CHAPTER 11 STUDY ON SAFETY IN CONSTRUCTION

11.1 Safety Plan

11.1.1 Introduction

Safety is of paramount importance at all times and consideration of such shall take precedence over any and all other consideration. The Contractor shall throughout the execution and completion of the work, having full regard for safety of all persons entitled to be upon the site and keep the site and the work in an orderly state appropriate to the avoidance of danger to such person.

The Contractor shall comply with all safety and health legislation including, without limitation, the rules and regulation of Socialist Republic of Vietnam and the authorities having jurisdiction.

The Contractor shall comply with the Consultant's requirements insofar as displaying in each of its site offices, workshops, and cafeteria a copy of such safety and health posters and keeping on the site copies of safety and health regulations and documents. All regulations and documents shall be translated into languages which can be easily understood by the work force employed by the Contractor, its Sub-Contractors and their lower tie sub-contractors and such translations shall be displayed or kept alongside those in Vietnamese and English languages.

11.1.2 Objectives

The objectives of this Safety Plan are as follows:

a) Fulfilling the requirement of this policy and perform the work in the safest manner possible consistent together with good construction practices.

b) To have effective Safety Plan at each location where work is performed.

c) To prevent accidents, loss of production time, and damage to nearby establishment and equipment.

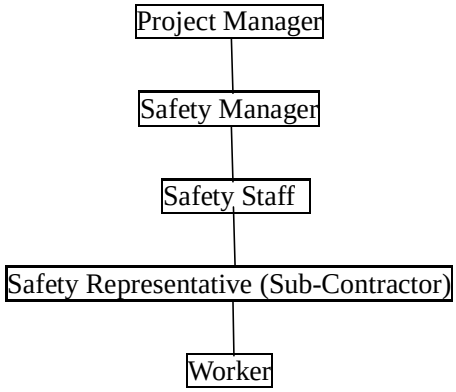
d) To promote safety consciousness in all management and construction staff.

e) To make every effort to achieve no accident through the proper planning and execution of safety for each project work item. The pre planning of safety will require the identification of present and future hazardous conditions in each operation to be performed on each scope of work.

f) To continue the development, motivate and updating safety education and training for all staff.

11.1.3 Safety Organization Chart and Responsibility

11.1.3.1 Safety Organization Chart



Source : Study Team

Figure 11.1.3-1 Example of Safety Organization Chart

11.1.3.2 Safety Responsibilities and Duties

a) Project Manager

The Project Manager is responsible for the establishment of the Safety Plan. This Plan shall be in accordance to our policies with the recommendations, Construction Manager and the Safety Manager. Accident prevention procedures will be included in all activities by the application of sound safety planning. Specifically, the Project Manager shall set the pace for the Safety Plan with the Safety Manager and shall act as follows:

- Direct the activities of the Safety Manager as the Project Manager
- Promote full support of the Safety Plan
- Taking a measure of accident prevention by coordination throughout the works.
- Site Patrol
- Instruction and Support for Safety Education of Workers
- Delegate responsibilities for the various safety functions and authorities with safety promotion at all levels of the Project
- Maintain active involvement in the Project's safety status and safety morale
- Ensure prompt investigation action on any accident investigations with proper reports completed and follow-up action taken.
- Manage safety Manager's work to be properly conducted based on the Safety Plan and if necessary to revise it.

b) Safety Manager

The Safety Manager defined in this Safety Plan means "Safety Officer" defined in the General Specifications.

The Safety Manager is responsible for the administration of the Contractor's Safety Plan. The Safety Manager reports to the Project Manager and shall actively promote Safety Plan to all levels within the project. As administrator of Safety Plan, he shall function as the Safety Coordinator, advisor and consultant to the Project Manager and supervisory personnel in

establishing and maintaining compliance with Safety Plan. Safety Manager shall be a suitable qualified and experienced person with complete involvement with the safety activity throughout the period of this Project.

The Safety Manager's specific responsibilities include the followings:

- Coordinating the site safety efforts with the Project Manager and the Client's safety requirements.
- Keeping the site management and the Project Manager informed of the progress of Safety Plan and making recommendations for site related safety improvements
- Administer site safety policies and procedures within the framework of the Contractor's Safety Plan particularly emphasis on potential hazardous operations.
- Proposing Plan to implement the accomplishment of short and long range of site safety objectives and to motivate all employee participation to obtain these objectives.
- Preparing, submitting and distributing the required safety and injury reports with records kept in his file
- Maintaining a continuing inspection program and reporting the findings and recommendations to the Project Manager/Managers/Sub-Contractors for prompt corrections.
- Conducting and/or participating in job safety meetings.
- Supervising safety trainings in accordance with the site requirements.
- Coordinating the first aid and rescue services on site with certification to ensure the appointed employees are equipped with proper first aid know-how in the absence of a nurse.
- Establishing a fire prevention plan with training on the actions and participation of employees for designated duties such as informing the Fire Brigade.
- Investigating all accidents, injuries, fires, property damage and other safety related incidents and prepare/submit the required reports.
- Identify the classification of injuries if they are occupational or time losing, disabling injuries and take the follow-up actions on the control of injury cases with appropriate accident forms to be filled.
- Assisting Sub-contractors with their Safety Plan to meet the various site safety requirements.
- Notify the Project Manager of all safety inspections with any action to be taken.
- Evaluating the needs and then, request of safety, first aid and fire protection equipment needed on the job. Ensure that safety equipment is maintained in good condition at all times.
- Check/provide safety approval for new tools and equipment, including tools needed for specific job.
- Effective display and maintain publicity of news of safety on the site bulletin boards, posters, safety signs, banners and distribution of safety literature to insist a good and positive attitude on safety environment amongst the people of all levels on site at all times.
- Administer and/or monitor the site hazardous waste plan.
- Administer and/or monitor the Occupational Safety Act and the hazardous materials information system regulation on worksite.
- Attend pre-job meetings with Sub-Contractors and ensure the Sub-Contractors comply with the Contractor's safety policies and procedures during their work in the Project.

- Plan the site Safety Plan timely to achieve the required site safety policies and procedures accordingly.
- Maintain an updated knowledge of all safety policies and procedures with knowledge of state provincial and local safety laws and regulations.
- Maintain updated knowledge of state-of-the-art concepts of accident prevention and continually contributing to upgrading the site safety effort.
- Execute effectively on any other assignments delegated by the General Superintendent.
- Records to be prepared and maintained by the Safety Manager and the Safety Staff, and communication procedures to be adopted by the Safety Manager such that the Consultant and others associated with the Works (e.g. Sub-Contractors and their lower-tier Sub-Contractors) are kept fully informed on matters relating to site safety and industrial health regulations throughout the period of the Contract.
- The Safety Manager shall maintain a daily site diary, such diary comprehensively recording all relevant matters concerning site safety, inspections and audits, related incidents and the like. The site diary shall be available at all times for inspection by the Consultant.
- Review Method of Construction prepared by the planning section (by Construction Manager) and requiring, if necessary, revision of such Method of Construction so as to comply with the project Safety Plan.

c) Safety Staff

The Safety Staff shall be capable of assuming the duties and functions of the Safety Manager as contained in the Safety Plan whenever necessary. Safety Staff also is responsible for the administration of the Contractor's Site Safety Plan.

d) Construction Manager

The Construction Manager is the key figure when it concerns the monitoring of the contractual obligations of the various contractors on the job. One of these obligations within our total plan is safety.

- The Construction Manager is responsible for the training and directing of site engineers and office engineers which includes their safety responsibilities.
- The Construction Manager shall be prepared to accept the responsibility for administering the site safety plan during the absence of the Safety Manager from the project.
- The Construction Manager will coordinate activities with the Safety Manager regarding Sub-Contractor performance and take whatever steps are necessary for proper safety compliance.
- He shall assist the Safety Manager on problems of a technical nature.

e) Site Engineer

The Site Engineers are directly responsible for the control of site activities of this Project. They are the key personnel in the implementation and maintenance of an effective job site Safety Plan, assisting the Safety Manager for a good Safety Plan are established by the Safety Manager and Construction Manager. The Site Engineers will be directly responsible for the success of the Safety Plan as they are in direct contact with the Sub-Contractors. Their abilities to instill good safety attitudes to the Sub-Contractors will reflect the success of the Safety Plan on site.

Site Engineers are responsible for a wide range of activities. They must plan their safety activities with care and good effort as they have to carry out other portions of their work plan such as cost, manpower allocation and scheduling of the respective work within this Project.

The specific safety responsibilities of Site Engineers include, but are not limited to, the following:

- Review all work and all new personnel for safety needs. Complete familiarization with safety requirements is an integral part of the total job responsibility.
- Continual monitoring of the safety attitudes of Sub-Contractors and their responsibilities towards the safety of their trade and participations in the job safety effort.
- Enforce on compliance with all established safety regulations before and during performance of the work.
- Conduct safety inspections and make corrections on a daily basis.
- Ensure that proper trade safety training is provided.
- Initiate plans prior to the start of work to supply the tools, materials, and equipment necessary to do the job safely.
- Assist with accident investigations to ensure proper reporting and documentation with prompt corrections made after accident and to prevent any recurrences.
- Coordinate planning and work activities with other supervisory personnel performing work within, or adjacent to, their assigned work areas.
- Site Engineers who have responsibility for Sub-contractors' operations, will monitor Sub-contractors' compliance with the site Safety Plan. This activity will be coordinated with the Safety Manager.

f) Sub-Contractor's Responsibility

- To ensure that all the respective agents and employees conform to the contents of this Safety Plan.
- To supply employees with appropriate safety equipment and appliances when working.
- To attend Contractor's safety meetings, when called upon, and to conduct safety meetings for all his employees.
- To rectify unsafe conditions and hazards when required by Contractor's Safety Manager and/or his staff.
- To maintain good housekeeping.
- Report all accidents to the Contractor's Safety Manager or his staff immediately.
- To seek first aid for all injuries at designated first aid station.
- To be entirely responsible for the implementation of safety measures and full compliance with regulations of his company in respect of both himself and all his employees.
- To accept this Safety Plan and perform the work accordingly. In case a Sub-Contractor wants to apply his own Safety Plan, the plan should be reviewed and approved by the Contractor's Safety Manager.
- To ensure that all staff and worker engaged on the project are in sound health and capable of carrying out their duties.

g) Safety Representative (Sub-Contractor's Staff)

The Safety Representative is key people on construction site to prevent accident from happening. They are the personnel at the front line, directing work activities whereby they are in control over

the workers for the respective works who are likelihood victims from potential accident. Therefore, the Safety Representative has to know and be responsible for the followings:

- Check their workers at the start of work daily to make sure these workers are ready to carry out their assigned tasks from their knowledge/information under their charge and also the physical and mental state of each worker daily.
- Observe and monitor continuously all workers on their knowledge and capabilities on their works and safety issues.
- Follow-up continuously site inspections to ensure safety instructions are carried out such as personal protective equipment required to be used in proper orders.
- Give specific safety instructions with each job assignment according to each worker's knowledge of job with related impacts to the environment and safety.
- Ensure workers under their charge, use the proper well-maintained tools and equipment for each job
- Check for any incident at every end of each work day and report to Safety Manager whenever necessary
- Inform Safety Manager if unsafe acts or conditions found which they are not responsible

h) Operators/Workers

Suitably qualified personnel shall operate all construction plants and equipments used on or around the Site.

Operators or workers working with tools, plant, equipment, etc. are responsible for their safety with others working around them. Therefore, there should be sufficient instructions provided to them. They shall be responsible for the following:

- Use proper, correct and well-maintained tools and equipments for the job
- Use protective measures such as safety helmets, safety boots, goggles, safety belts, etc. must be worn whenever required.
- Maintain and keep tools in good condition at all times
- Report defects in plant or equipment or any potential risks to safety to immediate superior.
- Avoid improvising work which entails unnecessary risk
- Refrain abuse of welfare facilities
- Suggest ways for eliminating hazards

11.1.4 Safety Training

All personnel who intend to work in the construction site are required to attend a safety training beforehand. The training has to be conducted by an authorized Safety Manager (The Contractor / Authority / Sub-Contractors)

Monthly safety training / lecture for workers must be held at project site regularly. The time of monthly safety training shall be decided by Safety Manager.

The objective of safety training is to equip staff at all levels in the organization with the knowledge, skills and attitudes that will enable them to perform their duties in a manner that does not represent a safety hazard.

A "Safety Training Record" shall be made after training.

11.1.4.1 Safety Orientation and Training

The Safety Education shall be enforced for workers throughout the daily activities, while it raises safety consciousness of workers to prevent accident.

- Orientation for the Newcomers: Newcomer shall have an orientation directed by the Safety Manager/Staff or group leader of the Sub-Contractor to be familiar with the working atmosphere.
- Education for a New Activity/Method: A group leader of the Sub-Contractor shall give a description of an activity with tips of safety matters to eliminate any unsafe factors.

11.1.4.2 Safety Training on the Job

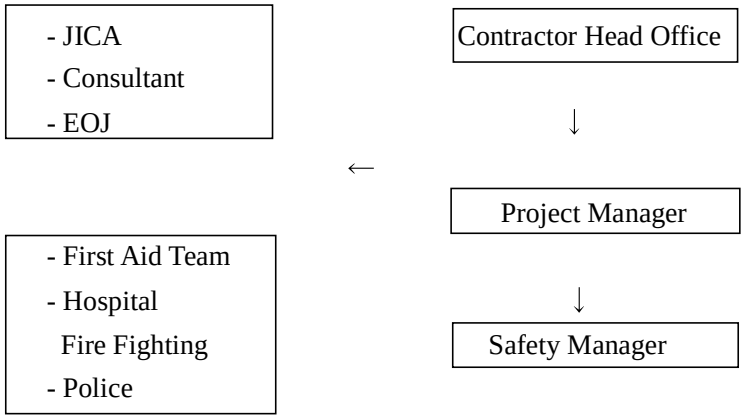
- Safety meetings scheduled on regular basis shall be held at least once a month for all Site Engineers on the Project to review past activities, to plan ahead for new or changed operations and establish safe working procedures for anticipated hazards.
- Everyone required entering confined or enclosed spaces or atmospheres with immediate danger to life, shall be instructed as to the hazards involved and precautionary measures to be taken. Training by qualified person on the use and care of such emergency and protective equipment shall be conducted. All staffs of the Contractor shall comply with all specific regulations in dangerous or potentially dangerous areas.
- All employees who have to handle poisons, caustic or other harmful substances, are required to receive instruction regarding the safe handling and use. Information and knowledge on the potential hazards, personal hygiene, protective equipment and other personal protective measures involved or required.
- Personnel who may be required to use the rescue or life saving equipment must be familiar with the locations of the equipment and knowledge with training on using them.
- Personnel required to provide or receive signals must be familiar with the proper use of the signal system.
- Personnel required in handling or using flammable liquids, gases or toxic materials must be trained in handling, storage and usage of it with specific protection requirements.
- Whenever the employees are likely exposed to extreme temperature or severe atmospheric pressure, instructions on recognition, potential hazards, and avoidance of injury and first aid procedures to be applied for any incident.
- The Contractor shall provide a trained fire fighting team on site if required by Authority, to ensure the protection of life and property.
- The Contractor shall provide training on the handling of emergency situations that may arise from the use of equipments in the Project.
- Instructions to use and operate any heavy equipment will be given by qualified representative of the Contractor and personnel required to use these equipment shall demonstrate their proficiency in the operation process.
- Any personnel required working with energized power and transmission lines shall be instructed and trained in the live line bare-hand technique and safety requirements before allowed to use.

11.1.4.3 Special Safety Training

- Objective: Specific Safety training for Workers to be in service for specific tasks that are considered as offshore and high-positioned work.
- Period & Time: Before work start (Required time will be decided by Safety Manager subject to work condition)
- Instructor: Safety Manager
- Contents: Work procedure, characteristic of work, potential risk of hazard, safety requirement and emergency measures

11.1.4.4 Emergency Communication

The emergency communication system shall be established and posted at the convenient access-ways, in all site offices, in all security towers/gates, medical center, in order for speedy rescue of accident victims, timely communication with local fire brigade office, prompt response from first aid staff, and the soonest possible evacuation of the workforce if necessary in case of serious emergency.



Source : Study Team

Figure 11.1.4-1 Emergency Communication Network

11.1.5 Safety Meeting

11.1.5.1 Monthly Safety Committee Meeting

The Contractor's Safety Committee Meeting will be held at a monthly basis. The attendees for this meeting shall be the Client, the Consultant, Project Manager, Deputy Project Manager, Construction Managers, Safety Manager, Safety Representative of the Sub-Contractor and relevant staff with the agenda of this meeting but not limited to them, as follows:

- Safety target for the month (topics depend on major work for the month)
- Detailed countermeasure for safety target in month
- Summary of monthly safety report
- Monthly safety patrol
- Safety key point for each work item
- Any other matters related to Safety

11.1.5.2 Weekly Safety and Schedule Meeting

Weekly Progress meeting will be held in every week to check the work progress and site safety conditions. This meeting will be conducted by the Consultant, Construction Manager, Safety Manager and Safety Representative on a regular basis to address the safety related matters with the workers. Issues will be raised or identified during the safety inspections and reminded at the weekly progress meeting. Safety Manager will prepare the items for these safety meeting and record and filing meeting memorandums. Site Engineers will take the necessary action for those issues mentioned at these meeting to ensure conformity of such issues are carried out.

11.1.5.3 Daily Meeting

Daily meeting will be held every morning before start of work. At the meeting, everybody do the radio exercise for the Construction Manager to inform schedule and Safety Manager communicate about safety standard for all staff and remind safety matters at respective job sites.

11.1.6 Personal Protective Equipment

11.1.6.1 Personal Protective Equipment

The safety equipment, rescue apparatus and protective clothing which will be required for the Works, including the quantity, sourcing, standards of manufacture, storage provisions and means of ensuring proper utilization by all workmen and staff employed directly or indirectly by the Contractor and repair to or replacement of damaged equipment. Such equipment shall include, but not be limited to, goggles and other eye protectors, hearing protectors, safety harnesses, safety equipment for working underground and in the confined spaces, rescue equipment, fire extinguishers, first aid equipment, lanyards, hard hats and, where appropriate, associated shock absorbers, chest harnesses. Personal Protective gears like protective footwear such as safety boots, rubber boots and gloves shall be worn by employees engaged in works that require such protection. All points of entry for hard hat (safety helmet) must be identified with signs. Visitors to site must also adhere to the safety requirements at site.

- Protection to eyes and face for work that may cause injury due to physical, chemical or radiation agents.
- Reflective or high visibility material should be worn for staff exposed to vehicular traffic, for example, signal men, spotters, inspectors, servicemen, etc.
- Protective nets for overhead protection shall be provided wherever the public or workers are subjected to injury due to falling objects.
- Work near protruded vertical reinforcing steel shall not be permitted unless provision to eliminate possible hazards is carried out.
- Protection to ears with ear plugs or ear muffs are required for unusually noisy working areas
- Insulated personal safety gears such as insulated gloves, insulated line hose, etc. to be provided for electrical staff.

11.1.6.2 Specification

Specification for the common personal protective gears is shown below:

- Any headgear
- Eye/Face Protection
- Ear Protection
- Hand Protection
- Footwear Protection
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11.1.6.3 Other Safety Equipment

a) Safety Nets

- Workers in unguarded work places over water, machinery, dangerous operations or where 7m above the surface will be protected by safety nets. Nets shall be installed as close under the work surfaces as practical but in no case more than 2m below such work surface. Nets shall be hung with sufficient clearance to prevent contact with the surfaces or structures below.
- It must be emphasized that safety nets are to be used in conjunction with handrails/barricades. They are not the primary means of preventing workers and or objects from falling. Kick-boards on scaffolding, safety harnesses, guard-rails etc., are primary means of preventing falling items.
- Where traffic or workers are permitted to be under a work area, safety nets may be utilized to satisfy the overhead protection requirement.
- Nets shall extend 2m beyond the edge of the work surfaces where workers are exposed.
- The maximum mesh size of nets shall be 10cm x 10cm. The preferred size is steel mesh or grills with no bigger spacing than 5cm x 5cm.
- Forged steel safety hooks or shackles shall fasten the net to its supports and connections between net panels shall develop the full strength of the net.
- Nets shall be inspected daily for cuts and damage from abrasions, chemicals, or heat. Repairs shall be made before work above work the net is resumed.
- Debris shall be removed from safety nets at least daily and combustible materials shall be removed above the net.
- To prevent small objects from passing through the safety nets, if they are used as overhead protection, fine woven mesh may be added on top of the rope or steel net.
- For overhead protection where objects can fall from more than 5m or any hot-works are carried out above, safety nets must consist of steel mesh with plywood and metal sheeting. The thickness of both will depend on the height from which objects can fall,the type of objects expected, and the type of area / access covered.
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b) Safety Belts

- Safety belts attached to an independently anchored line or other secure point/rail must be used as follows;

  - Working from scaffolds, platforms or other surfaces which do not provide sufficient protection against falls 2m or greater.

  - Working on any roof with a slope greater than one in four, or on any sloping roof that is wet.

- Working within 2m of any roof edge
- Being lifted or working from a basket suspended from a crane.
- When working in any elevated work platform basket

- Safety belts and harnesses should be visually inspected for defects prior to each use and return to work supervisor if found defective.
- Hardware for lineman's body belts, safety straps, and lanyards shall be drop forged or pressed steel and have a corrosive resistive finish and surfaces shall be smooth and free of sharp edges.
- All safety belts/safety harnesses/ropes/shackles etc. must be checked and approved by Safety Staff before use.
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c) Equipment on the Sea Works

It shall be watched over anyone not entering in the sea during constructing. It is prepared these equipments for safety as below when works will be conducted on the sea.

- Rescue Boats
- Safety Net
- Warning Signs
- Floating Buoys and Navigation Lights
- Life Saving Equipment
- Others

11.1.7 Access Control on Site

11.1.7.1 General

As access into work site by outside parties due to wide range of construction activities, the Contractor shall control the access to these working areas to prevent unexpected accidents.

Detail of this protection plan will be submitted to the Consultant on Method of Construction for temporary access road and yard.

11.1.7.2 Boundary Demarcation

a) Provisional Road Width

The Provisional Road Width shall be demarcated the boundary of the worksite and on existing roads with safety board, informing the public/outside parties on the Contractor's worksite.

b) Confined Area

These confined areas where the construction, mechanical plant, material stockyards, etc. are located shall be clearly marked with red flags for the attention of the public/outside parties. Handrails, barricades, wall and others will be installed along the boundary of these confined areas to prevent unforeseen/unexpected accidents such as falling. Lighting system shall be equipped at the handrails for identification of these confined and dangerous areas from the public. Fencing shall be erected along the boundary of the camp yards at office sites to ensure good security.

11.1.7.3 Site Security

All sites have to allocate designated site entrance to control the workers and vehicles entering to site. At the gate, a security guard has to be assigned to record the workers and vehicles entering the site. The rest of the site boundary has to be hoarded to ensure that unauthorized persons have no access to site.

a) Security Guards

Security Guards shall be employed to check/inspect on all accesses into the worksites for security purposes. They shall be stationed at the designated locations to patrol the site security.

b) Security Gate

Gate shall be built at the designated position of the boundary to control access in and out of the office site.

11.1.7.4 Visitors Come to Project

- To be introduced with enough information and site regulations.
- To be provided with helmet, safety boot, and safety gloves before visiting the site.
- Visitors must comply with site regulations.
- Site engineer must prepare good condition for the visitors to come to the site.
- Registering the visitors at gate point whenever entering and leaving the site.

11.1.8 Safety Control and Activity

11.1.8.1 Method Statements and Job Safety Analysis

All work procedures shall comply with local code of practice. In general, if there is a schedule to perform work on site, Sub-Contractors are to submit Method of Construction and Job Safety Analysis to the Contractor for review and approval.

The documents will be reviewed by the Contractor's site supervisor in charge, and be submitted to the Contractor's Project Manager for approval. In the event the Contractor disapprove any of the above documents, the relevant Sub-Contractors are to resubmit the above the documents again after amending points highlighted by the Contractor.

Upon approval Sub-Contractors are to brief their works via Toolbox meeting of the job safety requirements based on the approved Job Safety Analysis.

JSA and Method of Construction are to be prepared by site personnel who are going to perform the job indicated.

11.1.8.2 Table of Safety Activity

Table 11.1.8-1 Example of Table of Safety Activity

Item	Day	Time	Attendance
Daily **********	**********	**********	**********
Weekly **********	**********	**********	**********
Monthly **********	**********	**********	**********
Occasionally **********	**********	**********	**********

Source : Study Team

11.1.8.3 Safety Control Facilities

The Contractor shall be responsible for the protection of the Site, and all work, materials, equipment, and all existing or completed facilities thereon, against vandals and other unauthorized persons.

Safe storage yard in the site shall be prepared by the Contractor. No private property shall be used for storage/yard without written permission of the Client. For aggregate stockpile it will be raised and sloped to the center as required so as to provide proper drainage of excess moisture. Fence and safety warning sign shall be installed and visible to the public.

For Utilities affected by construction proper precautions shall be installed such as warning devices, barricades, fences and other national safety regulations. Work execution which required removal of the existing utilities shall be well coordinated with relative Authority and timely coordination with the Consultant. After completion the utilities shall be restored properly.

Maintenance works shall be executed with the same safety condition and plan mentioned in this Safety Plan. All works shall be executed in the properly manners to prevent accident and damage to the works, other property and third party.

11.1.9 Safety Inspection / Remedying Defects

11.1.9.1 Objectives

Finding unsafe conditions and work practices by means of inspection and promptly correcting them. This is one of the objective and one of the best methods for management to prevent accidents and safeguard employees. This includes the safety and health of workers working in the work site.

“To disseminate the Safety Plan to all staff, Sub-Contractors and workers”

The Contractor shall ensure that all essential inspections are being carried out in the work site, in order to ensure the safety and health of its workers and Sub-Contractors’ workers.

11.1.9.2 Standard Inspection

a) General

- All plant and equipment shall be maintained in safe and sound conditions and operated according to the rules and regulations of Socialist Republic of Vietnum and the authorities having jurisdiction and the manufacturer's or supplier's instructions prior to utilize on site.
- Regular inspections and servicing at regular basis as required by the local legal requirements or as that recommended by the manufacturer or suppliers must be adhered to.
- Electrical plant and equipment shall be inspected by responsible Electrician at a regular basis but not later than three (3) months between inspections or in other cases whenever repair due to breakdown is required.
- Any electrical plant except for the submersible plant when immersed in water shall be inspected by the Electrician before reusing it.
- All power plants including crawler cranes or any lifting devices must be operated by trained and competent person. Work schedule for each operator must be recorded and kept by him for identification whenever required. Signal men and to guide lifting operations shall be trained and certified.
- Use the correct machinery/plant for the work which it is designed to be used.
- Particulars of responsible person, operator and company of each plant and equipment are required to be pinned on Equipment Monitoring Board or other method for identification.
- Safety equipment including scaffoldings, ladders, working platforms, access ramps, access and other lighting and warning signs must be inspected daily by responsible and competent person.
- Wire ropes and slings for lifting equipment to be kept in good condition.
- Record must be kept for all inspections carried out.

b) Safety Devices

- Protective guards to be fitted to gears, shafts, pulleys, lifting devices, etc. to prevent contact to any person when operated.
- Proper ratchets or other positive locking devices for drums on load-hoisting equipment are required.
- Stoppers are required on hook of crane to prevent rope from slipping off.
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c) Crane Inspection and Testing

Service Cranes used shall be maintained in sound condition. Such crane shall be satisfied as follows as inspected:

- Engine condition
- Hoist condition
- Boom condition
- Hook condition
- Out rigger condition
- Safety switch
- Lifting capacity table

- Load indicator
- Boom angle indicator
- Sling belts
- Chain, wire rope, nylon slings
-

d) Tools and Equipment Inspection

All tools (electric, explosive, hydraulic, pneumatic, gas) and equipment especially for electrical distribution, welding, oxy-acetylene cutting, grouting machine, girder launching, jacking, hoisting, and drilling shall be inspected. After a successful inspection an inspection tag showing records of: date of test, name of tester, name of company, expiry date will be attached to the equipment. Tools and equipment that fail inspections will be removed from service.

e) Site Inspections of Tools and Equipment

During the daily and weekly safety inspections on site by the Safety Staff, special attention will be given to: the checking of equipment tags, the observation of correct use of equipments (including the use of safety gear), the condition of hand tools, and to the condition and use of non-mechanical equipment such as ladders and scaffolding. Any equipment in poor condition will be removed from service by the Safety Staff, without any further warning to the Sub-Contractor. Larger equipment that cannot be easily removed will be shut down if found to be in poor condition.

f) Inspection of Temporary Structure

- Temporary bent structure; Contents of the check sheet should be inspected weekly by differential leveling or visual. And if disaster like a typhoon, an earthquake or a heavy rain occurred, it should be inspected with inspection check list.
- Scaffolding; It should be inspected visually after erection or before use or after any disaster such as typhoon, earthquake or heavy rain.
- Safety Net; It should be visually inspected before use or every month at the latest.
- Provision against Ground Subsidence; In case of occurrence or apprehensive ground settlement, other temporary bent structure shall be erected on additional improved ground, additional pile foundation and so on instead of original location.
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11.1.9.3 Safe Operation

a) Lookout Men and Flagmen

Whether lookout men and flag men are required for the protection of such traffic the Contractor shall provide such lookout men and flagmen that are necessary for safety.

b) Maintenance of Facilities

Where the construction work interfere with road traffic, the Contractor shall provide and maintain all necessary barricades, suitable and sufficient light, danger signal and other sign, shall provide a sufficient number of watchmen and shall take all necessary precautions for the protection of the works and the safety of the public.

c) Safety Housekeeping

- Daily Safety Housekeeping Cycle

Keep the site in a clean, tidy and sanitary condition. Rubbish shall be cleared daily and not allowed to accumulate on site and checking of safety facilities at every end of each work day before leaving the site shall be performed by all workers and checked by their Site Engineers.

The night shift work following the earlier day work requires the concluded work done schedule with the daily safety duties carried out.

- Weekly Safety Housekeeping Cycle

Cleaning of work places by all workers shall be carried out after the group discussion before the start of that day's work.

- Monthly Safety Housekeeping Patrol/Cycle

Monthly Safety Patrol attended by representatives of the Contractor and the Consultant shall be carried out with reports prepared by the Safety Manager from these patrols. These reports shall be issued to all attendees at the Safety Patrols and also to discuss any issues at the Daily Meeting for follow-up actions.

The monthly patrol shall be held at end of each month as part of the Monthly Safety Committee Meeting whereby discussion on suggestions for any site safety/work schedule relating to the patrol can be taken into action for the following month.

d) Working at Height

Where works are to be carried out at extreme height, scaffolding erection for works will be carried out at elevated area. Safety concerning the erection, maintenance and dismantling of these scaffoldings is mandatory to ensure safe work at this location.

- All scaffoldings to be inspected/checked at regular intervals as required by the manufacturers or the legal requirements for well-maintained condition.
- Trained and competent workers with supervision for this work.
- Any defective parts of the scaffolding materials shall be removed from the storage area.
- Working platform shall be sufficiently strong, properly secured and not overloaded to prevent falling objects.
- Erect barricades or overhead shelter wherever practicable to prevent person from being struck by falling objects. Open-sides/working platforms higher than safe allowable height may be properly barricaded.
- All personnel working at heights have to wear their personal safety gear at all times.
- Routine checks on erected scaffoldings e.g. daily site check, monthly safety patrol, etc. shall be inspected such scaffolding to ensure the tag of records of checks conducted as per requirements.
- Safety nets should be hung around the scaffolding if exceeding the safe allowable height to prevent any falls of materials.

e) Working Around Equipment/Machineries

Limitation of working space for works to be carried out within construction site may affect movements of workers. As a result, accidents may happen when the machineries accidentally knocked/hit workers working too close to them. If such situation arises, the followings must be observed:

- Keep a safe distance depending on the type of work to be carried out by the workers within close vicinity of machineries. Site Engineer should inform such requirements to the workers and operators of machineries.
- Appoint signalmen/riggers to control the movement of the machineries during these periods.
- Do not store too many unnecessary items at this congested area. Housekeeping is required.
- If this situation is dangerous and congested, review work schedule and carry out work in sequence.
- Reflective personal vest/clothing provided for better visibility

f) Pressurized Equipment

- All pressurized equipment and systems shall be approved, tested and equipped with safety or relief valves and pressure gauges.
- All pressurized equipment or systems confirmed to be unsafe shall be tagged "OUT OF SERVICE", "DO NOT USE". Use of such unsafe equipment is strictly prohibited.
- Pressurized equipment shall be operated and maintained only by qualified and authorized personnel.
- Safety devices shall not be removed except to make repairs. Compressors and related equipment shall be correctly placed in order to provide safe access to workers to operate, maintain or repair.
- Safety valve setting shall not exceed the maximum working pressure.
- A stop valve shall be installed on each outlet for air hoses. The stop valve on the air hose shall be closed when a tool is being changed or repair work is in progress. A drain valve on the air received shall be opened to drain the accumulated oil or moisture before commencing work.

g) Hand Tools

- General

- All personnel who use hand tools must be trained properly to ensure safe operation and use at all times.
- Hand tools shall be kept in well-maintained condition/places and use them for the work which they are designed for the purposes.
- Inspections at periodic interval shall be carried out to assure safe operating conditions.
- Defective tools must be placed away for repair and not to be used.
- Tools that are not required at elevated position shall be secured or placed in holders.
- Transfer tools/materials from one location to another by throwing or dropping to lower levels are prohibited.
- Tools of non-sparking nature shall be used where hazardous vapor exist as it may initiate a fire or explosion. Power tools shall be operated only by appointed personnel.
- Flexible rubber cable shall be used for all portable electric tools. Waterproof connectors shall be used for cable connections.

- Grinding Tools

- Cracked or damaged grinding wheels of tools shall not be used.

- Pneumatic Tools
  - Compressed air shall be exhausted from the line before disconnecting tools from the line.
  - Air hose shall be labeled with maximum safety working pressure as recommended by the manufacturer and this stipulated pressure shall not be exceeded.
  - Hoses shall not be left on ladders, steps, scaffolds or walkways.
  - Compressed air to blow dirt from hands, face or clothing is prohibited.

h) Welding and Cutting

- General
  - All welding and cutting apparatus shall be inspected daily by personnel in-charge. Defective apparatus or equipment shall be replaced or repaired.
  - Combustible materials, equipment such as gas cylinders, rubber hoses and debris shall be removed or shielded from heat, sparks and slag from welding or cutting.
  - Welding or cutting in an area where flammable vapor may be present shall be carried out carefully, under the supervision of Safety Staff after confirming with the person in-charge of the gas detector that the area is safe.
- Welding Works
  - Welding machines to be placed at least 150mm above the ground to keep them in dry condition.
  - Welding machines shall be placed at level surface and secured with a suitable platform to keep them in a horizontal position.
  - All electric welding machines shall be effectively grounded. The ground lead for the welding machines shall be mechanically strong and electrically adequate for the service required.
  - Approved connectors shall be used to connect the welding cable between the welding machine and electrode holder.
  - Only electrode holders that have passed the inspection shall be used.
  - Welder has to leave the work site whenever his welding work is suspended. He has to turn-off the power and disconnects the welding rod from the holder.
  - All personnel located within 30m at electric welding operations shall be screened from the welding flash.
- Gas Works
  - Cylinders shall be stored in well-ventilated location/area and shield from direct sunlight with steel plates or incombustible canvass. Cylinders in service shall be secured in portable racks or handcarts.
  - Cylinders shall be transported by crane, hoist or derrick in cradles, nets or skid pans but not in slings or chains or by magnets.
  - Cylinder caps shall be placed in the proper area where they are in storage or during transfers and whenever the regulators are not in place.
  - Acetylene cylinders shall be in an upright position during use and secured to prevent displacement.
  - Cylinders for use underground must be equipped with flash back arrestor. Otherwise, it is prohibited to use them in underground.
  - Oxygen cylinders and fittings shall be kept away from oil or grease. No oil-greased hands or gloves are allowed to handle these cylinders. Tags indicating FULL or EMPTY must be carried out. Empty cylinders shall be returned immediately to storage areas.

- All connections between hoses, hose and torch and hose to regulator shall be tightened rigidly with hose bands.
- Pressure gauges with cracked glass or damaged regulators shall not be used and will be replaced.
- Before start of work, leakage test shall be made at all connections with soapy solution.
- Torch valve shall be closed and gas supply shall be shut off whenever work is suspended.
- Cylinder's block valve shall be closed after work is completed. Regulators and hoses shall be removed and put in the storage location and cap to be replaced properly.

i) Lifting and Hoisting Equipment

Prior to use on site, all lifting and hoisting equipment shall be tested to an approved safety margin. The operation of this equipment shall be noted as follows:

- Lifting of loads over public areas is prohibited. Clearing of workers below the lifting operating area is required.
- Do not operate lifting and hoisting works during inclement weather.
- Do not overload beyond the allowable safe working load.
- Outriggers are fully extended.
- Any sudden movements are to be avoided.
- Loads to be securely slung and no falling.
-

j) Working with Electricity

Only certified and qualified personnel shall be authorized to carry out electrical works.

- Prior to carry out maintenance and inspection of electric installation, turn off the main switch and put warning sign "UNDER MAINTENANCE"
- Always clean and remove anything around the switch area that will cause hindrance for the operation of the switch.
- Never directly touch the dangerous area of the electrical lines and devices.
- Never leave any flammable and explosive materials around and near the dangerous area of electrical devices such as switches, electrical motor and boards.
- After the completion of work or at the end of the day, turn off the switch whenever it is not necessary to leave the current running. Always save energy.
- Adequate protection such as gloves and safety boots should be worn especially at the connection points to avoid electric shock.
- If power cut off during the execution of work, immediately turn off the switches.
- Use explosion proof equipment whenever working in a place where leakage of a combustible gas is possible.
- Always make operational test on the circuit breaker equipped on the electric equipment before starting daily operation.
- Electrical machines must be grounded in order to leak current. A ground is especially important for electric equipment that is often transported (like welding machines) and portable electric tools.
- Testing, inspection and maintenance and electric installations shall be done by a certified electrician.

k) Working on the Sea

Special attention shall be made to the existing central navigation channel of the sea so as for ships and boats to make safe and smooth navigation, clearly guiding the course with floating buoys and other guiding devices. Ferry course of existing ferry shall be carried out also so as not to disturb the work operations.

l) Working Under Water

All regulations under the jurisdiction of Socialist Republic of Vietnam shall be followed upon working under water including the below stated safety precautions:

- Always clean the work area.
- Material and equipment needed must be in order
- Proper pumping out water, if necessary, must be implemented
- Strictly wear the Personal Protection Equipment requirements
- Whenever electric power is in use in wet conditions, electrical rules must be seriously followed and executed.
- Check everything especially lines, switches and connection of electricity.
-

m) Handling Dangerous Materials

- Transportation

When hazardous materials or chemical is going to be encountered, always read the Material Safety Data Sheets first and prepare all necessary equipments or materials that are required in the event of an emergency.

- Strage

- Always clean the work area and its surroundings. The materials shall be always arranged in orderly manner within the project site. Make sure that there is no fire or sparks from its surrounding. Work in the vicinity at 3m away from the passage and smoking place.
- During the operation, the flaw detecting agent and gas will spurt out together. Since these substances are highly inflammable, keep all sources of fire out of the work area. Strictly observe the “NO FIRE” rule.
- If the temperature of the materials being checked is over 45 degree, do not use the flaw-detecting agent.
- Store the materials for the color check in a tool room or grease room. Never remove the materials without authorization.
- Make sure the temperature in the storage area never exceeds 45 degree.
- Do not store the materials in a place exposed to direct sunlight.

- Construction

- Wear Personal Protective Equipment equipment such as goggles and gas mask and etc, if use gas, thinner etc.
- If the flaw-detecting agent gets on your skin, wash it off immediately.
- Use rubber gloves if you have allergies or if you have cut on your hand.
- If the flaw-detecting agent gets into your eyes, wash it out immediately with a large volume of water and consult a doctor.

- If necessary to work in a confined or poorly ventilated place, use a fan (with explosion-proof motor) or a ventilator while working in order to flush out the dangerous gases.

- Disposal

Before disposing of cans, make sure that no liquid remains inside. Punch a hole in the bottom of the cans and discard them in a predetermined place "Transportation"**.**

Transportation of materials and equipment rules shall be strictly followed as stated below:

- Never overload the vehicles when transporting
- Properly tie and use board (wooden or other) to prevent slippage of the equipment or material when it is in the vehicle
- When transporting machine parts with complicated shapes, dangerous objects, fragile materials, or slippery materials, always follow the instructions of the person in charge.
- Always inspect the transport tools and keep them well maintained
- Load the material as low as possible and as far forward as possible. If the material can easily tumble down or roll off, use a reinforcement or support to fix it securely, or tie it securely.
- Handle material and equipment with a lot of care.

n) Fire Prevention

Proper safety precaution shall be considered to prevent the fire.

- How to Prevent Fires

Three essential factors, heat, fuel, and air are required to maintain a fire. To prevent fires, or to put out a fire that has already started, remember that you must eliminate at least one of these three factors.

- Fire Prevention Rules

To prevent fires, observe the following:

- Never bring fire near a "NO FIRE" sign.
- Even if you think you need a fire to do your work, do not start a fire without permission.
- Keep oily wastes, sawdust and other combustible materials in the specified containers and arranged neatly.
- Smoke only in the designated place. Never work or walk around with a lighted cigarette.
- Watch out for traces of fire. Be sure to turn off the switches and gas cocks when you leave a place.
- Know where the fire extinguishers are kept and how to use them.
- Do not remove the fire extinguisher or fire fighting sand from their specified places without authorization.
- Always keep the area around the fire extinguisher clear and in good order.

When fire breaks out, there is a tendency for everyone to panic and take irrational action.

In order to stay calm during fire, it is recommended to carry out a fire drill periodically and keep the following in mind:

- Fire Fighting and Sounding the Alarm
  - If a fire breaks out, give an alarm in a loud controlled voice to everyone nearby.

- Give the fire alarm promptly. Always know the location of fire alarms and emergency telephones and how to give alarms.
- Close all gas cocks and turn off the power immediately.
- Fight the fire according to the instructions of the foremen or men in charge.
- If you don't know whether an electrical device is still on or not, do not use a water or foam fire extinguisher on it.

- Evacuation
  - Evacuate the area according to the instructions of the foremen or men in charge.
  - Know in advance the location of the emergency passage and the place of refuge.
  - Do not act selfishly or become a curious looker-on.

o) Deep Excavation

All excavations whether classified as deep excavations or not shall be properly identified and barricaded to prevent accidental access and put a warning signs as "Danger: Excavation Area" with adequate lighting at nighttime. Adequate shoring and bracing shall be provided against the bank or side of an excavation exposed to the hazard of falling or sliding materials for any bank or side 1.5m or above. During excavations, if underground water is encountered or percolation from an underground source occurs all work must stop while the situation is assessed and proper measures can be formulated.

11.1.10 Penalties for Safety Violations / Failure to Comply

11.1.10.1 Removals from Site

For a number of actions that are mentioned throughout this Safety Plan, personnel that will engage in activities as: drinking on site, stealing, vandalism, repeated failure to abide safety instructions, threatening behavior toward any staff, Safety Staff, Security Guards of the Contractor will result in their removal from site, confiscation of ID card, and if deemed necessary - escorted to the local police station.

11.1.10.2 Minor Offences

For personnel committing minor offenses, in most circumstances they will receive a verbal warning to rectify the situation immediately, however, if they refuse to take action, or ignore the Safety Staff's request their ID card No. will be recorded, along with their offense, and a penalty will be imposed on the worker's company and be deducted from progress payments of the Sub-Contractor. A minor offense is one where a worker violates the company safety rules.

11.1.10.3 Major Offences

A major offence being a violation of safety rules which places the workers or other personnel within immediate danger. Examples of these would be workers smoking near flammable material, workers at height without safety belt, carrying out welding without mask, etc. In all such cases the worker will receive a verbal instruction to immediately rectify the situation, but their ID card and nature of offence will be recorded / passed to Safety Manager, and a penalty will be deducted from Sub-Contractor. Companies that commit major offenses allow poor safety to continue without any effort to improve, who ignore safety instructions passed to them both verbally and /

or in writing, / or who fail to attend safety meetings and inspections without reason, shall be penalized.

11.1.11 First Aid

11.1.11.1 First Aid Boxes

First Aid Boxes will be provided at the office with full necessary things. First aid trained person will be kept in contact during the project period.

11.1.11.2 Medical Arrangement

The Contractor shall have adequately contact with trained personnel available for the on-site treatment of casualties and sick person in first-aid unit and shall provide the means whereby injured or sick personnel may be removed expeditiously to hospital or receive the necessary medical attention.

11.1.12 Special Obligations and Care of the works

11.1.12.1 Protection and Restoration of Property and Landscape

The Contractor shall be responsible for the preservation of all public and private property, crops, trees, monuments, highway signs and markers, fences, and other properties in the same manner, and shall use every precaution necessary to prevent damages or injury thereto. Suitable precaution shall be used to prevent damage to pipes, conduits and other underground structures, to poles, wires, cables and other overhead structures, whether shown on the drawings or not, shall protect carefully from disturbance or damage all land monuments and property marks until the Consultant has witnessed or otherwise referenced their location and shall not remove them until so directed by the Consultant. The Contractor shall not willfully or maliciously injure or destroy trees or shrubs, and will not cut them without proper authorization.

The Contractor shall be responsible for all damage or injury to property of any character, during execution of the works, resulting from any act, omission, neglect or misconduct in his manner or method of executing said work or at any time due to defective work or materials, and said responsibility shall not be released until the works have been completed and accepted.

11.1.12.2 Public Convenience and Safety

The Contractor shall carry out all operations necessary for the execution of the works and for the construction of any temporary works so far as compliance with the requirements of the contract permits, without unnecessary or improper interference with the public convenience or the access to use and occupation of public or private waterways, roads, and footpaths, or to properties whether in the possession of the Client or any other person.
Wherever it is necessary to divert the flow of traffic on land or water from its normal channel into another channel, the channel for such diverted traffic shall be clearly delineated by temporary and adequate guide markers or barricades subject to the approval of the Consultant. Between the hours of sunset and sunrise each temporary guide marker shall be illuminated or reflected as required by the Consultant.

The Contractor shall bear all responsibilities and expenses for providing public convenience and safety for maintaining public traffic on the sea, and over the section of the roads and streets

affected by the works or under construction or undergoing improvement and for constructing and maintaining such approaches, crossings, intersections, temporary traffic lights and other features as may be necessary. The Contractor shall save harmless and indemnify the Client in respect of all claims, proceedings, damages, costs, charges, and expenses whatsoever arising out of, or in relation to, any such matters so far as the Contractor is responsible thereof.

11.1.12.3 Barricades, Warning Signs and Navigation Lights

During the execution of the works and until the works or part thereof are accepted by the Client, the Contractor at his own expense shall provide and maintain all necessary barricades, suitable and sufficient red lights, danger signals and other signs, provide a sufficient number of watchmen and take all necessary precautions for the protection of the works and safety of the public. Road sections closed to traffic shall be protected by effective barricades and obstructions will be illuminated at night.

The Contractor shall erect warning signs in advance of any place on the site and the adjacent area to the works where operations interfere with the use of the road by traffic, and at all intermediate points where the new work crosses or coincides with an existing road. Such warning signs shall be constructed and erected in accordance with the standards of the Client, or as directed by the Consultant.

11.1.12.4 Traffic Signs, Lights and Safety Provisions

The Contractor shall provide on the site and on the approaches to the site such traffic signs and lights as may be required by the authority or the Consultant for the direction and control of traffic. The signs shall be approved by the authority and the Consultant before erection and shall be adequately illuminated at night and kept clean and legible at all times.

11.1.12.5 Extraordinary Traffic

The Contractor shall prevent any of the roads or bridges, communicating with or on the routes to the site, from being damaged or injured by any traffic of the Contractor or any of his Sub-Contractors and in particular, shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic as shall inevitably arise from the moving of plant and material from and to the site shall be limited, as far as reasonably possible, so that no damage or injury may be occasioned to such roads or bridges. If during execution of the works or at any time thereafter, the Contractor shall receive any claim arising out of the execution of the works in respect of damage or injury to existing roads or bridges, shall immediately report the same to the Consultant and thereafter the Contractor shall negotiate the settlement of and pay all sums due in respect of such claim and shall indemnify the Client in respect of all claims, proceedings, damages, costs, charges, and expenses in relation thereto.

11.1.12.6 Protection of Waterways

The Contractor shall conduct all work on navigable waters in such a way that free navigation of the waterways will not be interfered with, that passage for local passenger boats or ferries is provided at all times and that the existing navigable depths shall not be impaired. The Contractor shall further be required to comply with all rules and regulations of the respective government departments in control of waterways over which work is being performed.

Warning lights and signs, rescue boats, navigation lights and life saving equipments on the sea during the execution of the works shall be in accordance with requirements of Socialist Republic of Vietnam to whom the Contractor shall notify in due time.

11.1.12.7 Site Facilities

The Contractor shall arrange for, provide, install, construct and maintain all buildings, services, constructions, roads, and the like, on or near the site, directly or indirectly in connection with the works.

All these facilities shall be subject to the approval of the Consultant. Offices, laboratory and transport facilities shall be provided for the exclusive use of the Client and the Consultant all as detailed in the Specifications. Such facilities shall be provided, maintained and either ultimately removed or handed over to the Client in satisfactory condition all as specified.

11.1.12.8 Use of Explosives

When the use of explosives is necessary for the execution of the work, the Contractor shall exercise every care not to endanger life or property. The Contractor shall be responsible for any and all damage resulting from the use of explosives.
As government licenses are required, the Client shall provide assistance to the Contractor in obtaining such licenses.
All explosives shall be stored in a secure manner, in compliance with local laws and ordinances, and all such storage places will be marked clearly in Vietnamese and English languages.

The Contractor shall notify each property owner having structures in proximity to the site of the work, of his intention to use explosives and such notice shall be given sufficiently in advance to enable the owners to take such steps as they may deem necessary to protect their property from injury. Such notice shall not relieve the Contractor of responsibility for any damage resulting from his blasting operations.

11.1.12.9 Removal and Disposal of Structures and Obstructions

This refers to all properties within the Provisional Road Width may have been removed by the owners. All remaining fences, buildings, structures or encumbrances of any character, except those still to be removed or ordered to be salvaged upon within the limits of PRW, shall be removed by the Contractor and placed carefully on the abutting property, or otherwise disposed of as indicated on the Drawings or as directed by the Consultant. Materials so removed including any existing drain or culvert pipes, which the Consultant may order salvaged, shall be carefully removed and shall become the property of the Client.

11.1.12.10 Maintenance of Traffic Flow

The Contractor shall maintain the traffic flow at all times along the existing main roads, rivers and canals.
The Contractor shall provide and maintain all detours, temporary roads, necessary barricades, warning lights and guide signs as well as other equipment at all hours during day or night.

The Contractor in due time and at least one month before any diversion of traffic takes place shall submit a detailed stage plan for the Consultant's approval. The plan shall show all arrangements necessary to ensure a smooth traffic flow. Upon completion of the work, all temporary roads, barricades, signs and other equipment shall be completely removed.

11.1.12.11 Mitigating Measures to Reduce Environmental Disturbances from Construction

The Contractor, at all times, shall carry out all operation necessary for the execution of the works in such a way that disturbances from construction such as dust, noises, vibrations, etc are kept within the minimum requirements of the concerning governmental agencies.

The Contractor shall conform in all respects with the provisions of applicable laws or regulation or other duly constituted authority pertaining to environmental protection which may be applicable to the works.

11.1.13 Working under Extreme Conditions

11.1.13.1 Strong Wind

When strong wind blows during high-positioned works, the Safety Manager should re-examine the site activity carefully and decide if work operations will be temporarily stopped.

11.1.13.2 Lightning

Lightning arrestor will be installed on top of Tower Crane to transmit lightning shock directly underground in case of contact.

11.1.13.3 Flood

Water level will be monitored every hour in case of rainy conditions. If water level in the sea exceeds more than the expected elevation, Project Manager and Safety Manager will immediately examine the influence to the rise of water level to the project activity. Necessary amendment to work procedure will be implemented if necessary.

11.1.13.4 High Temperature

Once the temperature becomes abnormally high, in which the on-going works cannot be done properly, work operations will be temporarily stopped until the convenient working temperature is restored.

11.1.13.5 Night Shift Work

Workers or staffs who work at night shift will be controlled to take enough day time sleeping hours.

11.1.14 Emergency Preparedness

11.1.14.1 General

Emergency procedure will be prepared and displayed in a prominent position in the Contractor's site office.
The emergency plan will include the following:
a) The method to evacuate from the incident area will be given.
b) The person who is in-charge of such emergency
c) Location of mustering areas and directions
d) Instructions for people to walk instead of running during evacuation works
e) Instruction to turn-off any electrical tools and internal combustion engines and the valves closed on any oxy/acetylene equipment if safe to do so.
f) Instruction to leave powered ventilation system operating, if any
g) Instruction that no person can permit to re-enter unless authorized by appointed senior project management
A decision to activate emergency evacuation must be done by In-charge Site Engineer.

Any activation of the emergency evacuation procedure must be reported to Project Manager and Safety Manager.

11.1.14.2 Contractor Emergency Call out Procedure

A) Introduction
The procedure is intended to be used for the Contractor’s activities and must be observed by all employees and Sub-Contractors working in this Project.
B) Priorities
The Site Engineer in-charge / Construction Manager shall take full control of the situation. The Contractor’s duty personnel who have first aid training and can provide life-saving assistance including CPR (Cardio Pulmonary Resuscitation) must perform the first aid treatment, if required. Immediately, after being released, the Emergency Call-out Procedure shall be initiated.
C) Trigger Definition

11.1.15 Triggering must be done to conform to the following conditions:

- Fatal accidents
- Any accident that causes serious injury including loss of vital organs or severe bleeding
- Any accident that cause injury to the public
- Any severe blockage of public traffic or passageway
- Any important report incidents/accident to be reported
- Any significant utility damage or impact

The emergency situations in this project shall include:

- Fire
- Failure and collapse of structure
- Failure and collapse of heavy machinery and equipment
- Adverse weather and flooding

D) Procedure
- Initiation
Site with staff working on day and night works, shall initiate the Emergency Call Out Procedure. Site Engineer and Safety Staff (2nd Stage) will be called, and if they cannot be contacted, their level will be skipped and the 3rd Stage will be alerted. In addition, the initiator will take prompt action to mitigate the situation. When he is released he will report on:

- The situation in general in compliance with the trigger definition.
- The number of people killed / injured / involved.
- Action taken by responsible site supervisory personnel.
- Other vital information in brief.

The Site Engineer will also report the matter to the Construction Manager and contact the duty telephone on the situation.

- Second Stage (2nd Stage)

Safety Staff, upon receiving information will check the completeness and assess the situation. If necessary, he will travel to site to check the situation himself. Upon verification of all information involved, he will initiate the Third Stage (3rd Stage) with given telephone number(s).

- Third Stage (3rd Stage)

The persons at the 3rd Stage (Safety Manager) shall assess the situation i.e. severity of accident / incident and decide whether they will proceed with Emergency Call Out or not.

11.1.16 Motivation

Motivation is a key element in our lives and, if effectively used, spells the difference between our safety success and safety failure.

11.1.17 Effective Communication for Safety

In consideration of the above program, all of this will be meaningless without the effective communication for safety. The Contractor's goal is to transfer the Safety Plan and ideas from one person to another and to all employees and workers. The means and devices shall be used for effective communication as follows:

a) Bulletin board and notices
b) Inter-office memo
c) Posters
d) Interviews
e) Informal talks / Discussions
f) Letters
g) Meetings / Conferences

11.1.18 Safety Reports and Notification of Accidents

11.1.18.1 Safety Reports

Site Safety Reports shall be submitted to the Consultant as a part of monthly progress report where the site safety inspection results should be summarized with details on accident/injury or any dangerous occurrence of that month reported.

11.1.18.2 Notification of Accidents

a) The Contractor shall immediately notify the Consultant of any accidents occurred whether on-site or off-site in which the Contractor, his personnel or Construction plant, or those of his Subcontractors and their low-tier subcontractors are directly or indirectly involved and which result in any injuries to any person

b) Accident resulted in loss of life, public's notice and awareness or press coverage shall be reported immediately to the Client and the Consultant by telephone.
c) Further to informing them by telephone as mentioned in item, notification of accidents have to be provided by facsimile report in advance on the relevant issue. The complete detailed report must be submitted by the Contractor to the Client and the Consultant within 24 hours.
Injured person shall be responsible to report the injuries to their immediate Site Engineer as soon as possible. The respective Supervisor shall decline any report submitted by another person instead of the injured person.
d) Any accident shall be immediately reported to the Safety Manager. These accidents will be investigated in depth to identify all causes and to recommend hazard control measures. To prevent re-accident, all accident information will be informed to everybody by safety meeting.
The consequences requiring an in-depth investigation are;

- Fatal injury.
- Any accident requiring hospitalization of the victim.
- Any incident involving electricity/electric shock
- Persons admitted to a hospital due to disease, especially any infectious disease.
- Near-miss accidents that didn't result in any injury

11.1.18.3 Investigation / Analysis and Reporting Scheme

The following scheme shall be executed for investigation, analysis and reporting when accident occurs.

- Implementation and Monitoring of Preventive Measures
- Reporting of Accident
- Investigation for Accident
- Analysis and Recommendation of Preventive Measures

11.2 Safety Working Practices

11.2.1 Objectives

The objective of safe work practices is to ensure that all works are carried out in a safe manner so as to eliminate or minimize occurrence of incidents.

・Health Control

Fundamental measure to prevent a disorder in worker's health shall be taken.

a) Confirm status of health check and consulting for maintenance of health.
b) Confirmation of worker's health condition.
c) Considering worker who has high blood pressure.

・ HIV/AIDS protection practice

a) Peer education to provide advocacy and communication to others.
b) Direct communication:
Organize training course, talks on HIV/AIDS prevention with related parties.

c) Provide periodical medical examination including clinical examination and tests for early diagnosis.

11.2.2 Statutory Requirements on Safe Practices

Safe works practices have to be established in compliance with the code of practice to each region.

This safe work practices shall comply with the statutory requirements of Socialist Republic of Vietnam.

11.2.3 Preliminary Works / Typical Erection Works

11.2.3.1 Preliminary Works

a) A survey of the site vicinity shall be made and measures shall be taken to ensure public safety.
b) All kinds of permit from government shall be applied (or obtained) prior to the commencement of any work operations.
c) Hoarding/fencing shall be provided around the site periphery with barricades and warning signs posted.
d) Personal Protective Equipment such as safety helmet, safety footwear, safety glasses, safety glove etc. shall be issued to all workers.
e) All building materials and equipment shall be stored in designated storage area that shall be away from common access way. They shall be stacked in such a manner that does not cause obstruction and pose hazards to personnel.
f) All working tools shall be well maintained and workers shall be briefed on their correct usage.
g) All moving parts of machinery shall be fitted with protective guards.
h) A licensed electrician shall carry out all electrical installation.
i) Electrical equipment shall be well constructed and of sound material, free from defects and maintained according to the manufacturers' instructions.
j) Sufficient sanitary and washing facilities shall be provided and maintained and kept clean at all times.

k) Adequate temporary traffic signs shall be provided to warn drivers on the public road of the presence of the access to the work site.

11.2.3.2 Typical Erection Works

a) Protection for Heavy Equipment disaster
- Pre-working and periodic inspections should be enforced.
- Anybody other than construction persons concerned shall keep out of the lifting radius.

b) Keeping correct Wire Fixing Method
- Pre-working and periodic inspection of equipments for slinging work will be carried out.
- All materials shall be made of good quality bearing a mill certificate.

c) Protection for Fall Down disaster
- For the openings on the temporary passage or working floor, safety facilities such as handrails and covers shall be installed with the warning signs.
- Safety belts and harnesses shall be used when working in the place with the possibilities of fall accident.

d) Protection for Material Drop Down disaster
- Anybody other than construction persons concerned shall keep out of working place where there is assembly and disassembly of scaffoldings for formworks.
- Construction materials and equipments shall be well organized to prevent from falling down and shall not be laid near the opening.

e) Protection against Crane disaster
- Pre-working and periodic inspections shall be enforced.
- Outrigger of cranes shall be checked to be positioned appropriately.
- Anybody other than construction persons concerned shall keep out of the lifting radius of cranes.

f) Erection and removal work
- Anybody other than construction persons concerned shall keep out of working place when assembling and disassembling of scaffoldings for formwork.

g) Maintenance of Scaffolding
- All openings shall be covered or installed with railings.
- Safety passage shall be kept.

11.2.4 Excavation and Backfilling

a) Where there is any doubt as to the stability of structure adjoining or over areas to be excavated, the structure shall be supported where necessary by sheet piles, shoring, bracing or other means made or erected according to the design of a licensed Engineer.

b) If any person in an excavation is exposed to the hazard of falling or sliding materials from any bank or side more than 1.5 meters high above his footing, adequate shoring and bracing shall be provided against the bank or side to eliminate such hazard.

c) Where the excavation exceeds four (4) meters in depth, the shoring and bracing shall be constructed in accordance with the design and drawings of a licensed Engineer.

d) The excavation and its vicinity shall be checked by a designated person regularly and after every rainstorm or other hazard-increasing occurrence.

e) Excavated materials and other superimposed loads shall;
- be placed at least 1m back from the edge of open excavations and trenches; and
- be so piled or retained that no part thereof can fall into the excavation pit, cause the banks to slip or cause the upheaval of the excavation bed.

f) Open sides of excavations where a person may fall more than 3meters shall be guarded by adequate barricades and suitable warning signs shall be put up at conspicuous positions.

g) For excavations exceeding 1.2 meters in depth, ladders, stairways or ramps shall be provided to furnish safe access ingress and egress from such excavation.

h) During backfilling, method shall be layer by layer with uniform thickness every layer.

i) All safety work practices for excavation and backfilling shall be discussed during the daily safety Toolbox meeting for all staff and workers.

11.2.5 Road Works

a) Road works shall consist of the clearing works, embankment, construction of ditches and box culverts, slope protection, gabion installations, pavement works and the like.
b) During road works, safety signboards and barricades shall be installed to alert existing traffic of the on-going construction works.
c) Traffic men shall be assigned at critical road intersection points to facilitate smooth flow of traffic between heavy equipments and existing vehicular traffic.
d) Temporary access roads shall be constructed to interior located structures for safe and easy access of workers and equipments in and out of site.
e) During night time works, sufficient lighting equipment shall be put up.
f) All tools, materials, and equipments shall not be left in road site after work and shall be returned to storage room after each work day so as to prevent loss, damage, and accidents to workers and public.
g) Temporary drainage shall be constructed to convey runoff water out of work site and at the same time prevent unforeseeable landslides and soil erosions.

11.2.6 Temporary Jetty Work

a) Before start of temporary jetty construction, safety signboards, warning signs and buoys shall be placed at every hazard points to ensure safe working conditions throughout the works.
b) Navigable waterway which will be constructed with temporary jetty shall be closed to all private and public sea craft by providing sufficient offshore barricades with warning signs and safety signage's to avoid disturbance and accidents within the construction zone.
c) In case of nighttime works, sufficient navigation lighting equipments and floating buoys shall be installed within the perimeter of the construction site to warn and aid visibility for passing sea craft.
d) Temporary jetty structure shall be regularly checked by designated staff especially after every calamity occurrence.
e) Each worker and staff shall wear protective life vests/jackets, helmets, safety shoes/boots and other necessary safety equipments throughout the whole course of the works.
f) Lifting wires, belts, hooks, clamps for steel materials and equipments and condition of all equipments shall be periodically checked and inspected before execution. All lifting accessories to be used for lifting works shall bear a mill certificate.
g) Maintenance and inspection of electric-powered equipments such as welding machines and other working apparatuses by a certified electrician should be carried out strictly, and care must be taken to prevent accidents caused by electric shock, fire, or explosion.
h) Welders for welding works shall be fully equipped with welding safety equipments such as welding aprons, goggles, gloves, fire extinguishers, flashback arrestors and others. Only certified welders are allowed to do the works.
i) Upon removal and dismantling of the temporary jetty after completion of works, no any debris shall be left within the area and all rubbish shall be disposed at designated disposal areas.
j) All safety work practices and routines for temporary jetty construction shall be discussed during the daily safety Toolbox meeting for all staff and workers held every start of work.
k) Only authorized staff and workers shall be permitted to enter the working area.
l) Cleanliness and orderliness shall be practiced during working hours. Garbage shall be properly

disposed. Materials and tools shall be returned to original storage locations after use. After each working day, workers shall cooperatively clean the working site before leaving.

11.2.7 Bored Piling Work

a) Equipments, tanks, and material shall be arranged and set-up accordingly at every designated points of bored piling site. Safety signboards and warning signs shall be installed to inform the commuting public of the on-going construction works.
b) Bored piling work requires the use of relatively large and powerful piling equipments such as Drilling Rigs and Service cranes in restricted spaces. Equipment operators should have license and training certificate.
c) Excavated materials during the works shall be disposed at permissible disposal area approved by the Consultant.
d) Checking and confirmation of base condition prior to setting of Heavy Equipments such as the Drilling Rig and Rough Terrain Cranes shall be carefully done. In case of soft or unstable base, reinforcing treatment shall be required like lying of thick wood or 25mm steel plates or soil improvement.
e) Sea water level and current shall be monitored regularly. In case water level exceeds the High Water Level mark, work operations must be stopped temporarily.
f) Each worker and staff shall wear protective life vests/jackets, helmets, safety shoes/boots and other necessary safety equipments throughout the whole course of the works.
g) Access of all equipments in and out of site and lifting radius of cranes shall be clear at all times. No worker or staff shall stay within the lifting radius of cranes.
h) In case of nighttime works, sufficient lighting equipments shall be installed within the perimeter of the construction site to warn and aid visibility for passing sea craft.
i) Lifting wires, belts, hooks, clamps for steel materials and equipments and condition of all equipments shall be periodically checked and inspected before execution. All lifting accessories to be used for lifting works shall bear a mill certificate for quality assurance.
j) Maintenance and inspection of electric-powered equipments such as welding machines and other working apparatuses by a certified electrician should be carried out strictly and care must be taken to prevent accidents caused by electric shock, fire, or explosion.
k) All safety work practices and routines for bored piling work shall be discussed clearly during the daily safety Toolbox meeting for all staff and workers held before start of work.
l) Only authorized staff and workers shall be permitted to enter the working area.
m) Cleanliness and orderliness shall be practiced during working hours. Garbage shall be properly disposed. Materials and tools shall be returned to original storage locations after use. After each working day, workers shall cooperatively clean the working site before leaving.

11.2.8 Sheet Pile Work

a) Toolbox meeting before the start of every shift and educate safety to all staff and workers.
b) Do not exceed safe working load of cranes during lifting works.
c) Standardize the signaling for lifting operation.
d) Designated riggers shall be well trained personnel who are knowledgeable on signals.
e) All hazards associated with working adjacent to and above water shall be accommodated including but not limited to details of proposed rescue boats, safety nets, warning signs, warning and navigation lights, search procedures, life saving equipment, watching for persons entering the water and any other appropriate equipment or procedure.
f) In case of usage of barge and tug boat, try to collect weather information and secure the safety operation.

11.2.9 Pile Cap / Pier Column Work

11.2.9.1 Rebar Work

<Work Outline>
Same as ordinary Rebar work on site.

1) Prevention against Crane disaster.
2) Keeping correct Wire Fixing Method
3) Keeping safety in nighttime work

11.2.9.2 Formwork

<Work Outline>
Pre-fabricated steel and/or wooden form will be utilized for every construction work.

1) Prevention against crane disaster.
2) Keeping correct Wire Fixing Method
3) Keeping safety in nighttime work

11.2.9.3 Concrete Work

<Work Outline>
Concrete Pump truck, transit mixers and concrete vibrators will be utilized during concrete placement.

1) Prevention against Crane disaster
2) Keeping correct Wire Fixing Method
3) Basically, concreting work is prohibited to be executed in nighttime except extended planned time.

11.2.10 Construction of Bridge Superstructure (Main Bridge)

<Work Outline>
1) Cycle of constructing one (1) block of bridge deck consists of moving and setting of Form Traveler, form setting, installation of rebar and PC materials, cleaning, cast-in-place concrete works, curing and prestressing works.
2) When prestressing of cables and bars start, result of the stress of cylinder tests will be confirmed first if concrete has reached the required compressive strength.
3) Construction of center closure segment will be by scaffolding staged in the form traveler held by PC bars.
4) Construction of main bridge side span will be by cast-in-place method by hanging support scaffolding system.
5) Prestressing work will be installation of PC tendons, PC bars and anchorages for post-tensioning, setting of jacks and PT equipments, and finally prestressing of tendons and bars.

Construction method for main bridge superstructure will be by following:
1. Cantilever segments – by Form Traveler
2. End segment (Side span) – by Hanging support scaffolding system
3. Center closure segment – by Form Traveler (held by PC bars)

The following items shall be strictly complied during construction works, as already described in previously mentioned works.

1) Prevention from Heavy and Light Equipment accident
2) Keeping correct Wire Fixing Method
3) Protection for Fall Down accident
4) Protection for Material Drop Down disaster

11.2.10.1 Scaffolding Work

<Work Outline>
Movable type scaffolding (form traveler) will be utilized for construction of cantilever main bridge while hanging support scaffolding system will be used at end segment (side span) construction.

1) Usage of suitable equipment which has enough strength for this type of scaffolding
2) Prevention for crane disaster
3) Keeping safety work practice during working hours
4) Maintenance of scaffolding

11.2.10.2 Formwork

<Work Outline>
Pre-fabricated steel and/or wooden form will be utilized for every construction work.

1) Prevention against Crane disaster
2) Keeping correct Wire Fixing Method
3) Keeping safety work practice during working hours

11.2.10.3 Rebar Work

<Work Outline>
Rebars will be fabricated at shops and installed with the aid of crane. Bar benders and cutters will be used for rebar fabrication. Tie wires will be used to fix rebars during installation works.

1) Prevention against Crane disaster
2) Keeping correct Wire Fixing Method
3) Keeping safety work practice during working hours

11.2.10.4 Concrete Work

<Work Outline>
Concrete pump truck, transit mixers, and concrete vibrators will be utilized during concrete placement. Concrete will be supplied through batching plant.

1) Prevention against Crane disaster
2) Keeping correct Wire Fixing Method
3) Basically concreting work is disallowed to be executed in nighttime except for extended planned time and approved work permit.

11.2.10.5 Prestressing Work (Post-tensioning)

<Work Outline>
1) Installation of PC tendons and anchorages for post-tensioning
2) Setting jacks and other PT equipments
3) Prestressing of PC tendons

1) Prevention against Crane disaster
2) Keeping correct Wire Fixing Method
3) Keeping safety work practice during working hours
4) Protection against breaking disaster of PC tendons
- Prestressing equipments shall be checked regularly.
- Protection board shall be set behind the jack during prestressing work.
- All workers shall keep out of behind the jack during prestressing work.

11.2.11 Construction of Bridge Superstructure (Approach Bridge)

<Work Outline>
1) Erection method of PC box girder will be by the use of erection girder equipment.
2) Erection girder for PC box girder will be assembled on the ground.
3) Erection girder will be assembled using crane (truck-mounted/crawler type).
4) PC box girder will be fabricated in precast fabrication yard.
5) Transfer of PC box girder from precast yard to erection yard will be transported by trailer starting from fabrication yard to erection area.

11.2.11.1 Fabrication Precast Yard

<Work Outline>
Site of PC box girder fabrication, rebar fabrication, special steel and wooden forms. Storage yard will house all construction materials and tools needed for construction.

1) Prevention against heavy and light equipment disaster
2) Using good and reliable tools and equipment which are in working condition
3) Keeping safety work practice during working hours

11.2.11.2 Formwork

<Work Outline>
Pre-fabricated steel or wooden form will be utilized for fabrication works.

1) Prevention against crane disaster
2) Keeping correct Wire Fixing Method
3) Keeping safety work practice during working hours

11.2.11.3 Rebar Work

<Work Outline>
Rebars will be fabricated at shops and installed with the aid of crane. Bar benders and cutters will be used for rebar fabrication. Tie wires will be used to fix rebars during installation works.

1) Prevention against crane disaster
2) Keeping correct Wire Fixing Method
3) Keeping safety work practice during working hours

11.2.11.4 Concrete Work

<Work Outline>
Concrete pump truck, transit mixers, and concrete vibrators will be utilized during concrete placement. Concrete will be supplied through batching plant on barge.

1) Prevention against crane disaster.
2) Keeping correct Wire Fixing Method
3) Basically concrete pouring work is disallowed in nighttime except extended planned time with approved work permit.

11.2.12 Breach of Safety Plan

Any breaches of Safety Plan or the statutory regulations or disregard for the safety of any persons may be the reason for the Consultant or the Client to exercise his authority to require the Contractor's employees, Sub-contractor's employee's and or the Contractor's Project Manager's removal from the site.

CHAPTER 12 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

12.1 Objectives of environmental and social considerations and required actions

12.1.1 Objectives of the tasks on environmental and social considerations

Main objectives of the tasks on environmental and social considerations for the Project during the D/D Study are summarized as followings:

For environmental considerations:

1) Review the approved Environmental Impact Assessment (EIA) Report (including comments of the EIA Appraisal Council associated with the EIA Report appraisal);
2) Carry out supplemental surveys on natural environment
3) Examine items in the EIA Report which should be supplemented or revised during the design phase, and support PMU2 in preparing the supplemental EIA Report (if necessary);
4) Support PMU2 in preparing the Environmental Management Plan and the Environmental Monitoring Program;

For social considerations:

1) Review the approved Resettlement Action Plan (RAP) Report;
2) Carry out the socio-economic survey as a supplemental survey;
3) Support PMU2 in revising and update the RAP Report (if necessary);
4) Prepare the monitoring program for land acquisition, compensation, support, and resettlement (RAP Monitoring Plan)
5) Follow up the implementation of RAP, and support relevant authorities in carrying out land acquisition, compensation, and resettlement.
6) Support PMU2 in diffusing information and carrying out public consultation.

12.1.1.1 Required actions for environmental and social considerations

Table 12.1.1-1 and Table 12.1.1-2 show required actions for environmental considerations and social considerations respectively. Details of each action will be described in the next sections.

Table 12.1.1-1 Required actions for environmental considerations

Objective	Referenced issues	Main concerned issues	Required actions
1) Review of the EIA Report	a) Requirements attached in Decision 1420/QD-BGTVT (dated May 17, 2010) on the approval of the EIA Report; b) Comments given by the EIA Report Appraisal Council after the appraisal meeting on May 13, 2010;	a) Adjustment of road alignment to avoid and mitigate impacts to Thon Trung Hamlet in Cat Hai Island;	a) Discuss with the design team to examine possibility of the road alignment adjustment;
		b) Measures to mitigate impacts caused by the construction of cast-in-place concrete piles for bridge foundation;	b) Discuss with the design team on the proposed dump sites for waste soils;

Objective	Referenced issues	Main concerned issues	Required actions
	c) Impact mitigation measures recommended in the approved EIA Report; d) Comments raised by project- affected residents and local authorities during the consultation meetings. e) JICA environmental checklist (including checklist for port sector)	c) Measures to mitigate impact of noise for the populated villages along the planned highway in Cat Hai Island	c) Discuss with the design team on the measures to mitigate impact of noise to the populated villages;
		d) Measures to mitigate impact to surface water quality, which then may cause affects to the salt pans and the aquaculture ponds in the Project area;	d) Discuss with the design team on the measures to mitigate impacts to surface water quality (especially for impact of water runoff from the road surface)
		e) Compensation to residents whose aquaculture pond, or salt pan is to be affected by the Project, and fishermen whose livelihood may be affected by the Project.	e) Discuss with local authorities, local mass organizations (such as farmer organization, fishermen organization, etc.) on compensation and other mitigation measures for residents whose livelihood depends on salt produce, aquaculture, fishery, etc.
2) Supplemental survey	a) Supplemental baseline survey	Survey on surface water quality at an additional site in Cat Hai Island.	Request support from the environmental team of the port portion
	b) Survey on current environmental conditions surrounding the proposed construction yard, and the proposed waste soil dumping sites	- Identification and assessment of impacts caused by the proposed construction yard; - Identification and assessment of impacts caused by the proposed waste soil dumping sites.	Carry out field survey and collect necessary information on the proposed construction yard, and the proposed dump sites, after obtaining proposed plans from the design team.
3) Preparation of supplemental EIA Report (if necessary)	a) Items to be supplemented due to the road alignment adjustment (if necessary)	- Additional description on the Project - Additional impacts - Additional impact mitigation measures	Estimate impacts in case of road alignment adjustment, and revise the mitigation measures if necessary.

Objective	Referenced issues	Main concerned issues	Required actions
3) Preparation of supplemental EIA Report (if necessary)	b) Items to be supplemented after confirmation of construction yard, and waste soil dumping sites	- Additional description on the Project - Additional impacts - Additional impact mitigation measures	Describe result of estimation and assessment of impacts, and propose mitigation measures.
4) Preparation of the Environmental Management Plan, and the Environmental Monitoring Program	Review of the EIA Report, and identification of items to be included in the Environmental Management Plan and the Environmental Monitoring Program	a) Preparation of the Environmental Management Plan	a) Preparation of the Environmental Management Plan
		b) Preparation of the Environmental Monitoring Program	b) Preparation of the Environmental Monitoring Program

Source : Study Team

Table 12.1.1-2 Required actions on social considerations

Objective	Main concerned issues	Required actions
1) Review of the RAP Report	Review of the RAP Report and identification of issues to be supplemented or revised to meet requirements of Vietnam regulations, JBIC Environmental Guidelines, and project-affected persons' comments	Review of the RAP Report while referring to the following Vietnam regulations, JBIC guidelines, and project-affected persons' comments: - Decree 84/2007/ND-CP - Decree 69/2009/ND-CP - Decision 130/2010/QD-UBND issued by Hai Phong City PC - JBIC Environmental Guidelines - Comments raised by project-affected persons, and PCs of project-affected communes/townlet
2) Supplemental survey	a) Socio-economic survey to collect data and information on the project-affected persons which are necessary to prepare the resettlement site construction plans and the income restoration plan	- Prepare the detailed survey plan - Prepare the questionnaire - Discuss with relevant PCs on persons to be interviewed, interview method, interview schedule, etc. - Interview PCs of project-affected communes/townlet in Cat Hai Island and in Hai An District; - Interview (by questionnaire) project-affected persons in Cat Hai Island and in Hai An District.

Objective	Main concerned issues	Required actions
2) Supplemental survey	b) Survey on socio-economic condition of the areas around the proposed construction yard, and the waste soil dumping sites	- Carrying out field survey and identification of impacts caused by the proposed construction yard, and waste soil dumping sites - Prepare the detailed survey plan - Prepare the questionnaire - Interview PC of affected communes; - Interview a number of residents living near the proposed construction yard, and the waste soil dumping sites, if available.
3) Support PMU2 in revising the RAP Report	a) Revision of the RAP Report due to the road alignment adjustment (if available)	Estimate and assess impacts caused by the adjusted road alignment (if available)
	b) Revision of the RAP Report due to the construction yard, and waste soil dumping sites	Estimate and assess impacts caused by the construction yard and the waste soil dumping sites to the local communities.
4) Prepare the monitoring program for land acquisition, compensation, support, and resettlement	Monitor and follow up the following tasks, and support relevant authorities in carrying out these tasks : - Establishment of organizations in charge of land acquisition in Hai Phong City and Cat Hai District - Driving stakes determining boundary of the land lots to be acquired - Preparation of framework of compensation, support, resettlement, and Income Restoration Program - Compensation, support, resettlement (Based on relevant Vietnam regulations, information collected from PMU2, other project-related authorities, and local mass organizations).	
5) Follow up the tasks of land acquisition, compensation, support, and resettlement		
6) Support in diffusing information and carrying out public consultation	- Support to print a leaflet to introduce briefly about the Project - Support to organize the public consultation meetings (in case of necessary)	

Source : Study Team

12.2 Review of EIA Report

12.2.1 Brief description on the approval of the EIA Report

The EIA Report for the Tan Vu – Lach Huyen Highway Project was drafted by Vietnam Infrastructure Development and Finance Investment Joint Stock Company (VIDIFI) in July 2009. Hyder Consulting Ltd was the body in charge of preparation of this EIA report. In 2009, VIDIFI submitted this EIA Report to Hai Phong City People's Committee for approval. However, in December 2009, The Prime Minister decided to transfer the Project Proponent title from VIDIFI (Vietnam Infrastructure Development and Finance Investment Joint Stock Company) to MOT. Therefore, under the VN regulations, MOT is authorized to approve the EIA Report. PMU 2 (an implementing agency under MOT) revised the EIA Report and submitted it to MOT on May 4, 2010 for approval. An Appraisal Council was established and it organized a meeting on May 13, 2010 to appraise the EIA Report for the Project. The EIA Report was then approved by MOT on May 27, 2010 (Decision 1420/QD-BGTVT) after partly revised in following with comments of the Appraisal Council.

12.2.2 Deficiencies found in the EIA Report and proposed actions to improve deficiencies

12.2.2.1 Deficiencies in the EIA Report found by the Appraisal Council

According to the comments raised by members of the Appraisal Council in the meeting held on May 13, 2010, there are many deficiencies in the EIA Report that needs to be improved. Among them, the following comments (Table 12.2.2-1) are considered important and should be improved during the next stages of the Project. Proposed actions to improve these deficiencies are also described in the Table.

Table 12.2.2-1 EIA Report Appraisal Council's major comments and proposed actions to improve

Deficiencies		Proposed actions	Section of the Report which describes result of action
1	**Impacts to living and livelihood of local residents**		
a	Lack of descriptions on living condition and livelihood of local residents	Conduct socio- economic survey, and supplement descriptions	(Section 12.2.3.1)
b	Lack of prediction of impacts to living conditions and livelihoods of local residents, such as fishery, aquaculture, salt production	Conduct socio- economic survey, and recommend mitigation measures	(Section 12.2.3.2)
c	Lack of description on compensation, resettlement plan for project-affected people, and other measures to mitigate impacts to living and livelihood of local residents (such as impacts to historical/religious relics, public facilities, community houses, schools, etc.)	Conduct socio- economic survey, and recommend mitigations measures	(Section 12.2.3.3)

d	Lack of prediction of impacts caused by the split of community, and impediment to local resident movement, and measures to mitigate these impacts	Predict impacts and recommend mitigation measures	(Section 12.2.3.4)
e	Lack of description on plan to relocate the tombs affected by the Project	Conduct socio- economic survey and recommend plan to relocate tombs	(Section 12.2.3.5)
f	Lack of description on income restoration plan for affected residents, especially to residents who depends on salt production, aquaculture, fishery for their livelihood	Conduct socio- economic survey and recommend plan to restore income for affected residents	(Section 12.2.3.6)
2	**Impacts to air ambient**		
a	Lack of prediction of impacts caused by the cement mixing plants, and measures to mitigate these impacts	Describe recommended mitigation measures in tender document for contractor to obligate	(Section 12.2.4.1)
b	Lack of prediction of impacts to air ambient in the operation phase, and measures to mitigate these impacts	Refer to SAPROF Study Report for prediction of impacts by proper methods, and recommend- ed mitigation measures	(Section 12.2.4.2)
c	Lack of prediction of impacts of noise in the operation phase, and measures to mitigate these impacts	Refer to SAPROF Study Report for prediction of impacts by proper methods, and recommend- ed mitigation measures	(Section 12.2.4.3)
d	Lack of prediction of impacts to air ambient caused by the transportation of construction materials from the exploitation sources to the construction sites, and measures to mitigate these impacts	Describe recommended mitigation measures in tender document for contractor to obligate	(Section 12.2.4.4)
3	**Impacts to surface water quality**		
a	Lack of prediction of impacts caused by polluted water from the construction camps, and measures to mitigate these impacts	Describe recommended mitigation measures in tender document for contractors to obligate	(Section 12.2.5.1)
b	Lack of prediction of impacts caused by the polluted rain water runoff from the road surface in the operation phase, and measures to mitigate these impacts.	Predict impacts, and recommend mitigation measures (after obtained detailed information from the engineering design team)	(Section 12.2.5.2)
c	Lack of prediction of impacts caused by the bridge foundation works (especially impacts caused by bentonite wastewater generated from the cast-in-place concrete pile construction), and measures to mitigate these impacts	Predict impacts, and recommend mitigation measures (after obtained detailed information from the engineering design team)	(Section 12.2.5.3)

d	Lack of prediction of impacts to surface water bodies caused by the transportation of construction materials by ferries, and measures to mitigate these impacts	Describe recommended mitigation measures in tender document for contractors to obligate	(Section 12.2.5.4)
4	**Impacts of solid wastes, waste soils**		
a	Lack of prediction of impacts caused by solid wastes generated from the construction camps, and measures to mitigate these impacts	Describe recommended mitigation measures in tender document for contractors to obligate	(Section 12.2.6.1)
b	Lack of prediction of impacts caused by waste soils generated from the road foundation construction, and measures to mitigate these impacts	Predict impacts, and recommend mitigation measures (after obtained detailed information from the engineering design team)	(Section 12.2.6.2)
5	**Impacts caused by the dump sites of waste soils**		
a	Lack of prediction of impacts of waste soils generated from the bridge foundation construction (cast-in-place concrete pile) and measures to mitigate these impacts	Predict impacts, and recommend mitigation measures (after obtained detailed information from the engineering design team)	(Section 12.2.7)
6	**Impacts to local traffic, local topography, traffic accidents, etc.**		
a	Lack of prediction of impacts caused by the construction works to water transportation (boat, ferries, etc.), and measures to mitigate these impacts	Describe recommended mitigation measures in tender document for contractors to obligate	(Section 12.2.8.1)
b	Lack of prediction of impacts caused by the Project to the existing dikes in Cat Hai Island, and measures to mitigate these impacts	Predict impacts, and recommend mitigation measures (after obtained detailed information from the engineering design team)	(Section 12.2.8.2)
c	Lack of description on measures to prevent accidents at the rivermouths near the bridge foundations, during construction phase and during operation phase	Describe recommended mitigation measures in tender document for contractors to obligate	(Section 12.2.8.3)
d	Lack of description on measures to mitigate impacts of typhoon and sea water level rising caused by the climate change	Describe recommended mitigation measures in tender document for contractors to obligate	(Section 12.2.8.4)
7	**Impacts to ecosystem**		
a	Lack of prediction of impacts to green trees, mangrove trees, and measures to mitigate these impacts	Predict impacts, and recommend mitigation measures	(Section 12.2.9)

8	**Measures to restore the construction yards, construction sites, etc.**		
a	Lack of description on the measures to restore the construction sites, construction yards, etc. after the construction completion	Describe recommended mitigation measures in tender document for contractors to obligate	(Section 12.2.10)
9	**Issues on environmental management**		
a	The Environmental Management Plan should be made and described in a table format as instructed by Circular 05/2008/TT-BTNMT (issued by MONRE on December 8, 2008)	Make supplemental Environmental Management Plan	(Section 12.3)
b	Lack of detailed description on Environmental Management Plan, especially on the organizations responsible for the implementation of impact-mitigation measures, financial resources for environmental protection	Make supplemental Environmental Management Plan	(Section 12.3)
10	**Issues on environmental monitoring**		
a	Items and frequencies described in the Environmental Monitoring Plan should be revised and supplemented	Make supplemental Environmental Monitoring Plan	(Section 12.4)
b	In the Environmental Monitoring Plan, it lacks description on concrete monitoring activities during the operation phase	Make supplemental Environmental Monitoring Plan	(Section 12.5)
c	It needs to make plan to monitor land subsidence occured at the approaches of the bridge, and add it in the Environmental Monitoring Plan	Make supplemental Environmental Monitoring Plan which includes monitoring of land subsidence	(Section 12.4)

Source : Study Team

12.2.2.2 Deficiencies in the EIA Report found by the JICA Study Team

In addition, deficiencies in the approved EIA Report found by the JICA D/D Study Team can be summarized as shown in Table 12.2.2-2. Proposed actions to improve these deficiencies are also described in the table.

Table 12.2.2-2 Deficiencies in the EIA Report found by the JICA D/D Study Team and proposed actions to improve

Deficiencies		Proposed actions	Section of the Report which describes result of action
1	**Impacts to living and livelihood of local residents**		
g	It lacks of prediction of impacts of the Project to schools, hospitals, etc. in the local society	Conduct socio- economic survey, and recommend mitigation measures	(Section 12.2.3.7)
h	It lacks of prediction of impacts to local communities caused by a large number of construction laborers came from outside during the construction phase.	Conduct socio-economic survey, and recommend mitigations measures	(Section 12.2.3.8)
i	It lacks of prediction of impacts caused by the termination of the existing ferry operation	Conduct socio-economic survey, and recommend mitigations measures	(Section 12.2.3.9)
2	**Impacts to air ambient**		
e	Surveys on air quality were conducted only one time during rainy season in August 2008.	Conduct supplemental surveys on air quality during the dry season	(to be carried out in the next stage)
f	Surveys on air quality (and noise) were conducted at only 4 sites in 2008.	Conduct supplemental surveys on air quality (and noise) at atleast 7 sites as proposed in the SAPROF Study Report	(to be carried out in the next stage)
g	Methods to predict impacts on air quality, noise, were not appropriate.	Apply proper methods to predict impacts on air quality, noise in the years of 2015, 2020, and 2030.	(Section 12.2.4.2 ~ 3)
3	**Impacts to surface water quality**		
e	Surveys on surface water quality were conducted only one time during rainy season in August 2008.	Conduct supplemental surveys on surface water quality during the dry season	(to be carried out in the next stage)
f	Surveys on surface water quality were conducted at only 8 sites in 2008 (when considering the 16km-long of the road extension).	Conduct supplemental surveys on surface water quality at another one site in Cat Hai Island as proposed in the SAPROF Study Report	(Section 12.2.5.5)
g	It lacks analysis and assessment on metallic concentrations (such as asen, cadmium, lead, etc.) in surface water which may affect the local aquaculture and salt produce	Include analysis and assessment on metallic concentration in the supplemental surveys on surface water quality	(to be carried out in the next stage)

Deficiencies		Proposed actions	Section of the Report which describes result of action
11	**Others**		
a	Public consultation meeting was organized only one time on April 28, 2010 in Cat Hai Townlet	Review other public consultation meetings organized after the approval of the EIA Report	(Section 12.6)
b	It lacks means for diffuse information on the Project especially to local communities	Examine possibility to prepare and print a leaflet to diffuse information on the Project	(to be carried out in the next stage)

Source : Study Team

The required actions mentioned above will be described in detail in the following sections of this report.

