



Technical Assistance Report

Project Number: 43295
November 2009

Socialist Republic of Viet Nam: Climate Change Impact and Adaptation Study in the Mekong Delta (Cofinanced by the Climate Change Fund and the Government of Australia)

CURRENCY EQUIVALENTS

(as of 12 October 2009)

Currency Unit	–	dong (D)
D1.00	=	\$0.000056
\$1.00	=	D17,848

ABBREVIATIONS

ADB	–	Asian Development Bank
AusAID	–	Australian Agency for International Development
DONRE	–	Department of Natural Resources and Environment
GIS	–	geographic information system
M&E	–	monitoring and evaluation
MONRE	–	Ministry of Natural Resources and Environment
NGO	–	nongovernment organization
NTP	–	National Target Program
TA	–	technical assistance

TECHNICAL ASSISTANCE CLASSIFICATION

Type	–	Capacity development technical assistance (CDTA)
Targeting Classification	–	General intervention
Sector (subsectors)	–	Agriculture and natural resources (irrigation, drainage, and flood protection)
Themes (subthemes)	–	Environmental sustainability (environmental policy and legislation); economic growth (knowledge, science and technological capabilities); capacity development (institutional development)
Climate change	–	Climate change adaptation
Location impact	–	Rural (medium impact) and urban (medium impact)
Partnership	–	Government of Australia

NOTE

In this report, "\$" refers to US dollars.

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In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

I. INTRODUCTION

1. The Government of Viet Nam has requested the Asian Development Bank (ADB) for technical assistance (TA) to undertake a study on climate change impact and adaptation in the Mekong Delta.¹ The TA supports the Government's National Target Plan (NTP) for responding to climate change, as well as Viet Nam's commitments under the United Nations Framework Convention on Climate Change. It complements the Government's national socioeconomic development plan and Comprehensive Poverty Reduction and Growth Strategy.² A TA fact-finding mission visited Viet Nam and reached agreement with the Government on TA impact, outcome, outputs, activities, cost, implementation and financing arrangements, and terms of reference. The design and monitoring framework is in Appendix 1.

II. ISSUES

2. Viet Nam is one of the countries likely to be most affected by global climate change.³ Within Viet Nam, the Mekong Delta region, in the south of the country, has been identified as particularly susceptible to the impacts of extreme climate events and climate variability. The Mekong Delta region is home to one-fifth of the national population and has population densities that are among the highest in the country. There is a large proportion of poor and near-poor households, and the population remains predominantly rural. Agriculture and fisheries are the major sources of income for the large majority of the people. The area is known as the "rice bowl" of Viet Nam. Approximately 10,000 square kilometers (km²) of the delta are under rice cultivation, and the region contributes 46% of the total national food production.

3. The Mekong Delta region has experienced severe effects of climate events. Major floods in 2000 destroyed more than 400,000 hectares (ha) of rice paddies, 85,000 ha of farmland, and 16,000 ha of shrimp and fish ponds. With global climate change, the extent and frequency of extreme events are expected to intensify. Increased extent and duration of flooding, changes in wet season and dry season precipitation, inundation from a rising sea level, and changes in salinity intrusion will be significant threats to the region's agricultural and fisheries productivity, as well as to remaining natural coastal ecosystems. Effects on livelihoods and food security for the region's population are likely to be significant. Poor households are likely to be the most vulnerable to the effects of climate change.

4. Approximately 12,300 km², or 31%, of the total land area of the Mekong Delta, including 9,800 km² of land used for agriculture and aquaculture, could be affected by a 1.0-meter rise in sea level that could occur by 2100. About 4.8 million people could be affected by such a change in sea level, including more than 1.5 million poor individuals. Energy and road infrastructure in the region is also susceptible to effects of climate change that include flooding, salinity, temperature changes, and availability of water resources.

5. A number of ongoing assistance efforts relating to climate change are provided by various development partners, including the World Bank's Economics of Adaptation to Climate Change Project; initiatives by United Nations Development Programme in relation to mainstreaming climate change issues in socioeconomic development planning; and initiatives by the Danish and Dutch governments to develop climate change adaptation plans for a series of coastal provinces. Despite the importance of the region to national socioeconomic

¹ The TA first appeared in the business opportunities section of ADB's website on 13 July 2009.

² Government of Viet Nam. 2002. Comprehensive Poverty Reduction and Growth Strategy. Ha Noi.

