Executive Summary

DA NANG – QUANG NGAI EXPRESSWAY PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT
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1. Introduction

Background
This document summarizes the environment impact assessment of Danang Quang Ngai Expressway Project (DQEP) in Vietnam, highlighting the main issues and conclusions of the Environment Impact Assessment (EIA), Environment Management Plan (EMP) and Environmental Safeguards Framework (ESF) of the project. According to both Vietnamese Environmental Protection laws and regulations and the World Bank’s Operational Policy 4.01 Environmental Assessment, the proposed project is Category A for environmental assessment purposes, due to the scale and significance of potential environmental and social impacts and the sensitivity of the project areas. Therefore, a full environmental assessment report was required.

The EIA and EMP reports cover the DQ Expressway roadway, interchanges, tunnel, service areas, tolls, and all construction related infrastructure such as access roads, workers’ camps, borrow pits and disposal sites. All EIAs, EMP and EIA framework reports were submitted to the World Bank for review and they conform fully to Bank policy guidelines regarding environmental and social issues. All above reports have been made available in Vietnam and in the Public Information Center (INFOSHOP) of the World Bank.

Current institutional arrangements of MOT for the expressway network are centered on the Vietnam Expressway Corporation (VEC) established in October 2004. VEC’s mandate includes investment in expressway construction, management, maintenance and toll collection, construction, operation of related facilities, and the planning, appraisal, design, and supervision of construction.

As designed, the project (i) incorporated effective analysis of alternatives and engineering measures to maximize project benefits and minimize negative impacts that would have occurred; (ii) will not adversely affect or convert any critical natural habitats; (ii) will not adversely affect most resources of high cultural value; (iii) will have minimized the need for resettlement and will provide adequate and just compensation and income restoration for affected peoples; and (iv) includes a management plan for addressing environmental and social issues during construction and operation of the project.

A detailed assessment of mitigation measures was carried out along the alignment of the Expressway for all project components: main expressway, interchanges, tunnels, and all ancillary infrastructures (camps, access roads, disposal sites, quarries). These measures were either:

(i) Incorporated in project design and hence already included in the bill of quantities: noise mitigation measures, slope stability, drainage, landscaping.

(ii) Included in the environmental specifications for contractors: camp management, disposal sites, traffic management, dust, restoration of affected areas. This mitigation measures and actions will become contractual obligations for the Contractors and can be enforced by PMU and ECO.; or

(iii) Incorporated in programs of the EMP: Physical Cultural Resources, Biodiversity Enhancement, Monitoring, and Environmental Supervision.
**Project Development Objective**

The project’s development objectives are: (1) to enhance the efficiency and safety of travel between Quang Ngai and Da Nang, and (2) to support Vietnam in the development of its expressway system through the implementation of a sound institutional framework.

**Environmental Assessment Process and Legal Framework**

A full Environmental Assessment (EA) was carried out following the Vietnamese environmental protection laws/regulations as well as the World Bank safeguards policies. Of the ten World bank safeguards policies, the following ones are triggered: (1) Environmental Assessment; (2) Involuntary Resettlement; and (3) Physical Cultural Resources. Regarding Natural Habitats (OP4.04, 2001), the project will not involve critical natural habitats as identified in OP4.04. However, the project goes through some wildlife habitats, thus the general principle of this policy will be applied to the EIA.

Compliance with these policies, and the World Bank’s information disclosure requirement, is summarized in Table 1. The project is also in full compliance with environmental policies, regulations and technical guidelines in Vietnam.

<table>
<thead>
<tr>
<th>Safeguard Policy</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Assessment (OP/BP 4.01)</td>
<td>• Category A project</td>
</tr>
<tr>
<td></td>
<td>• Full EIA and EMP prepared for Component A.</td>
</tr>
<tr>
<td>Natural Habitats (OP/BP 4.04)</td>
<td><strong>This policy is not triggered.</strong> The project will not impact any protected area nor will affect important/endangered flora or fauna species or biodiversity areas of high value. No action is required under the policy.</td>
</tr>
<tr>
<td>Pest Management (OP 4.09)</td>
<td><strong>This policy is not triggered.</strong> The project will not procure any pesticides nor will an increased use of pesticides result from the project. No action is required under the policy.</td>
</tr>
<tr>
<td>Physical Cultural Resources (OP/BP 4.11)</td>
<td>• Cultural property survey along the whole line has been conducted with involvement of local relic's management authority. Test excavation and excavation in two sites before construction. Some local cemeteries will be relocated. Protection of pagodas during construction will be implemented. Chance‐find procedure will be strictly followed.</td>
</tr>
<tr>
<td>Indigenous Peoples (OP/BP 4.10)</td>
<td><strong>This policy is not triggered.</strong> The project will not adversely affect indigenous peoples in the project area.</td>
</tr>
<tr>
<td>Safety of Dams (OP/BP 4.37)</td>
<td><strong>This policy is not triggered.</strong> The project area does not include any dams.</td>
</tr>
<tr>
<td>Involuntary Resettlement</td>
<td>• Resettlement Action Plan has been prepared</td>
</tr>
</tbody>
</table>
Projects on International Waters (OP/BP 7.50)

This policy is not triggered. The project area does not include any international waters.

Forests (OP/BP 4.36)

This policy is not triggered. The project will not finance activities that would involve significant conversion or degradation of critical forest areas or related critical natural habitats as defined under the policy. No action is required under this policy.

Projects in Disputed Areas (OP/BP 7.60)

This policy is not triggered. The project area does not include any disputed areas.

Project Description

The Da Nang-Quang Ngai Expressway (DQEP) is 139.15 kilometers long, including 131.13 kilometers of expressway and 8.02 kilometers of connection way to National Highway No. 1A. This link would connect Da Nang with Quang Ngai on a new alignment bisecting 20 major national and provincial highways.

The Project alignment starts from the intersection with National Highway no. 14B (NH14B) at Km 23+908 in Tuy Loan hamlet, Hoa Nhon commune, Hoa Vang district, Da Nang City. It ends at Km131+129.26 in Dien An hamlet, Quang Phu commune, Quang Ngai City. The DQEP is connected with NH 1A (Km1063+750) in Nghia Thuong commune, Tu Nghia District, Quang Ngai Province through a ring-road of Quang Ngai City. The expressway runs entirely on the western side of NH1A and the north-south railway.

The project will be carried out by Vietnam Expressway Investment and Development Corp (VEC) as the main contractor with total investment capital of 27.372 trillion dong (1.403.7 billions USD). Construction supervision, expressway facilities, and equipment would also be financed from this component. It is proposed that the project will be parallel financed with WB, the Japan International Cooperation Agency (JICA), and the Government of Vietnam (GoV).

