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*Agenda of Kick-off Meeting on  
The Project for  
the Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste*

1. Opening remarks (MPWTC)
2. Presentation of Work Plan(JICA Team)
  - 2-1. Concept of the project
  - 2-2. Basic understanding of present condition of road in TL
  - 2-3. Activity plan of the project
3. Presentation of road maintenance activities in 2016 (Mr. Joao Pedro, chief of maintenance department)
4. Requests or comments to the project (All participants)
5. Q&A (*All participants*)
6. Closing remarks (DRBFC)



**The Project for  
the Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste**

***Work Plan***

**April 2016**



**Ingerosec Corporation**

**Earth System Science Co., Ltd.**

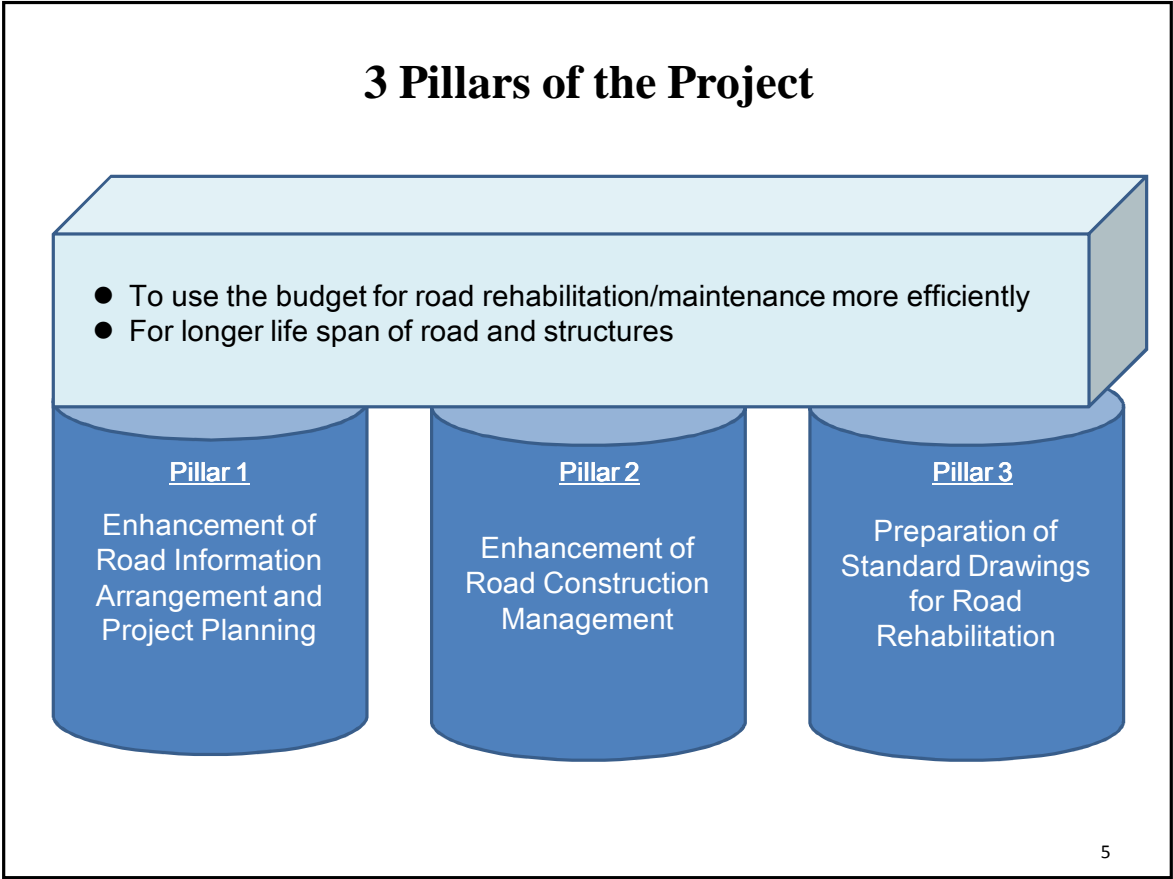
# 1. Outline of the Project

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## Outline of the Project (PDM)

Item	Description
Project Title	The Project for the Capacity Development of Road Services (CDRS)
Project Duration	March 2016～March 2019 (3 years)
Project Site	Whole National Roads in Timor-Leste (A01～A19)
Implementing Agency	Ministry of Public Works, Transport and Communications (MPWTC)
Target Group	Directorate of Road, Bridge and Flood Control (DRBFC)
Overall Goal	The maintenance conditions of major roads are improved in TL.
Project Purpose	Capacity of DRBFC for maintenance of major roads in the whole country is enhanced.
Outputs	1.Appropriate road maintenance for major roads is realized around the Dili area and introduced in other areas by improving cycle of road maintenance cycle 2.Capacity of DRBFC construction management for maintenance and rehabilitation including slope protection is improved through case studies in the whole country 3.Standard drawings of maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection

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2. Understanding of road conditions in Timor-Leste

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2-1. Existing condition of national roads

<p>A01 (Dili - Baucau)</p> <p>Typical slope cutting</p>  <p>Dili-Manatuto section Flatland</p> 	<p>A06 (Baucau - Viqueque)</p> <p>Venilale-Ossu section Starting point of Phase-II</p>  <p>Damaged apron work of drainage culvert</p> 	<p>A08 (Viqueque - Iliomar)</p> <p>Road condition near Viqueque town</p>  <p>Road severed point near Vessuro</p> 
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2-1. Existing condition of national roads

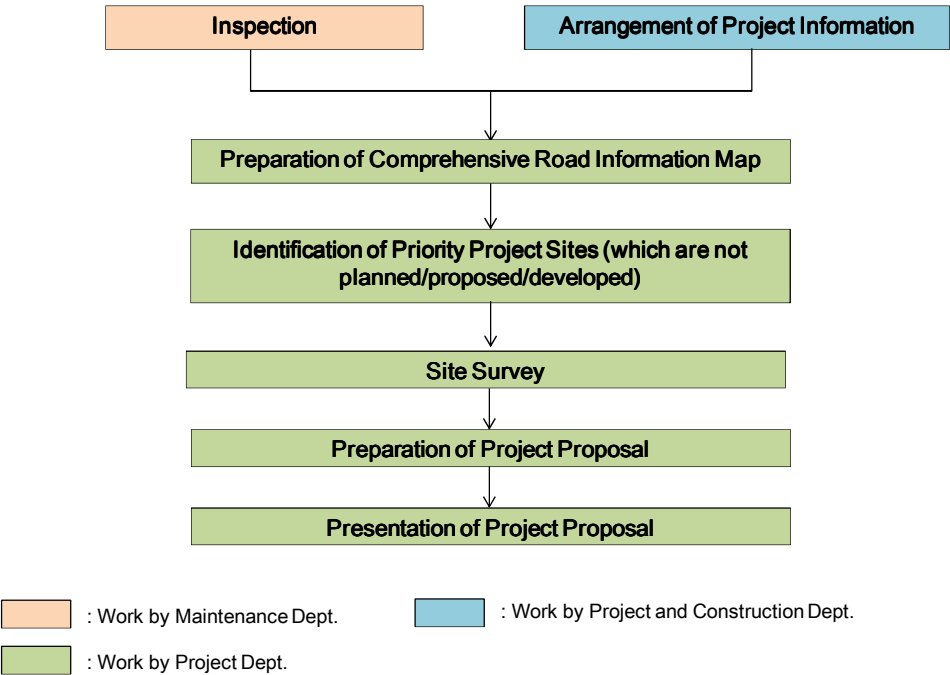
<p>A07 (Viqueque - Natarbora)</p> <p>Road condition near Natarbora town</p>  <p>Slope collapse near Viqueque town</p> 	<p>A05 (Aiassa - Aituto)</p> <p>Slope collapse at rehabilitation section</p>  <p>Road condition at Same town</p> 	<p>A02 (Cassa - Dili)</p> <p>Road condition near JAKARTA II</p>  <p>Slope collapse</p> 
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### 3. Major Targets of the Project

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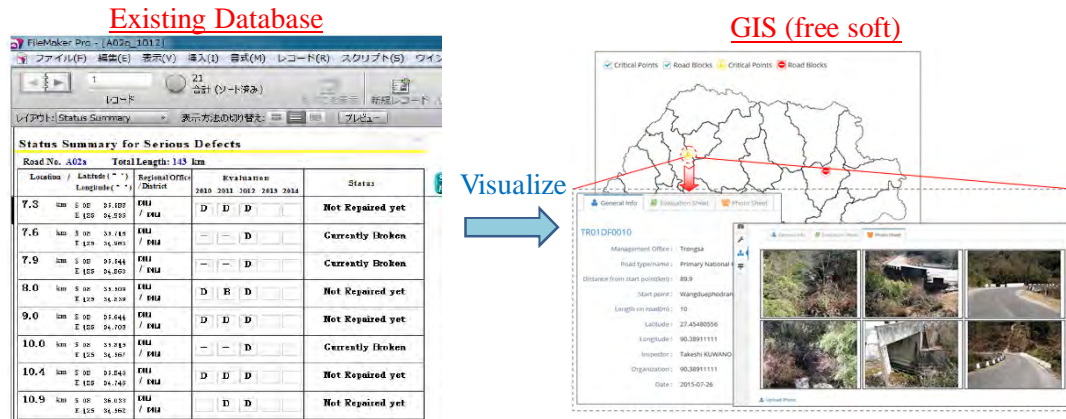
3-1. To prepare plans/proposals of road rehabilitation projects based on the inspection and project information to enhance the project planning



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## Database

- Utilize the existing database system
- Improve the system so as to update the project record
- Add the system to be visible on the map



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### 3-2. To plan and conduct case studies

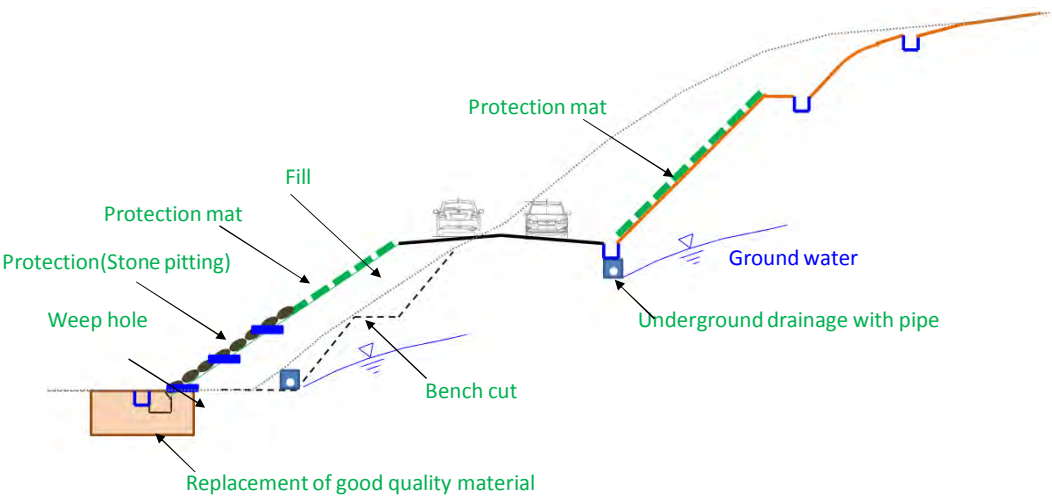
A total of 10 case studies will be conducted across the country.

Case studies are to be selected and conducted through the collaborative works of DRBFC with JICA Team for the following purposes.

- ✓ To plan better countermeasures for rehabilitation/repair work
- ✓ To check the project drawings prepared by the Contractor
- ✓ For the better inspection of construction quality and safety

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(1)Slope Protection



Example of slope protection measure

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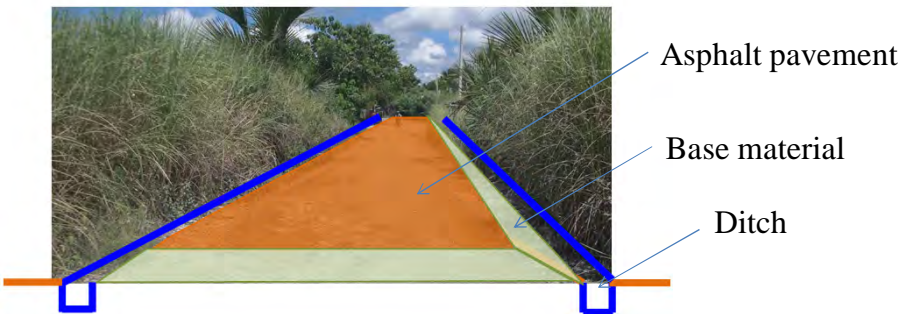
(2) Drainage measure



Scouring measure of cross culvert



Sub-drainage pipe under a side ditch



Road embankment and side ditch at lowland section

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### (3) Road surface repair

- Replace the existing subgrade/subbase to a quality material.
- Using the repair equipment by CDRW.



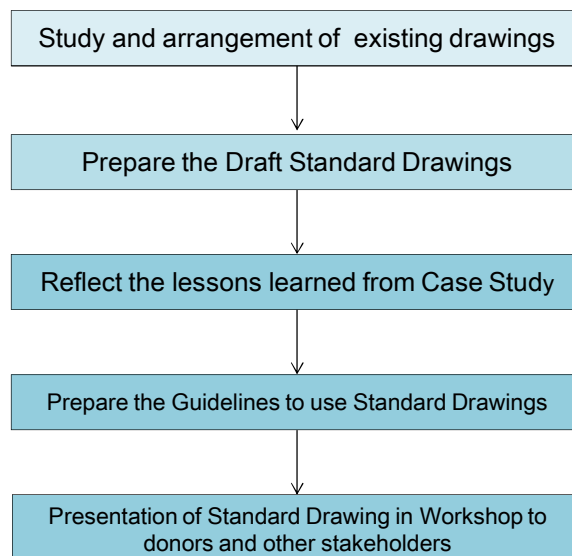
### (4) Emergency rehabilitation measure

- Large sand-bags for temporary retaining wall and counterweight work.
- Road safety measures by using barricades.



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### 3-3. To prepare standard drawings for road rehabilitation works



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3-3. To prepare standard drawings for road rehabilitation works

Type of Standard Drawings	Items to be cared in the drawings
Drainage and Cross Culvert	Detail of Inlet/Outlet Required thickness of earth covering
Gabion Mat Retaining Wall	Applicable height Drainage of slope surface and underground water
Cut and Embankment Slope	Slope Gradient depending on soil type Applicable height Terrace and drainage
Pavement	Typical thickness and material for each layer
Revetment	Embedded depth Applicable height

4. Overall schedule of the Project

1<sup>st</sup> Year (2016)

- ✓ Review and analysis of existing condition
- ✓ Establishment of Working Group
- ✓ Periodic Inspection
- ✓ Database Input
- ✓ Selection of Case Studies in 2017
- ✓ Preparation of Draft Standard Drawings

2<sup>nd</sup> Year (2017)

- ✓ Periodic Inspection
- ✓ Database Input
- ✓ Proposal of Priority Projects
- ✓ Design and Construction in Case Studies
- ✓ Preparation of Draft Standard Drawings and Guidelines
- ✓ Workshop (Database, Standard Drawings)

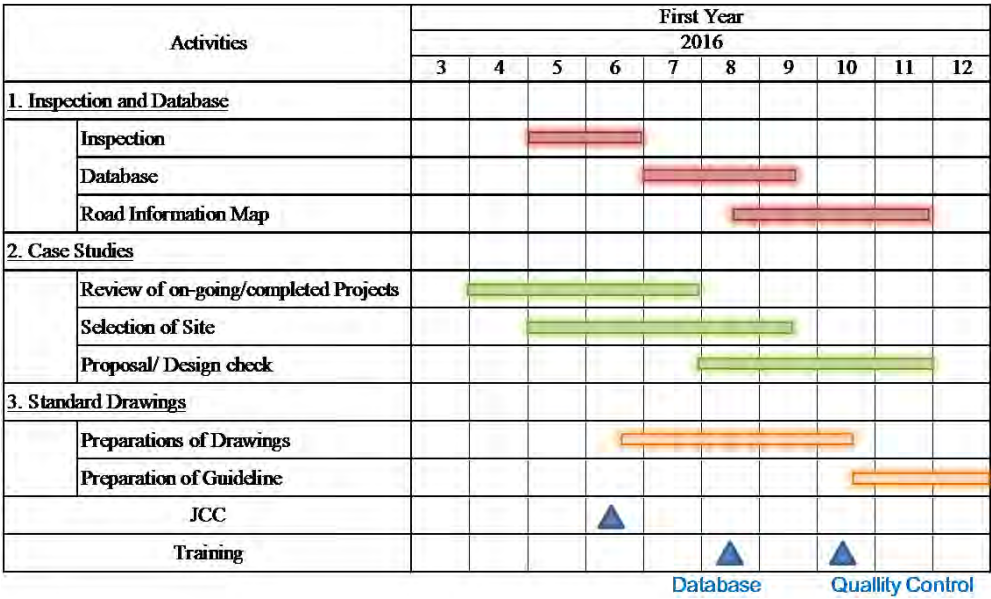
3<sup>rd</sup> Year (2018)

- ✓ Periodic Inspection
- ✓ Database Input
- ✓ Proposal of Priority Projects
- ✓ Construction in Case Studies
- ✓ Workshop (Case Study, For better road rehabilitation)

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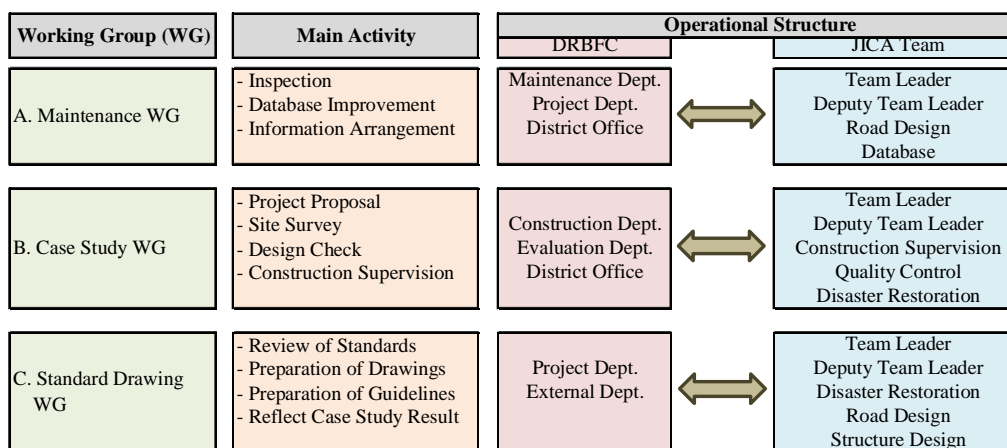
## 5. Activities in First Year

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6. Working Group





*Please nominate 2 or 3 working group members for each WG who will do collaborative work with JICA TEAM*

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### ***JICA TEAM Members***

No.	Name	Assignment
1	Hisashi MUTO	Team Leader/ Road Maintenance 1
2	Makoto MATSUURA	Deputy Team Leader/Road Maintenance 2
3	Johji KOIZUMI	Road Construction Supervision
4	Sueo HIROSE	Quality Control/Road Repair
5	Shutaro SAKANAKA	Disaster Restoration
6	Yoshiyuki AKAGAWA	Road Design/Project Coordinator
7	Kenji MINEGISHI	Structure Design
8	Takashi SAITO	Database
9	Nao Tsujimura	Evaluation/Monitoring

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# Presentation of Road Maintenance Activities in 2016

Department of Maintenance  
Eng. Joao Pedro Amaral

## Purpose of inspection

- Collect road condition data suitable to prepare the 2017 road maintenance plan.
- Create or update road and bridge inventory data
- The condition data will be used to select the type of maintenance and quantities for minor repairs and routine maintenance.
- Link Geographic references

## Inspection schedule

The length of roads to be surveyed and the estimate time to complete

Region	Length (km)			Team weeks			Total
	Condition & Inventory National	Condition & Inventory District	Inventory National	Condition & Inventory National	Condition & Inventory District	Inventory National	
1	270	279	157	4.5	4.7	2.0	11.1
2	42	109	174	0.7	1.8	2.2	4.7
3	166	201	99	2.8	3.4	1.2	7.4
4	407	143	34	6.8	2.4	0.4	9.6
Total	885.0	732.0	464.0	14.8	12.2	5.8	32.8

The inspections are scheduled to occur in May, June and July.

## Target roads

- Condition and inventory surveys will be undertaken of all national and district roads where there is no rehabilitation contract.
- Inventory surveys will be undertaken where there is a rehabilitation contract.

## Rehabilitation contracts 2017

Region	Link	from	to	Length (km)	Construction or Donor maintenance 2017
1	A01-02	Manatuto (A09 Jct)	Baucau (By-pass)	59.3	JICA
1	A01-03	Baucau (By-pass)	Lautem	59.9	JICA
1	A09-01	Manatuto	Criba	20.0	ADB
1	A09-02	Criba	Laclubar Jct	17.9	ADB
2	A01-01	Dili (Mota Ulum)	Manatuto (A09 Jct)	63.0	JICA
2	A02-01	Dili (Taibesi Rd)	Laulara	10.0	WB
2	A02-01/02	Solerema	Bandudatu	29.4	WB
2	A03-01	Dili (Airport Jct)	Tibar	12.9	ADB
2	A03-02	Tibar	Liquica	22.2	ADB
2	A03-03	Maubara	Karimbale	14.0	ADB
2	A04-01	Tibar	Railaco	23.0	ADB
3	A02-02/03	Bandudatu	Aituto	25.0	WB
3	A02-04	Aituto (A05 Jct)	Ainaro	27.3	WB
3	A09-03	Laclubar Jct	Mane Hat	35.9	ADB
3	A09-04	Mane Hat	Natarbora	10.8	ADB
4	A03-03	Atabae Jct	Batugade	24.2	ADB
4	A04-01	Railaco	Gleno	10.0	ADB
Total				464.8	

## Data Collected Road Infrastructure

Infrastructure	Inventory Item		Condition Item	
	Description	Unit	Description	Unit
Vehicle way	Width	m	Roughness	IRI
			Edge Condition	Good/Fair/Poor
			Road Surface	Good/Fair/Poor
			Ravelling	Good/Fair/Poor
			Cracking-type	C/L/T
			Cracking - extent	% of area
			Potholes	No.
			Patching	% of area
Shoulder	Width	m	Condition Item	Good/Fair/Poor
Drain	Type	Lined/Unlined/ None	Condition Item	Good/Fair/Poor
Washout	Number	No	Quantity	cum

Surveyor may also provide special comments to aid maintenance planning

## Data Collected on Road Structures

Infrastructure	Inventory Item		Condition Item	
	Description	Unit	Description	Unit
Culvert	Location	Station/Coordinate	Inlet	Good/Fair/Poor
	Type	Pipe/Box	Barrel	Good/Fair/Poor
	Material	Concrete/Masonry/ Steel	Outlet	Good/Fair/Poor
	Cells	No		
Bridge	Type	Truss/Concrete/ Steel beam	Sub-structure	Good/Fair/Poor
	Length	m	Super-structure	Good/Fair/Poor
	Width	m	Surface	Good/Fair/Poor
	Spans	No		
Retaining wall	Type	Gabion/Masonry/ Concrete	Face	Good/Fair/Poor
	Location	Left/Right	Drains	Good/Fair/Poor
	Length	m		
	Height	m		
	Surcharge	Road/Hillside		

## Inspection Method

- Visual inspection of condition
- Rapid assessment of dimensions
- Road data summarised in 100 metre sections.
- GPS coordinates for structures and road sections and road station.
- Three person in inspection team: Driver, Road Surveyor, Structure Surveyor

## Data Processing

- To prepare the 2017 maintenance plan data will be processed on a spreadsheet. (Data will be added to GIS dataset)
- Roads not in a maintainable condition will be identified and assessed for rehabilitation and reconstruction.
- Maintenance quantities will be calculated using the data.
- Contract BOQs will be prepared from the calculated quantities.

## 2016 Maintenance Contracts

Package No	Links	Length (km)	Type of Maintenance	2016 Cost (\$)
1	A01-09: Lautem Com	70.1	RM & PM	800,000
	A08-02: Lospalos-Iliomar-Uatucabau			
2	A07-01/02: Viqueque - Viqueque/Natarbora	62	RM	500,000
3	A14-01/02: Luak- Betano-Natarbora/Viqueque	52.8	RM	500,000
4	A13: Ainaro-Suai Border-Casa-Hatudo	29.7	RM & PM	250,000
5	A01-02: Area Branca - Hera Roundabout	23	RM	150,000
	A01-02: Benamaoc - Hera Roundabout			
7	A03-03: Liquica-Maubara	39.7	RM	450,000
	A03-04: Karimbala - Loes			
	C16: Aipelo-Bazartete			
8	A04-03: Gleno-Ermera-Letefoho	37.8	RM & PM	400,000
9	A03: Batugade-Maliana	51.9	RM	300,000
	A03-04: Loes -Atabae			
	Sub-total Tendered Contracts	367		3,350,000
6	Dili Town Roads		RM & PM	1,000,000
	Total			4,350,000



**The Project for  
the Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste**

***Work Plan***

**June 2016**



**Ingerosec Corporation**

**Earth System Science Co., Ltd.**

# 1. Background of the Project

Roads provide the dominant mode of transport, carrying about 70% of freight and 90% of passenger traffic in Timor-Leste

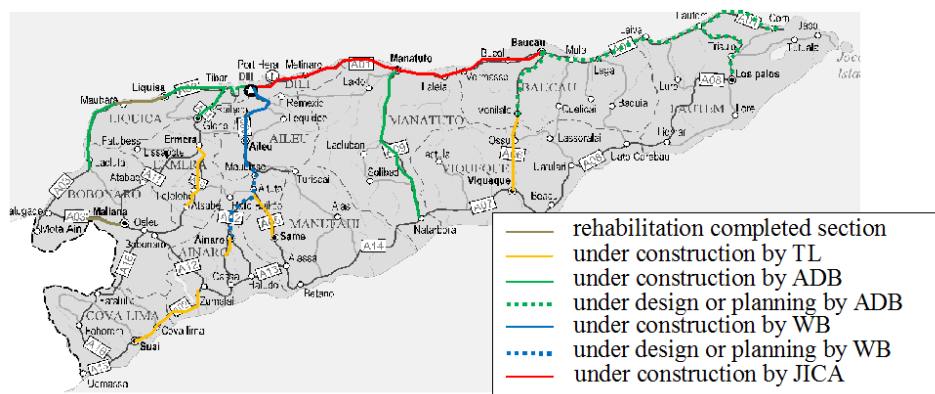
Timor-Leste is located on the island most of which is composed of steep mountainous area, and frequently receives natural disasters like heavy rain, land sliding, flood etc. Therefore, roads are frequently damaged.

Project for the Capacity Building of Road Maintenance (CBRM, 2005-2008) and the Project for the Capacity Development of Road Works (CDRW, 2010-2014) were executed by JICA and road & bridge database were developed for the budget planning.

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In the Strategic Development Plan (SDP), it is stated as an objective to complete the rehabilitation of all national and district roads by 2020.

Timor-Leste is carrying out the road rehabilitation projects in the whole country in cooperation with the donors such as ADB, WB, JICA and so on.

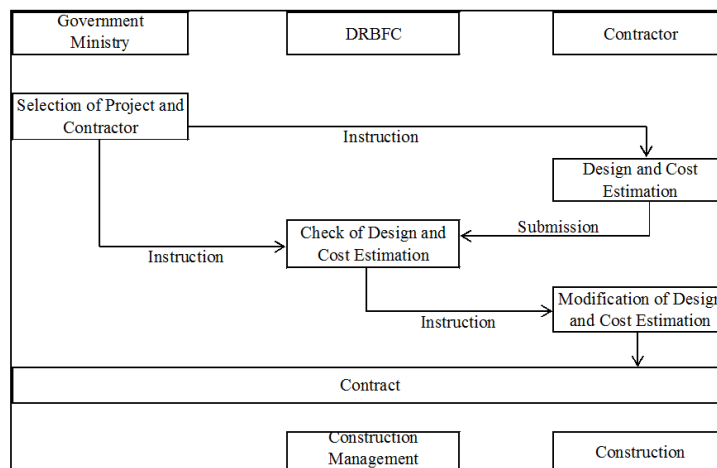


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## Implementation Structure of Road Rehabilitation

Road rehabilitation by Government are composed of  
i) Infrastructure Fund Projects and ii) Line Ministry Projects.  
Most of road rehabilitation projects in Timor-Leste are executed by design-build agreement.



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## Example of Road Damage



Pavement collapse on A05 due to the lack of roadside ditch



Alligator cracks on A05 due to the unsuitable base and roadbed material



Collapse of embankment slope on A07 due to the unsuitable foundation material and lack of compaction



Collapse of cut slope on A02 due to the heavy rain and lack of slope protection

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### Roles of DRBFC on the road rehabilitation and maintenance

#### 3) Check of Design and Cost Estimation

Checking the design and cost estimation prepared by the Contractor. Drawings are checked based on the checklist.

NO	DESCRIÇÃO ITEM	COMENT/SUGESTÃO/RECOMENDAS/UN
1	List of Drawings	
2	Counter Map	
3	General Layout	
4	Standard Drawings	
5	Typical Section	
6	Plan and Profile	

#### DRBFC Checklist

#### 4) Construction Supervision

Checking the monthly progress report submitted by the Contractor and to inspect the quality at the site and laboratory.

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### Issues to be tackled in the road rehabilitation and maintenance

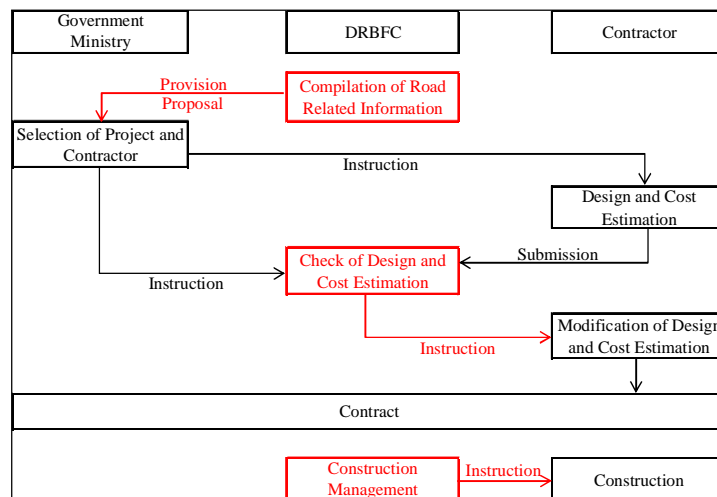
- ✓ Road information such as the road condition and project status is not compiled and shared among the concerned officials to select the priority projects efficiently
- ✓ There are some sections of national roads where the rehabilitation is not done or planned, especially in the south of the country.
- ✓ There are some road failures caused by not only severe natural conditions but also lack of quality of materials and construction work.
- ✓ Countermeasures for storm water and underground water are generally inadequate for the road surface, slope and bridge.

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## 2. Basic Policy of the Project

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- To provide Ministry the necessary information to select the priority projects
- To prepare the proposal of priority projects based on the database and site survey
- To consider and examine the cause of failure and countermeasures
- To inspect the drawing and construction site from more technical viewpoints



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### 3. Outline of the Project

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#### Outline of the Project (PDM)

Item	Description
<b>Project Title</b>	The Project for the Capacity Development of Road Services (CDRS)
<b>Project Duration</b>	March 2016～March 2019 (3 years)
<b>Project Site</b>	Whole National Roads in Timor-Leste
<b>Implementing Agency</b>	Ministry of Public Works, Transport and Communications (MPWTC)
<b>Target Group</b>	Directorate of Road, Bridge and Flood Control (DRBFC)
<b>Overall Goal</b>	The maintenance conditions of major roads are improved in TL.
<b>Project Purpose</b>	Capacity of DRBFC for maintenance of major roads in the whole country is enhanced.
<b>Outputs</b>	<ol style="list-style-type: none"> <li>1. Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and budget plan</li> <li>2. Capacity of DRBFC construction management for maintenance and rehabilitation including slope protection is improved through case studies in the whole country</li> <li>3. Standard drawings of maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection</li> </ol>

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### Activities for

#### Output 1: Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and budget plan

- 1-1. To review existing management structure and condition of maintenance and rehabilitation for major roads
- 1-2. To conduct periodic/routine inspections
- 1-3. To update the database based on the inspection result and repair/rehabilitation works of roads and bridges
- 1-4. To formulate maintenance and repair/rehabilitation plans for next cycle
- 1-5. To implement emergency inspections and repair/rehabilitation works when necessity arises
- 1-6. To undertake appropriate road maintenance/rehabilitation works by following annual work and budget plans which reflect priorities within the limited budget
- 1-7. To propose appropriate framework of road maintenance and rehabilitation for major roads

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### Activities for

#### Output 2: Capacity of DRBFC construction management for maintenance/rehabilitation including slope protection is improved through case studies

- 2-1. To identify typical rehabilitation and repair works of major roads in the whole country as case studies
- 2-2. To conduct the case studies for the planning, design check, and construction supervision of the project
- 2-3. To propose preferable structures for construction management for repair/rehabilitation works through case studies

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### Activities for Output 3: Standard drawings of maintenance/rehabilitation are provided

- 3-1. To review existing technical documents for road maintenance and rehabilitation
- 3-2. To review and identify factors of failure from past examples of damaged rehabilitation and construction works
- 3-3. To prepare a book of draft standard drawings for rehabilitation
- 3-4. To reflect the case studies in Activity 2-3 to the book of draft standard drawings
- 3-5. To prepare guidelines for using the standard drawings
- 3-6. To disseminate the book of standard drawings for each regional office

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### Modification of PDM from R/D (Record of Discussion) on the Project

Items	PDM Version 0 (Same as R/D)	Type of changes	PDM Version 1 (To be approved in JCC)	Reasons of Modification
<b>Output 1</b>	Appropriate road maintenance for major roads is realized in the Dili area and introduced in other area by improving cycle of road maintenance.	Modified	Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and annual budget plan.	Modified because the maintenance system is not firstly developed in Dili and introduced to other area. It shall be developed evenly in the whole country.
<b>Activity 1-1</b>	To formulate annual work plan and annual budget plan concerned with road maintenance and repair/rehabilitation work.	Modified	To review existing management structure and condition of maintenance and rehabilitation for major roads.	Modified that the activity shall start from the present condition analysis since the concrete annual work and budget plan are not formulated.
<b>Activity 1-2</b>	To conduct routine inspections and necessary repair works/rehabilitation of roads and bridges.	Modified	To conduct periodic/routine inspections.	Modified because the inspections and repair/rehabilitation works are not conducted in parallel at present.

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### Modification of PDM from R/D (Record of Discussion) on the Project

Items	PDM Version 0 (Same as R/D)	Type of changes	PDM Version 1 (To be approved in JCC)	Reasons of Modification
Activity 1-3	To update the database in accordance with the routine inspections and repair/rehabilitation works of roads and bridges.	Modified	To update the database based on the inspection result and repair/rehabilitation works of roads and bridges.	Modified because the database is updated based on not routine inspections but periodic maintenance. The database shall also include the project information.
Activity 1-7	Maintenance framework for major roads in regions is improved with considering head quarter's support.	Modified	To propose appropriate framework of road maintenance and rehabilitation for major roads.	Modified because not only the framework in regions but also the roles and relation between HQs and regions shall be proposed.
Activity 2-2	To conduct plan, design, procurement, construction and supervision as well as budgeting of the case studies.	Modified	To conduct the case studies for the planning, design check, and construction supervision of the project.	Modified considering the roles and responsibilities of DRBFC for the maintenance and rehabilitation works.
Activity 2-3	To propose necessary manpower for construction management for rehabilitation in HQs and regional offices through case studies	Modified	To propose preferable structures for construction management for repair/rehabilitation works through case studies.	Modified because not only necessary manpower but also the roles and relation between HQs and regions shall be proposed.

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## 4. Methodology of the Project

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## 4.1 Methodology of Activities for Each Output

*Activity1-1. To review existing management structure and condition of maintenance and rehabilitation for major roads*

- Methodology of present road inspections
- Contents and outputs of Database prepared by CDRW
- Implementation structures of road maintenance and rehabilitation projects
- Related road projects and activities funded by other donors

*Activity1-2. To conduct periodic/routine inspections*

The Project shall support DRBFC to conduct the periodic inspection properly and to introduce the routine inspection according to the necessity.

- Inspection sheet shall be improved by including the items of expected causes of failure and record of past rehabilitation.
- Surface conditions shall be inspected and rated by the average travel speed or other criteria.
- Expected cause of damages such as overloading, lack of earth burden and poor inlet/outlet shall be lectured to the inspection team before the next year's inspection.
- Lectures about the scouring and embedded depth of revetment shall be lectured to the inspection team before the next year's inspection.

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*Activity1-3. To update the database based on the inspection result and repair/rehabilitation works of roads and bridge*

The Project will support DRBFC to input the inspection results into the database prepared by CDRW at the first year.

The Project will cooperate with GIS Section to collect and compile all information so that everyone related to the road rehabilitation and maintenance can access the road related information.

The Project will also examine and discuss with concerned parties regarding the purpose, output and validity of database integration.



Example of Road Information Map

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*Activity1-4. To formulate maintenance and repair/rehabilitation plans for next cycle*

The Project shall support the DRBFC to estimate the annual budget and project plan in the next year based on the database.

*Activity1-5. To implement emergency inspections and repair/rehabilitation works when necessity arises*

The Project will attend the emergency inspections and rehabilitation work, and provide technical assistances or advises in case of the disasters.

*Activity1-6. To undertake appropriate road maintenance/rehabilitation works by following annual work and budget plans which reflect priorities within the limited budget*

The Project shall monitor the road maintenance and rehabilitation works done by DRBFC if they are in line with the annual work and budget plan.

*Activity1-7. To propose appropriate framework of road maintenance and rehabilitation for major roads*

The Project shall propose the preferable framework of road maintenance and rehabilitation regarding the personnel allocation and role demarcation of the headquarters and regional office of DRBFC.

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*Activity2-1. To identify typical rehabilitation and repair works of major roads in the whole country as case studies*

Typical items of road maintenance and rehabilitation works in Timor-Leste are pavement, drainage and small-scale retaining wall by gabion mat and masonry at the Timor-Leste's expenses.



Subdrainage pipe under roadside ditch



Repair of damaged pavement

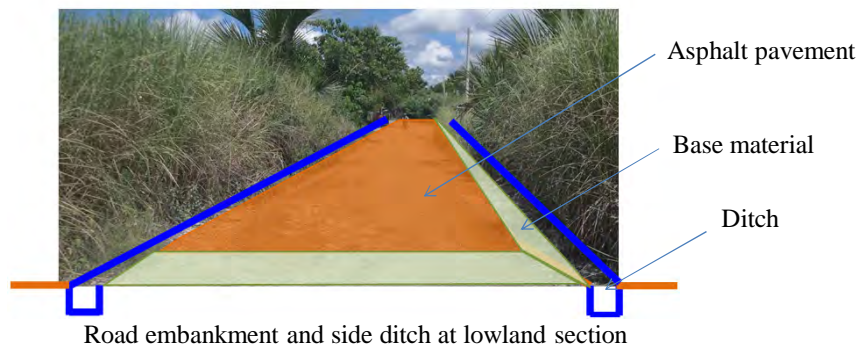


Rehabilitation of damaged revetment

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Retaining Wall



Road embankment and side ditch at lowland section

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### Criteria to select the case studies

Criteria	Description
Urgency	The site having negative impact on the safe and smooth travel of road users and to be rehabilitated urgently
Budget	Budget has already been secured or allowable for Timor-Leste
Work Item	<ul style="list-style-type: none"> <li>Measures and materials are applicable in Timor-Leste</li> <li>Many work items are included as much as possible</li> </ul>
Safety	Safety and security are ensured at the site
Environment and Social Considerations	<ul style="list-style-type: none"> <li>Land acquisition and involuntary resettlement are not required</li> <li>Negative impact on natural environment is not expected</li> </ul>
Accessibility	<ul style="list-style-type: none"> <li>Procurement and transportation of material and equipment are possible</li> <li>Access from accommodation to site is possible</li> </ul>

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*Activity2-2. To conduct the case studies for the planning, design check, and construction supervision of the project*

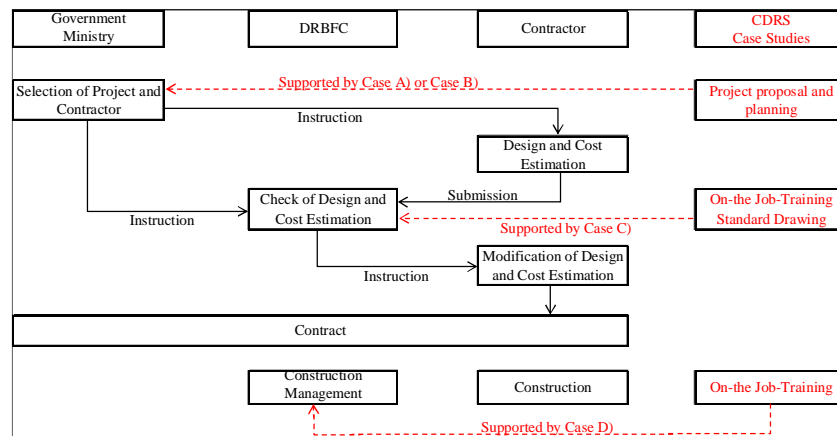
Candidate types of case studies are following 4 types stating from the different stages such as project proposal, planning, design and construction.

*Case A) Proposal of new rehabilitation project based on the database*

*Case B) Selection from the 9 maintenance package project handled by the Maintenance Dept. of DRBFC*

*Case C) Design check and construction management of the existing proposed project*

*Case D) Construction management of the existing proposed project*



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*Activity2-3. To propose preferable structures for construction management for repair/rehabilitation works through case studies*

The Project shall propose the preferable framework of construction management including the personnel allocation and role demarcation of the headquarters and regional office of DRBFC.

*Activity3-1. To review existing technical documents for road maintenance and rehabilitation*

- ✓ Existing project drawings by Timor-Leste's side and donors
- ✓ Road Geometric Standard
- ✓ Bridge Design Manual
- ✓ Standard Specification in Timor-Leste

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*Activity3-2. To review and identify factors of failure from past examples of damaged rehabilitation and construction works*

The Project shall review the factors of examples of failure on the drainage, pavement and slope by comparing the drawings with site conditions.

Category	Issues on drawings or site	Concept of Standard Drawings
Drainage	Drainages are not installed at the necessary locations, especially at the sag and bleeding channel.	Preparation of useful design checklist
	Soil and weed disturb the dimension for flow of drainage.	-
	Inadequate cross section	Preparation of guidelines to select the dimension by runoff volume or catchment area
	Overflow due to soil sedimentation in or upstream of the culvert	Standardization of countermeasures for soil sedimentation on the upstream of culvert
	Scouring on the slop toe by storm water from outlet of culvert	Standard drawing of the protection of culvert's outlet and slope based on the gradient and runoff volume
Retaining Wall	Collapse due to soft and weak foundation	Preparation of selection flow chart based on the required ground bearing capacity with the evaluation method.
Slope	Gully erosion on the embankment and cut slope	Rules of the drainage location and terrace shall be included in drawing
	Collapse of slope surface	Standard slope gradient depending on soil type
Roadbed	Road collapse at the border of cut and embankment	Preparation of standard drawing of Underground drain

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*Activity3-3. To prepare a book of draft standard drawings for rehabilitation*

The Standard drawings indicate the reasonable shape, gradient, thickness, and re-bar arrangement for the drainage structures, retaining walls and safety facilities.

Type of Standard Drawings	Items to be cared in the drawings
Drainage and Cross Culvert	Detail of Inlet/Outlet Required thickness of earth covering
Gabion Mat Retaining Wall	Applicable height Drainage of slope surface and underground water
Cut and Embankment Slope	Slope Gradient depending on soil type Applicable height Terrace and drainage
Pavement	Typical thickness and material for each layer
Revetment	Embedded depth Applicable height

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*Activity3-4. To reflect the case studies in Activity 2-3 to the book of draft standard drawings*

The Project shall reflect the result and lessons learned from case studies to the standard drawings.

*Activity3-5. To prepare guidelines for using the standard drawings*

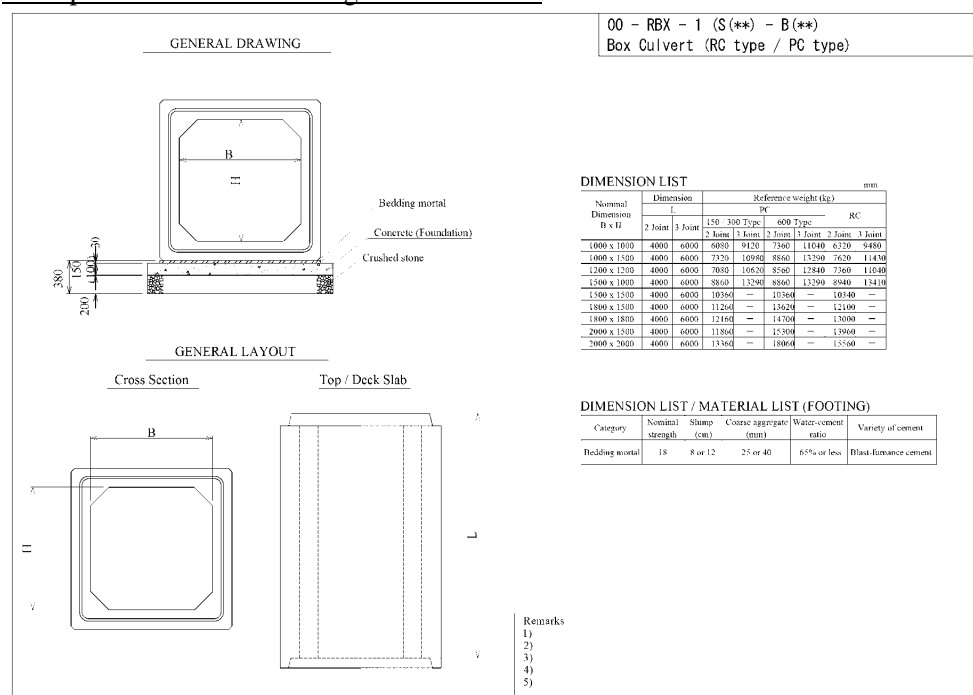
The Project shall prepare guidelines to use the standard drawings effectively.  
The guideline will indicate the technical conditions to select the appropriate drawings.

*Activity3-6. To disseminate the book of standard drawings for each regional office*

The Project shall present and explain the standard drawings to the related organizations of road design such as ADB and WB in the technical workshop and finalize the drawings and guidelines by reflecting their opinions.