12.2.3 Impacts to living and livelihood of local residents

12.2.3.1 Living condition and livelihood of local residents

The Project area spreads over the area of the following districts, wards, and communes/townlet of Hai Phong City:

- Hai An District: Trang Cat Ward and Dong Hai 2 Ward;
- Cat Hai District: Nghia Lo Commune, Dong Bai Commune, and Cat Hai Townlet.

1) Hai An District.

Hai An District was founded recently according to Decree 106/CP dated 20/12/2002 issued by the Government. It comprises 8 wards: Đông Hải 1, Đông Hải 2, Đằng Lâm, Đằng Hải, Nam Hải, Tràng Cát, Thành Tô and Cát Bi.

Dong Hai 2 Ward has 2,010 households with about 10.000 people, accounting for 12% population of Hải An District (80.000 people). The natural population growth rate is 0.98%. GDP in year 2008 obtained VND 63.3 billion, accounting for about 22% of GDP of the whole district, growth rate is 29%. Of which the agriculture and sea product accounting for 30%, handicraft cluster 39% and service commercial 31%. Annual GDP per capita of the ward reached 5.9 million VND which is 1.4 times of that in the district. A large number of households in the ward have well-off and constant life.

Dinh Vu Peninsula is a low land area not suitable for permanent residence, and is usually used for aquaculture production and fishing by residents of Trang Cat Commune and other neighboring areas. Hai Phong City has a plan to develop this peninsula as an industrial zone with deep sea port.

The water supply system and the telecommunication system in the area are relatively well developed.

Dinh Vu Water Supply Company Ltd. is permitted to construct a water treatment plant to supply piped water to Nam Dinh Vu Industrial Zone with designed capacity of 50.000m^3/day. The Company has invested about 400,000 USD to build a water pipe (with diameter of 90cm), a pump station and a water treatment facility. This water supply system is able to provide to the Zone with 500m^3/day of treated water. In addition, Hai Phong City has assigned the Department of Transportation and Public Works to make a plan to construct a pipeline to intake water from Da Do River to the Zone.

However, the drainage and sewage system in the area has not been developed. Industrial wastewater is basically treated at the small-scaled treatment facilities and then discharged to the ecological lakes in the Zone.

An electric power station (1,250 kVA) and two supplemental electric power generations (total capacity is up to 2,250 kVA) and an electric transmission net with 7 km of length have been built by Dinh Vu Development Joint Venture Co. Ltd. In addition, Dinh Vu Development Joint Venture Co. Ltd. and Haiphong Power Company have signed a contract in November 2002 for the supply of 1,800 kVA more to the Zone. Vietnam Electricity Company has prepared an electric power supply plan to the Zone up to the year 2020 with 4 wire lines of 220KV, 400MW.

2) Cat Hai District

Cat Hai District is located in the north of Hai Phong City and comprises Cát Bà Island, Cát Hải Island and more than 300 of big and small islands. The district was founded in 1890 under Quang Yen Province. In March 1977 it was merged with Cat Ba District to become Cat Hai District. Its surface area is 323.1km2 with population of 27,300 persons (2004). Cat Ba City is the district capital. Besides, it comprises Cat Hai Townlet, and the following communes: Dong Bai, Nghia Lo, Van Phong, Hoang Chau, Phu Long, Gia Thuan, Hien Hao, Viet Hai, Tran Chau, Xuan Đam.

Cat Hai District is known as a beautiful place for tourist and famous sea products. Cat Ba Townlet is a tourist spot with well developed high class hotels and rest houses. Cat Ba Water Park Resort is a modern resort which was brought to operation in 2006. In addition, Cat Ba National Park is an ecological tourist spot that is quite attractive for visitors to come to this island.

Cat Hai fish sauce is a famous special product of the district which is made by sea fishes with a traditional technology process.

Large scaled water supply system and sewage system have not been developed. Residents in Cat Hai Island and in a large part of Cat Ba Island are mainly using water taken from ponds, lakes, stream and rainy water for their daily life.

3) Socio-economic characteristics of the project-affected area

The project-affected area consists of 2 wards (Dong Hai 2 Ward and Trang Cat Ward in Hai An District), and 3 communes/townlet (Nghia Lo Commune, Dong Bai Commune, and Cat Hai Townlet in Cat Hai District).

As shown in Table 12.2.3-1, in Dong Hai 2 Ward, unused land occupies a largest ratio (about a half of the ward's total land area). In Trang Cat Ward, a large part of land is used for forestry and aquaculture. In Nghia Lo Commune and Dong Bai Commune, land used for agriculture (including salt production) is relatively large.

Table 12.2.3-1 Land use in the project-affected wards/communes

Ward/ Commune	Total number of villages	Total area of land (ha)	Agriculture land area (ha)	Forest area (ha)	Aquaculture Land (ha)	Residential land (ha)	Unused land (ha)
Đông Hải 2	6	4,175	872	600	247	86	2,370
Tràng Cát	8	2,514	333	974	595	102	510
Nghĩa Lộ	3	827	332	20	263	31	181
Đồng Bài *)	3	802	187	10	68	105	249
TT. Cát Hải	-	-	-	-	-	-	-

Source : Draft Final Report, Tan Vu-Lach Huyen Highway Project, the JV of JBSI-HYDER-HECO, 13 October 2008
* Rural development plan, Dong Bai Commune, 15 December 2010

Among the wards/communes in the Project area, Trang Cat Ward has the biggest population (8,840 pers). However, population per household in Dong Hai Ward is the biggest: 4.4 pers/household, while in Trang Cat Ward this number is relatively small: 3.9 pers/household (Table 12.2.3-2).

Table 12.2.3-2 Population of the wards/communes in the Project area

Commune	Household	Total population	Male (%)	Female (%)	Age (%)		
					0-14	15-64	> 65
Đông Hải 2	1,662	7,366	48.7	51.3	14.9	74.4	11.5
Tràng Cát	2,296	8,840	49.5	50.5	32.6	51.6	15.8
Nghĩa Lộ	593	2,377	49.4	50.6	20.8	67.9	11.2
Đồng Bài *)	303	1,332	44.9	55.1	-	-	-
TT. Cát Hải *)	1,668	6,538	47.4	52.6	-	-	-

Source : Draft Final Report, Tan Vu-Lach Huyen Highway Project, the JV of JBSI-HYDER-HECO, 13 October 2008
* Commune Socio-economic Development Plan Implementation Report, and D/D Study Team's hearing survey data.

In the Project area, a large portion of houses are one-story brick houses (70%), particularly in Nghia Lo Commune (96%). In Dong Hai 2 Ward, a relatively large number of houses (40%) are two-story or more higher concrete houses. There is no wood house, steel roof house and traditional leaf roof house in the Project area (Table 12.2.3-3).

Table 12.2.3-3 Category of house by its built material and story

Commune/ward	Category of house (%)		
	Concrete house (2 story or more)	Brick house (one story)	Temporary house
Đông Hải 2	40.0	55.1	5.0
Tràng Cát	17.6	74.0	8.3
Nghĩa Lộ	4.0	96.0	0.0
Đồng Bài *)	18.0	80.0	2.0
TT. Cát Hải	-	-	-
Project Area	24.0	70.0	6.0

Source : Draft Final Report, Tan Vu-Lach Huyen Highway Project, the JV of JBSI-HYDER-HECO, 13 October 2008
* Rural development plan, Dong Bai Commune, 15 December 2010

As shown in Table 12.2.3-4, almost all households in the Project area are connected with the national electric power grid. Houses in Cat Hai Island have not been supplied with piped water. However, a large portion of houses in Nghia Lo Commune has sanitary toilet (89.7%). Solid waste collection system covers more than 70% of households in the Project area.

Table 12.2.3-4 Coverage of public facilities

Commune/ward	Households using the services (%)					
	National electric power grid	House generator or other electric source	Piped water supply	Drainage system	Sanitary toilet (with permeable pit, septic tank, etc.)	Regular solid waste collection
Đông Hải 2	100.0	0.0	100.0	35.0	43.6	70.0
Tràng Cát	100.0	0.0	100.0	19.7	53.4	86.6
Nghĩa Lộ	99.8	0.2	0.0	63.1	89.7	76.1
Đồng Bài	100.0	0.0	0.0	-	-	-
TT. Cát Hải	100.0	0.0	0.0	-	-	-
Project area	100.0	0.0	87.0	30.9	54.6	79.2

Source : Draft Final Report, Tan Vu-Lach Huyen Highway Project, the JV of JBSI-HYDER-HECO, 13 October 2008, and Rural development plan, Dong Bai Commune, 15 December 2010.

12.2.3.2 Impacts to living conditions and livelihoods of local residents

1) Loss of residential lands and production lands

According to the Resettlement Action Plan prepared by PMU2 in June 2010 (based on result of F/S), land to be acquired for implementation of the Project is as following (Table 12.2.3-5).

Table 12.2.3-5 Land to be acquired for the Project (unit: m^2)

	Hai An District		Cat Hai District			Total
	Trang Cat Ward	Dong Hai 2 Ward	Nghia Lo Com-mune	Dong Bai Com-mune	Cat Hai Townlet	
Aquaculture land	129,300	192,000	178,400	58,586	102,600	660,886
Salt production land	0	0	6,470	12,896	25,389	44,755
Residential land	0	0	21,316	7,620	0	28,936
Sub-total	129,300	192,000	206,186	79,102	127,989	736,877
Public land (cemetery, etc.)	0	0	2,300	0	0	0
Total	129,300	192,000	208,486	79,102	127,989	736,877

Source : IOL Data Sheet, JV of JBSI-HYDER-HECO, May 2010

2) Affected structures, plants/trees, graves, etc.

And the following number of structures, plants/trees, graves, etc. and households should be affected and relocated (Table 122.3-6).

Table 12.2.3-6 Affected structures and households

	Hai An District		Cat Hai District			Total
	Trang Cat Ward	Dong Hai 2 Ward	Nghia Lo Com-mune	Dong Bai Com-mune	Cat Hai Townle t	
1. Affected structures						
Residential house (unit)	0	0	45	33	0	78
Plant/tree (unit)	0	0	3392	2148	0	5,540
Grave (unit)	0	0	344	0	236	580
Concrete road (m^2)	0	0	1,520	2,800	-	4,320
Asphalt road (m^2)	0	0	0	0	600	600
Electrical pole (unit)	0	0	16	5	0	21
Culvert (unit)	4	3	3	2	1	13
2. Affected households, persons						
Household (HHs)	51	29	95	79	45	299
Person (pers)	115	130	414	364	162	1,185

Source : The Resettlement Action Plan, PMU2, June 2010, and IOL Data Sheet, JV of JBSI-HYDER-HECO, May 2010.

It is estimated that about 140 households in Nghia Lo Commune and Dong Bai Commune would be resettled as a result of loss of residential land for the Project. In Dong Bai Commune, the Trung Hamlet would be disappeared if a part of its residents have to relocate to other place outside the hamlet, and then the hamlet does not have enough population to establish a hamlet in accordance with the state regulations.

3) Impacts to aquaculture ponds in Trang Cat Ward

The planned highway will pass through 4 large-scaled aquaculture ponds/swamps in Trang Cat Ward. Among these ponds/swamps, the largest one (covering about 20 ha of water body area) is being cultivated by Mr. Phung Van Manh and other 13 shareholders. The pond/swamp cultivated by Manh and their shareholders as well as other affected ponds/swamps would be split by the planned highway into several parts. Part of the pond/swamp located within the ROW would be subject to compensation, but the remaining parts of the pond/swamp located outside of the ROW would not be acquired by the Project and therefore would not be subject to compensation. However, the remaining parts of the pond/swamp will become fragmented and unsuitable for aquaculture. In addition, it is said that shrimp cultivated in the ponds/swamps is very sensitive to the surrounding environment, and is vulnerable to gas exhausted from vehicles, dust, polluted water run off from the road surface, etc.

During the hearing survey carried out by the D/D Study Team, owners of these ponds said that they have no other sources of income, so their life will become very difficult if they can not continue to cultivate the existing ponds/swamps. Some of them had to borrow money from the bank on their house for the construction and operation of the ponds/swamps.

4) Impacts to aquaculture ponds in Dong Hai 2 Ward

Similar to Trang Cat Ward, the planned highway will pass through three large-scaled aquaculture ponds/swamps in Dong Hai 2 Ward. These include a large-scaled (50 ha of surface area) intensive shrimp pond cultivated by Thuan Thien Phat Co. which is well known as one of the largest shrimp producers in Hai Phong City. The planned highway will cut off the pond into two

parts, and will make the electric power systems, automatic feeding system, sewage system, etc. become useless. The company has invested billions of VND into the pond, and recently has equipped the pond with about 300 modern automatic feeding systems. It is said that more than 100 workers working for the company would lose their mean of livelihood if the pond is damaged and forced to stop operation due to the Project.

5) Impacts to local communities, public facilities, religious relics, etc.

In addition to impacts caused by land acquisition, the Project will cause the following impacts to the local communities.

- (a)The office of Dong Bai Commune PC and the Culture House of Trung Village (Km 13+700) would be significantly affected and should be relocated.
- (b)Van Co Huong Temple, a religious structure located right near the highway at Km 13+700, would be affected of noise, air pollution, vibration during construction phase and operation phase.
- (c)A section of the wave protection dykes (Km 9+900 ~ Km 12+000) would also be damaged and should be rebuilt.
- (d)Transportation by boat through a canal (at Km 15+100) from the sea to a fish-sauce factory in Cat Hai Townlet would be halted.
- (e)Spiritual impacts due to the change of living conditions, loss of neighborhood, etc.
- (f)Split of community, discontinuity of neighborhood relationship (which has been formed and maintained for a long time between local residents).
- (g)Suspension of school enrollment, suspension of aquaculture production, salt production, fishing activities, etc.

12.2.3.3 Compensation, resettlement plan, and other mitigation measures for project-affected people (PAP)

1) Progress of tasks of land acquisition, compensation, and resettlement:

The "Resettlement Action Plan (RAP) for the Project was prepared by VIDIFI in July 2009, and updated by PMU2 in May 2010. This RAP has the content in line of Vietnam regulations related to land acquisition, compensation and resettlement (in particular, it refers to "*Decree No. 69/2009/ND-CP issued on August 13, 2009 on Additionally providing for land use planning, land prices, land recovery, compensation, support and resettlement"*), and it can be considered as a *"Master Plan on Compensation, Support, and Resettlement"* (in Vietnamese: *"Phương án tổng thể bồi thường, hỗ trợ, tái định cư"*, as stated in Article 29 of Decree No.69/2009/ND-CP) for the Project.

This RAP had been accepted by Hai Phong City PC (by the letter No. 713/STN&MT- QLTNĐ issued by Hai Phong DONRE on June 7, 2010). And Hai Phong City PC, as the agency taking overall responsible for land acquisition, compensation, and resettlement for the Project, had issued the Land Acquisition Announcement (*"Thông báo Thu hồi đất"*, by Circular No. 176/TB-UBND on June 16, 2011) and instructed relevant PCs and agencies to start the tasks of land acquisition for the Project. Hai Phong City PC had also nominated Hai An District PC and Cat Hai District PC to be owners of two sub-projects of land acquisition (by Decision No. 610/QD-UBND issued on April 25, 2011).

Task to drive demarcation stakes to define boundary of ROW (land to be acquired, based on result of F/S) for the Project had been carried out since June, 2011. Based on the defined ROW, the Fund Development Center (Trung Tâm Phát Triển Quỹ Đất) of Cat Hai District is entrusted by the District to carrying out the IOL (inventory of loss) surveys to identify affected land and properties for each household. It is reported that after completed the IOL surveys, the above-mentioned Center will prepare the Plan of Compensation, Support and Resettlement (Phương án Bồi thường, Hỗ trợ, Tái định cư) and the Livelihood Restoration Plan (Phương án Đào tạo và Chuyển đổi Nghề Nghiệp) for project-affect people in Cat Hai Island.

2) Plan to construct the resettlement sites

Among the project-affected households, it is anticipated that 140 households in Cat Hai Island would lose fully or partly its residential land and would be relocated. After received Hai Phong City PC's announcement on land acquisition, the Commune People's Committee (CPC) of Dong Bai and Nghia Lo had sent their own proposals on location of the resettlement site to HP City PC. The Dong Bai CPC, with the letter dated 31/05/2010, had proposed an area for construction of the resettlement site located about 300m from the existing CPC office (total area of 20,000m^2, including 10,000m^2 for housing of 50 households, 5,000m^2 for relocation of the CPC office, and 5,000m^2 for roads, trees, etc.). Nghia Lo CPC had also proposed a resettlement site (with 11,000m^2 of land area) located in the southern part of the trans-island-road near the Dinh Vu ferry terminal.

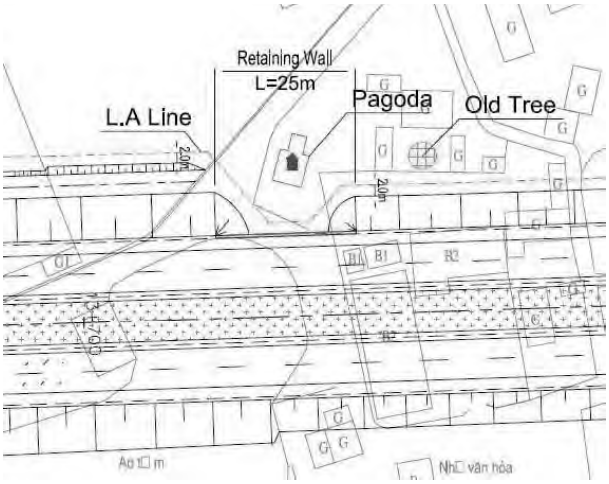
However, the HP City Planning Institute (an agency in charge of advising Hai Phong City PC on urban planning, etc.) has proposed a different resettlement site located in Hoang Chau Commune (about 10 ha of land area) for resettlement of about 200 households (150m^2 for a household), including affected households in Nghia Lo Commune and Dong Bai Commune. In the meeting on July 14, 2011 at the Nghia Lo CPC office, the representatives of Dong Bai CPC had raised comments that they still persist on the proposal to build the resettlement site in the area near the commune.

In the meeting at Hai Phong City PC office on October 5, 2011, the representative of the Department of Construction of Hai Phong City had reported that it will soon submit a proposal to construct the resettlement site in Hoang Chau Commune to the City PC for approval. However, as also reported in this meeting, budget for construction of the proposed resettlement site has not been ensured yet by either central government or local government at the time being. Representatives of PMU2 and Hai Phong City PC were agreed in the meeting that they will send letter to the Prime Minister to ask for the permission to apply a specific mechanism ("cơ chế đặc thù") for the resettlement site construction project by which Hai Phong City PC can appoint a contractor instead of select contractor by bidding in order to shorten the time for construction.

3) Measure to mitigate impact to Trung Hamlet in Dong Bai Commune

During the D/D Study, the adjustment of the road alignment at the section from Km 13+700 to Km 14+000 had been carefully studied with aim to reduce impacts to Trung Hamlet. However, after the consultation meeting with local residents in April 2011, it found out that the adjustment of road alignment is not the best choice. Affected residents told that they can move to the resettlement site near their existing dwelling.

In addition, to mitigate impacts to the Van Co Huong Temple/Pagoda (Km 13+700), the D/D Study Team has recommended to build a wall between the highway and the temple. However, a part of the barrier of the temple may be affected by the construction of the wall foundation.



Source : Study Team

Figure 12.2.3-1 Planned wall in front of the Van Co Huong Temple/Pagoda

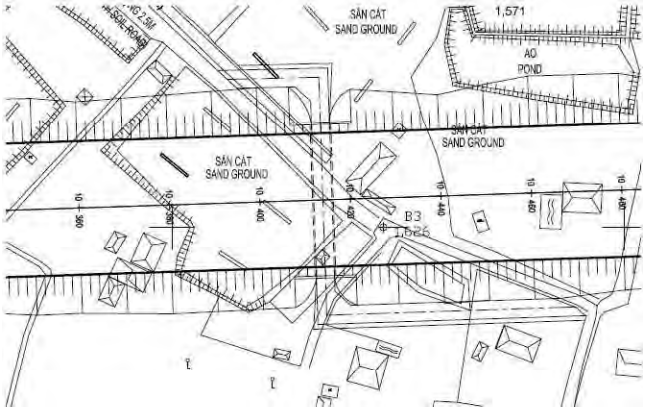
12.2.3.4 Impacts of split of community, and impediment to local resident movement

Although the highway is designed to pass through the low population density area in northern part of Cat Hai Island, it will cause splits of Ninh Tiep Hamlet (Nghia Lo Commune) and Trung Hamlet (Dong Bai Commune). The highway will also cut off several community roads and cause impediment to local resident movement.

To mitigate impediment to local resident movement, the following underpass and frontage road have been designed.

a) Underpass at Km10+420

Box culvert (4.0m of width and 3.2m of height) is planned as an underpass here. Frontage road is added to ensure access of existing local roads.

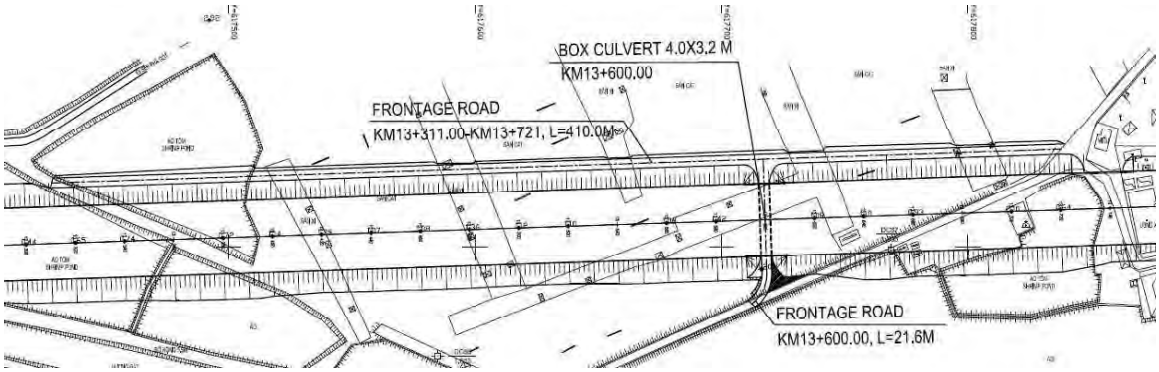


Source : Study Team

Figure 12.2.3-2 Planned underpass at Km10+420 and the frontage road

b) Underpass at Km13+600

Box culvert (4.0m of width and 3.2m of height) is planned as an underpass here. Frontage road is added to ensure access of existing local roads.

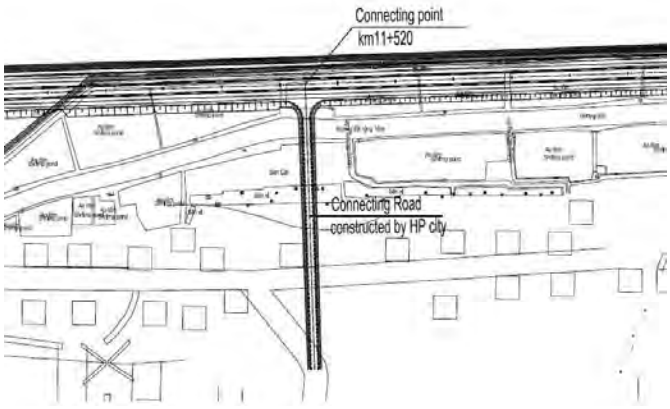


Source : Study Team

Figure 12.2.3-3 Planned underpass at Km13+600 and the frontage road

c) At-grade intersection at Km11+520

To respond to local authority's request, an at-grade inter- section at Km11+520, and a connecting road (with roadbed width = 7.50m) are designed to link the highway and District Road 356. Design and construction of the connecting road would be done by Hai Phong City and the Study Team would only carry out design of intersection within ROW of the highway.



Source : Study Team

Figure 12.2.3-4 Planned intersection at Km11+520

d) At grade intersection at Km15+576

As shown in Figure 12-4, two existing roads, District Road 356 and 2A, would be affected by the Project (port portion). To respond to local authority's request, an at-grade intersection is added at Km15+576, and a new road (with roadbed width = 7.50m) is proposed as a substitute for the affected existing roads. Design and construction of the relocated road would be done by Hai Phong City and the Study Team would only carry out design of intersection within ROW of the highway.

Source : Study Team

Figure 12.2.3-5 Planned intersection at Km15+576

12.2.3.5 Relocation of tombs affected by the Project

According to the Resettlement Action Plan prepared by PMU2 in June 2010, it is anticipated that about 600 tombs would be affected by the Project and would be relocated. Among them, there are tombs of residents' ancestor which were built several hundreds years ago. It is said that relocation of such tombs usually needs recommendation from a "psychic consultant" (who is accredited by the state), and final decision made by all family members in an open family meeting. Relocation of a new tomb (for the deaths in the recent 2~3 years) is also said very difficult and should be particularly considered. Generally, the relocation of tombs can only be done in the last two months of the lunar year.

Hai Phong City Planning Institute has proposed a plan to build a new cemetery (with land area of about 8ha) in northern area of Ninh Tiep Village, Nghia Lo Commune. This proposal seems to be favored by the representatives who attended the meeting on July 14, 2011 in Nghia Lo CPC office. Representative of Cat Hai Townlet PC said that this proposed cemetery is located quite far from Cat Hai Townlet and is inconvenient for Cat Hai Townlet's residents. However, the plan proposed by the Institute is likely to be approved by Hai Phong City PC in the near future.

12.2.3.6 Income restoration plan for PAP

1) Recommendation on Income Restoration Plan for PAP in Cat Hai District

As shown in Table 12.2.3-5, the Project will need to acquire a large area of land in the communes/townlet on Cat Hai Island which is mainly using for aquaculture (fish and/or shrimp pond) and salt production. Project-affected residents in the communes/townlet are depending on salt production and aquaculture as their main mean of livelihood. It is said that, even the Project needs to acquire only a part of the existing fish ponds, shrimp ponds, or salt pans, it will be very difficult for residents to continue their production with the remaining parts of these ponds/pans. Therefore, it is anticipated that a number of residents here would lose their main source of income and should be assisted in obtaining new mean of livelihood.

Particularly, it needs to provide concrete assistances to residents who have to relocate far from their existing salt pans and/or aquaculture ponds, and elderly residents who can not adopt means of livelihood other than salt production. Young people can change careers, but they need concrete supports in vocational training. During the hearing survey carried out by the D/D Study Team, almost all affected residents expressed that they want their children can be accepted as workers, road-builders, and employees in ports, or public service personnel at the Lach Huyen Port in the future. It is said that the remaining parts of affected land will not be suitable for growing vegetables or raising chickens, pigs, because of soil salinity, lack of fresh water, and high cost to buy and transport feeds for livestock from other areas.

The manager of Luong Hoa Salt Production Cooperative in Cat Hai Townlet said that after the road construction work commencement, their members would lose all income from the production of salt. They suggested that the Project owner would acquire all land of the salt pans, pay satisfactory compensation, and provide appropriate assistances to their children in finding new jobs, promptly for those who are now in the working age.

The Land Fund Development Center of Cat Hai District is in charge of preparation an Income Restoration Plan for affected residents here. However, the following issues may be referred to for the preparation of the Income Restoration Plan.

a) Potential mean of livelihood for project-affected residents

Due to the lack of fresh water, specific geological condition (saline soil), and geographical condition (located far from sources of raw materials and production consuming markets), it is hard to find out suitable works (other than aquaculture, fishing and salt production) for residents in Cat Hai Island to get income. Therefore, the Income Restoration Plan for affected residents in Cat Hai Island would be better to focus on the labor works during construction phase of the Project, and on the provision of services (such as logistic, transportation, hotel, restaurant, recreation, etc.) relating to the port in operation phase of the Project.

In construction phase of the Project, residents of Cat Hai Island should be given priority to involve in the construction works of the road, bridge, and port. However, Hai Phong City PC and Cat Hai District PC should assist these residents in attending vocational training. Table 12.2.3-7 shows the expected number of workers/officers necessary for the road and bridge construction, and the vocational trainings needed for residents to work for these jobs.

Table 12.2.3-7 Expected works during construction phase (Road & Bridge Portion)

Job title	Number of daily workers (pers)	Working duration (months)	1) Required skill 2) Vocational training
Form worker (concrete)	246	18	1) Experience in general/form work, leader of form-work with some general workers 2) Basic safety training, form basic technique training
Concrete worker	328	18	1) Experience in general/concrete work, leader of form-work with some general workers 2) Basic safety training, concrete basic technique training
Rebar worker	109	18	1) None 2) Basic safety training, rebar basic technique training
General worker	300	27	1) None 2) Basic safety training
Steel worker	50	25	1) Experience in steel work 2) Basic safety training, steel basic technique training
Dump truck driver	20	25	1) Read/write in Vietnamese 2) Basic safety training, large car-driving license
Construction machine operator	60	25	1) Preferably experience in machine operation 2) Basic safety training, machine operation training
Mechanic	40	25	1) Experience in mechanic work 2) Basic safety training, mechanical maintenance training for construction machines
Marine worker	30	28	1) Experience in onboard or boat operation, boat license for boat operator 2) Basic safety training
Office cleaner	10	30	1) Good health condition 2) Basic instruction
Security	20	30	1) Good health condition 2) Basic instruction
Equipment operator	20	25	1) Preferably experience in equipment operation 2) Basic safety training, equipment operation training
Office staff	60	30	1) Language skill,experience in accouting, computer, documenting 2) Training on general office works
Total	1,293		

Source : Study Team, Construction Plan

b) Required mechanism to implementing the Income Restoration Plan

In short-term, in construction phase of both road & bridge portion and port portion of the Project, affected residents should be given priority to be employed by contractors to work as construction workers. However, in order to facilitate and sustain this employment, trainings should be done to help affected residents to improve their skills suitable for their work. Land Fund Development Center of Cat Hai District, who is in charge of prepare the Income Restoration Program (*Phương án chuyển đổi nghề nghiệp*) should identify the types of training to be carried out, and make recommendation on method to carry out these trainings, including budget arrangement for these trainings. Project owner and Hai Phong City PC should provide the Land Fund Development Center with appropriate assistants and finance to carry out the trainings.

For long-term socio-economic development plan of the region, Hai Phong City PC and Cat Hai District PC should consider the schemes to create new jobs for residents of Cat Hai Island as a part of the *Dinh Vu – Cat Hai Economic Zone Development Plan*, and should mobilize the participation of local residents in the implementation of the Plan. Soft loan and assistances should be given to local residents as first priority in establishing new businesses such as restaurants, hotels, recreation facilities, etc. in the island to support activities of the new port and the economic zone.

2) Recommendation on Income Restoration Plan for PAP in Hai An District

In Trang Cat Ward and Dong Hai 2 Ward, project-affected people are mainly depending on their aquaculture ponds/swamps for their livelihood. They will suffer serious difficulties in living if they can not continue to cultivate their ponds/swamps. Therefore, in order to avoid and/or mitigate impacts caused by the Project to project-affected people here, the following measures are recommended.

- (1)During construction phase, appropriate measures should be taken to prevent polluted water and dust generated from the digging of land, cutting trees, operation of construction machinery and vehicles, etc.
- (2)At the road section across the aquaculture ponds/swamps, dikes should be constructed along the highway to prevent polluted water discharging into the ponds/swamps.
- (3)The drainage system should be properly designed along two sides of the highway to prevent polluted water from the road surface run off to the ponds/swamps.

In addition, in order to mitigate impacts to owners of affected ponds/swamps and assist them in restoring income, the following measures should be carefully considered by MOT, PMU2, and local PCs.

- (1)Rational compensation should be paid to affected people, in accordance with their actual damages, losses.
- (2)If the remaining parts of the affected pond/swamps are fragmented and unsuitable to cultivation, and if there is request from owners of the pond/swamps, these remaining parts should also be acquired and compensated. If not, Hai Phong City PC should provide supports to owners of affected ponds/swamps in changing its land use purpose from *aquaculture* to *industry*, so that these affected people can carry out other types of business on the remaining parts of land.

- (3)The state should provide compensation to owners of the affected ponds/swamps during the construction period for the interruption of production and decrease in income.
- (4)The state should provide proper supports to affected residents in vocational training, career change, etc.
- (5)The state should inform affected residents about compensation policy and price, the construction schedule, etc. as soon as possible.
- (6)The Project implementing agency should make agreement with owners of the affected ponds/swamps on the proper time to calculate amount of compensation for loss of production (preferably after harvest season).
- (7)Measures to mitigate impacts to aquaculture ponds/swamps (both during the construction phase and the operation phase) should be prepared and incorporated into the bidding documents for the contractors to obligate.

12.2.3.7 Impacts to schools, hospitals, etc.

In Trung Hamlet of Dong Bai Commune, there is a school (elementary cum junior high school) located about 100m in the north of the highway at Km 14+000. With this relatively long distance, impacts of air pollution, noise and vibration caused by the highway to the school are considered slight.

However, measures should be taken during construction phase to prevent traffic accident caused by construction vehicles to the students when they are on the way going to the school or returning home.

There is no other school or hospital identified in the area within 100m from the road sides.

12.2.3.8 Impacts caused by construction workers came from outside during the construction phase

As shown in Table 12.2.3-7, it is expected that more than 1,000 workers may be employed in the Project during construction phase.

In order to minimize impacts of an influx of workers come into the Project area from outside, wherever possible, suitable local companies and organizations should be involved. For unskilled manual labor, residents of Dinh Vu area and Cat Hai Island should be employed. Whenever available, the use of local services (such food supply, etc.) should be encouraged.

In the worker camps, adequate living standards with suitable services (water supply, sanitation and power supplies) should be provided. Effluents discharged from these worker camps should be treated properly in accordance to Vietnamese regulations.

12.2.3.9 Impacts to the existing ferries (Dinh Vu Ferry and Ben Got Ferry)

When the highway is brought to operation, the Dinh Vu – Ninh Tiep Ferry would be forced to stop operation. The Ferry is now being operated by a City-owned company belong to Department of Transportation of Hai Phong City PC. And it is said that, a part of about 30 persons working for the Ferry would be assigned to work for other ferries such as Pha Rung Ferry, Ben Got Ferry, etc. if the Ferry stops operation. Other staff members would quick the existing job and have to seek new jobs to maintain income. In addition, about 30 owners of small shops/stalls saling foods, drinks, and goods at two ferry terminals and on the ferries would also need to seek other businesses/works to maintain income.

During the hearing survey carried out by the D/D Study Team, the owners of the shop/stall at the ferry terminals and on the ferries said that, for instance, they expect to work as construction worker for the Project during construction phase, and their children can have works relating to the new port operation. Similar to assistances to be given to affected residents in Cat Hai Island, these persons should also be assisted in obtaining vocational trainings and soft loan for starting new businesses, etc.

12.2.4 Impacts to air ambient and noise

12.2.4.1 Impacts caused by the concrete batching plant

At the concrete batching plants, in addition to measures to mitigate impacts of air pollution, noise, vibration, wastewater, etc, described in the approved EIA Report (Section 4.1.2), the following measures should also be taken.

- a)Concrete batching plants and their ancillary areas shall be frequently cleaned and watered to minimize any dust emissions.
- b)Dry mix batching shall be carried out in a totally enclosed area with exhaust to suitable fabric filters.
- c)A suitable air pollution control system shall be installed and operated whenever the batching plant is in operation.
- d)All stockpiles of sand and aggregate within the batching plant site shall be enclosed on three sides with geotextile sheets (if they are greater than $20m^3$), and shall be enclosed on three sides with walls extending above the stockpile and 2000mm beyond the front of the stockpile (if they are greater than $50m^3$).
- e)Cement and other such fine-grained materials delivered in bulk shall be stored in closed silos fitted with a high-level alarm indicator. The high level alarm indicators shall be interlocked with the filling line such that in the event of the hopper approaching an overfill condition, an audible alarm will operate, and the pneumatic line to the filling tanker will close.
- f)All air vents on cement silos shall be fitted with suitable fabric filters provided with either shaking or pulse-air cleaning mechanisms. The fabric filter area shall be determined using an air-cloth ratio (filtering velocity) of 0.01 - 0.03 m/s.

12.2.4.2 Impacts to air ambient in the operation phase

As comments raised by the Appraisal Council in the meeting on May 13, 2010, in the approved EIA Report, it lacks of proper prediction of impacts to air ambient in the operation phase, and measures to mitigate these impacts. Therefore, in this Section, the relevant impact estimation, assessment and recommendation of impact mitigation measures are described with aim to supplement to the approved EIA Report.

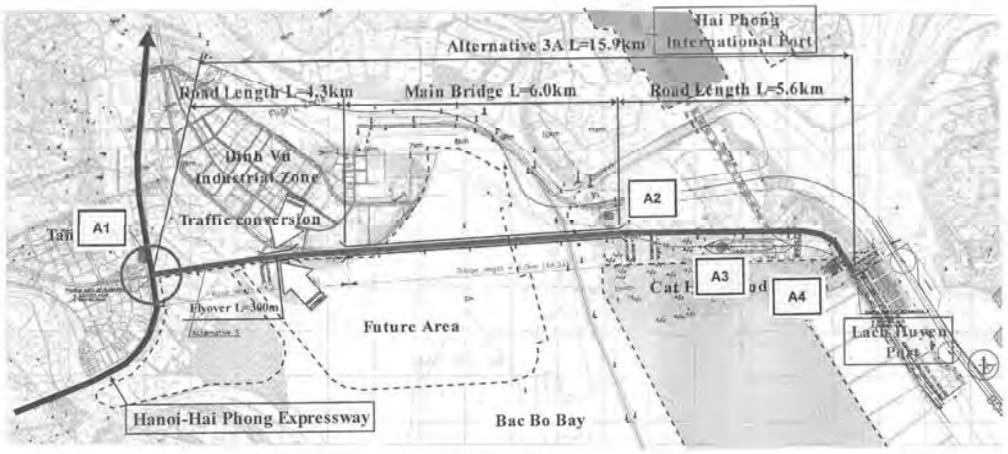
1) Estimation and assessment of impacts to air ambient in operation phase

The following table shows air pollutant concentrations at 4 survey sites along the planned highway. These data were obtained through the survey carried out by CASST (*Trung Tâm Ứng Dụng Khoa Học Công Nghệ*, under Quang Ninh Province DONRE) in August 2008.

Table 12.2.4-1 Background air pollution concentration (unit:μg/m3)

Survey point	Survey day	SO2	NO2	SPM	CO
A1 20°48'13.09"N 106°44'48.78"E	10-Aug-08	50	42	130	3,448
	12-Aug-08	52	42	131	3,497
	Average	51	42	131	3,473
A2 20°48'36.89"N 106°50'51.76"E	10-Aug-08	46	51	93	4,019
	12-Aug-08	46	49	91	4,035
	Average	46	50	92	4,027
A3 20°48'0.59"N 106°51'10.64"E	10-Aug-08	47	35	92	3,786
	12-Aug-08	48	36	88	3,899
	Average	48	36	90	3,843
A4 20°47'56.32"N 106°53'31.48"E	10-Aug-08	62	45	119	4,128
	12-Aug-08	61	44	120	4,227
	Average	62	45	120	4,178

Source : EIA Report of Tan Vu – Lach Huyen Highway Construction Project, Hanoi May 2010.



Source : Study Team

Figure 12.2.4-1 Location of air quality and noise survey carried by CASST in August 2008

During the SAPROF Study in 2010, air pollutant concentrations in the years of 2015, 2020, and 2030 were predicted (with the use of Plume Model) as shown in Table 12.2.4-2. Predicted traffic data in these target years were provided by the SAPROF Study 2010. And the survey data mentioned above were used as background data.

Table 12.2.4-2 Predicted ambient quality (unit: μg/m^3)
(at the survey point 10m from the road embankment side).

	Survey point	A1	A2	A3	A4	Standard*)
	Location	20°48'13.09"N 106°44'48.78"E	20°48'36.89"N 106°50'51.76"E	20°48'0.59"N 106°51'10.64"E	20°47'56.32"N 106°53'31.48"E	
TSP	2015	130.9	92.3	90.2	119.7	300μg/m3 (1 hour average)
	2020	131.2	92.4	90.4	119.8	
	2030	**132.5**	92.8	90.7	120.1	
SO2	2015	52.0	46.6	48.0	62.0	350μg/m3 (1 hour average)
	2020	53.1	47.2	48.6	62.5	
	2030	**60.7**	49.6	50.7	64.5	
NO2	2015	44.1	51.3	36.6	45.6	200μg/m3 (1 hour average)
	2020	45.4	52.0	37.3	46.2	
	2030	**52.7**	54.5	39.5	48.2	
CO	2015	3,496	4,043	3,857	4,191	30,000 μg/m3 (1 hour)
	2020	3,506	4,049	3,862	4,196	
	2030	**3,566**	4,068	3,879	4,211	

Source: SAPROF Study, July 2010

*) TCVN 5937:2005 Ambient air quality standard

As shown in Table 12.2.4-2, in 2030, at A1 survey site, where the traffic volume is the highest among the planned highway, even at the survey point located 10m from the road side, the predicted concentrations of SO2, NO2, CO and TSP are lower than the maximum allowable values stated by the Vietnam Ambient Air Quality Standard TCVN 5937- 2005 (TSP : 132.5μg/m^3, SO2 : 60.7μg/m^3, NO2 : 52.7μg/m^3, and CO : 3,566μg/m^3).

In all projected years (2015, 2020, and 2030), at all survey sites (A1, A2, A3, and A4), all predicted concentrations are lower than the maximum allowable values stated by the Vietnamese ambient air quality standard.

However, there are two constraints in this prediction: (1) due to the lack of data on air pollutants emission by vehicles in Vietnam, the coefficients of air pollutants emitted by moving vehicles using in this study are referred to the ones applied in Japan, and therefore, they may be inconsistent with actual situation in Vietnam; and (2) due to the lack of data on meteorology, the wind velocity (1.7m/s) described in the EIA Report is used for the prediction in this study. It may need to carry out further study with the use of other different data on wind velocity and wind direction to ensure the accuracy of the prediction.

2) Measures to mitigate impacts to air ambient in operation phase

In order to mitigate impacts caused by the Project to air ambient of local areas in operation phase, the following measures are proposed.

- -Forbid trucks with over exhaust gas to use the highway
- -Carry out regular maintenance of highway and bridge pavement
- -Spray water regularly on road surface at least 10 days/time in dry season
- -Take care of trees and landscape along the highway
- -Carry out monitoring of ambient air quality

12.2.4.3 Impacts of noise in operation phase

Similar to the case of impact of air ambient in operation phase described in Section 12.2.4.2, in the approved EIA Report, it lacks of proper prediction of impacts of noise in operation phase, and measures to mitigate these impacts. Therefore, in the SAPROF Study in 2010, noise levels in the years 2015, 2020, and 2030 were predicted with the application of the road traffic noise prediction model "ASJ RTN-Model 2003" developed by the Acoustical Society of Japan. In this Section, the relevant impact estimation, assessment and recommendation of impact mitigation measures are described with aim to supplement to the approved EIA Report.

1) Estimation and assessment of impacts of noise

Table 12.2.4-3~7 show predicted noise level (at the survey site located 10m from the road embankment side) in the years 2015, 2010, and 2030.

Table 12.2.4-3 Predicted noise level at survey point A1

(Unit: dBA)

Distance(m)	In day-time (6am~18pm)			In night-time (18pm~22pm)			In midnight (22pm~6am)		
	2015	2020	2030	2015	2020	2030	2015	2020	2030
10	61.9	65.5	71.0	58.1	61.8	67.2	51.5	55.1	60.5
20	61.7	65.3	70.8	58.0	61.6	67.0	51.3	54.9	60.3
30	61.3	65.0	70.4	57.6	61.2	66.7	50.9	54.5	60.0
40	60.9	64.6	70.0	57.2	60.8	66.2	50.5	54.1	59.6
50	60.6	64.2	69.6	56.8	60.4	65.9	50.1	53.7	59.2
70	59.8	63.4	68.9	56.1	59.7	65.1	49.4	53.0	58.4
100	58.9	62.5	68.0	55.1	58.8	64.2	48.4	52.1	57.5
TCVN5949-1998	75 dBA			70 dBA			50 dBA		

Source : SAPROF Study, July 2010

Table 12.2.4-4 Predicted noise level at survey point A2

(Unit: dBA)

	In day-time (6am~18pm)			In night-time (18pm~22pm)			In midnight (22pm~6am)		
Distance (m)	2015	2020	2030	2015	2020	2030	2015	2020	2030
10	61.4	64.9	68.5	57.6	61.1	64.7	50.9	54.5	58.0
20	60.8	64.3	67.9	57.1	60.6	64.1	50.4	53.9	57.4
30	60.2	63.7	67.3	56.5	60.0	63.5	49.8	53.3	56.8
40	59.7	63.2	66.7	55.9	59.4	63.0	49.2	52.7	56.3
50	59.1	62.7	66.2	55.4	58.9	62.4	48.7	52.2	55.7
70	58.3	61.8	65.3	54.5	58.0	61.6	47.8	51.3	54.9
100	57.2	60.7	64.3	53.4	56.9	60.5	46.7	50.3	53.8
TCVN5949-1998	60 dBA			55 dBA			50 dBA		

Source : SAPROF Study, July 2010

Table 12.2.4-5 Predicted noise level at survey point A3

(Unit: dBA)

	In day-time (6am~18pm)			In night-time (18pm~22pm)			In midnight (22pm~6am)		
Distance (m)	2015	2020	2030	2015	2020	2030	2015	2020	2030
10	59.5	63.2	66.6	55.8	59.3	62.8	49.1	52.6	56.1
20	59.4	62.9	66.5	55.6	59.1	62.7	48.9	52.5	56.0
30	59.0	62.5	66.1	55.3	58.8	62.3	48.6	52.1	55.6
40	58.6	62.2	65.7	54.9	58.4	61.9	48.2	51.7	55.2
50	58.3	61.8	65.3	54.5	58.0	61.6	47.8	51.3	54.9
70	57.5	61.1	64.6	53.8	57.3	60.8	47.1	50.6	54.1
100	56.6	60.2	63.7	52.9	56.4	59.9	46.2	49.7	53.2
TCVN5949-1998	60 dBA			55 dBA			50 dBA		

Source : SAPROF Study, July 2010

Table 12.2.4-6 Predicted noise level at survey point A4

(Unit: dBA)

	In day-time (6am~18pm)			In night-time (18pm~22pm)			In midnight (22pm~6am)		
Distance (m)	2015	2020	2030	2015	2020	2030	2015	2020	2030
10	58.5	62.0	65.6	54.7	58.3	61.8	48.0	51.6	55.1
20	58.5	62.0	65.6	54.8	58.3	61.8	48.1	51.6	55.1
30	58.3	61.8	65.4	54.5	58.1	61.6	47.8	51.4	54.9
40	58.0	61.5	65.1	54.3	57.8	61.3	47.6	51.1	54.6
50	57.7	61.2	64.8	53.9	57.4	61.0	47.2	50.8	54.3
70	57.1	60.6	64.2	53.3	56.8	60.4	46.6	50.2	53.7
100	56.3	59.8	63.3	52.5	56.0	59.6	45.8	49.4	52.9
TCVN5949-1998	60 dBA			55 dBA			50 dBA		

Source : SAPROF Study, July 2010

Table 12.2.4-7 Summarization of predicted noise level at 4 survey points

(Unit: dBA)

		A1	A2	A3	A4	Standard*)
	Location	20°48'13.09"N 106°44'48.78"E	20°48'36.89"N 106°50'51.76"E	20°48'0.59"N 106°51'10.64"E	20°47'56.32"N 106°53'31.48"E	
6am ~ 18pm	2015	61.9	61.4	59.5	58.5	60 dBA
	2020	65.5	64.9	63.2	62.0	
	2030	71.0	68.5	66.6	65.6	
18pm ~22pm	2015	58.1	57.6	55.8	54.7	55 dBA
	2020	61.8	61.1	59.3	58.3	
	2030	67.2	64.7	62.8	61.8	
22pm ~6am	2015	51.5	50.9	49.1	48.0	50 dBA
	2020	55.1	54.5	52.6	51.6	
	2030	60.5	58.0	56.1	55.1	

Source: SAPROF Study, July 2010

*) TCVN-5949-1998

At A1 site, in 2020, the predicted noise level at the survey point located 100m from the road side in the midnight is 52.1 dBA, and exceeds the maximum allowable level for a business service-shopping-industrial mixed residential area stated by the Vietnam Standard (Acoustics - Noise in public and residential areas, maximum permitted noise level TCVN 5949-1998).

At the A2, A3 and A4 sites, in midnight in 2030, the noise levels predicted in the area within 100m from the road side exceed the maximum allowable level for a residential area stated by Vietnam Standard TCVN 5949-1998.

2) Recommendation of measures to mitigate impacts of noise in operation phase

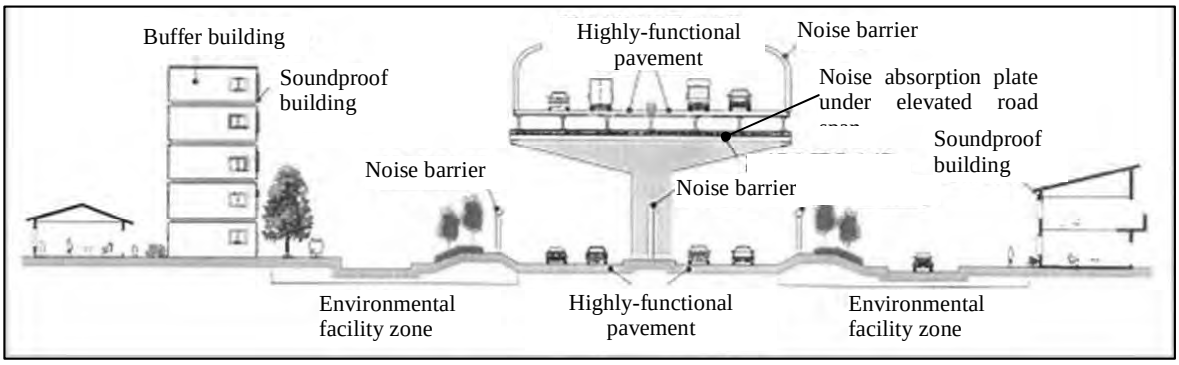
At the road sections where the predicted noise levels exceed the maximum allowable level, especially around the A2 and A3 survey sites, proper mitigation measures such as the followings should be introduced.

-
- -Plant trees along sections of road near the populous residential areas;
- - Install warning signs on road for horning bans and speed control at the road sections close to residential areas;
- - Regular maintenance on road to keep good road surface condition;
- - Respond to monitoring results which show higher noise than projected by the EIA.
-

In addition, other noise mitigation measures as listed in the following Table 12.2.4-8 may also be considered.

Table 12.2.4-8 Typical Noise Mitigation Measures

Mitigation Measure	Function	Effectiveness
Highly-functional pavement	Absorb noise generated by friction between the car tires and road surface.	About 3 dB
Noise barrier	Reduce noise by diffraction	About 10 dB
Environmental facility zone	Reduce noise by distance from noise sources	5~10 dB
Noise absorption plate attached under elevated road span	Reduce noise reflected from the under surface of the elevated road span	2 ~ 5 dB (depent on level of reflected noise)



Source: Japan Ministry of Land, Infrastructure, Transportation, and Tourism, Investor Relations Basic data, Noise Status, http://www.mlit.go.jp/road/ir/data/souon/souon3.html.

During the D/D Study, measures to mitigate impact of noise to the residential areas along the highway in Cat Hai Island have been discussed between the D/D Study Team and PMU2. However, according to PMU2, construction of noise barrier may need high cost, and all residents in Nghia Lo Commune, Dong Bai Commune would be relocated with other residents in Cat Hai Island under the *Dinh Vu – Cat Hai Economic Zone Development Plan* implemented by Hai Phong City PC. Therefore, planting trees along the road sides is considered at the first priority. In addition, PMU suggested that the noise barrier may be installed after the construction phase (during the operation phase) of the Project, if it is considered necessary.

After discussions with PCs of Nghia Lo Commune and Dong Bai Commune, the D/D Study Team had agreed to design the planting of the following species of tree along the sides of the highway at the sections close to the populous residential areas in Nghia Lo Commune and Dong Bai Commune.

- a)Flamboyant tree (Phượng Vĩ, Royal poinciana, Mohur tree, Family: Caesalpiniaceae, Genus: Delonix , Species: regia)
- b)Hopea odorata (Sao đen)

12.2.4.4 Impacts to air ambient caused by the transportation of construction materials

According to result of the materials sources investigation carried out by the D/D Study Team in August 2011, location of the potential exploitation sources of construction materials (soil/sand/rock quarries, borrow pits, etc.), transportation routes, and distances to the construction sites are as shown in Table 12.2.4-9.

Table 12.2.4-9 Location of materials exploitation sources, transportation routes, and distance to the Project site

(Project site/ stockpile located at Km11+00)

Mines / Stockpiles	Road	Waterway		Total
1. Lien Khe quarry Lien Khe commune - Thuy Nguyen - Hai Phong	***0.5 km*** Soil road		***36.4 km***	**36.9 *km***
		Da Bac river	9.2 *km*	
		Bach Dang river	17.2 *km*	
		Nam Trieu estuary	10.0 *km*	
2. Phuong Mai quarry Phuong Nam commune - Uong Bi - Quang Ninh	***0.5 km*** Soil road		***34.0 km***	**34.5 *km***
		Hang ma river	3.2 *km*	
		Da Bac river	3.6 *km*	
		Bach Dang river	17.2 *km*	
		Nam Trieu estuary	10.0 *km*	
3. Thong Nhat quarry Phu Thu town - Kinh Mon - Hai Duong	***1.5 km*** Soil road		***47.0 km***	**48.5 *km***
		Kinh Thay river	3.3 *km*	
		Da Vach river	4.9 *km*	
		Da Bac river	11.6 *km*	
		Bach Dang river	17.2 *km*	
		Nam Trieu estuary	10.0 *km*	
4. Thien Hoi borrow pit An Tien town - An Lao -Hai Phong	***1.5 km*** Soil road		***40.8 km***	**42.3 *km***
		Lach Tray river	25.9 *km*	
		Lach Tray estuary	3.3 *km*	
		Sea	11.6 *km*	
5. Minh Duc borrow pit Minh Duc town - Thuy Nguyen - Hai Phong	***1.5 km*** Soil road		***27.6 km***	**29.1 *km***
		Thai river	4.2 *km*	
		Bach Dang river	13.4 *km*	
		Nam Trieu estuary	10.0 *km*	
6. Doc Do borrow pit Yen Tu Road- Phuong Đong commune - Uong Bi - Quang Ninh	***11.0 km*** Asphalted road		***33.5 km***	**44.5 *km***
		Da Bac river	6.3 *km*	
		Bach Dang river	17.2 *km*	
		Nam Trieu estuary	10.0 *km*	
7. Diem Moi borrow pit An Sinh - Đong Trieu - Quang Ninh	***7.0 km*** Asphalted road		***53.7 km***	**60.7 *km***
		Đa Vach river	14.9 *km*	
		Da Bac river	11.6 *km*	
		Bach Dang river	17.2 *km*	
		Nam Trieu estuary	10.0 *km*	
8. Quy Cao bridge stockpile Giang Bien commune - Vinh Bao - Hai Phong	***0.0 km***		***54.8 km***	**54.8 *km***
		Thai Binh river	6.0 *km*	
		Van Uc river	22.7 *km*	
		Sea	26.1 *km*	
9. Tram Bac bridge stockpile Quoc Tuan commune - An Lao - Hai Phong	***0.0 km***		***44.0 km***	**44.0 *km***
		Lach Tray river	29.1 *km*	
		Lach Tray estuary	3.3 *km*	
		Sea	11.6 *km*	
10. Niem bridge stockpile Vinh Niem ward - Le Chan &Quan Tru ward - Kien An - Hai Phong	***0.0 km***		***28.7 km***	**28.7 *km***
		Lach Tray river	13.8 *km*	
		Lach Tray estuary	3.3 *km*	
		Sea	11.6 *km*	
11. Rao bridge stockpile Dang Giang ward – Ngo Quyen district & Anh Dung ward - Duong Kinh district – Hai Phong city	***0.0 km***		***22.4 km***	**22.4 *km***
		Lach Tray river	7.5 *km*	
		Lach Tray estuary	3.3 *km*	
		Sea	11.6 *km*	

12. PR 353 stockpile	***0.0 km***		***20.2 km***	**20.2 *km***
Anh Dung ward		Lach Tray river	5.3 *km*	
- Duong Kinh - Hai Phong		Lach Tray estuary	3.3 *km*	
		Sea	11.6 *km*	
13. BTK Đông Hải	***0.0 km***		***13.7 km***	**13.7 *km***
Phường Đông Hải		Sông Cửa Cấm	3.7 *km*	
- Hải An - Hải Phòng		Cửa Nam Triệu	10.0 *km*	

Source : Study Team

Transportation of construction materials is anticipated mainly by waterway. However, whenever transportation of materials is done on the existing roads, impact mitigation measures including the followings should be taken.

- 1)Construction materials shall be supplied only from the quarries that have exploitation license and operated under a good environmental management.
- 2)Earth, rock, sand shall not be deposited on public or private right of way as a result of Contractor's operations, including any deposits arising from the movement of construction plant or vehicles.
- 3)Provide water spray vehicles to water the unpaved ground, storage piles and other areas where airborne dust may originate. The water spray operation should be carried out in dry and windy day, at least twice a day (morning and afternoon).
- 4)Any vehicles with an open load carrying area used for moving potentially dust-producing materials shall have properly fitting side and tailboards. Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin in good condition. The tarpaulin shall be properly secured and shall extend at least 300 millimeters over the edges of the side and tailboards.
- 5)Trucks transporting construction materials should meet allowable exhaust gas emission standards (stated in Decision 249/2005/QĐ-TTg on October 1, 2005), and should be carefully covered.
- 6)Site for stockpiling soils and sand should be located far more than 120m from the populous residential areas (such as Ninh Tiep Hamlet, Trung Hamlet, and Cat Hai Townlet).

12.2.5 Impacts to surface water quality

12.2.5.1 Impacts caused by polluted water from the construction camps

At the construction sites, worker camps, measures including the followings should be taken to mitigate impacts to surface water environment.

- 1)The Contractor shall comply with the Vietnamese legislation and other regulations currently applied in Vietnam insofar as they relate to water pollution control.
- 2)Protection of the water environment shall be recognized as a key constraint for any construction work. The Contractor shall devise and arrange methods of working to minimize water quality impacts to the satisfaction of the Engineer.
- 3)The Contractor shall at all times ensure that all existing stream courses and drains within, and adjacent to, the Site are kept safe and free from any debris and any excavated materials arising from the Works.
- 4)The Contractor shall ensure that rain run-off from the construction sites is not deposited directly into any watercourse or the marine environment.
- 5)All drainage facilities and erosion and sediment control structures shall be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms.
- 6)Wastewater shall be collected, re-used and/or disposed of off-site after oil/grease removal and settlement of suspended solids. Sediment tanks of sufficient capacity, constructed from pre-formed individual cells of approximately 6-8m3 capacity shall be used at all sites for settling waste-waters prior to disposal.
- 7)Construction wastes shall be collected and re-used wherever possible, otherwise should be disposed in the small deposit area invulnerable to surface run-off, along with soil erosion prevention measures.
- 8)The material stockpile site shall be far away from surface water body and the area prone to surface run-off. The loose materials should be bagged and covered. Open ditch should be built around the stockpile site to intercept wastewater;
- 9)Drainage from vehicle maintenance areas, plant servicing areas and vehicle wash bays shall be passed via a petrol interceptor prior to discharge.
- 10)The Contractor shall ensure that no tools or machinery are washed in any water source or areas that drain into an existing watercourse or to the marine environment.
- 11)The Contractor shall weekly check all equipment for prevention of oil and or lubrication leaks and ensure that all equipment oil and lubrication replacements are performed only in bundled maintenance and repair areas.

12.2.5.2 Impacts caused by the rain water runoff from the road surface in operation phase

As described in the EIA Report, impacts caused by the Project (during both construction phase and operation phase) to the shrimp ponds and salt spans around the Project site are especially concerned.

During operation phase, there is possibility that polluted water runoff from the road surface may contaminate the adjacent watercourses, salt pans, aquaculture ponds, etc. along the highway.

Therefore, in the approved EIA Report, it is recommended to construct a reservoir (200 ha) near the Tan Vu Interchange (as planned by Hai Phong City PC) and use it to collect and regulate runoff water from the highway road surface on the Dinh Vu side. In addition, it is also recommended to design other two retention ponds (one near Ninh Tiep Hamlet, and one near Trung Hamlet) to collect and regulate runoff water from the highway road surface on the Cat Hai Island side.

However, according to PMU2, it is very difficult to operate and manage the retention ponds, and the cost for construction of the drainage gutters to collect the water runoff and the retention ponds may be a problem. Therefore, it came to agree to design a drainage gutter system at the sides of the highway to collect polluted water runoff from the road surface and discharge it to the water bodies outside the wave protection dyke in the north of Cat Hai Island.

In addition, in operation phase, the road surface should be periodically cleaned up, especially before a rain, in order to collect dust and dirt, and reduce concentration of pollutants in runoff water from the road surface.

12.2.5.3 Impacts caused by the bridge foundation works

1) Impacts of bentonite slurry generated from the bridge foundation works

During the construction works of cast-in-place concrete piles, bentonite slurry may be used to cooling the drill bit, lubricating the drill bit and drill rods, increasing the stability of the borehole, etc. A part of the original bentonite slurry may be recycled and reused, while the remaining slurry may spill out to the watercourses. If the bentonite slurry is not properly collected and treated, it will contaminate the adjacent watercourse.

Although bentonite is not toxic in term of chemical properties, it is harmful in term of physical properties. With its fineness, bentonite may paralyze the entire respiratory system of creatures in the river/sea bed under its coverage. In addition, to increase the viscosity and some other features for improving efficiency of boring work, some toxic chemical additives are usually mixed with bentonite. Therefore, it needs to carefully handle bentonite slurry to prevent them spilling to the adjacent watercourse.

To mitigate impacts caused by bentonite slurry to watercourse quality, the following measures should be taken.

- - Do not discharge bentonite slurry directly into the watercourse.
- -Bentonite slurry must be stocked in the temporary tanks arranged within the construction site, settled, dehydrated, and dumped in the designated sites.

2) Impacts to surface water quality caused by the operation of floating barges

A number of barges, floating platforms would be used for construction works of the bridge. Operation of these barges would generate a large amount of waste oils and oil-soaked rags, and may contaminate the adjacent watercourses.

To mitigate impacts caused by waste oils and oil-soaked rags to watercourses, the following measures should be taken.

- -Strictly forbid discharging waste oils and throwing oil-soaked rags to the watercourses.
- -Waste oil and oil-soaked rags should be collected and stocked in bins located on the barges. These bins should be transported to the designated sites for proper treatment.
- -Oil-soaked rags should be treated as hazardous waste

12.2.5.4 Impacts caused by the transportation of construction materials by waterways

As described in Section 12.2.4.4, construction materials (such as soil, sand, rock, etc.) would be exploited at the quarries located in the north of Hai Phong City, or provinces of Hai Duong, Quang Ninh. These construction materials would be transported to the construction sites mainly by waterways, and materials would be spilled out during transportation and cause pollution to the water courses. To mitigate water pollution caused by transportation of materials by waterways, the following measures should be applied.

- - Materials carriers should be equipped with surrounding wall barriers to avoid spillage of materials into the watercourses.
- - Fine materials which are easily dispersed by wind should be well covered by sheets, etc. during transportation.
- - Transportation of excessive large quantity of materials which overloads the capacity of the vessels should be forbidden.
- - Use only vessels which are in compliance with standards for waterway transportation.

12.2.5.5 Survey of surface water quality at supplemental site

During the F/S Study, survey on quality of surface water had been conducted at 8 sites in 2008. This number of survey sites is considered not sufficient, when comparing to the extension (about 16 km) of the planned highway. Therefore, in order to have appropriate baseline data for a proper environmental management plan, the D/D Study Team had conducted a survey on surface water quality at an additional site located near by the highway at section Km12+600. Location of the supplemental survey site and sampling day and time are shown in Table 12.2.5-1 and Figure 12.2.5-1. Result of the survey is shown in Table 12.2.5-2.

Table 12.2.5-1 Location of additional site for surface water quality survey and its sampling time

	Longitude	Latitude	Depth	Sampling time	
				Hour	Date
High tide	106°52’23”	20°48’23”	0.8	16h00	16/5/2011
Low tide	106°52’23”	20°48’26”	0.2	8h00	18/5/2026

Source : Study Team (Port Portion)

Source : Study Team

Figure 12.2.5-1 Location of the additional site for surface water quality survey

Table 12.2.5-2 Result of water quality survey at supplemental site

NO	Items	Units	Testing Result at WS-19	
			High tide	Low tide
			Surface	Surface
1	Temperature	^{o}C	28.5	26.5
2	pH	-	7.67	7.53
3	Sality	‰	14.7	15.2
4	BOD_5	mg/l	2.3	2.5
5	DO	mg/l	6.45	5.81
6	TSS	mg/l	11.6	6.8
7	NH_3	mg/l	1.056	0.822
8	Toal Phosphorus	mg/l	2.543	2.325
9	Total Nitrogen	mg/l	2.064	1.811
10	Cr^{3+}	mg/l	0.021	0.008
11	Cr^{6+}	mg/l	0.009	0.006
12	Zn	mg/l	0.0013	0.0015
13	Cd	mg/l	0.0007	0.0005
14	Pb	mg/l	0.003	0.001
15	Total-Fe	mg/l	1.630	0.965
16	Mn	mg/l	0.0031	0.0016
17	As	mg/l	0.006	0.004
18	Hg	mg/l	0.0001	0.0005
19	Hydrocarbons/mineral Oils	mg/l	<0.1	<0.1
20	Coliform	MPN/100ml	360	390

Source : Study Team (Port Portion)

12.2.6 Impacts of solid wastes, and waste soils

12.2.6.1 Impacts caused by solid wastes generated from the construction camps

The following measures should be taken to mitigate impacts of solid wastes generated from the construction camps.

- 1Raw material requirements shall be planned at the outset of each construction activity to avoid excess material storage and wastage on-site.
- 2Wastes shall be stored and handled in dedicated areas with bundled sides such a way as to avoid loss or leakage and subsequent pollution. Waste storage sites shall be located away from sensitive areas such as: residential, surface/groundwater. Designated waste storage areas shall be well maintained and cleaned regularly.
- 3No burning of debris, construction wastes or vegetation shall be allowed on-site.
- 4The Contractor shall segregate construction waste materials on-site to facilitate re-use, recycling and waste disposal practice in accordance with the best available technology, as follows:
    - -For construction waste deemed by the Engineer to be suitable for reclamation or land formation: the Contractor shall liaise with the Municipal Environmental Company of Hai Phong City to determine the appropriate location for reuse. Reuse shall not have a detrimental impact on the environment.
    - -For construction waste deemed by the Engineer to be unsuitable for reclamation or land formation: the Contractor shall classify wastes on-site with dedicated areas for each waste stream including but not limited to: wood/timber, metals and plastics.
- 5The Contractor shall enter into a contract with the Municipal Environment Company of Hai Phong City for the collection of domestic refuse. To facilitate waste collection the Contractor is required to designate locations on-site shielded from wind and rain.
- 6The Contractor shall enter into a contract with the Municipal Environment Company of Hai Phong City or similar approved company for the collection of asbestos waste arising from demolition works.
- 7Waste oils, chemicals, paints and other such materials used for machinery maintenance and construction shall be collected and stored in bundled areas on-site for resale/re-use or managed disposal without resulting in damage or pollution of the environment.
- 8In locations remote from the site offices the Contractor shall provide latrine pits in suitable locations for the convenience of the construction workforce.
- 9Grease traps shall be installed where canteen waste is collected and shall be capable of providing at least 20 minutes retention during peak flow, prior to discharge.

12.2.6.2 Impacts caused by waste soils generated from the road foundation construction

It is estimated that about 370,000m^3 of waste soils would be generated from the construction of road and bridge (300,000m^3 from the construction of road foundation, and 70,000m^3 from the construction of bridge foundations). A part of these soils can be utilized to fill the low grounds along the sides of the highway. And the remaining unusable soils should be disposed to the designated sites.

In the early stage of the D/D Study, an alternative to dump these waste soils to the same disposal sites for dredged soils generated from the navigation channel dredging (Port Portion) had been examined. However, due to the delay in making decision on the location of the dump sites for navigation channel dredged soils, the D/D Study Team was forced to examine another alternative under which waste soils generated from the road and bridge construction work will be dumped to the sites within the Nam Dinh Vu Industrial Zone, where the waste soil generated from the dredging work for the temporary waterway during construction phase is planned. A supplemental EIA study for this dredging work is planned to be carried out by the end of 2011 after obtained JICA's agreement.

12.2.7 Impacts caused by the waste soils dumping sites

As mentioned in the previous Section 12.2.6.2, a supplemental EIA study for the dredging work for the temporary waterway during construction phase is planned to be carried out by the end of 2011. Assessment of impacts caused by the waste soils dumping sites for the Road and Bridge Portion will be included in this EIA study.

12.2.8 Impacts to local traffic, local topography, traffic accidents, etc.

12.2.8.1 Impacts caused by construction works to water transportation

Nam Trieu Estuary is the main channel of waterway for boats and ships using Hai Phong Port. Everyday, there are more than 50 freighters passing through this channel. The bridge construction works will cause encroachment on the waterway, and may cause congestion and heighten the risk of collision of boats on the channel.

To prevent the risks of unsafe waterway traffic during construction phase, the following measures should be taken.

- -Beacon buoy should be installed for warning and signaling the construction and navigation in the channel
- -Construction facilities, equipment occupying the channel should be lighted at night.
- -Warning devices, marine delineators, marker posts, signboards, etc. should be installed in upstream and downstream of the construction sites.
- -Personnel should be assigned to the sites in upstream and downstream of the construction sites to instruct boats and regulate traffic on the waterway.

12.2.8.2 Impacts to the existing wave protection dikes in Cat Hai Island

After discussed with Hai Phong DARD, section of the road (Km10+900 ~ Km11+350) are being designed as a wave protection dike substitute to the existing dike. Elevation of the road surface will be +4.50 (while elevation of the existing dike is +3.7m). And the northern side of the highway will be reinforced by grouted riprap of 25cm of thickness.

12.2.8.3 Accidents at the rivermouths near the newly-constructed bridge

After construction completion, the existence of the bridge piers in the river estuary would cause accidents such as the followings.

- -The bridge piers will reduce the navigation clearance, especially when the tide is ebbing, and raise the risk of collision between the vessels.
- -During flood season, the fast river flow will increase the risk of collision between the vessels and the bridge piers, when the vessels are travelling near the bridge piers.

Vessel accidents will cause not only losses of lives and properties, but may also cause damages to the bridge piers.

Therefore, the following measures should be taken to prevent the vessel accident.

- -Signal system should be installed at the base of bridge piers to ensure safety on the waterway.
- -The maritime management agencies should work closely together to ensure safe navigation.
- -Rescue mechanism including close coordination with local hospitals should be prepared to ensure timely rescues when incident occurs.

12.2.8.4 Impacts of typhoon and sea water level rising caused by the climate change

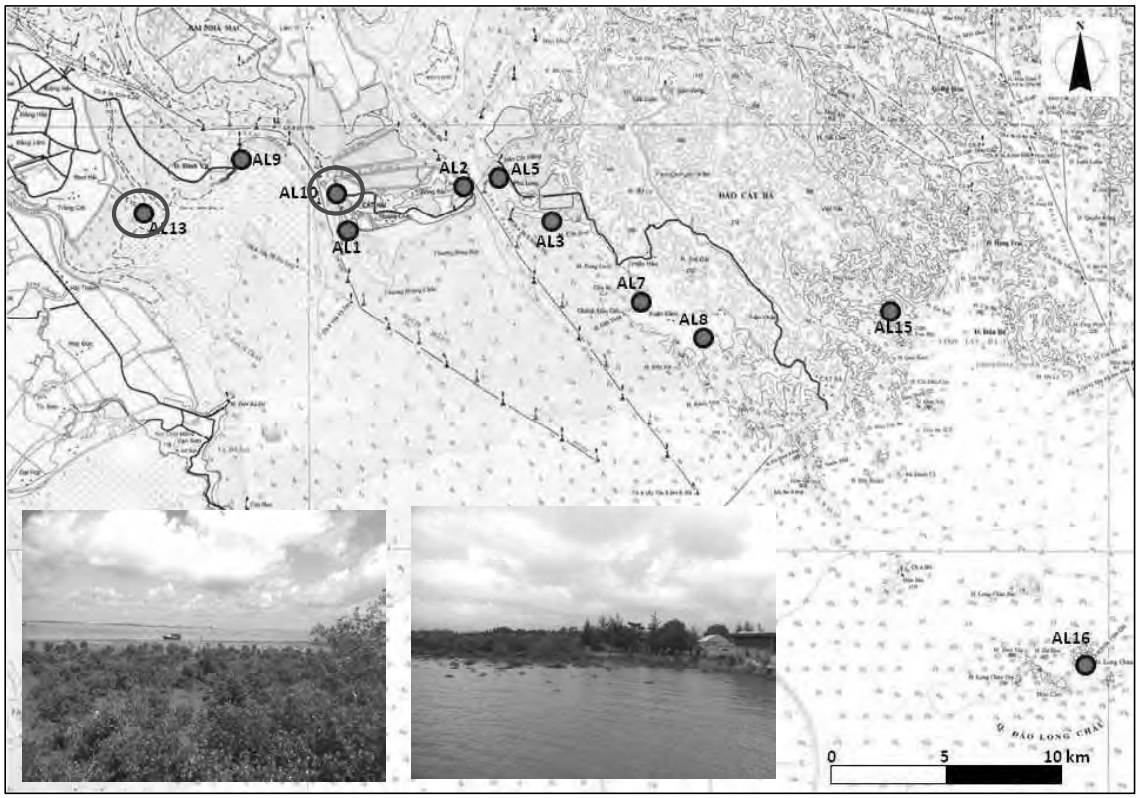
In order to deal with risks of sea water rising caused by the climate change, the D/D Study Team had discussed with Hai Phong City PC and agreed to heighten the road elevation to at least +4.5 m above the sea level. This road elevation is also consistent with the Dinh Vu - Cat Hai Economic Zone Development Master Plan of Hai Phong City.

In addition, because the Project sites are located in an area where there are many typhoons and storms annually, the following measures should be taken during construction phase.

- -Construction workers should be constantly informed about updated weather forecast.
- -In preparedness for a typhoon and storm, all on-water construction equipment should be anchored in the safe places. The onshore construction equipment should be moved to the safe inland sites. All workers should move inward the mainland. The sites under construction should be securely covered.
- -Contractors should work closely with local relevant authorities to prepare before hand the plans for preparedness, rescue and other counter-measures to typhoon and flood.

12.2.9 Impacts to ecosystem

The D/D Study Team (Port Portion) had conducted a survey on ecosystems in the coastal areas of Cat Hai and Hai An. Location of survey sites are shown in Figure 12.2.9-1. As a result of the survey, five species of 5 families of mangrove trees are found in the survey area. (Table 12.2.9-1). It found that the mangrove ecosystem in the Project area is small, and there is not any plant or animal species found in the survey area that is listed in the Vietnam's Red Book.



Source : Study Team (Port Portion)

Figure 12.2.9-1 Map of sites of survey on ecosystem carried out by the Study Team (Port Portion)

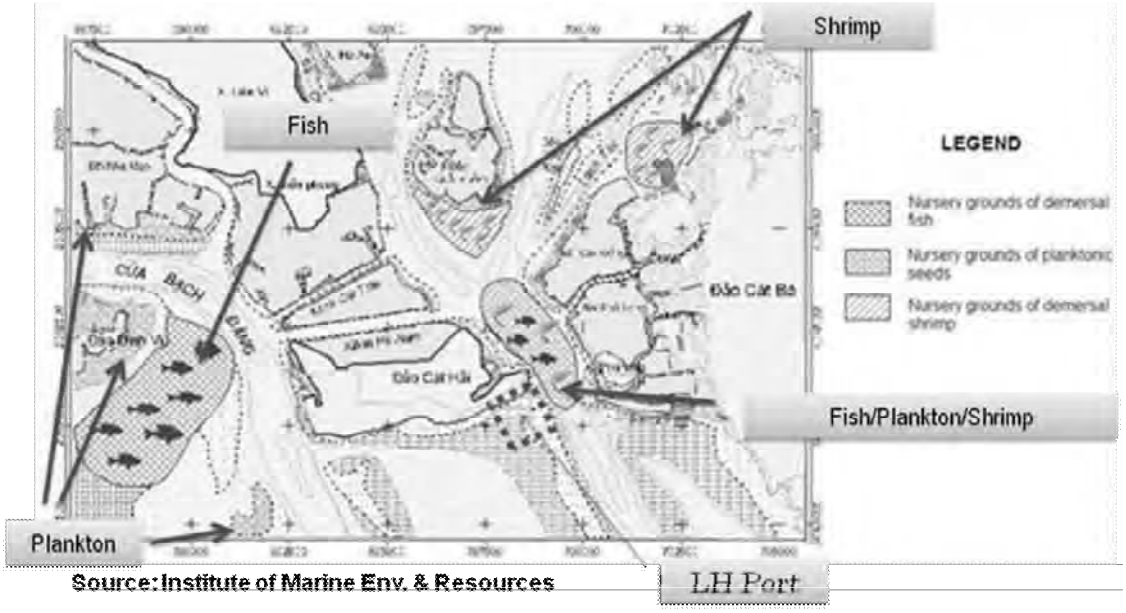
Table 12.2.9-1 Mangrove trees found in the Project area

	Family	Species	Listed in Viet Nam's Red Book	Area found
1	Sonneratiaceae	Sonneratia caseolaris	None	Hải An, Cát Hải
2	Rhizophoraceae	Kandelia obovata	None	Hải An, Cát Hải
3	Pteridaceae	Acrostichum aureumh	None	Hải An, Cát Hải
4	Acanthaceae	Acanthus ilicifolius	None	Hải An
5	Verbenaceae	Cleodendrum inerme	None	Hải An, Cát Hải

Source : Study Team (Port Portion)

According to a research carried out by Nguyen Thi Thu et al. (2008) and interview surveys with local fishermen, the shallow coastal areas in the south-east of Dinh Vu Island is an important nursery ground of various commercial fish and shrimp species (Figure 12.2.9-2). The zooplankton/larvae survey also supported the above findings, as several species of fish larvae were found here.

Construction activities may cause adverse impacts to these mangrove ecosystems. The larval fish, shrimp, etc. are considered as valuable sources of breeders for the local aquaculture and these may be affected by the polluted wastewater generated by construction activities, leading to economic losses for local aquaculture. The operation of construction equipment at the sites near by the nursery grounds may disturb the growth process and behaviors of aquatic species.



Source : Study Team (Port Portion)

Figure 12.2.9-2 Primary Nurseries in Coastal Water

In order to mitigate adverse impacts to the coastal mangrove ecosystems and the nursery grounds of fish and shrimp, the following measures should be implemented.

- - Demolition works, site clearance works, etc. should be taken only within the acquired construction sites. Trees and plants existing outside the construction sites should not be cut down.
- - Measures to mitigate impacts to water quality, soil quality, and air ambient caused by construction activities should be duly implemented.
- - In the next phase of the Project, further studies on fish spawning season should be carried out, to make reasonable construction plan which can avoid disturbances to fish spawning whenever possible.

12.2.10 Restoration of construction sites and yards after completion of construction

Construction activities and movement of vehicles on the site may cause compaction of soil and soil pollution. To prevent and mitigate these impacts, construction activities should be limited within the acquired areas. Operation of vehicles and machine should not be allowed outside the acquired areas. In case of occurrence of construction activities outside the acquired areas by inadvertence, the compacted soil should be tilled promptly to the depth more than 0.3 m.

For the land lots which were temporarily borrowed and used for construction yards, construction roads, etc., after completion of construction and before returning the land to its user, the land should be cleaned up, and restored to the former conditions. In case of necessary, the surface compacted soil of the land should be tilled as requested by the former land-user.

12.3 Environmental Management Plan

An Environmental Management Plan which includes an Environmental Monitoring Plan had been prepared by the D/D Study Team as a separated document attached to this main report. Main components of the Environmental Management Plan and the Environmental Monitoring Plan are summarized as followings.

12.3.1 Objectives

The Environment Management Plan (EMP) was prepared based on the estimated adverse impacts that may caused by the Project during construction phase and operation phase, and requirements for mitigation to meet the national and local environmental standards as well as to be in compliance with JBIC Guidelines for Confirmation of Environmental and Social Considerations (April 2002).

EMP which includes an Environmental Monitoring Plan, is a tool to ensure the environmental commitments made at the EIA study are implemented in an efficient and effective manner. The policy, objective and target of EMP are recommended as followings (Table 12.3.1-1).

Table 12.3.1-1 Policy, objective, and target of EMP

Policy	Objective	Target
Foster sound environmental management plan to oversee the environmental performance of the Project	Set up Environmental Management Plan (including an Environmental Monitoring Plan) for design, construction, operation stages to follow up implementation of EIA requirements	Carry out routine monitoring and data analysis to avoid adverse impact; audit and review environmental performance and implement mitigation measures in accordance with the Environmental Management Plan

Source : Study Team

12.3.2 EMP Implementing Organization

All parties including the followings should be involved actively in the implementation of EMP.

- - Project Management Unit 2 (PMU2) and its Environmental Unit
- -Department of Natural Resources and Environment (DONRE) of Hai Phong City, and other related local agencies
- - The Construction Supervision Consultant (CSE) and its Environmental Teams.
- - The Environmental Supervision Consultant (ESC),
- - The Contractors and its Environmental Staff
- - The Ministry of Transportation (MOT)
- -JICA

The proposed organization structure for the EMP implementation in construction phase is shown in Figure 12.3.2-1.

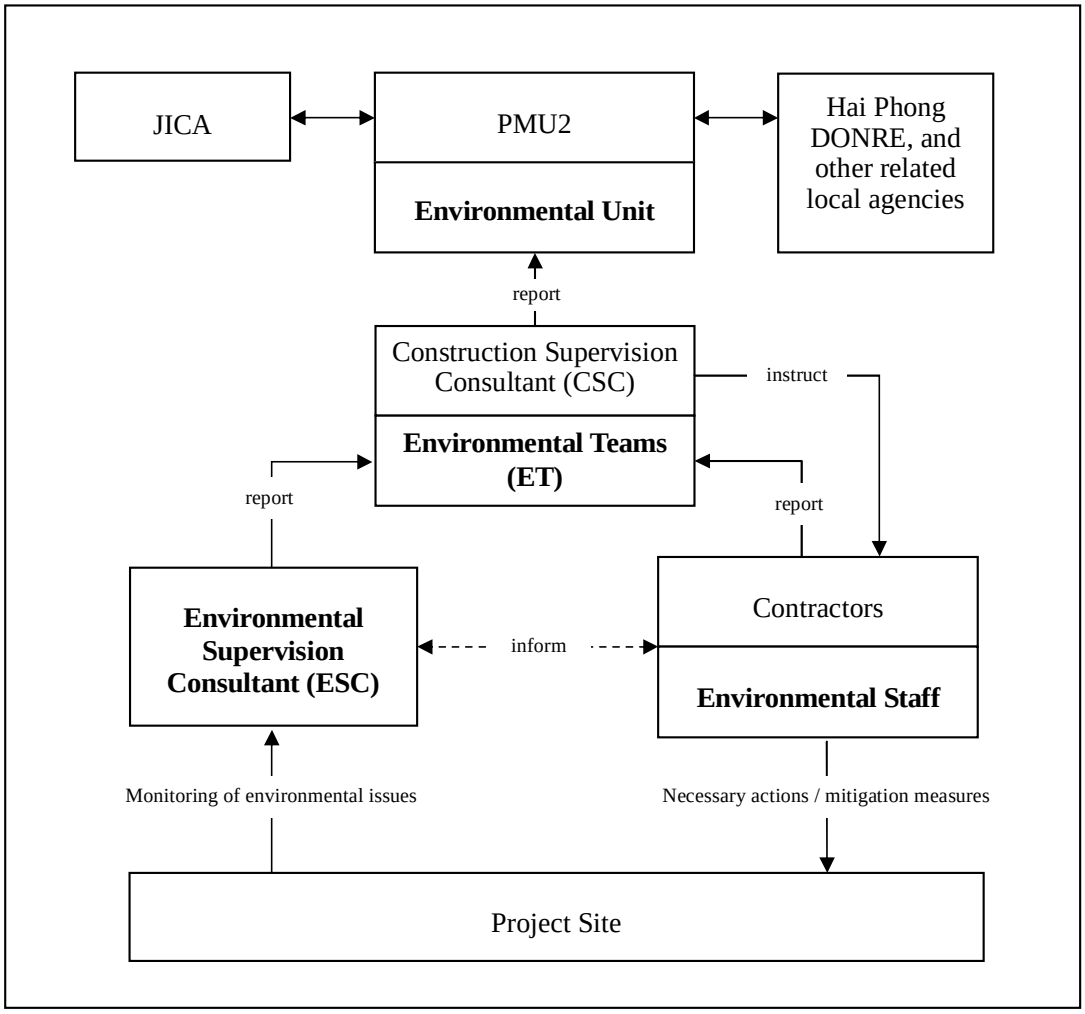


Figure 12.3.2-1 Proposed Organization Structure for EMP implementation (in construction phase)

The main environmental responsibilities of respective parties are described below.

1) Responsibilities of DONRE and other related local agencies

Hai Phong DONRE and environmental management authorities of Hai An District and Cat Hai District are responsible for supervision of project activities which are described in the approved EIA Report as causes of impacts to environment within their territory. These environmental authorities will also supervise the realization of requirements which are described in the approval decision issued by MOT. Their roles and responsibilities are:

-
- - Supervise the implementation of EMP;
- - Enforce applicable laws, regulations and standards;
- - Coordinate the environmental protection effort among departments concerned;
- - Check and supervise construction, completion and operation of environment facilities within their jurisdiction scope;

2) Responsibilities of Project Management Unit 2 (PMU2)

On behalf of MOT, PMU2 has the ultimate responsibility for environmental performance of the Project during both construction and operation phases. This is a day to day management organization for management of all aspects of project preparation and construction. In order to be able to fulfill this responsibility, PMU2 should have an **Environmental Unit** which consists of full time professional staffs on board to directly lead the supervision and management efforts from the PMU2 for environmental management of the Project.

The Environmental Unit will take charge for the following tasks.

- -Supervise the implementation of the EMP;
- - Ensure the interactions between the Environmental Teams/Experts and project planners and engineers for integrating mitigation measures and other environmental considerations and programs and requirements into project design;
- -Supervise the incorporation of environmental requirements into bidding documents, and construction contracts;
- -Supervise the trainings organized by Construction Supervision Consultant to strengthen environmental management capacity of contractors, and local staffs of PMU2;
- -Supervise the conduction of periodical inspections of the construction sites;
- -Engage and supervise environmental monitoring plans, receive and review monitoring reports from the ESC as well as from contractors on their regular reports for environmental performance and timely initiate necessary remedial actions as may be needed in response to the findings and/or recommendations, including any emergency, accidental situations and chance finds during construction;
- -Consult and/or communicate to the local communities, project affected people, regulatory agencies, JICA and other stakeholders during the project preparation and construction to ensure them the full knowledge about the project progress, potential issues and mitigation actions, as well as to listen and respond to their concerns, suggestions and demands for environmental and community protection.

3) Responsibilities of the Construction Supervision Consultant (CSC)

On behalf of the project proponent, the **Construction Supervision Consultant (CSC)** will take charge of ultimate supervision of all activities relating to environmental management of the project. CSC will have at least two **Environmental Teams** (ET), one will be in charge of management of natural environment, and one will be in charge of management of socio-economic environment. Each team may have at least one foreign environmental expert and one local environmental expert. Besides, CSC will entrust an **Environmental Supervision Consultant (ESC)** through a sub-contract to take charge of direct supervision of the EMP implementation.

Environment-related responsibilities of CSC will be identified in detail in the contract for consultant services, and will cover at least the following tasks.

- -Review construction organization design to ensure compliance with project engineering design and the EMP with regard to environmental protection and impact mitigation. The construction may only be ordered to start after the review is completed and the ET in charge is satisfied with the environmental arrangement;
- -Provide assistance to the ESC as necessary in the implementation of the environmental monitoring and supervising program;
- -Regularly monitor the performance of the contractor's Environment Staff, verifying monitoring methodologies and results. In case the contractor's Environment Staff fails to discharge duties or fails to comply with the contractual requirements, instruct the contractor(s) to replace the contractor's Environment Staff;
- -Instruct the contractors to take corrective actions within the ET determined timeframe. If there is breach of contract or strong public complaints on contractor environmental performance, the ET will order contractor to correct, change or stop the work, reporting to relevant agencies and PMU2 at the same time;
- -Supervise the contractor's activities and ensure that the requirements in the EMP and contract specifications are fully complied with;
- -If the contractor discovered cultural relics by chance, the ET will order site protection and report to the relevant authorities and PMU2;
- -Adhere to the procedures for carrying out complaint investigation, receiving and settling complaints relating to environmental issues;
- -Response to requests made by Hai Phong DONRE and other local environmental management authorities.

4) Responsibilities of Environmental Supervision Consultant (ESC)

Environmental Supervision Consultant (ESC) will be selected through a bid and work under a contract with CSC. ESC will have two main responsibilities: (1) supervise contractor's activities to ensure that they are complied with content of the EMP and the construction contract; (2) carry out monitoring of environmental changes, in order to be able to quickly discover unexpected accidents and work out appropriate measures to response to these accidents.

The ESC will send at least one supervisor for each construction package, in order to be able to visit any construction site at any time, and be easy to follow up contractor's daily activities and changes in environment at site. Major responsibilities of ESC are described as followings:

Phase I: Conduct trainings to strengthen environmental management capacity

The success of environmental management for the Project relies on the knowledge, and experience of the personnel involved in environmental management. As contemporary methodologies and approach towards environmental management for road construction and operation are still new to the agencies in the local department concerned, extensive training will be needed.

In the pre-construction phase, ESC will carry out the following tasks which aim to strengthen capacity in environmental management and supervision of relevant authorities and entities:

- -Reviewing the EIA, EMP and the project design and technical specifications and confirm that there have been no major omissions of mitigation measures;
- -Preparing a guide for contractors on implementing the EMP;
- -Preparing a guide on how to undertake supervision, including monitoring of effectiveness;
- -Preparing and executing a training program in support of the above two guides.