³ ADB. 2009. *The Economics of Climate Change in Southeast Asia*. Manila.

development and its vulnerability to climate change, no comprehensive study of the potential effects of climate change has been undertaken to date. The capacity of government authorities in the region in relation to climate change issues is low, and, despite a long history of disaster management response planning, regional sector and socioeconomic development planning includes scant reference to climate change adaptation measures. Therefore, effective climate change adaptation measures need urgently to be developed and integrated into the region's development planning to enhance the physical and economic climate-resilience of the region, and in particular to protect poor and rural households.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

6. The expected impact is that poor and rural people in the Mekong Delta region will have developed physical and economic resilience to future climate change and variability. The TA will contribute to the Government's socioeconomic development goals of poverty reduction and continued economic growth as contained in the national socioeconomic development plan and the Comprehensive Poverty Reduction and Growth Strategy. It will also contribute to fulfilling the goals of the NTP in relation to addressing climate change issues within a context of poverty alleviation and sustainable development.

7. The expected outcome is that sector and provincial authorities in the Mekong Delta region will have developed the capacity to increase climate-resilience of programs, plans, policies, and/or projects to guide future development planning. This outcome will result in increased climate change resilience in the region and contribute to poverty reduction through (i) climate-proofed socioeconomic development planning at provincial level (e.g., urban land use planning to avoid flooding of sensitive areas, adjusting agricultural patterns to adapt to changing drought or salinity conditions, providing such protective infrastructure as dikes, or enhancing natural protective ecosystems); (ii) adoption of regional adaptation measures to protect agricultural production and thus the livelihoods of poor, near poor, and rural households through structural and nonstructural measures; and (iii) development of climate-resilient infrastructure in the transport and energy sectors that will aid in protecting the livelihoods of vulnerable groups, as well as in supporting overall economic development.

B. Methodology and Key Activities

1. Overview

8. The TA will be implemented in two parts. Part A is climate change prediction and impact assessment, while part B is climate change adaptation and planning. Part A will include output 1: identification of future climate conditions in the Mekong Delta region; and output 2: assessment of the effects of future climate scenarios on natural, social, and economic systems in the Mekong Delta region. Part B will include output 3: identification of appropriate climate change adaptation measures for target provinces and targeted regional sectors; and output 4: development of pilot projects for scaling up and replication of TA outcomes and support to collaborative mechanisms for information sharing and coordinated action on climate change. Both parts of the TA will incorporate institutional strengthening activities for Government decision makers and technical staff, as well as awareness raising activities for the community (output 5). A fundamental principle of the TA will be to implement a participatory approach involving national and provincial government representatives.

9. Target provinces selected for the TA are Ca Mau and Kien Giang. Kien Giang was chosen because it has a conventional coastal and insular environment with a westerly aspect that is less exposed to mainstream hydrological influences. Existing community development and natural resources projects in this province will provide data sources and useful connections to local stakeholders. Ca Mau was selected as it is a large coastal province with a diverse mixture of land use types, remnant natural ecosystems, important infrastructure development in the energy and transport sectors, and pockets of high poverty rates and ethnic minority groups.

10. Regional sectors targeted for the TA are agriculture, energy, and transport. The agriculture sector was selected due to the region's importance to national food production and the population's high reliance on agricultural activities for its livelihoods. Agriculture is identified as a key sector for climate change adaptation in the region, and it is the subject of the Government's action plan for adaptation to climate change in agriculture and rural development. Energy and transport were selected as target sectors due to (i) the vulnerability of energy and transport infrastructure to climate change, (ii) the importance of energy and transport infrastructure to economic development and enhancing livelihoods among socially vulnerable groups, and (iii) the presence of important national energy and transport infrastructure in the Mekong Delta region.

2. Part A: Climate Change Prediction and Impact Assessment

11. Output 1 will be achieved by modeling future climate change scenarios in 2030 and 2050. Modeling activities will be undertaken initially at the regional level, with more detailed modeling carried out for the regional target sectors and provinces. Modeling and data collection will build on work already carried out by the Ministry of Natural Resources and Environment (MONRE) and donors. Global circulation models, regional downscaled models, and local and international climate data will be employed as appropriate. Modeling will investigate threats related to rising sea level, storm surge, change in temperature patterns, change in rainfall patterns (including drought frequency), and salinity patterns.

12. Output 2 will be achieved by first carrying out an impact risk assessment at Mekong Delta regional level using an approach based on GIS (geographic information system) to identify the effects of future climate change scenarios on natural systems (e.g., biodiversity, water resources and quality, soils.), social systems (e.g., population, poverty, gender, public health, urban settlements), economic systems (e.g., industry, gross domestic product, agricultural production), hydro-meteorological characteristics (e.g., flooding, sea levels and tides, salinity, river flows), and important development sectors (including, but not limited to, the identified target sectors). Regional hotspots of climate change sensitivity, including vulnerable infrastructure items in the target sectors, will be identified for use in the latter phases of the study and for developing pilot projects under output 4. Integrated assessment modeling will then be carried out for target provinces and sectors to provide a more detailed assessment of climate change effects. The results of the integrated assessment modeling will provide important inputs to the cost-benefit analysis of adaptation options for target sectors and provinces.

