The Project to Enhance the Capacity of Vientiane Capital State Bus Enterprise

Concept of Parts and Maintenance Record IT Introduction

Katahira and Engineers International, Ltd.
(KEI)
Tokyo, Japan

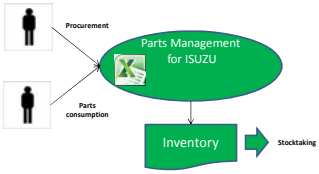
Purpose of Parts and Maintenance Record IT Introduction

- To simplify the parts and maintenance management and to gather the data for analyzing parts cost and bus maintenance cost from economical perspective.

- Workload saving for inputting data.
- Parts and maintenance cost analysis will be obtained.

Flow of IT Introduction

STEP:1 Create excel file for parts management



Major tasks to be conducted

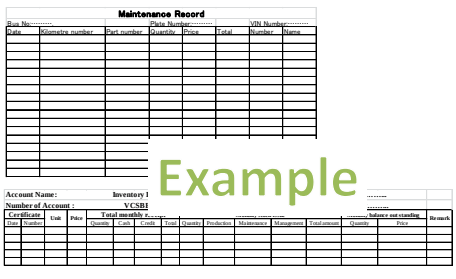
- **Create Parts Management excel file for ISUZU.**
- **Create Operation flow.**
- **Create Procedure documentation.**
- **Training for person who will maintain excel file.**

Issues to be discussed and considered

- **There are 2 PCs in parts division and fix division**
  Use 1 PC or copy the file every day?

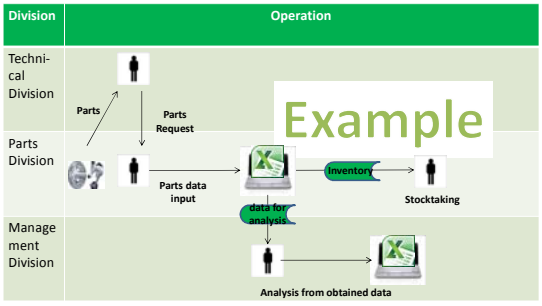
Example – Parts Management (excel)

To be created by modifying , enhancing following files



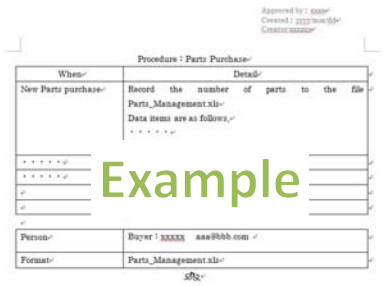
Example – Operation flow

This is to understand who will do what and when etc.

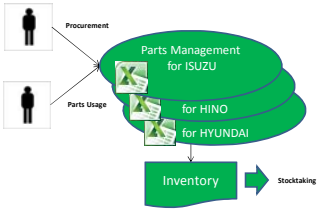


Example – Procedure document

This is to define what should be done in detail



STEP:2 Expand excel file for HINO and HYUNDAI



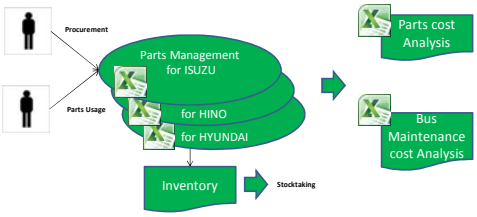
Major tasks to be conducted

- **Create Parts Management excel file for HINO/HYUNDAI based on ISUZU file.**
  (Preparing parts master and bus master)

Issues to be discussed and considered

- **How about Nissan micro, and international bus.**
- **It is better that step 2 will be conducted by enterprise itself.**
  (Training in advance is important)

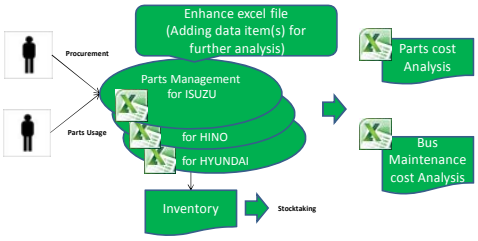
STEP:3 Analyze parts cost and maintenance cost



Major tasks to be conducted

- **Analyze parts cost.**
  (Which parts requires many times to exchange? Then why?)
- **Analyze bus maintenance cost.**
  (Which bus requires many maintenance cost? Then why?)

STEP:4 Enhance excel file for further analysis



Major tasks to be conducted

- **Confirm if further analysis can be done with current excel file.**
- **If it requires further data item(s), excel file must be enhanced.**

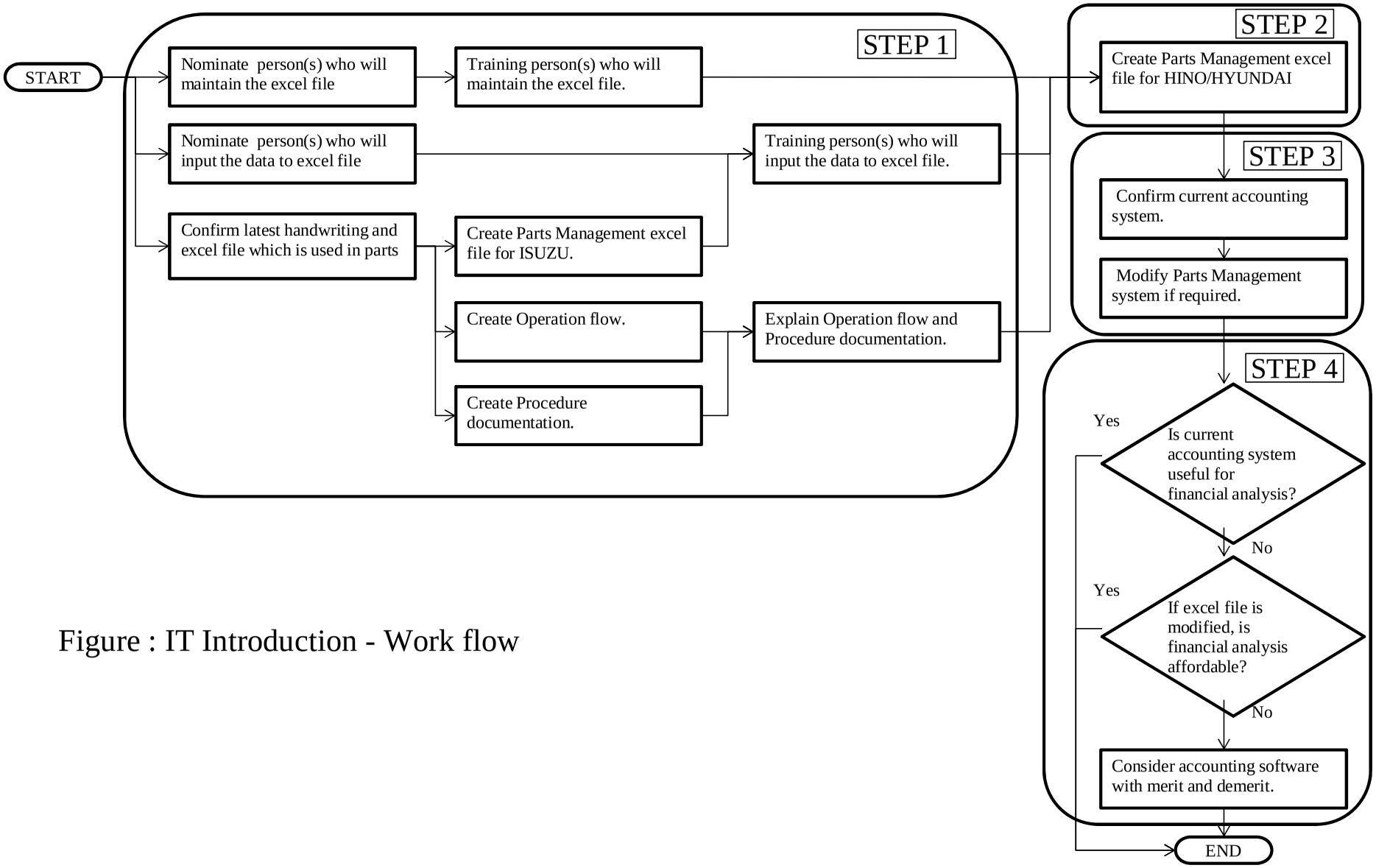


Figure : IT Introduction - Work flow

Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

Vientiane Capital
Department of Public Works and Transport
Vientiane Capital State Bus Enterprise

Date: 12 Month: February Year: 2013

Item	Bus No:	Incoming Bus	Operation Route		Name & Surname		No of Trip		Refill Fuel Rate (Diesel)			Ticket Price	Remark
					Bus Driver	Ticket Seller	Plan	Actual	Define	Tank Remain	Actual		
1	159		Tha Lath	5	Symone								
2	160		Tha Ngone	5	Soukkhavong								
3	161		Phone Tong	3	Vanxay								
4	162				Toun								
5	163				Soukxay								
6	164		Thong Pong	1	Phouthong								
7	165		Dong Dok	1	Phounthep								
8	166		Tha Deua	1	Aroune								
9	167		Phone Tong	1	Vilay								
10	168		Nong Tha	3	Soulith								
11	169		Tha Ngone	2	Khammanh								
12	170		Dong Dok	2	Singkeo								
13	171		Tha Deua	7	Pern								
14	130		Nong Teng	2	Bounmy								
15	131		Tha Lath	1	Lathsamy								
16	132		Phone Tong	2	Chamlong								
17	133		Tha Deua	8	Khounpaseurt								
18	134		Tha Ngone	1	Khamfath								
19	135		Thong Pong	2	Sysouk								
20	136		Dong Dok	3	Khamfong								
21	137		Tha Deua	10	Phoxay								
22	138		Nong Tha	1	Khamdeang								
23	139		Tha Ngone	6	Chanthavy								
24	140		Tha Lath	2	Bounsou								
25	141		Tha Deua	9	Souvanny								
26	142		Phone Tong	6	Samleth								
27	143		Dong Dok	6	Savai								
28	144		Tha Deua	2	Sammany								
29	145		Tha Lath - VTE		Symone								
30	146		Tha Deua	6	Khamdeang								
31	147				Khamfoung								
32	148		Dong Dok	5	Khankeo								
33	149		Tha Ngone	3	Bounthan								
34	150		Tha Deua	3	Oudom								
35	151		Tha Lath	3	Bounleap								
36	152		Dong Dok	4	Sengdeuang								
37	153				Khamphone								
38	154		Tha Deua	4	Khom								
39	155		Phone Tong	4	Litthsack								
40	156		Tha Ngone	4	Somboun								
41	157		Tha Deua	5	Sackda								
42	158		Tha Lath	4	Compiter								

Photos


Self Introduction
Toshiaki ISHIZEKI 石関 俊昭
Joined Katahira on Sep. 2012.
20 years experience in IB
Hobby : Tennis

THE PROJECT TO ENHANCE THE CAPACITY OF VIENTIANE CAPITAL STATE BUS ENTERPRISE

Register

Topic: Daily Maintenance Training

Date : 23 May 2013

Location : VCSBE

ລ/ດ No.	ຊື່ ແລະ ນາມສະກຸນ Name & Surname	ມາຈາກພາກສ່ວນ Organization	ເບີໂທລະສັບມືຖື Telephone number	ທີ່ຢູ່ອີເມວ Email Address	ລາຍເຊັນ Signature
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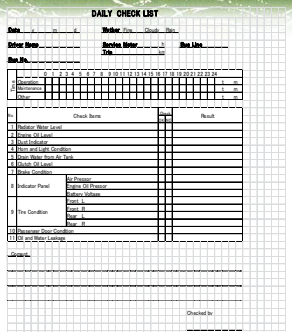
DAILY CHECK

The Project to Enhance the Capacity of Vientiane Capital State Bus Enterprise

2013-May-21

Sample of Check Sheet



DAILY CHECK LIST

Date m d

Driver Name

Run No.

Weather Fine Cloudy Rain

Service Meter h

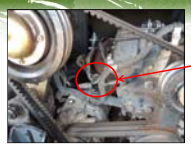
Bus Line

Trip

No.	Check Items	Time	Result
1	Radiator Water Level		
2	Engine Oil Level		
3	Dust Indicator		
4	Horn and Light Condition		
5	Drain Water from Air Tank		
6	Clutch Oil Level		
7	Brake Condition		
8	Indicator Panel	Air Pressure	
		Engine Oil Pressure	
		Battery Voltage	
9	Tire Condition	Front - L	
		Front - R	
		Rear - L	
		Rear - R	
10	Passenger Door Condition		
11	Oil and Water Leakage		

Checked by

Engine Oil Level



Engine Oil Level Stick

✓ Max Level

✓ Min Level

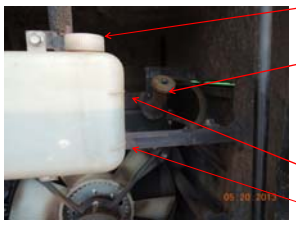
◆ If Oil is Low Level

□ You should be refill oil

Idemitsu CI-4 15W-40

Engine Oil

Water Level



If Water Low Level
Please Be Refill Water

Radiator Cap

✓ Max Level

✓ Min Level

Dust Indicator

Dust Indicator

If come out red line when should be check to Air cleaner

Horn and Light Condition

✓ Front

Head Light & Winker

✓ Rear

Stop, Winker and Back Lamp

✓ Drive Seat

Horn & Indicator

Drain Water from Air Tank

✓ L side Luggage Space

Please open door

✓ Water Drain Knob

After start engine when
Pull this knob

Clutch Oil Level

Please keep oil level
Between Min and Max

If Min Level

You should be refill oil

✓ Max Level

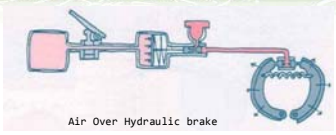
✓ Min Level

☐ Kind of Oil

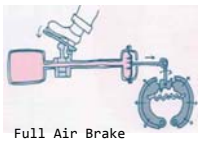
DOT-3 Brake Oil

Brake Condition

Hydraulic Brake



Air Over Hydraulic brake

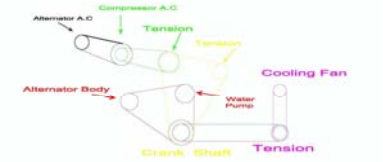


Full Air Brake

✓Check brake pedal free
Play and brake function

V-Belt Tension

✓ Please Check to Tension of Each V-Belt



Please Check to All V-Belt Tight Condition

Steering Oil

Please keep oil level
Between Min and Max

✓ Max Level

✓ Min Level

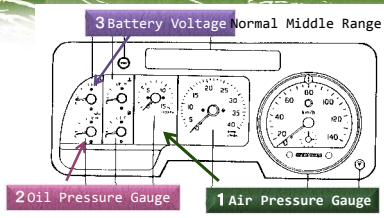
If Min Level

You should be refill oil

☐ Kind of Oil

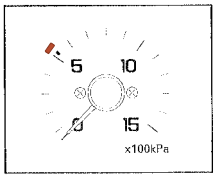
ATF Oil

Indicator Panel



Before Operation Bus, Please you check to condition for each Meter

Air Pressure Gage



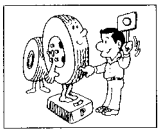
- Normal Pressure

690~780kpa

When the pressure becomes lower than 520kpa the indicator light on the instrument panel operates simultaneously with the warning buzzer

Tire

- All Tires Should Be Check

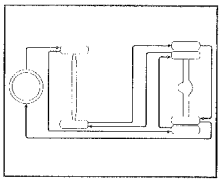


✓ Check tires for inflation and Damage

✓ Normal Air Pressure

725kpa 7.25kg/cm2

9.00R-20-14PR



✓ Please be Tire rotation

Necessary for tire control to Relocate tire periodically as Show in Figure to make each tire Wear even.