Phase II: Carry out supervision and monitoring

- -Review, inspect and audit independently all aspects of the implementation of the EMP;
- -Validate and confirm the adequacy and accuracy of monitoring data, equipment, locations, procedures and locations of sensitive receivers;
- -Carry out random monitoring checks and audits on monitoring and supervision data, etc;
- -Collect local residents' opinions on environmental issues around the construction sites, and feed back them in the measures to avoid / minimize adverse impacts to local environment;
- -Conduct regular site inspections;
- -Audit the status of implementation of environmental protection measures against the EMP and contract documents;
- -Review the effectiveness of environmental mitigation measures and project environmental performance;
- -Review the environmental acceptability of the construction methodology (both temporary and permanent works), relevant design plans and submissions.
- -Where necessary, seek and recommend the least environmental impact alternative in consultation to the designer, the contractor(s), and the relevant environmental management authorities;
- -Verify the investigation results of any non-compliance of the environmental quality performance and the effectiveness of corrective measures;
- -Provide regular feedback audit results for the ET of CSC;
- -Provide training programs at a minimum of three month intervals for contractor's staff, and local staff of PMU2, etc., to appraise issues and method to improve environmental compliance.

Relating to environmental monitoring, the ESC will have the following responsibilities.

-
- -Carry out regular monitor of noise, air and surface water quality of the construction sites and provide the CSC with the monitoring reports;
- The monitoring time will be consistent with the construction activities, and monitoring will be conducted during active construction;
- -Upon request by the CSC, conduct monitoring during environmental pollution accident investigation and provide the CSC with the monitoring reports;
- -Upon request by the CSC when necessary, conduct public complaint investigation and assessment.

5) Responsibilities of contractors

The duties of the contractors include but not limit to:

- -Strictly implement the listed impact mitigation measures in EMP;
- -Undertake self-check and self-rectify activities;
- -Strengthen the coordination, information sharing, opinion exchange with the ESC, and CSC;
- -Compliance with relevant environmental legislative requirements;
- -Work within the scope of contractual requirements and other tender conditions;
- -Each contractor will appoint 1~2 full time **environmental staff**, working with the ESC for mitigation implementation, site inspection and any corrective actions instructed by the CSC;
- -Provide and update information to the ESC regarding works activities which may contribute, or be continuing to the generation of adverse environmental conditions;
- -In case of non-compliances / discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impact;
- -Stop construction activities which generate adverse impacts upon receiving instructions from the ESC/CSC. Propose and carry out corrective actions and implement alternative construction method, if required, in order to minimize the environmental impacts;
- -Adhere to the procedures for carrying out complaint investigation;
- -Take responsibility and strictly adhere to the guidelines of the EMP and complementary protocols developed by the project staff.
-

12.3.3 Impact mitigation measures

The following impact mitigation measures are described in detail in EMP. Due implementation of these mitigation measures should be ensured by all agencies/entities/ persons involving in the design, implementation, construction supervision, and operation of the Project.

- 1)Measures in Design Stage
- 2)Air quality in construction
- 3)Noise and vibration in construction
- 4)Water quality in construction
- 5)Soil erosion in construction
- 6)Ecology, biodiversity, and landscape in construction
- 7)Waste management in construction
- 8)Construction site safety
- 9)Health and well-being of communities
- 10) Impact mitigation measures in operation phase

12.3.4 Site environmental supervision

Site environmental supervision provides a direct means to assess and ensure the project's environmental protection and pollution control measures are in compliance with the contract specifications. Site surveillance should be undertaken regularly and routinely by ESC to inspect the construction activities in order to ensure that appropriate environmental protection and impact mitigation measures are implemented in accordance with EMP.

ESC is responsible for formulation of the site environmental supervision, deficiency and remedial action reporting system, and for carrying out the site inspection works. He shall in consultation with the Environmental Experts of CSC, prepare a procedure for the site inspection, deficiency and remedial action reporting requirements.

Regular site inspections shall be carried out at least once per week for all works areas.

The inspections shall cover the environmental situation, pollution control and mitigation measures within the Site; they shall also review the environmental situation outside the Site area which is likely to be affected, directly or indirectly, by the site activities.

The Contractor shall update ESC with all relevant information of the construction contract for him to carry out the site inspections. The inspection report results and its recommendations for any necessary improvements in the project's environmental performance shall be submitted, in a site inspection pro forma, to the Environmental Experts of CSC and to the Contractor within 24 hours, for reference and for taking immediate remedial action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and remedial action reporting system (formulated by the ESC) to report on any remedial measures subsequent to the site inspections.

Ad hoc site inspections shall also be carried out by the ESC or Environmental Experts of CSC if major unacceptable or unforeseen environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the detailed action plan for environmental monitoring and audit.

12.3.5 Complaint Procedure

Complaints will be referred to ESC for carrying out complaint investigation procedures. ESC will undertake the following procedures up on receipt of the complaints:

- a)Log complaint and date of receipt onto the complaint database and inform the Environmental Experts of CSC immediately;
- b)Investigate the complaint to determine its validity, and to assess whether the source of the problem is due to project works;
- c)If a complaint is valid and due to project works, identify mitigation measures in consultation with the Environmental Experts of CSC;
- d)If mitigation measures are required, advise the Contractor accordingly;
- e)Review the Contractor's implementation of the identified and required mitigation measures, and the current situation;
- f)Undertake additional monitoring and audit to verify the complaint if necessary, and ensure that any valid reason for complaint does not recur through proposed amendments to work methods, procedures, machines and/or equipment, etc.;
- h)Report the investigation results and the subsequent actions to the complainant; and
- i)Log a record of the complaint, investigation, the subsequent actions and the results in the monthly EMP reports.

12.3.6 Reporting

1) EMP Implementation Reports prepared by Contractor

Contractor shall prepare the monthly EMP Implementation Reports (including works method statements, waste management plan, site drainage management plan, etc.) and submit to ESC and Environmental Experts of CSC for approval.

2) EMP reports prepared by ESC

As a minimum, ESC shall prepare the following written reports and submit to Environmental Experts of CSC:

-
- a)Baseline EMP Report (submit prior to commencement of construction)
- b)Weekly report of non-compliance issues
- c)Summary monthly report of key issues and findings from auditing activities
- d)Summary monthly report of key issues arising from CSC supervision activities
- e)Consolidated summary report from contractor’s monthly report
-

ESC shall also collect and report on unexpected issues as requested by Environmental Experts of CSC.

At the end of the construction phase, ESC shall prepare a final report summarizing the key findings from their work, the number of infringements, resolutions, *etc*. as well as advice and guidance for how such assignments should be conducted in the future.

During the course of the project ESC shall provide briefings as requested to CSC, environmental agencies, JICA, and others as requested by CSC on the project progress, incidents, and other issues associated with environmental management and supervision. As a minimum these are expected to be at six-monthly intervals.

3) EMP Supervision Reports prepared by CSC

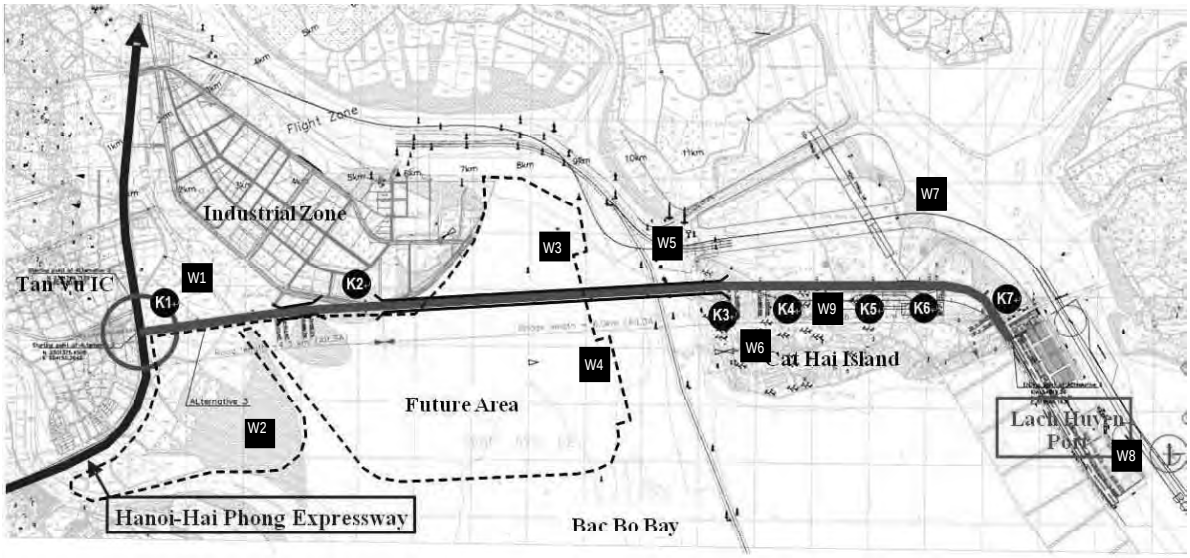
Environmental Experts of CSC would prepared and submit the EMP Supervision Reports to PMU2 and JICA on a quarterly basis. The EMP Supervision Reports should include a monitoring form as attached in EMP.

4) Documenting

All documentation shall be filed in a traceable and systematically manner. Site document, such as, monitoring field records, laboratory analysis records, meeting minutes, correspondences etc., shall be cross-referenced by the ESC's leader and be ready for inspection upon request. All EMP results and findings shall be documented in the EMP reports prepared by ESC and endorsed by Environmental Experts of CSC prior to disseminate to PMU2 and JICA.

12.3.7 Environmental Monitoring Plan

Figure 12.3.7-1 and Table 12.3.7-1 show location of sampling sites for monitoring of air quality, noise, and water quality.



Source : Study Team

Figure 12.3.7-1 Locations of sampling sites of ambient air and surface water

Table 12.3.7-1 Coordination of location of sampling sites of ambient air and surface water

Sampling sites of surface water			Sampling sites of ambient air		
Location	Coordination		Location	Coordination	
Wl	20°48'25.56"N	106°46'28.33"E	K1(Al)	20°48'13.09"N	106°44'48.78"E
W2	20°47'26.02"N	106°46'23.17"E	K2	20°48'23.69"N	106°47'24.22"E
W3	20°49'4.60"N	106°48'50.27"E	K3(A2)	20°48'36.89"N	106°50'51.76"E
W4	20°47'51.63"N	106°48'21.03"E	(A3)	20°48'0.59"N	106°51'10.64"E
W5	20°48'44.65"N	106°50'26.22"E	K4	20°48'20.70"N	106°51'8.12"E
W6	20°48'6.84"N	106°50'38.56"E	K5(A4)	20°47'56.32"N	106°53'31.48"E
W7	20°48'51.35"N	106°52'57.39"E	K6	20°48'10.81"N	106°52'13.07"E
W8	20°47'58.23"N	106°54'12.09"E	K7	20°48'32.11"N	106°53'10.28"E
W9	20°47'23"N	106°52'23"E			

Source : Study Team

Monitoring items, indicators and monitoring frequency in the pre-construction phase and the construction phase are shown in Table 12.3.7-2 and Table 12.3.7-3 respectively.

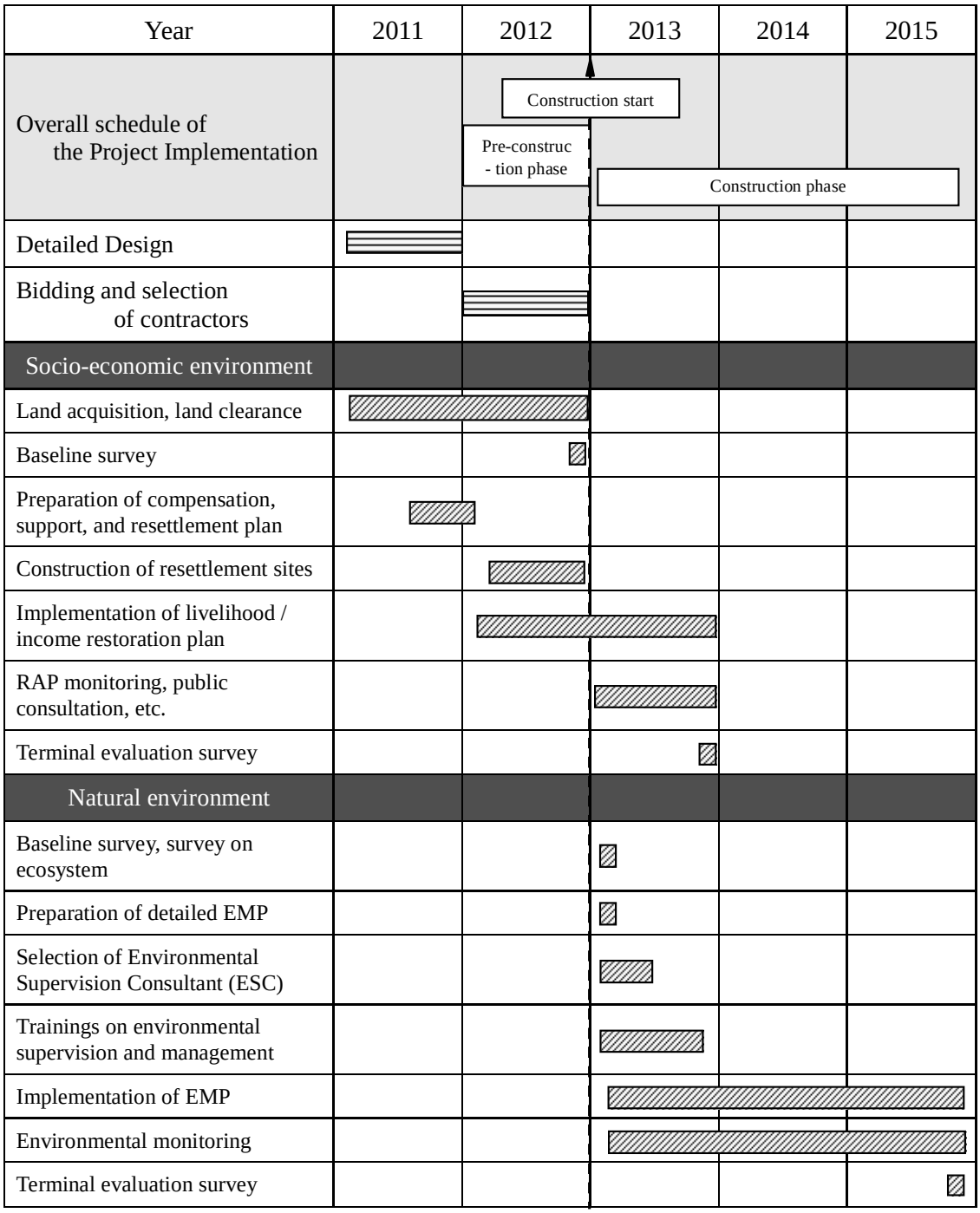
Table 12.3.7-2 Environmental Monitoring – Pre-construction phase

Items	Indicators	Frequency	Sites	Reference
1 Resettlement	Confirmation that explanatory meetings were held, Confirmation that comments were collected from local residents	Once	-	During pre-construction phase
2 Air Quality	SO2, NO2, CO, O2, SPM, carbohydrates, microclimate parameters, etc.	Once	7 sites (3 samplings /site)	QCVN 05:2009/ BTNMT
3 Noise	Leq, L10, L90	Once	7 sites (24 hours continuous measurement)	TCVN 5949-1998
4 Water Quality	pH, SS (suspended solids), BOD, COD, DO, Total-N, Total-P, NO3-, NH4+, heavy metals (Cd, Pb, Cr, As, Hg), hydrocarbons, phenols, cyanogen compounds, mineral oils, coliform, E-coli, temperature, etc.	Once	9 sites	QCVN 08:2008/ BTNMT, QCVN 10:2008/ BTNMT

Table 12.3.7-3 Environmental Monitoring Program - Construction Phase

Items	Indicators	Frequency	Sites	Reference
1 Resettlement	Confirmation that resettlement activities are done in compliance to the RAP	2 times	-	One year after resettlement, and 3 years after resettlement
2 Air quality	SO2, NO2, CO, O2, SPM, carbohydrates, microclimate parameters, etc.	6 months/ time	7 sites (3 samplings /site)	QCVN 05:2009/ BTNMT
3 Noise	Leq, L10, L90	6 months/ time	7 sites (24 hours continuous measurement)	TCVN 5949-1998
4 Water quality	pH, SS (suspended solids), BOD, COD, DO, Total-N, Total-P, NO3-, NH4+, heavy metals (Cd, Pb, Cr, As, Hg), hydrocarbons, phenols, cyanogen compounds, mineral oils, coliform, E-coli, temperature, etc.	6 months/ time	9 sites	QCVN 08:2008/ BTNMT, QCVN 10:2008/ BTNMT

12.3.8 EMP implementing schedule



Source : Study Team

Figure 12.3.8-1 EMP Implementing Schedule

12.4 Operation Phase EMP

There is often a considerable span of time between the preparation stages of a development project and its operational stage. Changes adopted during the course of a project's implementation might ultimately affect the predicted environmental performance of the project. An Operation Phase EMP is required to ensure the long-term impacts (such as impacts to air quality, noise/vibration, water quality, resettlement, etc.) are monitored, and appropriate mitigation measures are duly implemented.

The Operational Phase EMP is described in detail in EMP as a separated document attached with this main report.

12.5 RAP Monitoring Plan

The RAP Monitoring Plan has major components as followings.

12.5.1 Objectives of RAP Monitoring Plan

The RAP Monitoring Plan is prepared to manage and supervise the implementation of the RAPs (prepared by the PCs of project-affected districts: Hai An District and Cat Hai District). The RAP Monitoring Plan will be used as a tool to facilitate appropriate corrective measures during resettlement implementation based on the information obtained through routine collection of data.

12.5.2 Various stages to be covered by the RAP Monitoring Plan

The RAP Monitoring Plan covers various stages of resettlement and targets to the following activities (Table 12.5.2-1).

Table 12.5.2-1 Stages of resettlement and targeted activities covered by the RAP Monitoring Plan

Stages	Targeted activities
1. Preparatory Stage	+Conduct of baseline survey +Consultations +Identification of project-affected people (PAP) and the numbers +Identification of different categories of PAP and their entitlements +Collection of gender disaggregated data +IOL survey (inventory of losses survey) +Asset inventory +Entitlements +Valuation of different assets +Budgeting +Information dissemination +Institutional arrangements +Implementation schedule +Review budgets and line items expenditure
2. Relocation Stage	+Payment of compensation +Delivery of entitlement +Grievance handling +Land acquisition +Preparation of resettlement site, including civic amenities +Consultations +Relocation +For PAP who do not relocate: • Payment of Compensation • Livelihood restoration assistance.
3. Rehabilitation Stage	+Initiation of income generation activities +Provision of basic civic amenities and essential facilities in the relocated area +Consultations +Assistance to enhance livelihood and quality of life +Assistance to host populations

Source : Study Team

12.5.3 Scope of RAP Monitoring Plan

1) Internal Monitoring

Internal monitoring is an important responsibility and component of project management. The RAP Monitoring Plan will provide details of the monitoring and reporting framework for resettlement activities, including entitlements, timeframe, budget, costs, etc.

Internal monitoring should focus on the following indicators.

Table 12.5.3-1 Indicators to be applied for the internal monitoring

Sequence	Dimensions of the resettlement process	Indicators
Project Inputs	Institutional preparedness	Qualified staff in place
	Institutional preparedness	Equipment available
	Institutional preparedness	Finance on deposit
Project Process	Information to PAP	Information disseminated
	Capacity building	Training of PAP
	Consultation and participation	Meetings held and committees formed
Project Outputs	Compensation	Compensation paid for acquired assets
	Acquisition	Assets acquired
	Compensation	Community assets replace and relocation site prepared
	Relocation of PAP	Relocation completed and grants paid
	Rehabilitation	Jobs/businesses/income provided

Source : Study Team

The following activities are recommended for the institutional preparedness.

- 1Creation of a project implementation unit (PIU)
- 2Acquisition of office space, furniture & computers, etc.
- 3Assignment of adequate staff
- 4Budget allocation
- 5Training needs assessment & capacity building plan of staff
- 6Establishment of monitoring unit with adequate staff
- 7Capacity building for staff
- 8Establishment of field office with all infrastructure & computers and transport
- 9Preparation of activities implementation schedule with specific monitoring indicators
- 10Formation of Monitoring Committee at field level
- 11Capacity building for committee members
- 12Creation of database
- 13Hiring an External Monitor
- 14Reporting protocols of external monitor

2) External Monitoring

In addition to internal monitoring, external (or independent) monitoring is required to provide an independent periodic assessment of resettlement implementation and impacts, to verify internal monitoring and to suggest adjustment of delivery mechanisms and procedures as required.

The main objectives of the external monitoring is to review implementation and assess the achievement of resettlement objectives, the changes in living standards and livelihoods, restoration of the economic and social base of the affected people, the effectiveness, impact and sustainability of entitlements, the need for further mitigation measures if any, and to learn strategic lessons for future policy formulation and planning. Social and economic assessment of

resettlement and measurement of the income and standards of living of the PAP before and after resettlement are integral components of the external monitoring activity.

To function effectively, the organization responsible for external monitoring should be independent of the government agencies involved in resettlement implementation.

Regular external monitoring should begin along with implementation activities and continue until the end of the project. Sample socio-economic surveys should be conducted before beginning resettlement (baseline survey), repeated one year and three years after resettlement is completed, to assess the effectiveness of remedial measures.

Table 12.5.3-2 Indicators to be applied for the external monitoring

Sequence	Dimensions of the resettlement process	Indicators
Project Process	Information to PAP	Information disseminated
	Capacity building	Training of PAP
	Consultation and participation	Meetings held and committees formed
Project Outputs	Payment of compensation and timing	Compensation paid for acquired assets
	Land acquisition, land readjustment	Assets acquired
	Preparation and adequacy of resettlement sites, house construction	Community assets replace and resettlement site prepared
	Relocation of PAP	Relocation completed and grants paid
	Rehabilitation, provision of employment, aquadecy and income levels	Jobs/businesses/income provided
	Training	Training provided
	Rehabilitation of vulnerable groups	Jobs/businesses/income provided
	Infrastructure repair, relocation or replacement	Repaired, relocated or replaced infrastructure
	Enterprise relocation, compensation and its adequacy	Relocated enterprise
Project Impacts	Results of RAP implementation	Incomes restored
	Results of RAP implementation	Living standards restored

Source : Study Team

Organ responsible for the external monitoring should be equipped with adequate human resources, logistics, computers, etc. It should be a dedicated monitoring team with adequate gender representation. The skill of team members plays a crucial role in effective monitoring. Hence, the team needs to have members who are trained and skilled in data base management, interview techniques, social and economic assessments and financial audit.

It is recommended that the external monitoring organ should include following experts:

- A team leader
- Social scientist
- Gender specialist
- Research and Statistical specialist
- Accounts & Financial expert

12.5.4 Reports and Reporting

Table 12.5.4-1 lists the proposed reporting cycle.

Table 12.5.4-1 Proposed reporting cycle for RAP monitoring

Report	Content	Time line
Monthly Reports (prepared by the external monitoring organ)	Summarization of progress of RAP implementation.	Submitted monthly during the RAP implementation
Quarterly Financial Reports (prepared by the external monitoring organ)	Expenditure vs. budgeted amount by budget heads and sub heads	Submitted within 30 days of end of financial quarter
Six Monthly Progress Report (prepared by the Environmental Experts of CSC)	Narrative and as per Monitoring Plan format giving details on activity, results, issues affecting performance and variance if any and reason for same and corrections recommended	Submitted within 30 days of end of the six month period
Annual Reports (prepared by the Environmental Experts of CSC)	Narrative and as per reporting format giving details on activity, results, issues affecting performance and variance if any and reason for same and corrections recommended	Submitted within 30 days after the year end
Final Report (prepared by the Environmental Experts of CSC)	Projects achievements, failures and impact from the project	Submitted within 90 days of end of the project

Source : Study Team

12.5.5 Data Management

In addition to the findings of regular monitoring, some specific information are also required to develop a comprehensive database on the PAP, their situation and changing patterns during the period. To track disbursements, the monitoring unit should establish and maintain a completed database on all affected households/persons and a full inventory of lost assets. Computers can be extensively used both for analysis of data and presentation. The available data can be analyzed and depicted in various forms such as graphs, statistics, and spreadsheets.

12.6 Information dissemination and public consultations

Summary of the EIA report are disclosed at the community centers of affected areas, i.e. Hai An District (Trang Cat Ward, Dong Hai 2 Ward), and Cat Hai District (Nghia Lo Commune, Dong Bai Commune, Cat Hai Townlet) until completion of the Project, and residents are allowed to make photocopy of this summary EIA report.

A public consultation meeting was organized on 28 April 2010 at Civilization Center of Cat Hai Townlet. Approximately 80 local residents and representatives of local authorities of Cat Hai District, Cat Hai Townlet, Nghia Lo Commune, and Dong Bai Commune have participated the meeting. Record of the meeting is attached as an appendix in the EIA Report.

In addition to the first public consultation meeting mentioned above, there were other 4 meetings organized by PMU2: on September 13, 2010 in Nghia Lo Commune, on September 14, 2010 in Dong Bai Commune, on September 15, 2010 in Cat Hai Townlet, and on September 24, 2010 in Trang Cat Commune (Hai An District). A significant number of local residents and representatives of local authorities of Cat Hai District, Cat Hai Townlet, Nghia Lo Commune, Dong Bai Commune, and Trang Cat Commune have participated in these meetings. It seems that residents have been informed about outlines of the Project through many formal and informal channels including hearing surveys carried out during the F/S Study.

Major comments and requests raised by participants at the first public consultation meeting held on 28 April 2010 are as followings.

a) Residents' comments on environmental impacts

- -Measures to mitigate impacts of exhaust gas, dust, and other air pollutants should be carefully examined, due to the fact that aquaculture and salt production which are main sources of income of local residents would be affected significantly.
- -Polluted water from construction activities and wastewater from worker camps should be discharged somewhere outside of the Cat Hai Island, to avoid polluting surface water bodies of the island.
- -In the operation phase, noise generated by moving vehicles with high speed would be significant and should be mitigated by appropriate measures.
- -Sites to dispose waste soils, construction wastes, etc. should be appropriately examined.

b) Residents' comments on socio-economic impacts

- -A significant number of workers would come and cause disturbance of local community's security.
- -Land prices (including residential land, aquaculture land, salt production land, etc.) stipulated by Hai Phong City PC are too low compared to market price.
- -Resettlement at site (near existing residence, fish ponds, salt pan, and ancestor's tombs) would be considered as first priority mode of resettlement for residents who would lose their residential land. It will be very hard for them to maintain the existing production, spiritual activities, neighborhood, etc. if they have to resettle far away from their existing residence.
- -It is anticipated that about 120 graves would be removed to make land for the project. However, the project proponent should soon discuss with local residents to work out a plan to construct a new cemetery or expand the existing cemetery. Relocation of graves should

be carried out prior to the relocation of people, since relocation of ancestors' graves is considered very important for local residents.

- -Aged people are depending on lands for aquaculture and salt production for their livelihood. So, it will be very difficult for them to seek other means of livelihood if they lose these existing lands.
- -As may be seen in other development projects, the livelihood restoration programs were not duly implemented as promised by the project owners. Young people might be supported to get new job in companies, factories, etc. after obtained vocational trainings. But they were soon fired or found themselves difficult to maintain their job for a long time. Therefore, competent authorities should carefully examine proper measures to deal with this problem.

However, activities for information dissemination and public consultation should be continuously carried out in the next stages of the Project, in order to facilitate the Project implementation, and particularly to realize smooth implementation of resettlement and compensation.

As for information dissemination, it is recommended to make prints of several kinds of brochures and leaflets to introduce about outline of the Project, key impacts caused by the Project, the compensation and resettlement policy, the decisions on compensation tariffs, and other issues concerned. These brochures and leaflets should be distributed widely to all affected households and to all concerned people.

It also needs to coordinate with PMU2 to mobile mass media, such as newspaper, TV broadcasting, radio broadcasting, and particularly the broadcasting system of the communes, to frequently disseminate updated information on the Project.

As for consultation with PAP, it needs to coordinate with competent authorities to organize additional consultation meetings with participation of the PAP, representatives of Hai Phong City, districts and commune authorities, representatives of citizen organizations, NGOs, etc. to disseminate information and consult about the issues relating to the Project implementation. Plan to organize the meetings should be announced broadly to people in advance so that all people in the affected areas can attend the meeting and get information on the Project, particularly on the compensation policy, etc. and address their opinions and discuss related issues.

In addition, following activities should be conducted in order to facilitate the implementation of compensation procedures, resettlement plan, livelihood restoration plan, and other measures for mitigating adverse impacts cause by the Project to local communities.

- a)Organizing visits to the project-affected areas. Consulting with PAP on the measures for mitigating adverse impacts caused by the Project
- b)Assisting projected-affected communes to organize regular meetings in the communes in order to inform local residents about the Project, the commpensation program, the RAP, etc. and to consult with local residents on the Project implementation.

12.7 Estimated cost for environmental management

The cost estimated for environment management covers both the capital cost and recurring cost, including monitoring cost, for environmental facilities. All of the cost would be included in the overall budget of the project.

1) Estimated Cost for Training

Estimated cost for personnel training to be done by the contractors is presented in Table 12.7-1. This cost should be included in the bidding documents for the contractors

Table 12.7-1 Personnel Training Program

Feature	Description	Staff	Number of people	Time	Cost (Million VND)
Environmental protection	Once a year for : -EMP -Environmental monitoring and report, -Emergency Plan -Cultural property protection -Biodiversity protection	Members of Environmental Team of contractors	10 pers	2013~ 2015	200.0
Environmental supervision	Once a year for: Site supervision, methodology, procedures, etc.	Leaders and members of the Environmental Team of contractors	18 pers	2013~ 2015	300.0
Total					500.0

Source : Study Team

2) Cost Estimate for Environmental Protection

Estimated cost for construction of environmental facilities to be done by the contractors is presented in Table 12.7-2. This cost should be included in the bidding documents for the contractors.

Table 12.7-2 Estimated Costs for Environmental Protection
for construction of environmental facilities

Item	Mitigation Measures	Quantity	Cost (Million VND)
Surface water	Septic tanks and garbage pit in construction site	40	100
Air ambient	Water spray vehicle		(by contractor)
Eco-environment	Soil conservation measures in excavation area, filling area, bridge sites, spoil tipping area, and temporary works site	-	1,000
	Temporary ditch, settling tank	-	
	Materials to be used in rain season	-	
	Greening works design	-	
Noise	Planting trees at the road section near residential areas of Ninh Tiep Hamlet and Trung Hamlet (1.5km, 4m/tree, 200,000VND/tree)	375	75
Environmental management	Implementation of EMP in construction phase	3 years	40
Environmental monitoring	Implementation of monitoring plan in construction phase	3 years	75
Personnel training	Training for leaders and members of the Environmental Teams of contractors	-	25
Acceptance	Inspection and acceptance of mitigation measures	-	40
Total			1,355

Source : Study Team, Oct 2011.

Other estimated costs for environmental and social surveys, monitoring, land acquisition, etc. are presented in Table 12.7-3~10.

Table 12.7-3 Estimated cost for maintenance of environmental facilities
(during the first 2 years of operation phase)

No.	Item	Cost (Million VND)	Remark
1	Monitoring cost in operation stage	30	For maintenance of drainage system, vegetation, trees
2	Staff training cost	4	
3	Energy and medical consumption	5	
4	Environmental facilities operation, maintain and update	10	
5	Staff salary of environmental facilities operation and maintain (2 pers, 3,000,000VND/month/per)	72	
6	Vegetation plant maintain	10	
Sub-total		131	
Total		262	

Source : Study Team, Oct 2011.

Table 12.7-4 Estimated cost for socio-economic survey

(unit: US$)

		Unit	Quantity	Day	Unit price	Sub-total
1	**Preparation (4 persons, 3 days)**					**480**
	Making of questionnaire	person, day	1	1	50	50
	Questionnaire printing	sheets	150	1	0.2	30
	Personnel fees	person, day	4	2	50	400
2	**Logistics, hotel, accommodation**					**0**
	Air ticket	round	0	0	150	0
	Hotel, accommodation	person, day	0	0	20	0
3	**Survey (9 surveyors, 5 field days)**					**7,550**
	Rent-cars	car, day	0	30	50	0
	Rent-motobikes	motobikes, day	5	5	20	500
	Personnel fee: Project Manager	person, day	1	5	150	750
	Personnel fee: administrative assistant	person, day	1	5	50	250
	Personnel fee: surveyors	person, day	5	5	80	2,000
	Communication	day	6	5	10	300
	Foods	person, day	6	5	10	300
	Training course for interviewers	set	1	3	100	300
	Provincial guiders	province	2	2	50	200
	Local guiders at communes and villages	commune	9	5	50	2,250
	Allowance for interviewers	person, day	5	5	4	100
	Gift for the Householders	HH	120	1	5	600
4	**Report making**					**5,710**
	Data input	sheets	120	1	1	120
	Report writing: Project Manager	person, day	1	6	150	900
	Report writing: Team leaders	person, day	3	6	80	1,440
	Printing (Vietnamese)	copy	50	1	15	750
	Translation (English)	page	100	1	15	1,500
	Printing (English)	copy	50	1	20	1,000
5	**Management and others**					**1,374**
	Management (5% of total cost)					687
	Contingency (5% of total cost)					687
	Total (during pre-construction stage)					15,114
	One year after resettlement					18,288
	Three years after resettlement					20,404
	Grand total cost for socio-economic surveys (US$)					53,806

Source : Study Team, Oct 2011.

Table 12.7-5 Estimated cost for environmental sampling survey – direct expenses

Project Phase	Item	Monitoring Parameter	Location	Frequency	Total cost (x 1000 VND)	Reference Standards
Pre-construction phase	Air quality	SO2, NO2, CO, O2, SPM, carbohydrates, microclimate parameters, etc.	7 sites (3 samplings /site)	Once	23,415	QCVN 05:2009/ BTNMT
	Noise	Laeq, L10, L90	7 sites (24 hours continuous measurement)	Once	35,000	TCVN 5949-1998
	Surface water quality	Temperature, pH, SS, DO, BOD, COD, E.Coli, Total-P, Total-N, NO3-, NH4+, Oil/Grease, CN, Heavy metals (Cd, Pb, Cr, As, Hg)	9 sites	Once	17,235	QCVN 08:2008/ BTNMT, QCVN 10:2008/ BTNMT
	Sub-total				**75,650**	
Construction phase	Air quality	NO2, SO2, CO, SPM, Carbohydrates, Microclimate conditions	7 sites (3 samplings /site)	6 times = 2.5 years x 2 times/ year +1	140,490	QCVN 05:2009/ BTNMT
	Noise	Laeq, L10, L90	7 sites (24 hours continuous measurement)	6 times = 2.5 years x 2 times/ year +1	210,000	TCVN 5949-1998
	Water quality	Temperature, pH, SS, DO, BOD, COD, E.Coli, Total-P, Total-N, NO3-, NH4+, Oil/Grease, CN, Heavy metals (Cd, Pb, Cr, As, Hg)	9 sites	6 times = 2.5 years x 2 times/ year +1	103,410	QCVN 08:2008/ BTNMT, QCVN 10:2008/ BTNMT
	Sub-total				**453,900**	
Operation phase	Air quality	NO2, SO2, CO, SPM, Carbohydrates, Microclimate conditions	7 sites (3 samplings /site)	Once	31,165	QCVN 05:2009/ BTNMT
	Noise	Laeq, L10, L90	7 sites (24 hours continuous measurement)	Once	46,585	TCVN 5949-1998
	Water quality	Temperature, pH, SS, DO, BOD, COD, E.Coli, Total-P, Total-N, NO3-, NH4+, Oil/Grease, CN, Heavy metals (Cd, Pb, Cr, As, Hg)	9 sites	Once	22,940	QCVN 08:2008/ BTNMT, QCVN 10:2008/ BTNMT
	Sub-total				**100,690**	

Source : Study Team, Oct 2011.

Table 12.7-6 Estimated cost for environmental sampling survey – indirect expenses

Item	Parameter	Unit	Unit cost	Sample number	Cost
			(US$)		(US$)
Reporting	Data input	set	100	1	100
	Report writing	set	100	1	100
	Printing(Vietnamese 10, English 10) and CDs	set	200	1	200
	Translation (about 30 pages)	page	5	30	150
Office Consumer		set	50	1	50
Traveling Cost (7pers x 1 day)		man-day	30	7	210
Personnel cost	Manager	MM	1,200	0.1	120
	Expert	MM	800	0.1	80
	Surveyors (7pers x 3 days)	man-day	50	21	1,050
Other Indirect Expenses		set	618	1	618
Sub-total of Indirect Cost					2,678
VAT(5%)					134
Total of Indirect Cost					2,812
Baseline survey					2,812
During construction phase (2.5 years *2 + 1 = 5 times)					15,465
Evaluation survey (at the end of construction phase)					3,740

Source : Study Team, Oct 2011.

Table 12.7-7 Estimated cost for monitoring

Resettlement Action Plan (RAP) Monitoring					
RAP Monitoring Staffing (work during 1.0 years or 12 months)					
		Quantity	Unit	Unit price (US$)	Sub-total (US$)
	Team Leader	12	man-month	1,200	14,400
	Account & Financial Expert	12	man-month	720	8,640
	Social scientist	12	man-month	600	7,200
	Gender specialist	12	man-month	600	7,200
	Research and Statistical specialist	12	man-month	600	7,200
	Rent office	12	months	600	7,200
	Transportation (3 motorbikes x 12 months)	36	bike-month	12	432
	Communication	12	months	120	1,440
	Computer system	1	computers	2,400	2,400
	Printer	1	set	6,000	6,000
	Copy machine	1	set	9,600	9,600
	Stationery and consumption articles	12	months	180	2,160
	Reporting - monthly	12	reports	240	2,880
	Reporting - quarterly	3	reports	240	720
	Reporting - six-monthly progress	1	reports	360	360
	Reporting - annual	0	reports	360	0
	Reporting - final	1	reports	600	600
	Sub-grand total				78,432
	Management cost (5% of total cost)				3,922
	Contingency (5% of total cost)				3,922
	Grand total				**86,275**

Environmental Monitoring					
		Quantity	Unit	Unit price (US$)	Sub-total (US$)
	Team Leader	34	man-month	1,200	40,800
	Administrative assistant	34	man-month	720	24,480
	Data input and management	34	man-month	600	20,400
	Field surveyors (3pers x 34 months)	102	man-month	600	61,200
	Rent office	34	months	600	20,400
	Transportation (3 motorbikes x 34 months)	102	bike-month	12	1,224
	Communication	34	months	120	4,080
	Computer system (excluding 1 PCs from RAP Monitoring)	3	computers	2,400	7,200
	Stationery and consumption articles	34	months	180	6,120
	Reporting - monthly	34	reports	240	8,160
	Reporting - quarterly	11	reports	240	2,640
	Reporting - final	1	reports	600	600
	Sub-grand total				197,304
	Management cost (5% of total cost)				9,865
	Contingency (5% of total cost)				9,865
	Grand total				**217,034**

Source : Study Team, Oct 2011.

Table 12.7-8 Estimated cost for public consultation and information dissemination

	Unit	Quantity	Unit price (US$)	Sub-total (US$)	Total cost (US$)
Information Dissemination					24,000
Printing of leaflets					6,500
Pre-construction stage (1st year)	copies	1,000	0.5	500	
Construction stage (1st year)	copies	5,000	0.4	2,000	
Construction stage (2nd year)	copies	5,000	0.4	2,000	
Construction stage (3rd year)	copies	5,000	0.4	2,000	
Printing of brochures					17,500
Pre-construction stage	copies	500	5	2,500	
Construction stage	copies	5,000	3	15,000	
Organization of consultation meetings					10,200
					4,200
Meetings with PAP in Hai An	time	6	100	600	
Meetings with PAP in Ninh Tiep	time	6	100	600	
Meetings with PAP in Dong Bai	time	6	500	3,000	
Construction stage (during 2.5 years, to resolve complaints, etc.)					6,000
Meetings with local residents	time	15	200	3,000	
Meetings with relocated PAP	time	15	200	3,000	
Grand total cost for information dissemination and public consultation (US$)					**34,200**

Source : Study Team, Oct 2011.

Table 12.7-9 Estimated cost for implementation of RAP

STT	Items	Unit	Quantity	Unit price (1000 VND)	Total (1000VND)	Total (USD)
1	**Compensation for loss of land**		899,171		58,833,960	2,801,617
1.1	Residential land	m2	28,936	700	20,255,200	964,533
1.2	Aquaculture land	m2	823,180	45	37,043,100	1,763,957
1.3	Salt production land	m2	44,755	32	1,432,160	68,198
1.4	Other lands	m2	2,300	45	103,500	4,929
2	**Compensation for lost crops**		868,038		13,782,938	656,330
2.1	Aquaculture produce	m2	823,180	15	12,347,700	587,986
2.2	Salt produce	m2	44,755	32	1,432,160	68,198
2.3	Corn produce	m2	103	30	3,078	147
3	**Compensation for lost fruit trees**		5,641		488,720	23,272
3.1	Fruit trees - category 1	tree	498	400	199,200	9,486
3.2	Fruit trees - category 2	tree	182	150	27,300	1,300
3.3	Banana	tree	3,373	40	134,920	6,425
3.4	Bamboo	tree	420	25	10,500	500
3.5	Wood	tree	1,168	100	116,800	5,562
4	**Compensation for lost structures**		49,972		35,996,800	1,714,133
4.1	House	m2	5,249	2,500	13,122,500	624,881
4.2	Ancillary structures	m2	2,255	700	1,578,500	75,167
4.3	Outdoor toilet	m2	120	500	60,000	2,857
4.4	Outdoor shower/bath	m2	206	800	164,800	7,848
4.5	Fishing hut or shed	m2	2,413	500	1,206,500	57,452
4.6	Others	m2	39,729	500	19,864,500	945,929
5	**Compensation for relocation of graves**				2,529,468	120,451
	Relocation of graves	unit	275	3,945	1,084,875	51,661
6	**Relocation of public facilities**				10,000,000	476,190
7	**Cost for construction / expansion of cemetery**				5,000,000	238,095
8	**Construction of resettlement sites**		79	200,000	15,800,000	752,381
9	**Allowances (refer to Decisions 197, 84 and 69)**				78,253,240	3,726,345
9.1	Relocation allowances	HH	79	3,000	237,000	11,286
9.2	Life stabilization allowances (residential land)	HH	79	8,000	632,000	30,095
9.3	Temporary resettlement allowance	HH	79	5,000	395,000	18,810
9.4	Support for occupational change and job creation	m2	823,180	90	74,086,200	3,527,914
9.5	Life and produce stabilization allowances (cultivated land)	HH	112	25,920	2,903,040	138,240
	Sub total (1-9)				220,685,126	10,508,816
10	**Administration cost**				4,413,703	210,176
	Sub total (1-10)				225,098,829	10,718,992
11	**Contingency 10%**				22,509,883	1,071,899
	Total				243,195,009	11,580,715

Source : RAP Report prepared by PMU2, May 2010.

Table 12.7-10 Total estimated cost for environmental management and monitoring

Item	Cost by currency		Cost by funding source	
	US$	1000VND	Yen loan portion (US$)	Vietnam budget portion (1000VND)
Socio-economic environment				
Land acquisition (including compensation, supports, resettlement, etc)	11,580,715	243,195,009		243,195,009
Baseline survey for further planning and monitoring of RAP	15,114	317,394	15,114	
Implementation of livelihood restoration plan for PAP	2,000,000	42,000,000	2,000,000	
Implementation of monitoring of RAP implementation	86,275	1,811,779	86,275	
Public consultation and information dissemination	34,200	718,200	34,200	
Survey for terminal evaluation of RAP implementation	20,404	428,484	20,404	
Natural environment				
Trainings for environmental management and supervision	23,810	500,000	23,810	
Implementation of Environmental Management Program	217,034	4,557,722	217,034	
Implementation of Environmental Monitoring Program				
Pre-construction phase (baseline survey)	6,414	134,700	6,414	
Construction phase	37,080	778,674	37,080	
Operation phase	8,535	179,227	8,535	
Total	14,029,580	294,621,189	2,448,866	243,195,009

Source : Study Team, Oct 2011.

12.8 Supplementary EIA due to Dredging Works

After submission of draft final report, assessment of impacts caused by waste soils generated from civil works were required in accordance with the Vietnamese Regulation. The process was as follows:

(i) Selection of sub-consultant
(ii) Preparation of draft supplementary EIA report
(iii) Establishment of Appraisal Committee
(iv) Submission of draft supplementary EIA report
(v) Approval by MOT

It is estimated that about 370,000m^3 of waste soils would be generated from the construction of road and bridge (300,000m^3 from the construction of road foundation, and 70,000m^3 from the construction of bridge foundations). A part of these soils can be utilized to fill the low grounds along the sides of the highway, and the remaining unusable soils should be disposed to the designated sites. Methods to reuse and dispose these soils should be examined in further detail after the completion of the road design.

Besides, it is estimated that about 1 million m^3 of waste soil will be generated from the dredging work to make the temporary waterway necessary for construction of the approach bridge on Dinh Vu side. The Nam Dinh Vu Investment Joint Stock Company had agreed to allocate two lots of land in the Nam Dinh Vu Industrial Zone as dumping sites for this dredged soil. A supplemental EIA study for the temporary dredging waterway was carried out during the period from January to April 2012. Consequently, a supplemental EIA report had been prepared and submitted to MOT for approval on 27 June 2012. The appraisal committee was established in August 2012, and the appraisal meeting was held on 21st August 2012. However, there was some objection in selection of damping areas and it was required to carry out the official site investigation on 30th August 2012. After the site investigation, MOT instructed JST to re-submit the revised supplementary EIA report to MOT. The final revised report was submitted to MOT on 13th September 2012. After reviewing by MOT, the Report was modified again and finally approved by MOT in December 2012.

CHAPTER 13 HIV/AIDS Prevention Program

13.1 Introduction

Lach Huyen Port Infrastructure Construction Project (the Project), consists of two portion – the constructions of access roads/bridge to Lach Huyen port (Road & Bridge portion) and the civil works and constructions for soil improvement, and reclamation for terminal area, protection facility, dredging etc.(Port portion) has potential social risks for the increase of HIV infection and vulnerability against AIDS among staff and labor in construction sites and to the immediate local communities.

In August 2006, Japan International Cooperation Agency (JICA) signed a joint initiative together with five other donor agencies to commit to reducing HIV vulnerabilities associated with infrastructure projects through targeted interventions and supporting the HIV and AIDS response of partner countries. Since then, JICA has been incorporating HIV prevention programs targeting construction workers and the local communities they interact with into the design of its large scale infrastructure projects. In this context, JICA and Socialist Republic of Vietnam agreed on the inclusion of a plan to implement a prevention program against HIV/AIDS (Minuets of Discussion, 18 June 2010).

This chapter is to present draft HIV/AIDS prevention program for the Project, which will be reflected into general requirements of the tender documents for construction. HIV/AIDS prevention program will include such prevention/care activities and monitoring scheme to take care of the Contractor's personnel and workers from incident of infection of HIV/AIDS. The proposed drafted program is the product after discussion with Hai Phong City Health Department, Hai An district, and Cat Hai district, based on core components recommended in "Practice guidelines for harmonizing HIV prevention initiatives in the infrastructure sector" and past similar program in Vietnam.

13.1.1 Situation in Vietnam

The HIV epidemic in Vietnam continued to rise in all 64 provinces and cities until 2000, but incidence (new cases) has declined from 67 per 100,000 adults (15-49 age group) in 2000 to 39 in 2007. Meanwhile, the number of people living with HIV (PLHIV) is estimated 243,000 cases (0.41% of the Population) in 2009, and it is predicted that the number will have reached at 280,000 by the end of 2012(0.47%). In Vietnam, an estimated one in five males who inject drugs was living with HIV in 2009. For men who have sex with men, the infection level is also very high – at 16.7%. There has been progress in reducing the risk of HIV infection for female sex workers. National prevalence for this group was reported 3.2% in 2009. But hotspots of high prevalence still occur, such as in Hai Phong where HIV prevalence among street-based female sex workers in 2009 was 8.5%.

In 2004, The Government of Vietnam formulated "The National Strategy on HIV/AIDS Prevention and Control in Vietnam for 2004–2010 with a Vision to 2020", and in 2006, passed "The Law on Prevention and Control of HIV/AIDS (No. 64/2006/QH11)". This law prohibits terminating an employee, denying medical care, and refusing an employment based on HIV status, guarantees the right to have HIV status kept confidential as well as encouraging the employment of PLHIV. The law also provides for access to medical insurance and coverage for treatment expenses as well as free treatment for children living with HIV and other PLHIV living in difficult circumstances. In 2007, "Detailing the implementation of a number of articles of the law on Prevention and Control of HIV/AIDS (Decree No. 108/2007/ND-CP) defines target groups of harm reduction intervention measures in the prevention of HIV transmission, competency criteria of agency that provide such a program, and mandate on integration of HIV/AIDS prevention and control into social development program

While Vietnam Administration for AIDS Control (VAAC), Ministry of Health is the major stakeholder of HIV/AIDS prevention program, the Ministry of Transport (MOT) also has taken part in the response to HIV prevention. MOT set out a HIV Action Plan to respond the prevention of HIV risk in transportation sector in 2009. The overall objective of the Action Plan is to reduce the vulnerability to HIV and AIDS of those who are working in the transport sector, with a focus on staff and workers of the sea ports, waterways and civil construction sub-sectors in a period 2009-2013. The plan consists of the five (5) specific objectives such as "(1) To strengthen the committees for HIV/AIDS prevention and control", "(2) To improve the legislation for HIV/AIDS prevention and control, "(3) To improve capacity of staff of the MOT's health system", (4) "To raise awareness and reduce discrimination against PLHIV", and "(5) To improve the monitoring and evaluation system related to HIV/AIDS prevention and control"(Presentation at ICAAP-9 on 12 August 2009).

13.1.2 Situation in the Project Sites

Construction works will take place in two districts- Hai An district and Cat Hai district in Hai Phong City. The access roads which start from Tan Vu inter-change of Hanoi - Hai-Phong expressway in Hai An district via 5.44km bridge between the main land and Cat Hai Island will connect to Lach Huyen port terminal that stands out to the sea from Cat Hai Island of Cat Hai district. Japanese ODA loan finances the construction works for 15.63km Tan Vu- Lach Huyen highway and Lach Huyen port, and private investments are expected to fulfill the provision of Lach Huyen port facilities.

Hai Phong City is considered one of Vietnam's highest HIV epidemic areas. According to VAAC's data, more than 0.4% of the adult population in Hai Phong City is HIV positive, while it is estimated to be 1% in urban and 0.3% in rural. Vietnam's epidemic has mostly been driven by Injecting Drug Use (IDU) and its association with sex work.

Since the first case had been found in 1993, the total number of HIV positive has reached to 9,901 in Hai Phong City as of September 2011, in which 5,673 of AIDS. During past 18 years, 3,154 people died from AIDS or AIDS related diseases. Therefore, the number of people living with HIV/AIDS in Hai Phong City now is 6,747. In Hai Phong City, 64% of IDUs are PLHIV, and HIV prevalence among Female Sex Workers (FSWs) is 9.5% while the prevalence of street FSWs are 7.2%. An age group from 30 years old to 39 years old accounts for 54% of PLHIV. HIV Prevalence of Cat Hai district is now 3rd highest district among 15 districts of Hai Phong City while Hai An district is 8th among them. Ngo Quyen district, neighboring to Hai An district, is the first, and the districts where entertainment establishments are prospering.

Along with the national strategy and program of actions, Hai Phogn City executes nine (9) HIV/AIDS programs. Nine programs are (1) HIV Prevention through Information, Education and Communication (IEC) and Behaviour Change Communication (BCC), (2) Harm Reduction Prevention targeting high risk populations including Injection Drug User(IDU), (3) Care and Support for People Living with HIV (4) HIV Surveillance and Monitoring and Evaluation (M&E),(5) Access to HIV/AIDS Treatment Program, (6) Prevention of Mother to Child Transmission (PMTCT),(7) Management and Treatment of Sexually Transmitted Infections (STI), (8) Safe Blood Transfusion, and (9) Capacity Building and International Cooperation Enhancement.

Through those programs, Hai Phong City controls 100% of blood transfusions, assures that 80% of children living with HIV/AIDS access ART, and introduced methadone treatment program for IDUs. Hai Phong City operates 5 Voluntary Counseling and Testing (VCT) centers and one counseling center with the initiation of U.S. President's Emergency Plan for AIDS Relief (Emergency Plan/PEPFAR), and launched 100% condom use program through social marketing approach to entertainment establishment. In Hai Phong City, a HIV Legal Clinic is available since 2008, which provides face to face consultation and HIV hotline national free telephone (1800 1521). The hotline is

one of five Legal Clinics (Hanoi, Quang Ninh, An Giang, Hai Phong, and Ho Chi Minh) in the country. The Hai Phong City has been involved in the national leading pilot program such as Anti-retroviral therapy (ART) and methadone treatment for people who inject drugs. Prevalence is decreasing 5-7% every year, and new cases remains 100 cases per a year. Hai Phong City intensively carries out HIV/AIDS program through the collaboration with13-14 international organizations.

The location of Hai An district is close to the center of Hai Phong City. Hai An district consists of 8 communes with population of 103,000. The size of population increase 3-4,000 people every year. Hai An district health center has 8 workers, and four (4) of them are designated as staff for HIV/AIDS program operation.

In addition, the center accommodated eleven (11) persons who work for World Bank's program. The number of PLHIV counts 513 in the district, which consists of 436 men and 78 women. Seven (7) of them are children. All PLHIV receive ART service and other medical care. The Hai An district has one VCT center on the premise of Hai An district hospital and one methadone treatment center for IDUs. The number of IUDs who receive the service is 92, and it will be expected to reach 145 in October 2011. HIV positive IDUs among the clients are 41 (45%), and the clients with Hepatitis B positive is 13 and with Hepatitis C positive is 61.

The methadone treatment center is expected to expand its capacity up to 200. In order to cope with the increasing needs for health service including ART and VCT, new district hospital and district health center are under construction. Hai An receive financial support from Center for Disease Control(CDC), Family Health International(FHI), and World Bank(WB). Every commune operates health station with 4-6 health staff who engaged in primary health care including STI syndromic diagnosis and community mobilizations about HIV awareness in their spare time.

Despite its operation efforts, Hai An district concerns post operation of program after the expiration of support from international organization(e.g.WB's support to methadone treatment program), continues education of HIV for staff, insufficient resources for community mobilization, and enhancement of network among self-help groups.

Cat Hai Island, where is the center of the Port construction site, consist Cat Hai district with Cat Ba Island where the district administration office and the general hospital are located. Cat Hai district consists of 10 communes with the population of 29,800. The population of all five (5) communes in Cat Hai Island is around 14,100, where sixty-nine (69) cases are registered as PLHIV.

Furthermore, some immigrant fishermen inhabit Ben Pha Got Harbor of Cat Hai Island. Meanwhile, Cat Ba Island is commonly used as an overnight hotel stop on tours to Ha Long Bay run by travel agents from Hanoi. Hotels located in Cat Ba Island count around 40, and they accommodate 700 tourists. Cat Hai district administration office and the district hospital are located in Cat Ba Island. The general hospital provides VCT service.

13.2 Issues

The linkages between migration, mobility, and the spread of HIV are well documented. Increases in HIV prevalence have been observed along major transport routes, cross-border areas and in economic growing regions experiencing high seasonal and long-term population mobility. Large infrastructure projects offer economic opportunities that attract migrant workers, commercial retailers, and entertainment industries to previously remote and isolated communities. The interaction among the construction workforce, local communities, and sex workers can create a potentially high-risk environment for the spread of HIV and other STIs through unprotected sex and/or injecting drug use. Mobile and migrant workers, including construction workers, are highly vulnerable since their prolonged separation from family and communities, access to disposable income, and lack of alternative sources for rest and recreation can lead them to adopt high-risk behaviors. Other vulnerable groups include truck drivers and their helpers, commercial retailers, and seamen and common carriers who are involved in deliveries to the site.

While construction workers are considered higher at-risk to HIV epidemic, recent research in Vietnam shows that construction workers have general knowledge regarding HIV transmission and benefits of condom use, though the knowledge about STI/STD is rather low and certain % of men practice multiple partners.

The experience and the practice of program implementation were taken into policy progress and other program design and implementation, then main stream of HIV prevention in infrastructure sector gradually change the policy environments. The followings are the issues in current policy environment.

1) Large scale construction projects that seek to mitigate the spread of HIV must align their program to fit within existing national HIV responses and local programs. The sector interventions must also be linked to the various local health services delivery mechanisms, including local implementation units such as NGOs that are most effective for providing HIV services. Likewise, a number of ministries of transport have established their own HIV/AIDS plans and workplace policies, which can serve as good practice examples for the sector to address the threat posed by the epidemic. An important ingredient for success will be the working relationship that must be established between transport staff, health staff and local partners. The sector should also rely on existing best practice and supporting tools created by partners such as the International Labor Organization and the International Transport Workers Federation for implementing workplace HIV strategies and for influencing behavior change among transport workers. In Hai Phong City, various partners such International NGO take different role with its own coverage area in different time schedule. The issue is how the Program will formulate a mechanism that coordinates continuously synergetic enjoyment with the partners in the area.

2) HIV clause under construction contracts is effective for the staff and labor to acquire certain level of knowledge about HIV/AIDS as indicated in the monitoring and evaluation reports of similar programs. However, IEC activities that is run by construction companies tend to be passive, and they cannot grab the interest of individuals. In addition, it is pointed out that IEC and mass media fostered stigma and discrimination unintentionally while the law on Prevention and Control of HIV/AIDS has been in place. The issue is how the Program tackles on stigma and discrimination other than HIV awareness and their protection to the epidemic, how the Program integrate HIV/AIDS aspects into “health and safety” of each companies.

3) While construction workers know certain level of knowledge regarding to HIV/AIDS including protection method, the proportion of workers who know STI is lower, and most of them do not know their sero-status of HIV. If diagnosis and treatment service for STI are integrated into company health service, workers would not use them partly out of stigma and possibly because having an STI could be evidence of 'social evils' and grounds for dismissal. Workers do not use VCT even the services attached to worksites or those that are likely to give test results to employers due to fear of dismissal if HIV positive. The issue is how the Program sorts out the roles of service provider and construction contractor so that the site staff and labor can participated in the Program without fear and distrust.

4) If the prevalence of Hai Phong City will be applied to the number of site staff and labor, there will be several PLHIVs in the face of statistics. Attitudes and beliefs are a barrier to reflection on HIV, actual risk, self protection and protection of families. The issues are how the Program establishes the environment that enable all site staff and labor participate in voluntary testing or STI/STD service without fear and prejudices, and how the Program enable the site staff and labor utilize VCT and ART service provided by local health providers if they require.

5) Several international NGOs and organization operate their programs in Hai Phong City where the Program will be implemented, therefore, the Program continuously needs fine tuning with those partners during the Program period. In addition, situational change along with private investment may lead the Program framework revised. Furthermore, it is far more difficult to predict what the measure should be taken at the end of Program. The issue is how the Program institutionalizes a modifiable adjustment mechanism in monitoring, and how the evaluation can be utilized for the future.

6) The Vietnam law - Circular No.14/1998/TTLT-BLDTBXH-BYT imposes enterprise set up health station with one doctor and one practitioner if the enterprise has 501 – 1000 workers. For enterprise having less than 300 workers needs to have a clinic with at least one nurse; Enterprise with 300 – 500 workers needs at least one nurse and one practitioner. In case, lack of qualified health professionals, enterprises can make a contract with local health center to get services. The clinic is responsible for providing health care services for all kind of sickness, initial treatment for accidents during the work, control of contaminated foods, and provision of periodical health check including HIV/AIDS prevention. When the most of site staff and labor are assumed as temporary employed workers and engaged in short period of time by smaller enterprise, they may not be fully covered as expected.

13.3 Design and Implementation Strategy

The HIV/AIDS prevention program should be a single program that complies with the national and local framework. However, operationally, the Program will be divided into two portions: (1) Port potion and (2) Roads & Bridge portion, under project management unit respectively. In other words, the Program implementation should be controlled by PMU2 and MPMU2 as a part of the construction project management. However, due to limited human resource and technical capability, the PMU2 and MPMU2 should employ HIV management specialist as a consultant respectively. The appointed consultants will control quality of the Program through participating in the preparation of HIV clause for the contracts, monitoring and evaluation of the Program. Based on the contract between a prime contractor and Service Provider, the Service Provider operates the Program on site. Service Provider means an entity approved to provide the HIV/AIDS Prevention Program. The followings are the detailed strategy for design and implementation of the Program.

1) It is required to set up a mechanism that Service Providers, Hai Phong City authority, Hai Phong City Health department, representatives from Hai An district health center and Cat Hai district health center will be able to discuss the direction of the Program. The Program appoints Service Provider who shall attend quarterly HIV and Social Crime Steering Committee meeting for the purpose of reporting and coordination among stakeholders. Service Provider also attends the similar regular meeting held in Hai An district and Cat Hai district. In addition, the Program will organize the Program Management Coordinating Committee meeting, chaired by a member of HIV and Social Crime Steering Committee at the commencement of the Program, one year after, at the time of mid-term evaluation, 2 years after, and at the final evaluation. Participants of the meeting will be representatives from PMU2, MPMU2, construction contractors, Hai An district, Cat Hai district etc.

2) The Program will support executives, human resource manager, and health personal in site clinic, if it is set up, to create better HIV and workplace in the context of health and safety. Advocacy should focus on building company support for integration of the prevention program, and all employers should receive information to promote uptake of company run prevention activities and, where needed, changes in workplace policy. This work policy will cover anti-discrimination and elimination of stigma in workplace. The Program will extend the advocacy activities, if Ca Hai district and Hai An district agree, to owners of hotels, entertainment establishments, transport business in surrounding area.

3) Response to HIV/AIDS should focus on the both organization and individuals. In principle, construction contractors are responsible for HIV/AIDS prevention activities clarified by the HIV sub-clause under health and safety clause along with Vietnamese law. The Program support this principle though, Service Provider with its specialty and skills will access individual site staff and labor through BCC approach. Further, with the collaboration with local authority, the Service Provider will provide BCC approach to social groups and business communities where the local health authority cannot reach in general social campaigns.

4) Service providers will establish a mechanism that mediates and promotes VCT, STI/STD treatment, and access to ART if requred, through collaboration with site clinic (if it is set up) and health centers in Hai An district and Cat Hai district. The Service Provider will control the budget for this service within the Program cost.

5) The Program should include analyzing stakeholders and partners to find out priority activities and problems, and conducting baseline survey including behavior change and situation analysis at the time of the Project commencement. In order to reflect the change occurred during the implementation, it is required to conduct mid-term evaluation so that the Program will be able to re-design. The Program will need to conduct the evaluation together with an exit survey so that the results will reflect recommendations into the HIV/AIDS program in the post-construction period.

6) The Program should be implemented to involve in health staff of site clinic as much as possible as they are responsible health and safety including HIV prevention.

13.4 Scope of the Program

13.4.1 Program Title

HIV/AIDS Prevention Program for Lach Huyen Port Infrastructure Construction Project (the Program).

13.4.1.1 Outline of the Program Objectives and Outputs

The matrix of draft Program is attached in this chapter as Annex-1 Draft Program Design and Monitoring Framework.

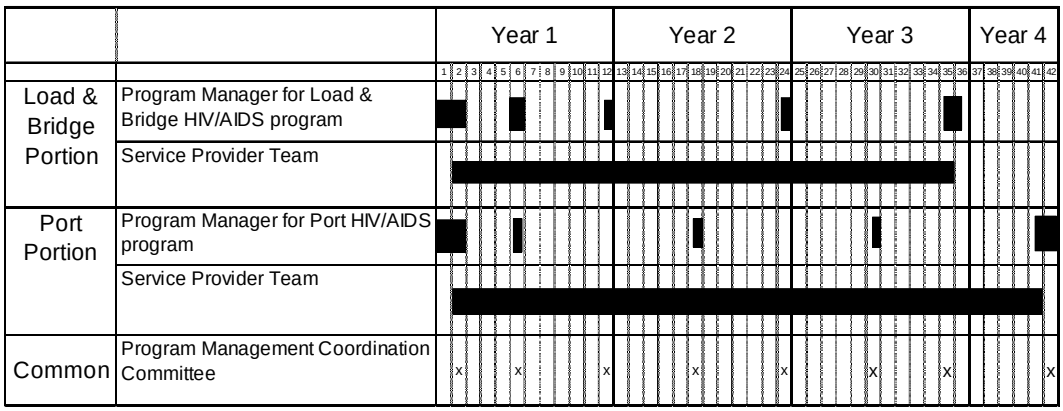
The overall goal of the Program is to reduce potential negative social impacts associated with the implementation and operation of the Lach Huyen Infrastructure Construction Project (Roads/Bridge and Port) in an HIV/AIDS prevalent area). In order to achieve the overall goal, the Program mitigates HIV risks and vulnerability to HIV/AIDS at the construction sites and surrounding communities by the following outputs.

1) Functioned management body and coordinating structure for the HIV/AIDS prevention program through proper implementation arrangement among major sub-contractors, Hai Phong City Health Department, Hai Phong City HIV/AIDS prevention center, Hai An district health center, Cat Hai district health center, service provider, and the Project management unit.
2) Increased awareness about, and applied workplace policy to address HIV, drug, stigma, and HIV resilient communities to sub-contractors and key partners including entertainment establishments, transportation business and local communities through advocacy and capacity building.
3) Increased awareness and positive behavior change among site staff and labor and local communities through IEC and BCC.
4) Secured access to quality HIV, STI and other health services including VCT and antiretroviral therapy (ART) for all site staff and labor with trust and confidentiality, through linking to other components and existing local resources.
5) Reliable performance of the Program through institutionalized monitoring and evaluation mechanism

13.4.2 The Program Period and Schedule

The Program covers 42 months (3 years and 6 months) along with the Project. However, the Program is managed by two management bodies under the project management unit respectively. The Road & Bridge program will end 6 months earlier than the Port program while the Port program covers full period of the Program. The appointed consultants for Roads & Bridge program and Port program supervise the designated part of the Program as program manager, but simultaneously monitor the progress of the entire program. Tentative plan of operation is attached in this chapter as Annex-2 Tentative Plan of Operation.

Table 13.4.2-1 Program Schedule



Source : Study Team

13.4.3 Supervision, Implementing Agencies, and Manager/Service Providers

The Program implementation should be controlled by PMU2 and MPMU2 as a part of the construction project management. However, due to limitation of human resource and technical specialty, PMU2 and MPMU2 should employ a consultant as a HIV management specialist respectively. The consultants control quality of the Program through preparation of contracts for HIV clause, monitoring and evaluation of the Program. Based on the contract between a prime contractor and service provider, the service provider operates the Program on site. The Program requires setting up Program Management Coordinating Committee (PMCC) which directs and controls the Program,

The PMCC meetings are expected to have every 6 months by the attendance of representatives from local authorities (Hai Phong City HIV and Social Crime Steering Committee and Cat Hai HIV and Social Crime Committee and Hai An HIV and Social Crime Committee), and representatives from PMU2 and MPMU2, and program managers for respective portion of the Program.

The both PMU2 (Roads & Bridge portion) and MPMU2 (Port portion) are expected to assign focal persons or a task team within their project management body respectively. Actual work and management of the Program will be assisted by prime contractors (consulting agency). An implementing guide including the recommended implementing structure is attached in this chapter as Annex-3 Implementation Guide.

Each prime contractor assigns a manger who is an expert on HIV/AIDS prevention program and, contract out the most of work to a service provider. The each prime contractor and the assigned manager control respective portion of the Program through HIV clause in contract of construction contractors and supervision and monitoring on the service provider. Sample TORs for program

management and monitoring consultant and Service Provider are attached in this chapter as Annex 4 Sample TOR for Management and Monitoring Consultant and Annex-5 TOR for Service Provider.

In order to secure the all site staff and labor participate in the Program, each prime contractor imposes construction contractor the obligation through HIV sub-clause under "Health and Safety" clause of contract. Sample HIV clause for inclusion in construction contract is attached as Annex-6 in this chapter. However, this sample only cover general condition, and it requires negotiation on specific conditions before the commencement of the Program. For instance, it may be possible for Service Provider to cover "Health and Safety" by assigning additional qualified personals and by setting up required facility on site.

13.4.4 Site and Immediate Community

The number and type of the site staff and labor will vary accordingly with the actual condition of construction work. Given information from similar construction work and construction plan of the Project, the best estimated number of workers for the Roads & Bridge construction will be 1,500 and the best estimated number of workers for the Port construction will be 600 at the peak construction period.

The Program encompasses managers of business community related to the construction works, entertainment establishment and local social groups in surrounding area. It is also expected to provide training to pharmacies, health staff of local health facilities, and health staff of site clinic in surrounding area.

The table below shows expected participants in the Program by output. It is difficult to get exact number of each group including business sector in immediate community but it is assumed that four times per a year workshop and capacity training cover all participants for Advocacy and Capacity Building; bi-monthly Peer Educator training cover all peer educators for IEC/BBC in both site and immediate community; twice a year technical training cover the technical need of health staff for Access to Health Service. However, this assumption also include that participants can have opportunity to utilize trainings planned by the both Road & Bridge program and Port program.

Table 13.4.4-1 Expected Participants in the Program

		Participants	
		site staff and labor	Immediate community
(1)	Implementation Arrangement	MPMU2, PMU2, Management and monitoring consultants, Service Providers, Major sub-contractors	Hai Phong City Health Department, Hai Phong City HIV/AIDS prevention center, Hai An district health center, Cat Hai district health center
(2)	Advocacy and Capacity Building	Responsible persons from Sub-contractors and business community directory associated with the construction works and workers' transfer (Truck Station Owners, Bus Station Owners, Dock Owners, Registration Authorities, General carriers' owner, motorcycle taxi owner etc.)	Through coordination with local partners, the following can be participants: Mangers of entertainment establishments (Fishermen, Seafarers, Youth union, Women's union) and representatives from local communities (bia hoi, karaoke clubs, and night clubs. Guest houses and small hotels)
(3)	IEC /BBC	Sub-contractors and business community directory associated with the construction works and workers' transfer (Truck Station Owners, Bus Station Owners, Dock Owners, Registration Authorities, General carriers' owner, motorcycle taxi owner etc.)	Through coordination with local partners, the following can be participants: Fishermen, Seafarers, Youth union, Women's union, sex workers
(4)	Access to Health Service	All the staff and labor who voluntary seek the STI/STD and HIV/AIDS related service including VCT, ART, and methadone treatment.	Training of local partners who provide health service(including pharmacies) and community mobilization, health personal in site clinic
(5)	Monitoring Evaluation	Management and monitoring consultants, Service Providers, Major sub-contractors	Local authorities and local partners

Source : Study Team

13.5 Expected Activities

13.5.1 Implementation Arrangement

The expected output is to establish functioned management body and coordinating structure for the HIV/AIDS prevention program through proper implementation arrangement among major sub-contractors, Hai Phong City Health Department, Hai Phong City HIV/AIDS prevention center, Hai An district health center, Cat Hai district health center, Service Provider, and the Project management unit. Activities are as follows.

(1) To establish management body such task team in MPMU II and PMU2 in order to accommodate supervision mechanisms for the Program among key stakeholders.

(2) To revise the draft Program frame work and plan of operation, and to prepare TORs of the Program implementation that Service Providers undertake and HIV clause in contracts with Contractors.

(3) To conduct a Management Coordinating Committee Meeting chaired by the member of Hai Phong City HIV and Social Crime Steering Committee every year on discussing annual plans and midterm and final evaluation. Representative from Service Provider attend quarterly Hai Phong City HIV and Social Crime Steering Committee and relevant regular meeting in other places.

13.5.2 Advocacy and Capacity Building

The expected output is to gain increased awareness about, and applied workplace policy to address HIV, drug, stigma, and HIV resilient communities to sub-contractors and key partners including entertainment establishments, transportation business and local communities. Activities are as follows.

(1) To plan and conduct regular workshops that advocate HIV/AIDS awareness, overcome of social stigma, confidentiality obligation, and privacy protection for each potential participating group of local communities, entertainment establishment, and business communities involved in the Project

(2) To plan and conduct "HIV and workplace" training program (workplace policy) for responsible person in contractors and business community that are interested in.

(3) To facilitate voluntary participants for introducing work place policy in their companies and local communities

(4) To monitor and support participants of the workshop and training program.

13.5.3 Information, Education, Communication (IEC) and Behavior Change Communication (Peer Education)

The expected output is to achieve the status of increased awareness and positive behavior change among site staff and labor and local communities through IEC and BCC. Activities are as follows.

<IEC and condom distribution>

(1) To regularly collect information on composition of site staff and labor in designated construction area for ICE approaches and Peer Education program.
(2) To select effective, locally acceptable, and IEC approaches for each group of the participants in the program with relevant local materials.
(3) To disseminate HIV/AIDS and STI information among site staff and labor (including all the Contractor's employees, all Sub-Contractors and Consultants' employees, and all truck drivers, mariners, and crew making deliveries to site for construction activities.
(4) To ensure the availability of condoms with free of charge during first implementation year; afterwards condoms made available at affordable costs.
(5) To cover or complement the community mobilization activities together with local health staff based on the method applied to the Program.

<Peer Education Part>

(6) To prepare Peer Education Program including curriculum and materials linking to other services such as access to condoms, medical care and voluntary HIV counseling and testing.
(7) To select Peer Educators from site staff and labor including all the Contractor's employees, all Sub-Contractors and Consultants' employees, and all truck drivers, mariners, and crew making deliveries to site for construction activities) and to the immediate local communities.
(8) To plan and conduct training program for Peer Educators so that the ratio of Peer Educator become one for every fifteen (15) or less of site staff and labor including identified groups in the local communities. The number of Peer Educator for trainings are assumed to be 150-200 (Roads & Bridge portion: 250-350) including turnover of participants and coverage of new recruits.
(9) To support and monitor Peer Educators.

13.5.4 Provision of Health Service and Counseling

The expected output is to secure the access to quality HIV, STI and other health services including Voluntary Counseling and Testing and antiretroviral therapy (ART) for all site staff and labor with trust and confidentiality, through linking to other components and existing local resources.

(1) To plan and prepare guidance and materials for Staff and labor who seek for STI/HIV prevention and treatment service on site or linking to local services. Although the use of local resources are free of charge in most cases, the plan should at least includes cost estimation of VCT use and Injection Drug User treatment center based on projected both prevalence and incidence of HIV/AIDS in the area.

(2) To support site staff and labor to secure the access to STI/HIV prevention and treatment services linking private and public health services or/and entities where he/she can protect privacy and human rights(i.e. establishment of a confidential referral system and/or voluntary self referral system is in place for the site staff and labor) .

(3) To plan and conduct training program for health workers in STI/STD management and VCT in order to ensure efficient, quality, confidential, and client-friendly services in site or /and surrounding communities.

(4) To monitor and evaluate the provision of access to HIV/AIDS related health service and counseling.

13.5.5 Monitoring and Evaluation

The expected output is to secure performance of the Program through institutionalized monitoring and evaluation mechanism. Activities are as follows.

(1) To review the draft Program frame work and set indicators of the objectives in the Program based on baseline survey and situation analysis at the time of the Project commencement.

(2) To outline coordination, monitoring and evaluation mechanism processes to ensure that the Program is relevant to the overall goal and the program goal of the Program, and sufficiently flexible to revise the Program when it is necessary and approved by PMCC. The mechanism should include the linkage with Vietnam's National Monitoring and Evaluation framework for HIV prevention and control programs and local monitoring system.

(3) To prepare monitoring and evaluation plan together with monitoring tools including formats for Service Providers.

(4) To design baseline and exit survey for the Program evaluation including sentinel behavior surveillance, complying Ministry of Health's questionnaire and analysis method.

(5) To conduct monitoring and evaluation by a planned schedule. The results of monitoring and evaluation are compiled as reports and to submit them to the executing agencies and associated entities.

13.6 Notes for Design Adjustment and Implementation

Notes for design adjustment and implementation of the draft Program are as follows.

(1) Management Coordinating Meeting revises the Draft Framework of Program before the commencement of the Program. Performance indicators for the objectives in the prevention program should be concretely developed, but those indicators should be always reviewed to match with the available human resources and the time of the Program implementation.

(2) Collaboration among implementation teams of the both Roads & Bridge program and the Port program, supporting agencies such local health providers, and local authorities are key to success to the program implementation. Especially, the Roads & Bridge program and the Port program should tightly coordinate to eliminate duplication and shortfall in the affected area. It may be useful to prepare HIV/AIDS terminology list including words and phrases used in the community or certain group.

(3) PLHIV should be involved as much as possible in providing communication to dispel fear, stigma, and discrimination. For instance, Service Provider is expected to ensure the involvement of PLHIV in the delivery of workshop/trainings.

(4) Service Provider applies Participatory Learning Action to workshop/trainings as much as possible, and provokes interaction among different sub-groups. However, some of the training session may require gender responsive, culturally and linguistically appropriate, work classification responsive, and work time adapted curriculum.

(5) Many similar materials and tools for IEC and BCC have been developed and used under HIV prevention program in Vietnam. In Hai Phong City, relevant and useful HIV prevention, care, and support program are carried out by different organizations. Development of IEC/BCC program is not issue since those programs in both local and national level produced a number of useful materials and tools. However, Service Provider may apply a few innovative approaches. For instance, use of mobile phone or hotline information on a small card can be tested. IEC materials for people in rural settings may need adequate pre-test to avoid wrong message and stigma.

(6) BCC through peer education program should be integrated into company structures and social systems. Peer educators should be selected among, and by, staff and labor with attention to potential for coverage. Training courses for new peer educators should be planned due to the high turnover rate to maintain regular operation. When peer education is applied in the community setting, use the name – peer communicator instead of peer educator.

(7) The Manager and Service Provider monitor the change of gender or culture related situation during every phase of the Program implementation so that gender-responsive and socially inclusive approach can be adapted to the situation.

13.7 Cost Estimates

The total cost of the additional scope of the Program is estimated at $887,000. The cost for the Roads & Bridge program is estimated $464,500, and the cost for the Port program is estimated $ 402,400 as shown in the table below. Some components of the Port program is estimated to require 60% of the Roads & Bridge Program since the estimated number of site staff and labor under the Port program would be less than 600 persons per a day in maximum. The detailed cost estimates are shown in this chapter as Annex- 7 Cost estimates.

Table 13.7-1 Summary Table for Cost Estimates

No	Item	Service Provider (USD)	Management Consultants (USD)	Cost (USD)	Cost ('000VND)
No	Item	Service Provider (USD)	Management Consultants (USD)	Cost (USD)	Cost ('000VND)
1	Road & Bridge potion	324,500	140,000	464,500	9,582,000
2	Port portion	262,400	140,000	402,400	8,302,000
	Total	586,900	280,000	866,900	17,884,000

1USD=20,628VND as of 20 Sept. 2011(State Bank)

Source : Study Team

13.8 Annexes

13.8.1 Annex-1: Draft Program Design and Monitoring Framework

Name of program
: HIV/AIDS prevention program for Lach Huyen Infrastructure Construction Project

Period : 42 months

Construction sites
: Lach Huyen port construction site in the Cat Hai Island and access roads and a bridge from Tan vu to Lach Huyen port

Target groups and program area
: site staff and labor (including all the Contractor's employees, all Sub-Contractors and Consultants' employees, and all truck drivers, mariners, and crew making deliveries to site for construction activities) and to the immediate local communities in Cat Hai district and Hai An district of Hai Phong City

Narrative Summary	Objectively Verifiable Indicators	Means of Verifications	Important Assumptions and Risks
Overall Goal : 1 Potential negative social impacts associated with the implementation and operation of the Lach Huyen Infrastructure Construction Project (Roads/Bridge and Port) in an HIV/AIDS prevalent area are reduced	1 HIV and sexually transmitted infections (STI) prevalence rate among target groups are higher than 2011 rates 2 Environment and land acquisition etc.	1 Health Department of Hai Phong City's serological surveillance and health information data 2 Social indicators and other mitigation measures to be monitored under the Project	
Program Objective : 1 HIV risks and vulnerability to HIV/AIDS at the construction sites and surrounding communities are mitigated	1-1)3% increase in HIV and STI testing at Cat Hai and Hai An district 1-2)50% increase in positive behavior change among construction workforce and local communities affected by the Project	1-1)Hai Phong City HIV and STI sentinel surveillance 1-2)The Program final report including baseline and end line data	
Outputs: **Implementation Arrangement** 1. Functional management body and coordinating structure for the HIV/AIDS prevention program through proper implementation arrangement among relevant sub-organizations, Hai Phong City Health Department, Hai Phong City HIV/AIDS prevention center, Hai An district health center, Cat Hai district health center, service providers and the Project management unit.	1-1)Established the Program Management and Coordinating Committee (PMCC) and attendance rate 1-2)Hold meetings once every 6 months to assess the progress of the Program	1-1)Role and function of Program Management and Coordinating Committee are signed among stakeholders 1-2)Minutes of Meeting (MM) of Program Management Coordinating Committee and availability of quarterly progress report.	-Timely implementation of the HIV/AIDS and STI prevention program -Commitment of the Hai Phong City, MUMPD/PMU1 and Contractors -Social disturbance or natural disasters do not affect the project areas -Social stigma and discrimination do not prevail

Narrative Summary	Objectively Verifiable Indicators	Means of Verifications	Important Assumptions and Risks
Advocacy and Capacity Building			
1. Increased awareness about and applied workplace policy to address HIV, drug, stigma, and HIV vulnerable communities, to sub-contractors and key partners including entertainment establishments, transportation business and local communities through advocacy and capacity building	1-1Development of HIV/AIDS workplace policy 1-2Number of workshops and capacity building for workplace policy 1-3Four times per a year workshop for business partners, entertainment establishments' community over the 3-year implementation period	1-1Participation level of target groups by Consultant Annual report 1-2Management Consultant Annual reports 1-3Management Consultant Annual reports	-Increased awareness translates into attitudinal changes. -Selected peer educators are welcomed by the target groups. -Construction companies facilitate information sessions at worksites and allow selected workers as project training courses. -Trained health workers are engaged in STI treatment. -Provided material is used properly. -Increased awareness translates into attitudinal changes.
Information, Education, and Communication (IEC) and Behavior Change Communication(Peer Education)	2-1100% coverage of site staff and labor 2-2100% increase in positive behavior change among site staff and labor and other groups in local communities	2-1Quarterly Service Provider report 2-2Quarterly Service Provider report	
3. Increased awareness and positive behavior change among site staff and labor and local communities through IEC and BCC	3-3One peer educator for every fifteen site staff and labor 3-4100% of the workers and CSWs know the benefit of use of condoms	3-3Quarterly Service Provider Report 3-4100% of the workers and participants of the Program know the benefit of use of condoms.	
Provision of Health Service and Counseling	+1-1 health workers receive continuous training in STI management and HIV voluntary testing and counseling including foot and stigma reduction and human rights	4-1Quarterly Service Provider Report	
4. Secured access to quality HIV, Sexual Transmitted Infection(STI) and other health services including Voluntary Counseling and Testing(VCT), and antiretroviral therapy(ART) for all site staff and labor units, trust and confidentiality, through linkage to other components and available local resources.	+2-1 increase in reported capacity among City and district health workers to diagnose and treat STI and VCT.	4-2Quarterly Service Provider Report	

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions and Risk
Monitoring and Evaluation 5 Reliable performance of the Program through established monitoring and evaluation mechanism	5-1 80% of the Contractor meets the requirement in contracts.	5-1 Annual Service Provider Report	
Activities: Implementation Arrangement 1-1 To establish management body such task team in MPMUI and PMUI2 in order to accommodate supervision mechanism for the Program among key stakeholders 1-2 To revise the draft Program frame work and plan of operation, and to prepare TORs of the Program implementation that Service Providers undertake and HIV clause in contracts with Contractors 1-3 To conduct a Management Coordinating Committee Meeting chaired by the member of Hai Phong City HIV and Social Crisis Steering Committee every year on discussing annual plans and midterm and final evaluation. Advocacy and Capacity Building 2-1 To plan and conduct regular workshops that advocate HIV/AIDS awareness, awareness of social stigma, confidentiality obligation, and privacy protection for each potential participating group of local communities, entertainment establishment and businesses communities involved in the Project			

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions and Risks
2-2To plan and conduct "HIV and workplace" training program (workplace policy) for responsible persons in contractors and business community that are interested in. 2-3To facilitate voluntary participants for introducing work place policy in their companies and local communities. 2-4To monitor and support participants of the workshop and training program. Information, Education, and Communication(IEC) and Behavior Change Communication(BCC) 3-1To project composition of site staff and labor in designated construction area for IEC approaches and Peer Education program. 3-2To select effective, locally acceptable, and IEC approaches, for each group of the participants in the program with relevant local materials. 3-3To disseminate HIV/AIDS and STI information among site staff and labor (including all the Contractor's employees, all Sub-Contractors and Consultants' employees, and all truck drivers, mariners, and crew making deliveries to site for construction activities. 3-4To ensure the availability of condoms with free of charge during first implementation year; afterwards condoms made available at affordable cost.			

Narrative Summary	Objectively Verifiable Indicators	Means of Verifications	Important Assumptions and Risks
3-5To cover or complement the community mobilization activities together with local health staff based on the method applied to the Program: -Peer Education Part- 3-6To prepare Peer Education Program including curriculum and manuals linking to other services such as access to condoms, medical care and voluntary HIV counseling and testing 3-7To select Peer Educators from site staff and labor including all the Contractor's employees, all Sub-Contractors and Consultant's employees, and all truck drivers, assistant, and crew making deliveries to site for construction activities and to business communities closely associated with construction works 3-8To plan and conduct training program for Peer Educators so that the ratio of Peer Educator Success rate for every fifteen (15) or less of site staff and labour including identified groups in the local communities 3-9To support and monitor Peer Educators and beneficiaries of Peer Education program			

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions and Risks
Securing confidentiality and access to HIV/AIDS related Health Service and Counselling in collaborations with local authority and front line communities.			
+-1To plan and prepare guidance and materials for Staff and labor who seek for STI/HIV prevention and treatment service on site or linking to local services. Although the use of local resources are free of charge in most cases, the plan should at least includes cost estimation of VCT center and Injection Drug User treatment center based on projected both prevalence and incidence of HIV/AIDS in the area.			
+-2To support site staff and labor to secure the access to STI/HIV prevention and treatment services linking private and public health services around section where he/she can protect privacy and human right.			
+-3To plan and conduct training program for health workers in STI/STD management and VTC in order to ensure efficient, quality, confidential, and client-friendly services in surrounding communities.			
+-4To monitor and evaluate the provision of access to HIV/AIDS related health service and counseling			
Monitoring and Evaluation 1. Regular execution of monitoring and reporting, and evaluation			
2-1To revise the draft Program frame work and set indicators of the objectives in the Program based on baseline survey and situation analysis at the time of the Project commencement.			

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions and Risks
5-2To outline coordination, monitoring and evaluation mechanism processes to ensure that the Program is relevant to the overall goal and the program goal of the Program, and sufficiently flexible to revise the Program when it is necessary and approved by PMCC. 5-3To prepare monitoring and evaluation plan together with monitoring tools including formats for Service Providers. 5-4To design baseline and exit survey for the Program evaluation including sentinel behavior surveillance, complying Ministry of Health's questionnaire and analysis method. 5-5To conduct monitoring and evaluation by a planned schedule.			

Note

The Project: Lach Huyen Infrastructure Construction Project

The Program: HIV/AIDS prevention program for Lach Huyen Infrastructure Construction Project

M/M: Minutes of Meeting

VCT: Voluntary Counselling and Testing

STI/STD: Sexual Transmitted Infection / Sexual Transmitted Disease

PMCC: Program Management Coordinating Committee

ART: Antiretroviral therapy

Workplace policy: Referred to ILO Code of Practice on HIV/AIDS and the World of Work

Business community: Truck Station Owners, Bus Station Owners, Dock Owners, Registration Authorities, General carriers, motorcycle taxi drivers, tourist agent, etc.

Local community: Fishermen, Seafarers, Youth union, Women's union, self-help groups such People Living with HIV (PLHIV), Injection Drug User etc.

Entertaining Establishments: These are often places where contacts for sex can be made, and in some instances, where sex can take place such as bia hoi, karaoke clubs, and night clubs. Guest houses and small hotels are generally included.

13.8.2 Annex-2: Tentative Plan of Operation

		Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
		Port Portion	<-																																									->
		Roads & Bridge Portion	<-																																			->						
			year 1												year 2												year 3												year 4					
1. Implementation Arrangement			1	0,5										0,5						1						0,5							0,5					1						
1-1		To establish management body such task team in MPMU2 and PMU2 in order to accommodate supervision mechanisms for the Program among key stakeholders	x																																									
1-2		To prepare TORs of the Program implementation that Service Providers undertake and HIV clause in contracts with Contractors	x																																									
1-3		To coordinate a Management Coordinating Committee Meeting chaired by the member of Hai Phong city HIV and Social Crime Steering Committee every year on discussing annual plans and midterm and final evaluation. Representative from Service Provider will attend quarterly Hai Phong city HIV and Social Crime Steering Committee and relevant regular meeting in other places.		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2. Advocacy and Capacity Building					1	1			3	1	3	1		3		1		3		1		3		1		3		1		3		1	2	1		1		1		1		1		1
2-1		To plan and conduct regular workshops that advocate HIV/AIDS awareness, overcome of social stigma, confidentiality obligation, and privacy protection for each potential participating group of local communities, entertainment establishment, and business communities involved in the Project			x	x			w		w			w				w				w				w				w			w											
2-2		To plan and conduct "HIV and workplace" training program (workplace policy) for responsible person in contractors and business community that are interested in.			x	x			t		t			t				t				t				t				t			t											
2-3		To facilitate voluntary participants for introducing work place policy in their companies and local communities									x	x		x		x		x		x		x		x		x		x		x		x		x		x		x		x		x		x
2-4		To monitor and support participants of the workshop and training program.									x	x		x		x		x		x		x		x		x		x		x		x		x		x		x		x		x		x
3. Information, Education, and Communication (IEC) and Behavior Change Communication(Peer Education)				1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	2	1	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1	0	0
3-1		To project composition of Site staff and labor in designated construction area for ICE approaches and Peer Education program			x	x																																						
3-2		To select effective, locally acceptable, and IEC approaches for each group of the participants in the program with relevant local materials			x	x																																						
3-3		To disseminate HIV/AIDS and STI information among Site staff and labor (including all the Contractor's employees, all Sub-Contractors and Consultants' employees, and all truck drivers, mariners, and crew making deliveries to Site for construction activities			x	x	x	x	x	x		x		x		x		x		x		x		x		x		x		x		x		x		x		x						
3-4		To ensure the availability of condoms with free of charge during first implementation year; afterwards condoms made available at affordable costs			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x		x		x		x		x		x		x										
3-5		To cover or complement the community mobilization activities together with local health staff based on the method applied to the Program		x	x	x			x						x					x						x						x												
3-6		3-6 To prepare Peer Education Program including curriculum and materials linking to other services such as access to condoms, medical care and voluntary HIV counseling and testing		x	x	x																																						

3-7		To select Peer Educators from Site staff and labor including all the Contractor's employees, all Sub-Contractors and Consultants' employees, and all truck drivers, mariners, and crew making deliveries to Site for construction activities) and to the immediate local communities and to business communities closely associated with construction works.		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
3-8		To plan and conduct training program for Peer Educators so that the ratio of Peer Educator become one for every fifteen (15) or less of Site staff and labor including identified groups in the local communities and to business communities closely associated with construction works.			x	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t		t		t		t		t		t				t					t					
3-9		To support and monitor Peer Educators and beneficiaries of Peer Education program			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
4, Provision of Health Service and Counseling				1	1	1	2	1	1	2	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1
4-1		To plan and prepare a guidance and materials for Staff and labor who seek for STI/HIV prevention and treatment service on Site or linking to local services. Although the use of local resources are free of charge in most cases, the plan should at least includes cost estimation of VCT center and Injection Drug User treatment center based on projected both prevalence and incidence of HIV/AIDS in the area		x	x																																							
4-2		To support Site staff and labor to secure the access to STI/HIV prevention and treatment services linking private and public health services or/and entities where he/she can protect privacy and human rights.			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
4-4		To plan and conduct training program for health workers in STI/STD management and VTC in order to ensure efficient, quality, confidential, and client-friendly services in surrounding communities.			x		t			t								t				t																				
4-3		To monitor and evaluate the provision of access to HIV/AIDS related health service and counseling.						x		x		x		x		x		x		x		x		x		x		x		x		x		x		x		x		x		
5. Monitoring and Evaluation			1	1	1			1						1						1	1					1						1						1				1	1	1
5-1		To review the Program frame work and set indicators of the objectives in the Program based on baseline survey and situation analysis at the time of the Project commencement.	x																																									
5-2		To outline coordination, monitoring and evaluation mechanism processes to ensure that the Program is relevant to the overall goal and the program goal of the Program, and sufficiently flexible to revise the Program when it is necessary and approved by PMCC.	x	x				x						x						x						x						x						x						x
5-3		To prepare monitoring and evaluation plan together with monitoring tools including formats for Service Providers.		x	x									x												x												x						
5-4		To organize baseline and exit survey for the Program evaluation including behavior sentinel survey, complying Ministry of Health's questionnaire and analysis method.		x	x															x	x																					x	x	
5-5		To conduct monitoring and evaluation by a planned schedule.						x						x							x					x						x						x						x

w : workshop t : training x : activities

13.8.3 Annex-3: Sample Implementation Guide

1) Objectives of the Meetings

<Program Management Coordination Committee Meetings>

1.2.1. The aim of the Program Management Coordination Committee is to consult with the Hai Phong City and designated district governments for coordinating HIV/AIDS initiatives and program within the entire infrastructure project.