13. Activities for output 5 will be commenced under part A. An analysis of existing climate change capacity within the Government will be carried out as the baseline to develop a tailored capacity building program for provincial and sector authorities (including a monitoring and evaluation framework). Implementation of the developed program will then begin. Key participants in the activities will be from national line ministries in the target sectors, such as the Ministry of Planning and Investment, MONRE, Ministry of Transport, Ministry of Industry and

Trade, Ministry of Agriculture and Rural Development, and Viet Nam Electricity. Also participating will be the ministries' provincial counterparts, such as the departments of Planning and Investment, Natural Resources and Environment (DONRE), Transport, Industry and Trade, and Agriculture and Rural Development. A community awareness-raising program will be implemented within the two target provinces.

3. Part B: Climate Change Adaptation and Planning

14. Output 3 will be achieved by identifying a long list of climate change adaptation options for integration into future development planning for target sectors and provinces. This process will use a "no-regrets" approach⁴ to identifying options and subjecting those options to economic, environmental, and social evaluation. The options should consider existing government policies, including the national strategy for natural disaster prevention. A prioritized list of feasible and practical adaptation options (both structural and nonstructural) will be developed for integration into the development planning framework, and their corresponding budget costs for implementation will be financed. Cost-benefit analyses of selected adaptation measures in target sectors and provinces will be conducted, together with economic modeling of the adaptation measures' impacts. Authorities will also be assisted in identifying financing options for eventual implementation of the adaptation actions.

15. Output 4 will be achieved by designing climate change adaptation pilot projects to allow eventual upscaling and replication of study outcomes in other provinces or sectors within the Mekong Delta region. This output will also facilitate the Government's participation in existing regional climate change advisory and information sharing bodies, thus allowing lessons learned from the study to be disseminated both internationally and nationally.⁵

16. Institutional strengthening activities under output 5 will be completed under part B with the objective of building the skills of technical staff and raising awareness among senior decision makers.

C. Cost and Financing

17. Total cost of the TA is expected to be \$1,630,000 equivalent, of which (i) \$800,000 will be financed on a grant basis by the Government of Australia,⁶ and administered by ADB; and (ii) \$500,000 will be financed on a grant basis by the Climate Change Fund.⁷ The Government will finance the remaining \$330,000 in kind, covering the costs of office accommodation, transport, utilities, remuneration for counterpart staff, as well as training and workshop facilities.

D. Implementation Arrangements

18. The Department of Meteo-Hydrology and Climate Change within MONRE will be the executing agency. The provincial people's committees of Ca Mau and Kien Giang will be implementing agencies for the activities at provincial level. There will be established within each

⁴ "No-regrets" adaptation interventions, meaning actions that generate net social benefits under all future scenarios of climate change and impacts.

⁵ Examples of forums include the Greater Mekong Subregion Working Group on Environment, the Mekong River Commission Climate Change Adaptation Initiative, Delta Research and Global Observation Network (DRAGON) institute at Can Tho University, and the Mekong Delta Forum supported by World Wide Fund for Nature.

⁶ Through the Memorandum of Understanding on Channel Financing (Technical Assistance Program) between the Government of the Commonwealth of Australia and the Asian Development Bank.

⁷ Established by ADB.

province a steering committee (chaired by the vice-chairperson of the provincial people's committee and with the deputy director of DONRE as vice-chair) and a project management unit (headed by the deputy director of DONRE and composed of technical staff from the relevant departments).

19. Regional activities at sectoral level will be carried out by a regional sector technical working group chaired by the Department of Meteo-Hydrology and Climate Change. The working group will be responsible for (i) guiding study activities related to regional sector analyses; (ii) providing technical inputs; (iii) sharing information, collaborating on study progress and outcomes, and liaising with senior decision makers and technical staff within relevant ministries and agencies; (iv) reviewing study outputs and contributing to evaluation and prioritization of regional sector adaptation options; and (v) disseminating study findings and recommendations to senior decision makers and technical staff. The working group will involve representatives of the Ministry of Planning and Investment, Ministry of Transport, Ministry of Industry and Trade, Viet Nam Electricity, and Ministry of Agriculture and Rural Development. The national level NTP Committee, the Climate Change Working Group of the International Support Group for the Environment, and the Natural Disaster Mitigation Partnership will be briefed on study progress and findings.

