Environmental and Social Considerations in Detailed Planning Survey (Technical Cooperation Project)

1. Full title of the Project

Project for Capacity Development of Power Sector Development Planning

2. Type of the study (e.g. Master Plan, Feasibility Study, Detailed Design, etc.)

Technical Cooperation Project for reviewing and updating Master Plan

3. Categorization and its reason

Categorization: B

Reason: The project is not likely to have significant adverse impact on the environment under the JICA Guidelines for Environmental and Social Considerations in terms of its sectors, characteristics and areas.

4. Agency or institution responsible for the implementation of the project

Ministry of Electric Power (MoEP)

5. Outline of the Project (objectives, justification, location, proposed activities, and scope of the study)

5.1 Objectives

To enhance the capacity of MoEP for power sector development planning through the process of reviewing, updating and utilizing National Electricity Master Plan (NEMP)

5.2 Location

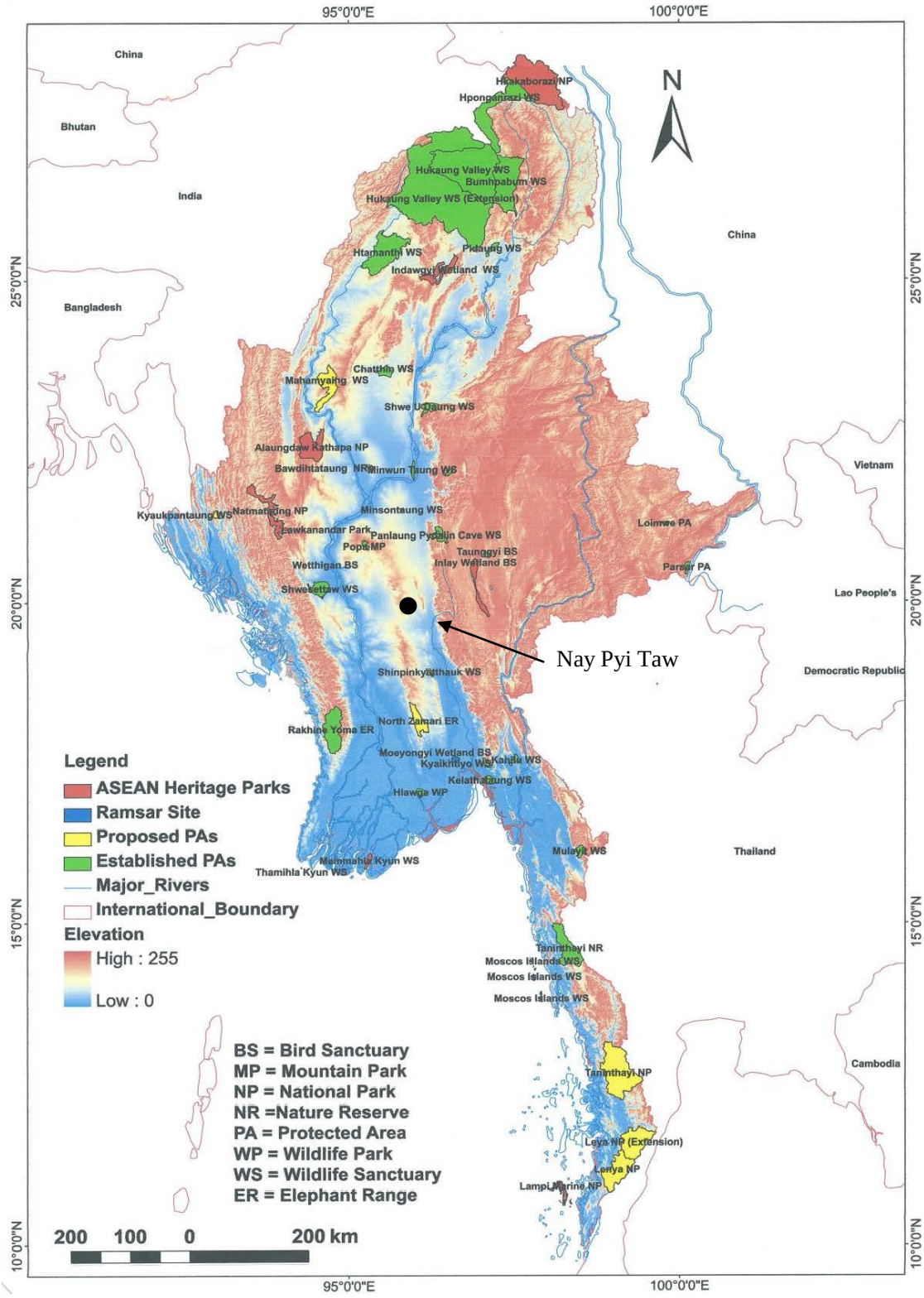
The project activities are mainly conducted at Nay Pyi Taw, the capital of Myanmar, but the NEMP covers the whole country.