1.2.2 The representatives from the Port and the Roads & Bridge Working Groups, the both program mangers, MPMU2 and PMU2, together with representatives from the Hai Phong City HIV and Social Crime Committee and Cat Hai district and Hai An district will meet jointly on a half-year basis to review and monitor progress of activities and necessary coordination with city and local on-going HIV/AIDS program.

1.2.3.The PMCC meetings will result in the identification of any problems or issues concerning the Program implementation, revision of the Program including indicators and recommend necessary collective/advocacy action. The PMCCC meetings will also confirm the direction of the implementation of each activity for the next half year.

<Bi-Monthly Working Group Meetings>

1.2.4 The Port Program Working Group and the Roads & Bridge program Working Group as well as the construction Contractor will meet jointly on a bi-monthly basis to review and monitor progress of activities including:

- peer education activities including; peer education sessions, meeting of peer supporters and the number of site staff and other beneficiaries reached by the peer education program;
- social marketing/IEC activities including; condom distribution and educational events, IEC materials, and distribution of promotional materials;
- First aid/STI Clinic operation including clinical services and HIV/AIDS and STI prevention education activates if the Clinic is set up; adherence to obligations by the construction Contractor concerning housing and recreational facilities for site staff and labor

1.2.5 The Bi-Monthly Working Group meetings will result in the identification of any problems or issues concerning program implementation, and recommend necessary collective/advocacy action and those responsible for taking action.

2) Membership

<Bi-Monthly Working Group Meetings>

2.1.1.Membership in the Bi-Monthly Working Group meetings will include the following:

Port Program Working Group

- Port program manager
- Leader of port program
- Focal person in construction contractor
- Local authority or others

Roads & Bridge Program Working Group

- Leader and sub-leader of port program
- Focal person in construction contractor
- Local authority or others (to be listed)

2.2.Program Management Coordination Committee Meetings

2.2.1.Membership in the PMCC meetings will include the followings:

- Representative from Hai Phong City HIV and Social Crime Committee
- Representative from Cat Hai district(HIV and Social Crime Committee)
- Representative from Hai An district(HIV and Social Crime Committee)
- Focal person from MPMU2
- Focal person from PMU2
- Program manager for the Port program
- Program manager for the Roads and Bridge program
- Representative from Port Working Groups
- Representative from Roads & Bridge Working Groups
-

3) Schedule

3.1.Bi-Monthly Working Group Meetings

3.1.1.The following tentative schedule is recommended for holding Bi-Monthly Working Group Meetings. The Roads and Bridge Working Group will inform the stakeholders once meeting dates are confirmed.

3.2.PMCC Meetings

3.2.1.The following tentative schedule is recommended for holding PMCC Meetings. The Roads and Bridge Working Group will inform the stake-holders once meeting dates are confirmed.

The commencement of the Program, one year after, at the time of mid-term evaluation, 2 years after, and at the final evaluation

4) Venue

4.1.Bi-Monthly Working Group Meetings

4.1.1.Bi-Monthly Working Group meetings will be held at:

4.2.PMCC Meetings

4.2.1.PMCC t meetings will be held at:

5) Roles and Responsibilities

5.1.Manager and Service Provider for the Roads & Bridge program — The Roads & Bridge Program Working Group(RPWG), which consists of program manager and service provider team will be responsible to take the lead in overall management and monitoring of the Roads & Bridge program to be carried out on site and near the site communities. The RPWG will serve as the link between the construction Contractor and key stakeholders in the communities.

In addition, the RPWG will cooperate with the Port Program Working Group(PPWG) for monitoring the Program.

The RPWG will convene Bi-Monthly Working Group and PMCC meetings. The RPWG will serve as the Secretariat for these meetings in turn with PPWG. The RPWG will issue invitations to participants and set meeting agendas. In addition, the RPWG will be responsible for collecting and compiling monitoring data and information based on monitoring formats and preparing brief summary reports.

The RPWG may arrange additional meetings (other than the Bi-Monthly Working Group) with stakeholders to ensure the smooth implementation of activities when necessary.

5.2.Manager and Service Provider for the Port Portion of the Program — The Port Portion Program Working Group(PPWG), which consists of program manager and service provider team will be responsible to take the lead in overall management and monitoring of the port portion of the Program to be carried out on site and near the site communities. The PPWG will serve as the link between the construction Contractor and key stakeholders in the communities.

In addition, the PPWG will cooperate with the RPWG for monitoring the Program.

The PPWG will convene Bi-Monthly Working Group and PMCC meetings. The PPWG will serve as the Secretariat for these meetings in turn with RPWG. The PPWG will issue invitations to participants and set meeting agendas. In addition, the PPWG will be responsible for collecting and compiling monitoring data and information based on monitoring formats and preparing brief summary reports.

The PPWG may arrange additional meetings (other than the Bi-Monthly Working Group) with stakeholders to ensure the smooth implementation of activities when necessary.

5.3.Construction Contractor — The construction Contractor will be responsible for providing the Bi-Monthly Working Group with the progress of the activities on HIV/AIDS/STI and prevention under the HIV clause. In addition, the construction Contractor will provide statistical information on site staff and labor including the number of construction workers, truck drivers and staff by work type and nationality, etc. Further, the construction Contractor will provide statistical information on the First aid/STI clinic including the number of visitors for first aid services, the number of distributed condoms, the number of workers for counseling and STI/STD service.

5.4.Cat Hai district and Hai An district — At least one representative from each district will attend the PMCC. The representative from each district may provide guidance to coordinate activities of the Program and local activities carried out by each district.

5.5.Chairpersons

5.5.1.Representative form Hai Phong City HIV and Social Crime Committee will serve as a Chair-person for PMCC. When he is not available, either representative of the designated districts will be replaced.

5.6.Taking of Minutes

5.6.1.The RPWG and PPWG will assign two staff (one from the RPWG and one from the PPWG) to take minutes for the Bi-Monthly Working Group meetings and PMCC meetings. In order to ensure continuity in minute taking/recording, these two staff should remain the same throughout the life of the Program. These two staff will be responsible for working together to compile minutes for both the Bi-Monthly Working Group and PMCC meetings.

5.6.2.Outline/Format of Minutes — Minutes should provide adequate detail regarding the reports/presentations of meeting participants, issues and concerns discussed, and recommended further actions.

5.7.Distribution of Minutes

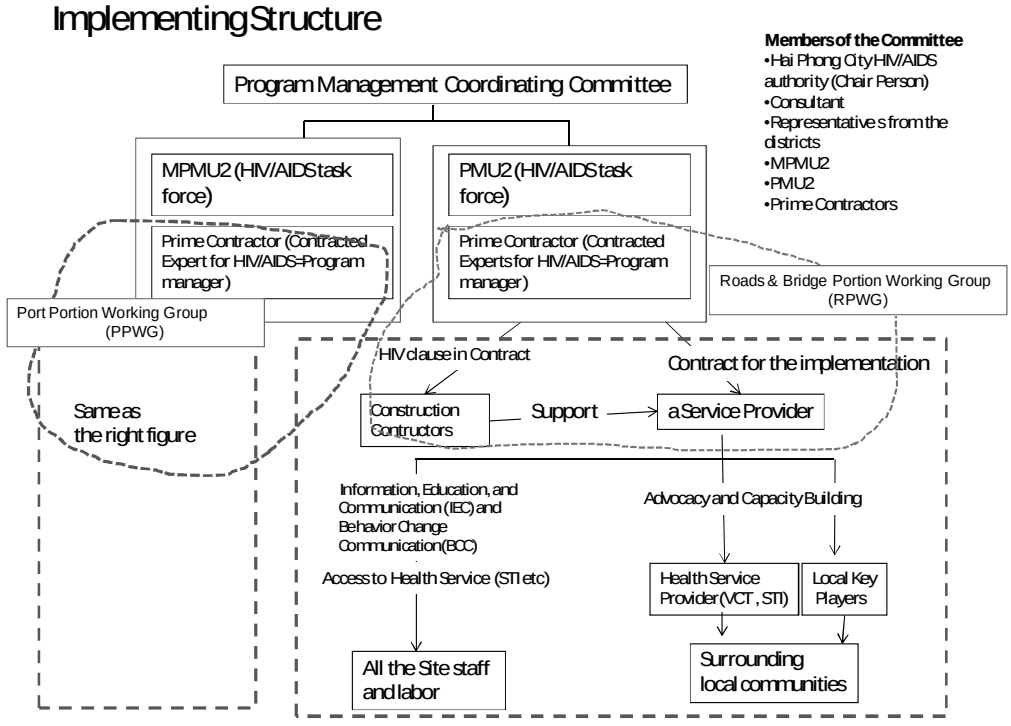
5.7.1.The two staff responsible for taking and compiling minutes for the Bi-Monthly Working Group and PMCCC meetings will be responsible for distributing minutes to all participants and the MPMU2 and PMU2.

5.8.Record Keeping

5.8.1.The two staff responsible for taking, compiling and distributing minutes for the Bi-Monthly Working Group and PMCC meetings will be responsible for maintaining a file of all minutes, reports, correspondence and other documents relating to program activities.

6) Management Structure and Reporting

The following diagram outlines structure of the Program management and reporting requirements of Bi-Monthly Working Group and PMCC meetings.



13.8.4 Annex-4: TOR for Management and Monitoring Consultants (Roads & Bridge)

1. The objectives of the Program Management Team (PMT) are to (1) develop a HIV/AIDS prevention program and a plan of operation associated with the port construction from the master Program (Annex 1 Draft Program Design and Monitoring Framework, i.e. the Program) and Tentative Plan of Operation(Annex 2 Plan of Operation), (2) organize and coordinate the management system of the Program from draft Implementation Guide(Annex 3 draft implementation guide) ,(2) assess the progress of the Program associated with the Roads & Bridge program in a timely fashion, (3) enable appropriate adjustment of the Roads & Bridge activities during the construction period through monitoring verifiable indicators, and (4) evaluate the impacts of the Program .

2. The Roads & Bridge program management unit will consist of one international and one national specialist. The international specialist will be required for a total input of 5 person-months, while the national specialist will be required for a total of 5 person-months. The consulting firm/organization will be highly qualified in program management, with recognized experience in monitoring and evaluating HIV prevention programs in Vietnam. The consulting services will be intermittently conducted over a period of 3 years and 6 months.

3. The Roads & Bridge program manager, i.e, an international specialist will have at least 13 years of public health experience in prevention programs of HIV. Some experience in Vietnam along with the prevention programs in non-health sectors would be beneficial. The program manager will be responsible for overall supervision, implementation, and report preparation for the Roads & Bridge program.

In coordination with focal person for the Roads & Bridge program, the program manager will undertake the following tasks but will not be limited to them:

(1) Report to the manger of the Project supervision consultant, focal person of MPUM2 for the Program, and Program Management Coordinating Committee.

(2) Manage the administration and implementation of the Program.

(3) Guide the team member of Service Provider and national specialist, and ensure that the Port program is implemented according to the terms of reference for the Service Provider.

(4) Take responsibility for preparing a Plan of Operation and budget for the Port program The plan must be submitted for approval at Program Management Coordination Committee.

(5) Develop and ensure the overall implementation of an effective system for internal monitoring of the Port program implementation and outcomes, in collaboration with the Road & Bridge Program,

(6) Take responsibility for facilitating the Program Management Coordinating Committee, and ensuring that regular monitoring meetings (Working Group Meeting) are conducted with the Service Provider.

(7) Prepare minutes of meetings and contracts required to implement the approved Program design, and financial and reporting requirements and to ensure formal and documented approval of the Port program

(8) Ensure complete and on-time submission of formal written reports, including the quarterly report, mid-term evaluation report, and completion report including an evaluation part. The evaluation part should include lessons for HIV/AIDS program for infrastructure projects and recommendations for future program in the affected area by the Project.

(9) Help fine-tune prevention programs associated with large infrastructure projects and post-HIV/AIDS programs in local communities.

4. The Roads & Bridge program coordinator, i.e, a national specialist, who is fluency in both English and Vietnamese, will have at least 5 years of public health experience in prevention programs of HIV. Some experience in Vietnam along with the prevention programs in non-health sectors would be beneficial. The program coordinator will be responsible for support the work of the Roads & Bridge program manager, and coordinate relationship among key stakeholders of the Roads & Bridge program for smooth implementation.

5. The Roads & Bridge program management unit will undertake the following tasks together with a selected Service Provider but will not necessarily be limited to them:

Implementation Arrangement

(1) To support establishing management body or personal in PMU2 in order to accommodate supervision mechanisms for the Program among key stakeholders

(2) To revise the draft Program frame work and plan of operation, and to prepare TORs of the Program implementation that Service Providers undertake and HIV clause in contracts with Contractors.

(3) To support and participate a management coordinating committee meeting chaired by Hai Phong City HIV and Social Crime Committee every 6 months

(4) To create a working group among Service Provider and construction contractors for the Port program refer to Sample Operation Guide for Program (Annex 3)

Regular execution of monitoring and reporting, and evaluation

(1) To review the draft Program frame work and set indicators of the objectives in the Program based on baseline survey and situation analysis at the time of the Project commencement.

(2) To outline coordination, monitoring and evaluation mechanism processes to ensure that the Program is relevant to the overall goal and the program goal of the Program, and sufficiently flexible to revise the Program when it is necessary and approved by Program Management Coordinating Committee.

(3) To prepare monitoring and evaluation plan together with monitoring tools including formats for Service Providers.

(4) To design baseline and exit survey for the Program evaluation including behavior survey, complying Ministry of Health's questionnaire and analysis method.

(5) To conduct monitoring and evaluation by a planned schedule. The results of monitoring and evaluation will be compiled as reports and to submit them to the executing agencies and associated entities including national supervising agency.

13.8.5 Annex-5: Sample TOR for Service Provider

1. The Service Provider will be responsible for the effective and efficient implementation of the following four components of the HIV/AIDS Prevention Program (the Program): (1) Increased awareness about, and capacity to address HIV, drug, stigma, and HIV resilient communities among key partners among entertainment establishment, transportation business and local communities through advocacy and capacity building, (2) Increased awareness and positive behavior change among site staff and labor and local communities through Information, Education, and Communication (IEC) and Peer Education, (3) Secured access to quality HIV/AIDS, STI/STD and other health service including VCT and ARV, through linking other the program components and existing local resources. (4)Monitoring and reporting.

The project supervision consultant, who will be selected by Management Unit 2(MPU2). Directorate of Roads for Vietnam to supervise consulting service for Lach Huyen Port Infrastructure Construction Project – Roads & Bridge portion (the Project), will make a subcontract with the selected organization / consulting firm for the Roads & Bridge portion of the Program(the Port program).

2. The selected Service Provider shall have demonstrated competence and experience in implementing an HIV/AIDS prevention programs or similar programs, preferably in the infrastructure projects. The Service Provider team should consist of one team leader (17 person-months), and two national officers (a total of 72 person months).

3. Team Leader (17 person-months, national)

The team leader will have at least 13 years of public health experience, including at least 3 years in Asia, in prevention programs for HIV/AIDS including workshop/training design, and as team leader of projects. Some experience in Vietnam along with HIV-prevention programs in non-health sectors would be beneficial. The team leader will be responsible for overall coordination, implementation, and report preparation. Under the supervision of the management unit, the team leader will undertake the following tasks but will not be limited to them:

(1) Report to the Roads & Bridge program manager of the Project supervision consultant, member of focal person for the Program, and other agencies as requested by the Port program manager.

(2) Manage the administration and implementation of the Roads & Bridge program.

(3) Guide the working group members, ensure that the Roads & Bridge program is implemented according to the TOR for the supervisory consultant and any subsequent instructions or guidance from the Port program manager.

(4) Ensure regular liaison with Port program management team, Hai Phong authority for HIV/ AIDS in the Project area, other ministries, development partners, and civil society.

(5) Take responsibility for preparing a detailed implementation and budget for the above four(4) components of the program through a participatory planning process (including consultations, task forces, field visits, and workshops) with the member of working group and groups from local communities. The plan should comprise the port part of Plan of Operation, budget, and a performance monitoring system from each component. The plan must be approved by the Roads & Bridge program Management Team (RPMT) who assigned by the supervise consultant, not later than 1.5 months after civil works commence.

(6) Develop and ensure the overall implementation of an effective system for internal monitoring of the program implementation and outcomes, in collaboration with the RPMT. The scope of the internal monitoring system will include (a) maintaining baseline data for benefit evaluation purposes as developed by the port RPMT team, and (b) tracking of resources, activities, and schedules related to the Port program.

(7) Support the RPMT in developing indicators and targets that are adequate for detailed planning,monitoring, and evaluation of the Port program using updated information on HIV/AIDS, sexually transmitted infections (STIs), transport settings, commercial and entertainment settings, mobility and migration patterns, ethnic minority settings, health systems, among others.

(8) Ensure that extensive consultation with the representatives of civil works contractors and subcontractors, transport companies, commercial and entertainment establishments, and local communities.

(9) Appoint a focal section/person from the above associated groups and initiate them as a port working group to active actors for the Port program.

(10) Take responsibility for facilitating the working group meetings, and ensuring that those meetings are conducted with representatives from construction and transport companies, and local community representatives..

(11) Prepare minutes of meetings /contracts required to implement the approved program design, and financial and reporting requirements and to ensure formal and documented approval of the program at provincial and district levels.

(12) Ensure complete and on-time submission of formal written reports, including the bi-monthly report, quarterly report, and completion report.

(13) Ensure the activities described under the implementation guide.

4. Program Officers (72 person-months, national)

The program officers will have a bachelor's degree in public health, social service, psychology or related field and at least 5 years of work experience in project implementation and/or provision of technical services. The Program Officers will consist of following technical field:

IEC and social marketing / Peer education program with quality assurance

Occupational health, STI/STD and HIV/AIDS management

5. The Service Provider team will undertake the following tasks together with the port working group:

Implementation Arrangement

(3) To coordinate a Management Coordinating Committee Meeting chaired by the member of Hai Phong City HIV and Social Crime Steering Committee every year on discussing annual plans and midterm and final evaluation. Representative from Service Provider will attend quarterly Hai Phong City HIV and Social Crime Steering Committee and relevant regular meeting in other places.

Advocacy and Capacity Building

(1) To plan and conduct regular workshops that advocate HIV/AIDS awareness, overcome of social stigma, confidentiality obligation, and privacy protection for each potential participating group of local communities, entertainment establishment, and business communities involved in the Project. Participants of HIV prevention advocacy workshops can be manager and responsible person for "Health and Safety" of consultants, contractors, subcontractors; local government authorities (e.g., immigration, customs, and border police);local community leaders; director of local public and private health providers and pharmacies; commercial and entertainment establishment owners and controllers; hotel and tourist owners. The workshops will contain the issues indicated in ten key principles of the ILO Code of Practice on HIV/AIDS and the World of Work (incl. its education and training manual) in local context.

(2) To plan and conduct training program of HIV workplace policy for responsible person who engaged in "Health and Safety" among consultants, contractors, sub-contractors, and local government. Trainings encompass steps to initiate a workplace policy and its management for HIV and STI prevention; advocacy; counseling; diagnosis and treatment; culture, power, and gender consideration among workers; HIV and STI confidential counseling and testing, treatment and care, available support and use of local resources; and the establishment of referral to the local resources etc.

(3) To facilitate voluntary participants for introducing work place policy in their companies and local communities.

(4) To monitor and support participants of the workshop and training program.

IEC and condom distribution

(1) To project composition of site staff and labor in designated construction area for ICE approaches and Peer Education program.

(2) To select effective, locally acceptable, and IEC approaches for each group of the participants in the program with relevant local materials.

(3) To disseminate HIV/AIDS and STI information among site staff and labor (including all the Contractor's employees, all Sub-Contractors and Consultants' employees, and all truck drivers, mariners, and crew making deliveries to site for construction activities.

(4) To ensure the availability of condoms with free of charge during first implementation year; afterwards condoms made available at affordable costs.

(5) To cover or complement the community mobilization activities together with local health staff based on the method applied to the Program.

Peer Education

(1) To prepare Peer Education Program including curriculum and materials linking to other services such as access to condoms, medical care and voluntary HIV counseling and testing.

(2) To select Peer Educators from site staff and labor including all the Contractor's employees, all Sub-Contractors and Consultants' employees, and all truck drivers, mariners, and crew making deliveries to site for construction activities) and to the immediate local communities.

(3) To plan and conduct training program for Peer Educators so that the ratio of Peer Educator become one for every fifteen (15) or less of site staff and labor including identified groups in the local communities. The number of Peer Educator for trainings are assumed to be 150-200 (Roads & Bridge portion: 250-350) including turnover of participants and coverage of new recruits.

(4) To support and monitor Peer Educators.

Provision of Access to HIV/AIDS related Health Service and Counseling

(1) To plan and prepare guidance and materials for Staff and labor who seek for STI/HIV prevention and treatment service on site or linking to local services. Although the use of local resources are free of charge in most cases, the plan should at least includes cost estimation of VCT center and Injection Drug User treatment center based on projected both prevalence and incidence of HIV/AIDS in the area.

(2) To support site staff and labor to secure the access to STI/HIV prevention and treatment services linking private and public health services or/and entities where he/she can protect privacy and human rights(i.e. establishment of a confidential referral system and/or voluntary self referral system is in place for the site staff and labor).

(3) To plan and conduct training program for health workers in STI/STD management and VTC in order to ensure efficient, quality, confidential, and client-friendly services in surrounding communities. Training program include reproductive health, preparation of STI diagnostic tools, and drug treatments in the project-affected districts, and it also include preventing HIV screening for employment, ensuring confidentiality of medical records and medical status, provision of a non discriminatory work environment, and promotion of workers' rights to continue employment if tested positive for HIV and other STIs.

(4) To plan and conduct training program for health workers in STI/STD management and VTC in order to ensure efficient, quality, confidential, and client-friendly services in surrounding communities.

Program Monitoring

(1) To prepare monitoring and evaluation plan together with monitoring tools including formats for Service Providers.

(2) To organize baseline and exit survey for the Program evaluation including sentinel behavior surveillance, complying Ministry of Health's questionnaire and analysis method.

(3) To conduct monitoring and evaluation by a planned schedule. The results of monitoring and evaluation will be compiled as reports and to submit them to the executing agencies and associated entities. To prepare monitoring plan together with monitoring tools the program manager team.

(4) To organize baseline and exit survey for the Program evaluation including sentinel behavior surveillance, complying Ministry of Health's questionnaire and analysis method.

(5) To conduct monitoring by a planned schedule. The results of monitoring will be compiled as reports and to submit them to the program manager, executing agencies and associated entities along with the implementation guide.

13.8.6 Annex-6: Sample HIV Clause for Inclusion in Construction Contracts

1. For the Purpose of this Clause:

"Service Provider" means a person or entity approved to provide the HIV-Awareness and Prevention Program; "the Contractor's Employees" means, without prejudice to any other definition contained in the Contract, any workers who are under the Contractor's control and on the Site in connection with the Contract, including any workers who are under the control of any person or entity to whom the Contractor has subcontracted any its obligations under the

Contract other than those responsibilities set out in this Clause); "the HIV Prevention Program" means HIV/AIDS prevention Program for Lach Huyen Infrastructure Construction Project";

1.2. It shall be a Condition of the Contract that the Contractor:

1.2.1 subcontracts with a Service Provider to implement an HIV-prevention program among the Contractor's Employees for the duration of the Contractor's contract and commencing as soon as practicable after the Contractor's Employees arrive at the Site/s;

1.2.2 gives any representative of the Service Provider, and the Employer all reasonable access to the Site in connection with the HIV-prevention program;

1.2.3 instructs the Contractor's Employees to participate in the HIV -Prevention Program in the course of their employment and during their normal working hours or any period of overtime provided for in the relevant employment contracts and uses all reasonable endeavors to ensure this instruction is followed;

1.2.4 does nothing to dissuade the Contractor's Employees from participating in the HIV-Awareness and Prevention Program.

1.3 The Contractor shall be entitled to be reimbursed by the Employer for any payments made under a subcontract made for the purpose of Clause 1.2.1 in accordance with the relevant provisions in the Contract.

1.4 Where the Contract does not provide for reimbursement of named costs, the amount paid by the Contractor to the Service Provider shall be added to any lump sum to be paid by the Employer to the Contractor under the Contract and, before such lump sum is paid, the Contractor shall provide to the Employer evidence of:

1.4.1 payment of the amount claimed to the Service Provider; and

1.4.2 provision of the HIV-Prevention Program (e.g., a certificate issued by the Service Provider).

1.5 Where a clinic is provided on behalf of the Contractor on Site, the Contractor shall ensure that such clinic provides to the Contractor's Employees, on request and without charge:

1.5.1 confidential counseling and advice on HIV/AIDS

and

1.5.2 condoms that comply with the WHO/UNAIDS Specification and for Condoms 1998 or any more recent equivalent publication to a maximum of [number] per member of the Contractor's Employees per year.

1.6 Where the Contractor subcontracts any of its obligations under the Contract, it shall require any subcontractor to comply with sub clauses [1.2.2–1.2.6] of the Contract as if it were the Contractor.

13.8.7 Annex-7: Cost estimates

(1) Cost estimates for the Roads and Bridge portion

No	Item	Unit	A. Unit Cost(USD)	B. Road & Bridge Potion (Quantity)	Cost(USD)
Cost for Service Provider					
1	Team Leader	MM	3,200	17	54,400
2	Officers	MM	600	72	43,200
3	Travel Cost	lump	20,000	1	20,000
4	Office and equipment	lump	25,000	1	25,000
5	Advocacy and cpacity building	lump	30,000	1	30,000
6	Information Education, and Communication and Peer Education including condom distribution	lump	70,000	1	70,000
7	Secure access to STI/STD,HIV/AIDS and counseling including local health staff trainings	3) Cost estimates for Healtrh Service			49,923
8	Baseline survey and mid-term situation analysis	lump	20,000	1	20,000
9	Endline survey, and situation analysis at the end of the	lump	20,000	0	0
10	Monitoring and reporting including coordination of working group meetings and Program Management Coordinating Committee	month	12,000	1	12,000
					324,523
Cost for Management Consultant				0	
11	International Consultant (Manager)	MM	20,000	5	100,000
12	National Coordinator	MM	3,000	6	18,000
13	International and Local Travel	lump	15,000	1	15,000
14	Review of the Program design,and supervise Service Provider and consturction contractor	lump	2,000	1	2,000
15	Monitoring and evaluation(Reporting)	lump	5,000	1	5,000
	Subtotal (2)				140,000
	Grand total (sub 1 + sub 2)				464,523

(2) Cost estimates for the Port portion

No	Item	Unit	Unit Cost(USD)	C. Port Portion(MM=Quantity; others=ratio)	Cost(USD)
Cost for Service Provider					
1	Team Leader	MM	3,200	17	54,400
2	Officers	MM	600	72	43,200
3	Travel Cost	lump	20,000	1.5	30,000
4	Office and equipment	lump	25,000	1	25,000
5	Advocacy and cpacity building	lump	30,000	0.5	15,000
6	Information Education, and Communication and Peer Education including condom distribution	lump	70,000	0.5	35,000
7	Secure access to STI/STD,HIV/AIDS and counseling including local health staff trainings	3) Cost estimates for Healtrh Service			27,849
8	Baseline survey and mid-term situation analysis	lump	20,000	0	0
9	Endline survey, and situation analysis at the end of the	lump	20,000	1	20,000
10	Monitoring and reporting including coordination of working group meetings and Program Management Coordinating Committee	month	12,000	1	12,000
					262,449
Cost for Management Consultant					
11	International Consultant (Manager)	MM	20,000	5	100,000
12	National Coordinator	MM	3,000	6	18,000
13	International and Local Travel	lump	15,000	1	15,000
14	Review of the Program design,and supervise Service Provider and consturction contractor	lump	2,000	1	2,000
15	Monitoring and evaluation(Reporting)	lump	5,000	1	5,000
	Subtotal (2)				140,000
	Grand total (sub 1 + sub 2)				402,449

(3) Cost estimates for Health Service - "8 Secure access to STI/STD/HIV/AIDS and counseling including local heath staff training".

		A	B	C	D	E	
No	**Interventions**	**Median unit cost($US)**	**Road & Bridge**	**Port**	**Years**	**Cost for Approach**	**Caliculation**
8-1	Outreach and needle/syringe exchange for IDU (Per IDU Reached)	24.49	750	300	3	3,857	A x (B+C) x 0.02(%) x D
8-2	Methadone treatment (Per IDU Reached)	1008	750	300	3	15,876	A x (B+C) x 0.005(P) x D
8-3	Couseling and Testing	14.66	400	200	3	26,388	A x (B+C) x D
8-4	ART	181	750	300	3	2,851	A x (B+C) x 0.005(P) x D
8-5	Reflesh training for Health staff	200	27	21	3	28,800	A x (B+C) x D
total						77,772	
Road & Bridge						49,923	
Port						27,849	

8-1	Assumption: (%) Percentage of IDU among the median number of site staff and labor is 5 % (2)
8-2	Assumption: (%) Percentage of IDU among the medican number of site staff and labor is 5 %(2), among them, one tenth receive the tretment
8-3	Asumption: During the Program period, 1800 person utlize VCT in total
8-4	Assumption: (%) Percentage of PLHIV among the median number of site staff and labor is 0.5 % (2)
8-5	Assumption: During the Program period, 48 health professional have reflesh trainings

The unit cost for the table above is based on the following documents.

(1) Supplementary web appendix to: Schwartländer B, Stover J, Hallett T, et al, on behalf of the Investment Framework Study Group. Towards an improved investment approach for an effective response to HIV/AIDS. Lancet 2011; published online June 3. DOI:10.1016/S0140-6736(11)60702-2

The variables such as HIV incident rate and prevalence used for the cost estimates are drawn from the following documents.

(2) Vietnam HIV/AIDS estimates and projections 2007–2012

13.8.8 Annex-8: Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral Therapy
BBC	Behavior Change Communication
CDC	Centers for Disease Control and Prevention
FSW	Female Sex Worker
HIV	Human Immunodeficiency Virus
IDU	Injecting Drug User
IEC	Information, Education, and Communication
ILO	International Labor Organization
JICA	Japan International Cooperation Agency
MOH	Ministry of Health
MOT	Ministry of Transport
MPMU2	Maritime Project Management Unit 2
MSM	Men who have Sex with Men
NGO	Nongovernmental Organization
PLHIA	People living with HIV
PMCC	Program Management Coordinating Committee
PMTCT	Prevention of Mother to Child Transmission
PMU2	Project Management Unit 2
STD	Sexually-Transmitted Diseases
STI	Sexually Transmitted Infection
TOR	Terms of Reference
VAAC	Vietnam Administration for AIDS Control
VCT	Voluntary Counseling and Testing
VINAMARINE	Vietnam National Maritime Bureau
WB	World Bank

CHAPTER 14 OPERATION AND MAINTENANCE PLAN

14.1 Outline of Constructed Road

14.1.1 Legislation Related to the Route

Details of the legislation related to the development of Tan Vu - Lach Huyen Highway are shown in Table 14.1.1-1. Initially, Tan Vu - Lach Huyen Highway was developed by a BOT scheme and financed by VIDIFI (Vietnam Infrastructure Development and Finance Investment Joint Stock Company) as the investor. The plan was changed in December 2009, and since then, MOT has taken over the project as a public work. A summary of each document relevant to its legislation is shown in Appendix-1.

Table 14.1.1-1 Law, Regulation, Decree and Circular for the Development of Tan Vu - Lach Huyen Highway

No.	Date	Documents			Title
Year 2007-2009: Construction project of Tan Vu Lach Huyen Highway was approved, and it is decided to execute it by BOT.					
1	2007 / Jan 19	Decision	Hai Phong City People's committee	113/QD -UBND	Approval of the Planning Construction Investment Report (Pre-FS) for Dinh Vu - Cat Hai Bridge
2	2007 / Apr 17	Announc ement	Government Office	75/TB -VPCP	Conclusion of Prime Minister Nguyen Tan Dung on Hanoi - Hai Phong Highway Project and Ho Chi Minh City - Long Thanh - Dau Giay Highway Project
3	2007 / July 26	Announc ement	Government Office	143/TB -VPCP	Conclusion of Vice Prime Minister Nguyen Sinh Hung on the implementation of some BOT projects in the transportation branch
4	2007 / Aug 28	Official Letter	Government Office	4801/VP CP-CN	Appointment of Consultant for the Construction Project of Bridge and Road to Cat Hai Island
5	2008 / Feb 29	Decision	MOT	501/QD -BGTVT	Approval of the Development Plan for Hai Phong International Port (Lach Huyen Port, Hai Phong in previous) Phase until 2020 and oriental until 2030
Year 2010-2011 Construction project of Tan Vu Lach Huyen Highway was changed to execution from BOT to Public Works.					
6	2010/ Apr 27	Official Letter	MOT	2678/BGT VT-KHDT	Assignment to the Employer of Hai Phong International Port Infrastructure Project
7	2010/ June 25	Official Letter	MOT	4265/BGT VT-KHDT	Intention to adjust Hai Phong International Port and Tan Vu - Lach Huyen Highway Infrastructure Investment Project
8	2010/ Aug 23	Report	MOTDRVN	74/TCDB VN-KHDT	Approval of Tan Vu - Lach Huyen Highway Project, Hai Phong City
9	2010/ Oct 22	Official Letter	MOTDRVN	2998/TCDB VN-KHDT	Explanation of the documents for Tan Vu - Lach Huyen Highway Construction Investment Project, Hai Phong City
10	2010/ Oct 28	Report	MOT	1382/KHDT	Appraisal result on the Investment Construction Project of Tan Vu - Lach Huyen Highway, Hai Phong City
11	2010/ Oct 29	Decision	MOT	3139/QD -BGTVT	Approval of the construction investment for Tan Vu - Lach Huyen Highway Project
12	2011/ Mar 2	Official Letter	Vietnam Development Bank	655/NHPT -CDKH	Implementation of Resolution 11/NQ-CP issued by the Government on Hanoi - Hai Phong Freeway Project
13	2011/ Apr 4	Notificati on	MOT	94/TB -BGTVT	Conclusions by the standing Vice Minister. Ngo Thinh Duc in the start-up meeting of the Consultant Team for Infrastructure Project for Hai Phong International Portal

Source: Study Team

14.1.2 Details of the Road Facilities

An outline of the constructed Tan Vu - Lach Huyen Highway is shown in Table 14.1.2-1. As Tan Vu - Lach Huyen Highway includes a special road and bridge structure that is 5.44km length over sea, the challenge is how to operate and maintain them.

Table 14.1.2-1 Outline of Tan Vu - Lach Huyen Highway

No	Items	Length	Details
1	Design Standard	—	Vietnam Highway Design Standard: Grade III, Flat Terrain, Design Speed 80km/hr
2	Total Length	15.63km	
	Bridge	5.44km	Main bridge (490m), East side approach bridge (519.2m), West side approach bridge (4,433.7m)
	West Side of Approach Road	4.5km	From Tan Vu IC (Intersection with Hanoi – Hai Phong Expressway) to the Abutment of West side approach bridge [Structures: Embankment, Bridge (Cam river), No1. Intersection (Dinh Vu Industrial Area)]
	East Side of Approach Road	5.69km	From the Abutment of East side approach bridge to the ending point[Structures: Embankment, Culver box (underpass, drainage)]
3	Right of Way	—	—
4	Width	—	Road Section: 29.5m / Bridge Section:16.0m
5	No. of Lane	—	Stage construction: 4 carriageways (future 6 carriageways)
6	Intersection/ Interchange	—	Stage construction: At-grade intersection (future Grade separation)
7	Other Works	—	Pavement work, Counter measure work for soft ground etc.

Source: Study Team

The assumed limits for the operation and maintenance for Tan Vu - Lach Huyen Highway are shown in Figure 14.1.2-1. There shall be no facilities transferred to another organization after the completion of the road and bridge.

Source: Study Team

Figure 14.1.2-1 Assumed Limits of the Operation and Maintenance for Tan Vu - Lach Huyen Highway

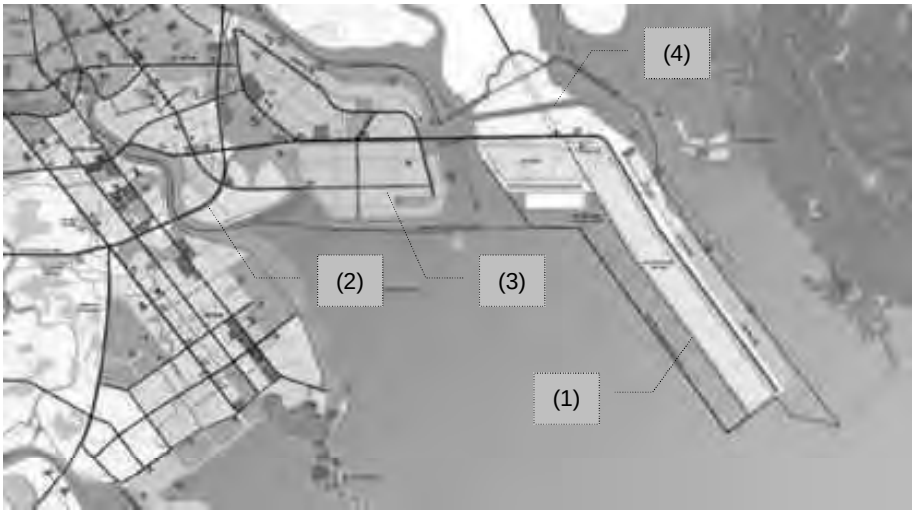
14.1.3 Ambient Circumstances of Route

The region surrounding Tan Vu - Lach Huyen Highway is described in Table 14.1.3-1 and Figure 14.1.3-1 respectively. Since Tan Vu - Lach Huyen Highway connects Lach Huyen Port to Hanoi - Hai Phong Expressway directly, it is necessary to maintain contact with the two facilities in operation and maintenance works.

Table 14.1.3-1 Ambient Surrounding Tan Vu - Lach Huyen Highway

No.	Project	Details
(1)	Lach Huyen Port	New international port and related facilities are constructed at Lach Huyen, Cat Hai District, Hai Phong City.
(2)	Hanoi – Hai Phong Expressway (Under construction)	105.5 km length of expressway between Hanoi City Third Ring Road and Hai An District of Hai Phong City
		Design speed: 120km/hr , No. of lanes: 6 lanes
		Total project cost: 24,000 bil VND
		BOT project by VIDIFI (Vietnam Infrastructure Development and Financial Investment, investment and development special company of the BIDV subsidiary).
		Land acquisition was completed in Hai Phong City area; the project will be completed in 2013.
(3)	Dinh Vu Industrial Area (Under construction)	Dinh Vu Industrial Zone: 944.49ha (by Dinh Vu Industrial Zone JSC) Nam Dinh Vu Industrial Zone: Zone-1: 1,354ha (by Nam Dinh Vu Investment JSC) None-tariff zone (southern part): 448ha Industrial zone (northern part): 906ha Zone-2: 658ha (by HAPACO)
(4)	Hai Phong City Ring Road	There is a City Ring Road Plan in Hai Phong City, but the section connected with Lach Huyen Port is a conceptual stage now.

Source: Study Team, information of Hanoi – Hai Phong Expressway is from http://news.searchina.ne.jp /disp.cgi?y = 2008 &d =0114&f



Source: Study Team

Figure 14.1.3-1 Plan for Tan Vu - Lach Huyen Highway

Sections and organizations that can adjust the plan for Tan Vu - Lach Huyen Highway are shown in Table 14.1.3-2.

Table 14.1.3-2 Related Organizations along Tan Vu - Lach Huyen Highway

Section	Road Facilities	Related Facilities	Related Organization	Remarks
Tan Vu	Tan Vu IC	Hanoi-Hai Phong Expressway	VIDIFI	—
Dinh Vu	No.1 intersection, at-grade	Dinh Vu Industrial Zone	Hai Phong People's Committee, HEZA (the Hai Phong Economic Zone Authority)	Based on Dinh Vu - Cat Hai Economic Zone Master Plan
Dinh Vu	No.2&3 intersection, inaccessible	Nam Dinh Vu Industrial Zone		
Hai An	Drainage Box Culverts	—	Hai An District People's Committee	—
Cat Hai	(Km11+520&Km15+576) Drainage Underpass Box Culverts, Frontage roads, Intersections with local approach road	—	Cat Hai District People's Committee	—
Cat Hai	(3 locations in Cat Hai Island) Relocation of dike roads	—	Department of Agriculture and Rural Development of Hai Phong City (DARD)	—

Source: Study Team

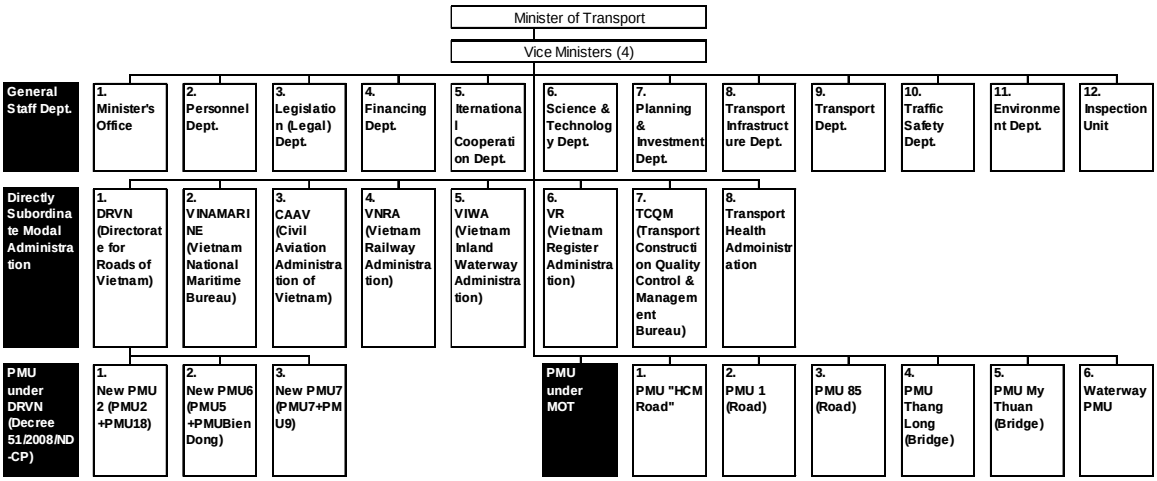
14.2 Existing State of the Road Operation and Maintenance

14.2.1 Outline of Responsible Organization for the Operation and Maintenance

14.2.1.1 Type of Maintenance Work and Responsible Organizations for the Work

(1) Road Administration Organizations

The DRVN (Directorate for Roads of Vietnam) is appointed by the MOT (Ministry of Transport) to take responsibility for the operational management of the national road network. VRA, (Vietnam Road Administration), the previous name of the DRVN, was established as a subsidiary of MOT pursuant to the Decree No 07/CP in 1993, which came into effect on January 30, 1993. Then, VRA was changed to DRVN, which is an organization with 11 departments pursuant to the Decision No.107/2009/QD-TTg since April 1, 2010. The organizational chart of MOT is shown in Figure 14.2.1-1. On the other hand, the authority of the actual maintenance work for half of the total national road's length is given to 4 RRMUs (Regional Road Management Units) and their subsidiary, RRMCs (Road Repair and Management Companies); and the remaining sections are given to 48 PDOTs (Provincial Department of Transports) and their subsidiary, PRRMCs (Provincial Road Repair and Management Companies).

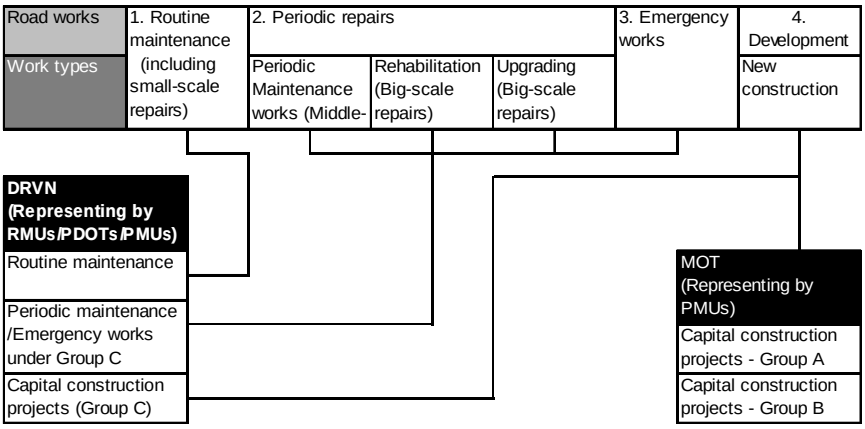


Source: Study Team (based on the MOT documents)

Figure 14.2.1-1 Organization Chart of MOT

(2) Type of Maintenance Work and Responsible Organizations for their Work

The type of maintenance work and the organization responsible for their work are shown in Figure 14.2.1-2. The MOT is responsible for the capital construction plan (new construction and rehabilitation), and the DRVN is responsible for the operational management plan in the same way. About half of the large-scale repair works in the national roads are executed by RRMUs, and the remaining work is executed by each PDOT. On the other hand, more than one half of the small/middle-scale repair work and the routine maintenance (daily maintenance work) in the national roads are executed by RRMUs, and the remaining work is executed by each PDOT. Specifically, MOT gives the authority of planning and executing the entire Group C projects to DRVN, and MOT still has the authority for executing all Group A and B projects.



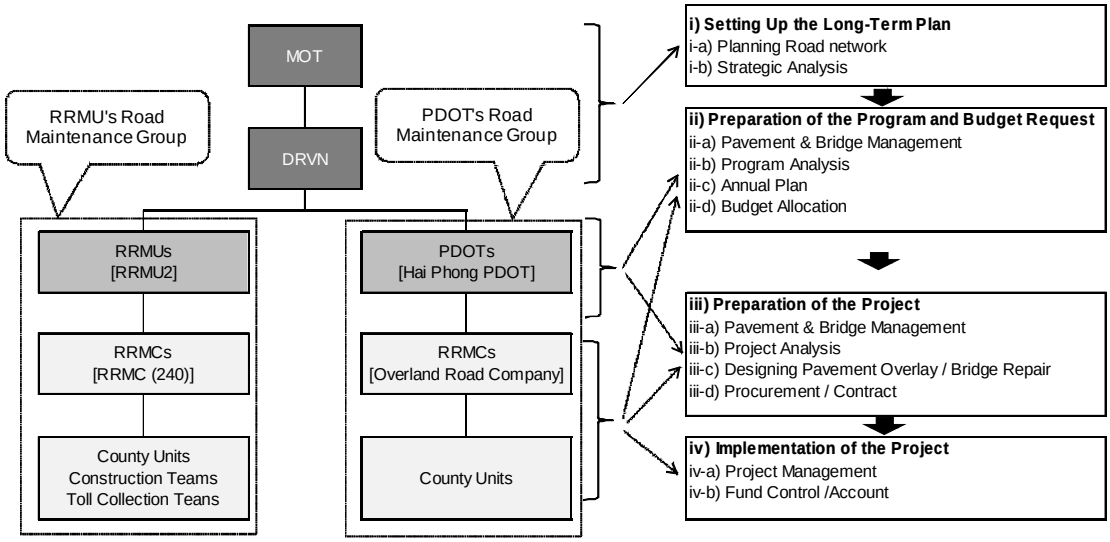
Note: Group A>1,500 bil VND, 75< Group B<1,500 bil VND, Group C<75 bil VND.

Source: Study team

Figure 14.2.1-2 Classifications of Road Maintenance Activities and Investment Projects

14.2.1.2 Flow of the Operation/Maintenance Work, Responsible Organizations at Each Stage

Road maintenance work progresses as follows: i) preparation of the mid/ long-term plan and relevant strategy, ii) survey of the project plan and the budget, iii) project preparation, and iv) project execution. Figure 14.2.1-3 shows the details of the activities and the responsible organization at each stage.



Note: [ ] shows the assumed road maintenance organization for Tan Vu - Lach Huyen Highway

Source: Study Team

Figure 14.2.1-3 Details of the Activities and the Responsible Organization at Each Stage on Road Maintenance

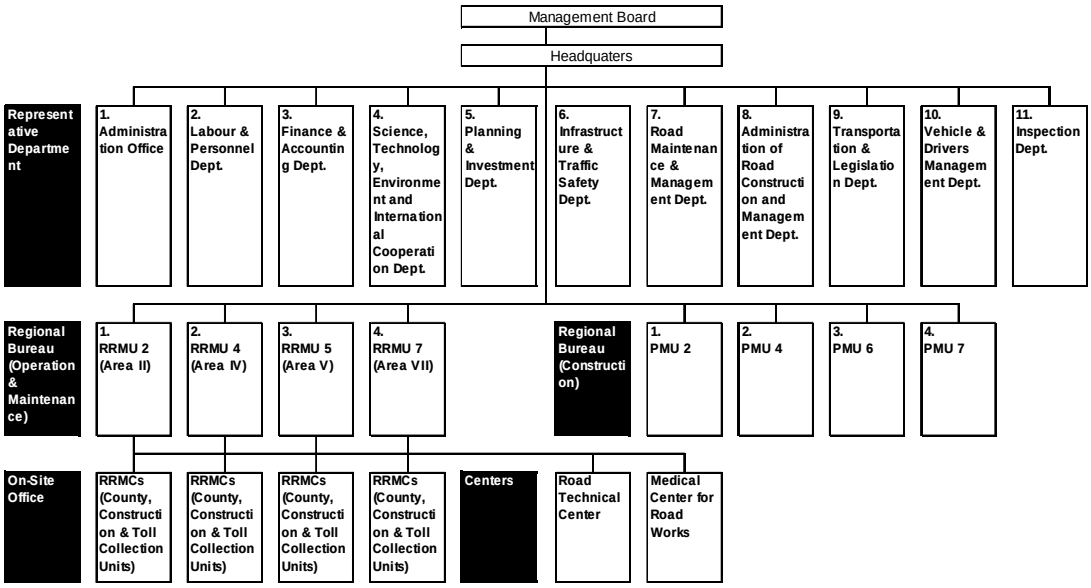
In the beginning stage, the Planning and Investment Dept. of DRVN is responsible for preparing the maintenance work to receive support from the Science, Technology, Environment and International Cooperation Dept. When in the implementation stages, the Infrastructure and Traffic Safety Dept. and Road Maintenance and Management Dept. are the responsible organizations. In the phase of actual maintenance works, execution organizations are divided into two groups, RRMU's Road Maintenance Group and PDOT's Road Maintenance Group. Local County Units carry out the actual routine maintenance works by the supervision of RRMC, and RRMU directly executes the medium and large-scale works (periodic maintenance) in the case of the RRMU Group. Similarly, the Local County Unit carries out the actual routine maintenance works under the supervision of the RRMC in the PDOT Group.

14.2.1.3 Outline of DRVN

The current state of the Infrastructure and Traffic Safety Department, and the Road Maintenance Management Department under DRVN, which has the jurisdiction over maintenance works and small-sized projects, and RRMU 2, RRMC (240) and its Unit which manages NH5 (National Highway No.5) between Hanoi and Haiphong, is shown as follows;

(1) Functions

The organizational chart of DRVN is shown in Figure 14.2.1-4, and roles of each department in DRVN are shown in Table 14.2.1-1



Source: Study Team (based on the MOT documents)

Figure 14.2.1-4 Organization Chart of DRVN

Table 14.2.1-1 Role and Duties of Representative Departments of DRVN

	Roles	Major Departments Roles and Responsibilities	No. of staff
1	Administration Office	Administrating all DRVN office operation	35
2	Labor and Personnel Dept.	Counseling about the personnel & labor force, including the organization setup and the organization's management for staff, training, and renovation.)	8
3	Finance and Accounting Dept.	Counseling about finance & accounting, including the establishment & guiding of mechanism, policies, control & management on the field of financial, asset & road accounting, management of the road contraction and O&M funding	14
4	Science, Technology, Environment and International Cooperation Dept.	Counseling about science, technology, environment and other international cooperation activities	13
5	Planning and Investment Dept.	Counseling about the investment & planning, including strategies, planning and preparation for the investment projects that DRVN is the investor, and sector statistics	14
6	Infrastructure and Traffic Safety Dept.	Counseling about the performance of the state management function on road infrastructure and traffic safety within DRVN's responsibilities	16
7	Road Maintenance and Management Dept.	Leading the counseling about periodical road repairing projects funded by non-productive budget	13
8	Administration of Road Construction and Management	Managing DRVN's basic construction (projects under DRVN) in the investment period.	51
9	Transportation and Legislation Dept.	Counseling about the management of the state-authorized agencies in terms of institutional management on Road	15
10	Vehicle and Drivers Management Dept.	Counseling about the management of the state-authorized agencies in terms of the management of vehicle & drivers which are operated on road in the country.	16
11	Inspection Dept.	Management of all activities of the road inspection & control, and the enforcement of the road laws and regulations to be applied. For individuals violating the road traffic, fines shall be paid.	311
Total number of staffs			506

Note: Most of the Staffs of Inspection Dept. are assigned in the office of RRMUs.

Source: Labor & Personnel Department, DRVN, Dec. 2010, Vietnam Transport Sector Study Task 5 Proposal for National Road Maintenance Program, JICA Feb. 2010 (P3-1)

(2) Work Details

The Infrastructure and Traffic Safety Dept. and Road Maintenance and Management Dept. in DRVN play an important role in the road operation and maintenance works along the national road network. The two departments' functions are mentioned below.

The function of the Infrastructure and Traffic Safety Dept. is to counsel the performance of the state management function on road infrastructure and traffic safety under DRVN's responsibilities in the Circular of DRVN, with details shown in Table 14.2.1-2.

Table 14.2.1-2 Function of Infrastructure and Road Safety Department

No	Job Description
1	Mentoring the Director General in : Drafting the legal document relating to the protection of infrastructure for road traffic. Preparation of regulations, standards, economic and technical norms for routine maintenance. Preparation of proposals or measures to ensure the road safety, provision of instructions, checking over the performance. Arranging the routine maintenance, emergent repair of roads.
2	Participating in the preparation of master plans, action plans, and proposals for development of infrastructure, road safety, planning in the annual management and maintenance of roads funded by the road economy budget.
3	Monitoring the system of (national roads) National Highways; making the proposals for changing the routes and alignment of roads in the country, making the proposals for selection of units to operate the maintenance of NHs; submission to MOT for announcement on the NHs, closing and opening of NHs; modification of beginning spot, ending spot, length, names, classification of roads for calculation of transport charges; announcement of load limits. Regulations on the weight, size limits; permits for super weight and supersize vehicles; caterpillar vehicles on roads, freighting of super length, super weight goods; monitoring and checking over the performance according to decentralized levels.
4	Negotiating, approving, instructing the usage of the right-of-way area and the connection of branch roads to NHs within its jurisdiction. At the same time the Department also extends its functions to oversee the performance of RRMUs and PDOTs.
5	Instructing, reviewing, checking over the road signal system for navigating the traffic on roads. Working on behalf of the DRVN to be present as on-line connection of provincial roads to NHs at ITS centers; regulating, traffic flow guidance in case of road incidents.
6	Presiding over the mentoring in planning, operation of weigh bridges; coordinating with the Transport & Legislation Department to mentor on the planning of service stations.
7	Collecting, collating data on infrastructure of roads, land for roads and right-of-way (except for bus stations, parking area); collecting the statistic data on traffic accidents, vehicle counts, weak bridges, perilous locations.
8	Appraising, approving the civic construction: county office, toll gate, weigh bridge, dossier on completion of urgent repair in response to typhoon and flood damages, ensuring the first traffic flow, emergent repair, perilous locations, rehabilitation of black spots, data collection projects.
9	Monitoring the handling-over of completed national highway which is put into use; working in consultation with the Finance Department to mentor on the management and dispatching of vehicles, equipment for infrastructure of roads. Presiding over the study on developing the mechanism for management of Build- Operation- Transfer (BOT) projects, as DRVN is the authorized state agency with full jurisdiction to perform the governance over the BOT roads.
10	Presiding over the mentoring on provincial traffic
11	Road/ traffic safety
12	Presiding over the mentoring for accreditation of bridges (coordination with Department of Science & Technology, Environment and International Cooperation)
13	Representing the DRVN to participate in the Standing Committee of Typhoon & Flood Prevention and Rescue; participating in traffic navigation in case of road or bridge incidents; supervising and settling formalities/procedures for delivery of stand-by materials and equipment in the incidents of flooding, typhoon and rescue.
14	Performing other duties incurred and assigned by DRVN.

Source: Decision of Specifications for functions, assignments and authorized power and the organizational structure of Department of Infrastructure and Traffic Safety by Directorate of Road of Vietnam 363/QD-TCDBVN Hà Nội, March 21st, 2011 (Pursuant to the Decision # 107/2009/QD-TTg dated August 26, 2009 issued by the Prime Minister specifying the functions, assignments and authorized power and the organizational structure of DRVN, affiliated to MOT)

One of the duties in Infrastructure and Traffic Safety Dept. is traffic control and management. The work demarcation between Infrastructure and Traffic Safety Dept. and Traffic Police is shown in Table 14.2.1-3.

Table 14.2.1-3 Roles in Road Traffic Safety Activities between DRVN and Traffic Police

No.	Type of Works	Activities by Traffic Police and Road Operator
1	Traffic Accident Rescue Works	Traffic police carry out the activities for the countermeasure of traffic accident at site. County unit staffs of RRMC support their activities.
2	Prepare the Documents of the Traffic Accidents	DRVN will only participate in the investigation when DRVN is invited by the Traffic Police. Because the investigation is totally under the jurisdiction of the Police by Law. Meanwhile, DRVN coordinate with the National Commission of Traffic Safety and the Traffic Police to observe the sites, to identify the problems relating to structure and so as to work out options for solving the problems.
3	Investigation and Analysis for Traffic Accident	When there is a cause in the infrastructure, the Dept. investigates jointly with the traffic police.
4	Examination of Countermeasures for the Traffic Accidents	There is a policy of solving the black spot within 90 days. (for instance, improvement of pavement) The Questions relating to black spots are solved according to regulations. Limited areas are improved by the economical reason.
5	Traffic Safety Educational Campaign	Provincial conferences on traffic safety and information dissemination are regularly held. Traffic Safety Educational Campaign: ready to participate in communication campaigns to raise the public awareness about traffic safety in the sector and the provinces.

Source: Study Team (Interview with Infrastructure and Traffic Safety Dept. of DRVN on 8th August 2011)

The function of the Road Maintenance and Management Dept. is to lead the counsel about the periodical road repairing projects that are funded by the non-productive budget in the Circular of DRVN with details shown in Table 14.2.1-4.

Table 14.2.1-4 Function of Maintenance and Management Department

No	Job Description
1	Develop standards, regulations and norms of road repair, the normative technical and policy mechanisms for periodic road repair.
2	Participate in formulating strategies, planning, development plans and long-term national program on development of transport as assigned.
3	Direct development and preparation of standards, procedures, rules, unit price (rates) and norms (limits) on the work of constant repair, unscheduled (emergent) repairs.
4	Join in the annual planning of repair and maintenance using the budget earmarked for road repair and maintenance;
5	Update, review and report to the Director General and other authorities on data projects, road repair recurring annually
6	Participate in making decision on preparation of investment projects of road repair
7	Presiding over submission to the Director General of the project approval for periodical repair and unexpected road repair (step 2); evaluation process for the Director General to approve the technical and economic report on projects of road repair, maintenance .
8	Evaluation for submission to the Director General for approval of project bidding plan in periodical repair and emergent repair (to ensure traffic step 2, except for projects of civic construction).
9	To advise the performance of the authorities responsible for making the investment decision: To examine and supervise and monitor the implementation; process the arising problems during the implementation process; Handling the arisen issues during the implementation of periodical road repair project and emergent repair of roads using the economic development budget.
10	Participate together with the Department of Infrastructure and Traffic Safety in appraising the safety of the works during the handover and operation.
11	Organize the filing of data, the modes of norms to apply for approval operation to ensure the access to the reports on periodical and emergent investment upon the request of DRVN and the Ministry of Transportation.
12	Perform other duties assigned by the leaders of the DRVN.

Source: Decision of Specifications for functions, assignments and authorized power and the organizational structure of Department of Road Maintenance and Management by Directorate of Road of Vietnam 362/QD-TCDBVN Hà Nội, March 21st, 2011 (Pursuant to the Decision # 107/2009/QD-TTg dated August 26, 2009 issued by the Prime Minister specifying the functions, assignments and authorized power and the organizational structure of DRVN, affiliated to MOT)

(3) Expenditure for Road Operation and Maintenance in DRVN

Expenditure for the road maintenance managed by the Infrastructure and Traffic Safety Dept. and the Road Maintenance and Management Dept. is shown in Table 14.2.1-5.

Table 14.2.1-5 Expenditure of Road Operation and Maintenance in DRVN (2006 - 2010)

Kind of Maintenance Works		Year (mil VND)					
		2,006	2,007	2,008	2,009	2,010	2,011
Operation Length (km)		n/a	17,002	16,839	16,763	17,470	16,700
Reconstruction	plan	n/a	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a	n/a
Routine Maintenance	plan	n/a	n/a	n/a	n/a	n/a	n/a
	actual	433,000	469,797	524,307	551,959	655,072	749,035
	/km	n/a	28	31	33	37	45
Periodic Maintenance	plan	n/a	n/a	n/a	n/a	n/a	n/a
	actual	1,271,300	1,405,015	1,381,740	1,438,378	1,847,334	1,836,144
	/km	n/a	83	82	86	106	110
Rehabilitation	plan	n/a	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a	n/a
Repair after Disasters	plan	n/a	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a	n/a
Total	plan	n/a	n/a	n/a	n/a	n/a	n/a
	actual	1,704,300	1,874,812	1,906,047	1,990,337	2,502,406	2,585,179
	/km	n/a	110	113	119	143	155

Source: Stud Team (based on the DRVN documents)

14.2.1.4 Outline of RRMU2's Road Maintenance Group

(1) Outline of RRMU 2

1) Outline of RRMUs in Vietnam

There are 4 RRMUs under DRVN in charge of operating and managing around 8,000km of half of the national road in the country. An outline of these 4 RRMUs is shown in Table 14.2.1-6.

Table 14.2.1-6 RRMUs under DRVN

RRMU	Location	Jurisdiction Regions	No. of Province /City	National Highway (km)		No. of PDOT	No. of Staff (persons)			Total Budget Allocation (mil VND)	
				Operated by RRMUs	Total		Engineer	Others	Total	FY 2008	FY 2009
RRMU2	Hanoi	Northern	24	2,342	4,018.1	24	35	32	67	321,424	317,270
RRMU4	Vinh	NorthCentral	6	2,540	4,146.8	6	27	31	58	66,659	77,242
RRMU5	Da Nang	SouthCentral	10	1,822	2,626.2	10	31	23	54	244,321	287,688
RRMU7	HCMC	Southern	—	2,658	4,233.3	-	65	15	80	222,720	241,141
Total			40	9,362	15,024	40	159	101	259	855,124	923,341

Note: The capacity of RRMU is approved by Ministry of Home Affairs, and MOT has the authority concerning the actual number of staff. Capacity is more than the actual above-mentioned number of staff.

Source: Vietnam Transport Sector Study Task 5 Proposal for National Road Maintenance Program, JICA Feb. 2010 (P3-4)

2) Organizational Profile of RRMU2

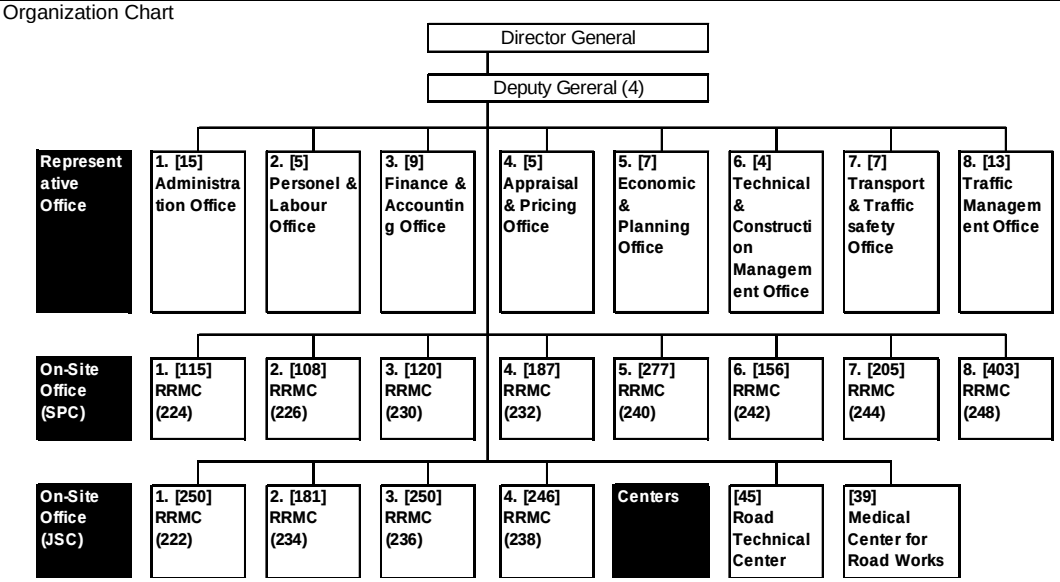
The organizational profile of RRMU2, which operates and manages the national roads in Northern Provinces where Tan Vu - Lach Huyen Highway is located, is shown in Table 14.2.1-7

Table 14.2.1-7 Organizational Profile of RRMU2

	Items		Details
1	History of the Organization		n/a
2	Operation Area	Office Location	4, Thanh Cong Street, Ba Dinh District, Hanoi
		Area	Northwestern: Vietnam Delta (24 provinces)
		Length	2,342km (Year 2011)
3	Organization Structure	Organization	8 Offices as follows; Administration, Personnel & Labour, Finance & Accounting, Appraisal & Pricing, Economic & Planning, Technical & Construction Management, Transport & Traffic Safety, and Traffic Management.
		No. of Staff	65 persons + Director General, Four Deputy Generals)
			69 persons (including 34 technical staff, and 35 administration staff)
			[Note] Capacity is 80 persons, but actual number is 69 persons.
	Subsidiary Organizations	Maintenance Companies	8 State-owned companies (SPC: Sole Proprietor Companies)
			4 Private companies (JSC: Joint Stock Companies)
			[Note-1] Number of JSC increase by the government policy, [Note-2] Government capital portion of each JSC is as follows; RRMC (238):61%, RRMC (234):31%, RRMC (222):56%, RRMC (236):32% .
		Other Institutions	Road Technical Center：advice, design , supervision for road maintenance
			Medical Center for Road Works
4	Outline of Activities		Manage and control the RRMCs under RRMU2 Manage the maintenance packages through the contract.
	Maintenance Works	Maintenance Plan	Basically, the Annual Maintenance Plan is the same as the Budget Plan, in which the managing units shall report all work that is needed repairing, and the estimated repair cost. The Annual Maintenance Plan includes routine and periodic maintenance. There is no Mid/Long-term maintenance plan.
		Road Patrolling and Inspection	Each Office's Tasks Traffic Management Office: routine maintenance, maintenance after disasters, license for overloaded vehicles, collects information and report to DRVN. Technical & Construction Management Office: periodic maintenance, apply new technology. Transport & Traffic Safety Office: equipment and vehicle management, black spot survey and treatment. In case of emergencies that cannot be solved by the County Unit, report to the Company immediately. In reality, RRMU2 is the actual unit that does the appointment since MOT and DRVN are upper-authorized agencies.
		Routine Maintenance Works	
		Periodic Maintenance Works	
		Emergency Works	
	Traffic Control Works	Road Patrolling	
		Traffic Accident Management Works	
	Toll Collection Work		
	Tender System		Routine maintenance is carried out by direct work. Medium and large-sized maintenance is carried out by bidding based on the nature, size and competence of the work. Project cost >5 bil VND: Bidding / Project cost< 5 bil VND: Appointed PBC (Performance-Based Road Management and Maintenance Contract) is adapted to the maintenance works in RRMC (234) and RRMC (236).

5

Organization Chart



Note: [ ] show the number of staffs in each representative office and each company

Source: Study team (based on the Interview with RRMU2 on 2nd June and 1st August in 2011)

3) Expenditure for Road Operation and Maintenance in RRMU2

Expenditures concerning the road maintenance in RRMU2 are shown in Table 14.2.1-8. Expenditures below are the planned figures that have already been approved by DRVN. Therefore, they can be thought of as the actual allocated expenses.

Table 14.2.1-8 Expenditure of Road Operation and Maintenance in RRMU2 (2006 - 2010)

Kind of Maintenance Works		Year (mil. VND)				
		2,006	2,007	2,008	2,009	2,010
Operation Length (km)		2,342	2,342	2,342	2,342	2,342
Reconstruction	plan	n/a	n/a	n/a	n/a	n/a
	actual	14,756	26,616	16,000	27,000	0
Routine Maintenance	plan	n/a	n/a	n/a	n/a	n/a
	actual	74,964	74,805	82,123	80,480	87,600
	/km	32	32	35	34	37
Periodic Maintenance	plan	n/a	n/a	n/a	n/a	n/a
	actual	79,023	53,113	104,890	97,151	142,203
	/km	34	23	45	41	61
Rehabilitation	plan	n/a	n/a	n/a	n/a	n/a
	actual	35,402	17,005	49,800	65,756	39,758
Repair after Disasters	plan	n/a	n/a	n/a	n/a	n/a
	actual	11,254	33,937	49,856	17,656	18,680
Total	plan	n/a	n/a	n/a	n/a	n/a
	actual	215,399	205,476	302,669	288,043	288,241
	/km	92	88	129	123	123

Note: Routine Maintenance cost are including the routine maintenance such as labor and machinery cost in RRMU2 and RRMCs under RRMU2, Total operation cost in RRMU2 in Year 2010 is 6,012,000 mil VND, Unit cost (/km) of each maintenance work is mentioned in NORM

Source: Study Team (based on the RRMU2 documents)

4) Outline of RRMCs under RRMU2

There are 12 RRMCs under RRMU2, including 8 state-owned companies (Sole Proprietor Company: SPC) and 4 private companies (Joint Stock Companies: JSC). The outline of these RRMCs is shown in Table 14.2.1-9.

In Table 14.2.1-9, the calculation results of the No. (Number) of Staff (persons)/Operation Length (km) and Operation Cost/Operation Length (km) is roughly shown by the efficiency of the maintenance work between different RRMCs under RRMU2. However, it is necessary to assess this result in consideration of the following matter: First, the condition of the road should be considered. For example, since Cau Binh Toll Pass is placed in new, big and modern constructed roads with a higher demand of use, more staff and machinery shall be needed as a result. On the contrary, for roads that are in mountainous areas, less staff and operation costs shall be required. In addition, after being privatized, there is a reduction in labor in JSC that requires a more efficient labor force. Finally, for companies applying PBMC (Performance - Based Maintenance Contracting) method such as RRMC (234) and RRMC (236), the Staff/ Operation Length method is not applied.

Table 14.2.1-9 RRMCs under RRMU2

No.	RRMC	Operation Length (km) (NH: National Highway)		No. of Staff (persons)		Operation Cost/year (VND)	Operation Cost (VND/km)
		Operation Sections	Total	Total	/km		
State-owned companies (Sole Proprietor Company: SPC)							
1	240	Toll Pass: Cầu Bình NH5: Km11+135-Km92+460 NH37: Km61-Km95+180	116	277	2.39	4,064,219,784	35,036,377
2	248	Toll Pass: Phả Lại NH18: Km0-Km46+300 Nội Bài – Bắc Ninh: Km1+593 -Km31+109 Thanh Trì bridge and approach bridges at two ends NH38: Km0-Km84+500	173	403	2.33	5,291,377,773	30,515,948
3	226	NH6:Km335-Km406 NH6 short cut through mountain pass Phadin: 13,55 Km NH 279: Km0-Km116+000	201	108	0.54	3,250,418,772	16,717,237
4	242	NH70: Km25A-Km198+050 NH4E:Km0-Km44+200	218	156	0.72	2,295,854,521	10,531,442
5	232	NH2: Km109 -Km312+500. NH70: Km0-Km25A	230	187	0.81	3,871,632,539	16,833,184
6	224	NH6: Km153 -km 335 NH6 short cut through mountain pass Son La: 4,25km NH43: Km 26-Km 79+715	223	115	0.51	2,953,018,300	13,242,234
7	244	NH3: Km113+700-Km344+436 NH3B: Km0-Km129	355	205	0.58	3,548,266,186	9,995,116
8	230	no road maintenance		120		n/a	n/a
Private companies (Joint Stock Companies: JSC)							
9	238	Toll Pass: Sóc Sơn NH2: Km 36+300-Km109 NH3: Km30+300-Km113	156	246	1.58	n/a	n/a
10	234	NH10: Km0-Km173+250	173	181	1.05	n/a	n/a
11	222	Toll Pass Chương Mỹ NH6: Km38+000-Km157+000 NH15: Km 0+000-Km20+000 Road HCM: Km409+000-Km503+000	233	250	1.07	n/a	n/a
12	236	Toll Pass: Lường Mẹt NH1mới(HN-LạngSơn):Km0+00-Km160+770 PVân – Cầu Giẽ: Km181+570-Km213+608 NH1A cũ: Km 213+608-Km285+400	264	250	0.95	n/a	n/a

Note: Based on the NORM: 6～7 persons/ 10km staff are assigned.

Source: Study Team (based on the RRMU2 documents)

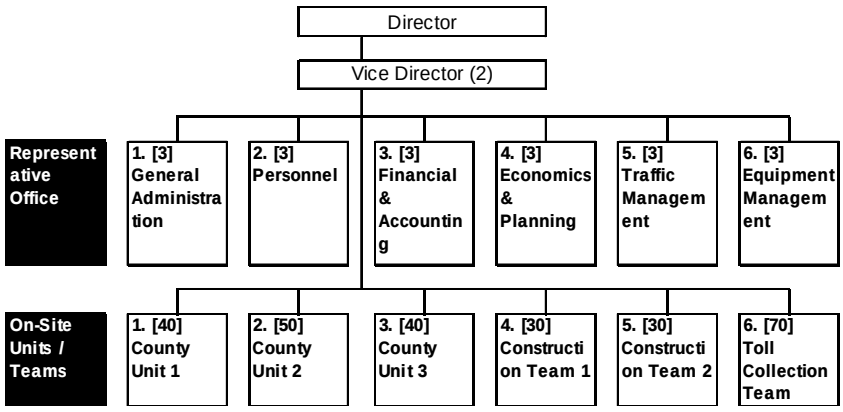
(2) Outline of RRMC (240)

1) Organizational Profile of RRMC (240)

The organizational profile of RRMC (240), an affiliated company under RRMU2, which operates and manages national roads in Hung Yen and Hai Phong District where Tan Vu - Lach Huyen Highway is located, is shown in Table 14.2.1-10.

Table 14.2.1-10 Organizational profile of RRMC (240)

No.	Items		Details
1	History of the Organization		The company was established in July 1992 (Good history since 1987 as the first road management company in Vietnam. From 1992, the original company was separated into RRMC 230, RRMC 232 and RRMC 240.) [Note] Currently, RRMC 240 is a state-owned company, but in the future, there is a plan to transform to a JSC. Documentations are in progress so that in the next 6 to 12 months, the transformation shall be completed.
2	Operation Area	Office Location	Nhu Quynh, Van Lam, Hung Yen. (NH5 +Km 12+250) (This is the Head Office, and responsible for the maintenance work of NH 5.) Besides, there is an office building at Km10+300 with 7 other county units' offices.
		Area	n/a
		Length	115km (National Road No.5: 81km, National Road No.37: 34 km), including the bridge maintenance (Lan Vu Bridge(250m) / Phu Luong(980m) / Quan Toan(300m) / Dong Lien(500m))
3	Organization Structure	Organization	6 Offices as follows; General Administration, Personnel , Economic & Planning, Finance & Accounting, Traffic Management, Equipment Management
		No. of Staff	290 persons (Office 20 persons/ Site 270 persons) Technical staff: 144 (74 engineers, 70 College graduates and Technicians), Patrolling staff: NH 5: 6 persons, NH 37: 2 persons Technical Workers: 146 (80 Workers + 66 Fee collectors)
			Total number of staff in the office is 18 persons, and 3 persons for director and vice directors
	Subsidiary Organizations	Maintenance Units	3 County Units, 2 Construction Team and 1 Toll Collection Team. The construction materials and equipments are procured by each unit.
	Equipments and Materials	Equipments	2 excavators, 1 roller, 1 lane marking machine and 1 track with crane. Other machines are borrowed from the rental company if necessary
		Materials	Although the company does not acquire any asphalt batching plants, the company shall rent them from other companies, if needed.
4	Activities		Managing units and teams
	Maintenance Works	Maintenance Plan	In every December, the company submits the annual maintenance plan (Budget plan) to RRMU 2.
		Road Patrolling and Inspection	See the below Traffic Control Works, Road Patrolling
		Routine Maintenance Works	Details of works are mentioned in NORM 3479 (MOT & Legal Document) All works by direct operation Each unit is assigned 30～40 persons, and manages 40～50 km section of National Highways.
		Periodic Maintenance Works	Details of works are mentioned in NORM 3479 Company's each unit carries out the minor and medium-sized manual repair works. Major works are assigned by DRVN and Joint Venture with other companies. The company can carry out major works (renewing the road such as overlay of pavement) with the equipment furnished in Construction Team 2. In case the company cannot implement major works, the company can hire another company to serve economic efficiency.
		Emergency Works	Each company has the construction units, and it has had a large-scale disaster and the accident to the repair after the incident.

<table>
<tr><td rowspan="4">4</td><td rowspan="3">Traffic Control Works</td><td>Road Patrolling</td><td>Patrolling by County Units
In case of emergencies that cannot be solved by the County Unit, report to the Company immediately.</td></tr>
<tr><td>Traffic Management Works</td><td>Traffic Inspection, Weigh bridge operation (Traffic management includes road work, embankment, pavement, safety signals and management of restaurants along the road.)
There is no more weigh bridge in operation currently as instructed by DRVN,
There used to be 2 operative weigh bridges at Km58 and Km87, but now, all of the equipment were already removed for maintenance when the stations are still there.
Traffic lights (red-green) are managed by the police,</td></tr>
<tr><td>Traffic Accident Management Works</td><td>If there are any traffic accidents, report to the police immediately, and support the police to clear the road and ask the people who damage the road to sign the report and to agree to pay for the road repairing fees.
In case there are injured people in traffic accidents, the vehicle owners or police shall call the rescue team.
The police shall call the ambulance for the injured.
There are private-owned ambulances to provide first-aids and help the police to tow the vehicles impeding the traffic.
RRMC 240 does not sign any contract with those private ambulances.</td></tr>
<tr><td colspan="2">Toll Collection Work</td><td>70 persons(3 shifts/day)
Toll collection for NH 37(There is a toll gate in No.5, but another company carries out the toll collection work.)
Check on a daily basis by the Accounting Division and upper authorized organization (RRMU2/DRVN) , and the collected money is sent to the government treasury every day.
Paper tickets under the management and surveillance cameras to control the license number and type of vehicles passing by.</td></tr>
<tr><td></td><td colspan="2">Tender System</td><td>Maintenance costs > 10 billion VND: Bidding
Maintenance costs < 10 billion VND: Appointment</td></tr>
<tr><td>5</td><td colspan="3">Organization Chart
 

Note: [ ] show the number of staffs in each representative office and each unit and team</td></tr>
</table>

Source: Study Team (based on the Interview with RRMC (240) on 3rd June, 26th July and 4th August in 2011)

2) Expenditure for Road Operation and Maintenance in RRMC (240)

Expenditures for road maintenance in RRMC (240) are shown in Table 14.2.1-11.

Table 14.2.1-11 Expenditures for Road Development and Maintenance in RRMC (240)

Kind of Maintenance Works		Year (mil. VND)				
		2,006	2,007	2,008	2,009	2,010
Operation Length (km)		115	115	115	115	115
Reconstruction	plan	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a
Routine Maintenance	plan	9,700	9,444	8,771	6,236	7,939
	actual	9,700	9,770	8,773	6,236	7,939
	/km	84	85	76	54	69
Periodic Maintenance	plan	1,723	6,670	3,251	2,800	21,144
	actual	1,723	3,146	3,251	2,826	21,076
	/km	15	27	28	25	183
Rehabilitation	plan	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a
Repair after Disasters	plan	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a
Total	plan	11,423	16,114	12,022	9,036	29,083
	actual	11,423	12,916	12,024	9,062	29,015
	/km	99	112	105	79	252

Note: Composition of above-mentioned budget and expenditure for road maintenance are as follows; Routine Maintenance (23.3%: Indirect (gasoline, heat water expenses, equipment expense, amenity, and office expenditure), 46.7%: Direct (salary for workers), 30%: Material (material cost, machine rental expense)

Source: Study Team (based on the RRMU2 documents)

(3) Outline of County Unit

1) Organizational Profile of County Unit

Table 14.2.1-12 shows the outline of County Unit 3 in the subsidiary of RRMC (236) that is a typical county unit of the maintenance companies.

Table 14.2.1-12 Organizational Profile of County Unit

	Items		Details
1	History of the Organization		n/a
2	Operation Area	Office Location	Main site office (NH 1+95km) and sub site office (NH 1+117km) Building of main site office is 2stories (3rooms) and dormitory for 20 workers
		Area	NH 1 (95km - +132km)
		Length	37km
3	Organization Structure	Organization	Administration staff , workers
		No. of Staff	Total 23 persons (Administration: 3 persons, worker: 20 persons） (2 for Patrolling:, 12 for +95km office:, 6 for +117km sub office)
	Subsidiary Organizations	Maintenance Units	n/a
	Equipments and Materials	Equipments	Equipment are rent according to the type of work such as truck etc.
		Materials	Bituminous material, aggregate for repairing the pavement are stored in the main site office.

4	Activities		Actual routine maintenance works, patrolling
	Maintenance Works	Maintenance Plan	n/a
		Road Patrolling and Inspection	See the below Traffic Control Works, Road Patrolling
		Routine Maintenance Works	Repairing the potholes, cleaning road, grass cutting, culvert cleaning, keeping drainage system (installation of ditches, and clearing the ditches), signboard cleaning, bridge shoe cleaning, corridor management etc.
		Periodic Maintenance Works	Clean road (every month), damaged road repair, slope repair, signboard repair In case of RRMC 236 is appointed the pavement overlay works, company own team carry out the works with other contractors
		Emergency Works	
	Traffic Control Works	Road Patrolling	2 times at morning and afternoon (Office manager also survey all section once a week.), riding motorbikes, and : visual check, pavement, ditch, bridge, culvert etc. If problems/ damages are observed, the worker shall get off the motorbike and walk for detail checking. By the end of the day, prepare the inspection report and submit to the County Unit Management Board, and report to the Company in the next day's morning Bridge report one/month every quarter report
		Traffic Management Works	n/a
		Traffic Accident Management Works	Basically, traffic police carry out the traffic accidents' countermeasures. Therefore, the traffic police call the ambulance to carry those who injure to the hospital and the towing car for carrying out the accident vehicle. The worker of the unit only exclude the works to secure traffic of the road cooperating with the traffic police ; such as removing the obstacle on the road etc.. At night time 1 manager and 3 workers are stayed at the office for urgent correspondence.
	Toll Collection Work		n/a
	Tender System		n/a
5	Organization Chart no chart		

Source: Study Team (based on the Interview with County Unit 3 of RRMC (236) on 5th August in 2011)

2) Expenditures for Road Operations and Maintenance in the County Unit

Since RRMC (236) pays workers' salaries directly, the cost of the County Unit is composed of a direct expense of material purchase and equipment rental for the road routine maintenance works. About 100mil VND is used every month in this County Unit.

14.2.1.5 Outline of Hai Phong PDOT's Road Maintenance Group

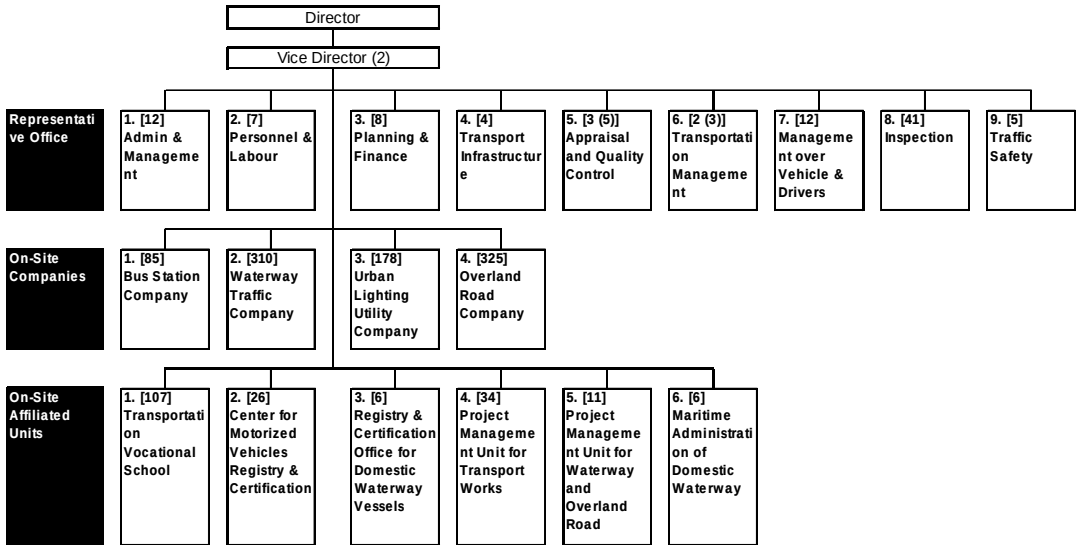
(1) Outline of Hai Phong PDOT

1) Organizational Profile of Hai Phong PDOT

The organizational profile of the Hai Phong PDOT, which operates and manages the national roads, provincial roads and urban roads in Hai Phong City where Tan Vu - Lach Huyen Highway is located, is shown in Table 14.2.1-13.

Table 14.2.1-13 Organizational Profile of Hai Phong PDOT

	Items		Details
1	History of the Organization		n/a
2	Operation Area	Office Location	Cù Chính Lan, Hồng Bàng, Hải Phòng
		Area	Hải Phòng city
		Length	40.88 Km (Seconded NH , including 1,098.8m bridges) 244 Km (Provincial road, including 2,251 m bridges) 150.5km (Urban road, 5 inter-provincial bus stations) Total: 435.38km
3	Organization Structure	Organization	9 offices as follows; i) Admin. & Management, ii) Personnel – Labor, iii) Planning & Finance, iv) Transport Infrastructure, v) Appraisal & Quality Control, vi) Transportation Management, vii) Management over Vehicles & Drivers, viii) Inspection, ix) Traffic Safety
		No. of Staff	97 persons (32 admin. Staff, 24 technical staff, 41 traffic inspectors)
	Subsidiary Organizations	Companies	4 state owned companies i) Overland Road Company, ii) Bus Station Company, iii) Waterway Traffic Company, iv) Urban Lighting Utility Company
		Units	6 affiliated units i) Transportation Vocational School, ii) Hải Phòng Center for Motorized Vehicles Registry & Certification, iii) Registry &Certification Office for Domestic, Waterway Vessel, iv) Hải Phòng, Project Management Unit for Transport Works, v) Hải Phòng Project Management Unit for Waterway and Overland, vi) Road Port Administration of domestic waterway
	Equipments and Materials	Equipments	n/a
		Materials	n/a
4	Activities		The main function of the Department is to advise and assist the municipal People's Committees in performing the function of state management of transportation, including roads, inland waterways, transport, safety of traffic on local city ; of public services in the field of management of the department and perform some tasks and powers under the authority of the city People's Committee and in accordance with the law
	Maintenance Works	Maintenance Plan	Basically, the Annual Maintenance Plan is the same as the Budget Plan, in which the managing units shall report all work that was needed repairing, and the estimated repair cost to PDOT. The Annual Maintenance Plan includes routine and periodic maintenance. Original plan is prepared by each company PDOT plan and allocate the budget, and carry out the verification and appraisal for company's works every month, and pay every three month. Company carry out the works by the allocated budget Company can supplements the budget shortfall by receiving an order of construction project etc. PDOT There are some Group A projects prepared by MOT (People's committee) Investment Plans for new construction: are prepared for 10 years, 5 years and priority Project (There is no Mid/Long-term maintenance plan)

<table>
<tr><td rowspan="5">4</td><td rowspan="4">Maintenance Works</td><td>Road Patrolling and Inspection</td><td rowspan="4">Each Office's Tasks
<u>Planning & Finance</u>
Make plans for monitoring and regular payment for routine maintenance and repair of medium and large repair and construction of new projects. Submit regular and irregular Reports to Ministry of Transport, General DRVN and Haiphong People's Committee
<u>Transport Infrastructure :</u>
Check, monitor the status of transportation, infrastructure, evaluation of records of routine maintenance, design, periodic maintenance, construction and vehicle licensing, oversized vehicles, heavy load vehicles
<u>Traffic Safety:</u>
organizational communication, the proposed classification, navigation control, handling of traffic congestion, accidents
Management and supervision of maintenance: with the following forms of application:
- assignments of plan implementation and appointment (local funds).
- Appointment of Contractor (central fund).
Supervision are done by consultants (big projects) or PDOT(small projects)</td></tr>
<tr><td>Routine Maintenance Works</td></tr>
<tr><td>Periodic Maintenance Works</td></tr>
<tr><td>Emergency Works</td></tr>
<tr><td rowspan="3">Traffic Control Works</td><td>Road Patrolling</td><td rowspan="3">RRMC's tasks</td></tr>
<tr><td>Traffic Management Works</td></tr>
<tr><td>Traffic Accident Management Works</td></tr>
<tr><td></td><td colspan="2">Toll Collection Work</td><td>RRMC's tasks</td></tr>
<tr><td></td><td colspan="2">Tender System</td><td>Medium and large-sized maintenance is carried out by bidding based on the nature, size and competence of the work.
(if the value is higher than VND 5 billion)</td></tr>
<tr><td>5</td><td colspan="3">Organization Chart
 

Note: [ ] shows the number of staffs in each representative office and each unit and team, () shows the budgeted number</td></tr>
</table>

Source: Study Team (based on the Interview with Hai Phong PDOT on 4th August and 18th August in 2011)

2) Expenditure for Operation and Maintenance

Expenditure for the road maintenance in the Hai Phong PDOT is shown in Table 14.2.1-14.