20. For part A, a team of six international (totaling 19.5 person-months) and seven national (totaling 25.5 person-months) consultants will be required. For part B, a team of three international (totaling 13.5 person-months) and three national (totaling 20.5 person-months) consultants will be required. The consultants will be engaged in accordance with ADB's *Guidelines on the Use of Consultants* (2007, as amended from time to time). Outline terms of reference for the consultant team are provided in Appendix 3. Any procurement will be implemented according to its *Procurement Guidelines* (2007, as amended from time to time). All training materials developed by the consultants and office equipment purchased under the TA will be transferred to the Government upon completion of the TA and thereafter will remain the property of the Government.

21. The TA will be implemented over 16 months, from January 2010 to April 2011. Part A consultants will start their work in January 2010, prepare an inception report within 1 month, and prepare a midterm report within 6 months. On this basis, part B consultants will be mobilized in June 2010 and prepare an inception report within 1 month and a final report by March 2011. The time frame for completion has been selected to correspond to the Government's socioeconomic development planning cycle and completion of the first phase of activities under the NTP. Tripartite meetings of the Government, ADB, and the consultants, as well as stakeholder workshops, will be held to discuss the inception, midterm, and final reports. ADB will field a review mission every 6 months during TA implementation to supervise the work of consultant. Close coordination will be maintained between ADB's Viet Nam Resident Mission and the office of AusAID in Ha Noi to ensure timely information sharing and effective TA implementation.

IV. THE PRESIDENT'S DECISION

22. The President, acting under the authority delegated by the Board, has approved (i) ADB administering a portion of technical assistance not exceeding the equivalent of \$800,000 to be financed on a grant basis by the Government of Australia, and (ii) ADB providing the balance not exceeding the equivalent of \$500,000 on a grant basis, to the Government of Viet Nam for the Climate Change Impact and Adaptation Study in the Mekong Delta, and hereby reports this action to the Board.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
<p>Impact Rural and poor people in the Mekong Delta region develop physical and economic resilience to future climate change and variability.</p>	<p>Understanding of the required adaptation response in the Mekong Delta plus initial policy and investment responses</p> <p>Identification of a baseline and measurable indicators in agriculture, energy, and transport sectors</p>	<p>Data from National Steering Committee for Flood and Storm Control</p> <p>Data from National Steering Committee for Flood and Storm Control</p>	<p>Assumptions Future climatic conditions are not significantly different than those identified from modeling scenarios.</p> <p>Government's existing commitment to address climate change as a priority in national development continues.</p> <p>Current positive trends in economic growth and poverty reduction in Viet Nam continue.</p> <p>Risks Scientific uncertainty implicit in climate change projections causes future climatic conditions to differ significantly from those predicted.</p> <p>Current scientific findings and projections in relation to climate change are substantially revised.</p>
<p>Outcome Sector and provincial authorities in the Mekong Delta region have developed capacity to increase the climate-resilience of programs, plans, policies, and/or projects to guide future development planning.</p>	<p>Agreed climate change adaptation measures integrated into regional socioeconomic development plan in the two targeted provinces of Mekong Delta by end of 2011</p> <p>Established emergency response units and procedures in target provinces as pilot</p>	<p>Review of plans, policies, programs, and/or project documentation in 2011</p>	<p>Assumption Consensus can be reached among study partners on the best approaches to climate change adaptation.</p> <p>Risks Temporal and/or political constraints mean that agreed adaptation measures are not adopted by authorities.</p> <p>Identified adaptation measures conflict with Government's other economic or social development priorities.</p> <p>Identified adaptation measures are financially, economically, socially or environmentally unacceptable to Government or ADB.</p>
<p>Outputs 1. Climate change model outputs for potential future climatic conditions in Mekong Delta region</p>	<p>Modeling of two future climate change scenarios in Mekong Delta completed by March 2010</p>	<p>Modeling documentation prepared as part of TA</p>	<p>Assumptions Global circulation and regional models adopted for climate forecasting provide feasible results.</p> <p>Government technical staff and senior decision makers have adequate skills and knowledge</p>