5.3 Scope of the Project

(1) Establishment of Organization / Institutional System for Power Sector Planning
(2) Development of Institutional Capacity for Information/Data Collection and Management.
(3) NEMP Update through Joint Work, and Development of Technical Capacity for Power Sector Planning.

6. Description of the project site (maps, environmental and social condition, current issues, etc.)

6.1 Location map of the Project site



Source: Ministry of Environmental Conservation and Forestry

Fig. 6-1 Location of Protected Area

6.2 Environmental and social conditions

Myanmar has an area of about 677,000 km^2 with a population of 51.41 million in 2014. Administrative wards consist of seven Regions (Sagaing, Magway, Mandalay, Bago, Ayeyarwady, Yangon and Tanintharyi), seven States (Kachin, Chin, Shan, Rakhine, Kayah, Kayin and Mon) and Nay Pyi Taw Union Territory.

Myanmar, a tropical country located in Southeast Asia, is geographically divided by a mountain range running north to south into four areas consisting of the eastern highlands, western mountain ranges, central highlands and coastal zones.

About 48.5% (328,139 km2) is forest cover, 15.5% (104,869 km2) is cultivated land, 9.5% (64,274 km2) is uncultivated land, 0.6% (4,059 km2) is fallow land and 24.8% (163,791 km2) is land for other use.

Climate characteristics are generally tropical - except for the central and eastern highlands, which are semi-tropical - consisting of hot/rainy/dry seasons. Average annual precipitation is about 800 to 1,000 mm in the central dry highlands and 3,800 to 5,000 mm in the southeast coastal zone facing Bay of Bengal. The country has unique meteorological conditions owing to its diversity of geography.

The diversity of geography and meteorology produce unique and delicate ecologies consisting of 11,800 plant species, 258 mammal species, 297 reptile species, 82 amphibian species, 1,056 bird species, and 775 fresh and marine water fish species. In addition, Myanmar has recorded several endemic species that consists of eight plant species, one mammal species, 21 reptile species, three amphibian species and six bird species[1].

In addition, 125 threatened species, including 40 species of mammals, 26 species of reptiles and 49 species of birds, have been identified by the year of 2004. Categories included in the Red List are 16 species under Critically Endangered, 34 species under Endangered and 75 species under Vulnerable.[2]

The country has many rivers which are used for transportation and water resources. Most rivers run north to south. The four largest rivers are the Ayeyarwady, Chindwin, Sittoung and Thanlwin.

Myanmar is an ethnically diverse country. The Government of Myanmar recognizes 135 distinct ethnic groups (or tribes). The main ethnic groups are Kachin, Kayah, Kayin, Chin,

1 Website of MOECAF (Ministry of Environmental Conservation and Forestry) as of May 2014 (www.moecaf.gov.mm)

2 Myanmar National Environmental Performance Assessment Report by National Commission for Environmental Affairs, 2011

Bamar, Mon, Rakhine and Shan. Tribes in the main ethnic groups are shown below.