Passenger Door Condition

- How is Condition of Passenger Door

✓ Smoothly Operate ?

✓ Completely Shut ?

During Operation

- Confirmation to Door Area

➢ No Parson, No Children ?

Oil and Water Leakage

- Finally Go Around BUS

If You See Leakage Oil WATER

Inform to Mechanic !

Digital Tachograph

Check to Memory Card for Digital Tachogrph

If not yet insert Memory Card for Digital Tachograph

Come Alarm Noise

The End

- Thank You Very Much

Safety Driving

DAILY CHECK LIST

Date y m d **Weather** Fine Cloudy Rain

Driver Name **Service Meter** h **Bus Line**

Trip km

Bus No.

Time	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
Operation																										t	m
Maintenance																										t	m
Other																										t	m

No.	Check Items		Check OK	Check NO	Result
1	Radiator Water Level				
2	Engine Oil Level				
3	Dust Indicator				
4	Horn and Light Condition				
5	Drain Water from Air Tank				
6	Clutch Oil Level				
7	Brake Condition				
8	V-Belt Condition				
9	Steering Oil Level				
10	Indicator Panel	Air Pressure			
		Engine Oil Pressure			
		Battery Voltage			
11	Tire Condition	Front L			
		Front R			
		Rear L			
		Rear R			
12	Passenger Door Condition				
13	Oil and Water Leakage				

Comment

Checked by

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Training in the Meeting Room 1

Training in the Meeting Room 2

Check Engine Room

Check Laggage Room

Check Cooling Water

Check Engine Oil

Check Engine Belt by hand

Check Engine Belt by gauge

VCSBE

Training Program of Preventive Maintenance and Quality Control

1. Purpose

To introduce the method of preventive maintenance and quality control is helpful to preventing breakdown of buses. In the result, Maintenance time and cost will be minimized. And the operation rates will be raised.

- Preventive Maintenance: To maintain buses before a breakdown.

- Quality Control: To secure an accuracy of maintenance with measure and record of each maintained parts.

2. Target Parts

1) Engine Oil Pressure
2) Engine Revolution (Min, Max, AC on)
3) V-Belts Tension
4) Coolant Water Temperature
5) Air Conditioner Gas Pressure
6) Braking Line Pressure
7) Each Part Temperature (Oil Pan, Engine Block, Transmission, Differential Gear, Brake Drum)
8) Brake Lining Thickness
9) Tire Depth
10) Survey about foreign material in each Oil (Engine, Transmission, Differential Gear)

The each measurement data should be compare with specified value or previous value. If there are any differences on these values, the parts will be repaired.

Registration

Meeting Topic: 1st QC and Digital Tachograph Workshop

Place: VCSBE Meeting Room

Date: 15 May 2014

Time: 14:00 - 16:00

ລ/ດ No.	ຊື່ ແລະ ນາມສະກຸນ Name & Surname	ຕໍາແໜ່ງ Position	ມາຈາກພາກສ່ວນ Organization	ເບີໂທລະສັບ Telephone number	ທີ່ຢູ່ອີເມວ Email Address	ລາຍເຊັນ Signature
1.	Bounpone Phongmany	Dep Dir	VCSBE	55512185		[illegible]
2	Boun souk. Sibounthanh	[illegible]	VCSPZE	55699495	souk.sibounthanh@hotmail.com	[illegible]
3	SouTchapith. Khotnhotha	[illegible]	–	55676257		[illegible]
4.	Thanongsy DETVONGSONE.	chief of city BUS	VCSBE	55675122.		[illegible]
5	Khayphavanh Oudomsack	IT	VCSBE	99997131	monyfolee2011@gmail.com	[illegible]
6	SOMLITH KHANKEO	[illegible]	–"–	55528230		[illegible]
7	Khamsone Vilasack	Head Mechanical Division	–"–	55614406		[illegible]
8.	Champhouy Somphaseuth	[illegible]	–"–	55616789		[illegible]

Q C

&

Digital Tachograph Analyze

KIE Vientiane 2014 2014 May VCSBE

Before

Quality Control

After

What is Quality Control (QC)

Quality control (QC) is a procedure or set of procedures intended to ensure that a manufactured product or performed service adheres to a defined set of quality criteria or meets the requirements of the client or customer.

In order to implement an effective QC program, an enterprise must first decide which specific standards the product or service must meet. Then the extent of QC actions must be determined (for example, the percentage of units to be tested from each lot). Next, real-world data must be collected (for example, the percentage of units that fail) and the results reported to management personnel. After this, corrective action must be decided upon and taken (for example, defective units must be repaired or rejected and poor service repeated at no charge until the customer is satisfied). If too many unit failures or instances of poor service occur, a plan must be devised to improve the production or service process and then that plan must be put into action. Finally, the QC process must be ongoing to ensure that remedial efforts, if required, have produced satisfactory results and to immediately detect recurrences or new instances of trouble.

What is Quality Control (QC)

QC Circle

Subject → **Discussion** → **Purpose**

- Improve Quality
- Lower the Cost
- Improve Safety
- Lower Disposal Emission

- 7 tools
  1. Histogram
  2. Control Chart
  3. Pareto Chart
  4. Scatter Chart
  5. Check Sheet
  6. Fishbone Diagram
  7. Flow Chart

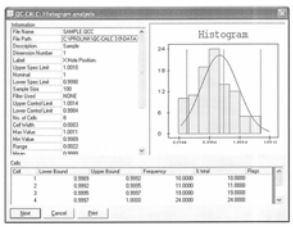
PDCA Cycle

- ***Standardization***
- ***Job Efficiency Contribution***
- ***Social Contribution***

What is Quality Control (QC)

1. Histogram

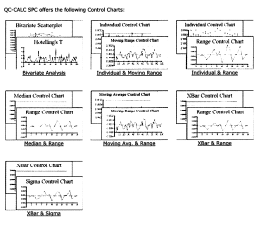
QC-CALC can generate Histogram chart which provide an indication of the frequency of occurrence of sample values over a range of measurement. A histogram chart provides a bar style graph as shown. The pattern of the bars provides an indication of the distribution of the sample date. If the bars are arranged with the tallest at the approximate center and the shorter bars at the left and right extremities of the range, the distribution is most likely to be normal.



What is Quality Control (QC)

2. Control Chart

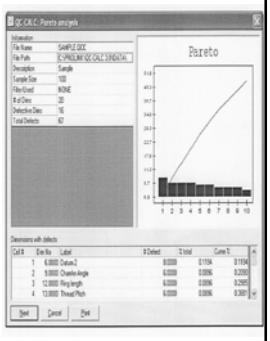
Control Chart are a valuable process control tool since they provide a signal that a process has assignable cause variation which requires corrective action. A requirement for process control is the elimination of assignable cause variation. Control chart show whether a process is in statistical control or if assignable cause variation is present.



What is Quality Control (QC)

3. Pareto Chart

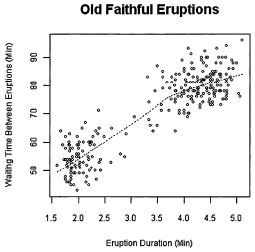
QC-CAL is equipped with Pareto analyzing charts which an indication of the main sources of defective characteristic. A Pareto chart is a bar style graph of defective characteristic arranged in order of significance. The characteristic causing the greatest number of defects is displayed at the left-most position on the bar graph. The traditional concept behind Pareto charts is to highlight the "significant few" causes of defects from the "trivial many". Generally speaking, most quality control problems can attributed to a relative few number of causes. Using a Pareto chart to sort defective characteristics in order of importance allows you to focus on the main cause of problems.



What is Quality Control (QC)

4. Scatter Chart

A scatter chart is a tool for analyzing relationship between two variables. One variable is plotted on the horizontal axis and the other is plotted on the vertical axis. The pattern of their intersecting point can graphically show relationship patterns. Most often a scatter chart is used to prove or disprove cause –and – effect relationships. While the chart shows relationships, it does not by itself prove that one variable causes the other. In addition to showing possible cause-and –effect relationship, a scatter chart can show that two variable are from a common cause-and-effect relationships, a scatter chart can show that two variables are from a common cause that is unknown or that one variable can be used as a surrogate for the other.



What is Quality Control (QC)

5. Check Sheet

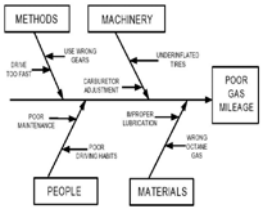
The check sheet is a simple document that is used for collecting date in real time and the location where the date is generated. The document is typically a blank from that is designed for the quick, easy, and efficient recording of the desired information, which can either quantitative or qualitative.

When the information is quantitative, the check sheet is sometimes called a tally sheet. The check sheet is one of the seven basic tools of quality control made popular by Dr.Ishikawa. A defining characteristic of a check sheet that date is recorded by making marks ("Checks")on it. A typical check sheet is divided into regions, and marks made in different regions have different significance. Date is read by observing the location and number of marks on the sheet.

What is Quality Control (QC)

6. Cause -and- Effect (Fishbone Chart)

The Cause & Effect chart, also sometimes called the " Fishbone Chart", is a tool for discovering all the possible causes for a particular effect. The effect being examined is normally some product or service quality, such as a machined part not to specification, delivery times varying too widely, excessive number of bugs in software under development, and so on , but the effect may also relate to internal processes such as high rate of term failures,

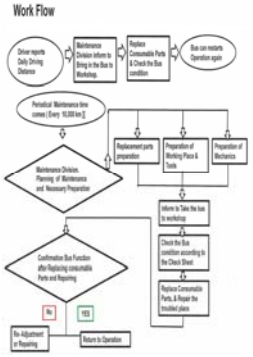


The major purpose of the Cause & Effect Chart is to act as a first step in problem solving by generating a immediate identification of major causes and point to the potential remedial actions or, failing this, it may indicate the best potential areas for further exploration and analysis. At a minimum, preparing a Cause & Effect chart will lead to greater understanding of the problem.

What is Quality Control (QC)

7. Flow Chart

A flowchart is a type of diagram that represents an algorithm, workflow or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows. This diagrammatic representation illustrates a solution to a given problemFlowcharts are used in analyzing, designing, documenting or managing a process or program in various fields.



What is Quality Control (QC)

PDCA Cycle

The plan–do–check–act cycle (Figure 1) is a four–step model for carrying out change. Just as a circle has no end, the PDCA cycle should be repeated again and again for continuous improvement.

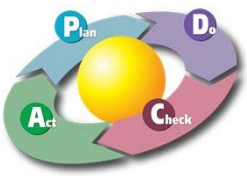


Figure 1

Plan–Do–Check–Act Procedure

1. **Plan**. Recognize an opportunity and plan a change.
2. **Do**. Test the change. Carry out a small-scale study.
3. **Check**. Review the test, analyze the results and identify what you've learned.
4. **Act**. Take action based on what you work, learned in the study step: If the change did not go through the cycle again with a different plan. If you were successful, incorporate what you learned from the test into wider changes.
   Use what you learned to plan new improvements, beginning the cycle again.

What is Quality Control (QC)

QC Circle

The small group of Workers of first line at work place improve the quality of Goods continuously ・Service・ Work

This small group

Do the operation by the one's motive, with the aid of thinking way of QC ・Means of QC , proceed activity with the exert creativeness and aiming

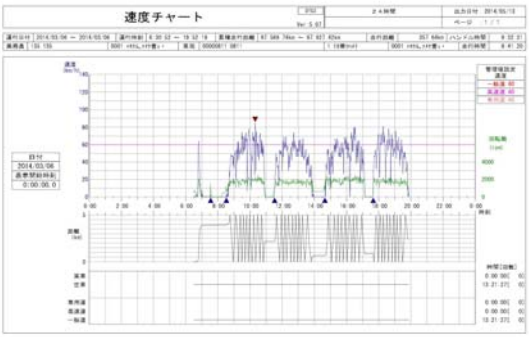
This activity

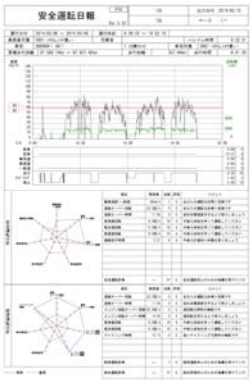
Aiming to make a work place, filling with bright and vitality and contribute customers' satisfaction and society and the improvement of QC circle member's ability , self – actualization.

Business Manager and Administrator

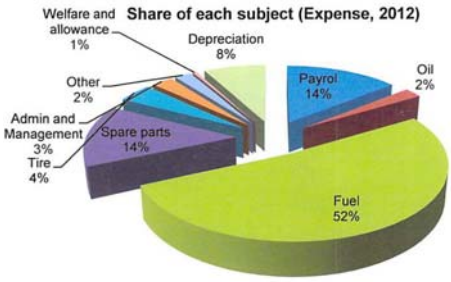
Place human resource development ・activation of work place to contribute constitutional improvement of company ・development *TQM*(P Practice total company activity, such as TQM (*Total Quality Management***and) and providing the support and leading to aiming to all workers joining by respecting humanity.**

Digital Tachograph





Digital Tachograph



Fuel Saving Driving Techniques & Maintenance and Management

- **Energy-efficient driving is a driving practice intended to improve fuel economy in automobiles.**
- **Fuel economy can be improved in many ways, including: increasing engine efficiency, reducing aerodynamic drag, rolling friction,**
- **This power points is consisted as followings,**

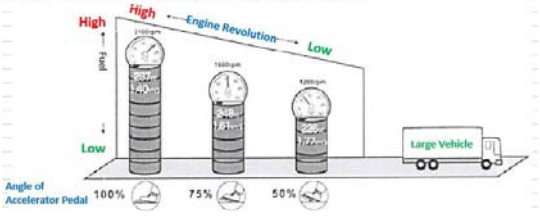
★ **Driving Technique: 1. Shift Up Earlier Stage**
2. Frequent Use High Shift Speed
3. Driving Speed should be Modestly
4. Making full use of Engine Brake
5. Requisite Minimum Idling of Engine
6. Vehicle Maintenance and Management for Fuel Saving

- **★ As far as vehicle Maintenance and Management, there are Tires,**
- **Engine Oil, Air Cleaner Elements which are related with Fuel Saving.**
- **Explain [Tire Air] in this material. 725kPa (7.25kg/cm2)**

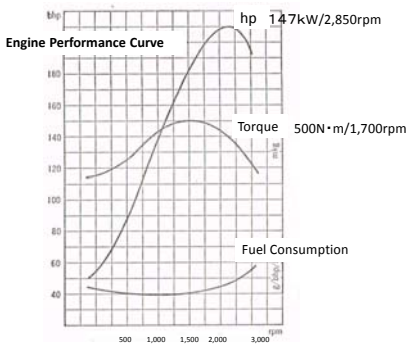
Driving Technique: 1. Shift Up Earlier Stage

Driving on the ordinary road, frequency of starting and acceleration will be increased. Because of traffic signal etc. this starting and acceleration will largely concerns with Fuel Consumption.
To keep in mind to shift up within green zone of the engine revolution gauge by avoiding acceleration.

