to stay at parents house when there are not many work at the brick kiln.
6	Thoi Loi A	Nguyen Ngoc Ton	Near poor	M	Small trader	Construction worker	Built house and on parents land, have no land of their own.
9	Phuoc Thoi Thoi Loi	Huynh Van Khoi	Poor	M	Laborer in brick factory	Brick kiln	Lived in the brick kiln- Family is in difficult situation- None of the children went to school and HoH is in poor health- Current House was built by borrowing money - and now is paying back by installment
7	Thai An- Thoi Loi	Nguyen Van Le	Near poor	M	Fisherman	Fisherman	Their income based on fishing - they claimed it's so hard to get fish from the river now and struggle to cover the cost for the youngest child even though the PC have helped with the school fee
8	Thoi An Thoi Loi	Le Van Mot *	Poor	M	Daily labor	Daily labor	They live on the land which belongs to a Pagoda. Used compensation money to build this house- They had a house- Cat 5 -38 m2- affected by the project.
9	Thoi An Thoi Loi	Vo Van Son	Poor	F	Elderly	Elderly	Live on 100m2 house bought by CP money from a 160m2 affected house. Struggle because only 2 people working to care for 7- children are still young and 1 elderly
10	Thoi An Thoi loi	Tran van Hoang *	Poor	M	Working Brick kiln	Fisherman	current house is 84m2 bought from CP money from 80m2 affected house by Omon 4
11	Phuoc Thoi	Huynh Thi Oi	Near poor	F	Farmer	Retired	Living standard is the same - even though no longer poor as the poverty criteria has not changed
12	Phuoc Thoi Thoi Loi	Nguyen Thi Ut Het	Near poor	F	Daily labor	Daily labor	Struggle to raise the children because their work will get less when the weather not so pleasant as construction worker don't get much work during rainy season
13	Phuoc Thoi	Pham Thi Lai	Near poor	F	Trade/service	Trade/service	No more land for farming - have to spend more on food
14	Thoi Loi	Bui Van Ly	Near poor	M	Daily Labour	Daily labor	Small land Holding
15	Thoi Loi	Ho Than thuong	Near poor	M	Fisherman	Fisherman	Realize on fishing in the local area- not much business since the project taken place.
16	Phuoc Thoi	Vo Van Van	Near poor	M	Construction worker	Construction	This daily work is not stable and have to travel far - have no land for farming
17	Phuoc Thoi	Hue Van Thang	Poor	M	Wage work	Wage work	Have no land - cat. 5 house built in 3.5meter wide land X10meter. The land was lent by a relatives and a haft from the PC Phuoc Thoi and he is still paying interest to the bank(borrow money to built house but was not compensated

## Vulnerable households by investigation of O Mon Compensation Committee and special assistant

No	Full name	Supporting Rate	Total
1	Vo Van Bay	15.000.000	15.000.000
2	Bui Van On	15.000.000	15.000.000
3	Ngo Thi Be	15.000.000	15.000.000
4	Ngo Thi Trinh	15.000.000	15.000.000
5	Danh Deo	15.000.000	15.000.000
6	Nguyen Thi Le Hoa	15.000.000	15.000.000
7	Nguyen Minh Son	15.000.000	15.000.000
8	Do Thi Dien	15.000.000	15.000.000
9	Nguyen Thi Chinh	15.000.000	15.000.000
10	Tran Van Manh	15.000.000	15.000.000
11	Tran Van Dung	15.000.000	15.000.000
12	Nguyen Van Cuoc	15.000.000	15.000.000
13	Do van Theo	15.000.000	15.000.000
14	Nguyen Thanh Trinh	15.000.000	15.000.000
15	Hue Van Thang	15.000.000	15.000.000
16	Vo Van dung	15.000.000	15.000.000
17	Nguyen Van Lien	15.000.000	15.000.000
18	Hue Van Dong	15.000.000	15.000.000
19	Nguyen van Hong	15.000.000	15.000.000
20	Hue Van Giao	15.000.000	15.000.000
21	Tran Thi Mung	15.000.000	15.000.000
22	Pham Huu Ly	15.000.000	15.000.000
23	Tran Quang Lien	15.000.000	15.000.000
24	Truong Van Binh	15.000.000	15.000.000
Total			360.000.000

Source: RDDR, p.24-30

**Table-4(1) Contents of Cash Compensation**

**Land** (CTTP documents)

- Land for planting annual trees : 126,000 VND/m<sup>2</sup>
- Land for planting perennial trees : 126,000 VND/m<sup>2</sup>
- Rural living land : 400,000 VND/m<sup>2</sup>
- Non-agriculture land : 200,000 VND/m<sup>2</sup>
- Land for living at Road 934 area : 1,000,000 VND/m<sup>2</sup>  
(from the power plant to Thoi An ward)
- Public land or alluvial ground : 108,000 VND/m<sup>2</sup>
- Agriculture land inside 50m from the protection slope of Road 934: in addition to compensation for agriculture land, 50% of living land cost was paid.

**Structures** (CTTP documents)

- Grade 1 (Villa) : no cases
- Grade 2 (Concrete floor, high quality of materials) : no cases
- Grade 3 (Concrete floor, average quality of materials) : 1,400,000 VND/m<sup>2</sup>
- Grade 4 (Brick wall, concrete frame with tiled roof) : 990,000 VND/m<sup>2</sup>
- Grade 5 (Wooden frame with palm roof) : 150,000 VND/m<sup>2</sup>

**Secondary structures** (CTTP documents)

- Kitchen, toilet: classified as the rates of houses
- Tomb: Normal 1,000,000 VND/unit; Cement: 3,000,000 VND/Unit
- Water tank: 380,000/m<sup>3</sup>

**Crops**

English name	Unit	Compensation rate		
		Grade A	Grade B	Grade C
Orange	VND/tree	360,000	252,000	72,000
Mango	VND/tree	600,000	420,000	120,000
Jack-fruit	VND/tree	192,000	134,000	38,000
Banana	VND/tree	14,000	7,000	2,000
Longan	VND/tree	300,000	210,000	60,000
Kumquat	VND/tree	96,000	67,000	19,000
Calaba tree	VND/tree	120,000	72,000	24,000
Rambutan	VND/tree	360,000	252,000	72,000
Starberry	VND/tree	96,000	67,000	19,000
Bamboo	VND/tree	14,000	10,000	2,900
Star apple	VND/tree	480,000	336,000	96,000
Durian	VND/tree	720,000	504,000	144,000
Lemon	VND/tree	120,000	84,000	24,000
Tamarind	VND/tree	180,000	126,000	36,000
Water apple	VND/tree	144,000	101,000	29,000
Grapefruit	VND/tree	240,000	168,000	48,000
Custard apple	VND/tree	96,000	67,000	19,000
Kapok	VND/tree	72,000	50,000	14,000
Eucalyptus	VND/tree	36,000	25,000	7,000
Pink shower cassia	VND/tree	180,000	96,000	36,000
One species of Tamarind	VND/tree	180,000	96,000	36,000
Pineapple	VND/m <sup>2</sup>	2,600	1,850	530
Agati	VND/tree	24,000	17,000	5,000

English name	Unit	Compensation rate		
		Grade A	Grade B	Grade C
Coconut	VND/tree	300,000	210,000	60,000
Jamun	VND/tree	96,000	67,000	19,000
Sapodilla	VND/tree	300,000	210,000	60,000
Mandarin	VND/tree	300,000	210,000	60,000
Beadtree	VND/tree	120,000	72,000	24,000
San(One species of Jamun)	VND/tree	120,000	72,000	24,000
Dipper	VND/tree	120,000	72,000	24,000
Arecanut	VND/tree	120,000	84,000	24,000
Starfruit	VND/tree	96,000	67,000	19,000
Trambau(One species of Jamun)	VND/tree	120,000	72,000	24,000
Guava	VND/tree	96,000	67,000	19,000
Cajuput	VND/tree	8,000	6,000	1,800
Cypress	VND/tree	120,000	72,000	24,000
Citronella	VND/m <sup>2</sup>	2,400	1,680	480
Sugar cane	VND/m <sup>3</sup>	2,600	1,850	530
Queen's crape-myrtle	VND/tree	120,000	72,000	24,000
Acerola	VND/tree	96,000	67,000	19,000
Poplar	VND/tree	120,000	72,000	24,000
Sapotaceae	VND/tree	120,000	84,000	24,000
Tropical almond	VND/tree	120,000	72,000	24,000

Source : CTTT documents

### Other Compensation

Allowance	Eligibility	Payment			
Transportation Allowance	Households, individuals who have to relocate	<b>Transitional Support (permanently relocated within a province or city)</b>			
		Multi-stories, concrete houses	3 MVND/household		
		Brick houses	2 MVND/household		
		Others	1 MVND/household		
		<b>Transitional Support (Permanently relocated to another province or city)</b>			
		Multi-stories, concrete houses	5 MVND		
Allowance for timely moving	The PAPs who have to be relocated and voluntarily hand the affected land to the project in accordance of the time regulated and announced by the project	Being entitled to a bonus of 5 % of the total compensation amount, but not more than 5 MVND.			
		Supports for job change and job creation	Households, individuals directly engaged in agricultural production have over 30 % of their assigned agricultural land areas expropriated, and being still within the working age	In case a vocational training course cannot be held, the support will be paid in cash, at a level of 1 MVND/person in labor age.	
				Temporary relocation allowance	Persons who have their residential land expropriated and have no other residences; pending the time of creating new residences
From 5-6 persons	0.6 MVND/household/month				
From 7-8 persons	0.7 MVND/household/month				
From 9-10 persons	0.8 MVND/household/month				
More than 11 persons	1 MVND/household/month				
Others: For "Policy" households who have to be relocated	Households with the person such as the ones being showed at right	Military Heroes, Vietnamese Hero Mothers, Labor Hero	5 MVND/household/month		
		Wounded soldiers, relatives of military soldiers	3 MVND/household/month		
		Revolutionaries, retired civil servants, households who are currently receiving other social assistance	1 MVND/household/month		

Allowance	Eligibility	Payment	
Resettlement site or Resettlement benefit	Household required to relocate due to the project, and has the legal rights and titles to land and property. Also households without legal rights. But their permanent use of land was certified by local government.	Houses whose owners do not agree to receive new land on resettlement site	Resettlement benefit is 65 MVND
Supports for subsistence and production stabilization	Households or individuals directly not engaged in agricultural production have over 30 % of their assigned agricultural land areas expropriated.	Without relocation	Life stabilization supports for 3 months 0.36 MVND/person/month
		With relocation	Life stabilization supports for 6 months 0.72 MVND/person/month
		Relocation with difficult socio-economic conditions	Life stabilization supports for 12 months 1.44 MVND/person/month

Source : CTPP

**Table-4(2) Contents of Job Training**

The job training course provided or planned in 2007-2008 is listed below ([RRP Annex 4, p.79-80](#)).