Major	Kachin	Kayah	Kayin	Chin	Mon	Bamar	Rakhine	Shan	Total
Tribes	12	9	11	53	1	9	7	33	135

Nay Pyi Taw is the capital of Myanmar, centrally located; 391 km from Yangon and 302 km from Mandalay. The city covers an area of 7,054.37 km2 and has a population of 924,608[3].

6.3 Current issues

Major environmental and social impacts, which are generally considered to occur when power projects are developed, are mainly resettlement, indigenous people, ecosystem/rare species, protected areas, air pollution and greenhouse gas emissions as shown below.

(1) Involuntary Resettlement

Large involuntary resettlement would most likely result by development of large scale hydropower projects. Especially, the location of large reservoirs influences resettlement needs. As most of large scale hydropower projects are located in areas of indigenous people, impacts are increased.

(2) Indigenous People

Most of hydropower schemes (40%) are located in the State of Kachin, Shan (25%), and Kayah (15%), where indigenous people mostly live. As they have their own culture, life style and ideas for their land and resources, large scale projects could impact them greatly. In northern areas of the country, some dam sites are to be located in armed conflict zones between army troops and ethnic forces.

(3) Ecosystem/Rare Species

Large scale hydropower projects have possible serious impacts, including possible extinction of forests and certain wildlife as well as impacts due to changes in river run off on aquatic organisms. Me Hka River and Mali Hka River upstream of the Ayeyarwady River have V-shaped valley and are covered by forest. According to EIA report for seven dams in the area, including Chipwi and Laza projects upstream from the Myitsone project, rich ecosystems including many rare species were found in the area. Some areas of Thanlwin River and Chindwin River are designated as protected areas (such as Hukaung Valley).

Taking into account the conditions in Myanmar, ecosystems and rare species will largely be impacted.

[3] https://en.wikipedia.org/wiki/Naypyidaw

(4) Protected Areas

Protected areas such as national park and wildlife conservation areas are defined by regulations as shown on Fig.6-1. Project areas should not be located within protected areas.

(5) Air Pollution

Suspended Particle Matters (SPM), SOx and NOx, which are included in exhaust gas from thermal power projects, have serious impacts on surrounding populations. Mitigation by means of introduction of suitable environmental equipment and proper operations could help reduce those impacts.

(6) Greenhouse Gas Emissions

The CO2 emissions from thermal power contain the large amount comparing to hydropower and solar power.

7. Legal Framework of Environmental and Social Considerations

7.1 Laws, regulations and standards related to environmental and social issues including requirements and procedures of Environmental Impact Assessment (EIA), stakeholder participation, and information disclosure.

Environment and social issues are prescribed by the Environmental Conservation Law which is the first comprehensive law relating to environment and was enacted in April 2012 to implement the Myanmar National Environmental Policy which lies down basic principles and gives guidance for environmental conservation, Environmental Impact Assessment (EIA), pollution control, waste management and other environmental matters related to sustainable development.

Designation of protection area is prescribed by the Forest Law 1992 and Protection of Wildlife and Conservation of Natural Area Law 1994.

Other related laws and regulations such as Conservation of Water Resources and Rivers Law 2006, Protection and Preservation of Cultural Heritage Regions Law 1998 and Environmental Standards and Emission Standards will be also referred to for the environmental and social considerations.

7.2 Relative agencies and institutions

Ministry of Environmental Conservation and Forestry (MoECF) has duties and power to carry out EIAs regarding projects or activities to be undertaken by any government department, organization or person that may cause a significant impact on environment.

8. Provisional Scoping (types and magnitudes of possible adverse impacts and mitigation measures)

8.1 Explanation of the National Electricity Mater Plan (NEMP)

This study aims to establish the strategy for and realization of a middle and long term power and transition line development plan in formulation of the NEMP of Myanmar.

The economic and stability analysis was carried out considering constraints of usage of primary energies to establish a Power Development Plan through 2030 based on a projects list provided by MoEP.

The best mix of power sources is studied by means of alternative scenarios comparison from the viewpoints of environmental aspects, supply stability, energy security, and so forth, in addition to least cost investment analysis.