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
2. Documentation of effects of future climate conditions on natural, social, and economic systems	Six impact risk assessments completed by June 2010: (i) Mekong Delta region, (ii) detailed integrated assessments for two target provinces (Kien Giang and Ca Mau), and (iii) detailed integrated assessments for target sectors (agriculture, energy, and transport)	Impact risk assessment modeling documentation prepared as part of TA	for effective involvement in capacity building activities. Regional and international stakeholders are willing to collaborate on climate change issues. Risks Scientific uncertainty associated with climate predictions and modeling
3. Documentation of appropriate climate change adaptation measures in two targeted provinces' and three targeted sectors' programs, plans, projects, and/or policies	Prioritized list of adaptation measures for inclusion in one selected plan, policy, and/or program agreed with authorities in each target sector (agriculture, energy, and transport) and each of two target provinces (Ca Mau and Kien Giang) by October 2010	Adaptation measures documentation prepared as part of TA Documentation from stakeholder workshops and meetings	Lack of available data means modeling results are not of suitable quality to accurately predict climate change at an appropriate scale to allow preparation of effective adaptation measures. Inadequate level of expertise or human resources within Government to effectively participate in and contribute to TA activities
4. Development of pilot projects to allow upscaling and replication of TA outcomes, and support to collaborative mechanisms for information sharing and coordinated action on climate change in the Mekong Delta region	Two pilot projects identified, designed and costed, and financing options identified by March 2011 Presentation of results of TA implementation to one regional forum	Documentation of pilot projects Documentation of TA implementation Documentation of forum presentation	
5. Institutional strengthening provided to enable authorities to fulfill their development responsibilities in future climate conditions while increasing community awareness of climate change issues and adaptation measures	Five technical staff from each targeted sector and provincial authority will participate in capacity building activities identified in the TA capacity building program by March 2011 and provide positive evaluation.	Records of participation in TA capacity building activities and participant evaluation forms Results from TA capacity building program's M&E framework	
Activities with Milestones			Inputs
1.1	Identify baseline conditions in study area in relation to natural, social, and economic characteristics; hydro-meteorological characteristics; and target sectors. Undertake review of legal framework governing development planning in study area with focus on agriculture, transport, energy, and urban planning (completion February 2010).		ADB Climate Change Fund: \$500,000 Consulting services: \$425,000 Capacity building activities: \$25,000 Contingencies: \$50,000
1.2	With Government, ADB, and external experts, confirm climate change modeling methodology to be implemented (completion March 2010).		
1.3	Model future climate change impact scenarios for fixed time slices, such as 2030 and 2050. Global circulation models, regional downscaled models and local and international climate data will all be considered and employed as appropriate (completion May 2010).		Government of Australia: \$800,000

<p>2.1</p> <p>3.1</p> <p>3.2</p> <p>3.3</p> <p>3.4</p> <p>3.5</p> <p>4.1</p> <p>4.2</p> <p>5.1</p> <p>5.2</p>	<p>Assess effects of future climate change scenarios on projected future characteristics of the study area in terms of natural, social, and economic characteristics; hydro-meteorological characteristics; and target sectors (completion June 2010).</p> <p>Within target sectors and provinces, confirm selected existing provincial and sector programs, plans, projects, and/or policies to be included in evaluation and assess level of climate-resilience of these in context of future climate change scenarios (completion June 2010).</p> <p>Develop climate change adaptation options for integration in future selected provincial and sector programs, plans, projects, and/or policies (completion October 2010).</p> <p>Conduct economic, environmental and social assessment of climate change adaptation options and assist authorities to prioritize options for selected programs, plans, projects, and/or policies (completion December 2010).</p> <p>Conduct detailed economic assessment of selected adaptation options in terms of effects on sector and provincial economies (completion March 2011).</p> <p>Assist authorities in identifying financing options for implementation of actions related to climate-resilience in selected programs, plans, projects, and/or policies (completion March 2011).</p> <p>Design and cost pilot projects for upscaling and replication of study outcomes in other provinces or sectors and identify possible arrangements for post-TA implementation (completion March 2011).</p> <p>Provide technical and/or financial support to regional climate change advisory and information sharing bodies (completion March 2011).</p> <p>Carry out capacity assessment and develop and implement capacity building program for province and sector authorities. The objective of the program will be to build skills of technical staff in engineering, economics, policy making, and planning, as well as to raise awareness of senior decision makers in relation to current challenges and opportunities for climate change adaptation. Activities may include participation in learning-by-doing activities for technical staff; international, national, and local training events; and study tours. The program will include an M&E framework to monitor its implementation and effectiveness (completion March 2011).</p> <p>Develop and implement community awareness raising program in two target provinces, including through use of community meetings; focus groups with community leaders; and use of television, radio, and print media (completion March 2011).</p>	<p>Consulting services: \$585,000 Capacity building activities: \$135,000 Contingencies: \$80,000</p> <p>Government: \$330,000</p> <p>Personnel: \$180,000 Office accommodation and transport: \$110,000 Operating expenses: \$40,000</p>
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ADB = Asian Development Bank, M&E = monitoring and evaluation, TA = technical assistance.