**In 2007**

- Total established courses: 12.
- Total students: 435.

Among them:

- Small scale industry (60 days/course) has 5 courses consist of hair dressing, household electric, motorbike repairing and household tailoring.
- Industry (15 days/course) has 7 courses, consist of aquaculture, livestock and veterinary, cultivation.

**In 2008**

O Mon district has proposed to DOLISA (Department of Labour, Invalids and Social Affairs) of Can Tho City to fund for organizing 19 courses as follows:

- Cultivation : 02 courses.
- Livestock and veterinary : 02 courses.
- Aquaculture : 02 courses.
- Motorbike repairing : 02 courses.
- Household electric : 02 courses.
- Household tailoring : 04 courses.
- Diesel engine repairing : 01 course.
- Industrial tailoring : 01 course.
- Hair dressing : 03 courses

The approved funding for 2008 is only sufficient for opening short-term courses.

**Result of job training from 2004 to 2007**

Since establishing of the district (2004), job training has been focused as one of solutions for employment creating, hunger erasing and poverty reducing.

- 2004: 3 courses
- 2005: 11 courses
- 2006: 13 courses
- 2007: 12 courses



**Table-5 Decision on Compensation of Acquired Land for the O Mon Power Complex**

Items	Number of affected household	Compensation plan	Date
O Mon 3 (No.1)	33	No.1038 /QD-UBND	4 / April/2006
O Mon 3 (No.2)	52	No.1279 /QD-UBND	9/ May/ 2006
O Mon 3 (No.3)	37	No.1536 /QD-UBND	22/ June/ 2006
O Mon 3 (No.4)	29	No.1831 /QD-UBND	14/ August/ 2006
Affected household	151		
O Mon 4 (No.1)	46	No.1605 /QD-UBND	5/ July/ 2006
O Mon 4 (No.2)	58	No.1792 /QD-UBND	8/ August/ 2006
O Mon 4 (No.3)	36	No.2098 /QD-UBND	20/ September/ 2006
O Mon 4 (No.4)	22	No.2552 /QD-UBND	28/ November/ 2006
O Mon 4 (No.5)	32	No.134 /QD-UBND	23/ January/ 2007
O Mon 4 (No.6)	9	No.1156 /QD-UBND	11/ May/ 2007
Affected household	203		
Access road No.2 (No.1)	33	No.2554 /QD-UBND	12/ September/ 2006
Access road No.2 (No.2)	23	No.2554 /QD-UBND	28/ November/ 2006
Access road No.2 (No.3)	21	No.2764 /QD-UBND	18/ December/ 2006
Access road No.2 (No.4)	2	No.134 /QD-UBND	23/ January/ 2007
Affected household	79		
Discharge channel No.2 (No.1)	50	No.1606 /QD-UBND	5/ July/ 2006
Discharge channel No.2 (No.2)	65	No.1631 /QD-UBND	10/ July/ 2006
Discharge channel No.2 (No.3)	40	No.1791 /QD-UBND	8/ August/ 2006
Discharge channel No.2 (No.4)	32	No.2555 /QD-UBND	28/ November/ 2006
Discharge channel No.2 (No.5)	31	No.2766 /QD-UBND	18/ December/ 2006
Discharge channel No.2 (No.6)	3	No.134 /QD-UBND	23/ January/ 2007
Discharge channel No.2 (No.7)	5	No.773 /QD-UBND	28/ March/2007
Affected household	226		
Total affected household	659		

**Table 6 Parameter, Location, Method, Frequency, Responsible Organization of Environmental Management Plan**

Items	Parameter	Location	Method	Frequency	Responsible Organization
<b>Construction phase</b>					
Meteorological condition	Temperature, Humidity, Wind direction, Wind speed	Same as the monitoring points for air pollutants and noise.	Assman's aspiration psychrometer, Anemometer	Same time with air pollutant and noise monitoring	EPC Contractor
Air pollutant	PM <sub>10</sub>	Within 500m of construction area. 4 sampling points. One week of continuous monitoring at every sampling point every month	Automatic mobile ambient air quality analyzers	Continuous	EPC Contractor
Water pollution	Ground water pH, Heavy metals (Fe, Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Total fecal coliform, NH <sub>4</sub> <sup>+</sup> , NO <sub>3</sub> <sup>-</sup> , NO <sub>2</sub> <sup>-</sup> , T-N, T-P, TDS, TSS	Two existing wells surrounding construction area	Analysis by sampling	Quarterly	Sampling: EPC Contractor Analysis: Environmental Consultant
	Ground water Conductivity, pH, DO, Salinity	Same as above	Portable water quality analyzer	Monthly	EPC Contractor
	River water Water temperature, Oil & grease, Heavy metals (Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Total fecal coliform, NH <sub>4</sub> <sup>+</sup> , T-N, T-P, TDS, TSS, pH, COD, BOD <sub>5</sub> , Turbidity	3 points along the lines perpendicular the shoreline (at 150m from shore), and 3 points at other	Analysis by sampling	Quarterly	Sampling: EPC Contractor Analysis: Environmental Consultant
	River water Water temperature, Conductivity, pH, DO, Salinity	3 points each along 3 lines perpendicular the shoreline (at 0, 150, and 500m from shore), and 3 points at other	Portable water quality analyzer	Monthly	EPC Contractor
Noise	Noise	2 points (Power Complex boundary, Nearest residences)	Sound-level meter	Daily for three days during start of new stage of construction	- EPC Contractor
Waste	Hazardous waste	Power complex Treatment sites	Provide the manifest from the licensed company	Yearly	Contract: EPC Contractor Supervisor: CTTP
	- Domestic waste		Provide the contract with the company		
Resettlement	Implementation of CAP	Villages around Power Complex	-	On going	CTTP
Local community	As defined in Community health and safety plan	Villages around Power Complex	As defined in Community health and safety plan	As define in the construction phase OHS plan	CTTP
	Grievance	Villages around Power Complex	Grievance from resident	On going	CTTP
Working environment	As defined in Occupational health and safety plan	Construction area	As defined in Occupational health and safety plan	As define in the construction phase OHS plan	CTTP
<b>Operation phase</b>					
Meteorological condition	Temperature, Humidity, Wind Direction, Wind Speed	Same as the monitoring points for air pollutants and noise.	Assman's aspiration psychrometer, Anemometer	Same time with air pollutant and noise monitoring	CTTP
Air pollution	Emission concentration NOx, SO <sub>2</sub> , PM <sub>10</sub>	Top of stack	CEMS: Continuous Emission Monitoring System	Continuously	CTTP
			Analysis by sampling	Yearly	Environmental consultant
	Ambient air quality NO <sub>2</sub> , SO <sub>2</sub> , PM <sub>10</sub>	4 sampling points surrounding Power Complex. One week of continuous monitoring at every sampling point every month	Automatic mobile ambient air quality analyzer	Continuous	CTTP

Items	Parameter	Location	Method	Frequency	Responsible Organization
Water pollution	Ground water pH, Heavy metals (Fe, Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Total fecal coliform, NH <sub>4</sub> <sup>+</sup> , NO <sub>3</sub> <sup>-</sup> , NO <sub>2</sub> <sup>-</sup> , T-N, T-P, TDS, TSS	Two existing wells	Analysis by sampling	Semi-annually (Dry and rainy season)	Sampling: CTPP Analysis: Environmental Consultant
	River water Water temperature, Conductivity, pH, Do, Salinity	3 points each along 3 lines perpendicular the shoreline (at 0, 150, and 500m from shore), and 3 points at other	Portable water quality analyzer	Monthly	CTPP
	Waste water Water temperature, Chlorine, pH, BOD <sub>5</sub> , COD, Oil & grease, Heavy metals (Zn, Cd, As, Pb, Hg, Cr, Cu, Mn), Pesticides, Total fecal coliforms	Discharge channel outlet	Analysis by sampling	Quarterly	Sampling: CTPP Analysis: Environmental Consultant
	Cooling water	Intake and discharge channel outlet	- Thermistor	- Continuous	CTPP
Noise	Noise level	Power Complex boundary adjacent to the power plant, nearest residences at different directions from the power plant	- Sound-level meter	- Nightly during start-up	CTPP
Waste	Hazardous waste	Power complex Treatment sites	Provide the manifest from the licensed company	- Yearly	CTPP
	Domestic waste		Provide the contract with the company		
Local community	As defined in Community health and safety plan	Villages around Power Complex	As defined in Community health and safety plan	As defined in Community health and safety plan	CTPP
	Grievance	Villages around Power Complex	Grievance from resident	Ongoing	CTPP
Working environment	As defined in Occupational health and safety plan	Construction area	As defined in Occupational health and safety plan	As defined in Community health and safety plan	CTPP
Global Climate Change	CO <sub>2</sub> gas yield	-	CO <sub>2</sub> gas yield is calculated by fuel consumption per a year.	Yearly	CTPP