8.2 Establish Scoping

(1) Scoping for Strategic Environmental Assessment (SEA)

Scoping is to decide the scope of environmental impact items and study methods to evaluate projects. The scoping for this study is focused on key impact issues to evaluate alternative scenarios for the formulation of the NEMP.

This study covers many prospective plans for various types of power projects. It is difficult for 'Spatial and Time Frame' and 'Range of Impacts Items" to be described and assessed as a simple set. Each project in the NEMP has different environmental impact characteristics and are all in different points in the planning process.

Considering above-mentioned special characteristics of the NEMP, scoping was developed by usage of an environmental checklist, document study, and discussions with engineers focused on serious environmental and social impacts of main power source types.

(2) Preparation of Checklist

A comprehensive checklist which describes serious impacts for power source types for each project was specifically prepared for this study. The checklist for large scale hydropower, small/medium scale hydropower, gas thermal power, coal-fired thermal power and transmission line was developed by JICA Study Team based on JICA Guideline. The checklist is shown in Table 8-1.

This checklist is used for scoping for power source types contained in the NEMP to evaluate the levels of possible environmental and social impacts if a standard facility of each type were to be developed.

Table 8-1 Checklist for Environmental and Social Items by Power Source Types

Category	Environmental Item	Main Check Items	Large Scale Hydro	Medium Scale Hydro	Gas-fired Thermal	Coal-fired Thermal	T/L
1. Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? (b) Is the resettlement plan, including compensation with full replacement costs and restoration of livelihoods and living standards based on socioeconomic studies? (c) Are the compensation principles prepared in document? (d) Does the resettlement plan pay particular attention to vulnerable people, including below the poverty line, ethnic minorities and indigenous peoples? (e) Are agreements with the affected people obtained prior to resettlement? (f) Is the organizational framework established to properly implement resettlement? Are the budgets secured to implement the plan? (g) Are any plans to monitor the impacts of resettlement? (h) Is the rectify for complaints mechanism established?	○	○	○	○	○
	(2) Living and Livelihood	(a) Will the project adversely affect living conditions of inhabitants? (b) Will the project causes the change of land uses to affect adversely livelihood of local people? (c) Will the project facilities adversely affect traffic systems? (d) Will the project diseases, including infectious diseases be brought due to the immigration of workers?	○	○	○	○	○
		(e) Is the minimum flow required for maintaining downstream water uses secured? (f) Will the project reductions in water flow downstream have impacts on downstream water and land uses? (g) Will the project reservoir-related diseases be introduced? (h) Will the project fishery rights, water usage rights, and common usage rights, etc. be restricted?	○	○			
		(i) Will the project installation of structures, such as power line towers cause a radio interference? (j) Are the compensations for transmission wires given in accordance with the domestic law?					○
	(3) Heritage	(a) Will the project damage the local archeological, historical, cultural, and religious heritage?	○	○	○	○	○
	(4) Landscape	(a) Will the project adversely affect local landscape?	○	○	○	○	○
	(5) Indigenous Peoples	(a) Are the considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?	○	○	○	○	○
2. Natural Environment	(6) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions?	○	○	○	○	○
	(7) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats? (b) Does the project site encompass protected habitats of endangered species designated by the country's laws or international treaties and conventions?	○	○	○	○	○
		(c) Is there a possibility that the project will adversely affect downstream aquatic organisms, animals, plants, and ecosystems? (d) Is there a possibility that dams will block the movement of migratory fish species?	○	○			