Table 14.2.1-14 Expenditures for Road Operations and Maintenance in Hai Phong PDOT (2006 - 2010)

Kind of Maintenance Works		Year (mil. VND)				
		2,006	2,007	2,008	2,009	2,010
Operation Length (km)		401	412	358	358	435
Reconstruction	plan	n/a	n/a	n/a	n/a	n/a
	actual	27,300	44,500	27,800	32,600	50,500
Routine Maintenance	plan	8,700	9,100	8,700	8,500	9,300
	actual	9,100	9,700	8,900	8,800	10,400
	/km	23	24	25	25	24
Periodic Maintenance	plan	7,500	8,200	7,800	8,200	9,500
	actual	7,900	8,600	8,500	8,600	10,600
	/km	20	21	24	24	24
Rehabilitation	plan	14,000	18,000	19,000	17,000	24,000
	actual	15.5	18.2	19.1	17.3	24.6
Repair after Disasters	plan	n/a	n/a	n/a	n/a	n/a
	actual	3,540	2,720	1,780	2,320	1,750
Total	plan	n/a	n/a	n/a	n/a	n/a
	actual	17,000	18,300	17,400	17,400	21,000
	/km	42	44	49	49	48

Source: Study Team (based on the Hai Phong PDOT documents)

(2) Outline of RRMC (Overland Road Company)

1) Organizational Profile

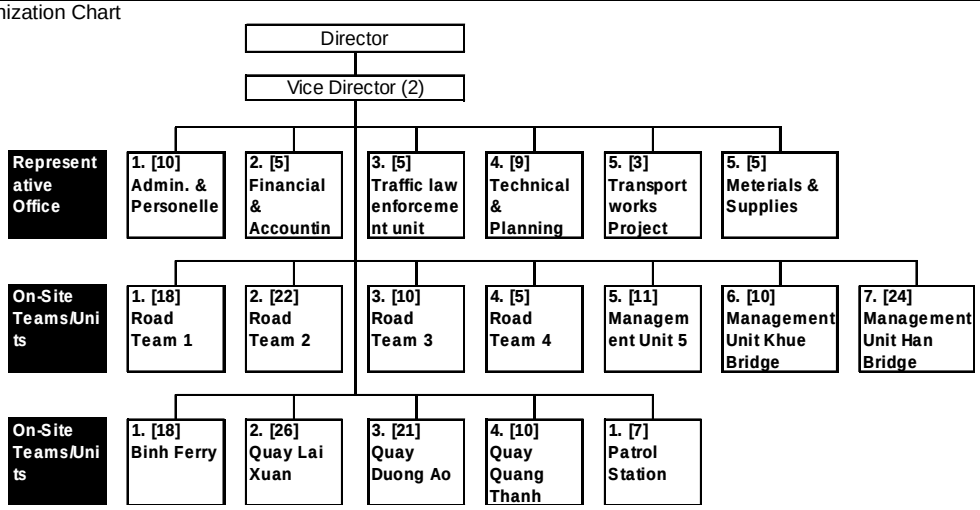
The outline of RRMC (Overland Road Company), an affiliated company under Hai Phong PDOT, is shown in Table 14.2.1-15.

Table 14.2.1-15 Organizational Profile of RRMC (Overland Road Company)

	Items		Details
1	History of the Organization		The company has specialized in road operation and maintenance with a tradition of nearly 50 years It was established as Road Management Section in 1963, responsible for operation and maintenance of roads, bridges and ferries in Hai Phong In 1982, it was changed into the Road Company of Haiphong from July 1st 2010 reformed into Haiphong Road Co., one of limited Companies
2	Operation Area	Office Location	Head Office: 77 Nguyen Duc Canh, Le Chan, Hải Phòng。: Usable 501m^2 Total 1,800m^2 Working space building 4 floors. Site Office: Usable 9,241m2, Total 48,871m2.
		Area	Hai Phong City
		Length	256 km 40.879 km highway (NH 5: 20,792 Km, NH 37: 20,087 Km) 216.637 km provincial roads included 2300 m of bridges (An Duong 2 Bridge (Km 96 +077 QL5) – BTCTDUL (360.3 m), Lach Tray Bridge (Km 100 +466 QL5) – BTCTDUL (231.4 m), Kien An Bridge (Tel 351 Km 0 +150) – BTCTDUL (252.3 m), Khue Bridge (Km 9 Phone +450 354) – BTCTDUL (787m)

3	Organization Structure	Organization	6 Offices as follow; Administration and Personnel, Finance & Accounting, Traffic Law Enforcement, Technical & Planning, Transport Works Projects, Materials and Supply
		No. of Staff	Total: 398 persons: (Office 43 persons(include 3 persons for director general and 2 deputies) / Unit: 355 persons) Administration: 40 persons Engineers: 54 (2 M.A, 42 university B.A, 10 college graduates) Technical workers and labourers: 304 persons The company has a contingent of managers, trained staff with science and technology.
		Units Teams	7 management teams , (There are 4 Road Teams, 1 Management Unit, 2 Bridge Management Units)
		Companies	1 Ferries, 1 Bus Enterprise, 1 Mechanical works,3 Quays
	Equipments and Materials	Equipments	Several construction equipments are kept in the premises, such as 1 Asphalt mixing plant 48ton/h, 1 overlaying production line asphalt (2 paver, articulated hauler, grader, bulldozer, road roller), 5 lorry(5-10ton), Road painting (thermal) machine, Hand-driven tools, grass cutter, hand vibrating tamper, sewing machine, mini-generator
		Materials	Self production or procurement from the market
4	Activities		the company Haiphong People's Committee is assigned the task of managing the entire maintenance system of provincial roads and national highway. Perform the function of the investor, with project management over the construction funds, such as building bridge of Tien Cuu on Highway 10, Kien An bridge, across the island road Cai Vieng – Moc Trang. Management and operation of five ferries, 01pontoon: Lai Xuan, Binh, Khue, Duong Ao, Quang Thanh and pontoon Han. Each year the average ferry carrier: 150,000 tons and transported over 3.7 million passengers, 40,000 cars and motorized vehicles across the river. Perform bus Transportation. Each year transporting 2.2 million passengers. Management and operation of tourist berth in Haiphong To advise the commissioned City Council and the municipal People's Committee and PDOT on the management, investment in transportation projects to ensure smooth safe transport, to enforce the Law on transportation, to improve the efficiency of investment, protection of transport works.
	Maintenance Works	Maintenance Plan	Every December the company submits the annual budget plan (from state budget) to upper managing level (PDOT).
		Road Patrolling and Inspection	See the below Traffic Control Works, Road Patrolling
		Routine Maintenance Works	Details of works are mentioned in NORM 3479 (MOT & Legal Document) All works by direct operation
		Periodic Maintenance Works	Execute the annual repair plan (including medium repair, major repair, rehabilitation and upgrade of transport works) generated by DRVN and HP provincial Peoples' Committee, Execute periodic repair (within 5-10 billion VND) by joint ventures with other partners
		Emergency Works	Arrange the rapid response forces to react to emergent incidents, preparedness for flooding and typhoon, fixing the damages after natural disasters, accidents, failure of transport works
	Traffic Control Works	Road Patrolling	Arrange 1- 3 patrollers 8h/day, (for NH5 which runs through the high density of traffic, we arrange 4 persons /1 day), riding motorbikes, and visual check, pavement, ditch, bridge, culvert etc. Identify the broken parts and critical road features which may cause accidents. Re-fix the minor damages, report to the Team leader for plans to deal with big damages. Report at the end of the day, the traffic jurisdiction officer reports to the Team Leader. Report to the Company at the next morning, and the company reports to PDOT
		Traffic Management Works	In case of incidents causing traffic jams, for example, erosion, flooded road, the patrollers can immediately react by channeling the traffic and reporting to higher levels for settlements.
		Traffic Accident Management Works	Once we have traffic problems, we coordinate with the Traffic Warden to ensure the continuous flow of vehicles, witnessing in the minutes and require the vehicle owner to sign in the minutes for accountability to the cost of road repair. In case of injuries as a result of road accidents, the vehicle owner or the traffic warden shall call the ambulance.

4	Toll Collection Work	collect fees for repair of road damages (1983-1990) collect fee on Toll Bridge Ti[a]n Cùu on NH10 (2000- 2002) collect bus service fee (2004 up to now) collect fee of all the ferries, pontoons within Hai Phong (1982 up to now)
	Tender System	n/a
5	Organization Chart	



Note: [ ] shows the number of staffs in each representative office and each unit and team.

Source: Study Team (based on the Interview with Hai Phong PDOT on 18th August in 2011, and the RRMC (Overland Road Company) documents)

2) Expenditure for Operation and Maintenance

Expenditures for road maintenance in RRMC (Overland Road Company) is shown in Table 14.2.1-16.

Table 14.2.1-16 Expenditures for Road Development and Maintenance in RRMC
(Hai Phong Overland road one member limited Company)

Kind of Maintenance Works		Year (mil. VND)				
		2,006	2,007	2,008	2,009	2,010
Operation Length (km)		187.07	208.04	213.07	213.77	210.58
Reconstruction	plan	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a
Routine Maintenance	plan	3,275	4,665	5,177	5,794	7,225
	actual	3,275	4,665	5,177	5,794	7,225
	/km	18	22	24	27	34
Periodic Maintenance	plan	3,614	4,192	4,805	4,638	4,029
	actual	3,609	4,186	6,921	5,124	4,004
	/km	19	20	32	24	19
Rehabilitation	plan	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a
Repair after Disasters	plan	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a
Total	plan	6,889	8,857	9,982	10,432	11,254
	actual	6,884	8,851	12,098	10,918	11,229
	/km	37	43	57	51	53

Source: Study Team (based on the RRMC (Overland Road Company) documents)

14.2.2 Recent Topics Related to Road Maintenance

14.2.2.1 Privatization of RRMCs

In recent years, the privatization of RRMCs has been completed, and there are now 4 RRMC's JSCs established under RRMU2. The privatization of RRMCs has been completed according to the change in the Corporate Law in 2006 to make the best use of the efficiency and the improvement of the management system, etc. in private companies. An outline of RRMC (236) one of the private companies under RRMU2 is introduced as follows:

(1) Outline of RRMC (236)

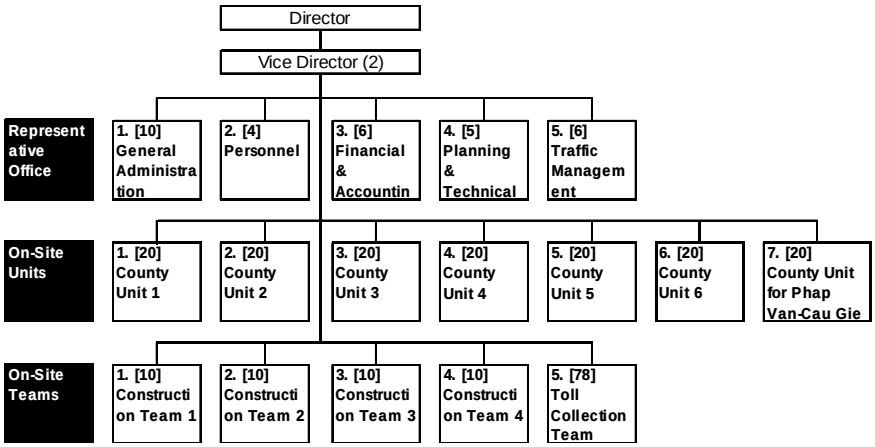
1) Organizational Profile

Outline of RRMC (236) under RRMU2, which operates and manages NH 1 (National Highway No. 1), is shown in Table 14.2.2-1.

Table 14.2.2-1 Organizational Profile of RRMC (236)

	Items		Details
1	History of the Organization		The company was privatized in 2006. (Originally, around 30 years ago, the company was a state-owned company; then, the company separated into 2 branches, which were Management and Civil Construction since 1993.) Capital: 11. 235 bil VRD (Shareholder：private 70% (640 employee are shareholders) , SCIC 30%, Planning IPO in 2012
2	Operation Area	Office Location	Alley 83, Ngoc Hoi Street, Hoang Liet, Hoang Mai District, Hanoi
		Area	n/a
		Length	271km (NH 1 (Lang Son (China border) – Thanh Tri Bridge): 161km, NH 1 (Phap Van- Cau Gie): 32km, NH 1 (Cau Gie – Ninh Binh): 72km)
3	Organization Structure	Organization	5 offices as follows: General Administration, Personnel, Finance & Accounting, Traffic Management, Planning and Technical issues.
		No. of Staff	Total number of staff in the office is 31 persons, plus 1 Director General and 2 Vice Directors.
			340 persons (Office 60 persons/ Site 280 persons) Administration staff: 10 persons (3%) Technical staff: 40 persons (16-17 site engineers) (12%) Workers: 290 persons (85%) [Note] After the establishment of ownership, no. of staff was decreased.
	Subsidiary Organizations	Maintenance Units	7 County Units, 4 Construction team and 1 Toll Collection team. The construction materials and equipments are procured with each unit.
	Equipments and Materials	Equipments	3 excavators, 5 rollers, 1 lane marking machine, 1 track with crane, 1 concrete mixer, 1 asphalt finisher and asphalt manufacturing plant (Capacity: 50ton/hour: selling the asphalt mixture material)
		Materials	n/a
4	Activities		Managing units and teams
	Maintenance Works	Maintenance Plan	In every December, the company submits annual maintenance (budget) plan to RRMU 2.
		Road Patrolling and Inspection	See the below Traffic Control Works, Road Patrolling
		Routine Maintenance Works	Details of works are mentioned in NORM 3479 All works by direct operation Each unit is assigned 10～15 persons, and manages 40～50 km section of National Highways. Company's each unit carries out the minor manual repair works.
		Periodic Maintenance Works	Details of works are mentioned in NORM 3479 Large size of maintenance works are done jointly by several units in the company Major works such as overlay of pavement are carried out by RRMU.
		Emergency Works	Each company has the construction units, and it has had a large-scale disaster and the accident to the repair after the incident.

4	Maintenance Works	Performance Based Road Management and Contracts	The company has contract of Performance -Based Road Management Contract (PBMC) with PMU2. See Chapter 1.2.2.2
		Others	The company (JSC) is given the right to do the other business of the following besides the road maintenance works; i) construction works, ii) house building, iii) house repairing In addition, it is possible to receive an order of the projects other than the MOT order, and become the JV member of big projects.
	Traffic Control Works	Road Patrolling	Patrolling by County Units In case of emergencies that cannot be solved by the County Unit, report to the Company immediately.
		Traffic Management Works	Same with Company (240)
		Traffic Accident Management Works	Same with Company (240)
	Toll Collection Work		78 persons (55 persons: under state's personnel requirement) (3 shift/day) Toll collection for NH1+ Km 93 Check on a daily basis by the Accounting Division and upper authorized organization (RRMU2/DRVN) , and the collected money is sent to the government treasury every day. Paper tickets under the management and surveillance cameras to control the license number and type of vehicles passing by.
	Tender System		Contract costs >30bil by PMU Contract costs <30bil by RRMU (supervisions carrying out by the consultants) Contract costs < 5bil direct appoint
5	Organization Chart		



Note: [ ] show the number of staffs in each representative office and each unit and team

Source: Study Team (based on the Interview with Hai Phong PDOT on 3rd June and 2nd August in 2011)

2) Expenditure for Operation and Maintenance

Expenditures for the road maintenance in RRMC (236) are shown in Table 14.2.2-2. Operating capital of RRMC (236) is 70% obtained from the company's net income and 30% from the government budget. Profit from the income is 6%. The income in 2010 rose greatly due to the contract of the lighting work, the traffic sign installation work and the road marking work. in the construction projects. The company can receive money from MOT, which covers 7 percent of the total budget. However, in the future, that percentage is predicted to decrease.

Table 14.2.2-2 Expenditures for Road Development and Maintenance in RRMC (236)

Kind of Maintenance Works		Year (mil. VND)				
		2006(Q4)	2,007	2,008	2,009	2,010
Operation Length (km)		271	271	271	271	271
Reconstruction	plan	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a
Routine Maintenance	plan	n/a	n/a	n/a	n/a	n/a
	actual	2,605	8,735	9,886	9,178	8,962
	/km	10	32	36	34	33
Periodic Maintenance	plan	n/a	n/a	n/a	n/a	n/a
	actual	10,713	3,674	33,852	21,800	25,969
	/km	40	14	125	80	96
Rehabilitation	plan	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a
Repair after Disasters	plan	n/a	n/a	n/a	n/a	n/a
	actual	n/a	n/a	n/a	n/a	n/a
Operating Expenses of the Company	plan	12,596	11,005	41,656	30,012	32,589
	actual	46	41	154	111	120
Total	plan	n/a	n/a	n/a	n/a	n/a
	actual	25,914	23,414	85,394	60,990	67,520
	/km	96	86	315	225	249

Source: Study Team (based on the RRMC (236) documents)

(2) Government Policy of Privatization of RRMCs

In recent years, the Vietnamese government has been positively advancing privatization policies for road operation and maintenance companies, and declared its policy by "Decree 14 2011".(see Appedix-2) According to the policy, the privatization of all road operation and maintenance companies will be completed by 2015. As a result, a state-run company (SPC) will change to the private company (JSC), and the following advantages can be expected: i) It will be possible to acquire maintenance budget funds, which is currently insufficient, by increasing the method of funding as the private company; ii) More efficient works in the road operation and maintenance can be done by the way of private company (For instance, through the introduction of advanced technology for road maintenance such as ITS etc.); iii) The company's capacity can be improved by recruiting qualified personnel. This privatization is promoted in the central government. However, in the local government it is judged by local government's policy.

14.2.2.2 Performance - Based Maintenance Contracting (PBMC)

(1) Contents of PBMC

PBMC has been contracted based on the guidance of the World Bank for two packages in NH 1 (National Road No.1) and one package in NH 10 (National Road No.10) in 2010. The current state of PBMC two years after contract execution is delineated below.

1) Outline of Contract

The outline of the contract is shown in Table 14.2.2-3.

Table 14.2.2-3 Outline of PBMC

Items	Details	Remarks
Contract Area	Package 1: NH 1 (0km- 95km): 95km Package 2: NH 1 (95km-160+770km): 65.77km Package 3: NH 10 (0km-141+760km): 141.76km	Total 302.53km,
Contract Period	3 years (June 2010 – June 2013)	
Contract Amount	n/a	
Name of Contract Owner & Contractor	Contract between PMU2 and JV by 3 companies	
Kind of Works	Routine and periodic maintenance, rehabilitation	
Finance	World Bank Fund	

Note: Originally RRMU2 under DRVN is designated as the organization for the road maintenance works. However, this PBMC is executed by PMU2 because this project was financed by the World Bank.

Source: Study Team (based on the bidding documents issued on 9 Oct. 2009 for Procurement of Works and Services)

Generally contractors should carry out the countermeasures to traffic accidents and the complaints from the road users according to the criterion in the PBMC contract. However, since this contract is designated as a pilot project of PBMC in Vietnam, a detailed criterion of the traffic accidents has not been established for this contract. In the contract, it is stipulated that contractors support the traffic police to manage the traffic accidents and to secure the traffic flow. Moreover, in addition, aside from police traffic records, there should also be traffic accident records, prepared by contractors, which describe the condition of the road. Additionally, performance regulations of the maintenance and inspection for pavement, structures, road safety facilities etc. are stipulated in the contract. Table 14.2.2-4 shows the inspection items in each facility to be managed and maintained. The contract owner's concern should not only be about how to monitor the performance, but also they should focus on the outcome regulated by the performance standard. Through proper monitoring, the contract owner can prove whether the maintenance work is executed according to the regulation in the contract condition, and to provide the outcomes as the regulated standard. Monitoring items are shown in Table 14.2.2-4.

Table 14.2.2-4 Monitoring Items of Each Facilities

Categories	Inspection Items
On Pavement	Pothole, Patching, Cracking in pavement, Multiple cracks in the pavement, Cleanliness of the pavement surface and shoulder, Depression, Rutting, Raveling, Loose pavement edge, Height of shoulders vs. height of pavement, Paved shoulder,
Signs and Road safety	Information signs, Warning signs, Traffic regulation signs, Horizontal demarcation: and /or pavement paint, Mileposts and marker posts, Guardrails
Drainage	Ditches and all drains without lining, Collectors, Culverts and similar
Vegetation Control	Vegetation not allow to grow beyond the median edges and not higher than 1.3m from the median surface, Vegetation free or near vegetation free, Growth remove when it encroaches into the vegetation free zone from the side or top
Bridge and Structures	Steel or other metal structures, Concrete structures, Expansion joints, Retaining walls, Riverbeds
Side Slope	Embankment slopes and slopes in cut, Removal of slides
Street lighting	Lighting unit, Lamp column
Overlay	Maximum IRI for any one-km section of overlaid pavement

Source: Study Team (based on the bidding documents issued on 9 Oct. 2009 for Procurement of Works and Services)

2) Evaluation and Monitoring Method for the Performance

Contractors inspect roads and bridges condition every day, and remain the report of it, and contractors repair the damages based on the inspection results. Contractor submits work documents and invoice according to the work results to "independent engineer" as a monthly report. After "independent engineer" receive them, he will survey the work results and confirm whether to satisfy the criterion in the contract. After that, he will report it to the project owner (PMU2), and payment is done from PMU2 to contractors based on it.

(2) Government Policy for PBMC

It has been about one year since the contract of PBMC was implemented. So far, evaluation to the contractor's performance by contact owner has been roughly excellent. Because the contractor's autonomy is demonstrated rather than the usual contract in the maintenance works, such as the damaged roads are repaired for short time. Moreover, there is the advantage that the road administrator will be able to control easily the road maintenance budget because the budget has become steady. At present, targeted highways for PBMC are only about 300km out of about 17,000km of national highways now (about 2% of the whole). There is an idea to increase PBMC to other highways in the future, and then MOT and the World Bank are selecting the candidate roads in each PMU throughout the county. Then, the workshop was executed to spread the knowledge of PBMC to the relevant people in Vietnam. The outline of this workshop is shown in Table 14.2.2-5. According to the government policy for PBMC and the results of the evaluation for PBMC so far, it will be positively adopted in the national highways in Vietnam in the future.

Table 14.2.2-5 Outline of PBMC Workshop in Vietnam

Items	Details
Date	14-15 June 2011
Organizer	Ministry of Transport and the World Bank
Title	Work shop on Performance- Based Contracts and Public Private Partnership, A part of the Vietnam Road asset management Program Institutional Strengthening Initiative
Agenda	Introduction of PBMC in Brazil and Peru

Source: Study Team (based on the information from JICA Vietnam Office)

14.2.3 Technical Level of Operation and Maintenance Work

(1) Status of Technical Level of Road Maintenance in DRVN

There is a possibility that the DRVN shall carry out the operation and maintenance work for Tan Vu - Lach Huyen Highway after the completion of the project. The technical level of the maintenance work in the organization shall be evaluated with the two items below, “Science, Technology, Environment and International Cooperation Dept. in DRVN” is concerned, i) What type of technical documents, standards, manuals, specifications etc. are prepared for the maintenance work? ii) What technical cooperation and assistance projects have been done before, or are planned for the future by donors?

1) Outline of Science, Technology, Environment and International Cooperation Dept.

The function of the Science, Technology, Environment and International Cooperation Dept. is to counsel about science, technology, environment and other international cooperation activities in the Circular of DRVN, with details shown in Table 14.2.3-1.

Table 14.2.3-1 Function of Science, Technology, Environment and International-Cooperation Department by DRVN's Regulation

No	Job Description
1	(Science and Technology) Implementing the research and application of scientific advances and technology transfer in the field of road transport; developing and prolonging the specialized electronic information gate and road database to serve road transport management
2	(Science and Technology)Developing national standards, national technical regulations and economic - technical norms specialized in road transport for submission to the Minister of Transport to issue under his competence or to request the competent authority for evaluation and publication; developing, evaluating and publicizing specialized basic standards of road transport.
3	(Science and Technology)Developing and submitting the Minister of Transport to issue under his authority the technical regulations and standards on road transport infrastructure and guiding, supervising the implementation thereafter.
4	(Environment) Developing and submitting the Minister of Transport environmental standards for road transport infrastructure
5	(Environment) Formulating and submitting competent authorities for approval of strategic environmental assessment reports for investment projects in road infrastructure construction decentralized by the Minister of Transport
6	(Environment) Implementing programs, projects, schemes, and plans on environmental protection in the construction, management, maintenance of road infrastructure under the jurisdiction of the Directorate for Road of Viet Nam
7	(International – Cooperation) Developing and submitting the Minister of Transport to approve the programs, plans of international cooperation on road transport; developing and submitting the Minister of Transport for submission to the competent authorities to approve the proposals on signing of or accessing to international agreements on road; participating in the negotiation of international agreements which are authorized or decentralized; organizing negotiation and signing of international agreements and cooperation programs as stipulated by law; organizing the licensing of international road transport in conformity with treaties, international agreements on road transport as assigned by the Minister of Transport
8	(International – Cooperation) Implementing international cooperation in road transport as decentralized by the Minister of Transport

Source: Study Team (based on the documents from Science, Technology, Environment and International-Cooperation Dept. in DRVN)

2) Preparation of Standards and Manuals for Road Maintenance

The department is in charge of preparing the standards and manuals for road and bridge maintenance work after the project is completed. Table 14.2.3-2 shows the prepared standards and specifications related to the road maintenance, and the maintenance work in RRMU is executed in accordance with these technological standards at present.

Table 14.2.3-2 List of Prepared Standards and Specifications on Road Operation and Maintenance by DRVN

Standards / Manuals	Document of Effect	Details
Technical Standards for Road Routine Maintenance	Decision N0. 1527/2003/QD-BGTVT dated 28/5/2003 of Ministry of Transport on promulgating 22TCVN306-03 on Technical Standards for Road Routine Maintenance	Road Maintenance Manual Items of road inspection Technological standard such as evaluation of IRI etc. Procedure regarding shoulder repair
Road Maintenance Routine Standards	Circular N0. 10/2010/TT-BGTVT dated 19/4/2010 of Ministry of Transport on regulations on management and maintenance road)	Road patrol Frequency of road inspection by each type of road Frequency of road and gutters' cleaning Technological standard such as road repair for damages and deterioration etc.
Regulations of Road Signs	(Decision N0. 4393/2001/QĐ-BGTVT dated 20/12/2001 of Ministry of Transport on promulgating 22TCN237-01 Standard of rules and road signs	Traffic regulation of traffic lane management for maintenance works on opened traffic road etc..

Source: Technical Standard on Road Maintenance Issued Pursuant to Decision No. 1527/2003/QD-BGTVT, May 28,2003 (Vietnam Transport Sector Study Task 5 Proposal for National Road Maintenance Program, JICA Feb. 2010 (P3-18))

3) Technical Co-operation and Technical Assistance Projects

A lot of technical co-operation and technical assistance projects concerning road operation and maintenance have been executed by the VRA and DRVN until now. However, they are technical assistance projects accompanied the road improvement or reconstruction projects, and there is not the technical co-operation project that comprehensively cover the whole road operation and maintenance activities. Then, JICA has a plan to carry out the technical co-operation project intended for the entire road operation and maintenance from 2011 to 2012. The outline of it is shown in Table 14.2.3-3. By this project, the capacity of the road maintenance organization including DRVN, RRMUs, and RRMCs can be improved.

Table 14.2.3-3 Outline of Technical Co-operation Project on Road Maintenance by JICA

Items	Details
Title of the Project	Capacity Enhancement Project for Road Maintenance
Project Period	From August 2011 to March 2014
Targeted Organization	MOT (Ministry of Transport) and DRVN (Directorate for Roads of Vietnam)
Details (Terms of Reference)	. Preparation of new road data base . Preparation of Input format of related system such as road asset management system is prepared . Execution of training for road information management to develop the human resources . Preparation of training program and teaching material to apply road information management to the whole country . Development of new PMS and preparation of PMS data set format . Preparation of mid-term road maintenance plan for targeted pilot area . Execution of training for road maintenance planning to develop the human resources . Execution of OJT to improve technical level of maintenance works such as road inspection, evaluation of the damages, selection of the suitable maintenance or repair methods . Improvement of the standard for routine maintenance technology . Creation of the monitoring system for road pavement using the established new road data base . Execution of training for road inspection, evaluation of the damages, selection of the suitable maintenance or repair methods to develop the human resources . Preparation of training program and teaching material to apply road maintenance works to the whole country . Review of obligation authority of each related organization regarding the road operation and maintenance . Support of establishing the new rules and training system in DRVN for nationwide development of new road information management and road operation and maintenance works

Source: JICA Consultants Procurement Announcement, July 2011

(2) Evaluation of Technical Level of Road Maintenance in Vietnam

Neither the capacity of the Department engaged in the technical matter in DRVN nor the preparation of technical specificationmanuals regarding road maintenance activities are sufficient to carry out the maintenance works appropriately at present. Therefore, the technical level of the road maintenance organizations in Vietnam can be improved by producing the good results of these technical co-operation projects by donors such as JICA's road maintenance project. Then, in order to do the effective and efficient technical co-operation to the road maintenance organizations it is important to coordinate the subjects appropriately in road maintenance activities among donors.

14.3 Financial and Budget Situation of Road Operation and Maintenance Organization

14.3.1 Legislation of National Budget Related to Road Operation and Maintenance

14.3.1.1 Legislation Related to Road Maintenance Fund

Regulations concerning tax, fee, and charge collected for the road maintenance fund are shown in Table 14.3.1-1. According to Article 48 of the New Road Law (No.23/2008/QH12), the budget related to the road maintenance is covered as: i) national budget, ii) user charge, and iii) other collected taxes. The summary of each document is shown in Appendix-2.

Table 14.3.1-1 Law, Regulation, Decree and Circular of Fiscal Resources for Road Development, Operation and Maintenance

No.	Date	Documents			Title
1	1997 / Aug 16	Circular	MOF	53/TC/TCT	Guiding the procedure for collection, payment and management of the fee for ensuring inland waterway traffic order and safety
2	2002 / June 3	Decree	GOV	57/2002/ ND-CP	Detailing the implementation of the ordinance on charges and fees
3	2004 / July 29	Circular	MOF	76/2004/ TT-BTC	Instruction for collection, remittance, management and usage of fee, charges in road transportation
4	2007/ May 21	Circular	MOF	53/2007/ TT-BTC	Instructions for collection, payment and usage of fees levied on driving test
5	2010 / July 28	Ministerial Decision	DRVN	1270/QD -TCDBVN	On the promulgation of "Regulations for authorization of power and responsibility of DRVN in the management of investment into repairs conducted in the National Highway system, with the usage of economic road fund and revenues collectible from ferry fee
6	2011 / Apr 28	Resolution	Ho Chi Minh City People's Committee	03/2011/ NQ-HDND	Adjustment of road charges at toll gate of Binh Trieu 2 Bridge

Source: Study Team

14.3.1.2 Road Maintenance Fund

The organization responsible for each type of the collected taxes, fees, and charges regarding road maintenance fund is shown in Table 14.3.1-2. These collected incomes are delivered as general revenue sources for the government without becoming earmarked for the road maintenance fund. Afterwards, the fund for the road development and maintenance are allocated from the general account of the government to the road administrative agencies as an annual budget by the Ministry of Finance. The allocated budget is used for routine and periodic road maintenance works, emergency works, management of the weigh bridges, procurement of the equipments and materials, and the subsidy to the ferry of a sufficient income. Since there are no specific fiscal resources for the road fund of the road development and maintenance in Vietnam now, donors such as JICA and the World Bank are proposing the establishment of a fund to secure enough capital related to road maintenance. The road fund is scheduled to be established based on the discussion among the government by the end of 2011.

Table 14.3.1-2 List of Tax, Fee and Charge for Road Maintenance Fund

Items of Incomes	Type of Incomes	Responsible Organization	Remarks
Vehicle registration authorization tax Driving license issue commission Vehicle number plate sales income	Tax	MOT	—
Toll fee Route advertisement income	Fee / Fair	DRVN, MOT, MOF	—
Overloaded vehicle traffic permission issue charge	Charge	DRVN, MOT	—

Source: JICA preparatory Survey of Lach Huyen Port Construction (Road & Bridge Portion) Final Report (Summary) July 2010 (P2-115)

14.3.2 National Budget Related to Road Operation and Maintenance

14.3.2.1 Road Maintenance Strategy Plan and Amount of Plan Budget

In Vietnam, the mid/long-term road maintenance plan that has officially been approved doesn't exist at present. However, the mid/long-term maintenance plan that focuses on pavement improvement was already prepared with the donor's support at the beginning of the 2000's. Moreover, the annual road maintenance plan is prepared every year to determine the road maintenance budget. Those plans are shown as follows:

(1) Ten-Year Strategy Plan

The ten-year strategy plan was established for the national road network in RNIP (Road Network Improvement Project) that was prepared with the World Bank's support in 2003[1]. This is the general maintenance, rehabilitation and upgrading plan that shows the type of work and the amount of the fiscal resources needed for specific maintenance work in the national road network during ten years (2004 - 2013). The breakdown of the maintenance works are routine and periodic maintenance, rehabilitation, pavement improvement, pavement of the unpaved road and necessary reconstruction. In the strategy plan, the maintenance and improvement of the existing road network is particularly emphasized. Therefore, the construction of new roads is not considered in this plan. Although annual maintenance plan is prepared based on the Ten-Year Strategy Plan, the plan has not been officially approved.

The data base of the road condition for the national road network of 15,500km in 2001 was prepared. In the analysis, HDM 4 (Highway Development & Management Module 4) was used. The analysis was done by using the following three scenarios, i) Optimum budget scenario, ii) Constant roughness scenario, and iii) Current VRA budget-level scenario. The investment plan of each maintenance work during these ten years was analyzed, along with the investment amount that was estimated in each scenario, are shown in Table 14.3.2-1.[2]

Table 14.3.2-1 Analysis Results of Ten Years Plan

	Scenario	Proposed budget (per year)	IRI	Remarks
i)	Optimum budget scenario	93 million USD	—	Expected expenditures Overlays, Upgrading of unpaved sections
ii)	Constant roughness scenario	73 million USD	IRI; 6	—
iii)	Current VRA budget-level scenario	37 million USD	IRI; 6.6/2004 IRI; 8.7/2013	—

Source: Loan No. 1653 - VIE (SF), Third Road Improvement Project, Vietnam, Implementation of Sector Development Policy, Draft Final Report, March 2006 (Vietnam Transport Sector Study Task 5 Proposal for National Road Maintenance Program, JICA Feb. 2010 (P3-12))

(2) Three-Year Maintenance Plan

The DRVN has prepared the Three-Year Maintenance Plan for the national road network based on the Ten-Year Strategy Plan with the World Bank's support and a part of the government budget. HDM 4 was alSourced for this analysis. From the data base of 11,586km length of the national road network, 2,750km was selected for evaluation. Based on the result, 1,079km needs further maintenance work, which is prepared in the Three-year maintenance plan by DRVN. When the Three-Year Maintenance Plan begins, the government approval is needed.

[1] The Louis Berger INC. prepared it as a consultant.

[2] Contents of Ten-Year, Three-Year and Annual Plan are quoted from "Vietnam Transport Sector Study Task 5 Proposal for National Road Maintenance Program, JICA Feb. 2010".

(3) Annual Maintenance Plan

The Annual Maintenance Plan is the budget plan prepared for the entire year. RRMU and PDOT, the regional offices, play a major role in preparing the annual maintenance plan. The Annual Maintenance Plan includes the budget for routine and periodic maintenance, consisting of medium/large sized repair work. Although HDM 4 is used to prepare both the Ten-Year Plan and the Three-Year Plan, the Annual Maintenance Plan is prepared by the maintenance cost shown in the Budget Nome and Standard based on the data that has been accumulated so far.

14.3.2.2 Annual Maintenance Budget

(1) Annual Budget Request and Allocation Process

In the road maintenance budget at the national level, MPI (Ministry of Planning and Investment) takes the responsibility and allocates the budget for the operation and maintenance of the capital construction planned for Group A and Group B projects. The budget for Group C projects is allocated by MOT from the fund controlled by MPI according to the MOT's budget allocation plan. On the other hand, the MOF (Ministry of Finance) is responsible for the road operation and maintenance budget. Therefore, the road maintenance budget is allocated from MOF to RRMU and PDOT, which are the executive organizations for the actual road maintenance work through MOT and DRVN.

The decision making process of the road maintenance budget in the government during the year, and the annual budget allocation process in MOT and DRVN after the government determines the road maintenance budget are shown in Table 14.3.2-2.

Table 14.3.2-2 Government Budget System and Process

Step	Details
Decision Making Stage of the Budget	
Step-1: Every year, RRMUs and PDOTs prepare and send the budget plans to DRVN.	
1-1	RRMUs and PDOTs (through the Provincial Treasuries) that are the regional road maintenance organizations for national highways demand the road operation and maintenance budget to DRVN.
1-2	DRVN takes the responsibility for the review and the approval of the plan and the design that is proposed from RRMUs and PDOTs, and the allocation of the budget to them, and the preparation of the technological training.
1-3	The amount of the budget demand is decided to take into consideration to more necessary amount of the projection based on a past tendency.
Step-2: DRVN integrates all plans into a single format, examines the contents and then, submits this draft budget proposal to MOT in every October.	
2-1	Infrastructure and Road Safety Dept. in DRVN submit the budget demand to MOT after adjustment of the budget demand from RRMUs and PDOTs.
Step-3: Receiving the proposal from DRVN, MOT examines the contents again, and sends the plan to MOF, who examines the budget proposals assembled from various ministries about the expected revenue amount.	
3-1	MOF reviews the national operational budget requests from the line ministries on behalf of the government, and will try to balance the budget between income and expenditure in the expense frame of the development policy in the government. Therefore, in order to balance the annual budget, MOF requests MOT to submit the amount of the budget estimate for one year.
3-2	MOT prepares and submits to MOF the budget allocation plan that needs fiscal resources for each road maintenance organization.
Step-4: The final budget proposal is subject to the National Assembly's decision.	
4-1	Finally, the Prime Minister approves the budget allocation plan in the Diet

Allocation Stage of the Budget	
Step-5: After the National Assembly approves the budget, MOF shall determine how to allocate the estimated amount to MOT.	
5-1	MOT specifies directly the budget allocation to all road sectors in the planned national budget.
Step-6: Then, MOT shall order DRVN to draft the budget distribution plans to the regional agencies and report to MOT.	
6-1	DRVN prepares and submits to MOT the expense plan for the national roads maintenance during a fiscal year.
Step-7: After appraising these draft plans, MOT shall make the final decision about the budget allocation of the national road maintenance to the regional RRMUs and PDOTs.	
7-1	MOT allocates the annual budget to DRVN and PPCs ((Provincial Peoples Committees) based on the expense plan.
Step-8: DRVN convenes a meeting with all RRMUs and PDOTs to re-allocate the budget constraint.	
8-1	DRVN adjusts the amount of a whole budget allocated by MOT to balance between allocation and demand from the locale organizations.
8-2	According to the allocated budget, DRVN allocates the budget to RRMUs and PDOTs that the national road operation and maintenance authority is given.
8-3	The road maintenance budget every year are not satisfied the request under the present situation.
Step-9: Following the decision made at the meeting, RRMUs and PDOTs reorganize and renew their initial annual maintenance plans, work out and send the new implementation plans to DRVN for approval.	
9-1	RRMUs make the order of the priority in routine maintenance works in RRMCs.
Step-10: Upon approval, RRMUs and PDOTs move to the next step of making maintenance contracts with the maintenance companies.	
10-1	To secure the certain service level of road network, road maintenance organizations should continue to carry out the maintenance works more than the planned maintenance works in the constrained road sector budget.
10-2	To obtain the enough budget for road operation and maintenance, RRMCs are asking the loan etc. as the financial resources.

Source: Study Team (Vietnam Transport Sector Study Task 5 Proposal for National Road Maintenance Program, JICA Feb. 2010 (P3-14))

(2) Actual Annual Budget

1) Road Maintenance Budget Changes over the Years

During the period from 1999 to 2002, the increasing ratio of the entire national budget (from 11% to 13.8%) is higher than that of GDP (from 2.7% to 3.5%). And, according to the public annual expense report in the transportation traffic sector, the annual budget allocated to road sector accounts for 82.8% of the budget of this sector. However, the road maintenance budget was only occupied by a small amount (about 5.7%-7.2%) in the entire road sector budget in the beginning of the 2000's.[3]

[3] Statistic data (year): average of 12% during the period from 1995 to 2002

Table 14.3.2-3 shows the amount of the requested budget and the actual allocated budget concerning the road maintenance work from 2000 to 2009. The amount of the actual allocated budget has been increasing in recent years. However, since the increase of the unit price of the construction (materials and labor costs) exceeds the increase of the budget allocation, a decrease in the workload happens as a result. In addition, since the allocated budget cannot satisfy the requested demand, it is very hard to repair serious road damages in RRMUs and PDOTs.

Table 14.3.2-3 State Budget for Maintenance, Repair Work and Construction

Year	Proposed Budget (mi VND)			Allocated Budget (mi VND)			
	Total	Routine Maintenance	Periodical Maintenance & Unscheduled Maintenance	Total	Routine Maintenance	Periodical Maintenance & Unscheduled Maintenance	Basic Construction (Group C)
2000	1,203,150	231,375	971,775	731,080	190,000	308,000	233,080
2001	1,257,120	248,320	1,008,800	1,012,910	180,550	329,450	502,910
2002	1,352,087	264,197	1,087,870	661,791	182,680	416,480	62,631
2003	1,694,910	311,310	1,383,600	1,382,017	243,990	640,417	497,610
2004	1,885,155	328,605	1,556,550	1,056,484	284,200	700,384	71,900
2005	2,583,809	381,502	2,202,307	1,137,392	326,180	811,212	0
2006	3,272,701	474,796	2,797,905	1,704,300	433,000	1,271,300	0
2007	3,400,400	510,060	2,890,340	2,101,992	469,797	1,405,015	227,180
2008	2,860,000	690,000	2,170,000	,2,080,889	518,892	1,384,628	177,369
2009	3,126,400	757,288	2,369,112	2,140,328	546,611	1,451,517	142,200

Note-1: 2010 (planned budget: 2,300 billion VDN / implemented budget 2,500 billion VDN), and 2011 (planned budget: 2,484 bil VDN),Total operation : 16,950km

Note: Budget Breakdown data (routine, periodic, road inspection, Clearance of Corridor (exclusion of squatters in ROW), emergency, weighbridge, office (staff salary, equipment))

Source: Vietnam Transport Sector Study Task 5 Proposal for National Road Maintenance Program, JICA Feb. 2010 (P3-15)

2) Sufficiency Ratio of the Maintenance Budget

In general, the sufficiency ratio of the maintenance budget is calculated by dividing "the Allocated Budget" over "the Proposed Budget". Table 14.3.2-4 shows the sufficiency ratio that is calculated from the comparison between the requested amount and the actual allocated amount in

Table 14.3.2-3. The ratio ranges from 44% to 82% because of the constrained budget. Since the actual needed budget is less than the actual allocated budget, the quality of the road is in poor condition. Specifically, road damages are occuring more often because more rehabilitation or reconstruction is needed before the design life cycle of the road maintenance activities.

Table 14.3.2-4 Sufficiency Ratio of the Maintenance Budget

Items	Year (mil VND)									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Proposed Budget	1,203,150	1,257,120	1,352,087	1,694,910	1,885,155	2,583,809	3,272,701	3,400,400	2,860,000	3,126,400
Allocated Budget	731,080	1,012,910	661,791	1,382,017	1,056,484	1,137,392	1,704,300	2,101,992	2,080,889	2,140,328
Ratio	61%	81%	49%	82%	56%	44%	52%	62%	73%	68%

Note: Allocated Budget includes Basic Construction (Group C)

Source: Study Team

14.4 Proposal of Operation and Maintenance to Constructed Road

14.4.1 Proposal of Management Organization for Operation and Maintenance

14.4.1.1 Legislation Process of Designation of the Management Organization

A typical process of determining the road operator (management organization for operation and maintenance) in Vietnam is shown in Table 14.4.1-1. According to this table, when the project nears completion, the project owner will hold the meeting to discuss about handing over the constructed roads and bridges with MOT, DRVN, MOC (Ministry of Construction), and the local government. In the case of Tan Vu-Lach Huyen Highway, the procedure will be started and preceded by PMU 2, the project owner, and finally the management organization will be decided.

In general, the road operator is appointed one month before road opening. However, it is necessary to make the decision six months earlier to acquire enough time to prepare for the operation and maintenance work even if the existing road agency still becomes the operator.

Table 14.4.1-1 Typical Process and Schedule to Determine the Road Operator

Stage		Schedule (Year)	Decisions for Selecting Road Operator
1	Detailed Design Period	2011	—
2	Tendering Period	2012	—
3	Construction Period	2013 - 2015	PMU reports to MOT on the time of opening to the traffic.
4	Operation Period	2015 -	MOT decides the road operator 1 or 2 months before road opening.

Source: Study Team (based on the Interview with Planning and Investment Dept. Dept. of DRVN on 31st May and 1st June in 2011)

14.4.1.2 Designation Criteria of the Management Organization

Although the road operator for the constructed road and bridge has not been determined yet, there shall be only one road operator. An official decision of a road operator after the completion of Tan Vu - Lach Huyen Highway has not been reached yet. However, the 3 options of the assumed future road operator are shown in Table 14.4.1-2.

Table 14.4.1-2 Options of the Assumed Management Organization

Option	Type of Road	Road Operator	Actual Road Maintenance Organization	Remarks
Option-1	National Road	RRMU's Road Maintenance Group	RRMU2, RRMC (240), and New established County Unit	There is a high possibility.
Option-2	National Road or Urban Road	PDOT's Road Maintenance Group	Hai Phong PDOT, Overland Road Company, and existing County Unit	There is a possibility of integral operation with other urban roads in Hai Phong City.
Option-3	Expressway	VIDIFI	New established Road Maintenance Company by BOT Concessionaire	There is little possibility.

Source: Study Team (based on the Interview with Planning and Investment Dept. Dept. of DRVN on 31st May and 1st June in 2011)

According to this table, Option-1 has a high possibility of being selected over Option-2 or Option-3. However, there is the case that the National Highway of Hanoi – Noibai Airport has been transferred from the central government to the local government two years ago. Thus, the road operator is decided by the discussion between the central government and the local government, and there is a possibility of becoming it both. Then, it examines which of RRMU 's Road Maintenance Group and PDOT' s Road Management Group is the suitable roads operator for Tan Vu - Lach Huyen Highway.

Important matters that should be considered in determining the road operator for the road operation and maintenance are as follows:

- The Organization should be experienced enough about the operation and maintenance of roads and bridges.
- The Organization should be able to secure enough number of experienced staff about the operation and maintenance of roads and bridges.
- The Organization should be able to carry out efficient and effective operation and maintenance works on Tan Vu - Lach Huyen Highway.
- The Organization must acquire enough information (meteorological conditions, geographical features, local situation, etc.) of the region where Tan Vu - Lach Huyen Highway is located.

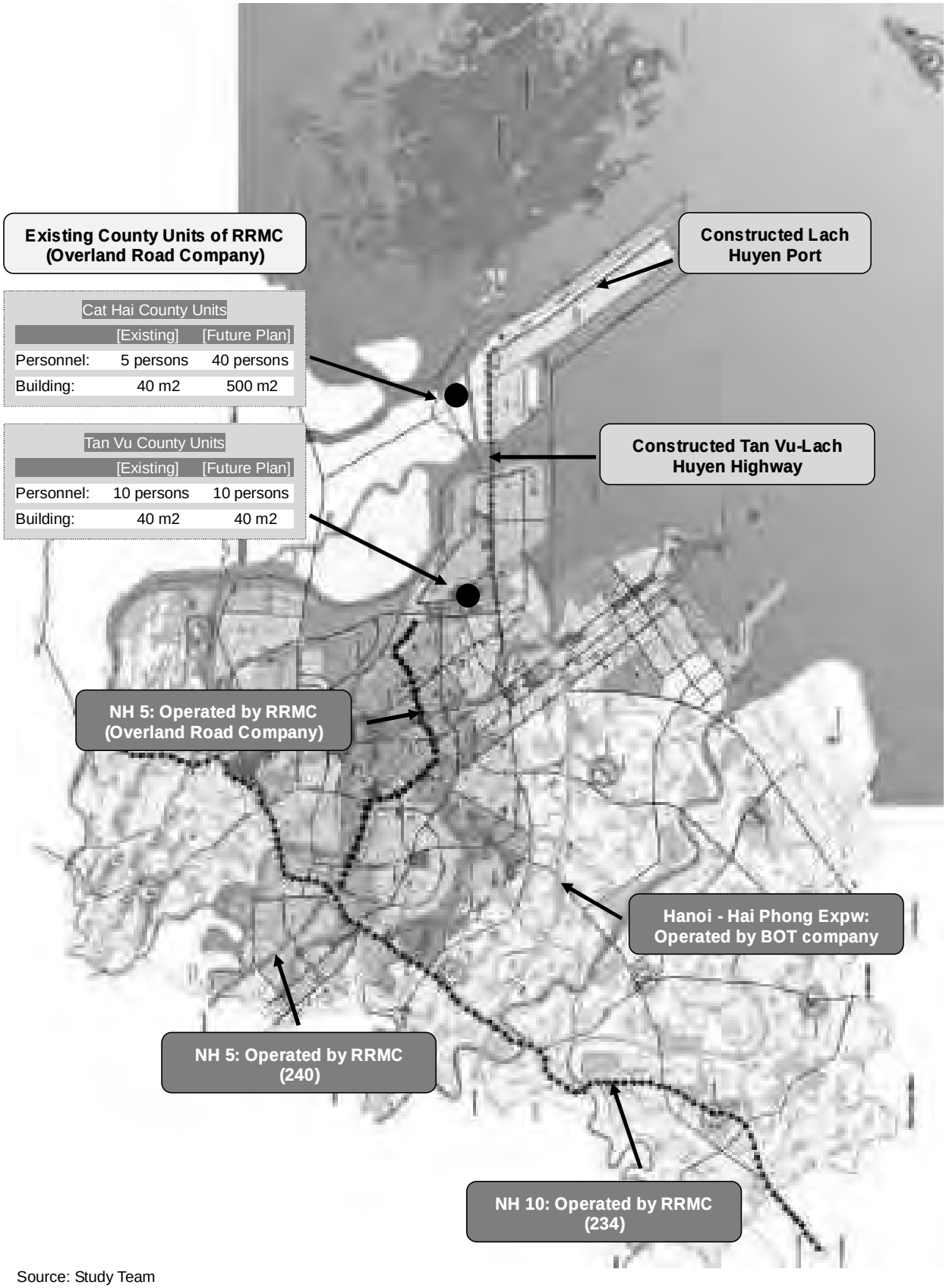
Table 14.4.1-3 shows the comparison table regarding the road operators for the RRMU's Road Maintenance Group and PDOT's Road Maintenance Group. And the road operators of trunk roads in the Hai Phong City are shown in Figure 14.4.1-1 as reference.

Table 14.4.1-3 Comparison Table of the Maintenance Organization

	Evaluation Criteria	Option-1 RRMU's Road Maintenance Group	Option-2 PDOT's Road Maintenance Group
1	Enough experienced about the operation and maintenance of road and bridge.	There is 24 years experience of the road maintenance. Operation length of national roads is 115km, included 2030m total length of bridges	There is 50 years experience of the road maintenance. Operation length of roads is 256km, included40km national roads and 2300m total length of bridges
	Evaluation	3	3
2	Enough number of experienced staff about the operation and maintenance of road and bridge.	There are 290 employees now.(Engineers are 80 persons.) There are 224 people in 5 units and teams as technical staff and workers.	There are 309 employees now. (Engineers are 54 persons.) There are 269 people in 7 units and teams as technical staff and workers. There are some places where get the damages and not repair for long time in the city because of the insufficient road maintenance budget
	Evaluation	3	2
3	Efficient and effective operation and maintenance work on Tan Vu - Lach Huyen Highway.	It is away from the head office to site about 75km. County Unit must be set up the site. (It is needed to establish the communication system between the head office and County Unit.) As for NH 5, the pavements are maintained comparatively well.	Adjoining roads to Tan Vu-Lach Huyen Highway are operated and maintained, and 2 County Units are located at the site. There is an expansion plan of these County Units for the future.
	Evaluation	2	3
4	Enough information (meteorological conditions, geographical features, local situation, etc.) of the region where Tan Vu - Lach Huyen Highway is located.	Since it is away from the head office to site about 75km, it might be late to correspond in the emergency. There is an operation and maintenance experience NH5 in Hai Phong. County Unit is set up on the site, and it is possible to carry out the operation and maintenance activities without trouble.	A regional situation has been well known Cooperation with a regional urgent organization (police, fire fighting, and towing company) is also early. Assistance from the head office can be obtained easily, correspond time is short.
	Evaluation	2	3
5	Others	There is a high possibility that RRMU2 becomes an administration authority in the present road administrative system because Tan Vu Lach Huyen Highway will be a national road RRMC also has a positive idea about the operation and maintenance of this road. Privatization is planned by next year, and an efficient business can be expected of RRMC.	If PDOT manages, dedication of the operation and management right is necessary There are a similar procedure results of other national roads in the city RRMC has a positive idea about the operation and maintenance of this road.
	Evaluation	3	2
Overall Evaluation		13	13

Note: Evaluation Good: 3 points, Fair: 2 points, Poor: 1 point

Source: Study Team

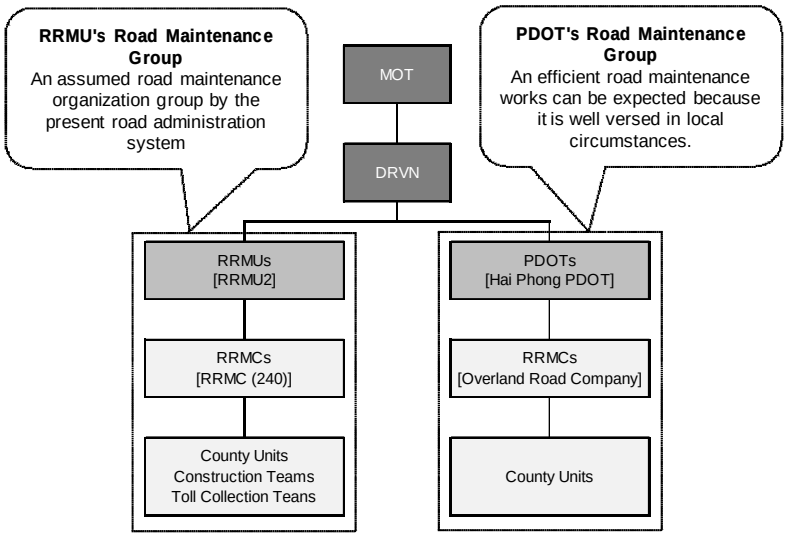


Source: Study Team

Figure 14.4.1-1 Road Operator of Trunk Roads in Hai Phong City

Figure 14.4.1-2 shows this result. It is desirable that the PDOT's Road Maintenance Group becomes the road operator from the view points, which can correspond in the emergency situation by well known a local situation, and can correspond by expanding an existing County Unit, as above-mentioned result.

However, even if RRMC (240) is designated as the road operator, it can also work on the maintenance of Tan Vu – Lach Huyen Highway, such as in the example of former and current maintenance project: NH 5, Phu Luong Bridge, Lai Vu Bridge. By that time, the structure and amount of work load shall be expanded and more diversified. Also, the company shall be able to mobilize more capital.



Source: Study Team

Figure 14.4.1-2 Possible of the Management Organization

Then, the below-mentioned proposal how to operate and maintain Tan Vu Lach Huyen Highway is focused on the activities of RRMC and County Unit. Because they will carry out the actual maintenance works regardless of whether RRMU'S Road Maintenance Group or PDOT' s Road Maintenance Group becomes the road operator.

14.4.2 Proposal of Organization and Activities in the Management Organization

14.4.2.1 Structure and Functions of the Management Organization

(1) Organizational Structure and Number of Staff

In case RRMC (240) executes the operation and maintenance work for Tan Vu - Lach Huyen Highway, the organizational structure shall be changed as shown in

Table 14.4.2-1. Three people in total are increased about one staff of Traffic Management Office, one staff of Equipment Management Office, and one vice-director has a responsibility for all of Tan Vu-Lach Huyen Highway. On the other hand, it proposes to set up one newly County Unit on the site, and to deploy about 40 workers (2- 3 supervisors included).

Table 14.4.2-1 Size of the RRMC's Office by NORM

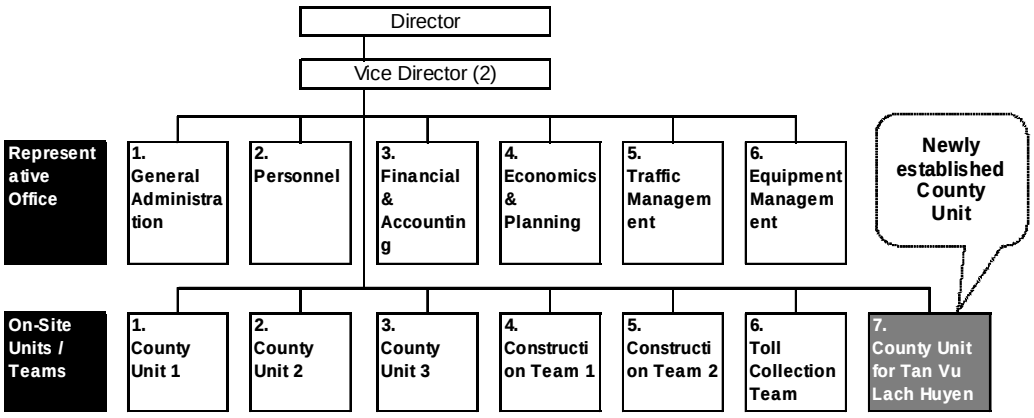
Organization	No.	Division/ Unit	No. of Persons		Remarks
			Existing	Proposal	
Head Office	1	Head of the office	1	1	—
	2	Vice Head of the office	2	**3**	
	3	General Administration	3	3	
	4	Personnel	3	3	
	5	Economic & Planning	3	3	
	6	Finance & Accounting	3	3	
	7	Traffic Management	3	**4**	
	8	Equipment Management	3	**4**	
		Sub Total	21	24	
		Persons/ km	0.16	0.18	
Site Office	1	County Unit 1	40	40	
	2	County Unit 2	50	50	
	3	County Unit 3	40	40	
	4	New County Unit		**40**	
	5	Construction Team 1	30	40	
	6	Construction Team 2	30	30	
	7	Toll Collection Team	70	70	
		Sub Total	260	300	
		Persons/ km	2.26	2.29	
Total			281	324	
		Persons/ km	2.44	2.47	

Note: Operation Length of RRMA (240) = 115km, Length of Tan Vu - Lach Huyen Highway = 16km,

Note: Based on the NORM: 6～7 persons / 10km staffs are assigned.

Source: Study Team

Figure 14.4.2-1 shows the new organization chart of RRMC base on the above-mentioned proposal.



Source: Study Team

Figure 14.4.2-1 Proposed Organization Chart of RRMC

(2) Responsible Organization to Each Maintenance Works

Table 14.4.2-2 shows the divisions and units corresponding to different types of the maintenance work executed by RRMC in Tan Vu - Lach Huyen Highway.

Table 14.4.2-2 Responsible Organization to Each Maintenance Work

Type of Work	Responsible Organization to Each Maintenance Work				Remarks
	Site Office		Head Office		
	Units/Teams	Staff	Offices	Staff	
Daily Inspection (Road Patrolling)	County Unit	4	Traffic Manage	1	—
Routine Maintenance	County Unit	40	Traffic Manage /Equipment Management	1	—
Periodic Maintenance	Construction Team	case by case		1	—
Rehabilitation/ Reconstruction	Construction Team	case by case		1	—

Source: Study Team

14.4.2.2 Operation Office of the Management Organization

(1) Office Location and Office Building

In case RRMC (240) takes charge of the maintenance works for the constructed Tan Vu - Lach Huyen Highway, a County Unit should be preferably set up near the highway because the head office of RRMC (240) is far from Hai Phong City by about 70km. On the other hand, if RRMC (Overland Road Company) takes charge of it, RRMC (Overland Road Company) that the head office of it is located in Haiphong City makes efficient use of two existing County Unit near the highway. Then, Table 14.4.2-3 shows what kind of site office for County Unit is needed as reference of County Unit 3 of RRMC (236) that was visited as the field survey.

RRMC (236)'s site office is mentioned below as reference; there are 7 site offices under RRMU (236), in which each of them is placed at every 40-50km of road. Each site office is 500m2 at least and well furnished with the equipment, auditorium, parking and dormitories to serve all work management, material collection, and living activities of the workers. Therefore, five out of seven site offices (1500 – 2000 m2) are much bigger than the headquarters of RRMU (236) in Ngoc Hoi Street (200m2). There is an office building of about 200–300m2; and 5 or 6 dorms for the workers. The size of the dorm differs and depends on the situation of the site office, but the biggest dorm is 200m2.

Table 14.4.2-3 Details of the Site Office

Items	Details	Remarks
Name	Site Office for County Unit	—
Location	Near Tan Vu - Lach Huyen Highway	—
Area	500m2	—
Building	Building 100m2	—
	Administration office, Meeting room, Dormitory for the worker	—
Construction Cost for the building	2bil VND	—
Function	Resides about three staffs for emergency operation at night Parking lot, Space for construction materials.	—

Source: Study Team (For example, in Hanoi – Lang Son route, there is two site offices in Bac Ninh (which is 50km away from Hanoi) and in Bac Giang (which is 70km away from Hanoi)

(2) Construction Machinery for Works in the Office

The type and number of construction machinery that are possessed in RRMC (240) and RRMC (236) at present are shown in Table 14.4.2-4. The RRMC (236) owns more construction machinery than RRMC (240) because of being responsible for more construction and maintenance projects. However, in the future, 7 RRMCs (including RRMC (240)) shall be privatized by 2012 according to the government policy; RRMC (240) shall need to purchase more construction equipment to meet the requirements of more projects. As a result, the cooperation between RRMC (240) and other independent contractors shall provide the ability to execute large-scale repairs or re-construction work in Tan Vu - Lach Huyen Highway if assigned. Then, the kind of the equipment that had to be owned so that the company might do appropriate road maintenance works is also shown in Table 14.4.2-4. Especially, it strongly proposes to purchase the vehicle for the marine bridge inspection.

Table 14.4.2-4 Construction Equipment in RRMC (240) and RRMC (236)

No.	Type of Construction Machinery	No. of Machinery		that should be owned	Type of Work for the Machinery
		RRMC (240)	RRMC (236)		
1	Excavator	2	3	at least 1	emergency works for the slope failure
2	Roller	1	5	-ditto-	emergency works for the pavement
3	Lane maker	1	1	-ditto-	routine maintenance
4	Track with crane	1	1	-ditto-	all of maintenance works
5	Concrete mixer	—	1	-ditto-	routine maintenance
6	Asphalt finisher	—	1	—	depend on the company's idea
7	Asphalt mixing plant	—	1	—	-ditto-
8	vehicle for the marine bridge inspection.	—	—	1	bridge inspection

Source: Study Team

(3) Telecommunication System

At this moment the telecommunication system for the operation and maintenance works is not well connected between the current road activities and RRMCs. Particularly, in case of traffic accident, there is not a professional agency to inform the police, ambulance, and road users about the road condition. However, since Tan Vu - Lach Huyen Highway is a very important road that connects Lach Huyen International Port to Hanoi - Hai Phong Expressway, and will form Hai Phong City Ring road in the future; it is necessary to equip the Traffic Information System with ITS (Intelligent Transport Systems) so as to inform the current traffic situation of the main line and other roads to the user. (Details are mentioned in chapters 1.4.2.3(2).) As a consequence, the development of the telecommunication system will become a big issue for the operation and maintenance activities of Tan Vu - Lach Huyen Highway in the future.

(4) Procurement of Equipment and Materials for Work

The construction equipment needed for the work in RRMCs is basically rented. The materials needed for the work are procured, in response to the amount of work, and there is no space for storing them in the office. However, it is necessary that RRMCs should prepare enough equipment and materials to carry out any emergency work in case of disasters or major traffic accidents etc. Then, it is necessary to always store the materials for emergency works in site office of the County Unit.

14.4.2.3 Operation and Maintenance Activities

(1) Assumed Maintenance Works

Road maintenance works are roughly divided into five categories, such as Maintenance Works, Improvement Works, Traffic Control Works, Countermeasures for Traffic Accident, Toll Collection Works. Then, a proposal of responsible organization and the detailed activities in each works for Tan Vu - Lach Huyen Highway are shown in Table 14.4.2-5 by referring to the actual road maintenance activities in Japan

Table 14.4.2-5 Concrete Activities of the Maintenance Works

No	Type of Work	Breakdown	Responsible Organization	Detailed Activities
1	Maintenance Works	Road Inspection	RRMC County Unit	Data of road surface condition are regularly collected, and the damages condition of the roads is understood. The bridges are regularly inspected. Especially, it is important to do the visual inspection of the lower side of the box bridge directly.
		Routine Maintenance	RRMC County Unit	Pavement, lighting, bridge accessories, and drains etc. are regularly cleaned.
		Periodic Maintenance	RRMU (RRMC)	Maintenance and repair plan for damages are prepared based on the inspection result, and maintenance and repair works are executed based on it. The overlay of the pavement, the waterproof work s on the bridge slab, and replacement of expansion joints of the bridges are assumed.
		Emergency	RRMC County Unit (RRMU)	The road facilities which get damages by the traffic accidents and the natural disasters are repaired. In general, firstly temporary countermeasures are executed to secure the traffic flow and full-scale countermeasures will be done after making the plan and procure the budget for the work.
2	Improvement Works	Rehabilitation	RRMU (RRMC)	If the road facilities are damaged, and damage might, progress, the rehabilitation works will be done so that the life of the facilities may extend.
		Reconstruction	PMU	If the road facilities are greatly damaged and the recovery is difficult, re-constructs works will be done.
3	Traffic Control Works	Patrolling	RRMC County Unit	Traffic patrolling is needed to observe the traffic flow besides the patrol for road inspection.
4	Countermeasures for Traffic Accidents	Accident Handling	Traffic Police RRMC County Unit	Basically, the traffic police has a responsibility for the handing of the traffic accidents, and the road operator does the assistance to the police The road operator is requested immediately to repair the damaged road facilities to secure traffic due to the accident.
		Ambulance	Traffic Police	Basically, the traffic police call into action.
		Fire engine	Traffic Police	-ditto-
		Towing car	Traffic Police	-ditto-
5	Toll Collection Works	Toll Collection	—	Since Tan Vu - Lach Huyen Highway is the non toll road, toll collection work is not necessary.

Note: For bridge maintenance, there are 3 different regulations of DRVN which are corresponding to the 3 different size of the bridge, with the length less than 25m; from 25m to 300m; and greater than 300m.

Source: Study Team

(2) Special Techniques Needed for Tan Vu - Lach Huyen Highway

The features in Tan Vu - Lach Huyen Highway (road and bridge) are shown as follows:

- Viaducts and embankment shall be constructed on soft and marshy ground and ponds.
- 5km long bridge shall be constructed over the sea.
- Access should be controlled as Tan Vu - Lach Huyen Highway connects Lach Huyen International Port to Hanoi - Haiphong Expressway.
- Two-way traffic (two-lane each way) shall be adopted at the bridge section for use during the first stage construction of the bridge.

Then, a special operation and maintenance technique that can correspond to those features can be requested during the operation and maintenance period. The special techniques and counter measures needed are shown in Table 14.4.2-6.

Table 14.4.2-6 Needed Operation and Maintenance Technique for Tan Vu - Lach Huyen Highway

Needed Operation and Maintenance Technique	
1. Maintenance Technique (Bridge)	
Items	Inspection technology for marine bridge ,viaduct
Subject	It is important to carry out the appropriate maintenance works based on the periodic investigation result.
Countermeasure	i) About inspection of the box girder, inside of the girder can be inspected by walking internally; on the other hand, outside of the girder cannot be inspected because there is no pedestrian path attached the girder. Then, it proposes to execute the inspection regularly with the vehicle for the inspection as shown in the below photograph. [Reference 1-1] ii) In the inspection result, when the cracks etc. are seen, it is important to repair the seal etc. promptly. If the rust of the reinforcement bar in the concrete is generated caused by the crack, it is important to do the countermeasures to it because damage of the structure expands rapidly in the marine bridge. And, it is necessary to prepare the bridge inspection and repair manual. [Reference 1-2]

[Reference 1-1] Vehicle to inspect the marine bridge

Inspection vehicle

Inspection for outside of the girder
Source: http://image.search.yahoo.co.jp/search?rkf=2&ei=UTF-8&p

[Reference 1-2] Repairing methods of concrete crack

Injector installation

Crack bond injection

Grinding after injection

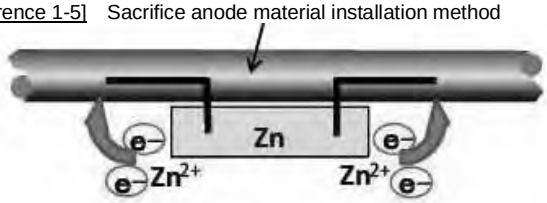
Source: http://aoi-chemical.co.jp/execution/repair14.html

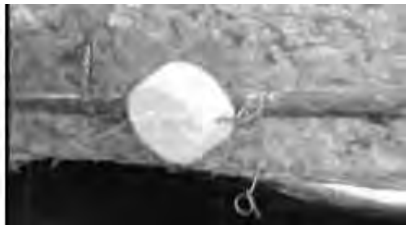
Items	Counter measures for the damage by salt in the structure
Subject	Strength of the structure decreases because the damages in the structure are expanded by the salt.
Countermeasure	Countermeasures for salt damage in a concrete structure are adopted the following four methods according to the situation of the salt damage. i) Electrochemical desalination method [Reference 1-3], ii) Electrochemical anti-corrosion method [Reference 1-4], iii) Sacrifice anode material installation method [Reference 1-5], and iv) Surface coating method [Reference 1-6]

[Reference 1-3] Electrochemical desalination method

[Reference 1-4] Electrochemical anti-corrosion method

[Reference 1-5] Sacrifice anode material installation method





[Reference 1-6] Surface coating method

Source: http://www.fujips.co.jp/wp-content/uploads/2011/02/807e4ee250b028e75cf9fc9c57043a2e.pdf

2. Maintenance Technique (Road)	
Items	Counter measures for Subsiding embankment by soft soil Embankment
Subject	i) Unequal subsidence of embankment, ii) Unequal subsidence on embankment slope, iii) Un stabilization of embankment slope, iv) Residual settlement after open to the traffic [Reference 2-1]
Countermeasure	i) Preloading for a traffic load is constructed and the subsidence is ended. The foundation ground is replaced with the soil equal with the embankment The subsidence generated after open to the traffic is repaired by overlay. [Reference 2-2] ii) Height of the embankment is kept by the overlay. If the amount of subsidence can be allowed, the interception wall to the subsidence is installed in the vicinity of the embankment slope. [Reference 2-2] iii) The stability of the slope is examined and confirmed. Slow fill up the embankment to increases the strength of the foundation ground. If the stability is not satisfied, ground improvement method such as deep-mixing-method will be constructed at the edge of the embankment slope iv) Frequent overlay will be planned taking into account the residual settlement. [Reference 2-2]

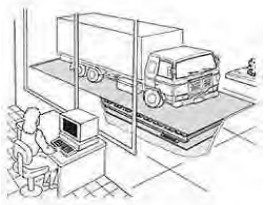
[Reference 2-1] Situation of subsidence on embankment and slope

[Reference 2-2] Correction of subsiding embankment by overlay and interception wall installation to the subsidence

Source: http://www.ktr.mlit.go.jp/kangi/kengaku/techno-kan/shutten/kouen/data/kouen6_kouenkobasi.pdf#search'

3. Traffic Safety	
Items	Heavy Vehicles Regulation of overloaded vehicles
Subject	The overloaded vehicles related to the harbors might cause the damage of the road and the bridge
Countermeasure	Weighbridge is installed in the entrance of the harbors side of Tan Vu-Lach Huyen Highway, and overloaded vehicle will be controlled. [Reference 3-1] and [Reference 3-2]

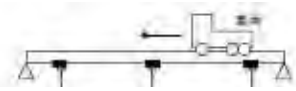
[Reference 3-1] present model weighbridge



Sketch of weighbridge

Measurement

[Reference 3-2] "weigh-in-motion system" by which vehicle can be weighed while running



Position where strain gauges are set up (ends and center, 3 positions),
The strain amount is measured, weight is presumed, and the overloaded vehicle is warned.

Source: http://www.nilim.go.jp/japanese/technical/bwim/program/kaisetsu.pdf#search'

Items	Two-way traffic safety countermeasures
Subject	Four lanes of two-way traffic will be constructed on the bridge by the stage construction, and there is a high possibility to occur the traffic accident of head-on collision
Countermeasure	Center poles are installed along the center line, and the driving lanes are clarified. The occurrence of the traffic accidents are decreased by the functions of center poles that are preventing the invasion to an opposite lane and preventing the U-turn on the bridge. [Reference 3-3]

[Reference 3-3] Traffic safety facilities at the center line

Center poles in expressway in Japan

Center poles of ordinary road in Japan

Source: http://image.search.yahoo.co.jp/search?rkf=2&ei=UTF-8&p

4. Traffic Control	
Items	Traffic information ITS (Information providing at the emergency etc)
Subject	Tan Vu-Lach Huyen Highway is designed as the access control highway that is no entrance and exists for 15km length of highway. If there is an obstacle on the road and traffic is closed, vehicles need to do the U-turn on the road. However, it's very difficult to do the U-turn on the stage constructed 4 lanes bridge for the trailers and the semitrailers.
Countermeasure	It proposes to install the variable message boards at both ends of the road that informs the traffic information to the road users. Since the variable message boards is a facilities for sending the real time information, information collection and processing facilities are also equipped. [Reference 4-1]

[Reference 4-1] Traffic Information System

Information collection and processing facilities

Variable message boards

Source: http://www.nagoya-denki.co.jp/jp/product_info/loadinfo.html

Source: Study Team

14.4.3 Contract Method for Operation and Maintenance Works

Recent topics about the road maintenance activities in Vietnam that are described in Chapter 1.2.2 are as follows: i) the privatization of RRMCs and ii) the introduction of the Performance-Based Maintenance Contracting (PBMC). It is possible that the operation and maintenance activities of Tan Vu - Lach Huyen Highway shall be affected by these new policies.

As mentioned in Chapter 1.2.2.1., the road operation and maintenance companies that manage the national highways where a central government has authority are scheduled to be privatized by 2015. RRMC (240) with the possibility of managing Tan Vu-Lach Huyen Highway is also planned to be privatized. On the other hand, RRMC (Overland Road Company) of the operation and Maintenance Company of Hai Phong PDOT do not plan to privatize. In the viewpoint of doing an efficient and sufficient management of roads, the private management company is desirable. Moreover, PBMC that is carried out at several roads as a pilot project now will widely spread to the whole country in the future according to the government policy. Then, it is very significant in Tan Vu-Lach Huyen Highway to examine the introduction of PBMC.

14.4.4 Estimated Cost for Operation and Maintenance Activities

14.4.4.1 Method of Estimation

Factors of the road structure to determine standard unit price (per Km) for the road maintenance work are as follows: i) Number of Lanes, ii) Type of Pavement, and iii) Traffic Volume and Character. The criteria to determine the road maintenance budget are as follows: i) Existing condition、ii) Available resources、iii) Condition of materials、iv) NORM of quotation of routine maintenance.

In this study, the maintenance cost calculated by the SAPROF study of this project in 2010 is verified by the comparison with the actual maintenance expenditure of DRVN, RRMU2 and RRMCs. As a

result, the maintenance cost needed for the operation and maintenance of Tan Vu - Lach Huyen Highway (road and bridge) has been calculated. An outline of each calculation method for operation and maintenance cost is shown in Table 14.4.4-1.

Table 14.4.4-1 Outline of Each Calculation Method for Operation and Maintenance Cost

Method	Outline of Each Method	Details
Method-1	Calculation Result for Operation and Maintenance Cost by SAPROF Study in 2010	Operation and maintenance cost of Tan Vu Lach Huyen Highway is calculated by the assumed unit price for each works that are 40% of unit price in Japan.
Method-2	Actual Cost of DRVN, RRMU2, and RRMC by Survey Results of This Study	In this study, actual annual operation and maintenance cost of DRVN, RRMU2, Hai Pong PDOT, RRMC240, 236, Overland Road Company are surveyed, and operation and maintenance cost per km are calculated.
Method-3	Actual Maintenance Cost of NH 3, PhapVan-CauGie Expressway, Bai Chay Bridge, Can Tho Bridge and My Thuan Bridge, and Actual Pavement Overlay Cost are obtained from DRVN.	Data for the operation and maintenance cost of roads and bridges that are the similar scale to Tan Vu Lach Huyen Highway is acquired in DRVN, and operation and maintenance cost per km are calculated.

Source: Study Team

14.4.4.2 Results of Estimation

(1) The calculation result for maintenance cost of Tan Vu - Lach Huyen Highway

1) Routine maintenance cost

Table 14.4.4-2 shows the result of calculated routine maintenance cost of Tan Vu Lach Huyen Highway referring to the above-mentioned data. Consequently, 7,631 mil VND (4 lanes) and 11,400 mil VND (6 lanes) are needed annually.

Table 14.4.4-2 Routine Maintenance Annual Cost

Items	Unit Cost (mil VND/km)	Length (km)	Cost (mil VND)	Remarks
Road	215	10.19	2,191	[Method-2] 140 mil VND (RRMC (236)) of maximum value of routine maintenance cost (road) is adopted, and consider the sufficiency ratio of the maintenance budget (65%).
Bridge	1,000	5.44	5,440	[Method-3] 1,027 mil VND of actual value of routine maintenance cost (bridge) of Can Tho Bridge is adopted.
Total		15.63	7,631	4 lane
		15.63	**7,600**	4 lanes(round to the nearest multiple of 100)
		15.63	**11,400**	6 lanes(4lanes ×4/6)

Note: Detailed data of routine maintenance costs are attached in Appendix-4.

Source: Study Team

2) Periodic maintenance cost

In periodic maintenance, costs of asphalt pavement overlay, waterproof replacement on bridge slab and expansion joints replacement for bridges are calculated as expected actual works. As for the construction frequency, the pavement overlay and waterproof replacement works are assumed every 10 years and expansion joint replacement works are assumed every 15 years. Periodic maintenance cost calculated based on the above-mentioned is shown in Table 14.4.4-3.

Table 14.4.4-3 Periodic Maintenance Cost for 10 Years

Type of Works	Year (after open to the traffic) (mil VND)				Remarks
	0 - 9	10 - 19	20 - 29	30 - 34	
Asphalt pavement overlay	65,646	98,601	98,601	—	[Method-3] Actual unit cost in Vietnam
Waterproof replacement	36,111	36,111	36,111	—	[Method-1] Unit cost by SAPROF
Expansion joints replacement	—	19,000	—	19,000	-ditto-
Total	101,757	153,712	134,712	19,000	/15.63km
	101,800	**153,700**	**134,700**	**19,000**	(round to the nearest multiple of 100)

Note: Detailed data of periodic maintenance costs are attached in Appendix-4.

Source: Study Team

3) Calculation result for the operation and maintenance cost of Tan Vu - Lach Huyen Highway

Future operation and maintenance costs for 35 years after Tan Vu Lach Huyen Highway opens the traffic is calculated based on the above-mentioned result as shown in Table 14.4.4-4.

Table 14.4.4-4 Estimate of Future Operation and Maintenance Cost

Kind of Works	Year (Unit: mil VND)										Total
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Initial Investment	2,000	—	—	—	—	—	—	—	—	—	2,000
Routine Maintenance	7,600	7,600	7,600	7,600	7,600	7,600	7,600	7,600	7,600	11,400	79,800
Periodic Maintenance	—	—	—	—	—	—	—	—	—	101,800	101,800
Total	9,600	7,600	7,600	7,600	7,600	7,600	7,600	7,600	7,600	113,200	183,600
aggregate	9,600	17,200	24,800	32,400	40,000	47,600	55,200	62,800	70,400	183,600	183,600
	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Total
Routine Maintenance	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	114,000
Periodic Maintenance	—	—	—	—	—	—	—	—	—	153,700	153,700
Total	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	165,100	267,700
aggregate	195,000	206,400	217,800	229,200	240,600	252,000	263,400	274,800	286,200	451,300	451,300
	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	Total
Routine Maintenance	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	114,000
Periodic Maintenance	—	—	—	—	—	—	—	—	—	134,700	134,700
Total	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	146,100	248,700
aggregate	462,700	474,100	485,500	496,900	508,300	519,700	531,100	542,500	553,900	700,000	700,000
	2045	2046	2047	2048	2049	Total	—	—	—	—	—
Routine Maintenance	11,400	11,400	11,400	11,400	11,400	57,000	—	—	—	—	—
Periodic Maintenance	—	—	—	—	19,000	19,000	—	—	—	—	—
Total	11,400	11,400	11,400	11,400	30,400	76,000	—	—	—	—	—
aggregate	711,400	722,800	734,200	745,600	776,000	776,000	—	—	—	—	—

Note: Office operation cost is included in the routine maintenance cost.

Source: Study Team

(2) Verification of the estimated maintenance cost of this study

Table 14.4.4-5 shows the whole maintenance cost of combined routine and periodic maintenance costs by SAPFOR.

Table 14.4.4-5 Routine and Periodic Maintenance Cost Estimation by SAPROF

	Items	Cost (mil VND)	Remarks
1	Office Operation Cost (10 times annual cost)	26,140	
2	Routine Maintenance and Repair Cost (10 times annual cost)	148,610	
3	Periodic Maintenance Cost	64,747	
Total		**239,497**	**15.88km/10 years**
		1,508	**/km/year**

Source: Study Team

In the same way, Table 14.4.4-6 shows the whole maintenance cost of combined routine and periodic maintenance costs by this study.

Table 14.4.4-6 Routine and Periodic Maintenance Cost Estimation by This Study

	Items		Cost (mil VND)	Remarks
1	Office Operation Cost (10 times annual cost)		—	
2	Routine Maintenance and Repair Cost	(year 2015 –2023)	68,400	7,600×9
	-ditto-	(year 2024 –2049)	296,400	11,400×26
3	Periodic Maintenance Cost	(year 2015 –2024)	101,800	
	-ditto-	(year 2025 –2034)	153,700	
	-ditto-	(year 2035 –2044)	134,700	
	-ditto-	(year 2045 –2049)	19,000	
Total			**774,000**	**15.88km/35 years**
			1,393	**/km/year**

Source: Study Team

Regarding the whole maintenance cost for Tan Vu Lach Huyen Highway: 1,508 mil VND and 1,393mil VND are estimated by SAPROF and this study respectively. The value of SAPROF is 108% to this study value. Equally, routine maintenance cost of Can Tho Bridge (1,027 mil VND/km/year) is 74% to this study value. It is judged that 1,393 mil VND is appropriate because it doesn't differ much from SAPROF's value and actual long bridge maintenance costs. On the other hand, 252 mil VND of actual expenses in RRMC (240), that is, the maximum value of whole maintenance cost in all organizations surveyed area, is only about 18% to this study value, and actual maintenance cost has a large difference from this study value. It is important that the road management organization acquires an appropriate maintenance budget based on the maintenance plan to do appropriate maintenance works.

CHAPTER 15 COST ESTIMATE AND PROCUREMENT

15.1 The Policy of The Cost Estimate for Road and Bridge Portion

15.1.1 Application Standard and Related Laws and Regulations

15.1.1.1 Construction expenses guideline

- Circular No. 04/2010/TT-BXD on 26/5/2010 of Ministry of Construction on Formulation and management manual of investment construction expenses.

15.1.1.2 Cost Estimate Standard and Laws

- Decision No. 957/QĐ-BXD dated 29/9/2009 of Ministry of Construction announcing standard rates of management and consultancy cost of construction investment project.
- Capital construction norms for work construction part: refer to the norms enclosed to the letter No. 1776/2007/BXD-VP dated 16 August 2007 of the Ministry of Construction.
- Capital construction norms for installation part: refer to the norms enclosed to the letter No. 1777/2007/BXD-VP dated 16 August 2007 of the Ministry of Construction.
- The norm on maternace of public ligting system No. 2274/BXD-VP dated November 10, 2008 of the Ministry of Construction.
- Document No. 2565/BXD-KTCL dated 29/11/2006 on application of traffic safety cost.
- Letter No. 1784/BXD-VP dated 16 August 2007 of the Ministry of Construction issued the norms for materials.
- Decision No. 131/2007/QD-TTg dated 9/8/2007 of Prime Minister of Vietnamese government about publishing regulation of foreign consultant choosy cost in construction activities in Viet Nam.
- Decision No. 33/2004/QD-BTC dated 12/4/2004 of Ministry of Finance about insuarance fee.
- Decree No. 123/2008/ND-CP dated 08/12/2008 of Vietnamese Goverment about VAT law
- Circular No. 194/2010/TT-BTC of December 6, 2010, guiding customs procedures; customs inspection and supervision; import duty, export duty and tax administration applicable to imports and exports (MOF)

15.1.1.3 Material Price

- Material price announcement No. 41/2012/SXD-CBG of Hai Phong People Committee dated 12/7/2012. Other spencial materials are estimated according to price announcement of supplier.

15.1.1.4 Labor Cst

- Decree No. 70/2011/ND-CP dated 22nd Aug 2011 by the Goverment providing area minimum wages rates for employees working companies, enterprises, co-operative, co-operative groups, farms, family households, individuals and other Vietnamese organaizations which hire employees.

15.1.1.5 Lease Cost of Costruction Equipment

- Machine prices mainly based on “List of machine shift prices and construction equipment” No. 131/QD-UBND of Hai Phong People Committee dated 26/01/2011.

15.1.1.6 Unit Price

- Unit price of construction No. 2542/QĐ-UBND dated 17/12/2009 of Hai Phong People Committee.
- Unit price of installation No. 2538/QĐ-UBND dated 17/12/2009 of Hai Phong People Committee.

15.1.1.7 Application of a Japanese cost estimate standard

Since there are not steel pipe pile and a SBS construction method in the Vietnam standard, they apply a Japanese standard. The Japanese standard to apply is as follows.

Table 15.1.1-1 Application of a Japanese cost estimate standard

Application standard title	Editorial supervision	Version
Ministry of Land, Infrastructure and Transport public works cost estimate standard	Ministry of Land, Infrastructure and Transport	2011
Cost estimate of bridge erection	Japan Construction Mechanization Association	2011
Construction machinery hire table	Japan Construction Mechanization Association	2010

Source: JICA study team

The composition of the laborer in connection with construction of a SBS construction method makes Japanese people those who are engaged in technical guidance.

Table 15.1.1-2 The composition of the labour in SBS construction method

Laborers' classification	Japanese	Vietnamese
Bridge labor organizer		O
Bridge specialist		O
Labor organizer		O
Usually worker		O
Technician		O
Scaffold erector		O
Reinforcement worker		O
Form worker		O
Special driver		O
Usually driver		O
Welder		O
Bridge painter		O
Electric worker		O
Traffic control worker		O
Waterproofing worker		O

Source: Study Team

15.1.2 Construction Cost Structure

Construction cost structure is base on the current Vietnamese standard, Circular No 04/2010/TT-BXD dated May 26, 2010 and issued by the Ministry of Construction (MOC).

Table 3-6 of the above-mentioned standard is shown.

Table 3.6. CONSTRUCTION EXPENSES SUMMARY IS CALCULATED CONSUMPTION OF MATERIAL, LABOR AND MACHINE AND CORRESPONDED PRICE TABLE

ORD	CONTENT OF EXPENSES	FORMULA	AMOUNT	SYMBOL
I	DIRECT EXPENSES			
1	Material expenses	From table 3.5		VL
2	Labor expenses	From table 3.5		NC
3	Machine expenses	From table 3.5		M
4	Other direct expenses	(VL+NC+M) x tỷ lệ		TT
	Direct expenses	VL+NC+M+TT		T
II	General Expenses	T x rate		C
III	Pre-Determined Taxable Income	(T+C) x rate		TL
	Pre-tax construction expenses	(T+C+TL)		G
IV	VAT	$G \times T^{GTGT-XD}$		GTGT
	After-tax construction expenses	G + GTGT		G_{XD}
V	Expense for Building make-shift House on Construction Sites for Accommodation and Construction Management	$G \times rate \times (1+ T^{GTGT-XD})$		G_{XDNT}
	TOTAL	$G_{XD} + G_{XDNT}$		

Source: Circular No 04/2010/TT-BXD (MOC)

The adoption rate of each item is as follows by regulation of Circular No 04/2010/TT-BXD.

Table 15.1.2-1 Adoption Rate of Construction Expenses

Item	Rate
Other direct expenses	2.0%
General Expenses	5.5%
Pre-Determined Taxable Income	6.0%
VAT	10%
Expense for Building make-shift House on Construction Sites for Accommodation and Construction Management	2.0%

Source: Circular No 04/2010/TT-BXD (MOC)

15.1.3 Conditions of Cost Estimate

15.1.3.1 Time of Cost Estimate

Time of cost estimate is June 2012.