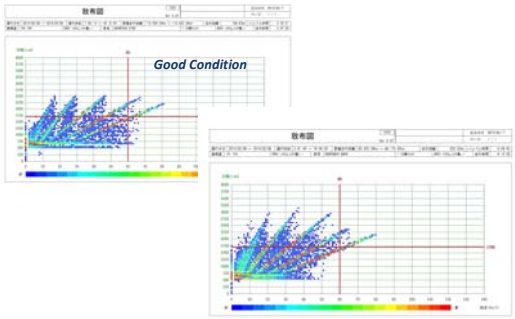
The difference of fuel consumption related to the Engine Revolution, and the Engine Revolution is going out from the stepping on angle of the Accelerator Pedal. (When accelerating from starting to 400m)



ISUZE 6HH1 ENGINE



Digital Tachograph



Driving Technique: 1. Shift up earlier stage [Actual Data]

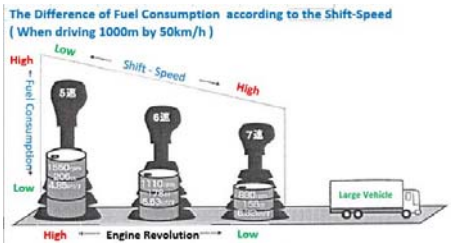
Large Vehicle	2100 rpm Shift 100% Stepping On	1600 rpm Shift 75% Stepping On	1200 rpm Shift 50% Stepping On
Fuel Consumption (cc)	287	248	226
Fuel Efficiency (km/ L)	1.40	1.61	1.77
Fuel Consumption difference (%)	Standard	16	27

Medium Vehicle	3300 rpm Shift 100% Stepping On	2350 rpm Shift 75% Stepping On	1400 rpm Shift 50% Stepping On
Fuel Consumption (cc)	145	130	116
Fuel Efficiency (km/ L)	2.76	3.08	3.46
Fuel Consumption difference (%)	Standard	11	25

Small Vehicle	3900 rpm Shift 100% Stepping On	2750 rpm Shift 75% Stepping On	1600 rpm Shift 50% Stepping On
Fuel Consumption (cc)	108	94	86
Fuel Efficiency (km/ L)	3.70	4.28	4.64
Fuel Consumption difference (%)	Standard	16	25

Driving Technique: 2. Frequent Use High Shift Speed

Driving on the ordinary road, using 4-shift speed in case of small car and 5-6 shift speed in case of large car as a actual shift speed.
Because, for catching up car flow on the road easily, but, this increase fuel Consumption and there will be to collide with the another car from the behind.
By shifting up 1(One) speed, engine will be decreased and can be expected lowering fuel consumption .
Same speed will not be changed to the destination time.
Let's keep in mind to use one more high shift speed.



Driving Technique: 2.Frequent Use High Shift Speed

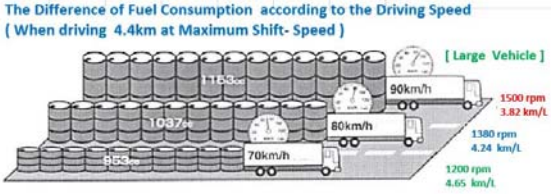
Large Vehicle	5	6	7
Engine Revolution (rpm)	1550	1110	880
Fuel Consumption (cc)	206	178	158
Fuel Efficiency (km/ L)	4.85	5.63	6.32
Fuel Consumption difference (%)	Standard	16	30

Medium Vehicle	4	5	6
Engine Revolution (rpm)	2400	1570	1100
Fuel Consumption (cc)	161	128	113
Fuel Efficiency (km/ L)	6.21	7.84	8.87
Fuel Consumption difference (%)	Standard	26	43

Small Vehicle	4	5	6
Engine Revolution (rpm)	2780	2180	1600
Fuel Consumption (cc)	149	110	94
Fuel Efficiency (km/ L)	6.72	9.07	10.62
Fuel Consumption difference (%)	Standard	35	58

Driving Technique: 3. Driving Speed should be Modestly

There is a close relationship between vehicle speed and time. Specially, bus will have a case to decide bus speed to get to the destination to carry Passengers within time.
But, speed has a close relationship with fuel consumption.
Speed is the cause of air resistance, air resistance is proportional to the square of the speed. Accordingly, when speed increases, air resistance will be dramatically increased.
When thinking the time only, " Driving fast will be able to get the destination earlier " but when thinking the fuel consumption, possible to say, " Slow driving will be able to get the far distance" therefore, would like suggest you to drive economic speed, having the free time from the pressure to drive.



Driving Technique: 3. Driving Speed should be Modestly

Large Vehicle

	90km/h	80km/h	70km/h
Engine Revolution (rpm)	1500	1380	1200
Fuel Consumption (cc)	1153	1037	953
Fuel Efficiency (km/ L)	3.82	4.24	4.65
Fuel Consumption difference (%)	Standard	11	22

Medium Vehicle

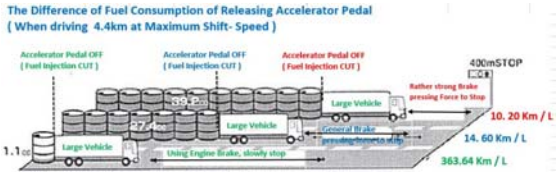
	100km/h	90km/h	80km/h
Engine Revolution (rpm)	2200	2000	1780
Fuel Consumption (cc)	854	771	701
Fuel Efficiency (Km/ L)	5.15	5.71	6.28
Fuel Consumption difference (%)	Standard	11	22

Small Vehicle

	100km/h	90km/h	80km/h
Engine Revolution (rpm)	3100	2800	2600
Fuel Consumption (cc)	818	727	657
Fuel Efficiency (Km/ L)	5.38	6.05	6.69
Fuel Consumption difference (%)	Standard	13	25

Driving Technique: 4. Making full use of Engine Brake

It tends to be thought that better fuel consumption is depending on pressing accelerator pedal as the whole, but releasing accelerator pedal will change the fuel consumption largely. Ultimate fuel saving is driving without using fuel, needless to say, it is impossible of starting, acceleration and ordinal driving, but, possible when travelling down hill or shifting down driving. Because, when releasing foot from accelerator pedal, diesel engine is no fuel injection condition. It is useless to say, to release foot at early stage from the accelerator pedal at the long down hill and stopping the bus at the red signal or temporally stop. You can contribute fuel saving largely by using engine brake.



Driving Technique: 4. Making full use of Engine Brake

Large Vehicle

	Accelerator + Rather Strong Brake	Accelerator + General Brake Pressing Force	Engine Brake Effective Use
Fuel Consumption (cc)	23.2	27.4	1.1
Fuel Efficiency (Km/ L)	10.20	14.60	363.64
Fuel Consumption difference (%)	Standard	43	3632

Medium Vehicle

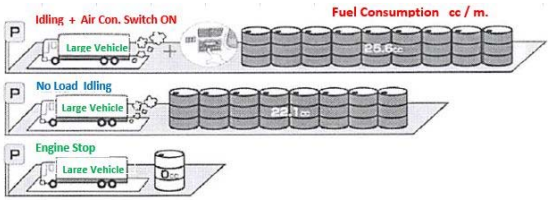
	Accelerator + Rather Strong Brake	Accelerator + General Brake Pressing Force	Engine Brake
Fuel Consumption (cc)	27.8	21.0	0.9
Fuel Efficiency (Km/ L)	10.79	14.29	333.33
Fuel Consumption	Standard	33	2989

Small Vehicle

	Accelerator + Rather Strong Brake	Accelerator + General Brake Pressing Force	Engine Brake
Fuel Consumption (cc)	24.1	18.1	0.8
Fuel Efficiency (Km/ L)	12.45	16.57	375.00
Fuel Consumption difference (%)	Standard	33	2913

Driving Technique: 5. Requisite Minimum Idling Driving

Recently, low idling driving stop movement is getting active by the regulation of local government of autonomous community or company instruction.
But, It is not generalized to stop the engine when stopping or parking the vehicle because of many reasons.
Avoiding the engine low idling, there will be great effect to reduce fuel consumption when thinking monthly or yearly.
You are requested to stop the engine when you leave the vehicle.
And make consideration that Air Conditioner will consume fuel considerably.



Driving Technique: 5. Requisite Minimum Idling Driving

Large Vehicle

	+ Air Con. Switch ON	No Load Idling	Engine Stop
Fuel Consumption cc / Minute	25.6	22.1	0
Fuel Consumption L / Hour	1.54	1.33	

Medium Vehicle

	+ Air Con. Switch ON	No Load Idling	Engine Stop
Fuel Consumption cc / Minute	14.3	11.5	0
Fuel Consumption L / Hour	0.86	0.69	

Small Vehicle

	+ Air Con. Switch ON	No Load Idling	Engine Stop
Fuel Consumption cc / Minute	12.2	9.7	0
Fuel Consumption L / Hour	0.73	0.58	

Driving Technique: 5. Requisite Minimum Idling Driving

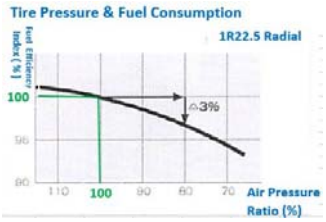
6. Vehicle Maintenance and Management for Fuel Saving

1. Tire

☆ As far as vehicle Maintenance and Management, there are Tires, Engine Oil, Air Cleaner Elements which are related with Fuel Saving.

☆ Tire Proper Pressure

When Tire pressure is 20% lower. Fuel Consumption will increase 3%.
On the other hand, when Tire pressure is higher, Fuel Consumption will be better, but, the life of Tire will be shortened.
So, it is important o keep proper Tire pressure.



Mr. Konosuke MATSUSHITA

The Founder PANASONIC

Don't repeat same things of yesterday, for today,
Even small things is acceptable,
Even small matter is acceptable,
Many people's these small THINK OUT 's accumulation
will produce large prosperity.

The END

Thank you very much

The JICA project to enhance the capacity of Vientiane capital state bus enterprise
Workshop of QC and Digital tachograph

Date : 15th May 2014
Name : SOMLITH
Position : Teeha
Organization :

Item		Rating Scale	
		Yes	No
1. QC			
1	Do you know the outline of the QC before this workshop?	✓	
2	Did you understand of QC ?	✓	
3	Do you know the 7 tools of the QC before this workshop?		✓
4	Did you understand of 7 tools for QC before this workshop?	✓	
5	Do you know the PDCA cycle before this workshop ?	✓	
6	Did you understand the PDCA cycle ?	✓	
2. Digital Tachograph			
1	Do you know the Digital Tachograph before this workshop ?	✓	
2	Did you understand the Digital Tachograph ?	✓	
3	How to analyze to the Digital Tachograph before this workshop?	✓	
4	Did you understand analyze to Digital Tachograph ?	✓	
5	How to drive to save the fuel before this workshop ?	✓	
6	Did you understand save the fuel driving?	✓	

The JICA project to enhance the capacity of Vientiane capital state bus enterprise
Workshop of QC and Digital tachograph

Date : 15th May 2014
Name : [illegible]
Position : [illegible]
Organization :

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The JICA project to enhance the capacity of Vientiane capital state bus enterprise
Workshop of QC and Digital tachograph

Date : 15th May 2014
Name : KhamSene VILASACK
Position : Head Mechanical Division
Organization :

Item		Rating Scale	
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1. QC			
1	Do you know the outline of the QC before this workshop?	✓	
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The JICA project to enhance the capacity of Vientiane capital state bus enterprise
Workshop of QC and Digital tachograph

Date : 15th May 2014
Name : Champhorey
Position :
Organization :

Item		Rating Scale	
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1. QC			
1	Do you know the outline of the QC before this workshop?	✓	
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The JICA project to enhance the capacity of Vientiane capital state bus enterprise
Workshop of QC and Digital tachograph

Date : 15th May 2014
Name : Xoumpone
Position : Dep. Director
Organization : VCSBE

Item		Rating Scale	
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1. QC			
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The JICA project to enhance the capacity of Vientiane capital state bus enterprise
Workshop of QC and Digital tachograph

Date : 15th May 2014
Name : Mr. Khaysavanh outhasack
Position : IT
Organization : VSCBE

Item		Rating Scale	
		Yes	No
1. QC			
1	Do you know the outline of the QC before this workshop?		✓
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6	Did you understand save the fuel driving?	✓	

The JICA project to enhance the capacity of Vientiane capital state bus enterprise
Workshop of QC and Digital tachograph

Date : 15th May 2014
Name : Thanongsy DETVONGSONE
Position : Chief of City Bus
Organization : VCSBE

Item		Rating Scale	
		Yes	No
1. QC			
1	Do you know the outline of the QC before this workshop?		✓
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The JICA project to enhance the capacity of Vientiane capital state bus enterprise
Workshop of QC and Digital tachograph

Date : 15th May 2014
Name : [illegible]
Position : [illegible]
Organization : VCSBE.