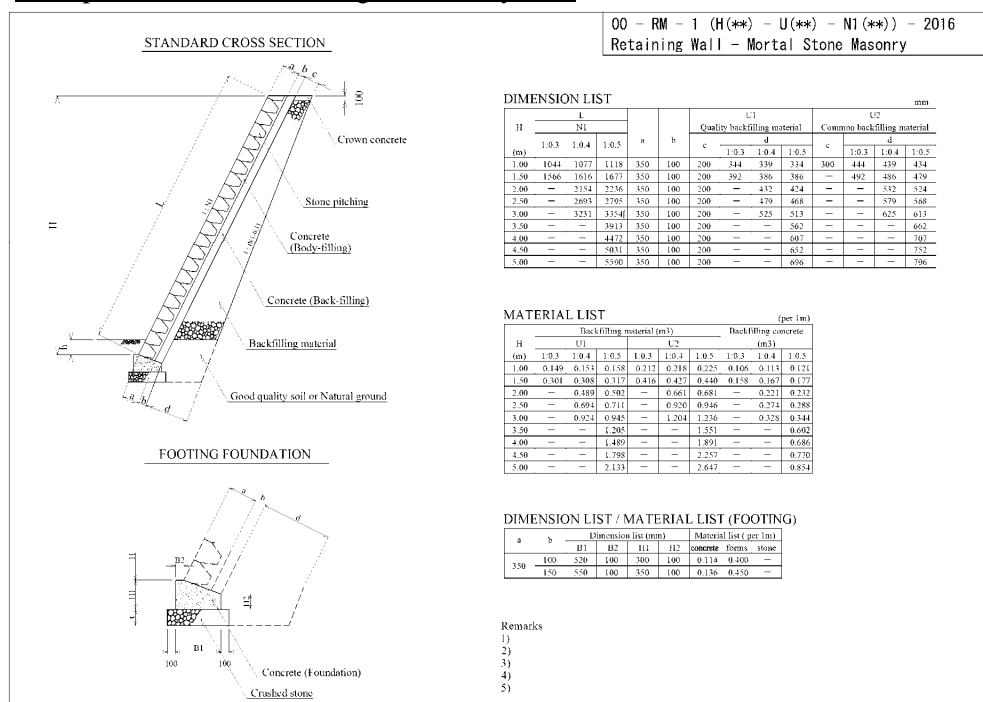
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Example of Standard Drawing of Box Culvert



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### Example of Standard Drawing of Masonry Wall



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## 4.2 Lecture Programme in 1<sup>st</sup> Year

The Project is expecting to have classroom lectures for the concerned DRBFC staffs with regard to the following categories in the first year.

Category	Contents	Timing
Hydrology	Hydraulic analysis and the design of drainage and revetment	July 2016
Database	GIS General and database improvement	August 2016
Structure Design	Design of Retaining Wall with stable computation	October 2016
River and Coast	Shoreline setback caused by river sand extraction	November 2016

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### 4.3 Implementation Structure of Working Group

The Project shall organize the Working Groups(WG) for the collaborative activities among JICA Expert Team and the concerned Department of DRBFC. JICA Expert Team shall take care of the limited DRBFC personnel and the roles of each Department.

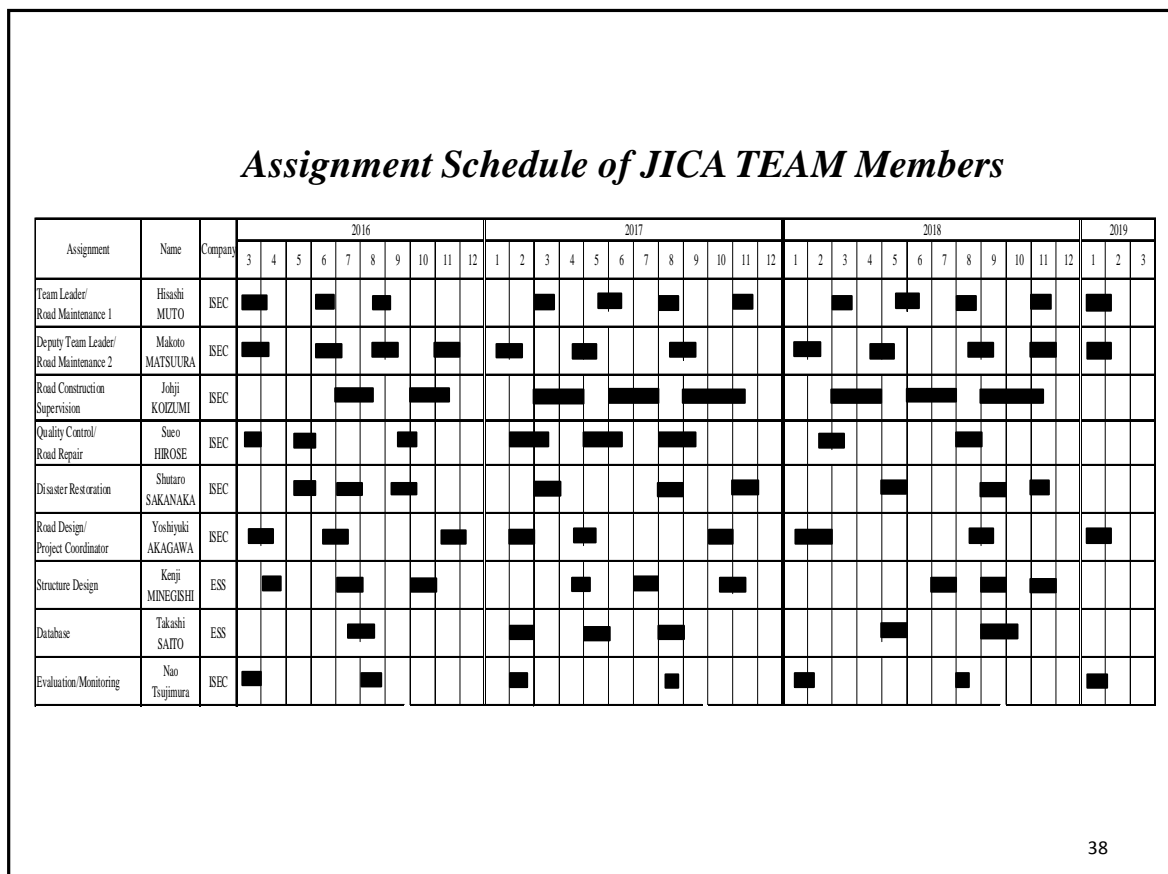
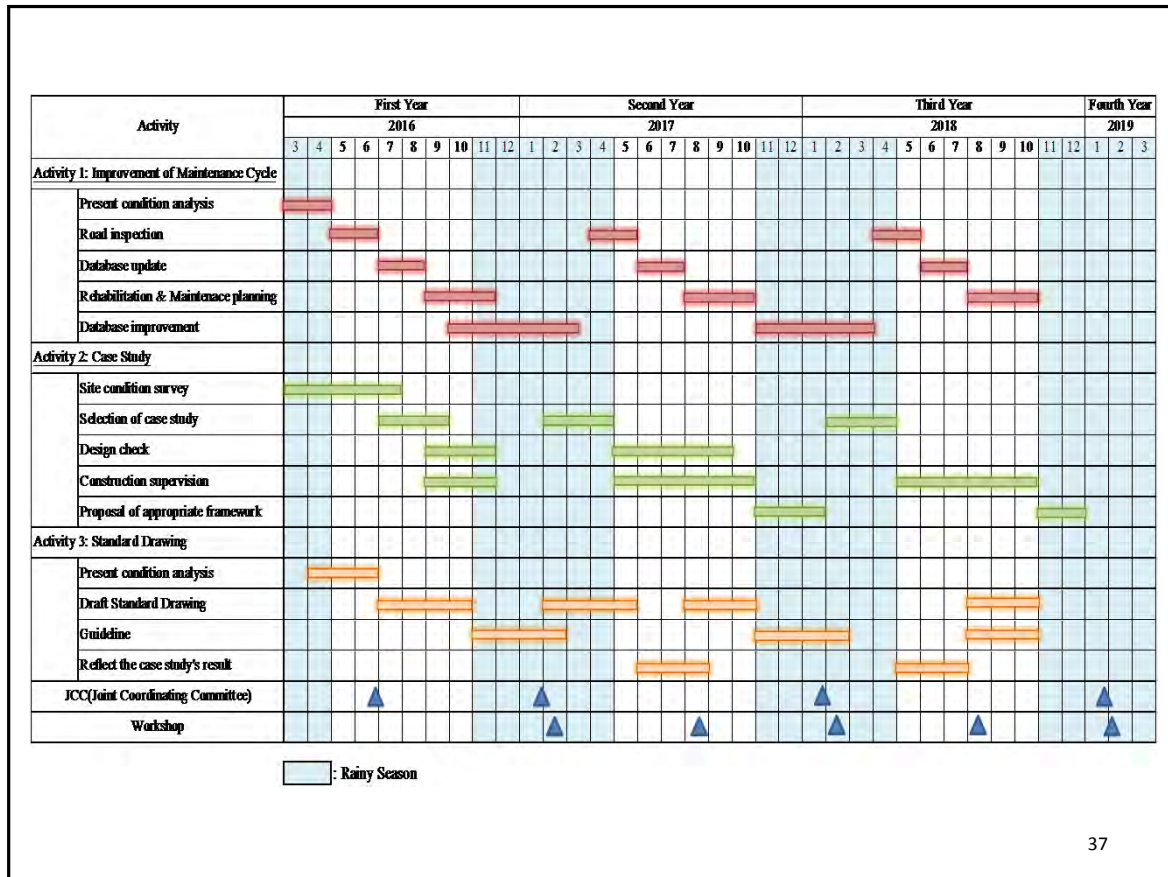
Working Group (WG)	Main Activity	Operational Structure	
		DRBFC	JICA Team
A. Maintenance WG	<ul style="list-style-type: none"> <li>- Inspection</li> <li>- Database Improvement</li> <li>- GIS Mapping</li> </ul>	Maintenance Dept. Project Dept.(GIS) District Office	<ul style="list-style-type: none"> <li>Team Leader</li> <li>Deputy Team Leader</li> <li>Road Design</li> <li>Database</li> <li>Evaluation/Monitoring</li> </ul>
B. Case Study WG	<ul style="list-style-type: none"> <li>- Project Proposal</li> <li>- Site Survey</li> <li>- Design Check</li> <li>- Construction Supervision</li> </ul>	Project Dept. Maintenance Dept. Construction Dept. District Office	<ul style="list-style-type: none"> <li>Team Leader</li> <li>Deputy Team Leader</li> <li>Construction Supervision</li> <li>Quality Control</li> <li>Disaster Restoration</li> <li>Evaluation/Monitoring</li> </ul>
C. Standard Drawing WG	<ul style="list-style-type: none"> <li>- Review of Standards</li> <li>- Preparation of Drawings</li> <li>- Preparation of Guidelines</li> <li>- Reflect Case Study Result</li> </ul>	Project Dept.	<ul style="list-style-type: none"> <li>Team Leader</li> <li>Deputy Team Leader</li> <li>Disaster Restoration</li> <li>Road Design</li> <li>Structure Design</li> <li>Evaluation/Monitoring</li> </ul>

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## 5. Implementation Schedule

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## 6. Request Items to Timor-Leste's side

39

- To allocate sufficient budgets for case studies
- To allocate sufficient travel allowances to the DRBFC personnel in the timely manner with the Project activities
- To assist the Project to get the cooperation and understanding from the Contractor and nearby residents in the case studies
- To dispatch sufficient personnel to Working Group of the Project

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# **The Project for the Capacity Development of Road Services in the Democratic Republic of Timor-Leste**

**Presentation of 2<sup>nd</sup> JCC  
February 2017**



**Ingerosec Corporation  
Earth System Science Co., Ltd.**

## **Contents**

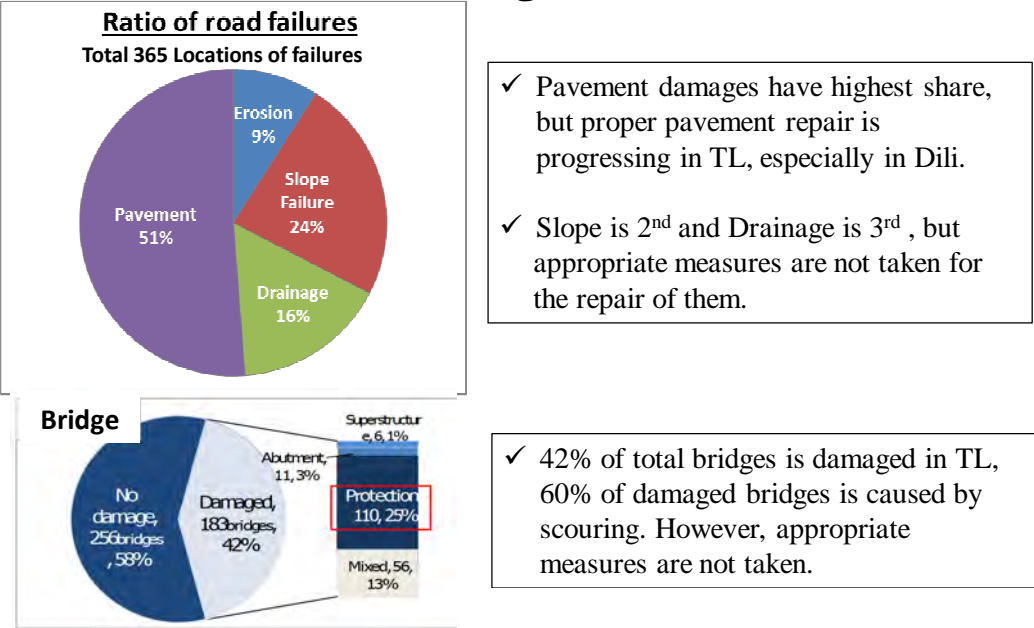
- 1. Project activities done in 2016**
- 2. Project activity plan in 2017**
- 3. Change of Project Design Matrix(PDM)**
- 4. Issues and challenges**

# 1. Project activities done in 2016

3

## 1-1. Baseline Survey

### 1) Share of road and bridge failures



4

2) Cause of road and bridge damages



Pavement failure on A05 due to the lack of roadside ditch



Cut slope failure on A02 due to the heavy rain and lack of slope protection



Embankment slope failure on A07 due to the unsuitable foundation material and lack of compaction

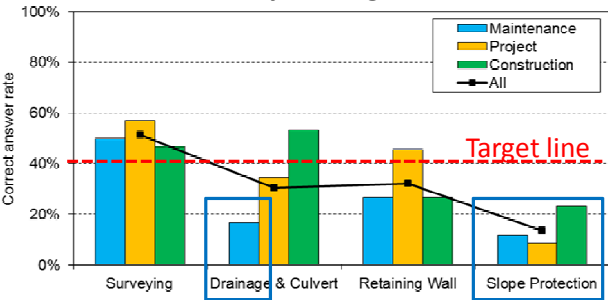


Scouring of bridge substructure on A14 due to severe river flow and lack of protection

5

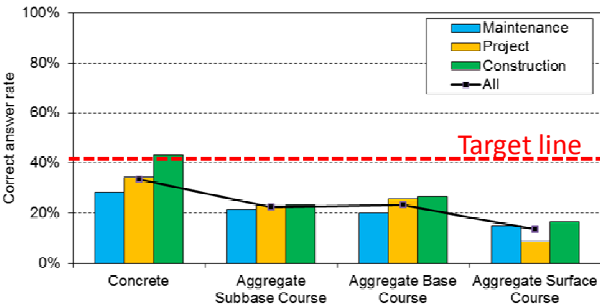
3) Baseline examination to DRBFC

Survey & Design



- ✓ Training of slope protection to every department will be required and effective.
- ✓ Training of drainage to Maintenance Dpt. will be required and effective

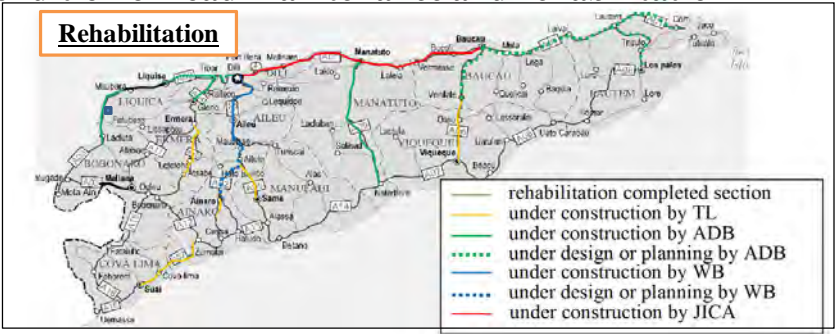
Quality Control



- ✓ Training of quality control, especially in pavement, to every department will be required and effective.

6

4) Condition of road maintenance and rehabilitation



Approx. 700km (50%) of national roads are under full rehabilitation by TL Government and Donors.



Approx. 350km (26%) of national roads are on-going or under preparation of road maintenance package(9 package project).

5) Road maintenance budget in 2016 and 2017

Budget Implementation

4 million US\$ was secured by Infra Fund as the road maintenance budget in 2016. However, none of the budget has been used due to the delay of procedure and project implementation.

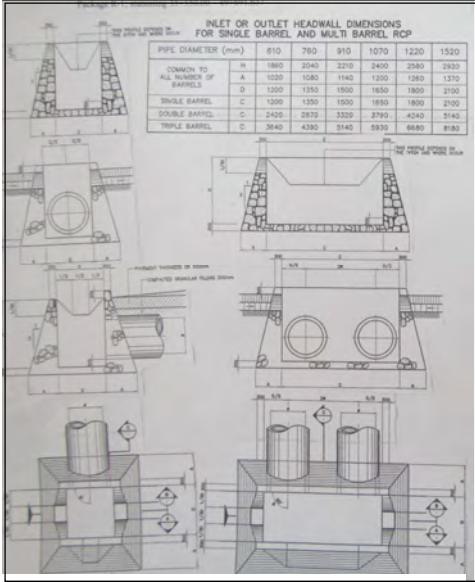
Budget Request

16 million US\$ was requested for road/bridge maintenance budget in 2017. However, 3.4 million US\$ (20% of request) has been secured (by LMs Fund).

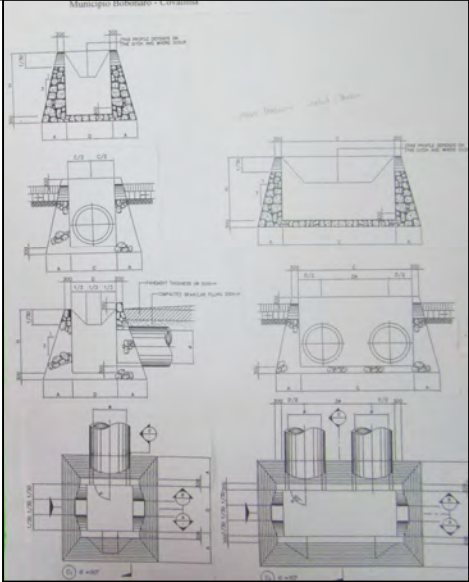


6) Existing Drawing

This Project originally include the preparation of standard drawings. However, the Team studied 100 existing drawings and found out that drawings on ADB and WB projects are commonly and repeatedly utilized on the TL Government Project.



Drawing of Drainage on ADB project



Drawing of Drainage on Government project

1-2. Selection of Case Studies Sites

At least 6 Case Studies are conducted to have OJT and enhance the capacity of DRBFC technical staff on the important points of design and construction supervision by utilizing the on-going projects and difficult sites to be solved.



1-3. Lectures in 2016

1) Hydrology



2) Observation of quality control test in Comoro Bridge



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3) Safety activity



3) Safety Assembly

Safety Assembly is held with attending all staff & workers on the site for;

- a) encouraging the importance of the Safety and
- b) knowing safety minds and points



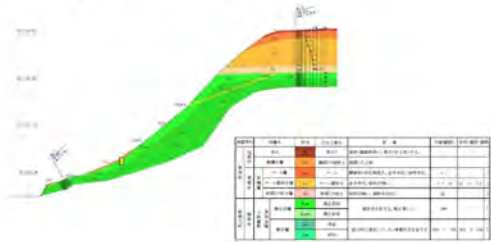
Project Manager or senior staff give speech regarding the importance of Safety and reminding safety manners to all the workers.

4) Slope protection



Geology Information

• Geological Cross Section






## 2. Project activities plan in 2017

### 2-1. Improvement of road inspection and database

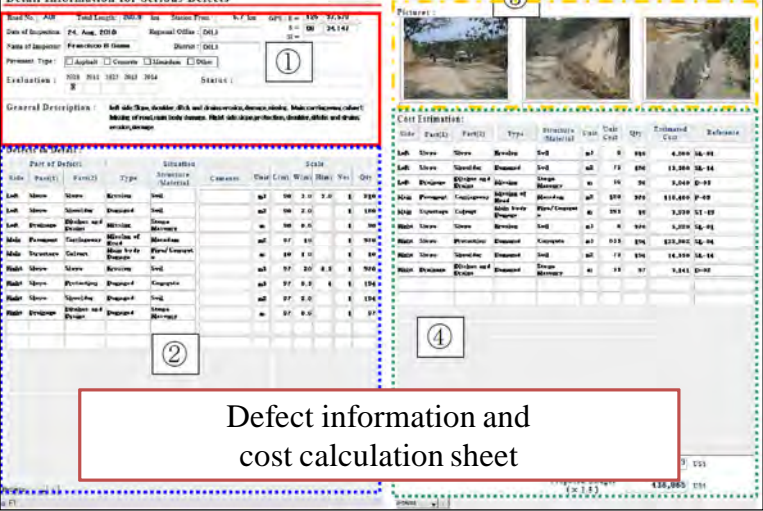
[ Issues of Existing database]

- ✓ So delicate (many items to be input) ⇒ Take long times to input
- ✓ Each defect is inspected and rehabilitation cost is calculated  
⇒ It does not match the present road maintenance activity.

Evaluation sheet



Detail Information for Serious Defects



Defect information and cost calculation sheet

## 2-1. Improvement of road inspection and database

[ Proposed improvement ] ⇒ Simple and quick road maintenance planning

A) Road inspection form  
Inspect the items and volume of road maintenance work

Station (km)	Municipal Office	General Condition	Main Body						Right Side			
			Pothole Patching (nos)	Gravel (%)	Cement Base (%)	Concrete Pavement (%)	Culvert Cleaning (nos)	New construction (nos)	Shoulder Grass Cutting (%)	Gravel (%)	Drainage Cleaning (%)	Masonry Repair (%)
0	-	1	Dili	A								
1	-	2	Dili	A								
2	-	3	Dili	A								
3	-	4	Dili	B					30		50	

B) Database form  
Input the items and volume based on A)

Structure	Maintenance Measures	A.Quantity(from Sheet A)	B.Quantity(from Sheet B)	Quantity(A+B)	Unit Price	Amount
Masonry	Repair	m(length)	m	m <sup>3</sup>		
	Cleaning	m(length)		m		
Drainage	Repair	m(length)		m		
	Grass Cutting					
Shoulder	Gravel					
	Pothole Patching					
Pavement	Gravel					
	Cement Base	m(length)	m(width)	m		
	Concrete	m(length)	m(width)	m <sup>3</sup>		
Culvert	Cleaning	nos	m	m <sup>3</sup>		
	New construction	nos	m	m		
Total Amount						

C) Cost estimation (BOQ)  
Automatically calculated based on B)

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## 2-2. Case study

### 1) Design

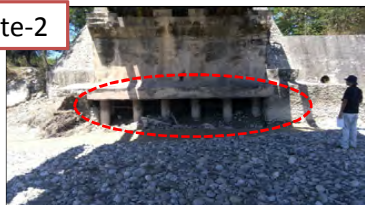
Site-1



Site-1: Landslide in Aituto

- Geotechnical boring and topographic survey
- Monitoring of slope mass movement
- Analysis of field survey data
- Propose the proper or applicable measures

Site-2



Site-2: Scouring of bridge abutment in Sahen River

- Topographic survey
- River flow analysis
- Propose the proper or applicable measures
- Technical advice to the basic design

Site-3



Site-3: Damaged Culvert in Sesurai


- Topographic survey
- Catchment area analysis
- Discharge volume analysis
- Technical advice to the basic design

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2) Construction-Quality Control

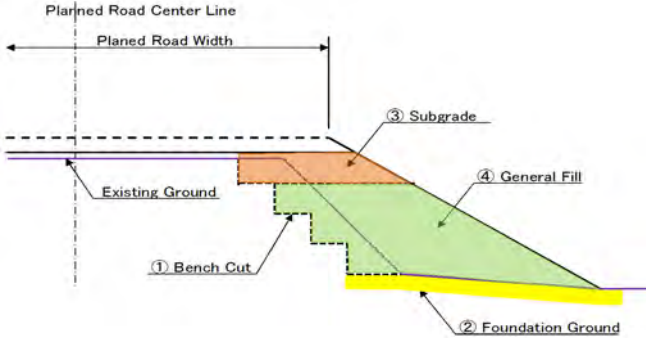
Proposed check items on construction site

Existing Road



Damaged Shoulder

Check item of under construction for Widening of Embankments

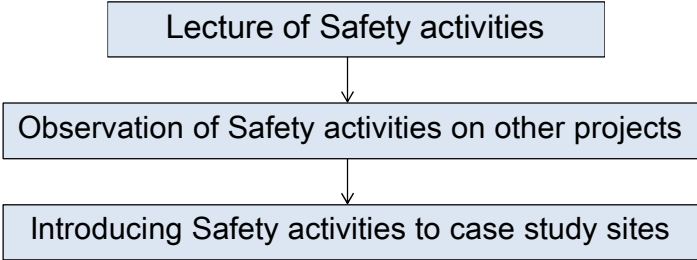


Checklist(Draft)

No.	Check Items	Judgements		Standards	Remarks
①	Was Bench Cut carried out appropriately?	Yes	No		
②	Was Foundation Ground satisfied?	Yes	No		Replacement, Thickness=60cm
③	Subgrade				
	Subgrade Material	—	—	—	Selected Material, From Borrow Pit No.1
	Compaction Degree	96%	95%		
	Compacted Thickness	30cm	30cm		
④	General Fill				
	Subgrade Material	—	—	—	From Site
	Compaction Degree	91%	90%		
	Compacted Thickness	30cm	30cm		

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3) Construction-Safety Control



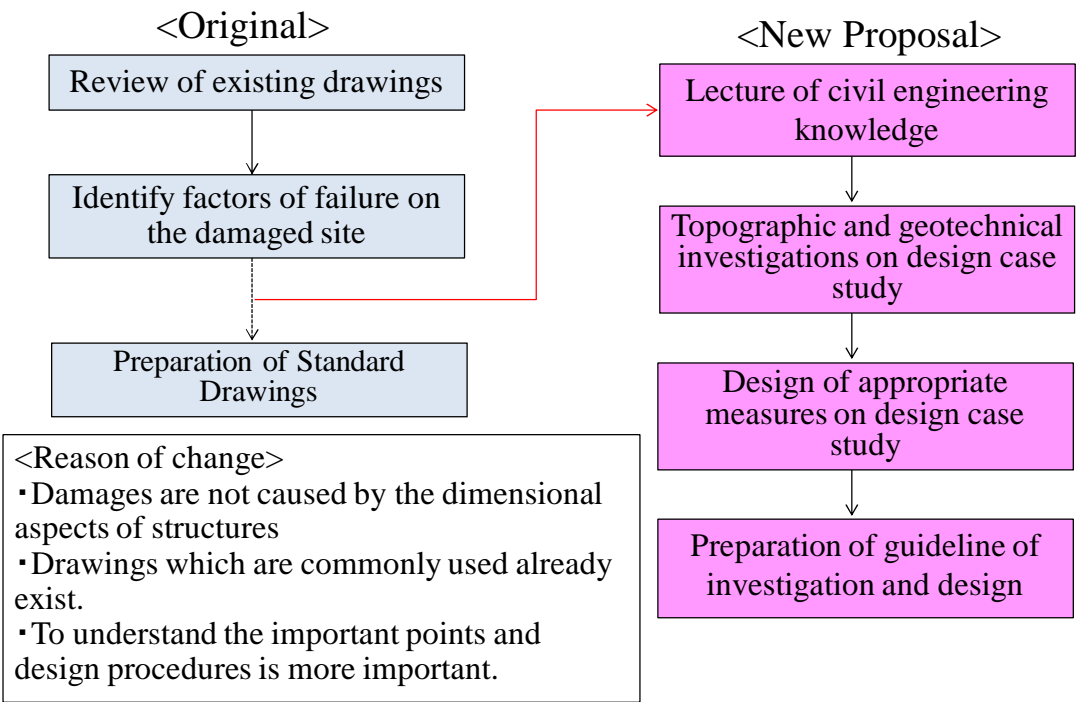
Monthly Safety Patrol



Feedback meeting after Safety Patrol

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2-3. Preparation of technical guideline



3. Change of Project Design Matrix(PDM)

### ➤ Review of PDM and indicators(target)

#### <OUTPUT 1>⇒No change

Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and annual budget plan.

#### <Indicator in 2019>

- 1-1. More than 30% of requested budget for road maintenance are distributed.
- 1-2. Improved road database is utilized for preparing the annual work plan of road maintenance.



Preparing the breakdown of requested budget by improved inspection and database

#### <Baseline in 2016>

- 1-1. Approx. 20% of requested budget from DRBFC for road maintenance were distributed.

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### ➤ Review of PDM and indicators(target)

#### <OUTPUT 2>⇒No change

Capacity of DRBFC construction management for maintenance and rehabilitation including slope protection is improved through case studies in the whole country.

#### <Indicator in 2019>

- 2-1. At least 3 case studies for construction and 3 case studies for design are conducted.
- 2-2. More than 60 % of trainees pass the achievement test for construction supervision and design.



#### <Baseline in 2016>

- 2-1. 1 case study for construction and 3 case studies for design is selected.
- 2-2. 28% of examinees passed design baseline test. 8 % passed quality control baseline test.

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➤ Review of PDM and indicators(target)

<Original OUTPUT 3>

Standard drawing of maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection.



Changed based on the analysis in 2016

<Changed OUTPUT 3>

Technical guideline of investigation and design for maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection.

<Indicator in 2019>

Technical guideline of investigation and design for slope protection, drainage and measures against scouring are prepared.

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➤ Review of PDM and indicators(target)

<Project Purpose>⇒No change

Capacity of DRBFC for maintenance of major roads in the whole country is enhanced.

<Indicator in 2019>

Total length of maintained national roads become 400km.



Challenges of smoothening the project implementation by technical supports to DRBFC in the review of design, cost estimation and site inspection by ADN.

<Baseline in 2016>

350km is being prepared or on-going in the 9 maintenance package in 2016.

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➤ Review of PDM and indicators(target)

<Overall Goal>⇒No change

The maintenance conditions of major roads are improved in TL.

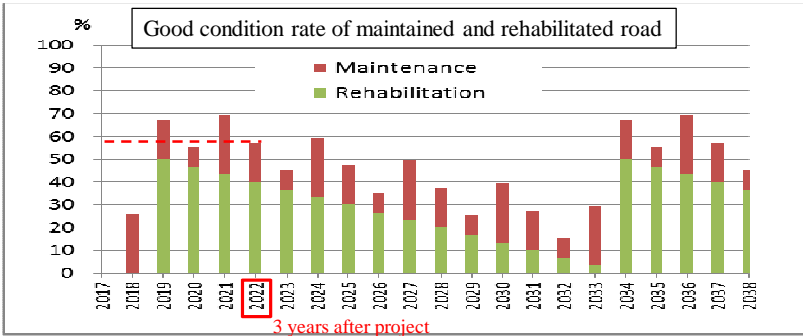
<Indicator in 2022(3 years after project completion)>

More than 60% of major national roads will be in good condition.



<Baseline in 2016>

Currently 2~3% is in good condition. 26 % is target of road maintenance package. 50 % is target of whole rehabilitation project by TL and Donors.



4. Issues and challenges



#### 4. Issues and challenges

##### 1) Limited number and time of C/P staff

How the C/P staffs are involved is so important in this Project activity because of their limited time and number

##### 2) Travel allowance to C/P staff

Schedule of road inspection and activities tends to be delay due to the delay of distribution of travel allowance to C/P staff

##### 3) Review of design and cost by ADN

Budget disbursement and project implementation tend to be delay because of review by ADN. Improving the accuracy of design and cost as well as relation with ADN is required to smoothen the project implementation.

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**Thank you for your attention  
Obrigado Barak !!**



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## **Presentation on Roads Maintenance Activities in 2016 and 2017**

BY:

João Pedro Amaral  
**MAINTENANCE DAPARTMENT**

## **Contents**

- Roads Maintenance Activities in 2016
- Roads Maintenance Activities for 2017
- Issues and challenges of roads maintenance activities
- Recommendations

### **Roads Maintenance Activities in 2016**

- There were 9 maintenance packages planned in 2016.
- 8 packages implemented through out sourcing process, and the implementation status are now under contract signing process for implementation in early 2017
- Another 1 package for Dili Urban Maintenance is implemented through direct appointment system and it's now under implementation process.

### **Roads Maintenance Activities for 2017**

- Supervising the implementation of 9 maintenance packages from 2016
- Some candidate roads have been identified to be packaged for 2017 maintenance program, but there is no real action taken in term of documents preparation for no budget allocate for 2017
- Finalizing of National and District Roads Map Trip line to support Data Base updating process
- To finalize the development of existing Data Base
- To finalize Roads Maintenance Unit Rates analysis for the consolidation and uniformity
- Recruiting consultant to prepare SOP Standard Manual, conducting traffic count survey and IRI survey in collaboration with ADB

### **Issues and challenges of Roads Maintenance implementation process**

- Lack and no continue budget allocation for roads maintenance
- No operational cost to secure the quality of roads maintenance and rehabilitation supervision work
- Lack facilities (vehicles) to support roads maintenance work
- lack of technical staffs
- Payment process takes to much time
- No unit rates uniformity in place for roads maintenance

### **Recommendations**

- Needs enough and continuous budget allocation for roads maintenance every year
- Increase the no of Engineer or technical staffs
- Need enough facilities(vehicles) and operational cost in place to secure the quality of roads maintenance work
- Beaurocracy simplification to accelerate payment process
- Uniform maintenance unit rates to be used nationally
- To improve communication and coordination amongst related parties who involve in roads sector development





## The Project for the Capacity Development of Road Services in the Democratic Republic of Timor-Leste

		By	Time
1	Opening speech and Presentation	Vice Minister	9:30- 9:45
2	Presentation of Project activities done in 2017 and Activities plan in 2018	JICA Expert Team	9:45-10:15
3-1	Database for road maintenance and rehabilitation activities in 2017	Maintenance Department, NDRBFC	10:15-10:30
3-2	Case study on Culvert design in 2017	Highways Department, NDRBFC	10:30-10:45
3-3	Case study on Bridge scouring in 2017	Project Department, NDRBFC	10:45-11:00
3-4	Case study on Supervision of road construction in 2017	Construction Department, NDRBFC	11:00-11:15
4	Open discussion for the Project	All	11:15-11:40
5	Comment by JICA	JICA Rep	11:40-11:50
6	Conclusion and Closing remarks by MDIR	DG	11:50-12:00



## The Project for the Capacity Development of Road Services in the Democratic Republic of Timor-Leste

**3rd JCC  
March 2018**



**Ingerosec Corporation**

**Earth System Science Co., Ltd.**

# Contents

- 1. Project Outline
- 2. Project activities done in 2016 and 2017
- 3. Project activity plan in 2018

3

# 1. Project Outline

---

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## 1.1 Project target and Output

Item	Description
Project Title	The Project for the Capacity Development of Road Services (CDRS)
Project Duration	March 2016~March 2019 (3 years)
Project Site	Whole National Roads in Timor-Leste
Implementing Agency	Ministry of Public Works, Transport and Communications (MPWTC)
Target Group	Directorate of Road, Bridge and Flood Control (DRBFC)
Overall Goal	The maintenance conditions of major roads are improved in TL.
Project Purpose	Capacity of DRBFC for maintenance of major roads in the whole country is enhanced.
Outputs	1. Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and budget plan 2. Capacity of DRBFC construction management for maintenance and rehabilitation including slope protection is improved through case studies in the whole country 3. Technical guideline of investigation and design for maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection.

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## 1.2. Project Outputs and Indicator

<OUTPUT 1> Improve Road Maintenance Cycle



1-1. Over 30% of requested budget for road maintenance are distributed.

1-2. Improved road database is utilized for preparing the annual work plan of road maintenance.

<OUTPUT 2> Improve Capacity of DRBFC Construction Management for maintenance and rehabilitation

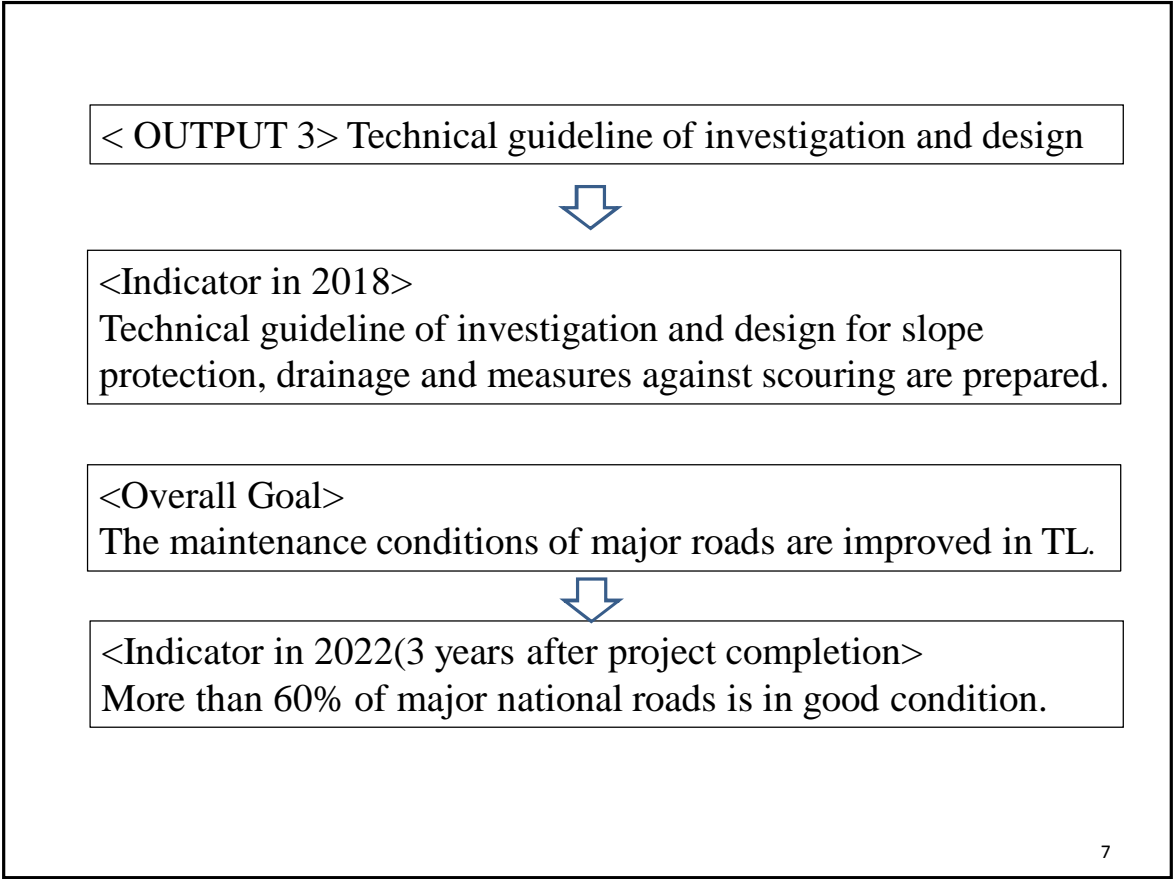


<Indicator in 2018>

2-1. At least 6 case studies for construction and for design are conducted.

2-2. Over 60 % of trainees pass the achievement test for construction supervision and design.

6



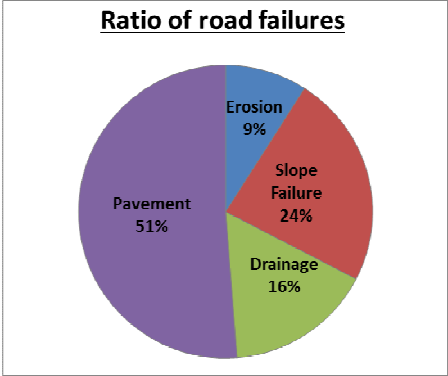
2. Project activities done in 2016 and 2017

8

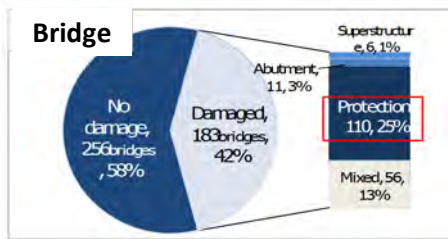
2. Project activities done in 2016 and 2017

2-1. Baseline Survey

1) Share of Road and Bridge Failures



- ✓ Pavement damages have highest share, but proper pavement repair is progressing in TL, especially in Dili.
- ✓ Slope is 2<sup>nd</sup> and Drainage is 3<sup>rd</sup> , but appropriate measures are not taken for the repair of them.



- ✓ 42% of total bridges is damaged in TL, 60% of damaged bridges is caused by scouring. However, appropriate measures are not taken.

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2) Cause of road and bridge failures



Pavement failure on A05 due to the lack of roadside ditch



Cut & embankment slope failure on A02 due to the heavy rain and lack of slope protection



Embankment slope failure on A07 due to the unsuitable foundation material and lack of compaction



Scouring of bridge substructure on A14 due to severe river flow and lack of protection

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## 2-2 Databasing of Maintenance activities in 2017

### Session1: Report of activities regarding GIS database and inspection on 2017

#### Step 1

The basic map for inspection was developed by GIS database

#### Step2

The field inspection was conducted for checking the existing road facility condition

#### Step3

The result of inspection is input to GIS database

### Session2: Report of activity for Cost estimation system

#### Step 1

Input the data from result of inspection

#### Step2

Input the unit cost and estimate the total cost for maintenance

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## 2-2. Case Study activity in 2017

### Case Studies Sites



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1) Design

- Site-1: Landslide in Aituto
- Geotechnical boring and topographic survey

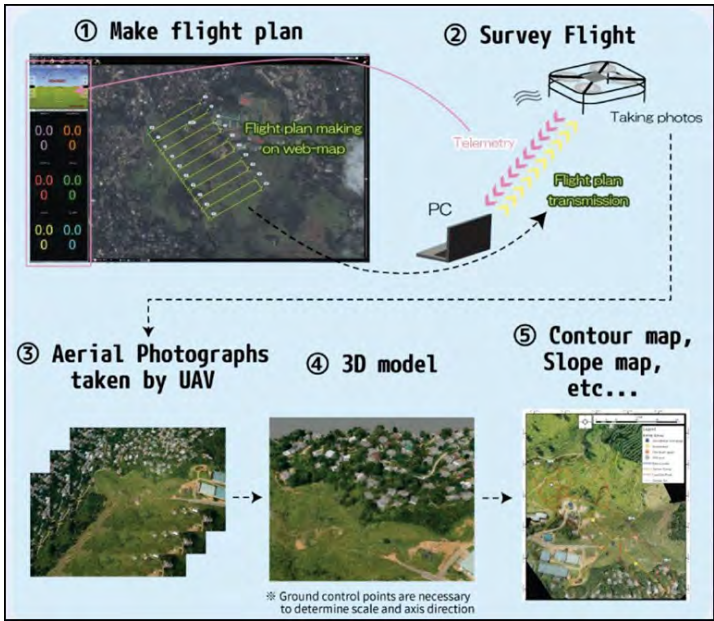
➤ Monitoring of slope mass movement

➤ Analysis of field survey data

➤ Propose the proper or applicable measures



Topographic survey and mapping using Unmanned Aerial Vehicle (UAV)



### Site-2: Bridge scouring in Natabora

- Topographic survey
- River flow analysis
- Propose the proper or applicable measures
- Technical advise to the basic design



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### Site-3: Damaged Culvert in Same

- Topographic survey
- Catchment area analysis
- Discharge volume analysis
- Technical advise to the basic design



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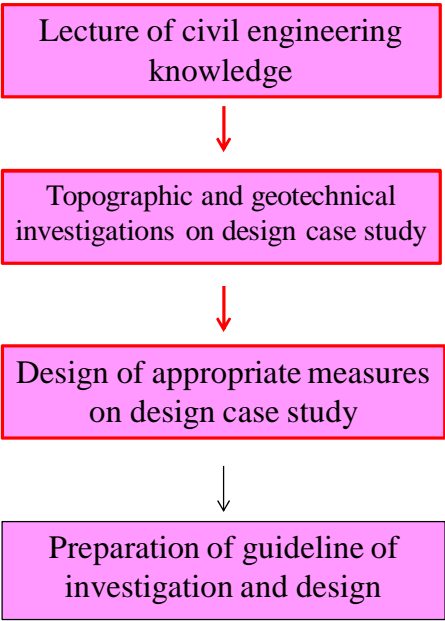
2) Construction

- Site-4: Super vision to quality control at Ex-Japan road
- Construction-Quality Control
  - Construction-Progress Control
  - Construction-Safety Control



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2-3. Technical guideline



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### 3. Project activity plan in 2018

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### 3. Proposed Action on 2018

Output	activities	plan/ actual	2016	2017	2018	Proposed action in 2018
<b>Output 1: Road Maintenance and Rehabilitation</b> for Major Roads is realized in accordance with annual work plan						
	1.1 To review existing management structure and maintenance and rehabilitation condition on major roads	plan				—
		actual				
	1.2 To conduct the periodic/routine inspection	plan				a b
		actual				
	1.3 To update the database on the inspection result and repair/rehabilitation works of roads	plan				c
		actual				
	1.4 To formulate maintenance and repair/rehabilitation plan for next cycle	plan				
		actual				
	1.5 To implement emergency maintenance and repair/rehabilitation works	plan				conduct works as required
		actual				
	1.6 To undertake road maintenance/rehabilitation works by following annual work plan and budget plan	plan				conduct works as required
		actual				
	1.7 To propose framework of road maintenance /rehabilitation for major roads	plan				d e f
		actual				

 : Plan
  : On schedule
  : Gradual progress
  : Delayed

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# Proposed Action on 2018

**Output 2: Capacity of DRBFC construction management for maintenance and rehabilitation is improved through case studies including slope protection**





2.1 To <b>identify</b> typical rehabilitation/repair work as <b>case study</b>	plan				g
	actual				
2.2 To conduct <b>case study for planning, design check and construction supervision</b>	plan				h
	actual				
2.3 To propose <b>recomendable structure</b> for rehabilitation and construction <b>through case study</b>	plan				
	actual				

**Output 3: Technical guideline of investigation and design for maintenance and rehabilitation including slope protection**

3.1 To <b>review existing technical document</b> for maintenance and rehabilitation	plan				—
	actual				
3.2 To review and <b>identify factors of failure</b> from past examples of damaged rehabilitation and construction	plan				—
	actual				
3.3 To aquire necessary <b>knowleges of civil engineering for design</b>	plan				—
	actual				
3.4 To prepare the <b>technical guideline</b> of investigation and design.	plan				i
	actual				
3.5 To <b>reflect the lessons learned from case studies</b> to the technical guideline.	plan				
	actual				
3.6 To <b>disseminate the technical guideline</b> for concerned parties.	plan				
	actual				

Publicity

j, k, l

 : Plan
  : On schedule
  : Gradual progress
  : Delayed

21

21

- a. Reporting from road user and communities to local office contact information on signboards, etc.
- b. Inspection by IRI application and or Drive recorder,

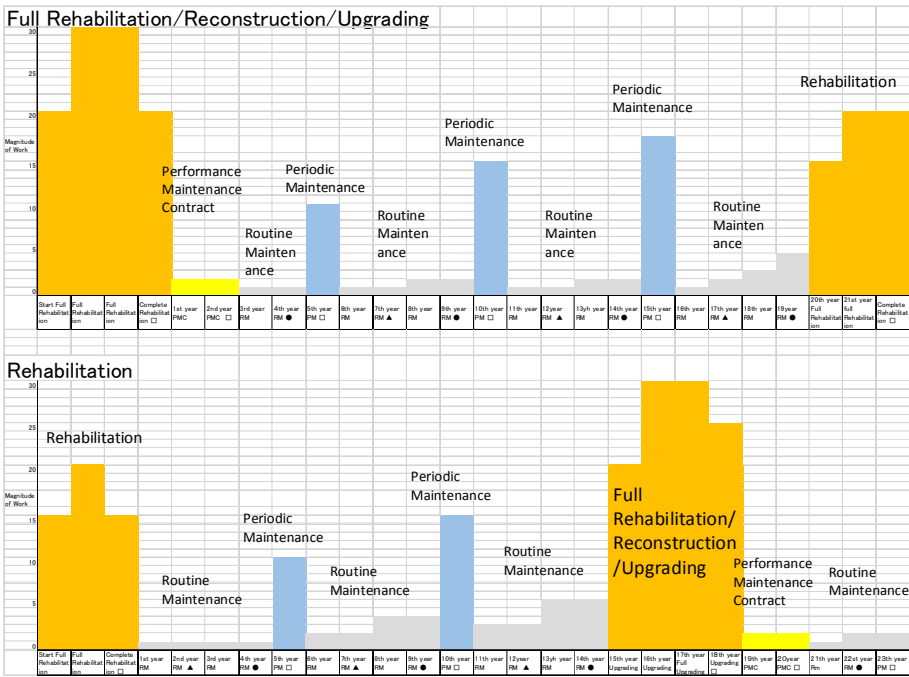


- c. Strengthen Database for Rehabilitation and Maintenance,

22

- d. Either personal exchange or integration with Construction Dep. and Maintenance Dep. in order to strengthen maintenance capacity,
- e. Preparation Check list for tender document,
- f. One model case, design and construction separate ordering method.