15.1.3.2 Currency

Japanese Yen (JPY) is used as F/C while Vietnamese Dong (VND) is used as L/C in this detail design.

15.1.3.3 Exchange Rate

Annex-1 of M/D as of March 19, 2010 exchanged between JICA and Vietnam is followed.

- VND 1=JPY 0.00532
- USD 1=JPY 90.5=VND 17,002

An exchange rate is due to be changed into the rate defined by L/A after L/A conclusion.

Present exchange rate: The construction costs which use the present exchange rate by the request of MOC were computed.

- VND 1=JPY 0.0037375
- USD 1=JPY 77.96=VND 20,860

15.1.3.4 The Currency Classification and The Tax in Project Cost Item

Table 15.1.3-1 The Currency Classification and The Tax in Project Cost Item

Project Expense Item	FOREIGN CURRENCY (JPY)	LOCAL CURRENCY (VND)
I.JICA Loan Eligible Portion		
1.Construction Cost		
1)Direct construction cost	The currency was determined based on labor's nationality, procurement place of material and equipment	
a.Material cost	material requiring individual import procedure	material distributed domestically
b.Labor cost	foreign nationality	Vietnamese labor
c.Equpment cost	equipment requiring individual import procedure	equipment distributed domestically
d.Other direct cost	Shipping cost for equipment requiring individual import procedure	-----
2)Indirect construction cost	others	Cost required at the site
e.Management cost	Travel expense for foreign nationality	others
f.Overhead and Profit	The cost was in F/C since it is expense of contractor's headquarter	-----
2.Price contingency	The cost was classified by the ratio of F/C and L/C of the cost requiring contingency	
3.Physical contingency	The cost was classified by the ratio of F/C and L/C of the cost requiring contingency	
4.Consulting services	Followed Annex I of M/D between JICA and GOVN dated on March 19, 2010	
II.State Budget Portion		
5.Environmental Management and Monitoring Cost	-----	The cost was in L/C since it was expense in Vietnam
6.Administration cost		
7.Value Added Tax (VAT)		The cost is in L/C
8.Inport Tax		Pay in Vietnam

Source: Study Team

15.1.3.5 Price Contingency Rate

The same rate as SAPROF is used.

- F/C : 1.8% per annum
- L/C : 10.3% per annum

15.1.3.6 Physical Contingency Rate

In accordance with Circular No. 04/2010/TT-BXD on 26/5/2010 of Ministry of Construction, it is made to 5%.

15.1.3.7 Interest During Construction

The same rate as SAPROF is used.

- Construction cost : 0.2% per annum
- Consulting services : 0.01% per annum

15.1.3.8 Commitment Charge

Annex-1 of M/D as of March 19, 2010 exchanged between JICA and Vietnam is followed.

- Loan amount × number of years of disbursement period × 0.1%

15.1.3.9 Administration Cost

In accordance with Circular No. 04/2010/TT-BXD on 26/5/2010 of Ministry of Construction, it is made to 5%.

15.1.3.10 Value Added Tax

In accordance with Circular No. 32/2007/TT-BTC dated 9/4/2007 of Ministry of Finance, it is made to 10%.

15.1.3.11 Import Tax

Annex-1 of M/D as of March 19, 2010 exchanged between JICA and Vietnam is import tax 3.0%.

However, in drawing up a final report, it was required that DRVN should change an import tax to 10%. We made the import tax 10% according to this DRVN's request.

15.2 Project Cost

15.2.1 Structure of Project Cost

Composition of Bill item of Project cost is made into the following item from the classification of road structure.

Although contained in general, since the rate of occupying to a whole cost of construction is large, temporary facilities shall be divided into seven items by the request of MOT, and shall be measured.

Table 15.2.1-1 Composition of Bill item of Project cost

Bill Item No.		Bill Item
A1		**General**
A2		**Temporary Facility**
	A2-1	Entrance Access Road
	A2-2	Site Access Road
	A2-3	Site Compound
	A2-4	Temporary Birdge
	A2-5	Dredging to Open a Temporary Channel
	A2-6	Temporary Jetty for Loading and Unloading
	A2-7	Temporary water Cutoff
B		**Road Works Hai An Side**
	B1	Highway in Dinh Vu
	B2	Cam River Bridge
	B3	Soft Soil Ground Improvement
	B4	Drainage Culvert
C		**Approach Bridge Hai An Side**
	C1	Superstructure
	C2	Substructure
D		**Main Bridge**
	D1	Superstructure
	D2	Substructure
E		**Approach Bridge Cat Hai Side**
	E1	Superstructure
	E2	Substructure
F		**Road Works Cat Hai Side**
	F1	Highway
	F2	Soft Soil Ground Improvement
	F3	Drainage and Underpass Culvert
G		**Lighting and Electrical**
H		**Provisional Sums**

Source: Study Team

15.2.2 Project Cost

This project cost calculates that expense based on the detail design which JST carried out, and was revised in response to the detailed check of Vietnam side (MOC,DRVN and PMU-2)

15.2.2.1 Verification Cost of MOC

MOC did the next assessment to the project cost which the consultant proposed.

(1) Verification Principle of MOC

1) The content, structure of cost items in the cost estimate compliance with the provisions of Circular No. 04/2010/TT- BXD dated 26/5/2010 of the Ministry of Construction for guiding the establishment and management of investment and construction costs;

2) The volume of work is compared with the design documents provided by the investor. The volume of work that is not enough basis to determine or not shown in the design documents is temporarily used according to the recorded data proposed by the consultant;

3) Norms, construction unit prices:

- For the work which is not included in the published norms is applied according to the norms of the similar work.
- For work which is not included in the announced norm system and calculated on the basis of norms of Japan, the cost estimate after verifying is only considered the corresponding between the content of extracted norms of consultant with the work included in the estimate.
- Materials cost included in the cost estimate based on the announcement of construction materials of Hai Phong city. Some materials which are not included in that announcement or included but not consistent with the actual price ground are temporarily calculated on the basis of the quotations of suppliers or temporarily calculated at the request of the consultants with the approving of investor at the time of the verification. Particularly, a number of imported materials such as: steel piles, prestressed cables, etc. are imported from Japan should be examined based on the quotations of the providing organizations and method of material price calculation was approval by consultant and investor.
- Construction machine price is calculated based on the price table of construction machinery and equipment of Hai Phong city, prices of raw materials, fuel, labor salaries at the time of examination. For some types of specialized machinery appointed to hire directly from Japan by the consultant, rent price of these machines is temporarily calculated according to the recorded data of the consultant and was approved by the investor.
- Some unit prices, costs which are insufficient basis to determine as noted above are temporary calculated as proposal of the consultant.
- The distance, mine plans, materials transportation, structures in verified cost estimate are determined as proposal of the consultant. Material transportation cost is referenced in table of transportation price of Quang Ninh province and was adjusted to suit each type of building materials.
- Depreciation period, steel pile recycle plans are determined as proposal of the consultant. Depreciation period of steel materials of SBS beam segment moulding with provisional execution time is about 465 days.
- The rate of depreciation, repairs and other expenses, annual number of machines of SBS equipment is referenced to the norms for beams execution in Circular No. 06/2010/TT-BXD of the Ministry of Construction.
- Provisional import tax of 10% on the value of imported goods.
- The verified cost estimate does not include the recoverable value of unloading materials, demolition.
- A number of cost items such as: the cost of projects establishing, the cost of supervision

consultants, procurement support, the cost of project verification, the cost of technical design verification, cost estimates, cost of demining and explosives is taken according to the value offered by the project Management 2.

- Rate in cost estimate is 1 Japanese Yen = 267.56 Vietnam Dong as announcement of the Bank for Foreign Trade of Vietnam at the time of September 2012.

(2) MOC's Result of Cost Estimate Verification

Based on above principles, the cost estimate of Project of Construction of motorways Tan Vu - Lach Huyen, Hai Phong City after verification is 10,823,185,117,000 VND

Table 15.2.2-1 Verification Cost of MOC

No.	Cost Item	Value of Consultant (VND)	Value of Verifier (VND)	(+) Increase (-) Decrease (VND)
1	Construction Cost	8,395,683,786,101	7,715,929,761,595	-679,754,024,506
2	Project management Cost	32,618,671,937	36,559,439,828	3,940,767,891
3	Consultancy and Other Cost	880,452,281,201	1,046,200,931,834	245,748,650,633
4	Provisional Cost	2,421,065,355,842	2,024,494,984,195	-396,570,371,646
5	Total Cost	11,649,820,095,081	10,823,185,117,452	-826,634,977,628
	Rounded value	11,649,820,095,000	10,823,185,117,000	-826,634,978,000

Source: MOC Letter No. 1009/VKT-BDS

15.2.2.2 Approved Cost of DRVN

Appraisal base of cost estimate is as follows:

(1) Norms

- For the work items exists in local norm system: applied local norm

- For those items doesn't exists in local norm system: could be applied the norm of ongoing ODA projects in Vietnam which have work nature similar to Project of Hanoi – Hai Phong highway, Project of Construction of Nhat Tan bridge, etc. For the norms related to SBS beam as it is new technology in Vietnam, so they are uniformly applied the norm of Association of Japanses mechanical construction engineer in 2011 and the norm of public works of the Ministry of Land Infrastructure and Transport of Japan in 2010.

- Depreciation of SBS erection girder equipment: The JST suggested the ratio of 90% according to the general rule of Japan. However, according to the calculation method of machinery and equipment depreciation issued by Ministry of Construction, the depreciation cost of local erection girder equipment is about 43% / 36 months. So, the parties agreed to apply the depreciation ratio of formwork scaffolding in a period of 20 months in salt water environment of about 50%.

(2) Material Price

- For the local material: applied according to the local quotation including freight to construction site, the massive volume materials such as soil filling, sand, stone, etc are applied according to quotation at the mine or local yards and transported to construction site. As Hai Phong city doesn't promulgate the material freight so it is uniformly applied the freight of Quang Ninh province.
- For the material under STEP condition (material originating from Japan): prioritize the local materials produced by the joint venture company with Japanese manufacturers such as cement, steel pipe, etc.
- For the special materials imported from Japan, not available in country: their price need to be based on quotation of 03 manufacturers. Where the manufacturer is not enough 03, it is necessary to add the reliability coefficient (01 manufacturer then additional coefficient is 0.85; 02 manufacturers then additional coefficient is 0.9) according to the guide No. 69 dated 01/10/2005 on the determination of material prices in HOKUEI city of Japan.

(3) Unit Price of machine shift

For the unit price of machine shift, maximum use the local issued unit price. Where equipments are not available in country or do not have announced price, using the published price of Association of Japanese mechanical construction engineer in 2011.

(4) Labor Cost

- Ranking factor is applied on the basis of Decree No. 205/2004/ND-CP dated 14/12/2004 prescribing the system of salary scales, salary tables and salary allowance regimes in State companies.
- The region-based minimum wage level based on the guidance in Decree No. 70/2011/ND-CP dated August 22, 2011 of the Government providing for region-based minimum wage levels for laborers working for Vietnamese companies, enterprises, cooperatives, cooperative groups, farms, households and individuals and other organizations employing laborers.

(5) Cost estimate value after appraisal

Table 15.2.2-2 Approved Cost of DRVN

Item	Construction cost in adjusted E.C	Submitted value	Appraisal value	Difference
1	2	3	4	5=4-3
Package Value in Equivalent to VND	10,283,848,869,000	10,348,484,100,000	10,186,044,572,000	-162,439,528,000
Construction cost in equivalent to VND	8,086,852,674,000	8,088,701,354,000	8,002,139,387,000	-86,561,967,000
- Foreign currency (JPY)	11,971,573,900	10,977,076,000	10,846,828,000	-130,248,000
- Local currency (VND)	4,883,755,97,000	5,151,690,965,000	5,099,978,049,000	-51,712,916,000
Conversion contingency cost VND	2,196,996,195,000	2,259,782,746,000	2,183,905,185,000	-75,877,561,000
- Foreign currency (JPY)	1,277,367,000	1,131,620,000	1,157,357,000	25,737,000
- Local currency (VND)	1,855,225,760,000	1,957,008,054,000	1,874,244,450,000	-82,763,604,000

Source: DRVN Letter No. 1198/CQLXDDB-TD1

BẢNG TỔNG HỢP DỰ TOÁN XÂY DỰNG / SUMMARY OF PROJECT COST

DỰ ÁN ĐƯỜNG Ô TÔ TÂN VŨ - LẠCH HUYỆN, THÀNH PHỐ HẢI PHÒNG

(Kèm theo Quyết định số /QĐ-TCĐBVN ngày tháng 11 năm 2012)

TT	NG M	Items	NGOẠI TỆ/ FOREIGN CURRENCY (JPY)	NỘI TỆ / LOCAL CURRENCY (VND)	QUY ĐỔI NỘI TỆ/ COMBINED CURRENCY in VND
A1	**Hạng**	**General Requirements**	**229,034,884**	**92,007,830,068**	**153,288,066,552**
A2	**Công**	**Temporary Facilities**	**500,723,267**	**904,080,595,800**	**1,038,053,376,342**
	A2-1	Entrance Access Road	0	6,529,346,326	6,529,346,326
	A2-2	Site Access Road	0	371,232,318,645	371,232,318,645
	A2-3	Site Compound	0	154,164,959,139	154,164,959,139
	A2-4	Temporary Birdge	34,306,935	9,168,095,887	18,347,208,809
	A2-5	Dredging to Open a Temporary Channel	5,604,927	286,112,701,965	287,612,348,058
	A2-6	Temporary Jetty for Loading and Unloading	276,203,661	44,205,916,961	118,106,562,020
	A2-9	Temporary water Cutoff	184,607,745	32,667,256,878	82,060,633,345
B	**Đườn**	**Road Works Hai An**	**225,783,289**	**764,590,830,752**	**825,001,075,325**
	B1	Highway	18,284,815	241,427,455,445	246,319,713,518
	B2	Cam River Bridge	139,348,265	115,252,906,445	152,536,723,045
	B3	Soft Soil Ground Improvement	53,589,980	390,526,873,764	404,865,329,951
	B4	Drainage Culvert	14,560,230	17,383,595,098	21,279,308,811
C	**Cầu d**	**Approach Bridge Works Hai An**	**8,363,828,344**	**1,004,409,594,174**	**3,242,223,197,822**
	C1	Superstructure	5,945,449,943	501,785,606,029	2,092,541,443,548
	C2	Substructure	2,418,378,401	502,623,988,145	1,149,681,754,274
D	**Cầu c**	**Main Bidge Works**	**785,227,638**	**284,678,173,727**	**494,772,525,080**
	D1	Superstructure	363,520,463	240,883,786,422	338,146,786,483
	D2	Substructure	421,707,175	43,794,387,305	156,625,738,598
E	**Cầu d**	**Approach Bridge Works Cat Hai**	**656,641,704**	**234,147,944,192**	**409,838,032,121**
	E1	Superstructure	333,250,778	101,176,738,097	190,340,825,905
	E2	Substructure	323,390,925	132,971,206,095	219,497,206,216
F	**Đườn**	**Road Works Cat Hai**	**84,457,758**	**732,588,374,396**	**755,185,767,890**
	F1	Highway	16,593,412	336,135,937,650	340,575,646,498
	F2	Soft Soil Ground Improvement	19,253,614	338,617,695,536	343,769,164,068
	F3	Drainage and Under-pass Culvert	47,589,931	56,757,613,445	69,490,705,327
	F4	Frontage Road	1,020,802	1,077,127,765	1,350,251,997
G	**Điện c**	**Lighting and Electrical**	**1,131,431**	**61,298,592,276**	**61,601,316,265**
H	H1	**Land Lease cost**		**37,126,440,532**	**37,126,440,532**
I	**Các k**	**Provisional Sums**	**0**	**257,582,448,572**	**257,582,448,572**
	H1	Soil Investigation Hai An Side		5,513,382,708	5,513,382,708
	H2	Soil Investigation Cat Hai Side		3,614,695,381	3,614,695,381
	H3	HIV Countermeasure		11,052,996,256	11,052,996,256
	H4	Maintenance and Protection of Traffic		4,949,488,189	4,949,488,189
	H5	Environmental Control and Protection		7,872,429,591	7,872,429,591
	H6	Temporary Navigation Roadsmarker Buoys for Existing Navigation Channel		63,384,287,271	63,384,287,271
	H7	Import Tax (10%)		161,195,169,176	161,195,169,176
J	**Giá tr**	**Construction cost (without VAT)**	**10,846,828,315**	**4,372,510,824,490**	**7,274,672,246,501**
	Thuế	VAT		727,467,224,650	727,467,224,650
K	**Giá tr**	**Construction cost (with VAT)**	**10,846,828,000**	**5,099,978,049,000**	**8,002,139,387,000**
L	**Dự ph**	**Contingency**	**1,157,357,000**	**1,874,244,450,000**	**2,183,905,185,000**
	K1	Price Escalation	585,729,000	1,542,138,617,000	1,698,855,406,000
	K2	Physical Contingency (5%)	571,628,000	332,105,833,000	485,049,779,000
GIÁ TRỊ X ÂY DỰNG		**Construction cost (with VAT and Contingency)**	**12,004,185,000**	**6,974,222,499,000**	**10,186,044,572,000**

Source: DRVN

15.2.2.3 Modification Project Cost After DRVN Approval

Simplification of a unit price item and correction of the electric items were made by DRVN request. This project cost is in agreement with BOQ for a bid.

Here shows the cost based on two exchange rates about project cost.

- Present exchange rate: for bidding shown in table 2-4.
- M/D (19th March 2010) exchange rate: comparison with SAPROF shown in table 2-5.

Table 15.2.2-3 Project Cost Based On Present Exchange Rate of Road and Bridge Portion

SUMMARY OF PROJECT COST

THE DETAILED DESIGN STUDY FOR LACH HUYEN PORT INFRASTRUCTURE CONSTRUCTION PROJECT IN VIET NAM

BILL NO	CONSTRUCTION ITEMS	FOREIGN CURRENCY (J.YEN)	LOCAL CURRENCY (VND)	CURRENCY in VND	CURRENCY in JPY
A1	**General Requirements**	**231,785,113**	**93,900,307,994**	**155,916,391,617**	**582,737,514**
A2	**Temporary Facilities**	**501,222,845**	**963,088,412,468**	**1,097,194,859,169**	**4,100,765,786**
A2-1	Entrance Access Road	0	7,225,324,877	7,225,324,877	27,004,652
A2-2	Site Access Road	0	377,936,845,367	377,936,845,367	1,412,538,960
A2-3	Site Compound	0	205,316,872,180	205,316,872,180	767,371,810
A2-4	Temporary Birdge	34,394,840	9,288,115,623	18,490,748,399	69,109,172
A2-5	Dredging to Open a Temporary Channel	5,604,927	286,112,701,965	287,612,348,058	1,074,951,151
A2-6	Temporary Jetty for Loading and Unloading	276,615,333	44,541,295,578	118,552,086,943	443,088,425
A2-7	Temporary water Cutoff	184,607,745	32,667,256,878	82,060,633,345	306,701,617
B	**Road Works Hai An**	**198,455,964**	**775,350,085,636**	**828,448,671,225**	**3,096,326,909**
B1	Highway	18,284,847	248,217,896,225	253,110,163,054	945,999,234
B2	Cam River Bridge	111,042,670	112,458,016,028	142,168,429,406	531,354,505
B3	Soft Soil Ground Improvement	54,389,551	397,179,418,592	411,731,806,795	1,538,847,628
B4	Drainage Culvert	14,738,895	17,494,754,791	21,438,271,969	80,125,541
C	**Approach Bridge Works Hai An**	**8,487,194,109**	**1,006,653,079,656**	**3,277,474,245,968**	**12,249,559,994**
C1	Superstructure	6,067,735,076	502,189,261,235	2,125,663,529,159	7,944,667,440
C2	Foundation	2,419,459,033	504,463,818,421	1,151,810,716,809	4,304,892,554
D	**Main Bidge Works**	**799,434,772**	**285,144,487,970**	**499,040,079,092**	**1,865,162,296**
D1	Superstructure	377,693,015	241,211,828,163	342,266,815,332	1,279,222,222
D2	Substructure	421,741,757	43,932,659,807	156,773,263,760	585,940,073
E	**Approach Bridge Works Cat Hai**	**672,576,073**	**234,391,135,988**	**414,344,600,263**	**1,548,612,943**
E1	Superstructure	348,633,125	101,203,644,847	194,483,410,855	726,881,748
E2	Substructure	323,942,947	133,187,491,141	219,861,189,408	821,731,195
F	**Road Works Cat Hai**	**85,276,026**	**744,230,726,250**	**767,047,054,374**	**2,866,838,366**
F1	Highway	16,598,550	345,023,139,949	349,464,223,561	1,306,122,536
F2	Soft Soil Ground Improvement	19,480,740	340,739,985,043	345,952,223,170	1,292,996,434
F3	Drainage and Under-pass Culvert	48,175,935	57,392,321,303	70,282,203,455	262,679,735
F4	Frontage Road	1,020,802	1,075,279,955	1,348,404,188	5,039,661
G	**Lighting and Electrical**	**1,131,431**	**56,611,581,892**	**56,914,305,881**	**212,717,218**
H	**Provisional Sums**	**0**	**302,869,386,036**	**302,869,386,036**	**1,131,974,330**
H1	Soil Investigation Hai An Side		5,513,382,708	5,513,382,708	20,606,268
H2	Soil Investigation Cat Hai Side		3,614,695,381	3,614,695,381	13,509,924
H3	HIV Countermeasure		11,052,996,256	11,052,996,256	41,310,574
H4	Maintenance and Protection of Traffic		9,762,017,358	9,762,017,358	36,485,540
H5	Environmental Control and Protection		7,872,429,591	7,872,429,591	29,423,206
H6	Temporary Navigation Roadsmarker Buoys for Existing Navigation Channel		82,976,072,424	82,976,072,424	310,123,071
H7	Import Tax (10%)		182,077,792,318	182,077,792,318	680,515,749
I	**SUB TOTAL, A+B +C+D+E+F+G+H**	**10,977,076,332**	**4,462,239,203,890**	**7,399,249,593,625**	**27,654,695,356**
II.	**Price Escalation (I×10.3% (L), I×1.8% (F))**	557,100,309	1,408,062,216,710	1,557,119,155,693	5,819,732,844
III.	**Physical Contingency ((I+II+IV)×5%)**	626,691,832	296,617,421,030	464,294,165,392	1,735,299,443
IV.	**Cosulting Service**	999,660,000	62,047,000,000	329,514,558,528	1,231,560,663
V.	**Land Acquisition**		314,131,878,000	314,131,878,000	1,174,067,894
VI.	**Administration Cost ((I+II+III+IV+V)×5%)**		327,154,885,982	327,154,885,982	1,222,741,386
VII.	**VAT ((I+II+III+IV)×10%)**		975,017,747,324	975,017,747,324	3,644,128,831
VIII.	**Interest during Construction**	103,895,989	52,498,206,610	80,296,464,413	300,108,036
IX.	**Commitment Charge**	92,850,971		24,843,069,226	92,850,971
	TOTAL Project Cost	**13,357,275,433**	**7,897,768,559,546**	**11,471,621,518,184**	**42,875,185,424**

Source: Study Team (Exchange rate: 1 VND=0.0037375 JPY)

Table 15.2.2-4 Project Cost based on M/D (19th March 2010) of Road and Bridge Portion of "Lach Huyen Port Infrastructure Construction Project"

SUMMARY OF PROJECT COST (The consultant's recommendation cost)

THE DETAILED DESIGN STUDY FOR LACH HUYEN PORT INFRASTRUCTURE CONSTRUCTION PROJECT IN VIET NAM

BILL NO	CONSTRUCTION ITEMS	FOREIGN CURRENCY (J.YEN)	LOCAL CURRENCY (VND)	CURRENCY in VND	CURRENCY in JPY
A1	**General Requirements**	**269,035,584**	**93,189,938,142**	**165,172,703,153**	**617,332,978**
A2	**Temporary Facilities**	**521,867,167**	**906,390,205,050**	**1,046,020,216,360**	**3,909,500,559**
A2-1	Entrance Access Road	0	6,600,497,606	6,600,497,606	24,669,360
A2-2	Site Access Road	0	373,470,776,614	373,470,776,614	1,395,847,028
A2-3	Site Compound	0	154,164,959,139	154,164,959,139	576,191,535
A2-4	Temporary Birdge	35,711,420	9,168,095,887	18,722,990,871	69,977,178
A2-5	Dredging to Open a Temporary Channel	5,934,629	286,112,701,965	287,700,562,591	1,075,280,853
A2-6	Temporary Jetty for Loading and Unloading	284,754,095	44,205,916,961	120,394,303,705	449,973,710
A2-7	Temporary water Cutoff	195,467,023	32,667,256,878	84,966,125,835	317,560,895
B	**Road Works Hai An**	**202,570,062**	**775,350,085,636**	**829,549,433,280**	**3,100,441,007**
B1	Highway	18,364,876	248,217,896,225	253,131,575,520	946,079,264
B2	Cam River Bridge	114,709,161	112,458,016,028	143,149,430,318	535,020,996
B3	Soft Soil Ground Improvement	54,757,129	397,179,418,592	411,830,155,472	1,539,215,206
B4	Drainage Culvert	14,738,895	17,494,754,791	21,438,271,969	80,125,541
C	**Approach Bridge Works Hai An**	**10,171,966,275**	**989,038,911,887**	**3,710,635,239,768**	**13,868,499,209**
C1	Superstructure	7,741,243,030	484,575,093,466	2,555,810,686,777	9,552,342,442
C2	Foundation	2,430,723,245	504,463,818,421	1,154,824,552,991	4,316,156,767
D	**Main Bidge Works**	**806,937,375**	**285,144,487,970**	**501,047,464,437**	**1,872,664,898**
D1	Superstructure	385,123,038	241,211,828,163	344,254,781,522	1,286,652,246
D2	Substructure	421,814,336	43,932,659,807	156,792,682,915	586,012,652
E	**Approach Bridge Works Cat Hai**	**681,897,751**	**234,391,135,988**	**416,838,694,760**	**1,557,934,622**
E1	Superstructure	355,166,682	101,203,644,847	196,231,519,581	733,415,304
E2	Substructure	326,731,069	133,187,491,141	220,607,175,179	824,519,317
F	**Road Works Cat Hai**	**85,814,526**	**744,230,726,250**	**767,191,134,642**	**2,867,376,866**
F1	Highway	16,625,226	345,023,139,949	349,471,361,050	1,306,149,212
F2	Soft Soil Ground Improvement	19,584,100	340,739,985,043	345,979,878,019	1,293,099,794
F3	Drainage and Under-pass Culvert	48,584,398	57,392,321,303	70,391,491,385	263,088,199
F4	Frontage Road	1,020,802	1,075,279,955	1,348,404,188	5,039,661
G	**Lighting and Electrical**	**1,131,431**	**56,611,581,892**	**56,914,305,881**	**212,717,218**
H	**Provisional Sums**	**0**	**344,249,748,888**	**344,249,748,888**	**1,286,633,436**
H1	Soil Investigation Hai An Side		5,513,382,708	5,513,382,708	20,606,268
H2	Soil Investigation Cat Hai Side		3,614,695,381	3,614,695,381	13,509,924
H3	HIV Countermeasure		11,052,996,256	11,052,996,256	41,310,574
H4	Maintenance and Protection of Traffic		9,762,017,358	9,762,017,358	36,485,540
H5	Environmental Control and Protection		7,872,429,591	7,872,429,591	29,423,206
H6	Temporary Navigation Roadsmarker Buoys for Existing Navigation Channel		82,976,072,424	82,976,072,424	310,123,071
H7	Import Tax (10%)		223,458,155,170	223,458,155,170	835,174,855
I	**SUB TOTAL, A+B +C+D+E+F+G+H**	**12,741,220,172**	**4,428,596,821,703**	**7,837,618,941,168**	**29,293,100,793**
II.	**Price Escalation (I×10.3%(L), I×1.8%(F))**	646,632,809	1,397,446,343,138	1,570,458,465,883	5,869,588,516
III.	**Physical Contingency ((I+II+IV)×5%)**	719,375,649	294,404,508,242	486,879,598,279	1,819,712,499
IV.	**Cosulting Service**	999,660,000	62,047,000,000	329,514,558,528	1,231,560,663
V.	**Land Acquisition**		314,131,878,000	314,131,878,000	1,174,067,894
VI.	**Administration Cost ((I+II+III+IV+V)×5%)**		324,831,327,554	324,831,327,554	1,214,057,087
VII.	**VAT ((I+II+III+IV)×10%)**		1,022,447,156,386	1,022,447,156,386	3,821,396,247
VIII.	**Interest during Construction**	120,456,804	52,102,801,659	84,332,046,850	315,191,025
IX.	**Commitment Charge**	106,591,418		28,519,442,952	106,591,418
	TOTAL Project Cost	**15,333,936,851**	**7,896,007,836,682**	**11,998,733,415,601**	**44,845,266,141**

Source: Study Team (Exchange rate: 1 VND=0.00532 JPY)

The total amount of a direct cost of construction is 35,261 million yen (6,628 Billion VND).

The rate of increase of a direct cost of construction is +38.3% as compared with SAPROF. The increase items will be explained by the following paragraph.

The temporary road plan which was being taken into consideration by the basic design reconsidered the structure in consideration of reduction of the construction cost.

About the cut in the construction cost, manufacture of a SBS girder, the unit price of PC tendon, the unit price of Bearing, etc. were reconsidered.

15.2.3 Comparison of Construction Cost with SAPROF

The construction cost of the detail design is 35,261 million yen became large increase compared with 25,518 million yen of SAPROF.

The factor of construction cost increase is in increase of temporary expense. Increase of the temporary road installation expense and temporary construction expense of bridge is especially remarkable.

Table 15.2.2-5 Comparison of a direct construction cost (without VAT)

ITEM	Detail Design	SAPROF	Balance	
	(million VND)	(million VND)	(million VND)	(million JPY)
I.General	**1,210,729**	**502,560**	**708,169**	**3,767**
(1) Contractor's Mobilization	129,639	94,050	35,589	189
(2) Temporary road	385,162	408,510	-23,348	-124
(3) Site compound	205,317	0	205,317	1,092
(4) Dredging to Open a Temporary Channel	287,336	0	287,336	1,529
(5) Temporary Jetty	120,334	0	120,334	640
(6) Temporary Water Cutoff	72,950	0	72,950	388
(7) Contractor's drawings	9,992	0	9,992	53
II. Highway works (Hai An)	**820,040**	**782,900**	**37,140**	**198**
(1) Embankment	117,310	93,226	24,084	128
(2) Soft soil treatment	409,019	377,427	31,592	168
(3) Drainage	29,176	0	29,176	155
(4) Pavement	87,733	25,709	62,024	330
(5) Traffic safety	18,773	4,845	13,929	74
(6) Culvert	21,350	17,338	4,012	21
(7) Cam river bridge	136,679	20,156	116,523	620
(8) Tan Vu IC	0	244,199	-244,199	-1,299
III. Bridge works	**3,525,208**	**2,873,974**	**651,234**	**3,465**
(1) App. Br. (Hai An) Superstructure	1,660,106	965,931	694,174	3,693
(2) App. Br. (Hai An) Substructure	1,038,283	801,958	236,325	1,257
(3) Main bridge Superstructure	316,993	154,505	162,488	864
(4) Main bridge Substructure	136,021	440,485	-304,464	-1,620
(5) App. Br. (Cat Hai) Superstructure	168,711	109,199	59,512	317
(6) App. Br. (Cat Hai) Substructure	205,095	111,312	93,782	499
(7) Retaining wall	0	290,583	-290,583	-1,546
IV. Highway works (Cat Hai)	**765,110**	**609,570**	**155,540**	**827**
(1) Embankment	196,314	177,784	18,530	99
(2) Soft soil treatment	344,710	324,234	20,476	109
(3) Drainage	26,487	0	26,487	141
(4) Pavement	104,761	55,603	49,158	262
(5) Traffic safety	21,815	7,009	14,806	79
(6) Culvert	69,674	44,939	24,735	132
(7) Frontage Road	1,348	0	1,348	7.2
V. Electric	**56,314**	**23,155**	**33,160**	**176**
(1) Lighting	56,314	23,155	33,160	176
VI. Provisional Sums	**250,592**	**0**	**250,592**	**1,333**
(1) Land Lease cost	0		0	0
(2) Soil investigation Hai An side	5,513		5,513	29
(3) Soil Investigation Cat Hai side	3,615		3,615	19
(4) HIV Countermeasure	9,009		9,009	48
(5) Maintenance and Protection of Traffic	9,759		9,759	52
(6) Environmental Control and Protection	7,872		7,872	42
(7) Temporary Navigation Roadsmarker Buoys for	82,976		82,976	441
(8) Water Connection and Power Connection	0		0	0
(9) Import Tax	131,848		131,848	701
Total	**6,627,994**	**4,792,158**	**1,835,836**	**9,767**

Source: Study Team (Exchange Rate based on M/D)

The detail factors of increase amount are shown in the following table.

Table 15.2.2-6 The Detail Factor of Change

ITEM	Detail Design	The Breakdown According to Change Factor (million JPY)						
	(million VND)	Update of the Unit Price	Changed by site investigation	Change by a geological survey result	Design examination	Hai Phong City's request	Change quantity and Other	Total (million JPY)
I.General	**1,210,729**	**189**	**0**	**0**	**3,525**	**0**	**53**	**3,767**
(1) Contractor's Mobilization	129,639	189						189
(2) Temporary road	385,162				-124			-124
(3) Site compound	205,317				1,092			1,092
(4) Dredging to Open a Temporary Channel	287,336				1,529			1,529
(5) Temporary Jetty	120,334				640			640
(6) Temporary Water Cutoff	72,950				388			388
(7) Contractor's drawings	9,992						53	53
II. Highway works (Hai An)	**820,040**	**924**	**30**	**-637**	**-741**	**620**	**0**	**198**
(1) Embankment	117,310	27	0		101			128
(2) Soft soil treatment	409,019	805		-637				168
(3) Drainage	29,176	0			155			155
(4) Pavement	87,733	98			231			330
(5) Traffic safety	18,773	3			71			74
(6) Culvert	21,350	-9	30					21
(7) Cam river bridge	136,679					620		620
(8) Tan Vu IC	0				-1,299			-1,299
III. Bridge works	**3,525,208**	**2,282**	**-1,194**	**0**	**1,065**	**0**	**1,311**	**3,465**
(1) App. Br. (Hai An) Superstructure	1,660,106	386			2,533		773	3,693
(2) App. Br. (Hai An) Substructure	1,038,283	2,232	-975					1,257
(3) Main bridge Superstructure	316,993	23			324		518	864
(4) Main bridge Substructure	136,021	-671			-948			-1,620
(5) App. Br. (Cat Hai) Superstructure	168,711	147			149		21	317
(6) App. Br. (Cat Hai) Substructure	205,095	165	-219		553			499
(7) Retaining wall	0				-1,546			-1,546
IV. Highway works (Cat Hai)	**765,110**	**889**	**225**	**-599**	**306**	**0**	**0**	**827**
(1) Embankment	196,314	143			-44			99
(2) Soft soil treatment	344,710	708		-599				109
(3) Drainage	26,487	0			141			141
(4) Pavement	104,761	121			141			262
(5) Traffic safety	21,815	11			68			79
(6) Culvert	69,674	-94	225					132
(7) Frontage Road	1,348	0.6	5.0		1.1			6.7
V. Electric	**56,314**	**0**	**0**	**0**	**176**	**0**	**0**	**176**
(1) Lighting	56,314				176			176
VI. Provisional Sums	**250,592**	**0**	**0**	**0**	**1,333**	**0**	**0**	**1,333**
(1) Land Lease cost	0				0			0
(2) Soil investigation Hai An side	5,513				29			29
(3) Soil Investigation Cat Hai side	3,615				19			19
(4) HIV Countermeasure	9,009				48			48
(5) Maintenance and Protection of Traffic	9,759				52			52
(6) Environmental Control and Protection	7,872				42			42
(7) Temporary Navigation Roadsmarker Buoys for	82,976				441			441
(8) Water Connection and Power Connection	0				0			0
(9) Import Tax	131,848				701			701
Total	**6,627,994**	**4,284**	**-939**	**-1,236**	**5,664**	**620**	**1,365**	**9,767**
	JPY							
The rate of increase from SAPROF	**35,261**	**16.8%**	**-3.7%**	**-4.8%**	**22.2%**	**2.4%**	**5.4%**	**38.3%**

Source: Study Team (Exchange Rate based on M/D)

15.2.3.1 Consultant Recommendation Cost

This cost is corrected and calculated with the adoption rate based on the cost estimate standard of Japan about the material unit price depreciated by MOC and DRVN.

Table 15.2.2-7 Consultant Recommendation Cost

SUMMARY OF PROJECT COST (The consultant's recommendation cost)

THE DETAILED DESIGN STUDY FOR LACH HUYEN PORT INFRASTRUCTURE CONSTRUCTION PROJECT IN VIET NAM

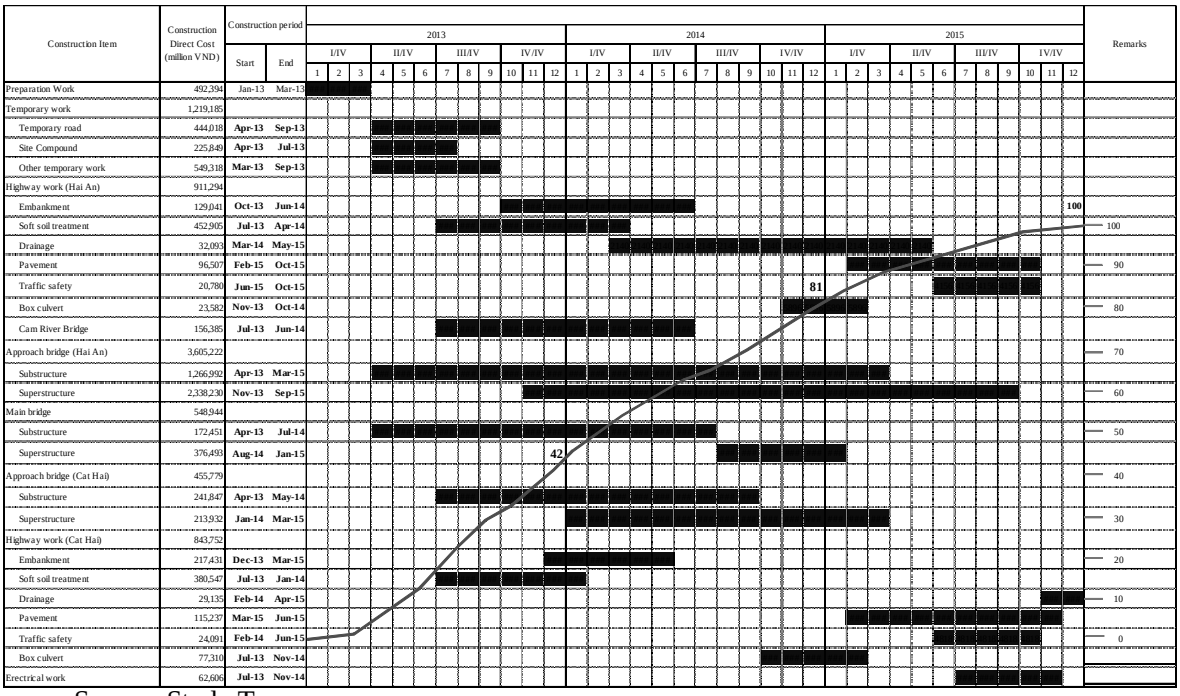
BILL NO	CONSTRUCTION ITEMS	FOREIGN CURRENCY (J.YEN)	LOCAL CURRENCY (VND)	CURRENCY in VND	CURRENCY in JPY
A1	**General Requirements**	**248,127,754**	**93,068,889,821**	**159,457,586,483**	**595,972,729**
A2	**Temporary Facilities**	**521,867,167**	**906,390,205,050**	**1,046,020,216,360**	**3,909,500,559**
A2-1	Entrance Access Road	0	6,600,497,606	6,600,497,606	24,669,360
A2-2	Site Access Road	0	373,470,776,614	373,470,776,614	1,395,847,028
A2-3	Site Compound	0	154,164,959,139	154,164,959,139	576,191,535
A2-4	Temporary Birdge	35,711,420	9,168,095,887	18,722,990,871	69,977,178
A2-5	Dredging to Open a Temporary Channel	5,934,629	286,112,701,965	287,700,562,591	1,075,280,853
A2-6	Temporary Jetty for Loading and Unloading	284,754,095	44,205,916,961	120,394,303,705	449,973,710
A2-7	Temporary water Cutoff	195,467,023	32,667,256,878	84,966,125,835	317,560,895
B	**Road Works Hai An**	**202,570,062**	**775,350,085,636**	**829,549,433,280**	**3,100,441,007**
B1	Highway	18,364,876	248,217,896,225	253,131,575,520	946,079,264
B2	Cam River Bridge	114,709,161	112,458,016,028	143,149,430,318	535,020,996
B3	Soft Soil Ground Improvement	54,757,129	397,179,418,592	411,830,155,472	1,539,215,206
B4	Drainage Culvert	14,738,895	17,494,754,791	21,438,271,969	80,125,541
C	**Approach Bridge Works Hai An**	**9,202,700,872**	**1,006,653,079,656**	**3,468,914,182,484**	**12,965,066,757**
C1	Superstructure	6,771,977,626	502,189,261,235	2,314,089,629,493	8,648,909,990
C2	Foundation	2,430,723,245	504,463,818,421	1,154,824,552,991	4,316,156,767
D	**Main Bidge Works**	**806,937,375**	**285,144,487,970**	**501,047,464,437**	**1,872,664,898**
D1	Superstructure	385,123,038	241,211,828,163	344,254,781,522	1,286,652,246
D2	Substructure	421,814,336	43,932,659,807	156,792,682,915	586,012,652
E	**Approach Bridge Works Cat Hai**	**681,897,751**	**234,391,135,988**	**416,838,694,760**	**1,557,934,622**
E1	Superstructure	355,166,682	101,203,644,847	196,231,519,581	733,415,304
E2	Substructure	326,731,069	133,187,491,141	220,607,175,179	824,519,317
F	**Road Works Cat Hai**	**85,814,526**	**744,230,726,250**	**767,191,134,642**	**2,867,376,866**
F1	Highway	16,625,226	345,023,139,949	349,471,361,050	1,306,149,212
F2	Soft Soil Ground Improvement	19,584,100	340,739,985,043	345,979,878,019	1,293,099,794
F3	Drainage and Under-pass Culvert	48,584,398	57,392,321,303	70,391,491,385	263,088,199
F4	Frontage Road	1,020,802	1,075,279,955	1,348,404,188	5,039,661
G	**Lighting and Electrical**	**1,131,431**	**56,611,581,892**	**56,914,305,881**	**212,717,218**
H	**Provisional Sums**	**0**	**321,023,905,968**	**321,023,905,968**	**1,199,826,849**
H1	Soil Investigation Hai An Side		5,513,382,708	5,513,382,708	20,606,268
H2	Soil Investigation Cat Hai Side		3,614,695,381	3,614,695,381	13,509,924
H3	HIV Countermeasure		11,052,996,256	11,052,996,256	41,310,574
H4	Maintenance and Protection of Traffic		9,762,017,358	9,762,017,358	36,485,540
H5	Environmental Control and Protection		7,872,429,591	7,872,429,591	29,423,206
H6	Temporary Navigation Roadsmarker Buoys for Existing Navigation Channel		82,976,072,424	82,976,072,424	310,123,071
H7	Import Tax (10%)		200,232,312,250	200,232,312,250	748,368,267
I	**SUB TOTAL, A+B +C+D+E+F+G+H**	**11,751,046,937**	**4,422,864,098,231**	**7,566,956,924,294**	**28,281,501,505**
II.	**Price Escalation (I×10.3% (L), I×1.8% (F))**	596,380,283	1,395,637,378,859	1,555,204,009,666	5,812,574,986
III.	**Physical Contingency ((I+II+IV)×5%)**	667,354,361	294,027,423,855	472,583,774,624	1,766,281,858
IV.	**Cosulting Service**	999,660,000	62,047,000,000	329,514,558,528	1,231,560,663
V.	**Land Acquisition**		314,131,878,000	314,131,878,000	1,174,067,894
VI.	**Administration Cost ((I+II+III+IV+V)×5%)**		324,435,388,947	324,435,388,947	1,212,577,266
VII.	**VAT ((I+II+III+IV)×10%)**		992,425,926,711	992,425,926,711	3,709,191,901
VIII.	**Interest during Construction**	111,161,600	52,035,423,932	81,777,658,136	305,643,997
IX.	**Commitment Charge**	98,879,222		26,455,979,203	98,879,222
	TOTAL Project Cost	**14,224,482,404**	**7,857,604,518,535**	**11,663,486,098,110**	**43,592,279,292**

Source: Study Team (Exchange rate: 1 VND=0.0037375 JPY)

15.3 Annual Fund Requirement

The output computed based on the process taken into consideration by the execution scheme is as follows.

Table 15.3-1 The output by year (Based on the construction plan)



Source: Study Team

The outputs at a given fiscal year are 2013 (42%), 2014 (39%), 2015 (19%).

Price escalation Rate:

Detailed information is to be referred to Section 2.7 2012

F/C portion: 1.8% per year

L/C portion: 10.3% per year

Table 15.3-2 Yearly Price Index

Yearly Price Index (Index2011=100)

Year	2011		2012		2013		2014		2015		2016	
F/C, L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	LC	F/C	LC
Price Index	100	100	101.8	110.3	103.63	121.66	105.50	134.19	107.40	148.01	111.30	180.07

Source : Study Team

Physical Contingency Rate: 5.0%

Interest during Construction

Construction Cost: 0.2% per year

Consulting Services : 0.01% per year

Commitment Charge : Loan Amount x number of years of the disbursement period x 0.1%

Table 15.3-3 Annual Fund Requirement

Table 3-3 Annual Fund Requirement (Eligible Portion)

(1) Eligible Portion

(F/C,&Total= Million JPY, L/C: Billion VND)

Item	Yearly Cost during Construction Period																		Total (Million JPY)		
	2012			2013			2014			2015			2016			2017			2018					
	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total
(1) Construction Cost	0	0	0	4,610	1,874	11,615	4,281	1,740	10,785	2,086	848	5,254	0	0	0	0	0	0	0	0	0	10,977	4,462	27,655
(2) Price Contingency = (1) x {Yearly Price index}	0	0	0	167	406	1,685	235	595	2,459	154	407	1,676	0	0	0	0	0	0	0	0	0	557	1,408	5,820
(3) Physical contingency = {(1)+(2)} x 5%	0	0	0	260	115	691	245	118	686	121	63	358	0	0	0	0	0	0	0	0	0	627	297	1,735
sub-Total = (1)+(2)+(3)	0	0	0	5,038	2,395	13,991	4,762	2,453	13,931	2,361	1,318	7,288	0	0	0	0	0	0	0	0	0	12,161	6,167	35,210
(4) Consulting Services for Construction Supervision	0	0	0	420	26	517	390	24	480	190	12	234	0	0	0	0	0	0	0	0	0	1,000	62	1,232
(5) Interest during Construction	0	0	0	51	24	141	38	20	112	15	8	47	0	0	0	0	0	0	0	0	0	104	52	299
(6) Commitment Charge	13	0	13	13	0	13	13	0	13	13	0	13	13	0	13	13	0	13	13	0	13	93	0	93
Total = (1)+(2)+(3)+(4)+(5)+(6)	13	0	13	5,522	2,446	14,662	5,203	2,497	14,536	2,580	1,338	7,582	13	0	13	13	0	13	13	0	13	13,358	6,281	36,834

(2) Non Eligible Portion (For Reference Only)

Item	Yearly Cost during Construction Period																		Total (Million JPY)		
	2012			2013			2014			2015			2016			2017			2018					
	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total
(7) Environmental Management and Monitoring Cost	0	140	523	0	146	546	0	22	82	0	6	22	0	0	0	0	0	0	0	0	0	0	314	1,174
(8) Administration Cost	0	20	73	0	46	171	0	196	734	0	65	245	0	0	0	0	0	0	0	0	0	0	327	1,223
(9) Value Added Tax (VAT)	0	0	0	0	388	1,451	0	386	1,441	0	201	752	0	0	0	0	0	0	0	0	0	0	975	3,644
Total = (7)+(8)+(9)	0	160	597	0	580	2,168	0	604	2,257	0	273	1,019	0	0	0	0	0	0	0	0	0	0	1,616	6,041
Grand Total Annual Requrement = sum{(1)-(10)}	13	160	610	5,522	3,026	16,830	5,205	3,101	16,793	2,580	1,611	8,602	13	0	13	13	0	13	13	0	13	13,358	7,897	42,875

Souse: Study Team

15.4 Procurement Ratio from Japan

This Project is expected to apply STEP scheme. Therefore, the procurement ratio and goods and services expected to be procured from Japan were calculated in this Study.
Table 15.4-1 shows the procurement ratio from Japan

Table 15.4-1 Summary of Procurement Ratio from Japan

Construction Cost		27,654,695,356	
Goods procured from Japan			
1	Erection Girder	747,587,664	2.7%
2	Steel Pipe Pile	2,035,712,126	7.4%
3	Steel Pipe Sheet Pile	514,746,321	1.9%
4	PC Strand	1,529,879,869	5.5%
5	Reinforcement Steel	0	0.0%
6	Cement	267,776,304	1.0%
7	Bearing	1,451,862,759	5.2%
8	Steel Sheet Pile for Cofferdam	855,038,150	3.1%
9	H-shaped Steel for Jetty	569,142,301	2.1%
10	Japanese Engineer	315,061,980	1.1%
11	Japanese Skilled Labor	0	0.0%
12	Administration Overhead	1,852,509,503	6.7%
Total		10,139,316,976	36.7%

Source: Study Team

The details of Procurement from Japan are as in Table 15.4-2.

Table 15.4-2 Amount of Procurement from Japan

Item	UNIT	Quantites	UNIT PRICE (VND)	UNIT PRICE (JP\)	Amount (VND)	Amount (JP\)	Amount (VND)	Amount (JP\)
Material and Equiqment					**317,860,218,966**		**1,471,888,221,459**	**5,501,182,228**
1 **Erection Girder**	**m^3**	**3,582**		**208,683**		**747,587,664**	**200,023,455,251**	**747,587,664**
Approach Bridge Hai An Side	ton	3,582		208,683		747,587,664	200,023,455,251	747,587,664
2 **Steel Pipe Pile & Machine**	**ton**	**15,929**		**127,797**		**2,035,712,126**	**544,672,140,798**	**2,035,712,126**
Temporary jetty φ600	ton	705		127,797		90,058,341	24,095,877,259	90,058,341
Approach Bridge Hai An Side φ800	ton	369		127,797		47,169,766	12,620,673,047	47,169,766
Approach Bridge Hai An Side φ1100	ton	13,369		127,797		1,708,488,651	457,120,709,378	1,708,488,651
Approach Bridge Cat hai Side φ800	ton	420		127,797		53,712,957	14,371,359,744	53,712,957
Approach Bridge Cat hai Side φ1100	ton	1,066		127,797		136,282,411	36,463,521,369	136,282,411
3 **Steel Pipe Sheet Pile & Machine**	**ton**	**5,396**		**95,395**		**514,746,321**	**137,724,768,247**	**514,746,321**
Main Bridge φ1200	ton	5,396		95,395		514,746,321	137,724,768,247	514,746,321
4 **PC Tendon**	**ton**	**3,212**		**476,364**		**1,529,879,869**	**409,332,406,445**	**1,529,879,869**
Approach Bridge Hai An Side								
19S15.2	ton	1,131		316,800		358,451,280	95,906,696,990	358,451,280
Anchors Setting work for 19S15.2 Cable	each	1,320		109,021		143,907,720	38,503,737,793	143,907,720
12S15.2	ton	708		316,800		224,284,579	60,009,251,960	224,284,579
Anchors Setting work for 12S15.2 Cable	each	2,292		28,118		64,446,456	17,243,198,930	64,446,456
1S28.6	ton	625		329,800		206,212,397	55,173,885,485	206,212,397
Anchors Setting work for 1S28.6 Cable	each	19,354		9,612		186,030,648	49,774,086,421	186,030,648
PC steel bar φ32	ton	25		328,950		8,164,868	2,184,580,054	8,164,868
Anchors Setting work for PC steel bar φ32	each	2,640		3,383		8,931,120	2,389,597,324	8,931,120
Main Bridge								
19S15.2	ton	212		316,800		67,313,347	18,010,260,120	67,313,347
Anchors Setting work for 19S15.2 Cable	each	348		109,021		37,939,308	10,150,985,418	37,939,308
12S15.2	ton	183		316,800		57,973,877	15,511,405,292	57,973,877
Anchors Setting work for 12S15.2 Cable	each	328		28,118		9,222,704	2,467,613,110	9,222,704
1S28.6	ton	55		329,800		18,262,240	4,886,217,970	18,262,240
Anchors Setting work for 1S28.6 Cable	each	1,668		9,612		16,032,816	4,289,716,656	16,032,816
Approach Bridge Cat hai Side								
12S12.7	ton	153		287,300		43,891,970	11,743,670,957	43,891,970
Anchors Setting work for12S12.7 Cable	each	1,036		17,510		18,140,360	4,853,608,027	18,140,360
1S28.6	ton	70		329,800		23,079,734	6,175,179,612	23,079,734
Anchors Setting work for 1S28.6 Cable	each	2,096		9,612		20,146,752	5,390,435,318	20,146,752
PC steel bar φ32	ton	8		328,950				
Cam River Bridge								
7S12.7	ton	9		287,300		2,548,920	681,985,207	2,548,920
Anchors Setting work for 7S12.7 Cable	each	312		12,325		3,845,400	1,028,869,565	3,845,400
1S19.3	ton	31		304,300		9,556,013	2,556,792,798	9,556,013
Anchors Setting work for1S19.3 Cable	each	480		3,120		1,497,360	400,631,438	1,497,360
6 **Cement**	**ton**	**55,126**	**1,299,671**		**71,645,833,714**		**71,645,833,714**	**267,776,304**
Road Hai An Side	ton	1,064			1,371,771,206		1,371,771,206	5,126,995
Cam River Bridge	ton	2,288			2,958,927,300		2,958,927,300	11,058,991
Approach Bridge Hai An Side	ton	37,392			48,203,250,959		48,203,250,959	180,159,650
Main Bridge	ton	8,590			11,414,975,945		11,414,975,945	42,663,473
Approach Bridge Cat hai Side	ton	3,340			4,438,630,116		4,438,630,116	16,589,380
Road Cat Hai Side	ton	2,452			3,258,278,188		3,258,278,188	12,177,815
7 Bearing, Expanjoint						**1,451,862,759**	**388,458,263,179**	**1,451,862,759**
Cam River Bridge								
Rubber Bearing 350*400*78	each	96	96	43,435		4,169,760	1,115,654,849	4,169,760
Expansion Joint Type 80 for Cam River Bridge	m	127.8	127.8	164,900		21,074,220	5,638,587,291	21,074,220
Approach Bridge Hai An Side								
Bearing elastmeric type A3 (970*970*340-SGN12)	each	60	60	5,865,374		351,922,438	94,159,849,531	351,922,438
Bearing elastmeric type B2 (1220*1220*250-SGN12)	each	120	120	6,133,034		735,964,075	196,913,464,949	735,964,075
Expansion Joint Type160 foApproach Bridger	m	15.1	15.1	444,145		6,706,587	1,794,404,492	6,706,587
Expansion Joint Type 250 for Approach Bridge	m	211.4	211.4	762,745		161,244,255	43,142,275,592	161,244,255
Main Bridge								
Expansion Joint Type 350 for Main Bridge	m	30	30	785,820		23,574,603	6,307,586,152	23,574,603
Approach Bridge Cat hai Side								
Bearing elastmeric type A1 (870*870*240-SGN12)	each	4	4	4,110,374		16,441,496	4,399,062,433	16,441,496
Bearing elastmeric type A2 (870*870*278-SGN12)	each	4	4	4,340,594		17,362,376	4,645,451,730	17,362,376
Bearing elastmeric type B1 (1320*1320*212-SGN12)	each	14	14	6,798,494		95,178,915	25,465,930,554	95,178,915
Expansion Joint Type160 foApproach Bridger	m	15.1	15.1	444,145		6,706,587	1,794,404,492	6,706,587
Expansion Joint Type 250 for Approach Bridge	m	15.1	15.1	762,745		11,517,447	3,081,591,114	11,517,447
8 **Steel Sheet Pile**	**ton**	**11,460**				**855,038,150**	**228,772,749,142**	**855,038,150**
Road Hai An Side								
SP-II	ton	1,983		72,893		144,546,026	38,674,521,953	144,546,026
SP-III	ton	1,593		72,893		116,117,912	31,068,337,605	116,117,912
Road Cat Hai Side								
SP-II	ton	1,222		72,893		89,074,757	23,832,710,957	89,074,757
SP-III	ton	795		72,893		57,949,617	15,504,914,247	57,949,617
Bridge Substructure								
SP-III	ton	2,147		72,893		156,507,701	41,874,970,290	156,507,701
SP-V	ton	292		78,194		22,856,071	6,115,336,756	22,856,071
SP-V_L	ton	3,427		78,194		267,986,066	71,701,957,334	267,986,066
8a **Temporary Jetty (H-Steel)**	**ton**	**7,808**				569,142,301	**152,278,876,521**	**569,142,301**
Temporary bridge	ton	1,256		72,893		91,571,985	24,500,865,494	91,571,985
Landing jetty,	ton	2,090		72,893		152,364,632	40,766,456,685	152,364,632
Dumping area	ton	169		72,893		12,316,298	3,295,330,611	12,316,298
Main bridge V shape pier support	ton	457		72,893		33,316,146	8,914,018,989	33,316,146
Side span support	ton	1,260		72,893		91,821,729	24,567,686,799	91,821,729
Bracket support	ton	2,576		72,893		187,751,511	50,234,517,943	187,751,511

Source: Study Team

15.5 The Detailed Explanation of Cost Estimate

15.5.1 General Items

Many of General items are managed by regulation of Circular No.04/2010-/TT-BXD dated 26th May 2010 as cost of a direct cost of construction.

The item included in general expenses is as follows.

- General Provisions
- General Works
- Contractor's Submittals
- Contractor's Drawings
- Programme of Work
- Monthly Progress Reports
- Project Safety
- Lavoratory and Engineer's Equipment
- Contractor's Quality Control
- Acceptance of Work
- Control of Materials

About Contractor's Mobilization, it decided to deal with the expense equivalent to 2.0% specified to CircularNo04/2010/TT-BXD as an object of payment.

Since the expense of temporary work was large as a feature of this project, it decided to pay temporary work and to treat as an object, and the item of "Temporary Facilities" was set up.

The item which composes "Temporary Facilities" is as follows.

Table 15.5.1-1 Summary of Temporary Facilities

Item	Amount		Combined Amount	
	Foreign Currency (million JPY)	Local Currency (million VND)	In VND (million VND)	In JPY (million JPY)
Temporary road (Entrance acess road)	0	7,948	7,948	30
Temporary road (Site access road)	0	415,731	415,731	1,554
Temporary site compound	0	220,135	220,135	823
Temporary Bridge	38	10,085	20,208	76
Dredging to Open a Temporary Channel	6	314,724	316,374	1,182
Temporary Jetty for Loading and Unloading	304	48,995	130,407	487
Temporary Navigation Roads marker Buoys for Existing Navigation Channel	-	91,274	91,274	341
Water Connection Fee and Power Connection Fee	-	0	0	0
Temporary Water Cut-off Hai An	130	22,526	57,265	214
Temporary Water Cut-off Cat Hai	73	13,408	33,002	123

Source: Study Team

Refer to the Chapter 10 Construction planning for detailed contents construction of Temporary works.

The plan and cost of temporary roads are shown in the following table.

Table 15.5.1-2 Temporary Roads and Site Compound

NAME	AMOUNT		COMBINDED AMOUNT	
	FOREIGN CURRENCY (¥)	LOCAL CURRENCY (VND)	LOCAL CURRENCY (in VND)	FOREIGN CURRENCY (in JPY)
Temporary Roads	**37,834,324**	**433,763,292,744**	**443,886,188,798**	**1,659,024,631**
Entrance Access Road B (Hai An Side)	0	5,681,430,167	5,681,430,167	21,234,345
Entrance Access Road C (Hai An Side)	0	2,266,427,197	2,266,427,197	8,470,772
Site Access Road A (Hai An Side)	0	33,181,912,761	33,181,912,761	124,017,399
Site Access Road B (Hai An Side)	0	309,732,220,190	309,732,220,190	1,157,624,173
Access Road Bridge Km1.7&3.2 (Hai An Side)	26,597,081	7,181,635,370	14,297,911,223	53,438,443
Site Access Road B (Cat Hai Side)	0	20,409,705,329	20,409,705,329	76,281,274
Site Access Road C (Cat Hai Side)	0	4,788,925,810	4,788,925,810	17,898,610
Site Access Road D - Cat Hai Side	0	47,617,765,815	47,617,765,815	177,971,400
Access Road Bridge Km15.1 (Cat Hai Side)	11,237,243	2,903,270,106	5,909,890,307	22,088,215
Site Compound	**0**	**220,135,370,394**	**220,135,370,394**	**822,755,947**
Site Compound 1 - Km1.7 (Hai An Side)	0	40,132,118,067	40,132,118,067	149,993,791
Site Compound 2 - Km3.2 (Hai An Side)	0	51,219,700,780	51,219,700,780	191,433,632
Site Compound 3 - Dinh Vu Ferry (Hai An Side)	0	40,672,718,682	40,672,718,682	152,014,286
Site Compound 4 - Km9.7 (Cat Hai Side)	0	29,445,812,259	29,445,812,259	110,053,723
Site Compound 5 - Km10 (Cat Hai Side)	0	38,391,432,155	38,391,432,155	143,487,978
Site Compound 7 - Km16 (Cat Hai Side)	0	20,273,588,451	20,273,588,451	75,772,537

Source: Study Team

The details of the temporary expense for water cut-off for road construction are shown in the following table.

Table 15.5.1-3 Water Cut-off Expense for Road Construction

NAME	AMOUNT		COMBINDED AMOUNT	
	FOREIGN CURRENCY (¥)	LOCAL CURRENCY (VND)	LOCAL CURRENCY (in VND)	FOREIGN CURRENCY (in JPY)
Water cut-off				
Hai An Side (steel sheet pile II, III)	129,836,049	22,526,261,801	57,265,004,008	214,027,952
Cat Hai Side (steel sheet pile II, III)	73,232,470	13,407,720,765	33,001,692,671	123,343,826

Source: Study Team

Maintenance and Protection of Traffic

We appropriated the following item for safety measures in a construction period.

These expenses shall be contained in overhead expenses by instructions of DRVN.

Arrangement of a traffic security guard: 8 place x 33 month

A barricade is installed in the entrance of a construction zone: 8 place, total length=150m

It is disposition of a sprinkler truck as an environmental measure: soil transport period 12+3 month

Hai An side 1 vehicle

Cat Hai side 1 vehicle

A road surface cleaning member is arranged: 10 person x 33 month

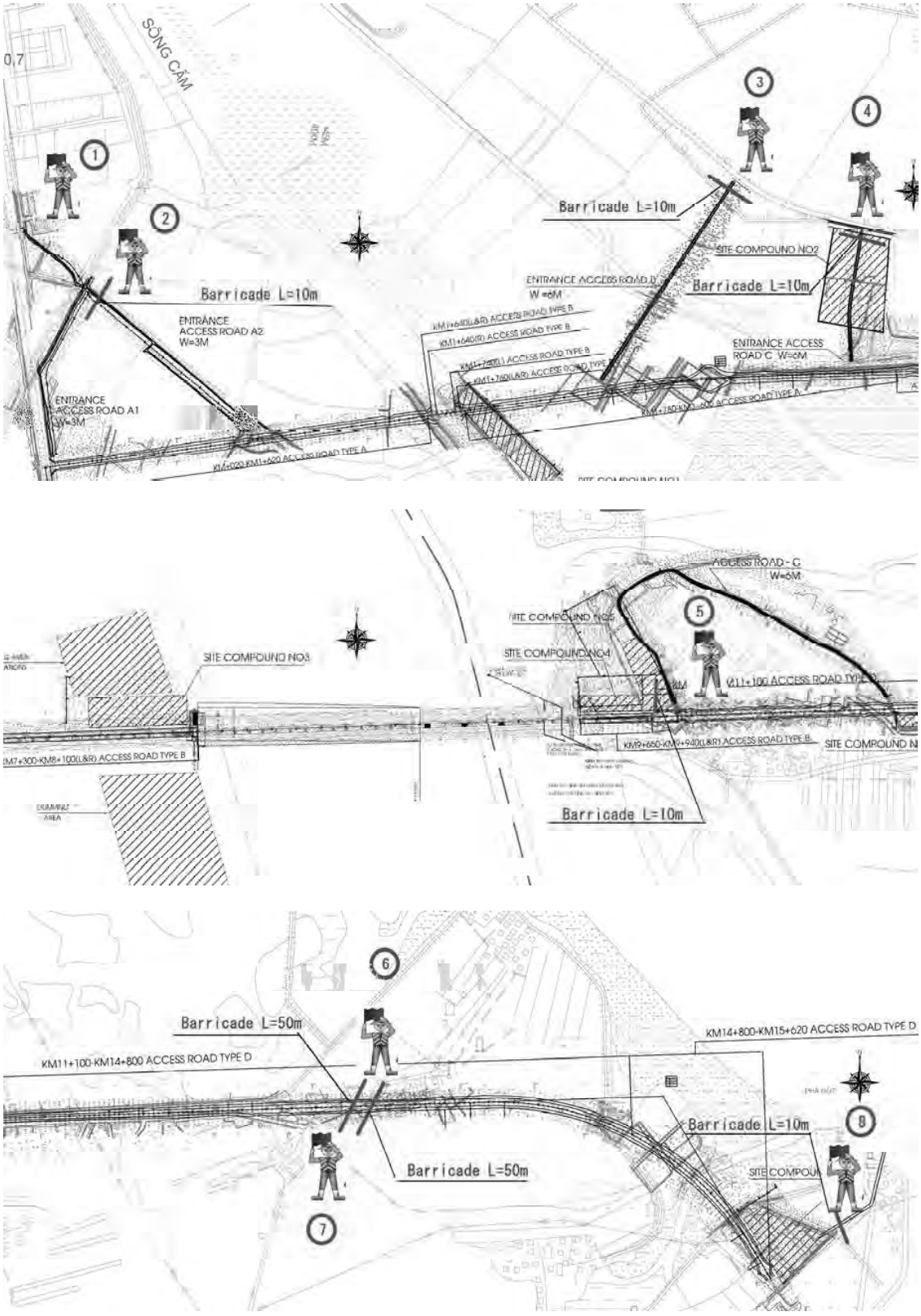


Figure 15.5.1-1 Layout of Maintenance and Protection of Traffic

15.5.2 Borrow Pit for Earth Work

All road plans were planned with filling in the seaside zone where the geographical feature of this project is flat. Therefore, all the filling material is purchase material.

Filling material is procured from the following Borrow Pit.

Table 15.5.2-1 The procurement place of filling material

Iterm	Stockpiles						
	Location of mines/ stockpiles	Material resource	Reserve (m^3)	Supplied capacity (m^3/day)	Route from quarry / sand stockpile to the Project	Transportation distance	
						Highway (Km)	Water way (Km)
Filling sand	PR 353 stockpile	Thai Binh and Kinh Thay sand pit river	100.000x4	1000	From the quarry/ stockpile to material stockpile at Km11+00 (weter way) & *Km4 (highway)*	20.6	20.2
	Rao bridge stockpile		100.000x3	1000		18.1	22.4
	Niem bridge stockpile		50.000x2	200		15.6	28.7
	Dong Hai stockpile	Kinh Thay sand pit river	50.000x2	200		7.4	13.7
	Tram Bac stockpile	Kinh Thay and Thai Binh sand pit river	100.000	200		30.5	44.0
	Quy Cao stockpile	Thai Binh sand pit river	50.000	200		41.6	54.8
Filling soil for embankment , slope protection and subgrade	Thien Hoi borrow pit		1.000.000	2000	From the borow pits to material stockpile at Km11 +00 (weter way) & *Km4 (highway)*	30.1	Existing way + waterway 0.8+40.8
	Minh Duc borrow pit		1.000.000	2000		34.2	Ditto 1.6+27.0
	Doc Do borrow pit		100.000	500		40.8	Ditto 3.3+35.4
	Diem Moi borrow pit		3.000.000	3000		71.6	Ditto 12.1+53.2

Source Study Team (material survey report)

The required quantity of filling and procurement distribution are shown in table 5-3.

Transportation of filling material takes both an overland route and a ship into consideration.

Table 15.5.2-2 Required quantity of filling and procurement distribution

Table 15.5.2-3 Required quantity of filling and procurement distribution

Item		Design Volume			Borrow pit			PR353	Sand pit				
		Earth Works	soft soil treatmen	Total	Minh Duc	Thiên Hoi	Diem Moi		Rao bridge	Niem bridge	Dong Hai	Tram Bac	Quy Cao
					Clay	Gravel soil	Soil						
		1,000,000m3			1,000,000m3	1,000,000m3	3,560,000m3	1000m3/day	1000m3/day	200m3/day	200m3/day	200m3/day	200m3/day
Temporary road													
	Entrance access road A1	0.0		0.0		0.0		0.0	0.0				
	Entrance access road A2	0.0		0.0		0.0		0.0	0.0				
	Entrance access road B	19,668.0		19,668.0		17,779.9		2,399.5	2,399.5				
	Entrance access road C	7,847.0		7,847.0		8,867.1							
	Site access road A	95,192.0	0.0	95,192.0				58,067.1	58,067.1				
	Site access road B (Hai An)	7,300.0	1.0	7,301.0				4,453.6	4,453.6				
	Site access road B (C.Hai)	560.0	1.0	561.0				342.2	342.2				
	Site access road C	8,703.0		8,703.0		9,834.4							
	Site access road D	131,158.52		131,158.5				80,006.7	80,006.7				
	Dumping Site (Site 1+ Site 2)		41,973.9	41,973.9				25,604.1	25,604.1				
	Sub-total	270,428.5		270,430.5	0.0	36,481.4	0.0	170,873.2	170,873.2	0.0	0.0	0.0	0.0
Temporary compound													
	Site compound 1	62,933.4		62,933.4		17,778.7	17,778.7	19,194.7	19,194.7				
	Site compound 2	76,626.5		76,626.5		21,647.0	21,647.0	23,371.1	23,371.1				
	Site compound 3	0.0		0.0		0.0	0.0	0.0	0.0				
	Site compound 4	0.0		0.0		0.0	0.0	0.0	0.0				
	Site compound 5	0.0		0.0		0.0	0.0	0.0	0.0				
	Site compound 7	56,322.1		56,322.1		15,911.0	15,911.0	17,178.2	17,178.2				
	Sub-total	195,881.9		195,881.9	0.0	55,336.6	55,336.6	59,744.0	59,744.0	0.0	0.0	0.0	0.0
Hai An side													
	Subgrade (K=98%)	31,205.0		31,205.0		36,197.8							
	Below subgrade (K=95%)	196,046.0	204,906.0	400,952.0		181,230.3	271,845.5						
	Surcharge		187,866.0	187,866.0		84,915.4	127,373.1						
	Cohesive slope construction	34,371.0		34,371.0	37,808.1								
	Side ditch embankment(K=90%)	10,938.0		10,938.0		4,944.0	7,416.0						
	Coarse Drainge Blanket	104,402.0		104,402.0				50,948.2	50,948.2	12,737.0	12,737.0		
	Backfill under GDB (K=90%)	128,800.0		128,800.0				62,854.4	62,854.4	15,713.6	15,713.6		
	Sand drain		473,841.9	473,841.9				189,536.8	189,536.8	47,384.2	47,384.2		
	Sand compaction pile		49,227.3	49,227.3				19,690.9	19,690.9	4,922.7	4,922.7		
	Sub-total	505,762.0	915,841.2	1,421,603.2	37,808.1	307,287.5	406,634.6	323,030.3	323,030.3	80,757.6	80,757.6	0.0	0.0
Cat Hai side													
	Subgrade (K=98%)	36,268.0		36,268.0		42,070.9							
	Below subgrade (K=95%)	318,804.0	232,002.0	550,806.0		248,964.3	373,446.5						
	Surcharge		220,251.0	220,251.0		99,553.5	199,106.9						
	Cohesive slope construction	70,395.0		70,395.0	77,434.5								
	Side ditch embankment(K=90%)	13,474.0		13,474.0		6,090.2	9,135.4						
	Coarse Drainge Blanket	139,288.0		139,288.0				67,972.5	67,972.5	16,993.1	16,993.1		
	Backfill under GDB (K=90%)	162,373.0		162,373.0				79,238.0	79,238.0	19,809.5	19,809.5		
	Sand drain		267,343.3	267,343.3				106,937.3	106,937.3	26,734.3	26,734.3		
	Sand compaction pile		21,649.5	21,649.5				8,659.8	8,659.8	2,165.0	2,165.0		
	Sub-total	740,602.0	741,245.8	1,481,847.8	77,434.5	396,678.9	581,688.7	262,807.7	262,807.7	65,701.9	65,701.9	0.0	0.0
	Total	1,712,674.4	1,657,087.1	3,369,763.5	115,242.6	795,784.4	1,043,659.9	816,455.2	816,455.2	146,459.5	146,459.5		
Hai An side					37,808	373,360	446,060	430,516	430,516	80,758	80,758		
Cat Hai side					77,435	422,424	597,600	359,993	359,993	65,702	65,702		

Yellow sand	Hai An side	260,176	260,176	65,044	65,044
	Cat Hai side	183,570	183,570	45,892	45,892
Black sand	Hai An side	170,340	170,340	15,714	15,714
	Cat Hai side	176,423	176,423	19,810	19,810

Souse: Study Team

15.5.3 Quarry site for Pavement Work and Concrete Work

Paving work and concrete construction install a batcher plant in a construction site, respectively.

The batcher plant for pavement prepares 200 t/h capacity for the Hai An and Cat Hai side, respectively.

A concrete batcher plant prepares 90-m3/h for a segment manufacture yard, and prepares two 60 m3/h of offshore plant for marine construction.

It is necessary to always stock aggregate in these plants, and carries from the following quarry and a sand stock pile.

Table 15.5.3-1 Required quantity of sand and a crushed stone

Item	Description		Design Quantity	Cement	Sand	Crushed stone
Temporary works						
	Entrance access road B		1,159			1,159
	Entrance access road C		695			695
	Site access road A		9,344			9,344
	Site access road B		7,773			7,773
	Site access road C		2,241			2,241
	Site access road D		12,178			12,178
	Sub-total	Hai An	18,971			18,971
		Cat Hai	14,419			14,419
Concrete						
Concrete 50Mpa				542kg/m3	0.373m3	0.740m3
	Approach Bridge Hai An	Superstructure	45,887	24,870,483	17,116	33,956
	Sub-total	Hai An	45,887	24,870,483	17,116	33,956
Concrete 40Mpa				463kg/m3	0.456m3	0.708m3
	Approach Bridge Hai An	Substructure	3,037	1,406,224	1,385	2,150
	Main Bridge	Superstructure	14,711	6,811,286	6,708	10,416
	Approach Bridge Cat Hai	Superstructure	5,921	2,741,608	2,700	4,192
		Substructure	1,841	852,337	839	1,303
	Cam River Bridge	Superstructure	900	416,746	410	637
	Sub-total	Hai An	3,937	1,822,970	1,795	2,788
		Cat Hai	22,474	10,405,231	10,248	15,911
Concrete 35Mpa				458kg/m3	0.424m3	0.861m3
	Cam River Bridge	Superstructure	16	7,420	7	14
	Sub-total	Hai An	16	7,420	7	14
Concrete 30Mpa				455kg/m3	0.400m3	0.851m3
	Cam River Bridge	Superstructure	3,716	1,690,735	1,486	3,162
	Box culvert 0+788	Hai An	304	138,275	122	259
	Box culvert 0+915	Hai An	382	173,583	153	325
	Box culvert 2+390	Hai An	329	149,650	132	280
	Box culvert 2+650	Hai An	336	152,744	134	286
	Box culvert 4+140	Hai An	510	232,232	204	434
	Box culvert 10+805	Cat hai	409	185,868	163	348
	Box culvert 14+620	Cat hai	393	178,724	157	334
	Box culvert 14+650	Cat hai	38	17,381	15	33
	Box culvert 14+907	Cat hai	292	132,997	117	249
	Box culvert 15+100	Cat hai	1,127	512,740	451	959
	Box culvert 10+075	Cat hai	451	205,251	180	384
	Box culvert 10+414	Cat hai	441	200,655	176	375
	Box culvert 13+600	Cat hai	442	201,201	177	376
	Box culvert 14+651.5	Cat hai	449	204,386	180	382
	Box culvert 15+340	Cat hai	450	204,887	180	383
	Sub-total	Hai An	5,576	2,537,217	2,231	4,745
		Cat Hai	4,493	2,044,088	1,797	3,823

Item	Description		Design Quantity	Cement	Sand	Crushed stone
Temporary works						
Concrete 30Mpa				455kg/m3	0.448m3	0.805m3
	Bored pile Cam river Br.	D=1200	879	399,896	394	708
	Bored pile Hai An	D=1500	10,234	4,656,652	4,585	8,239
	Bored pile Cat Hai	D=1500	3,329	1,514,832	1,492	2,680
	Sub-total	Hai An	11,113	5,056,548	4,979	8,946
		Cat Hai	3,329	1,514,832	1,492	2,680
Concrete 28Mpa				455kg/m3	0.400m3	0.851m3
	Approach Bridge Hai An	Superstructure	2,891	1,315,587	1,157	2,461
		Substructure	30,834	14,029,334	12,333	26,239
	Main Bridge	Superstructure	301	136,819	120	256
		Substructure	2,536	1,153,880	1,014	2,158
	Approach Bridge Cat Hai	Superstructure	336	153,017	135	286
		Substructure	3,810	1,733,550	1,524	3,242
	Cam River Bridge	Substructure	298	135,499	119	253
	Piled slab	Hai An	1,451	660,205	580	1,235
	Piled slab	Cat hai	549	249,795	220	467
	Box culvert 0+788	Hai An	33	14,879	13	28
	Box culvert 0+915	Hai An	65	29,484	26	55
	Box culvert 2+390	Hai An	33	14,879	13	28
	Box culvert 2+650	Hai An	33	14,879	13	28
	Box culvert 4+140	Hai An	74	33,625	30	63
	Box culvert 10+805	Cat hai	59	26,618	23	50
	Box culvert 14+620	Cat hai	89	40,404	36	76
	Box culvert 14+650	Cat hai	90	40,905	36	77
	Box culvert 14+907	Cat hai	29	13,059	11	24
	Box culvert 15+100	Cat hai	225	102,284	90	191
	Sub-total	Hai An	35,711	16,248,369	14,284	30,390
		Cat hai	8,023	3,650,329	3,209	6,827
Item	Description		Design Quantity	Cement	Sand	Crushed stone
Concrete 20Mpa				344kg/m3	0.456m3	0.872m3
	Main Bridge	Substructure	2,096	721,024	956	1,828
	Sub-total	cat hai	2,096	721,024	956	1,828
Concrete 15Mpa				281kg/m3	0.493m3	0.891m3
	Approach Bridge Hai An	Substructure	845	237,417	417	753
	Approach Bridge Cat Hai	Substructure	131	36,811	65	117
	Cam River Bridge	Substructure	124	34,956	61	111
	Piled slab	Hai An	1,451	407,731	715	1,293
	Piled slab	Cat hai	549	154,269	271	489
	Box culvert 0+788	Hai An	53	14,893	26	47
	Box culvert 0+915	Hai An	61	17,057	30	54
	Box culvert 2+390	Hai An	57	15,905	28	50
	Box culvert 2+650	Hai An	58	16,158	28	51
	Box culvert 4+140	Hai An	77	21,525	38	68
	Box culvert 10+805	Cat hai	64	18,068	32	57
	Box culvert 14+620	Cat hai	61	17,113	30	54
	Box culvert 14+650	Cat hai	14	3,794	7	12
	Box culvert 14+907	Cat hai	50	14,050	25	45
	Box culvert 15+100	Cat hai	114	32,034	56	102
	Box culvert 10+075	Cat hai	42	11,746	21	37
	Box culvert 10+414	Cat hai	42	11,662	20	37
	Box culvert 13+600	Cat hai	42	11,690	21	37
	Box culvert 14+651.5	Cat hai	42	11,718	21	37
	Box culvert 15+340	Cat hai	42	11,746	21	37
	Sub-total	Hai An	2,725	765,641	1,343	2,428
		Cat Hai	1,191	334,699	587	1,061

Item	Description		Design Quantity	Cement	Sand	Crushed stone
Pavement					Sand	Crushed stone
Surface Course, thickness=6cm			m2	2.37t/m3	0.256m3/t	0.384m3/t
		Hai An	94647	13,459	3,445	5,168
		Cat hai	113340	16,117	4,126	6,189
Surface Course, thickness=5cm			m2	2.37t/m3	0.256m3/t	0.384m3/t
	Tan Vu IC	Hai An	1857	264	68	101
Binder Course, thickness=7cm First Layer				2.37t/m3	0.256m3/t	0.384m3/t
		Hai An	94647	15,702	4,020	6,030
		Cat hai	113310	18,798	4,812	7,218
Binder Course, thickness=14cm First Layer			m2	2.37t/m3	0.256m3/t	0.384m3/t
	Tan Vu IC	Hai An	1857	264	68	101
Surface Course, thickness=7.5cm (for Bridge)				2.37t/m3	0.256m3/t	0.384m3/t
		Hai An	68117	12,108	3,100	4,649
		Cat hai	15431	2,743	702	1,053
Asphalt Treated Base, thickness=10cm First Layer				2.33t/m3		0.652m3/t
		Hai An	96200	22,415		1,461
		Cat hai	115049	26,806		1,748
Asphalt Treated Base, thickness=12cm First Layer			m2	2.32t/m3		0.652m3/t
	Tan Vu IC	Hai An	1955	544		43
Aggregate Subbase						
		Hai An	82626			82626
		Cat hai	98080			98080
Total		Hai An			52,455	202,418
		Cat hai			27,929	160,838

Source: Study Team

Table 15.5.3-2 Summary of Distribution of Sand Pit and Quarry Site

Sand pit				Quarry site		
PR353	Rao bridge	Niem bridge	Dong Hai	Lien Khe	Phuong Mai	Thong Nhat
1000m3/day	1000m3/day	200m3/day	200m3/day	800m3/day	200m3/day	6000m3/day
25,597.9	25,597.9	6,399.5	6,399.5	45,746.4	-	182,985.6
13,629.3	13,629.3	3,407.3	3,407.3	36,349.4	-	145,397.7

Source: Study Team

Table 15.5.3-3 Existing Sand Stockpiles

Item	Stockpiles						
	Location of mines/ stockpiles	Material resource	Reserve (m^3)	Supplied capacity (m^3/day)	Route from quarry / sand stockpile to the Project	Transportation distance	
						Highway (Km)	Water way (Km)
Sandblanket Sandrain	PR 353 stockpile	Lo sand pit, Viet Tri, Phu Tho	100.000x4	200	From the quarry/ stockpile to material stockpile at Km11+00 (weter way) & *Km0 (highway)*	20.6	20.2
	Rao bridge stockpile		100.000x3	200		18.1	22.4
	Niem bridge stockpile		50.000x2	200		15.6	28.7
	Tram Bac stockpile		100.000	200		30.5	44.0
	Dong Hai stockpile		50.000x2	200		7.4	13.7
	Quy Cao stockpile		50.000	200		41.6	54.8
	Lo river, Viet Tri-Phu Tho		Very large			0	272

Source: Study Team (Material survey report)

Table 15.5.3-4 Existing Quarry Site

Item	Mines / stockpile						
	Location	Material resource	Reserve (m^3)	Supplied capacity (m^3/day)	Route from quarry / sand stockpile to the Project	Transportation distance	
						Highway (Km)	Water way (Km)
Fine aggregate (rock 0x5mm) And coarse for AC/ cement concrete, Base, & Sub-base	Thong Nhat quarry	Limestone	>1.500.000	6000	From the quarry to material stockpile at Km4+00/ Km11+00 (weter way) & *Km4 (highway)*	47.5	48.5
	Phuong Mai quarry		>1.000.000	200		33.7	34.5
	Lien Khe quarry		600.000	800		33.0	36.9
Fine aggreagte for AC/ cement concrete (coarse sand)	PR 353 stockpile	Lo sand pit, Viet Tri, Phu Tho	100.000x4	200	From the quarry/ stockpile to material stockpile at Km7+00/ Km11+00 (weter way) & *Km0 (highway)*	20.6	20.2
	Rao bridge stockpile		100.000x3	200		18.1	22.4
	Niem bridge stockpile		50.000x2	200		15.6	28.7
	Tram Bac stockpile		100.000	200		30.5	44.0
	Dong Hai stockpile		50.000x2	200		8.5	13.7
	Quy Cao stockpile		50.000	200		41.6	54.8
	Lo river, Viet Tri-Phu Tho		Very large	As requirement		0	272

Source: Study Team (Material survey report)

15.5.4 SBS Erection Method

SBS construction method required many equipment, Fabrication of a segment, transportation of segment, erection girder, etc.

This equipment is included in main pay-items. The SBS equipment included in pay-items is as follows.

Table 15.5.4-1 The SBS equipment included in pay-items

Pay-item	The item included in Pay-item	The element of an item	Application norm
Concrete 50Mpa for Segment	Concrete foundation of Fabrication Equipment	Foundation of Gantry crane (80t) for stock yard	Vietnam norm
		Foundation of Gantry crane (7.5t) for steel Fab. Yard	Vietnam norm
		Foundation of Tower crane (180t-m)	Vietnam norm
		Rail foundation of Movable shed	Vietnam norm
		Foundation of Reinforcement assembly yard	Vietnam norm
		Segment stockyard	Vietnam norm
		Foundation of Segment manufacture stage	Vietnam norm

		Pavement for temporary road	Vietnam norm
		Disposal cost	Vietnam norm
	Equipment of Segment fabrication Yard	Gantry crane (80t)	Japan, Vietnam norm
		Gantry crane (7.5t)	Japan, Vietnam norm
		Tower crane (180t-m)	Japan, Vietnam norm
		Movable shed	Japan norm
		Curing equipment	Japan norm
		H beam of Segment stockyard	Japan norm
		Reinforcement assembly stand	Japan norm
	Short line equipment	Short line equipment installation removal	Japan norm
		Short line form equipment production costs	Japan norm
		Short line hydraulic-machines cost of equipment	Japan norm
	Segment manufacture	Segment Manufacture	Japan norm
	Freight of Fabrication Equipment	Movable shed	Japan norm
		Reinforcement assembly stand equipment	Japan norm
		Short Line Equipment	Japan norm
Concrete 50Mpa for Pier Head Cast in Place	Bracket support and scaffold	Bracket support and scaffold	Japan norm
		Pier head temporary bearing	Japan norm
		Form fabrication, installation, and removal	Japan norm
Erection of Segment	SBS girder installation and removal	No.1 and No.2 Bent foundation (for erection girder erection)	Japan norm
		Bent equipment (for erection girder assemblies)	Japan norm
		Erection girder assembly and demolition	Japan norm
		SBS Erection Girder Equipment	Japan norm
	Erection of segment	Movement and installation of SBS girder	Japan norm
		Segment loading and transport	Japan norm
		Segment erection	Japan norm
		segment connection	Japan norm

Source: Study Team

15.5.5 Temporary expense contained in Pay-item "Concrete 50Mpa for Segment"

15.5.5.1 Concrete foundation of Fabrication Equipment

(1) Gantry crane 80t Rail foundation

The item composition unit price of the rail foundation applies a Vietnam norm.

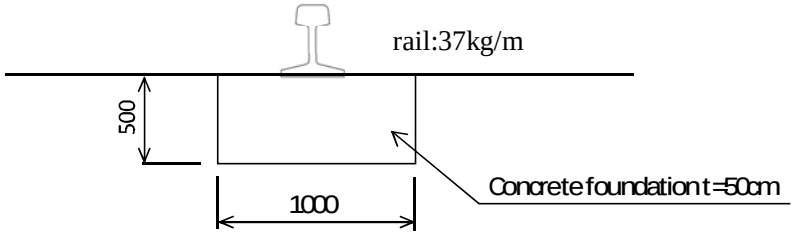


Figure 15.5.5-1 Gantry crane 80t Rail foundation

Table 15.5.5-1 Quantity of Rail Foundation of Gantry Crane (80t)

Rail legth = 372.5m x 4 line

Item	Description	unit	Quantity	Remarks
Concrete	28Mpa	m3	745.0	V= 1.00*0.50*372.5*4
Form	Common	m2	1494.0	A= (0.50*372.5*2+1.00*0.50*2)*4
Excavation	soil	m3	1490.0	V=2*372.5*4*0.5
Back filling	K=95%	m3	745.0	V=1490-745
Rail	37kg/m	m	1490.0	L= 372.5*4

Source: Study Team

(2) Gantry crane 7.5t Rail foundation

The item composition unit price of the rail foundation applies a Vietnam norm.

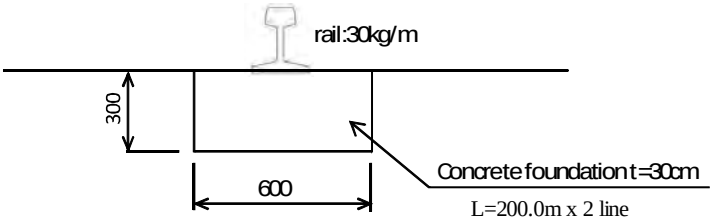


Figure 15.5.5-2 Gantry crane 7.5t Rail foundation

Table 15.5.5-2 Quantity of Rail Foundation of Gantry Crane (7.5t)

Rail legth = 190m x 2 line

Item	Description	unit	Quantity	Remarks
Concrete	28Mpa	m3	68.4	V= (0.60*0.30*190)*2
Form	Common	m2	228.7	A= (0.3*190*2+0.6*0.3*2)*2
Excavation	soil	m3	182.4	V= 1.60*190*2*0.3
Back filling	K=95%	m3	114.0	V= 182.4-68.4
Rail	30kg/m	m	380.0	L= 190*2

Source: Study Team

(3) Shed Rail foundation

The item composition unit price of the rail foundation applies a Vietnam norm.