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6	Did you understand save the fuel driving?	✓	

App4 Workshop Materials

Act 1-2-2 Improve Daily Bus Operation Based on the Operation Regulation

	No.	Date	Seminar / Workshop	Page
(2) Bus Driver Training				
	1	22 May, 2014	Bus Driver's Training by Keisei Bus	App4-270
	2	23 May, 2014	Seminar for Managers of Bus Drivers by Keisei Bus	App4-284

Meeting Records on VCSBE Bus Drivers' Training

Time/Date: Thursday, May 22, 2014, 19:00 – 21:00PM
Place: VCSBE Meeting Room

Speaker	Content	Action
Opening remark of the meeting: Mr.Yasuo Akiyama	1. Mr. Yasuo Akiyama, Assistant Manager, Transport Management Division was opening remarks and warmly welcomed to all participants. 2. Mr. Yasuo Akiyama presented about background of Keisei Bus Company and its operation of public transportation in Japan.	
Video display and explanation of daily bus operation procedure of Keisei Bus: Mr. Yasuo Akiyama	Mr. Yasuo Akiyama explained about daily bus operation procedure with Video display.	
Discussion		
Bus driver	The bus driver questioned that: Is there any driver who stands by in case of the usual driver absent?	
Keisei Bus	The representative of Keisei Bus answered question above that: Yes, there are drivers who stand by in case of the usual driver absent. In this regard, Keisei Bus company prepares two or three drivers per day to stand by.	
Bus driver	Is there any punishment for the driver who always gets drunk?	
Keisei Bus	Yes, there is. Disciplinary rules upon alcohol test results are defined. In case above 0.25 mg/l, the driver is immediately hired. So far, nobody is dismissed due to alcohol test. Keisei Bus Company provide bonus to the drivers. The amount of the bonus is determined upon drivers' manner and attitude, drinking habitat is also considered.	
Bus driver	In case of the driver is not enough, is there any recruitment for new driver? - If yes, how about the salary of new driver and old driver?	
Keisei Bus	Yes, we have open recruitment for mid-career drivers and many people apply for. However, the regulation and the criteria for the selection are very difficult, so that many people fail to be selected for new driver. - For the salary payment is the same amount between new driver and old driver	
Bus driver	How about the old driver who will retire?	
Keisei Bus		

Speaker	Content	Action
	The driver at age 60 years old can get retirement and they are also able to continue bus driver as a contract employee until 65 years old. As a contract employee, the salary is decreased.	
Bus driver	Who wash and clean the bus?	
Keisei Bus	The driver is responsible to wash and clean the bus. Two drivers are assigned to one bus and they rotate driving shifts in the morning and the evening.	
Bus driver	Is there any solution of traffic congestions in Vientiane that affects bus operation?	
Keisei Bus	In Japan, we also face the traffic congestions. However our first priority is safety. If driver is irritated not to be able to follow the timetable, it may cause accident. Therefore we say "safety first" and it reduces passengers accusing on bus operation as well. On the other hand, we have measures to mitigate bus operational delay caused by traffic congestions. - If a driver gets stuck in a serious congestion, the driver calls to the company to send stand by bus to pick up passengers. - Daily peak hours are taken into consideration on timetables in Japan. The bus travel time is evaluated first and travel time between bus stops in peak hours are longer than other ordinary hours.	
Alcohol test		
Explanation purpose of the seminar: Mr. Yasuo Akiyama	Mr. Yasuo Akiyama showed a manual for bus drivers and explained about being a good driver and good service for the passengers. (see attachment)	
Requests from Keisei Bus Mr. Tsutomu Aizawa	The representative of Keisei bus company had 2 requests for the drivers as follows: 1. Greeting and saying 'Thank You' to the passengers. 2. Stop the bus engine when there is no passenger in the bus.	

The bus driver's training was adjourned at 21:00.

List of Paticipants

Meeting Topic: VCSBE Bus Driver Training

Place: VCSBE Meeting Room

Date: 22 May 2014

Time: 19:00 - 21:00

ລ/ດ No.	ຊື່ ແລະ ນາມສະກຸນ Name & Surname	ຕຳແໜ່ງ Position	ເບີໂທລະສັບມືຖື Telephone number	ລາຍເຊັ່ນ Signature
1	Mr. Bounpone Fongmany	Deputy Director of VCSBE	55512185	
2	Mr. Vanly	Deputy Director of VCSBE	55606390	
3	Mr. Buapha Phetvisai	Deputy Director of VCSBE	55514112	
4	Mr. Thanongsy	Chief of Transport sector	55675122	
5	Mr. Punya Vilatham	Chief of Provincial Transport sector	54002902	
6	Mr. Soudchalit	Mechanic	56676257	
7	Mr. Juang Phengkhammy	Driver	98999100	
8	Mr. Khamphone	Driver	55569622	
9	Mr. Ken	Driver	55809834	
10	Mr. Tui	Driver	55022545	
11	Mr. Bounlath	Driver	56496383	
12	Mr. Sengphet	Driver	28048886	
13	Mr. Phouvong	Driver	55799261	
14	Mr. Phaiboun	Driver	56028386	
15	Mr. Suliya	Driver	22407316	
16	Mr. Khampong	Driver	9896832	
17	Mr. Koksavan	Driver	22338967	
18	Mr. Douangsamone	Driver	56127122	
19	Mr. Sengduan	Driver	5565778	
20	Mr. Litthisak	Driver	55328386	
21	Mr. Hai	Driver	59050997	
22	Mr. Phouvan	Driver	58816905	
23	Mr. Anousak	Driver	55910411	
24	Mr. Bounsou	Driver	55679912	

List of Paticipants

Meeting Topic: VCSBE Bus Driver Training

Place: VCSBE Meeting Room

Date: 22 May 2014

Time: 19:00 - 21:00

ລ/ດ **No.**	ຊື່ ແລະ ນາມສະກຸນ **Name & Surname**	ຕຳແໜ່ງ **Position**	ເບີໂທລະສັບມືຖື **Telephone number**	ລາຍເຊັ່ນ **Signature**
25	Mr. Sunsai	Driver	99850520	

Bus Driver's Training Manual

Keisei Bus Co., Ltd.

1. Driver's Intention

   1) Appreciate passengers

   Public bus service is to carry passengers to destinations safely and securely. Whereby, it is important for drivers to recognize that public bus is a hospitality business to passengers.

   A forwarding company receives fees by transporting goods by trucks, whereas, we, public bus company; receive fare from passengers directly as consideration for transporting them safely. In other words, passengers purchase transportation service from us. So that, please say "thank you" when a passenger rides on your bus and pays fare.

   2) Professionalism

   You, drivers shall dedicate to safety driving as a professional driver with strong will not to cause any accident keeping passengers away from any peril on their trip.

   Public bus service is an absolutely necessary transportation in Vientiane Capital. You are contributing socially by providing the essential service of transporting passengers safely. Safety is the most important for passengers, so that, you should keen on safety driving and proud of it.

2. What is the Safety Driving?

   1) Drivers' mind while driving

   - Be prudent

     Carefully observe traffic conditions you face and drive your bus adequately vis-à-vis. Always be ready for giving way to other cars, rather than cutting into lane.

   - Be careful and suspicious

     Drive carefully with evaluating your driving skill suspiciously. This attitude will avoid an accident.

   - Be calm and steady

     Whenever drive calmly and steadily, even when you late for scheduled departure times, drive safety first.

   - Be gentle

     Drive gently without anxiety.

2) Self control
   - Keep well-regulated life style
   - Care your health
   - Be sober in the morning
   - Free from drugs

3) Check vehicle before starting operation

Please note that if you cause an accident, it affects all your passengers and their relatives' lives. You are responsible on your passengers while they are on your bus. If you cause an accident, it may kill somebody and it is never recoverable.

3. Importance of customer service
   1) Remember that your salary is paid from collected fare paid by passengers
   2) Appreciate passengers and say "thank you" with smile to passengers
   3) Talk politely to passengers, never be arrogant
   4) Keep smiling and make eye contact
   5) Keep yourself tidy, wearing uniform

Please note that some passengers are not familiar with public bus service and get nervous to be stranger in the town. You can ease them by your kind, polite and gentle attitude to them. Such your attitude may increase the number of passengers.

To transport passengers safely

< Duty of the bus driver >

Provide comfortable transportation to the passengers with safe, relief and relax.

< Responsibility of the bus driver >

Drive safely and properly in accordance with traffic condition, and serve to the passengers with good manners.

1. Actions of driving

Perception: To percept sensitively any strange traffic situation to avoid traffic accident in advance

Judgment: To judge and decide how to avoid any danger in drive

Control: To control bus properly to avoid any danger in accordance with judgment

1) Starting

Safety first: Observe left side, right side and under the vehicle of front car. Check passengers on board.

Secure safety before starting, it will avoid any accident at the starting.

Engage the clutch at low engine revolutions as shown in figure 1 and 2. Slowly press the accelerator, never floor it at once. Shift up early.

Lives of passengers are in drivers' hands. Thus, sudden acceleration, sudden braking, abrupt steeling are shall be avoided, or passengers feel nervous and distrust bus services. This is the major difference between cargo services.

In addition, high engine revolutions at a low speed make passengers anxious. It is fuel consuming and expensive driving manner.

How to control the clutch?

- Foot the clutch pedal from position 1 to 2
- Slowly engage the clutch from position 2 to 3
- If you release the clutch quickly, it cause a knocking

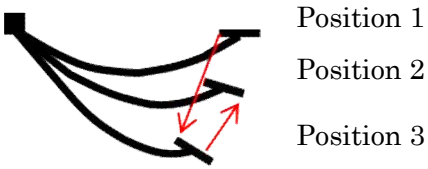


Figure 1　Clutch Control for Comfortable Driving

How to control the accelerator pedal?

- Foot the accelerator pedal slowly from position 1 to 2, and then bus accelerates slowly.
- Raise the accelerator pedal slowly, with feeling the pedal pushing your foot.

- If you foot steeply, the bus starts suddenly.

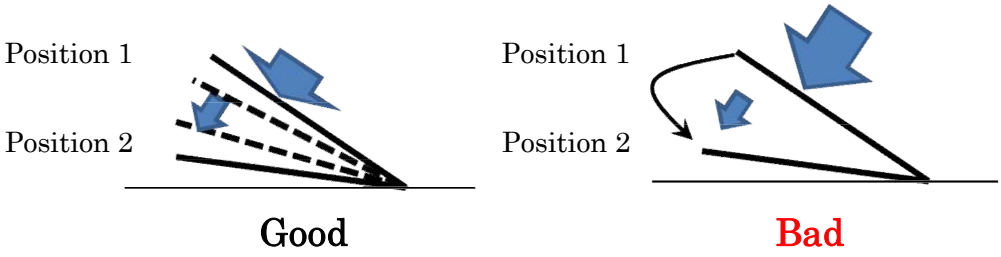


Figure 2　Accelerator Control for Comfortable Driving

2) Driving

Observe surroundings and traffic conditions; especially be careful on other vehicles, children, elderly people and bicycles.

You should always check traffic situations at front, rear, left side and right side and drive properly suit to the conditions.

When you dive, you should keep selecting higher gear to keep lower rev of engine, and keep in mind of early shift up and constant velocity. Over speed causes accidents.

Please note that traffic conditions are always changing even though you are familiar with the roads. Be careful, keep eyes on broaden sight, as a professional driver drive safer than yesterday.

To secure driving safely and prevent accident, all drivers of Keisei Bus conduct point and call activity when they start bus, turn right and turn left at intersection. The point and call

activity is to check by pointing and calling action they take.

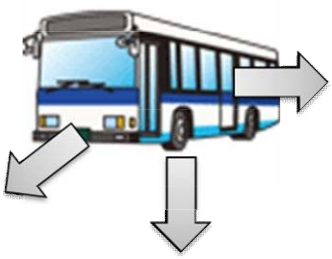
[Black Spots]

Intersections are black spots of traffic accidents. When you turn at intersections, beware and thoroughly decelerate before entering the intersections. Vehicles are under the laws of physics as shown in figure 3.

Inertial Force (to the front)
- The more rapid acceleration/ deceleration cause the stronger force.
- The higher speed causes the stronger force.
- The heavier weight causes the stronger force.

Impulsive Force (to the front)
- The harder object exerts the stronger force.
- The higher speed object exerts the stronger force.
- The heavier weight object exerts the stronger force.

Centrifugal Force (to the left and right)
- The sharper curve causes the stronger force.
- The higher speed causes the stronger force.
- The heavier weight causes the stronger force.



Gravitational Force (to the road)
- The heavier vehicle weight causes the stronger force.

Figure 3　Laws of Physics to the Bus Vehicle

3) Stopping

Sudden braking injures passengers on board by tumbling them and/ or hitting them to facilities in the cabin. Please remember to drive gently as same as starting.

Passengers do not expect sudden shock caused by sudden braking and hard braking. As the results, passengers hit each other and/ or facilities in the cabin and get injured. It may

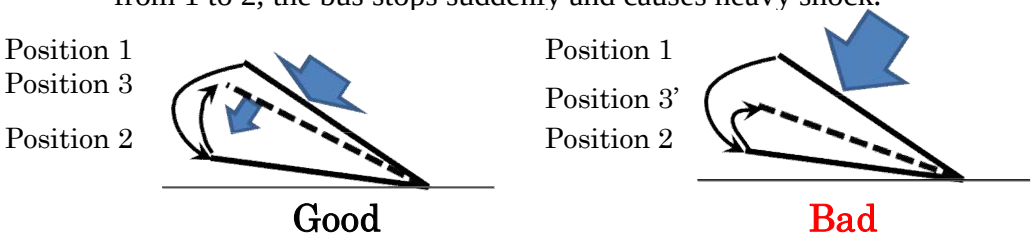
sound weird but sudden braking in low speed is much more dangerous to passengers than that in high speed since passengers are unprepared sudden shock.

To decelerate gently, brake as shown in figure 4.

How to control the brake pedal?

- Foot the brake pedal from position 1 to 2, and then raise foot to position 3.This action reduces shock of braking.

- If you keep position 2 or raise foot insufficiently after footing the brake pedal from 1 to 2, the bus stops suddenly and causes heavy shock.



Good　　Bad

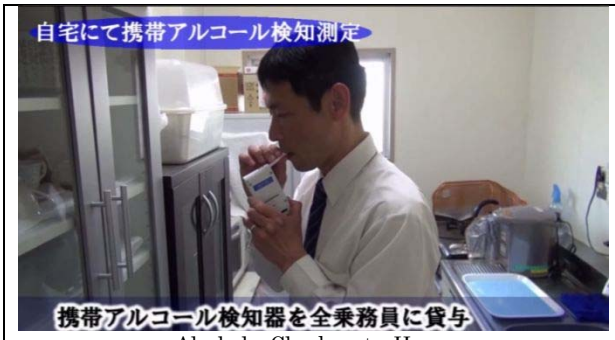
Figure 4　Brake Control for Comfortable Driving

2. Conclusion

Let me emphasize that what the most important thing for the bus driver is to carry passengers safely and securely to the destinations. If you cause any accident, you shall be blamed as unaccountable for a professional bus driver. Your accident also tarnishes confidence in society of the bus service. It will reduce number of passengers which reduce turnover of the bus enterprise, as the result, it causes serious financial difficulties.

Let's drive safely, respect passengers and be friendly to them. Then, passengers and citizens will love your bus service and the company will be well-run.

Proud of you to be a bus driver, supporting citizens' transportation. Carry out your duties as a professional driver to keep driving safely.



Alcohol Check at Home

Roll call at Office

Receive ID Card to operate bus

Set ID Card on board

Check facilities on board

Mechanical check

Check outside facilities

Tire and loosing nuts check

Call for starting operation with operation manager

Departure

"Thank you very much for using Keisei Bus."

Say thank you to passengers when they alight.

Driver does not touch any cash but automatic cash collection system handle cash.

Driver feeds fuel by himself. Records of feeding are stored in an ICT Card.

