



GLOBAL ENVIRONMENT FACILITY  
INVESTING IN OUR PLANET

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December 8, 2011

Dear Council Member:

World Bank as the Implementing Agency for the project entitled: ***China: Huai River Basin Marine Pollution Reduction under the Regional: World Bank/GEF Partnership Investment Fund for Pollution Reduction in the Large Marine Ecosystems of East Asia (Tranche 1 of 3 tranches)***, has submitted the attached proposed project document for CEO endorsement prior to final approval of the project document in accordance with World Bank procedures.

The Secretariat has reviewed the project document. It is consistent with the proposal approved by Council in June 2007 and the proposed project remains consistent with the Instrument and GEF policies and procedures. The attached explanation prepared by World Bank satisfactorily details how Council's comments and those of the STAP have been addressed. I am, therefore, endorsing the project document.

We have today posted the proposed project document on the GEF website at [www.TheGEF.org](http://www.TheGEF.org). If you do not have access to the Web, you may request the local field office of UNDP or the World Bank to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

Monique Barbut  
CEO and Chairperson



# REQUEST FOR CEO ENDORSEMENT/APPROVAL

PROJECT TYPE: FULL-SIZED PROJECT

THE GEF TRUST FUND

Submission Date: November 15, 2011

## PART I: PROJECT INFORMATION

GEFSEC PROJECT ID:4092

GEF AGENCY PROJECT ID: 108592

COUNTRY(IES): People's Republic of China

PROJECT TITLE: Huai River Basin Marine Pollution Reduction

GEF AGENCY(IES): World Bank

OTHER EXECUTING PARTNER(S): Shandong Provincial Government

GEF FOCAL AREA(S): International Waters

GEF-4 STRATEGIC PROGRAM(S): IW-SP2

NAME OF PARENT PROGRAM/UMBRELLA PROJECT: GEF/WB Strategic Partnership Investment Fund for Pollution Reduction in the Large Marine Ecosystems of East Asia.

| Expected Calendar (mm/dd/yy)     |            |
|----------------------------------|------------|
| Milestones                       | Dates      |
| Work Program (for FSPs only)     | 03/2010    |
| Agency Approval date             | 11/2011    |
| Implementation Start             | 01/2012    |
| Mid-term Evaluation (if planned) | 12/2013    |
| Project Closing Date             | 12/31/2015 |

### A. PROJECT FRAMEWORK (Expand table as necessary)

| <b>Project Objective:</b> To demonstrate innovative and effective water pollution control practices in Guangli river catchment of Dongying Municipality, contributing to pollution reduction in the Bohai Sea. |  |  |  |                            |             |                           |             |                   |
|--|--|--|--|----------------------------|-------------|---------------------------|-------------|-------------------|
| Project Components   | Indicate whether Investment, TA, or STA <sup>2</sup> | Expected Outcomes  | Expected Outputs   | GEF Financing <sup>1</sup> |             | Co-Financing <sup>1</sup> |             | Total (\$) c=a+ b |
|  |  |  |  | (\$ a)                     | %           | (\$ b)                    | %           |                   |
| <b>A. Wetland Construction and Sluice Gate Operation Optimization</b>  | Investment   | (a) nutrient and pollution reduced from the constructed wetland; | (a) reduction of 430 ton of COD, 215 ton of BOD, 129 ton of NH <sub>3</sub> -H, 12 ton of TP in 2014 from the constructed wetland; | <b>1,843,000</b>           | <b>6.3</b>  | <b>27,253,000</b>         | <b>93.7</b> | <b>29,096,000</b> |
| A1. Constructed Wetland at Dongbalu  |  | (b) improved sluice gate operation;                              | (b) upgraded automatic control system in operation for five sluice gates;  | 1,843,000                  | 8.6         | 19,469,000                | 91.4        | 21,312,000        |
| A2. Sluice Gate Operation Optimization   |  |  |  | 0                          | 0           | 992,000                   | 100.0       | 992,000           |
| A3. Resettlement Compensation  |  |  |  | 0                          | 0           | 6,792,000                 | 100.0       | 6,792,000         |
| <b>B. Agricultural Pollution Control and Rural Waste Management</b>  | Investment, TA, STA                                  | (a) agricultural non-point pollution reduced;                    | (a) reduction of 9.3 ton of COD and 4.6 ton of SS in 2014 from rural waste management facilities;                                  | <b>1,839,000</b>           | <b>40.1</b> | <b>2,752,000</b>          | <b>59.9</b> | <b>4,591,000</b>  |
| B1. Rural Waste Management   |  | (b) reduced pollution from rural waste to Guangli river ;        | (b) rural waste water treatment facilities constructed in 8 villages;  | 857,000                    | 38.0        | 1,398,000                 | 62.0        | 2,255,000         |
| B2. Agricultural Pollution Control   |  |  |  | 692,000                    | 34.5        | 1,311,000                 | 65.5        | 2,003,000         |
| B3. Establishment and Operation of FEPAs   |  |  |  | 290,000                    | 87.0        | 43,000                    | 13.0        | 333,000           |

|  |         |  |  |                  |             |                |             |                  |
|--|---------|--|--|------------------|-------------|----------------|-------------|------------------|
|  |         | management   | <p>(c) reduction of 78.3 ton of COD; 0.743 ton of TP; and 5.883 ton of TN in 2014 from construction of livestock manure storage tanks;</p> <p>(d) reduction of 1.71 ton of TN, 0.123 ton of TP in 2014 from agricultural pollution control practices in pilot villages;</p> <p>(e) 80% of farmers in participating villages adopt comprehensive and balanced fertilization application and other new technologies;</p> <p>(f) 22 FEFA's established;</p> |                  |             |                |             |                  |
| <b>C. Capacity Building and Policy Studies</b> | TA, STA | (a) increased public and targeted group awareness and education;           | (a) 1 education and training center established;   | <b>1,011,000</b> | <b>54.6</b> | <b>840,000</b> | <b>45.4</b> | <b>1,851,000</b> |
| C1. Education and Training Center              |         | (b) overall institutional capacity strengthened;                           | (b) training and workshops organized and provided for 9,000 persons in project management, implementation and community participation;   | 0                | 0.0         | 193,000        | 100.0       | 193,000          |
| C2. Capacity Building                          |         | (c) nutrient/pollution management in Guangli river watershed strengthened; | (c) two policy studies (the Impact on Pollution Reduction through Constructed Wetlands in Guangli River, and Evaluation Study and Management   | 240,000          | 30.8        | 538,000        | 69.2        | 778,000          |
| C3. Policy Studies                             |         |  |  | 771,000          | 87.6        | 109,000        | 12.4        | 880,000          |

|   |                     |   |  |                  |              |                   |              |                   |
|---|---------------------|---|--|------------------|--------------|-------------------|--------------|-------------------|
|   |                     |   | Planning for Agricultural and Rural Pollution Reduction in Guangli River Catchment) carried out and 1 replication strategy developed and disseminated; |                  |              |                   |              |                   |
| <b>D. Project Management and Implementation Support</b> | Investment, TA, STA | (a) project management capacity strengthened; | (a) adequate resources provided on a timely basis;   | <b>307,000</b>   | <b>13.4</b>  | <b>1,983,000</b>  | <b>86.6</b>  | <b>2,290,000</b>  |
| D1. Implementation Support                              |                     | (b) project M&E improved;                     | (b) monitoring reports submitted as stipulated in grant agreement;   | 250,000          | 13.5         | 1,599,000         | 86.5         | 1,849,000         |
| D2. Monitoring and Evaluation                           |                     |   |  | 7,000            | 7.6          | 84,000            | 92.4         | 91,000            |
| D3. Project Management                                  |                     |   | (c) project progress reports submitted semi-annually;  | 50,000           | 14.3         | 300,000           | 85.7         | 350,000           |
| <b>Total Project Costs</b>                              |                     |   |  | <b>5,000,000</b> | <b>13.2%</b> | <b>32,828,000</b> | <b>86.8%</b> | <b>37,828,000</b> |

<sup>1</sup>List the \$ by project components. The percentage is the share of GEF and co-financing respectively of the total amount for the component.

<sup>2</sup>TA=Technical Assistance; STA = Scientific and Technical Analysis.

#### B. SOURCES OF CONFIRMED FOR THE PROJECT (expand the table line items as necessary)

| <i>Name of Co-financier (source)</i>      | <i>Classification</i> | <i>Type</i> | <i>Project</i>    | <i>%*</i>   |
|---|-----------------------|-------------|-------------------|-------------|
| Dongying Municipal Government             | Local Gov't           | cash        | 30,148,000        | 79.7        |
| Dongying Municipal Government             | Local Gov't           | In-kind     | 1,181,000         | 3.1         |
| Shandong Academy of Agricultural Sciences | Academic NGO          | In-kind     | 123,000           | 0.3         |
| Participating Farmers                     | Beneficiaries         | cash        | 1,376,000         | 3.7         |
| <b>Total Co-financing</b>                 |                       |             | <b>32,828,000</b> | <b>86.8</b> |

\* Percentage of each co-financier's contribution at CEO endorsement to total co-financing.

#### C. FINANCING PLAN SUMMARY FOR THE PROJECT (\$)

|               | <i>Project Preparation<br/>a</i> | <i>Project<br/>B</i> | <i>Total<br/>c = a + b</i> | <i>Agency Fee</i> | <i>For comparison:<br/>GEF and Co-financing<sup>1</sup> at PIF</i> |
|---------------|----------------------------------|----------------------|----------------------------|-------------------|--|
| GEF financing |                                  | \$5,000,000          | 5,000,000                  |                   | 5,000,000  |
| Co-financing  |                                  | \$ 32,828,000        | 32,828,000                 |                   | 30,660,000   |
| <b>Total</b>  |                                  | <b>37,828,000</b>    | <b>37,828,000</b>          |                   | <b>35,660,000</b>  |

**D. GEF RESOURCES REQUESTED BY AGENCY(IES), FOCAL AREA(S) AND COUNTRY(IES)<sup>1</sup>**

| <i>GEF Agency</i>          | <i>Focal Area</i>    | <i>Country Name/<br/>Global</i> | <i>(in \$)</i>     |                                   |                    |
|----------------------------|----------------------|---------------------------------|--------------------|-----------------------------------|--------------------|
|                            |                      |                                 | <i>Project (a)</i> | <i>Agency Fee (b)<sup>2</sup></i> | <i>Total c=a+b</i> |
| World Bank                 | International Waters | China                           | 5,000,000          |                                   | 5,000,000          |
|                            |                      |                                 |                    |                                   |                    |
|                            |                      |                                 |                    |                                   |                    |
|                            |                      |                                 |                    |                                   |                    |
|                            |                      |                                 |                    |                                   |                    |
| <b>Total GEF Resources</b> |                      |                                 |                    |                                   |                    |

<sup>1</sup> No need to provide information for this table if it is a single focal area, single country and single GEF Agency project.

<sup>2</sup> Relates to the project and any previous project preparation funding that have been provided and for which no Agency fee has been requested from Trustee. Includes PPG amount.

**E. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:**

| <i>Component</i>           | <i>Estimated person weeks</i> | <i>GEF amount(\$)</i> | <i>Co-financing (\$)</i> | <i>Project total (\$)</i> |
|----------------------------|-------------------------------|-----------------------|--------------------------|---------------------------|
| Local consultants*         | 1,040                         | 840,000               | 668,000                  | 1,508,000                 |
| International consultants* |                               |                       |                          |                           |
| <b>Total</b>               | 1,040                         | 840,000               | 668,000                  | 1,508,000                 |

\* Details to be provided in Annex C.

**F. PROJECT MANAGEMENT BUDGET/COST**

| <i>Cost Items</i>  | <i>Total Estimated person weeks/months</i> | <i>GEF amount (\$)</i> | <i>Co-financing (\$)</i> | <i>Project total (\$)</i> |
|--|--|------------------------|--------------------------|---------------------------|
| Local consultants*   | 109  | 257,000                | 603,000                  | 860,000                   |
| International consultants*                                 |  |                        |                          |                           |
| Office Facilities, equipment, vehicles and communications* |  |                        | 31,000                   | 31,000                    |
| Travel*  |  |                        |                          |                           |
| Others*  |  | 50,000                 | 1,349,000                | 1,399,000                 |
|  |  |                        |                          |                           |
| <b>Total</b>   |  | 307,000                | 1,983,000                | 2,290,000                 |

\* Details to be provided in Annex C. \*\* For others, it has to clearly specify what type of expenses here in a footnote.

Others include incremental operating costs (GEF \$50,000); and management fee, project management staff salary and non-consultant services for survey, feasibility study, design, supervision and insurance (Covered by counterparts funds/co-financing).

**G. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT? yes no**

(If non-grant instruments are used, provide in Annex E an indicative calendar of expected reflows to your agency and to the GEF Trust Fund).

**H. DESCRIBE THE BUDGETED M&E PLAN:** The achievement of the project development objectives will be measured through the two Key Performance Indicators: (a) annual reduction of pollutants and nutrients flowing from Guangli River into Bohai Sea through implementation of the project; and (b) annual reduction of pollutants and nutrients through the constructed wetlands at Dongbalu. Annex 1 shows the key performance indicators and intermediate output indicators for tracking project progress and results. The Dongying PMO will set up and maintain a M&E system, it will consolidate and report regularly on the monitoring results, with assistance from implementation support consultants. The monitoring and data collection for wetland inflow and outflow water quality, water quality monitoring at Minghai Sluice Gate and along Guangli River will be the

responsibility of Dongying Environmental Protection Bureau (Monitoring Division). Monitoring and data collection for the agricultural pollution reduction and rural waste management component under the Project will be undertaken by the SAAS (agricultural pollution control sub-component) and other consultants under Dongying Agriculture Bureau PIU. Monitoring of safeguards policy compliance will be carried out by consultants hired by the Dongying PMO. The Dongying municipal government is committed to long-term monitoring beyond the completion of the project. Scope, approach and activities for monitoring and evaluation, relevant indicators and M&E arrangements will be detailed in the Project Implementation Plan. The government committed a long-term monitoring for the project to extend the monitoring activities for at least five years which is beyond the completion of the project implementation.

### **Monitoring and Evaluation Activities**

| Scope of Monitoring   | Monitoring Activities   | Budget (US\$)  |               |                |
|---|---|----------------|---------------|----------------|
|   |   | Total          | Of which, GEF | Budgeted under |
| Constructed wetland   | Take water samples and test in the lab to monitor COD, BOD, NH <sub>3</sub> -N and TP values on a monthly basis; report in annual monitoring report;  | 6,800          | 0             | Component D2   |
| Rural waste water plants                                      | Take samples and test in the lab to monitor COD and SSS on a monthly basis; report in annual monitoring report;   | 7,000          | 7,000         | Component D2   |
| Agricultural non-point pollution reduction                    | Install monitoring devices; take soil and water (surface and ground) samples, lab test on a monthly basis to monitor TN and TP; report in annual monitoring report;   | 199,900        | 76,700        | Component B2   |
| Safeguard policies - environmental impact and pest management | Monitor if the Bank's relevant environmental impact and pest management policies are complied with; ensure mitigation actions are taken if required; report in semi-annual progress report and in annual monitoring report; | 76,700         | 0             | Component D2   |
| Safeguard policies - involuntary resettlement                 | Monitor if the Bank's involuntary resettlement policies are complied with; ensure mitigation actions are taken if required; report in semi-annual progress report and in annual monitoring report;                          | 167,000        | 0             | Component A3   |
| Progress and performance                                      | Record implementation progress and evaluate performance by project sub-component; report in semi-annual progress report and ICR;  | 32,500         | 0             | Component D3   |
| <b>TOTAL</b>  |   | <b>489,900</b> | <b>83,700</b> |                |

## **PART II: PROJECT JUSTIFICATION:**

(In addition to the following questions, please ensure that the project design incorporates key GEF operational principles, including sustainability of global environmental benefits, institutional continuity and replicability, keeping in mind that these principles will be monitored rigorously in the annual Project Implementation Review and other Review stages.)

### **A. STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:**

#### **Background and Context**

Over the past 30 years, China has seen impressive and unprecedented economic growth. However, such rapid growth, compounded by population growth and fast urbanization, has been achieved at the cost of, among many other sacrifices, deteriorating water environment caused mostly by land-based pollution from industries, farming and domestic sources. Majority of the rivers and lakes in the country have been polluted to different degrees, leading to very dire consequences. This situation has alerted Chinese policy makers and general public to give much higher priority to pollution reduction and control. This is clearly articulated in the 12<sup>th</sup> Five-Year Plan (2011-2015), which aims to sustain the rapid and steady development of China's "socialist market economy" following a green growth path. Water management is one of the pillars of green growth.

The Huai River Basin covers four provinces, i.e. Shandong, Jiangsu, Anhui and Henan. The key development challenge in the Huai River Basin is to maintain the balance between socio-economic development and

environmental protection. With rapid economic growth in the region, many river systems in the Huai River Basin have become increasingly polluted rendering it one of the most polluted rivers in China, and consequently more and more nutrients and pollutants are discharged into the Bohai Sea and Yellow Sea contaminating these international waters. Official statistics show that Shandong Province, with the longest coastlines of the Bohai Sea and the Yellow Sea within the Huai River Basin, is contributing more polluting loads to these seas than any of the other three provinces.

Coastal cities such as Dongying in Shandong Province are both significant contributors to and direct victims of such pollution. Dongying has been the central city of the Yellow River delta since its establishment in 1983, with over 350 km coastlines along the Bohai Sea, and a total population of some 1.8 million. Oil, natural gas, salt, coal and geothermal energy are the major resources of Dongying. Over the past two decades, the city has seen continued growth in these sectors. However, the delicate eco-system of Dongying city is being heavily impacted by increasing water pollution.

Water pollution in Dongying originates from different sources: both urban and rural areas, point and non-point sources. In spite of the government's efforts in point source pollution control over the years, the total nutrients and pollutants (organics) discharged into the Bohai Sea from Dongying city, in terms of COD, BOD, TN and TP, have yet to be further reduced to an acceptable level. The observed concentrations of COD and NH<sub>3</sub>-N in the water discharged into Bohai Sea end 2010 from Guangli River estuary were 64.60 and 2.11 mg/L respectively. Based on a survey by Dongying Environmental Protection Bureau, municipal sewage (60%), industrial sewage (8%), rural wastes and agricultural runoff (30%) are identified as the main sources of pollution for Guangli River, which contributes to pollution and eutrophication of Bohai Sea.

### Issues to be Addressed

The main issues with existing water pollution control practices are basically twofold: (a) need for a more balanced and integrated approach to water pollution management: experiences from previous water pollution management investments in Dongying and elsewhere, all point to the fact that effective pollution management calls for balancing the supply-driven and infrastructure-focused approach with likely more cost-effective demand-side management interventions (awareness raising, policy incentives, behavior change) and management practices (introducing new/clean production technologies and environmentally-friendly practices). Many investment programs did not achieve intended effect or fail to sustain because of this reason; and (b) lack of effective institutional mechanism for managing non-point source (NPS) pollution in rural and agricultural areas. Despite the fact that much efforts have been made by the government in reducing NPS pollution through various subsidized investment programs such as biogas generation from human and livestock wastes, and balanced fertilizer applications, the results are usually not very satisfactory, and very often the facilities built or management practices introduced can not be sustained. The major reason for such failures is the lack of an institutional mechanism with which the investment activities are identified, prioritized, implemented and then maintained with direct involvement of beneficiary communities in an organized manner. Such an mechanism requires establishment of a self-managed community organization which is at the core of community-based approach to pollution management. The proposed GEF project attempts to pilot an integrated and community-based approach to address the above issues in Dongying Municipality (City).

Based on stakeholder consultation, Guangli river watershed in Dongying City of Shandong Province, was selected as the pilot area. Guangli river is a man-made drainage channel for Dongying district and Kenli county, with an annual average flow of 2 m<sup>3</sup>/s. The river is 48.8km long and has a catchment area of 792km<sup>2</sup> covering one urban district and a county with a total population of 745,000. It is chosen as the demonstration watershed because: (a) it is easier to measure and evaluate reliably the project impact, as this watershed is entirely within the jurisdiction of Dongying City and is not subject to interference from external pollution sources; (b) it is the main river following through Dongying city to Bohai Sea, and thus a significant pollution contributor; and (c)

there is in the watershed a substantial wastewater treatment capacity in operation, and it is covered under municipality's major water pollution control program.

### *Client's Commitment*

The \$5 million GEF grant is set to leverage some \$33 million of co-financing from the government of the Dongying Municipality and participating villagers and farmers. Both Dongying municipal and Shandong provincial governments as well as Huai River Basin Commission are committed to replicating successful experience and practices from the project to much wider areas within their respective jurisdictions with potentially much larger government financing for water pollution management.

### *Project Description*

The Project would have the following four components.

**Component A. Constructed Wetland and Sluice Gate Operation Optimization (Base Cost: US\$27.19 million).** This component will treat Guangli River water through constructed wetlands to improve water quality, and increase the carrying capacity of the river through sluice gate regulation. It supports: (a) construction of wetlands at Dongbalu consisting of free-surface flow wetlands, an ecological retention pool, an entrance gate, a gated overflow weir and a pumping station, and provision of related equipment; (b) upgrading the automatic gate control system covering three sluice gates on the Guangli River, and the gates at the entrance and exit of the Dongbalu wetlands; and (c) provision of cash transfers to Affected Persons of the wetlands construction.

The resettlement compensation sub-component will provide transfer payment to compensate the affected enterprises and persons. Seven small-sized enterprises and some attachments to the land (such as power lines and fish pounds) within Dongbalu wetlands area would be affected, and need to be compensated with counterpart funding from Dongying Municipal Government per agreed resettlement action plan (RAP) which was prepared by a consultant upon detailed impact survey and consultation with affected people/enterprises and local authorities. The RAP has been developed in compliance with Bank safeguard policy and applicable national laws and government regulations, and has been reviewed by the Bank and disclosed publicly.

**Component B. Agricultural Pollution Control and Rural Waste Management (Base Cost: US\$4.59 million).** The component finances facilities and management practices for agricultural pollution reduction and rural waste management to reduce nutrient/pollutant loads in selected pilot areas. It covers: (a) wastewater, human and livestock waste collection and treatment in Participating Villages; (b) introduction of agricultural pollution reduction technologies and management practices in Participating Villages through comprehensive and balanced fertilizer applications, provision and use of insect luring lamps, and construction of eco-trenches and buffer strips in crop fields; and monitoring of the results of implementation of these technologies and practices; and (c) establishment, equipping and operation of FEPAs in Participating Villages.