The DQEP is designed to meet the standard for a 6-lane expressway (4 lanes will be built in the first stage) with travel speed of 120 km/h and the width of roadbed is 26m. The road has restricted access at the interchanges. The main technical parameters for the road are given in Table 2 below.

Table 2. Main Expressway Technical Parameters

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class of road</td>
<td></td>
<td>4 lane expressway (Reservation for 6 lanes during future expansion of the expressway).</td>
</tr>
<tr>
<td>Travel speed</td>
<td>Km/h</td>
<td>120</td>
</tr>
<tr>
<td>Min. curve radius</td>
<td>m</td>
<td>1000</td>
</tr>
<tr>
<td>Max. longitudinal slope</td>
<td>%</td>
<td>8</td>
</tr>
<tr>
<td>Width of road base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration type</td>
<td>m</td>
<td>26</td>
</tr>
<tr>
<td>Separate type</td>
<td>m</td>
<td>13</td>
</tr>
<tr>
<td>Road surface</td>
<td></td>
<td>Asphalt and concrete</td>
</tr>
</tbody>
</table>
The proposed expressway will include 132 bridges spanning 15.5 km, of which four major bridges will cross four large rivers namely Ky Lam, Chiem Son, Tra Bong and Tra Khuc. The proposed project also includes other 128 bridges crossing smaller rivers, irrigation canals, and drainage channels. The proposed expressway project has 26 viaducts in the area subjected to annual flooding, 23 flyovers crossing local roads and at-grade intersections, and one tunnel (with two tubes) with length of 540 m. In addition, 107 underpass culverts, 492 drainage culverts on the expressway, and culverts on the connection roads to NH1A are also included. In addition, nine interchanges, four parking yards and one management center have also been proposed in the project. The expressway will be equipped with an ITS (Intelligent Transport System) as part of traffic management and toll collection facilitates. Operation, management and maintenance of the expressway will be through the control centre and a maintenance centre; the project includes the provision of equipment and facilities necessary for maintenance of the expressway. The component also includes land acquisition and resettlement necessary to construct the expressway.

2. Analysis of Alternatives

Alternative alignment analysis has been carefully conducted during the feasibility study and EA preparation process. Alternative alignment has been extensively studied to choose the optimal scheme in terms of environmental and social impact, technical feasibility and financial and economic benefits. Three major firms were contracted to work on the final determination of the project alignment TEDI, JETRO, and NIPPON KOEI. Consultation with local governments and relevant authorities in charge of environmental sensitive areas and crossing of urban areas were conducted and fully incorporated into the alternative alignment selection process. Two basic categories of alternatives were explored and evaluated for this project:

1. The without-the-proposed project alternative: includes short term minor maintenance activities that maintain continuing operation of the existing roadway(s) and all other committed projects within the network (such as adjacent roads).
2. The built-the-proposed-project alternatives: include construction of a new expressway which is systematically designed and selected from proposed road options both at macro-scale and micro-scale.

Without the Proposed Project

According to JETRO’s survey (April, 2008), in 2007 total mixed traffic volume of National Highway 1A (NH1A) was 9,965 vehicles/day, of which 3,944 vehicles/day belonged to the Da Nang - Quang Ngai section. Traffic volume in NH1A is escalating on a yearly basis. The NH 1A has been re-constructed under the class III standard for delta roads, but the flood frequency calculated and designed on flooded road sections of NH 1A were only $P= 10\%$ instead of the suggested $P=2\%$. All flooded road sections of NH 1A with small depth were repaired by elevating the road bed and widening aperture of culverts and bridges. However, at present, the narrow width, bad road bed, small radius curve, and large traffic volume, facilitate the
occurrence of traffic accidents, particularly, because of the mixed traffic during night time. That is industrial and residential traffic, long trip and short trip traffic, mixing of cars, buses, motorbikes, heavy load trucks, vehicles, and even bicycles. In general, NH1A does not satisfy the daily increasing traffic volume demand brought about by the rapid social economic development of the region.

**With the Proposed Project**

The Project construction will be pivotal in developing the Chu Lai open economic zone, Dung Quat industrial zone, Da Nang port, and airports of the region. The new expressway shall meet requirements such as minimization of flood sections, resolve flood induced traffic jams and improving the regional road transportation system. Particularly by: i) providing safe and secured transportation for high speed and heavy vehicles, and ii) institutional strengthening to adequately manage the expressway transportation system. With the project, mixed traffic will be significantly reduced. Industrial and long trip traffic along the expressway will be separated from residential traffic. The Expressway is designed to minimize transport time while reducing traffic accidents.

**Macro-scale Alternative Analysis**

The TEDI F/S’s study for selecting the optimal expressway alignment of Da Nang - Quang Ngai expressway project started early in the Pre-feasibility and Feasibility stages on 2003 and 2005. In April 2008, the TEDI F/S’s study was updated by JETRO. In February 2009, Nippon Koei Co., Ltd., made adjustments to the TEDI-JETRO’s alignment following World Bank’s requirements and suggestions. These previous efforts resulted in the selection of the proposed expressway alignment following a range of macro-scale criteria: 1) avoiding mountains and hilly areas as much as possible; ii) avoiding a major reservoir located between Da Nang and Quang Ngai; iii) minimizing impacts on paddy fields and agricultural lands; iv) avoiding and minimizing the railway route; v) avoiding and minimizing impacts on local towns and industrial zones along the alignment; vi) avoiding existing NH1A highway; vii) enhancing and optimizing connections with existing road network and NH1A; viii) avoiding and minimizing impacts on critical protected areas, critical forests, flora and fauna species of conservation importance. Basically at a macro-scale there was only one major viable and cost/effective corridor available to design the expressway between Da Nang city and Quang Ngai (see Figures 1 and 2).
Figure 1: Cross-section of Project Location

Figure 2: Diagram Illustrating Alignment Location and Major Existing Barriers including Mountains and Coast Line
Micro-scale Alternative Analysis

In the TEDI feasibility 2005 report, two alternative alignments were developed. One of the alternatives runs through lowland terrain securing a good geometric aspect and connecting to the local road systems while providing good service to industrial parks along the route. But the line passes through a flood area and has large clearance. The second alternative alignment goes up to the highlands of the west, where is less affected by the flooding. But disadvantages include a less adequate geometric aspect of the alignment, a large digging volume and especially is very difficult for the clearance to run through the military area and the 500kV line circuit 2 building area.

The alignment proposed in 2009 by Nippon Koei established by the World Bank basically overlaps with the one proposed by TEDI in 2005 and JETRO in 2008. However, Nippon Koei proposed to revise the western side of the alignment in several sections such as Km 21-Km 26, Km 34-Km 43; Km 67-Km 90; Km 106-Km 115; and Km 122-Km 129 including a new design control at Km 90-Km 96.