Image of maintenance cycle



## Proposed Countermeasures for Maintenance & Rehabilitation(Draft)

facility		Condition/counter measure for Maintenance and rehabilitation				
			Good	Fair	Bad	Worth
1	Asphalt Pavement	Condition	IRI<3, V>60km/h	IRI<6, V>40km/h	IRI<9, V>20km/h	IRI>10, V<20km/h
			Pothole	Pothole	Rutting	many Pothole
		Measures	Patching	Resealing	Cut/overlay	Reconstruction from subbase course
				Overlay	Reconstruction from base course	
2	Gravel pavement	Condition	IRI<6, V>40km/h	IRI<9, V>20km/h	IRI>10, V<20km/h	do
			deformation	Rutting	no gravel	do
			pothole	bumpy	very bumpy	do
		Measures	grading	regravelling	regravelling	do
paching	Reconstruction		Reconstruction from embankment	do		
3	Side Dich/cross culvert	Condition	Sedimentation	Partial deformation	Partial breakdown	Total breakdown
			Cleaning	Repair	Repair/rehabilitation	Reconstruction
		Measures				Detour road
						Bridge construction
4	Embankment	Condition	Gully	Pavement Cruck/deformation	Embankment land slide	Cut and embankment land slide
		Measures	Cleaning	Repair embankment	cut mountain, embankment & construct slope protection	Construct deture road
				Gabion Wall protection		Cut maintain and construct enbankment with slope protection measures
5	Cut Slope	Condition	Gully	Drainage breakdown	Rock/slope falling	Cut and embankment land slide
		Measures	Cleaning	Drainage repair	Shotcreak	Construct deture road
				construction gabion wall	Other slope protection	Cut maintain and construct embankment with slope protection measures

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## Road Inspection for Maintenance and Rehabilitation 2018

No. of Road	Section	Distance	Periodic Payment	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
A1	20-Basuco	106.44	JICA					Start	Upgrade	Upgrade	CompC	PMC	PMC □	Start RM	RM●	RM	PMC□
A1	Basuco-Luzman	17.64	ADB					Start	Upgrade	Upgrade	Upgrade	CompC	PMC	PMC □	Start RM	RM●	RM
A2	20-Luzman	10	WB			Start	Upgrade	Upgrade	CompC	PMC	PMC □	Start RM	RM●	RM	PMC□	RM	RM●
A2	Luzman-Solomana	22.7	WB					Start	Upgrade	Upgrade	CompC	PMC	PMC □	Start RM	RM●	RM	RM●
A2	Solomana-Vatidisa	23.38	WB			Start	Upgrade	Upgrade	CompC	PMC	PMC □	Start RM	RM●	RM	PMC□	RM	RM●
A2	Vatidisa-Malika	25	WB			Start	Upgrade	Upgrade	CompC	PMC	PMC □	Start RM	RM●	RM	PMC□	RM	RM
A2	Malika-Suoi	23	WB			Start	Upgrade	Upgrade	CompC	PMC	PMC □	Start RM	RM●	RM	PMC□	RM	RM
A2	Ainaro-Suai		TL				▲	R	R	●RM	RM	PMC□	RM	RM▲	RM	RM●	PMC□
A3	Portulak-Fiber	4.55	ADB								Start RM	Upgrade	CompC	PMC	PMC □	Start RM	RM●
A3	20-Fiber-Luzman	28.7	ADB		Start	Upgrade	Upgrade	CompC	PMC	PMC □	Start RM	RM●	PMC□	RM	RM▲	RM	RM●
A3	Malika	33.8	ADB		Start	Rehab	Rehab	CompC	PMC	PMC □	Start RM	RM●	PMC□	PMC	PMC □	Start RM	RM●
A3	Luzman-Mota	65.65	ADB	Rehab	Upgrade	Upgrade	CompC	PMC	PMC □	Start RM	RM●	PMC□	RM	RM▲	RM	RM●	PMC□
A3	Mota-Maliana		ADB	Comp▲			▲	RM	RM	●RM	RM	PMC□	RM	RM●	RM	RM	PMC□
A4	Suoi-Gleno	31.9	ADB		Start	Upgrade	Upgrade	CompC	PMC	PMC □	Start RM	RM●	PMC□	RM	RM●	RM	RM
A4	Gleno-Ermera		TL							●RM	RM	Start RM	Upgrade	Upgrade	CompC	PMC	PMC □
A5	Malika-Suoi		TL			▲	R	R	R	□	RM	▲RM	RM	●RM	PMC□	RM	RM▲
A5	Suoi-Maliana		TL			R	R	R	□	RM	RM	▲RM	RM	●RM	PMC□	RM	PMC□
A6	Basuco-Gleno		ADB			▲	R	R	□		Start RM	Rehab	Rehab	CompC	PMC	PMC □	Start RM
A6	Suoi-Maliana	55	ADB			▲	R	R	R	□	Start RM	Rehab	Rehab	CompC	PMC	PMC □	Start RM
A7	Natarbora-Viqueque		TL				▲	R	R	□	●RM	R	R	□	RM	▲RM	RM
A8	Lautem-Lospalos		ADB				▲	R	R	□		RM	Start RM	Rehab	Rehab	CompC	PMC
A8	Lospalos-Iliomar		ADB				▲	R	R	□		RM	Start RM	Rehab	Rehab	CompC	PMC
A8	Iliomar-Viqueque		ADB					▲	R			RM	Start RM	Rehab	Rehab	CompC	PMC
A9	Maraua-Natarbora	80.15	ADB		Start	Rehab	Rehab	Rehab	CompC	PMC	PMC □	Start RM	RM●	PMC□	RM	RM▲	R
A10	Elmera-Boronaro									●RM	RM	▲RM	RM	●RM	PMC□	RM	RM▲
A11	Elmera-Maliana		TL				▲	R	R	R	□	RM	▲RM	RM	●RM	PMC□	RM
A12	Luzman-Solomana	TL-ADB				▲	R	R	R	▲	R	□	RM	Start RM	Rehab	CompC	PMC
A12	Solomana-Maliana	TL-ADB				▲	R	R	R	▲	R	□	RM	Start RM	Rehab	CompC	PMC
A13	Cassa-Daisua					▲	RM	RM	□	●RM	R	R	□	RM	▲RM	RM	●RM
A14	Betano-Natarboia		TL				▲	RM	RM	□	●RM	R	R	□	RM	▲RM	RM
A15	Suoi-Suoi	TL						▲		R	R	□	RM	▲RM	RM	●RM	PMC□
A16	Suoi-Gleno	TL				▲	R	R	R	R	□	RM	▲RM	RM	●RM	PMC□	RM
Total																	

**Legend**

- Rehabilitation/Upgrade by External Dep. and PMC
- Rehabilitation by Construction Dep.
- Performance Maintenance Contract
- Routine Maintenance by Maintenance Dep.
- Periodic Maintenance by Maintenance Dep.
- Routine annual inspection by Maintenance Dep.
- Period

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## Work Integration Idea

Department	Maintenance Department	Project Department	Construction Department	Contract and Evaluation Department	Director of DRBFC	Private Consultant	Private Contractor
Works							
Annual Inspection	●						
Database	●	●					
selection of countermeasures	●	●					
estimation of Work quantities	●	●					
Database of Unite cost	●	⇒		⇒ ⊙			
Unite rate by District	●	⇒		⇒ ⊙			
estimation of required cost	● ⇒	⇒				⊙	⇒ ⊙
Traffic Survey		●					⇒ ⊙
Benefit estimation		●					⇒ ⊙
Feasibility Study/ Economic Evaluation		●					⇒ ⊙
Mid term Plan		●			●		
Preparation of Budget Proposal	●	●	●			— ⊙	
Allocation of Total Budget to DRBFC	●	●	●	●	●		
Establishment baget allocation to each project	●	●	●	●			
Establishment of Annual Work Program	●	●	●	●			
Preparation of desgin document	● ⇒	⇒				⊙ ⇒	⇒ ⊙
Prepaeration of Implementation Plan	● ⇒	⇒				⊙ ⇒	⇒ ⊙
Preperatio of Tender document inclduing drawing and Spec.	● ⇒	⇒		● ⇒		⊙ ⇒	⇒ ⊙
Tendering, and Contract				●		⊙	
Evaluation contract Document and Contract				● ⇒		⊙	⇒ ⊙
Construction Plan, Quarry Control Plan, Safty and Enviromental Protection Plan	● ⇒		● ⇒			⊙	
Material teasting and Trial Construction	● ⇒		● ⇒			⊙	⇒ ⊙
Monthly and weekly supervision	● ⇒		● ⇒			⊙	⇒ ⊙
Site Inspection for Pay Items	● ⇒		● ⇒	▲		⊙	⇒ ⊙
Final Inspection and Certificate of Completion	● ⇒		● ⇒	●		⊙	⇒ ⊙
Hand over to DRBFC	●		●			⊙	⇒ ⊙
Database input of as Built Drawing and	●		●				

Project Implementation Dep.  
Sec1:maintenance, Sec2: construction

Business Privatization /  
Design/investigation and  
Construction Separate Metho  
27

## g. Proposed Case Study

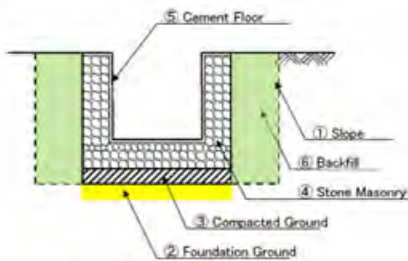
- Box Culvert Planning, Design and Construction Drainage in upper section on Ex-Japan Road
- OJT using “Check List” on site of Emergency Works, Humboe-Letefoho, Ermera on A10

No.	Site	target of design study			target of Construction level-up		
		Scoring	Culvert	Slope protection	Safty	Progress control	Quality Control
1	Landslide in Aituto			●			
2	Scouring of bridge abutment in Sahen River	●					
3	Damaged Culvert in Sesurai		●				
4	Super vision to quality control at Ex-Japan road				●	●	●
5	Box Culvert Planning, Design and Construction Drainage in upper section on Ex-Japan Road		●				●
6	OJT using “Check List” on site of Emergency Works, Humboe-Letefoho, Ermera on A10				●		●

Action Done  
Proposed Actions

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h. Prepare Check list for Supervision



No	Check Items	Judgements	Remarks
① Preparatory activity			
	Did you confirm the drawings?	Yes No	
	Did you confirm the construction work plan?	Yes No	
① Slope			
	Was excavation slope appropriate?	Yes No	
	Was removal of water appropriate?	Yes No	
② Foundation Ground			
	Is strength of bearing ground sufficient?	Yes No	
	If No, was the replacement of soft ground appropriate?	Yes No	Replacement Thickness=80cm

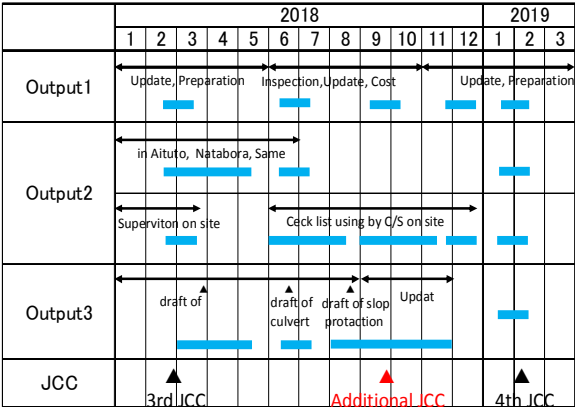
- i. Case Study and Design Guideline for Scouring by March, Culvert and Slop protection by August
- j. Continue site emergency inspection, on-site check of damaged facilities for C/P and donors,

29

- k. Opening or completion ceremony of the case study project inviting guest and media.
- l. Provide congestion situation, travel information, etc. through Radio to road users.

Other

JCC in September as a interim presentation by counter part (C/P)



Join to JICA Expert

30

## Opening

- Chief Representative of JICA Timor-Leste Office
- JICA Team leader and delegations
- ILO Representative
- Secretariat General
- General Directors
- National Directors
- All staff members
- Ladies and Gentlemen



## 3<sup>rd</sup> JCC Meeting today

- The Project for the Capacity Development of Road Services in the Democratic Republic of Timor-Leste

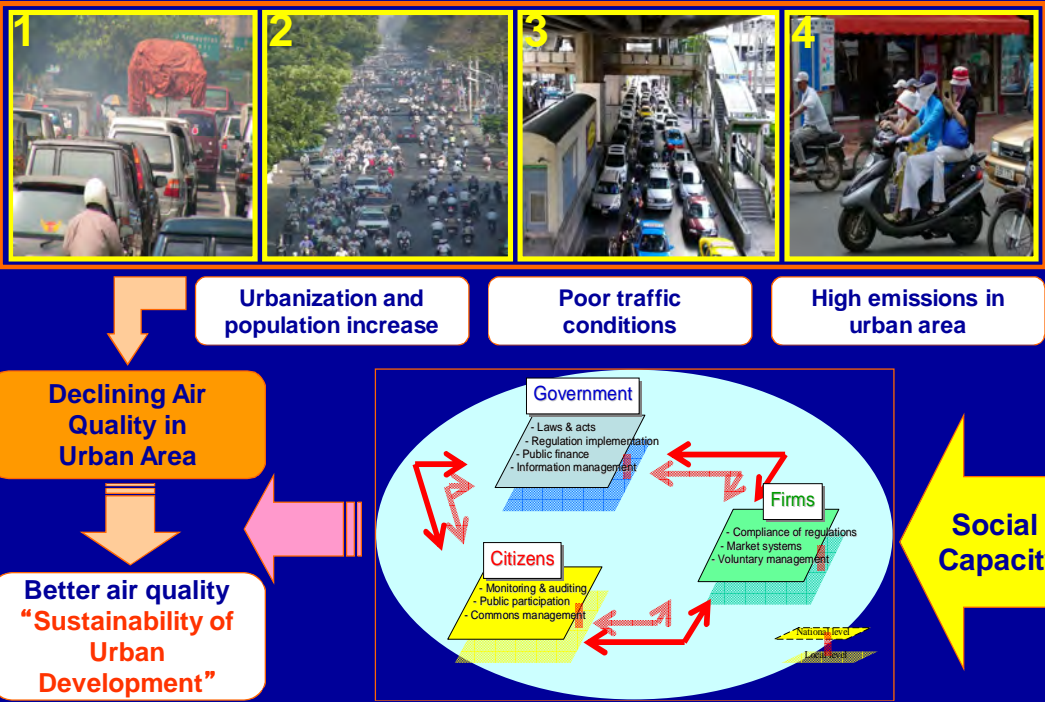


# 1. Illustration

*General idea related to the  
CAPACITY DEVELOPMENT*



## 2. Background and Objective



### 3. Project Cycle

- Survey or F. study
- Programs & Projects
  - Indicators or Outputs
  - Implementation Programs/Projects
  - Monitoring
  - Evaluation



### 4. Instruction or Orientation

- Pay attention
- Contribute in discussion
- Find alternative solution
- Re-Implementation



The Project for Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste (CDRS)

*Presentation for Maintenance activity on  
No.3 JCC*

Session1: Activities regarding GIS database and  
inspection in 2017

Session2: Activities for cost estimation system in 2017

2<sup>nd</sup> March, 2018

9:30 ~ 12:00

Direstorate of Road, Bridge and Flood Control (DRBFC) of  
Ministry of Public Works, Transport and Communications (MPWTC)  
and JICA Expert Team (JET)

1

Details information for Session1 activities in 2017

2

Session 1: Report of activities regarding inspection on 2017

Procedure of this activity

Step 1

The basic map for inspection was developed by GIS database

Step2

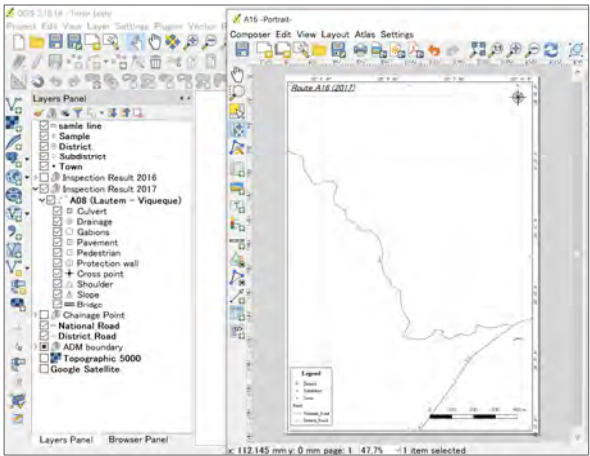
The field inspection was conducted for checking the existing road facility condition

Step3

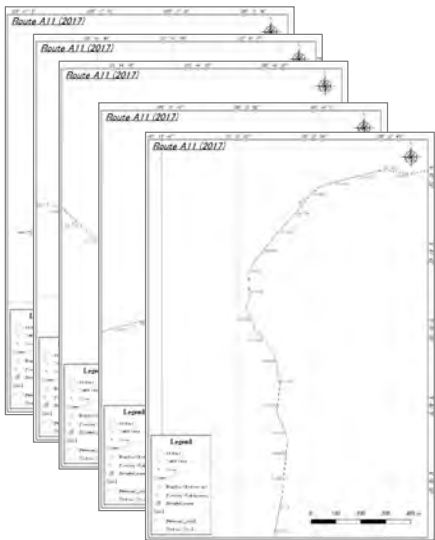
The result of inspection is input to GIS database

3

Step 1: Preparation for Inspection map by GIS database



Blank Map by GIS database



Paper Map for field inspection

4



Step 2: Field inspection

Region 1: Lospalos – Iliomar (A08-a)  
Region 4: Ermera - Maliana (A11), Lourba - Zumalai (A12), Salele - Oeleu (A16)

Activity for Region 1



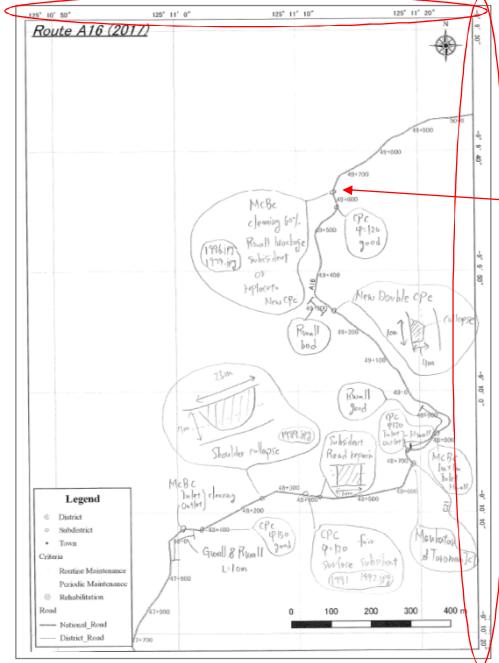
Activity for Region 4



5

Step 2: Field inspection

Result of Inspection by hand writing



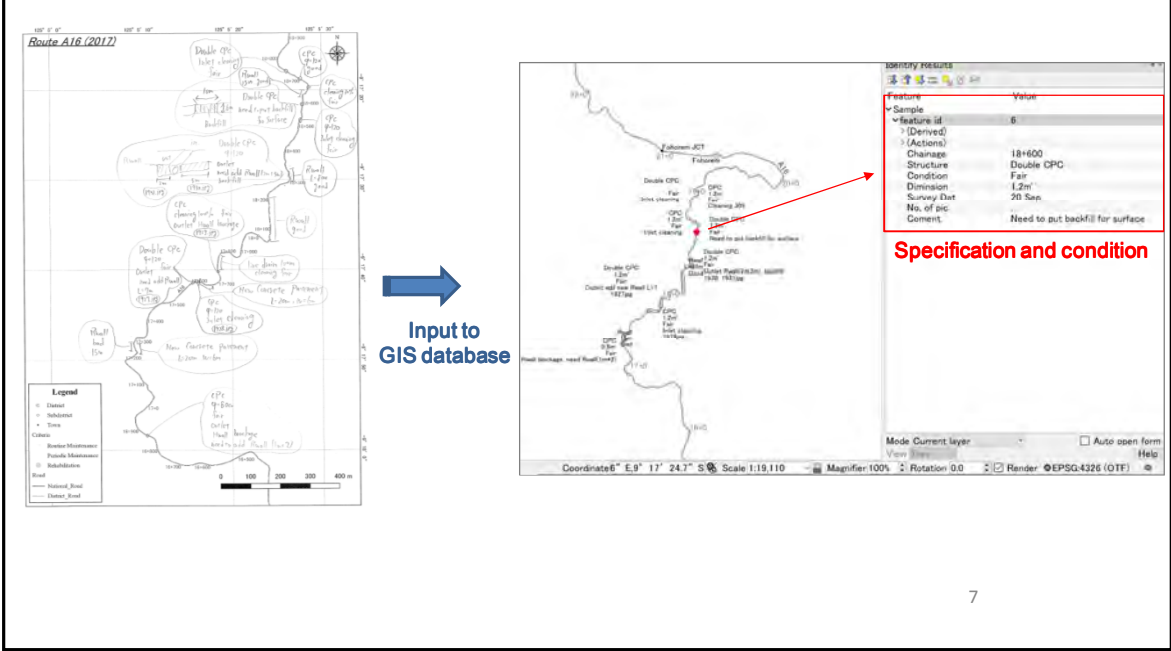
10 second distance of Longitude and Latitude

Location is detected by Portable GPS

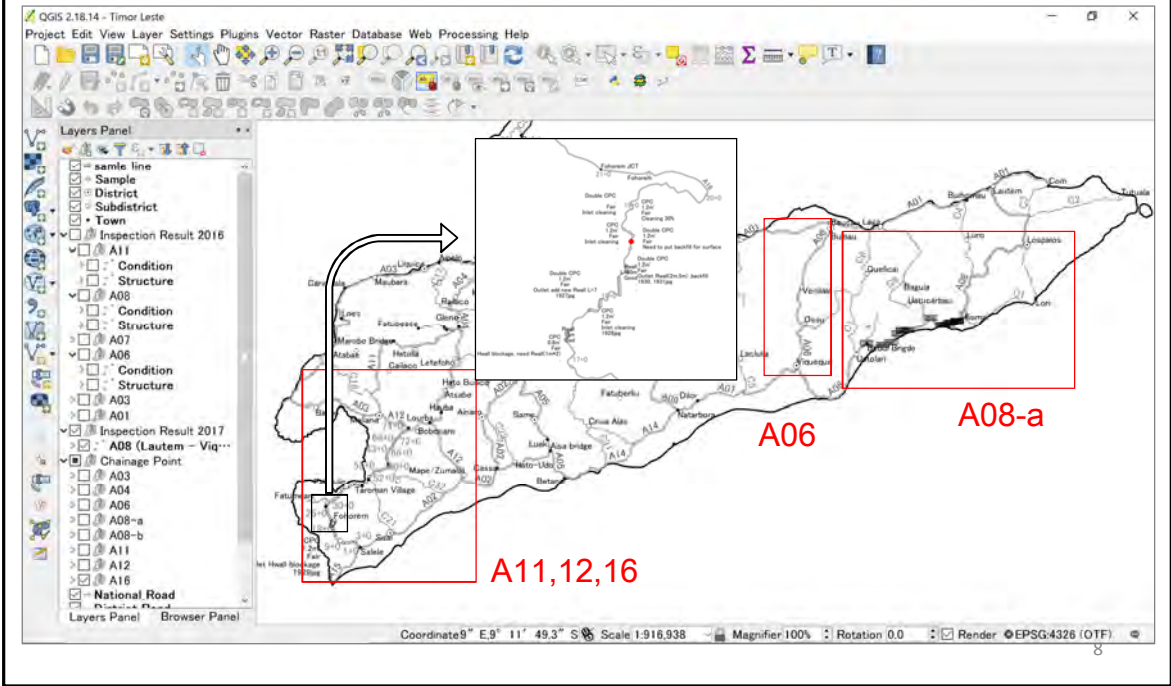


6

Step 3: The result of inspection is input to GIS database



Step 3: GIS database will be developed for all national road and district road (on going)



## Details information for Session2 activities in 2017

9

- The system has been developed by File Maker Pro Software

### Procedure of this activity

#### Step 1

Input the data from result of inspection in 2017

#### Step2

Input the unit cost and estimate the total cost for maintenance

10

➤ Samples of result of cost estimation system

Maintenance Cost estimation has been prepared for  
Region 1: Lospalos – Iliomar (A08-a), Baucau – Ossu(A06)  
Region 4: Ermera - Maliana (A11), Lourba - Zumalai (A12), Salele - Oeleu (A16)

Definition of scale

Input quantity per km

Input unit cost and estimate total cost

Item	Unit	Quantity	Unit Cost	Total Cost
74.75	m	100	100	10000
75.76	m	100	100	10000
76.77	m	100	100	10000
77.78	m	100	100	10000
78.79	m	100	100	10000
79.80	m	100	100	10000
80.81	m	100	100	10000
81.82	m	100	100	10000
82.83	m	100	100	10000
83.84	m	100	100	10000
84.85	m	100	100	10000
85.86	m	100	100	10000

Total Calculation

Item	Structure	Measurement	A (Construction)	B (Maintenance)	A+B (Quantity)	Unit Price	Amount
Main	Structure	Repair	5 m	100 m	205 m	175	35875
	Shoulder	Concrete	1.400 m	1.400 m	175	1000	175000
		Repair	100 m	100 m	100	1000	100000
		Grass Cutting	14.000 m	14.000 m	10.25	13.000	
Drainage	General	5 m	5 m	175	100	17500	
	Profile Patching	100 m	100 m	100	100		
	Concrete	100 m	100 m	100	100		
	General	2.000 m	14.100 m	20.200 m	100	2020000	
Culvert	Concrete	1.000 m	10.000 m	10.000 m	10.000	100000	
	New Construction	5 m	1.7 m	10.000 m	10.000	100000	
	Repair	100 m	100 m	100	100		
	General	5 m	100 m	100 m	100	100000	
Road	Shoulder	Concrete	1.400 m	1.400 m	175	1000	175000
	Grass Cutting	14.000 m	14.000 m	10.25	13.000		
	Profile Patching	100 m	100 m	100	100		
	General	5 m	100 m	100 m	100	100000	

Total Amount: 3587500

☆ Obrigado Barak !!

**The Project for  
the Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste**

**Case Study for Culvert Design**

**Summary of Training in 2017**

**March 2018**

**Filomena Correia Carvalho de Almeida**

2

## Rationale for Drainage Structure Design



### Present Condition

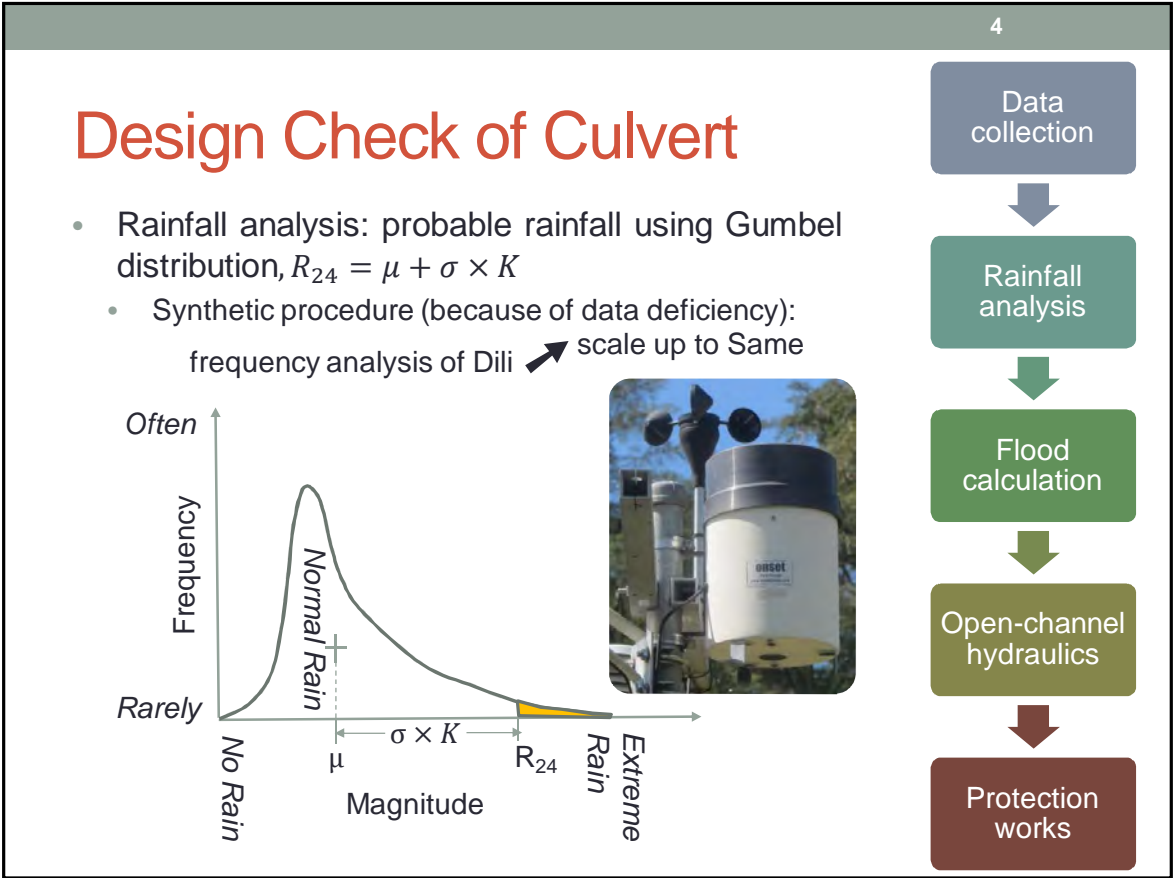
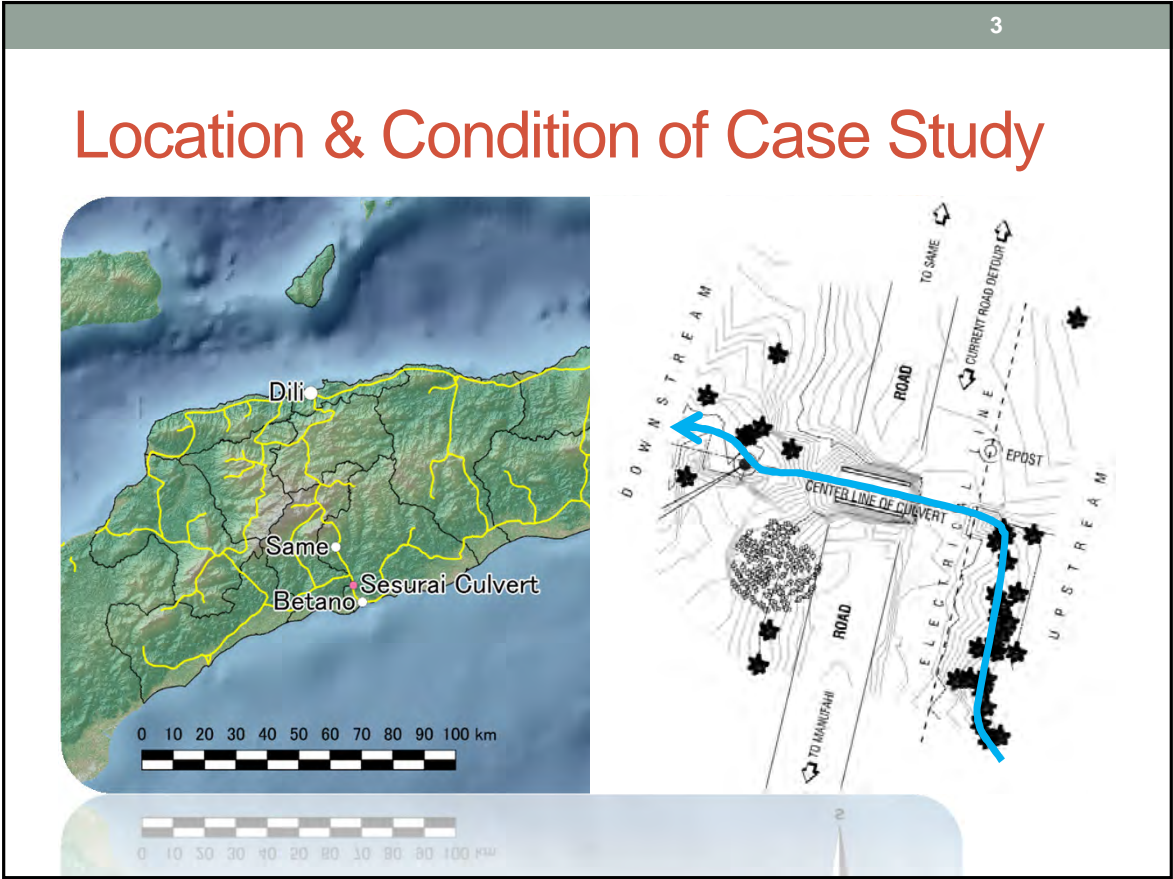
- Bridge Design Manual exists
- Implementation of flow checks for culvert constructions are seldom implemented
- Flooding and overtopping occur during heavy rains
- Roads structures become damaged

### Solution

- Acquisition of technical knowledge through the case study of Sesurai Culvert
- Practical training for design calculations
- Provision of a technical guideline for culvert design in Timor-Leste



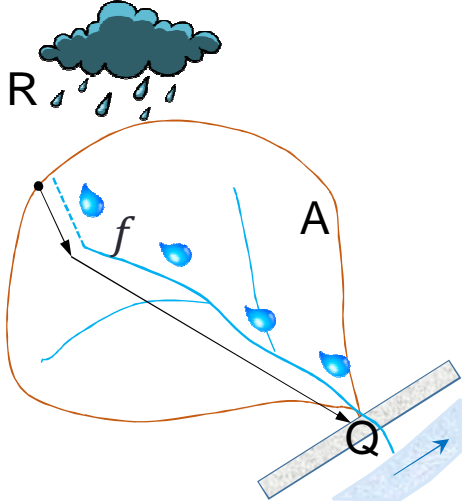




5

## Design Check of Culvert

- Flood calculation using Rational Method,  $Q_r = \frac{1}{3.6} fRA$
- Rainfall intensity using Mononobe formula,  $R = \frac{R_{24}}{24} \left( \frac{24}{t_c} \right)^{0.6}$



The diagram shows a catchment area A with rainfall R falling on it. The runoff coefficient is f. The discharge Q is shown flowing through a culvert structure.

Data collection

↓

Rainfall analysis

↓

Flood calculation

↓

Open-channel hydraulics

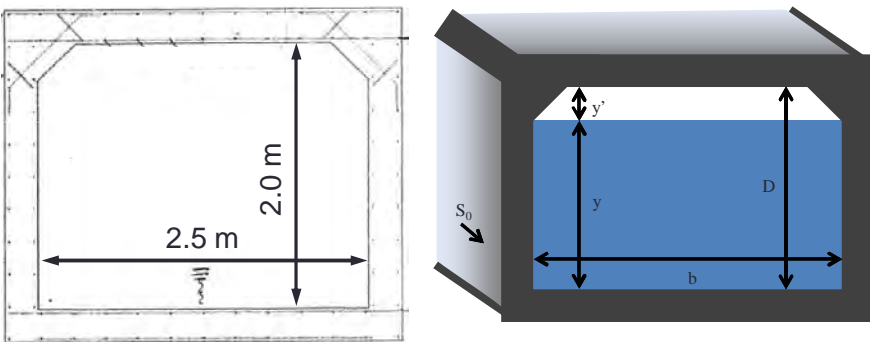
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Protection works

6

## Design Check of Culvert

- Open-channel hydraulics using Chézy-Manning discharge formula,  $Q_c = \frac{A}{n} R^{2/3} S_0^{1/2}$



The diagram shows a rectangular culvert with a plan view of 2.5 m by 2.0 m. The cross-section shows the water depth y, the bottom width b, and the total depth D. The bottom slope is labeled S<sub>0</sub>.

- Discharge capacity of culvert > discharge of catchment,  $Q_c > Q_r \therefore$  sufficient culvert ✓

Data collection

↓

Rainfall analysis

↓

Flood calculation

↓

Open-channel hydraulics

↓

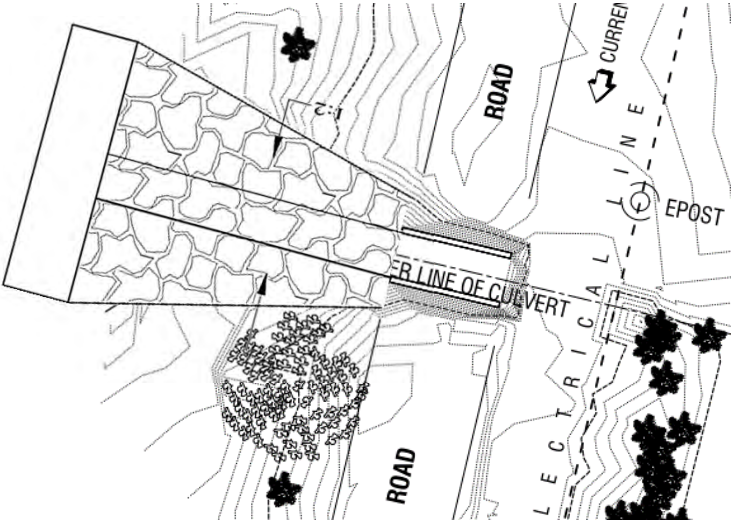
Protection works



7

# Design Check of Culvert

- Protection works: erosion prevention measures for outlets



Data collection

Rainfall analysis

Flood calculation

Open-channel hydraulics

Protection works

8

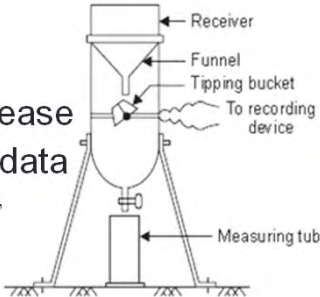

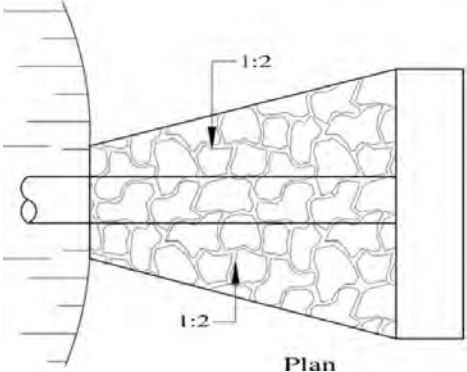
# Recommendations

**From now:** construction of protection works at outlet

**Next time:** ensure minimum recommended gradient of culvert

**Next time:** improvement of river alignment

**Institutionally:** increase collection of rainfall data (15-min, 30-min, 1-hr, 2-hr, 3-hr, 6-hr, 12-hr, 24-hr intervals)





# Case Study for Sahen River, Timor-Leste

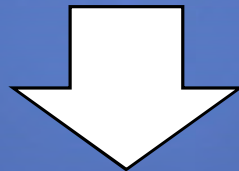
**Presenter :** Letigia Dos Reis Hanjan Corbafo  
(Department of Project, NDRBFC)

March 2018

## Rationale for Bridge Substructure Protection

### Present Condition

The hydrological studies have not been considered before the design of bridge substructures and river structures in Timor-Leste. As a result, substructures and river structures were easily damaged after flooding in the rainy season.