**Component C. Capacity Building and Policy Studies (Base Cost: US\$1.85 million).** This component intends to strengthen the pollution management capacity of Dongying government and farmer communities. It would support: (a) establishment and operation of an environmental protection education and training centre to be located in Dongying Municipality for training and dissemination of technologies and good practices in environmental protection, nutrient management and pollution reduction; (b) capacity building activities to provide technical and Project management training for staff involved in Project implementation and monitoring; and (c) evaluation study of the effectiveness of constructed wetlands in the treatment of polluted water with recommendations for improvement/replication, based on the analysis of the Project monitoring results; development of an agricultural pollution reduction and rural waste management strategy and plan for the Guangli River Watershed in the Dongying Municipality, including an evaluation study of the related Project



interventions for this purpose; and development of a Huai River Basin-wide replication strategy for cost-effective water pollution control, including dissemination and training and workshops as required for the purpose.

**Component D. Project Management and Implementation Support (Base Cost: US\$2.29 million).** This component would finance project management and implementation support activities to ensure timely and efficient implementation. The main activities include: (a) provision of technical assistance for the review of technical designs and tendering documents, construction quality of Project facilities, and for Project reporting; (b) project monitoring and evaluation; and (c) support for Project management by the PMOs and PIUs.

The project would provide information and prepare Experience Notes to GEF's IW LEARN hub, set up a project website according to the guidelines from IW: LEARN, and participate in GEF's information sharing activities, e.g., its biannual IW LEARN conference, and PEMSEA's triennial East Asia Seas Congress; and join UNEP's Best Practices and Success Stories Global Network, and report annually on the GEF 4 output indicators using the IW Tracking Tool.

#### Expected Global Environmental Benefits

Set as the project development objective, the project is to demonstrate innovative and effective water pollution control practices in Guangli river catchment of Dongying Municipality, contributing to pollution reduction in the Bohai Sea. Though the project's tangible impact on water pollution in Bohai Sea is negligible, pollution reduction in the Bohai Sea is expected to be achieved through implementation of a replication strategy developed under the project to replicate the successful experiences and practices piloted under the project in much larger areas in Dongying Municipality, Shandong Province and other provinces in Huai River Basin bordering the Bohai Sea.

#### Sustainability

The project's sustainability depends on several key factors: (a) government commitment to sustainable water resources management and pollution control; (b) ownership of the project activities by implementing agencies and beneficiary communities; and (c) replication of good practice experiences from the pilot over large areas. These factors are well reflected in this project. Government at all levels has assured the Bank of the high priority of this project. There is strong ownership of the project by the project entities and beneficiaries in Dongying. The project is designed with sustainability in mind as indicated below:

- **Technical Sustainability.** To the extent possible, project interventions will be based on technologies and methodologies that are cost-effective, reliable, replicable and environmentally sustainable. The project follows an integrated approach with focus on technical solutions applicable to local conditions that are easy to operate and maintain at low cost. It integrates pollutant and nutrient reduction at source and mitigation in water body, and combines technical measures with behavior change.
- **Institutional Sustainability.** The Government is committed to providing all the necessary government support needed for successful project implementation, including establishment of project organizations at each level and provision of sufficient counterpart funding during project implementation, and financial resources for O&M upon completion of the Project. Institutional sustainability will be enhanced by establishing and empowering the FEPAs, and by building capacity of implementing agencies, PMOs and beneficiary communities.
- **Long-term Sustainability.** The project is expected to yield limited direct impact on water quality of Guangli River and the Bohai Sea because the selected project area represents a fraction of the total land-

based nutrient and pollution load discharged. A noticeable nutrient and pollution reduction can be achieved through the replication of the demonstrated practices throughout Dongying municipality and other areas around the Bohai Sea. To ensure long-term sustainability through replication, specific project interventions include: (i) development of a replication strategy and plan; (ii) specialized training; (iii) empowering FEPAs, local communities, and other stakeholders; and (iv) dissemination of pilot results.

**B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL AND/OR REGIONAL PRIORITIES/PLANS:**

Dongying Municipal Government has recognized the gravity of water pollution. The Master Plan for Dongying Water City Development (2009) sets the goal to transform Guangli River into an eco-corridor during the “12<sup>th</sup> Five-Year Plan” period, through improving the water quality and environment. The government’s strategy is to seek through the GEF project to: (a) reduce nutrient and pollution loads from agricultural and rural sources through pilot interventions, complementary to the M&I sewage treatment being covered by government programs; (b) treat the water in the Gunagli river through a constructed wetland at the downstream end of the river; and (c) increase the carrying capacity of the river system by improving the circulation of water through optimal operation of regulating sluice gates along the river. Farmer environmental protection associations (FEPA) would be established as pilot to demonstrate community-based pollution management in rural areas. The project serves dual purposes: to help improve water environment in Guangli river contributing to pollution/eutrophication reduction in Bohai Sea, and to gain experience for replication over a much wider scope, in Dongying Municipality, Shandong Province and Huai River Basin.

The project contributes towards the country’s long term objective of sustainable economic growth and poverty reduction through improved water resources management and pollution control. As part of the Bank’s program to assist China in water resources and environmental management, the proposed project will focus on demonstrating innovative and cost-effective water pollution control practices which are well aligned with the Government’s Long-term Strategic Plan for Water Pollution Management and Control in Key Basins and Seas, and the current Bank’s Country Partnership Strategy (CPS), a main pillar of which is ‘managing resource scarcity and environmental challenges’.

The proposed project supports the government’s priorities in systematically controlling pollution in heavily polluted river basins such as Huai River, in reducing land-based pollutants to international waters such as Bohai Sea and Huanghai Sea. It is consistent with the current Bank Group’s Country Partnership Strategy for China (CPS dated May 23, 2006), which requires that the Bank Group help mainstream environmental concerns into the development process. "Taking steps to minimize water pollution" and piloting and scaling up "policies and mechanisms to address agriculture non-point pollution" are among priority Bank engagement areas.

**C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH AND STRATEGIC PROGRAMS:**

The proposed project is part of the World Bank and GEF Strategic Partnership Investment Fund for Pollution Control in Large Marine Ecosystems of East Asia (the IF), a program approved by GEF in 2005 to finance innovative demonstration projects for pollution control. Compliant with the IF, the proposed project is expected to provide incremental benefits to the baseline Bank-financed China Huai River Basin Flood Management and Drainage Improvement Project (HRBFMDI Project) which became effective in January 2011. The project also fits with the regional PEMSEA strategy (of which the IF is a partner), which promotes sustainable development in the region.

**D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES:**

As mentioned above, the GEF resources are set to leverage over US\$33 million of counterpart funding from the local government and beneficiaries with the high replication potential of influencing much larger investment programs and policies over much wider areas in Dongying Municipality and Shandong province as well as other provinces in Huai River Basin. The financing will generate much needed capacity and knowledge to stimulate

the policy shift towards effective nutrient/pollution reduction in the Bohai Sea through successful pollution reduction practices demonstrated under the project and their replication.

**E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES**

In project preparation, the Bank team kept close communication with the Bank regional GEF coordinator for East Asia, GEF IW team and agreed on project adjustments. The meeting minutes are attached in Annex B. Key lessons were drawn from similar projects implemented by the Bank. These include Ningbo Water and Environment Project, Livestock Waste Management in East Asia Project, Shanghai Agricultural and Non-Point Pollution Reduction Project and other government funded projects. The lessons learned are reflected in the project design (see Section III/C of the Project Appraisal Document for more detail). The provincial Project Leading Group (PLG) and provincial PMO for this project are shared with the IBRD-funded China HRBFMDI Project to provide a closer coordination between the two projects and ensure a higher potential for replication. Key government agencies in Dongying Municipality are members of Dongying PLG under a local government institutional coordination mechanism to better coordinate between this project and other relevant government funded programs in the area.

**F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH :**

This project takes a comprehensive and coordinated approach in a relatively enclosed Guangli river catchment area to (a) address both point and non-point pollution issues; (b) cover both urban and rural areas; (c) integrate technological solutions, policy development; monitoring, training and dissemination; and (d) involve agencies at municipal, province and Huai River Basin levels to achieve the Project objectives. The proposed project is designed to provide innovative and demonstrative experience to catalyze further investments for nutrient and pollution reduction to international waters which can be replicated in Dongying Municipality, Shandong Province and other provinces in Huai River Basin. Replication may take place in other countries in the region under the support of the IF and PEMSEA. The proposed project is incremental to the IBRD-funded China HRBFMDI Project. Without GEF grant support, the following will not be considered as priorities by the local government in the next few years due mainly to its focus on urban pollution issues and limited budget available for environmental protection: (a) comprehensive approach in nutrient and agricultural pollution reduction; (b) actions to reduce nutrient and pollution loads to international waters; and (c) control of rural non-point source pollution through community-based approach.

**G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED AND OUTLINE RISK MANAGEMENT MEASURES:**

The World Bank task team carried out operational risk assessment for the project, the results of which together with agreed mitigation measures are detailed in the Annex 4, Operational Risk Assessment Framework (ORAF) of the Project Appraisal Document (PAD). The main risks of the project are implementation agencies' capacity in technical aspect, procurement, financial management, safeguards management and results monitoring, cross-sector coordination, and main stakeholders' (beneficiaries') ownership in the pilot areas. Mitigation measures include: (a) designing the pilot and project interventions based on close consultation with local governments and communities; (b) enhancing ownership of beneficiary communities through continued public awareness raising activities, financial subsidy and affordable contributions, and establishing FEPAs to institutionalize communities' self-management; (c) hiring competent technical and implementation support consultants, and providing targeted training for project staff during preparation and implementation on key project aspects; and (d) setting up multi-sectoral project leading group, and agreeing upfront on clear responsibility division and coordination mechanism among different sectoral agencies involved in the project.

Climate change related risk to the project due to potential sea level rise is considered negligible. Potential sea level rise is not expected to have significant impact on the proposed project because: (a) wetlands under the project will have functions to improve flood management and drainage, and buffer against storm surge; (b) the

project area has an average elevation of 6-8 meters above the sea level and is not subject to immediate impacts of sea level rise in short and medium terms; (c) Dongying Municipality will benefit from an improved flood management and drainage system in Shandong Province under the IBRD-funded HRBFMDI Project. In addition, the sluice gates under this project will further improve the flood management capacity in the project areas and mitigate the impact of potential sea level rise, if any.

#### **H. EXPLAIN HOW COST-EFFECTIVENESS IS REFLECTED IN THE PROJECT DESIGN:**

The project takes an integrated approach to water pollution and nutrient management, with technological and institutional innovations and taking into considerations of incentives for beneficiary communities, potential for replication and O&M costs. The technologies the project will introduce are cost-effective, for instance, the constructed wetland is of low cost design with virtually single function of water treatment; the on-site treatment schemes for rural domestic wastewater treatment are inexpensive in capital costs and O&M costs; so are the cases of anaerobic and aerobic processes for livestock waste treatment and agricultural pollution control measures; optimal use of existing infrastructure (water gates and monitoring stations) is another example. Pollution reduction in rural areas through the FEPAs to be established under the project offers a cost-effective institutional mechanism to implement and maintain project interventions funded by the GEF grant.

The project will keep full time staff to minimum, limited to ensuring compliance with the Bank's fiduciary policies. Government counterpart staff at all levels will be responsible for the implementation of the project. To the extent possible training programs are designed to be delivered on site, and consultant services are also largely drawing on the national expertises.

### **PART III: INSTITUTIONAL COORDINATION AND SUPPORT**

#### **A. INSTITUTIONAL ARRANGEMENT:**

The project adopts a tiered organizational structure involving Huai River Basin Commission through the central project management office (CPMO) of the HRBFMDI Project, Shandong Province, Dongying Municipality (including project implementation units) and community levels. The following figure shows the institutional arrangements and responsibility division for the project. The project is institutionally linked to the WB/GEF Strategic Partnership for Sustainable Development of the Large Marine Ecosystems of East Asia, its financing arm— Strategic Partnership Investment Fund for Pollution Reduction in the Large Marine Ecosystems of East Asia—and its regional agency, PEMSEA.

### **Institutional Arrangements for Project Implementation**

## **B. PROJECT IMPLEMENTATION ARRANGEMENT:**

The detailed responsibilities of each party and the coordination mechanisms are reflected in the Project Implementation Plan (PIP) and Project Feasibility Study Report (FSR). The project implementation arrangement is set as the following:

**At River Basin Level.** The Huai River Basin Commission will provide technical guidance to the project and participate in the implementation of the institutional development and capacity building component.

**At Provincial Level.** The Shandong Provincial Project Leading Group (PPLG) of the HRBFMDI Project would also function as the PPLG for the GEF Project, and the Provincial Project Management Office (PPMO) of the HFMDIP Project would function as the Provincial Project Management Office (PPMO) for the GEF project to oversee project implementation and provide necessary guidance. The PPLG would include members from Central Project Management Office of the HFMDI Project and Dongying Municipal Government and the PPMO would include members from Provincial Financial Bureau (PFB). The PFB will take main responsibilities of the project management together with Provincial Water Resources Bureau.

**At Municipal Level.** The Dongying Project Leading Group (DPLG) and the Dongying Project Management Office (DPMO) have been established for project preparation and implementation. Project Implementation Units (PIUs) are established in each of the three implementing agencies: Dongying Water Resources Bureau, Dongying City Management Bureau, and Dongying Agricultural Bureau. Staff has been assigned to Project Management Office. The DPMO would include members from Dongying Water Resources Bureau, Financial Bureau, Development and Reform Bureau, Environmental Protection Bureau, Agricultural Bureau, City Management Bureau, and other related municipal government line bureaus. Each of the three PIUs would have a designated project management group to manage implementation of the respective sub-component(s), with assistance from external consultant teams on need basis.

**At Community Level.** Farmer Environmental Protection Associations (FEPAs) will be established in each of the pilot villages to organize FEPA members in participating in the implementation of agricultural/rural pollution management activities. They will operate as long-term community self-management institution for village-level environmental protection, with support and guidance from Dongying Agricultural Bureau and Environmental Protection Bureau, and local governments.

## **PART IV: EXPLAIN THE ALIGNMENT OF PROJECT DESIGN WITH THE ORIGINAL PIF:**

All key project elements remain unchanged from PIF i.e. project objectives; overall project design; total project investment (higher) and GEF grant amounts; and project location. However, some necessary adjustments have been made in response to the latest development in project area. These adjustments were reconfirmed with the Client during the Bank appraisal mission from July 25 to August 2, 2011 and summarized below. The following table provides a comparison of project Components and Sub-components listed in approved PIF and agreed with the Client.

- The wetland in Shaying (Comp. A(a)) was dropped due to reallocation of the wetland as a result of Dongying city's land use plan review. This is not expected to adversely affect the overall water quality in Guangli river, and it is compensated by introducing agricultural and rural pollution control measures in the upper catchment of Guangli River.
- Construction of the waste water treatment plant (Comp. B(c)) was dropped due to the fact that construction of the waste water treatment plant was completed as planned, in the process of the GEF project preparation. The construction was financed entirely by Dongying municipal government.
- Number of water gate to be upgraded (Comp. B(a)) was reduced from five to three due to the fact that upgrading of two water gates conceived under the project has been completed, in the process of GEF project preparation. The upgrading was financed entirely by Dongying municipal government.
- Agricultural pollution control (Comp. B1) and Rural pollution management (Comp. B2) were added to the project to (a): pilot a comprehensive approach towards water pollution management; and (b) relocate the budget savings from the dropped sub-components above.
- Project components and sub-components were reorganized for more effective implementation management.

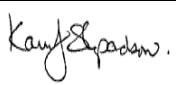
### A Comparison of Project Components and Sub-components

| At PIF Submission   | Link     | Agreed with the Client  |
|---|----------|---|
| Comp. A: Wetland Construction   |          | Comp. A: Wetland System and Gate Regulation                   |
| (a) Wetland at Shaying  | dropped  | A1. Constructed wetland at Dongbalu                           |
| (b) Wetland at Dongbalu   | =A1      | A2. Water gate and automatic control                          |
| (c) Education and training center   | =C1      | A3. Resettlement compensation                                 |
| Comp. B: Innovative Nutrient and Pollution Control Practice Demonstration |          | Comp. B: Agricultural and Rural Pollution/Nutrient Management |
| (a) Water gate  | =A2      | B1. Agricultural pollution management                         |
| (b) Farmer Environmental Protection Association                           | =B3      | B2. Rural pollution management                                |
| (c) Waste Water Treatment Plant   | dropped  | B3. Farmer Environmental Protection Association development   |
| Comp. C: Policy Development   |          | Comp. C: Institutional Development and Capacity Building      |
| (a) Preparation of an Action Plan   | =C3      | C1. Education and training center                             |
| (b) Development of a Replication Strategy                                 | =C3      | C2. Capacity building   |
| Comp. D: Project Monitoring and Capacity Building                         | =C2 & D2 | C3. Policy development  |
| Comp. E: Project Management   | =D3      | D. Project Management and Implementation Support              |
|   |          | D1. Technical support   |

|  |  |                               |
|--|--|-------------------------------|
|  |  | D2. Monitoring and evaluation |
|  |  | D3. Project management        |

### **PART V: AGENCY(IES) CERTIFICATION**

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for CEO Endorsement.

| Agency Coordinator,<br>Agency name                          | Signature   | Date       | Project Contact<br>Person | Telephone    | Email Address     |
|---|---|------------|---------------------------|--------------|-------------------|
| Karin Shepardson<br>Program Manager,<br>ENVGC<br>World Bank |  | 11/15/2011 | Jiang Ru                  | 202 473-8677 | jru@worldbank.org |

## ANNEX A: PROJECT RESULTS FRAMEWORK

| PDO Indicators  |       |                       |      |          |        |       |       |           |   |  |  |
|---|-------|-----------------------|------|----------|--------|-------|-------|-----------|---|--|--|
| <i><b>PDO:</b> To demonstrate innovative and cost-effective water pollution control practices in Guangli river catchment of Dongying Municipality, contributing to reduction in pollution to the Bohai Sea.</i> |       |                       |      |          |        |       |       |           |   |  |  |
|   | Items | Core?<br>(Yes/<br>No) | Unit | Baseline | Target |       |       | Frequency | Data Sources  | Responsible<br>Agencies                                    | Notes  |
|   |       |                       |      | 2011     | 2012   | 2013  | 2014  |           |   |  |  |
| PO-1: Project-induced reduction in pollutant /nutrient loads entering Bohai Sea from Guangli River Watershed  | COD   | Yes                   | T/a  | 0        | 3.8    | 240.3 | 517.6 | 12/a      | On-line concentration monitoring, by monitoring stations (MS) | Dongying PMO, Dongying Environment Protection Bureau (EPB) | In 2011, the total amount of COD, BOD, NH3-N and TP that enter Bohai Sea from Guangli River will amount to 2,700 tons, 900 tons, 360 tons and 45 tons, respectively. The amount of each pollutant discharged is calculated based on the flow and concentration obtained through real-time monitoring. The concentration of each pollutant is calculated based on the average of the concentrations measured by Dongying Environment Protection Stations every month. This indicator is the total amount of pollution reduction from (a) Dongbalu wetlands, (b) agricultural non-point pollutant reduction, and (c) pollution reduction due to the rural waste water treatment project. |
|   | BOD   |                       | T/a  | 0        | 0      | 92    | 215   | 12/a      | Manual monitoring methods, by MS                              | Dongying PMO, Dongying EPB                                 |  |
|   | NH3-N |                       | T/a  | 0        | 2.5    | 60    | 134   | 12/a      | On-line concentration monitoring, by MS                       | Dongying PMO, Dongying EPB                                 |  |
|   | TP    |                       | T/a  | 0        | 1.1    | 8.6   | 12.9  | 12/a      | Manual monitoring methods, by MS                              | Dongying PMO, Dongying EPB                                 |  |
| PO-2: Reduction in pollutants/nutrients reduction through constructed wetlands at Dongbalu  | COD   | No                    | T/a  | 0        | 0      | 185   | 430   | 12/a      | On-line concentration monitoring, by MS                       | Dongying PMO, Dongying EPB                                 | After the construction of wetlands, water quality monitoring stations will be built at both the entrance to and the exit of wetlands. Based on pollutant concentrations measured at the exit of Dongbalu Wetlands and the volume of treated waste water at wetlands, the amount of   |
|   | BOD   |                       | T/a  | 0        | 0      | 92    | 215   | 12/a      | Manual monitoring methods, by MS                              | Dongying PMO, Dongying EPB                                 |  |



|   |                    |     |                       |   |       |       |       |      |  |   |   |
|---|--------------------|-----|-----------------------|---|-------|-------|-------|------|--|---|---|
|   | NH <sub>3</sub> -N |     | T/a                   | 0 | 0     | 55    | 129   | 12/a | On-line concentration monitoring, by MS  | Dongying PMO, Dongying EPB                    | treated pollutants in wetlands can be calculated, which is the reduction in pollution.  |
|   | TP                 |     | T/a                   | 0 | 0     | 5     | 12    | 12/a | Manual monitoring methods, by MS   | Dongying PMO, Dongying EPB                    |   |
| Intermediate Output Indicators  |                    |     |                       |   |       |       |       |      |  |   |   |
| Component A: Wetland Construction and Sluice Gate Operation Optimization    |                    |     |                       |   |       |       |       |      |  |   |   |
| IO-1.1. Annual volume of treated waste water at wetlands                    | —                  | No  | 1 m m <sup>3</sup> /a | 0 | 0     | 9.25  | 21.5  | 2/a  | Project Progress Report  | Dongying PMO, Dongying City Management Bureau | Accumulated   |
| Component B: Agriculture Pollution Control and Rural Waste Management       |                    |     |                       |   |       |       |       |      |  |   |   |
| IO-2.1: Rural wastewater pollution load reduction in participating villages | COD                | Yes | T/a                   | 0 | 0     | 9.3   | 9.3   | 12/a | Based on the volume of treated waste water. Measure once per month to calculate the annual quantity, which is the total of the monthly quantities. | Dongying PMO, Dongying Agricultural Bureau    | Incremental   |
|   | SS                 |     | T/a                   | 0 | 0     | 4.6   | 4.6   | 12/a | Based on the volume of treated waste water. Measure once per month to calculate the annual quantity, which is the total of the monthly quantities. | Dongying PMO, Dongying Agricultural Bureau    |   |
| IO-2.2:Livestock Waste pollution reduction in participating villages        | COD                | Yes | T/a                   | 0 | 13.8  | 46.0  | 78.3  | 2/a  | By monitoring and calculation method. Monitor the physical   | Dongying PMO, Dongying Agricultural Bureau    | Based on implementation pace of 30%, 40% and 30% in the first 3 years and calculated in mid-year. Assumed 50% of livestock wastes |
|   | TN                 |     | T/a                   | 0 | 0.131 | 0.437 | 0.743 | 2/a  |  |   |   |