The Horizontal alignment was carefully updated through several meetings with the People’s Committee considering design standards, and design controls. Following are major updates: i) use longer tangent element and larger curve radius in order to minimize VOC and land areas; ii) update design controls by site investigation and in consultation with People’s Committees, Armies, and Chu Lai O EZ Development Company; and iii) the minimum radius applied in the study is 1,000 m between the Chiem Son Bridge and the tunnel. A 1,200 m radius is applied at the ending point, and all other curves have more than 2,000 m radius.

As a result, the length of the expressway was shortened approximately two (2) km (excluding the extension of two (2) km at the ending point).

Figure 3: NIPON KOEI’s Updated Route in Relation to TEDI -JETRO Alignment

In December 2009, after reconsidering the Nippon Koei alignment, feedback from field trips, and suggestions from the Ministry of Transport (MOT), TEDI adjusted the alignment on three
sections: the Km0+000 - Km16+000; Km60-Km73; and Km109-Km129 in order to reduce the amount of relocation, avoid crowded residential areas, and avoid 500KV power sub-stations. Comparison of results from each alternative scheme allows to conclude that the Alignment adjusted by TEDI-Completed Consultant in March 2010 based on NK's alignment has fully considered many factors so as to reduce land occupation (especially farmland), to protect ecological environment, to avoid sensitive locations, to minimize the relocation of electric poles 500KV, 35KV and to solicit local government and people's opinion. Thus, the recommended route scheme is relatively reasonable. Further comparison and analysis in terms of environmental protection indicated that the recommended route scheme is basically the most optimal scheme, so it is recommended.

3. Environmental Setting

Physical Setting

Da Nang, Quang Nam and Quang Ngai are coastal provinces in the south-central region of Viet Nam, which are strongly affected by typical tropical-monsoon weather and are influenced by climates from both northern and southern Vietnam. The provinces have two distinct seasons: the dry season that lasts from January to July and the rainy season that lasts from August to December.

Topography of areas along the alignment of the Da Nang - Quang Ngai expressway is characterized by low mountain terrain and accumulative coastal sand dunes plain terrain. Such topography is distributed along a narrow range but it runs continuously along the proposed Expressway. Typically, ground elevation ranges from 1 m to 50 m. To the west of the route high mountain ranges are situated. The east of the expressway is characterized by relatively flat and wide fields which are separated by mountain sections leading to the sea; typically, ground elevation ranges from 1 m to 50 m.

Sensitive Areas surrounding the DQEP alignment

The proposed alignment was designed following the avoidance principle. The Phu Ninh reservoir was avoided. The distance from the alignment to the Phu Ninh protected area varies from 2.0 km to 3.0 km. The proposed highway will mainly cross the residential land, and agricultural cultivation area south of the Phu Ninh reservoir basin.

Sensitive Receptors

The site investigation identified 62 villages, two schools, and one pagoda as noise, air pollution, and construction activities sensitive receptors located about 15 m to 200 m from the proposed expressway.

Along the six linking roads, a total of 21 schools and kindergartens, 13 churches, pagodas and museum, martyr’s Cemetery, six hospitals and health units and many crowded residential areas (30m/house) are identified as sensitive receptors to changes and activities in the surrounding environment including increasing traffic volume in construction and operation phases, dust, increased noise, and traffic accidents.

Ecology

Through field survey and analysis of collected data, it has been identified that within the area 300 m from the both sides of the expressway is the area having extensive human activities with agricultural land and reforest land. Low biodiversity is present in the area. Some sections such as K21-Km 35, Km58-Km80 harbor important habitats with more forest and
shrubs with relatively more flora and fauna but no endangered species were observed or reported. The proposed Project crosses four major river systems namely Thu Bon-Vu Gia; Ba Ren, Tra Bong, and Tra Khuc. According to field surveys and consultations, there is no fishing industry distributed up and down the river along the expressway, and the bridge construction is carried on by means of drilling, so it has little impact on the aquatic flora and fauna.

**Air Quality**

A total of 14 representative sampling points were selected for ambient air quality sampling along the proposed alignment route. The ambient air quality is monitored at the same time and located with the noise monitoring. The parameters for analysis included NO₂ (nitrogen dioxide), SO₂ (sulfur dioxide), CO (carbon monoxide) and TSP (total suspended particulates). The procedure of sampling and analysis followed the Technical Specifications for Environmental Monitoring. Results indicate that in the 14 sensitive locations, each concentration parameter for ambient air assessment does not exceed the set standard, thus complying with the enforced environmental standard. In summary, the ambient air quality within the assessment scope is relatively good.

**Noise**

The existing noise level along the proposed expressway is mainly subject to noise from daily-life activities and traffic noise in existing roads (national roads and village roads). Based on the monitoring data in villages, the noise level between 6h-18h at the sensitive receptors ranges from 49.3 dB(A) to 69.4 dB(A), 18h-22h ranges from 34.5 dB(A) to 61.9 dB(A) and from 22h-6h ranges from 33.1 dB(A) to 54.5 dB(A). The noise level in the periods from 6h to 18h and from 18h to 22h meet class III standard of The "Environmental Noise Standard for public and residential Area" (TCVN 5949 - 1998); noise levels in three villages (Tri Binh, An Hoi, and La Ha) exceed the Class III standard for the time period between 22h-6h. Noise level in most of the villages along the expressway must follow specific mitigation measures (see EMP) to ensure standards are allowed. The noise level at the schools and pagoda ranges from 48.1 dB(A) to 53.8 dB(A) between 6h - 18h, from 42.8 to 51.2 between 18h - 22h and 41.0 dB(A) to 46.2 dB(A) during 22h - 6h. In general, the noise levels measured at the schools and pagoda exceed the Class I standard. The school ambient acoustic environment quality is not suitable. The Noise level along the linking roads at the schools and temples are exceeding the standard in almost all time periods (See Figure 3 for the location of noise sensitive receptors)

**Water Quality**

The water of the four major Rivers: Thu Bon, Ba Ren, Tra Bong, and Tra Khuc is mainly used for agricultural irrigation and navigation. According to National Technical Regulation on Surface Water Quality QCVN 08-2008/BTNMT, the surface water environment in the project area conforms to class B1 of QCVN 08-2008/BTNMT basically except for the contents of SS at Thu Bon river, BOD₅ at Thu Bon, Ba Ren and Tra Bong rivers and COD at Thu Bon and Ba Ren rivers reaches conform to class B2 of QCVN 08-2008/BTNMT. In general, the water quality of major rivers and reservoirs in the study area is fairly good and these rivers achieve the water quality statutory compliance levels for their classification. Regarding groundwater results indicate that groundwater in the project area has a good quality. Parameters of groundwater quality generally meet QCVN 09: 2008/BTNMT requirements.
Soil Erosion

The primary types of soil erosion in the project area are water and colluvial erosion, particularly surface and ditch erosion, caused by unfavorable land form, topography, soil and hydrology conditions (flooding) of Thu Bon, Ba Ren, Tam Ky –Truong Giang, Tra Bong Tra Khuc river systems, coupled with disturbance to the surface vegetation without appropriate control. Common forms of soil erosion include movement of superficial materials, ditch failures due to the lack of vegetation, soil dissolution following heavy rain falls, and landslides. The most serious erosion area within the Project area is located in section Km 0-Km 16.