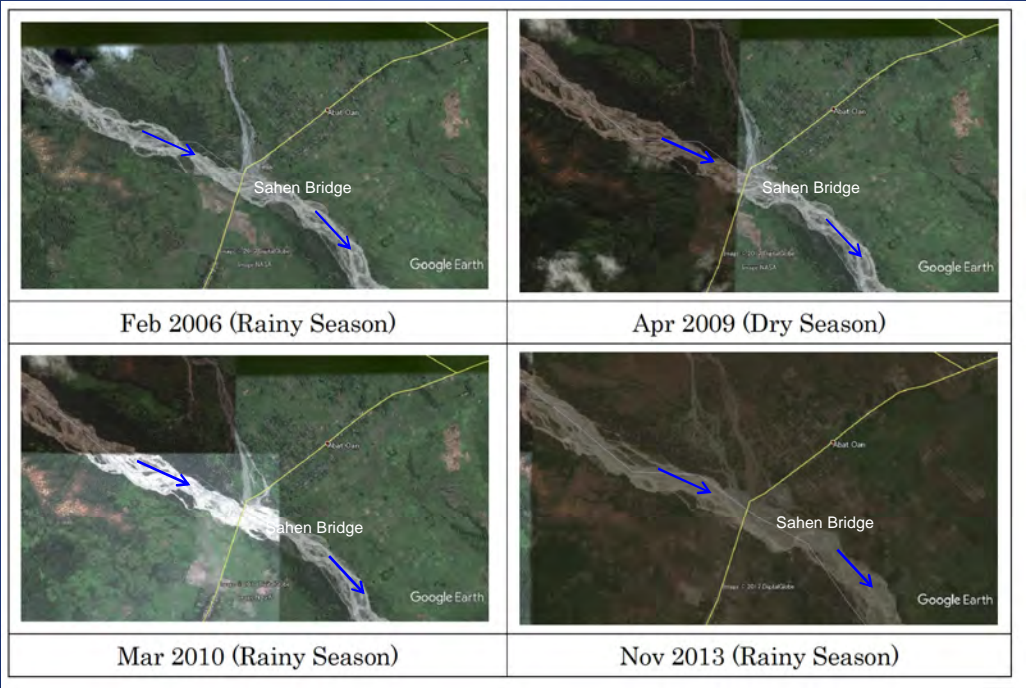
### Solution

- Acquisition of technical knowledge through the case study of Sahen Bridge with CDRS expert
- Provision of a technical guideline for bridge substructure protection in Timor-Leste

# Members of Working Group

Post	Name
Disaster Management, Disaster Restoration, The Project for Capacity Development of Road Services in the Democratic Republic of Timor-Leste (CDRS)	Shutaro SAKANAKA
Maintenance Department (Region III)	Cristovao da Costa Monteiro
Maintenance Department	Antonio Araujo
Project Department	Letigia dos Reis Hanjan Corbafo

## Morphological Change





## Damaged Observation at Sahen River



5

## Study

*Step 1***Set of River Flow Velocity***Step 2***Study of Protection Structure**

6

*Step 1***Set up of river flow velocity****How to set up Velocity of Sahen River****Manning formula**

$$V = \frac{1}{n} \times R^{2/3} \times I^{1/2}$$

7

**Result of Calculation**

Cross section No.	No.6
n: Coefficient of roughness	0.03
S: Cross-sectional area of river (m <sup>2</sup> )	566.4
P: Wetted perimeter (m)	253.5
I: Riverbed gradient	0.008
R: Hydraulic radius	2.2
V <sub>m</sub> : Mean flow velocity (m/s)	5.10
Q: Discharge(m <sup>3</sup> /s)	2886.1

8

**Step 2*****Study of Protection Structure*****Formula for Weight of Foot Protection Block**

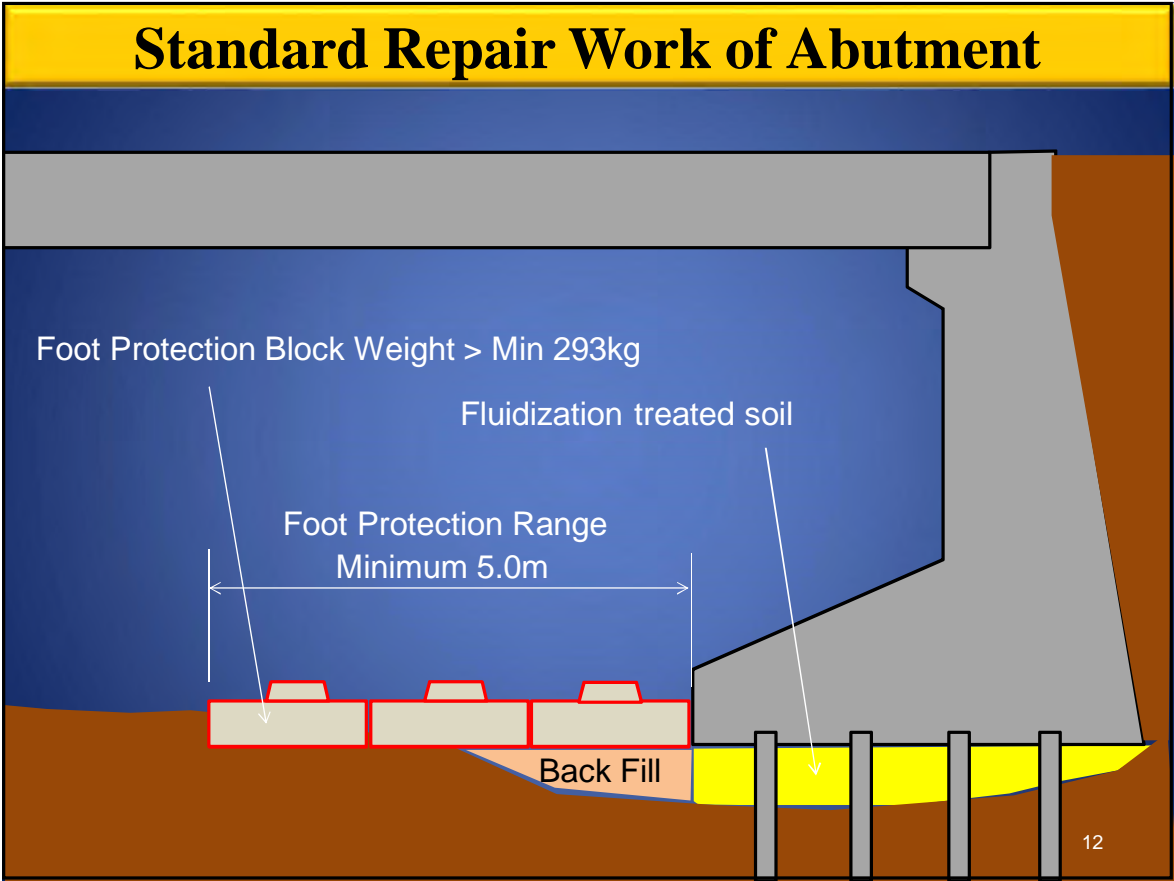
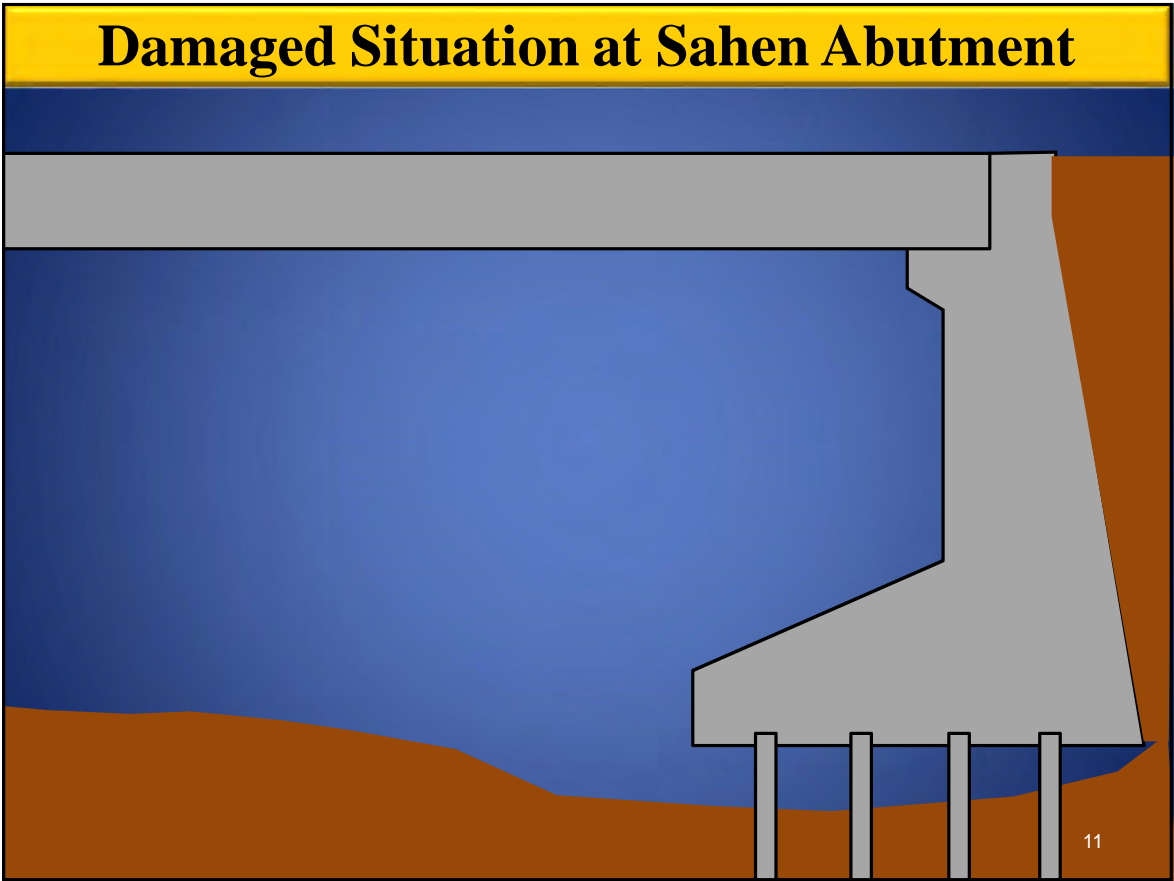
$$W > a \left( \frac{\rho_w}{\rho_b - \rho_w} \right)^3 \cdot \frac{\rho_b}{g^2} \cdot \left( \frac{V_0}{\beta} \right)^6$$

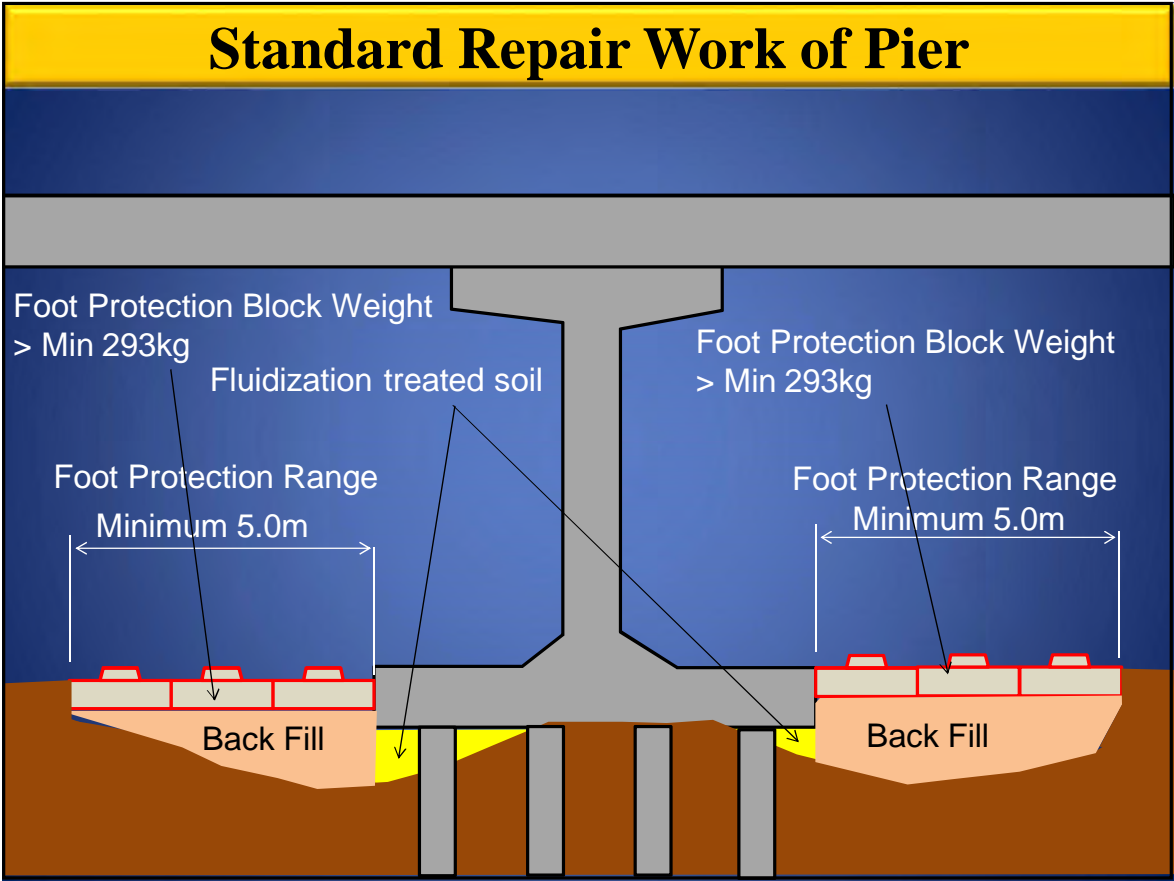
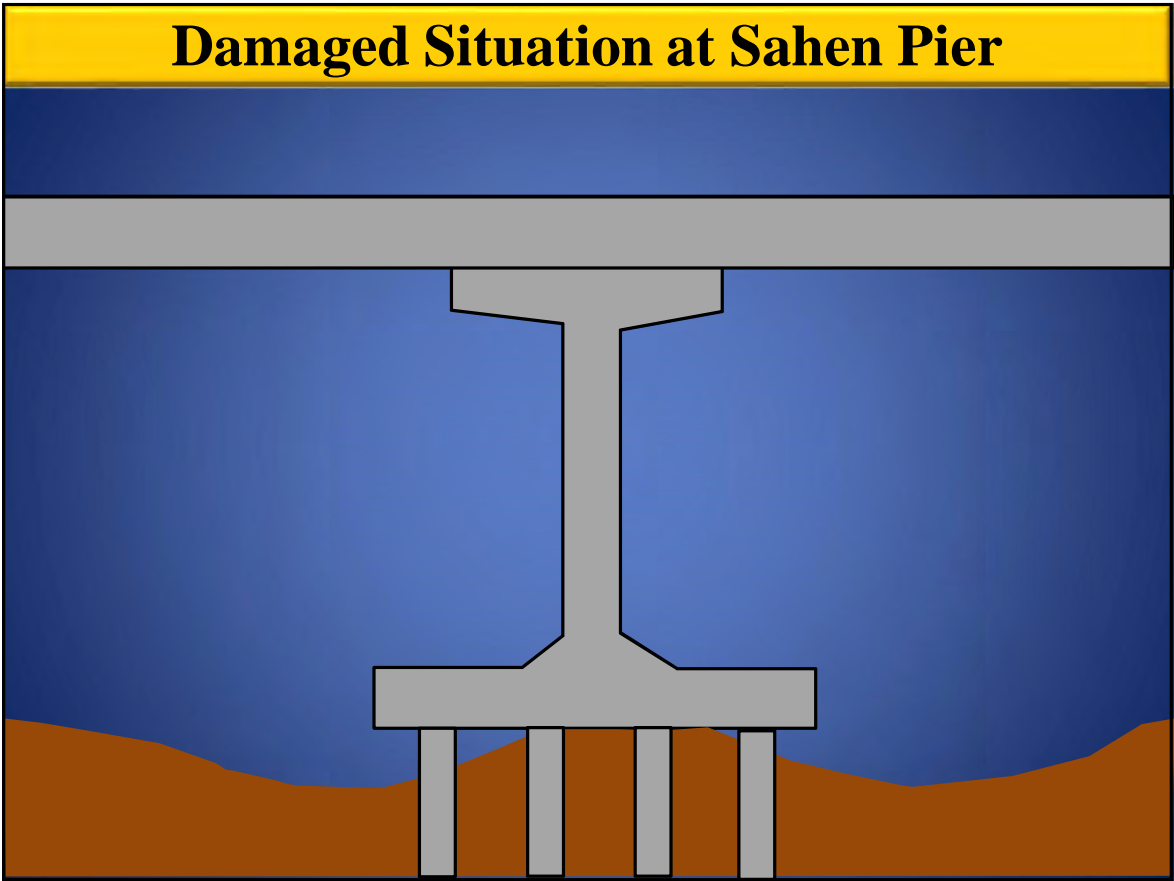
$$= 0.54 \times \left( \frac{1000.0}{2030.0 - 1000.0} \right)^3 \times \frac{2030}{9.8} \times \left( \frac{5.1}{2} \right)^6$$

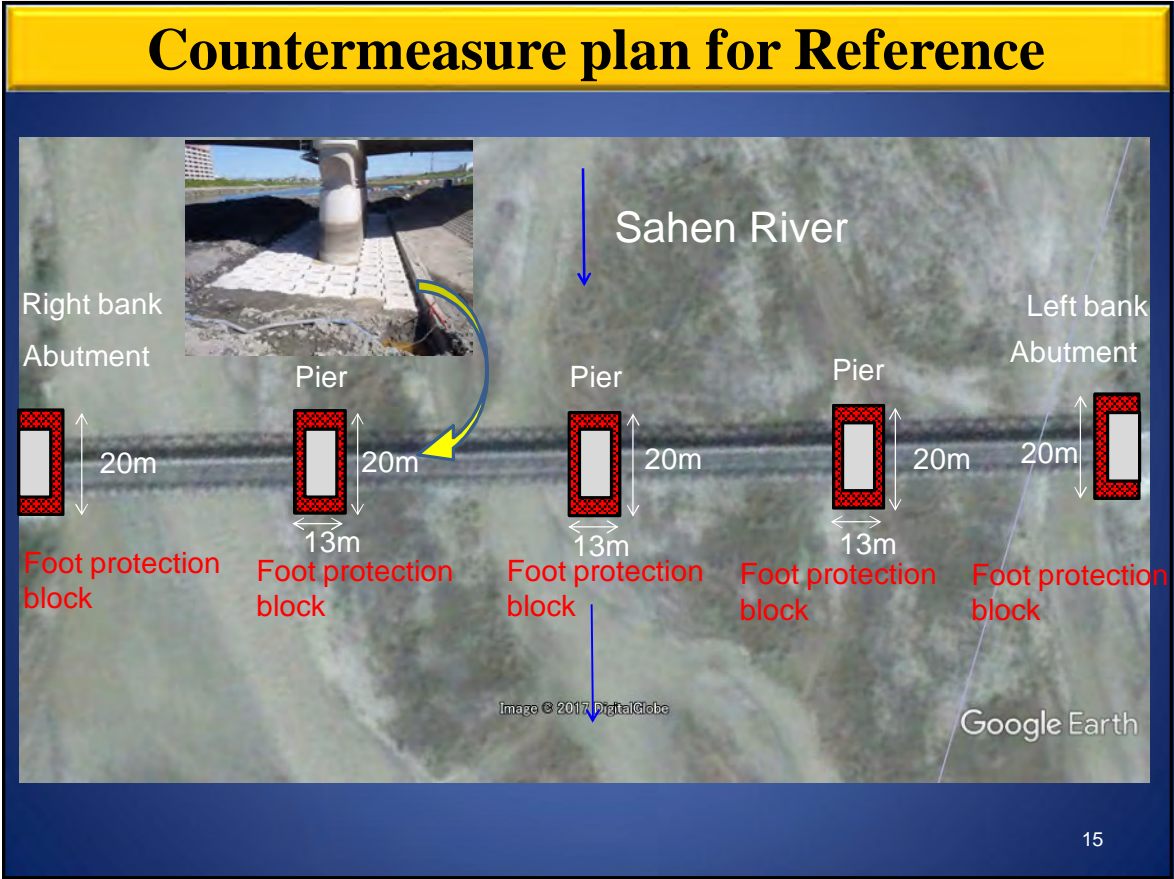
$$= 2872 \quad (\text{N})$$

$$= 293 \quad \text{kg}$$









OBRIGADO GOZAIMASU

16

The Project for Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste (CDRS)

*1: Progress of activities in 2017*

*2: Plan of activities on 2018*

*for Road Construction Supervision*

Eng. Nazario De Jesus Freitas, Construction Dept., DRBFC

2<sup>nd</sup> March, 2018

Ministry of Development and Institutional Reform (MDIR),  
Vice Ministry for Public Works,  
Directorate General for Public Works,  
National Directorate of Road, Bridge and Flood Control (NDRBFC)  
and JICA Expert Team (JET)

*1: Progress of activities in 2017 for Road Construction Supervision*

i] Case Study on Reconstruction Road of Ex Japan (Ex Japan Road) and other site <C/P: Construction Dept.>

C/S of Ex-Japan Road has following activities;

No. / Activity	Description / events	
1.Base Line Survey	Checking the room for improvement	Questionnaire on June 2017
	Baseline test for construction SV	
2.Safety Control	Awareing the importance of Safety	Lecture of Safety Control and Observation Safety Activities 13Oct'16 and Jul, Sep, Nov '17
	Conducting Safety lecture	
	Observation/practicing of safety event	
3.Progress Control	Practicing progress chart	Lecture of Progress Control @12 Sep 2017
	Checking the total section consited 6 contracts	
	Attenting progress meeting and giving advices	
4.Quality Control	Making the required table for QC	Work Shops for Asphalt Pavement @12&15 Dec 2017
	Understanding QC test items and meanings	
	Practicing QC test on the site & at the laboratory	
5.Reporting		



**Photos of activities of Case Study as an Ex Japan Road**



At the edge of embankment, it is danger for Bulldozer park: **Observation of Safety Patrol** @2016.10.06



**Observation of Safety Gathering**, discussion of Safety measures @2017.07.04



Observation of PC Girder Bridge construction @2017.07.04



**Work Shop 2: Marshall Stability Test**, measuring Stability and Flow value at Laboratory @2017.12.15

3

**1: Progress of activities in 2017 for Road Construction Supervision**

**OJT on No.4 site of 9 Package, Betano – Dotic on A14**  
as ii] Case Study on 7 and/or 9 Maintenance Package Project



No.4\_9 Packages, Betano Pipe Culvert installation, Foundation ground condition must be checked @2017.08.16



Stone Masonry Line Drain: Due to a little gradient 0.35%(upper stream) and 0.25% (near out-let), instruction was made for most attention setting the elevation line @2017.09.30

**OJT & Instruction/advice for Quality Control;**

. Setting out the gradient should be most attention in the small gradient of line drainage.

. **Adequate compaction of back-filling is necessary**  
**for Cross Culvert**

4

## OJT on No.1 site of 9 Package, Iliomar on A08

### ii] Case Study on 7 and/or 9 Maintenance Package Project



A half lane has already been concrete. But there is not found Expansion (Construction) joints on for dividing the concrete slab @2017.09.26



Concrete Mix(50kg cement: 25 shovel of sand (fine aggregate) and 6 bucket of stone (Coarse aggregate): It is advised the less water, the more strong concrete.

### OJT & Instruction/advice for Quality Control:

- 1) Instruction was made **to provide "Expansion-Joint" onto concrete pavement**
- 2) Concrete mix was 50kg cement:25 shovel of sand and 6 bucket(20liter)of crushed stone. It was explained that **strength of concrete is desired as little water as possible**

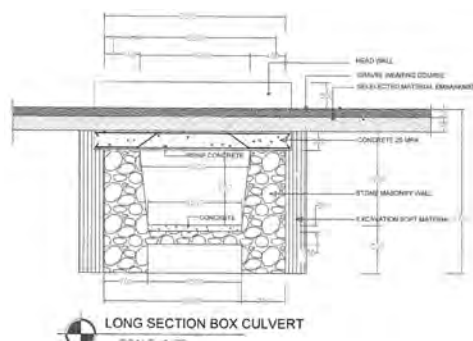
5

## OJT on No.5 7 Package, Emergency Works, Ainaro C23a

### ii] Case Study on 7 and/or 9 Maintenance Package Project



Height of weep holes are pointed out too high, it should be lower position. @2017.08.21



Original 1.0m dia pipe drain to revised 1.0m \*1.5m Box Shape Drainage with concrete slab.

### OJT & Instruction/advice for Quality Control:

- 1) Weep Holes of stone masonry retaining is to be set more high.
- 2) After discussion and consideration with CDRS Expert and Region3 Maintenance, **Cross Culvert is revised from original 1m dia pipe to box shape 1.5\*1.0m culvert with RC slave concrete**

6



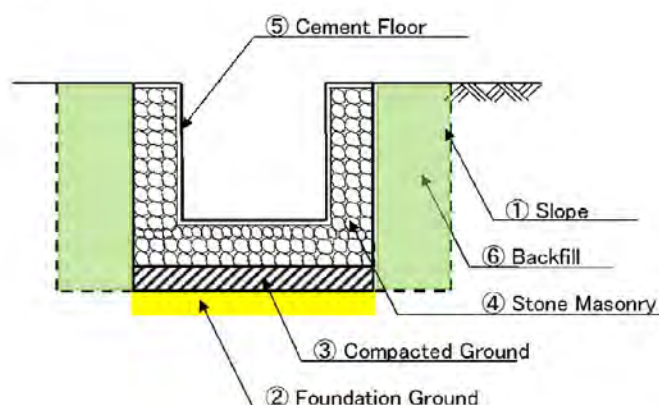
## 2: Plan of activities on 2018 for Road Construction Supervision

### 2.1 Using of Checking List for Quality, Safety and Progress Control for OJT on Case Study (C/S) sites

#### CHECK LISTS

*Please see one Example of "Check List" below*

#### Stone Masonry Drainage



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#### Example of Check List for Stone Masonry Drainage

Name of Project:		Comoro Bridge Project			
Location:		STA.8+ 00 – STA. 9+00			
Date:		25/01/2017			
Inspector:		Sueo HIROSE			
No.	Check Items	Judgements	Standards	Remarks	
①	<u>Preparatory activity</u>				
	Did you confirm the drawings?	<input checked="" type="radio"/> Yes <input type="radio"/> No			
	Did you confirm the construction work plan?	<input checked="" type="radio"/> Yes <input type="radio"/> No			
①	<u>Slope</u>				
	Was excavation slope appropriate?	<input checked="" type="radio"/> Yes <input type="radio"/> No			
	Was removal of water appropriate?	<input checked="" type="radio"/> Yes <input type="radio"/> No			
②	<u>Foundation Ground</u>				
	Is strength of bearing ground sufficient?	<input checked="" type="radio"/> Yes <input type="radio"/> No			
	If No, was the replacement of soft ground appropriate?	<input checked="" type="radio"/> Yes <input type="radio"/> No		Replacement, Thickness=60cm	
③	<u>Compacted Ground</u>				
	Did you use the compactor for compaction?	<input checked="" type="radio"/> Yes <input type="radio"/> No			
④	<u>Stone Masonry</u>				
	Was Stone material appropriately?	<input checked="" type="radio"/> Yes <input type="radio"/> No	150mm ≤ Stone thickness < 225mm		
	Was cement mortar composed appropriately?	<input checked="" type="radio"/> Yes <input type="radio"/> No	Cement 1 : Sand 3		
⑤	<u>Cement Floor</u>				
	Was cement mortar composed appropriately?	<input checked="" type="radio"/> Yes <input type="radio"/> No	Cement 1 : Sand 3		
⑤	<u>Foundation Ground</u>				
	Did you check the backfill material?	<input checked="" type="radio"/> Yes <input type="radio"/> No	—	Selected Material, From Borrow Pit No.1	
	Did you confirm the soil density test results?	<input checked="" type="radio"/> Yes <input type="radio"/> No	95%	Inspected density: 96%	
	Did you confirm the compacted thickness?	<input checked="" type="radio"/> Yes <input type="radio"/> No	30cm	Inspected thickness: 30cm	

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2: Plan of activities on 2018 for Road Construction Supervision

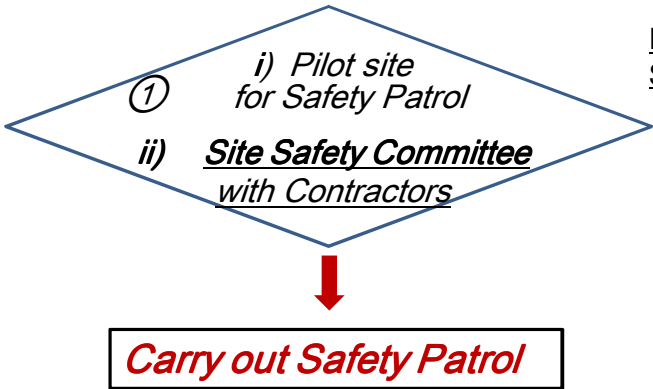
2.2 New Case Study (C/S) for activities on 2018

- ①

“Safety Patrol by DRBFC”, at pilot site on Ex-Japan Road
- ②

New Box Culvert Planning, Design and Construction
- ③

OJT using “Check List” on site of “Emergency Works,  
Humboe-Letefoho, Ermera on A10”



Inspection by member of Site  
Safety Committee like this



















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Time Table of “*Safety Patrol “by DRBFC on a pilot site*”

Initial Time Table for Case Study for Safety Activities by DRBFC

First wrote on 24 Nov 2017

Year	2106		2107			2018						
Month	1	7	1	4	7	9	1	3	5	7	9	12
C/S Ex-Japn Road Safety Control		 Lecture of Safety 1  Observation of Safety Patrol & Assembly			Questionnaire for Safety   Observation of Safety Patrol	 Lecture of Safety 2 						
C/S Safety Activities by DRBFC												
1) Declation of carrying out Saftey Activities by DRBFC Apoint engineers for Working Group							 <i>Instruction by Top-management</i>					
2) Making initial plan for Safety Activities Selection of pilot site for "Safety Patrol"							 <i>Explanation to parties</i>					
3) Establish/organaize a site Safety committee with Contractors Discussion/training safety measures to Contractor Planning "Safety Patrol"							 <i>Coordination / preparation Meeting</i>	 				
4) Carry out "Safety Patrol"								  <i>June, July &amp; August</i>				
5) Reporting the result of pilot safety patrol Organaizing and diffusing regulay "Safety Patrol"												

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② New Box Culvert Planning, Design and Construction



Box Culvert at STA 12Km+065 on Ex-Japan Rd.: 2.0\*2.5m, both side with Sone Masonry Wall, L=12m @2017.10.02

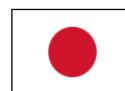


Ditto but Completed Box Culvert 2.5m\*2.0m, as a Variation Order @2017.11.17



\* The newly construction Box Culvert is to be made at about STA3+200Km on Ex-Japan Road (from Salala A02 JCT) as an Variation works in 2018

☆ Obrigado Barak !!



**The Project for  
the Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste**

	By	Time
1 Opening speech	Vice Minister	10:30-10:40
2-1 Project activities up to date	JICA Expert Team	10:40-10:50
2-2 Database for road maintenance and rehabilitation activities	Maintenance Department, NDRBFC	10:50-11:00
2-3 Guideline for Bridge Substructure Protection	Project Department, NDRBFC	11:00-11:10
2-4 Guideline for Drainage - Culvert Design	Project Department, NDRBFC	11:10-11:20
2-5 Guideline for slope protection	Project Department, NDRBFC	11:20-11:30
2-6 Guideline for land slide	Project Department, NDRBFC	11:30-11:40
2-7 Check list for construction	Maintenance Department, NDRBFC	11:40-11:55
3 Evaluation of project and review of project activities plan	JICA Expert Team	11:55-12:10
4 Open discussion for the Project	All	12:10-12:40
5 Comment by JICA	JICA Rep	12:40-12:50
6 Conclusion and Closing remarks by MOP	DG	12:50-13:00



**The Project for  
the Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste**

**4th JCC  
September 2018**



**Ingerosec Corporation**



**Earth System Science Co., Ltd.**

# Contents

- 1. Project Outline**
- 2. Project activities up to date**
- 3. Evaluation of project and review of project activities plan**

3

## **1. Project Outline**

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4

## 1.1 Project target and Output

Item	Description
Project Title	The Project for the Capacity Development of Road Services (CDRS)
Project Duration	March 2016~March 2019 (3 years)
Project Site	Whole National Roads in Timor-Leste
Implementing Agency	Ministry of Public Works, Transport and Communications (MPWTC)
Target Group	Directorate of Road, Bridge and Flood Control (DRBFC)
Overall Goal	The maintenance conditions of major roads are improved in TL.
Project Purpose	Capacity of DRBFC for maintenance of major roads in the whole country is enhanced.
Outputs	1. Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and budget plan 2. Capacity of DRBFC construction management for maintenance and rehabilitation including slope protection is improved through case studies in the whole country 3. Technical guideline of investigation and design for maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection.

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## 1.2. Project Outputs and Indicator

<OUTPUT 1> Improve Road Maintenance Cycle



1-1. Over 30% of requested budget for road maintenance are distributed.

1-2. Improved road database is utilized for preparing the annual work plan of road maintenance.

<OUTPUT 2> Improve Capacity of DRBFC Construction Management for maintenance and rehabilitation

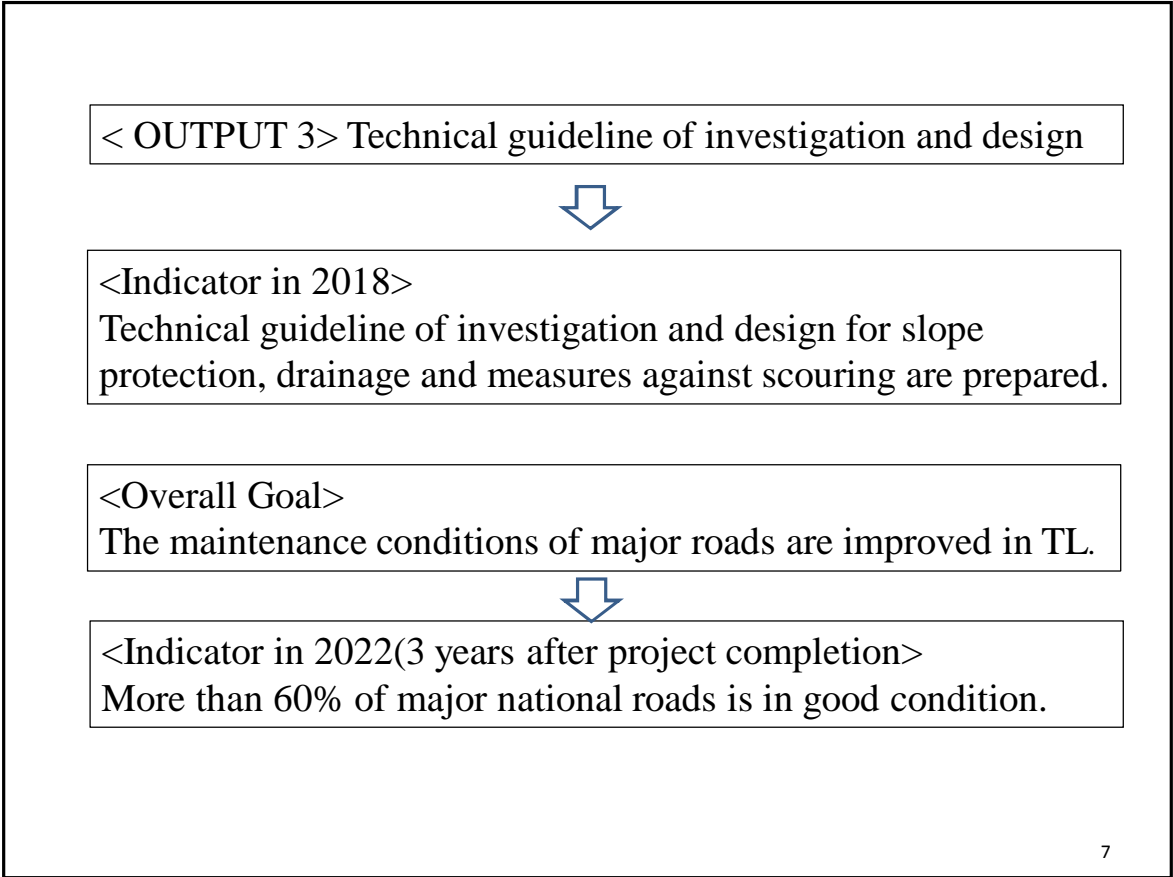


<Indicator in 2018>

2-1. At least 6 case studies for construction and for design are conducted.

2-2. Over 60 % of trainees pass the achievement test for construction supervision and design.

6



## 2. Project activities up to date

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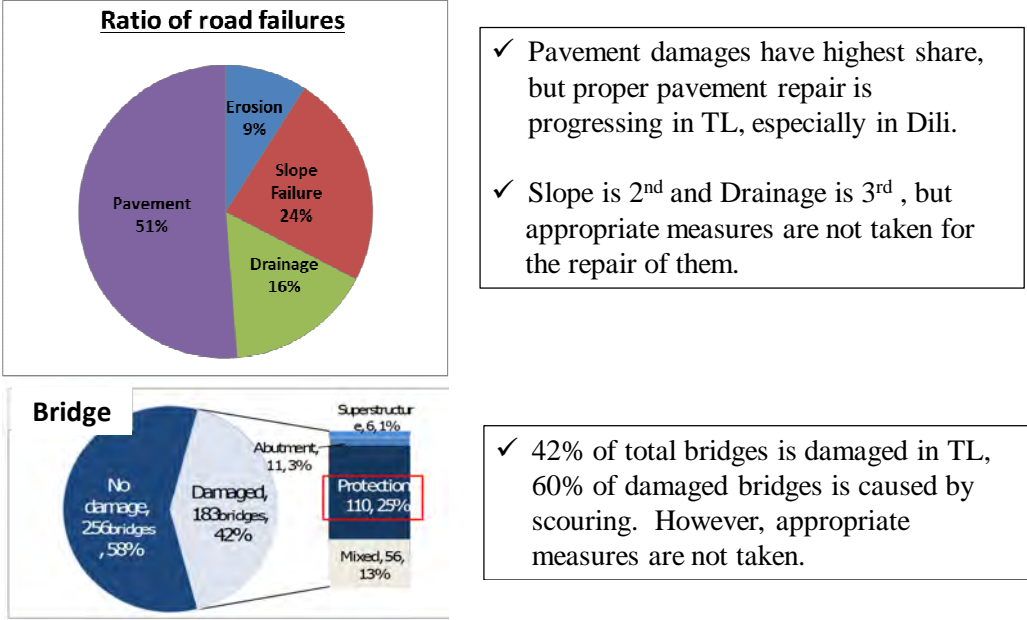
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2. Project activities for up to date

2-1. Baseline Survey

1) Share of Road and Bridge Failures



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2) Cause of road and bridge failures



Pavement failure on A05 due to the lack of roadside ditch



Cut & embankment slope failure on A02 due to the heavy rain and lack of slope protection



Embankment slope failure on A07 due to the unsuitable foundation material and lack of compaction



Scouring of bridge substructure on A14 due to severe river flow and lack of protection

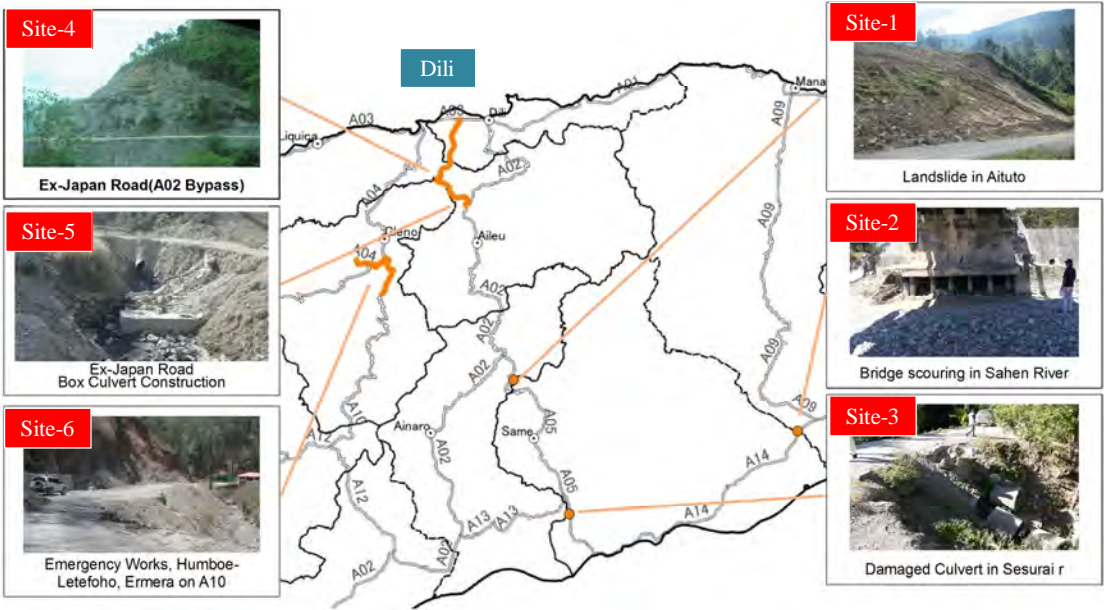
10

2-2 Database of Maintenance activities

- Step 1:
- The position and point of road infrastructures are input in GIS database
- Method 1: The data are collected by existing of as built drawing
- Method 2: The data are collected by Drive recorder and IRI application
- Step2:
- The basic data input to GIS Map according to the result of “Step 1”
- Step3:
- The inspection for collecting damaged condition
- Step4:
- The data input to GIS Map for damaged condition and estimated the budget

2-2. Case Study activity

Case Studies Sites



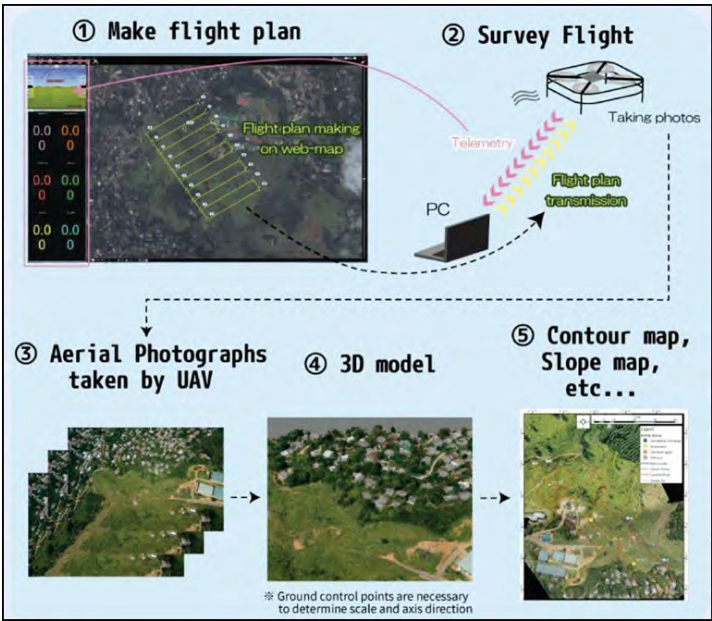
To improve the capacity of survey and design for slope protection

- Site-1: Landslide in Aituto
- Geotechnical boring and topographic survey
  - Monitoring of slope mass movement
  - Analysis of field survey data
  - Propose the proper or applicable measures



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Topographic survey and mapping using Unmanned Aerial Vehicle (UAV)



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## To improve the capacity of survey and design for bridge scouring

### Site-2: Bridge scouring in Natabora

- Topographic survey
- River flow analysis
- Propose the proper or applicable measures
- Technical advise to the basic design



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## To improve the capacity of survey and design for drainage

### Site-3: Damaged Culvert in Same

- Topographic survey
- Catchment area analysis
- Discharge volume analysis
- Technical advise to the basic design



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To improve the capacity of construction management  
for maintenance and rehabilitation

Site-4: Super vision to quality control at Ex-Japan road

- Construction-Quality Control
- Construction-Progress Control
- Construction-Safety Control



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To improve the capacity of construction management for maintenance  
and rehabilitation and the capacity of design for drainage

Site-5: Box Culvert Planning, Design and Construction  
Super vision at Ex-Japan road

- Confirmation of Box Culvert size ( lecture is done)
- Construction Super vision using “Check List”



\* Red word; progress is delayed

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To improve the capacity of construction management  
for maintenance and rehabilitation

Site-6: OJT using “Check List” on site of “Emergency  
Works, on the site of Humboe-Letefoho, Ermera on A10”  
➤ Construction-Quality Control using “Check List”  
➤ Construction-Safety Control using “Check List”



## 2-3. Technical guideline

### Guideline for Bridge Substructure Protection

Outline of the Presentation

- I. Introduction
- II. Objective
- III. Characteristics of rivers in Timor-Leste
- IV. Damage of bridge substructures in Timor-Leste
- V. Hydraulic phenomena around bridge pier
- VI. Study of bridge substructure and scour depth
- VII. Study for protection of bridge substructure

V. Hydraulic Phenomena Around Bridge Pier

➤The figure shows the hydraulic phenomenon that occurs around bridge piers during flood.

➤ Bridge piers located in a river cause complex vortices and waves that disturb the flow and water surface during flood, as a result, an increase in water level and riverbed scouring occur

I. Introduction

Bridges are easily damaged during flooding periods and from soil caving and settlement damage at the abutment and piers.

When bridges are repeatedly damaged and then repaired with each flood, this increases lifecycle cost.

The lack of maintenance program for bridge

This design guideline primarily is prepared according to Japanese technical standards for countermeasures to protect bridge substructures from flood scour

VII. Study for Protection of Bridge Substructure

There are two types of protection work: Gabion and foot protection block. However, due to issues with the durability (due to deterioration, etc.) of the metal wire use for gabion, it is recommended that Timor Leste take the same approach as Japan and use Foot Protection

Gabion damaged situation Mda 2011

Foot Protection blocks in Japan

Foot Protection blocks in Japan



Guideline for Drainage – culvert design

Culvert Design guideline & annex

Culvert alignment & planning

Existing alignment: sharp bend on downstream side and long culvert (higher cost)  
✓ Recommended alignment: change channel to minimize sharp bend  
✗ Not recommended alignments: sharp bend upstream or downstream

Overview of culvert design steps

Data collection	Basic site information Topographic data Cartographic (map) / geospatial data Rainfall data	Section 5
Rainfall analysis	Frequency analysis Calculation of daily rainfall for design	Section 6
Flood calculation	Calculation of catchment area Calculation of time of concentration Calculation of rainfall intensity Assessment of run-off coefficient Calculation of flood discharge	Section 7
Open-channel hydraulics	Selection of culvert size Calculation of culvert capacity for discharge Calculation of flow type and velocity	Section 8
Protection works	Selection of protection measure and size	Section 9

Capacity calculation & checks

Guideline for Slope Protection, Retaining Wall and Slope Collapse

Contents

1. Scope	8. Slope
2. Normative references	9. Slope Disaster
3. Terms and definitions	10. Slope Stability Calculation
4. Investigation	11. Influence of factors in slope stability calculation formula
5. Design of Gravity Retaining Wall	12. Design Example of Countermeasure against Shallow Slope Collapse
6. Gravity Retaining Wall in the Common Drawings	
7. Bearing Capacity	

Design Procedure of Gravity Retaining Wall

Geological Information

① Geomorphologic approach
② Surficial geological observation
③ Mechanical boring and standard penetration test
④ Other penetration test Dokenbo

Classification of Slope Disaster


Tipo 1 CORRIJIME (CR) slope collapse	Tipo 2 CAÍDA DE ROCAS (CR) rock fall	Tipo 3 FALLA DE MASA ROCOSA (FR) rock mass failure
Tipo 4 DESPLAZAMIENTO (DL) mass movement	Tipo 5 FALLO DE ESCOMBROS (FE) debris flow	Tipo 6 FALLA DE PLATAFORMA (FP) soil collapse



Guideline for landslide

The contents of Guideline

The guideline introduces the general approach how to investigate the mass movement landslide. The process of the contents is along the case study activity on Atitula Landslide.

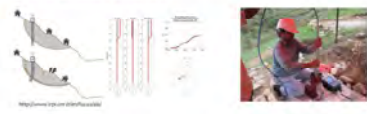


This is a slide in which the surface of rupture is curved concavely upward and the slide movement is roughly rotational about an axis that is parallel to the ground surface and transverse across the slide.

2. Detailed investigation


Inclinometer Measurement

To detect displacement of the sliding mass, monitoring with the inclinometer is the useful tool. Measurement the inclination of casings with the inclinometer should be performed periodically, and the cumulative displacement of the casing should be analyzed to detect the depth of the surface of rupture.




1. How was the landslide found?


The collapse of the slope  
(Ghana landslide)




The cracks and deformation



The house crack and deformation

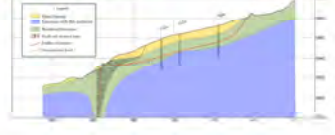


The tree bending



2. Detailed investigation

Analysis of landslide mechanism



3. Evaluation of project and review of project activities plan

3. Evaluation of project and review of project activities plan

3-1. Evaluation of project activity   Output1

Output 1: Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and annual budget plan.

Progress is delayed. Because budget is not provided.

activities	plan/ actual	2016	2017	2018
1.1 To review existing management structure and maintenance and rehabilitation condition on major roads	plan			
	actual			

: Plan     : On schedule     : Gradual progress     : Delayed

Done, DRBFC accept to use GIS database.

activities	plan/ actual	2016	2017	2018
1.2 To conduct the periodic/routine inspection	plan			
	actual			

: Plan     : On schedule     : Gradual progress     : Delayed

Site inspection; A06,A08,A11,A12,A16   153km  
Site inspection using drive recorder       63km  
Not enough to practical training on site  
Not enough to technical transfer

	Plan	2016				2017				2018				2019			
	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1.2	Plan																
	Modify																
	Actual																

activities	plan/ actual	2016	2017	2018
1.3 To update the database based on the inspection result and repair/rehabilitation works of roads and bridges	plan			
	actual			

: Plan  : On schedule  : Gradual progress  : Delayed

Update 153km, on going 63km  
Inspection results of national road could not be updated.  
Necessary to update the inspection results  
Corporate with the department of Project and Maintenance

	Plan	2016				2017				2018				2019			
	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1.3	Plan																
	Modify																
	Actual																

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activities	plan/ actual	2016	2017	2018
1.4 To formulate maintenance and repair/rehabilitation plan for next cycle	plan			
	actual			

: Plan  : On schedule  : Gradual progress  : Delayed

Process of result inspection to request budget was completed. Construction at site and update to database are delayed.  
necessary to plan for next cycle

	Plan	2016				2017				2018				2019			
	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1.4	Plan																
	Modify																
	Actual																

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activities	plan/ actual	2016	2017	2018
1.5 To implement emergency inspections and repair/rehabilitation works when necessity arises	plan			
	actual			

: Plan
  : On schedule
  : Gradual progress
  : Delayed

CDRS was supported to A03, Loes river (scouring, Large sandbag ) and Jakarta II emergency work.  
 In 2019, CDRS plans to support emergency work when necessity arises.

	Plan	2016				2017				2018				2019			
	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1.5	Plan																
	Modify																
	Actual																

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activities	plan/ actual	2016	2017	2018
1.6 To undertake appropriate road maintenance/ rehabilitation works by following annual work and budget plans which reflect priorities within the limited budget	plan			
	actual			

: Plan
  : On schedule
  : Gradual progress
  : Delayed

DRBFC are preparing draft 5-years and annual plans .

Reviewing and updating these plans  
 Reasonable plan, construction by priority

	Plan	2016				2017				2018				2019			
	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1.6	Plan																
	Modify																
	Actual																

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activities	plan/ actual	2016	2017	2018
1.7 To propose framework of road maintenance /rehabilitation for major roads	plan			
	actual			

: Plan
  : On schedule
  : Gradual progress
  : Delayed

Integration of work between the department of Project and Maintenance in order to strengthen maintenance capacity was proposed.

**CDRS propose to establish a sustainable framework.**

	Plan	2016				2017				2018				2019			
	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1.7	Plan																
	Modify																
	Actual																

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### 3-2. Review of project activity Output1

Activities	Plan	2016				2017				2018				2019			
Sub-Activities	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1.1 To review existing management structure and condition of maintenance and rehabilitation for major roads	Plan																
	Actual				done												
1.2 To conduct the periodic/routine inspection	Plan																
	Modify																
	Actual																
1.3 To update the database based on the inspection result and repair/rehabilitation works of roads and bridges	Plan																
	Modify																
	Actual																
1.4 To formulate maintenance and repair/rehabilitation plans for next cycle	Plan																
	Modify																
	Actual																
1.5 To implement emergency inspections and repair/rehabilitation works when necessity arises	Plan																
	Modify																
	Actual																
1.6 To undertake appropriate road maintenance/ rehabilitation works by following annual work and budget plans which reflect priorities within the limited budget	Plan																
	Modify																
	Actual																
1.7 To propose appropriate framework of road maintenance/rehabilitation for major roads	Plan																
	Modify																
	Actual																

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3-3. Evaluation of project activity    Output2

Output 2: Capacity of DRBFC construction management for maintenance and rehabilitation is improved through case studies in the whole country including slope protections.

Progress is delayed. Because budget is not provided.

activities	plan/ actual	2016	2017	2018
2.1 To identify typical rehabilitation and repair works of major roads in the whole country as case studies	plan			
	actual			

: Plan     : On schedule     : Gradual progress     : Delayed

Decided to 6 case studies

33

activities	plan/ actual	2016	2017	2018
2.2 To conduct the case studies for the planning, design check, and construction supervision of the project	plan			
	actual			

: Plan     : On schedule     : Gradual progress     : Delayed

Case studies for the planning and design check are on schedule. However, construction supervision progress is delayed. Because budget is not provided.  
necessary to continue OJT and polish “Check List” for construction

	Plan	2016				2017				2018				2019			
	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
2.2	Plan																
	Modify																
	Actual																

34



activities	plan/ actual	2016	2017	2018
2.3 To propose preferable structures for construction management for repair/rehabilitation works through case studies	plan			
	actual			

: Plan  : On schedule  : Gradual progress  : Deleyed

Not enough to practical training on site  
Not enough to technical transfer

CDRS propose to establish a sustainable structures.