|  |                    |     |         |   |       |       |       |      |  |  |   |
|--|--------------------|-----|---------|---|-------|-------|-------|------|--|--|---|
|  | TP                 |     | T/a     | 0 | 1.038 | 3.460 | 5.883 | 2/a  | progress semi-annually and calculate the annual quantity.  |  | are currently discharged into Guangli river.  |
| IO-2.3: Agricultural pollution/nutrient load reduction in participating villages   | NH <sub>3</sub> -N | Yes | T/a     | 0 | 2.5   | 5     | 5     | 12/a | By directly measure and calculation method. Measure once per month to calculate the annual quantity, which is the total of the monthly quantities. | Dongying PMO, Dongying Agricultural Bureau             | By June 2012, construction of ecological intercepting ditch will be completed. In 2012, 2013 and 2014, pollution reduction as a result of changes in application of chemical fertilizer will be 50%, 100% and 100%, respectively. In 2012, the amount of NH <sub>3</sub> -N and TP that enter Guangli River due to agricultural non-point pollution will be 6.163 tons and 1.71 tons, respectively. |
|  | TP                 |     | T/a     | 0 | 0.054 | 0.103 | 0.123 | 12/a | By directly measure and calculation method. Measure once per month to calculate the annual quantity, which is the total of the monthly quantities. | Dongying PMO, Dongying Agricultural Bureau             |   |
| IO-2.4: Proportion of farmers adopting integrated and balanced fertilizer application technology in participating villages | —                  | No  | %       | 0 | 15    | 35    | 80    | 2/a  | Project Progress Report and Project Monitoring Report  | M&A team of Dongying PMO, Dongying Agricultural Bureau |   |
| IO-2.5: Number of farmers environmental protection associations operational  | —                  | Yes | —       | 0 | 4     | 10    | —     | 2/a  | Project Progress Report  | Dongying PMO   |   |
| <b><u>Component C: Capacity Building and Policy Studies</u></b>  |                    |     |         |   |       |       |       |      |  |  |   |
| IO-3.1. Number of people trained   | —                  | No  | Persons | 0 | 1500  | 3000  | 4500  | 2/a  | Project Progress Report  | Dongying PMO   | Accumulated amount, including project management, implementation and training for villagers in pilot villages   |

|  |   |     |             |  |                          |                      |                             |     |  |                               |  |
|--|---|-----|-------------|--|--------------------------|----------------------|-----------------------------|-----|--|-------------------------------|--|
| IO-3.2. Study of the impact on pollution reduction through constructing wetlands in Guangli River                          | — | No  | Description |  |                          | Complete the outline | Complete                    | 2/a | Project Progress Report                          | Provincial and municipal PMOs |  |
| IO-3.2. Evaluation study and management planning for Agricultural and Rural Pollution Reduction in Guangli River Catchment | — | No  | Description |  |                          | Complete the outline | Complete                    | 2/a | Project Progress Report                          | Provincial and municipal PMOs |  |
| IO-3.3. Development and dissemination of Huai River basin-wide replication strategy  | — | Yes | Description |  | Develop a strategic plan | Compile a draft      | Complete and to disseminate | 2/a | Project Progress Report, Bank Supervision Report | Dongying PMO                  |  |

**ANNEX B: RESPONSES TO PROJECT REVIEWS** (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF)

1. Response to GEF Secretariat comments:

Items worth noting at CEO Endorsement: At time of CEO endorsement, it is expected that the output indicators will be quantifiable and include target values, as to enable the project to report project progress using the IW TT. Please, at time for Request for CEO Endorsement, include wording to support the use of the IW TT. (September 10, 2009)

Response: the output indicators are now quantifiable and include target values. The wording to support the use of the IW TT has been included in the PAD.

2. No comment was received from STAP reviewer.

**ANNEX C: CONSULTANTS TO BE HIRED FOR THE PROJECT USING GEF RESOURCES**

| <i>Position Titles</i>   | <i>\$/<br/>person week*</i> | <i>Estimated person<br/>weeks**</i> | <i>Tasks to be performed</i>  |
|--|-----------------------------|-------------------------------------|---|
| <b>For Project Management</b>                                      |                             |                                     |   |
| Local  |                             |                                     |   |
| Project implementation support                                     | 2,570                       | 100                                 | To provide services to (a) review technical designs, tendering documents and construction quality of project facilities, including constructed wetlands, gates, wastewater treatment and livestock waste storage facilities and eco-trenches for agricultural pollution control, etc; and (b) provide other necessary support/technical assistance to Dongying PMO and different PIUs in project implementation and management, such as monitoring results consolidation and project reporting.   |
| International  |                             |                                     |   |
| Justification for Travel, if any:                                  |                             |                                     |   |
| <b>For Technical Assistance</b>                                    |                             |                                     |   |
| Local  |                             |                                     |   |
| Monitoring and evaluation for agricultural pollution control       | 1,000                       | 78                                  | To provide monitoring and evaluation services to (a) monitor results of all technologies introduced under agricultural pollution control sub-component; (b) construct a monitoring site and install essential equipment in a participating village for cotton crop; (c) collect and lab test soil and water samples from all dominant crop lands in the participating villages; (d) prepare and submit semi-annual monitoring reports to Dongying PMO; (e) share about 60% of the total cost for this sub-component. Agreement has been reached that the consultant will carry out a long term results monitoring program to cover a period of 5 years or beyond. |
| Monitoring and evaluation for rural waste management               | 800                         | 9                                   | To provide M&E services by an independent consulting team to (a) collect and lab test water samples to monitor water quality of treated rural wastewater; (b) carry out site visits to monitor performance (efficiency and effectiveness) of the rural waste management facilities; and (c) prepare and submit semi-annual monitoring reports to Dongying PMO.  |
| Technical support for buffer strip and eco-trench                  | 2,200                       | 7                                   | To provide technical support during the entire project implementation period in the areas of (a) site selection, (b) technical design, (c) plant selection, (d) operation and maintenance   |
| Comprehensive & balanced fertilization by a technical expert panel | 1,800                       | 17                                  | An expert panel consisting of municipal, provincial and national experts in soil, crop nutrient, plant protection and agricultural environment would study the soil test results and provide a comprehensive technical advisory package for fertilizer application in the form of a soil-crop-village specific report to offer professional advices and technical suggestions on: (i) appropriate fertilizers; (ii)   |

|   |       |     |   |
|---|-------|-----|---|
|   |       |     | crop-specific and customized nutrient fertilization; (iii) accurate fertilizer application; (iv) alternative organic and biological fertilizer; (v) quantity, timing and methodology; (vi) introduction of fine crop varieties; and (vii) crop planting management skills. The expert panel members will pay frequent visits to all participating villages to provide on-site technical support and training. |
| FEPA establishment and operation specialist   | 1,600 | 30  | To provide technical support on participatory consultation, FEPA registration, establishment, operation, and mini-PIP preparation.  |
| Consulting firm for evaluation study of the constructed wetlands  | 1,600 | 58  | To carry out evaluation study of the effectiveness of constructed wetlands in treatment of polluted water based on the analysis of the Project monitoring results.  |
| Consulting firm for development of agricultural pollution control and rural waste management strategy and action plan   | 1,600 | 67  | To develop an agricultural pollution control and rural waste management strategy and action plan for Guangli River Watershed in Dongying including evaluation study of the project interventions under Component B, and formulation of a strategy and action plan for scaling up the pilot interventions from this project, over the entire catchment area of Guangli River, during the project period.       |
| Consulting firm for Replication Strategy development  | 1,600 | 288 | To draft, test and finalize a replication strategy which will incorporate implementation experience of all project components, inputs from all PIUs, Dongying PMO, Shandong PMO and Huai River Basin Commission, and be in line with the government mainstream strategies and programs.   |
| International   |       |     |   |
| Justification for Travel, if any: Travel expenses are required for consultants from locations other than Dongying municipality e.g. Jinan (capital city of Shandong province) and other cities in the country. For simplicity reason, travel expenses are included in the unit cost estimate calculated at an average rate of \$80 person week, one week each trip assumed at 60% of consultants from Dongying municipality (no travel expenses), 20% of consultants from Jinan and other cities within Shandong province (\$600 each round trip inclusive), 20% of consultants from other cities in the country (\$1,000 each round trip). |       |     |   |

\* Provide dollar rate per person week. \*\* Total person weeks needed to carry out the tasks.

## ANNEX D: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS

**A. EXPLAIN IF THE PPG OBJECTIVE HAS BEEN ACHIEVED THROUGH THE PPG ACTIVITIES UNDERTAKEN.**

**B. DESCRIBE FINDINGS THAT MIGHT AFFECT THE PROJECT DESIGN OR ANY CONCERNS ON PROJECT IMPLEMENTATION, IF ANY:**

**C. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES AND THEIR IMPLEMENTATION STATUS IN THE TABLE BELOW: N/A**

| <i><b>Project Preparation<br/>Activities Approved</b></i> | <i><b>Implementation<br/>Status</b></i> | <i><b>GEF Amount (\$)</b></i>     |  |                                    |                                       | <i><b>Co-<br/>financing<br/>(\$)</b></i> |
|---|---|-----------------------------------|--|------------------------------------|---------------------------------------|--|
|   |   | <i><b>Amount<br/>Approved</b></i> | <i><b>Amount<br/>Spent To<br/>date</b></i> | <i><b>Amount<br/>Committed</b></i> | <i><b>Uncommitted<br/>Amount*</b></i> |  |
|   |   |                                   |  |                                    |                                       |  |
|   |   |                                   |  |                                    |                                       |  |
|   |   |                                   |  |                                    |                                       |  |
|   |   |                                   |  |                                    |                                       |  |
|   |   |                                   |  |                                    |                                       |  |
|   |   |                                   |  |                                    |                                       |  |
|   |   |                                   |  |                                    |                                       |  |
|   |   |                                   |  |                                    |                                       |  |
|   |   |                                   |  |                                    |                                       |  |
| <b>Total</b>  |   |                                   |  |                                    |                                       |  |

\* Any uncommitted amounts should be returned to the GEF Trust Fund. This is not a physical transfer of money, but achieved through reporting and netting out from disbursement request to Trustee. Please indicate expected date of refund transaction to Trustee.

**ANNEX E: CALENDAR OF EXPECTED REFLOWS**

Provide a calendar of expected reflows to the GEF Trust Fund or to your Agency (and/or revolving fund that will be set up)



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**The World Bank**

**FOR OFFICIAL USE ONLY**

Report No.:

PROJECT APPRAISAL DOCUMENT  
ON A  
PROPOSED GRANT FROM THE  
GLOBAL ENVIRONMENT FACILITY TRUST FUND  
IN THE AMOUNT OF US\$5 MILLION  
TO THE  
PEOPLE'S REPUBLIC OF CHINA  
IN SUPPORT OF THE  
**HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT**

August 29, 2011

China and Mongolia Sustainable Development Unit  
Sustainable Development Department  
East Asia and Pacific Region

|   |
|---|
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**CURRENCY EQUIVALENTS**  
(Exchange Rate Effective June 30, 2011)

Currency Unit        =    Renminbi (RMB) Yuan  
RMB Yuan 1.0       =    US\$ 0.15  
US\$ 1.0        =    RMB Yuan 6.5

**FISCAL YEAR**  
January 1        –        December 31

**ABBREVIATIONS AND ACRONYMS**

|       |   |
|-------|---|
| COD   | Chemical Oxygen Demand                      |
| CPS   | Country Partnership Strategy                |
| CWRAS | Country Water Resources Assistance Strategy |
| DA    | Designated Account                          |
| EA    | Environmental Assessment                    |
| EIRR  | Economic Internal Rate of Return            |
| EMP   | Environmental Management Plan               |
| FEPA  | Farmer Environmental Protection Association |
| FMM   | Financial Management Manual                 |
| FSR   | Feasibility Study Report                    |
| GEF   | Global Environmental Facility               |
| GOC   | Government of China                         |
| IEG   | Independent Evaluation Group                |
| IPM   | Integrated Pest Management                  |
| KPIs  | Key Performance Indicators                  |
| MIS   | Management Information System               |
| MOF   | Ministry of Finance                         |
| MTR   | Mid-Term Review                             |
| MWR   | Ministry of Water Resources                 |
| M&E   | Monitoring & Evaluation                     |
| NDRC  | National Development and Reform Commission  |
| O&M   | Operation and Maintenance                   |
| PAP   | Project Affected People                     |
| PDO   | Project Development Objectives              |
| PIP   | Project Implementation Plan                 |
| PIU   | Project Implementation Unit                 |
| PLG   | Project Leading Group                       |
| DPMO  | Dongying Project Management Office          |
| PMP   | Pest Management Plan                        |
| PPMO  | Provincial Management Office                |
| RAP   | Resettlement Action Plan                    |
| RPF   | Resettlement Policy Framework               |
| SAAS  | Shandong Academy of Agricultural Sciences   |

|                   |   |
|-------------------|---|
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| Country Director: | Klaus Rohland, EACCF  |
| Sector Director:  | John Roome, EASSD   |
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# PAD DATA SHEET

## CHINA

### GEF HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT

#### PROJECT APPRAISAL DOCUMENT

#### EAST ASIA AND PACIFIC

#### China Sustainable Development Unit (EASCS)

#### Sustainable Development Department

|  |  |
|--|--|
| Date: August 29, 2011<br>Country Director: Klaus Rohland<br>Sector Director: John Roome<br>Sector Managers: Ede Jorge Ijjasz-Vasquez and Vijay Jagannathan<br>Co-Team Leaders: Xiaokai Li/Ximing Zhang<br>Project ID: P108592<br><br>Lending Instrument: GEF Grant   | Sector(s): General water, sanitation and flood protection sector (55%); Pollution Control and Waste Management (45%)<br><br>Theme(s): Water resources management (P); Pollution management and environmental health (P); Rural policies and institutions (S)<br><br>EA Category: B |
| <b>Project Financing Data:</b>   |  |
| Proposed terms:<br>[ ] Loan [ ] Credit [X] Grant [ ] Guarantee [ ] Other:  |  |
| Source   | Total Amount (US\$M)   |
| Total Project Cost:  | 37.83  |
| Borrower:  | 32.83  |
| Total Bank Financing:  | 5.00   |
| IBRD   |  |
| IDA  |  |
| GEF  | 5.00   |
| Recipient: People's Republic of China<br>Responsible Agencies:<br>Dongying Municipal Government, Shandong Province<br>Contact Person: Director, Shandong Project Management Office<br>Office of International Economic Cooperation<br>Shandong Provincial Water Resources Department<br>No. 127 Lishan Road, Lixia District, Jinan, Shandong Province<br>Postal Code: 250013<br>Telephone No.:<br>Fax No.:<br>Email: |  |

|  |      |      |      |  |      |
|--|------|------|------|--|------|
| Estimated Disbursements (Bank FY/US\$ m)   |      |      |      |  |      |
| FY   | 2012 | 2013 | 2014 | 2015   | 2016 |
| Annual   | 0.80 | 2.04 | 1.06 | 0.98   | 0.12 |
| Cumulative   | 0.80 | 2.84 | 3.90 | 4.88   | 5.00 |
| Project Implementation Period: Start: January 1, 2012      End: December 31, 2014<br>Expected effectiveness date: January 1, 2012<br>Expected closing date: June 30, 2015  |      |      |      |  |      |
| Does the project depart from the CAS in content or other significant respects?   |      |      |      | <input type="radio"/> Yes <input checked="" type="radio"/> No  |      |
| If yes, please explain:  |      |      |      |  |      |
| Does the project require any exceptions from Bank policies?<br>Have these been approved/endorsed (as appropriate by Bank management)?<br>Is approval for any policy exception sought from the Board?                     |      |      |      | <input type="radio"/> Yes <input checked="" type="radio"/> No<br><input type="radio"/> Yes <input type="radio"/> No<br><input type="radio"/> Yes <input checked="" type="radio"/> No |      |
| If yes, please explain:  |      |      |      |  |      |
| Does the project meet the Regional criteria for readiness for implementation?  |      |      |      | <input checked="" type="radio"/> Yes <input type="radio"/> No  |      |
| If no, please explain:   |      |      |      |  |      |
| Project Development Objective: to demonstrate innovative and cost-effective water pollution control practices in Guangli river catchment of Dongying Municipality, contributing to pollution reduction in the Bohai Sea. |      |      |      |  |      |

**Project Description:** The proposed project has the following components:

**Component A Wetland Construction and Sluice Gate Operation Optimization:** (a) Construction of wetlands at Dongbalu consisting of free-surface flow wetlands, an ecological retention pool, an entrance gate, a gated overflow weir and a pumping station, and provision of related equipment; (b) Upgrading the automatic gate control system covering three sluice gates on the Guangli River, and the gates at the entrance and exit of the Dongbalu wetlands; and (c) Provision of cash transfers to Affected Persons of the wetlands construction.

**Component B Agricultural Pollution Control and Rural Waste Management:** (a) Wastewater, human and livestock waste collection and treatment in Participating Villages; (b) Introduction of agricultural pollution reduction technologies and management practices in Participating Villages through comprehensive and balanced fertilizer applications, provision and use of insect luring lamps, and construction of eco-trenches and buffer strips in crop fields; and monitoring of the results of implementation of these technologies and practices; and (c) Establishment, equipping and operation of FEPAs in Participating Villages.

**Component C Capacity Building and Policy Studies:** (a) Establishment and operation of an environmental protection education and training centre to be located in Dongying Municipality for training and dissemination of technologies and good practices in environmental protection, nutrient management and pollution reduction; (b) Capacity building activities to provide technical and Project management training for staff involved in Project implementation and monitoring; and (c) Evaluation study of the effectiveness of constructed wetlands in the treatment of polluted water based on the analysis of the Project monitoring results; development of an agricultural pollution reduction and rural waste management strategy and plan for the Guangli River Watershed in the Dongying Municipality, including an evaluation study of the related Project interventions for the purpose; and development of a Huai River Basin-wide replication strategy for cost-effective water pollution control, including dissemination and training and workshops as required for the purpose.

**Component D Project Management and Implementation Support:** (a) Provision of technical assistance for the review of technical designs and tendering documents, construction quality of Project facilities, and for Project reporting; (b) Project monitoring and evaluation; and (c) Support for Project management by the PMOs and PIUs.

|   |   |          |
|---|---|----------|
| Safeguard policies triggered?                 |   |          |
| Environmental Assessment (OP/BP 4.01)         | <input checked="" type="radio"/> Yes <input type="radio"/> No |          |
| Natural Habitats (OP/BP 4.04)                 | <input type="radio"/> Yes <input checked="" type="radio"/> No |          |
| Forests (OP/BP 4.36)                          | <input type="radio"/> Yes <input checked="" type="radio"/> No |          |
| Pest Management (OP 4.09)                     | <input checked="" type="radio"/> Yes <input type="radio"/> No |          |
| Physical Cultural Resources (OP/BP 4.11)      | <input type="radio"/> Yes <input checked="" type="radio"/> No |          |
| Indigenous Peoples (OP/BP 4.10)               | <input type="radio"/> Yes <input checked="" type="radio"/> No |          |
| Involuntary Resettlement (OP/BP 4.12)         | <input checked="" type="radio"/> Yes <input type="radio"/> No |          |
| Safety of Dams (OP/BP 4.37)                   | <input type="radio"/> Yes <input checked="" type="radio"/> No |          |
| Projects on International Waters (OP/BP 7.50) | <input type="radio"/> Yes <input checked="" type="radio"/> No |          |
| Projects in Disputed Areas (OP/BP 7.60)       | <input type="radio"/> Yes <input checked="" type="radio"/> No |          |
| <b>Conditions and Legal Covenants</b>         |   |          |
| Grant/Project Agreements Reference            | Description of Condition/Covenant                             | Date Due |

|                               |   |   |
|-------------------------------|---|---|
| PA: SCHEDULE, Section I, D    | Shandong shall make the principal amount of the Grant available to Dongying Municipality under arrangements satisfactory to the Bank, and ensure that Dongying Municipality provide counterpart funding for the Project implementation including financing of the cash transfer referred to in Part A of the Project.   | As needed per PIP and RAP                             |
| PA: SCHEDULE, Section I, E, 1 | Shandong shall through the Dongying Municipality, prior to commencing the bidding process for any of the works or goods required for implementation of Part B(a) or (b) of the Project in a Participating village, enter into an agreement satisfactory to the Bank with the respective FEPA setting forth their respective obligations.  | Before physical activities of Part B(a) and (b) start |
| PA: SCHEDULE, Section I, F    | Shandong shall (a) prior to authorizing disbursements of any Subsidy Payment for the respective FEPA verify that the crop has been planted in accordance with technical and quality requirements satisfactory to the Bank; and (b) (i) not later than June 30, 2013 review the acceptability of the Unit Costs being financed under Subsidy Payments, and propose to the World Bank any modifications as may be required for the financing any Subsidy Payments; and (ii) thereafter, modify the amount financed as Subsidy Payments as shall have been approved by the World Bank. | As specified  |

## **I. Strategic Context**

### **A. Country Context**

1. Over the past 30 years, China has seen impressive and unprecedented economic growth. However, such rapid growth, compounded by population growth and fast urbanization, has been achieved at the cost of, among many other sacrifices, deteriorating water environment caused mostly by land-based pollution from industries, farming and domestic sources. Majority of the rivers and lakes in the country have been polluted to different degrees, leading to very dire consequences. This situation has alerted Chinese policy makers and general public to give much higher priority to pollution reduction and control. This is clearly articulated in the 12<sup>th</sup> Five-Year Plan (2011-2015), which aims to sustain the rapid and steady development of China's "socialist market economy" following a green growth path. Water management is one of the pillars of green growth.

### **B. Sectoral and Institutional Context**

2. The Huai River Basin covers four provinces, i.e. Shandong, Jiangsu, Anhui and Henan. The key development challenge in the Huai River Basin is to maintain the balance between socio-economic development and environmental protection. With rapid economic growth in the region, many river systems in the Huai River Basin have become increasingly polluted rendering it one of the most polluted rivers in China, and consequently more and more nutrients and pollutants are discharged into the Bohai Sea and Yellow Sea contaminating these international waters. Official statistics show that Shandong Province, with the longest coastlines of the Bohai Sea and the Yellow Sea within the Huai River Basin, is contributing more polluting loads to these seas than any of the other three provinces.