Socio-economic Setting

The total population in the expressway impacted area is approximately 3.5 million living in Danang City, Quang Nam, and Quang Ngai provinces. The total serviced area is around 16,874.5 km², including approximately 7,593.3 km² of cultivated land. The major cities/urban centers along the expressway include Da Nang City, Tam Ky, Nui Thanh District, Dung Quat, Chu Lai industrial centers and Quang Ngai city, although the expressway will not go through the any of these urban areas directly. Quang Nam province exhibits a remarkable development of the industry and infrastructure facilities, positively influencing the stable growth of the national economy. Quang Ngai province has embarked into a fast economic structural adjustment and growth in recent years. At present, agriculture is considered the main industry of Quang Ngai province.
Figure 4. Location of Noise Sensitive Receptors
Cultural Resources

In January 2010, The Vietnam Institute of Archaeology carried out a comprehensive investigation regarding tangible cultural heritage sites along the DQE project. The survey showed that there are four Champa architectural ruins, namely Chùa Vua, Triền Tranh, Gò Lôi and Gò Gách, occurring in the Chiem Son Tây valley (Duy Trinh commune, Duy Xuyên district), and one area presenting evidence of an ancient pottery kiln system along the Trà Bồng river in Bình Sơn district (Quảng Ngãi). The location of these sites is within the route construction area. Three sites namely Triền Tranh (Km 22 - Km22+300), Go Gách (Km 21+800-Km 21+950), Gò Lôi (Km 22+450) are under a direct impact and Chùa Vua (it is far from the central line of the road 500m) is indirectly influenced by the route construction. 135 graves will be relocated for the construction of the road (this issue will be addressed as part of the resettlement plan). Nuisances to a pagoda during construction will be mitigated by specific protection measures (noise barrier, and control of construction activities during key ceremonies).

4. Assessment of Impacts and Mitigation

The DQE project has aimed to minimize impacts on the environment and people through careful selection of the route in consultation with the public and completion of impact assessments compliant with Vietnam and World Bank regulations. The Project will involve the construction of a new expressway which will result in permanent land take resulting in an important negative impact on land-use particularly agricultural land. The Project will result in the removal of trees and partial loss of habitats (agro-ecosystem), including vegetation along watercourses, giving rise to some negative effects, but no endangered species, protected or valuable habitats will be affected. Noise and dust impacts during construction of the road, bridges, and tunnel can be severe and result from construction activities in general and particularly from the operation of heavy machinery. Construction of the road will require millions of cubic meters of borrowed fill material. Such quantities will be obtained from local quarries, sand pits, and hills along the construction corridor. If unprotected and poorly managed, the borrow areas could trigger serious erosion, cause chronic siltation, generate dust, and become a permanent scar on the land. Given the high rainfall during the peak construction season months, erosion rates will be extremely high.

The proposed roadway requires 132 bridges, 26 viaducts subjected to annual flooding, 23 flyovers crossing local roads and at-grade intersections, 107 underpass culverts, and 492 drainage culverts. These installations will require diversions for the larger projects, construction equipment in the riverbeds, and the transport and use of construction materials in and over the water surface.

In addition, up to 1,500 people are expected to work full time on the project for the four-year period and will produce significant volumes of sewage per day. High impacts on the water surface and underground water could result from dredge and piling hole waste material, hazardous substances in the sediments, accidental spills, serious erosion, and other contaminants that could enter the watercourse accidentally. Natural drainage of the area will be significantly modified by the road, which will act as long earthen dam, channeling runoff to specific agricultural and flooding areas and the rivers. During operation stage there are 65 sensitive receptors along the road that will be impacted by increased noise, emissions, and potential accidents (hazardous leakages, traffic accidents). It is considered that the predicted
negative impacts can be sufficiently mitigated and compensated by various measures, which are detailed with specific recommendations in the corresponding Environmental Management Plan.

**Crossing Sensitive Areas**

In the construction stage, the majority of ecological impacts are to come from site clearance, removal of vegetation at the beginning of construction which would result in loss of habitat and vegetation for animals. Unplanned land occupation of ecological sensitive areas, damage to vegetation beyond proposed working areas, and illegal hunting by construction workers, etc. due to lacking of awareness or training could result in certain impacts to the local ecosystem along the expressway. During the operation phase, the expressway, where it runs on the group instead of elevated viaduct or tunnel would divide the land or habitats.

**Impacts on the Agro-ecosystem**

This project will acquire significant land around 9,605,859 m² of land, of which 4,374,723 m² (around 438 hectares) is cultivated land, accounting for 45.5% of the total. It is clear that the land acquisition will cause some losses and impacts on the local agricultural production. However, there are over 167.100 of cultivated lands in the districts crossed by the expressway. This means that the expressway will only uptake 0.26% of the total cultivated land in the districts. The design document indicates that the DQE (about 140km long and 300m scope), there is totally 423,000,000 m² of greening work to be planted on the occupied land. There are about 15,830 fruit and timber trees; 310,544 wood trees and 835,729 industrial trees that shall be cut off, which will impact both economic activities and biodiversity values in local areas. Except in the expressway pavement area itself, impacts on vegetation in other portion of the expressway areas will be short termed as the slopes, central separation media, open space of the nine interchange areas, borrow pits, disposal sites and other temporary occupied areas will be landscaped and rehabilitated with lawns, trees bushes and other vegetation.

Impacts on land-use will stem from greater opportunities to develop industrial centers and other economic activities rather than agriculture. Technology and information drawn by the expressway will help develop a series of industrial projects. Da Nang has developed a comprehensive land use and development plan which will be further consolidated trough the expressway which will catalyze and transform current land use and development trends according to the plan.