Source: Asian Development Bank.

COST ESTIMATES AND FINANCING PLAN
(\$'000)

Item	Amount
A. Government of Australia Financing^a	
1. Consultants	
a. Remuneration and Per Diem	
i. International Consultants	430.0
ii. National Consultants	110.0
b. International and Local Travel	35.0
c. Reports and Communications	10.0
2. Equipment ^b	20.0
3. Training, Seminars, and Conferences	
a. Facilitators	35.0
b. Training Program	50.0
4. Surveys	30.0
5. Contingencies	80.0
Subtotal (A)	800.0
B. Climate Change Fund^c	
1. Consultants	
a. Remuneration and Per Diem	
i. International Consultants	300.0
ii. National Consultants	90.0
b. International and Local Travel	30.0
c. Reports and Communications	5.0
2. Training, Seminars, and Conferences	
a. Facilitators	10.0
b. Training Program	15.0
3. Contingencies	50.0
Subtotal (B)	500.0
C. Government of Viet Nam Financing	
1. Office Accommodation and Transport	110.0
2. Remuneration and Per Diem of Counterpart Staff	180.0
3. Others	40.0
Subtotal (C)	330.0
Total	1,630.0

^a Administered by ADB through the Memorandum of Understanding on Channel Financing (Technical Assistance Program) between the Government of the Commonwealth of Australia and the Asian Development Bank. The Government of Australia will finance part A – climate change prediction and impact assessment.

^b Desktop and laptop computers and associated hardware and software for data acquisition, processing, and modeling.

^c Established by ADB. The Climate Change Fund will finance part B—climate change adaptation and planning.

Source: Asian Development Bank estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

A. Part A (Climate Change Prediction and Impact Assessment)

1. Part A will require 19.5 person-months of international consultants and 25.5 person-months of national consultants.

2. **Study Team Leader and Climate Change Integrated Assessment Modeling Specialist** (international, 4.5 person-months). The consultant will:

- (i) Maintain overall responsibility for budget, scheduling, and quality of study outputs.
- (ii) Organize high-level stakeholder meetings, as required, and provide regular progress reports to government representatives and ADB project officers.
- (iii) Present results for part A at inception, midterm, and final study workshops.
- (iv) Coordinate technical activities associated with integrated assessment modeling in target sectors and provinces.

3. **Climate Change Prediction Modeler** (international, 3.0 person-months). The consultant will:

- (i) Collect baseline data on climate and hydro-meteorological conditions in study area, including the final report of Addressing Climate Change¹ and existing adaptation measures.
- (ii) Liaise with external specialists and government representatives to finalize detailed methodology for climate change modeling, including baseline data requirements, choice of models, modeling periods, modeling scenarios etc.
- (iii) Carry out climate change modeling for agreed time slices and model scenarios.
- (iv) Prepare a climate change modeling outcomes working paper documenting the methodology employed and results of the modeling activities.

4. **Climate Change Assessment (Energy and Industry Sectors) Specialist** (international, 3.0 person-months). The consultant will:

- (i) Collect baseline data on energy and industry issues relevant to study.
- (ii) Liaise with national and provincial government representatives and external stakeholders (e.g., NGOs, project consultants) to identify key issues, including forecasts for future industrial development; trends in types of industrial development; and proposed development of the energy infrastructure.
- (iii) Using results of climate change prediction modeling, undertake impact and vulnerability assessment of climate change impacts on result of energy and industrial sectors inputs to integrated assessment modeling.
- (iv) Prepare an energy and industry sector climate change assessment working paper, documenting methodology employed and results of activities carried out.

5. **Climate Change Assessment (Transport and Urban Planning Sectors) Specialist** (international, 3.0 person-months). The consultant will:

- (i) Collect baseline data on urban planning and transport issues relevant to study.
- (ii) Identify urban planning and transport issues in study area, including planning for future urban developments; projected land use changes; changes in transport modes and volumes; and proposed development of water, rail, and road transport networks.

¹ ADB. 2008. *Technical Assistance for Addressing Climate Change in the Asia and Pacific Region*. Manila.

- (iii) Using results of climate change prediction modeling, undertake impact and vulnerability assessment of climate change impacts on urban planning and transport issues including inputs to integrated assessment modeling.
- (iv) Prepare an urban planning and transport sector climate change assessment working paper, documenting the methodology employed and results of activities.