	Plan	2016				2017				2018				2019			
	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
2.3	Plan																
	Modify																
	Actual																

3-4. Review of project activity   Output2

Activities		Plan	2016				2017				2018				2019			
Sub-Activities		Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
2.1 To identify typical rehabilitation and repair works of major roads in the whole country as case studies	Plan																	
	Actual																	
2.2 To conduct the case studies for the planning, design check, and construction supervision of the project	Plan																	
	Modify																	
	Actual																	
2.3 To propose preferable structures for construction management for repair/rehabilitation works through case studies	Plan																	
	Modify																	
	Actual																	

### 3-5. Evaluation of project activity Output3

Output 3: Technical guideline of investigation and design for maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection..

On schedule  
Consider further additions to slope protection guideline after confirming challenges faced in the rainy season.

37

activities	plan/ actual	2016	2017	2018
3.1 To <b>review existing technical document</b> for maintenance and rehabilitation	plan			
	actual			

: Plan
  : On schedule
  : Gradual progress
  : Delayed

### Collect and review to technical drawing

activities	plan/ actual	2016	2017	2018
3.2 To review and <b>identify factors of failure</b> from past examples of damaged rehabilitation and construction	plan			
	actual			

: Plan
  : On schedule
  : Gradual progress
  : Delayed

Observe and examine to sites of damaged roads/bridges and slopes

38

activities	plan/ actual	2016	2017	2018
3.3 To aquire necessary knowleges of civil engineering for design	plan			
	actual			

: Plan : On schedule : Gradual progress : Deleyed

Lecture to each case studies

activities	plan/ actual	2016	2017	2018
3.4 To prepare the technical guideline of investigation and design.	plan			
	actual			

: Plan : On schedule : Gradual progress : Deleyed

Decided to 4 technical guideline

39

activities	plan/ actual	2016	2017	2018
3.5 To reflect the lessons learned from case studies to the technical guideline.	plan			
	actual			

: Plan : On schedule : Gradual progress : Deleyed

On schedule

→Consider further additions to slope protection guideline after confirming challenges faced in the rainy season.

	Plan	2016				2017				2018				2019			
	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
3.5	Plan																
	Modify																
	Actual																

40

activities	plan/ actual	2016	2017	2018
3.6 To disseminate the technical guideline for concerned parties.	plan			
	actual			

: Plan : On schedule : Gradual progress : Delayed

On schedule  
→ Depending on 3-5, preparation for dissemination may be later.

	Plan	2016				2017				2018				2019			
	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
3.6	Plan																
	Modify																
	Actual																

41

3-6. Review of project activity Output3

Activities	Plan	2016				2017				2018				2019			
Sub-Activities	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
3.1 To review existing technical documents for road maintenance and rehabilitation	Plan																
	Actual					done											
3.2 To review and identify factors of failure from past examples of damaged rehabilitation and construction works	Plan																
	Actual					done											
3.3 To acquire necessary knowledges of civil engineering for design through classroom lectures and case studies	Plan																
	Actual													done			
3.4 To prepare the technical guideline of investigation and design	Plan																
	Actual																
3.5 To reflect the lessons learned from case studies to the technical guideline	Plan																
	Modify																
3.6 To disseminate the technical guideline for concerned parties	Plan																
	Actual																

42

### 3-7. Review of Monitoring Plan

Monitoring Plan		2016				2017				2018				2019			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
<b>Monitoring</b>																	
Joint Coordination Committee	Plan																
	Modify																
	Actual																
Set-up the Detailed Plan of Operation	Plan																
	Modify																
	Actual																
Submission of Monitoring Sheet	Plan																
	Modify																
	Actual																
Joint Monitoring	Plan																
	Modify																
	Actual																
<b>Reports/Documents</b>																	
Technical Guideline	Plan																
	Modify																
	Actual																
Project Completion Report	Plan																
	Modify																
	Actual																
<b>Public Relations</b>																	
information to road users	Plan																
	Modify																
	Actual																
Event or opening ceremony for a OJT site	Plan																
	Modify																
	Actual																

43

### 3-8. Review of expert schedule

Inputs		2016				2017				2018				2019			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
<b>Expert</b>																	
Team Leader/Road Maintenance 1 /Mr. Hisashi MUTO	Plan																
	Modify																
	Actual																
Deputy Team Leader/Road Maintenance 2 /Mr. Mitsuhide SAITO	Plan																
	Modify																
	Actual																
Road Construction Supervision /Mr. Johji KOIZUMI	Plan																
	Modify																
	Actual																
Quality Control/Road Repair /Mr. Suelo HIROSE	Plan																
	Modify																
	Actual																
Disaster Restoration /Mr. Shutaro SAKANAKA	Plan																
	Modify																
	Actual																
Disaster Restoration 2 /Mr. Kazuharu KOISHIKAWA	Plan																
	Modify																
	Actual																
Road Design/Project Coordinator /Mr. Nicholas BROOKER-JONES	Plan																
	Modify																
	Actual																
Structure Design /Mr. Kenji MINEGISHI	Plan																
	Modify																
	Actual																
Database /Mr. Takashi SAITO	Plan																
	Modify																
	Actual																
Landslide /Mr. Masahiko HAYASHI	Plan																
	Modify																
	Actual																
Topographical Analysis /Mr. Sohshi MIKAMI	Plan																
	Modify																
	Actual																
Evaluation/Monitoring Ms. Nao TSUJIMURA	Plan																
	Modify																
	Actual																

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### 3-9.Other

Secure budget for the below activities to allow progress during extension period of the project

- OJT (Ex-Japan Box culvert) budget
- site inspection budget

etc

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Thank you for your attention  
Obrigado Barak !!

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The Project for Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste (CDRS)

## The progress and activity for Database in 2018

26<sup>th</sup> Sep. 2018

Direstorate of Road, Bridge and Flood Control (DRBFC) of  
Ministry of Public Works, Transport and Communications (MPWTC)  
and JICA Expert Team (JET)

### ◆ Today's Topics

1. The procedure of developing GIS database is decided
2. Progress of Database Activity
3. Activity plan

**Procedure of Database activity for inspection**

- Step 1:*  
*The position and point of road infrastructure facilities are input in GIS database*  
Method 1: The data are collected through as built drawing for under construction road  
Method 2: The data are collected by Drive recorder and IRI application (for Good and Bad road)
- Step2:*  
The inspection for collecting damaged condition
- Step3:*  
The data input to GIS Map for damaged condition and estimated the budget

- *Step 1-a (Room and Field activity)*  
The inspection for collecting basic data used by Drive recorder and IRI application, and As built drawing

Data collection by As built drawing

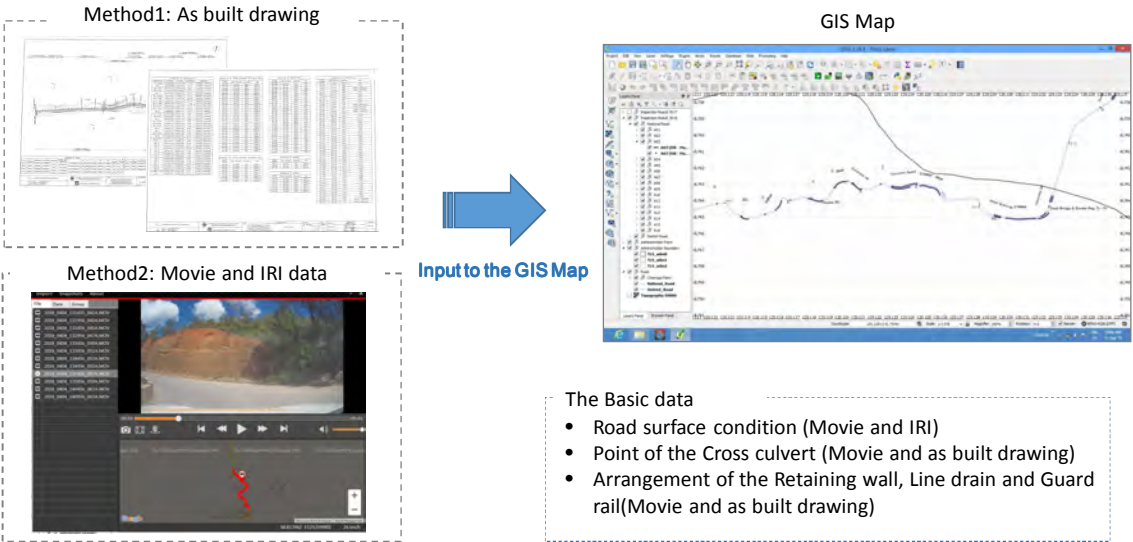


Data collection by Drive Recorder and IRI smartphone application



➤ Step 1-b: (Room activity)

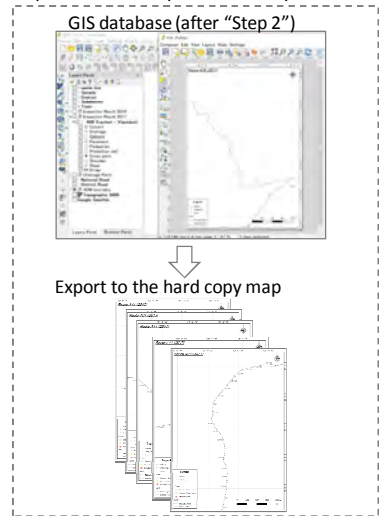
The basic data input to GIS Map according to the result of “Step 1”



➤ Step 2: (field activity)

The inspection for collecting damaged condition

Preparation of Map for field inspection

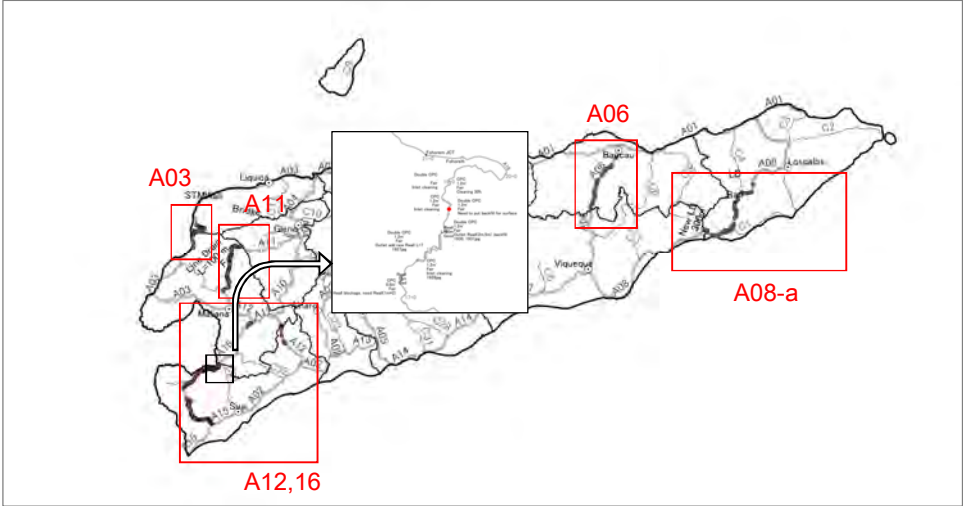


Field inspection for checking the damaged condition



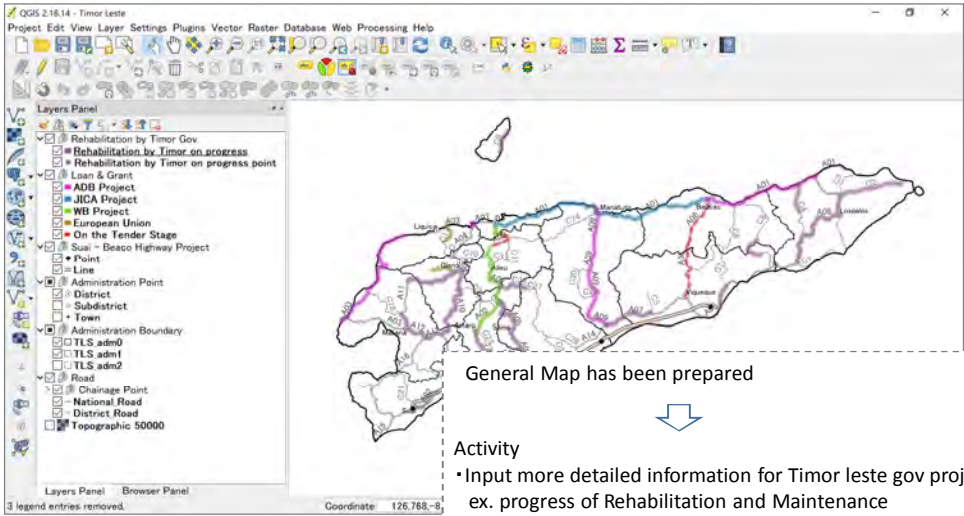


- The Progress of GIS database for Maintenance



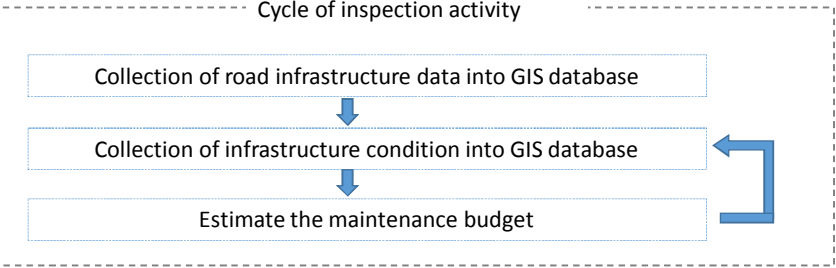
9

**The GIS database development for rehabilitation and maintenance will be prepare to cooperate with GIS section, project department**



**The next activity plan of the database activity**

1. The technical transfer activity is conducted for maintenance department



2. The GIS data input of infrastructure information of 5 years maintenance plan from 2019 will be completed until February, 2019

3. The GIS database for rehabilitation progress will be establish to cooperate with GIS section, Project department.

☆ Obrigado Barak !!





# Design Guideline For Bridge Substructure Protection In Timor-Leste

## September 2018

**Presenter : Antonio De Araujo**  
(Department of Maintenance)  
**and Julius L. Kehy**  
(Department of Project)  
NDRBFC

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**Democratic Republic of Timor-Leste**

Ministry of Public Works

Directorate General for Public Works

Directorate of Roads, Bridges and Flood Control

DRAFT

### Bridge Substructure Protection Guidelines

Guia de Protecção da Subestrutura de Ponte

FDG stage

### Warning

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Document type: Technical Specification  
Document subtype:  
Document stage: (FDG) Final Draft Guideline  
Document language: E

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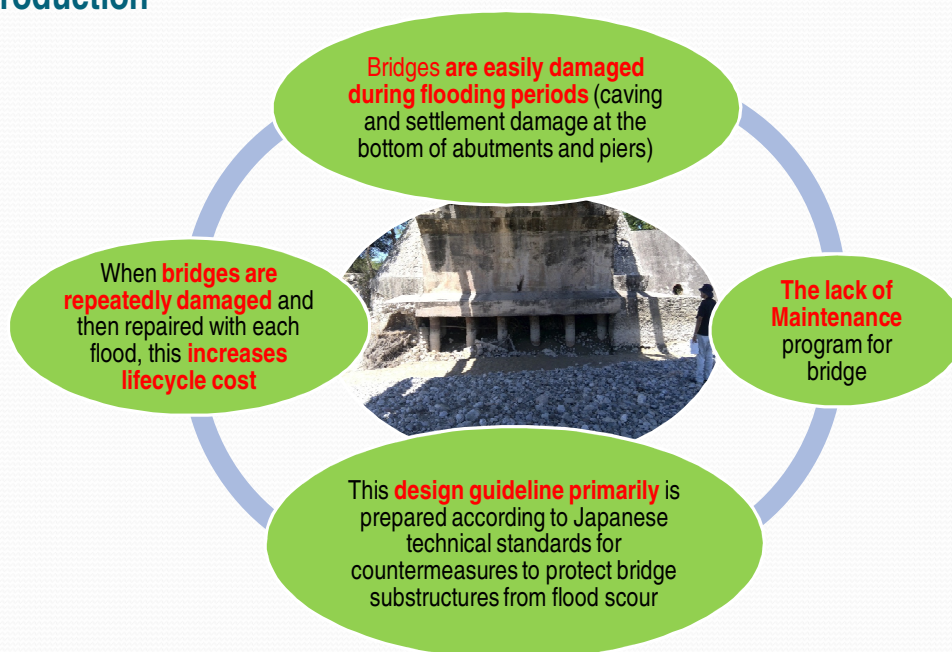
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# Outline of the Presentation

- I. Introduction
- II. Objective
- III. Characteristics of rivers in Timor-Leste
- IV. Damage of bridge substructures in Timor-Leste
- V. Hydraulic phenomena around bridge pier
- VI. Study of bridge substructure and scour depth
- VII. Study for protection of bridge substructure
- VIII. What we have to apply more and what should be resolved for future.

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## I. Introduction



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## II. Objective of the design guideline

### Objective:

- To improve the design of countermeasure for bridge protection substructure from flood scour
- To reduce flood scour damage to bridge substructure in Timor-Leste

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## III. Characteristics of majority of Rivers in Timor-Leste

- ❖ Sources of many rivers in Timor-Leste are located in the mountainous area, at an altitude of **1000m to 2000m**
- ❖ The average annual rainfall in the northern region of Timor-Leste is approximately **1000mm to 2000mm** and in the southern region it is **1500 mm to 2000 mm**
- ❖ The length of their rivers is **short** and **share many natural characteristics with rivers in Japan**

## IV. Condition of Bridges Substructure in Timor Leste

- ❖ The following figures show the scouring damage of Sahen Bridges right bank abutment and pier.



Figure 1. Sahen bridge abutment 2017

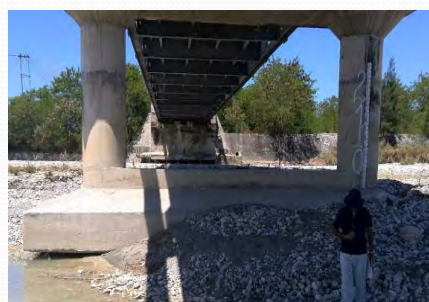


Figure 2. Sahen bridge pier 2017

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❖ Figures 3 and 4 show the scouring damage of Mola Bridges Pier & abutment. Due to scouring damage, the caving of the footing can be seen

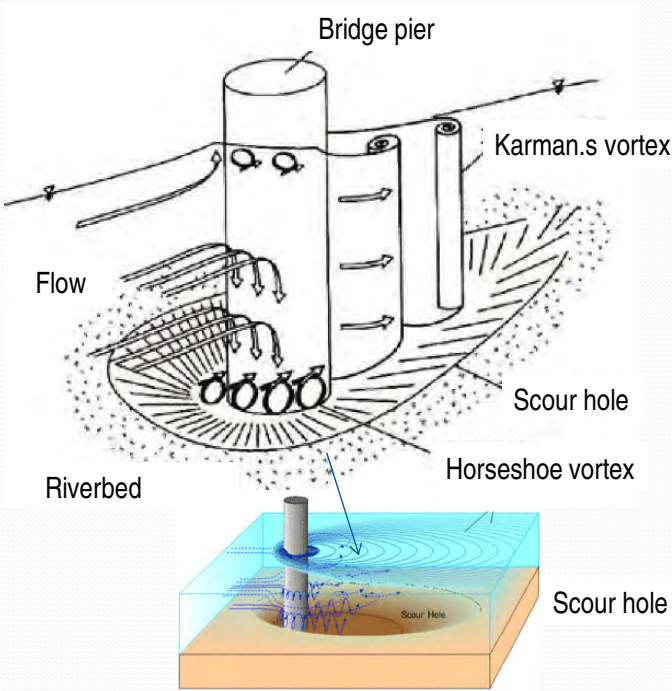


Figure 3. Mola bridge abutment



Figure 4. Mola bridge pier 2011

V. Hydraulic Phenomena Around Bridge Pier





- The figure shows the hydraulic phenomenon that occurs around bridge piers during flood.
- Bridge piers located in a river cause complex vortices and waves that disturb the flow and water surface during flood; as a result, an increase in water level and riverbed scouring occur



### Hydraulic Phenomenal around bridge pier (Japan Example)

The figure show the state of scour on bridge pier after a flood in Japan.The flood caused a scour hole to form around the bridge pier



The figure show the actual phenomenon around a bridge pier during floods.the occurrences of complex flow around the bridges pier apparent.

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## VI. Study of Bridge Substructure Scour Depth

### 1. Scour depth around bridge pier

$$\frac{Z}{D}=f \cdot \left( \frac{h_0}{D} \cdot \frac{h_0}{dm} \cdot Fr \right)$$

$h_0$ : Average water depth

$D$  : Diameter of bridge pier

$dm$  : Average grain diameter of riverbed material

$Fr$  : Froude number

$Z$  : Score depth

Step1

Calculate the dimensionless scour depth  $Z/D$  using the target locations average water depth  $h_0$ , the diameter of bridge pier  $D$ , average grain diameter of riverbed material  $dm$ , and Froude number  $Fr$

↓

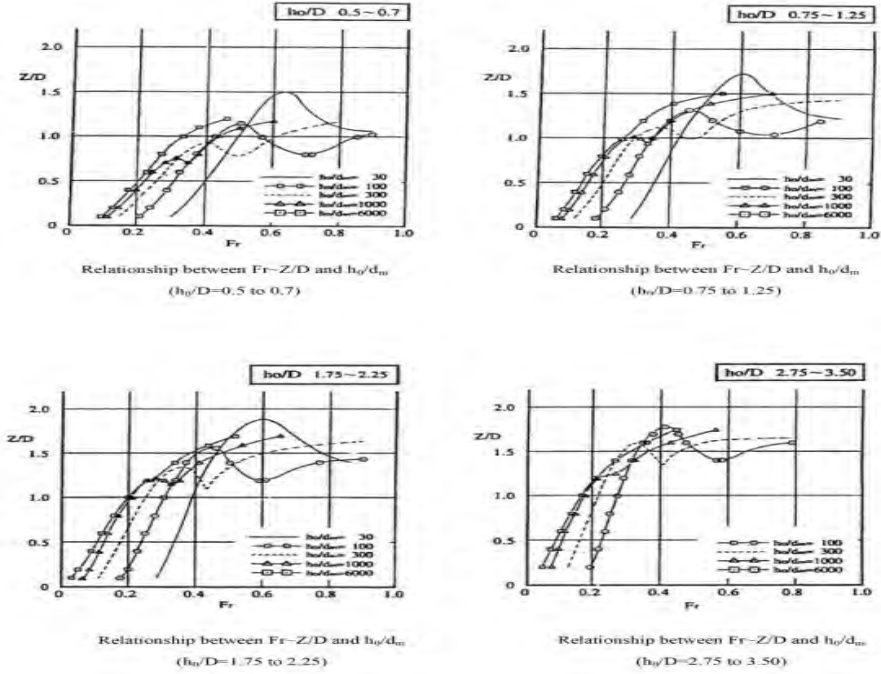
Step 2

The resulting  $Z/D$  should be corrected for changes in flow direction due to flooding or nearby bridge piers. After these corrections, the depth of scour hole around a bridge pier can be calculated.

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2. Scour depth around abutments

Timor-Leste have short lengths for the footings depth of their abutments, so when new bridges are being planned, it is necessary to conduct the field investigations of the abutment or nearby abutments and ensure sufficient lengths for footing depth.



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Calculation Example

Calculation Condition

High water level ; 24.80 m  
Design river bed ; 18.97 m  
Diameter bridge pier (D) = 2.0 m  
Average grain diameter of riverbed material (dm) = 24.9 mm  
Froude number (Fr) = 0.54

Study Process

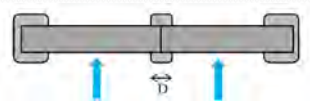


Figure 2. Plan

Average Water depth  $h_0 = 24.80 - 18.97 = 5.83 \text{ m}$

$\frac{h_0}{D} = \frac{5.83}{2.0} = 2.915$

$\frac{h_0}{d_m} = \frac{5.83}{0.0249} = 234.91$

$Z/D = 1.5$  (Refer to right figure)

Score depth  $Z = (Z/D) * D = 1.5 * 2.0 = 3.0 \text{ m}$

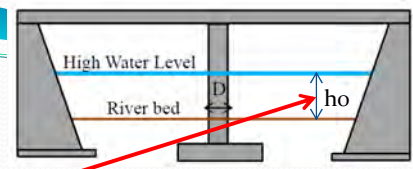
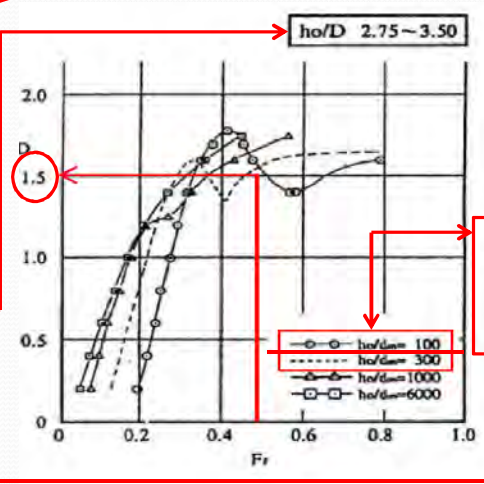


Figure 1. Cross Section



Relationship between  $Fr \sim Z/D$  and  $h_0/d_m$   
( $h_0/D = 2.75$  to  $3.50$ )

Figure 3. Relationship between  $Fr \sim Z/D$

The number between 100 & 300

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VII. Study for Protection of Bridge Substructure

There are two types of protection work: Gabion and foot protection block. However, due to issues with the durability ( due to deterioration, etc.) of the metal wire use for gabion, it is recommended to that Timor Leste take the same approach as Japan and use “Foot Protection”



Gabion damaged situation  
Mola 2011



Foot Protection Blocks  
in Japan

Types of foot protection block

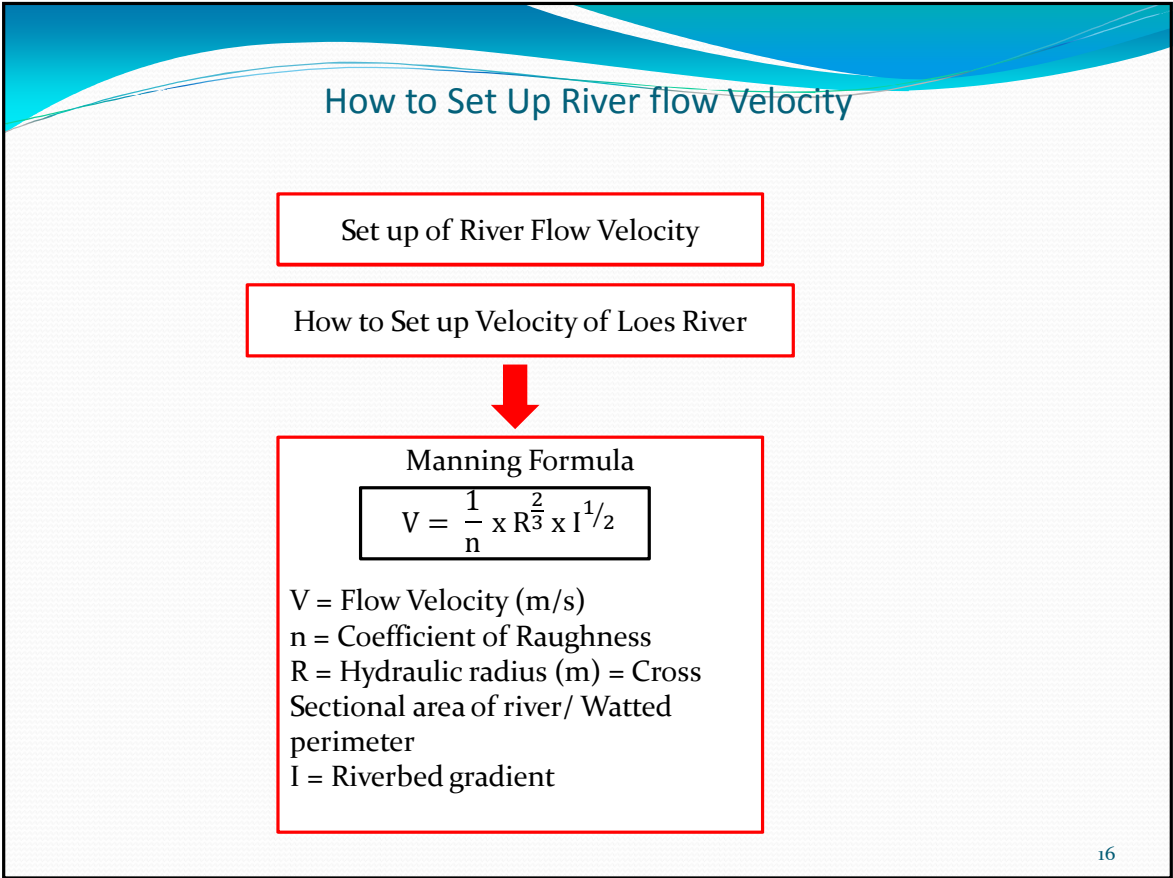


Types of foot protection blocks in Japan

Table Factor of  $\alpha$  and  $\beta$

Shape of block	specific gravity $\rho_b/\rho_w$	$a \times 10^{-3}$	$\beta$
Type A: Projection	2.22	1.2	1.5
Type B: Plane	2.03	0.54	2.0
Type C: Triangular conic	2.35	0.83	1.4
Type D: Triangular bearing	2.25	0.45	2.3
Type E: Rectangle	2.09	0.79	2.8

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Average Velocity

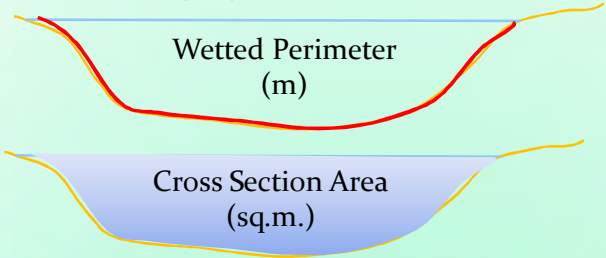
The flow velocity used I the calculation of foot protection block weight is calculated using the manning formula for calculating the average velocity. The roughness coefficient is selected from the table below based on the conditions at the target river site.

River or channel conditions		Scope of Manning's n
Artificial channel, improved river	Concrete artificial channel	0.014~0.020
	Spiral half-pipe channel	0.021~0.030
	Channel with stone masonry on both banks (mud bed)	0.025 (mean value)
	Bedrock excavation	0.035~0.05
	Bedrock forming	0.025~0.04
	Clay riverbed with flow velocity not enough to cause scouring	0.016~0.022
	Sandy loam, clayey soil loam	0.020 (mean value)
	Drag line dredging, little weeds	0.025~0.033
Natural river	Small channel on plain, with no grass	0.025~0.033
	Small channel on plain, with grass and shrubs	0.030~0.040
	Small channel on plain, with lots of grass and gravel bed	0.040~0.055
	Mountain channel, with gravel and boulders	0.030~0.050
	Mountain channel, with boulders and large boulders	0.040 or higher
	Large channel, with sandy bed and little meandering	0.018~0.035
	Large channel, with gravel bed	0.025~0.040

Table. Revised Ministry of Construction River and Erosion Control standard (draft) Japan 1997,Survey Section P132

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Hydraulic Radius (m)

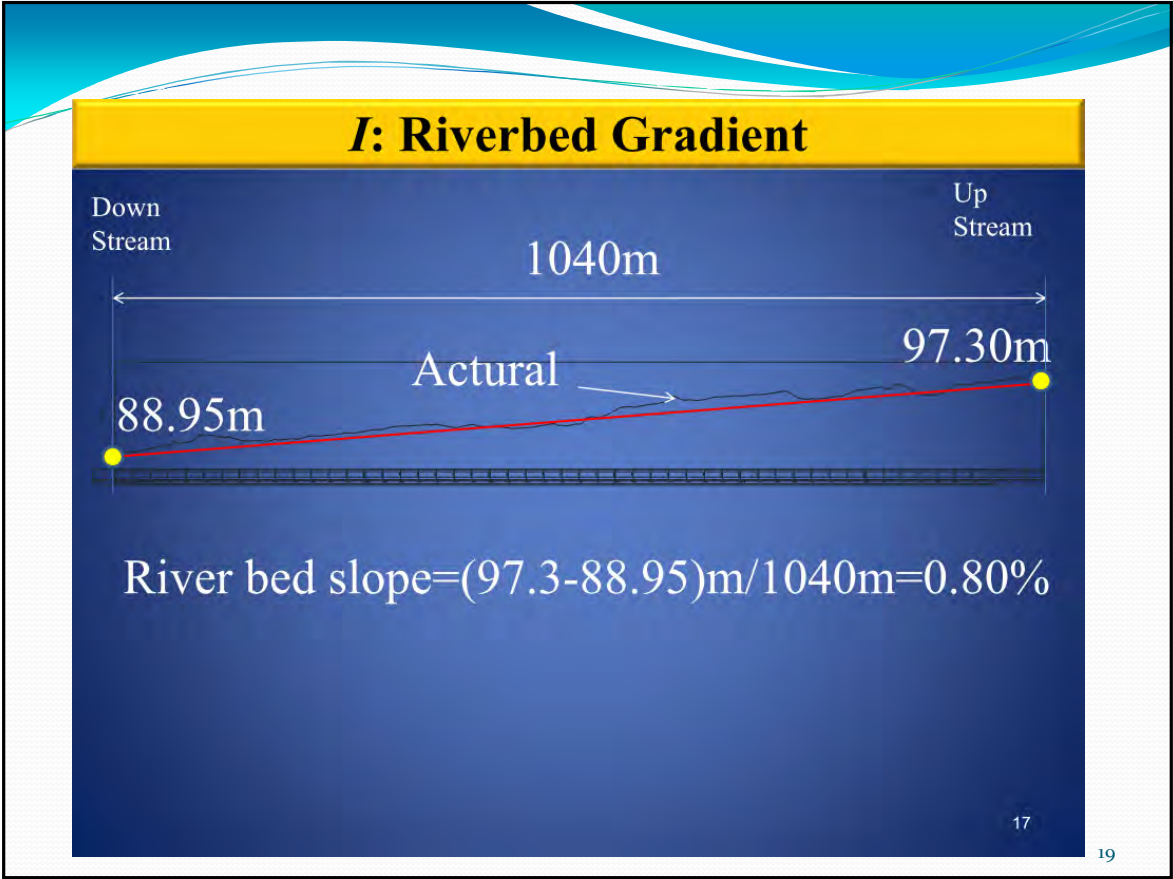


Hydraulic Radius (m) =  $\frac{\text{Cross Section Area (sq. m.)}}{\text{Wetted perimeter (m)}}$

Cross Section Area = 566.4 m<sup>2</sup>  
Wetted perimeter = 253. 5 m

Hydraulic Radius (m) =  $\frac{566.4 \text{ m}^2}{253.5 \text{ m}}$   
= 2.2 m

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Result of Calculation

Cross section No.	No.6
n: Coefficient of roughness	0.03
S: Cross-sectional area of river (m2)	566.4
I: Rivered gradient	253.5
R: Hydraulic radius	0.008
Vm: Mean flow velocity (m/s)	5.1
Q: Discharge (m3/s)	2886.1

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### Calculation of weight of foot Protection blocks

The formula is used in Japan to calculate the necessary weight of foot protection blocks.

$$W>a\left(\frac{\rho w}{\rho b-\rho w}\right)^3\frac{\rho b}{g^2}\left(\frac{Vm}{\beta}\right)^6$$

### Calculation Example for weight of foot Protection Block

- Calculation Condition

$$W>a\left(\frac{\rho w}{\rho b-\rho w}\right)^3\frac{\rho b}{g^2}\left(\frac{Vm}{\beta}\right)^6$$

Here

W

is the weight of foot protection block

Vm

5.1m/s

is the river velocity;

Shape

Type B

is the block type;

$\alpha$

0.54

is the block factor;

$\beta$

2.0

is the block factor;

$\rho w$

980kg/m<sup>3</sup>

is the density of water

$\rho b$

2030kg/m<sup>3</sup>

is the density of block

g

9.8m/s<sup>2</sup>


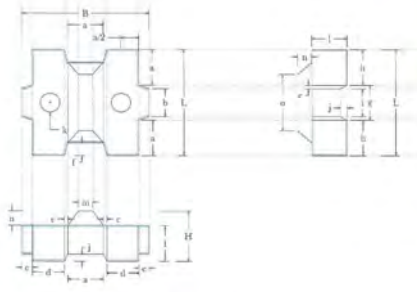
is the acceleration of gravity

- Now W can be calculated as follows


$$W = 0.54 \times \left(\frac{1000}{2030-1000}\right)^3 \times \frac{2030}{9.8^2} \times \left(\frac{5.1}{2}\right)^6$$
$$W = 2872 \text{ N}$$
$$W = 293 \text{ kg}$$

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## Dimension Shape of Block Plane



Completion of the block at pier at Comoro Bridge



The works for foot protection block at pier

j	L	B	H	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q
0.5	800	1080	420	90	340	90	270	90	108	158	388	288	80	165	150	300	120	120	480	960
1	1140	1360	552	90	306	98	342	114	157	418	361	342	78	209	190	380	152	152	608	1258
2	1500	1800	700	90	450	90	450	150	180	549	478	449	100	275	250	500	200	200	800	1650
3	1860	1980	770	350	480	55	620	185	198	604	552	494	110	303	238	330	220	220	880	1815

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A5-137



## VII. What we have to apply more and what should be resolved for future.

What we can do at the moment is that

We prepared design and cost estimate of budget for project implementation. However, No formula and No standard as guideline to resolve bridge substructure protection, therefore, the cost estimate were not included bridge protection design.

Therefore detailed survey, detail design, detail estimate budget for bridge protection can be provided based on the guideline so we have to apply formula on each project. And the monitoring is significant for not only quality control but also feedback for design checking in maintenance department.

However it is still insufficient that requirement of engineering justification from decision maker. Hence, it maybe no budget for monitoring at the site and no arrangement for facility for engineers.

- Therefore we propose that decision maker should consider further engineering justification, and training opportunity in DRBFC.
- Regarding formwork of foot protection like Comoro No. 3 Bridge, it is needed to obtain formwork with its royalty, so DRBFC should keep one set of the form work at least.

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# OBRIGADO



24



**The Project for  
the Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste**

**Finalisation of Guideline  
for Culvert Design**

**September 2018**

**Manuel Soares**

**(Department of Projects & Administration)**

**General purpose of culverts**

- *“The purpose of drainage design is to ensure reasonable capacity of drainage facilities, which means specifying culverts with sufficient drainage capacity to accommodate probable volumes of stormwater and at reasonable construction costs compared to their benefit to economic activities.”* (Objectivo husi Design drainajem atu garante capacidade drainajem nebe apropriado ba facilidade drainajem nian, nebe signifika katak culvert nian spesifikasi suficiente atu akumulika kemungkinan volume be'e husi Limpasan no kusto konstrusaun nebe razoavel compara ho ninia benefisiu no aktividade ekonomia.)
- *“Within the context of road crossings, the purpose of box culverts is to ensure the protection of road structures and road users.”* (iha kontekstu hakur Estrada, Objectivo husi Box Culvert atu garante proteksaun ba Estrada nia estrutura no ba sira nebe usa Estrada.)

3

## Rationale and development activities

### Present condition

- Bridge Design Manual exists
- Checks for culvert capacity are seldom implemented
- Flooding and overtopping occur during heavy rains
- Roads structures become damaged



### Solution

- Acquisition of knowledge through practical training for planning & design
- Experience of design through conducting case studies of culverts on A05 near Sesurai & Ex-Japan Road near Sarlala
- Development of a technical guideline for culvert planning & design in Timor-Leste

4

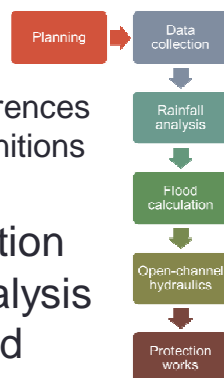
## Contents of draft guideline

### Introduction

1. Scope
2. Normative references
3. Terms and definitions
4. Planning
5. Data collection
6. Rainfall analysis
7. Design flood
8. Open-channel hydraulics
9. Protection works

Glossary

Bibliography



- Annex A: Case study of Sesurai culvert
- Annex B: Training materials
- Annex C: Weather stations in Timor-Leste



7

Design flood (calculation of runoff)

- Rational Method

**7 Design flood**

The calculation of design flood determines the volume of water that will be discharged in catchments during the design period. The design flood determines the required capacity of the structure for calculation of a design flood is shown in Figure 7.1.

**7.1 Catchment area**

A catchment is an area of land that drains to a point of interest, such as a culvert, as shown in Figure 7.2. All water flow that originates inside the catchment area passes the point of interest before going downstream. The watershed is the boundary between a catchment and its neighbor catchment areas of the watershed (boundary) can be identified by considering the surrounding points with elevations, such as mountain summits, ridges, ridges, ridges and spurs as shown in Figure 7.3.

**7.2 Watercourse properties**

Similar to Section 7.1, watercourse properties can be measured with topographical maps, CAD software or GIS. If possible, a request for information should be made to the GIS & Mapping Section of DNPCC.

The watercourse properties required for calculation of time of concentration are the length and the gradient. The length of a watercourse (L) should be measured from the furthest discernible start of a watercourse to the point of interest, as shown in Figure 7.4.

**7.3 Time of concentration**

The time of concentration is required for the calculation of rainfall intensity. The time of concentration is the time for water to flow from the furthest point in the watershed (in the mountain) to the point of interest (at the culvert). Different areas of a watershed contribute to run-off at different times after rainfall begins. Time at which all parts of the watershed begin contributing to the run-off from the basin, as shown in Figure 7.5. The time of concentration is calculated with equation 7.1.

**7.4 Example of the inverse relationship of an intensity-duration curve**

Rainfall intensity is inversely proportional to storm duration for most climates. This inverse relationship means that shorter-duration storms have higher intensity of rainfall and longer duration storms have lower intensity of rainfall, as shown in Figure 7.7.

**7.5 Design intensity of rainfall for maximum probable discharge**

used in Section 7.4, there is insufficient rainfall data to use only for creation of intensity-duration curves, such as Figure 7.7. The Monomath Formula is an empirical equation for estimation of rainfall. It is a practical reference for applications with low rainfall area.

8

Open-channel hydraulics & Protection works

- Capacity checks
- Erosion protection

**8 Open-channel hydraulics**

Open-channel hydraulics is characterized by water flowing under gravity and its characteristics are the water surface being constant with no up or down current. The process of design is shown in Figure 8.1.

**8.1 Design capacity of culverts**

The design capacity of culverts is calculated with equation 11. The design capacity should be more than the design flood,  $Q > Q_d$ .

The following is the equation for calculation of design capacity for culverts:

$$Q = \frac{A^{5/3} S^{1/2}}{P^{2/3} n} \quad (11)$$

where:

- $Q$  design capacity of culvert ( $m^3/s$ )
- $A$  area of flow ( $m^2$ )
- $P$  wetted perimeter ( $m$ )
- $n$  roughness coefficient ( $m^{1/3}$ )
- $S$  gradient of culvert ( $m/m$ )

For culverts, it should be noted that equation 11 is a combination of the equation for discharge and the Manning equation, as shown below in equations 12 and 13, respectively.

The following is the general equation for calculation of discharge:

$$Q = A \times V \quad (12)$$

where:

- $Q$  design capacity of culvert ( $m^3/s$ )
- $A$  area of flow ( $m^2$ )
- $V$  velocity of flow ( $m/s$ ), see equation 13

**8.2 Erosion protection**

Protection works are necessary where erosion can occur. Outlets of culverts are more problematic; erosion is shown in Figure 8.3. Generally, erosion occurs where velocity of flow is high or flow is superficial, see Sections 8.4 and 8.5.

**8.3 Erosion protection**

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A5-142



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## Finalisation of guideline by DNEPCC

- Handover of draft guideline in June 2018
- Collection of feedback from stakeholders
- Amendment of contents based on feedback
- Correction of official names
- Preparation for submission for approval

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Democratic Republic of Timor-Leste  
Ministry of Public Works  
Directorate General of Public Works  
National Directorate of Roads, Bridges and Flood Control

Road Guidelines — Drainage — Culvert Design

Cais de Escofado — Drenagem — Passagem Hidráulica

FDG stage

Warning

This document is not a Timor-Leste Standard. It is distributed for review and comment. It is subject to change without notice and may not be printed or used for publication.

Resumo: Este documento não é uma Norma do Timor-Leste. É distribuído para revisão e comentário. Está sujeito a alterações sem aviso prévio e não deve ser impresso ou usado para publicação.