3. Coastal cities such as Dongying in Shandong Province are both significant contributors to and direct victims of such pollution. Dongying has been the central city of the Yellow River delta since its establishment in 1983, with over 350 km coastlines along the Bohai Sea, and a total population of some 1.8 million. Oil, natural gas, salt, coal and geothermal energy are the major resources of Dongying. Over the past two decades, the city has seen continued growth in these sectors. However, the delicate eco-system of Dongying city is being heavily impacted by increasing water pollution.

4. Water pollution in Dongying originates from different sources: both urban and rural areas, point and non-point sources. In spite of the government's efforts in point source pollution control over the years, the total nutrients and pollutants (organics) discharged into the Bohai Sea from Dongying city, in terms of COD, BOD, TN and TP, have yet to be further reduced to an acceptable level. The observed concentrations of COD and NH<sub>3</sub>-N in the water discharged into Bohai Sea end 2010 from Guangli River estuary were 64.60 and 2.11 mg/L respectively. A recent survey by Dongying Environmental Protection Bureau identified municipal sewage (60%) and industrial sewage (8%), rural wastes and agricultural runoff (30%) as the main sources of pollution for Guangli River, which contributes to water pollution and eutrophication in the Bohai Sea.



5. **Main Development Issues.** The main issues with existing water pollution control practices are basically twofold:

(a) *need for a more balanced and integrated approach to water pollution management:* experiences from previous water pollution management investments in Dongying and elsewhere, all point to the fact that effective pollution management calls for balancing the supply-driven and infrastructure-focused approach with likely more cost-effective demand-side management interventions (awareness raising, policy incentives, behavior change) and management practices (introducing new/clean production technologies and environmentally-friendly practices). Many investment programs did not achieve intended effect or fail to sustain because of this reason; and

(b) *lack of effective institutional mechanism for managing non-point source (NPS) pollution in rural and agricultural areas:* Despite the fact that much efforts have been made by the government in reducing NPS pollution through various subsidized investment programs such as biogas generation from human and livestock wastes, and balanced fertilizer applications, the results are usually not very satisfactory, and very often the facilities built or management practices introduced cannot be sustained. The major reason for such failures is the lack of an institutional mechanism with which the investment activities are identified, prioritized, implemented and then maintained with direct involvement of beneficiary communities in an organized manner. Such a mechanism requires establishment of a self-managed community organization which is at the core of community-based approach to pollution management. The proposed GEF project attempts to pilot an integrated and community-based approach to address the above issues in Dongying Municipality (City).

6. Based on stakeholder consultation, Guangli river watershed in Dongying City of Shandong Province, was selected as the pilot area. Guangli river is a man-made drainage channel for Dongying district and Kenli county, with an annual average flow of 2 m<sup>3</sup>/s. The river is 48.8km long and has a catchment area of 792km<sup>2</sup> covering one urban district and a county with a total population of 745,000. It is chosen as the demonstration watershed because: (a) it is easier to measure and evaluate reliably the project impact, as this watershed is entirely within the jurisdiction of Dongying City and is not subject to interference from external pollution sources; (b) it is the main river following through Dongying city to Bohai Sea, and thus a significant pollution contributor; and (c) there is in the watershed a substantial wastewater treatment capacity in operation, and it is covered under municipality's major water pollution control program.

7. **Government strategy.** Dongying Municipal Government has recognized the gravity of water pollution. The Master Plan for Dongying Water City Development (2009) sets the goal to transform Guangli River into an eco-corridor during the "12<sup>th</sup> Five-Year Plan" period, through improving the water quality and environment. The government's strategy is to seek through the GEF project to: (a) reduce nutrient and pollution loads from agricultural and rural sources through pilot interventions, complementary to the M&I sewage treatment being covered by government programs; (b) treat the water in the Guangli river through a constructed wetland at the downstream end of the river; and (c) increase the carrying capacity of the river system by improving the circulation of water through optimal operation of regulating sluice gates along the river. Farmer environmental protection associations (FEPA) would be established as pilot to

demonstrate community-based pollution management in rural areas. The project serves dual purposes: to help improve water environment in Guangli river contributing to pollution/eutrophication reduction in Bohai Sea, and to gain experience for replication over a much wider scope, in Dongying Municipality, Shandong Province and Huai River Basin.

8. ***Rational for Bank Involvement.*** The proposed project is part of the World Bank and GEF Strategic Partnership Investment Fund for Pollution Control in Large Marine Ecosystems of East Asia (the IF), a program approved by GEF in 2005 to finance innovative demonstration projects for pollution control. Compliant with the IF, the proposed project is expected to provide incremental benefits to the baseline Bank-financed China Huai River Basin Flood Management and Drainage Improvement Project (HRBFMDI Project) which became effective in January 2011.

9. The proposed project supports the government's priorities in systematically controlling pollution in heavily polluted river basins including Huai River and Hai River, etc., in reducing land-based pollutants to international waters such as Bohai Sea and Huanghai (Yellow) Sea. It is consistent with the current Bank Group's Country Partnership Strategy for China (CPS dated May 23, 2006), which requires that the Bank Group help mainstream environmental concerns into the development process. "Taking steps to minimize water pollution" and piloting and scaling up "policies and mechanisms to address agriculture non-point pollution" are among priority Bank engagement areas. The project also fits with the regional PEMSEA strategy (of which the IF is a partner), which promotes sustainable development in the region.

## **C. Higher Level Objectives to which the Project Contributes**

10. The project contributes towards the country's long term objective of sustainable economic growth and poverty reduction through improved water resources management and pollution control. As part of the Bank's program to assist China in water resources and environmental management, the proposed project will focus on demonstrating innovative and cost-effective water pollution control practices which are well aligned with the Government's Long-term Strategic Plan for Water Pollution Management and Control in Key Basins and Seas, and the current Bank's Country Partnership Strategy (CPS), a main pillar of which is 'managing resource scarcity and environmental challenges'.

## **II. Project Development Objectives**

### **A. Project Development Objectives (PDO)**

11. The project development objective is to demonstrate innovative and cost-effective water pollution control practices in Guangli river catchment of Dongying Municipality, contributing to pollution reduction in the Bohai Sea. This will be achieved by integrating pollution reduction at source in participating villages along Guangli River and in-stream treatment through constructed wetlands and sluice gate operation optimization, and introduction of community-based approach to rural and agricultural pollution management through establishment and empowerment of the

farmer environmental protection associations (FEPAs). These represent the main innovations of the Project design.

## **B. Project Beneficiaries**

12. A total of about 1.8 million people in Dongying city will benefit directly or indirectly from the project. Beneficiaries would include: (a) farmers benefiting from improved production practices and production cost savings (reduced use of chemical fertilizer, agricultural chemicals, etc.); (b) rural residents benefiting from improved living environment (reduced pollution from household wastes, livestock wastes, etc.); (c) urban residents benefiting from improved living environment and reduced water pollution in Guangli river; (d) project entities benefiting from project investments and capacity building; and (e) fishermen benefiting from reduced threat for eutrophication in the Bohai Sea.

## **C. PDO Level Results Indicators**

13. The main outcome indicators of the proposed project are: (a) project-induced reduction in pollutant and nutrient loads entering Bohai Sea from Guangli River Watershed; and (b). reduction in pollutants and nutrients through the constructed wetlands at Dongbalu.

# **III. Project Description**

## **A. Project Components**

14. The Project would have the following four components (See Annex 2 for details).

### **Component A. Wetland Construction and Sluice Gate Operation Optimization (Base Cost: US\$27.19 million):**

(a) Construction of wetlands at Dongbalu consisting of free-surface flow wetlands, an ecological retention pool, an entrance gate, a gated overflow weir and a pumping station, and provision of related equipment;

(b) Upgrading the automatic gate control system covering three sluice gates on the Guangli River, and the gates at the entrance and exit of the Dongbalu wetlands; and

(c) Provision of cash transfers to Affected Persons of the wetlands construction.

### **Component B. Agricultural Pollution Control and Rural Waste Management (Base Cost: US\$4.59 million):**

(a) Wastewater, human and livestock waste collection and treatment in Participating Villages;

(b) (i) Introduction of agricultural pollution reduction technologies and management practices in Participating Villages through comprehensive and balanced fertilizer applications, provision and use of insect luring lamps, and construction of eco-trenches and buffer strips in

crop fields; and (ii) monitoring of the results of implementation of these technologies and practices; and

(c) Establishment, equipping and operation of FEPAs in Participating Villages.

**Component C. Capacity Building and Policy Studies (Base Cost: US\$1.85 million):**

(a) Establishment and operation of an environmental protection education and training centre to be located in Dongying Municipality for training and dissemination of technologies and good practices in environmental protection, nutrient management and pollution reduction;

(b) Capacity building activities to provide technical and Project management training for staff involved in Project implementation and monitoring; and

(c) (i) Evaluation study of the effectiveness of constructed wetlands in the treatment of polluted water based on the analysis of the Project monitoring results; (ii) development of an agricultural pollution reduction and rural waste management strategy and plan for the Guangli River Watershed in the Dongying Municipality, including an evaluation study of the related Project interventions for the purpose; and (iii) development of a Huai River Basin-wide replication strategy for cost-effective water pollution control, including dissemination and training and workshops as required for the purpose.

**Component D. Project Management and Implementation Support (Base Cost: US\$2.29 million):**

(a) Provision of technical assistance for the review of technical designs and tendering documents, construction quality of Project facilities, and for Project reporting;

(b) Project monitoring and evaluation; and

(c) Support for Project management by the PMOs and PIUs.

15. This project is part of the WB/GEF Strategic Partnership Investment Fund for Land-based Pollution Reduction in the Large Marine Ecosystems of East Asia, which focuses on both urban wastewater treatment and agricultural pollution reduction. The IF is managed in cooperation with the PEMSEA that has developed a Regional Sustainable Development Strategy of the Seas of East Asia. PEMSEA is also part of the regional implementation plan of the UNEP's Global Program of Action (GPA) for the Protection of the Marine Environment from Land-based Activities. The objective of the IF is to scale up investment to reduce land-based water pollution in coastal areas and major river basins in East Asia. The Project will benefit from experiences and lessons learned from other international and national initiatives and programs completed or under way around the Bohai Sea and Yellow Sea, for example, Reducing Environmental Stress in the Yellow Sea Large Marine Ecosystem (GEF/UNDP), Regional Program on PEMSEA (GEF/IMO), Hai River Basin Integrated Water and Environment Management Project (GEF/WB), and Baltic region agricultural pollution control program (GEF/WB).

## B. Project Financing

### Lending Instrument

16. The lending instrument for the proposed project is a stand-alone GEF Grant. The project interventions and targets are well defined and can be completed within the agreed implementation period.

### Project Cost and Financing

17. The total project cost is estimated to be US\$38.16 million. The project will be financed through a US\$5 million grant from GEF, with the remaining to be funded through counterpart funding from Dongying Municipal Government and beneficiary rural households. The project implementation will be from 2012 to 2015. The disbursement arrangements for the grant are shown in Annex 3.

Project Cost and Financing by Component

| Component  |                                      | Project Costs<br>(US\$'000) | GEF Financing |             |
|--|--------------------------------------|-----------------------------|---------------|-------------|
|  |                                      |                             | (US\$'000)    | (%)         |
| A. Wetland Construction and Sluice Gate Operation Optimization |                                      | 27,188                      | 1,843         | 6.8         |
| A1   | Constructed Wetland at Dongbalu      | 19,473                      | 1,843         | 9.5         |
| A2   | Sluice Gate Operation Optimization   | 923                         |               | 0.0         |
| A3   | Resettlement Compensation            | 6,792                       |               | 0.0         |
| B. Agricultural Pollution Control and Rural Waste Management   |                                      | 4,591                       | 1,839         | 40.1        |
| B1   | Rural Waste Management               | 2,255                       | 857           | 38.0        |
| B2   | Agricultural Pollution Control       | 2,003                       | 692           | 34.5        |
| B3   | Establishment and Operation of FEPAs | 333                         | 290           | 87.0        |
| C. Capacity Building and Policy Studies                        |                                      | 1,851                       | 1,011         | 54.6        |
| C1   | Education and Training Center        | 193                         |               | 0.0         |
| C2   | Capacity Building                    | 778                         | 240           | 30.8        |
| C3   | Policy Studies                       | 880                         | 771           | 87.6        |
| D. Project Management and Implementation Support               |                                      | 2,290                       | 307           | 13.4        |
| D1   | Implementation Support               | 1,849                       | 250           | 13.5        |
| D2   | Monitoring and Evaluation            | 91                          | 7             | 7.6         |
| D3   | Project Management                   | 350                         | 50            | 14.3        |
| Total Base Cost  |                                      | 35,920                      | 5,000         | 13.9        |
| Contingencies  |                                      | 1,908                       |               | 0.0         |
| <b>Total Costs</b>   |                                      | <b>37,828</b>               | <b>5,000</b>  | <b>13.2</b> |

## C. Lessons Learned and Reflected in the Project Design

18. The Bank has over the years accumulated a wide range of experiences from water pollution reduction and management interventions around the globe. The lessons from similar projects in China and elsewhere and incorporated in project design include:

- (a) effective water pollution management in a basin or catchment requires an integration of pollution reduction at source and treatment of polluted water;
- (b) pollution reduction measures need to be prioritized on the basis of their importance, and their design need to be well aligned with the government strategy and priority programs, and the interests of other key stakeholders, particularly for local communities, to ensure synergy, high commitment level and high adoption rate;
- (c) technical design of treatment wetlands should adapt to the local conditions both in terms of water quality (e.g. water-salt balance and pollutant types) and operating environment (e.g. temperature), and avoid being taken over by need for landscaping;
- (d) a community-based approach is required to deal with pollution management involving numerous individuals such as agricultural non-point pollution control and rural waste management, for project sustainability consideration;
- (e) monitoring and evaluation arrangements are crucial to track the effectiveness of innovative pilot interventions, and must be included in the project design and detailed out in the project implementation plan with solid baselines and realistic targets; and
- (f) raising awareness of stakeholders and general public, and dissemination of project information and pilot results are important measures for successful replication of new technologies and management practices of pollution reduction.

## **IV. Implementation**

### **A. Institutional and Implementation Arrangements**

19. The project adopts a tiered organizational structure involving Huai River Basin Commission through the central project management office (CPMO) of the HRBFMDI Project, Shandong Province, Dongying Municipality (including project implementation units) and community levels. At the basin level, the Huai River Basin Commission will provide technical guidance to the project and participate in the implementation of the institutional development and capacity building component. At the Shandong provincial level, the Provincial Project Leading Group (PPLG) and Provincial Project Management Office (PPMO), established for Shandong Province Component of the HRBFMDI Project, will also serve as the PPLG and PPMO for this project to oversee project implementation and provide necessary guidance. At the Dongying municipal level, the Dongying Project Leading Group (DPLG) and the Dongying Project Management Office (DPMO) have been established for project preparation and implementation. Project Implementation Units (PIUs) are established in each of the three implementing agencies: Dongying Water Resources Bureau, City Management Bureau, and Agricultural Bureau.

20. At the village level, Farmer Environmental Protection Associations (FEPAs) will be established in each of the participating villages to organize FEPA members in participating in the implementation of agricultural/rural pollution management activities. They will operate as long-term community self-management institution for village-level environmental protection, with support and guidance from Dongying Agricultural Bureau and Environmental Protection Bureau, and local governments.

## **B. Results Monitoring and Evaluation**

21. The monitoring and evaluation arrangements for the project include implementation performance and results (inputs, outputs and outcomes) monitoring, specialized monitoring, and safeguards compliance monitoring. Project implementation performance monitoring will be undertaken against the key performance indicators, by Dongying PMO with inputs from the PIUs and Dongying Environmental Protection Bureau and with assistance of implementation support consultants. Specialized monitoring such as water quality of wetlands inflow and outflow, water quality of treated rural wastewater, effect of changes in fertilizer use on surrounding water quality, will be carried out by the Dongying Environmental Protection Bureau, and Dongying Agricultural Bureau PIU and external consultant teams respectively. Safeguards compliance monitoring based on the EMP, PMP and RAP are to be conducted by external environmental and resettlement supervision consultants. The agreed results framework with outcome and outputs indicators and annual targets as shown in Annex 1 forms the core of the monitoring system described in the project implementation plan (PIP). See Annex 3 for more details.

## **C. Sustainability**

22. The project's sustainability depends on several key factors: (a) government commitment to sustainable water resources management and pollution control; (b) ownership of the project activities by implementing agencies and beneficiary communities; and (c) replication of good practice experiences from the pilot over large areas. These factors are well reflected in this project. Government at all levels has assured the Bank of the high priority of this project. There is strong ownership of the project by the project entities and beneficiaries in Dongying. The project is designed with sustainability in mind as indicated below:

- (a) **Technical Sustainability.** To the extent possible, project interventions will be based on technologies and methodologies that are cost-effective, reliable, replicable and environmentally sustainable. The project follows an integrated approach with focus on technical solutions applicable to local conditions that are easy to operate and maintain at low cost. It integrates pollutant and nutrient reduction at source and mitigation in water body, and combines technical measures with behavior change.
- (b) **Institutional Sustainability.** The Government is committed to providing all the necessary government support needed for successful project implementation, including establishment of project organizations at each level and provision of sufficient counterpart funding during project implementation, and financial resources for O&M upon completion of the Project.

Institutional sustainability will be enhanced by establishing and empowering the FEPAs, and by building capacity of implementing agencies, PMOs and beneficiary communities.

- (c) **Long-term Sustainability.** The project is expected to yield limited direct impact on water quality of Guangli River and the Bohai Sea because the selected project area represents a fraction of the total land-based nutrient and pollution load discharged. A noticeable nutrient and pollution reduction can be achieved through the replication of the demonstrated practices throughout Dongying municipality and other areas around the Bohai Sea. To ensure long-term sustainability through replication, specific project interventions include: (i) development of a replication strategy and plan; (ii) specialized training; (iii) empowering FEPAs, local communities, and other stakeholders; and (iv) dissemination of pilot results.

## **V. Key Risks and Mitigation Measures**

23. The main risks of the project are implementation agencies' capacity in technical aspect, procurement, financial management, safeguards management and results monitoring, cross-sector coordination, and main stakeholders' (beneficiaries') ownership in the pilot areas. Mitigation measures include: (a) designing the pilot and project interventions based on close consultation with local governments and communities; (b) enhancing ownership of beneficiary communities through continued public awareness raising activities, financial subsidy and affordable contributions, and establishing FEPAs to institutionalize communities' self-management; (c) hiring competent technical and implementation support consultants, and providing targeted training for project staff during preparation and implementation on key project aspects; and (d) setting up multi-sectoral project leading group, and agreeing upfront on clear responsibility division and coordination mechanism among different sector agencies involved in the project.

## **VI. Appraisal Summary**

### **A. Economic**

24. The economic benefits and costs of the project are identified and quantified to the extent possible. The project's main benefit include cost saving associated with reduced application of chemical fertilizer and pesticides, increase in agricultural and fishery productivity, and increase in value of the surrounding land. Indirect benefits include the improvement of the water quality, biodiversity protection in the Bohai and Huanghai Seas, and carbon emission reduction. The economic costs of the project are capital investments costs and O&M costs.

25. The Project consists of two investment components plus activities of capacity building and project management. While most benefits described above are difficult to quantify and monetize, several valuation methods have been used to capture the economic values in monetized terms of those that are fairly easy to quantify. For the component of wetland restoration, cost-benefit analysis was conducted with the application of valuation techniques such as hedonic methods and benefit transfer method to monetize ecological and land value increase.



For the component of agricultural and rural water pollution control, cost saving by reducing application of chemical fertilizer and pesticides is identified as a main benefit and quantified. Market value of biogas, biogas fertilizer, and wastes of animal husbandry is also estimated.

26. Cost-benefit analyses by components and of the whole project indicate that the Project is economically viable. The economic internal rate of return (EIRR) of the whole project is 13.8%. The sensitivity analysis is conducted by changing the assumption of three variables: economic benefit, capital investment, and O&M costs. The result is equality sensitive to changes on economic benefit and capital investment. The estimated EIRR is 12.5% even under the assumption of 10% decrease in economic benefit. Net present value of the project is 153.6 million RMB under the discount rate of 8%.

## **B. Technical**

27. The proposed project interventions are prioritized and selected based on sound pollution source survey and analysis. The project design is in line with the water pollution control and ecological city master plan of Dongying Municipality, and is well aligned with government's priority programs and local communities' interests. Treatment of polluted water through constructed wetlands at downstream end of Guangli River, combined with pollution reduction measures at source – rural villages and crop fields in the upstream reach, represents an integrated approach to water pollution management in a watershed. The constructed wetlands will treat the Guangli river water to maximize removal of pollutants and nutrients before replenishing the urban water bodies and discharging into the Bohai Sea. The proposed free surface wetland (FSW) is considered a cost effective option appropriate for the local conditions. Similarly, the on-site treatment of rural domestic wastewater is regarded as cost-effective considering the low capital investment, scattered nature of houses and availability of waste lands to dispose tail water in the villages, and ease of maintenance. The agricultural pollution control measures, such as accurate/balanced fertilizer application and agricultural runoff treatment, reflect some of the international best practices in the field. These interventions at the village level are expected to demonstrate effective reduction of pollutant and nutrient loads at source. The innovative community-based approach in non-point pollution management, represented by the establishment and empowerment of FEPAs, lays a solid foundation for replication of best management practices and sustainability of project investments.

## **C. Financial Management**

28. The GEF Grant and the Designated Accounts will be managed by Shandong Provincial Finance Bureau (SPFB). A financial management assessment has been conducted and mitigation actions to strengthen the project financial management capacity have been agreed with the implementing agencies. The assessment has concluded that with the implementation of these actions, the proposed financial management arrangements will satisfy the Bank's minimum requirements under OP/BP 10.02. Annex 3 provides additional information on financial management.

## **D. Procurement**

29. Procurement will be carried out by the Dongying Project Management Office (DPMO). One full-time procurement staff member has been appointed and is in place in DPMO, and one procurement staff has been appointed for each PIU. The DPMO procurement staff member has substantial experience in procurement in government funded projects, but has no direct experience with Bank-financed projects. Targeted training on procurement planning, preparation and implementation was organized for all local procurement staff with assistance of the Bank before appraisal.