6. Climate Change Assessment (Agriculture, Water and other Natural Resources) Specialist (international, 3.0 person-months). The consultant will:

- (i) Collect baseline data on agricultural, water resources, and natural systems issues relevant to study.
- (ii) Identify key issues, including forecasts for agricultural productivity and yields, changes in agricultural production trends, planned development of irrigation or related infrastructure, projections for water supply and demand, proposed water resources infrastructure development, and planning for protected areas and sensitive ecosystems (including coastal mangrove areas).
- (iii) Using results of the climate change prediction modeling, undertake impact and vulnerability assessment of climate change impacts on agriculture, water resources, and natural systems issues (including inputs to integrated assessment modeling for target sectors and provinces).
- (iv) Prepare a climate change assessment working paper, documenting the methodology employed and results of the activities carried out.

7. Climate Change Assessment (Economic and Financial) Specialist (international, 3.0 person-months). The consultant will:

- (i) Collect relevant baseline data on socioeconomic issues, including population and demographic trends; and poverty, public health, and gender issues.
- (ii) Identify key socioeconomic issues in study area, including population projections, population distribution projections, trends within socially vulnerable groups (including gender issues), trends within the public health sector, and estimates of climate migrant movements to and from the study area.
- (iii) Develop methodologies for climate change cost estimation and economic analysis of adaptation options and undertake impact and vulnerability assessment of climate change impacts on socioeconomic issues.
- (iv) Prepare a socioeconomic and financial climate change assessment working paper, documenting the methodology employed and results of the activities.

8. Deputy Team Leader (national, 4.5 person-months).² The consultant will:

- (i) Coordinate national part A study team members and ensure team members are aware of technical, budgetary, and scheduling obligations of study.
- (ii) Assist Institutional strengthening specialists to undertake capacity assessment and develop capacity building program.
- (iii) Work with government representatives to identify regional climate change forums for provision of TA support and define resources to be provided to such forums.
- (iv) Provide inputs to management of project management system, quality assurance system, and reporting systems.

9. Climate Change Prediction Modeler (national, 3.5 person-months). The consultant will:

- (i) Assist international climate change modeler to collect baseline data.

² The deputy team leader will be based within the Department of Meteo-Hydrology and Climate Change at the Ministry of Natural Resources and Environment.

- (ii) Liaise with government representatives and local specialists to assist international climate change modeler to finalize detailed methodology for climate change modeling activities.
- (iii) Assist international climate change modeler to carry out climate change modeling according to agreed methodology.

10. **Climate Change Assessment (Energy and Industry Sectors) Specialist** (national, 3.5 person-months). The consultant will:

- (i) Liaise with national and provincial government representatives to assist the international specialist to collect baseline data.
- (ii) Liaise with national and provincial government representatives to assist the international specialist to identify key issues.
- (iii) Assist the international specialist to carry out impact and vulnerability assessment of issues in the energy and industrial sectors, including geographic information system (GIS) mapping outputs.

11. **Climate Change Assessment (Transport and Urban Planning Sectors) Specialist** (national, 3.5 person-months). The consultant will:

- (i) Liaise with national and provincial government representatives to assist the international specialist to collect baseline data as well as to identify urban planning and transport issues.
- (ii) Assist the international specialist to carry out impact and vulnerability assessment of urban planning and transport issues, including GIS mapping outputs.
- (iii) Assist the international specialist to prepare an urban planning and transport sector climate change assessment working paper.

12. **Climate Change Assessment (Agriculture, Water and other Natural Resources) Specialist** (national, 3.5 person-months). The consultant will:

- (i) Liaise with national and provincial government representatives to assist the international specialist to collect baseline data as well as to identify key issues.
- (ii) Assist the international specialist to carry out impact and vulnerability assessment of agriculture, water resources, and natural systems issues, including GIS mapping outputs.
- (iii) Assist the international specialist to prepare a working paper on agriculture, water resources and natural systems climate change assessment.

13. **Climate Change Assessment (Economic and Financial issues) Specialist** (national 3.5 person-months). The consultant will:

- (i) Liaise with national and provincial government representatives to assist the international specialist to collect baseline data, finalize methodologies for climate change cost estimation and economic analysis of adaptation options, and identify key socioeconomic issues.
- (ii) Assist the international specialist to carry out impact and vulnerability assessment of socioeconomic issues, including GIS mapping outputs, and to estimate the future costs of climate change in the study area using results of climate change modeling.
- (iii) Assist the international specialist to prepare a socioeconomic climate change assessment working paper.