**Air Impact**

The main ambient air pollutant during road construction stage is flying dust produced from mixing lime and soil, from material stock grounds and from leakage/spillover of material transportation, in addition to dust from temporary roads and unpaved road surfaces. According to the monitored data, surrounding air quality standards, and considering the prevailing wind direction throughout the year along the route during construction stage, mixing stations should be set up 300 m away from the leeward wind direction in sensitive villages. Lime, cement and other bulk materials are apt to fly dust under wind force, the flying dust is basically concentrated on the scope 50 m in leeward wind direction, considering its harmful effect to humans and plants, protection work should be well done during storage. Lime, gravel, sand and other bulk materials are very likely to cause dust pollution during their transportation whose impact coverage can reach 150 m leeward wind direction (on 150 m leeward wind direction, TSP pollution may still exceed the air quality standard by 4 times), so
vehicles transporting bulk materials must be managed strictly. If access roads have pavement or adopt gravel/sand to pave, then transported flying dust is going to be relatively light. If the builder’s access roads are only earth road surfaces, the dust pollution caused by vehicle transport will be more serious, and the impact coverage will be relatively large. Compared to dust pollution caused by mixing stations, hazard from wind-borne flying dust is relatively small with shorter impacting cycle.

**Noise Impacts**

The major noise sources during the construction phase are construction equipments and transportation vehicles. Although the noise arising from these sources is temporary, it could affect the near receptors unless there is a stringent control measure. Typically, the construction of a road takes place in three stages, namely construction of base, construction of road surface, and construction of auxiliary facilities. Noise from construction will have a certain impact on the acoustic environment along the expressway; this kind of noise impact mainly appears in a range 267 m from construction site in daytime and 4,700 m from construction site in nighttime. The acoustic sensitive receptors along this project are mainly residential areas, pagodas, and schools. Construction noise may affect their normal life; especially noise from large-scale equipment will produce significant impact on inhabitants. The information obtained from field investigation also indicates that most sensitive receptors, such as the Nghia Trung Primary school (Km 137+500), Nghia Dien 2 primary school (Km 132+200) and Duc Long Pagoda (km 129+400) located 140 m, 100 m and 129 m far from alignment respectively, will be seriously affected by construction in daytime. In night-time, however, the construction operation would cause significant noise affecting people within the residential affected area, especially on the houses next to the road and bridge construction sites, and on flat land.

**Impacts on Surface Water**

The proposed expressway construction will inevitably exert certain impact on the water environment, with pollution sources encompassing transportation and placement of building materials, disposal of construction waste materials, bridge construction and camp buildings, etc. If the construction materials such as asphalt, fuel, oil and chemicals are not well preserved, they may be washed away into rivers causing water pollution. During the construction period of sections adjoining the rivers, soil from the road base construction or road surface without proper care is likely to be wash out to the river because of rainfall. The project will construct various bridges crossing four major rivers. In the construction of the underwater works, such as piles, foundations, and temporary support, the water quality will be affected. In addition, the disturbance to the riverbed sediments may increase the suspended solid (SS) load in these localities. Based on the experience obtained from similar projects, the load of SS within 100 m radius of the site is noticeable. Due to dispersion, the SS load will be reduced with distance from the site; this impact will be reduced enough 200-300 m away from the construction site. When the work is completed, such impact will end immediately. The oil leaked from the operation of machinery of the bridge construction may be another major source for water pollution. Run-off from tunnel work comes mainly from underground water and slurry. Experiments proved that tunnel effluent contains cement, so it will quickly precipitate in static state. The wastewater generated in the tunnel construction site is derived mainly from drilling, dust removal, and muddy water intruded from groundwater. As the wastewater often contains oil and sand, it tends to appear alkaline. If the
wastewater from tunnel construction is discharged directly into rivers or drainage canals, it causes impact on the water quality of the rivers.

Potential water pollution is expected to arise from the domestic wastewater discharged from the construction camps. It is expected that the large camps will have about 200 workers; 120 workers in middle camp, and 80 workers in small camp. Assuming 80L water/person/day, the total wastewater generated from these camps will be 11.2 m$^3$/day; 6.72 m$^3$/day and 4.48 m$^3$/day. The main pollutants in the wastewater are COD and BOD$_5$. The average concentration of COD and BOD$_5$ is estimated at 150 mg/l - 250 mg/l respectively. If the above-mentioned sewage directly enters into nearby water body without treatment, it will adversely impact the water quality.

Construction of bridges may have effects on the groundwater level and quality. With piles being driven into the riverbed penetrating a depth of about 40 – 50 m (end of the sediment of the quaternary), the separation between the water bearing and water repellent objects will be unintentionally perforated. This constitutes a risk which could mix the water layers and thus, the groundwater might become polluted.

**Impact on flooding**

The construction of a new route parallel with the railway, 2-6m higher than the natural ground, longer than 140 km, crossing over four big rivers (Thu Bon, Ba Ren, Tra Bong and Tra Khuc) and many irrigation canals, lakes and swamps will limit the capability of water drainage of coastal and upstream areas. Furthermore, raising the road surface, and constructing bridges and culverts crossing rivers and canals will make the natural currents narrower, increasing the likelihood of inundations in the project area. The flooding impact is estimated very high at some sections (Section from Km 0-Km 21; Section from km 65- km77; Section from km 100-km 103). Proper design of bridges, culverts and cross drainage will minimize this impact.

**Soil Erosion**

The DQ expressway embankment includes 15,320,000 m$^3$, roadbed discarded earthwork will require 2,040,000 m$^3$, tunnel discarded earthwork is 3,020,000 m$^3$, the total discarded earthwork is 5.06 million m$^3$; which is the biggest hidden problem to soil erosion. Soil erosion will occur during the project construction phase when surface vegetation and soil are damaged. The primary area of potentially increased soil erosion includes deep cuts, high fills, earth borrow pits, construction waste/excessive earth disposal sites, temporary construction sites, treatment of special geological conditions and other areas where surface soil will be disturbed. The most severe soil erosion would occur in the areas of spoil deposit pits, main structure of bridge/tunnel, which thus are considered to be the focus for soil conservation.

**Socio-economic Impact**

**Community Severance**

There are 9 interchanges, 23 overpasses and 26 viaducts in the proposed expressway. In addition, where the road passes large farmland, agricultural vehicle passages are designed to ensure the agricultural operation convenience. As the expressway will have only one tunnel and elevated viaducts, the actual severance impact will not be as high as the expressway length implies. Under the project, there will be 132 bridges and 492 culverts for road waterway. As such, the existing river and irrigation systems will be intact, so as to ensure adequate functioning of the irrigation system.
Health and Safety

Health risks are primarily related to increased transit population during construction (construction workers) and operation (visitors) in the regions. The increased mobile population could potentially bring and spread infectious diseases in the Project area. The in-hygiene and un-healthy life style of the workers could spread diseases such as hepatitis and HIV-AIDS to local residents as well as among themselves.

The safety risk is primarily in the construction phase with the local residents, particularly children who have little awareness of construction site safety and traffic safety. In a linear construction site there will be hardly full control of the site and the construction areas will be mostly open with no control from public access. The curious students may hang around the sites after the school causing safety risks. Deep cuts and other excavation, if near normal roads could also be a safety hazard at night. The explosion operation for deep cuts and materials borrowing and the resulting flying stones, as well as explosive handling, will be among the most dangerous activities on the construction sites which pose risks to residents. The explosive operation could also affect the safety and structure integrity of houses in a 500 m radius area through strong vibration of the explosion as well as damaging roof tiles and windows from flying stone from explosion.