Check lost properties of passengers, clean inside of the bus

Place Car locks

Check for finishing work including alcohol check

Call for finishing work with operation manager

From CBS Bus Departure Check List

	Time	Routo No.	For	Bus No.	Name	Check
5	5H50	14	Friendship			
	5H50	23	Thangon			
6	6H00	30	Thonpong			
	6H00	24	NBS			
	6H05	14	Friendship			
	6H10	23	Thangon			
	6H10	31	Phongtong			
	6H20	14	Friendship			
	6H20	30	Thonpong			
	6H30	23	Thangon			
	6H30	29	Dongdok			
	6H30	31	Phongtong			
	6H30	24	NBS			
	6H35	14	Friendship			
	6H40	30	Thonpong			
	6H45	29	Dongdok			
	6H50	14	Friendship			
	6H50	23	Thangon			
	6H50	31	Phongtong			
7	7H00	29	Dongdok			
	7H00	24	NBS			
	7H05	14	Friendship			
	7H10	23	Thangon			
	7H10	31	Phongtong			
	7H15	29	Dongdok			
	7H20	14	Friendship			
	7H30	23	Thangon			
	7H30	29	Dongdok			
	7H30	31	Phongtong			
	7H30	24	NBS			
	7H35	14	Friendship			
	7H45	29	Dongdok			
	7H50	14	Friendship			
	7H50	23	Thangon			
	7H50	31	Phongtong			
8	8H00	30	Thonpong			
	8H00	24	NBS			
	8H00	29	Dongdok			
	8H05	14	Friendship			
	8H10	31	Phongtong			
	8H15	23	Thangon			
	8H20	14	Friendship			
	8H20	29	Dongdok			
	8H30	31	Phongtong			
	8H30	30	Thonpong			
	8H30	24	NBS			
	8H35	14	Friendship			
	8H40	23	Thangon			
	8H40	29	Dongdok			
	8H50	14	Friendship			
	8H50	31	Phongtong			
9	9H00	23	Thangon			
	9H00	29	Dongdok			
	9H00	30	Thonpong			
	9H00	24	NBS			
	9H05	14	Friendship			
	9H10	31	Phongtong			
	9H20	14	Friendship			
	9H20	23	Thangon			
	9H20	29	Dongdok			
	9H30	31	Phongtong			
	9H30	24	NBS			
	9H35	14	Friendship			
	9H40	23	Thangon			
	9H40	29	Dongdok			
	9H50	14	Friendship			
	9H50	31	Phongtong			
10	10H00	23	Thangon			
	10H00	29	Dongdok			
	10H00	24	NBS			
	10H05	14	Friendship			
	10H10	31	Phongtong			
	10H20	14	Friendship			
	10H20	23	Thangon			
	10H20	29	Dongdok			
	10H20	30	Thonpong			
	10H30	31	Phongtong			
	10H30	24	NBS			
	10H35	14	Friendship			
	10H40	23	Thangon			
	10H40	29	Dongdok			
	10H50	14	Friendship			
	10H50	31	Phongtong			
	10H50	30	Thonpong			
11	11H00	23	Thangon			
	11H00	29	Dongdok			
	11H00	24	NBS			
	11H05	14	Friendship			
	11H10	31	Phongtong			
	11H20	14	Friendship			
	11H20	23	Thangon			
	11H20	29	Dongdok			
	11H20	30	Thonpong			
	11H30	31	Phongtong			
	11H30	24	NBS			
	11H35	14	Friendship			
	11H40	23	Thangon			
	11H40	29	Dongdok			
	11H50	14	Friendship			
	11H50	31	Phongtong			

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	Time	Routo No.	For	Bus No.	Name	Check
12	12H00	23	Thangon			
	12H00	29	Dongdok			
	12H00	24	NBS			
	12H05	14	Friendship			
	12H10	31	Phongtong			
	12H20	14	Friendship			
	12H20	23	Thangon			
	12H20	29	Dongdok			
	12H30	31	Phongtong			
	12H30	30	Thonpong			
	12H30	24	NBS			
	12H35	14	Friendship			
	12H40	23	Thangon			
	12H40	29	Dongdok			
	12H50	14	Friendship			
	12H50	31	Phongtong			
	12H50	30	Thonpong			
13	13H00	23	Thangon			
	13H00	29	Dongdok			
	13H00	24	NBS			
	13H05	14	Friendship			
	13H10	31	Phongtong			
	13H20	14	Friendship			
	13H20	23	Thangon			
	13H20	29	Dongdok			
	13H30	31	Phongtong			
	13H30	30	Thonpong			
	13H30	24	NBS			
	13H35	14	Friendship			
	13H40	23	Thangon			
	13H40	29	Dongdok			
	13H50	14	Friendship			
	13H50	31	Phongtong			
14	14H00	23	Thangon			
	14H00	29	Dongdok			
	14H00	24	NBS			
	14H05	14	Friendship			
	14H10	31	Phongtong			
	14H20	14	Friendship			
	14H20	23	Thangon			
	14H20	29	Dongdok			
	14H30	31	Phongtong			
	14H30	30	Thonpong			
	14H30	24	NBS			
	14H35	14	Friendship			
	14H40	23	Thangon			
	14H40	29	Dongdok			
	14H50	14	Friendship			
	14H50	31	Phongtong			
15	15H00	23	Thangon			
	15H00	29	Dongdok			
	15H00	30	Thonpong			
	15H00	24	NBS			
	15H05	14	Friendship			
	15H10	31	Phongtong			
	15H20	14	Friendship			
	15H20	23	Thangon			
	15H20	29	Dongdok			
	15H30	31	Phongtong			
	15H30	30	Thonpong			
	15H30	24	NBS			
	15H35	14	Friendship			
	15H40	23	Thangon			
	15H40	29	Dongdok			
	15H50	14	Friendship			
	15H50	31	Phongtong			
16	16H00	23	Thangon			
	16H00	29	Dongdok			
	16H00	24	NBS			
	16H05	14	Friendship			
	16H10	31	Phongtong			
	16H20	14	Friendship			
	16H20	23	Thangon			
	16H20	29	Dongdok			
	16H30	31	Phongtong			
	16H30	30	Thonpong			
	16H30	24	NBS			
	16H35	14	Friendship			
	16H40	23	Thangon			
	16H40	29	Dongdok			
	16H50	14	Friendship			
	16H50	31	Phongtong			
	16H50	30	Thonpong			
17	17H00	23	Thangon			
	17H00	29	Dongdok			
	17H00	24	NBS			
	17H05	14	Friendship			
	17H10	31	Phongtong			
	17H20	14	Friendship			
	17H20	29	Dongdok			
	17H30	23	Thangon			
	17H30	31	Phongtong			
	17H30	30	Thonpong			
	17H30	24	NBS			
	17H35	14	Friendship			
	17H40	29	Dongdok			
	18H00	14	Friendship			
18	18H00	29	Dongdok			

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Routo No.	For	Cars	Trip
14	Friendship	10	49
23	Thangon	7	35
29	Dongdok	6	37
31	Phongtong	6	35
24	NBS	4	24
30	Thonpong	3	18
		36	198

Note

1.How to fillin the check list.

①Departed at designated time: レ

②Departed earlier or later than designated time: Fill in actual departure time

③Absent operation: －

2. Heavy lined box shows same time departure of 23Thangon and 29Dongdok

It is better to separate departure time, since their routes duplicate from CBS to SBS.

The duplicated section from CBS to SBS shall be same price (3,000Kip).

Photos

Meeting Records on Manager Bus Operation Seminar

Time/Date: Friday, May 23, 2014, 09:00 – 11:00AM
Place: VCSBE Meeting Room

Speaker	Content
Mr.Aizawa Tsutomu	1. Mr. Aizawa Tsutomu made opening remarks and warmly welcomed to all participants. 2. Mr. Aizawa Tsutomu expressed his happiness to see changing of VCSBE in 6 months. For instance, time table at Friendship Bridge was newly installed, number of bus operation on Dongdok route (No.29) was increased and NBS route was operated by Isuzu buses. 3. Mr. Aizawa Tsutomu presented a concept of time tables installing at terminals and the bus stops on the routes (see attachment). Furthermore, Mr. Aizawa recommended VCSBE to set time tables firstly at bus stops along the route from Dongdok to CBS, in order to increase the number of passengers. 4. Mr. Aizawa Tsutomu presented a sample of diagram for Dongdok route (No.29). The diagram shall be used for increasing the punctuality of bus operation (see attachment) 5. Mr. Aizawa Tsutomu showed the sample of bus driver salary of Keisei Bus Company (see attachment)
Discussion	
Mr. Buapha Phetvisay	Mr. Buapha Phetvisay reported that the bus stop facility installation is under preparation by Blue Grass Company, an advertisement company which has the concession contract with Vientiane Capital for bus stop facility installation and maintenance.
Mr. Aizawa Tsutomu	Mr. Aizawa Tsutomu proposed VCSBE to request Blue Grass to set bus stops near the entrance of passages to facilitate passengers to use buses.
Mr. Aizawa Tsutomu	Mr. Aizawa Tsutomu showed a sample of bus driver working schedule and rest time table of Keisei bus. Keisei bus company assigns two drivers to one bus and drivers work the shift, for instance one driver works in the morning and another works in the evening in one day. Normally, A Keisei Bus driver works 8 hours a day.
Mr. Buapha Phetvisay	Mr. Buapha Phetvisay corresponded that VCSBE also used such kind of working system, in previous time. However it was not efficient in VCSBE, therefore, VCSBE canceled it. Currently, VCSBE contracts with bus drivers on lump sum system. Due to the system, drivers tended to catch passengers anywhere on the road because drivers had to submit certain amount to VCSBE. If contracts with drivers were changed to salary system, it was assumed to be better management on drivers.
Mr. Aizawa Tsutomu	Mr. Aizawa Tsutomu explained a check list he prepared which had all bus departure times from CBS. He recommended checking actual departure time by using the check list from time to time. He also noted that Dongdok route (No.29) and Thangon route (No.23) were set as same time departure, in spite of both routes pass SBS. He recommended setting time intervals between departure times of two routes, in addition,

Speaker	Content
	set same fare between CBS and SBS. By those improvements, passengers between CBS and SBS would become more convenient.
Mr. Buapha Phetvisay	Mr. Buapha Phetvisay explained that fare rate of from SBS to CBS of Thangon route (No.23) was same as Dongdok route (No.29), however, from CBS to SBS was different price. He said he would consider Mr. Aizawa's recommendations.
Mr. Aizawa Tsutomu	Mr. Aizawa Tsutomu asked which routes were profitable among urban bus routes.
Mr. Buapha Phetvisay	Mr. Buapha Phetvisay answered that profitable route was only Friendship Bridge Route (No.14). A bus fare calculation of Dongdok route upon distance was 4,500 kip, however the government allowed only 3,000 kip for the route due to students' convenience. Thangon Route (No.23) was also discounted route. Fare calculation of Thangon was 6,000 kip, however to compete sonteos the fare was set as 5,000 kip.
Mr. Aizawa Tsutomu	Mr. Aizawa Tsutomu proposed VCSBE to pick up passengers at the bus stops for the punctuality of bus operation and trustworthy from the bus user.
Mr. Buapha Phetvisay	Mr. Buapha Phetvisay noted that another issue disturbing punctuality was carrying luggage by passengers. Loading and unloading luggage took time and caused delay.
Mr. Bounpone Fongmany	Kanekeo NAOVALATH explained the features of urban bus service in Vientiane. Number of passengers in the weekend was larger than that of the weekday. Because people who had cars or motor cycles would not use bus for commuter. People from countryside lives in dormitories near universities or factories. Those people use bus in the weekend.

Registration

Meeting Topic: Manager Bus Operation Seminar

Place: VCSBE Meeting Room

Date: 23 May 2014

Time: 09:00 - 11:00

ລ/ດ No.	ຊື່ ແລະ ນາມສະກຸນ Name & Surname	ຕຳແໜ່ງ Position	ມາຈາກພາກສ່ວນ Organization
1	Mr. Bounpon Fongmany	Deputy Director	VCSBE
2	Mr. Buapa Phetvisay	Deputy Director	VCSBE
3	Mr. Vanly Chanchalern	Deputy Director	VCSBE
4	Mr.Aizawa Tsutomu	General Manager, Sales Division	Keisei Bus
5	Mr.Akiyama Yasuo	Manager, General Affairs Division	Keisei Bus
6	Mr. Yoshiro Kunimasa		KEI
7	Mr. Chanthala VORRASING		KEI

VCSBE Seminar for Managers of Bus Drivers

23 May, 2014

KEISEI Bus

Recommendations on No.29 CBS ~ Dongdok:
1. Installation of Timetables at Bus Stops
2. On-time Operation at Bus Stops

1) Install timetables at present facilitated bus stops.
   Start installation from inbound bus stops.
2) Name each bus stop on the route by place name or landmark.
   Ex) AAA elementary school, BB bridge, CC intersection
3) Install timetables at Dongdok, the timetables shall have all departure time and all buses should comply not to depart earlier than designated times. At the CBS, timetables have been installed, therefore all buses should comply the timetables.
4) Clocks in the buses should keep in time.
5) Timetables at bus stops on the route shall have time of first bus, last bus and headways or frequency for operating hours.
   Ex) *:00~*:00 Every 15 minutes
   :00~:00 6 buses operation
6) Drivers shall check bus passengers at bus stops. If there is any passenger, stop and let a passenger ride. In case, obviously there is no passenger, it is possible to pass the bus stop.
7) After a certain period passes, increase the number of bus stops upon passengers' responses. It is recommended to install at where passengers are willing to use, for instance, at the corner of passage.
   A target of distances of bus stops can be set at 500m, and 23 bus stops are required for route no.29.

Ref) Calculation of travel time between bus stops on the route

Distance between bus stops / Distance of the whole route (one way) * Travel time of the whole

route (one-way) [Round down to the nearest decimal]

Ex) No.29: CBS~Dongdok (12km, 40minutes), in case install bus stops every 500 m,

500m / 12,000m * 40 minutes = 1.6 minutes -> 1 minutes

Note: Round down reduces risk of earlier departure than the designated time.

This is "Dongdok Bus Stop".

【RouteNo.】 NO.29 CBS～DONGDOK

【For】CBS(Central Bus Station)

【Fare】 3, 000KIP

Timetable

Hour	Minute							
6								
7	10	25	40	55				
8	10	25	40	55				
9	10	25	40	55				
10	10	25	40	55				
11	10	25	40	55				
12	10	25	40	55				
13	10	25	40	55				
14	10	25	40	55				
15	10	25	40	55				
16	10	25	40	55				
17	10	25	40	55				
18	10							
19								

Timetable shows approximate departure times.

Depend on the traffic conditions, buses would be delay.