14. **GIS Expert** (national, 3.5 person-months). The consultant will:

- (i) Determine requirements of GIS database for study.
- (ii) Develop agreed GIS database structure to meet part A requirements and in a format that can be transferred to the part B team.
- (iii) Liaise with national and provincial government representatives to source required data to input to GIS database.

B. Part B (Climate Change Adaptation and Planning)

15. Part B will require 13.5 person-months of international consultants and 20.5 person-months of national consultants.

16. **Study Team Leader and Climate Change Adaptation Adviser** (international, 4.5 person-months). The consultant will:

- (i) Provide strategic and technical advice to study team members and coordinate study technical activities for part B.
- (ii) Maintain established study project management system, quality assurance system, and reporting systems.
- (iii) Prepare documentation and costing for future climate change adaptation pilot projects.
- (iv) Develop long list of adaptation options for target sectors and provinces. Advise on feasibility and effectiveness of identified options.
- (v) Carry out economic evaluation of adaptation options and integrate results into an overall social, economic, and environmental assessment of adaptation options.
- (vi) Develop recommendations for a short list of adaptation options, and develop priority ranking for them.

17. **Climate Change Adaptation Specialist** (international, 4.5 person-months). The consultant will:

- (i) Develop extensive list of potential adaptation options for target sectors and provinces and evaluate options within a socioeconomic and natural resource context.
- (ii) Undertake preliminary economic assessment of identified adaptation options and carry out detailed cost-benefit analysis of selected options in target sectors and provinces using results of climate change integrated assessment modeling.
- (iii) Develop recommendations on adaptation options for target sectors and provinces from a socioeconomic point of view.
- (iv) Provide input to developing adaptation pilot projects for future implementation.
- (v) Prepare recommendations on establishment of emergency response units and procedures in consideration of existing risk management policies, including the *National Strategy for Natural Disaster Prevention, Response and Mitigation*, overseen by the National Committee for Flood and Storm Control.

18. **Climate Change Institutional Strengthening Specialist** (international, 4.5 person-months). The consultant will:

- (i) Conduct interviews and consultations with decision makers and technical staff in relevant national line ministries and target provinces to develop understanding of existing capacity regarding development planning and technical issues related to climate change.
- (ii) Prioritize capacity building needs of decision makers and technical staff in relevant national line ministries and target provinces to enable them to fulfill their assigned roles under the TA and build long-term capacity.

- (iii) Develop capacity building program for decision makers and technical staff in relevant national line ministries and target provinces
 - (iv) Develop and implement a community awareness raising campaign in Ca Mau and Kien Giang provinces in relation to climate change risks and adaptation measures, including use, as appropriate, of public meetings; focus groups with community leaders; and newspaper, television, and radio.
19. **Deputy Team Leader** (national, 4.5 person-months).³ The consultant will:
- (i) Coordinate national Part B study team members and ensure team members are aware of technical, budgetary, and scheduling obligations of study.
 - (ii) Attend high-level stakeholder meetings as required.
 - (iii) Work with government representatives to provide agreed support to regional climate change forums.
 - (iv) Provide inputs to management of project management system, quality assurance system, and reporting systems.
20. **Climate Change Adaptation Specialists** (national, 8 person-months). The consultant will:
- (i) Liaise with representatives of government ministries, institutes, and agencies in relation to climate change modeling data requirements and methodology.
 - (ii) Liaise with external specialists, government representatives to develop an extensive list of potential adaptation options for target sectors and provinces and evaluate options within a socioeconomic and natural resource context.
 - (iii) Undertake preliminary economic assessment of identified adaptation options and carry out detailed cost-benefit analysis of selected adaptation options.
 - (iv) Assist in developing nationally and locally appropriate recommendations on adaptation options for target sectors and provinces.
 - (v) Provide inputs to developing adaptation pilot projects for future implementation.
21. **Climate Change Institutional Strengthening Specialists** (national, 8.0 person-months). The consultant will:
- (i) Assist the international specialist to conduct interviews and consultations with decision makers and technical staff in relevant national line ministries and target provinces to develop understanding of existing capacity regarding development planning and technical issues related to climate change.
 - (ii) Assist the international specialist to develop and cost a capacity building program for decision makers and technical staff in relevant national line ministries and target provinces.
 - (iii) Work with the international specialist to begin implementing the capacity building program and report the results using the developed M&E framework.
 - (iv) Assist the international specialist to develop and implement a community awareness raising campaign in Ca Mau and Kien Giang provinces in relation to climate change risks and adaptation measures.

³ The deputy team leader will be based within the Department of Meteo-Hydrology and Climate Change at the Ministry of Natural Resources and Environment.