Economic development and poverty alleviation

Currently from the Da Nang, Tam Ky, Quang Ngai to the west mountain villages, communes will take 5-7 hours while when the expressway is in operation this trip will only take about 1-3 hours. The greatly improved transportation conditions will help shipping of local agricultural produces and resources out to the urban centers Da Nang, Tam Ky, Quang ngai, contributing to local economic development. In addition, the greatly improved transportation conditions will help attract outside investment to the region contributing further economic development. the Project will help the poverty reduction effort and improve the standard of living to the local urban and rural residents for the access to services and others in the urban areas.

Resettlement and Relocation

Human Environment: according to the results of the inventory of losses 6,194 households will be affected within 38 communes in 12 Districts within the three project provinces. The resettlement issue is the most serious concern expressed by the local communities during public consultations. the general disruption of their traditional movement and community life patterns, accidental leaks of toxic substances, contamination of soils, an increase in the ambient noise they experience, and decreased air quality are also important concerns. Given the scale of the relocations a major Resettlement Action Plan has been carefully developed.

About 959 ha of land will be acquired for the project development. Of this, about 434 ha is agriculture land, 73 ha is residential land, 184 ha is cultivated forest/wood land and 269 ha is used for other purposes. A total of 1,588 Households will be impacted on either partially or fully on houses (affected area of houses is 37,594 m²). 632 households had to be relocated to new places. The other 4,237 households will be affected primarily on their agricultural land and 64 households will be affected on their private business. In addition, 62 villages along the proposed alignment, two schools and one pagoda along the part connected the ending point of DQEP with NH1A will be affected on their assets. No religious building shall be relocated. There are 25 schools and kindergartens; nine pagodas and churches; five hospitals and health Units; crowded residential areas, which belong both side of the six linking road: PR610;
NH14E; PR616; PR617, PR 623; PR 625 will be directly affected by noise, vibration and traffic accident from project in construction and operation phase. The Project will also occupy yards, water wells, walls, tombs, trees, irrigation systems, country roads and utilities within the expressway area. The impacts will also include mismanagement of land and house compensation funds, unsatisfactory with land re-assignment and insufficient compensation for house replacement. However, in general, the new houses following the relocation program are expected to be better and bigger than the houses they replace with using the resettlement and relocation compensation funds, representing an improvement of housing conditions and the standards of living. The total cost of resettlement and relocation, including compensation to all affected, is estimated to be 1,204,130,307,275 VND (about 119,441,898 US$).

**Cultural Resources**

Three Champa architectural ruins in the west of Chiem Son valley of Chiem Son hamlet, Duy Trinh commune, Duy Xuyen district, namely the sites of Go Loi, Trien Tranh và Go Gach from Km 21-Km 22+500), with a total area of about 4,692 m² are directly impacted and one Champa architectural ruin Chua Vua is indirectly impacted by the project. Based on the current assessment by Archaeological Research Institute, a cultural heritage protection plan including the necessary mitigation and budget had been prepared and approved by MOT. Test excavation and excavation of underground cultural relics according to the Cultural relics report will be carried out prior to initiation of construction.

*The site of Gò Lôi*
Mitigation Measures

Design Stage

The project owner has contracted various agencies to carry out field investigation and prepare reports for soil conservation, cultural property, geological disaster, and mineral resource with the major findings to be considered in the design stage by the design team. In the pre-feasibility study stage, the proposed road will cross the flooding area of Da Nang city, Quang Nam and Quang Ngai province (Km 0-km 16; km 63-km 78; Km 109-Km 129). In the feasibility study stage the road section has been adjusted to avoid the flooding area. During the field research, it was suggested to adjust the alignment in order to avoid the 500 KV, and 35 KV electric cables. As the project is located on flooding areas, the total length of bridges is 14.6 km accounting for 10% of the total road (including 26 viaducts and 23 overpasses totaling 6,880 m, accounting for 46% of the total length of bridges). This design while avoiding flooding areas also minimizes the impact on the agro ecosystem and the local flora and fauna. Flood prevention considerations have been taken into account the design of bridges and roadbed.

Construction Stage

In road sections where sensitive receptors are located, speed limits will be set, and the whistle blowing will be banned. The road surface will be regularly maintained to reduce the noise derived from vehicle movement. The new residential houses will be planned 200 m away from the proposed road. The sensitive receptors, such as hospitals and schools, will be constructed at least 250 m from the road central line. If Cam Son, Bich Bac, Chu Lai and Dung Quat industrial zones decide to modify their development plans expanding toward the proposed road, it is suggested that in the area within the distance of 200 m from the road storehouses, plants, and greening works will be constructed.

Low noise machines and noise windows are recommended for sensitive receptors including Phu Hoa, Thach Bo, Le Son 2, Thai Cam, Duc Ky, Chau Thuy, Bi Nhai, Xuan dai, Ky lam, Ben Den Dong hamlet 4 and 5 of Duy Son Commune and Nghia Trung, Nghia Dien primary schools, Duc Long pagoda. At these locations, night time (22:00 pm- 6:00 am) construction will be strictly limited. The day time construction will also take measures to minimize the noise operations near the sensitive receptors where possible. Other sensitive receptors, such as KY lam village (Km 18) Villages 1, 2 (Km 20+00) are near a bridge site, where piling construction can be very noisy. The transportation routes will also be carefully planned to make sure the noise, dust, and safety impacts will be minimized.

During the construction of bridges, advanced environmental measures will be adopted, site construction camps, and material stockpiling sites will be carefully selected. The wastewater from construction sites will be collected and treated in septic tanks. The wastewater from material washing will be treated through settling tanks prior to being discharged into surface water bodies. The water spray operation will be scheduled twice a day (morning and afternoon) on unpaved road surfaces, and loose material stockpile areas. The frequency of water spray will be increased in dry and windy days. The asphalt and cement mixing station will be located as far as 200 m from the resident’s blocks. The mixing station will be enclosed. The access roads will be as far as possible from the resident's blocks. The stockpiles for cements, sand and limes will be covered.
A cultural heritage protection plan including the necessary mitigation and budget had been prepared and approved by MOT. Test excavation and excavation of underground cultural relics according the Cultural relics report will be carried out prior to initiation of construction.