Document type: Technical Specification  
Document status: Draft  
Document stage: Final Review  
Document language: English

10





# Introduction of Road Guidelines Slope Protection Retaining Wall and Slope Collapse

JCC of CDRS  
26<sup>th</sup> Spt. 2018  
Project Dep. Lourenco Luis

## Contents

- |  |  |
|--|--|
| 1. Scope   | 8. Slope   |
| 2. Normative references                                | 9. Slope Disaster  |
| 3. Terms and definitions                               | 10. Slope Stability<br>Calculation   |
| 4. Investigation                                       | 11. Influence of factors in<br>slope stability<br>calculation formula        |
| 5. Design of Gravity<br>Retaining Wall                 | 12. Design Example of<br>Countermeasure<br>against Shallow Slope<br>Collapse |
| 6. Gravity Retaining Wall<br>in the Common<br>Drawings |  |
| 7. Bearing Capacity                                    |  |

## Annex

Annex A How to Use the Total Station

Annex B How to Use the Dokenbo

Annex C Excel Worksheets for Stability  
Calculation of Gravity Retaining Wall

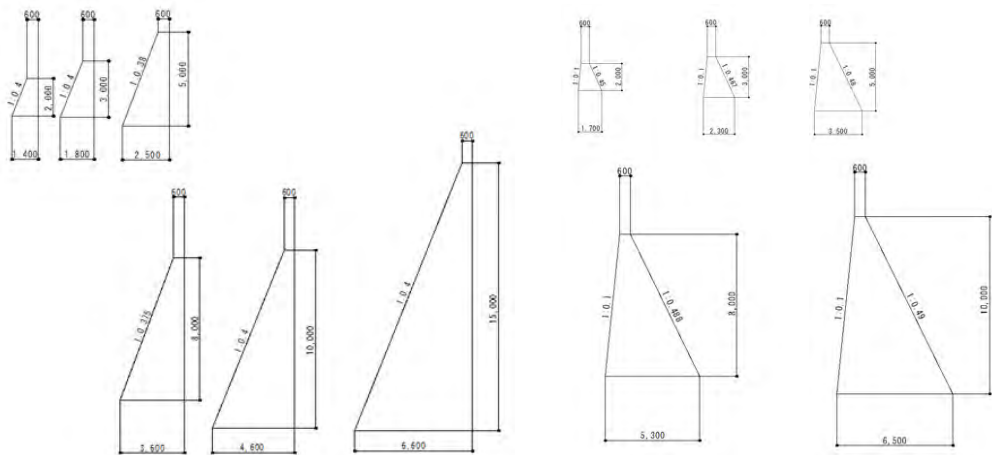
Annex D Excel Worksheets for Slope Stability  
Calculation

Annex E Design Example of Catch Wall

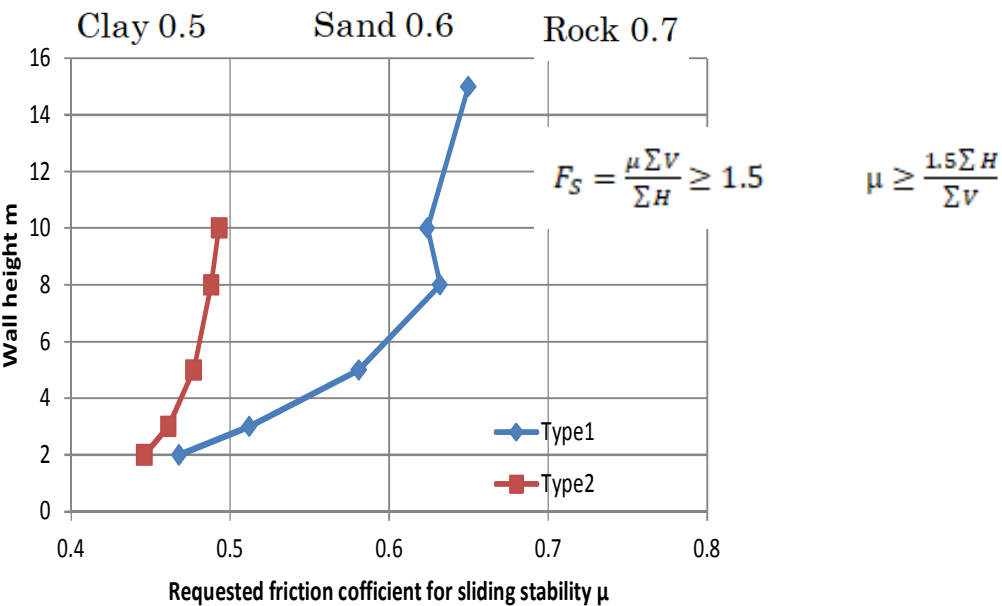
## Dokenbo



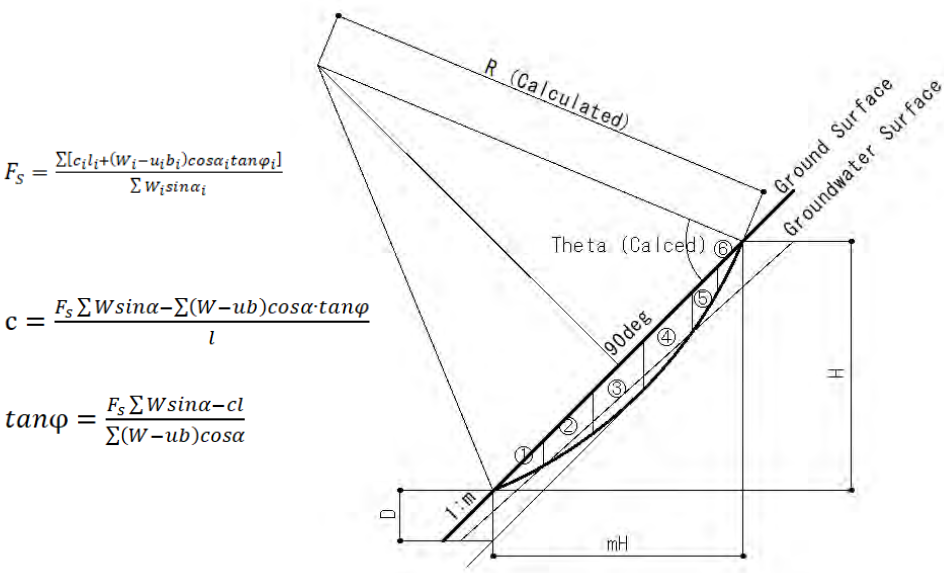
# Gravity Retaining Wall in the Common Drawings



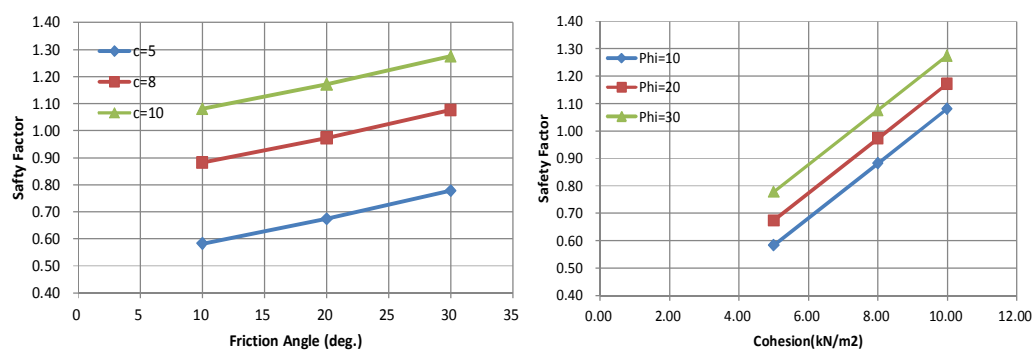
# Sliding Condition



# Slope Stability Calculation



# Influence of Shear Strength to the Safety Factor



Conditions; slope gradient 1:1.0, all saturated (ground water surface equals ground surface),  $\gamma_{sat}=20\text{kN/m}^3$ , size (height=5m, vertical depth=2.07m)



Thank You for Your Attention!



## The Project for Capacity Development of Road Services in the Democratic Republic of Timor-Leste (CDRS)

### Introduction of Landslide Guideline

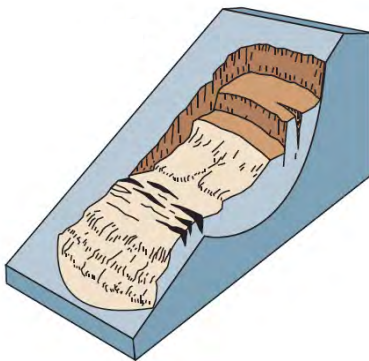
Cristovao da Costa Monteiro ST  
Maintenance Dept. DRBFC

26<sup>th</sup> Sep. 2018

Direstorate of Road, Bridge and Flood Control (DRBFC) of  
Ministry of Public Works, Transport and Communications (MPWTC)  
and JICA Expert Team (JET)

## The contents of Guideline

The guideline introduces the general approach how to investigate the mass movement landslide. The process of the contents is along the case study activity on Aituto Landslide



This is a slide in which the surface of rupture is curved concavely upward and the slide movement is roughly rotational about an axis that is parallel to the ground surface and transverse across the slide.

# 1. How was the landslide found?

The collapse of the slope  
(Aituto landslide)



The crack and deformation



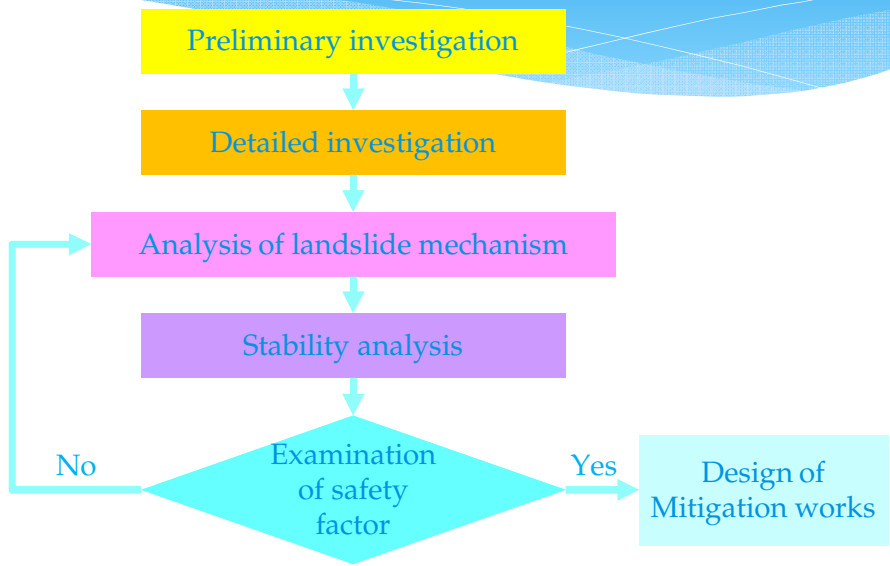
The house crack and deformation



The tree bending



## Flow of investigations



# 1. Preliminary investigation

## 1 Topographic investigation

Purposes of the topographic investigation are to recognize

- (1) The overall topographic feature of the site slopes
- (2) Understanding the topographic characteristics of the site slope
- (3) Estimating the regional geologic structure of the site

Creating a topographical map

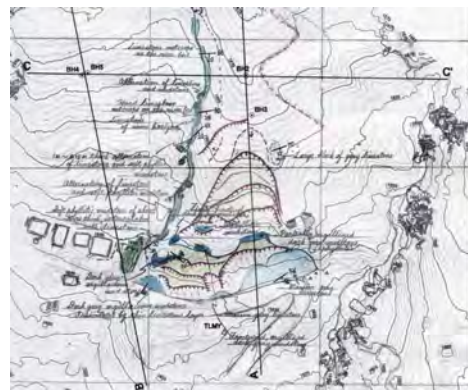


# 1. Preliminary investigation

## 2 Field investigation

Purposes of the field investigation are to

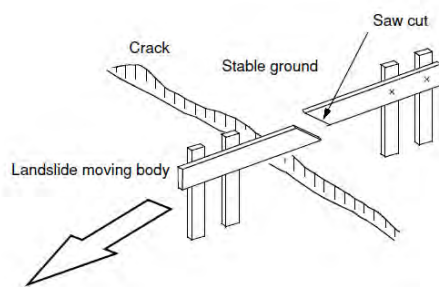
- (1) Understand the aerial extent and a general direction of movement of the landslide
- (2) Assess the geology and geologic structure
- (3) Estimate the cause of the sliding
- (4) Predict future movement



## 2. Detailed investigation

Detailed investigation should be planned by selecting appropriate investigation methods and instruments.

### Simple method to measure movement



Drive stakes across a tension crack along the direction of movement.

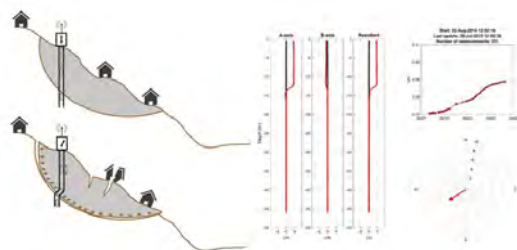
Then attach horizontal board to the stakes, and saw through the board.

Any movement across the tension crack can be determined by measuring the space between the sawed portion of the board.

## 2. Detailed investigation

### Inclinometer Measurement

To detect displacement of the sliding mass, monitoring with the inclinometer is the useful tool. Measurement the inclination of casings with the inclinometer should be performed periodically, and the cumulative displacement of the casing should be analyzed to detect the depth of the surface of rupture.

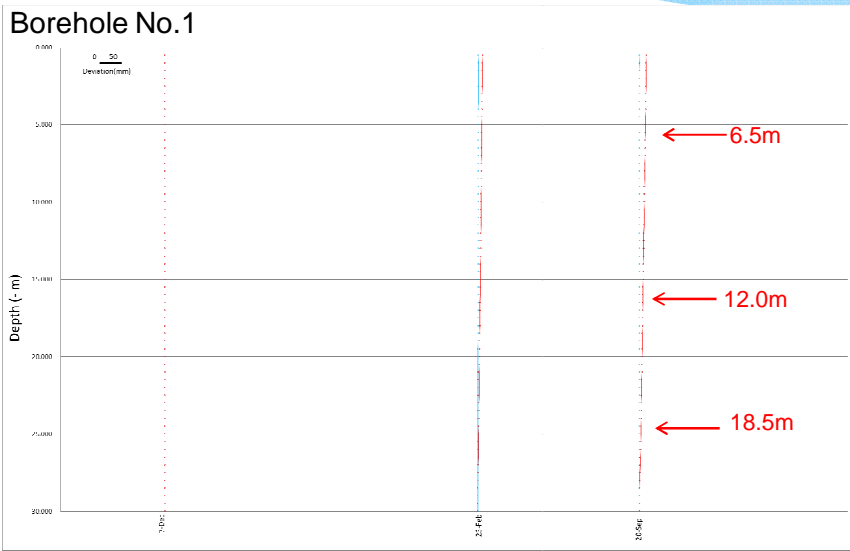


<http://www.irpi.cnr.it/en/focus/ais/>



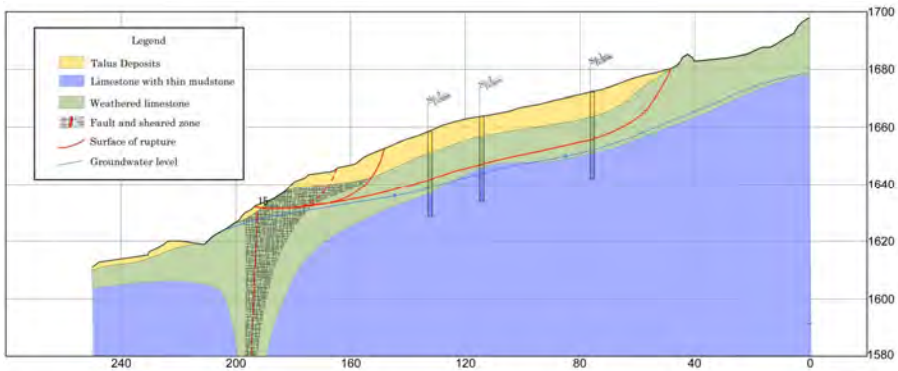
## 2. Detailed investigation

### Inclinometer Measurement

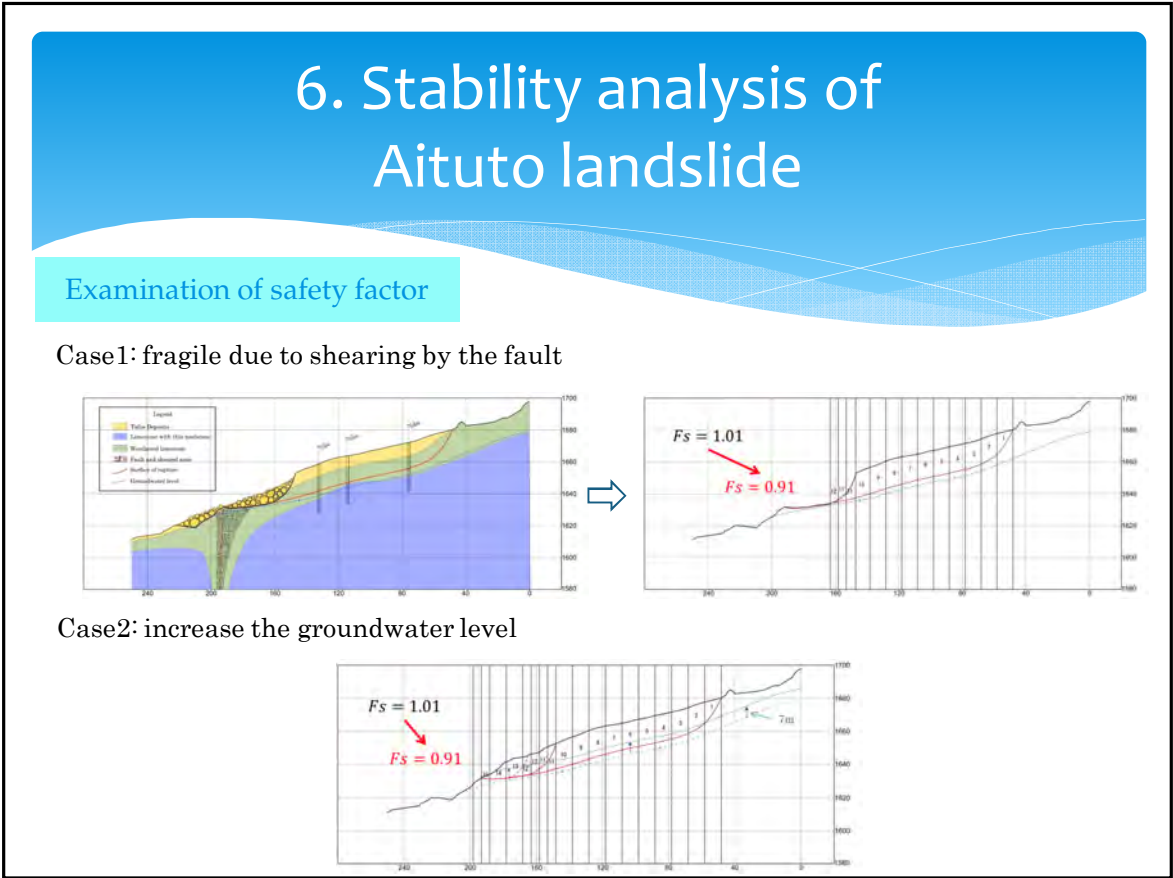
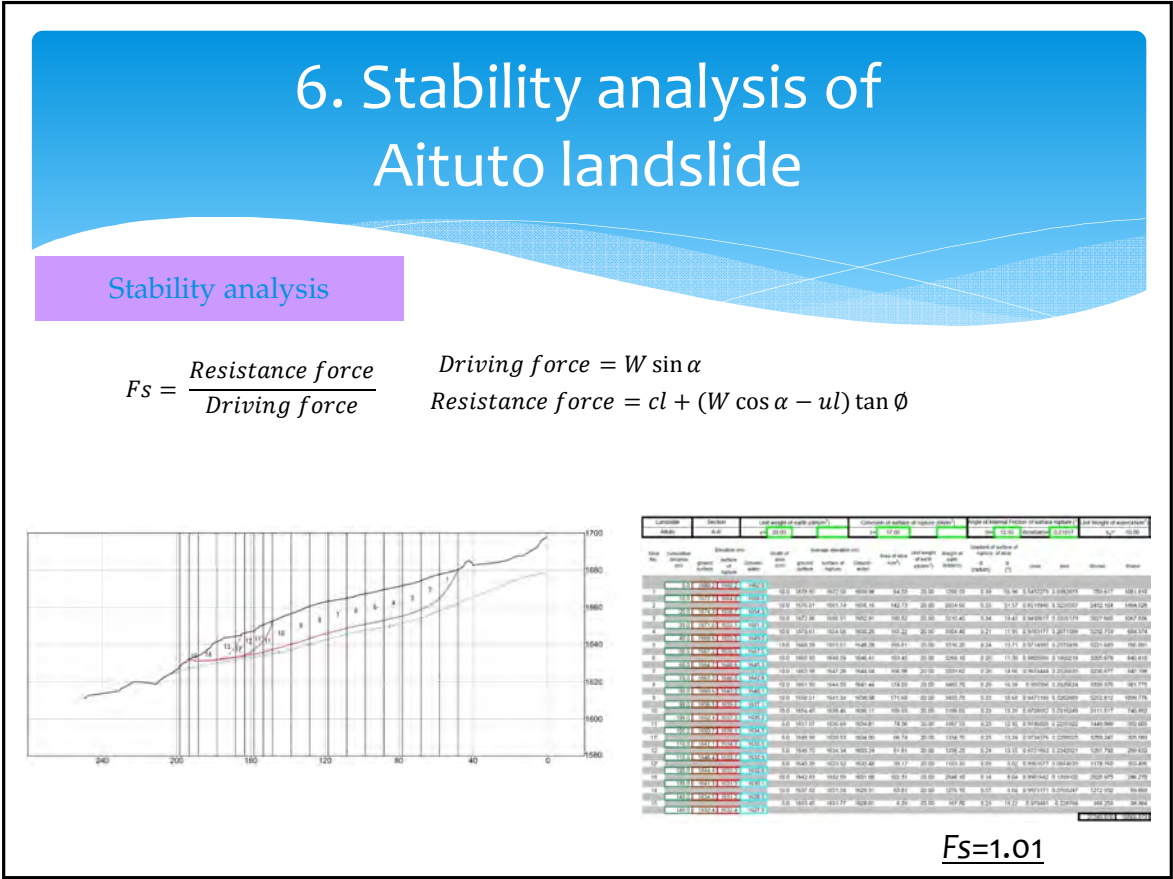


## 2. Detailed investigation

### Analysis of landslide mechanism



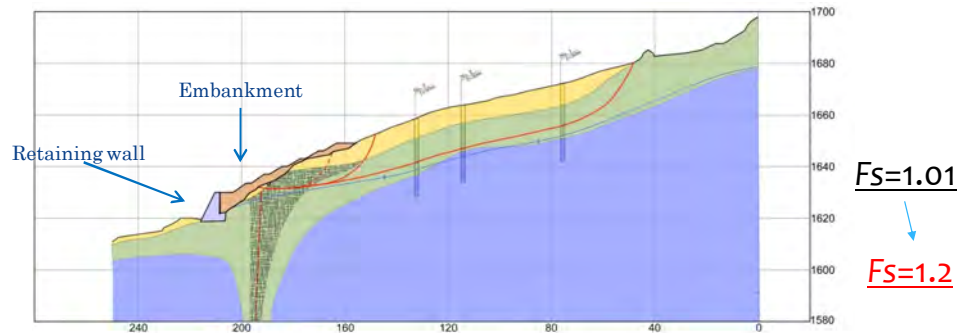




## 6. Stability analysis of Aituto landslide

### Design mitigation works

Sample proposed countermeasure against the collapse



Some countermeasure should be taken in near future to avoid the occurrence of the collapse. And it is also very important to continue monitoring with the inclinometer.



The Project for Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste (CDRS)

## *Check List for Construction*

Eng. Sabino Da Costa Ventura, Region 4 of  
Maintenance Dept., DRBFC

on 26<sup>th</sup> September 2018 & at 4<sup>th</sup> JCC (Joint Coordination Meeting)

Direstorate of Road, Bridge and Flood Control (DRBFC) of  
Ministry of Public Works (MOP) and JICA Expert Team (JET)

1

### Content of presentation for “Check List for Construction”

*There are two part;*

*Part One*

*Case Study*

#### I: *Report* of C/S activities using Check List

1. “Safety Patrol by DRBFC”, at pilot site on Ex-Japan Road
2. OJT using “Check List” on the site of “Emergency Works,  
Humboe-Letefoho, Ermera on A10”

*On the Job Training*

*Part Two*

#### II: *Plan* for usage of Check List

1. Continue OJT on the site of Emergency Works
2. Review and making good “Check List” version 0\_June 2018
3. Further utilizing and diffusing “Check List”

2

## I: *Report* of C/S activities using Check List

### 1. “Safety Patrol by DRBFC”, at pilot site on Ex-Japan Road

1<sup>st</sup> site “Safety Patrol” held on 26 June, 2018



1st Coordination Meeting of site Safety Committee with Contractor  
were held  
at the conference room of DRBFC, Dili;

3



STA 18+300, Footway construction  
using precast concrete block,  
(constructed by “SunRise” management  
by “NTN”)



STA 7– 8km, Stone Masonry Retaining Wall  
(Constructed by “Mejori” management by  
“Jonise”)

*And,  
2<sup>nd</sup> Safety Patrol by DRBFC were carried out on 19 September 2018*

4



Using Check List for “ Safety Patrol”

② Check List for Safety Patrol

(4. Daftar Periksa untuk Patroli Keselamatan)

(Nama Proyek)

Section of Contract/work item: Stone Masonry Retaining Wall

Date : 26/06/2018

(Isim Kontrak /item Pekerjaan: )

(Tembok Penahan)

(Tanggal)

Name of Contractor: Mijori

Location : ② STA 71 - STA 84000

(management by Jonise)

Name of Inspector (Nama Inspektur) : Julius Lufahy

Sub base course

No.	Check Items	Judgements	Standards	Remarks
(Item Pemeriksaan)	(Penilaian)			(Keterangan)
	Participants and interval of "Safety Patrol"			
	(Peserta dan interval dari Patroli Keselamatan)			
①	Have you received "Announcement" of today "Patrol"?	Yes No		
	(Subjek dan waktu menerima "Pengumuman" mengenai "Patroli" hari ini?)	(Ya) (Tidak)		
②	DRBFC staff in charge, attend the Patrol?	Yes No		
	(Staf DRBFC yang bertanggung jawab, menghadiri Patroli?)			
③	Contractor's staff in charge, attend the Patrol?	Yes No		
	(Staf Kontraktor yang bertanggung jawab, menghadiri Patroli?)			
	Inspection Points for Safety			
	(Poin Inspeksi untuk Keselamatan)			
④	Workers wear safety helmets ?	Yes No		
	(Pekerja menggunakan helm keselamatan?)			

Check List is like this, checking points are printed and Judgment/ comments shall be recorded on the site

5

1. "Safety Patrol by DRBFC", at pilot site on Ex-Japan Road

Using Check List for “ Safety Patrol”

	Finding out Dangerous points		
	(Menemukan titik titik berbahaya)		
1)			Near the slope very steep (Dangerous).
2)			
3)			
	Instructions and expecting counter-measures (if any)		
	(Instruksi dan ekspektasi untuk Penanggulangan (Jika ada))		
1)	→ Using marker		
	→ Watering		
2)	→ Put Signal Board		
	→ Helmet		
3)	→ safety wear color vests		
	→ Temporary police line in dangerous area		
	(Warning Board)		
Overall comments:			
(komentar secara keseluruhan)			

The Contractor must Watering for dusty condition

Dangerous points and Instructions / counter measures will be remarked!!

All workers should wear Safety Helmet

6



2. OJT using “Check List” on the site of “Emergency Works, on the site of Humboe-Letefoho, Ermera on A10”



At STA 13km near existing Bridge, Stone Masonry Retaining Wall OJT held on 28 June 2018



STA 13km, Stone Masonry Retaining Wall are inspected for completed part **OJT using the Check List** held on 12 September 2018

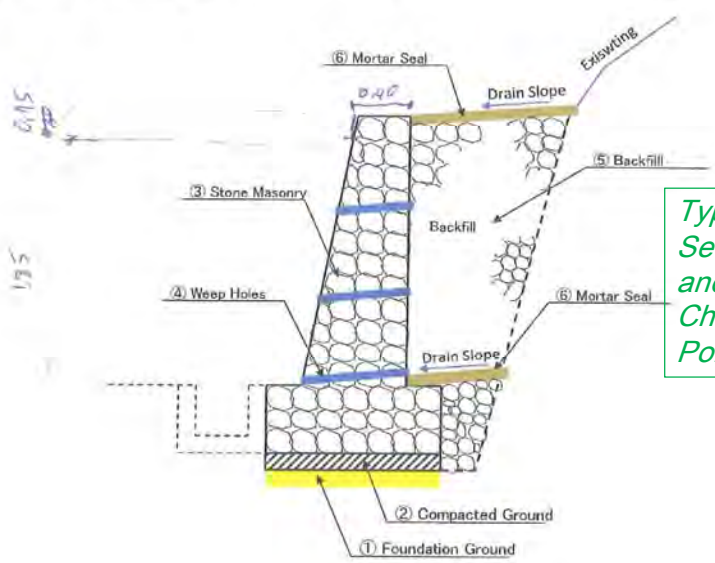
7

2. OJT using “Check List” on site of “Emergency Works, on the site of Humboe-Letefoho, Ermera on A10”

CHECK LISTS

Stone Masonry Retaining Wall

1/2



1/3

Typical Cross Section and Checking Points

8

2. OJT using “Check List” on site of “Emergency Works, on the site of Humboe-Letefoho, Ermera on A10”

Using Check List for “ Stone Masonry Retaining Wall”

2/3

Check point  
No. @

Name of Project:		Emergency Works Humboe-Letefoho Road			
Location:		STA. +13+500 STA. +			
Date:		14/06/2018			
Inspector:		AGUSTIN HO ATADO PEG-IV MAINTENANCE			

No.	Check Items	Judgements		Standards	Remarks (Printed figure is reference only)
①	Preparatory activity				
	Did you confirm the drawings?	Yes	No		
	Did you confirm the construction work plan?	Yes	No		
①	Foundation Ground				
	Is strength of bearing ground sufficient?	Yes	No		
	If No, was the replacement of soft ground appropriate?	Yes	No		Replacement, Thickness=80cm
②	Compacted Ground				
	Did you use the compactor for compaction?	Yes	No		No need

For instance; Typical Section of Retaining Wall is shown, but location and length of Wallis are not shown

2. OJT using “Check List” on site of “Emergency Works, on the site of Humboe-Letefoho, Ermera on A10”

CHECK LISTS Stone Masonry Retaining Wall 2/2

③	Stone Masonry				
	Was Stone material appropriately?	Yes	No	150mm ≤ Stone thickness < 225mm	CHECK ALREADY
	Was cement mortar composed appropriately?	Yes	No	Cement 1 : Sand 3	
④	Weep Holes				
	Was diameter of weep hole appropriate?	Yes	No	dia 100mm	
	Were Weep Holes laid out appropriately?	Yes	No	Interval 1m	
⑤	Backfill				
	Did you check the backfill material?	Yes	No	Crashed stone 15 DKE	
	Has the compaction been carried out properly?	Yes	No	Vibrating Compac	
	Did you confirm the soil density test results?	Yes	No	N/A	
	Did you confirm the compacted thickness?	Yes	No	N/A	
⑥	Backfill				
	Did you check the thickness of mortar seal?	Yes	No	100mm	
	Was cement mortar composed appropriately?	Yes	No	Cement 1 : S	

To mark the answer (Yes/No) and to write Notes and Remarks

3/3

MR. ATADO 12/09/2018

2. OJT using "Check List" on site of "Emergency Works, on the site of Humboe-Letefoho, Ermera on A10"



STA 18km (near Letefoho); Existing bridge had been destroyed by Flash Flood. RC pipe on site were inspected on OJT held on 28 June 2018



STA 18km; 2 ×  $\phi$ 1200mm Pipe Culvert has been completed as a Variation. OJT & inspection are carried out on 12 September 2018

Using Check List for "Pipe Culvert"

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II: *Plan* for usage of Check List

1. Continue OJT on Emergency Works

- 1) Some works items are still continued at Emergency Works. So, OJT for using Check List for Construction can be done.
- 2) OJT are to be carried out on construction sites under supervised by DRBFC.

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II      Plan for usage of Check List

2. Review and making good “Check List”  
version 0\_June 2018

1) Review of site OJT and discuss about the “List”, and  
make the room for improvement of “Check List for  
Construction”

2) After brushing up and add required sheets, and  
Version 1of “Check List for Construction” will be issued

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Check List for Construction

Version 1\_October 2018

Earth Work

Excavation

EmbankmentAggregate Surface Course (Crushed Aggregate Course on Existing Pavement)Widening of Embankment

Small Structures

Pipe Culvert

Stone Masonry DrainageStone Masonry Retaining WallConcrete DrainageGabion Mat

Box Culvert

Road Pavement works

Base Course and Sub-base Course

Asphalt PavementOverall Checking PointCheck Points of Daily Quality Control on SiteCore Sampling Test

Safety Control

Daily Safety Checking

Regular Safety ActivitiesSafety organization and managementCheck List for Safety Patrol

Tender and Inspection Document

Tender document

Daily, Interim payment and Final InspectionDrawing

Draft of proposed  
content of Check  
List\_2018.09.16

Red : Revise and/or  
Add from  
Version0\_June 2018

14

## II Plan for usage of Check List

### 3. Further utilizing and diffusing “Check List”

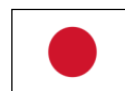
- 1) To make it more understandable List on the site supervision, description by Tetun words might be need if so requested
- 2) More practice / OJT of using “Check List for Construction” are carried out and its practice results will be feedback for brushing up the “Check List”

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☆Thank you Very Much  
&  
Obrigado Barak !!

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**The Project for  
the Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste**

		By	Time
1	Opening speech	MOP	9:30-9:40
2-1	Project activities up to date	JICA Expert Team	9:40-10:00
2-2	Database for road maintenance and rehabilitation activities	Maintenance Department, NDRBFC	10:00-10:15
2-3	Checklist for construction	Construction Department, NDRBFC	10:15-10:35
2-4	Technical guidelines	JICA Expert Team	10:35-10:40
2-5	Report on Workshop	JICA Expert Team	10:40-10:50
3	Evaluation of project and review of project activities plan	JICA Expert Team	10:50-11:10
4	Open discussion for the Project	All	11:10-11:40
5	Comments by JICA	JICA Representative	11:40-11:50
6	Conclusion and Closing remarks by MOP	MOP	11:50-12:00



**The Project for  
the Capacity Development of Road Services  
in the Democratic Republic of Timor-Leste**

**5th JCC  
March 2019**



**Ingerosec Corporation**

**Earth System Science Co., Ltd.**

# Contents

## **1. Project outline**

## **2. Project activities up to date**

- 1. Case studies**
- 2. Database**
- 3. Checklists**
- 4. Guidelines**
- 5. Workshop**

## **3. Evaluation of project and review of project activity plan**

3

## **1. Project Outline**

---

4

## Project Target and Outputs

Item	Description
Project Title	The Project for the Capacity Development of Road Services (CDRS)
Project Duration	March 2016~December 2019 (45 month)
Project Site	Whole National Roads in Timor-Leste
Implementing Agency	Ministry of Public Works, Transport and Communications (MPWTC)
Target Group	Directorate of Road, Bridge and Flood Control (DRBFC)
Overall Goal	The maintenance conditions of major roads are improved in TL.
Project Purpose	Capacity of DRBFC for maintenance of major roads in the whole country is enhanced.
Outputs	1. Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and budget plan 2. Capacity of DRBFC construction management for maintenance and rehabilitation including slope protection is improved through case studies in the whole country 3. Technical guideline of investigation and design for maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection

5

## Project Outputs and Indicators

### <OUTPUT 1> Improve Road Maintenance Cycle



- 1-1. Over 30% of requested budget for road maintenance are distributed.
- 1-2. Improved road database is utilized for preparing the annual work plan of road maintenance.

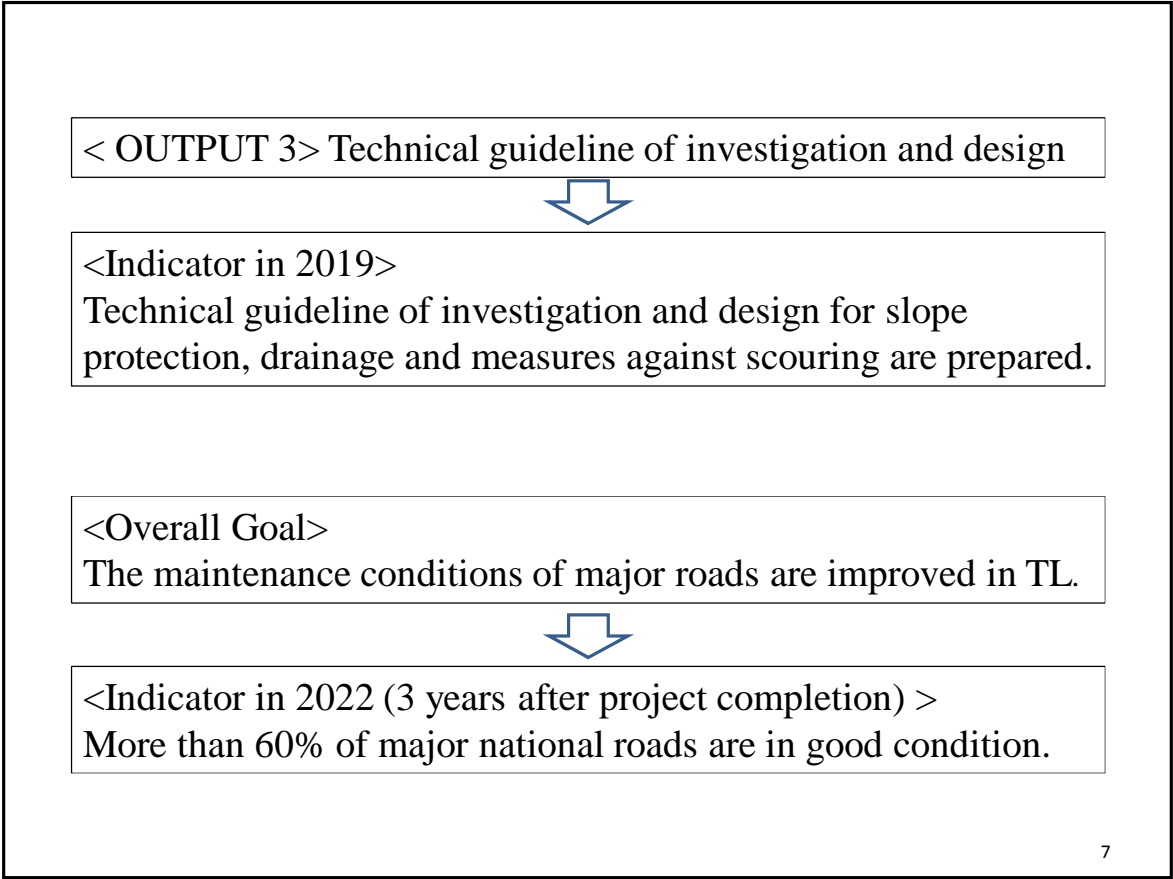
### <OUTPUT 2> Improve Capacity of DRBFC Construction Management for maintenance and rehabilitation



#### <Indicator in 2019>

- 2-1. At least 6 case studies for construction and for design are conducted.
- 2-2. Over 60 % of trainees pass the achievement test for construction supervision and design.

6



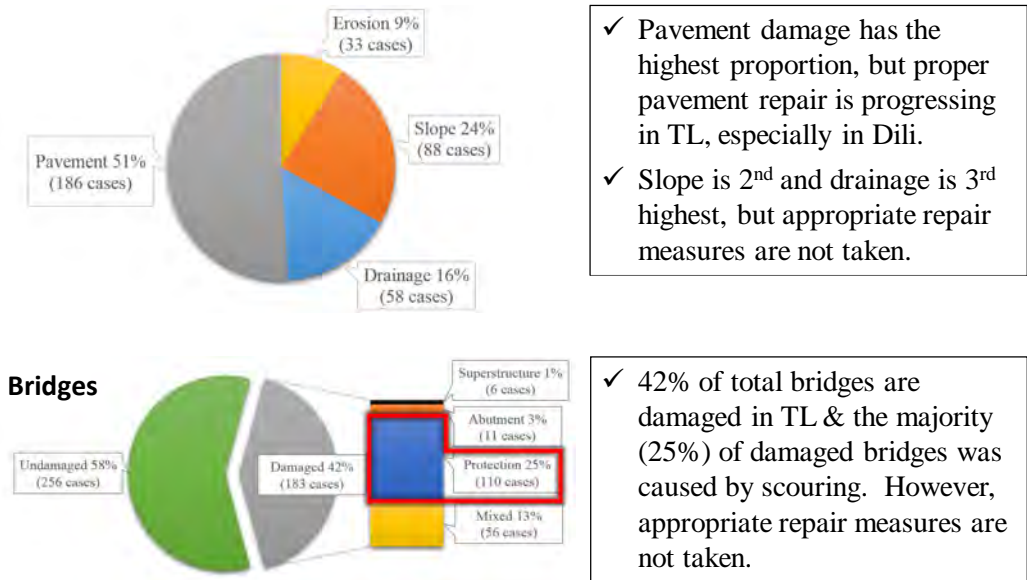
## 2. Project activities up to date

8

2-1. Project activities up to date

Baseline survey

1) Causes of road and bridge failures



9

2) Cases of road and bridge failures



Pavement failure on A05 due to the lack of roadside ditch



Cut & embankment slope failure on A02 due to the heavy rain and lack of slope protection



Embankment slope failure on A07 due to the unsuitable foundation material and lack of compaction



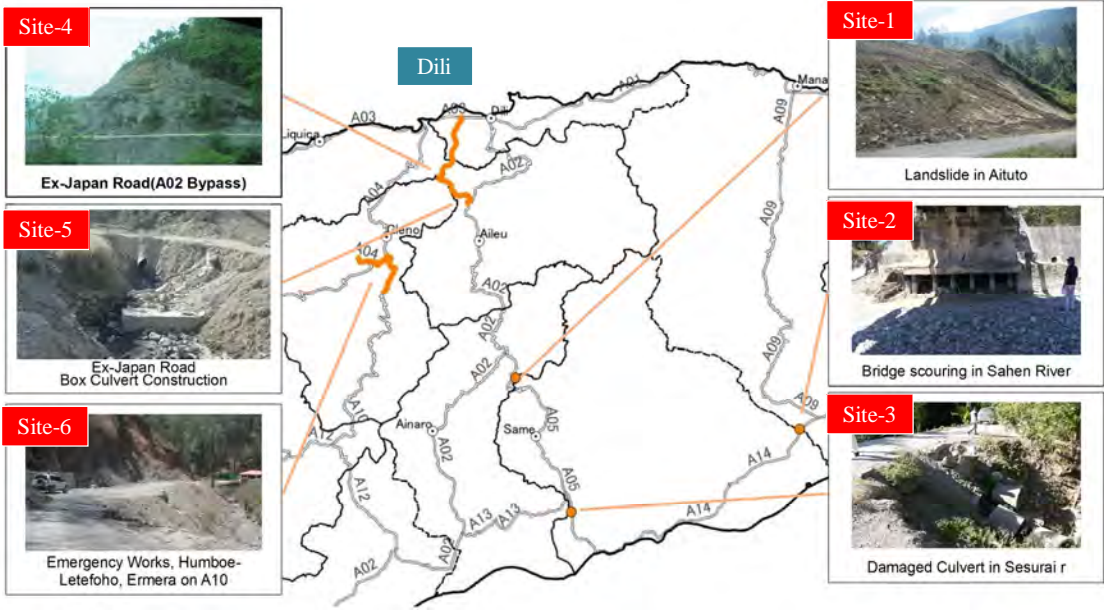
Scouring of bridge substructure on A14 due to severe river flow and lack of protection

10



Case study activities

Case study sites



11

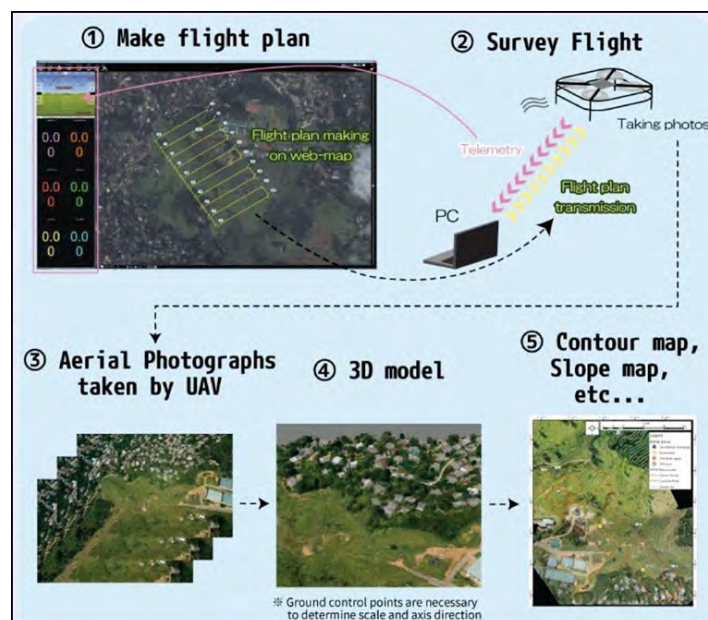
Activities to improve the capacity for surveying and design of slope protection

- Site-1: Landslide in Aituto
- Geotechnical boring and topographic survey
  - Monitoring of slope mass movement
  - Analysis of field survey data
  - Propose appropriate and applicable measures



12

### Topographic survey and mapping using Unmanned Aerial Vehicle (UAV)



13

### Activities to improve the capacity for surveying and design of protection against bridge scour

#### Site-2: Bridge scouring in Manatuto

- Topographic survey
- River flow analysis
- Propose appropriate or applicable measures
- Technical advice on basic design



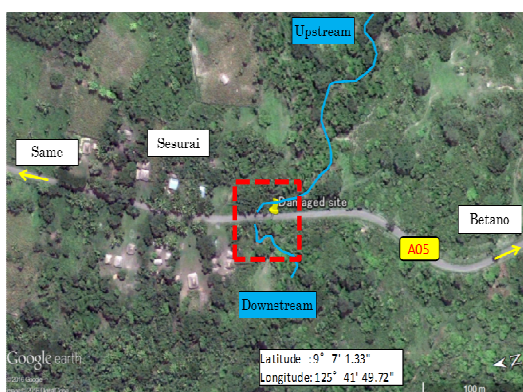
14



## Activities to improve the capacity for surveying and design of drainage

### Site-3: Damaged culvert in Manufahi

- Topographic survey
- Catchment area & discharge volume analysis
- Culvert capacity calculation
- Technical advice on the basic design checks



15

## Activities to improve the capacity of construction management for maintenance and rehabilitation

### Site-4: Construction supervision on Ex-Japan Road

- Quality control
- Progress control
- Safety control



16

### Activities to improve the capacity for design of drainage and the capacity of construction management

Site-5: Box culvert planning, design and construction supervision on Ex-Japan Road

- Check of box culvert size
- Construction supervision using “Checklist”



17

### Activities to improve the capacity of construction management for maintenance and rehabilitation

Site-6: On-the-job training for construction supervision on Emergency Works site on A10, Humboe-Letefoho, Ermera

- Quality control using “Checklist”
- Safety control using “Checklist”



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2-2. Database of maintenance activities

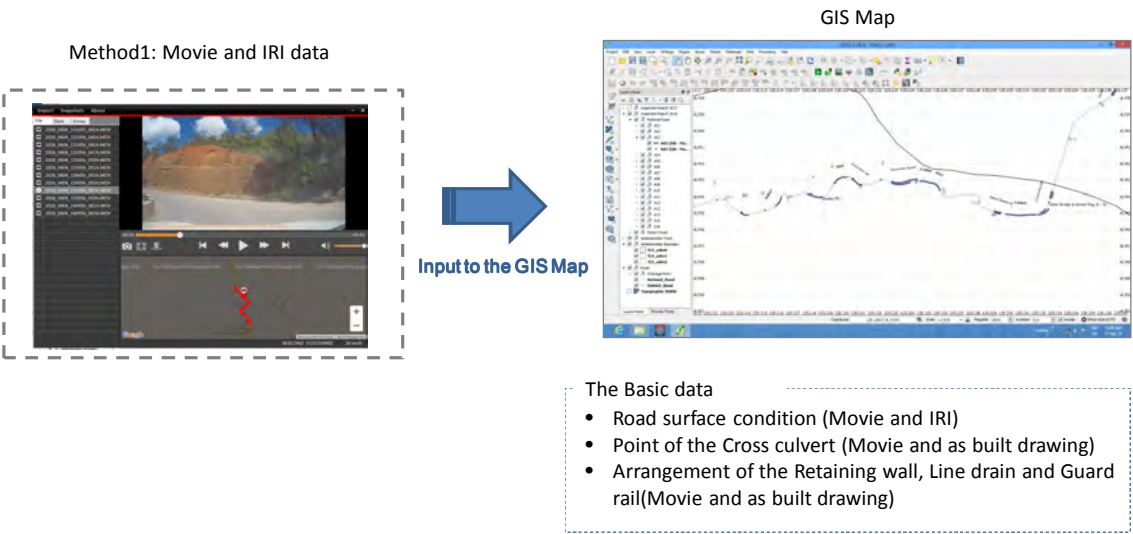
Database for road maintenance  
and rehabilitation activities

- Session1: Activities regarding GIS database and Cost estimation
- Session2: IRI data activity