# CHAPTER 6

## CLIMATE CHANGE REMEDIES

**CHAPTER 6 CLIMATE CHANGE REMEDIES**

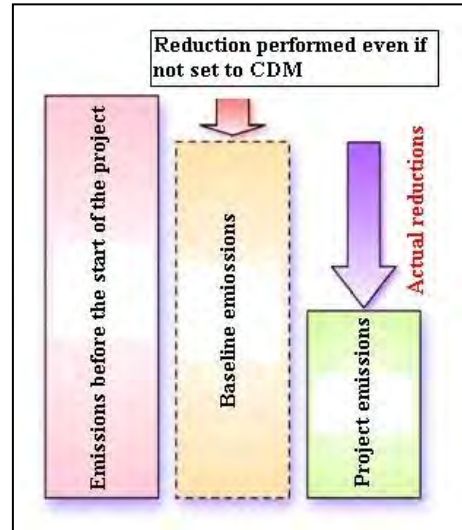
**6.1 CONSIDERING CLEAN DEVELOPMENT MECHANISM (CDM) METHODOLOGY**

According to “CDM Methodology Guidebook<sup>1</sup>”, amount of Emissions Reductions for each project is defined as following formula (Fig.6.1-1).

$$\text{Emissions Reduction} = \text{Baseline Emissions} - \text{Project Emissions}$$

“Project emissions” are the emissions from actual project activities. ‘Baseline emissions’ are the volume of emissions under theoretical conditions of ‘scenario that reductions are not achieved if the project is not certified as CDM project’.

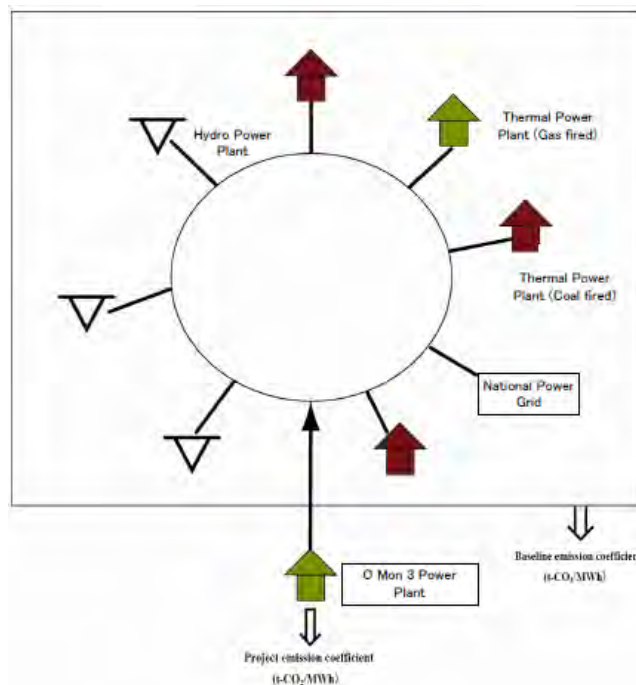
Monitoring methodology corresponding to the baseline scenario is required for actual Project Design Document (PDD). In addition to this, ‘applicable condition’ is required to be stated in the methodology, which is omitted in this document due to just trial calculation.



Source: CDM Methodology Guidebook

**Fig. 6.1-1 Images of Emissions Reductions**

As is shown in Fig.6.1-2, new electric power grid from O Mon 3 is connected to existing power network. In Vietnam, the network of electric power grid covers the whole country and the O Mon 3 new grid is to be connected to the network.



**Fig. 6.1-2 Configuration of O Mon 3 Project**

<sup>1</sup> [http://gec.jp/main.nsf/jp/Publications-Others-CDM\\_Meth\\_Guidebook](http://gec.jp/main.nsf/jp/Publications-Others-CDM_Meth_Guidebook)

There are two ways of CDM methodology which are approved by United Nations Climate Change Conference, in case of connecting grid from new gas fired power plant to existing power grid network.

- AM0029: Connecting to existing power grid network
- AM0087: Connecting to existing power grid network, or supplying to individual operator

Though both ways are similar ideas, AM0029 seems to be more general. So the volume of emission reductions is calculated through AM0029 methodology. Strictly speaking, however, the following cases of gas leaks or emissions should be considered, since main component of natural gas is methane (CH<sub>4</sub>), which are regarded as greenhouse gas; 1) gas leaks during transportation from gas wells to power plant (the same applies to LNG), 2) if the gas does not burn up for 100%, the remaining gas is emitted to the atmosphere.

This time, as preliminary estimations, calculations are conducted in ideal situation, assuming that no leaks or emissions are generated.



## 6.2 ESTIMATION OF EFFECT OF GREENHOUSE GAS EMISSIONS REDUCTIONS BASED ON CDM METHODOLOGY

### 6.2.1 Flow of Calculation

#### (1) Project Emissions

Volume of Project Emissions (PE<sub>y</sub>) is calculated by following formula.

$$PE_y = \sum_f FC_{f,y} * COEF_{f,y}$$

$FC_{f,y}$  : annual consumption of fuels (gas (m<sup>3</sup>/per year) and light gas oil (ton/per year))

$COEF_{f,y}$  : annual CO<sub>2</sub> emission coefficient (t-CO<sub>2</sub>/m<sup>3</sup> and t-CO<sub>2</sub>/ton)

#### (2) Baseline Emissions

Volume of Baseline Emissions (BE<sub>y</sub>) is calculated by following formula.

$$BE_y = EGP_{I,y} * EF_{BL, CO_2, y}$$

$EGP_{I,y}$  : volume of electricity supplying to the power grid network generated by the project activities (MWh/ year)

$EF_{BL, CO_2, y}$  : baseline emission coefficient (t-CO<sub>2</sub>/MWh)

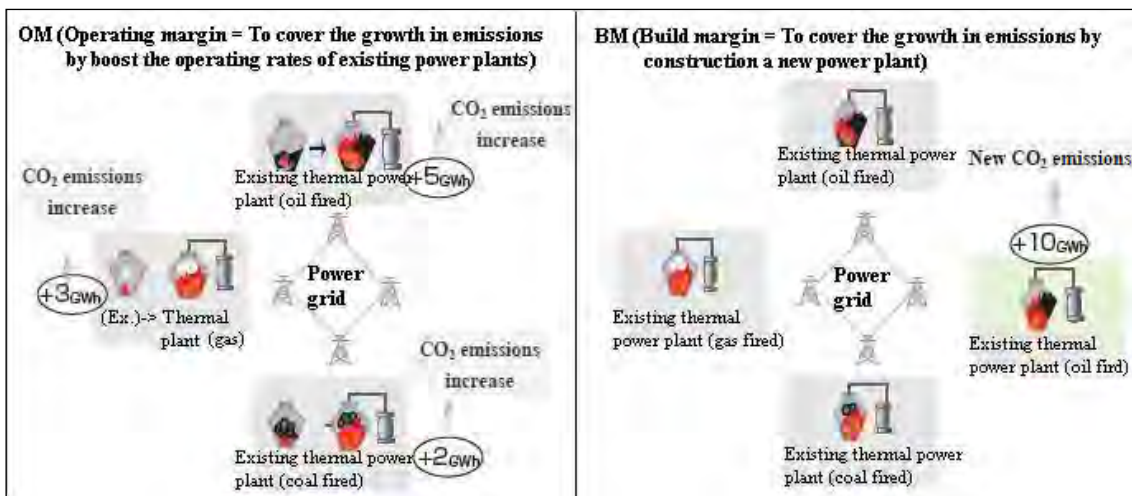
There are three options for calculations of baseline emission coefficient (t-CO<sub>2</sub>/MWh)

Option 1 : the build margin emission coefficient (t-CO<sub>2</sub>/MWh)

Option 2 : the combined margin emission coefficient (using a 50/50 operating margin/build margin weight)

Option 3 : emission coefficient (t-CO<sub>2</sub>/MWh) identified as the most likely baseline scenario

The images of operating margin (OM) and build margin (BM) emissions coefficient are shown in the Fig.6.2-1.



Source: [http://gec.jp/gec/jp/Activities/cdm\\_meth/pACM0002-old-080414.pdf](http://gec.jp/gec/jp/Activities/cdm_meth/pACM0002-old-080414.pdf)

**Fig. 6.2-1 Images of OM and BM**

## 6.2.2 Preliminary Calculations of CO<sub>2</sub> Reductions in O Mon 3

### (1) Baseline Emissions

In Vietnam, each emission coefficient within national electricity network is calculated for the sake of CDM project by electricity sector, cooperating MONRE, MOIT, and EVN. Values of each emission coefficient from 2006 to 2008 are shown in Table 6.2-1.

**Table 6.2-1 Each Emission Coefficient for Electricity Network in Vietnam**

	Unit	2006	2007	2008
Build Margin (BM)	t-CO <sub>2</sub> / MWh	0.5961	0.5729	0.5064
Operation Margin (OM)	t-CO <sub>2</sub> / MWh	0.6960	0.6795	0.6465
Combined Margin (CM)	t-CO <sub>2</sub> / MWh	0.6461	0.6262	0.5764

According to the table, the values of emission coefficient are all decreased year by year. Thus, utilizing the 2008 values of emission coefficient is appropriate, instead of utilizing average values of these three years. As is described, there are three options for calculations of baseline emission coefficient. The combined margin emission coefficient is adopted for this trial calculation.