Revised on 16 May, 2014

This is "●●● Bus Stop"

【RouteNo.】 NO.29 CBS～DONGDOK

【For】For CBS（Central Bus Station）

【Fare】 3，000KIP

Timetable

Hour	Minute					
6						
7	20	35	50			
	[Case1: Number of Vehicles]			[Case2: Headway Time]		
8	4 Vehicles per hour			Every 15 to 20 minutes		
9						
10						
11						
12						
13						
14						
15						
16						
17						
18	05	20				
19						

Departure time of the first bus

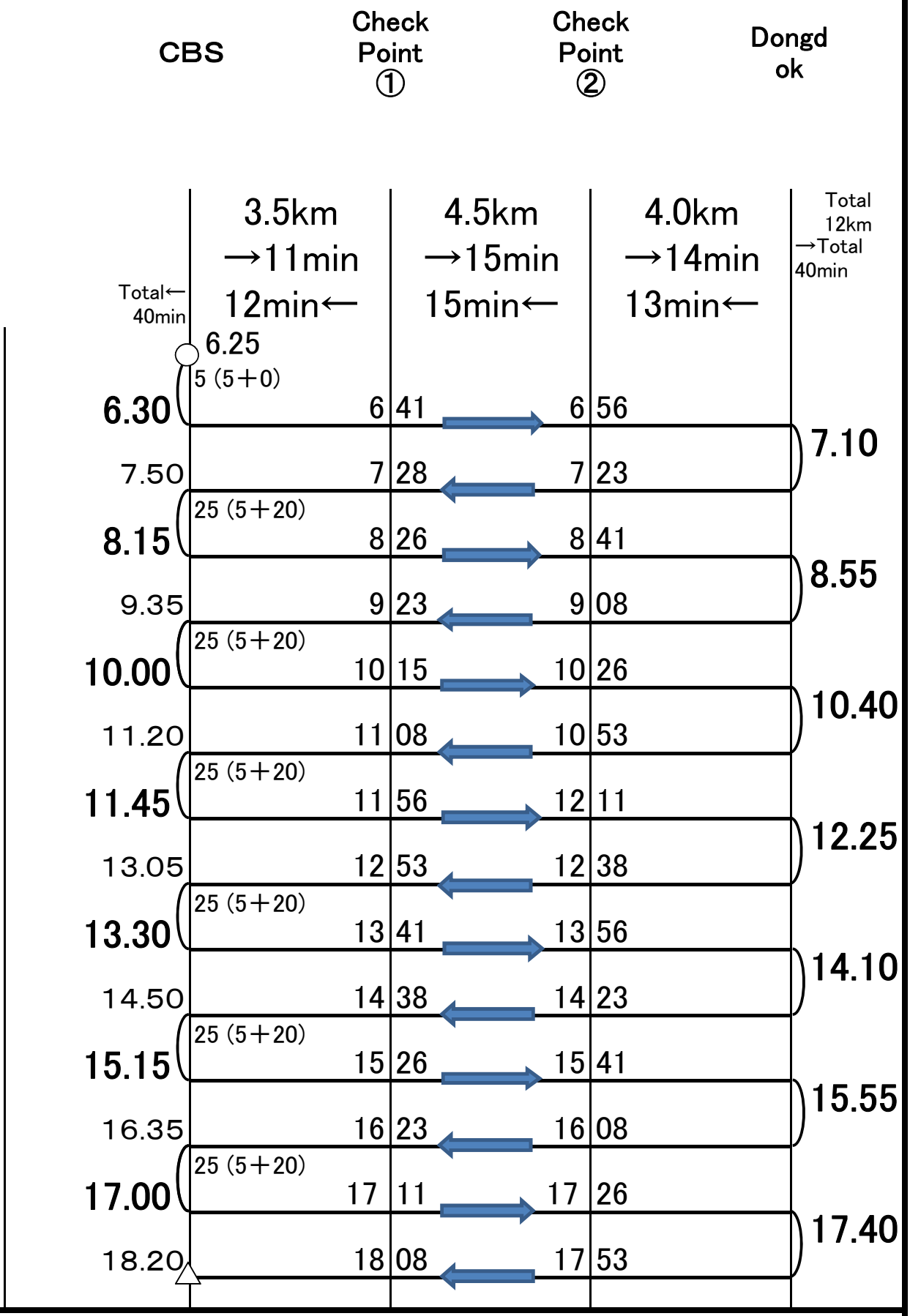
These spaces show number of vehicles or headway time

Departure time of the last bus

Depend on the traffic conditions, buses would be delay.

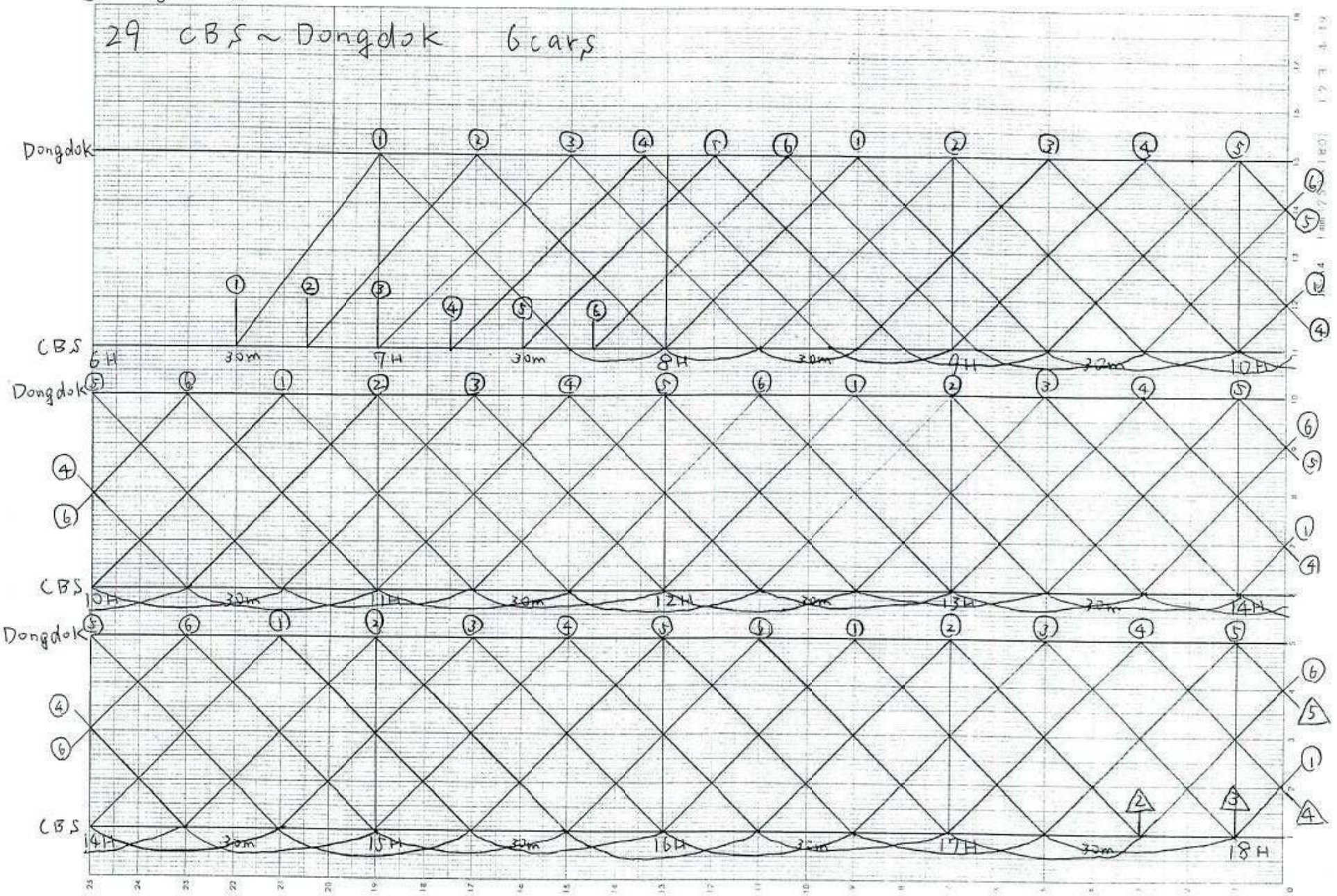
Revised on 16 May, 2014

BUS NO. 1	29Dongdok	Dep. 06 : 25 Arr. 18 : 40



Remarks	Duty Hours 12h30(Working Hours 10h30+Rest Hours 2h00)	Driving km	168km

[Diagram]


29 CBS ~ Dongdok 6cars
Dongdok
CBS
6H
7H
8H
9H
10H
11H
12H
13H
14H
15H
16H
17H
18H
30m

VCSBE Seminar for Managers of Bus Drivers

23 May, 2014
KEISEI Bus

For Your Reference: Wage of KEISEI Bus Drivers

1) Income and Expenditure of KEISEI Bus (FY 2013)

Income	100%	
Breakdown	Fare Income	96%
	Others	4%
Expenditure	94%	
Breakdown	Personnel Expenditure	46%
	Fuel and oil	9%
	Depreciation	8%
	Other	27%
	Administrative Expense	4%
Benefit	6%	

2) Wage balance of KEISEI Bus Driver

Items	Contract Employee	Permanent Employee
Basic Salary	67%	53%
Over time	25%	22%
Allowance	0%	10%
Bonus	8%	17%
Total	100%	100%

3) Labor Regulation in Japan

- Working hours exceeding 8 hours are defined as over time. More than 25% premium allowance shall be paid for the overtime.
- More than one day off per week is obligated.
- Drivers' wage is a fixed salary, not a payment upon the number of passengers.
- Rest hours are not counted as over time.

4) Labor Regulation of KEISEI Bus

- During three years after joining the company, a driver is a contract employee. After three years, the driver contracts as permanent employee.
- A salary of contract employee does not increase, whereas a salary of permanent employee increases according to working years.
- Drivers get bonuses two times a year, in July and December. The amount of the bonus is determined upon performance evaluation of each bus driver. Evaluation criteria are such as absence, tardy, alcohol, accident, complaint from passengers, attitude toward passengers, etc.

5) Reference

[Average of KEISEI Bus Drivers' Annual Salary]

Contract Employee: About 18,000 times as much as fare rate

Permanent Employee: About 25,000 times as much as fare rate

[Average of KEISEI Bus Drivers' Daily Salary]

Ex) Ride on a bus of No.29, with 10hours and 30 minutes working time, 7 trips and 168km drive.

The driver's daily salary is equivalent to about 70 passenger fare.

Photos

App4 Workshop Materials

Act 2-3 Set Criteria to Evaluate Bus Service and Target Levels of Public Bus Service

Presentation of Bus Service Quality

Date: 1 March, 2012, Thursday, 2:00pm
Place: VCSBE Meeting Room

Agenda

1. Presentation of Bus Service Quality
   Mr. KUNIMASA Yoshiro

2. Discussion

Registration

Meeting Topic:

Place: VCSBE Meeting Room

Date: 01 March 2012

Time:

ລ/ດ No.	ຊື່ ແລະ ນາມສະກຸນ Name & Surname	ຕຳແໜ່ງ Position	ມາຈາກພາກສ່ວນ Organization	ເບີໂທລະສັບມືຖື Telephone number	ທີ່ຢູ່ອີເມວ Email Address	ລາຍເຊັນ Signature
1	Mr.Khamphoune TEMERATH	Director	VCSBE			
2	Mr. Bounpone FONGMANY	Deputy director	VCSBE			
3	Mr. Buapha PHETVISAY	Deputy director	VCSBE			
4	Mr. Vanly CHANCHALERN	Deputy director	VCSBE			
5	KUNIMASA Yoshiro	Vice Team Leader/ Bus Service/ Human Resource Development 2	JICA Study Team			
6	Mr. Pannha VIRATHAM	Planing Section	VCSBE			
7	Mr.Bounngu THAMMASARD	Personen Section	VCSBE			
8	Mr.Khamsean Vilasack	Chief of Technical Sectiom	VCSBE			
9	Mr.Bounma Vilavong	Chief of Personen Section	VCSBE			
10	Mr.Duangta Soutkhamhak	Admin	VCSBE			
11	Ms. Chansouk Chanthavong	Deputy Chief of Finance Section	VCSBE			
12	Mr. Bounsouk Sibounthan	Chief of Technical Sectiom	VCSBE			
13	Mr. Somlith Khankeo	Chief of Technical Sectiom	VCSBE			

Registration

Meeting Topic:

Place: VCSBE Meeting Room

Date: 01 March 2012

Time:

ລ/ດ No.	ຊື່ ແລະ ນາມສະກຸນ Name & Surname	ຕຳແໜ່ງ Position	ມາຈາກພາກສ່ວນ Organization	ເບີໂທລະສັບມືຖື Telephone number	ທີ່ຢູ່ອີເມວ Email Address	ລາຍເຊັນ Signature
14	Mrs. Manyvone PHENGPHANGSAVATH	Marketing,Planing Section	VCSBE			
15	Mr.Khamphay SUVADDY	Tranportation Section	DPWT			
16						
17						
18						
19						
20						
21						
22						
23						
24						

THE PROJECT TO ENHANCE THE CAPACITY OF VIENTIANE CAPITAL STATE BUS ENTERPRISE

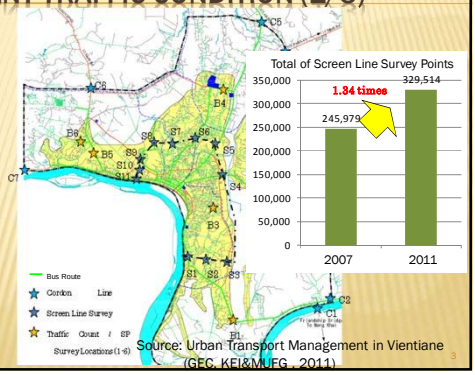
BUS SERVICE QUALITY

KUNIMASA Yoshiro

CONTENTS

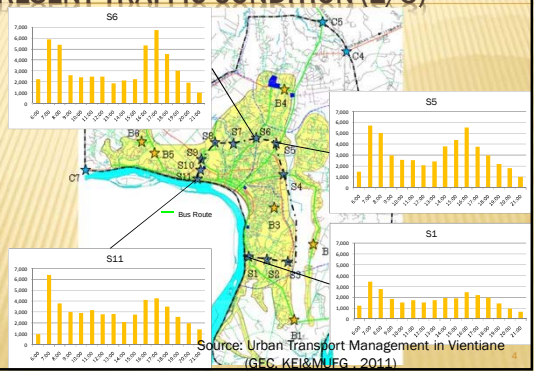
- Present Traffic Condition in Vientiane
- Quality Management
- Necessity of Monitoring
- Data Collection
- Analysis of On Board Survey/ Opinion Survey
  * Conducted on 10th August, 2010

PRESENT TRAFFIC CONDITION (1/3)



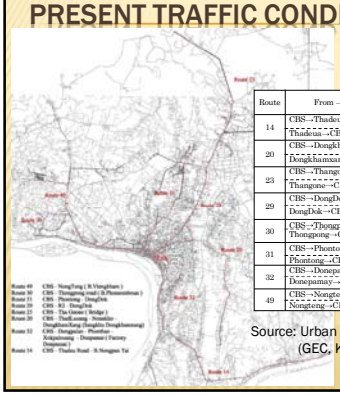
Source: Urban Transport Management in Vientiane (GEC, KEI&MUFG , 2011)

PRESENT TRAFFIC CONDITION (2/3)



Source: Urban Transport Management in Vientiane (GEC, KEI&MUFG , 2011)

PRESENT TRAFFIC CONDITION (3/3)