Direstorate of Road, Bridge and Flood Control (DRBFC) of  
Ministry of Public Works, Transport and Communications (MPWTC)  
and JICA Expert Team (JET)

Session1: Activities regarding GIS database and cost estimation

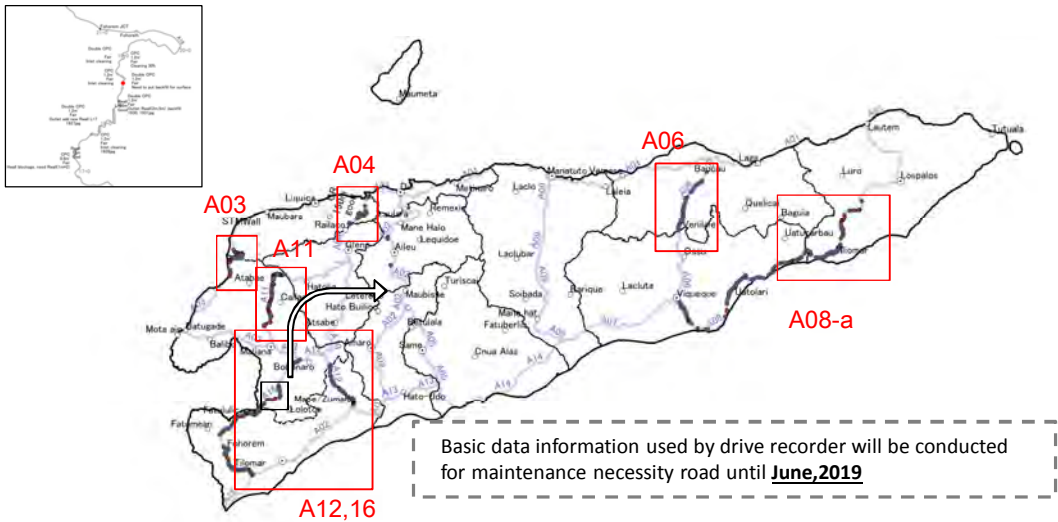
- Step 1: (Preparation activity)  
The basic data will be input to GIS Map from Drive Recorder





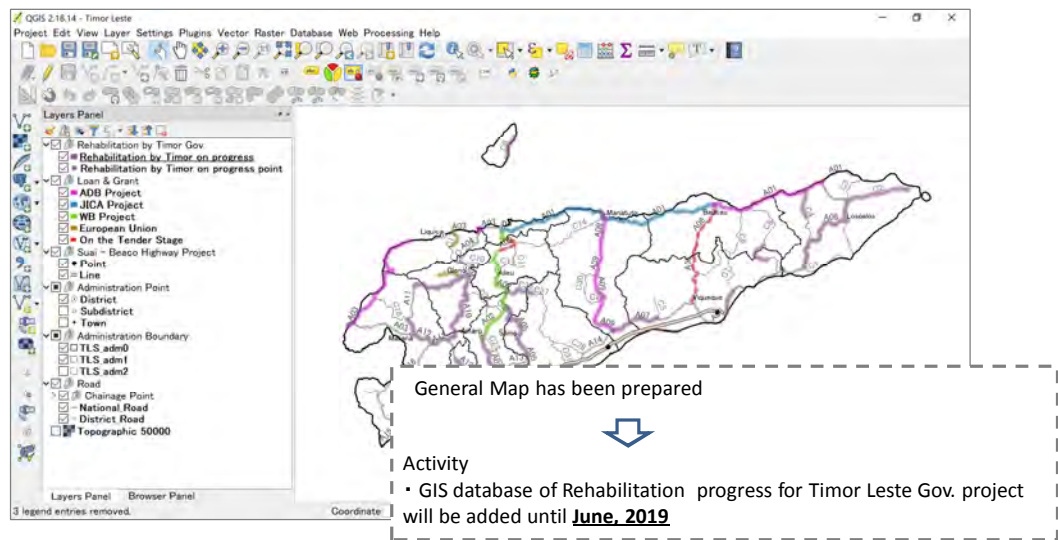


The Progress of GIS database for Maintenance



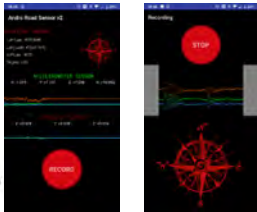
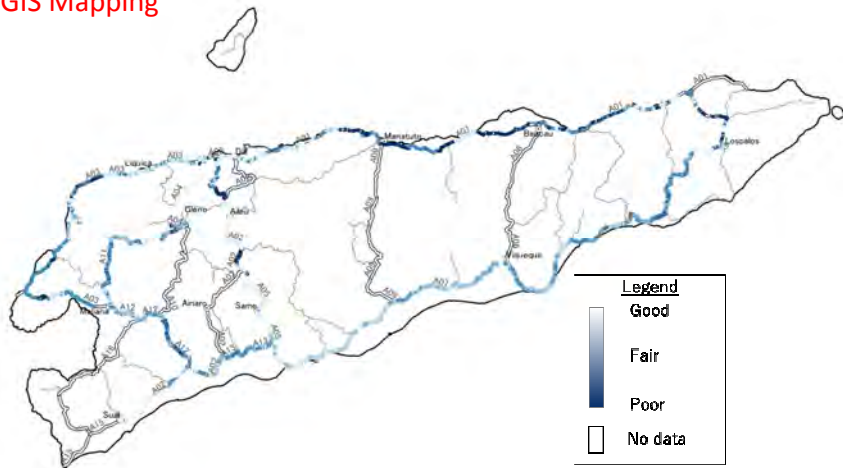
23

GIS database of road rehabilitation progress prepared by GIS section, project department



Introduction of IRI activity

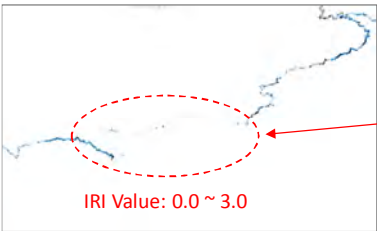
GIS Mapping



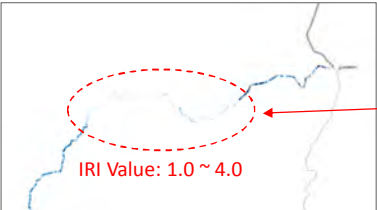
A screen shot of android application which we developed

GIS Mapping

Sample of Classification in Paved Road



New Paved Road

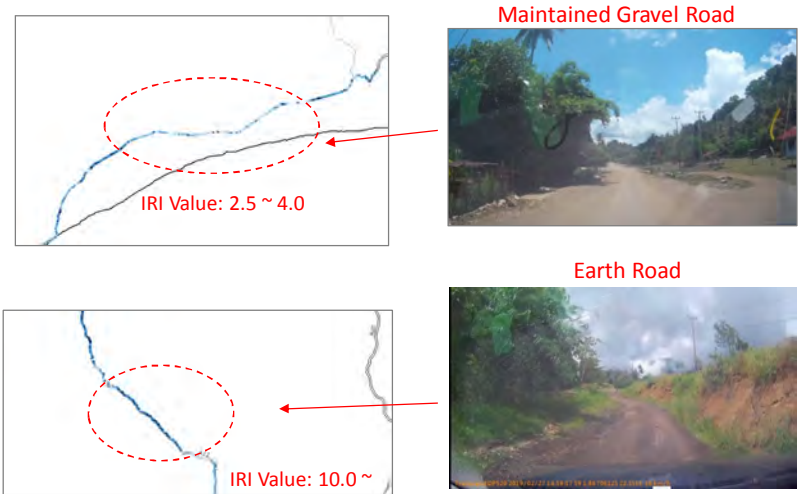


Existing Paved Road



# GIS Mapping

## Sample of Classification in Unpaved Road

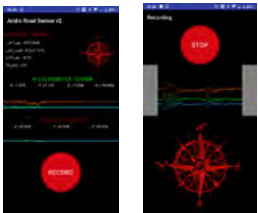


# System proposal for IRI Data acquisition and GIS Mapping in the future

- The smartphone system is developed by Gifu University  
Graduate School of Natural Science and Technology, Department of Intelligence Science and Engineering, Information Science, Fukai-Lab,
- The system developer is Mr. Frederico Soares Cabral  
Faculty of Engineering, [National Univ. of Timor-Leste, TIMOR-LESTE](#)



Proposal:  
This activity will be Collaborated with DRBFC



A screen shot of android application which we developed

## 2-3. Checklist of construction

### *Checklist for Construction*

Eng. Nazario De Jesus Freitas,  
Construction Department, DRBFC

Direstorate of Road, Bridge and Flood Control (DRBFC) of  
Ministry of Public Works (MOP) and JICA Expert Team (JET)

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### Content of presentation for “Checklist for Construction (CL)”

1. Objective of Checklist for Construction
2. Application of CL work item & user
3. Content of CL \_ March 2019
4. Report of On-the-Job Training (OJT) using CL
5. Finalizing and Dissemination of CL

30



## 1. Objective of Checklist for Construction

One of objective of the CDRS Project is the improvement of capacity of DRBFC construction management for maintenance and rehabilitation Works.

There is lack of the tool like a “Checklist for Construction”, effective references, for daily supervising works on sites.

So, “Checklist for Construction” has been drafted and issued for an effective small booklet, as simple technical navigation and one of supporting material, for construction supervising on the site.

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## 2. Application of CL work item & user

CL consists of three fields ; I. Quality Control (QC), II. Safety and III. Construction Management

- 1) Checklists for QC is very simple and focusing essential check point on the site. So even junior staff of the Works can be use it and can instruct the Contractor properly and easily.
- 2) Checklist for Safety can be used by **all personnel** who are engaged and responsible for construction works.
- 3) Checklist for Construction Management, they are used when “Procurement” of the Works and “Evaluation” for the works accomplished are required to DRBFC officers according to the Contract

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3. Content of CL \_ Version-2

Preface	
1. Objective	40_Road Pavement works
2. Application of Check List	41_Base Course and Sub-base Course
3. Utilization of Check List for Construction	42_Aspphalt Pavement
4. Dissemination	Design and specification
	Check Points of Daily Quality Control on Site
	Core Sampling Test
I. Quality Control	
10_Earth Work	II. Check List of Safety Control
Excavation	10_Daily Safety Checking
Embankment	20_Regular Safety Activities
Aggregate Surface Course	30_Safety organization and management
(Crushed Aggregate Course on Existing Pavement)	40_Check List for Safety Patrol
Widening of Embankment	III. Check List of Construction Management
20_Small Structures	10_Tender document
Pipe Culvert	(Drafting; reference only)
Stone Masonry Drainage	20_Interim/Final Inspection for the works done
Stone Masonry Retaining Wall	30_Drawing
Concrete Drainage	
Gabion Mat	
30_Box Culvert	References; Quality Control Plan

4. Report of On-the-Job Training (OJT) using CL



Ph1: STA0+300 A10 from Humboe JCT, Stone Masonry Retaining Wall is constructing.



Ph2: Ditto but using, CL(Checklist)\_SM Retaining Wall sheets. Inspecting according to each “check item” of the sheet.

**OJT (1), using “Checklist for Construction” by DRBFC’s Trainer on Emergency Works. A10 Ermera**

CHECK LISTS

(LISTA VERIFIKASAU)

Stone Masonry Retaining Wall

(Muru Retensaun ho Fatuk)

1/2

CL SM Retaining Wall

Edisi 20150223

OJT CL for proposed site No.1 & No.2

CHECK LISTS for Stone Masonry Retaining Wall

(LISTA VERIFIKASAU ba Muru Retensaun ho Fatuk)

Name of Project: Emergency water harness for Lefalehu

(Naran Projeitu):

Location: A10 Highway Lefalehu

(Patin):

Date: 21/12/2019

(Data):

Name of Contractor: Bafutli

(Naran Kontraktar):

Location: STA km 01300 km

(Patin):

Name of Inspector: Domingos D. S. B.

(Naran Inspektor):

Name of Department: Eng. of Maintenance Div.

(Naran Departamentu):

SPC: Standard Specification of MPWTC-Nov2014 Edition

(Sedraun spesifikasau baui MOP-Edisiun Nov2014)

No.	Check Items (Verifika Itens)	Judgements (Seleksiun No.)	Specification (Seleksiun No.)	Remarks (Observasun)
①	Preparatory activity (Aktividade preparatoriu)			
	Did you confirm the drawings? (Ita bo'ot komfina ona desenhu?)	Yes	No	Original drawings on bed difference. Alteration in the
	Did you confirm the construction work plan? (Ita bo'ot komfina ona plano servisu konstruasun nian?)	Yes	No	
②	Foundation Ground (Landasan Fondasi)			
	Is strength of bearing ground sufficient? (Resistensia bantalan tanah suficiente?)	Yes	No	For the plan design, no surface and after works. Use 2800 kg/cm². Surface is very strong.
	If No, was the replacement of soft ground appropriate? (se lae, truka rai mamar ne'e apropriado ka?)	Yes	No	Replacement thickness 100cm (Substituisun, mamar - 100cm)
③	Compacted Ground (Rai compactado)			
	Did you use the compactor for compaction? (Ita bo'ot utiliza Compactor ba compactado?)	Yes	No	Not Applicable because cutting area.

CHECK LISTS for Stone Masonry Retaining Wall

(LISTA VERIFIKASAU ba muru retensaun ho fatuk)

2/2

CL SM Retaining Wall

Edisi 20150223

OJT CL for proposed site No.1 & No.2

CHECK LISTS for Stone Masonry Retaining Wall

(LISTA VERIFIKASAU ba muru retensaun ho fatuk)

Name of Project: Emergency water harness for Lefalehu

(Naran Projeitu):

Location: A10 Highway Lefalehu

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(Data):

Name of Contractor: Bafutli

(Naran Kontraktar):

Location: STA km 01300 km

(Patin):

Name of Inspector: Domingos D. S. B.

(Naran Inspektor):

Name of Department: Eng. of Maintenance Div.

(Naran Departamentu):

SPC: Standard Specification of MPWTC-Nov2014 Edition

(Sedraun spesifikasau baui MOP-Edisiun Nov2014)

No.	Check Items (Verifika Itens)	Judgements (Seleksiun No.)	Specification (Seleksiun No.)	Remarks (Observasun)
③	Stone Masonry (Fatuk / Pasangan batu belah)			
	Was Stone material appropriately? (Material huanan fatuk sira ne'e apropriado ka?)	Yes	No	100mm ± Stone thickness, 225mm according standard specification.
	Was cement mortar composed appropriately? (Komposu sementi mortar ne'e apropriado ona ka?)	Yes	No	Cement 1 : Sand 3 (Sementi 1 : Pasir 3) (Not check it) So scope & I cannot confirm.
④	Weep Holes (Lubang cucuran)			
	Was diameter of weep hole appropriate? (Lubang cucuran nia diameteru apropriado ona ka?)	Yes	No	dia 100mm Not yet
	Were Weep Holes laid out appropriately? (Lubang cucuran koloka ho lokos ona ka?)	Yes	No	Interval 1m (Intervally 1 m) Not yet.
⑤	Backfill (Timbunan)			
	Did you check the backfill material? (Ita bo'ot verifika ona material timbunan ka?)	Yes	No	Graded stone (Fatuk bera) Not yet.
	Has the compaction been carried out properly? (compactasun halo ho lokos ka?)	Yes	No	Vibrating Compactor 40~60kg (Kompaktasun Vibrasun)
	Did you confirm the soil density test results? (Ita bo'ot komfina ona rezultadu teste densidade rai ka?)	Yes	No	N/A Not Applicable.
	Did you confirm the compacted thickness? (Ita bo'ot komfina ona compactasun nia mamar ka?)	Yes	No	N/A Not Applicable.
⑥	Mortar Seal (Mortar pengunci)			
	Did you check the thickness of mortar seal? (Ita bo'ot verifika mortar seal nia mamar ka?)	Yes	No	100mm Not Applicable.
	Was cement mortar composed appropriately? (Sementi mortar nian komposu apropriado ona ka?)	Yes	No	Cement 1 : Sand 3 (Sementi 1 : Pasir 3) Not yet.

\* Note, Remark and/or Comment <Optimal column for only OJT (1) & (2)>

Check Confirmation Real with Eng. Owner Project with any comparison about the check item No. 3 for the cement mortar composed. Jakman Panyia Approva Heni Epec by

Inspector (Trainee): (Signature/date) 21/12/2019  
Inspected by (Name) Domingos D. S. B.  
(Department) Eng. of Maintenance Div.  
Trainer: (Signature/date)  
Checked by (Name) Eng. Nazario Da Jesus Freitas/  
Eng. Sabino Da Costa Ventura  
(Department):

\* Record of recognition for the inspection

Rep. of Contractor (date/sign)	Inspected by (date/signature)	Checked by (date/signature)	Testified by (date/signature)
(Representante huantraktar)	(Inspeksiunado por)	(Verifika hui)	(Testemunha hui)
name: Title & Contractor's name:	Domingos D. S. B. Inspector's name: Department of DRBFC:	name & title of Department:	name & title of DRBFC:



Using “Checklist for Safety Patrol” on the occasion of C/S  
Safety Patrol by DRBFC and the contractors



Ph-3: 2<sup>nd</sup> Safety Patrol by site Safety Committee, including Contractor in charge of the works, using Checklist for “Safety Patrol” : Inspection site: STA 7 – 8km of Ex-Japan Road, Stone Masonry Retaining Wall



Ph-4: Ditto but Inspection site ②: STA 6+270 , RC double Pipe Culvert, half of the road open to Public Traffic

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Member of pilot “Site Safety Committee”

= For Case Study of “Safety Patrol by DRBFC” at pilot site on Ex-Japan Road =

Updated on 2018.09.10 a First wrote on 2018.03.01

Party	Role in the Committee	Title and Department	Name of member (Draft only)	Correspondence
DRBFC	Chair person	Chief of Construction Dept.	Eng. Joao Gregorio de Carvalho	
	Coordinator	Engineer in charge of proposed site	Eng. Nazario De Jesus Freitas	
	Coordinator	Engineer in charge of proposed site (Pavement works)	Eng. Martinho B. De Sousa	
	Sub-coordinator	Construction Dept.	Eng. Pricilla I. Dos R. Gomas	
	Observer	Representative of Training & Cooperation Dept.	Mr. Alfredo E. Dos Santos	
	Observer	Ditto but Project Dept.	Mr. Angelo Riberiro	
	Observer	Ditto but Maintenance Dept.	Eng. Lourenco, Chief of Planning Eng. Julius L. Kehy, Planning Section	
	Observer	Ditto but Highway Dept.	Eng. Mouzinho Tilman, Coordinator of Region 2 Eng. Altino Femasndes Da Costa, Region 2	
Contractor	Jonise	Project Manager	Mr. Syahrul Akbar	
		engineer in charge of Safety	XX	
	NTN (NATUREZA TIMOR NAROMAN Lda)	Project Managers	Mr. Hartoill	
	Mijori	PM or Staff in charge Safety	Mr. Januario	
	Sunrise	PM or Staff in charge Safety	cc	
CDRS	Advisor(Ad)	CDRS, Road Construction Supervisor	dd	
	Assistant Ad and Interpreter	Civil Engineer	Mr. Johji Koizumi Ms. Leticia Silveira A. Barreto	

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CHECK LISTS of Inspection for Payment

CL-03-20 Inspection for Payment  
Final (Interim / Daily) Inspection  
Revised 2018/005  
Updated on 2018/001

Flow of normal procedure for Inspection

Ref.#1: CL for Payment Inspection Questionnaire, QJT 3

I. Inspection for Documentation

① Drawing and Specification

② Actual Progress Schedule

③ Changes of the Works, Variation Order etc.

④-1 Records of Quality Control

⑤-1 Calculation sheet for the works done

⑥ BG and Final Contract amount

⑦ "As-built Drawing"

II. Inspection for the Quality and the measurement of the Works on the site

④-2 Quality of works on the site

⑤-2 Measurement of works on the site

⑧ Evaluation result

⑨ Certificate of the Completion (of Interim works done)

\* Remarks

<Type of Inspection for the Works and required Checking points>

1) Daily (routine) Inspection  
④, ⑤, ⑥

\* Utilize "Check List for construction"

2) Interim Inspection for the Interim Payment (Monthly Payment)  
⑤ - ⑥

3) Final (Completion) Inspection  
All of ① - ⑦

CL-03-20 Inspection for Payment  
Updated on 2018/004

CHECK LIST for Final (Interim / Daily) Inspection (CM-03-20)

Type of Contract:

Tender/Proposal

Design Build/only construction

Name of Project: Asphalt Pavement Works, for Reconstruction of Road Ex. Japan (Part II) (STA17+000 - STA19+750)

Location: Municipal Road Dã-Bedour-Sarbala-Aleu, STA17+000 - STA19+750

Date: 07 / 03 / 2019 (CP-00/2019)

Name of Contractor: Sun Rise Golden Construction Pty Ltd

Name of Participant: Juliana P. das NEVES

Name of Department: Construction Department

SPC: Standard Specification of MPWTC-10v2014 Edition

No.	Check Items	Judgements (Selection No.)	Specification (Selection No.)	Remarks (Printed figure is reference only)
I	Inspection for Documentation		PLS choose	and make comments, if any
①	Is Contract Drawing and Specification provided?	Yes No		
②	Is the actual Progress Schedule provided?	Yes No		I don't know for this project.
③	Is Variation Order(s), Claim(s) and other documents related the execution of the Works	Yes No		

1

Checklist for Inspection

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Ref.#1: CL for Payment Inspection Questionnaire, QJT 3

CHECK LIST for Final (Interim / Daily) Inspection 2/3 (CM-03-20)

No.

Check Items

Judgements  
(Selection No.)

Specification  
(Selection No.)

Remarks  
(Printed figure is reference only)

④-1

Is QC(Quality Control) records provided?

Yes No

\* Refer to CHECK LIST for Design Mix & specification (AsP-1)

• Test for material

- Test Result for Aggregate

- Test Result for Characteristic of Asphalt.

• Mix Design

- Test Results for proposed the Combination

- Gradation

- Test report for Asphalt Content of Asphalt

- Concrete

PLS fill items which you think necessary for QC records for Asphalt Pavement works on the Blank left

\* Refer to CHECK LIST for Core Sampling Test (AsP-3)

• Marshall Test

- Test Result Marshall test of Asphalt Concrete at plant

• Evaluation of Core Samples

- Doing Core drilling test on the site how to know the thickness & density.

< Give your comments >

⑤-1

Is the calculation sheet for the works done provided?

Yes No

It provided as shown PPT P-12

⑥

Is the BG and Final Contract amount provided?

Yes No

Date of Check Item ⑤-1

⑦

Is the "As-built Drawing" provided?

Yes No

N/A IF for the final payment (100% work on site) the Contractor submitted to Department Construction.

2

Checklist for Inspection

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A5-184

## 5. Finalizing and Dissemination of Checklist

### Finalizing of Checklist

- 1) To make it more understandable List on the site supervision, description by Tetun words would be added
- 2) After feedback from practice / OJT of using “Checklist for Construction”, it will be brushing up for updated Version of “Checklist”
- 3) Updated Checklist for Construction will be issued on September 2019

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### Dissemination of Checklist

- 1) In order to feedback for brushing up the “Checklist for Construction”, as many practices / OJT of using CL as possible are required.
- 2) Practical making use of “Checklist for Construction” are expected for improvement of supervising works on construction site
- 3) Not only DRBFC staff but also other personnel related to construction supervision may use this Checklist

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2-4. Technical guidelines

Provision of Guideline for “Bridge Substructure Protection”

Outline of the Presentation

- I. Introduction
- II. Objective
- III. Characteristics of rivers in Timor-Leste
- IV. Damage of bridge substructures in Timor-Leste
- V. Hydraulic phenomena around bridge pier
- VI. Study of bridge substructure and scour depth
- VII. Study for protection of bridge substructure

V. Hydraulic Phenomena Around Bridge Pier

The figure shows the hydraulic phenomenon that occurs around bridge piers during flood.

Bridge piers located in a river cause complex vortices and waves that disturb the flow and water surface during flood, as a result, an increase in water level and riverbed scouring occur.

I. Introduction

Bridges are easily damaged during flooding periods and there are lacking the maintenance of the bottom of abutments and piers.

When bridges are repeatedly damaged and then repaired with each flood, this increases the repair cost.

The lack of the maintenance program for bridges.

This design guideline primarily is prepared according to determine such measures to protect bridge substructures from flood hazard.

VII. Study for Protection of Bridge Substructure

There are two types of protection work: Gabion and foot protection block. However, due to issues with the durability (due to deterioration, etc.) of the metal wire use for gabion it is recommended to that Timor Leste take the same approach as Japan and use Foot Protection.

Gabion damaged situation (Kila 2011)

Foot Protection blocks in Japan

Foot Protection blocks in Japan

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Provision of Guideline for “Drainage — Culvert Design”

Culvert Design guideline & annex

Culvert alignment & planning

Existing alignment: sharp bend on downstream side and long culvert (higher cost)

✓ Recommended alignment: change channel to minimise sharp bend

✗ Not recommended alignment: sharp bend upstream or downstream

Change Channel

Sharp Bend

Sharp Bend

✓ Good

✗ Bad

✗ Bad

Overview of culvert design steps

Data collection	1. Basic site information 2. Topographic data 3. Cartographic (map) / geospatial data 4. Baseline data	Section 5
Basin analysis	5. Frequency analysis 6. Calculation of catchment area for design	Section 6
Flow calculation	7. Calculation of catchment area 8. Calculation of time of concentration 9. Calculation of rainfall intensity 10. Assessment of runoff coefficient 11. Calculation of flood discharge	Section 7
Hydrochannel hydraulics	12. Selection of culvert size 13. Calculation of culvert capacity for discharge 14. Calculation of flow type and velocity	Section 8
Protection measure	15. Selection of protection measure and size	Section 9

Capacity calculation & checks

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Provision of Guideline for “Slope Protection – Retaining Wall and Slope Collapse”

Contents

1. Scope

2. Normative references

3. Terms and definitions

4. Investigation

5. Design of Gravity Retaining Wall

6. Gravity Retaining Wall in the Common Drawings

7. Bearing Capacity

8. Slope

9. Slope Disaster

10. Slope Stability Calculation

11. Influence of factors in slope stability calculation formula

12. Design Example of Countermeasure against Shallow Slope Collapse

Design Procedure of Gravity Retaining Wall

Geological Information

① Geomorphologic approach

② Surficial geological observation

③ Mechanical boring and standard penetration test

④ Other penetration test Dokenbo

Classification of Slope Disaster

Provision of Guideline for “Slope Protection — Landslide Investigation”

The contents of Guideline

The guideline introduces the general approach how to investigate the mass movement landslide. The process of the contents is along the case study activity on Aitute Landslide

This is a slide in which the surface of rupture is curved concavely upward and the slide movement is roughly rotational about an axis that is parallel to the ground surface and transverse across the slide.

2. Detailed investigation

Instrumented Measurement

To detect displacement of the sliding mass, monitoring with the inclinometer is the useful tool. Measurement the inclination of casings with the inclinometer should be performed periodically, and the cumulative displacement of the casing should be analyzed to detect the depth of the surface of rupture.

1. How was the landslide found?

The collapse of the stone structure (landslide)

The crack and distortion on the road

The house crack and deformation

The tree bending

2. Detailed investigation

Analysis of landslide mechanism

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## 2-5. Report on Workshop Overview

- Purpose:  
Dissemination of information about CDRS database, checklists and guidelines
- Activity:  
One-day workshop of presentations and discussions in ETDA, Dili
- Reach:  
Total participants = 58, including
  - 10 municipal directors
  - 3 municipal officers
  - 5 university / education staff (UNPAZ / DIT)
  - 5 donor program officers (ILO / R4D-SP / ERA-AF)
  - 2 public institute staff (IPG)
  - 8 interns / new graduates

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## 2-5. Report on Workshop Agenda

- I. Database for road maintenance and rehabilitation
- II. Introduction of IRI application
- III. Checklist for Construction
- IV. Guideline for *Bridge Substructure Protection*
- V. Guideline for *Drainage - Culvert Design*
- VI. Guideline for *Slope protection – Retaining wall and Slope Collapse*
- VII. Guideline for *Slope protection – Landslide investigation*

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2-5. Report on Workshop

Opening speech

by Nene Lobato  
Chief of Department of  
Training and External  
Cooperation, DRBFC



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2-5. Report on Workshop

Database for road maintenance and rehabilitation

Presentation by Department  
of Projects &  
Administration, DRBFC /  
CDRS Expert



Discussion with participants:  
UNPAZ (university)

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2-5. Report on Workshop  
Checklist for Construction

Presentation by Department  
of Maintenance &  
Conservation, DRBFC



Discussion with participants:  
municipal director

2-5. Report on Workshop  
Guideline for Bridge Substructure Protection

Presentation by Department  
of Maintenance &  
Conservation / Project &  
Administration, DRBFC



Discussion with participants:  
DIT (higher education institute)



2-5. Report on Workshop  
Guideline for Drainage - Culvert Design

Presentation by Department  
of Highways, DRBFC /  
CDRS Expert



Discussion with participants:  
municipal director

2-5. Report on Workshop  
Guideline for Slope protection – Retaining wall and  
Slope Collapse

Presentation by Department  
of Projects &  
Administration, DRBFC



Discussion with participants:  
clarification of *Dokenbo*

2-5. Report on Workshop

Guideline for Slope protection – Landslide investigation

Presentation by Geological  
Hazard Division, Instituto  
do Petroleo e Geologia  
(IPG)



Discussion with participants:  
municipal officer

3. Evaluation of project and review of  
project activities plan

### 3-1. Evaluation of project activity for Output 1

Output 1: Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and annual budget plan

- Progress is gradual.

activities	plan/ actual	2016	2017	2018	2019
1.1 To review existing management structure and maintenance and rehabilitation condition on major roads	plan				
	actual				

: Plan
  : On schedule
  : Gradual progress
  : Delayed

#### 1.1 Management structure and maintenance conditions

- Completed: DRBFC agreed to use GIS database.

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### 1.2 Periodic / routine inspections

activities	plan/ actual	2016	2017	2018	2019
1.2 To conduct the <b>periodic/routine inspection</b>	plan				
	actual				

: Plan
  : On schedule
  : Gradual progress
  : Delayed

- Site inspection of  
A03,A04,A06,A08,A11,A12,A16 173 km
- Site inspection using drive recorder of  
A01,A02,A03,A04,A05,A06,A07,A08,A09,A11,  
A12,A13,A14 1419 km
- Not enough to practical training on site  
→ July 2019

60



### 1.3 Database updates

activities	plan/ actual	2016	2017	2018	2019
1.3 To update the database based on the inspection result and repair/rehabilitation works of roads and bridges	plan				
	actual				

: Plan    
  : On schedule    
  : Gradual progress    
  : Delayed

- DRBFC has completed update of 173 km of national roads in the database.
- DRBFC plans to input the inspection results for 1171 km.
- DRBFC will continue to input the inspection results and update the database.
- CDRS will facilitate cooperation between the Department of Project & Administration and the Department of Maintenance & Conservation.

61

### 1.4 Maintenance plans

activities	plan/ actual	2016	2017	2018	2019
1.4 To formulate maintenance and repair/rehabilitation plan for next cycle	plan				
	actual				

: Plan    
  : On schedule    
  : Gradual progress    
  : Delayed

- DRBFC completed process of result inspection to request budget with CDRS assistance.
- DRBFC construction on site and update of database are gradually progressing.
- It is necessary for DRBFC to plan for the next cycle

62

1.5 Emergency inspections

activities	plan/ actual	2016	2017	2018	2019
1.5 To implement emergency inspections and repair/rehabilitation works when necessity arises	plan				
	actual				

: Plan  : On schedule  : Gradual progress  : Delayed

- CDRS supported DRBFC works on A03, Loes river (scouring, large sandbag) and Jakarta II emergency work.
- In 2019, CDRS plans to support emergency work when the necessity arises.

63

1.6 Annual work and budget plans

activities	plan/ actual	2016	2017	2018	2019
1.6 To undertake appropriate road maintenance/ rehabilitation works by following annual work and budget plans which reflect priorities within the limited budget	plan				
	actual				

: Plan  : On schedule  : Gradual progress  : Delayed

- DRBFC prepared drafts of 5-year and annual plans.
- CDRS is reviewing the plans regarding appropriateness and priority. CDRS will then advise DRBFC about updating these plans.

64

## 1.7 Framework for maintenance

activities	plan/ actual	2016	2017	2018	2019
1.7 To propose framework of road maintenance /rehabilitation for major roads	plan				
	actual				

: Plan
  : On schedule
  : Gradual progress
  : Delayed

- CDRS proposed integration of work between the Department of Project & Administration and the Department of Maintenance & Conservation in order to strengthen their capacity for maintenance.
- CDRS will confirm that DRBFC will establish a sustainable framework.

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## 3-2. Evaluation of project activity for Output 2

Output 2: Capacity of DRBFC construction management for maintenance and rehabilitation is improved through case studies in the whole country including slope protections.

- Progress is gradual.

activities	plan/ actual	2016	2017	2018	2019
2.1 To identify typical rehabilitation and repair works of major roads in the whole country as case studies	plan				
	actual				

: Plan
  : On schedule
  : Gradual progress
  : Delayed

### 2.1 Identification of case studies

- CDRS identified 6 case studies

66

2.2 Case studies for planning, design and supervision

activities	plan/ actual	2016	2017	2018	2019
2.2 To conduct the case studies for the planning, design check, and construction supervision of the project	plan				
	actual				

: Plan  : On schedule  : Gradual progress  : Delayed

- Case studies for the planning and design check are on schedule. However, progress of construction supervision is gradual.
- CDRS will continue OJT and polish checklists for construction management.

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2.3 Preferable structures for construction management

activities	plan/ actual	2016	2017	2018	2019
2.3 To propose preferable structures for construction management for repair/rehabilitation works through case studies	plan				
	actual				

: Plan  : On schedule  : Gradual progress  : Delayed

- Necessary for CDRS to continue practical training on site and technical transfer to DRBFC.
- CDRS proposes to continue construction management using checklists.

68

### 3-3. Evaluation of project activity for Output 3

Output 3: Technical guideline of investigation and design for maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection.

- Activities are on schedule.
- CDRS has been monitoring on site during the rainy season. CDRS will consider further additions to the slope protection guideline depending on issues faced after the rainy season.

69

### 3.1 Technical documents

activities	plan/ actual	2016	2017	2018	2019
3.1 To <b>review existing technical document</b> for maintenance and rehabilitation	plan				
	actual				

: Plan
  : On schedule
  : Gradual progress
  : Delayed

- CDRS collected and reviewed technical drawings.

### 3.2 Factors of failure

activities	plan/ actual	2016	2017	2018	2019
3.2 To review and <b>identify factors of failure</b> from past examples of damaged rehabilitation and construction	plan				
	actual				

: Plan
  : On schedule
  : Gradual progress
  : Delayed

- CDRS examined sites with damaged roads, bridges and slopes.

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### 3.3 Knowledge of engineering

activities	plan/ actual	2016	2017	2018	2019
3.3 To acquire necessary <b>knowleges of civil engineering for design</b>	plan				
	actual				

: Plan     : On schedule     : Gradual progress     : Delayed

- CDRS held lectures about each case study.

### 3.4 Technical guidelines

activities	plan/ actual	2016	2017	2018	2019
3.4 To prepare the <b>technical guideline</b> of investigation and design.	plan				
	actual				

: Plan     : On schedule     : Gradual progress     : Delayed

- CDRS prepared 4 technical guidelines.

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### 3.5 Lessons learned

activities	plan/ actual	2016	2017	2018	2019
3.5 To reflect the lessons learned from case studies to the technical guideline.	plan				
	actual				

: Plan     : On schedule     : Gradual progress     : Delayed

- CDRS provided the guidelines on schedule.
- CDRS is monitoring on site during the rainy season. CDRS will consider further additions to the slope protection guideline depending on issues faced after the rainy season.

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3.6 Dissemination of guidelines

activities	plan/ actual	2016	2017	2018	2019
3.6 To disseminate the technical guideline for concerned parties.	plan				
	actual				

: Plan  : On schedule  : Gradual progress  : Delayed

- Dissemination of guidelines is on schedule.
- CDRS conducted a workshop on 15 March, 2019, to disseminate information about the database, checklists and guidelines to interested parties.

3-4. Other

Activity schedule for CDRS assistance

- As necessary, CDRS will consider further additions to the slope protection guideline depending on issues faced after the rainy season.
- CDRS will continue to update the database.
- CDRS will continue to utilize the checklists on site.
- CDRS will conduct a training workshop about the database and checklists in August 2019.
- CDRS will hold the 6th JCC meeting in September 2019.

  <div style="text-align: center;"> <b>The Project for the Capacity Development of Road Services in the Democratic Republic of Timor-Leste</b> </div>  			
		By	Time
1	Opening speech	MOP	9:30-9:40
2-1	Project outline	JICA Expert Team	9:40-9:45
2-2	Project activities & outputs 2016 – 2019	JICA Expert Team	9:45-10:15
2-3	Project evaluation	JICA Expert Team	10:15-10:35
	Break		10:35-10:45
2-4	Project implementation & lessons learned	JICA Expert Team	10:45-11:10
2-5	Recommendations for achieving the Overall Goal	JICA Expert Team	11:10-11:25
3	Open discussion for the Project	All	11:25-11:40
4	Comments by JICA	JICA Representative	11:40-11:50
5	Conclusion and Closing remarks by MOP	MOP	11:50-12:00

  <div style="text-align: center;"> <b>The Project for the Capacity Development of Road Services in the Democratic Republic of Timor-Leste</b> </div> <div style="text-align: center;"> <b>6th JCC September 2019</b> </div> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">   </div> <div style="text-align: center;"> <b>Ingerosec Corporation Earth System Science Co., Ltd.</b> </div> </div>			
 			

# Contents

- 1. Project outline
- 2. Project activities & outputs 2016 – 2019
  - 2.1 Output 1
    - 2.1.1 Database
    - 2.1.2 Formulation of annual maintenance work plans
  - 2.2 Output 2
    - 2.2.1 Case studies outline
    - 2.2.2 Checklists for construction supervision & quality control
    - 2.2.3 Implementation of case studies
    - 2.2.4 Proposal for an appropriate construction supervision system
  - 2.3 Output 3
    - 2.3.1 Bridge substructure protection guidelines
    - 2.3.2 Culvert design guideline guidelines
    - 2.3.3 Slope protection & Landslide investigation guidelines
  - 2.4 Publicity & other activities
- 3. Project evaluation
- 4. Project implementation & lessons learned
- 5. Recommendations for achieving the Overall Goal

3

## 1. Project outline

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## Project Target and Outputs

Item	Description
<b>Project Title</b>	The Project for the Capacity Development of Road Services in the Democratic Republic of Timor-Leste (CDRS)
<b>Project Duration</b>	March 2016 – December 2019 (45 months)
<b>Project Site</b>	Whole national roads in Timor-Leste
<b>Implementing Agency</b>	Ministry of Public Works (MOP)
<b>Target Group</b>	National Directorate of Roads, Bridges and Flood Control (DRBFC)
<b>Overall Goal</b>	The maintenance conditions of major roads are improved in Timor-Leste.
<b>Project Purpose</b>	Capacity of DRBFC for maintenance of major roads in the whole country is enhanced.
<b>Outputs</b>	<ol style="list-style-type: none"> <li>1. Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and annual budget plan.</li> <li>2. Capacity of DRBFC construction management for maintenance and rehabilitation including slope protection is improved through case studies in the whole country.</li> <li>3. Technical guideline of investigation and design for maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection.</li> </ol>

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## Project Outputs and Indicators

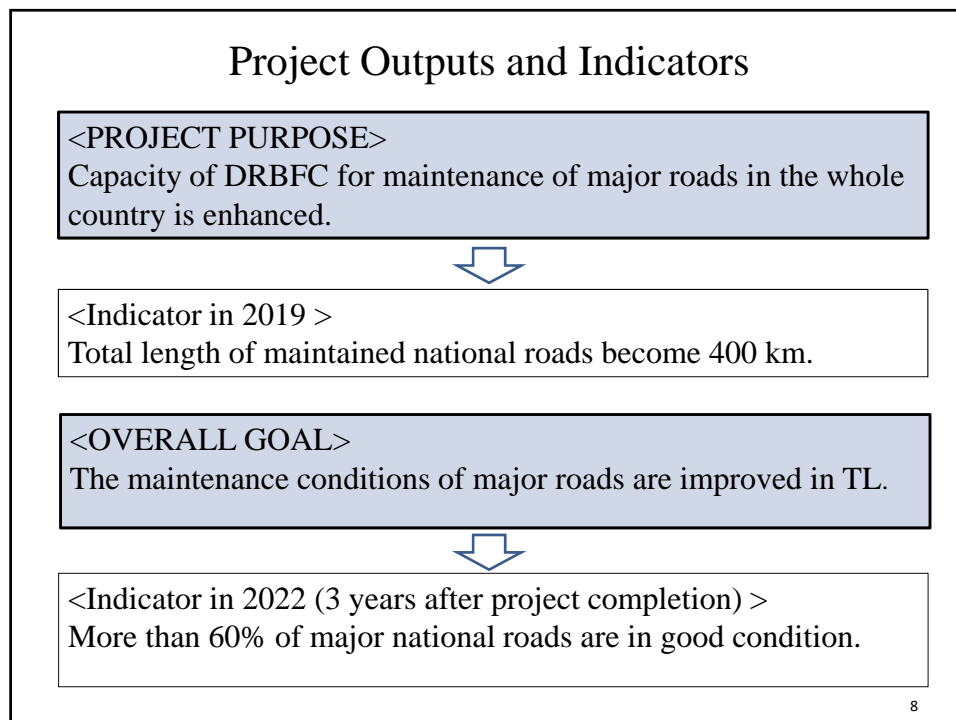
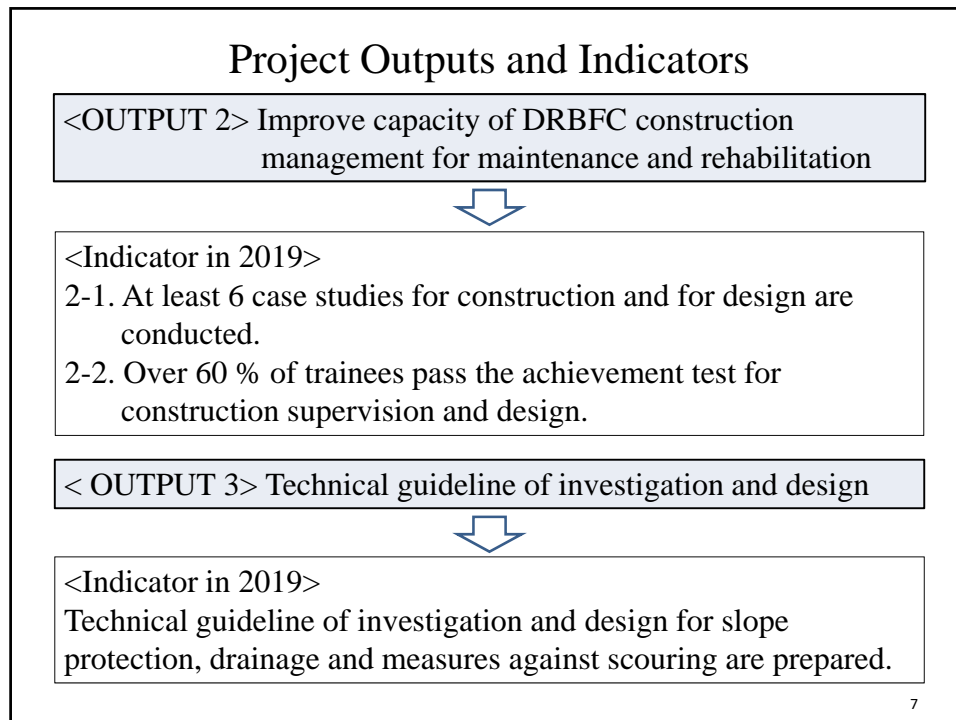
<OUTPUT 1> Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and annual budget plan.



- 1-1. Over 30% of requested budget for road maintenance are distributed.
- 1-2. Improved road database is utilized for preparing the annual work plan of road maintenance.

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## 2. Project activities & outputs 2016 – 2019

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### 2.1 Activities for Output 1:

Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and annual budget plan.