30. The procurement risk is the DPMO and the procurement staff's lack of experience in procurement under Bank-financed projects. This risk will be mitigated through appropriate setting of prior review thresholds, close coordination with PPMO and guidance from PPMO, targeted training and capacity building of DPMO staff, close supervision by PPMO and implementation support from the Bank. Further enhancement and refresher procurement training will be included in the PIP, and a procurement manual has been prepared as part of the PIP to guide staff responsible for processing and approving procurement. More detailed information on procurement is provided in Annex 3.

## **E. Social**

31. Reduction of rural and agricultural non-point pollution is a key aspect of the project objectives. It is crucial to have farmers as local host and end user of land and water resources engage in the pollution management activities. For this purpose, Farmer Environment Protection Associations (FEPA) will be piloted under the project, to function as the engine of community-based pollution management practices. Farmers in the participating villages will organize themselves in managing the implementation of related project activities and replicating the proven practices later in the project period. Governmental line agencies will provide the FEPAs with necessary social services and technical supports to strengthen their capacity and enable them to function effectively as grass-root self-managed organizations for water pollution control and environment protection, during and beyond the project period.

32. The potential negative social impact of the project is from the construction of wetlands at Dongbalu which requires the change of land use, even though the land is state-owned. This land was previously regulated by the state-owned Shandong Shengli Petroleum Company. The Dongying Municipal Government has negotiated and agreed with that Company for a paid land use transfer between the two government entities. However, the land use change will entail relocation of seven small-sized enterprises that leased the land for business operation. Also there are some attachments to the land, such as power lines and fish ponds which would be affected as well. An abbreviated RAP has been developed by the government project team. Based on the impact survey and inventory, and consultation with affected enterprises and persons, the abbreviated RAP sets forth appropriate compensation and restoration measures for the relocation impact and the enterprises' business, in accordance with the relevant national laws and regulations, as well as the Bank OP4.12 requirements.

## **F. Environment**

33. The Environment Assessment (EA) shows that the project as a whole has positive environmental impacts with the benefits much outweighing the negative impacts. The project

will potentially reduce fertilizer use by some 20% and pollutant loads flowing into the Guangli River by introducing a set of environmental technologies and best practices in participating villages. The project will further cut down pollutant loads discharged to the Bohai Sea by financing a constructed wetland located at the downstream end of the Guangli River, for treating the polluted water. In addition, the project will support local farmer communities with capacity-building activities, and the establishment and operation of the Farmer Environmental Protection Associations enabling farmer communities to involve directly in rural waste management and agricultural pollution control in a collective manner.

34. The principal potential impacts are associated mainly with construction activities including dust emission, noise, spoil disposal, and short disruption to local community life. Negative impacts are expected to be minimal, site specific, reversible, and easily mitigatable. An EMP has been developed laying out necessary mitigation measures, institutional arrangements, and a monitoring plan to avoid or minimize adverse impacts. Additional information on EMP implementation can be found in Annex 3.

35. The project will reduce the use of pesticides in the pilot villages by promoting the use of non-chemical approach such as insect luring lamps, and by providing farmers with related training and technical support. A Pest Management Plan (PMP) has been developed to help farmers reduce the use of chemical pesticides.

36. In accordance with the World Bank Safeguard policies and applicable national regulations, public consultations were conducted during the environmental assessment process, including questionnaire survey, meetings with the project affected people and other stakeholders regarding the project. Their feedbacks and concerns have been taken into account in the EA process and project design. The safeguard documents were locally disclosed and uploaded to the website of Dongying Municipal Government in May 2011, and sent to the Bank InfoShop for disclosure in June 2011. The updated safeguards documents were disclosed locally and in the InfoShop in August 2011.

## Annex 1: Results Framework and Monitoring

### CHINA: GEF HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT

#### Results Framework

| PDO Indicators   |       |                       |      |          |        |       |       |           |   |  |   |
|--|-------|-----------------------|------|----------|--------|-------|-------|-----------|---|--|---|
| <i>PDO:</i> To demonstrate innovative and cost-effective water pollution control practices in Guangli river catchment of Dongying Municipality, contributing to reduction in pollution to the Bohai Sea. |       |                       |      |          |        |       |       |           |   |  |   |
|  | Items | Core?<br>(Yes/<br>No) | Unit | Baseline | Target |       |       | Frequency | Data Sources  | Responsible<br>Agencies                                    | Notes   |
|  |       |                       |      | 2011     | 2012   | 2013  | 2014  |           |   |  |   |
| PO-1: Project-induced reduction in pollutant /nutrient loads entering Bohai Sea from Guangli River Watershed   | COD   | Yes                   | T/a  | 0        | 13.8   | 240.3 | 517.6 | 12/a      | On-line concentration monitoring, by monitoring stations (MS) | Dongying PMO, Dongying Environment Protection Bureau (EPB) | In 2011, the total amount of COD, BOD, NH3-N and TP that enter Bohai Sea from Guangli River will amount to 2,700 tons, 900 tons, 360 tons and 45 tons, respectively. The amount of each pollutant discharged is calculated based on the flow and concentration of it obtained through real-time monitoring. The concentration of each pollutant is calculated by taking the average of the concentrations measured by Dongying Environment Protection Stations every month. Every year, around 45,000,000 m3 water enters Bohai Sea from Guangli River. This indicator is the total amount of pollution reduction in Donggalu wetlands, agricultural non-point pollutant reduction, and pollution reduction due to rural waste water treatment project. |
|  | BOD   |                       | T/a  | 0        | 0      | 92    | 215   | 12/a      | Manual monitoring methods, by MS                              | Dongying PMO, Dongying EPB                                 |   |
|  | NH3-N |                       | T/a  | 0        | 2.5    | 60    | 134   | 12/a      | On-line concentration monitoring, by MS                       | Dongying PMO, Dongying EPB                                 |   |
|  | TP    |                       | T/a  | 0        | 1.1    | 8.6   | 12.9  | 12/a      | Manual monitoring methods, by MS                              | Dongying PMO, Dongying EPB                                 |   |

|  |                    |     |          |   |   |      |      |      |  |   |   |
|--|--------------------|-----|----------|---|---|------|------|------|--|---|---|
| PO-2: Reduction in pollutants/nutrients reduction through constructed wetlands at Dongbalu | COD                | No  | T/a      | 0 | 0 | 185  | 430  | 12/a | On-line concentration monitoring, by MS  | Dongying PMO, Dongying EPB                    | The difference between the amounts of pollutants at the entrance to and the exit of wetlands. Data collected at Minghai Sluice Gate will be used. After the construction of wetlands, water quality monitoring stations will be built at both the entrance to and the exit of wetlands. Based on pollutant concentrations measured at the exit of Dongbalu Wetlands and the volume of treated waste water at wetlands, the amount of treated pollutants in wetlands can be calculated, which is the reduction in pollution. |
|  | BOD                |     | T/a      | 0 | 0 | 92   | 215  | 12/a | Manual monitoring methods, by MS   | Dongying PMO, Dongying EPB                    |   |
|  | NH <sub>3</sub> -N |     | T/a      | 0 | 0 | 55   | 129  | 12/a | On-line concentration monitoring, by MS  | Dongying PMO, Dongying EPB                    |   |
|  | TP                 |     | T/a      | 0 | 0 | 5    | 12   | 12/a | Manual monitoring methods, by MS   | Dongying PMO, Dongying EPB                    |   |
| Intermediate Output Indicators   |                    |     |          |   |   |      |      |      |  |   |   |
| Component A: Wetland Construction and Sluice Gate Operation Optimization                   |                    |     |          |   |   |      |      |      |  |   |   |
| IO-1.1. Annual volume of treated waste water at wetlands                                   | ——                 | No  | 1 m m³/a | 0 | 0 | 9.25 | 21.5 | 2/a  | Project Progress Report  | Dongying PMO, Dongying City Management Bureau | Accumulated   |
| Component B: Agriculture Pollution Control and Rural Waste Management                      |                    |     |          |   |   |      |      |      |  |   |   |
| IO-2.1: Rural wastewater pollution load reduction in participating villages                | COD                | Yes | T/a      | 0 | 0 | 9.3  | 9.3  | 12/a | Based on the volume of treated waste water. Measure once per month to calculate the annual quantity, which is the total of the monthly quantities. | Dongying PMO, Dongying Agricultural Bureau    | Incremental   |
|  | SS                 |     | T/a      | 0 | 0 | 4.6  | 4.6  | 12/a | Based on the volume of treated waste water. Measure once per month to calculate the annual quantity, which is the total of the monthly             | Dongying PMO, Dongying Agricultural Bureau    |   |

|  |                    |     |         |   |       |       |       |      |  |  |  |
|--|--------------------|-----|---------|---|-------|-------|-------|------|--|--|--|
|  |                    |     |         |   |       |       |       |      | quantities.  |  |  |
| IO-2.2: Livestock Waste pollution reduction in participating villages  | COD                | Yes | T/a     | 0 | 13.8  | 46.0  | 78.3  | 2/a  | By monitoring and calculation method. Monitor the physical progress semi-annually and calculate the annual quantity.                               | Dongying PMO, Dongying Agricultural Bureau             | Based on implementation pace of 30%, 40% and 30% in the first 3 years and calculated in mid-year. Assumed 50% of livestock wastes are currently discharged into Guangli river.   |
|  | TN                 |     | T/a     | 0 | 0.131 | 0.437 | 0.743 | 2/a  |  |  |  |
|  | TP                 |     | T/a     | 0 | 1.038 | 3.460 | 5.883 | 2/a  |  |  |  |
| IO-2.3: Agricultural pollution/nutrient load reduction in participating villages   | NH <sub>3</sub> -N | Yes | T/a     | 0 | 2.5   | 5     | 5     | 12/a | By directly measure and calculation method. Measure once per month to calculate the annual quantity, which is the total of the monthly quantities. | Dongying PMO, Dongying Agricultural Bureau             | By June of 2012, construction of ecological intercepting ditch will be completed. In 2012, 2013 and 2014, pollution reduction as a result of changes in application of chemical fertilizer will be 50%, 100% and 100%, respectively. In 2012, the amount of NH <sub>3</sub> -N and TP that enter Guangli River due to agricultural non-point pollution will be 6.163 tons and 1.71 tons, respectively. |
|  | TP                 |     | T/a     | 0 | 0.054 | 0.103 | 0.123 | 12/a | By directly measure and calculation method. Measure once per month to calculate the annual quantity, which is the total of the monthly quantities. | Dongying PMO, Dongying Agricultural Bureau             |  |
| IO-2.4: Proportion of farmers adopting integrated and balanced fertilizer application technology in participating villages | —                  | No  | %       | 0 | 15    | 35    | 80    | 2/a  | Project Progress Report and Project Monitoring Report  | M&A team of Dongying PMO, Dongying Agricultural Bureau |  |
| IO-2.5: Number of farmers environmental protection associations operational  | —                  | Yes | —       | 0 | 4     | 10    | —     | 2/a  | Project Progress Report  | Dongying PMO   |  |
| <b>Component C: Capacity Building and Policy Studies</b>   |                    |     |         |   |       |       |       |      |  |  |  |
| IO-3.1. Number of people trained   | —                  | No  | Persons | 0 | 1500  | 3000  | 4500  | 2/a  | Project Progress Report  | Dongying PMO   | Accumulated amount, including project management, implementation and training for villagers in pilot villages  |

|  |   |     |             |  |                          |                      |                             |     |  |                               |  |
|--|---|-----|-------------|--|--------------------------|----------------------|-----------------------------|-----|--|-------------------------------|--|
| IO-3.2. Study of the impact on pollution reduction through constructing wetlands in Guangli River                          | — | No  | Description |  |                          | Complete the outline | Complete                    | 2/a | Project Progress Report                          | Provincial and municipal PMOs |  |
| IO-3.2. Evaluation study and management planning for Agricultural and Rural Pollution Reduction in Guangli River Catchment | — | No  | Description |  |                          | Complete the outline | Complete                    | 2/a | Project Progress Report                          | Provincial and municipal PMOs |  |
| IO-3.3. Development and dissemination of Huai River basin-wide replication strategy  | — | Yes | Description |  | Develop a strategic plan | Compile a draft      | Complete and to disseminate | 2/a | Project Progress Report, Bank Supervision Report | Dongying PMO                  |  |

## **Annex 2: Detailed Project Description**

### **CHINA: GEF HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT**

1. **Background:** Four provinces in China including Shandong border the Bohai Sea which has lost part of its ecological service and productive functions owing to water pollution. An official report from Chinese Government (2009) indicates that over 12,000 km<sup>2</sup> of Bohai Sea are polluted to different levels, with concentrated belts of pollution in Bohai Gulf, Eastern Liaoning Province and Eastern Shandong Province (including Dongying City). In the summer of 2009, the total area of eutrophication in Bohai Sea reached 17,900 km<sup>2</sup> (or 23%) which covers part of the coast of Dongying (at Yellow River Delta). In accordance with the monitoring results of Dongying Oceanic Environment Monitoring and Forecasting Center, the main pollutants entering the Bohai Sea from Guangli River are COD, NH<sub>3</sub>-N and oil.

2. The observed concentrations of COD, NH<sub>3</sub>-N and oil discharged in October 2010 into Bohai Sea from Guangli River estuary were 64.60, 2.11 and 0.30 mg/L respectively that represent the current water quality, against those in October 2008 of 73.70, 3.27 and 0.31mg/L respectively. Such significant reduction in pollutant loads to the Bohai Sea reflects the effects of Dongying Municipal Government's efforts and investments in intercepting, collecting and treating municipal and industrial wastewater/sewage in the urban areas, particularly in the Guangli River catchment, to improve the ecological environment in the city's water system.

3. To identify the main pollution sources for the worse than Class V water quality (defined by Chinese National Standard) of Guangli river, a survey by Dongying Environment Protection Bureau in April 2009 showed that the main pollution sources are: (a) domestic wastewater in the urban areas of the city (municipal sewage), contributing to about 60% of the COD loads into the river; (b) agricultural runoff (including irrigation return water) and rural wastewater and wastes (livestock and human) carrying pollutants and nutrients into the river. They account for around 30% of the total pollution loads. The estimated pollutants (COD, NH<sub>3</sub>-N and TP) from agricultural runoff and rural wastewater in the 11 townships along Guangli River (total population: 630,000; and farmland: 20,000 ha in 2010) are: (4506, 901, 900) and (2003, 286 and 48) ton/year respectively; and (c) industrial wastewater accounts for some 8% of the COD discharged into the river. In addition, due to lack of sufficient water inflow from precipitation and other catchments, water environment further deteriorates in Guangli river during dry season, resulting in worse than Class V water quality (COD:NH<sub>3</sub>-N/TN:TP = 40, 2.0,0.4 or smaller) year long.

4. In order to revert the trend of deteriorating water quality, Dongying Municipal Government developed a water-city master plan that stipulates the transformation of the Guangli River into an ecological corridor within the 12<sup>th</sup> Five-Year Plan period (with a minimum of 15 million m<sup>3</sup> (MCM) water of Class IV quality (COD,TN,TP = 30,1.5,0.3 mg/L or smaller). Starting from the 11<sup>th</sup> Five-Year Plan period, the Dongying municipal government stepped up its efforts, and has been making a series of investments ranging from sewage collection networks and treatment plants, storm-water pumping stations, sluice gates and automatic water quality monitoring stations (network). In early 2010, the government issued "Regulations on Water Pollution Prevention and Management in Guangli River Catchment of Dongying City". The



following is a summary of the wastewater treatment plants (WWTPs) in operation and under preparation for construction in Guangli river catchment. It is expected that once these WWTPs are operational at full capacity, they would be able to treat all the urban wastewater in the medium term.

WWTPs in the Catchment Area of Guangli River

| Name of WWTP                       | Capacity (ton/day)                          | Operational Status          |
|------------------------------------|---|-----------------------------|
| Shengtuo                           | 20,000                                      | operational                 |
| Dongying Economic Development Zone | 40,000 (Phase I)<br>Final capacity: 120,000 | Phase I operational         |
| Shaying                            | 120,000                                     | operational                 |
| Chengnan                           | 60,000                                      | Under prep for construction |

5. The GEF project is designed in line with government priority programs to complement the above investments, by integrating rural and agricultural pollution reduction at source, and in-stream water treat and carrying capacity enhancement through constructed wetland and sluice gate operation optimization, as well as capacity building and institutional development interventions. The project interventions are selected based on in-depth consultation with the farmer communities to serve dual purpose of improving their living environment with production cost saving and reducing nutrient/pollution discharge into the Guangli River. These interventions are expected to be implemented and managed through the FEPAs. The river water treated by the wetland through removal of pollutants (organics) and nutrients, will be circulated back into Guangli river system with only limited amount of water discharging into Bohai Sea, thus contributing to reduction in pollution of the Bohai Sea. Bigger impacts on the water quality of Bohai Sea are expected through replication of the experiences from the pilot in the entire Guangli River catchment, Dongying Municipality, and Huai River Basin.

6. **Detailed Project Description.** The proposed Project has four Components (Parts), as described below.

7. **Component A. Wetland Construction and Sluice Gate Operation Optimization.** The objective of this component is to improve water quality in Guangli River through constructed wetlands to meet Class V standard suitable for landscaping purpose, and increase the carrying capacity of the Guangli River through sluice gate regulation. It comprises three sub-components:

(a). *Constructed Wetland at Dongbalu.* This sub-component will support construction of a wetland (1.8 km<sup>2</sup>) at Dongbalu, about 20 km downstream of the city center along the Guangli River, and about 15 km above the estuary. The site is a piece of wasteland that is around 3,500 m from south to north and some 500 m from east to west with a few constructed structures. The constructed wetland will consist of water regulation structures (inlet control gate to control river water flow into the wetland and a pumping station to pump the effluent to replenish the surface water system), a bio-retention pond, and free surface wetlands (FSW). The wetlands will treat Guangli River water at about 70,000 m<sup>3</sup>/day (2,900 m<sup>3</sup>/hr) between March and November, and 25,000 m<sup>3</sup>/day (1,040 m<sup>3</sup>/hr) between December and February, which are about 43% and 15% of total river flow (50 to 60 million m<sup>3</sup>/year) during summer and winter seasons respectively. The wetland is to help further treat the polluted

water in this man-made river (as a drainage channel) by removing part of the pollutants and nutrients. The hydraulic loading is  $0.04 \text{ m}^3/\text{m}^2/\text{day}$  (summer) and  $0.015 \text{ m}^3/\text{m}^2/\text{day}$  (winter). The design water quality parameters of effluent from the wetlands are: COD: 40 mg/L, BOD: 10 mg/L, Ammonia: 2.0 mg/L, TP: 0.4 mg/L respectively.

The selected option of free surface wetland (FSW) functions as follows:

- (i) Bio-retention pond installed with solar aerators acting as pre-treatment system to remove suspended solids (SS) and pollutants such as BOD and ammonia, and increase dissolved oxygen (DO) concentration in the influent to wetland.
- (ii) FSW with native emergent and submergible plants, mostly cattail (*Typha angustifolia*), common reeds (*Phragmites karka*), and bulrush (*Scirpus mucronatus*). The FSW will have three stages. The first two stages serve as main treatment cells; the third stage gives the effluent a final quality polish.
- (iii) The dense wetland flora would provide habitats and resting sites for many bird species to benefit wildlife conservation.

To ensure that the wetland will function effectively, the plants chosen for the wetland are salt-tolerant and can grow properly in cold climate. Furthermore, since wetland operation requires continuous flow, the water treated by the wetlands will be circulated back into the Guangli river network with regulation. As a safeguards measure to ensure continuous flow in the river, the government has built a small regulating reservoir at Shaotou in the upper reach of Guangli River to store up local precipitation and flood water from Yellow River, and provide 15 MCM additional water to Guangli River annually.

(b). *Sluice Gate Operation Optimization*. This sub-component will support upgrading of an existing gate automatic control system covering three sluice gates on the Guangli River (average annual flow:  $2\text{-}2.5 \text{ m}^3/\text{s}$ ), and the construction of one sluice gate each at the entrance and exit of the Dongbalu wetland. These facilities will regulate the river flow to increase the carrying capacity of the water body, and adjust water balance of the wetland.

(c). *Resettlement Compensation (Cash Transfer)*. This sub-component will provide transfer payment to compensate the affected enterprises and persons. Seven small-sized enterprises and some attachments to the land (such as power lines and fish pounds) within Dongbalu wetlands area would be affected, and need to be compensated with counterpart funding from Dongying Municipal Government per agreed RAP.