Route	From → To	Dist.	Average Travel Speed		
			Morning	Daytime	Evening
14	CBS→Thadeua	27.0km	30.6km/h	32.5km/h	32.5km/h
	Thadeua→CBS		30.9km/h	32.2km/h	28.8km/h
20	CBS→Dongkhamxang	13.7km	25.7km/h	30.3km/h	23.4km/h
	Dongkhamxang→CBS		17.4km/h	24.6km/h	22.8km/h
23	CBS→Thangone	24.1km	36.2km/h	42.5km/h	21.3km/h
	Thangone→CBS		28.4km/h	28.9km/h	32.9km/h
29	CBS→DongDok	12.2km	25.0km/h	27.0km/h	20.8km/h
	DongDok→CBS		17.0km/h	26.0km/h	22.1km/h
30	CBS→Thongpong	14.7km	21.5km/h	24.5km/h	20.5km/h
	Thongpong→CBS		19.0km/h	26.5km/h	25.7km/h
31	CBS→Phontong	11.4km	26.2km/h	24.4km/h	18.0km/h
	Phontong→CBS		26.2km/h	23.5km/h	21.3km/h
32	CBS→Donepamay	6.6km	20.7km/h	26.6km/h	23.4km/h
	Donepamay→CBS		23.4km/h	23.4km/h	19.0km/h
49	CBS→Nongteng	16.7km	35.8km/h	33.4km/h	23.9km/h
	Nongteng→CBS		21.8km/h	14.7km/h	26.3km/h

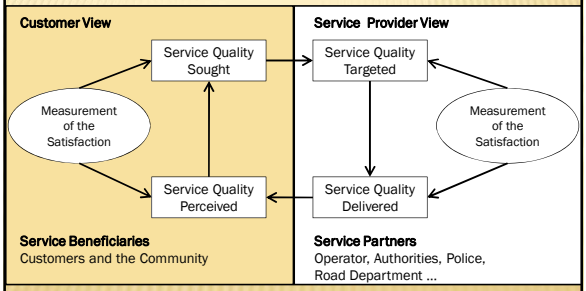
Source: Urban Transport Management in Vientiane (GEC, KEI&MUFG , 2011)

QUALITY MANAGEMENT (1/2)

- Good Service Attracts Users
- Proper Frequency, Punctuality, Information of Operation
- Evaluate Bus Service from Both “Service Provider View” and “Customer View”
- Service Quality Target -> Operation Monitoring -> Evaluate -> Improve

QUALITY MANAGEMENT (2/2)

Service Quality Loop



Source: EN 13816: 2002

NECESSITY OF MONITORING

- To Evaluate System's Performance
- To Identify Present Problems
- To Provide More Effective Public Transportation Services
  -> Medium-term Public Bus Transportation Plan

DATA COLLECTION

- Ridership Data
  -> On Board Survey (VCSBE)
- Travel Time and Delays
  -> Record Actual Operation Records (VCSBE)
  * On Board Survey can verify the record
- Origin – Destination Patterns
  -> To Assess the Adequacy of Present Network (DPWT/ VC)
- Travel Needs and Attitudes Information
  -> 1) Interview at Households (DPWT/ VC)
  2) Interview with Bus Users (DPWT/ VC, VCSBE)
- Bus Drivers' Suggestions

ANALYSIS OF ON BOARD SURVEY (1/6)

On Board Survey Sheet (No.14 Thadeua)

Inventory Sheet for Bus Route (No. 14 / 1-1)

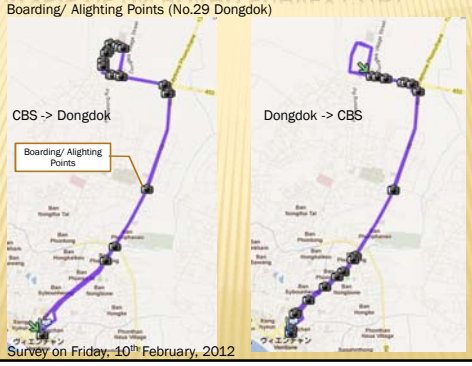
Bus Plate No.: 14	Date	10.08.2010	From	KHUAEN Bas station	To	XIENGKHUAN												
Bus Type: Nissan	Departure Time	5:50	Arrival Time	6:43	Length	29 Km												
	Time	Position	Passenger Number										Loading				Bus Stop Conditions	
Bus Stop			On				Off										Yes(√) or No()	
No.	Name		Picture	M	W	Student (M)	Student (W)	M	W	Student (M)	Student (W)	M	W	Student (M)	Student (W)	Sign	Shelter	Lay-by
1	Bus station	5:50	5021	4	4							4	4	0	0		✓	
2	B. PHANMUN	6:00						1				3	4	0	0			✓
3	B. NAHAI	6:15							2			3	2	0	0			✓
4	Friend ship bridge	6:25	5027			1		3	2			0	0	0	0			✓
5	B. PAVAH	6:31			1							0	1	0	0			✓
6	B. THINTOM	6:37	5028		1							0	2	0	0			✓
7	B. NONGPAN	6:39						1				0	1	0	0			✓
8	B. XIENGKHUAN	6:43						1				0	0	0	0			✓

Surveyor
Mr AAAAA
Mr.BBBBB

Survey on Tuesday, 10th August, 2010

ANALYSIS OF ON BOARD SURVEY (2/6)

Boarding/ Alighting Points (No.29 Dongdok)



Survey on Friday, 10th February, 2012

ANALYSIS OF ON BOARD SURVEY (3/6)

Summary of On Board Survey Result (No.14 Thadeua)

Code	CBS—Thadeua					Thadeua—CBS				
	CBS Departure Time	Arrival Time	Travel Time	Number of Passengers	Maximum Lading Passengers	Departure Time	CBS Arribval Time	Travel Time	Number of Passengers	Maximum Lading Passengers
R14_1_1	5:50	6:43	0:53	10	8	6:45	7:32	0:47	18	17
R14_1_2	8:15	9:11	0:56	26	24	9:11	10:16	1:05	30	23
R14_1_3	10:45	11:41	0:56	28	26	11:47	12:52	1:05	22	19
R14_1_4	13:20	14:13	0:53	29	29	14:16	15:20	1:04	21	18
R14_1_5	16:05	17:16	1:11	25	25	17:16	18:13	0:57	10	7
R14_2_1	6:00	6:47	0:47	5	5	7:00	8:03	1:03	22	16
R14_2_2	8:29	9:25	0:56	31	25	9:33	10:32	0:59	37	29
R14_2_3	11:00	12:00	1:00	35	32	12:05	13:08	1:03	32	29
⋮										
R14_10_1	7:45	8:45	1:00	45	35	8:50	9:50	1:00	28	24
R14_10_2	10:19	11:10	0:51	34	27	11:20	12:25	1:05	31	31
R14_10_3	12:45	13:38	0:53	44	43	13:52	14:45	0:53	18	18
R14_10_4	15:43	16:37	0:54	36	33	16:40	17:40	1:00	26	26
			Average	Total	Max			Average	Total	Max
			0:56	1,430	45			1:03	1,041	31

Survey on Tuesday, 10th August, 2010

Average Passengers (Round Trip) = 57.5 persons

ANALYSIS OF ON BOARD SURVEY (4/6)

Headway of Departure at Terminals (No.14 Thadeua) Unit (Hour: Minute)

Route No.14 Thadeua		5:00 ~6:00	~7:00	~8:00	~9:00	~10:00	~11:00	~12:00	~13:00	~14:00	~15:00	~16:00	~17:00	~18:00	Total
CBS -> Thadeua	Ave.	0:50	0:53	0:55	0:55	0:55	0:56	0:59	0:55	0:55	0:55	0:55	1:02	0:59	0:56
	Max	0:53	0:56	1:00	0:57	0:58	1:00	1:07	0:59	1:02	1:03	0:55	1:11	1:04	1:11
Thadeua -> CBS	Ave.	-	0:55	1:07	1:00	1:02	1:04	1:06	1:04	1:04	1:02	1:10	1:04	1:00	1:03
	Max	-	1:03	1:18	1:01	1:05	1:10	1:08	1:10	1:13	1:05	1:18	1:09	1:04	1:18

Survey on Tuesday, 10th August, 2010

Recording of actual operation can provide this information

13

ANALYSIS OF ON BOARD SURVEY (5/6)

Punctuality of CBS Departure (No.14 Thadeua)

Code	Plan	Actual	Gap	Code	Plan	Actual	Gap
R14_1_1	5:35	5:50	0:15	R14_5_4	14:05	14:25	0:20
R14_1_2	8:05	8:15	0:10	R14_5_5	17:30	-	-
R14_1_3	10:35	10:45	0:10	R14_6_1	6:50	7:20	0:30
R14_1_4	13:05	13:20	0:15	R14_6_2	9:20	9:50	0:30
R14_1_5	16:05	16:05	0:00	R14_6_3	11:50	12:14	0:24
R14_2_1	5:50	6:00	0:10	R14_6_4	14:25	15:00	0:35
R14_2_2	8:20	8:29	0:09	R14_7_1	7:05	-	-
R14_2_3	10:50	11:00	0:10	R14_7_2	9:35	9:35	0:00
			0:10	R14_7_3	12:05	12:05	0:00
			0:13	R14_7_4	14:45	14:45	0:00
			0:15	R14_8_1	7:20	8:06	0:46
			0:15	R14_8_2	9:50	10:35	0:45
			0:15	R14_8_3	12:20	13:05	0:45
			0:15	R14_8_4	15:05	16:05	1:00
			0:20	R14_9_1	7:35	7:33	0:02
			0:15	R14_9_2	10:05	9:59	0:06
			0:15	R14_9_3	12:35	12:25	0:10
R14_4_3	11:20	11:35	0:15	R14_9_4	15:25	15:25	0:00
R14_4_4	13:50	14:05	0:15	R14_10_1	7:50	7:45	0:05
R14_4_5	17:05	17:30	0:25	R14_10_2	10:20	10:19	0:01
R14_5_1	6:35	6:50	0:15	R14_10_3	12:50	12:45	0:05
R14_5_2	9:05	9:20	0:15	R14_10_4	15:45	15:43	0:02
R14_5_3	11:35	11:50	0:15				

Operating Ratio = 95 %
Average Delay = 15 minutes
Max Delay = 60 minutes
Punctuality Ratio= 44%
* Less than 15 minutes Delay

Survey on Tuesday, 10th August, 2010

14

ANALYSIS OF ON BOARD SURVEY (6/6)

Passengers (No.14 Thadeua) Unit (Persons)

Route No.14 Thadeua		5:00 ~6:00	~7:00	~8:00	~9:00	~10:00	~11:00	~12:00	~13:00	~14:00	~15:00	~16:00	~17:00	~18:00	Total
CBS -> Thadeua	Ave.	8	21	37	29	32	35	40	41	38	34	41	32	41	33
	Max	10	24	45	34	37	41	46	47	46	40	41	37	41	47
Thadeua -> CBS	Ave.	-	20	24	28	31	25	27	28	22	26	21	23	17	24
	Max	-	22	31	30	37	30	31	36	25	32	24	25	21	37

Survey on Tuesday, 10th August, 2010

15

ANALYSIS OF OPINION SURVEY (1/2)

Opinion Survey Sheet

I. ABOUT YOURSELF

1. Sex: 1. Male 2. Female

2. Age: 1. <19 2. 20-29 3. 30-39 4. 40-49 5. 50-59 6. >60

3. Educational Background: 1. Primary School 2. High School 3. University/College 4. Vocational Training 5. None

4. Working Status: 1. Working 2. Studying (Univ./Col.) 3. Schooling 4. Housewife 5. Jobless 6. Retired

5. How much are you earning per month? (Kip/month) (Family Income)

6. How many car or Motorcycle do you have ?

II. ABOUT THIS TRIP

7. Where did you start this trip?

8. Where will you end this trip?

9. What is the purpose of this trip?

1. To Home 2. To Work 3. To School 4. Business 5. Private 6. Others

10. How do you access and egress mode to/from bus stop?

10.1 Access: Mode _____ , Time _____ minutes

10.2 Egress: Mode _____ , Time _____ minutes

1. Walking 2. Bicycle 3. Motorcycle 4. Tuk Tuk 5. Bus 6. Others (Please specify)

III. OPINION ON BUS SERVICE

12. What is your assessment of present Bus service?

	1. very good	2. good	3. fair	4. bad	5. very bad
1) Travel time/speed	1.	2.	3.	4.	5.
2) Waiting time	1.	2.	3.	4.	5.
3) Punctuality	1.	2.	3.	4.	5.

16

ANALYSIS OF OPINION SURVEY (2/2)

Access Mode	~5 minutes	~10 minutes	~15 minutes	~20 minutes	~30 minutes	~40 minutes	~50 minutes	~60 minutes	more than 1h	Total
Walking	1	4	1	0	0	0	0	0	0	6
Bicycle	0	0	1	0	0	0	0	0	0	1
Motorcycle	0	6	1	6	4	1	0	1	0	19
Tuk Tuk	0	3	11	1	1	0	1	1	3	21
Bus	0	3	9	34	84	30	18	36	38	252
Others	0	0	0	2	0	0	0	0	0	2
Total	1	16	23	43	89	31	19	38	41	301

Egress Mode	~5 minutes	~10 minutes	~15 minutes	~20 minutes	~30 minutes	~40 minutes	~50 minutes	~60 minutes	more than 1h	Total
Walking	0	4	0	0	0	0	0	0	0	4
Bicycle	0	0	0	0	0	0	0	0	0	0
Motorcycle	0	1	0	1	2	0	3	0	0	7
Tuk Tuk	0	0	1	1	0	2	1	1	0	6
Bus	1	6	4	35	97	47	40	23	27	280
Others	0	1	0	0	1	1	1	0	0	4
Total	1	12	5	37	100	50	45	24	27	301

17

RECOMMENDATION

- Record Actual Operation
- Record Operation Plan/ Record in Computerized Format
- Utilize Driver's Opinion

18

Photos


VIENTIANE MUNICIPALITY
STATE BUS COMPANY


VIENTIANE MUNICIPALITY
STATE BUS COMPANY

Bus Service Quality Indices

Date: 2 April, 2013, Tuesday, 2:00pm
Place: VCSBE Meeting Room

Agenda

1. Presentation of Bus Service Quality
   Mr. KUNIMASA Yoshiro

2. Discussion

Participants:

VCSBE	Mr.Khamphoune TEMERATH,Director of VCSBE Mr. Bounpone FONGMANY, Deputy Director of Technical Affaires Mr. Vanly CHANCHALERN, Deputy Director of Administrative Affaires Mr. Bouapha PHETVISAY, Deputy Director of Planning division
DPWT/VC	Mr.Khamphay SOUVADDY
DoT/MPWT	Absent
JICA Project Team	Mr. KUNIMASA Yoshiro, Vice Team Leader/ Bus Service/ Human Resource Development 2 Mr. SHIMEGI Natsuki, Corporate Management/ Accounting Mr. MURAKAMI Tadaaki, Bus Route and Operation Ms. Pathana INTHALANGSY, Interpreter Ms.Phayakala CHANDENG, Secretary Mr. Chanthala VORRASING, Engineer

Result of bus needs survey

Investigated in the conference held on 9th March 2013 in NUOL Dongdok campus

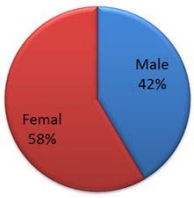
Advance announcement

2nd April, 2013
JICA PEC-VCSBE

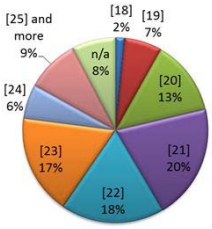
Number of respondents = 183

Individual attribute (sample=183)

Gender



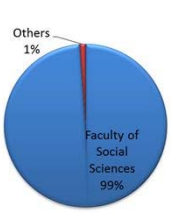
Age



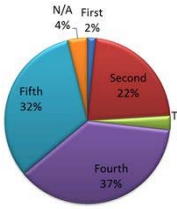
77% of respondents is 24 or less years old.