Category	Environmental Item	Main Check Items	Large Scale Hydro	Medium Scale Hydro	Gas-fired Thermal	Coal-fired Thermal	T/L
2. Natural Environment	(7) Ecosystem	(e) Will discharge of thermal effluents and leachate from coal storage and coal ash disposal sites adversely affect ecosystem and aquatic environments of surroundings? (f) Will intake of a large volume of cooling water affect ecosystem and aquatic environments of surroundings?				○	
	(8) Topography and Geology	(a) Is there a possibility that reductions in sediment loads downstream due to settling of suspended particles in a reservoir will cause impacts, such as scouring of downstream riverbeds and soil erosion? (b) Is there a possibility that sedimentation of a reservoir will cause loss of storage capacity, water logging upstream, and formation of sediment deposits at the reservoir entrance? Are the possibilities of the impacts studied, and adequate prevention measures taken?	○				
		(c) Is there a possibility that the project will cause a large-scale alteration of topographic features and geologic structures?	○			○	
3. Pollution Control	(9) Air Quality	(a) Do air pollutants, such as SPM[*1], SOx[*2] and NOx[*3] emissions comply with the country's emission standards? Will pollutants emit from the project cause areas that do not comply with the country's ambient air quality standards?			○	○	
		(b) In the case of coal-fired power plants, will dust from coal storage, coal handling facilities, and dust from coal ash disposal sites cause air pollution?				○	
	(10) Water Quality	(a) Does the water quality of reservoir and water discharge from reservoir comply with the country's ambient water quality standards? Will plague of plankton occur? (b) Are adequate measures, such as clearance of woody vegetation to prevent water quality degradation in the reservoir? (c) Will the reduced river flow downstream cause water quality degradation?	○				
		(d) Do effluents including thermal effluents from power plant comply with the country's effluent standards? Will the effluents from the project cause areas that do not comply with the country's ambient water quality standards or cause any significant temperature rise in receiving waters?			○	○	
		(e) In the case of coal-fired power plants, do leachate from coal storage and coal ash disposal sites comply with the country's effluent standards? (f) Are adequate measures taken to prevent contamination of surface water, soil, groundwater, and seawater by the effluents?				○	
	(11) Wastes	(a) Are earth and sand generated by excavation properly treated and disposed of in accordance with the country's regulations?	○	○	○	○	○
		(b) Are wastes, (such as waste oils, and waste chemical agents), coal ash, and by-product gypsum from flue gas desulfurization generated by power plant operations properly treated and disposed of in accordance with the country's regulations?			○	○	
	(12) Noise, Vibration and Odor	(a) Do noise and vibrations comply with the country's standards? (b) Are there any odor sources? Are adequate odor control measures taken?	○		○	○	
(13) Global Warming		Does the planned power plant emit considerable greenhouse gases?			○	○	

Note: (1) This environmental checklist provides environmental key items based on JICA Guidelines as to be checked for main types of power projects
(2) This environmental checklist is prepared by JICA Study Team based on the JICA Guidelines
(3) The character of ○ shows items of predicted environmental and social impacts on each type of power projects

*1 SPM : Suspended Particle Matters
*2 SOx : Sulfur Oxide
*3 NOx : Nitrogen Oxide

8.3 Result of Scoping

(1) Predicted Serious Adverse Impacts

Based on the checklist of Table 8-1, the SEA should focus on key issues of predicted serious adverse environmental and social impacts and evaluate alternatives in a wide range. Serious environmental and social impacts in large scale hydropower are regarded as resettlement, indigenous people, ecosystem/rare species and water pollution. Serious environmental and social impacts of thermal power, especially coal-fired, are regarded as air pollution and greenhouse gas emissions. The main serious adverse impacts by power source types are shown in the Table 8-2 as below.

Table 8-2 Predicted Serious Adverse Impacts by Power Source Types

Potential Serious Adverse Impacts	Large Scale Hydropower	Small/Medium Scale Hydropower	Gas Thermal Power	Coal-Fired Thermal Power
Resettlement/ Indigenous People	Likely large scale	Possible	Possible	Possible
Ecosystem / Rare Species	Likely large scale	Possible	Possible	Possible
Water Pollution/ Water Usage	Likely water quality degradation by reservoir	Reduction of run-off in the river section	Rare	Likely from coal storage and ash disposal
Air Pollution	None	None	NOx	SPM, SOx, NOx
Greenhouse Gas Emission	None. If timber remain in reservoir, CH_4 likely	None	CO_2	Relatively large amount of CO_2
Reference: Suitable Load for Supply	Peak load Middle load	Middle load Base load	Peak load Middle load	Mainly base load

Note 1: Large hydropower projects are classified to be over 1,000 MW along the main rivers in this study.
Note 2: SPM stands for suspended particle matter.