**Operation Stage**

There are 65 sensitive receptors along the road. Various noise control measures will be designed and implemented to mitigate the noise impact from the road project. The main mitigation measures are installation of noise barrier, noise window, and relocation. Two service areas and two parking areas as well as Da Nang, Quang Ngai toll station/maintenance depot will all have secondary wastewater treatment stations. The vehicle washing effluent from the service areas will be recycled and reused after proper treatment. The five ramps and one main line toll stations will have septic tanks for wastewater treatment. The supernatant will be used for landscape spray and sediment will be regularly cleared.

Additional consultation with communities along the expressway will be carried out during the detail design stage of the expressway to identify and agree on additional mitigation measures for noise and dust reduction during construction and operation. The EMP will include the necessary will include a budget for these additional measures.

In order to mitigate the impacts from hazardous material transportation accidents on the major bridges of the Thu Bon river, Ba Ren, Tra Bong, and Tra Khuc rivers, liquid collection systems and strong guard rails will be built. The spills, if any, will be collected in holding tanks for later hauling and disposal, to avoid direct discharges in case of accidents on the bridges. The collection system will also collect the first flush from rain water to minimize the water quality impacts. The bridge and expressway company will be responsible of developing an emergency plan to handle promptly and properly accidents and environmental emergencies. The emergency team will be equipped with appropriate equipment and staffed with proper well trained people.

<table>
<thead>
<tr>
<th>Table 3. Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Issue</strong></td>
</tr>
<tr>
<td>1. Alignment</td>
</tr>
</tbody>
</table>
| 2. Conservation of Environmental Resources | • Improved environmental supervision  
• EMP compliance framework  
• Conserve top soil for reuse  
• Train workers on environmental protection  
• Waste disposal in designated areas  
• Service and road maintenance stations | • Road aligned to minimize impact to land and natural resources |
| 3. Traffic and Noise | • Limit construction activities to daylight hours  
• Install noise barriers | • Noise monitoring will occur near sensitive receptors.  
• Noise barriers/plantings |
| 4. Water Pollution | • Treat wastewater and manage solid waste | • Culverts and drainage ditches will reduce |
5. Air Pollution

- Spray water to control dust during construction activities
- Cover delivery vehicles in order to reduce spills
- Locate asphalt mixing sites 500 m from residences
- Monitoring of air pollutants will occur near sensitive receptors (residential areas)
- Road alignment limits impacts to Champa ruins and other cultural sites

6. Cultural Relics

- A cultural heritage protection plan including the necessary mitigation and budget had been prepared and approved by MOT. Test excavation and excavation of underground cultural relics according the Cultural relics report will be carried out prior to initiation of construction.
- Reinforcement of sites and protection of relics will occur during construction
- Chance Finding procedures will be utilized should artifacts of cultural, archaeological, or paleontological surface during construction activities
- Road alignment limits impacts to Champa ruins and other cultural sites

7. Soil Erosion/Irrigation Channels

- Rebuild irrigation or drainage systems damaged during construction
- Trees and grasses along the roadside will reduce erosion
- Retaining walls will limit soil movement and runoff

8. Construction Camp

- Adhere to national drinking water standard
- Maintain sanitary conditions of camps
- Not applicable

9. Health and Safety

- Environmentally and socially responsible procurement to inform workers of rights
- Provide information on disease prevention, especially HIV/AIDS
- Provide adequate protective gear to workers
- Education campaigns
- Offer seminar on safety issues to local public

10. Management of Contractor

- Separate environmental consultant for auditing and monitoring EMP compliance
- Provide environmental protection training to contractor and local supervisors
- Include EMP in bidding documents
- Not applicable

5. Environmental Management Plan

A detailed Environmental Management Plan (EMP) addressing all issues identified in the EIA (i) organizes all measures to mitigate environmental impacts during the construction and
operation; and (ii) establishes an organizational structure, procedures, institutional responsibilities for implementation, and a budget and source of financing for each activity. The EMP also includes an Environmental Safeguards Framework (ESF) specifically for the environmental management of temporary works that are left for contractor to design, and environmental monitoring and capacity building programs. Main components of the EMP are:

- **Environmental protection measures in design stage:** mitigation measures have been incorporated in project design: alignment selection, slope stabilization, noise reduction, landscaping, and special attention to protect irrigating system.
- **Environmental protection measures during construction:** these include: additional surveys and test excavations for cultural resources, environmental specifications for construction, camp management, restoration of affected areas, access roads and borrow pits, and environmental supervision of construction.
- **Environmental protection measures during operation:** mainly monitoring programs.

In addition to the project-specific mitigation measures included in the EIA and EMP, project design and construction of the DQEP are also subject to a wide range of domestic laws, regulation, technical guidelines and codes of practice in Vietnam, which by default are legal requirement for project design and construction management. The Environmental Management Plan (EMP) for the Da Nang – Quang Ngai Expressway Project (DQEP) was prepared by the Project Management Unit of the Vietnam Expressway Corporation (VEC) following the study results of the project's Environmental Impact Assessment (EIA). The EIA report was submitted to the Ministry of Natural Resources and Environment (MONRE) for appraisal. MONRE reviewed and approved the EIA on 28 November 2008. This EA report was subsequently updated and a new version prepared and submitted to the World Bank in October 2010.

**Management Organization and Responsibilities**

On behalf of the Ministry of Transport (MOT), the Vietnam Expressway Corporation (VEC) will act as the Owner of The Dang Nang – Quang Ngai Expressway Project. VEC is responsible to MOT and the WB for overseeing Project implementation. The **Ministry of Natural Resources and Environment, the provincial Department of Natural Resources and Environment (DONREs)** of Da Nang City, Quang Nam and Quang Ngai provinces are the Project environmental supervisors and administrators.
Environmental Monitoring

Comprehensive environmental monitoring programs have been designed for both construction and operation phases. Monitoring includes water quality, noise, hydrology, construction dust and noise, as well as soil erosion and vegetation restoration. The PMU will be in charge of environmental monitoring during the construction and the operation phase. The selected EMC will conduct monitoring and write reports of the monitoring results to PMU on a quarterly basis during the construction phase and twice a year during the operation phase. All personnel of the Project Office Environment Protection Section and construction workers will receive environmental training at least one time before commencement of construction. Key environmental administrative and monitoring personnel will also go through technical training provided by the project.

Environmental Supervision

The Environmental Control Officer will prepare two guides: (i) an EMP implementation guide for contractors clearly identifying their responsibilities and the DONRE’s requirements; and, (ii) a guide for environmental supervisors on how to undertake supervision, including monitoring of effectiveness. These guides will be supported by a training program.