*Baseline Emission Coefficient: 0.5764 (t-CO<sub>2</sub>/ MWh)*

### (2) CO<sub>2</sub> Emission Factor of Type of Generation

Table 6.2-2 shows CO<sub>2</sub> emission factor of each type of generation studied by Central Research Institute of Electric Power Industry. The project emission coefficient of the O Mon 3 is adopted for this trial calculation.

*Project Emission Coefficient: 0.519 (t-CO<sub>2</sub>/ MWh)*

**Table 6.2-2 CO<sub>2</sub> Emission Factor of Type of Generation**

(Unit: t-CO<sub>2</sub>/ MWh)

Type of power generation	Fuel fired	Facilities & Operation	Total
Thermal power plant (Coal fired)	0.887	0.088	0.975
Thermal power plant (Oil fired)	0.742	0.038	0.780
Thermal power plant (LNG fired)	0.478	0.130	0.608
Combined cycle power plant (LNG fired)	0.408	0.111	0.519
Photovoltaic power generation	0.000	0.053	0.053
Wind power generation	0.000	0.029	0.029
Nuclear power plant (PWR)	0.000	0.025	0.025
Geo-thermal generation	0.000	0.015	0.015
Hydro power plant	0.000	0.011	0.011

Source: "Evaluation of Power Generation Technologies based on Life Cycle CO<sub>2</sub> Emissions", Central Research Institute of Electric Power Industry. 2009

**(3) Trial Calculation of CO<sub>2</sub> Reduction**

Table 6.2-3 shows the net output of O Mon 3. Total power generation is expected to be 4,275,000MWh with the generation capacity of 750MW (F/S Report) and 4,759,500MWh with the generation capacity of 824MW (New Technology). Table 6.2-4 shows the amount of CO<sub>2</sub> reduction, calculated based on the net output of O Mon 3, Emission Factor and Baseline Emission Coefficient and Project Emission Coefficient. According to the calculation result, the emission amount of 245,385 ton-CO<sub>2</sub> per year to 273,195 ton-CO<sub>2</sub> per year is expected to be reduced when O Mon 3 power plant operates with the advanced gas combined cycle technology.

**Table 6.2-3 Net Output of O Mon 3 Power Plant**

Item	Generation capacity (MW)	Operation time (hour)	Total power generation (MWh)	Rate of plant (%)	Net output (MWh)
F/S Report	750	6,000	4,500,000	5.0	4,275,000
New technology	835	6,000	5,010,000	5.0	4,759,500

**Table 6.2-4 Expected Amount of CO<sub>2</sub> Reduction**

Item	Generation capacity (MW)	Net output (MWh)	Baseline Emission Coefficient (tCO <sub>2</sub> /MWh)	Project Emission Coefficient (tCO <sub>2</sub> /MWh)	Amount of CO <sub>2</sub> reduction (tCO <sub>2</sub> /year)
F/S Report	750	4,275,000	0.5764	0.519	245,385
New technology	835	4,759,500	0.5764	0.519	273,195

# **CHAPTER 7**

## **PROJECT EXECUTION PLAN**

## CHAPTER 7 PROJECT EXECUTION PLAN

### 7.1 PROJECT IMPLEMENTATION SCHEDULE

Two options (Option 1 & Option 2) are considered by TPPC as of February 2012 as mentioned below. CTTTP prepares project implementation schedule in case of option 1 which provides earlier operation of O Mon 3 provided that loan agreement become effective in October 2012.

- Option 1:** Selection of Foreign Consultant before Effectiveness of Loan Agreement
- GAS Turbine No.1 commissioning : Mar. 7, 2016
  - GAS Turbine No.2 commissioning : Apr. 7, 2016
  - Operation of the whole combined cycle power plant : Nov.14, 2016
- Option 2:** Selection of Foreign Consultant after Effectiveness of Loan Agreement
- GAS Turbine No.1 commissioning : Jul. 28, 2016
  - GAS Turbine No.2 commissioning : Aug. 28, 2016
  - Operation of the whole combined cycle power plant : Apr. 6, 2017

#### 7.1.1 Appropriateness of Implementation Schedule for O Mon 3 Power Plant

The both construction periods for O Mon 3 power plant and O Mon 4 power plant are estimated 30 months at present by CTTTP as shown in Table 7.1-1. Taking into consideration of actual manufacturing and installation periods of a gas turbine generator/ a steam turbine generator in Japan and overseas, the construction period of 30 months seems appropriate for O Mon 3 and O Mon 4. And the latest implementation schedules<sup>1</sup> as of February 2012 for O Mon 3 project and O Mon 4 project are shown in Table 7.1-2 and Table 7.1-3 respectively.

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<sup>1</sup> According to the last implementation schedules provided by CTTTP in December 2011, O Mon 3 project was planned to be completed in August 2016 and O Mon 4 project was planned to be completed in November 2015.

**Table 7.1-1 Milestones for O Mon 3 and O Mon 4 Projects**

No.	Item	O Mon 3 Project			O Mon 4 Project		
		Start	End	days	Start	End	days
<b>1</b>	<b>Effectiveness of Loan Agreement</b>	15/10/12	15/10/12	1	05/10/11	05/10/11	1
<b>2</b>	<b>EVN'S Consultant Services</b>	01/01/12	15/08/12	228	08/10/10	31/12/11	450
1	Selection of EVN' Consultant	01/01/12	14/02/12	45	—	—	—
<b>3</b>	<b>Consulting Services</b>	15/06/12	21/05/13	341	23/02/11	04/05/12	443
1	Issuance of RFP and Consultant's Preparation	22/07/12	04/09/12	45	17/06/11	02/08/11	56
2	Contract Signing	06/01/13	06/01/13	1	20/01/12	20/01/12	1
<b>4</b>	<b>EPC Package/Bidding process</b>	22/05/13	14/11/16	1,273	20/02/12	16/11/15	1,366
1	Notice of invitation	22/05/13	05/06/13	15	16/03/12	30/03/12	15
2	Issuance of Bid Document and or PQ	06/06/13	(Bid) 03/09/13	90	31/03/12	(PQ) 29/04/12	30
3	Bid opening	04/09/13	04/09/13	1	12/10/12	12/10/12	1
4	Contract Signing	26/03/14	26/03/13	1	27/03/13	27/03/13	1
5	L/C opening and contract effectiveness	26/04/14	25/05/14	30	27/04/13	26/05/13	30
<b>5</b>	<b>EPC Package/Implementation process</b>	<b>26/05/14</b>	<b>14/11/16</b>	<b>904</b>	<b>27/05/13</b>	<b>16/11/15</b>	<b>904</b>
1	Ground breaking	26/05/14	26/05/14	1	27/05/13	27/05/13	1
2	Commissioning of Gas Turbine No.1	07/03/16	07/03/16	1	09/03/15	09/03/15	1
3	Commissioning of Gas Turbine No.2	07/04/16	07/04/16	1	09/04/15	09/04/15	1
4	Operation of the whole CCPP	14/11/16	14/11/16	1	16/11/15	16/11/15	1

Source : CTPP

**Table 7.1-2 Implementation Schedule for O Mon 3 Power Plant Construction Project**  
*(Loan Agreement Effectiveness in October 2012)*

**Option 1 : Selection of Foreign Consultant before Effectiveness of Loan Agreement**

Source: CTTP

No.	Item	2012			2013			2014			2015			2016						
		1	3	4	1	3	4	1	3	4	1	3	4	1	3	4	1	3	4	
1	Effectiveness of Loan Agreement(expected)																			
2	EVN'S Consultant Services	1/1																		
	1 Selection of EVN'Consultant	1/1	2/14																	
3	Consulting Services			5/21																
	1 Issuance of RFP and Consultant's Preparation			7/22	9/4															
	2 Contract Signing					1/6														
4	EPC Package/Bidding process																			
	1 Notice of invitation																			
	2 Issuance of Bid Document																			
	3 Bid opening																			
	4 Contract Signing																			
	5 L/C opening and contract effectiveness																			
5	EPC Package/Implementation process																			
	1 Ground breaking																			
	2 Commissioning of Gas Turbine No.1																			
	3 Commissioning of Gas Turbine No.2																			
4	Operation of the whole CCP																			





# CHAPTER 8

## IMPLEMENTATION ORGANIZATION

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## CHAPTER 8 IMPLEMENTATION ORGANIZATION

### 8.1 ORGANIZATION AND TECHNICAL CAPABILITY OF EVN

#### 8.1.1 EVN Organization

EVN organization chart as of the end of 2011 is shown in Fig.2.4-1 in Chapter 2. The council consists of the president and 6 vice presidents. 6 departments such as operation, business, power generation investment, nuclear power construction etc. are under controlled by the 6 vice presidents. Under the above six departments, there are 16 sections.