(2) Scoring for Assessment of Environmental and social impacts Degrees

Environmental items are scored as AA=10, A=8, B=5 and C=2 and level of environmental impact degrees for power source types are scored as a=10, b=5 and c=2. Scores in each power source type are added to become overall environmental impact degree of power source types. Environmental impact degrees are regarded as indicators for evaluation of power source types. Higher scores mean large environmental and social impacts. The result of scoring is shown in Table 8-4 as below.

Table 8-3 Weighting for Environmental Items and Power Source Types

Category	Environmental Items	Weighting for Environmental Items *1	Weighting for Power Types *2				
			Large Scale Hydropower	Small/medium Scale Hydropower	Gas Thermal Power	Coal-fired Thermal Power	Transmission Line
1 Social Environment	(1) Resettlement	AA	a	b	c	b	c
	(2) Living and Livelihood	A	a	b	c	b	c
	(3) Heritage	AA	—	—	—	—	—
	(4) Landscape	C	c	c	a	b	a
	(5) Indigenous Peoples	A	a	b	c	b	c
2 Natural Environment	(6) Protected Areas	AA	—	—	—	—	—
	(7) Ecosystem	AA	a	b	c	b	c
	(8) Topography and Geology	B	a	c	c	c	c
3 Pollution Control	(9) Air Quality	AA	—	—	c	a	—
	(10) Water Quality	A	a	c	c	b	—
	(11) Wastes	B	c	c	b	a	—
	(12) Noise, Vibration	C	c	—	a	b	—
	(13) Global Warming	AA	c	c	b	a	c

Note 1) "Weighting for Environmental Items" is defined to be four ranks by JICA Study Team
AA = Extremely large impacts and difficult mitigation possibility
A = Large impacts and tough mitigation possibility
B = Medium impacts and relatively easy mitigation possibility
C = Small impact and easy mitigation possibility
Note 2) "Weighting for Power Types" is defined to be three ranks by JICA Study Team as shown below
a = Large; B = Medium; C = Small; — = none or cannot generalized due to specific items
Note 3) "Weighting" is carried out by JICA Study Team considering past objective lesson

Table 8-4 Scoring for Assessment of Environmental Items by Power Source Types

Categories	Environmental Items	Weighted Score for Environmental Items [1]	Large Scale Hydropower		Small/medium Scale Hydropower		Gas Thermal Power		Coal-fired Thermal Power	
			Score of Environmental Impact [2]	Score of Environmental Impact with Weighting [3]	Score of Environmental Impact [2]	Score of Environmental Impact with Weighting [3]	Score of Environmental Impact [2]	Score of Environmental Impact with Weighting [3]	Score of Environmental Impact [2]	Score of Environmental Impact with Weighting [3]
1. Social Environment	1) Resettlement	**10**	10	10	5	5	2	2	5	5
	2) Living and Livelihood	**8**	10	8	5	4	2	1.6	5	4
	3) Heritage	**10**	0	0	0	0	0	0	0	0
	4) Landscape	**2**	2	0.4	2	0.4	10	2	5	1
	5) Indigenous Peoples	**10**	10	10	5	5	2	2	5	5
2. Natural Environment	6) Protected Areas	**10**	0	0	0	0	0	0	0	0
	7) Ecosystem Rare Species	**10**	10	10	5	5	2	2	5	5
	8) Topography and Geology	**5**	10	5	2	1	2	1	2	1
3. Pollution Control	9) Air Quality	**10**	0	0	0	0	2	2	10	10
	10) Water Quality	**8**	10	8	2	1.6	2	1.6	5	4
	11) Wastes	**5**	2	1	2	1	5	2.5	10	5
	12) Noise, Vibration,	**2**	2	0.4	0	0	10	2	5	1
	13) Global Warming	**10**	2	2	2	2	5	5	10	10
Total Scores [4]			54.8		25		23.7		51	
Environmental Impacts Degrees [5]			**4.2**		**1.9**		**1.8**		**3.9**	