**8. Component B. Agricultural Pollution Control and Rural Waste Management.** The objective of this component is to introduce proven and cost-effective technologies and practices for environment-friendly agricultural pollution control and rural waste management to reduce point and non-point nutrient/pollutant loads in selected areas. The component would comprise three sub-components:

(a). *Rural Waste Management*. This sub-component would address pollution management of rural wastes including human and livestock wastes, household wastewater, and solid wastes. Specifically, the project would support:

- (i) construction of rural domestic wastewater treatment works. This activity supports collection and pipe-network systems for on-site treatment of domestic wastewater. Eight (8) villages located in the upper reach of Guangli River Basin will be selected to participate in the program. Public sewers will be installed to collect wastewater from households, the wastewater will flow by gravity into a centralized septic tank. The effluent from the tank will be pumped into wastewater stabilization ponds (WSPs) for treatment to meet the discharge standard for land applications (drainage field). The following table summarizes the base data for the eight potential participating villages selected based on agreed criteria. These villages are subject to changes during implementation.

| <b>Village</b>      | <b>Population</b> | <b>Houses</b> | <b>WW generation<br/>(m<sup>3</sup>/day)</b> |
|---------------------|-------------------|---------------|--|
| Zhaojia Village     | 470               | 180           | 13.5   |
| Tangjia Village     | 1,700             | 652           | 45   |
| Xiaodou Village     | 1,615             | 685           | 45   |
| Wangying Village    | 712               | 238           | 20   |
| Shangzhuang Village | 1,870             | 623           | 50   |
| Jiangjia Village    | 265               | 88            | 8  |
| Huangdian Village   | 1,374             | 458           | 35   |
| Qinjia Village      | 1,319             | 382           | 35   |
| <b>Total</b>        | <b>9,325</b>      | <b>3,306</b>  | <b>252</b>                                   |

The design discharge standard is: COD: 100 mg/L, BOD: 30 mg/L, and TSS: 30 mg/L. 25. The sewer and treatment process design parameters are as follows:

Connection Pipe: DN100 UPVC  
 Sewers: DN150 – DN200  
 Septic Tank: hydraulic retention time (HRT): 3 days  
 Effluent from septic tank is pumped to SWP (2 submergible pumps)  
 SWP: - facultative ponds followed maturation ponds  
 HRT: 60 days  
 Loading: 40 kg BOD/ha/day (yearly average)  
 Average 1.0 m in depth  
 Effluent from SWP is flow by gravity into the discharge trenches.  
 Dispersal field: Open discharge trenches for evaporation and soil absorption

- (ii) livestock waste management: Livestock waste is one of major rural pollution sources and environmental challenges in project area. As the government's livestock environmental regulations apply to registered livestock farms (mostly large and medium sized), non-registered livestock farms are the priority for project support. The sub-component would support the following activities: (I) For non-registered livestock farms, three sizes (1m<sup>3</sup>, 5m<sup>3</sup> and 10m<sup>3</sup>) of manure storage tanks would be constructed in participating villages to meet different needs of the livestock farmers. The primary function of the storage tanks is to store both solid and liquid livestock wastes for composting or temporary placement before they are disposed to stop direct discharge of

these wastes into public water bodies and reduce human health risks as fresh livestock manure contains various pathogens. Back-to-field option of treated manure is the first choice for promotion. A total of 1,550 storage tanks have been included under the project support; (II) For registered livestock farmers, government environmental regulations will be strictly enforced by government environmental agencies at Dongying, county/district and township levels. All necessary actions including awareness raising activities, trainings, and regulatory actions would be taken to enforce the environmental regulations in the participating villages. FEPAs would be the primary force in participating villages to work with; (III) A centralized composting facility would be constructed. The facility would include: (1) a manure collecting system to collect livestock wastes from all animals in Shangzhuang and Huangdian villages; (2) an aerobic composting workshop to treat collected manure and produce organic fertilizer; and (3) a liquid distribution system to convey livestock liquid wastes for irrigation and land application. The facility would be constructed and operated by Dongying Fenghe Agricultural and Livestock Co. Ltd., a privately owned company with major business in dairy farming and physically located in Shangzhuang village. Separate agreement would be signed between the Company and the two participating villages as a base for their cooperation and to specify responsibilities and obligations of each party.

*(b). Agricultural Pollution Control.* The sub-component would address key agricultural pollution sources to Guangli River and Bohai Sea including chemical fertilizer and agricultural chemicals through introduction of the following three key technologies in a number of participating villages.

(i) Comprehensive and balanced fertilizer application. The main problems in project area, unbalanced and over application of chemical fertilizers, lead to serious pollution of nitrogen and phosphate to surface and ground waters. The fundamental idea of the technology is to reduce pollution through reduced use of chemical fertilizer (about 20-30%) by applying customized fertilization practices to each dominant crop in every participating village based on soil survey and testing results. Soil samples of representative crop land would be collected, lab tested and analyzed three times during a crop season to determine the soil characteristics and base nutrient values. An expert panel consisting of municipal, provincial and national experts in soil, crop nutrient, plant protection and agricultural environment would study the soil test results and provide a comprehensive technical advisory package for fertilizer application in the form of a soil-crop-village specific report to offer professional advices and technical suggestions on: (1) appropriate fertilizers; (2) crop-specific and customized nutrient fertilization; (3) accurate fertilizer application; (4) alternative organic and biological fertilizer; (5) quantity, timing and methodology; (6) introduction of fine crop varieties; and (7) crop planting management skills. The expert panel would pay frequent visits to all participating villages to provide on-site technical support and training. The technology is expected to support a cumulative total of about 2,278 ha of crop land in 6 participating villages.

(ii) Use of insect luring lamps. Agricultural chemicals have been widely used in project area which caused serious and increasing environmental and food safety concerns. As demand for use of agricultural chemicals is hardly predictable, it is

difficult to prepare a precise plan for such purpose. To provide guidance to participating farmers and other stakeholders, a Pest Management Plan has been prepared by Dongying PMO and reviewed by the Bank which will be closely followed during project implementation. As moth-killing lamp is proved to be highly effective in crop field without use of any agricultural chemicals, a total of 100 lamps have been budgeted under the project which will be used in crop field where insects and pests are active. The lamps, powered with solar energy and with a life span of about 10 years, would be able to provide protection for about 2 to 3 ha of crop land by each lamp. The project would also promote using eco-friendly chemicals and technologies to reduce pollution from agricultural chemicals including using high efficiency, low toxic, and low residual effect agricultural chemicals; eco-friendly biological pesticides; anti-disease crop species; other non-chemical technologies for insect and pest control such as insect net and sex-alluring agent whenever there is an interest.

(iii) Construction of buffer strips and eco-trenches. Though new to Dongying municipality and Shandong province, these technologies have been in successful demonstration in China for years. The technologies are to reduce nutrient discharge from run-offs through (1) the buffer strips at the edge of crop land and separated by earth ridge from the main crop land; and (2) the eco-trenches built next to the buffer strips and on the basis of drainage canals. Based on experience of the demonstrations, these technologies are low in cost for construction and maintenance but highly effective in nutrient reduction. About 50% reduction of TN and TP respectively in run-offs by buffer strips and over 50% reduction of TN and TP respectively in run-offs by eco-trenches have been demonstrated. National specialists in buffer strips and eco-trenches would be hired to provide technical support during the entire project implementation period in the areas of site selection, technical design, plant selection, operation and maintenance. These technologies would be introduced into all 6 participating villages with a total of about 36.5 ha of buffer strips and associated eco-trenches.

(iv) Results monitoring and evaluation. Results monitoring and evaluation of the sub-component would be carried out by Shandong Academy of Agricultural Sciences (SAAS) to take advantages of its expertise, local knowledge as well as its results from practical research. SAAS has agreed to provide monitoring and evaluation services to (1) monitor results of all technologies introduced under agricultural pollution control sub-component; (2) construct a monitoring site and install essential equipment in a participating village for cotton crop; (3) collect and lab test soil and water samples from all dominant crop lands in the participating villages; and (4) prepare and submit semi-annual monitoring reports to Dongying PMO. SAAS has also agreed to (1) share about 60% of the total cost for carrying out the result monitoring and evaluation activities; and (2) carry out a long term results monitoring program to cover a period of 5 years or beyond.

*(c). Establishment and Operation of FEPAs.* A total of 22 FEPAs will be established, based on existing farmer community organizations where possible to enable farmer communities to participate collectively in implementing project interventions, taking responsibilities of O&M, and replicating proven best practices in their respective villages. Establishment of the FEPAs is

expected during project implementation at four, six, six, six respectively in the first, second, third and fourth year of project implementation. A minimum of 8 FEPAs would be established with physical investment for project activities under sub-components B(a) and B(b). Other FEPAs would be established associated with activities aiming at pollution reduction but financed by non-project funds as a part of project replication. The Project promotes the empowerment of FEPAs as the key element of an innovative community-based approach to water pollution management in rural areas, to ensure strong ownership and sustainability of the Project. The procedures and process for FEPA establishment is described in the FEPA Development Plan endorsed by the Bank. Detailed responsibilities of a FEPA will be stipulated in the Implementation Agreement to be signed between the FEPA and DPMO. A mini-PIP is to be prepared for each participating village, by the FEPA with assistance of the Agricultural Bureau PIU/DPMO to lay out the detailed implementation plan of project activities in that village. Project activities under Sub-components B(a) and B(b) can be started only after the Agreement has been signed.

Project support for FEPA development is mainly for financing the expenditures for FEPA establishment (registration fee, workshops), member training, office furniture, equipment and supplies, and other small expenses incurred for operation of FEPAs.

9. ***Participating Village Selection Criteria.*** The Agricultural Pollution Control and Rural Waste Management Component will be implemented by FEPAs in selected villages. The participating villages will be selected based on the following selection criteria:

- (a) An administrative village where
  - significant agricultural and rural pollution sources exist and the current pollution situation is representative of the project area;
  - at least 80% of villagers are interested to participate and contribute;
  - a FEPA will be established based on an existing farmer community organization or as a new organization;
  - a mini-PIP is prepared, submitted and reviewed by Dongying PMO and approved by the Bank;
- (b) priority is given to villages under five rural townships of Dongying municipality;
- (c) high potential for replication and there would be no major change in land use in the near term; and
- (d) alignment with government strategies and mainstream programs.

10. **Component C. Capacity Building and Policy Studies.** The objective of this component is to develop and strengthen overall capacity of the institutions involved in project preparation and implementation. This component comprises three sub-components:

- (a). *Education and Training Center.* To raise public awareness and provide training in environmental protection, nutrient management and pollution reduction, the project would support establishment of an Education and Training Center, purchase of essential training facilities and development of training materials funded entirely by government counterpart funds. Technical training would focus on pollution reduction through a

constructed wetland, agricultural pollution control and livestock waste management. To take advantage of and benefit from an established college, the Education and Training Center will be established within Dongying Vocational College.

(b). *Capacity Building*. A capacity building program will be developed by the Provincial and Dongying PMOs which will include training, and domestic and international study tours necessary for all components. Each capacity building activity would list clearly the objective, contents, targeted participants, number of participants, timing, venue, form and estimated costs. The capacity building program will be followed as a blueprint to develop and strengthen overall capacity for efficient project management and implementation.

(c). *Policy Studies*. The project will support policy studies critical to the long-term application and dissemination of the demonstrated technologies and practices in Dongying, Shandong province, Huai River Basin and beyond. The policy studies include: (i) Agricultural Pollution Control and Rural Waste Management Strategy and Action Planning for Guangli River Watershed in Dongying. It includes evaluation study of the project interventions under Component B, and formulation of a strategy and action plan for scaling up the pilot interventions from this project, over the entire catchment area of Guangli River, during the project period; (ii) evaluation study of the effectiveness of constructed wetlands in treatment of polluted water based on the analysis of the Project monitoring results; and (iii) Huai River Basin-wide Replication Strategy for cost-effective water pollution control. This is for formulation of a strategy and plan to replicate the successful pilot experiences of this project in Dongying, Shandong and Huai Basin, including preparation and dissemination of good practice documents (such as case analysis, guideline brochures, videos, etc), training and workshops.

11. **Component D. Project Management and Implementation Support.** This component would finance consultant services, office equipment and incremental operating costs to ensure adequate technical support provided for timely and efficient project management.

(a). *Implementation Support*. This would: (i) provide financial resources for technical assistance consultants to review the technical designs and tendering documents and construction quality of project facilities, including constructed wetlands, gates, wastewater treatment and livestock waste storage facilities and eco-trenches for agricultural pollution control, etc; and (ii) provide other necessary support/technical assistance to Dongying PMO and different PIUs in project implementation and management, such as monitoring results consolidation and project reporting.

(b). *Monitoring and Evaluation*. The sub-component would support the monitoring and evaluation of Project results. For this purpose, the Dongying PMO is to set up and maintain an M&E system. The M&E system would include project progress, results, and safeguards policy compliance. The establishment and implementation of the M&E system will be under the overall responsibility of the Dongying PMO. Project progress monitoring will be carried out by Dongying PMO, PIUs and FEPAs respectively. Project results monitoring will be carried out by Dongying Environmental Protection Bureau (water quality along Guangli river and at constructed wetlands) and the monitoring consultants.

(c). *Project Management*. This will be implemented jointly by the Provincial PMO, Dongying PMO and PIUs. It includes: (i) supporting the project institutions in project management activities, including day to day project administration, project programming and reporting, preparation and dissemination of project documentation, etc.; (ii) facilitating World Bank supervision missions; and (iii) supporting collaboration with PEMSEA, the Bank's partner responsible for the Regional Component of the Strategic Partnership.

12. The project would provide information and prepare Experience Notes to GEF's IW LEARN hub, set up a project website according to the guidelines from IW: LEARN, and participate in GEF's information sharing activities, e.g., its biannual IW LEARN conference, and PEMSEA's triennial East Asia Seas Congress; and join UNEP's Best Practices and Success Stories Global Network, and report annually on the GEF 4 output indicators using the IW Tracking Tool.



### **Annex 3: Implementation Arrangements**

#### **CHINA: GEF HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT**

##### **A. Project institutional and implementation arrangements**

1. Project management organizations have three layers: provincial level, municipal level and community level. They include Shandong Provincial Project Leading Group (PPLG), Huai River Basin Commission, Shandong Provincial PMO (PPMO), Dongying Municipal Project Leading Group (DPLG), and Dongying Project Management Office (DPMO). At the provincial level, the PPLG and the PPMO are shared with the HRBFMDI Project. The PPLG, headed by a vice-governor, is responsible for overall leadership and coordination, decisions on and oversight of policy matters. The PPMO, headed by a deputy director general of the Provincial Finance Department, will act as the chief coordination body for the project, assisting the PPLG in reviewing and making decisions on strategic and policy issues, and as the project's focal point for communication with the Bank, GEF and central government. Huai River Basin Commission through the Central Project Management Office (CPMO) of the HRBFMDI Project, participate in the PPLG and provide technical advice and support to project implementation, particularly on the preparation and dissemination of the replication strategy, and design and implementation of M&E activities under the project.

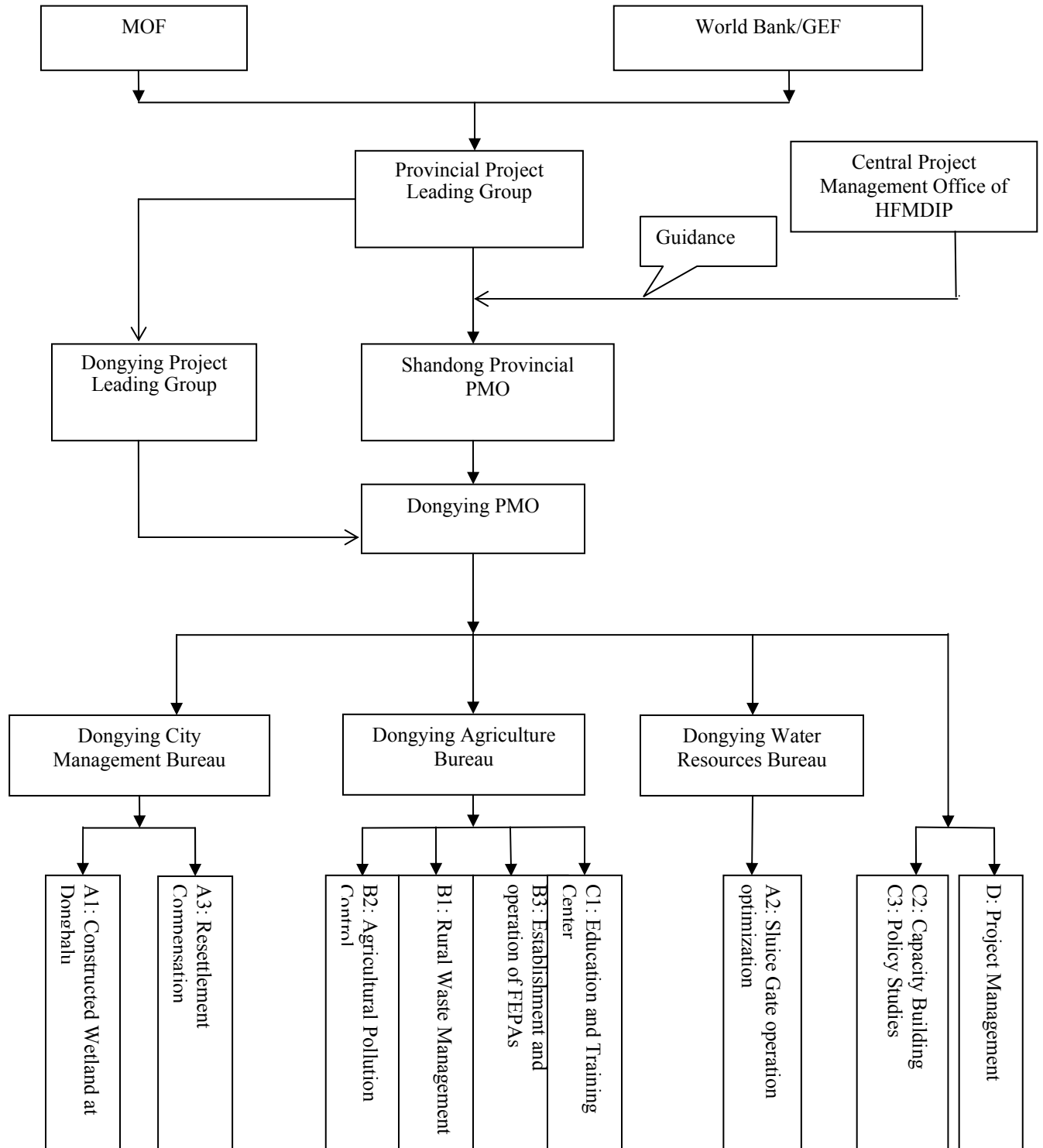
2. At the municipal level, DPLG is the leading and oversight body for project implementation, reporting to both Dongying Municipal Government and the PPLG. DPMO, hosted by the Dongying Water Resources Bureau, is comprised of senior officials and staff from the Bureaus of Finance, Development and Reform, General Administration, Water Resources, Agriculture, City Management, Environmental Protection, Marine and Fishery, Forestry, Urban Planning, Land Resources, Housing Construction and Meteorology of Dongying Municipal Government Management. Under the leadership of both DPLG and PPMO, it coordinates among different line agencies and project implementing agencies or PIUs, organizes, guides and monitors project implementation, and assists in resolving implementation issues.

3. The project implementing agencies include Dongying City Management Bureau (CMB), Dongying Agriculture Bureau (DAB) and Dongying Water Resources Bureau (WRB). CMB will be in charge of implementation of sub-components A1: constructed wetland at Dongbalu and A3: resettlement compensation. DAB will be in charge of implementation of component B, including B1: rural waste management, B2: agricultural pollution control, B3: establishment and operation of FEPAs, and sub-component C1: education and training center. WRB will be in charge of implementation and operation of sub-component A2: sluice gate operation optimization. DPMO shall take lead in implementing sub-components C2 and C3, and Component D. The scope of responsibility covers project preparation, consultation, planning and programming, implementation, quality assurance, organizing training, monitoring and reporting, making arrangements for transition into operational phase, etc. DMB will be responsible for the wetland operation, and FEPAs for rural waste management and agricultural pollution control facilities under guidance of DAB PIU (comprised of members from rural environment station, rural economy station, soil & fertilizer testing station, and technical extension services station,

etc). The detailed responsibilities of the different project organizations mentioned above are described in the project implementation plan (PIP). The project management structure is shown in Figure 3.1.

4. At Community (Village) Level, Farmer Environmental Protection Associations (FEPAs) will be established in each of the participating villages to organize FEPA members in participating in the implementation of agricultural/rural pollution management activities. They will operate as long-term community self-management institution for village-level environmental protection, with support and guidance from Dongying Agricultural Bureau and Environmental Protection Bureau, and local governments. To enhance project readiness and gain experiences in FEPA establishment, the first FEPA will be established in Huangdian Village before grant negotiations, with the assistance from the Bank team.

**Figure 3.1: Institutional Arrangements for Project Implementation**



## **B. Financial Management, Disbursements and Procurement**

### **Financial Management**

5. The financial management capacity assessment identified the principal risks as lack of previous experience with Bank financed projects on the part of the finance staff in DPMO and PIUs. The financial management risk pre and post-mitigation has been assessed as “modest”. Mitigation measures agreed include: (a) PPMO should coordinate with SPFB to provide necessary training to help project financial staff to get familiar with World Bank requirements and procedures on financial management and disbursement; and (b) a financial management manual (FMM) is prepared to uniformly align project financial management policies among various implementing agencies. The FMM to be finalized by grant negotiations, will be distributed to all relevant finance staff before the project starts.

6. **Budgeting.** The DPMO will prepare its annual implementing plan. The project is required to conduct variance analysis at least twice a year to ensure that project activities can be implemented as planned.

7. **Funds flow.** SPFB will be directly responsible for the management, maintenance and reconciliation of the DA activities. Supporting documents required for Bank disbursements will be prepared and submitted by the respective PIUs through the MPMO, municipal finance bureau and provincial PMO (PPMO) for verification and consolidation, before sending to the provincial finance bureau for further disbursement processing. The reimbursed funds will be delivered from DA to PIU through the municipal finance bureau. Delivery of counterpart funds will follow domestic procedures.

8. **Accounting and financial reporting.** “Accounting Regulations for World Bank Financed Trust Funds” issued by MOF will be used for project accounting and financial reporting. The standard set of project financial statements has been agreed between the Bank and MOF. Each PIU will individually decide whether they would utilize computerized financial management information system or manually record and maintain project accounting books. Original supporting documents for project activities will be retained by each PIU. Each PIU will prepare the financial statements on its implemented components, which will then be used by DPMO and SPFB for preparing consolidated project financial statements submitted to the Bank for review and comment on a regular basis. The unaudited semi-annual consolidated project financial statements (in accordance with the aforementioned format) as part of the Progress Report will be furnished to the Bank within forty-five days after the end of each semester in form and substance satisfactory to the Bank.

9. **Internal control.** The related accounting policy, procedures and regulations were issued by MOF and a FMM will be prepared and issued to uniformly align the financial management and disbursement requirements among PMOs and PIUs.

10. **Audit.** Shandong Provincial Audit Office (SPA0) has been identified as auditor for the project. Annual audit reports will be issued by SPA0 and will be subject to reviews by the

China National Audit Office (CNAO). The annual audit report of the project financial statements will be due to the Bank within 6 months after the end of each calendar year.

### **Disbursement Arrangement.**

11. Four disbursement methods: These include advance, reimbursement, direct payment and special commitment. Supporting documents required for Bank disbursement under different disbursement methods will be documented in the Disbursement Letter issued by the Bank. One designated account (DA) denominated in US dollars will be established at a commercial bank acceptable to the Bank and managed by SPFB. The ceiling of DA for the grant will be documented in the Disbursement Letter issued by the Bank.

12. The agreed disbursement arrangement for the project is summarized below, where category (4) Operating Costs would include establishment and operation of FEPAs i.e. registration fee, workshops, member training, and other small expenses; and category (7) Incremental Operating Costs would include the reasonable costs of incremental expenditures incurred by the PMOs and PIUs in the implementation of its Respective Parts of the Project, which expenditures would not have been incurred absent the Project, including per diem field allowances, travel expenses, costs for vehicle operation and maintenance, office consumables (except office equipment), communication expenses, printing expenses, and local contractual staff, but excluding salaries and salary supplements of civil servants. ***Retroactive financing*** of US\$500,000 in total from the GEF Grant will be needed for the project to support priority activities that will be implemented on or after August 1, 2011 and within 12 months of grant agreement signing date.