#### 8.1.2 Technical Capability of EVN

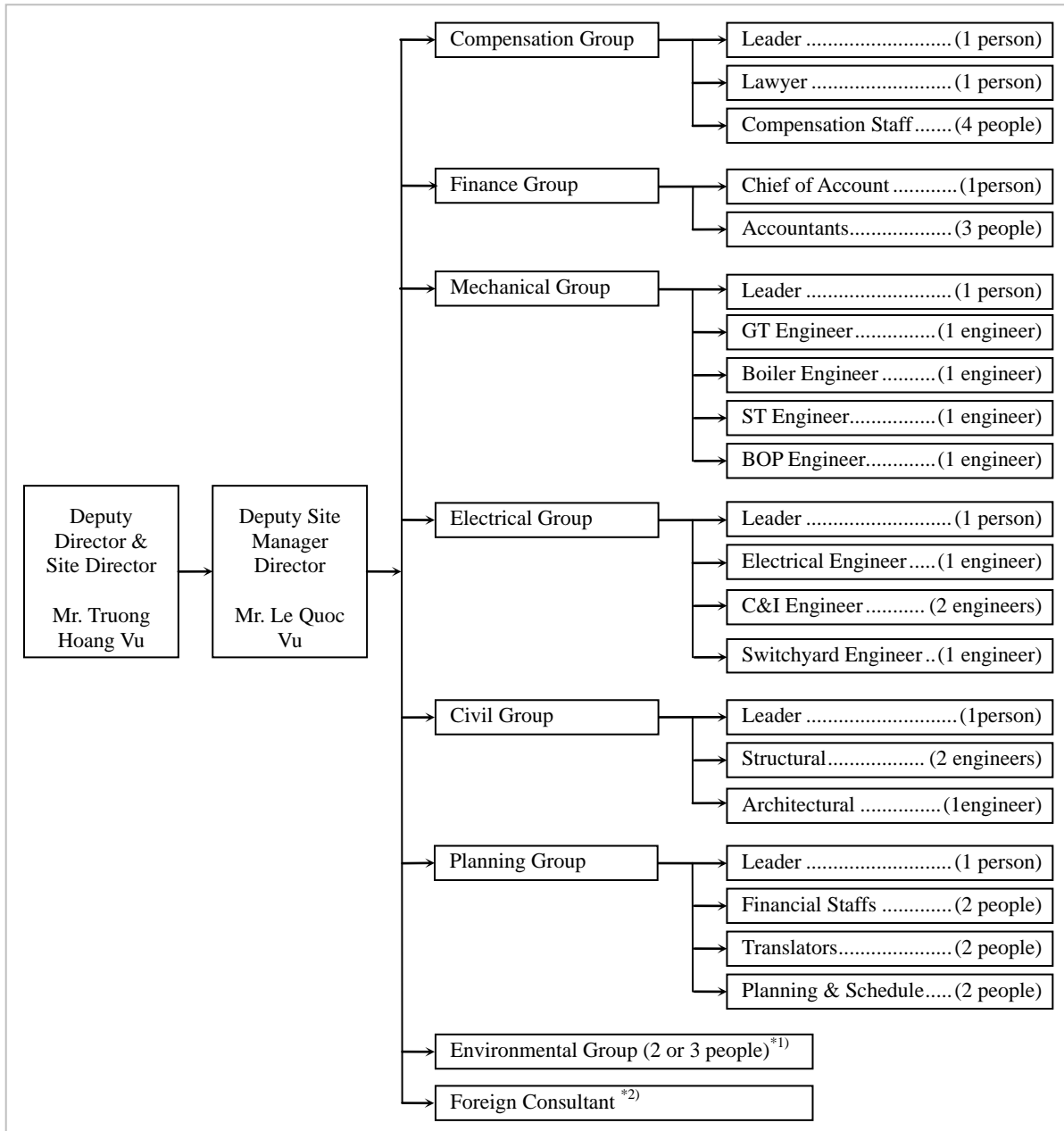
EVN has 4 technical colleges and tries to improve the technical capability of EVN staffs. Moreover, EVN has an experience of implementation of Phu My 1 combined cycle power plant (1,090 MW, operation in 2002). Therefore, technical knowledge and skills acquired from Phu My 1 project seem to be applicable to the O Mon 3 project.

## 8.2 ORGANIZATION AND TECHNICAL ABILITIES OF CTTP FOR O MON 3 PROJECT

### 8.2.1 Organization Chart

CTTP is responsible for implementation of O Mon 3 power plant and planned to be in charge of designing, supervision, performance tests witness under the organization chart shown in Table 8.2-1. Following the government policy, job development of local region, the local resident will be employed and be set in the above organization as well as O Mon 1.

**Table 8.2-1 Organization Chart of CTTP for Construction Stage**



\*1) Environmental group will carry out the requirements of environmental activities.

\*2) Consultant will be included after final selection.

Note: During the construction stage, CTTP departments' specialists will be mobilized, if necessary.

## 8.2.2 Technical Abilities of CTTTP

The total employees of CTTTP are 418 personnel and some of them are in charge of operation and maintenance for Tra Noc gas turbine power plant and O Mon 1A power plant. CTTTP has 3 experiences of construction of thermal power plants as shown in Table 8.2-2 and conducted the project management of O Mon 1A as shown in Table 8.2-3 under the advisory service by the Japanese Consultant. Therefore, technical knowledge and skills acquired from O Mon 1A project seem to be applicable to the O Mon 3 project.

**Table 8.2-2 CTTTP's Construction Experience of Thermal Power Plants**

No.	Project Name	Owner	Output (MW)	Site	Operation Year
1	2 × F6 Gas Turbine Installation Project (Phase 1)	EVN	76.8	Tra Noc District Can Tho City	1996.10
2	2 × F6 Gas Turbine Installation Project (Phase 2)	EVN	78.2	Tra Noc District Can Tho City	1999.05
3	O Mon I Unit No.1 Thermal Power Plant Project	EVN	330	O MON District Can Tho City	2009.07

**Table 8.2-3 Work Content in O Mon 1A**

Work Content
(1) All design works including operation and maintenance manuals
(2) All construction works including site preparation, all equipment, consumables and electricity
(3) All pre-commissioning works including temporary equipment
(4) Complete set of turbine generator /boiler & associated auxiliaries
(5) Fuel oil receiving facilities for two (2) units
(6) Designing natural gas receiving and firing facilities for two (2) units
(7) Power Transformers
(8) Switchyard equipment for two (2) units
(9) Witness to all performance tests
(10) Supervision of all civil and architectural works
(11) And others

In addition to the above construction experiences, CTTTP has also experiences of response to initial machine troubles in O Mon 1A as shown in Table 8.2-4. Therefore, CTTTP seems to be enough technical abilities to supervise the construction stage of O Mon 3 power plant.

**Table 8.2-4 Machine Troubles in O Mon 1A for the Last Three Years**

Time	Hours in operation	No. of troubles	Hours in troubles	Outage hours for maintenance	Reasons of troubles
2009 (from July 09)	3,727.72	02	28.83	237.83	① The pressure of AUTO STOP OIL of turbine oil system was low during the process of condenser vacuum test, which caused turbine trip on August 13, 2009. ② Main transformer (MAT) oil flow relay failure (due to the high temperature of MAT windings) occurred and the MAT protection relay 86 was activated and caused turbine trip on November 11, 2009.
2010	8,295.47	01	1.75	462.78	① Boiler trip due to high pressure of combustion furnace, high pressure of flue gas duct and high pressure of flue gas at the outlet of Gas Air Heater 1A and 1B on May 11, 2010.
2011 (up to Dec. 12)	6,431.17	01	433.75	1,482.00	① The boiler tube leakage on March 07, 2011 and the plant was intentionally shutdown.
<b>Total</b>	<b>18,454.36</b>	<b>04</b>	<b>464.33</b>	<b>2180.61</b>	

**8.3 OPERATION AND MAINTENANCE ORGANIZATION FOR O MON 3 POWER PLANT**

**8.3.1 Organization**

**(1) Planned Organization**

Table 8.3-1 shows the planned operation and maintenance organization for O Mon 3 power plant. 191 staffs will be in charge of operation and maintenance for O Mon 3 power plant. Table 8.3-1 also shows the planned organization for O Mon 4 for reference.

**Table 8.3-1 Planned Operation and Maintenance Organization for O Mon 3 Power Plant**

O Mon 3 Power Plant	O Mon 4 Power Plant
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Director Board (4persons)</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Assistants to Director Board (5persons)</div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="border: 1px solid black; padding: 5px;">(1) Operation Department (67persons) Operation Team (5teams) – Team Leader – Operator (12persons)</div> <div style="border: 1px solid black; padding: 5px;">(2) Thermal Maintenance Department (32persons)</div> <div style="border: 1px solid black; padding: 5px;">(3) Electrical Maintenance Department (27persons)</div> <div style="border: 1px solid black; padding: 5px;">(4) Chemical Test Department (8persons)</div> <div style="border: 1px solid black; padding: 5px;">(5) Technical Department (6persons)</div> <div style="border: 1px solid black; padding: 5px;">(6) Labor Department (12persons)</div> <div style="border: 1px solid black; padding: 5px;">(7) Planning Department (10persons)</div> <div style="border: 1px solid black; padding: 5px;">(8) Accounting Financial Department (6persons)</div> <div style="border: 1px solid black; padding: 5px;">(9) Company Office (14persons)</div> </div> </div>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Director Board (3persons)</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Assistants to Director Board (4persons)</div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="border: 1px solid black; padding: 5px;">Operation Department (62persons) Operation Team (5teams) – Team Leader – Operator (11persons)</div> <div style="border: 1px solid black; padding: 5px;">Thermal Maintenance Department (32persons)</div> <div style="border: 1px solid black; padding: 5px;">Electrical Maintenance Department (27persons)</div> <div style="border: 1px solid black; padding: 5px;">Chemical Test Department (10persons)</div> <div style="border: 1px solid black; padding: 5px;">Technical Department (6persons)</div> <div style="border: 1px solid black; padding: 5px;">Labor Department (12persons)</div> <div style="border: 1px solid black; padding: 5px;">Planning Department (10persons)</div> <div style="border: 1px solid black; padding: 5px;">Accounting Financial Department (6persons)</div> <div style="border: 1px solid black; padding: 5px;">Company Office (14persons)</div> </div> </div>
<b>Total Staffs: 191 Staffs</b>	<b>Total: 186 Staffs</b>

As shown in Table 8.3-1, the organization for O Mon 3 power plant will consist of 9 departments and 6 departments out of 9 departments are the departments related to operation and maintenance. The work content to be carried out by 4 departments which are substantially in charge of operation and maintenance is as follows.