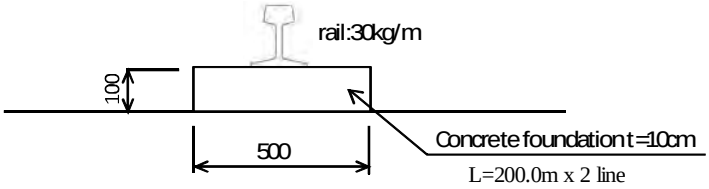


Figure 15.5.5-3 Shed Rail foundation

Table 15.5.5-3 Quantity of Shed Rail Foundation

Rail length = 200m x 2 line

Item	Description	unit	Quantity	Remarks
Concrete	28Mpa	m3	20.0	V= (0.50*0.10*200)*2
Form	Common	m2	80.2	A= (0.1*200*2+0.5*0.1*2)*2
Rail	30kg/m	m	400.0	L= 200*2

Source: Study Team

(4) Foundation of Reinforcement assembly stand

The item composition unit price of the rail foundation applies a Vietnam norm.

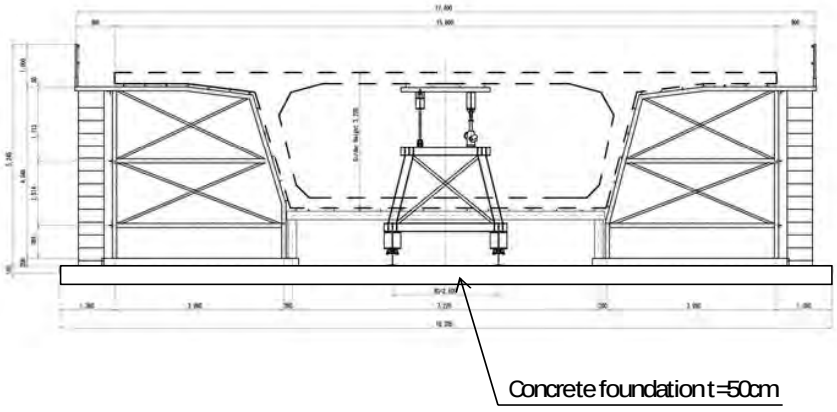


Figure 15.5.5-4 Foundation of Reinforcement assembly stand

Table 15.5.5-4 Quantity of Reinforcement assembly stand Foundation

(per one stand)

Item	Description	unit	Quantity	Remarks
Concrete	28Mpa	m3	182.1	V= 18.205*19.0*0.5+18.205*0.5*0.5*2
Form	Common	m2	38.2	A= 18.205*0.5*2+0.50*0.50*4+19.0*0.5*2
Excavation	soil	m3	192.1	V= 19.205*20.0*0.5
Back filling	K=95%	m3	19.2	V= 192.1-(18.205*19.0*0.5)

Source: Study Team

(5) Foundation of Segment Fabrication stage (per 5 set)

The item composition unit price of the rail foundation applies a Vietnam norm.

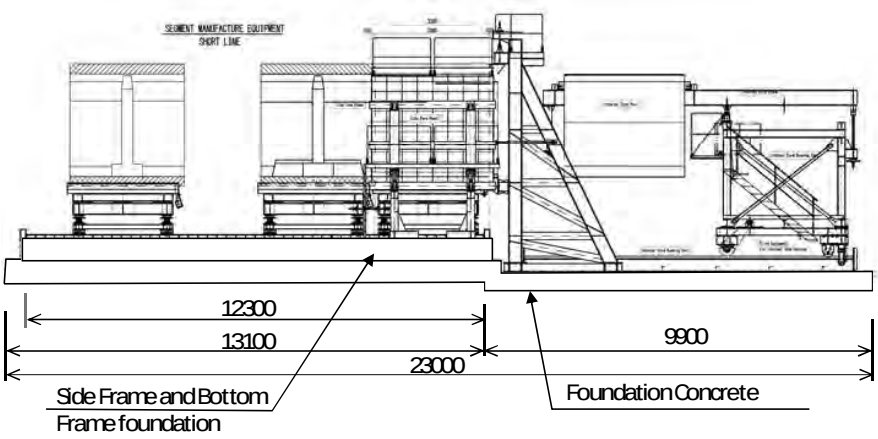


Figure 15.5.5-5 Short Line Equipment Foundation Side View

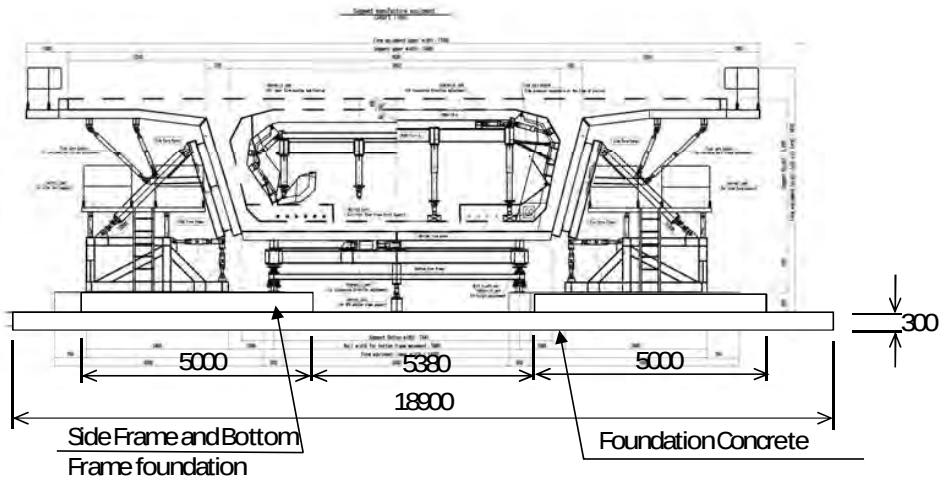


Figure 15.5.5-6 Short Line Equipment Foundation Front View

Table 15.5.5-5 Quantity of Short Line Equipment Foundation

Foundation of Short Line Equipment (per 5 set)

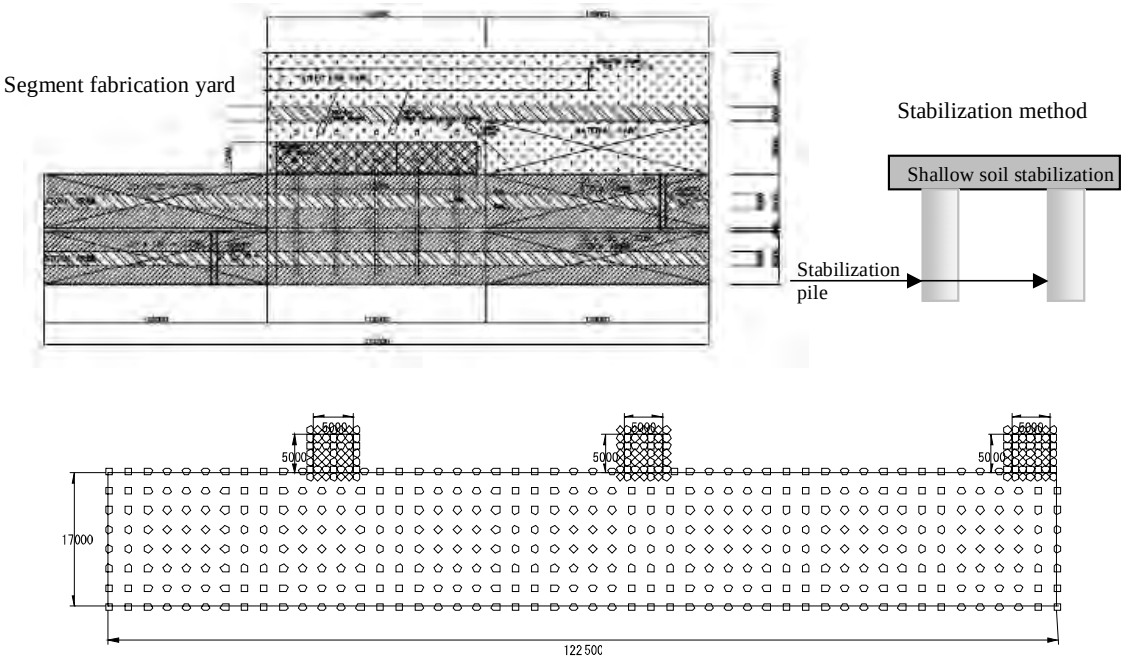
Item	Description	unit	Quantity	Remarks
Concrete	28Mpa	m3	652.1	V=18.90*0.30*23.00*5
Form	Common	m2	125.7	A=18.9*0.3*2*5+23.0*0.3*2*5
Excavation	soil	m3	680.4	V= 18.9*0.3*24.0*5
Back filling	K=95%	m3	28.3	V= 680.4-652.1

Side Frame and Bottom Frame foundation (per 5 set)

Item	Description	unit	Quantity	Remarks
Concrete	28Mpa	m3	307.5	V=(5.0*12.3*0.50*2)*5
Form	Common	m2	173.0	A=(5.0*0.5*2+12.3*0.5*2)*5*2

Source: Study Team

Since accuracy is required of segment manufacture, the manufacture yard shall control settlement by soft ground, and it shall perform stabilized treatment.



Stabilization pile (Alicc method)	Pile length	18.0 m
	Pile number	393 piles
	Stabilization pile volume	5,553.1 m3
Shallow soil stabilization	Improvement area	2,082.5 m2
	Treatment thickness	1.0 m
	Stabilization soil volume	2,082.5 m3

Figure 15.5.5-7 Soil Stabilization of Segment Fabrication Yard

(6) Segment Stockyard

The item composition unit price of the rail foundation applies a Vietnam norm.

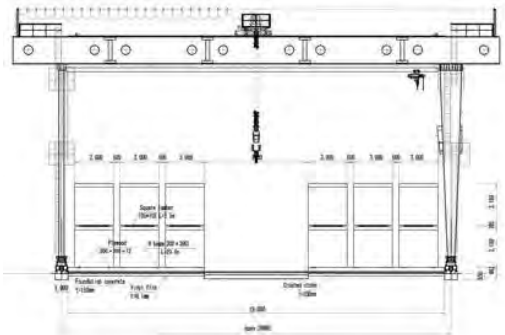


Figure 15.5.5-8 Foundation of Segment Stockyard

Table 15.5.5-6 Quantity of Segment Stockyard Foundation

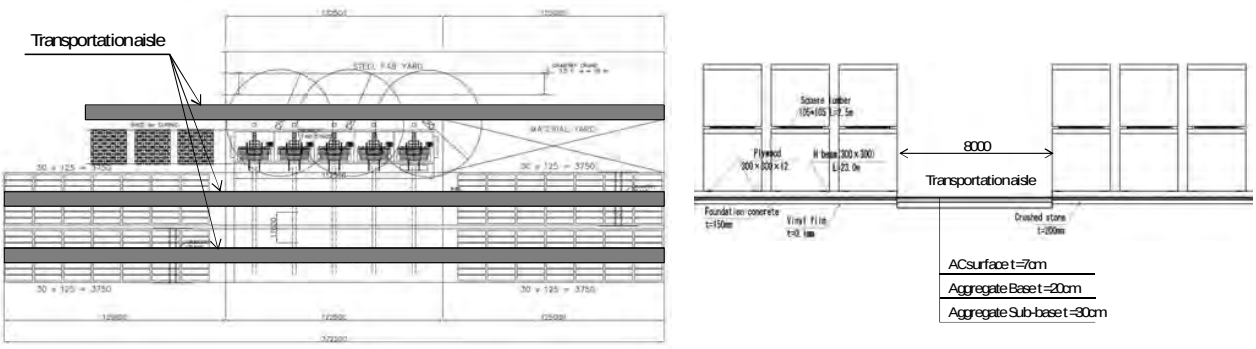
(per 2 yard)

Item	Description	unit	Quantity	Remarks
Crushed stone	t=20cm	m2	10,500.0	A=10.5*125.0*2*2*2yard
Concrete		m3	88.2	V=10.5*0.15*1.0*14*2*2yard
Form		m2	193.2	A=(10.5*0.15*2+1.0*0.15*2)*14*2*2yard
H beam	300x300x10/15 (94.0kg/m)	m	1176.0	L=10.5*2*7*2*2*2yard
		kg	110,544	
Plywood	300x300x12	m3	0.7	V=(0.30*0.30*0.012)*4*3*7*2*2*2yard
Square lumber	105x105*2.5m	m3	9.3	V=(0.105*0.105*2.5)*2*3*7*2*2*2yard
Vinyl film	t=0.1mm	m2	10,500	A=10.5*125*2*2*2yard

Source: Study Team

(7) Pavement of Transportation aisle in a segment yard

The item composition unit price of the rail foundation applies a Vietnam norm.



Item	Description	unit	Quantity	Remarks
AC surface	t=7cm	m2	8,480.0	A=(315+372.5+372.5)*8.0
Aggregate Base	t=20cm	m3	1696.0	V=8480*0.20
Aggregate Sub-base	t=30cm	m3	2544.0	V=8480*0.30

Source: Study Team

Figure 15.5.5-9 Pavement of Segment Stockyard

(8) Disposal Cost

This item is the removal expense of the concrete foundation installed in the segment fabrication yard, and pavement.

The item composition unit price of the rail foundation applies a Vietnam norm.

Quantity is the above-mentioned foundation concrete and the gross quantity of asphalt paving.

15.5.5.2 Equipment of Segment Fabrication Yard

(1) Gantry Crane (80t)

The unit price of Gantry crane (80t) consists of the following items.

- Rail equipment for Gantry crane (80t)
- Gantry crane (80t) assembly and demolition
- Hire of Gantry crane equipment
- Hire of Rail for gantry crane

1) Rail equipment for Gantry crane (80t)

It is the expense of rail equipment of Gantry crane (80t).

Application standard : Cost estimate of bridge erection P209 table 2-138

Table 15.5.5-7 Japan Norm of Rail Equipment installation and Removal (Per 100m)

Item		Unit	norm
Bridge labor organizer		Person	1.0
Bridge specialist		person	4.0
Usually worker		person	1.0
Rough terrain crane	hydraulic 25t hung	day	100/40=2.5
Miscellaneous cost	4.0% of sum of labor costs		

Source: Japan norm (Cost estimate of bridge erection)

2) Gantry crane (80t) assembly and demolition

This is an assembly of Gantry crane (80t), and the expense of demolition.

Application standard : Cost estimate of bridge erection P208 table 2-136

Table 15.5.5-8 Japan Norm of Gantry crane (80t) assembly and demolition

Item		Unit	norm
Bridge labor organizer		Person	1.0
Bridge specialist		person	6.0
Usually worker		person	1.0
Electric worker	Per site	person	8.0
Rough terrain crane	hydraulic 25t hung	t/day	W/(0.25W+2)
Miscellaneous cost	3.0% of sum of labor costs		

Source: Japan norm (Cost estimate of bridge erection)

The weight of a gate type crane is computed by the following formula. (Cost estimate of bridge erection P558)

$W=1.33P(B+0.1H)\times(B+1.5H)\times10^{-3}+M$

Where,

W : Weight of Gantry crane frame (t)

P : Weight of PC girder *1/2 (t) =80t*1/2=40t

B : Width of Foot (m)

H : Height of Foot (m)

M : Weight of a ladder, a handrail, and a driver's seat = 4.0t

W : Frame weight $=1.33*40*(30+0.1*15)*(30+1.5*15)*10^{-3}+4.0=92$ t

The amount of construction per day of a rough terrain crane is computed by the following formula. (Cost estimate of bridge erection P208)

The amount of construction per day = $W/(0.25W+2)=92/(0.25\times92+2)$ = 3.68t/day

Required days=92/3.68=25days

Rail hire of 30kg/m = 2540 yen/day (Cost estimate of bridge erection P621 table 3-83)

Operation days of Gantry Crane (80t)

Operation days are from installation to the end of segment erection .

Refer to the construction work schedule.

Installation: 2013/2/15

End of segment erection: 2015/3/30

Total operation days: **1139days**

(2) Gantry crane (7.5t) assembly and demolition

This is an assembly of Gantry crane (7.5t), and the expense of demolition.

Application standard : Cost estimate of bridge erection P208 table 2-136

Norm is same as gantry crane 80t

Weight of gantry crane 7.5t

W : Frame weight $=1.33*4.0*(18.5+0.1*15)*(18.5+1.5*15)*10^{-3}+4.0=8.4$t

The amount of construction per day =W/(0.25W+2) = 6.5/(0.25*6.5+2) = 1.79t/day

Required days=6.5/1.79=3.63day

Rail hire of 30kg/m = 2080 yen/day (Cost estimate of bridge erection P621 table 3-83)

Operation days of Gantry Crane (7.5t)

Operation days are from installation to the end of segment erection .

Refer to the construction work schedule.

Installation: 2013/2/15

End of segment erection: 2015/3/30

Total operation days: **1139days**

(3) Tower Crane(180 t-m)

Tower crane capacity: Max load 6.0t, Max radius R=30m

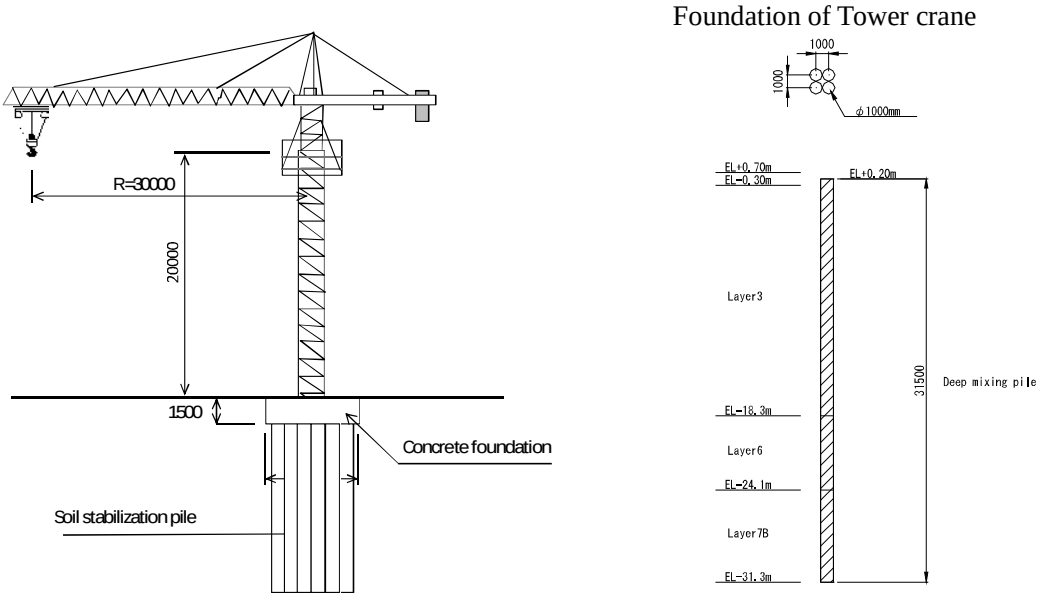


Figure 15.5.5-10 Tower crane (180 t-m)

Table 15.5.5-9 Concrete foundation (per one crane)

per one crane

Item	Description	unit	Quantity	Remarks
Concrete	28Mpa	m3	37.5	V= 5.000*5.000*1.500
Form	Common	m2	30.0	A= 5.000*1.500*4
Excavation	soil	m3	54.0	V= 6.000*6.000*1.500
Back filling	K=95%	m3	16.5	V= 54.0-37.5
Soil stsbilization pile	D=1.0m	m3	791.3	V=(3.14*1.0^2/4)*32*31.5

Source: Study Team

Tower crane (180t-m) installation and demolition

Application standard : Cost estimate of bridge erection P710 table 3-41-2

Table 15.5.5-10 Japan norm of Tower crane (180t-m) installation and demolition

Item		Unit	norm
Bridge labor organizer		Person	1.0
Bridge specialist		person	6.0
Usually worker		person	1.0
Erection tool		day	1.0
Rough terrain crane	hydraulic 45t hung	t/day	W/(0.25W+2)

Source: Japan norm (Cost estimate of bridge erection)

The assembly demolition days of a tower crane = 0.25*W+0.125*H

W : Weight of tower crane = 88t

H : Height of tower crane = 20m

Days = 0.25*88+0.125*20 = 24.5days

Tower crane equipment Hire is based on Table 3-41-1 of Cost estimate of bridge erection

- Main part hire (per one crane) × operation days
- Intermediate part hire (per m day) × operation days
- Small equipment = 1.8% of the above-mentioned total

(4) Movable Shed equipment

It is the expense of the shed equipment for curing of a segment.

Shed equipment production costs

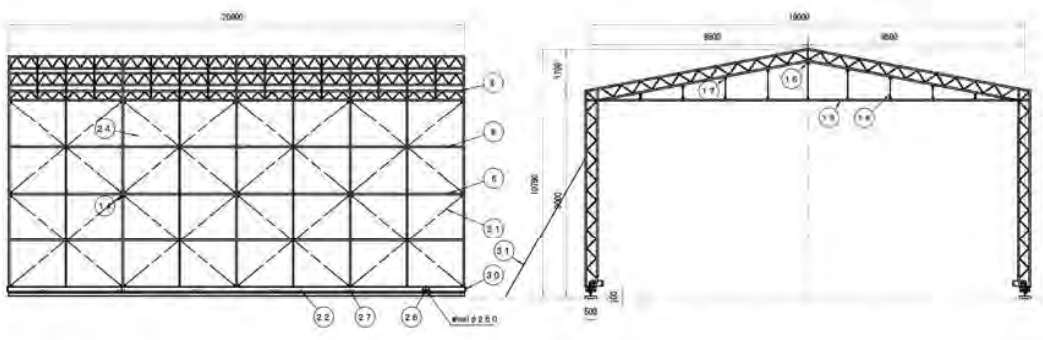


Figure 15.5.5-11 Movable Shed

Table 15.5.5-11 Shed material List

No.	Item	Material	Quantity	Unit weight	Weight
1	φ89.1×3.2t	STK400	364m	6.78 m/Kg	2468 Kg
2	φ42.7×2.3t (lattice of 1)	STK400	243m	2.29 m/Kg	556 Kg
3	φ76.3×2.8t	STK400	158m	5.08 m/Kg	803 Kg
4	φ76.3×2.8t	STK400	236m	5.08 m/Kg	1199 Kg
5	φ34×2.3t (lattice of 4)	STK400	87m	1.8 m/Kg	157 Kg
6	φ48.6×2.3t	STK400	39m	2.63 m/Kg	103 Kg
7	φ48.6×2.3t (lattice of 6)	STK400	29m	1.19 m/Kg	35 Kg
8	φ60.5×2.3t	STK400	77m	3.3 m/Kg	254 Kg
9	φ60.5×2.3t	STK400	39m	3.3 m/Kg	129 Kg
10	φ27.2×1.9t (lattice of 9)	STK400	15m	1.19 m/Kg	18 Kg
11	φ60.5×2.3t	STK400	150m	3.3 m/Kg	495 Kg
12	φ27.2×1.9t (lattice of 11)	STK400	58m	1.19 m/Kg	69 Kg
13	φ27.2×1.9t (lattice of 19)	STK400	61m	0.928 m/Kg	57 Kg
14	FB150×6t (batten plate)	SS400	5m	7.07 m/Kg	35 Kg
15	FB150×6t (batten plate)	SS400	6m	7.07 m/Kg	42 Kg
16	FB150×6t (batten plate)	SS400	7m	7.07 m/Kg	49 Kg
17	FB150×6t (batten plate)	SS400	7m	7.07 m/Kg	49 Kg
18	φ16	SS400	34m	1.58 m/Kg	54 Kg
19	□ 75×75×2.3t	STKR400	97m	5.14 m/Kg	499 Kg
20	φ16	SS400	244m	1.58 m/Kg	386 Kg
21	φ16	SS400	201m	1.58 m/Kg	318 Kg
22	[250×90×9t	SS400	80m	34.6 m/Kg	2768 Kg
23	L 65×65×5t (support)	SS400	20m	5 m/Kg	100 Kg
24	Membrance		1118m²	0.6 m²/Kg	671 Kg
25	0.75Kw motor 1/60 reduction gears		4nos		
26	φ250 drive wheel		4nos		
27	φ250 wheel		8nos		
28	Rail clamp		4set		
29	Chain for a drive		4nos		
30	Stopper with rubber		4nos		
31	Windproof rope		16nos		
				Total	11,312 Kg

Source: Study team

Application standard : Cost estimate of bridge erection P697 table 3-34-1

- The number of staffs which factory fabrication requires : 8.0person/t
- Secondary labor costs use 32.2% of factory direct labor expenses.
- Factory administrative cost uses 28.8% of the sum total of a factory direct labor cost, sub-materials expense, paint expense, and secondary labor costs.

(5) Movable shed assemble and demolition

Application standard : Extrusion construction method Prestressed concrete bridge Standard cost estimate P37 (Japan Prestressed Concrete Contractors Association)

Table 15.5.5-12 Japan norm of Movable shed assemble and demolition

Per installation area of 1 m2

Item		Unit	norm
Bridge labor organizer		Person	0.04
Bridge specialist		person	0.16
Scaffold erector		person	0.08
Usually worker		person	0.08
Electric worker		person	0.04
Rough terrain crane	hydraulic 25t hung	day	0.04

Source: Japan norm (Extrusion construction method Prestressed concrete bridge Standard cost estimate)

(6) Curing equipment

When the segment concrete curing removes a form, it must secure the following intensity.

- Concrete age 15 hours : Compressive strength of 14K/mm2 for stripping.
- Concrete age 2 days : Compressive strength of 35K/mm2 for Installation of a pretension.

In order to secure the above-mentioned intensity, it is necessary to carry out steam curing.

The average program of steam curing is shown below.

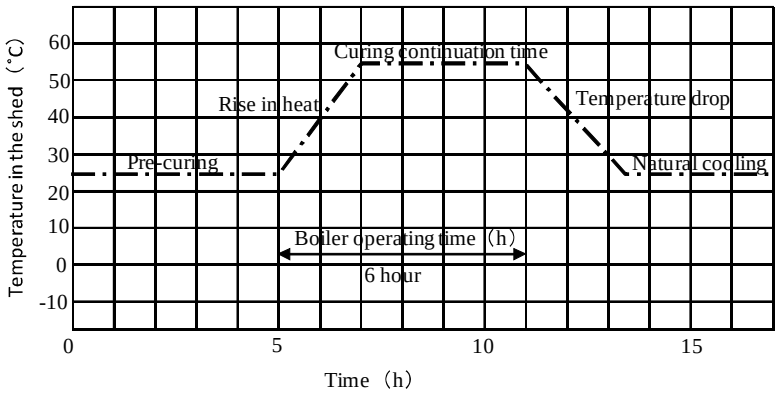


Figure 15.5.5-12 Curing Program

The equipment to adopt was determined as follows than the example of construction.

- Curing equipment : 1500kg/h,
- Fuel consumption per time : 110.1 litter/h

(7) Temporary place yard support steel installation and removal (H-Beam)

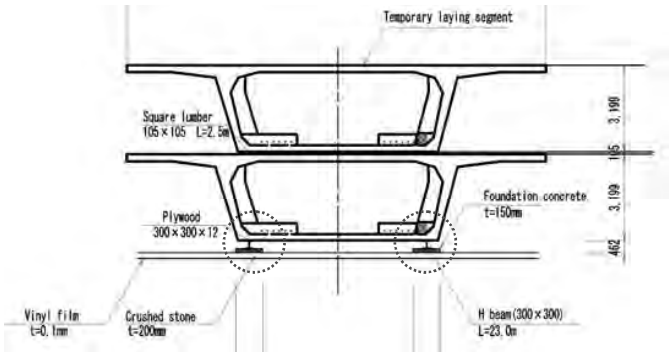


Figure 15.5.5-13 H-Beam of Segment Stockyard

Application standard : Ministry of Land, Infrastructure and Transport public works cost estimate standard P943 table4.2

Table 15.5.5-13 Japan Norm of Support Installation and Removal (per 10m)

Item		Unit	norm
Labor organizer		Person	0.11
Technician		person	0.34
Usually worker		person	0.24
Rough terrain crane	hydraulic 25t hung	day	0.13
Steel hire	H beam 300*300	t	0.93

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

(8) Reinforcement assembly stand

Steel Material Weight Table

Structure Name	Steel Standard	Length (m)	Unit weight (kg/m)	Weight (kg)
Side Frame	H-100×100×6/8	351.0	16.9	5932
	H-200×200×8/12	83.5	49.9	4167
	L-50×50×6	452.0	4.43	2002
	L-75×75×6	82.5	6.85	565
	SGP-50A	3.6	5.31	19
			Subtotal	12685
Bottom Frame	H-200×200×8/12	83.7	49.9	4177
	L-50×50×6	115.5	4.43	512
	L-75×75×6	16.5	6.85	113
			Subtotal	4802
Inner Frame Cart	H-400×400×13/21	9.8	172.0	1686
	H-400×200×8/13	12.6	64.5	813
	H-200×200×8/12	20.2	49.9	1008
	H-100×100×6/8	19.2	16.9	324
	C-250×90×9/13	2.8	34.6	97
	L-100×100×10	8.2	14.9	122
	L-65×65×6	8.8	5.91	52
	L-50×50×6	15.6	4.43	69
	PL			50
			Subtotal	4221
Rail for move	I-300×150×8	21.0	48.3	1014
	FB-300×25	21.0	58.9	1237
	PL			100
			Subtotal	2351
			Total Weight	24059

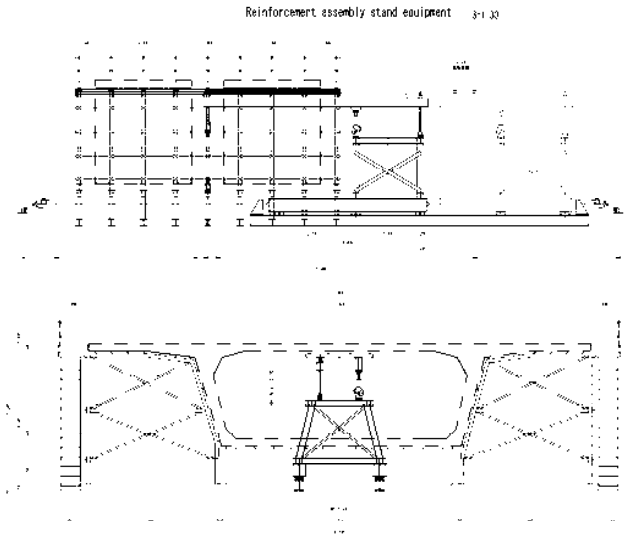


Figure 15.5.5-14 Reinforcement assembly stand

Application standard : Cost estimate of bridge erection P702 table 3-34-1

- The number of staffs which factory fabrication requires : 8.0person/t
- Secondary labor costs use 32.2% of factory direct labor expenses.

Factory administrative cost uses 28.8% of the sum total of a factory direct labor cost, sub-materials expense, paint expense, and secondary labor costs.

(9) Reinforcement assembly stand ground assembly

Application standard : Cost estimate of bridge erection P310 table2-145

Steel girder is adopted.

Table 15.5.5-14 Japan Norm of Reinforcement assembly stand ground assembly

Item		Unit	norm
Bridge labor organizer		Person	1.0
Bridge specialist		person	5.0
Usually worker		person	1.0
Rough terrain crane	hydraulic 25t hung	t/day	G/(0.032(G+20))
Miscellaneous cost	4.0% of sum of labor costs		

Source: Japan norm (Cost estimate of bridge erection)

Reinforcement assembly stand weight is 27.1t/one stand

The amount of construction per day =W/(0.25W+2) = 27.1/(0.032*(27.1+20) = 17.98t/day

Required days=27.1/17.98=1.5day

(10) Reinforcement assembly stand installation

Application standard : Ministry of Land, Infrastructure and Transport public works cost estimate standard P336 table 4.4

Temporary bridge substructure installation is adopted.

Table 15.5.5-15 Reinforcement assembly stand installation Per 10t

Item		Unit	norm
Bridge labor organizer		Person	1.7
Bridge specialist		person	4.2
Welder		person	1.1
Usually worker		person	2.6
Rough terrain crane	hydraulic 25t hung	day	1.5
Miscellaneous cost	28.0% of sum of labor costs		

Source: Japan Norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

(11) Reinforcement assembly stand removal

Application standard : Ministry of Land, Infrastructure and Transport public works cost estimate standard P336 table 4.4

Temporary bridge substructure installation is adopted.

Table 15.5.5-16 Reinforcement assembly stand removal Per 10t

Item		Unit	norm
Bridge labor organizer		Person	1.1
Bridge specialist		person	3.0
Welder			1.0
Usually worker		person	1.4
Rough terrain crane	hydraulic 25t hung	day	0.7
Miscellaneous cost	1.0% of sum of labor costs		

Source: Japan Norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

15.5.5.3 Short Line Equipment

Short Line Equipment is equipment for segment fabrication.

Short line equipment is fabricated and imported in Japan.

(1) Short line form installation and removal

Application standard : Cost estimate of bridge erection P202 table2-125

Table 15.5.5-17 Short line form installation and removal Per 1.0t

Item		Unit	norm
Bridge labor organizer		Person	1.0
Bridge specialist		person	5.0
Usually worker		person	1.0
Rough terrain crane	hydraulic 25t hung	t/day	T/(0.14T+1.0)
Miscellaneous cost	1.0% of sum of labor costs		

Source: Japan norm (Cost estimate of bridge erection)

The amount of construction per day per 1.0t = 1.0/(0.14*1.0+1.0) = 0.88t/day

Required days = 1.0/0.88 = 1.14days

(2) Side form main part

Application standard : Cost estimate of bridge erection P697 table 3-34-1

- The number of staffs which factory fabrication requires : 8.0person/t
- Secondary labor costs use 32.2% of factory direct labor expenses.
- Factory administrative cost uses 28.8% of the sum total of a factory direct labor cost, sub-materials expense, paint expense, and secondary labor costs.

Table 15.5.5-18 Quantity of Side form main part

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=4.5mm	kg	85.535	35.3kg/m2	3,019.4	
Steel plate	t=9.0mm	kg	113.841	70.7kg/m2	8,048.6	
Steel plate	t=12.0mm	kg	6.730	97.2kg/m2	654.2	
Steel plate	t=22.0mm	kg	2.896	172.7kg/m2	500.2	
Flat bar	6×50	kg	0.755	47.1kg/m2	35.5	
Flat bar	9×100	kg	2.699	70.7kg/m2	190.8	
Equal-leg angle	65×65×6	kg	52.559	5.91kg/m	310.6	
Equal-leg angle	90×90×10	kg	15.834	13.3kg/m	210.6	
Stripe steel plat	t=4.5mm	kg	20.211	36.99kg/m2	747.6	
Channel	100×50×5	kg	61.310	9.36kg/m	573.9	
STK steel pipe	φ48.6×2.3	kg	53.549	2.63kg/m	140.8	
STK steel pipe	φ60.5×2.3	kg	4.387	3.30kg/m	14.5	
Round bar	φ19	kg	31.872	2.23kg/m	71.1	
Total					14,517.7	

Source: Study Team

(3) Side form support beam

The expense of a fabrication factory is assumed same as Side form main part.

Table 15.5.5-19 Quantity of Side form support beam

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=9.0mm	kg	6.944	70.7kg/m2	490.9	
Steel plate	t=16.0mm	kg	6.738	125.6kg/m2	846.3	
Stripe steel plat	t=4.5mm	kg	11.037	35.3kg/m2	389.6	
Flat bar	6×50	kg	1.984	47.1kg/m2	93.5	
Equal-leg angle	75×75×9	kg	52.595	9.96kg/m	523.8	
Equal-leg angle	50×50×6	kg	31.494	4.43kg/m	139.5	
Steel-square-bar pipe	175×175×6	kg	57.896	31.1kg/m	1,800.6	
H beam	200×200×8/12	kg	78.972	49.9kg/m	3,940.7	
STK steel pipe	φ48.6×2.3	kg	105.096	2.63kg/m	276.4	
STK steel pipe	φ60.5×2.3	kg	13.162	3.30kg/m	43.4	
Total					8,544.8	

Source: Study Team

(4) Frame of Side form

The expense of a fabrication factory is assumed same as Side form main part.

Table 15.5.5-20 Quantity of Frame of Side form

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=9.0mm	kg	2.625	70.7kg/m2	185.6	
Channel	200×90×8	kg	33.187	30.3kg/m	1,005.6	
H beam	200×200×8/12	kg	18.437	49.9kg/m	920.0	
H beam	250×250×9/14	kg	16.453	72.4kg/m	1,191.2	
H beam	500×200×10/16	kg	19.221	88.2kg/m	1,695.3	
Total					4,997.6	

Source: Study Team

(5) Bottom form (for L= 3.000 m)

The expense of a fabrication factory is assumed same as Side form main part.

Table 15.5.5-21 Quantity of Bottom form (for L= 3.000 m)

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=6.0mm	kg	38.416	47.1kg/m2	1,809.4	
Steel plate	t=32.0mm	kg	0.806	251.2kg/m2	202.4	
Steel plate	t=12.0mm	kg	1.316	94.2kg/m2	123.9	
Flat bar	9×100	kg	28.339	70.7kg/m2	2,003.6	
Flat bar	12×90	kg	1.118	94.2kg/m2	105.3	
Flat bar	12×100	kg	3.881	94.2kg/m2	365.6	
Equal-leg angle	75×75×9	kg	30.900	9.96kg/m	307.8	
Total					4,918.0	

Source: Study Team

(6) Bottom frame support beam （for L=3.000m）

The expense of a fabrication factory is assumed same as Side form main part.

Table 15.5.5-22 Quantity of Bottom frame support beam（for L=3.000m）

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
H steel	300×150×6.5/9	kg	97.986	36.7kg/m	3,596.1	
H steel	100×100×6/8	kg	35.906	17.2kg/m	617.6	
Steel-square-bar pipe	100×100×4.5	kg	39.418	13.1kg/m	516.4	
Steel-square-bar pipe	100×50×3.2	kg	26.519	7.01kg/m	185.9	
H beam	350×350×12/19	kg	12.016	137kg/m	1,646.2	
H beam	350×175×7/11	kg	6.080	49.6kg/m	301.6	
Steel plate	t=9.0mm	kg	5.989	70.7kg/m2	423.4	
Steel plate	t=16.0mm	kg	2.072	125.6kg/m2	260.3	
Steel plate	t=12.0mm	kg	1.272	94.2kg/m2	119.8	
Round bar	φ40	kg	5.023	9.87kg/m	49.6	
Total					7,716.8	

Source: Study Team

(7) Frame of bottom form (for L=3.0m)

The expense of a fabrication factory is assumed same as Side form main part.

Table 15.5.5-23 Quantity of Frame of bottom form (for L=3.0m)

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=9.0mm	kg	1.285	70.7kg/m2	90.9	
Steel plate	t=12.0mm	kg	3.399	94.2kg/m2	320.2	
Steel plate	t=22.0mm	kg	2.069	172.7kg/m2	357.3	
Steel plate	t=25.0mm	kg	1.031	196.3kg/m2	202.4	
Steel plate	t=70.0mm	kg	1.157	550kg/m2	636.2	
H steel	250×250×9/14	kg	33.807	72.4kg/m	2,447.6	
Equal-leg angle	100×100×10	kg	23.150	14.9kg/m	344.9	
Steel-square-bar pipe	175×175×6	kg	2.059	31.1kg/m	64.0	
Round bar	φ200	kg	1.238	247kg/m	305.7	
Round bar	φ130	kg	5.362	104kg/m	557.7	
Total					5,327.0	

Source: Study Team

(8) Bottom form pillar (replacement type)

The expense of a fabrication factory is assumed same as Side form main part.

Table 15.5.5-24 Quantity of Bottom form pillar (replacement type)

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Column	200×200×6	kg		35.8kg/m	10,951.4	
Total					10,951.4	

Source: Study Team

(9) Bottom form rail material

The expense of a fabrication factory is assumed same as Side form main part.

Table 15.5.5-25 Quantity of Bottom form rail material

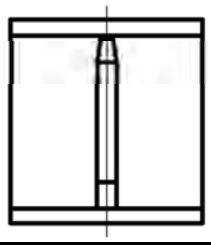
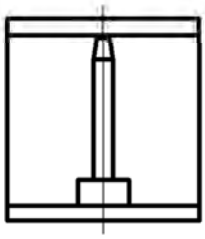
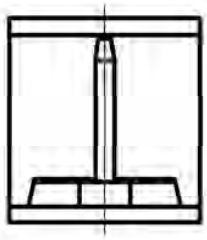
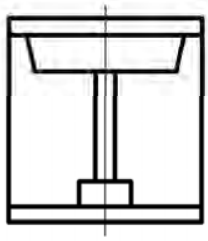
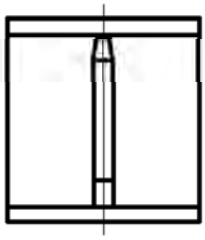
Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=9.0mm	kg	12.124	70.7kg/m2	857.2	
Steel plate	t=12.0mm	kg	10.503	94.2kg/m2	989.4	
Steel plate	t=19.0mm	kg	6.202	149.2kg/m2	925.4	
Steel plate	t=32.0mm	kg	12.391	251.2kg/m2	3,112.7	
H steel	250×250×9/14	kg	81.936	72.4kg/m	5,932.2	
Round bar	φ19	kg	82.436	2.23kg/m	183.8	
					12,000.7	

Source: Study Team

(10) Inner form

As for Inner form, five types are prepared by the shape of the projection inside a segment.

Table 15.5.5-26 Type of Inner Form

Inner form type	Shape of form	Description
Type-1		This type is used for the section with a rib of the Span central part. The number of segments produced with this equipment is 197. Form area = 44.267m2
Type-2		This type is used for the deviation part type 1. The number of segments produced with this equipment is 210. Form area = 46.225m2
Type-3		This type is used for the deviation part type 2. The number of segments produced with this equipment is 300. Form area = 45.973m2
Type-4		This type is used for the deviation part type 3. The number of segments produced with this equipment is 240. Form area = 47.689m2
Type-5		This type is used for the Web thickness change part of a bearing part. The number of segments produced with this equipment is 457. Form area = 42.767m2

Source: Study Team

1) Inner Form Type-1

Application standard : Cost estimate of bridge erection P697 table 3-34-1

- The number of staffs which factory fabrication requires : 8.0person/t
- Secondary labor costs use 32.2% of factory direct labor expenses.
- Factory administrative cost uses 28.8% of the sum total of a factory direct labor cost, sub-materials expense, paint expense, and secondary labor costs.

Table 15.5.5-27 Quantity of Inner Form Type-1

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=4.5mm	kg	44.267	35.3kg/m2	1,562.6	
Steel plate	t=9.0mm	kg	11.812	70.7kg/m2	835.1	
Steel plate	t=12.0mm	kg	1.907	97.2kg/m2	185.4	
Flate bar	9×150	kg	790.834	10.6kg/m	8,382.8	
Flate bar	9×125	kg	281.548	8.8kg/m	2,477.6	
Equal-leg angle	75×75×9	kg	7.907	9.96kg/m	78.8	
Equal-leg angle	100×100×10	kg	15.746	14.9kg/m	234.6	
H beam	150×150×7/10	kg	45.372	31.5kg/m	694.1	
H beam	200×100×5.5/8	kg	13.8	21.3kg/m	493.9	
Round bar	φ50	kg	12.573	15.4kg/m	193.6	
Round bar	φ80	kg	5.234	39.5kg/m	206.7	
Round bar	φ30	kg	28.674	5.55kg/m	159.1	
Total					15,504.4	

Source: Study Team

2) Inner Form Type-2

The expense of a fabrication factory is assumed same as Inner Form Type-1.

Table 15.5.5-28 Quantity of Inner Form Type-2

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=4.5mm	kg	46.225	35.3kg/m2	1,631.7	
Steel plate	t=9.0mm	kg	12.335	70.7kg/m2	872.1	
Steel plate	t=12.0mm	kg	1.992	97.2kg/m2	193.6	
Flate bar	9×150	kg	825.814	10.6kg/m	8,753.6	
Flate bar	9×125	kg	294.002	8.8kg/m	2,587.2	
Equal-leg angle	75×75×9	kg	8.256	9.96kg/m	82.2	
Equal-leg angle	100×100×10	kg	16.442	14.9kg/m	245.0	
H beam	150×150×7/10	kg	45.372	31.5kg/m	724.8	
H beam	200×100×5.5/8	kg	13.800	21.3kg/m	515.7	
Round bar	φ50	kg	13.129	15.4kg/m	202.2	
Round bar	φ80	kg	5.465	39.5kg/m	215.9	
Round bar	φ30	kg	29.942	5.55kg/m	166.2	
Total					16,190.2	

Source: Study Team

3) Inner Form Type-3

The expense of a fabrication factory is assumed same as Inner Form Type-1.

Table 15.5.5-29 Quantity of Inner Form Type-3

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=4.5mm	kg	45.973	35.3kg/m2	1,622.8	
Steel plate	t=9.0mm	kg	12.268	70.7kg/m2	867.3	
Steel plate	t=12.0mm	kg	1.981	97.2kg/m2	192.5	
Flate bar	9×150	kg	821.312	10.6kg/m	8,705.9	
Flate bar	9×125	kg	292.399	8.8kg/m	2,573.1	
Equal-leg angle	75×75×9	kg	8.211	9.96kg/m	81.8	
Equal-leg angle	100×100×10	kg	16.353	14.9kg/m	243.7	
H beam	150×150×7/10	kg	45.372	31.5kg/m	720.8	
H beam	200×100×5.5/8	kg	13.8	21.3kg/m	512.9	
Round bar	φ50	kg	13.058	15.4kg/m	201.1	
Round bar	φ80	kg	5.435	39.5kg/m	214.7	
Round bar	φ30	kg	29.779	5.55kg/m	165.3	
Total					16,102.0	

Source: Study Team

4) Inner Form Type-4

The expense of a fabrication factory is assumed same as Inner Form Type-1.

Table 15.5.5-30 Quantity of Inner Form Type-4

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=4.5mm	kg	47.689	35.3kg/m2	1,683.4	
Steel plate	t=9.0mm	kg	12.726	70.7kg/m2	899.7	
Steel plate	t=12.0mm	kg	2.055	97.2kg/m2	199.7	
Flate bar	9×150	kg	851.968	10.6kg/m	9,030.9	
Flate bar	9×125	kg	303.313	8.8kg/m	2,669.2	
Equal-leg angle	75×75×9	kg	8.518	9.96kg/m	84.8	
Equal-leg angle	100×100×10	kg	16.963	14.9kg/m	252.8	
H beam	150×150×7/10	kg	45.372	31.5kg/m	747.7	
H beam	200×100×5.5/8	kg	13.8	21.3kg/m	532.1	
Round bar	φ50	kg	13.545	15.4kg/m	208.6	
Round bar	φ80	kg	5.638	39.5kg/m	222.7	
Round bar	φ30	kg	30.890	5.55kg/m	171.4	
Total					16,703.0	

Source: Study Team

5) Inner Form Type-5

The expense of a fabrication factory is assumed same as Inner Form Type-1.

Table 15.5.5-31 Quantity of Inner Form Type-5

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=4.5mm	kg	42.767	35.3kg/m2	1,509.7	
Steel plate	t=9.0mm	kg	11.412	70.7kg/m2	806.8	
Steel plate	t=12.0mm	kg	1.843	97.2kg/m2	179.1	
Flate bar	9×150	kg	764.036	10.6kg/m	8,098.8	
Flate bar	9×125	kg	272.008	8.8kg/m	2,393.7	
Equal-leg angle	75×75×9	kg	7.639	9.96kg/m	76.1	
Equal-leg angle	100×100×10	kg	15.212	14.9kg/m	226.7	
H beam	150×150×7/10	kg	45.372	31.5kg/m	670.5	
H beam	200×100×5.5/8	kg	13.8	21.3kg/m	477.2	
Round bar	φ50	kg	12.147	15.4kg/m	187.1	
Round bar	φ80	kg	5.056	39.5kg/m	199.7	
Round bar	φ30	kg	27.702	5.55kg/m	153.7	
Total					14,979.1	

Source: Study Team

(11) Inner form support beam

The expense of a fabrication factory is assumed same as Inner Form Type-1.

Table 15.5.5-32 Quantity of Inner form support beam

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=12.0mm	kg	5.723	97.2kg/m2	556.2	
Steel plate	t=16.0mm	kg	0.523	125.6kg/m2	65.6	
Steel plate	t=19.0mm	kg	1.309	149.2kg/m2	195.3	
Equal-leg angle	100×100×10	kg	19.712	14.9kg/m	293.7	
H beam	150×150×7/10	kg	32.400	31.5kg/m	1,020.6	5.400*6
H beam	200×100×5.5/8	kg	13.800	18.2kg/m	251.2	3.450*4
H beam	300×150×6.5/9	kg	23.280	21.3kg/m	495.9	1.552*3*5
H beam	300×300×10/15	kg	4.656	49.9kg/m	232.3	1.552*3.0
H beam	400×200×9/14	kg	32.880	76.0kg/m	2,498.9	8.22*4.0
Round bar	φ40	kg	4.987	9.87kg/m	49.2	
Round bar	φ60	kg	2.439	22.2kg/m	54.1	
Round bar	φ90	kg	1.151	49.9kg/m	57.4	
Round bar	φ120	kg	1.644	88.8kg/m	146.0	
Round bar	φ150	kg	4.922	139.0kg/m	684.2	
Total					6,600.7	

Source: Study Team

(12) Inner form move cart

The expense of a fabrication factory is assumed same as Inner Form Type-1.

Table 15.5.5-33 Quantity of Inner form move cart

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=9.0mm	kg	4.003	70.7kg/m2	283.0	
Steel plate	t=12.0mm	kg	2.130	97.2kg/m2	207.0	
Steel plate	t=16.0mm	kg	1.003	125.6kg/m2	126.0	
Stripe steel plate	t=4.5mm	kg	8.385	35.3kg/m2	296.0	
Equal-leg angle	75×75×9	kg	26.720	9.96kg/m	266.1	
Equal-leg angle	100×100×10	kg	6.400	14.9kg/m	95.4	
Channel	100×50×5/7.5	kg	1.000	9.36kg/m	9.4	
Channel	200×90×8/13.5	kg	7.200	30.3kg/m	2.2	
H beam	200×100×5.5/8	kg	1.800	21.3kg/m	38.3	
H beam	200×200×8/12	kg	29.312	49.9kg/m	1,462.7	
Total					2,786.0	

Source: Study Team

(13) Inner form rail material

The expense of a fabrication factory is assumed same as Inner Form Type-1.

Table 15.5.5-34 Quantity of Inner form rail material

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=9.0mm	kg	3.352	70.7kg/m2	237.0	
Steel plate	t=12.0mm	kg	5.350	97.2kg/m2	520.0	
Steel plate	t=19.0mm	kg	3.003	149.2kg/m2	448.0	
Channel	150×75×6.5/10	kg	10.800	18.6kg/m	200.9	
H beam	250×250×9/14	kg	23.798	72.4kg/m	1,723.0	
Round bar	φ19	kg	30.045	2.23kg/m	67.0	
Total					3,195.9	

Source: Study Team

(14) Lateral beam parts of Inner form

The expense of a fabrication factory is assumed same as Inner Form Type-1.

Table 15.5.5-35 Quantity of Lateral beam parts of Inner form

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=4.5mm	kg	22.404	35.3kg/m2	790.9	
Steel plate	t=9.0mm	kg	2.947	70.7kg/m2	208.4	
Flat bar	9×150	kg	142.409	10.6kg/m	1,509.5	
Flat bar	9×125	kg	101.431	8.8kg/m	892.6	
Equal-leg angle	100×100×10	kg	35.459	14.9kg/m	528.3	
H steel	150×150×7/10	kg	44.067	31.5kg/m	1,388.1	
Channel	200×90×8/13.5	kg	15.758	30.3kg/m	477.5	
H steel	200×100×5.5/8	kg	10.322	21.3kg/m	219.9	
H steel	200×200×8/12	kg	68.920	49.9kg/m	3,439.1	
H steel	400×200×8/13	kg	42.035	66.0kg/m	3,194.6	
Total					12,648.9	

Source: Study Team

(15) Edge form main part

The expense of a fabrication factory is assumed same as Inner Form Type-1.

Table 15.5.5-36 Quantity of Edge form main part

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
Steel plate	t=4.5mm	kg	41.111	35.3kg/m2	1,451.2	
Flat bar	9×200	kg	75.824	70.7kg/m2	5,360.7	
Total					6,812.0	

Source: Study Team

(16) Frame of edge form

The expense of a fabrication factory is assumed same as Inner Form Type-1.

Table 15.5.5-37 Quantity of Frame of edge form

Item	Description	Unit	Length or Area (m) (m2)	Unit weight (kg/m) (kg/m2)	Weight (kg)	Remarks
H beam	250×250×9/14	kg	116.241	72.4kg/m	8,415.9	
H beam	350×175×7/11	kg	33.798	49.6kg/m	1,676.4	
					10,092.3	

Source: Study Team

(17) Hydraulic-machines equipment hire for beam separation (Unit price No.36~40)

Table 15.5.5-38 List of Hydraulic-machines equipment hire for beam separation

Per one short line equipment

Name	Requirements	Unit	Quantity	Unit weight	Weight	Equipment hire (JPY/day)	Compound hire (JPY/day)	Cord
1. Jack for Beam Separation								
Jack for beam separation	100t x 50st	nos	2	0.04	0.08	1,310	2,620	Construction machinery Hire calculation tables 1810-100
Electric hydraulic jack	2 Linkage 2.2KW	nos	1	0.13	0.13	2,700	2,700	Construction machinery Hire calculation tables 1814-027-030
Total Compound hire							5,320	
2. Inner Form Equipment								
Hydraulic jack for inner form opening and closing	20t x 200st	nos	4	0.02	0.08	525	2,100	Construction machinery Hire calculation tables 1810-017-020
Hydraulic jack for inner forme slide	20t x 350st	nos	4	0.03	0.12	525	2,100	Construction machinery Hire calculation tables 1810-017-020
Inner form front support hydraulic jack	Journal jack 25t x 800st	nos	2	0.05	0.1	589	1,178	Construction machinery Hire calculation tables 1812-025
Hydraulic jack for inner form frame vertical adjustments	20t x 150st(Double move)	nos	2	0.03	0.06	525	1,050	Construction machinery Hire calculation tables 1810-017-020
Hydraulic jack for inner form frame horizontal adjustments	20t x 150st(Double move)	nos	2	0.03	0.06	525	1,050	Construction machinery Hire calculation tables 1810-017-020
Valve stand - operator control panel, an electric hydraulic unit	control capability 20 sets	nos	1	0.7	0.7	4,960	4,960	Construction machinery Hire calculation tables 1867-020
Tilt tank	50t type-6	nos	6	0.08	0.48	491	2,946	Construction machinery Hire calculation tables 1834-050
Electric hydraulic pressure tilt Hall	1.6t	nos	1	0.08	0.08	2,030	2,030	Construction machinery Hire calculation tables 1880-016
Total Compound hire							17,414	
3. Cart Equipment								
Hydraulic jack for cart raising	100t x 100st (Double move)	nos	4	0.06	0.24	1,310	5,240	Construction machinery Hire calculation tables 1810-017-100
Hydraulic jack for cart level adjustment	50t x 100st (Double move)	nos	2	0.03	0.06	879	1,758	Construction machinery Hire calculation tables 1810-017-050
Valve stand - operator control panel, an electric hydraulic unit	7.5KW×1	nos	1	0.7	0.7	4,960	4,960	Construction machinery Hire calculation tables 1867-020
Electric hydraulic power package (for carts)	7.5KW	nos	1	1.2	1.2	5,040	5,040	Construction machinery Hire calculation tables 1814-027-040
Tilt tank (for carts)	75t, Type-6	nos	4	0.01	0.04	607	2,428	Construction machinery Hire calculation tables 1834-075
Electric oil pressure Tilt Hall (for cart movement)	3.2t (two way)	nos	2	0.13	0.26	5,020	10,040	Construction machinery Hire calculation tables 1880-032
Total Compound hire							29,466	
4. Bottom Form Equipment								
Hydraulic jack for bottom form center support	100t×50st	nos	2	0.16	0.32	1,310	2,620	Construction machinery Hire calculation tables 1810-017-100
Total Compound hire							2,620	
5. Side Form Equipment								
Hydraulic jack for side form forcing	20t×150st	nos	12	0.05	0.6	525	6,300	Construction machinery Hire calculation tables 1812-025
Valve stand - operator control panel, an electric hydraulic unit	3.7KW×2	nos	2	0.7	1.4	4,960	9,920	Construction machinery Hire calculation tables 1867-020
Total Compound hire							16,220	
Total Weight					5.31			

Source: Study Team

15.5.5.4 Segment fabrication

(1) Standard Segment production costs

Since there was no standard, the Irabu bridge which JBSI carried out was referred to and was determined as follows.

Table 15.5.5-39 Reference norm of Standard Segment production

Per one SEGMENT

Item	Item Description	Unit	norm
Bridge labor organizer		Person	1.0
Bridge specialist		person	1.0
Technician		person	5.0
Usually worker		person	7.0
Concrete vibrator	cylinder flexible type ϕ 40*3	set/day	1.0
Concrete vibrator	High frequency inverter 3.0kvA*1	set/day	1.0
Concrete vibrator	Form vibrator 0.18KW	set/day	6.0

Source: Study Team

(2) Temporary work

Manufacture yard power supply equipment

Electric energy required for segment manufacture is as in the following table.

Table 15.5.5-40 Manufacture yard power supply equipment

Item	Equipment	unit	Quantity	Capacity (kw)	Total capacity (kw)
Gantry crane (80t) 2 set	Main hoist (80t)	nos	2	30.0	60.0
	Main Lateral forward device	nos	2	3.7	7.4
	Sub hoist	nos	2	7.5	15.0
	Sub Lateral forward device	nos	2	0.9	1.8
	Travel device	nos	4	7.5	30.0
Gantry crane (7.5t) 2 set	Main hoist (7.5t)	nos	2	9.5	19.0
	Main Lateral forward device	nos	2	0.76	1.52
	Travel device	nos	4	3.7	14.8
Tower crane(180tm) 3set	Main hoist (7.5t)	nos	3	9.5	28.5
	Swing device	nos	3	11.0	33.0
	Lighting	nos	6	0.75	4.5
Short line equipment 5 set	Hydraulic system pump	nos	5	10.0	50.0
	cylinder flexible type φ40*3	nos	15	1.9	28.5
	High frequency inverter 3.0kvA*1	nos	5	3.0	15.0
	Form vibrator*6	nos	30	0.18	5.4

Item	Equipment	unit	Quantity	Capacity (kw)	Total capacity (kw)
	Electric hydraulic jack	nos	5	2.2	11.0
	Electric hydraulic power package (for carts)	nos	5	7.5	37.5
	Electric hydraulic pressure tilt Hall 1.6t	nos	5	1.5	7.5
	Electric oil pressure Tilt Hall (for cart movement) 3.2t	nos	10	3.7	37.0
	Valve stand - operator control panel, an electric hydraulic unit	nos	10	3.7	37.0
Boiler	1500kg/h	nos	1	15	15.0
Reinforcement assembly stand 5 set	Tilthole 1.6 t Both-way	nos	20	1.5	30.0
Total capacity					489.42

Source: Study Team

The common maximum use electric power is made into 60% of the total capacity. is made into 60% of the total capacity.

The common maximum use electric power＝489.42×60%=293.65kw≒300kw

High-pressure incoming installed capacity=300kw×1.25=375KVA

15.5.6 Temporary expense contained in Pay-item "concrete 50Mpa for Pier Head Cast in Place"

15.5.6.1 Bracket support and scaffold

➢Bracket support main part

Application standard : Ministry of Land, Infrastructure and Transport public works cost estimate standard P924 table 5.2

Table 15.5.6-1 Japan Norm of Bracket support and scaffold

Per 1.0 ton

Item	Item Description	Unit	norm
Bridge labor organizer		Person	0.4
Form worker		Person	0.2
Bridge specialist		person	2.4
Usually worker		person	1.6
Rough terrain crane	hydraulic 25t hung	day	0.3
Miscellaneous cost	1.0% of sum of labor costs	%	25

Source: Japan Norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

(1) Segment support on the bracket

Application standard : Ministry of Land, Infrastructure and Transport public works cost estimate standard P924 table 5.2

Table 15.5.6-2 Japan Norm of Segment support on the bracket

Per 1.0 empty/m3

Item	Item Description	Unit	norm
Bridge labor organizer		Person	0.4
Form worker		Person	0.4
Bridge specialist		person	1.3
Usually worker		person	1.3
Rough terrain crane	hydraulic 25t hung	day	0.3
Miscellaneous cost	1.0% of sum of labor costs	%	4

Source: Japan Norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

15.5.7 Temporary expense contained in Pay-item "Erection of Segment"

15.5.7.1 SBS Girder installation and Removal

(1) No.1 and No.2 Girder Bent Foundation

The bent of No.1 and No.2 is taken as the foundation by a steel plate.

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P856 table 1.14

Table 15.5.7-1 Japan Norm of Steel Plate Foundation

(per one girder)

Item	Item description	Unit	norm
Bridge labor organizer		Person	1.0
Bridge specialist		person	2.0
Usually worker		person	1.0
Rough terrain crane	hydraulic 25t hung	day	A/(0.029*A+0.14)

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

Area of steel plate foundation

$A = \Sigma Ai$

$h < 10m$ $\quad Ai=(B+2)\times(0.15\times h+1.5)$

$10m \leq h \leq 30m$ $\quad Ai=(B+2)\times 3$

Where, Ai: Steel plate area per bent (m2)

B: Width of erection girder (m)

h: Height of bent (m)

W: Width of foundation of bent (m)

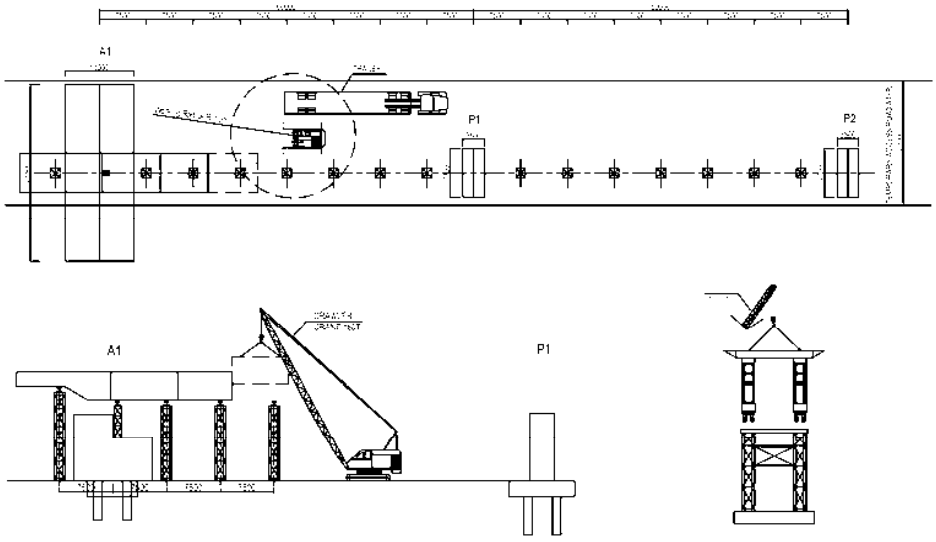


Figure 15.5.7-1 RNo.1, 2 Erection Girder Installation

No.1 Erection girder

Average height h=2.3m

Erection girder width B=8.2m

Ai=(8.2+2)*(0.15*2.3+1.5) = 18.819m2

Number of bent = 15

A = 18.819*15 = 282.285m2

No.2 Erection girder

Average height h=5.2m

Erection girder width B=8.2m

Ai=(8.2+2)*(0.15*5.2+1.5) = 23.256m2

Number of bent = 15

A = 23.256*15 = 348.840m2

The amount of construction per day of rough terrain crane

D = A/(0.029*A+0.14)

Where, D: The amount of construction per day

A: Total steel plate area

No.1 girder D = 282.285/(0.029*282.285+0.14) = 33.9m2/day

No.2 girder D = 348.840/(0.029*348.840+0.14) = 34.0m2/day

Construction days = A/D

No.1 girder CD = 282.285/33.9 = 8.33days

No.2 girder CD = 348.84/34.0 = 10.26days

(2) No3 Erection Girder Bent Foundation

Since the erection girder of No. 3 is sea construction, it installs a bent in the stand built on the H beam pile.

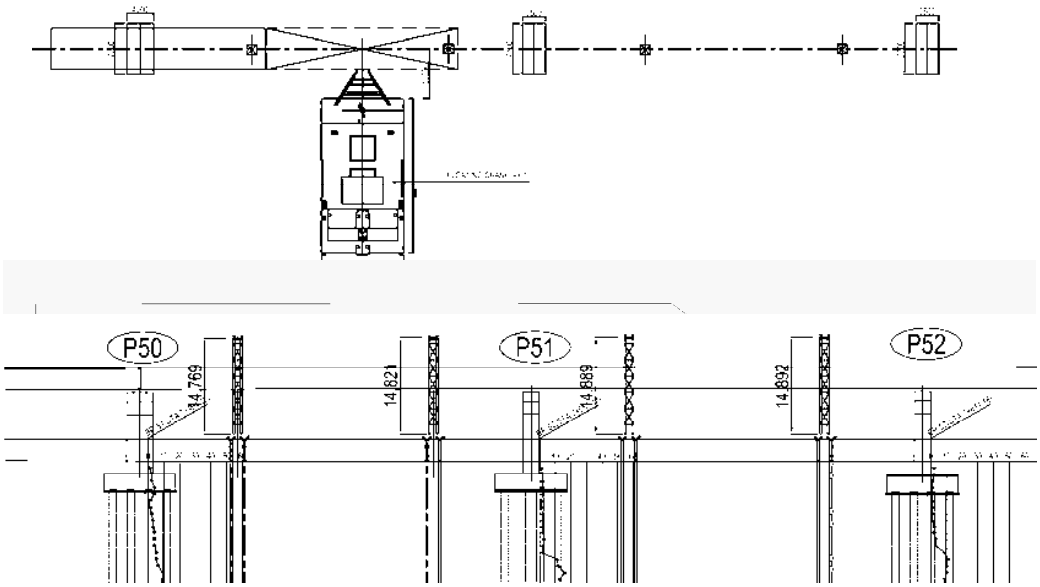


Figure 15.5.7-2 RNo.3 Erection Girder Installation

Table 15.5.7-2 Quantity of Bent Foundation

Item	Description	Unit	Quantity	Unit weight (kg/m)	Weight (kg)	Remarks
H beam pile	H-400*400*13/21	m	385	172	66,220	L=38.5*10
Pile head	H-300*300*10/15	m	35	94	3,290	L=3.5*10
	H-300*300*10/15	m	34	94	3,196	L=8.5*4
Lacing	[-250*90*9/13	m	35	34.6	1,211	L=3.5*10
Lacing	[-150*75*6.5/10	m	28	18.6	521	L=3.5*8
Column						
Receiving H beam	H-300*300*10/15	m	17	94	1,598	L=8.5*2
Total					76,036	

Source: Study Team

Weight except a pile = 76.036-66.220 = 6.816ton

1) Driven and pulling cost of H beam pile

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P337 table 4.9

Table 15.5.7-3 Japan Norm of Driven and pulling cost of H beam pile

(personnel organization per day)

Item	Item description	Unit	norm
Labor organizer		Person	1.0
Scaffold erector		person	2.0
Usually worker		person	1.0

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

A construction machine is set to vibratory hammer 90kw.

Driven pile number : Construction number of a vibratory hammer per one day = 4nos

Pulling pile number : Construction number of a vibratory hammer per one day = 16nos

2) Bent foundation installation and removal

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P339 table 4.14

This expense is installation of the material except a H beam pile, and removal.

Table 15.5.7-4 Japan Norm of foundation installation and removal

(per 10 ton)

Item	Item description	Unit	Installation	Removal
Bridge labor organizer		Person	2.1	1.2
Bridge specialist		person	3.9	2.3
Welder		person	3.2	1.6
Usually worker		person	2.6	1.3
Crawler crane	50t hung	day	1.9	1.4
Miscellaneous cost		%	28	2

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

Miscellaneous cost are expenses, such as electric welding, flame cutting, a drift pin, an erection bolt, and a tool.

3) Installation and removal of bent equipment

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P856 table 1.13

Table 15.5.7-5 Japan Norm of Installation and removal of bent equipment

(per ton)

Item	Item description	Unit	norm
Bridge labor organizer		Person	1.0
Bridge specialist		person	5.0
Usually worker		person	1.0
Rough terrain crane	hydraulic 25t hung	day	T/(0.14*T+1.0)

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

Bent weight

Bent weight is computed by Cost estimate of bridge erection (Japan standard).

W=Wi1+Wi2

h<10m Wi1=0.372×(B+1.5)+{4.097×n+0.372×(B+1.5)}×h/10 Formula 3-4-1

10m≤h≤30m Wi2=0.326×n×h+0.744×(B+1.5)+0.837×n Formula 3-4-2

Where, W : Total Bent weight (t)

Wi: Bent weight per 1 set (t)

n: The bent number per 1 set (nos)

h: Height of column (m)

B: Structure width (m)

No.1 girder

h = 2.3m, 15 set

Wi = 0.327*(8.2+1.5)+{4.097*3+0.372*(8.2+1.5)}*2.3/10 = 6.829t/set

Total W = 6.829*15set = 102.435t

Construction capacity of rough terrain crane = 102.435/(0.14*102.435+1.0) = 6.7t/days

Construction days = 102.435/6.7 =15.3days

No.2 girder

h = 5.2m, 15 set

Wi = 0.327*(8.2+1.5)+{4.097*3+0.372*(8.2+1.5)}*5.2/10 =11.440t/set

Total W = 11.440*15set = 171.600t

Construction capacity of rough terrain crane = 171.600/(0.14*171.600+1.0) = 6.9t/days

Construction days = 171.600/6.9 = 24.9 days

No.3 girder Bent weight

h = 14.8m, 4 set

Wi = 0.326*3*14.8+0.744*(8.2+1.5)+0.837*3 = 24.202t/set

Total W = 24.202*4set = 96.808t

Construction capacity of rough terrain crane = 96.808/(0.14*96.808+1.0) = 6.7t/days

Construction days = 96.808/6.7 = 14.4 days

4) Erection of No.1, No.2 Erection girder

The construction norm of a steel bridge is applied.

Since construction beams are two beam type, it will apply the norm of box girder

A construction machine shall be used as a crawler crane and shall be 150 t from lifting load and an operating radius.

Table 15.5.7-6 Capacity of 150t Crawler Crane

Standard weight use 標準ウェイト使用の場合

	12	14	16	18	20	22	24	26	28	30	34	38	5	6	7	8	9	10
82.30			20.3	19.7	19.2	18.6	18.0	16.7	15.2	13.6	11.1	9.1	7.5	6.1	4.9	3.8	2.9	2.2
79.25			22.8	22.1	21.6	21.0	19.4	17.2	15.3	13.7	11.1	9.1	7.6	6.2	5.0	4.0	3.1	2.4
73.15			27.1	26.4	25.7	22.4	19.7	17.5	15.6	14.0	11.4	9.5	7.9	6.6	5.5	4.4	3.6	2.8
67.06		33.5	32.7	30.1	25.9	22.7	20.0	17.8	15.9	14.3	11.8	9.8	8.2	7.0	5.9	5.0	4.1	
60.96		37.0	35.6	30.3	26.2	22.9	20.2	18.0	16.2	14.6	12.0	10.1	8.5	7.3	6.2	5.4		
54.86	43.5	40.3	35.1	29.8	25.7	22.5	19.9	17.7	15.9	14.4	11.9	10.1	8.6	7.4				
48.77	49.6	42.6	35.5	30.2	26.2	23.0	20.4	18.2	16.4	14.9	12.5	10.6	9.1					
42.67	53.2	42.9	35.8	30.6	26.5	23.4	20.8	18.7	16.9	15.4	12.9	11.1						62.8
36.58	53.5	43.2	36.1	30.8	26.8	23.7	21.1	19.0	17.2	15.7						77.8	75.2	69.2
30.48	53.8	43.6	36.5	31.3	27.3	24.2	21.6	19.5							94.4	90.7	81.8	69.9
24.38	54.2	44.0	37.0	31.8	27.8	24.7								116.8	111.5	98.7	82.2	70.2
18.29	54.6	44.5	37.5										150.0	140.0	123.6	99.1	82.5	70.5

operating radius 作業半径 m

Source: Maker catalog of crawler crane

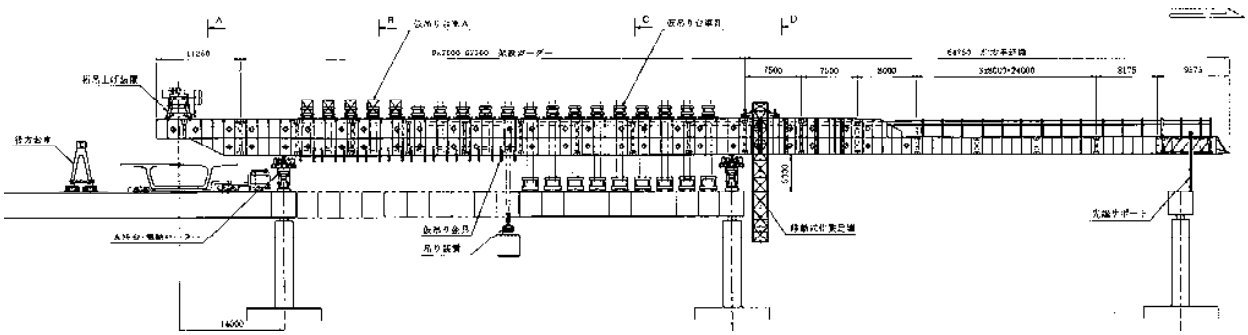


Figure 15.5.7-3 Erection Girder

Weight of No.1, No.2 SBS girder main part : 606.8t

The number of construction division : 18

Construction weight per one time : 606.8/18 = 33.7t

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P891 table 4.2

Table 15.5.7-7 Japan Norm of Erection girder

(per ton)

Item	Item description	Unit	norm
Bridge labor organizer		Person	1.0
Bridge specialist		person	6.0
Usually worker		person	3.0
Crawler crane	hydraulic 150t hung	day	0.41*L+0.75

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

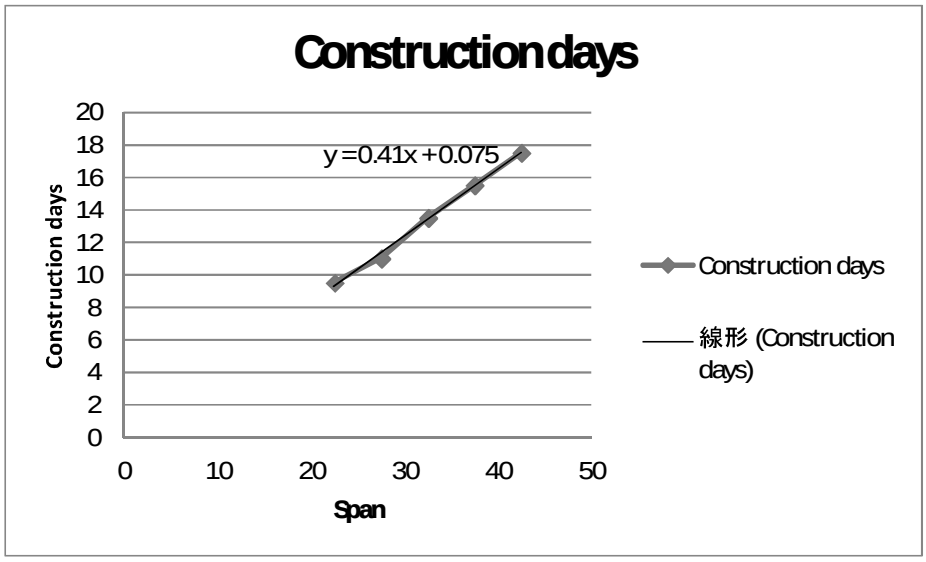


Figure 15.5.7-4 Construction days of Installation and Demolition

Construction days = 0.41*60m+0.75 = 25.4days

5) Erection of No.3 Erection Girder

Construction of No. 3 uses a 300t floating crane as sea construction.

Weight of No.3 SBS guarder main part : 750.4t

The number of construction division : 5

Construction weight per one time : 750.4/5 = 150.08t

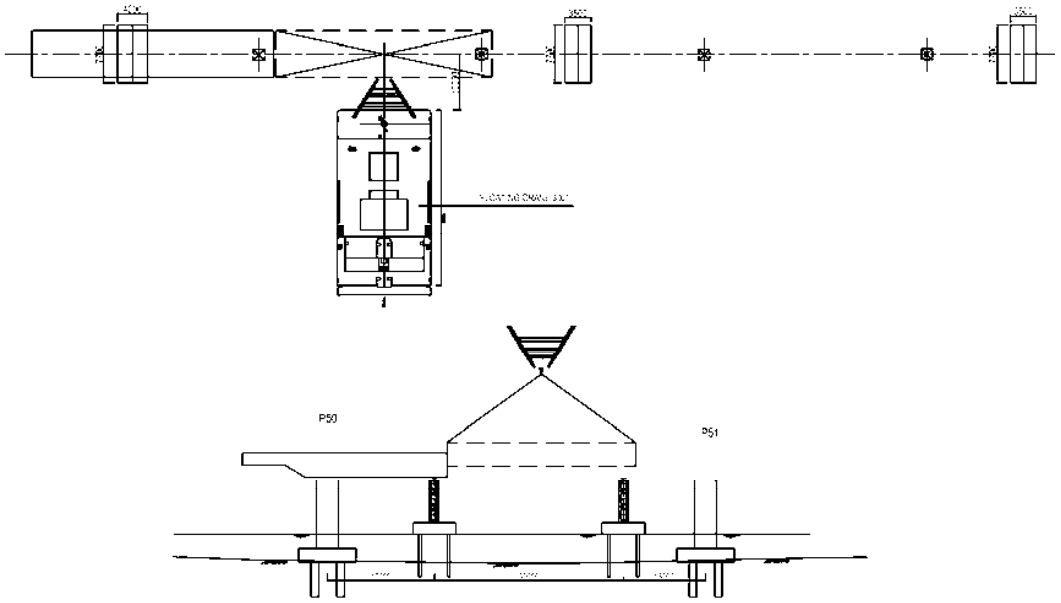


Figure 15.5.7-5 Erection of No.3 girder

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P853 table 1.6. Only personnel expenses are adopted in this standard.

The construction with a floating crane shall be 1 block per 1 day.

6) Field preassembling of erection girder for construction

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P852 table 1.5.

Table 15.5.7-8 Japan Norm of Field preassembling of erection girder

(per 1.0 ton)

Item	Item description	Unit	norm
Bridge labor organizer		Person	1.0
Bridge specialist		person	6.0
Usually worker		person	1.0
Truck crane	hydraulic 50t hung	day	G/(0.02*(G+20))
Miscellaneous cost			

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

Construction capacity = 642.6/(0.02*(642.6+20)) = 48.5 t/ days

Construction days = 642.6/48.5 = 13.2days

7) Erection Girder Equipment

Erection girder consists of a main girder and beam lifting equipment.

Table 15.5.7-9 Weight of main girder

Item	Unit	No.1 girder	No.2 girder	No.3 girder	Remarks
Lifting Girder	t	498.8	498.8	642.4	
Launching girder	t	108.0	108.0	108.0	
Total	t	606.8	606.8	750.4	

Source: Study Team

Table 15.5.7-10 Attached structure

Item	Unit	No.1 girder	No.2 girder	No.3 girder	Remarks
Lifting equipment of beam	set	2	2	2	
Metal fittings of lifting beam (standard type)	set	38	38	28	
Metal fittings of lifting beam (special type)	set	-	-	10	
Wire rope φ16	m	200	200	200	
Miscellaneous cost	%	1.5	1.5	1.5	

Source: Study Team

8) Compound hire of No.1 and No.2 Erection Girder

The requirements of composition equipment is according to "Cost estimate of bridge erection (2011)".

- Lifting equipment of beam: For the rating 40t
- Metal fittings of lifting beam: For the rating 40t
- Wire rope: φ16*200m

The product cost of No.1, No.2 erection girder shown in table 15.5.7-8.

Table 15.5.7-11 Product Cost of No.1, No.2 Erection Girder (Quotation)

(per one girder)

Item	Unit	Quantity	Unit price (yen/t)	Amount (yen)	Remarks
Main girder	t	498.8			
Girder	t	478.8	450,000	215,460,000	
Junction BNW	t	20.0	500,000	10,000,000	
Launching girder	t	108,0			
Launching girder	t	106.0	450,000	45,900,000	
Junction BNW	t	6.0	500,000	3,000,000	
Girder accessories	LS	1		37,780,000	
Segment hung cart	LS	1		65,892,000	
Support stand	LS	1		85,320,000	
Rear support cart	set	1		25,900,000	
Main lifting equipment(18kw*2)	set	2		29,585,000	
Attached apparatus	LS	1		166,780,000	
Total compound hire	t	1123.8		685,617,000	

Table 15.5.7-12 Product Cost of No.3 Erection Girder (Quotation)

(per one girder)

Item	Unit	Quantity	Unit price (yen/day)	Amount (yen/day)	Remarks
Main girder	t	642.4			
Girder	t	620.4	450,000	279,180,000	
Junction BNW	t	22.0	500,000	11,000,000	
Launching girder	t	108,0			
Launching girder	t	106.0	450,000	45,900,000	
Junction BNW	t	6.0	500,000	3,000,000	
Girder accessories	LS	1		39,670,000	
Segment hung cart	LS	1		77,952,000	
Support stand	LS	1		85,320,000	
Rear support cart	set	1		27,000,000	
Main lifting equipment(18kw*2)	set	2		29,585,000	
Rear hung equipment	set	1		24,500,000	
Attached apparatus	LS	1		166,780,000	
Total compound hire				789,887,000	

Source: Study Team

Days of operation of Erection Girder

No.1 Erection Girder A1~P25 : Installation 60days
Segment erection 75days*5 span=375days
Demolition girder 30 days
} 465days

No.2 Erection Girder P25~P50 : Installation 60days
Segment erection 75days*5 span=375days
Demolition girder 30 days
} 465days

No.3 Erection Girder P50~P75 : Installation 60days
Segment erection 75days*5 span=375days
Demolition girder 30 days
} 465days

15.5.7.2 Erection of Segment

(1) Movement and installation of a SBS girder

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P891 table 4.3.

Table 15.5.7-13 Japan Norm of Movement and installation of a SBS girder (per one time)

Item	Item description	Unit	norm
Bridge labor organizer		Person	2.0
Bridge specialist		person	16.0
Usually worker		person	10.0
Transfer days		day	3.5

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

(2) Special Trailer 80t

Carrying capacity of a trailer

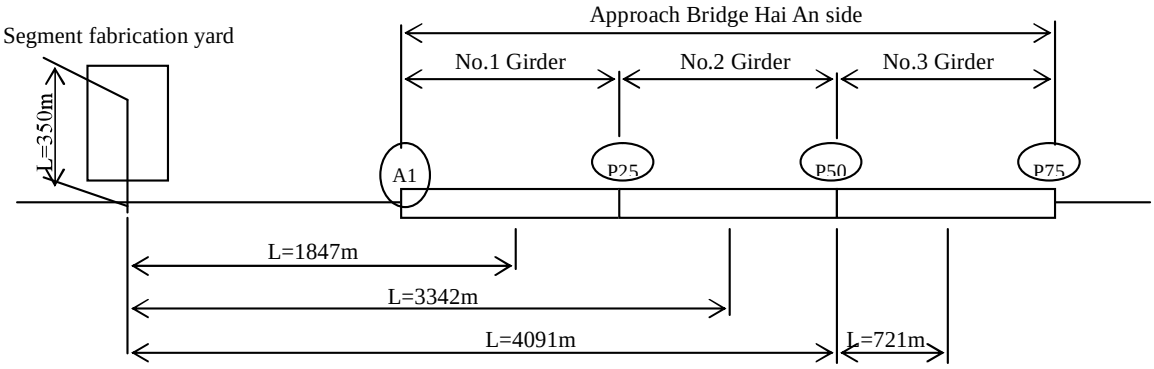
Cycle time

Lording time of segment : 45min

Unloading time of a segment : 30min

Transshipment time at No.3 girder : 60min

Carrying to erection site : Speed of materials handling shall be 10 km/h.



To No.1 Girder = 45+(350+1847)*60/10000+30 = 86.08min

To No.2 Girder = 45+(350+3342)*60/10000+30 = 97.15min

To No.3 Girder =45+ (350+4091+721)*60/10000+60 = 135.97min

One day capacity (8 h/day)

No.1 girder = 8.0*60/86.08/1.35 = 4.13 times > 2.5 segment ⇒One-set use

No.2 girder = 8.0*60/97.15/1.35 = 3.66 times > 2.5 segment ⇒One-set use

No.3 girder = 8.0*60/135.97/1.35 = 2.61 times > 2.5 segment ⇒Tow-set use

(3) The gantry crane (80t) for segment transshipment

Since No.3 girder is marine construction, a segment transships at P50.

Transshipment of a segment shall be based on an 80t gantry crane.

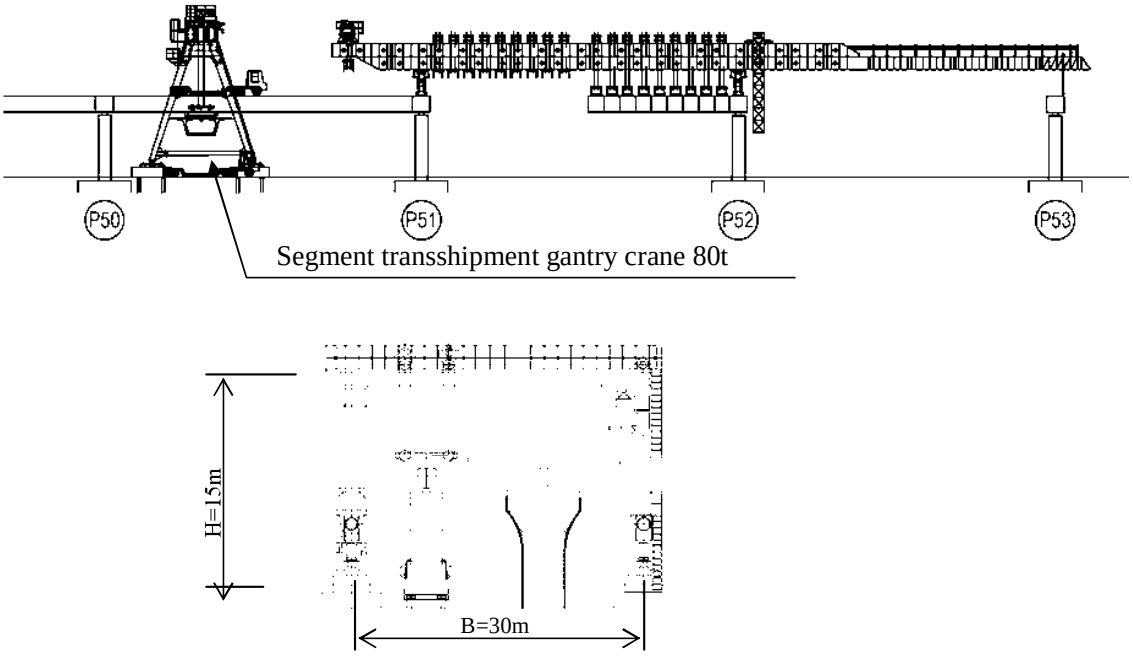


Figure 15.5.7-6 Segment transshipment gantry crane 80t

It sets from Japanese standard "Cost Estimate of Bridge Erection" 2011 edition P558 .

Frame weight calculation formula

$$W = 1.33\ P\ (B + 0.1H)\ x\ (B + 1.5H)\ x\ 10^{-3} + M$$

Where,

W : It is mass per one gate type crane. (t)

P : Segment mass x 1/2 (t) P=40t

B : Foot width B =30m

H : Foot height H=15m

M : Mass of a ladder, a handrail, a driver's seat, safety facilities, etc. = 4.0t

$$W = 1.33\ x40\ x\ (30 + 0.1\ x\ 15)\ x\ (30 + 1.5\ x\ 15)\ x\ 10^{-3} + 4.0 = 92t$$

Table 15.5.7-14 Compound hire of a gantry crane with a leg width of 30 m

(JPY/day)

Item	Description	Unit	Quantity	Hire	Compound hire	Construction machinery Hire calculation tables
Gantry crane frame		t	60.2	738	44,428	1803-001
Travel device	for t80	set	1	22,000	22,000	1804-080
Winch	for 80t	nos	1	63,200	63,200	1808-800
Metal fitting for hanging	for 80t	set	1	634	634	1852-080
Miscellaneous cost	3.0% of sum of above	LS	1		3,908	
Total					134,170,	

Source: Study Team

(4) Adhesives coating

After lifting of a segment shall be segment position adjustment and connection.

Adhesives shall use an epoxy adhesive.

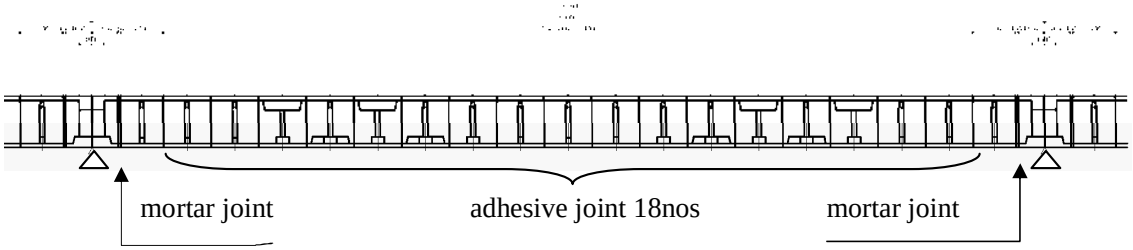


Figure 15.5.7-7 Adhesives coating of Joint

The total number of adhesion parts = 1326 place

Adhesion area per one place = 10.35m2

The total area of adhesion parts = 1326*10.35 = 13724.1m2

(5) Segment connection

After applying adhesives to a segment, PC steel bar is inserted and it connects by strain.

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P930 table 11.1.

Table 15.5.7-15 Japan Norm of Segment connection

(per PC steel bar 1.0 t)

Item	Item description	Unit	norm
Bridge labor organizer		Person	1.6
Bridge specialist		person	13.6
Usually worker		person	7.5
Rough terrain crane	hydraulic 25t hung	day	0.5
Miscellaneous cost	7.0% of sum of labor costs	%	7.0

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

(6) PC steel bar fixation

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P930 table 11.3.

Table 15.5.7-16 Japan Norm of PC steel bar fixation

(per 10 nos)

Item	Item description	Unit	norm
Bridge specialist		person	1.1
Miscellaneous cost	19.0% of sum of labor costs	%	19.0

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

(7) PC steel bar strain

Application standard: Ministry of Land, Infrastructure and Transport public works cost estimate standard P931 table 11.4.