### **GEF Grant Disbursement Arrangement**

| <b>Category</b>   | <b>Amount of the Grant Allocated (USD)</b> | <b>Percentage of Expenditures to be Financed (inclusive of Taxes)</b> |
|---|--|---|
| (1) Works for Part A(a) of the Project  | 1,843,000                                  | 100%  |
| (2) Works, goods, training, and consultant services for Part B(a), (b) and (c) of the Project | 1,321,000                                  | 100%  |
| (3) Subsidy Payments  | 489,000                                    | 100%  |
| (4) FEPA Operating Costs  | 139,000                                    | 100%  |
| (5) Training and consultant services for Part C(b) and (c) of the Project                     | 902,000                                    | 100%  |
| (6) Consultants services for Part D (a) and (b) of the Project                                | 256,000                                    | 100%  |
| (7) Incremental Operating Costs for Part D(c) of the Project                                  | 50,000                                     | 100%  |
| <b>TOTAL AMOUNT</b>   | <b>5,000,000</b>                           |   |

13. **Disbursement for Unit-Cost Based Subsidy.** The comprehensive and balanced fertilizer application technology aims to reduce pollution through reduced use of chemical fertilizer (about 20-30%) by customizing fertilization application for each main crop in participating villages based on soil survey and test results. As an incentive for participation, financial subsidy will be provided under the project through FEPAs to participating farmers. The subsidy is calculated at 30 percent of average fertilizer cost for the main crops in the participating villages, i.e. cotton, wheat, corn and paddy rice, and will be disbursed based on average fertilizer costs per ha. These unit costs were proposed by Dongying Agriculture Bureau and were considered realistic based on local crop production data and prevailing market prices in Dongying. The following table shows the disbursement arrangement for unit-cost based subsidy agreed at appraisal.

**Disbursement Arrangement for Unit-Cost-Based Subsidy**

| <b>Crop</b> | <b>Unit Average Fertilizer Cost (US\$/Ha)</b> | <b>Disbursement in % of Unit Cost</b> | <b>Disbursement in US\$ per Unit</b> |
|-------------|---|---------------------------------------|--------------------------------------|
| Cotton      | 600   | 30%                                   | 180                                  |
| Wheat       | 508   | 30%                                   | 152                                  |
| Corn        | 415   | 30%                                   | 125                                  |
| Paddy Rice  | 600   | 30%                                   | 180                                  |

14. Shandong shall: (a) prior to authorizing disbursements of any Subsidy Payment for the respective FEPA verify that the crop has been planted in accordance with technical and quality requirements satisfactory to the Bank; and (b) (i) not later than June 30, 2013 review the acceptability of the Unit Costs being financed under Subsidy Payments, and propose to the World Bank any modifications as may be required for the financing any Subsidy Payments; and (ii) thereafter, modify the amount financed as Subsidy Payments as shall have been approved by the World Bank.

## **Procurement**

15. The procurement capacity and risk assessment identified the following principal risk: procurement staff members in DPMO do not have experience with Bank financed projects. The overall risk for procurement is considered “Substantial”. Mitigation measures include: (a) procurement training has been provided during project preparation, and procurement staff will be further trained before and during project implementation; (b) a procurement manual (PM) has been prepared as part of the PIP and will be issued to standardize project procurement procedures and provide guidance to project staff responsible for processing and approving procurement. DPMO will be responsible for the procurement of all project contracts. Procurement for the proposed project would be carried out in accordance with the World Bank’s “Guidelines: Procurement under IBRD Loans and IDA Credits” dated May 2004 and revised October 2006 and May 2010; and “Guidelines: Selection and Employment of Consultants by World Bank Borrowers” dated May 2004 and revised on October 2006 and May 2010.

16. **Procurement of Works.** Works procured under this project will include construction of wetland and agricultural pollution control facilities, rural wastewater treatment facilities and livestock manure storage tank and composting plant, etc. Procurement will be based on the National MBD (Model Bidding Documents) agreed with or satisfactory to the Bank for all National Competitive Bidding.

17. **Procurement of Goods.** Goods procured under this project will include wetland operational and management equipment and office equipment, moth-killing lamp, etc. Procurement will be carried out using National MBD agreed with or satisfactory to the Bank for all National Competitive Bidding.

18. **Procedures for Community Participation in Procurement:** construction of eco-trenches and buffer strips in crop fields under Part B(b) (i) of the Project would be procured by the community participation. Dongying Agriculture Bureau PIU would be responsible for oversight of the procurement. To ensure the ownership and promote transparency, the following procurement procedures are agreed for community participation:

- (a) Local Shopping for Procurement of Works: Under local shopping, quotations would be obtained through the invitation of several (at least three) qualified contractors to submit quotations on basis of simplified quotation requests. The request would describe the scope of the works, technical specifications including drawings if applicable as well as desired completion time. Quotations should be opened at the same time and to the extent possible in the presence of community. As a general rule, the contractor who offers the lowest price and also can meet technical requirements should be awarded the contract. The threshold for local shopping for procurement of civil works is below the equivalent of US\$100,000 per contract.
- (b) Community Force Account: Communities will mobilize their own labor and use their own equipment to carry out the works. Works to be constructed under force account should have a detailed description of the works, a set of technical specifications, and a supervision team to carry out check of quality and quantities. Payment would be made based on pre-estimated unit costs for works against completed works as certified by communities.

19. **Selection of Consultants** includes consultant services for (a) monitoring and evaluation for agricultural pollution control; (b) monitoring and evaluation for rural waste management; (c) technical support for buffer strip and eco-trench; (d) comprehensive & balanced fertilizer application by a technical expert panel; (e) for FEPA establishment and operation; (f) evaluation study of the effectiveness of constructed wetlands in treatment of Guangli river water; (g) evaluation study and action planning for Agricultural Pollution Control and Rural Waste Management in Guangli River Catchment; (h) development of Huai River Basin-wide Replication Strategy for cost-effective water pollution control; and (i) project implementation

support. Short lists of consultants (firms) for services estimated to cost less than US\$300,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines. The short lists should normally be composed of firms of similar experience acting in the same field of expertise. If mixing is used, the selection should be made using Quality Based Selection (QBS) or Selection Based on the Consultants' Qualifications (CQS) for small assignments. Consultant for results monitoring and evaluation of agricultural pollution control activities may be selected on a single-source basis in accordance with the provisions of the Consultant Guidelines and with due justification and the Bank's prior agreement.

20. **Procurement Plan.** The overall Procurement Plan for the project has been prepared by DPMO and reviewed by the Bank and will be finalized before negotiation. It will also be available in the Project's database and in the Bank's external website. The Procurement Plan will be updated in agreement with the Bank annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

21. **Frequency of Procurement Supervision.** In addition to the prior review supervision to be carried out from the Bank offices, the Bank will carry out post review of procurement actions every twelve months. The post review sampling ratio will be one out of five contracts.

22. **Prior-Review Thresholds.** The prior review thresholds are specified in the Procurement Plan and indicated in the table below.

**Procurement Thresholds**

|                         | Prior Review Thresholds (US\$ million)  | Procurement/Selection Method Thresholds (US\$ million) |         |                        |      |     |     |            |     |
|-------------------------|---|--|---------|------------------------|------|-----|-----|------------|-----|
|                         |   | ICB  | NCB     | Shopping               | QCBS | QBS | CQS | Least Cost | SSS |
| Works                   | All ICB; All contracts $\geq 5$ ; the first contract for NCB and all direct contracting.    | $\geq 20$  | $< 20$  | $< 0.2$                |      |     |     |            |     |
| Goods                   | All ICB; All contracts $\geq 0.3$ ; the first contract for NCB and all direct contracting . | $\geq 1.0$   | $< 1.0$ | $< 0.1$                |      |     |     |            |     |
| Community Participation | None  | None   | None    | Local Shopping $< 0.1$ |      |     |     |            |     |



|                     |   |  |  |  |    |    |      |    |    |
|---------------------|---|--|--|--|----|----|------|----|----|
| Consulting Services | ≥ 0.1 for firms,<br>≥ 0.05 for individuals.<br>SSS: all |  |  |  | -- | -- | <0.2 | -- | -- |
|---------------------|---|--|--|--|----|----|------|----|----|

-- No Threshold

23. The following is a list of consulting contracts subject to international competition under the project.

#### QCBS Consulting Packages:

| Ref. No. | Description of Assignment   | Selection Method | Review by Bank (Prior / Post) |
|----------|---|------------------|-------------------------------|
| C-3-C-3  | Consultant Service for development of a Huai River Basin wide replication strategy and plan for water pollution reduction   | QCBS             | Prior                         |
| D-1-C-1  | Consultant service for project implementation support (design and tendering document review, construction quality oversight, project reporting and completion report) | QCBS             | Prior                         |

#### C. Environmental and Social Safeguards Management

24. Two Bank safeguards policies which are triggered by the proposed project: Environmental Assessment (OP/BP 4.01), Pest Management (OP/BP 4.09) and Involuntary Resettlement (OP/BP 4.12).

25. **Environmental Assessment (OP/BP 4.01).** The Environment Assessment (EA) indicates that the project as a whole has positive environmental impacts with the benefits well exceeding the negative impacts. For pollution reduction, the project will introduce a set of environmentally friendly technologies and best practices in the participating villages, which include: (a) use of green/organic fertilizers, comprehensive and balanced fertilizer application for agricultural production; (b) managing agricultural run-off through buffer strips and eco-trenches; and (c) collection and treatment of livestock wastes and rural domestic wastewater. These interventions will contribute to the reduction of fertilizer use and nutrient and pollutant loads discharged into the Guangli River. Moreover, the constructed wetlands will further reduce pollutant and nutrient loads by removal of pollutants and nutrients from the polluted water before it is discharged to the Bohai Sea, thus improving water quality and aesthetic amenities in the project area. To enhance project sustainability, Farmer Environmental Protection Associations will be established and empowered to manage water pollution reduction and environmental protection at the community level.

26. The principal potential adverse impact are associated with construction mainly including dust emission, noise, spoil disposal, and short disruption to local community. Negative impacts are expected to be minimal, site specific, reversible, and can be easily mitigated. An EMP has been prepared by the EA consultant, and it lays out necessary mitigation measures, institutional arrangements, and a monitoring plan to minimize adverse impacts associated with the project. The EMP forms part of implementation plan and its implementation will be monitored closely.

27. In accordance with the World Bank Safeguard policies and applicable national regulations, public consultations was conducted during the environmental assessment, including questionnaire survey, meetings of the project affected people and other stakeholders regarding the project. Their feedbacks and concerns have been taken into account in the EA process and project design. The safeguard documents were locally disclosed and uploaded to the website of Dongying Municipal Government in May 2011, and sent to the Bank Info Shop for disclosure in June 2011. The updated EA and EMP were re-disclosed in August 2011.

28. ***Pest Management (OP4.09).*** The project will not finance any procurement of pesticides nor pesticide application equipment. Instead the project will aim to reduce the use of pesticides in the project areas by promoting non-chemical pest control alternatives such as insect luring lamps, and by providing farmers with training and awareness raising activities. A Pest Management Plan (PMP) has been developed to guide farmers in reducing reliance on chemical pesticides. Consultation with local farmers has been conducted and the feedbacks incorporated in the PMP. The PMP was locally disclosed (e.g. village, library, website) and in the Bank InfoShop in August 2011.

29. ***Involuntary Resettlement (OP/BP 4.12).*** Project Component A includes construction of a wetland (with an area of about 169 ha.) on the state-owned land (mostly wasteland) which was previously regulated by the state-owned Shandong Shengli Petroleum Company. Dongying Municipal Government negotiated and agreed with the Company for the paid land use transfer between the two governmental agencies based on the national land law. Part of the land is irregularly contracted to Company staff individually to build fish ponds which are mostly abandoned during the winter time. In addition, there are seven small enterprises leasing a total area of 15 ha on this land which need to be relocated for the wetland construction. In view of the potential housing demolition and enterprises relocation, as well as the possible impact on some temporary land contractors of fish pond production, Dongying PMO engaged a resettlement consultant for land use survey and resettlement action plan (RAP) preparation. Upon detailed impact survey and consultation with affected people/enterprises and local authorities, an abbreviated RAP has been developed in compliance with Bank safeguard policy and applicable national laws and government regulations.

30. The abbreviated RAP inventories and analyzes the land transfer and relocation impacts, based on which it sets forth compensation measures for building demolition, enterprise relocation and loss of attachments to the land (power lines, fish ponds, abandoned oil wells, etc.). Five of the seven affected enterprises will be re-established in new places owned and leased by

the Shengli Petroleum Company, and the other two will receive cash compensation and stop their land leases. A total of 39.30 million RMB Yuan has been included in the project budget for the resettlement program. The final abbreviated RAP was disclosed publicly in the project area in May 2011, and in the Bank InfoShop in June 2011 prior to project appraisal.

31. ***Stakeholder Consultations and Disclosure.*** The main stakeholders have been involved and consulted in the process of EA and RAP preparation. The EAs and RAP for the Project, after clearance from the Bank, have been disclosed locally in Dongying (Chinese version) to the public, and submitted to the Bank for disclosure in the Infoshop before project appraisal.

#### **D. Monitoring and Evaluation (M&E)**

32. The achievement of the project development objectives will be measured through the two Key Performance Indicators: (a) annual reduction of pollutants and nutrients flowing from Guangli River into Bohai Sea through implementation of the project; and (b) annual reduction of pollutants and nutrients through the constructed wetlands at Dongbalu. Annex 1 shows the key performance indicators and intermediate output indicators for tracking project progress and results. The Dongying PMO will set up and maintain an M&E system, it will consolidate and report regularly on the monitoring results, with assistance from implementation support consultants. The monitoring and data collection for wetland inflow and outflow water quality, water quality monitoring at Minghai Sluice Gate and along Guangli River will be the responsibility of Dongying Environmental Protection Bureau (Monitoring Division). Monitoring and data collection for the agricultural pollution reduction and rural waste management component under the Project will be undertaken by the SAAS (agricultural pollution control sub-component) and other consultants under Dongying Agriculture Bureau PIU. Monitoring of safeguards policy compliance will be carried out by consultants hired by the Dongying PMO. The Dongying municipal government is committed to long-term monitoring beyond the completion of the project. Scope, approach and activities for monitoring and evaluation, relevant indicators and M&E arrangements will be detailed in the Project Implementation Plan. The government committed a long-term monitoring program for the project to extend the monitoring activities for at least five years which is beyond the completion of the project implementation.

## Annex 4. Operational Risk Assessment Framework (ORAF)

### CHINA: GEF HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT

#### *Appraisal and Post Appraisal Package Version<sup>1</sup>*

#### Project Development Objective(s)

The project development objectives and global environment objectives are to demonstrate innovative and cost-effective water pollution control practices in Guangli river catchment of Dongying Municipality, contributing to reduction in pollution to the Bohai Sea.

PDO Level Results Indicators:

1. Project-induced reduction in pollutant and nutrient loads entering Bohai Sea from Guangli River Watershed.
2. Reduction in pollutants and nutrients through the constructed wetlands at Dongbalu.

| Risk Category                         | Risk Rating | Risk Rating Explanation  | Risk Description  | Proposed Mitigation Measure   | Status <sup>2</sup>  |
|---------------------------------------|-------------|--|---|---|----------------------|
| <b>1. Project Stakeholder Risks</b>   |             |  |   |   |                      |
| 1.1 Stakeholder                       | Medium-L    | Dongying Municipal Government is fully committed to the Project. Local governments and communities in the participating villages showed strong interest and actively participated in project design and option assessment. | Ownership of the project by local governments (district and township) and communities in the pilot areas. | a. Pilot and intervention design based on close consultation with local governments and communities.<br>b. Enhancing ownership of beneficiary communities through continued public awareness raising activities, grant incentives and affordable contributions.<br>c. Establishing and empowering FEPAs to institutionalize communities' self-management. | a. O<br>b. N<br>c. N |
| <b>2. Operating Environment Risks</b> |             |  |   |   |                      |
| 2.1 Country                           | Low         | 1. China has strong recent record of   | 1. China ranks 79/180   | 1. A sound regulatory framework for   | N/A                  |

<sup>1</sup> This is the version that should be used for Appraisal stage as well as for seeking clearance by management to move forward with negotiations.

<sup>2</sup> C= completed; O = ongoing; NYD = Not yet Due; N/A = Not Applicable

|  |  |  |   |   |  |
|--|--|--|---|---|--|
|  |  | <p>macroeconomic management. Quick, forceful response to the recent crisis mitigated the most negative immediate impacts, but at the cost of heightened future macroeconomic risks. Main pillar of the stimulus package has been massive growth of bank credits to all sectors of the economy, including local governments. Rapid growth of loans raises concerns on rising NPLs, and feasibility of reducing credit growth to sustainable levels without excessively impacting economic activity, especially property and related sectors. Local governments depend heavily on revenues from land transactions and own borrowings; a sharp decline in real estate development activity could impact on local public finances. As any other open economy, China faces risks related to negative developments in the global economy.</p> <p>2. The Government of China is aware of the environmental challenges ahead and has adopted a set of environmental policies and strategies and related improvements in which the World Bank is involved in through its China program.</p> | <p>countries in the 2009 TI Corruption Perception Index. Situation is better/improving at the central level. High level corruption is prosecuted. Corruption widely discussed in local and national media. Public accountability, conflict of interest and governance are improving at the central level and in a few provinces, but have not yet become a common practice. In remote areas, implementation and enforcement of transparency and accountability continues to be difficult.</p> <p>2. China has achieved various environmental successes during the past decades of rapid unprecedented economic growth. Its environmental policies and regulations have continuously improved and are increasingly near or at par with international standards and practices. Nonetheless, much remains to be done and China has</p> | <p>public financial management is in place (budget preparation, classification, treasury management, accounting, reporting and audit). Government funds, including project counterpart, are integrated into the overall budget, within the government's accounting system. Donor funds are outside the budgetary/accounting system but included as a separate line item reported to Congress. Reporting and transparency of fiscal activities outside the budgetary framework is limited, particularly at local levels. Public accounts are consistently audited by the National Audit Office with results generally publicly available, except for national security or commercial secrecy items.</p> <p>2. Since 2002, an Environmental Impact Assessment Law has been officially promulgated, providing the legal basis for EIA and Plan-EIAs. This has a lead to a rapid expansion of the use of EIA's in many spheres of activities in China. However, international standards have not yet been achieved in all sectors and areas. Furthermore, technical knowhow and institutional capacity varies significantly between Regions, Provinces and Sectors. Implementation and enforcement – in such a vast decentralized EIA system – requires</p> |  |
|--|--|--|---|---|--|

|  |          |  |  |  |     |
|--|----------|--|--|--|-----|
|  |          | <p>3.1 China's recent central government policies on land acquisition and involuntary resettlement provide guidance that is consistent with Bank policy. However, there is no comprehensive national law such as for EIA. Different regulations and procedures are applied at the provincial and local level.</p> <p>3.2 Other important social aspects of Bank investment projects in China are dealt with through a Social Assessments (SA) undertaken by the clients at the Bank's request. SA need to be expanded and of better quality to increase the weight of social aspects in decision making.</p> | <p>some of the world's most intractable environmental issues to address.</p> <p>3. Rapid growth, urbanization and infrastructure development has put pressure on land use and caused the displacement of millions of people in China. The land regime in China - with its public ownership and village collectives - has unique features. Ethnic minority rights are enshrined in the constitution. Furthermore, China has an institutional and territorial regime that recognizes administratively the diversity of its 55 ethnic minorities. Nevertheless, past or recent issues related to Ethnic Minority groups such as the Tibetans and the Uyghurs are very sensitive and illustrative of potential social tensions among certain Ethnic Minorities groups in China. Civil society in China is taking an increasingly important role.</p> | <p>improvement and remains a challenge in certain areas.</p> <p>3. Bank policy requires that civil society within the project influence area be consulted.</p> |     |
| 2.2 Institutional Risk (sector & multi-sector Level) | Medium-L | Water pollution control is high on government agenda and much has  | Water pollution reduction is a multiple-sector task  | a. Promoting cross-sector coordination mechanism, and integrated water and   | N/A |

|  |          |  |  |   |   |
|--|----------|--|--|---|---|
|  |          | <p>been achieved on industrial/urban sewage pollution control. However, the priority tends to be given to wastewater/sewage treatment (supply-side management), with limited attention to reduction at source and direct involvement of other key stakeholders (polluter/demand-side management). Overlapping and sometime unclear responsibilities weaken law/regulation enforcement, and lead to delay in taking important pollution reduction actions. Non-point pollution management is one example.</p> | <p>and requires joint efforts of different line agencies (water, environment, agricultural, etc) and other stakeholders (polluters in particular), and an integrated approach to be effective. The main risks at the sector level are: (a) fragmented management and lack of coordination affect effective decision making; (b) top-down approach impacts wide project ownership and sustainability.</p> | <p>environmental management with a river basin/catchment as a planning unit, at different government levels<br/> b. Decision making should combine top-down with bottom-up approach. For non-point pollution control in rural areas, a community-based approach should be adopted.<br/> c. Balancing supply-side interventions (treatment, subsidy, technical support, etc) and demand-side management (awareness raising, policy incentives, behavior change, etc) for effective water pollution management.</p> |   |
| <p><b>3. Implementing Agency Risks (including FM &amp; PR Risks)</b></p> | Medium-I | <p>Project staff at implementing agency level lacks experiences in implementing and managing Bank supported project (financial and procurement management), although much experiences reside at the basin and provincial levels. Dongying Municipal Government has assigned a strong leadership team with effective coordination arrangements.</p>   | <p>Inadequate technical and management capacity of DPMO and PIUs as well as lack of cross-sectoral coordination are the main risks at implementing agency level.</p>   | <p>Mitigation measures include hiring of competent technical and implementation support consultants, targeted training for project staff during preparation and implementation on key project aspects, establishing multi-sectoral project leading group, and clear responsibility division and coordination mechanism agreed upon upfront</p>  |   |
| <p>3.1 Capacity</p>  | Medium-I | <p>The PPMO and Huai River Basin Commission are experienced in managing Bank operations and will guide DPMO and PIUs during project implementation. However, the DPMO and PIUs lack prior experiences with Bank or GEF funded projects, although Dongying Government is part of another Bank project in Shandong.</p>  | <p>The technical and management (financial management and procurement) capacity of the DPMO and project implementing units may not be sufficient.</p>  | <p>a. DPMO and PIUs are fully staffed with competent designated staff.<br/> b. PPMO and Huai Basin Commission provide continuous technical and management support and guidance.<br/> c. Practical training on technical, procurement, financial management, safeguards management and M&amp;E for project staff will be provided during preparation and implementation.<br/> d. TA consultants will be hired for design, supervision, M&amp;E, and general</p>  | <p>a. N<br/> b. O<br/> c. O<br/> d. N</p> |