**1) Operation department**

Operation department will consist of 5 teams with 3 shifts and the total will be 67 staffs. The each team will consist of one team leader, one sift leader, and twelve operators. Operators are responsible for operation and monitoring of mechanical and electrical equipment, and inspection of equipment. And remote control and monitoring of mechanical and electrical



equipment will be done in the Central Control Room.

**2) Thermal maintenance department and electrical maintenance department**

Thermal maintenance department will consist of 32 staffs and electrical maintenance department will consist of 27 staffs. The both departments will responsible for maintenance of all equipment.

The maintenance will be carried out by the Contractor (Manufacturer) during the guarantee period and by CTPP after guarantee period. The above maintenance departments are also responsible for preparation of maintenance and inspection manuals based on the instruction manuals provided by the Contractor.

**3) Chemical test department**

Chemical test department will consist of 8 staffs and be responsible for measurement, analyses, monitoring and tests based on the environmental requirements at the timing of normal operation, start-up and shutdown of the power plant. Technical department might be also involved in the above works in some cases.

**(2) Comparison of Organization between O Mon 3 and O Mon 4 Power Plants**

CTTP will be responsible for operation and maintenance of O Mon 3 power plant and O Mon 4 power plant. Table 8.3-2 shows the comparison of number of staffs between O Mon 3 power plant and O Mon 4 power plant based on Table 8.2-1.

**Table 8.3-2 Number of Staffs of O Mon 3 and O Mon 4 Power Plants**

No.	O Mon 3 Power Plant	Number of Staffs	No.	O Mon 4 Power Plant	Number of Staffs
<b>I</b>	<b>Board of Directors</b>	<b>4</b>	<b>I</b>	<b>Board of Directors</b>	<b>3</b>
<b>II</b>	<b>Group assistant</b>	<b>5</b>	<b>II</b>	<b>Group assistant</b>	<b>4</b>
<b>II</b>	<b>Operation department</b>	<b>67</b>	<b>III</b>	<b>Technical department</b>	<b>137</b>
1	Manager and deputy manager	2	3.1	Technical room	4
2	Team leader	5	3.2	Chemical workshop	10
3	Shift leader	5	1	Manager and deputy manager	2
4	Panel board GT1	5	2	The chemical test team	8
5	Panel board GT2	5	3.3	Operation workshop	62
6	Panel board ST	5	1	Manager and deputy manager	2
7	Generator room GT1	5	2	Foreman (screw)	5
8	Generator room GT2	5	3	Panel board GT1	5
9	Steam turbine room	5	4	Panel board GT2	5
10	Heat recovery No 1	5	5	Panel board ST	5
11	Heat recovery No 2	5	6	Generator room GT1	5
12	Circulation pump station	5	7	Generator room GT2	5
13	Water treatment systems	5	8	Steam turbine room	5
14	Storage and fuel supply	5	9	Heat recovery No 1	5
<b>IV</b>	<b>Maintenance and chemical test</b>	<b>67</b>	10	Heat recovery No 2	5
1	Thermal Maintenance Department	32	11	Circulation pump station	5
	Manager and deputy manager	2	12	Water treatment systems	5
	Team of stem turbine and HRSG	10	13	Storage and fuel supply	5
	Team of Gas Turbine	10	3.4	<i>Heat muscularis repair workshop</i>	32
	Mechanical Processing	10	1	Manager and deputy manager	2
2	Manager and deputy manager	2	2	TBK team (GT)	10
	Plant	10	3	TBH and LTHN team (ST&HRSG)	10
	C&I	10	4	Processing and repair workshop	10
	High Voltage	5	3.5	Electrical and C&I repair workshop	27
3	Chemical Test Department	1	1	Manager and deputy manager	2
	Manager	1	2	Electrical	10
	Team of Chemical	7	3	C&I	10
<b>V</b>	<b>Departments</b>	<b>48</b>	4	High voltage	5
	Technical Department	6	<b>IV</b>	<b>Economic and officer</b>	<b>42</b>
	Labor Department	12	4.1	Finance Accounting room	6
	Planning Department	10	4.2	Administrative organizations room	12
	Accounting financial Department	6	4.3	<i>Materials organizations room</i>	10
	Company office	14	4.4	<i>Company Security</i>	14
	-Office manager	1	1	Manager and deputy manager	2
	-Deputy office manager(fire fighting)	1	2	Staff	12
	-Staff	12			
	<b>TOTAL</b>	<b>191</b>		<b>TOTAL</b>	<b>186</b>

The result of comparison is as follows.

### 1) Organization

The both organizations for O Mon 3 power plant and for O Mon 4 power plant are approximately same ones, although the minor differences are observed like that O Mon 3 power plant is not equipped with a workshop and O Mon 4 power plant is equipped with a workshop. CTPP is recommended to reconsider the current organization for O Mon 3 power

plant by reviewing the effectiveness of the organization in the operation stage of O Mon 4 power plant.

Number of staffs for O Mon 3 power plant is 191 personnel and that for O Mon 4 power plant is 186 personnel, although the both power plants have the same power output of 750 MW. Number of staffs for O Mon 3 power plant is recommended to be optimized in the operation stage of O Mon 3 power plant and by reviewing the effectiveness of the organization in the operation stage of O Mon 4 power plant.

## 2) Operation staff

Number of operation staffs for O Mon 3 power plant is 5 more regarding the team leaders than those for O Mon 4 power plant as shown in Table 8.3-3.

**Table 8.3-3 Number of Operation Staffs**

(Unit: person)

No.	Position	O Mon 3 Power Plant	O Mon 4 Power Plant
1	Department chief and sub-chief	2	2
2	Team leader	5	0
3	Sift leader	5	0
4	Master workman	0	5
5	Operation staff	55	55
	Total	67	62

## 3) Maintenance department and technical department

The both maintenance department and technical department for O Mon 3 power plant and O Mon 4 power plants consist of the same number of staffs, such as 59 staffs for maintenance department (thermal: 32, electrical: 27) and 6 staffs for technical department.

## 4) Chemical test department

Number of staffs for chemical test department for O Mon 3 power plant is 2 less than those for O Mon 4 power plant. The department consists of 1 department chief and 7 chemical test staffs for O Mon 3 power plant and 1 department chief, 1 department sub-chief and 8 chemical test staffs for O Mon 4 power plant.

### 8.3.2 Technical Capabilities

Almost all of staffs for operation and maintenance for O Mon 3 power plant will be newly employed and CTTP intends to carry out a skill upgrading program and plan<sup>1</sup> for the newcomers in advance of the operation of O Mon 3 power plant.

<sup>1</sup> In Japan, power utility companies carry out the skill upgrading program for 2 years. Considering the required period of 2 years, CTTP has to complete the skill upgrading program in October 2014, 2 years before of commercial operation of O Mon 3 power plant.

## 8.4 RECRUITMENT PLANNING FOR OPERATION AND MAINTENANCE STAFFS

### 8.4.1 Planned Number of Staffs in O Mon Power Complex

Number of staffs for each power plant in the O Mon Power Complex is planned as follows. The total number of staffs will be 909 personnel if the plan is implemented as planned.

O Mon 1 power plant:	341 staffs
O Mon 2 power plant:	191staffs
O Mon 3 power plant:	191staffs
O Mon 4 power plan:	186staffs (191 staffs in original plan)
<b>Total</b>	<b>909 staffs</b>

### 8.4.2 Recruitment Planning for O Mon 3 Power Plant and O Mon 4 Power Plant

The existing number of staffs in CTPP is 418 personnel and all of them are in charge of operation and maintenance of other power plants. Therefore, almost operation and maintenance staffs for O Mon 3 power plant are newly employed as mentioned above.

The resident being impacted by the O Mon 3 project, the relatives of existing staffs and the residents working at power related facilities will be employed on a preferential base.

The recruitment plan prepared by CTPP is shown in Table 8.4-1. The contents of recruitment plan for Mon 3 and O Mon 4 power plants are same, although operation year of O Mon 3 power plant is different from that of O Mon 4 power plant.

**Table 8.4-1 Recruitment Plan for O Mon 3 Power Plant and O Mon 4 Power Plant**

O Mon 3 Power Plant	O Mon 4 Power Plant
<p>The recruitment plan for the Project is scheduled to be as follows:</p> <ul style="list-style-type: none"> <li>- From January 2013 to December 2013, 10 personnel will be employed and trained for environment impact assessment.</li> <li>- 60 personnel will be employed and trained at Ho Chi Minh City Power College for position of skilled workers from September 2014 to June 2016 for operation and maintenance of the O Mon 3 power plant.</li> <li>- 60 personnel will be employed and trained at Ho Chi Minh City Power College for position of workers from September 2014 to June 2016 for operation and maintenance of the O Mon 3 power plant.</li> <li>- From January 2016 to January 2017, on-site training for 56 university and college personnel will be conducted by the EPC Contractor.</li> <li>- 120 trained personnel graduated from Ho Chi Minh City Power College are to be trained at site by the EPC Contractor from January 2016 to January 2017.</li> </ul>	<p>The recruitment plan for the Project is scheduled to be as follows:</p> <ul style="list-style-type: none"> <li>- From January 2012 to December 2012, 10 personnel will employed and trained for environment impact assessment.</li> <li>- 60 personnel will be employed and trained at Ho Chi Minh City Power College for position of skilled workers from September 2013 to June 2015 for operation and maintenance of the O Mon 4 power plant.</li> <li>- 60 personnel will be employed and trained at Ho Chi Minh City Power College for position of workers from September 2013 to June 2015 for operation and maintenance of the O Mon 4 power plant.</li> <li>- From January 2015 to January 2016, on-site training for 56 university and college personnel will be conducted by the EPC Contractor.</li> <li>- 120 trained personnel graduated from Ho Chi Minh City Power College are to be trained at site by the EPC Contractor from January 2015 to January 2016.</li> </ul>

Source: CTPP

## 8.5 TRAINING PROGRAM

### (1) Training Program

The training program for skill upgrading of operation and maintenance staffs for O Mon 3 power plant and O Mon 4 power plant is prepared by CTTTP based on the training program developed in O Mon 1-A power plant as shown in Table 8.5-1.