During construction, environmental supervision shall be carried out by qualified supervision unit reporting to the PMU. Each Supervision Engineer company will be required by contract to assign at least one Environmental Supervision Engineer. The Environmental Supervision Engineers will:

- Review and assess on behalf of the Project Office whether the construction design meets the requirements of the mitigation and management measures of the EIA and EMP,
- Supervise site environmental management system of contractors including their performance, experience and handling of site environmental issues, and provide corrective instructions;
• Review the EMP implementation by the contractors and subcontractors, verify and confirm environmental supervision procedures, parameters, monitoring locations, equipment and results;
• Approve any new proposal by contractors for new access road, disposal site, or quarries (in addition to any necessary permit from local authorities).
• Report EMP implementation status to Project Office and prepare the environmental supervision statement during the construction period; and
• Approve invoices or payments.

**Independent Environmental Consultant (IEC)**

In order to minimize the environmental impacts during construction of the Expressway Project, PMU shall ensure that Project-specific monitoring and audit requirements are established for the Project. The monitoring and audit shall be carried out by an Independent Environmental Monitoring Consultant (EMC) appointed by VEC. This monitoring will be part of an Integrated Project Performance Review and Monitoring Package which will also include design review, quality control of technical, social, procurement as well as environmental issues. The EMC must perform the following duties:

- The EMC shall familiarize himself with the project works through review of the reports, including the project EMP.
- Review and audit in an independent, objective and professional manner all aspects of the EMP;
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers;
- Carry out random sample check and audit on monitoring data and sampling procedures, etc;
- Conduct random site inspection;
- Audit the EIA recommendations and requirement against the status of implementation of environmental protection measures;
- Review the effectiveness of environmental mitigation measures and project environmental performance;
- Verify the investigation results of any non-compliance of the environmental quality performance and the effectiveness of corrective measures; and
- Submit audit results to PEO, and SES according to EMP procedures.

**Compliance Framework Procedures**

The Contractor shall comply with the environmental specifications and requirements on an on-going basis and any failure on his part to do so will entitle PMU to impose a penalty. The DONRE and the World Bank jointly devised a compliance framework for the DQEP designed to motivate contractors to comply with the EMP. This compliance framework will be strictly enforced. For minor infringements—an incident which causes temporary but reversible damage—the contractor will be given a reasonable period of time to remediate the problem and to restore the environment.

If restoration is done satisfactorily during this period, no further actions will be taken. If it is not done during this period, PMU will immediately arrange for another contractor to do the restoration, and deduct the cost from the offending contractor’s next payment. For major infringements—an incident where there is long-term or irreversible damage—there will be a
financial penalty in addition to the cost for restoration activities. To minimize the damage, the restoration activities will be implemented without delay.

**EMP budget**

The estimated cost for environment management covers both the capital cost and recurring cost, including monitoring costs. Most mitigation measures have been included in project design and hence are part of Bill of Quantities. All of the cost has been included in the overall budget of the project. The total cost of the proposed project is $29,203 billion Vietnam Dong (1,500 million USD). The total estimated cost for the mitigation and environmental management is $105.00 billion Vietnam Dong, the mitigation and environmental management cost will be about 0.36% of the total. This estimate does not include the cost of all mitigation measures that are included in project design, the management of construction activities (camp, disposal sites, dust, traffic control, etc.), and the restoration of construction affected areas. All these measures have been included either in project design, and therefore are part of the bill of quantities, or included as environmental specifications to be implemented by the Contractor, and therefore included in construction costs. It is estimated that around 3 % of total construction costs (US$45 million) will be invested in environmental mitigation measures in the project as a whole.

<table>
<thead>
<tr>
<th>Item</th>
<th>Mitigation Measures</th>
<th>Quantity</th>
<th>Cost (Million VND)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land clearance</td>
<td>Residual unexploded ordnance clearance</td>
<td>70,000</td>
<td></td>
</tr>
<tr>
<td>Greening work</td>
<td>Planning trees in residential areas</td>
<td>5,800</td>
<td></td>
</tr>
<tr>
<td>Biodiversity Support Program</td>
<td>Support to the Phu Ninh Nature reserve</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>Noise reduction measures</td>
<td>Engineering solutions for noise mitigation (to be determined based on agreements with communities, consultation with affected communities on noise mitigation measures has been included in TOR for detail engineering design) with local communities on immediate noise mitigation measures</td>
<td>Unspecified</td>
<td>1,000</td>
</tr>
<tr>
<td>Cultural property</td>
<td>Test Excavation and Excavation of underground cultural relics according the Cultural relics report Implementation of chance finding procedures in EMP in construction phase (PMU)</td>
<td>-</td>
<td>17,400</td>
</tr>
<tr>
<td>Environmental management</td>
<td>Implementation of EMP in construction phase (PMU)</td>
<td>4 years</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Environmental supervision in construction phase by ECO</td>
<td>4 years</td>
<td>1,000</td>
</tr>
<tr>
<td>Environmental monitoring</td>
<td>Implementation of monitoring plan in construction phase</td>
<td>4 years</td>
<td>1,000</td>
</tr>
<tr>
<td>Item</td>
<td>Mitigation Measures</td>
<td>Quantity</td>
<td>Cost (Million VND)</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------</td>
<td>----------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Other</td>
<td>Contingency (5%)</td>
<td></td>
<td>4,925</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>~105.00</td>
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</table>

Table 5. Estimated Annual Environmental Costs during Operation Phase

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Cost (Million VND)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monitoring cost in operation stage</td>
<td>300</td>
</tr>
<tr>
<td>2</td>
<td>Environmental facilities operation, maintain and update</td>
<td>500</td>
</tr>
<tr>
<td>3</td>
<td>Staff salary of environmental facilities operation and maintain</td>
<td>500</td>
</tr>
<tr>
<td>4</td>
<td>Vegetation plant maintain</td>
<td>1,000</td>
</tr>
<tr>
<td>5</td>
<td>Contingency (5%)</td>
<td>115</td>
</tr>
<tr>
<td>Total (2 years)</td>
<td></td>
<td>2,415</td>
</tr>
</tbody>
</table>

6. Public Consultation and Information Disclosure

Two round public consultations were carried out in the early and final stages of EIA preparation. The public consultation involved directly affected inhabitants and local authorities in various manners such as public meeting, questionnaires, interviews, panel discussions and so on. Important information such as EIA TOR, the preparation status of the EIA and the public consultation plan has been disclosure by local media.

The results of the public consultation indicate that most of the affected people are supportive of the Expressway project and have a good understanding of the potential tourism stimulation and the benefits arising from the Expressway. Most of them are concerned about the policies concerning land acquisition, relocation and house demolition and thus expect a reasonable compensation for the loss due to land acquisition. The affected people also voiced their concern on the impact on the community isolation and the farmland irrigation and expect that appropriate mitigation measures will be adopted.

In compliance with EIA process requirements of Vietnamese government and the World Bank, the completed draft EIA and EMP reports as well as part of the public consultation records were distributed in public places along the expressway. In addition, EIA, EMP, and Resettlement Action Plans will be available at the World Bank’s INFOSHOP.