Note 1: Weights from 0 to 10 is set up to "Environmental Items" and "Power source types" shown in Table 8-3.
Environmental Items: AA=10, A=8, B=5, C=2 Power source types in an Environmental Item: a=10, b=5, c=2, -=0
Note 2: (3) is calculated by multiplied (1) and (2) and divided 10; (3) = (1) x (2) / 10
Note 3: (4) is calculated by adding all of (3)
Note 4: (5) is calculated by divided 13 of the total number of items and 10. Maximum impact for every items will be 10 score.

8.4 Mitigation Measures

The prime mitigation measures for the revision and overall supervision of the NEMP are described as follows.

These mitigation measures should be examined continuously by MOEP after the completion of this Study to contribute to the (on-going) revision of the NEMP. The revision should be carried out at least annually. The vision for mitigation measures of the NEMP are as follows:

i) Useless demand growth should be avoided by conserving electricity consumption.

ii) Power development with lesser environmental and social impacts should be promoted.

iii) Re-planning of existing schemes with proper mitigation should be adopted.
iv) Risk for development should be reduced by gaining proper consensus with all stakeholders.

Specific mitigation measures for NEMP are described as follows in line with the above-mentioned vision.

(a) Conserve electricity consumption by applying DSM (Demand Side Management)

- ✓ Facilitate introduction of energy-saving equipment
- ✓ Promote and raise energy-saving consciousness among the public

(b) Effective use of energy resources

- ✓ Reduce transmission, substation and distribution losses
- ✓ Adopt high efficiency equipment

(c) Promote low environmental impact projects

- ✓ Replace and/or extend existing power projects.
- ✓ Promotion of new small/medium hydropower projects.
- ✓ Promotion of gas thermal power projects.
- ✓ Promotion of renewable energy projects.

(d) Project site selection review with reduced environmental and social impacts

NEMP is revised by means of a review of project sites selection as follows:

- ✓ Re-evaluation of existing hydropower schemes,
- ✓ Change of site locations to avoid impacts and implement design alternatives such as lowering dam heights to minimize impacts of existing hydropower schemes,
- ✓ Promotion and formulation of new small/medium hydropower schemes in environmentally benign sites,
- ✓ Evaluation of accumulated impacts caused by concentration of thermal power projects in high density population areas or cascade type hydropower projects in small river sections, and
- ✓ Evaluation of trans boundary hydropower projects as well as hydropower projects located in international rivers.

(e) Allocate mitigation measures regarding project costs

The NEMP is revised by means of the allocation of mitigation measures cost to the total project cost as follows:

- ✓ Include description and costing of facilities and operation for mitigation

measures for resettlement, land acquisition, watershed management, local development, air pollution, and so forth, in F/S and EIA reports,

- ✓ The revision of the NEMP on the basis of economic analysis with mitigation measures costs.

(f) Information disclosure and stakeholders participation

- ✓ Information disclosure on environmental considerations in early stages so as to ensure accountability and to promote participation of various stakeholders
- ✓ Ensuring stakeholder participation so as to reach consensus; stakeholder opinions are taken into consideration in decision-making processes (regarding environmental concerns)

The planning of specific projects, selection of projects of IPP (Independent Power Producer) and management of implementation of projects, followed by above mentioned mitigation measures for NEMP are indispensable.

9. Alternatives to the project activities including 'without project' option.

9.1 Alternative options and Results

The scenario alternatives are evaluated by focusing on the total installed capacities of each power source type in 2030. The total installed capacities of power sources, which have their own environmental impact degrees, differ for each scenario alternative. The alternative options and results are shown on the Table 9-1 below.