*Table 8.5-1 Training Program for O Mon 3 and O Mon 4 Power Plants*

Training Program	
1.	<u>Training on environment impact assessment:</u> Training on environment impact assessment will be conducted by the main consultant during the project implementation.
2.	<u>Training on construction quality management:</u> The main consultant will train CTTTP's engineers on construction quality management before start of plant construction.
3.	<u>Training on power plant management:</u> To make the plant operate stably and economically, the EPC Contractor has to train the key personnel of CTTTP in the field of operation organization maintenance, material tracking, financial issues, asset monitoring.... Time of training is about 30 days for 12 persons.
4.	<u>Training on operation:</u> Training of operators will be made 4 months prior to the taking over time by the EPC Contractor to ensure that the trained operators can run the power plant safely and economically. The place for training shall be at on-site and off-site.
5.	<u>Training on maintenance of the plant:</u> Training to troubleshoot the incidents or defects arisen during operation shall be made by the EPC Contractor to the maintenance staff. Maintenance of equipment (C&I equipment, control system, measuring equipment...) is required for the training program. Training shall be on-site and off-site, lasting in 30 days for 12 workers.

Source: CTTTP

### (2) Reinforcement of OJT (on-the-job training)

Aiming at earlier skill upgrading of the staffs, CTTTP is recommended to prepare the following manuals with assistance by the foreign consultant after receiving the instruction manuals provided by the Contractor.

<Operation Department>

- Inspection manual for equipment
- Check list for operation equipment
- Operation manual for operation, start-up and shut down
- Operation manual for troubles and malfunctions
- Periodical replacement manual for equipment

<Maintenance Departments>

- Maintenance manual
- Construction manual and etc.

## &lt; Chemical Test Departments &gt;

- Manual for measurement, analyses, monitoring and test relating to air pollution, thermal effluent, plant drainage water, noise and so on required by environmental monitoring and control plans

## &lt; Chemical Test Departments and Technical Department &gt;

- Execution manual for environmental monitoring and control plans

## 8.6 WORK SAFETY AND HEALTH

- (1) The following activity plan relating to work safety and health is confirmed.
  - 1) Work safety : Plan and execution of work safety activities based on the instruction by the Ministry of Labor, Invalids and Affairs
  - 2) Health: Plan and execution of health activities such as health checking for all staffs
- (2) Questionnaire investigation to CTPP was conducted relating to working environment for the implementation of the projects. The result of questionnaire is shown in Table 8.6-1 and CTPP will observe the related laws and degrees.

**Table 8.6-1 Result of Questionnaire Investigation relating to Working Environment**

Study Team's Questionnaires	YES or NO			
	O Mon 1	O Mon 2	O Mon 3	O Mon 4
1. Is the project proponent not violating any law and ordinances associated with the working conditions of the country which the project proponent should observe in the project? <Answer> Yes, the project proponent is not violating any law ordinances mentioned above.	Yes	(*)	Yes	Yes
2. Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? <Answer> Yes, tangible safety considerations are in place for individuals involved in the project as mentioned above.	Yes	(*)	Yes	Yes
3. Are tangible measure being planned and implemented for individuals involved in the project, such as the establishment of safety and health programs and safety training (including traffic safety and public sanitation) for workers etc.? <Answer> Yes, tangible measure being planned and implemented for individuals involved in the project as mentioned above.	Yes	(*)	Yes	Yes
4. Are appropriate measures being taken to ensure that security guards involved in the project do not violate safety of other individual involved, or local residents? <Answer> Yes, appropriate measures are being taken to ensure the above requirements.	Yes	(*)	Yes	Yes

Note: (\*)O Mon 2 will be BOT project which does not belong to EVN.



# **CHAPTER 9**

## **REVIEW OF PROJECT EFFECT**

## CHAPTER 9 REVIEW OF PROJECT EFFECT

### 9.1 OPERATION AND EFFECT INDICATORS

JICA developed operation and effective indicators applicable to thermal power plants in March 2000 as shown in Table 9.1-2 for the objective ex-post evaluation of the project. According to Table 9.1-2, the maximum output (MW) and plant load factor (%) are set as the typical operation indicators and net electric energy production (GWh/year) is set as the typical effect indicator. Table 9.1-1 shows the operation and effect indicators for O Mon 1A which are developed in the advance evaluation stage of O Mon 1A.

*Table 9.1-1 Operation and Effect Indicators for O Mon 1A*

Indicators	Planned values in the advance evaluation stage
Sending out energy (GWh/year)	1,902.8 GWh
Maximum output (MW)	330 MW
Plant load factor (%)	68.5 %
Availability factor (%)	89.0 %
Station use (own consumption) (%)	3.9 %
Gross thermal efficiency (%)	41.9 %

When developing the operation and effect indicators for O Mon 3 power plant, the following issues are envisaged.

- Installed capacity for O Mon 3 power plant in case of adoption of the advanced technology for a F-type gas turbine will exceed 750 MW which was planned in the F/S Report in 2009 and the actual installed capacity for O Mon 3 is unknown until the result of bidding. Therefore, the net electric energy production is also unknown at the moment because the net electric energy production depends on the maximum output.

Based on the above issues, operation and effect indicators for O Mon 3 power plant are set as follows:

- (a) The maximum out is set as 750 MW and more.
- (b) The average operation hours per annum is set as 6,000 hours planned in the F/S Report in 2009.
- (c) Station use is set as 3% and less
- (d) Net electric energy production is set as 4,365 GWh and more/year (= 750 MW × (1-station use) × 6,000 hours).
- (e) Plant load factor is set as 68.5% (= 4500 GWh/year / (750 MW × 8670 hours/year))
- (f) Availability factor is set as 89.0% based on the negotiation with EVN.

Table 9.1-2 Operation and Effect Indicators (JICA: ver.2)

Category	Name	Policy and method of establishing the indicator	Target	Purpose	Remarks
<b>Operation Indicator</b>					
Basic	Maximum Output (actual value) (MW)	As shown by the name of the indicator	Maximum output planned at the time of appraisal	To assess if the plant performance has been maintained and exhibited	
Basic	Plant Load Factor (%)	= Electricity generated per year / (rated output × hours per year) × 100	About 70-90%	To confirm the adequacy of the original operation plan	On the assumption that the plant is operated for base load
Auxiliary	Availability Factor (%)	= Operating hours per year / hours per year × 100	About 83-90%	To confirm the adequacy of the original operation plan	On the assumption that the plant is operated for base load: 83% in the regular examination for 2 months Can be substituted for by the operating hours per year
Auxiliary	Auxiliary Power ratio (%)	= (Auxiliary electricity consumption per year / gross electricity generated) × 100	Coal Gas combined Geothermal Oil	To check the conditions for maintaining performance	
Basic	Gross Thermal Efficiency (%)	= (Gross electricity generated per year × 860) / (fuel consumption per year × heat release value of the fuel) × 100	Coal Gas combined Geothermal Oil	To check the conditions for maintaining performance and energy conservation levels	1 kWh = 860 kcal
Basic	Outage Hours for Every Cause (Hours/Year or Days/Year)	As shown by the name of the indicator	Human error Machine trouble Planned outage	To check this as the operating condition of the plant	Classified according to the causes: human error, machine trouble, and planned outage
Auxiliary	Outage Times for Every Cause (Times/Year)	As shown by the name of the indicator	0 Discussion Regular inspection Human error Machine trouble Planned outage	To check this as the operating condition of the plant	Classified according to the causes: human error, machine trouble, and planned outage
<b>Effect Indicator</b>					
Basic	Maximum Output (actual value) (MW)	As shown by the name of the indicator	Maximum output planned at the time of appraisal	To assess if the plant performance has been maintained and exhibited	
Basic	Net Electric Energy Production (Gwh/Year)	As shown by the name of the indicator	Refer to the remarks	To check if the assumed electricity generated was actually produced	From the view that the fixed amount of electricity can be continuously generated, it is highly possible that this indicator is regarded as an operational indicator = Rated output × hours per year × plant load factor = Gross electricity generated - auxiliary electricity consumption

Table 9.1-3 shows the operation and effect indicators for O Mon 3 power plant based on the above considerations.

**Table 9.1-3 Proposed Operation and Effect Indicators for O Mon 3 Power Plant**

Item	Indicator	Setting value	Remarks
Operation Indicators	Plant factor	68.5% and more	Plant factor does not change unless the average operation hours of 6,000 hours do not change.
	Availability factor	89.0% and more	
	Station use	3% and less	Subject to the result of bidding
	Gross thermal efficiency	57.5% and more	Subject to the result of bidding
	Outage hours by human error	0 hour/year	
	Outage hours by machine trouble	240 hours and less/year	
	Planned outage hours	450 hours and less/year	Based on the negotiation with EVN
Effect Indicators	Max output	750 MW and more	Subject to the result of bidding
	Net electric energy production	4,365 GWh and more/year	Subject to the result of bidding

# **CHAPTER 10**

## **CONCLUSION AND CONSIDERATION**

## CHAPTER 10 CONCLUSION AND CONSIDERATION

### 10.1 CONCLUSION

#### (1) Technical Evaluation

Technical specifications for O Mon 3 power plant explained in the F/S Report seem nearly reasonable except the following items and these items are recommended to be reconsidered at the Tender stage.