Table 15.5.7-17 Japan Norm of PC steel bar strain

(per 10 nos)

Item	Item description	Unit	norm
Bridge labor organizer		Person	0.8
Bridge specialist		person	4.6
Usually worker		person	2.0
Miscellaneous cost	4.0% of sum of labor costs	%	4.0

Source: Japan norm (Ministry of Land, Infrastructure and Transport public works cost estimate standard)

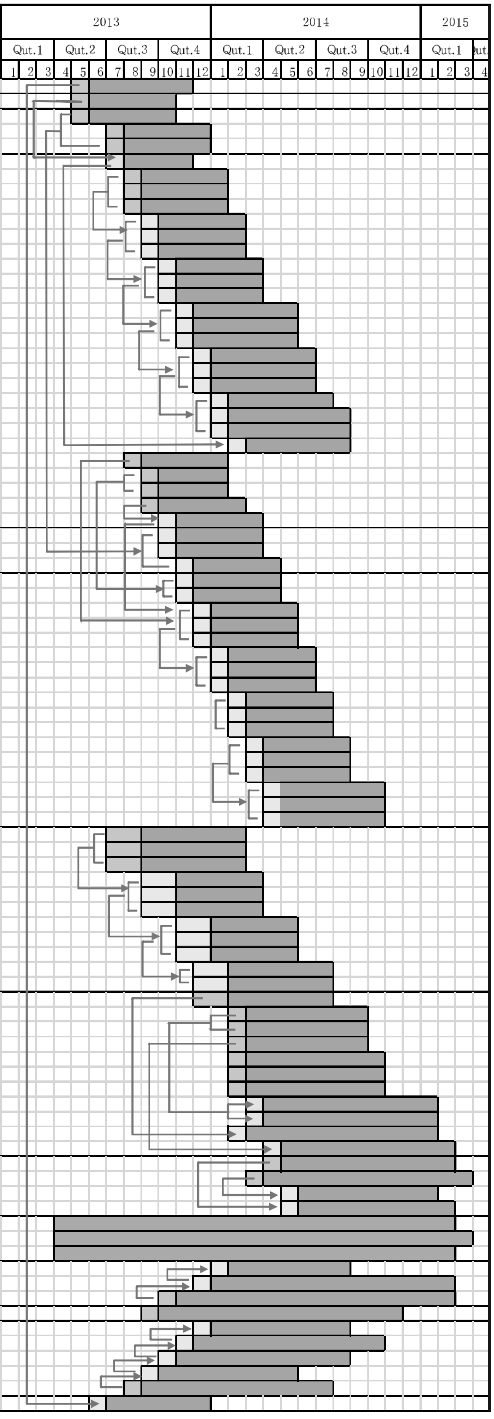
15.5.8 Depreciation of Steel Sheet Pile

Diversion shall be taken into consideration about depreciation of a steel sheet pile.

Diversion of the steel sheet pile following bridge pier construction of an approach bridge shall be as follows.

Table 15.5.8-1 Diversion of The Steel Sheet Pile

Type of cofferdam		Foundation No	shape of pile cap	Sheet pile type	Unit weight (kg/m)	Length (m)	Number of pile	Total pile length (m)	Weight (tf)	Driven length (m)	Total driven length (m)
Type-3		A1	28.5m×8.5m	Ⅲ	60	14	218	3052	183.1	11	2398
Type-1	1	P1	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
	2	P2	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
		P3	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
		P4	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
	1	P5	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P6	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P7	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P8	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P9	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P10	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P11	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P12	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P13	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P14	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P15	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P16	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
	1	P17	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P18	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P19	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P20	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P21	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P22	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P23	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P24	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P25	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P26	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P27	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P28	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P29	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
	2	P30	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
		P31	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
		P32	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
	1	P33	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P34	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P35	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P36	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P37	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P38	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P39	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P40	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
	1	P41	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P42	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P43	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P44	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P45	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P46	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P47	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P48	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
		P49	11.0m×11.0m	Ⅲ	60	22	132	2904	174.2	19	2508
	3	P50	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
		P51	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
		P52	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
		P53	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
		P54	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
		P55	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
		P56	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
		P57	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
		P58	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
		P59	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
		P60	11.0m×11.0m	VL	105	24	104	2496	262.1	21	2184
Type-2	1	P61	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
		P62	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
		P63	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
		P64	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
		P65	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
		P66	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
		P67	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
		P68	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
		P69	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
		P70	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
		P71	10.5m×10.5m	VL	105	24	100	2400	252	21	2100
	2	P72	10.5m×14.25m	VL	105	24	116	2784	292.3	21	2436
		P73	10.5m×14.25m	VL	105	24	116	2784	292.3	21	2436
		P74	10.5m×14.25m	VL	105	24	116	2784	292.3	21	2436
		P75	10.5m×14.25m	VL	105	24	116	2784	292.3	21	2436
SPSP		P76	–								
		P77	–								
		P78	–								
Type-4		P79	10.5m×14.25m	V	105	24	116	2784	292.3	21	2436
		P80	10.5m×14.25m	V	105	24	116	2784	292.3	21	2436
		P81	10.5m×14.25m	V	105	24	116	2784	292.3	21	2436
	3(s)	P82	10.5m×14.25m	VL	105	24	116	2784	292.3	21	2436
Type-1		P83	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
	2	P84	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
		P85	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
		P86	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
		P87	11.0m×11.0m	Ⅲ	60	18	132	2376	142.6	15	1980
Type-3		A2	28.5m×8.5m	Ⅲ	60	14	218	3052	183.1	11	2398



Source: Study Team

Table 15.5.8-2 Diversion Times and Quantity of Steel Sheet Pile

	Fabrication Weight (t)	Recycle time						Pile number	Driven length	driven length						Total driven length
		0	1	2	3	4	5			0	1	2	3	4	5	
Type 1-1	1393.6			174.2		348.4	871									
	III			1		2	5	132	19			7,524.0		25,080.0	75,240.0	107,844.0
Type 1-2	570.4		427.8			142.6										
	III		3			1		132	15		11,880.0			9,900.0		21,780.0
Type 1-3	786.3			262.1	524.2											
	VL			1	2			104	21			6,552.0	17,472.0			24,024.0
Type 1-3$_{(S)}$	292.3	292.3														
	VL	1						116	21	2,436.0						2,436.0
Type 2-1	1764	756	1008													
	VL	3	4					100	21	6,300.0	16,800.0					23,100.0
Type 2-2	584.6		584.6													
	VL		2					116	21		485.0					485.0
Type 3	183.1		183.1													
	III		1					218	11		4,796.0					4,796.0
Type 4	292.3			292.3												
	V			1				116	21			7,308.0				7,308.0
Total III	2147.1	0	428.8	174.2	0	491	871									
Total VL	3427.2	1048.3	1592.6	262.1	524.2	0	0									
Total V	292.3	0	0	292.3	0	0	0									
Ground Total	5866.6	1048.3	2021.4	728.6	524.2	491	871									

Source: Study Team

Table 15.5.8-3 Diversion Times of Other Material

	H Beam	Fabrication Weight (t)	Recycle time					
			0	1	2	3	4	5
Type 1-1	H 300*300	179.5			22.4		44.9	112.2
	H 350*350	0.0			0.0		0.0	0.0
	accessory member	62.9			7.9		15.7	39.3
Type 1-2	H 300*300	142.3		106.7			35.6	
	H 350*350	0.0		0.0			0.0	
	accessory member	28.5		21.4			7.1	
Type 1-3	H 300*300	72.5			24.2	48.4		
	H 350*350	96.9			32.3	64.6		
	accessory member	38.2			12.7	25.5		
Type 1-3$_{(S)}$	H 300*300	12.1	12.1					
	H 350*350	35.1	35.1					
	accessory member	12.4	12.4					
Type 2-1	H 300*300	143.4	61.4	81.9				
	H 350*350	169.7	72.7	97.0				
	accessory member	83.1	35.6	47.5				
Type 2-2	H 300*300	48.4		48.4				
	H 350*350	59.4		59.4				
	accessory member	27.7		27.7				
Type 3	H 300*300	27.0	27.0					
	H 350*350	0.0						
	accessory member	8.4	8.4					
Type 4	H 300*300	38.7			38.7			
	H 350*350	32.8			32.8			
	accessory member	14.6			14.6			
Total H 300		663.8	100.5	237.0	85.3	48.4	80.4	112.2
Total H 350		393.9	107.8	156.4	65.1	64.6	0.0	0.0
Total accessory		275.8	56.4	96.6	35.2	25.5	22.9	39.3
Ground Total		1,333.5	264.8	490.0	185.5	138.4	103.3	151.5

Source: Study Team

CHAPTER 16 Project Effectiveness

16.1 General

Based on the detailed design and forecasted demand, economic analysis is carried out in order to evaluate effectiveness of the Project. The economic effectiveness is examined quantitatively with such indicators as Net Present Value (NPV), Economic Internal Rate of Return (EIRR), and Benefit/Cost (B/C) ratio. The analysis basically follows the process used in the Preparatory Survey with revision of input values and parameters. Meanwhile, financial analysis is not conducted in This Study, since MOT and JICA agreed that Tan Vu – Lach Huyen road would be developed as a freeway without toll collection from users.

Following the economic analysis, this chapter examines operation and effect indicators for monitoring of project effectiveness after completion.

16.2 Economic Analysis

16.2.1 Review of the Existing Studies

Economic viability of the project has been assessed both in the VIDFI's Feasibility Study (hereinafter F/S, 2009) and the JICA's Preparatory Survey (2010). Economic analysis in This Study principally follows an approach in the latter survey which carefully reviewed settings in the F/S. Comparison with the past studies and This Study are summarized in the following table.

The major points revised from the Preparatory Survey are; (i) setting of traffic volume in the "without project case"; (ii) inclusion of opportunity cost of freight; and (iii) calculation of operation cost of vessels (barge and ferry). In addition, unit values of benefit are updated in This Study.

Table 16.2.1-1 Comparison of Economic Analysis of the Past Studies and This Study

Item	F/S (2009)	Preparatory Survey (2010)	This Study (2012)
Traffic Demand Forecast	Based on traffic survey in 2008 (Target year: 2015-2032)	Updated in 2010 (Target year: 2015-2035)	Updated in 2012 (Target year: 2015-2035)
Project Life for Analysis	2008-2048 (35 years after completion)	2011-2035 (20 years after completion)	2012-2035 (20 years after completion)
Benefit Items			
- VOC saving	Calculated	Unit value is revised.	Operating cost of ferry is considered.
- TTC saving	Single unit value is applied to all vehicle types.	Unit value is revised by vehicle type.	Opportunity cost of freight is considered.
- Others	Accident cost saving and financial revenue*	Container transport cost saving (as operating cost of barge)	Container transport cost saving is considered in VOC & TTC savings.

* It is not common to include such financial revenues as road toll, tax reimbursement, and advertisement to economic analysis.

Source : Study Team

16.2.2 Preconditions of the Analysis

(1) General Conditions

In accordance with recent studies on highway development in Viet Nam, general conditions of the economic analysis are set as follows.

- Base year of price: November, 2012
- Evaluation period: 2012-2035 (20 years after completion)
- Base currency: VND (USD 1 = VND 20,860, VND 1 = JPY 0.00374)
- Social discount rate: 12.0 %
- Standard Conversion Factor (SCF): 0.85
- Benefit items: Savings in Vehicle Operating Cost (VOC) and Travel Time Cost (TTC) of both passenger and freight transport
- Salvage value is not considered at the end of project life.
- Evaluation indicators: EIRR, NPV, and B/C ratio

(2) Cases for Comparison

Effectiveness of the Project is figured out by comparison of two cases; “with” and “without” cases of the Project. In the “with project case”, it is assumed that the Tan Vu-Lach Huyen Highway will open in 2016 and connect directly Lach Huyen Port to Tan Vu Interchange, and all traffic of passenger and freight in and out of the Lach Huyen port pass through the road and bridge constructed by the Project.

On the other hand, the “without project case” does not assume construction of the Tan Vu-Lach Huyen Highway, though the Lach Huyen Port is supposed to start operation from 2016. In this case, passenger and freight traffic has to go over Nam Trieu Channel by using vessels. Considering capacity limitation, the existing ferry route between Dinh Vu and Ninh Tiep will be used only by passengers, and freight needs to be trans-loaded to barge and shipped between Haiphong Port and Lach Huyen Port.

The following tables summarize the concrete routes and conditions of each case.

Table 16.2.2-1 Summary of Project Cases for Evaluation

Without Project Case	With Project Case
Route A - All freight of Lach Huyen Port use this route. - Road transport between Tan Vu IC and Haiphong Port Area (8 km) - Barge transport between Haiphong Port and Lach Huyen Port (26 km)	**Route C** - All passengers and freight use this route. - Road transport between Tan Vu IC and Lach Huyen Port (15.6 km)
Route B1 - All passengers and freight of industrial zones in Dinh Vu use this route. - Road transport between Tan Vu IC and Dinh Vu Industrial Zone (12 km)	**<Common Preconditions in Both Cases>** - Lach Huyen Port starts operation in 2015. - Industrial zones in Dinh Vu are developed as planned. - Hanoi-Haiphong Expressway starts operation until 2015.
Route B2 - All passengers use this route. - Road transport between Dinh Vu Industrial Zone and Dinh Vu ferry port (3 km) + between Ninh Tiep ferry port and Lach Huyen Port (7.7 km) - Ferry transport between Dinh Vu ferry port and Ninh Tiep ferry port (5 km)	

Source : Study Team

Table 16.2.2-2 Conditions of Each Section

Case	Route and Section	Distance (km)	Travel Time by Vehicle Type (hour)				
			MC	Car	Bus	HGV	Barge/ Ferry
Without Project	**Route A**	**34.0**				**0.20**	
	Tan Vu IC - Hai Phong Port Area	8.0				0.20	
	Hai Phong Port - Lach Huyen Port	26.0					4.00
	Route B	**22.7**	**0.57**	**0.57**	**0.57**	**0.57**	
	Tan Vu IC - Dinh Vu Industrial Zone	12.0	0.30	0.30	0.30	0.30	
	Dinh Vu Industtrial Zone - Ferry Port	3.0	0.08	0.08	0.08	0.08	
	Dinh Vu Ferry Port - Ninh Tiep Ferry Port*						1.00
	Ninh Tiep Ferry Port - Lach Huyen Port	7.7	0.19	0.19	0.19	0.19	
	Typical Speed on Local Roads (km/h)		40	40	40	40	
With Project	**Route C**	**15.6**	**0.26**	**0.20**	**0.20**	**0.20**	
	Tan Vu IC - Dinh Vu Intersection No. 1	2.8	0.05	0.04	0.04	0.04	
	Dinh Vu Intersection No. 1 - Lach Huyen Port	12.8	0.21	0.16	0.16	0.16	
	Typical Speed on Highway (km/h)		60	80	80	80	

* Waiting time is included.

Source : Study Team

(3) Traffic Demand

The evaluation is based on the result of traffic demand forecast done by four vehicle types updated in This Study. The forecasted volume is regarded as traffic for the “with case” at target years (2020, 2030 and 2035), from which traffic volume of each year is derived. Meanwhile in the case of “without project”, different routes are used by type of transport (i.e. route A, B1 and B2) and traffic volume of each route is estimated from that in the “with case”.

Passengers use the aforementioned routes B1 and B2, where the traffic is bottlenecked by capacity of ferries over Nam Trieu Channel. In this analysis, the maximum number of ferry is assumed, and it determines possible traffic volume in one direction between Dinh Vu and Cat Hai Island. Specifically, it is assumed that 8 ferries carrying 90 PCU each are operated every 15 minutes during the whole day (24 hours) at both sides of the existing ferry route. Under this condition, trips can be made up to 96 times/day in one direction and it can accommodate 8,640 PCU/day. This capacity is considered as the maximum transport volume in the route B2, and it also affects demands in the route B1. That means decreased demand in the route B2 is deducted from that in the route B1 as summarized in figure below.

Table 16.2.2-3 Traffic Volume Used for Benefit Calculation

Without Project Case — Unit: vehicle/day (both directions)

Route	Route A	Route B1					Route B2			
Section	TV - HPP	Tan Vu IC - Dinh Vu Industrial Zone					Dinh Vu Industrial Zone - Lach Huyen Port			
Vehicle	HGV*	MC***	Car	Bus***	HGV**	Total	MC***	Car	Bus	Total
2016	1,601	0	1,346	2,061	597	4,003	25,494	828	936	27,259
2017	2,510	0	1,732	2,231	525	4,488	25,939	996	975	27,910
2018	3,420	0	2,119	2,400	454	4,973	26,383	1,163	1,015	28,561
2019	4,329	0	2,338	2,478	365	5,181	26,383	1,163	1,015	28,561
2020	5,238	0	2,557	2,555	286	5,398	26,383	1,163	1,015	28,561
2021	6,152	0	3,374	2,670	637	6,680	26,383	1,163	1,015	28,561
2022	7,066	0	4,190	2,785	973	7,948	26,383	1,163	1,015	28,561
2023	7,980	0	5,006	2,900	1,300	9,206	26,383	1,163	1,015	28,561
2024	8,894	0	5,823	3,015	1,618	10,456	26,383	1,163	1,015	28,561
2025	9,808	0	6,639	3,130	1,932	11,701	26,383	1,163	1,015	28,561
2026	10,722	0	7,456	3,245	2,242	12,942	26,383	1,163	1,015	28,561
2027	11,636	0	8,272	3,360	2,548	14,180	26,383	1,163	1,015	28,561
2028	12,550	0	9,088	3,475	2,852	15,415	26,383	1,163	1,015	28,561
2029	13,464	0	9,905	3,589	3,154	16,648	26,383	1,163	1,015	28,561
2030	14,378	28,632	10,721	3,704	3,684	46,741	26,383	1,163	1,015	28,561
2031	16,267	28,632	13,346	3,897	4,722	50,597	26,383	1,163	1,015	28,561
2032	18,156	28,632	15,970	4,089	5,756	54,448	26,383	1,163	1,015	28,561
2033	20,044	28,632	18,595	4,281	6,787	58,295	26,383	1,163	1,015	28,561
2034	21,933	28,632	21,220	4,474	7,815	62,141	26,383	1,163	1,015	28,561
2035	23,822	28,632	23,844	4,666	8,842	65,984	26,383	1,163	1,015	28,561

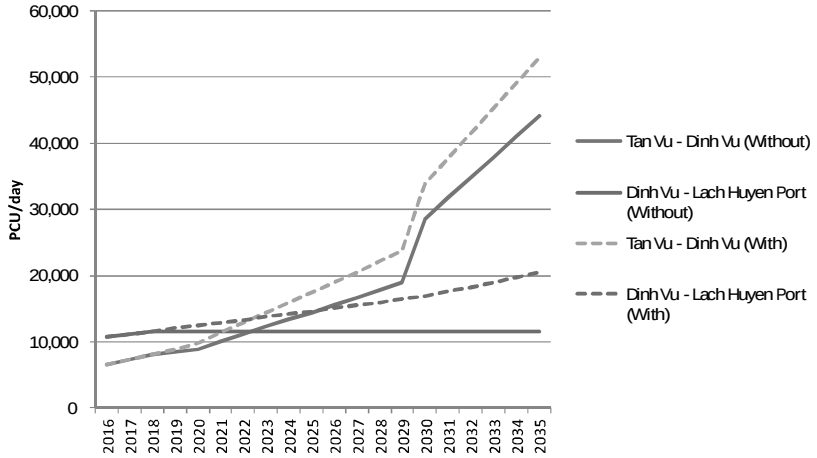
Note: (*) This route is used for freight of Lach Huyen Port.
(**) This route is used for freight of industrial zones in Dinh Vu.
(***) Reduced traffic volume of MC is converted to that of bus in route B1.

With Project Case — Unit: vehicle/day (both directions)

Route	Route C									
Section	Tan Vu IC - Dinh Vu Intersection #1					Dinh Vu Intersection #1 - Lach Huyen Port				
Vehicle	MC	Car	Bus	HGV	Total	MC	Car	Bus	HGV	Total
2016	0	1,346	2,061	2,198	5,604	25,494	828	936	1,601	28,860
2017	0	1,732	2,231	3,036	6,998	25,939	996	975	2,510	30,420
2018	0	2,119	2,400	3,873	8,393	26,383	1,163	1,015	3,420	31,981
2019	0	2,505	2,570	4,711	9,787	26,828	1,331	1,054	4,329	33,541
2020	**0**	**2,892**	**2,740**	**5,549**	**11,181**	**27,272**	**1,498**	**1,093**	**5,238**	**35,101**
2021	0	3,942	2,939	6,868	13,748	27,617	1,731	1,135	6,152	36,635
2022	0	4,991	3,137	8,186	16,315	27,961	1,964	1,178	7,066	38,169
2023	0	6,041	3,336	9,505	18,881	28,306	2,198	1,220	7,980	39,703
2024	0	7,090	3,534	10,823	21,448	28,650	2,431	1,262	8,894	41,237
2025	0	8,140	3,733	12,142	24,015	28,995	2,664	1,305	9,808	42,772
2026	0	9,190	3,932	13,461	26,582	29,340	2,897	1,347	10,722	44,306
2027	0	10,239	4,130	14,779	29,149	29,684	3,130	1,389	11,636	45,840
2028	0	11,289	4,329	16,098	31,715	30,029	3,364	1,431	12,550	47,374
2029	0	12,338	4,527	17,416	34,282	30,373	3,597	1,474	13,464	48,908
2030	**28,632**	**13,388**	**4,726**	**18,735**	**65,481**	**30,718**	**3,830**	**1,516**	**14,378**	**50,442**
2031	28,632	16,472	5,022	21,874	72,000	31,133	4,289	1,570	16,267	53,259
2032	28,632	19,555	5,318	25,013	78,519	31,549	4,748	1,624	18,156	56,076
2033	28,632	22,639	5,615	28,153	85,038	31,964	5,207	1,678	20,044	58,894
2034	28,632	25,722	5,911	31,292	91,557	32,380	5,666	1,732	21,933	61,711
2035	**28,632**	**28,806**	**6,207**	**34,431**	**98,076**	**32,795**	**6,125**	**1,786**	**23,822**	**64,527**

Note: Bold letters represent target years of demand forecast in This Study.

Source : Study Team



Source : Study Team

Figure 16.2.2-1 Comparison of Passenger Transport PCU

On the other hand, freight of Lach Huyen Port is transported by barge on the route A, since the volume is too heavy to be handled by the limited ferry capacity. Following the assumption in the Preparatory Survey, freight equivalent to 90 TEU is loaded on one barge and shipped with a tugboat. Based on this condition and demand forecast, the total number of trip reaches 394 times per day in 2035 to carry more than 35,000 TEU of freight between two ports, for instance. It requires 99 barges and 60 tugboats. The following analysis grounds on this assumption for comparison, though this "without project case" is not realistic considering the actual capacity of Haiphong Port and Nam Trieu Channel.

Table 16.2.2-4 Demand of Barge Transport

	Freight Demand	Number of Trip	Number of Barge	Number of Tugboat
	TEU/day	trip/day	ship/day	ship/day
2016	1,833	21	6	4
2017	2,742	31	8	5
2018	3,652	41	11	7
2019	4,561	51	13	8
2020	5,471	61	16	10
2021	7,464	83	21	13
2022	9,458	106	27	17
2023	11,452	128	32	20
2024	13,445	150	38	23
2025	15,439	172	43	26
2026	17,432	194	49	30
2027	19,426	216	54	33
2028	21,419	238	60	36
2029	23,413	261	66	40
2030	25,407	283	71	43
2031	27,400	305	77	47
2032	29,394	327	82	50
2033	31,387	349	88	53
2034	33,381	371	93	56
2035	35,374	394	99	60

Source : Study Team

Besides of ocean cargo, there exist freight transport between Tan Vu and Dinh Vu in the "without project case", since industrial zones in Dinh Vu would be developed regardless of the Project. This traffic is also counted in This Study, while it may have overlooked in the Preparatory Survey.

16.2.3 Evaluation of Project Benefits

(1) Benefit Items

Savings of VOC and TTC are assessed as the most common benefit items quantified in evaluation of road development projects. The difference of VOC and TTC between "with" and "without" conditions can be seen as benefits, and it is calculated following the equation below. According to the Preparatory Survey, the large portion of benefits came from savings in freight transport, so saving of accident cost is not counted as a benefit item in This Study. Specific items considered as VOC and TTC are summarized in the table below.

$$(Saving\ of\ VOC) = VOC_O - VOC_W$$

$$VOC_i = \sum_j \sum_l (Q_{ijs} \times L_l \times \alpha_j) \times 365$$

$$(Saving\ of\ TTC) = TTC_O - TTC_W$$

$$TTC_i = \sum_j \sum_l (Q_{ijs} \times T_{ijs} \times \beta_j) \times 365$$

Where:

VOC_i : Vehicle operating cost in case i (VND/year)
TTC_i : Travel time cost in case i (VND/year)
Q_{ijs} : Traffic volume of vehicle type j on section s in case i (vehicle/day)
L_l : Length of section s (km)
T_{ijs} : Travel time of vehicle type j on section s in case i (hour)
α_j : Unit value of VOC of vehicle type j (VND/vehicle/km)
β_j : Unit value of TTC of vehicle type j (VND/vehicle/hour)
i : Without case (O) and With case (W)
j : Vehicle types
s : Section

Table 16.2.3-1 Benefit Items Considered in This Study

	VOC	TTC
Passenger	●Operating cost of passenger vehicles (MC, car and bus) ●Operating cost of ferry (without project case)	●Passengers' value of time
Freight	●Operating cost of trucks ●Operating cost of barge and tugboat (without project case)	●Drivers' value of time ●Opportunity cost of freight

Note: Underlined items were not considered in the Preparatory Survey

Source : Study Team

(2) Saving of Vehicle Operating Cost

VOC consists of major expenses needed for vehicle operation such as fuel, lubricants, tires, maintenance, and depreciation of vehicles. The unit values of VOC are given by vehicle types and operating speeds, and those are determined by escalating that shown in the "Study on Road Improvement in Lam Dong and Binh Thuan Provinces" released by the Ministry of Economy, Trade and Industry of Japan on 2010.

Table 16.2.3-2 Unit Value of VOC

Unit: VND/vehicle/km

Speed (km/hour)	MC	Car	Bus	HGV
5	1,237	8,955	20,437	32,363
10	919	6,635	13,891	21,105
20	724	5,221	10,404	15,443
30	654	4,679	9,300	11,549
40	601	4,282	8,561	9,703
50	586	4,185	9,046	9,026
60	618	4,405	10,195	8,799
70	663	4,715	11,703	9,138
80	713	5,065	13,352	9,906
90	780	5,516	14,753	10,946

Source: Adjusted to the 2012 current price based on Study on Road Improvement in Lam Dong and Binh Thuan Provinces, 2010, Ministry of Economy, Trade and Industry of Japan

In the "without project case", ocean freight shuttles between Lach Huyen Port and Haiphong Port on barge, so costs for using barge and tugboat are also calculated as VOC. In addition, trans-shipment charge between container ship and barge is included as a part of the operating costs (40 USD/TEU). Though loading/unloading charge of truck was also counted in the Preparatory Study, This Study regards that it is cancelled out between "with" and "without" cases.

Likewise, This Study counts operating cost of passenger ferry as an opportunity cost to be saved by the Project, though it was not included in the Preparatory Survey. These operating costs of vessels are summarized as shown in the following tables.

Table 16.2.3-3 Unit Value of Vessel Operating Cost

		Freight		Passenger
Item	Unit	Barge	Tugboat	Ferry
Vessel Hiring Cost	**VND/ship/day**	**9,668,800**	**13,812,500**	**19,431,233**
Fuel Cost*	**VND/ship/trip**		**24,840,000**	**7,486,500**
Diesel Gasoline Requirement	liter/hour		540	434
Time Required per Trip	hour		2	0.75
	(Capacity per Trip)	90 TEU	1 barge	90 PCU

* Fuel costs 23,000 VND/liter as of 3rd quarter 2012 at Singapore MDO price (http://www.bunkerworld.com/markets/prices/sg/sin/)

Source: Study Team based on the Preparatory Survey

(3) Saving of Travel Time Cost

TTC of passengers is measured as wage rate per hour and summarized by vehicle types as shown in the table below. Although opportunity cost of freight is not considered in the Preparatory Survey, This Study estimates the cost as a part of TTC based on the equation below, because facilitation of freight transport is the main objective of the Project. Total value of transported goods is represented by gross output of each industry shown in the national statistics, and the opportunity cost of freight is calculated as 51 VND/ton/hour by multiplying hourly interest rate.

$$(Opportunity\ Cost\ of\ Freight\ per\ Ton\ per\ Hour) = \frac{(Total\ Value\ of\ Transported\ Goods)}{(Total\ Volume\ of\ Transported\ Goods)} \times \frac{(Interest\ Rate)}{365\ days \times 24\ hours}$$

Table 16.2.3-4 Estimation of Freight Opportunity Cost

Item	Unit	Value
Gross Output Value	**Bil. VND**	**3,717,270**
Agriculture, Forestry and Fishing	Bil. VND	561,070
Mining and Manufacturing	Bil. VND	2,173,000
Retail Sale	Bil. VND	983,200
Freight Transport Volume	**'000 ton**	**699,810**
Interest Rate per Hour	percent/hour	0.00103
Value of Freight Transport Time	VND/ton/hour	46
Adjusted Price at 2010	**VND/ton/hour**	**65**

Source: Study Team based on data from General Statistics Office

Table 16.2.3-5 Unit Value of TTC

		Vehicle Type			
Item	Unit	MC	Car	Bus	HGV
Driver & Passenger	**VND/h**	**20,565**	**45,700**	**305,822**	**49,900**
Driver Monthly Wage	'000 VND		**3,656**	**4,562**	**4,562**
Assistant Monthly Wage	'000 VND			**3,422**	**3,422**
Driver & Assistant Hourly Rate	VND/h		**22,850**	**49,900**	**49,900**
Passenger Monthly Wage	'000 VND	**3,656**	**3,656**	**3,656**	
Passenger Work Time Ratio	%	**78**	**52**	**52**	
Passenger Time Cost	VND/h	**13,710**	**9,140**	**9,140**	
Vehicle Occupancy	Persons	**2**	**3**	**36**	
Freight	**VND/h**				**1,520**
Average Volume	ton				**23**
Value per Ton Hour	VND/ton				**85**
TTC per Hour by Vehicle Type	**VND/h**	**20,565**	**45,700**	**305,822**	**51,420**

Source: Study Team based on data from General Statistics Office

(4) Total Benefits of the Project

Based on the assumed unit values, total benefits of the Project are calculated by vehicle types for both "with" and "without" cases. The result is summarized in the following table. According to the result, most part of the benefits is explained by saving of operating cost in freight transport by barge.

Table 16.2.3-6 Summary of Project Benefit

Without Project Case

Item	VOC ('000 VND/day)					TTC ('000 VND/day)				
Route	Route A	Route B1		Route B2	Total	Route A	Route B1		Route B2	Total
Type	Freight	Freight	Passenger	Passenger		Freight	Freight	Passenger	Passenger	
2016	2,288,966	69,466	280,836	1,790,602	4,429,871	22,037	9,203	172,535	878,560	1,082,335
2017	3,399,526	61,153	318,143	1,849,637	5,628,459	34,149	8,102	189,807	908,431	1,140,489
2018	4,533,799	52,839	355,450	1,908,673	6,850,761	46,262	7,000	207,079	938,302	1,198,644
2019	5,644,823	42,538	374,650	1,908,673	7,970,684	58,376	5,636	215,419	938,302	1,217,733
2020	6,779,561	33,248	393,851	1,908,673	9,115,332	70,491	4,405	223,759	938,302	1,236,956
2021	9,150,205	74,171	447,606	1,908,673	11,580,655	85,948	9,826	241,599	938,302	1,275,675
2022	11,569,170	113,338	501,362	1,908,673	14,092,543	101,405	15,015	259,439	938,302	1,314,162
2023	13,939,814	151,315	555,117	1,908,673	16,554,919	116,862	20,047	277,280	938,302	1,352,490
2024	16,320,126	188,448	608,873	1,908,673	19,026,120	132,319	24,966	295,120	938,302	1,390,707
2025	18,690,770	224,962	662,628	1,908,673	21,487,033	147,776	29,804	312,961	938,302	1,428,842
2026	21,084,895	261,007	716,384	1,908,673	23,970,959	163,233	34,579	330,801	938,302	1,466,915
2027	23,455,539	296,689	770,139	1,908,673	26,431,041	178,690	39,306	348,642	938,302	1,504,940
2028	25,835,852	332,085	823,895	1,908,673	28,900,505	194,147	43,996	366,482	938,302	1,542,927
2029	28,254,817	367,250	877,650	1,908,673	31,408,391	209,604	48,654	384,323	938,302	1,580,883
2030	30,625,461	428,940	1,137,810	1,908,673	34,100,884	225,061	56,827	544,968	938,302	1,765,158
2031	33,095,255	549,821	1,292,424	1,908,673	36,846,173	250,543	72,842	588,770	938,302	1,850,457
2032	35,541,567	670,214	1,447,037	1,908,673	39,567,491	276,024	88,792	632,572	938,302	1,935,691
2033	37,997,549	790,242	1,601,651	1,908,673	42,298,114	301,506	104,693	676,374	938,302	2,020,876
2034	40,443,861	909,990	1,756,265	1,908,673	45,018,789	326,988	120,558	720,176	938,302	2,106,025
2035	42,938,495	1,029,519	1,910,878	1,908,673	47,787,566	352,470	136,394	763,978	938,302	2,191,144

With Project Case

Item	VOC ('000 VND/day)			TTC ('000 VND/day)		
Route	Route C		Total	Route C		Total
Type	Freight	Passenger		Freight	Passenger	
2016	264,683	512,677	777,360	17,173	188,162	205,335
2017	403,454	545,720	949,174	26,177	195,718	221,895
2018	542,224	578,763	1,120,987	35,181	203,275	238,456
2019	680,995	611,806	1,292,800	44,185	210,832	255,016
2020	819,765	644,849	1,464,614	53,189	218,388	271,577
2021	972,652	692,510	1,665,162	63,108	227,526	290,634
2022	1,125,538	740,171	1,865,709	73,028	236,664	309,692
2023	1,278,425	787,832	2,066,257	82,948	245,802	328,749
2024	1,431,311	835,493	2,266,804	92,867	254,940	347,807
2025	1,584,198	883,154	2,467,352	102,787	264,077	366,865
2026	1,737,084	930,816	2,667,900	112,707	273,215	385,922
2027	1,889,971	978,477	2,868,447	122,626	282,353	404,980
2028	2,042,857	1,026,138	3,068,995	132,546	291,491	424,037
2029	2,195,744	1,073,799	3,269,543	142,466	300,629	443,095
2030	2,348,630	1,171,675	3,520,305	152,386	337,598	489,984
2031	2,676,212	1,269,440	3,945,652	173,640	353,622	527,262
2032	3,003,794	1,367,205	4,371,000	194,894	369,647	564,541
2033	3,331,377	1,464,971	4,796,347	216,149	385,671	601,820
2034	3,658,959	1,562,736	5,221,695	237,403	401,695	639,098
2035	3,986,541	1,660,501	5,647,042	258,658	417,719	676,377

Annual Benefit*

VOC	TTC	Total
(Mil. VND/year)		
1,333,166	320,105	1,653,271
1,707,939	335,287	2,043,226
2,091,368	350,469	2,441,836
2,437,428	351,391	2,788,819
2,792,512	352,363	3,144,876
3,619,155	359,540	3,978,695
4,462,794	366,631	4,829,426
5,288,362	373,665	5,662,027
6,117,150	380,659	6,497,809
6,942,184	387,622	7,329,805
7,775,617	394,562	8,170,179
8,600,347	401,485	9,001,832
9,428,501	408,395	9,836,896
10,270,680	415,293	10,685,972
11,161,911	465,439	11,627,350
12,008,690	482,966	12,491,656
12,846,719	500,470	13,347,189
13,688,145	517,956	14,206,101
14,525,939	535,428	15,061,367
15,381,291	552,890	15,934,181

Note: Value in each year is not discounted.

(*) Benefit in the first year comes out from the second half after completion.

Source : Study Team

16.2.4 Evaluation of Project Benefits

(1) Construction Cost and Annual Spending

Total financial project costs as a Yen loan project are estimated in this detailed design study. Economic cost needs to be derived for the analysis by excluding price escalation and transfer items such as taxes and subsidies from the cost in a financial term. Also, financial cost in local currency has to be converted into border price by multiplying Standard Conversion Factor (SCF), which is set to 0.85 in accordance with generally used values in the recent studies in Viet Nam's transport sector. Expenditure of the economic investment costs in the initial construction phase is scheduled as shown in the table below.

Although the Yen loan targets the first stage of construction, the cost for the second stage is also included to the economic project cost for evaluation as the full-scaled project. The cost used in the Preparatory Survey is referred and adjusted as an estimated value for the second stage, though it would be re-examined afterward with timing of construction. In This Study, the cost for the second stage is assumed to be 150% of that in the previous study in accordance with increase of the first stage cost.

Table 16.2.4-1 Breakdown of Economic Cost of the Project (First Stage)

Items	Local Currency	Foreign Currency	Total Cost
	VND	JPY	VND
I. Construction Cost	3,792,903,323,307	10,977,076,332	6,727,950,470,803
II. Price Escalation	-	-	-
III. Physical Contingency	252,124,807,876	626,691,832	419,689,468,853
IV. Consulting Service	52,739,950,000	999,660,000	320,028,720,053
V. Land Acquisition, HIV/AIDS Prevention	267,012,096,300	0	267,012,096,300
VI. Administration Cost	278,081,653,084	0	278,081,653,084
VII. VAT	-	-	-
VIII. Import Tax	-	-	-
IX. Interest during Construction	-	-	-
X. Commitment Charge	-	-	-
TOTAL Economic Cost	**4,642,861,830,567**	**12,603,428,164**	**8,012,762,409,093**

Note: Gray rows represent items not counted as economic cost.

Source : Study Team

Table 16.2.4-2 Annual Requirement of Economic Project Cost (First Stage)

	F/C	L/C	Total
	Mil. JPY	Bil. VND	Bil. VND
2012	0	136	136
2013	5,290	1,876	3,291
2014	4,916	1,786	3,100
2015	2,397	845	1,486
Total	12,603	4,643	8,013

Source : Study Team

(2) Cost Benefit Flow and Evaluation

Cash flow of the Project is summarized in the following table through the evaluation period. In addition to the construction cost, the Project requires cost for maintenance, which is based on the proposed operation and maintenance plan. Indicators of effectiveness are calculated from this cash flow table. As the result, every economic indicator substantially exceeds the cut-off standard (i.e. EIRR>12%, NPV>0, B/C>1). Also, accumulation of the net undiscounted benefit turns to positive at the ninth year of the Project (2020).

Table 16.2.4-3 Result of Economic Evaluation

(Unit: Million VND)

Year	Investment Cost	2nd Stage Investment Cost	Routine Maintenance	Initial Cost & Periodic Maintenance	Annual Total Cost	Annual Incremental Benefit	Annual Net Benefit	Accumulated Net Benefit
2012	135,735				135,735	0	-135,735	-135,735
2013	3,290,734				3,290,734	0	-3,290,734	-3,426,469
2014	3,100,140				3,100,140	0	-3,100,140	-6,526,609
2015	1,486,153				1,486,153	0	-1,486,153	-8,012,762
2016			6,460	1,700	8,160	1,653,271	1,645,111	-6,367,651
2017			6,460		6,460	2,043,226	2,036,766	-4,330,885
2018			6,460		6,460	2,441,836	2,435,376	-1,895,509
2019			6,460		6,460	2,788,819	2,782,359	886,850
2020			6,460		6,460	3,144,876	3,138,416	4,025,266
2021		1,246,025	6,460		1,252,485	3,978,695	2,726,211	6,751,476
2022		1,661,366	6,460		1,667,826	4,829,426	3,161,600	9,913,077
2023		1,246,025	6,460		1,252,485	5,662,027	4,409,543	14,322,619
2024			9,690	86,530	96,220	6,497,809	6,401,589	20,724,208
2025			9,690		9,690	7,329,805	7,320,115	28,044,323
2026			9,690		9,690	8,170,179	8,160,489	36,204,812
2027			9,690		9,690	9,001,832	8,992,142	45,196,955
2028			9,690		9,690	9,836,896	9,827,206	55,024,160
2029			9,690		9,690	10,685,972	10,676,282	65,700,443
2030			9,690		9,690	11,627,350	11,617,660	77,318,103
2031			9,690		9,690	12,491,656	12,481,966	89,800,068
2032			9,690		9,690	13,347,189	13,337,499	103,137,567
2033			9,690		9,690	14,206,101	14,196,411	117,333,978
2034			9,690	130,645	140,335	15,061,367	14,921,032	132,255,010
2035			9,690		9,690	15,934,181	15,924,491	148,179,501
				Present Value	7,160,490	25,448,788		

EIRR =	28.7%
NPV =	18,288,299
B/C =	3.6
Discount Rate =	12%

Source : Study Team

(3) Sensitivity Analysis

Sensitivity of the evaluation indicators is analyzed against change in cost (+10% and +20% from the base case) and benefit (-10% and -20%) of the Project. The result is tabulated as follows.

Table 16.2.4-4 Summary of Sensitivity Analysis

(a) EIRR

		Benefit		
		Base Case	-10%	-20%
Cost	Base Case	28.7%	27.0%	25.2%
	+10%	27.1%	25.5%	23.7%
	+20%	25.8%	24.2%	22.5%

(b) NPV (Million VND)

		Benefit		
		Base Case	-10%	-20%
Cost	Base Case	18,288,299	15,743,420	13,198,541
	+10%	17,572,250	15,027,371	12,482,492
	+20%	16,856,201	14,311,322	11,766,443

(c) B/C

		Benefit		
		Base Case	-10%	-20%
Cost	Base Case	3.6	3.2	2.8
	+10%	3.2	2.9	2.6
	+20%	3.0	2.7	2.4

Source : Study Team

As another scenario, sensitivity against freight demand of Lach Huyen Port is examined as well, since it accounts for the large portion of traffic demand of the Project road. According to the result shown in the table below, the total amount of benefit dramatically decreases in parallel of decrease in ocean freight, though the indicators remain above acceptable standards even in the scenarios.

Table 16.2.4-5 Result of Lower Container Scenario

Decrease in Ocean Freight	Decrease in Benefit	EIRR	NPV (Mil. VND)	B/C
-10%	-8.6%	27.4%	16,232,170	3.3
-30%	-25.8%	24.7%	12,119,913	2.7
-50%	-43.0%	21.5%	8,007,656	2.1

Source : Study Team

(4) Conclusion of Economic Analysis

The above results indicate high economic validity of the Project, showing that the values of EIRR are much higher than 12%, very much positive figures of NPV (>0), and B/C ratios higher than unity (>1) in any case undertaken for the sensitivity analysis. This result mainly comes from high operating cost of barge transport for freight in the "without project case", however the case could be said almost impossible in practice considering severe congestion on Nam Trieu Channel. It is indicated from the result of the sensitivity analysis that freight demand of Lach Huyen Port is the most sensitive factor to the evaluation indicators.

In conclusion, it is numerically verified that this road and bridge project has quite high economic validity on the condition that Lach Huyen Port would attract freight as much as forecasted. On the contrary, there would be huge opportunity loss in freight transport without the Project road. Therefore, well-coordinated development of port and road is highly recommended to maximize the effectiveness of the Project.

16.3 Monitoring of Project Performance

16.3.1 Qualitative Benefit of the Project

Besides of the benefits quantitatively evaluated in the previous section, a variety of benefit can be expected from the Project. Through improvement of the logistics environment of the region, the Project will activate economic activities.

(1) Direct Benefit

The Project provides direct benefits as listed below to users of the route. The road and bridge will be able to reduce not only travel cost and time, but also possible accidents and uncertainty on transport by alternating ferry and barge transport.

- Avoiding disastrous maritime traffic congestion at Nam Trieu Channel and possible accidents
- Reducing possible damages and delays in freight transport
- Stimulating industrial development in the coastal side of Haiphong
- Promoting tourism activity in Cat Ba Island

(2) Indirect Benefit

Logistics environment of Haiphong City and surrounding region will be improved by the Project, and it will stimulate industrial production and distribution. As a result, economy of the region is expected to keep growing steadily.

- Expanding the market sphere
- Integrating the regional economy
- Streamlining the logistics environment
- Promoting and attracting investment for new industries
- Enhancing industrial productivity

16.3.2 Indicators and Targets

Continuous monitoring of performance given by the Project is essential to maximize the benefit. For that purpose, indicators should be specified and properly collected during operation period of the Project road. The table below summarizes proposed operation indicators and benchmark values for evaluation after completion.

As a current practice, traffic volume of highway is counted in monthly basis by the road management county under RRMC. The county (unit) counts traffic by eleven different vehicle types and reports the data to RRMC for routine maintenance works. It can be assumed that one RRMC would be assigned for management of the Project road and traffic data would be available at the level. On the other hand, data on travel time or speed of specific road sections is not collected under the current maintenance structure. It can be recommended that the data would be measured periodically with routine maintenance activities at the RRMC level.

Table 16.3.2-1 Proposed Operation Indicators and Benchmarks

Indicator	Unit	Description	Baseline on 2010*	Target on 2017**
Annual Average Daily Traffic (AADT)	vehicles/day	24 hour traffic volume by vehicle type at specific points/timing	●150 vehicles/day at Ninh Tiep Ferry Port ●412 vehicles/day on the existing Cat Hai road (excluding MC)	●6,998 vehicles/day on Tan Vu IC- Dinh Vu section ●4,481 vehicles/day on Dinh Vu- Lach Huyen Port section (excluding MC)
Travel Time	minutes	Time required for driving through the project route in peak and off-peak hour	●Passenger: 155 minutes (including ferry section) ●Freight: N/A	●12 minutes (average speed: 80km/h)

Note: (*) Based on traffic survey in the Preparatory Survey
(**) Based on forecast in This Study

Source : Study Team

Based on the operation indicators above, the following effect indicators should be also measured. These indicators are able to quantify core benefits substantially generated by the Project and will be referred for ex-post evaluation by both Vietnamese and Japanese sides.

- ●Saving of VOC (Million VND/year)
- ●Saving of TTC (Million VND/year)
- ●EIRR (%)

CHAPTER 17 ROJECT IMPLEMENTATION PLAN

17.1 Loan Agreement

The fund of Lach Huyen Port Infrastructure Construction Project is financed by the Japan International Cooperation Agency (JICA) and the Government of the Socialist Republic of Vietnam.

The Loan Agreement of JICA consists of two (2) portions as follows,

Port Portion: Loan Agreement No. VN10-P3, signed date; November 2, 2011

Road/Bridge Portion: Loan Agreement No. VN10-P4, signed date; November 2, 2011

17.2 Implementation Structure

17.2.1 Related Organizations

According to MOT's letter, No 2678/BGTVT-KHDT dated 27 April 2010, the organizations related to project implementation for the road/bridge portion are as follows,

1) Funding Agency: JICA
2) Borrower: Ministry of Finance
3) Line Agency: MOT
4) Project Owner: Directorate of Roads of Viet Nam (DRVN)
5) Implementing Agency: PMU 2
6) Land Acquisition, Resettlement Action Plan and Land Clearance:
   Hai Phong People's Committee

17.3 Implementation Schedule

17.3.1 Pre-construction Works

(1) Procurement of Consulting Service

Procurement of a consultant for construction supervision will be conducted in accordance with the Guidelines for the Employment of Consultants under Japanese ODA loans. Because STEP is applied as mentioned in the Loan Agreement dated November 2, 2011, the prime consultant must be a Japanese firm, or a Japanese-led JV with firms incorporated and registered in Vietnam.

(2) Procurement of Contractor for Construction Works

The procurement of contractors should be in accordance with the guidelines for procurement under Japanese ODA Loans. Because the implementation of this project will be funded by the Japanese Government with an ODA Loan, STEP scheme based on the Loan Agreement on Lach Huyen Port Infrastructure Construction Project between JICA and GOVN dated November 2, 2011, prime contractors must be Japanese firms. JVs with the firms incorporated and registered in recipient countries are also allowed to be a prime contractor under the condition that a Japanese firm will be the lead partner. Subcontractors, on the other hand, may be from any country.

(3) Other Pre-construction Works

The other pre-construction works are listed below,

- Finalization of Detailed Design by JICA,
- Finalization of PQ and Tender Documents by Vietnamese Side
- Land Acquisition for the permanent facilities and the related Resettlement by Vietnamese Side
- Land Acquisition for permanent facilities and the related Resettlement by Vietnamese Side
- Acquisition for land for temporary use for construction and related Resettlement by Vietnamese Side

17.3.2 Construction Works

(1) Construction Package

Since Vietnamese side has not decided yet the definitive construction packaging plan as of 31th of October, one (1) package for the whole project is assumed in this report as recommended in Section 17.4.

(2) Construction Schedule

As discussed in Chapter 10, the estimated period of the construction is 36 months.

17.3.3 Implementation Program (I/P)

(1) Assumption of Implementation Program

The implementation program in this Study is established based on following assumptions:

· STEP scheme of Japanese ODA Loan is applied,
· The tender documents and estimated costs are approved by February 2012,
· Loan agreement is signed in November 2011,
· Acquisition of the land for the permanent facilities and the related resettlement are completed before commencement of construction,
· Acquisition of the temporary land for construction and the related resettlement are completed before commencement of construction,
· The number of construction package is one, and,
· Construction period is 36 months.

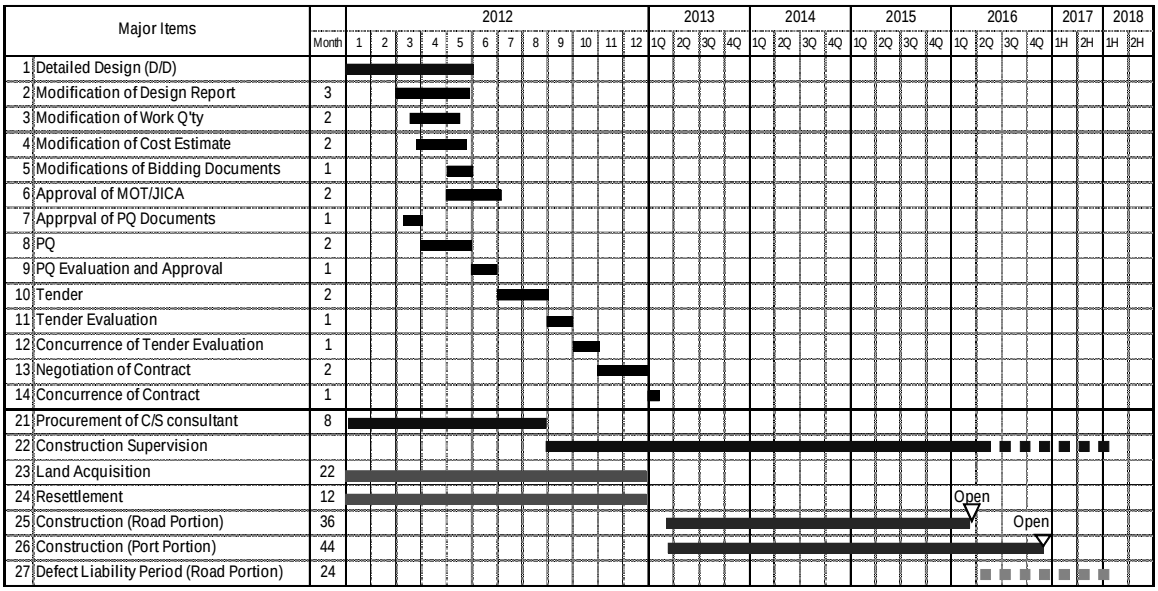
(2) Estimated Implementation Program

The estimated implementation milestone and schedule are shown in the following table and the following figure, respectively.

Table 17.3.3-1 Implementation Milestone

Event/ Milestone	Time/ Period
Exchange Note & Loan Agreement	November 2011
Detail Design	March 2011 to May 2012
Finalization and Approbation of Tender Documents	November 2011 to May 2012
Procurement of Contractor	April 2012 to January 2013
Prequalification and Tender Period	April 2012 to August 2012
Tender Evaluation	September 2012
Concurrence of Tender Evaluation	October 2012
Negotiation of Contract	November 2012 to December 2012
Concurrence of Contract	January 2013
Procurement of C/S consultant	January 2011 to August 2012
Construction Supervision	September 2012 to March 2018
Land Acquisition	March 2011 to December 2012
Resettlement	January 2012 to December 2012
Construction	March 2013 to February 2016
Defect Liability Period	March 2016 to February 2018

Source: Study Team



Source: Study Team

Figure 17.3.3-1 Estimated Implementation Program

17.4 Construction Packaging Plan

17.4.1 Background

Concerning construction packaging, VIDIFI F/S conducted in 2008 and 2009 recommended three packages.

On the contrary, it was concluded in JICA's Preparatory Survey (SAPROF Study) conducted in 2010 that one package for the whole work (no package division) is preferable and most recommended.

In the minutes of discussion between Government of Vietnam and JICA dated 18th of June, 2010, it is stated as follows,

> The JICA mission explained that due consideration to these risks would require that the number of packages for both the port portion and the road and bridge portion be as small as possible and recommended the packaging plans proposed in Preparatory Surveys as follows:
>
> 1) Port portion
>
> Package 1: Dredging of the navigation channel
>
> Package 2: All the other part of work
>
> 2) Road and bridge portion
>
> One package for the whole work
>
> After discussions, the Vietnamese side proposed tentative packaging plans as of now as follows:
>
> 1) Port portion: 3 or 4 packages
>
> 2) Road and bridge portion: 1 or 2 package(s)
>
> JICA reiterated the recommendation above. The both sides agreed that the actual procurement packages will be reviewed and finalized at the detailed design stage of the Project.

In Summary Report on Investment Project of DRVN and PMU2 complied in 2010, Packaging plans with 1 or 2 package(s) are recommended.

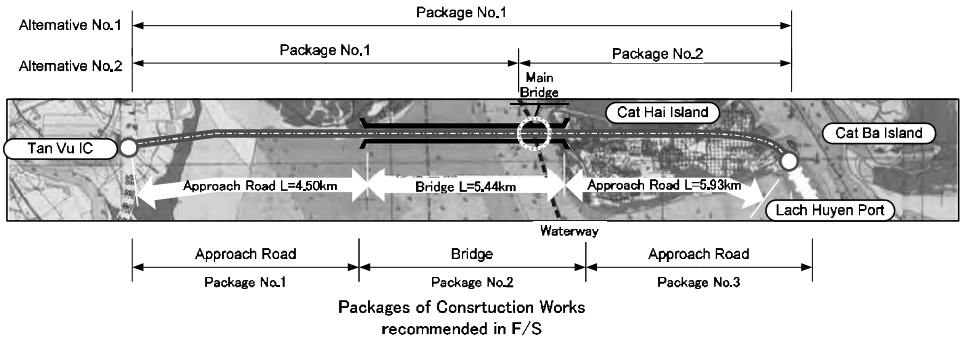
Considering the above-mentioned background, a comparative study was performed for selecting appropriate packaging plan for the construction work.

17.4.2 Alternatives of Packaging Plans

17.4.2.1 Conditions of Study

(1) Contents of packaging plans

In order to select appropriate construction packaging plan, alternatives shown in the figure below are studied and discussed in the following sections.



Source: Study Team

Figure 17.4.2-1 Alternatives on Construction Packaging Plan

(2) Construction costs

The locations and construction costs of the alternatives are summarized in the tables blow.

Table 17.4.2-1 Alternatives in Procurement Plan and Construction Cost

		Alternative No.1	Alternative No.2	
		Package No.1	Package No.1	Package No.2
Location		All Section	Tan Vu IC, Din Vu area and West Approach Bridges	Main Bridge, East Approach Bridges and Cat Hai Island
Construction Cost*	mil. VND	6,949,545	4,877,051	2,106,677
	mil. Yen**	36,972	25,946	11,208

		Packages recommended in F/S		
		Package No.1	Package No.2	Package No.3
Location		Tan Vu IC and Din Vu area	Main Bridge and Approach Bridges	Cat Hai Island
Construction Cost*	mil. VND	1,323,450	4,621,758	1,132,476
	mil. Yen**	7,041	24,588	6,025

*preliminary estimation

**converted by using an exchange rate:1VND=0.00532Yen

Source: Study Team

17.4.2.2 Advantages and Disadvantages of Alternatives

(1) Alternative 1: One Package

This alternative is the one recommended by JICA's Preparatory Study (SAPROF Study) and recommended by JICA as stated in MOD between MOT and JICA dated 18th of June, 2010. Also, this alternative is one of the two options which MOT proposed in the meeting with JICA as stated in MOD.

Advantages and disadvantages for this alternative are listed below.

Advantages:

a) Construction schedule can be managed comprehensively, which is good in terms of overall project implementation.

b) The problems concerning interference can be solved as part of the scope of one contractor.

c) The problems concerning material capture can be solved as part of the scope of one contractor.

Disadvantages:

a) The contract amount is bigger and the length of the bridge is longer than any Japanese contractors have accomplished. The specifications for pre-qualification should be decided after discussion with MOT and JICA.

(2) Alternative 2: Two Packages

Another alternative of construction contract packaging is as follows:

Package 1: Tan Vu IC, Dinh Vu area and West Approach Bridge

Package 2: Main Bridge, East Approach Bridges and Approach Road in Cat Hai Island

This alternative is the other of the two options which MOT proposed in the meeting with JICA as stated in MOD.

Advantages:

a) Both packages have reasonable contract amounts which are including the potions of road and bridge works

b) The boundary of the packages is the west end of the Main Bridge, and hence, no interference of construction works is anticipated.

Disadvantages:

a) The contract amount in Package 1 is bigger and the length of the bridge is longer than any Japanese contractors have accomplished. The specifications for pre-qualification should be decided after discussion with MOT and JICA.

b) It is difficult to control the overall construction schedule as the completion of each package varies.

c) Contractors compete each other for capture of material resource which results in non-necessary price hike and delay in procurement.

(3) Alternative 3: Three Packages

On the other hand, the construction packages recommended in the F/S are as follows:

Package 1: Tan Vu IC and Dinh Vu area

Package 2: Approach and Main Bridges

Package 3: Section in Cat Hai Island

Advantages and disadvantages of implementing said packages, as discussed in the F/S, are summarized as follows:

Advantages:

a) The type of construction works for each package can be simply defined. Contractors who specialize in the type of construction works could be qualified.

Disadvantages:

a) Package No.1: There is a risk that no contractors would participate in the bidding due to a relatively low contract amount. They may also avoid facing troubles on possible delay due to delay in land acquisition and earth works for making embankment on soft soil ground near the sea. In addition, interference with the construction works of Package No. 2 is expected in case that a common jetty is used for both packages.

b) Package No.2: The length of the bridge, 5.44 km, is longer than any Japanese contractors have accomplished. The specifications for pre-qualification should be decided after discussion with MOT and JICA. In addition, interference with the construction works of Package No. 1 is expected in case that a common jetty is used for both packages.

c) Package No.3: There is a risk that no contractors would participate in the bidding due to a relatively low contract amount. It is also possible that contractors will avoid risks of delays due to possible delay in land acquisition and soft soil treatment.

d) It is difficult to control the overall construction schedule as the completion of each package varies.

e) Contractors compete each other for capture of material resource which results in non-necessary price hike and delay in procurement.

17.4.3 Comparative Study

17.4.3.1 Conditions of Comparative Study

(1) Evaluation Criteria

Since the alternative study for packaging plan is quite different from other alternative studies with technical matters, the items for evaluation are adjusted particularly for the packaging, such as controllability and aspects in PQ and tender process. The evaluation criteria of the alternative study and maximum scores are shown in the table below.

Table 17.4.3-1 Evaluation Criteria of Alternative Study and Maximum Scores

No.	Category	Evaluation Criteria	Maximum Score
1.	Economic Viability (50 points)	Construction Cost	40
2.		STEP Clearance	10
3.	Technical Viability (35 point)	Controllability	10
4.		Construction Plan (Difficulty) and Construction Period	25
5.	Other Viability (15 points)	Aspects in PQ and tender process	15
Total Points			100

Source: Study Team

17.4.3.2 Results of Comparative Study

(1) Comparison Table

The table on the next page shows the result of the comparative study.

(2) Conclusions

As shown in the table, results of comparison reveal that one package for the whole work is the most preferable for the following reasons;

- Temporary facilities can be concentrated and minimized
- Schedule and quality are controlled and optimized for the entire project with the biggest liquidated damage.
- The problems concerning interference can be solved as part of the scope of one contractor or JV.
- The problems concerning material source capture can be solved as part of the scope of one contractor or JV.
- Superior in implementation of electric wiring and lighting which is not dividable.
- Superior in implementation of pavement which can be realized continuously for whole length of the highway.
- Since the package is attractive for big general contractors, competitive tender is expected.

On the contrary as shown in the same table, in case with three packages, there are the highest risks to fail the tender, which leads serious delay, and there could be chance for unsuitable contractors to be awarded, which would lead problems in schedule, quality and safety of construction.

Since, in particular, the controllability on construction schedule is crucial for the project to open before the inauguration of the port, Alternative-1 with one package is most recommended.

On the meeting between JICA and MOT on 14th of December 2011, the both parties agreed on the package plan of Alternative-1 with one package recommended by Study Team.

Table 17.4.3-2 Comparison of Alternatives in Construction Packaging Plan

Evaluation Items		Alternative-1 1 Package (F/S Approved by MOT, SAPROF)		Alternative-2 2 Packages (F/S Approved by MOT)		Alternative-3 3 Packages (VIDIFI F/S)	
Schematic Plan View					
Construction Cost (preliminary estimate)	40	Temporary facilities are concentrated. Management cost is minimum Package No.1: ¥36,972 Total: ¥36,972 Ratio: 1.000	40	Temporary facilities are divided and duplicated. So is to management. Package No.1: ¥25,946 Package No.2: ¥11,208 Total: ¥37,154 Ratio: 1.005	32	Temporary facilities are divided and duplicated. So is to management Package No.1: ¥7,041 Package No.2: ¥24,588 Package No.3: ¥6,025 Total: ¥37,654 Ratio: 1.018	32
STEP Clearance	10	33% (Preliminary Estimate)	8	33% (Preliminary Estimate)	8	33% (Preliminary Estimate)	8
Controllability	10	- Schedule and quality are controlled and optimized for the entire project. - Contractual amount of liquidated damage for one package is the biggest.	10	- Schedule and quality control are limited to the divided package, which results in variation in completion. - Contractual amount of liquidated damage for one package is smaller than Alternative-1.	8	- Schedule and quality control are limited to the divided package, which resulted in variation in completion. - Contractual amount of liquidated damage for one package is the smallest.	6
Construction Plan	25	- Temporary facilities, such as Temporary road, pre-cast segment yard and stock yard with cranes, camp for administration and labor, can be concentrated and minimized. - The problems concerning interference can be solved as part of The scope of one contractor or JV. - Superior in implementation of electric wiring and lighting which is not dividable. - Superior in implementation of pavement which can be realized continuously for whole length of The highway. - Superior in procurement of construction materials	25	- Temporary facilities are divided and duplicated. - The construction of The pier at The package boundary can be interference for The construction of The girder in The adjacent package. - Inferior in implementation of electric wiring and lighting since it is not dividable. - Inferior in implementation of pavement since material transportation would be via water route for package No.2. - Inferior in procurement of construction materials.	20	- Temporary facilities are divided and duplicated. - Interference of construction works for Package No.1 and 2 is expected along the temporary road. - Inferior in implementation of electric wiring and lighting since it is not dividable. - Inferior in implementation of pavement since material transportation would be via water route for Package No.3. - Inferior in procurement of construction materials.	10
Aspects in PQ and Tender Process	15	- Since the package is attractive for big general contractors, competitive tender is expected. - Since The contract amount is bigger and The length of The bridge is longer than most Japanese contractors have accomplished, The specification for PQ should be adjusted.	15	- Both package have reasonable contract amounts, which is attractive for general contractors. - Since the contract amount is bigger and the length of the bridge is longer than most Japanese contractors have accomplished, the specification for PQ should be adjusted for Package No.1.	12	- Highest risk that no bidders apply to the packages No.1 and 3, which are not attractive for contractors to apply tender because of relatively small contract amounts and risks due to soft ground and resettlement issues. - In case that no bidders apply for the first bid, the tender process will take longer, which results in delay of road opening. - The contractor specializing in the type of construction works could be qualified.	6
Evaluation	100	This alternative is superior in cost, controllability, construction plan and aspects in PQ and tender process.	**98**	This alternative is superior in aspects in PQ and tender process but inferior in efficiency in construction plan.	**80**	This alternative has risk to have failure in tender process in which no contractors applies in Packages No.1 and 3.	**62**
		Most Recommended		**Les Recommended**		**Not Recommended**	

Source: Study Team

CHAPTER 18 FUTURE UPGRADE PLAN

18.1 General

18.1.1 Basic Concept

Based on the results of the comparison study on investigation timing conducted in JICA's Preparatory Survey, stage construction method is selected because of its superiority in the result of economic evaluation in which, for example, the much higher EIRR is indicated for the case of the stage construction compared with the case of one-time construction. The outline of the stage construction is shown in the table below.

Table 18.1.1-1 Outline of Stage Construction

	First Stage	Second Stage
Embankment Road Sections	4 Lanes(Pavement width for 4 lanes and embankment width for 6 lanes)	6 Lanes
Bridge Section*	4 Lanes	6 Lanes
Tan Vu IC	At Grade	Separate Grade

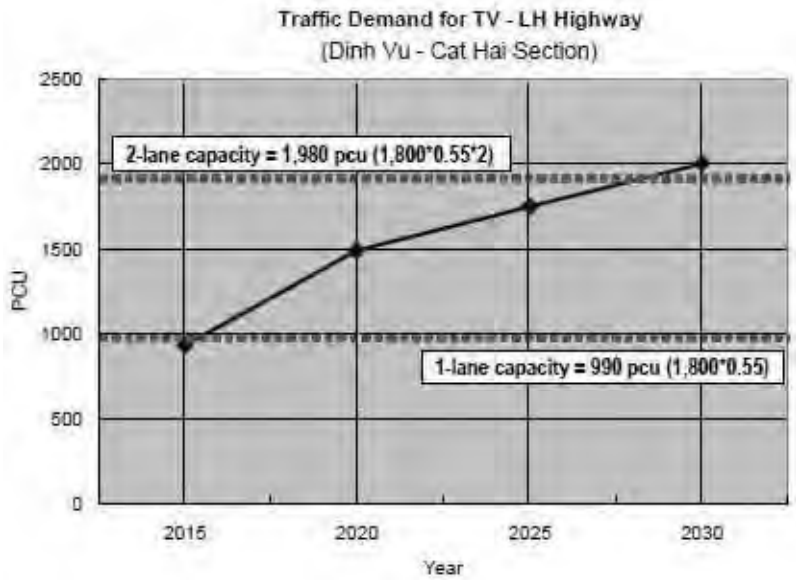
*6 lane shall be installed in Cam River Bridge since it is in the section of embankment road.

Source: Study Team

18.1.2 Expected Timing of Second Stage

(1) Expected Timing of Second Stage for Road and Bridge

Based on the results of the comparison study on investigation timing conducted in JICA's Preparatory Survey, two lanes par direction could sufficiently accommodate traffic capacity until 2027.



Source: JICA's Preparatory Survey, 2010

Figure 18.1.2-1 Future Lane Requirement in JICA's Preparatory Survey

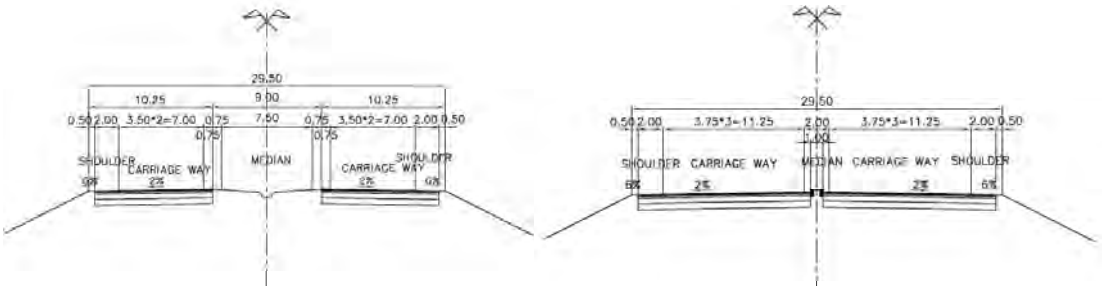
(2) Expected Timing of Second Stage for Tan Vu Interchange

As discussed in the section 7.3.1.1 and shown in Table 7.3.1-3, the signalized at-grade intersection could sufficiently accommodate traffic capacity until 2026.

18.2 Future Upgrade Plan of Road Section

18.2.1 Second Stage

The width with 7m (2x3.5m) of the median shall be paved for adding 2 more lanes at the second stage. The typical cross sections at the first stage and the second stage are shown in the figure below.



(a) First Stage (b) Second Stage

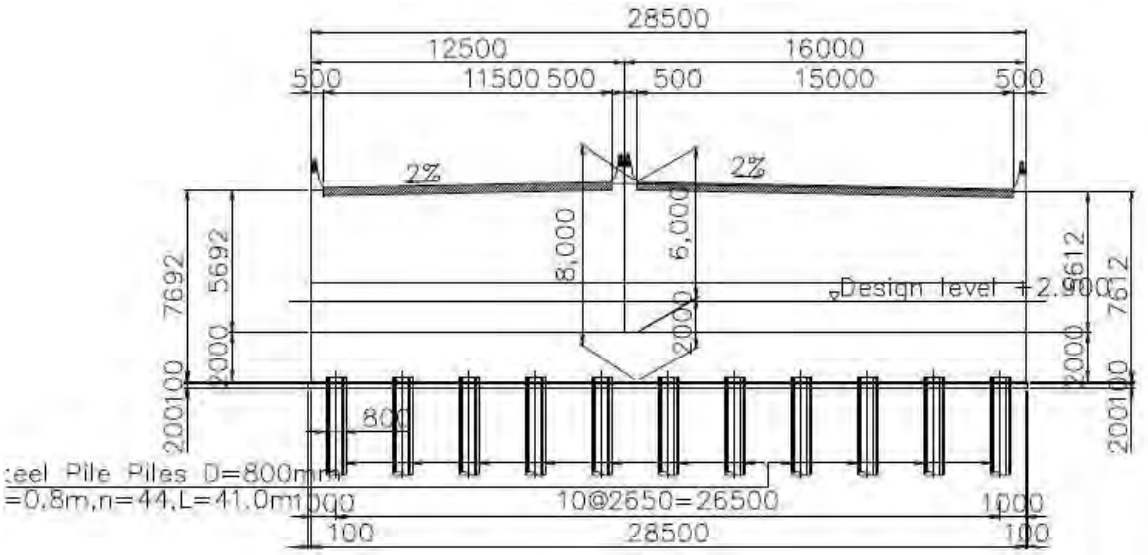
Source: Study Team

Figure 18.2.1-1 Typical Cross Section of Road Section

18.3 Future Upgrade Plan of Bridge Section

18.3.1 Abutment

As stated in the chapter 8.4.5.1, the abutments A1 and A2 are designed with full scale construction.

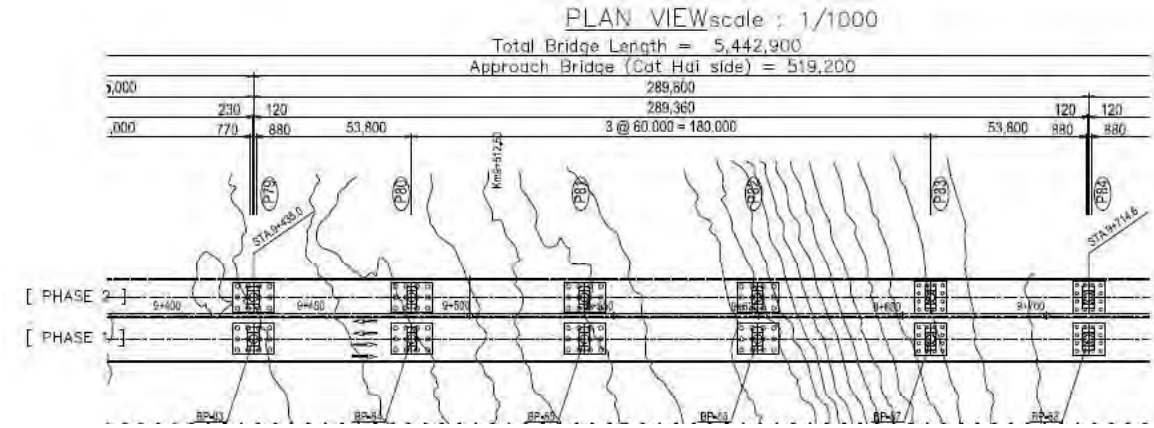


Source: Study Team

Figure 18.3.1-1 Cross Section at Abutment

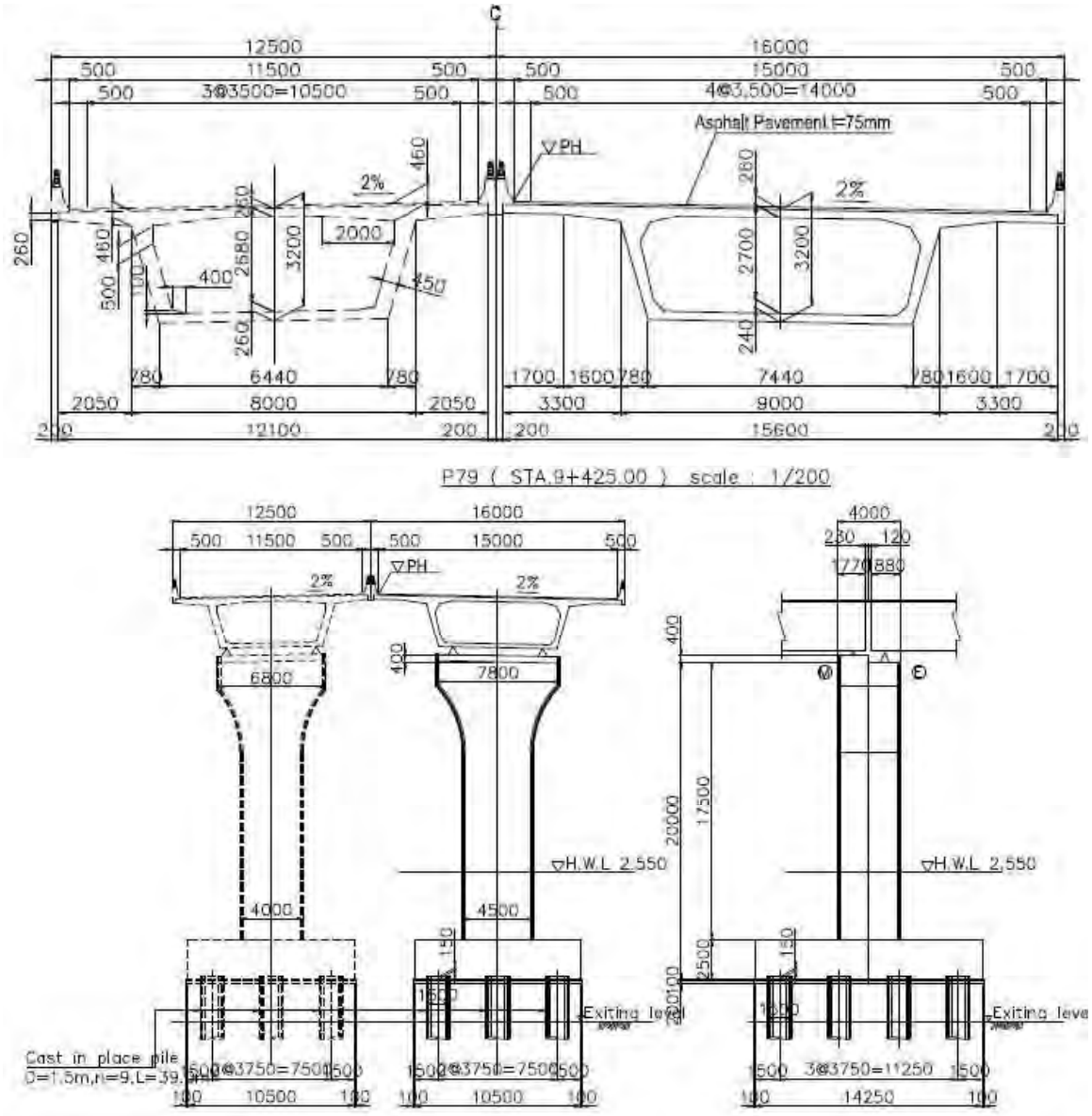
18.3.2 Approach Bridge

In the second stage, an additional bridge with 3 lanes is planned to be constructed adjacent to the approach bridge for first stage as shown in the following figures.



Source: Study Team

Figure 18.3.2-1 Plan View of Approach Bridge



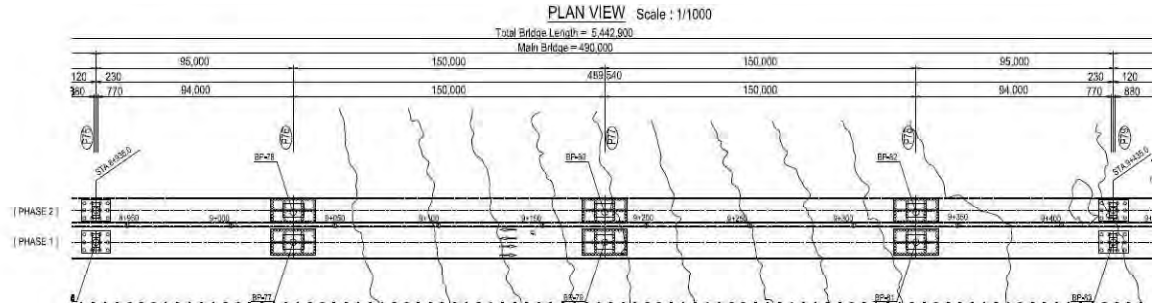
Source: Study Team

Figure 18.3.2-2 General View of Approach Bridge with Second Stage

18.3.3 Main Bridge

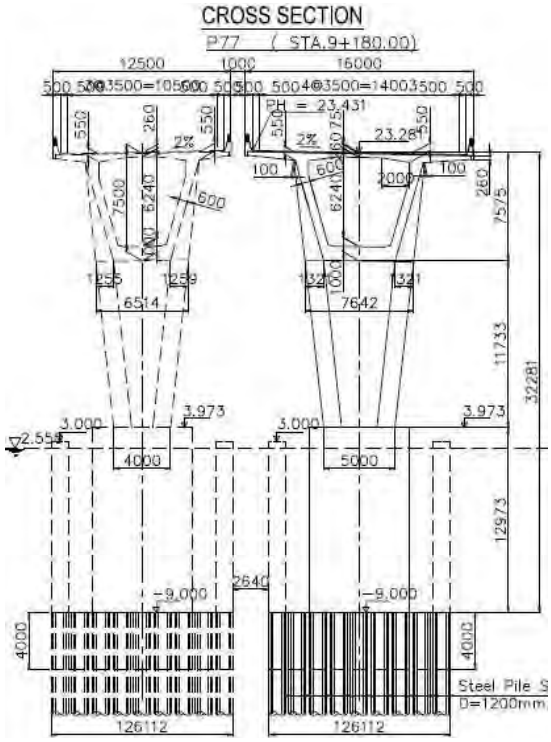
Same as the approach bridge section, an additional bridge with 3 lanes is planned to be constructed adjacent to Main Bridge for first stage as shown in the following figures.

As stated in the section 8.3.5.1, the foundation shall be separated between the first stage and the second stage.



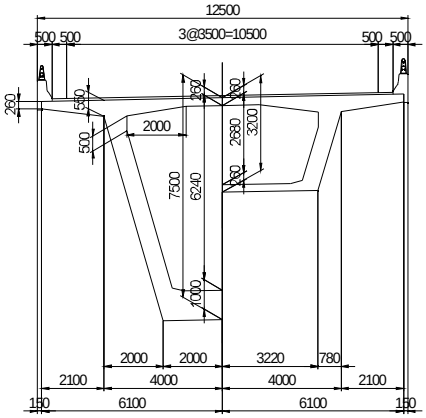
Source: Study Team

Figure 18.3.3-1 Plan View of Main Bridge



Source: Study Team

Figure 18.3.3-2 Cross Section at Pier P77 of Main Bridge including



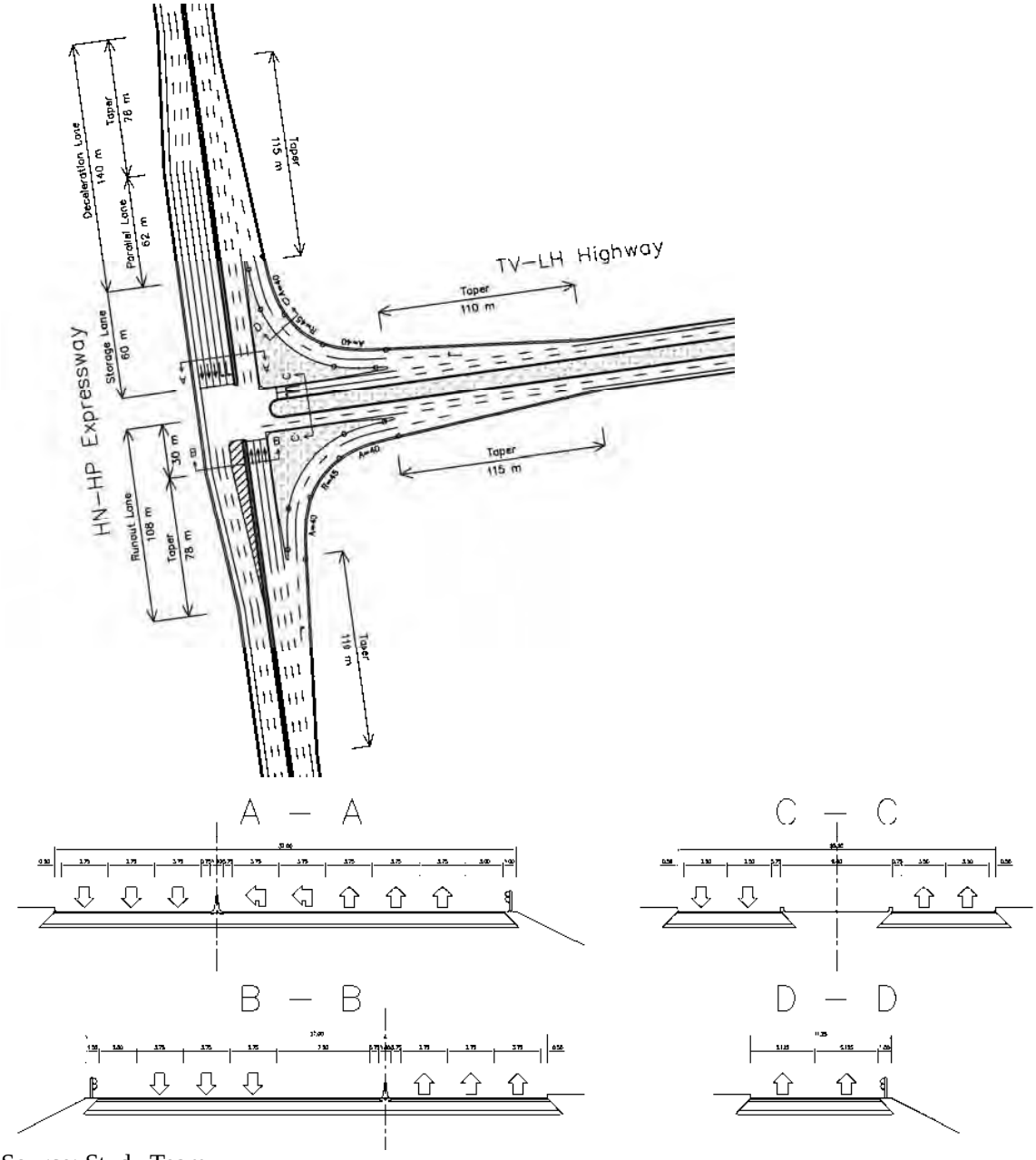
Source: Study Team

Figure 18.3.3-3 Cross Section for Main Girder for the Second Stage

18.4 Future Upgrade Plan of Tan Vu Interchange

18.4.1 First Stage

At the first stage, the signalized at-grade intersection is planned as the figure below.

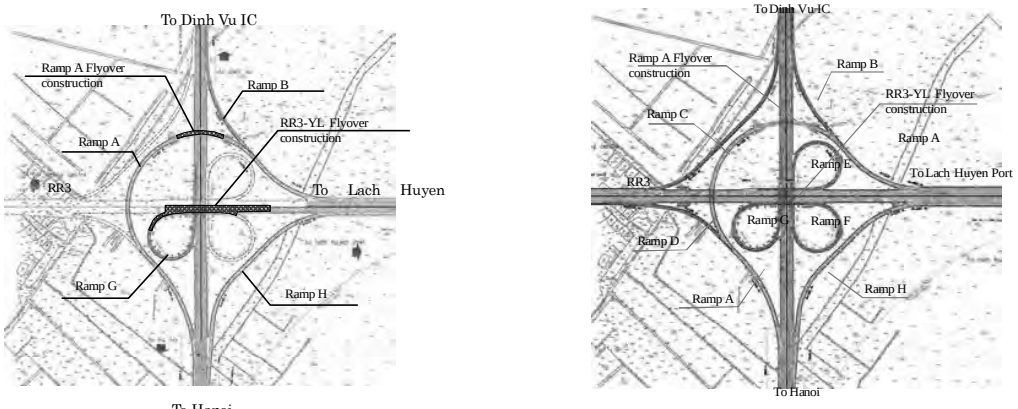


Source: Study Team

Figure 18.4.1-1 Signalized At-grade Intersection

18.4.2 Second Stage

At the Second stage, the separate grade interchange is planned depending on the actual situation of Ring Road No.3 (RR3) as the figures below.



(a) Option-1: without connection to RR3 (b) Opetion-2: with connection to RR3

Source: F/S, June 2009

Figure 18.4.2-1 Separate-grade Interchange

CHAPTER 19 PREPARATION OF TENDER DOCUMENTS

19.1 Prequalification Documents

19.1.1 Descriptions

As the project is a large and complex civil works contract, the Sample Prequalification Documents (SPD) prepared by JICA is applied to facilitate prequalification of bidders.

19.1.2 Types of Contract

The Project is under Japanese ODA loan with STEP (Special Terms for Economic Partnership) Scheme. The PQ documents are prepared to meet the requirements of JICA guideline.

19.1.3 Prequalification Documents

The prepared Prequalification Document consists of following contents:

(1) Part 1.PREQUALIFICATION PROCEDURES

Section I.Instructions to Applicants (ITA)

This Section specifies the procedures to be followed by Applicants in the preparation and submission of their Applications for Prequalification (AFPs). Information is also provided on opening and evaluation of AFPs.

Section II.Prequalification Data Sheet (PDS)

This Section consists of provisions that are specific to each prequalification and supplement the information or requirements included in Section I, Instructions to Applicants.

Section III.Qualification Criteria and Requirements

This Section contains the methods, criteria, and requirements to be used to determine how Applicants shall be prequalified and later invited to bid.

Section IV.Application Forms

This Section contains the forms for the Application Submission Form and all the forms required to be submitted with the application.

Section V.List of Eligible Countries of Japanese ODA Loans

This Section contains information in respect of eligible countries under Japanese ODA Loans.

(2) PART 2. WORKS REQUIREMENTS

Section VI.Scope of Works

This section includes following contents:

1. Description of the Works.
2. Construction Period
3. Site and Other Data

Appendix-1 Location Map of the Project

Appendix-2 Typical Drawings

19.2 Bidding Documents

19.2.1 Descriptions

The Bidding Documents for the project were prepared based on the Sample Bidding Documents (SBD) for Procurement of Works. The SBD was prepared by JICA to be used for the procurement of admeasurement (unit price or rate) type of works. The SPDs are consistent with Guidelines for Procurement under Japanese ODA Loans, March 2009.

19.2.2 Sample Bidding Documents Under Japanese ODA Loans

The SBDs are based on the Master Bidding Documents for Procurement of Works which are prepared by the Multilateral Development Banks and International Financing Institutions.

The SBDs are considered that prequalification has taken place before bidding.

The SBDs include One-Envelope bidding procedure A brief description of the bidding documents for the Project is given below.

19.2.3 Bidding Documents for the Project

- Necessary information and data to the contract and required by the bidders in order to prepare responsive bids are provided in the Bid Data Sheet (Section II), the Evaluation and Qualification Criteria (Section III), the works requirements (Section VI), the particular Conditions (Section VIII), and the Annex to the Particular Conditions-Contract Forms (Section IX).
- Preparing Technical Specifications: There are no standard Specifications for universal application in Vietnam as well as in all sectors in all countries. Specifications from previous similar projects in Vietnam are reflected in to this Bidding Documents.
- The General Conditions used in the Bidding Documents are the Multilateral Development Bank Harmonized Edition of General Conditions of Contract prepared by the International Federation of Consulting Engineers (FIDIC)
- The Bidding Documents contain below mentioned Parts and Sections.

(1) PART 1 – BIDDING PROCEDURES

Section I:Instructions to Bidders (ITB)

This Section provides relevant information to help Bidders prepare their bids. Information is also provided on the submission, opening, and evaluation of bids and on the award of Contracts. Section I contains provisions that are to be used without modification.

Section II.Bid Data Sheet (BDS)

This Section consists of provisions that are specific to each procurement and that supplement the information or requirements included in Section I, Instructions to Bidders.

Section III.Evaluation and Qualification Criteria

This Section contains the criteria to determine the lowest evaluated bid and the qualifications of the Bidder to perform the contract. Two alternative Sections III, Evaluation and Qualification Criteria are provided to address the possibility of having or not having prequalification of Bidders.

Section IV:Bidding Forms

This Section contains the forms which are to be completed by the Bidder and submitted as part of his Bid.

Bill of Quantities is included in this section.

Section V.List of Eligible Countries of Japanese ODA Loans

This Section contains information regarding eligible countries.

(2) PART 2 – WORKS REQUIREMENTS

Section VI. Works Requirements

This Section requires the Specification, the Drawings, and supplementary information that describe the Works to be procured.

However in this Bidding Document the Specifications are stipulated in Part 4 and Drawings are listed in Part 5.

(3) PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section VII.General Conditions (GC)

This Section contains the general clauses to be applied in all contracts. The text of the clauses in this Section shall not be modified.

Section VIII.Particular Conditions (PC)

This Section consists of Part A, Contract Data, which contains data, and Part B, Specific Provisions, which contains clauses specific to each contract. The contents of this Section supplement the General Conditions and shall be prepared by the Employer.

Section IX:Annex to the Particular Conditions - Contract Forms

This Section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

(4) PART 4 – SPECIFICATIONS

Specifications consist of General Specification and Technical Specifications.

(5) PART 5 – BILL OF QUANTITIES

This Part consists of all contract quantities.

(6) PART 6 – DRAWINGS

This Part consists of all contract drawings.