|                         |           |   |  |   |                      |
|-------------------------|-----------|---|--|---|----------------------|
|                         |           |   |  | implementation support.   |                      |
| 3.2 Governance          | Medium-I  | Dongying Municipal Government has assigned strong leadership team to the project, and set up a cross-sectoral coordination mechanism. Coordination and decision making during preparation stage appear to be effective.   | Effectiveness of cross-sectoral (agencies) coordination at Dongying Municipal Government level for project implementation. | a. Set up multi-sectoral project leading group, headed by vice-mayor in charge and comprised of senior officials from all key line agencies of Dongying Municipal Government.<br>b. Clear responsibility division and coordination mechanism for project implementation are agreed upfront and specified in the PIP.  | a. C<br>b. O         |
| 3.3 Fraud & Corruption  | Medium -L | The Bank team is not aware of any cases of corruption regarding the sector agencies, PMO, and related providers of infrastructure services in the city.   | The main risk is that project implementing agency may award contracts on a non competitive basis.                          | a. Intensive procurement review (prior and ex-post) and contract management supervision will be undertaken.<br>b. Hands-on training will be provided to concerned project staff before implementation starts.   | a. N<br>b. O         |
| <b>4. Project Risks</b> |           |   |  |   |                      |
| 4.1 Design              | Medium-I  | The project design is innovative in overall approach (integrated, and community-based), although the technologies and management practices are relatively straightforward and focus on local solutions drawing upon international and local experience, particularly from China's recent experience in constructed wetlands and rural waste management. | The integrated design and community-based approach add complexity to project design and implementation.                    | a. The project will adopt innovative approach but proven technologies and management practices.<br>b. DPMO will hire experienced consultants to provide technical assistance during implementation and train the operators of project facilities before completion.<br>c. Bank team will engage specialized international experts to enhance project quality. | a. C<br>b. N<br>c. O |



|                            |          |  |  |  |                              |
|----------------------------|----------|--|--|--|------------------------------|
| 4.2 Social & Environmental | Medium-L | Satisfactory RAP and EA/EMP have been prepared by qualified organizations, and related costs included in project cost estimates. Relocation and compensation involve only a few of small business facilities and some fish ponds on public land. There is no physical resettlement of people involved. Environmental impacts are limited and manageable. Shandong has a good track record of implementing Bank projects. | The resettlement action plan (RAP) and environmental mitigation and management plan (EMP) are not properly implemented, leading to unsatisfactory results in rehabilitating livelihoods of affected persons and/or residual environmental impacts. | a. Training on Bank resettlement and environmental assessment policies and RAP/EMP implementation monitoring will be provided before project start.<br>b. A qualified organization will be engaged to advise Dongying City Management Bureau team on RAP implementation.<br>c. Construction related environmental mitigation measures will be included in bidding and contract documents.  | a. N<br>b. N<br>c. N         |
| 4.3 Delivery Quality       | Medium-L | Some technologies are new to the PIUs, but construction is relatively simple. In addition to supervision engineers and M&E consultants, FEPAs will also oversee related construction work. For the wetlands, sluice gates, and training centers, the concerned line agencies have agreed to assume responsibilities for O&M upon project completion.   | Weak contract management and/or inadequate M&E may lead to poor construction quality and project performance. O&M arrangements for project facilities may not be in place for sustainable use.   | a. Construction supervision engineer will be appointed to supervise work quality for each sub-components of Component A and B.<br>b. M&E consultants will be recruited at the beginning of implementation to track project progress and performance.<br>c. Agreement will be signed with FEPAs and/or concerned beneficiaries before investment starts on rural and agricultural pollution reduction.<br>d. Concerned line agencies will make arrangements to take over O&M responsibilities of respective project facilities. | a. N<br>b. N<br>c. N<br>d. O |

A - Proposed Rating before Decision Meeting<sup>3</sup>:

| Project Team | Risk Rating: Preparation | Risk Rating: Implementation | Date       | Comments |
|--------------|--------------------------|-----------------------------|------------|----------|
| Overall Risk | MI                       | MI                          | June, 2011 | .        |

<sup>3</sup> For Track II Operations only.

B - Review by IL Risk Team for Decision Meeting: This project is not subject to IL Risk Team review as the concept review was before July 1, 2010.

C - Final Decision Meeting Rating:

| <b>Appraisal Decision Chair</b> | <b>Risk Rating:<br/>Preparation</b> | <b>Risk Rating:<br/>Implementation</b> | <b>Date</b>         | <b>Comments</b>                                   |
|---------------------------------|-------------------------------------|--|---------------------|---|
| <b>Overall Risk</b>             | MI                                  | MI                                     | July<br>14,<br>2011 | The meeting endorsed team's overall risk ratings. |

## **Annex 5: Implementation Support Plan**

### **CHINA: GEF HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT**

1. The implementation support plan has been developed based on the project risk profile, with focus on the main risks identified. These risks include implementation agencies' capacity in technical aspect, procurement, financial management, safeguards management and results monitoring, cross-sector coordination, and main stakeholders' (beneficiaries') ownership in the pilot areas. The key principle underpinning this plan is to make it flexible and efficient as much as possible. The summary plan for managing the main risks is provided below.

2. **Technical Guidance and Results Monitoring.** The Bank team technical specialists (wetlands, rural waste/water, and agricultural nutrient/pollution management) will review and provide advice to the government project team and its consultants on technical designs, implementation and results monitoring & evaluation, on institutional development and policy studies, as well as on development of the replication plan. The team will also facilitate the organization of important exchange visits for project teams to learn from other pertinent pollution reduction projects and practices.

3. **Procurement.** Procurement implementation support will include: (a) facilitation in targeted training, at different stages, to procurement staff in Dongying PMO and implementing agencies; (b) reviewing procurement documents and providing timely feedback on results of prior review and post review to the project management offices concerned; (c) providing detailed guidance on the Bank's Procurement Guidelines to project procurement staff; and (d) monitoring procurement progress against the agreed Procurement Plan.

4. **Financial Management.** The supervision strategy for this project is based on its FM risk rating, which will be evaluated on regular basis by financial management staff. Financial management staff will join supervision missions and undertake desk reviews periodically, to provide technical support to project implementing agencies and to resolve related issues in a timely manner. The review and monitoring will include evaluation of the adequacy of the financial management arrangements in place, including accounting, auditing, budgeting, counterpart fund provision, financial reporting, internal control and funds flow. Financial management staff will also follow up on actions agreed during project appraisal and negotiations, as well as on observations derived from reviews of audit reports, management letters and IFRs.

5. **Environmental and Social Safeguards.** The Bank team will supervise the implementation of the agreed Environmental Management Plan (EMP) and Resettlement Action Plan (RAP), and provide guidance to implementing agencies and management offices concerned to address any outstanding issues. Training is required on environmental monitoring and reporting, and on implementation and monitoring of the RAP. In addition, guidance will be provided by the social development specialist to support the establishment and strengthening of FEPAs in the participating villages.

6. Most of the Bank team members are based in the China country office in Beijing to ensure rapid and effective response to the Borrower's needs for implementation support. Formal supervision and field visits covering all aspects of project implementation will be carried out semi-annually, enhanced with needs-based visits by small groups. Estimated inputs from different specialists in different stages of project implementation are outlined below.

| <b>Time</b>         | <b>Focus</b>  | <b>Resource Estimate</b>   |
|---------------------|---|--|
| First twelve months | Procurement review, supervision and training  | Procurement specialist(s) 1.5 SWs  |
|                     | FM and disbursement training and FM supervision   | FM specialist 1.5 SWs  |
|                     | Resettlement and FEPA development   | Social development specialist 3 SWs  |
|                     | Environmental training and supervision  | Environmental specialist 1.5 SWs   |
|                     | Technical review and support  | Wetlands/Rural/Agricultural pollution control specialists 6 SWs            |
|                     | Team leadership   | TTL 4 SWs  |
| 13-42 months        | Technical support for project implementation (Wetlands/Rural & Agricultural pollution control ) | Wetlands/Rural/Agricultural Pollution Control specialists 11 SWs           |
|                     | Environment and social safeguards (& FEPAs) monitoring & reporting                              | Environmental specialist(s) 3.5 SWs<br>Social development specialist 6 SWs |
|                     | Financial management & disbursement and procurement review and support                          | FM specialist 4 SWs<br>Procurement specialist 3.5 SWs                      |
|                     | Monitoring & Evaluation/Institutional   | M&E specialist 4 SWs   |
|                     | Task leadership   | TTL 6 SWs  |

*Note: SW – Staff Week*

7. The skill mix of implementation support team required is summarized below.

| <b>Skills Needed</b>                                       | <b>Number of Staff Week</b> | <b>Number of Trip</b> | <b>Remark</b>        |
|--|-----------------------------|-----------------------|----------------------|
| TTL/Water Resources Management Specialist(s)               | 6 SWs annually              | Two trips             | Bank staff           |
| Rural waste/Agricultural NPS pollution control Specialists | 4 SWs annually              | Two trips             | Team consultants     |
| Constructed Wetlands /Rural Wastewater Specialist(s)       | 3-4 SWs annually            | Two trips             | Team consultants     |
| Procurement specialist                                     | 1.5 SWs annually            | Two trips             | Country office based |
| Social development specialist                              | 2-3 SWs annually            | Two trips             | Country office based |
| Environment specialist                                     | 1.5 SWs annually            | One-Two trips         | Country office based |
| Financial management specialist                            | 2 SWs annually              | Two trips             | Country office based |

## Annex 6: Team Composition

### CHINA: GEF HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT

The World Bank staff and consultants who worked on the project are listed below:

| <b>Name</b>           | <b>Title</b>                                      | <b>Unit</b> |
|-----------------------|---|-------------|
| Xiaokai Li            | TTL, Senior Water Resources Management Specialist | EASIN       |
| Ximing Zhang          | CO-TTL, Senior Water Resources Specialist         | EASCS       |
| Joe Zhao              | Wastewater Management/Constructed Wetlands        | Consultant  |
| Weiguo Zhou           | Rural Wastewater & Agricultural Pollution Control | Consultant  |
| Peter Haase           | Constructed Wetland/Wastewater Management         | Consultant  |
| Zongcheng Lin         | Senior Anthropologist                             | EASCS       |
| Feng Ji               | Environmental Specialist                          | EASCS       |
| Jian Xie              | Senior Environmental Economist                    | EASER       |
| Yi Dong               | Senior Financial Management Specialist            | EAPFM       |
| Yuan Wang             | Procurement Specialist                            | EAPPR       |
| Marta Molares-Halberg | Lead Counsel                                      | LEGES       |
| Robert O’Leary        | Senior Finance Officer                            | CTRFC       |
| Tomoko Kato           | Operations Officer                                | EASIN       |
| Vellet E. Fernandes   | Program Assistant                                 | EASIN       |
| Hongwei Zhao/Dan Xie  | Program Assistant/Team Assistant                  | EACCF       |
| <b>Peer reviewers</b> |   |             |
| Alexander Danilenko   | Sr. Water & Sanitation Specialist                 | TWIWP       |
| Caroline Van Den Berg | Lead Water & Sanitation, Specialist               | MNSWA       |
| Rita Cessti           | Sr. Rural Development Specialist                  | OPCQC       |

## **Annex 7. Economic and Financial Analyses**

### **CHINA: GEF HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT**

#### **Project objectives and brief description of project components**

The project development objective is to demonstrate innovative and cost-effective water pollution control practices in Guangli river catchment of Dongying Municipality, contributing to pollution reduction in the Bohai Sea. The project includes two investment components: wetland construction and agricultural pollution control and rural waste management, and activities of capacity building and project management.

#### **Need for environment improvement in Guangli River basin**

Rapid economic growth and industrialization around Bohai Sea have contributed to water quality deterioration of Bohai Sea. In 2009, about 28% of total area of Bohai Sea does not meet the national water standards of Class III, and 23% of total sea area was in certain stage of eutrophication.

Due to weak environmental management, pollutants from various sources are discharged into Guangli River and contribute to water quality degradation of Bohai Sea. According to the official data of water quality monitoring at the estuary of Guangli River near Bohai Sea in October 2008, the concentration of COD was 73.7 mg/L, about 4 times higher than the national standard of 15 mg/L, that of ammonia nitrogen was 3.27 mg/L, 6.5 times higher than the national standard level, and that of phosphate and oil pollutant were also 4-6 times higher.

Main sources of pollution to Guangli River are excessive application of chemical fertilizers and pesticides, untreated domestic wastewater discharge, and animal and human manure disposal. The wastes from domestic sources and animal husbandry also affect the quality of soil and living standards of local population.

#### **The government development strategies and targets**

The Chinese government has realized the great importance to protect water quality of seas for China's sustainable development. It has developed master plans of environmental protection for all of the four international seas including Bohai Sea. According to the National Master Plan for Environmental Protection of Bohai Sea (2008-2010), the short-term objectives by 2012 are to reduce the total COD discharge to 1.2 million tons and TN to 12,000 tons through non-point source control in a total area of 640,000 hectares and construction/restoration of 210,000 hectare wetland. Shandong Provincial and Dongying Municipal governments have also made their plans for environmental protection in coastal areas. In the Dongying Environmental Action Plans for Water and Air Pollution Control, water pollution control through wetland construction, and rural waste/wastewater and agricultural non-point source pollution control are listed as top priorities for investments.

#### **Economic benefits and costs identified**

Economic benefits. The project will generate a variety of economic benefits to local residents in project areas in Dongying Municipality and those use the Bohai Sea and Yellow (Huanghai) Sea

directly or indirectly beyond the project areas. The project's economic benefits and costs have been identified and quantified to the extent possible.

Main economic benefits of the project consist of improved water and environmental quality in project influence areas, improved living standards and public health of local residents in project areas, cost saving associated with reduced application of chemical fertilizer and pesticides, and increase in aesthetic amenities in surrounding areas of the project. Indirect benefits which are beyond the project area include avoided biodiversity and fishery productivity loss in the Bohai and Yellow Seas, and carbon emission reduction.

Economic costs. The main economic costs for each component are identified as capital investment and O&M costs. The project's economic costs are mostly capital investment costs and operation and maintenance (O&M) costs. The total capital investment is 257.0 million yuan RMB.

The following key parameters are used in the analysis. Social discount rate is 8% and the project duration is 33 years, including 3 years of construction and 30 years of operation.

### **Valuation methods**

While most benefits described above are difficult to quantify and monetize, several valuation techniques were applied in attempt to capture the economic values of those that are possible to quantify. For wetland restoration, the benefit transfer approach was used to estimate part of the economic value of wetland restoration. In particular, the results of Costanza (1997)<sup>4</sup> were used to estimate the value of scientific research, water purification and biodiversity conservation provided by wetlands. Hedonic method was used to quantify the value of land appreciation due to environmental and ecological improvement. For water pollution control, productivity increase was estimated as the proxy of economic benefits.

### **Economic analysis by component**

#### **A. Wetland Construction and Sluice Gate Operation Optimization**

Economic benefits and costs. The proposed wetlands restoration component is expected to bring about a number of benefits to the population in and beyond the project areas. These benefits fall into two categories of values of the wetlands: (i) Direct use value to local residents, including the value of animals and plants in wetland areas, scientific research values, land value increase, and increased tourism revenue from improved environment; and (ii) Indirect use value to population beyond the project area, such as water quality improvement in the seas, avoid carbon emissions, and biodiversity conservation. Economic costs of this component consist of capital investment cost and O&M cost.

The cost-benefit analysis was conducted. In the analysis, such benefits as tourism revenue, and increased ecological functions of carbon fixation and flood mitigation were identified but not quantified as it is difficult to do so. But the benefits from land value increase, value of increased productivity of wetland animals and plants, water purification, and biodiversity conservation were quantified and monetized using different valuation techniques in attempt to capture the economic benefits of amenity, environmental quality and living standards improvement by the project.

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<sup>4</sup> Constanza R, d'Arge R, de Groot R, et al. 1997. The value of the world's ecosystem services and natural capital. *Nature*, 387:253-260

Hedonic valuation technique was applied to estimate the land value increase due to the proposed component. There will be 5,000~6,000 mu (334 ~ 400 ha) undeveloped land within 500 meters surrounding the wetland. Based on the data of land values in comparable wetland projects in Dongying, it is estimated that the value of the vacant land would rise from 150,000 to 300,000 ~ 400,000 Yuan RMB per mu after the completion of the project. A conservative estimate of land value increase will be 150,000 yuan RMB per mu. Assuming the land will be gradually developed over the project period, the increase in land value is estimated to be at least 25 million Yuan per year.

A benefit transfer approach was adopted to estimate the value of benefit in terms of biodiversity conservation provided by the proposed component. According to Costanza (1997), the value of ecological service in terms of providing wildlife habitats by wetlands is US\$304/ha each year. Therefore, the annual economic value of environmental service for biodiversity conservation provided by the proposed component would amount to about 0.4 million Yuan. Similarly, Costanza (1997) also shows that the benefit from water purification is US\$4,177/ha each year. Total benefit will be 4.96 million Yuan during the entire project period. Economic proceedings from wetland plants were also taken into account. In this case, reed harvested in wetland areas is estimated to be 400 ton each year, which would generate annual revenue of 0.6 million Yuan at current price levels.

The capital investments in this component were projected to be evenly spread over the entire project implementation period. The total capital investment of this component is estimated to be about 194.8 million Yuan. The O&M costs are RMB0.5million per year.

*Results of the cost-benefit analysis.* The aggregated results of the analysis are summarized in the table below. It shows that the economic internal rate of return (EIRR) of the investment is 14.5%, its net present value (NPV) is 118.0 million Yuan (USD 17.6million) and benefit-cost ratio (BCR) is 1.8.

## **B. Agricultural Pollution Control and Rural Waste Management**

The objectives of this component are to reduce water discharges to Guangli River, improve agricultural productivity by promoting the application of related technology, and developing rural waste management facilities in two villages.

Economic costs and benefits. The main economic benefits of this component are cost saving by reducing application of chemical fertilizer and pesticides, income increase from the improved ecological environment, and revenue from sales of animal wastes as bio-fertilizer. The costs of the component consist of capital investment cost and the O&M cost.

It is estimated that after upgrading production technology, use of fertilizers can be reduced by 15-20% and pesticides by 20-30%. Per hectare income will increase by 1200-1500 Yuan, aggregating to 11.97 million Yuan each year. The rural waste management facility can produce 500 tons of bio-fertilizer each year, which will generate about 78,400 Yuan annually.

The capital investment of this component is a total of 82.2 million Yuan, spread evenly over 2012-15. The O&M cost is about 0.2 million Yuan per year.



*Results of the cost-benefit analysis.* The aggregated results of the analysis show that the economic internal rate of return (EIRR) of the investment is 12.3%, its net present value (NPV) is 35.6 million Yuan (USD 5.3 million) and benefit-cost ratio (BCR) is 1.5.

#### Aggregated results of the cost-benefit analysis

The aggregated results of the analysis are summarized in the table below. It shows that the economic internal rate of return (EIRR) of the investment is 13.8%, its net present value (NPV) is 153.6million Yuan (US\$ 22.9 million) and benefit-cost ratio (BCR) is 1.7.

**Table 1. Cost-benefit analysis of the whole project**

| Benefit/Cost (10,000 RMB)   | Present Value (at 8%) | 2012    | 2013    | 2014    | 2015   | 2016   | 2028   | 2044   |
|---|-----------------------|---------|---------|---------|--------|--------|--------|--------|
| <b>Benefit</b>  |                       |         |         |         |        |        |        |        |
| Wetland construction  | 29438.6               |         |         |         | 2480.9 | 3101.1 | 3101.1 | 3101.1 |
| Treatment of pollution from rural areas and agricultural production | 10788.7               |         |         |         | 981.9  | 1227.4 | 1227.4 | 1227.4 |
| Total benefit   | 38046.7               |         |         |         | 3462.8 | 4328.5 | 4328.5 | 4328.5 |
| <b>Cost</b>   |                       |         |         |         |        |        |        |        |
| Capital Investment  | 22078.6               | 8567.3  | 8567.3  | 8567.3  |        |        |        |        |
| Operating & Maintenance   | 612.0                 |         |         |         | 67.8   | 71.8   | 68.2   | 68.2   |
| Total cost  | 22690.6               | 8567.3  | 8567.3  | 8567.3  | 67.8   | 71.8   | 68.2   | 68.2   |
| <b>Net economic flows</b>   | <b>15356.0</b>        | -8567.3 | -8567.3 | -8567.3 | 3395.0 | 4256.7 | 4260.3 | 4260.3 |
| <b>EIRR</b>   | <b>13.8%</b>          |         |         |         |        |        |        |        |
| <b>B/C ratio</b>  | <b>1.7</b>            |         |         |         |        |        |        |        |

To further test the robustness of the analysis, a sensitivity analysis was conducted with the assumption of a 10% increase in capital costs, a 10% decrease in claimed economic benefits, and a combined scenario. The results, shown in the same table below, suggest a robust EIRR. For instance, in the case of 10% increase in capital investment, the aggregate EIRR is reduced from 13.8% to 12.6%. The combined scenarios still yielded an aggregate EIRR of 11.4%. All components have an EIRR above 10%. Therefore, the project is sound even despite the possible variation in capital investment and estimated benefits.

| Component   | Base case EIRR | 10% increase in capital investment | 10% decrease in main benefit | Combined case |
|---|----------------|------------------------------------|------------------------------|---------------|
| wetland construction  | 14.50%         | 13.25%                             | 13.12%                       | 11.95%        |
| Treatment of pollution from rural areas and agricultural production | 12.34%         | 11.22%                             | 11.10%                       | 10.04%        |
| <b>Aggregate project</b>  | <b>13.83%</b>  | <b>12.62%</b>                      | <b>12.49%</b>                | <b>11.36%</b> |

## Project Map