##### 1) Mechanical equipment

- In the F/S Report, “horizontal gas flow HRSG with natural circulation” and “vertical gas flow HRSG with forced circulation” were compared. However, many of “vertical gas flow HRSG with natural circulation” have been used worldwide. Therefore, “vertical gas flow HRSG with natural circulation” should also be accepted. (HRSG)
- The demineralized water plant is planned to be a combination of RO filter and mixed bed polisher. It is required to explain clearly the reason why RO filter is selected. (Feed Water Supply System)
- There is no description about a tube cleaning device of the turbine steam condenser in the F/S Report. It is recommended that a ball type tube cleaning device will be installed.
- Pre-treatment of waste water (water/oil separation, primary neutralization, sewage treatment, etc.) will be done by each power plant (O Mon 1 to 4), however, it is not clear whether the final treatment (aeration, final neutralization, sedimentation, etc.) is done by individual treatment system or by the common system. (Waste Water Treatment System)
- According to the plan described in the F/S Report, 2 units of 100% capacity compressors will supply total required air for both of instrumentation air and plant service air. However, this arrangement is not preferable for supplying the air to instruments at steady pressure condition. Because a demand of the service air is intermittent and large amount use, that may cause a pressure fluctuation of the air supply system. Therefore the compressed air supply system should be divided into the instrument air and plant service air supply systems. (Compressed Air Supply System)
- There is no description about auxiliary steam system, however, it is recommended that the auxiliary steam is supplied from the existing O Mon 1.(Auxiliary Steam System)

##### 2) Electrical Equipment

- The Study Team would recommend three diesel generators with 0.4kV output, each 1 for each generator. As for the excitation system, brushless excitation system is recommendable, instead of static excitation. Because the emergency generator will be operated when all power are failed. During this time, there is no stable power supply to support the static exciter. (Emergency power supply system)
- The F/S Report plans that 24V (or 48V) shall be divided from DC220V busbar by DC/DC converters. The Study Team would recommend an option to install independent DC24V (or 48V) battery system and DC220V battery system from the view point of noise and voltage fluctuations addition to the plan in the F/S Report. (Emergency power supply system)

- The F/S Report plans to install 6.6kV, 0.4kV and 220V systems for all gas turbine systems and steam turbine system. However, there is no large auxiliary equipment in gas turbine plant which needs to be fed from 6.6kV power supply. Therefore, 6.6kV switchgears for gas turbine plants can be deleted. (Switchgear Equipment)
- The F/S Report requests that fluorescent lamps, mercury high pressure luminaries, 250W high pressure sodium floodlight shall be provided. From the energy saving point of view, fluorescent lamp, mercury high pressure luminaries and 250W high pressure sodium floodlight shall be substituted for LED lamps and halogen gas lamps. (Lighting and small power system)
- The F/S Report does not mention about cables and/or cabling works except isolated phase bus duct which connect between generator terminals and transformers. (Cables and cabling works)
- Chapter 7.25.10, CECR of the F/S Report proposes that CECR will be expanded from the 500kV switchyard control room or new construction next to this control building or next to the central control room in the control building of the power plant. This concept of control of 500kV switchyard seems to contradict the existing control system of 500kV switchyard. The expansion for switchyard seems not necessary. (Control System)

## **(2) Review of the Project in terms of CDM**

O Mon 3 combined cycle power plant is expected to reduce CO<sub>2</sub> emission of 245 ~ 270 thousand ton per annum by the preliminary estimation based on the CDM method. A combined cycle power plant is one of thermal power plants as well as a coal-fired thermal power plant and an oil-fired thermal power plant. However CO<sub>2</sub> emission from a combined cycle power plant is much less than those of other thermal power plants. Therefore, implementation of O Mon 3 project is the potential clean production power plant.

## **(3) Necessity and Emergency of the Project**

As mentioned in Chapter 3, it is envisaged that the reserve margin will be minus for the period from 2013 to 2014 and power supply shortage will occur in the Southern Region where O Mon 3 power plant is to be constructed, even though the other power sources are implemented by the year 2014 as planned in the PDP7.

According to SPC data, planned blackouts constantly occurred for the past three years, such as 345 times in 2009, 341 times in 2010 and 340 times in 2011 due to the absolute shortage of power plants. Number of planned blackouts of 340 ~ 345 divided by 365 days is 0.93 ~ 0.96, which indicates that blackout almost occurs every day in some places of SPC's supply area. Hours per one planned blackout are always 7 hours from 8:00 to 16:00 except 12:00 to 13:00, which covers operation hours of manufactures.

For the above circumstances, the O Mon 3 project should be implemented as soon as possible.

## **(4) Finance Source of the O Mon 3 Project**

As discussed in Chapter 9, the O Mon 3 project seems financially feasible by virtue of lower Yen Credit interest rate of 1.4% and larger Yen Credit amount which covers 85% of the total investment cost. In case of Yen Credit, financial feasibility of the O Mon 3 project will be kept even though escalations of gas price and power tariff are changed to a certain extent.

On the other hand, in case that the O Mon 3 project is to be implemented by BOT scheme, the



feasibility from the financial viewpoint seems uncertainty considering the above risks and there will be less possibility that private investors participate in the implementation of the O Mon 3 project. In fact, a concrete developer for the O Mon 2 project has not been determined yet as of February 2012, even though the O Mon 2 project was planned to be implemented by BOT scheme in the PDP6 (operation in 2013).

Furthermore, WB has no intention to finance power sources development in future. Therefore, applicable public finance sources are limited to ADB and JICA, and ADB already committed implementation of two power plant projects.

If the gas price at initial operation is set as 10 USD/MMBTU, financial feasibility of the O Mon 3 project will disappear even under the utilization of preferable loan condition of Yen Credit. However, cancellation of implementation of the O Mon 3 project will seriously damage the economic activities in Vietnam because power supply shortage in the Southern Region becomes worse and worse. It seems that implementation of the O Mon 3 project should be determined not only from the financial viewpoint but also from the national policy viewpoint.

For the above reasons, Japanese Yen Credit seems the only finance source applicable to implementation of the O Mon 3 project and the O Mon 3 project should be implemented by Japanese Yen Credit.

## **10.2 CONSIDERATION RELATING TO IMPLEMENTATION OF O MON 3 PROJECT**

### **(1) Internal Factor**

#### **1) Management Capabilities of EVN**

EVN is responsible for further development of power sources in future. If the limited manpower of EVN is distributed to each power source project, EVN might be lack of management capability of projects and delays of implementation are envisaged as occurred in the PDP6. To avoid the same situation in the PDP6, EVN should employ the highly capable consultant for the O Mon 3 project and the consultant should fully support EVN.

#### **2) Power Tariff Setting**

EVN's financial condition becomes worse in comparison to that in 2002. EVN has to burden 15% of the total investment cost. However, under the current financial condition of EVN, worsening of cash management of EVN might cause payment delay to the Contractor and the construction work is delayed or suspended consequently. To avoid such situation, EVN should review the current power tariff periodically and set the appropriate power tariff which contributes to the soundness of EVN's business base.

#### **3) Additional EIA and Disclosure of Information**

Increase of environmental impact due to the increase of installed capacity (about 10%<sup>1</sup> more) will be minor in comparison to the impact in case of 750 MW. EVN has an opinion that additional EIA is not necessary because no technical condition is changed as long as adoption of F-type turbine. However, EVN is recommended to issue the official letter to MONRE and confirm whether additional EIA is necessary or not officially. Even if the additional EIA is required, civil work and foundation work can be commenced without the approval of additional EIA report by MONRE because additional EIA will be carried out for change of installed capacity related.

In addition to above, EVN is recommended to disclose information of changes of installed capacity and environmental impact to the stakeholders regardless of the additional EIA.

#### **4) Gas Supply Volume**

EVN promised that gas will be provided to O Mon 3 power plant on a priority base by reducing/limit of gas-firing operation of O Mon 1A and 1B power plants when gas supply volume is not enough for all power plants in the O Mon Complex. By virtue of cancellation of O Mon 5 power plant, gas supply volume seems enough for all power plants at the moment. However, when gas supply volume is not enough, EVN is expected to put his promise into practice.

### **(2) External Factor**

#### **1) Gas Price**

Gas price of 7.5 USD/MMBTU used in the financial evaluation is based on the information by EVN. On the other hand, it is said that the gas price proposed by the gas developer to the government of Vietnam is 10 USD/MMBTU. If gas price is determined 10 USD/MMBTU,

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<sup>1</sup> 835 MW/750 MW = 1.113

the financial feasibility of the O Mon 3 project is not assured if the gas price is subject to the escalation. The government of Vietnam is expected to conclude the gas price of 7.5 USD/MMBTU from financial viewpoint of the O Mon 3 project.

## **2) Gas Development Schedule**

Commencement of gas supply in this report is anticipated in 2015. Since the construction of the gas pipeline takes 42 months, FID should be concluded by June 2012 among the related parties in order to complete the gas pipeline in November 2015 because the commencement of operation of O Mon 4 power plant is expected in November 2015.

## **3) Construction schedule of Common Facilities for O Mon 3 and O Mon 4 power plants**

As described in Section 4.7, most common facilities for O Mon 3 power plant and O Mon 4 power plant, such as No.2 CW discharge channel, CW intake and CW intake pump etc., are to be constructed by the O Mon 4 project. The common facilities are expected to be constructed by May 2014 which is the planned start month for the construction of O Mon 3 power plant. To attain the above target, O Mon 4 power plant is required to start the construction in May 2015 as planned.