Table 9-1 Alternative options and Results

Options	Contents	Results
(1) Zero Option	a) No implementation of power projects b) No formulation of NEMP.	a) As the principle of power supply to meet forecasted demand, this option is not realistic. b) Inefficient power projects would be implemented and might trigger power outage due to lack of best-mix power sources and suitable power systems.
(2) Scenario 1: Domestic Energy Consumption Alternative Scenario (Large Scale Hydro Oriented):	Projects which use domestic energy resources (large scale hydro oriented) have priority.	The ratio of large scale hydropower is dominant with the environmental impact degree high. Serious environmental and social impacts in hydropower are regarded as resettlement/indigenous people, ecosystem/rare species, and water pollution.
(3) Scenario 2: Least Cost Alternative Scenario	Projects with the least total cost in 2014 ~ 2030 should be developed.	The ratio of large scale hydropower is dominant with the environmental impact degree high.
(4) Scenario 3: Power Resources	The ratio of power sources (hydropower, gas thermal and	The ratio of some large scale hydropower and much coal-fired

Balance Alternative Scenario	coal-fired thermal) should be balanced.	thermal power are dominant with the environmental impact degree medium. Serious environmental and social impacts in thermal power, especially coal-fired, are regarded as air pollution (SPM, SOx, NOx) and greenhouse gas emissions (relatively large amount of CO2).
(5) Environmental and Social Consideration Option	Power sources such as the small/medium hydropower, gas thermal power and renewable energy which have least environmental and social impacts are promoted for development and serve as a basis for evaluation of the three other scenarios.	The ratio of small/medium scale hydropower and gas thermal power is dominant with the environmental impact degree low.

The assumptions for the environmental and social consideration option are:

- Small/medium scale hydropower is promoted over large scale hydropower as one of the power source types which relies on domestic energy resources and has lesser environmental and social impacts.
- Gas thermal power, which has less environmental and social impacts than coal-fired thermal power, is promoted.
- Renewable energy such as solar power is promoted.

According to those assumptions, the installed capacities of small/medium scale hydropower, gas thermal power and renewable energy projects are assumed to be about 1.5 times more than that in Scenario 3 (to be reasonably achievable by 2030). This option includes possible future development schemes which have yet to be listed in MOEP.

The installed capacities of power sources does not reflect their dependable capacities during dry season, but rather the installed capacity of the plants themselves, which is considered as a possible indicator when studying environmental and social impacts.

10. Result of the consultation with recipient government on environmental and social consideration including roles and responsibilities.

MOEP agreed to abide by "JICA Guidelines for Environmental and Social Considerations" in order to ensure that appropriate considerations will be made for the environmental and social impacts of the Project.

11. Terms of Reference for Environmental and Social Considerations

The following activities will be conducted through Joint-work with Experts and Working

Group members of Ministry of Electric Power (MoEP) for the revision of NEMP.

(1) Review baseline conditions of strategic environmental assessment (SEA) for this Project.
- On legal context of environmental and social considerations (ESC), including requirements for Environmental Impact Assessments, Resettlement Action Plans, stakeholder engagements, and information disclosures.
- On institutional context of ESC in Myanmar and SEA for this Project
- On referral study reports of SEA conducted in Myanmar development projects and other relevant information
- On environmental and social baseline conditions concerned with this Project, including land use, natural environment, socio-economic environment, and presence of indigenous people.
- On environmental measures, and environmental management activities in existing power supply facilities in Myanmar

(2) Review the sector policies of electricity, environment and others relevant to this Project in the SEA context, including objectives and targets, alternatives, and action plans.

(3) Conduct workshops to consult with Ministry of Environmental Conservation and Forestry (MoECF) and other relevant parties including stakeholders on the ESC study based on SEA.

(4) Review the SEA
- Profile the alternative scenarios and compare potential environmental and social impacts and possible mitigation on key-environmental factors identified above, including 'without formulation of a NEMP and implementation of power projects' as zero-option alternative
- Prepare strategic environmental management framework for the optimal plan, in integrated planning procedure with working group members.
- Consider monitoring methods for the environmental management framework identified above.

(5) Prepare and finalize the SEA report reflecting comments from MoECF and other relevant parties.

12. Other relevant information

None