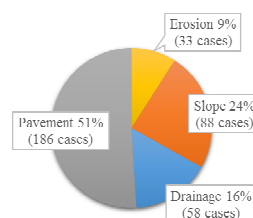
- Analysis of the current maintenance and management system and conditions of major roads

#### Situation:

Result of the road damaged analysis in National road, the portion of pavement damage is the largest at 51%, slope failure 24%, drainage 16%, and shoulder erosion 9%

#### Findings:

The damaged condition of each road facility was not established and integrated as database in the whole country



The database for maintenance activity with GIS mapping, and cost estimation system was proposed in this project

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### 2.1.1 Database

- Implementation support for periodic check  
Proposal of inspection method and contents
- 1<sup>st</sup> Technical transfer activity of field inspection and data collection

#### Introduction of GIS map



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### 2.1.1 Database

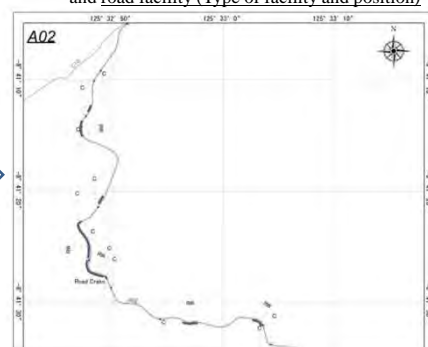
- Implementation support for periodic check  
Proposal of inspection method and contents
- 2<sup>nd</sup> Technical transfer activity of field inspection and data collection

#### Introduction of Dashboard Camera for map preparation

The Dashboard Camera Setting and sample of movie



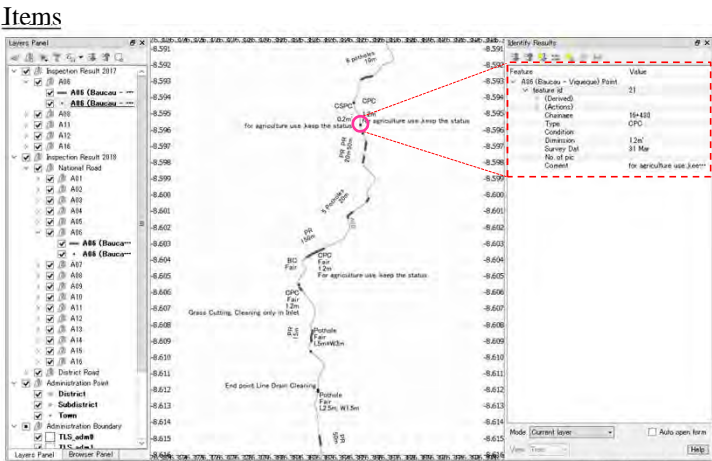
The information is only road alignment and km post and road facility (Type of facility and position)



12

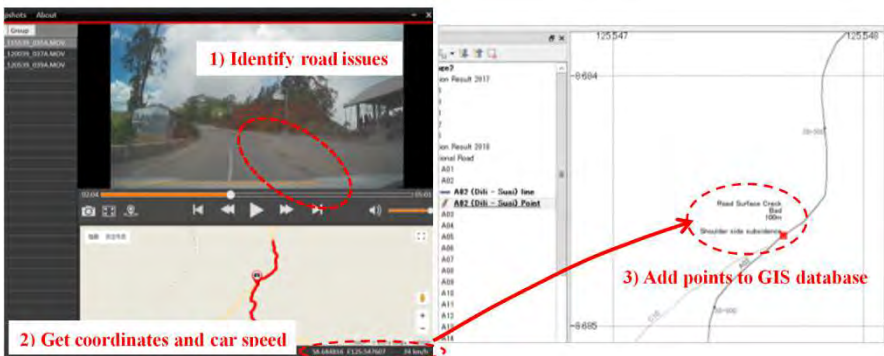
2.1.1 Database

- Database update support
- Structure of GIS database



2.1.1 Database

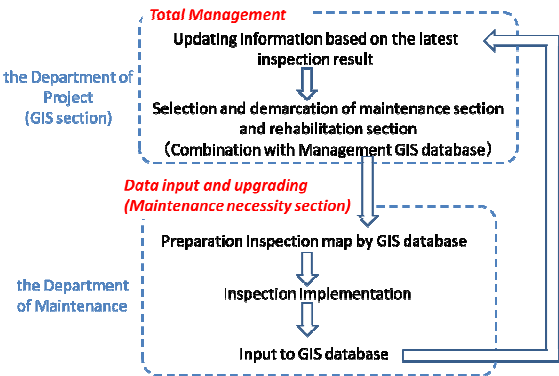
- Database update support
- Method of data input



Example of data input from the video of a dashboard camera to the GIS database

2.1.1 Database

- Database update support
- Technical transfer activity and method of database management
- Technical transfer activity:
- Each region of the Department of Maintenance, GIS section
- Database management method



Flowchart of database management for the Timor-Leste Road Inspection GIS

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2.1.1 Database

- Database update support
- GIS database for road network management (Timor-Leste Management GIS)
- Structure and items of GIS database



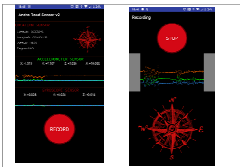
A sample of project information in the Timor-Leste Management GIS

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2.1.1 Database

- Database update support
- GIS database for road network management (Timor-Leste Management GIS)
- Method of data acquisition



A screen shot of android application which we developed



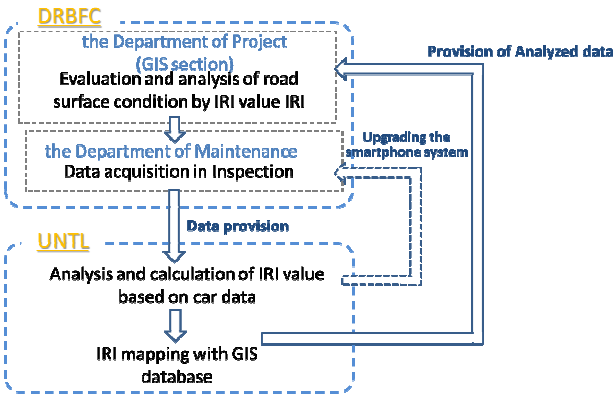
Setting in Vehicle



IRI Mapping

2.1.1 Database

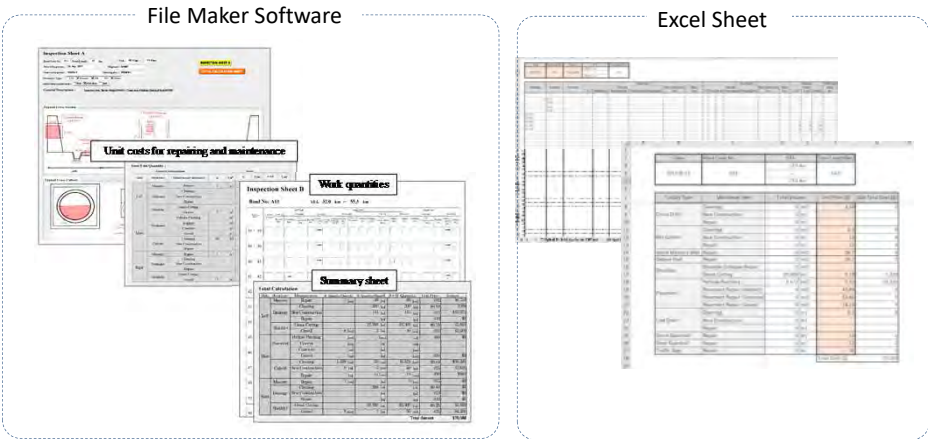
- Database update support
- GIS database for road network management (Timor-Leste Management GIS)
- Collaboration with National University of East Timor (UNTL)



Flowchart of development activities and demarcation between DRBFC and UNTL

### 2.1.2 Formulation of annual maintenance work plans

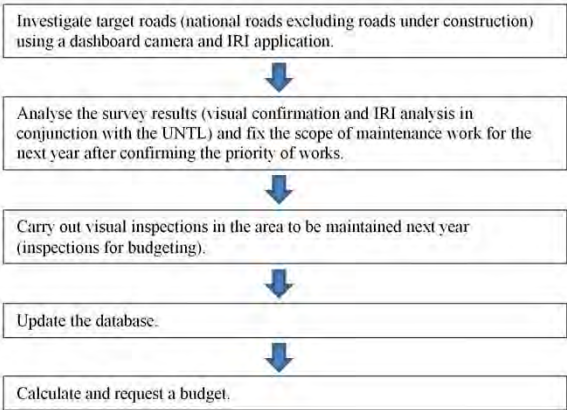
Technical support to formulate annual maintenance budget System Structure



Example of the main components of the cost estimation system

### 2.1.2 Formulation of annual maintenance work plans

Support for formulating annual work plans for maintenance work



Flowchart for formulation of annual work plans

## 2.1.2 Formulation of annual maintenance work plans

Implementation of maintenance work based on the annual work plan

BUDGET FOR THE MAINTENANCE WORKS (National roads, Municipal roads and Urban roads)													
			FIVE YEARS PLAN for MAINTENANCE of ROADS										
No.Link	Name Link	Length( KM )	Proposal	2019		2020		2021		2022		2023	
			Implement align Km	BUDGET USD ( 000)	Implement align Km	BUDGET USD ( 000)	Implement align Km	BUDGET USD ( 000)	Implement align Km	BUDGET USD ( 000)	Implement align Km	BUDGET USD ( 000)	
I. NATIONAL ROADS													
A01	DILI - COM	272.00	15.30	15.30	45.90	15.30	45.90	15.30	45.90	15.30	45.90	15.30	45.90
A02	DILI - SUAI	175.30	168.50	42.10	126.30	42.10	126.30	59.02	177.06	59.02	177.06	136.40	409.20
A02	Mota Unu - Saniha	15.75	19.75	-	-	-	-	-	-	19.75	59.25	19.75	59.25
A03	DILI - MOTA AIR	118.00	73.30	73.30	219.90	73.30	219.90	73.30	219.90	73.30	219.90	73.30	219.90
A03	BATUGADE - MALIANA	25.00	35.00	35.00	107.40	35.00	107.40	35.00	107.40	35.00	107.40	35.00	107.40
A04	TIBAR - ERMERA	135.00	45.00	45.00	135.00	45.00	135.00	45.00	135.00	45.00	135.00	45.00	135.00
A05	AUTUTO - BETANO	53.00	50.00	-	-	-	-	50.00	150.00	50.00	150.00	50.00	150.00
A07	VIQUEQUE - NATARBORA	48.80	48.80	48.80	146.40	48.80	146.40	-	-	-	-	-	-
A08	LAUTEM - VIQUEQUE	103.30	108.80	108.80	326.40	108.80	326.40	-	-	-	-	-	-
A09	MANATUTO - NATARBORA	79.77	79.77	-	-	-	-	-	-	-	-	79.77	239.31
A10	ERMERA - HAUSA	68.50	68.50	68.50	205.50	68.50	205.50	68.50	205.50	-	-	-	-
A12	MALIANA - ZUMALAI	11.00	11.00	11.00	33.00	11.00	33.00	11.00	33.00	-	-	-	-
A13	HAUSA - CASSA	24.80	24.80	24.80	73.80	24.80	73.80	-	-	-	-	-	-
A14	NATARBORA - BETANO	48.50	48.50	48.50	145.50	48.50	145.50	48.50	145.50	-	-	-	-
A16	TILOMAR - ULELO	62.30	62.30	62.30	186.90	62.30	186.90	62.30	186.90	-	-	-	-
TOTAL			1,282.75	838.12	554.00	1,752.00	554.00	1,752.00	406.12	1,406.16	2,122.83	894.31	1,363.96

National road maintenance plan of five years plan from 2019

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## Other activities for Output 1

Support for emergency inspection and emergency restoration work

- Damage to national road A03



- Jakarta II Landslide



3D topographic model produced from UAV survey results

- Comoro River damage



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2.2 Activities for Output 2

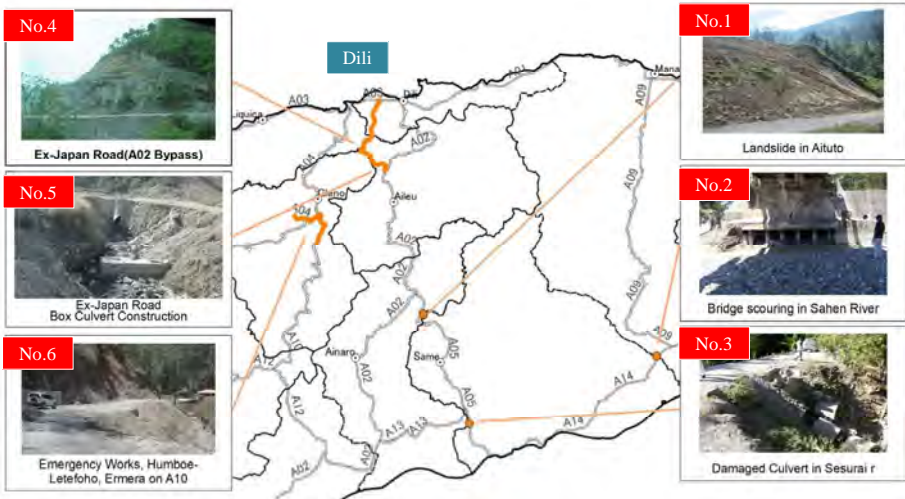
Improve capacity of DRBFC construction management for maintenance and rehabilitation

2.2.1 Case studies outline

case studies	Locations
No.1 Design against slope failure	Aitutu landslide investigation
No.2 Design against bridge scour	Sahen River scour countermeasures
No3. Design of cross drainage	Sesurai River culvert repair
No.4 Construction management	Ex-Japan Road improvement work
No.5 Construction management	Ex-Japan Road cross drainage
No.6 Construction management	Humbœ–Letefoho emergency repair work

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Case study sites



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## 2.2.2 Checklists for construction supervision & quality control

Problems and inappropriate cases confirmed on site

### Quality control

Collapse of road shoulder embankment	<ul style="list-style-type: none"> <li>◆ Inappropriate levelling thickness</li> <li>◆ Insufficient compaction.</li> <li>◆ Insufficient bearing capacity of foundations</li> </ul>
Drainage	<ul style="list-style-type: none"> <li>◆ Untreated ground water in excavations</li> <li>◆ Insufficient bearing capacity of foundations</li> <li>◆ Insufficient rolling of backfill soil</li> </ul>

Problems and inappropriate cases confirmed on site

### Safety control

Personal protective equipment (clothing)	<ul style="list-style-type: none"> <li>◆ Helmet not worn</li> <li>◆ Safety shoes not worn</li> <li>◆ High-visibility vest not worn</li> </ul>
Separation of road and site	<ul style="list-style-type: none"> <li>◆ No barricades installed</li> <li>◆ No traffic observers arranged</li> </ul>



Contents of Checklist

I. Quality Control	
10_Earth Work	Excavation Embankment Aggregate Surface Course (Crushed Aggregate Course on Existing Pavement) Widening of Embankment
20_Small Structures	Pipe Culvert Stone Masonry Drainage Stone Masonry Retaining Wall Concrete Drainage Gabion Mat
30_Box Culvert	
40_Road Pavement Works	41_Base Course and Sub-base 42_Aspphalt Pavement Design and specification Check Points of Daily Quality Control on Site Core Sampling Test
II. Safety Control	
10_Daily Safety Checking	
20_Regular Safety Activities	
30_Safety organization and management	
40_Check List for Safety Patrol	
III. Construction Management	
10_Tender document (Drafting, reference only)	
20_Daily, Interim payment and Final Inspection	
30_Drawing	

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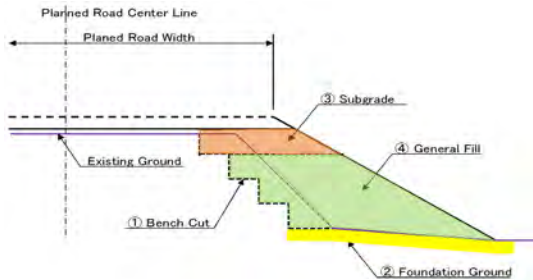
Checklists for Quality Control

Existing Road



Damaged Shoulder


Check item of under construction for Widening of Embankments



No	Check Items Verifika Itens	Judgements Sifirkeana ni		Specification Speefikaasau		Remarks Observasaun (Printed figure is reference only) (Figura ne bele impressa hanesan)
		Yes Sim	No Lae	SPC Podraun	SPC Podraun	
①	Preparatory activity Aktividade preparatoria					
	Did you confirm the drawings? Ita bo ot konfirma ona dezennu ka?	Yes Sim	No Lae			
	Did you confirm the construction work plan? Ita bo ot konfirma ona planu servisu konstruksaun ka?	Yes Sim	No Lae			
②	Bench Cut Corte bankada					
	Was Bench Cut carried out appropriately? Bench cut ne'e halsao ho apropriadu ona ka Lae?	Yes Sim	No Lae			

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## Checklists for Safety Control



**Checklist for daily safety control**

No.	Check Items Verifika Items	Judgements Pengamatan		Specification Spesifikasi		Remarks Observasi (Printed figure is reference only) (Figure ini tidak merupakan referensi)
		Yes Ya	No Tidak	SPC Spesifikasi	SPC Spesifikasi	
(1)	Protection equipment for workers					
-1	Safety Helmets are worned by workers ? <i>Trabalador sira utiliza kapasete seguranca ka lae ?</i>	Yes Sim	No Lae			
-2	Does workers keep proper shoes for his jobs ? <i>Trabalador sira kandoana sira sapatu na sira adeguada ka ?</i>	Yes Sim	No Lae			
-3	In case of watchmen, works in the night and/or near heavy traffic, Do they wear a safety (reflective) jacket ? <i>Iba kazu vigias, servisu iha tempu kalam no/ka baak trafiku na cbc intensu, sira usa jaket seguranca ka lae ?</i>	Yes Sim	No Lae			

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### 2.2.3 Implementation of case studies

Ex-Japan Road activities

Quality control for improvement and restoration work

Implemented period	Main activity description	Participant
9/08/2017~ 28/02/2018	<ul style="list-style-type: none"> <li>Site inspection</li> <li>Quality control with concrete material and compression testing</li> <li>Material and formulation design, laboratory quality control and Marshall testing</li> <li>Safety patrol of the Construction of the Upriver Comoro Bridge</li> <li>Site inspection of the Construction of the Upriver Comoro Bridge using a checklist</li> </ul>	Total: 144 DRBFC engineers

### Photos of Ex-Japan Road activities



Photo 1  
Seminar of QC



Photo 2  
On-the-job training

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### Safety patrol

Implemented date	Main activity description	Participant
26/06/2018	<ul style="list-style-type: none"> <li>• 1st Site Safety Committee</li> <li>• Safety patrol of footpath construction</li> <li>• Safety patrol of masonry retaining wall construction</li> </ul>	14 DRBFC engineers
19/09/2018	<ul style="list-style-type: none"> <li>• 2nd Site Safety Committee</li> <li>• Safety patrol of aggregate base course construction</li> <li>• Safety patrol of masonry retaining wall construction</li> <li>• Safety patrol of laying of cross drainage</li> </ul>	12 DRBFC engineers

### Photos of safety patrols



Photo 3  
Safety patrol



Photo 4  
Safety patrol

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### Humboe–Letefoho activities

Implemented period	Main activity description	Participant
14/06/2018 25/06/2018 12/09/2018 03/10/2018 10/10/2018	<ul style="list-style-type: none"> <li>• Site inspection of road subbase</li> <li>• Explanation of Checklists for Construction</li> <li>• On-the-job training using checklists for road subbase, masonry side drains and crossing drainage</li> <li>• Workshop on inspections of Humboe–Letefoho emergency repair work and Ex-Japan Road improvement work using checklists</li> <li>• Explanation and dissemination of Checklists for Construction</li> </ul>	Total: 37 DRBFC engineers

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Photos of Humboe–Letefoho activities



Photo 5  
On-the-job training



Photo 6  
On-the-job training

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Other activities

9 Packages and 7 Packages activities

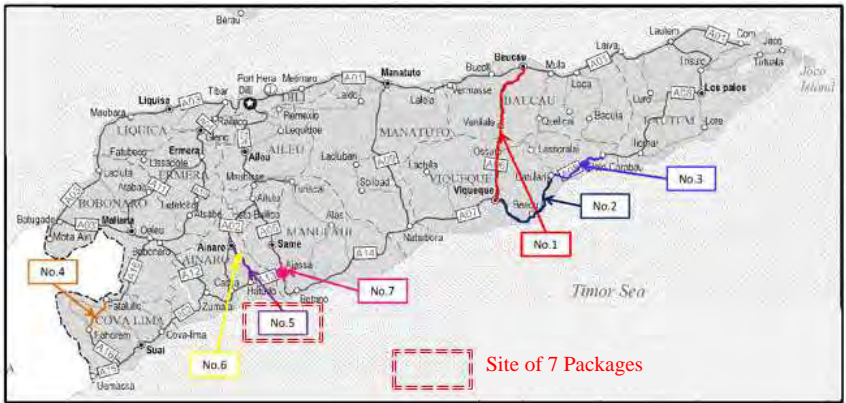


Location map of 9 Packages sites

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9 Packages and 7 Packages activities



Location map of 7 Packages sites

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9 Packages and 7 Packages activities

Implemented period	Main activity description	Participant
09/08/2017 ~ 22/11/2017	<ul style="list-style-type: none"><li>•Site inspection and confirmation of progress</li><li>•OJT for site inspection and quality control</li><li>•OJT for site inspection and quality control of drainage and road base construction</li></ul>	Total: 24 DRBFC Department of Maintenance engineers

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### Photos of 9 Packages and 7 Packages activities



Photo 7  
OJT for quality control



Photo 8  
OJT for quality control

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### Regional office support activities

<b>Date</b>	<b>11 April, 2019</b>
<b>Location</b>	Likisá
<b>Contents</b>	Conducting workshops using checklists for regional office staff
<b>Target office</b>	Likisá Municipal Road Department (2 persons), Department of Maintenance (1 person)
<b>Project name</b>	Road and Drainage Rehabilitation Project, Emergency Road at Tibalau and Karimbala Likisá, (on A03, Infrastructure Fund 2018 No.287), Work type: Retaining wall
<b>Trainer</b>	Mr. Sabino da Costa Ventura, engineer of DRBFC Department of Maintenance

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### Evaluation of capacity development for construction supervision

Test	Subject			
	Quality control	Safety control	Construction control	Average
1st test	24%	30%	43%	27%
2nd test	64%	63%	37%	56%
Improvement rate	40%	33%	-6%	29%

41

### 2.2.4 Proposal of an appropriate construction supervision system

- 1) Preparation and utilization of Checklists for Construction.
- 2) Utilization of regional offices.
- 3) Enhancement of construction supervision training.

42

## 2.3 Activities for Output 3

Technical guidelines for investigation and design

### 2.3.1 Bridge substructure protection guidelines

Review of existing technical documents

Existing technical document:

- Bridge Design Standards & Manual (2012), based on United States', Australian and Indonesian standards



Findings:

- Some guidance for preliminary design of bridges, including calculation of river discharge
- No guidance for substructure scouring

43

## Analysis of past damage cases

Findings:

- Bridge structure damage occurrence where scour holes have developed
- Lack of footing protection works
- Cracking of abutments
- Exposure of foundations



Solution:

- Training for protection works
- Experience of countermeasure planning with case studies
- Preparation of guidelines for bridge substructure protection

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## Training for bridge substructure protection

- Seminars, workshops and site visits for river-related engineering
- Jul. 2016 – Jun. 2018
- Average of 17 participants



Training topics for bridge substructure protection:

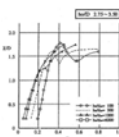
- Calculation example of Comoro River discharge (Rational Method)
- Foot protection works for scouring
- Weather resistance big sand bag method for damage site
- Groin study using Loes River
- Case study for Sahen
- Explanation of Bridge Substructure Protection Guidelines

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## Training for foot protection

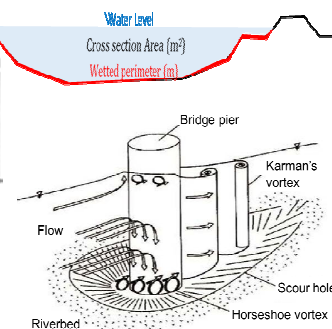
- Calculation of river velocity

$$Vm = \frac{1}{n} \times R^{2/3} \times I^{1/2}$$



- Scour depth around bridge pier

$$\frac{Z}{D} = f \times \left( \frac{h_0}{D} \times \frac{h_0}{dm} \times Fr \right)$$



- Recommended size of foot protection blocks

$$W > \alpha \times \left( \frac{\rho_w}{\rho_b - \rho_w} \right)^3 \times \frac{\rho_b}{g^2} \times \left( \frac{Vm}{\beta} \right)^6$$

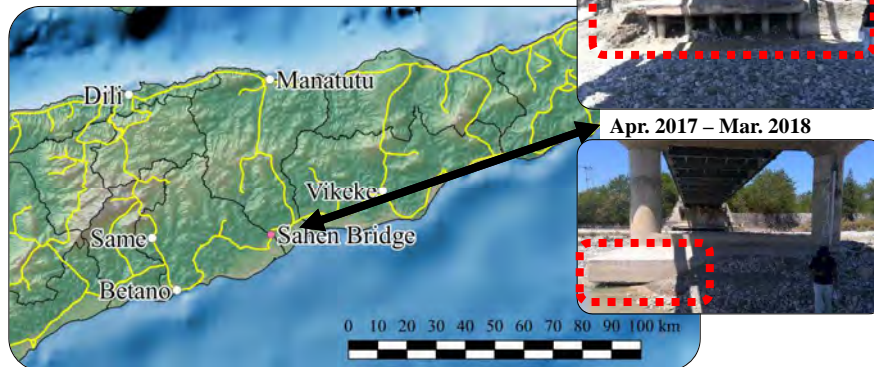


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## Case study for bridge substructure protection

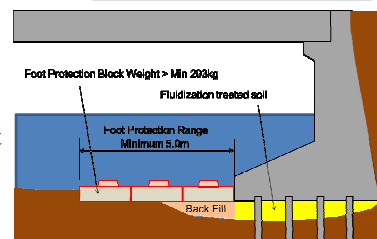
- Importance: A14 national road
- Accessibility: < 60 minutes from a town
- Generality: common type of damage



47

## Case study overview

- Selection of working group for case study (5 members)
- Explanation of purpose and contents of riverbed materials survey
- Explanation of purpose and contents of topographic survey
- Case study investigation:
  - Joint site surveys
  - Study of river discharge
  - Study of river velocity
  - Studies of protection work using foot protection blocks



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## Contents of Bridge Substructure Protection Guidelines

### Introduction

1. Scope
2. Normative references
3. Terms and definitions
4. Characteristics of rivers in Timor-Leste
5. Damage of bridge substructures in Timor-Leste
6. Hydraulic phenomenon around bridge piers
7. Scour depth of bridge substructures
8. Protection of bridge substructures

- Annex A: Case study of Sahen Bridge
  - Annex B: Training materials
- Bibliography



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## 2.3.2 Culvert design guidelines

### Review of existing technical documents

#### Existing technical documents:

- Bridge Design Standards & Manual (2012)
- Standard Specifications (2014)
- Road Geometric Design Standards (2010)

#### Findings:

- Some guidance for drainage regarding structural form, materials and construction management
- No guidance for hydrological studies or hydraulic design of cross drainage / culverts



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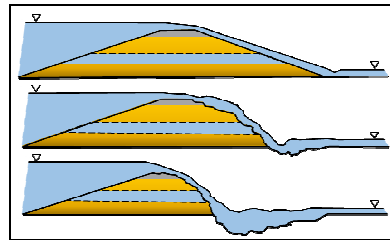
## Analysis of past damage cases

### Findings:

- Road structure damage occurrence where roads cross watercourses
- Overtopping failure mechanism
- Inadequate capacity
- No hydraulic design checks

### Solution:

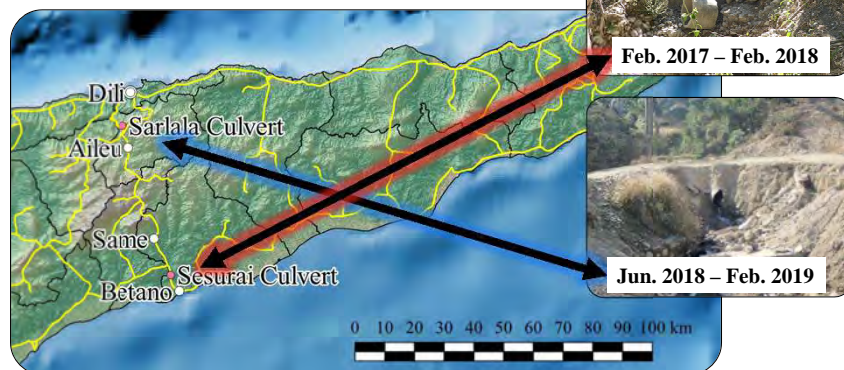
- Training for planning & design
- Experience of design checks with case studies
- Preparation of technical guidelines for culvert design



51

## Case studies for culvert design

- Importance: A05 and Ex-Japan Road
- Accessibility: < 60 minutes from a town
- Generality: common type of construction



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## Training for culvert design

- Seminars, workshops and site visits for hydrological studies and hydraulic design of culverts
- Feb. 2017 – Mar. 2019
- Total training time of 25 hours
- 155 participants in total
- 2 trainers selected from participants
- Trainers conducted 4 seminars



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## Training overview

Stages and methodology of culvert design checks

- Verification of culvert design:

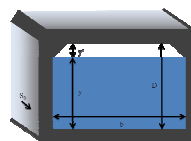
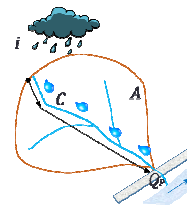
$$Q > Q_P$$

- Rational Method for peak runoff estimation:

$$Q_P = \frac{1}{3.6} \times C \times i \times A$$

- Manning and discharge equation for culvert capacity:

$$Q = \frac{A^{5/3} \times S_0^{1/2}}{P^{2/3} \times n}$$



Planning

Data  
collectionRainfall  
analysisFlood  
calculationOpen-channel  
hydraulicsProtection  
works

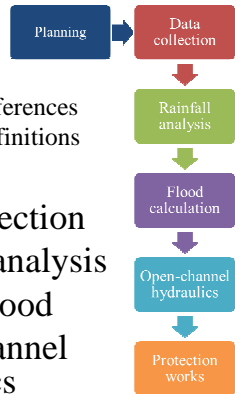
## Contents of Culvert Design Guidelines

### Introduction

1. Scope
2. Normative references
3. Terms and definitions
4. Planning
5. Data collection
6. Rainfall analysis
7. Design flood
8. Open-channel hydraulics
9. Protection works

Glossary

Bibliography



- Annex A: Case study of Sesurai culvert
- Annex B: Training materials
- Annex C: Weather stations in Timor-Leste

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## 2.3.3 Slope protection & Landslide investigation guidelines

### Review of existing technical documents

*Slope Protection Guideline (2008)* are existing guidelines related to slope protection; however, they are rarely used.

- The contents stay within schoolbook general theory
- Users must read on till reach useful information for their pending problems among
- The contents consist of wide coverage and big volume of textual information and not user-friendly structure
- Technical knowledge such as geology is required to utilize the guideline

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## Analysis of past damage cases

There was a problem that could not be controlled by existing countermeasures

⇒ Surface layer collapse of about 2 m in depth or landslide



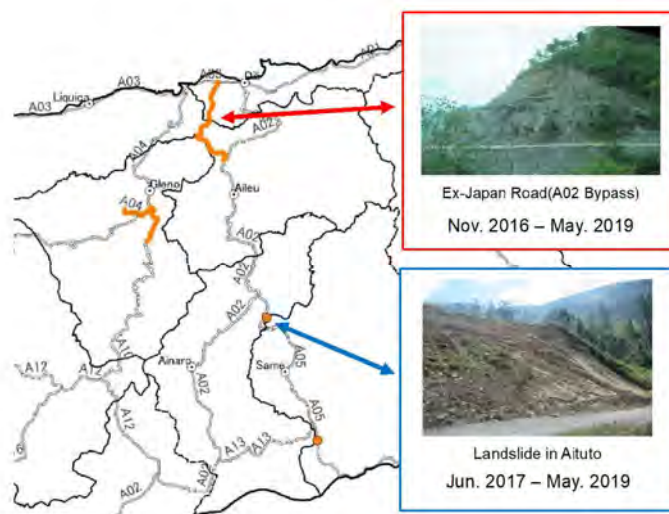
Surface layer collapse



Scarp (long, steep slope) suspected of landslide

57

## Case studies for slope protection and landslide Investigation



58

## Training for slope protection and landslide Investigation

- Seminars, workshops and site visits for Safety factor calculation of slope protection, how to use "Dokenbo" and Total station
- Seminars, workshops and site visits for Landslide investigation method, UAV, field investigation and Inclinator measurement
- Nov. 2016 – May. 2019

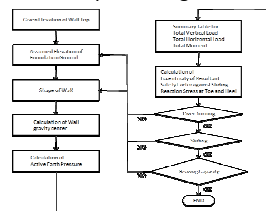


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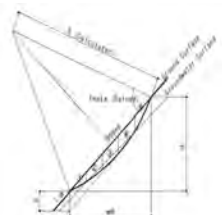
## Training overview of slope protection

### Slope protection theory training

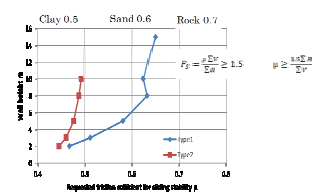
#### Design Procedure of Gravity Retaining Wall



#### Slope Stability Calculation

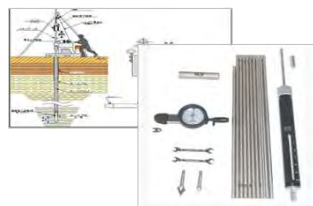


#### Wall Sliding Condition



### Measurement instrument training

#### Dokenbo



#### Total Station

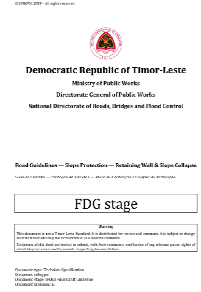


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## Contents of Slope Protection Guidelines

### Introduction

1. Scope
2. Normative references
3. Terms and definitions
4. Investigation
5. Design of Gravity Retaining Wall
6. Gravity Retaining Wall in the Common drawings
7. Bearing Capacity
8. Slope
9. Slope Disaster
10. Slope Stability Calculation
11. Influence of factors in slope stability calculation formula
12. Design Example of Countermeasure against Shallow Slope Collapse

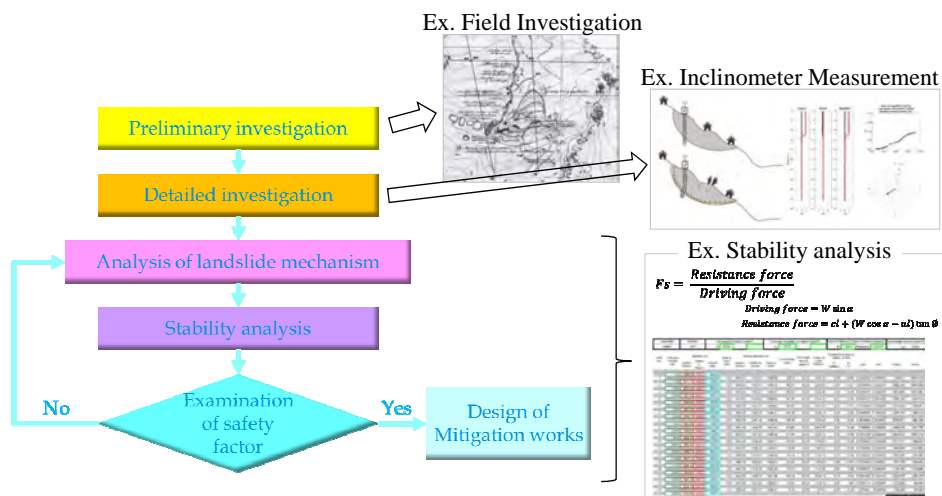


- Annex A: How to use the Total Station
- Annex B: How to use the Dokenbo
- Annex C: Excel worksheets for Stability calculation of gravity retaining wall
- Annex D: Excel worksheets for slope stability calculation
- Annex E: Catch wall

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## Training overview of landslide Investigation

### Stages and methodology of Landslide Investigation



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## Contents of Landslide Investigation Guidelines

### Introduction

1. What is a Landslide?
2. What is a Landslide Warning Signs?
3. Flow chart of landslide investigation
4. Preliminary investigation
5. Detailed investigation
6. Analysis of mechanism of the landslide
7. Consideration on the counter-measures for landslide prevention
8. Conclusion



- Annex A: Standard specification and operation method of UAV
- Annex B: Technical Specification for Geotechnical Investigation
- Annex C: Guideline for Installation of Inclinometer Casings
- Annex D: Supplementary Guide for Installation of Inclinometer Casings
- Annex E: How to use the inclinometer
- Annex F: How to use the logger for inclinometer
- REFERENCE Document Procedure Manual for Landslide

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## 2.4 Publicity & other activities

1. Published articles about CDRS activities on the JICA website, social media and in a newspaper
2. Supported establishment of a DRBFC Facebook page
3. Provided vests with custom design
4. Disseminated technical guidelines through a joint seminar with R4D-SP & guest seminars at DIT



3.



2.



1.



4.

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### 3. Project evaluation

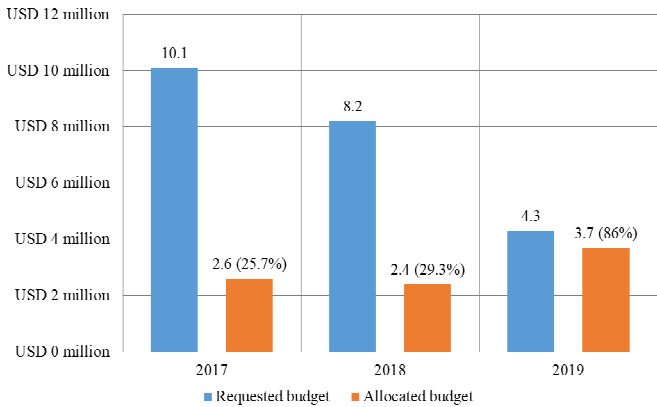
65

#### Evaluation of Output 1

Appropriate road maintenance and rehabilitation for major roads is realized in accordance with annual work plan and annual budget plan

**Indicator 1-1: Over 30% of requested budget for road maintenance are distributed**

Achieved and transition of the distribution of road maintenance of national roads

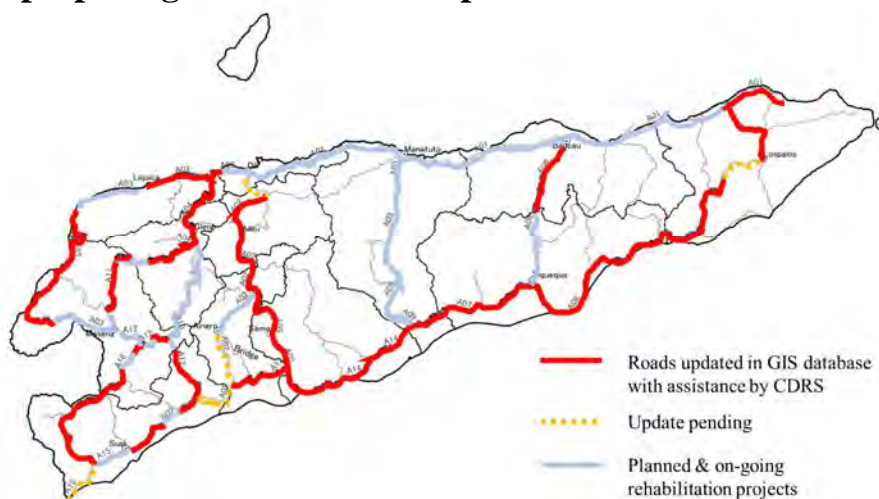


66



## Evaluation of Output 1

**Indicator 1-2: Improved road database is utilized for preparing the annual work plan of road maintenance**



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## Evaluation of Output 2

Capacity of DRBFC construction management for maintenance and rehabilitation including slope protection is improved through case studies in the whole country

**Indicator 2-1: At least 6 case studies for construction and for design are conducted**

Site of case study on design	Subject
1. Aitutua area (National road A05)	Landslide survey
2. Sesurui area (National road A05)	Cross drainage design
3. Sahan bridge (National road A07)	Bridge pier protection design as countermeasure of scouring
Site of case study on construction	Subject
4. Ex-Japan (by-pass of National road A02)	Safety management and quality control
5. Ex-Japan (by-pass of National road A02)	Culvert design and construction
6. Humboe- Letefoho (National road A10)	Supervision and quality control

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## Evaluation of Output 2

**Indicator 2-2: Over 60 % of trainees pass the achievement test for construction supervision and design**

Result of achievement test

Achievement Test	Target	Baseline survey (2016 July)	End line survey (2019 June)
Subjects for Quality control	Over 60% of trainees pass the achievement test	8%	60%
Subjects for Design		28%	64%

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## Evaluation of Output 3

Technical guideline of investigation and design for maintenance and rehabilitation are provided as a tool for more appropriate design including slope protection

**Indicator 3-1: Technical guideline of investigation and design for slope protection, drainage and measures against scouring are prepared**

Target	Status
Guidelines for slope protection	✓ Prepared
Guideline for bridge substructure protection	✓ Prepared
Guideline for culvert design	✓ Prepared
Guideline for landslide investigation	✓ Prepared

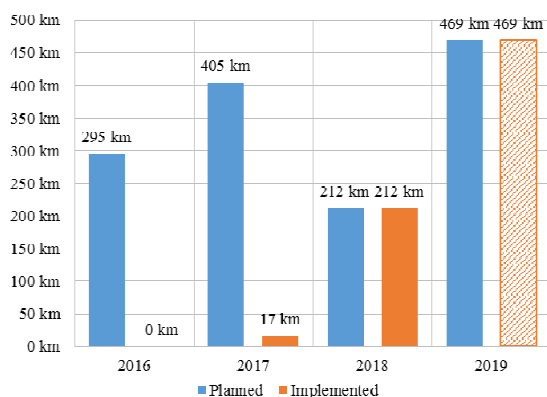
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## Evaluation of Project Purpose

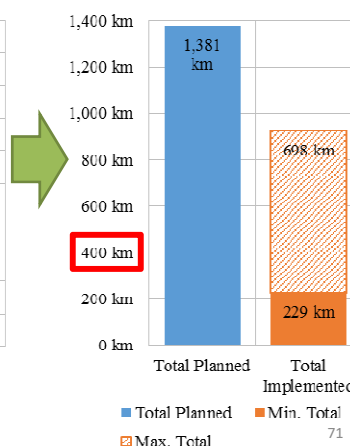
Capacity of DRBFC for maintenance of major roads in the whole country is enhanced

**Indicator: Total length of maintained national roads become 400 km.**

Length of planned and implemented maintenance work by year



Total length of maintenance work during the project period



## Evaluation of Overall Goal

The maintenance conditions of major roads are improved in Timor-Leste.

**Indicator : More than 60% of major national roads is in good condition.**

⇒ High probability of achievement

- Based on the 5 years road rehabilitation plan, in 2022 1,020km (73% of total 1,400km of national roads) of national roads will be completed.
- And also approximate 1,000km (71% of total 1,400km of national roads) of national roads will be maintained based on the 5 years road maintenance plan.

## Five evaluation items of JICA Project Evaluation Guidelines

Evaluation items	Overview of perspective
Validity	Evaluate whether Japan's aid policy is consistent with the development policy of Timor-Leste, and whether it matches the needs of the target group and the needs of the region.
Effectiveness	Evaluate whether there are prospects for achieving the Project Purpose, whether there are obstacles to achieving the Project Purpose, and whether the outputs were sufficient to achieve the Project Purpose.
Efficiency	Evaluate whether outputs are expected to be achieved, whether there were any factors that hindered achievement of outputs, whether there were enough activities or enough inputs to produce the outputs, whether there was any influence by external conditions, and whether there was any excess or deficiency in carrying out activities according to the plan.
Impact	Evaluate whether the Overall Goal is expected to be manifested as a project effect or the Overall Goal is achieved, whether there are any obstacles to achieving the Overall Goal, whether there is a discrepancy between the Overall Goal and the Project Purpose, and whether effects / impacts other than the Overall Goal are expected. In particular, if a negative impact is assumed, verify whether measures are taken to reduce it.
Sustainability	Evaluate whether the Project Purpose, Overall Goal and other project outputs are expected to persist after the project ends. Evaluate any factors that may contribute to or inhibit the sustainability of these effects from the perspectives of policy / system, organization, finance and technology.

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## Validity

**High relevance of consistency**

### Consistency with the development policy of Timor-Leste is High:

Due to high priority given to Infrastructure development and maintenance in the Strategic Development Plan (SDP) 2011-2030.

### Consistency with Japan's assistance policy for Timor-Leste is High:

Support for Sustainable Development is the Japanese basic policy including support for maintenance.

### Consistency with local needs are High:

Because The National Roads are the only routes connecting cities and are very important and the relevance of this project is high.

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## Effectiveness

Level of achievement is medium

### Achievement of Project Purpose

Indicator of the Project Purpose is 400km length of maintained national roads and more than 400km is planned to be maintained in 2019 budget.

### Logic from achievement of Outputs to achievement of Project Purpose

Most of the indicators level of the Outputs is achieved for to conduct proper maintenance activities.

### External conditions from Outputs to Project Purpose

Except delay of budget allocation in 2017 and 2018, the other external conditions were satisfied.

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## Efficiency

The efficiency was slightly high

### Achievement of each Output:

Achievement of Output 1 is medium, Output 2 is achieved and Output 3 is medium waiting final authorization.

### Input of experts from Japan:

Necessary and reasonable.

### Introduction of equipment:

Survey equipment is contributed to the achievement of the output.

### Project period:

Has been extended necessary due to the delay in budget execution.

### External conditions from Activities to Outputs:

Although the condition was eventually satisfied, the budget was not secured in 2017 and 2018 due to the transition of the government.

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## Impact

Medium

### Expected achievement of the Overall Goal:

Based on the 5 years plan of rehabilitation and maintenance of national roads, Good performance of more than 70% of national roads are planned to be rehabilitated and maintained by 2022.

### Ripple effect of the project:

Ripple effect is the preparation of technical guidelines waiting official approval and establishment of platform for collaborate many people.

### External conditions from "Project purpose" to "Overall goals"

It will be confirmed at this JCC whether the external condition from the Project Purpose to the Overall Goal, "The road maintenance budget is secured" will be met.

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## Sustainability

Medium

### Policy aspect:

Since the Infrastructure development is Policy in SDP, Sustainability is maintained.

### Organizational aspect:

Based on the recommendation made by the experts, many improvement actions have been started from 2019 budget.

### Technical aspect:

Technology will be propagated and trained to young engineers using the guidelines but still the slope failure, rock fall and road shoulder collapses occurred and required countermeasures for disaster prevention as well as medium term of road pavement management plan.

### Financial aspects:

For sustainable long term road maintenance, new road maintenance fund supported by the introduction of fuel tax and also multi year maintenance contract applied the Infrastructure Fund shall be introduced.

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## 4. Project implementation issues & lessons learned

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### Implementation Issues, Ingenuity and Lessons Learned

#### 1. Preparation of technical guidelines and checklists

##### Issues:

Understanding level and method of works were not unified by the staff and quality of construction could not be **maintained**.

##### Ingenuity and lessons:

4 design guidelines and checklists were prepared for most problematic works and also candidate staffs for trainer by TOT have been developed requiring future training in-house trainers continuously.

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## Implementation Issues, Ingenuity and Lessons Learned

### 2. Improvement of Budgeting and Operation

#### Issues

Design and Construction of Projects were based on proposals from contractors and the detailed design, drawing and quality were not sufficiently prepared and checked.

#### Ingenuity and lessons

Separation of Design and Construction and Private orders for design and supervision were recommended and some of this recommendations were realized in 2019 budget. More rational design will be realized by utilizing the guidelines.

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## Implementation Issues, Ingenuity and Lessons Learned

### 3. Development of efficient inspection methods

#### Issues

Detailed and complicated road inspection surveys were introduced by previous project therefore DRBFC staff were unable to continue.

#### Ingenuity and lessons

Simplifying of inspection method was introduced and automating IRI using a smartphone and visualize the results by video collaborating with UNTL. Hoping for autonomous development of inspection system by collaboration with UNTL.

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## Implementation Issues, Ingenuity and Lessons Learned

### 4. Cooperation with IPG for Landslide Observation

#### Issues

Timor-Leste is a narrow island with weathered geology and has a lot of rainfall, collapse of steep slopes and rock falling along the national roads.

#### Ingenuity and lessons

Expert conducted OJT with case studies at large-scale landslide area. But since landslide techniques require very special knowledge, collaboration with highly competent IPG staff introduced. Hoping for further cooperation with IPG.

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## Implementation Issues, Ingenuity and Lessons Learned

### 5. Strengthen of Construction Supervision

#### Issues

By previous organizational reform, DRBFC's local staffs were transferred and bring difficulties frequent supervision and quality assurance.

#### Ingenuity and lessons

Expert proposed supplement internal supervisor and private order contractor's supervisor and DRBFC decided to hire 50 new supervisor from 2019 budget.

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## Implementation Issues, Ingenuity and Lessons Learned

### 6. Securing Emergency Budget

#### Issues

Payment of trip expenses for on-site supervision, road inspections and design surveys was delayed.

#### Ingenuity and lessons

Expert proposed to secure the necessary temporary expense for business trip and DRBFC began such emergency expense from 2019 budget.

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## 5. Recommendations for achieving the Overall Goal

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## Recommendations for Achievement of Overall Goal after Project Completion:

It is judged that it is possible to achieve the Overall Goal.

However

- ✓ it is pointed out that there is a need for capacity building for preventative investigations and countermeasures against these natural disasters.
- ✓ For more practical training of improvement of facilities and paving maintenance capacity, capacity building of DRBFC engineers who investigate and design the maintenance and repair methods for each pavement type should be conducted through training and also through the implementation of pilot projects.



Project for Capacity Development for Road Asset Management of Disaster Prevention and Pavement Management.

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## Proposals for Project Purpose and main activities

- Implementation of multi-year maintenance using infrastructure funds

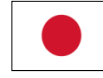
In order to improve existing long time tendering procedure and short time implementation of the maintenance project under the line ministry budget, Recommendation is multi-year maintenance system using Infrastructure Fund

- New gasoline tax as target tax and new road maintenance fund

In order to well maintain for the growing numbers and length of roads, Introduction of new fuel tax paid by road users and use it for road maintenance only under the name of road fund.

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**Thank you for your attention  
Obrigadu Barak**