Individual attribute (sample=183)

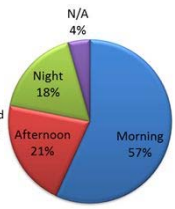
Faculty



Grade



Course

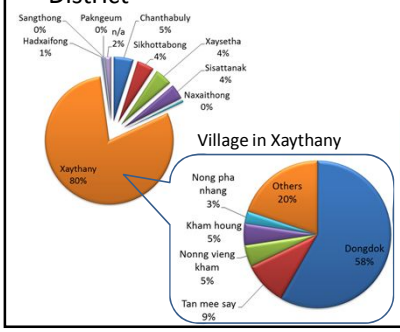


In this survey, we asked students who belong to Faculty of social Sciences.

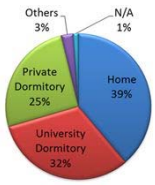
57% of respondents belong to Morning class.

Where do you live?

District

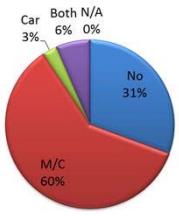


Dormitory?



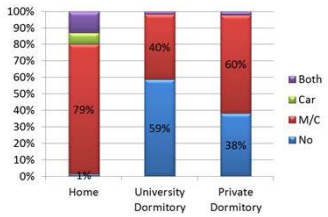
50% of respondents live in dongdok

Do you have Motorcycle or Car?



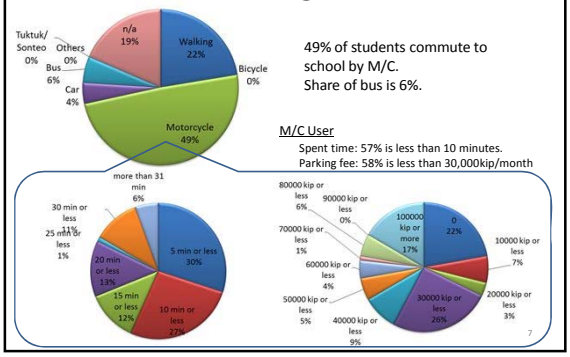
60% of students have M/C.

The ratio according to Living place



79% of students who live in their home have M/C.

Commuting mode?



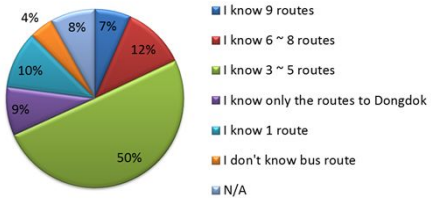
49% of students commute to school by M/C.
Share of bus is 6%.

M/C User

Spent time: 57% is less than 10 minutes.
Parking fee: 58% is less than 30,000kip/month

7

How much do you know about the bus?



Publicity work is required!

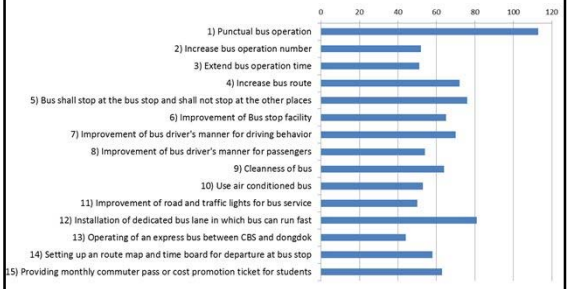
8

Do you know about extension of bus operation hours? (17:30 →18:00)

Note) Respondent who uses the bus for commuting is 6%.

9

What kind of bus service or improvement do you request?

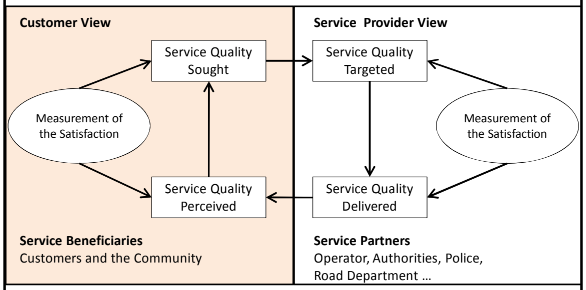


10

Bus Service Quality Indices

2 April, 2013
KUNIMASA Yoshiro

Service Quality Loop



Source: EN 13816: 2002

Bus Service Quality Indices : Sample 1

Items	Descriptions
1) Availability	extent of the service offered in terms of geography, time, frequency and transport mode
2) Accessibility	access to the Public Passenger Transport (PPT) system including interface with other transport modes
3) Information	systematic provision of knowledge about a PPT system to assist the planning and execution of journeys
4) Time	aspects of time relevant to the planning and execution of journeys
5) Customer care	service elements introduced to effect the closest practicable match between the standard service and the requirements of any individual customer
6) Comfort	service elements introduced for the purpose of making PPT journeys relaxing and leasurable
7) Security	sense of personal protection experienced by customers, derived from the actual measures implemented and from activity designed to ensure that customers are aware of those measures
8) Environmental Impact	effect on the environment resulting from the provision of a PPT service

Source) BS EN 13816:2002

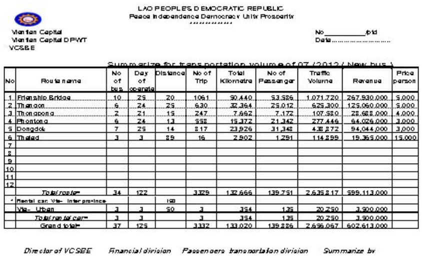
Bus Service Quality Indices : Sample 2

Point of view	Category	Performance Measure Examples	
Vehicle/ Driver	Travel Time	• Transit-auto travel time • Transfer time	• Delay • System speed
Passenger	Availability	• Service coverage • Service denials	• Frequency • Hours of service
	Service Delivery	• Reliability • Comfort	• Passenger environment • Customer satisfaction
	Safety & Security	• Vehicle accident rate • Passenger accident rate	• Crime rate • % vehicles with safety devices
	Maintenance & Construction	• Road calls • Fleet cleaning	• Spare ratio • Construction impact
Agency	Economic	• Ridership • Fleet maintenance performance	• Cost efficiency • Cost effectiveness
	Transit Impact	• Community economic impact • Employment impact	• Environmental impact • Mobility
Vehicle/ Driver	Capacity	• Vehicle capacity • Volume-to-capacity ratio	• Roadway capacity
Passenger	Travel Time		

Source) TCRP Report 100 Transit Capacity and Quality of Service Manual, 2nd Edition,2003

Operation Records of VCSBE

1. Number of Bus Vehicles which dedicated to each route
2. Monthly days of operation for each route
3. Monthly round trip number of bus for each route
4. Monthly Number of passengers for each route calculated by revenue
5. Monthly revenue for each route


LAO PEOPLE'S DEMOCRATIC REPUBLIC
Peace Independence Democracy Unity Prosperity

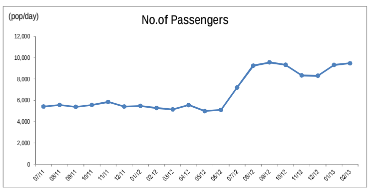
Vientian Capital
Vientian Capital DPWT
VCSBE

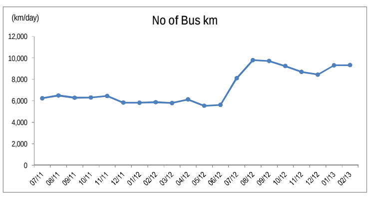
No__________/ptd
Date……………………

Summarize for transportation volume of 07 /2012 (New bus)

No	Route name	No of bus	Day of operate	Distance	No of Trip	Total Kilometre	No of Passenger	Traffic Volume	Revenue	Price person
1	Frienship Bridge	10	25	20	1061	50,440	53,586	1,071,720	267,930,000	5,000
2	Thanon	6	24	25	630	32,364	25,012	625,300	125,060,000	5,000
3	Thongpong	2	21	15	247	7,662	7,172	107,580	28,688,000	4,000
4	Phontong	6	24	13	558	15,372	21,342	277,446	64,026,000	3,000
5	Dongdok	7	25	14	817	23,926	31,348	438,872	94,044,000	3,000
6	Thalad	3	3	89	16	2,902	1,291	114,899	19,365,000	15,000
7										
8										
9										
10										
11										
12										
	Total route	34	122		3329	132,666	139,751	2,635,817	599,113,000	
*	Rental car Vte- Inter province			150						
	Vte- Urban	3	3	50	3	354	135	20,250	3,900,000	
	Total rental car	3	3		3	354	135	20,250	3,900,000	
	Grand total	37	125		3332	133,020	139,886	2,656,067	602,613,000	

Director of VCSBE — Financial division — Passengers transportation division — Summarize by





Bus Service Quality Indices for VCSBE (tentative)

Quality criteria	Index	2011	2012	2015 (Target)
Network	Total operation length	128km (February)	366km (September)	300km
Operation	Operation Number (per day)	177 (2010) 190(Feb 2011)	263 (September)	211 (Preliminary)
	Caring capacity (Pop-km per day)	155,300 (February)	364,700 (September)	331,000 (Preliminary)
Passenger	Number of Passenger (Pop per day)	6,270 (February)	9,540 (September)	10,000
	Passenger per vehicle (Pop per vehicle)	16 (February)	18 (September)	20

Note: Passenger per vehicle is calculated total bus service in Vientiane capital, including Big bus, small bus and electric bus

In addition,

- Excel training: Spare parts, Maintenance record
- Digital tachograph: Operation records, Fuel consumptions
- ICT Ticket System: Number of passengers by categories

Challenge: How to collect user's evaluation on bus services by VCSBE ?

Possibly:

- Enhance Division of Planning and Transport
- Cooperate with NUOL
- Develop business department

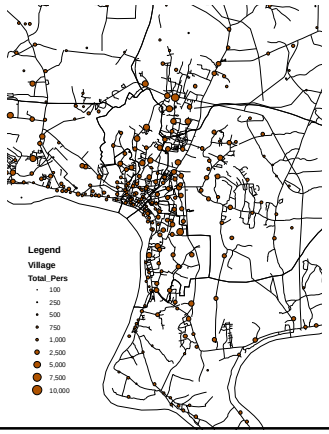
7

Sample analysis on bus service coverage area

Source) TCRP Report 100 Transit Capacity and Quality of Service Manual, 2nd Edition,2003

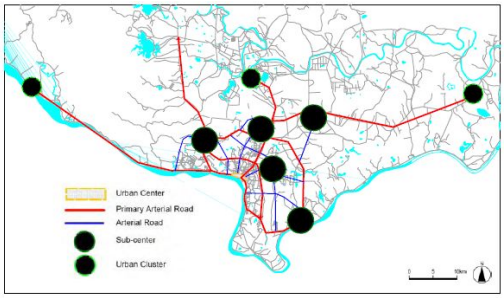
8

Sample GIS in Vientiane



9

Future Development Plan



Source) The Project for Urban Development M/P Study in Vientiane Capital (JICA, 2011)

10

Bus Service Quality Indices

Date: 5 February, 2014, Wednesday, 2:00pm
Place: VCSBE Meeting Room

Agenda

1. Presentation of Bus Service Quality
   Mr. KUNIMASA Yoshiro

2. Discussion

Participants:

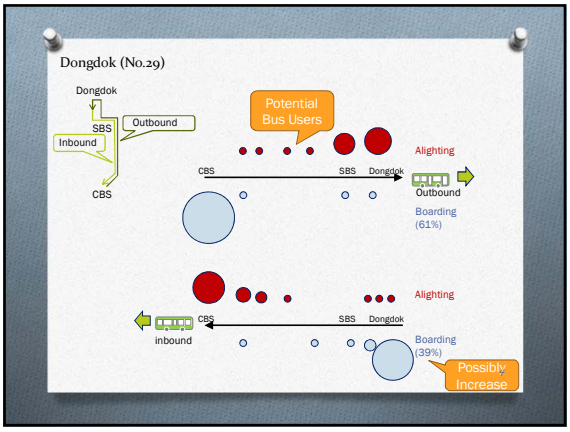
VCSBE	Mr.KhamphouneTEMERATH,Director of VCSBE Mr. Bounpone FONGMANY, Deputy Director of Technical Affaires Mr. Vanly CHANCHALERN, Deputy Director of Administrative Affaires Mr. Bouapha PHETVISAY, Deputy Director of Planning division
DPWT/VC	Mr. Somsanith HOUATHONGKHAM
DoT/MPWT	Mr. Phouthasai SILISAK
JICA Project Team	Mr. Kunimasa Yashiro Mr. SHIMEGI Natsuki Mr. Siththiphon CHANTHOTHAVONG, Engineer's assistant Mr. Chanthala VORRASING, Engineer Ms. Palitda CHANSY, Assistant

Bus Service Improvement: On-time Operation at Bus Stops

KUNIMASA Yoshiro

5 Feb, 2014

1



Background

- User's requests: Punctual bus operations, Time table installation at bus stops
- Present users ridership:
  - Passengers from CBS is dominant
  - CBS to destination is larger than opposite
  - A few passengers ride from bus stops
- There are potential demands to use public bus bound to CBS, from where passengers alight from CBS

2

Target

- To increase number of passengers bound to CBS
- To increase number of passengers riding at bus stops

Measurement

- To install time table on bus stops
- To distribute handy time tables to passengers
- To operate bus service at the appointed time

5

Passengers from CBS is dominant

Route Name	Route No	Outbound ratio	Inbound ratio	Ref: No. of Passengers for a round trip
Dongdok	29	61%	39%	46
Thangon	23	61%	39%	45
Friendship Bridge	14	54%	46%	56
Thongpong	30	80%	20%	20
Phontong	31	63%	37%	40
Donpamay	32	53%	47%	15
Dong Kham Xang	20	70%	30%	26

Note: Inbound and outbound ratio is the result of on-board survey in September 2012
Number of passengers are provided from Planning Department, VCSBE

3

Activity

- Preparation
- Discussion with Planning Department
- Study and selection of pilot routes
- Study and selection of bus stops
- Schedule and prepare bus time table
- Explanation to bus drivers
- Publicity activity
- Implementation
- Evaluation

* Red colored letter shows done or in action

6

Bus Time Table

- Time table on bus stops
- Time table for passengers

No. 29 (CBS -> Dongdok) at CBS

Hours	Minutes			
6	30	45		
7	00	15	30	45
8	00	20	40	
9	00	20	40	
10	00	20	40	
11	00	20	40	
12	00	20	40	
13	00	20	40	
14	00	20	40	
15	00	20	40	
16	00	20	40	
17	00	20	40	
18	00			

No. 29 (Dongdok -> CBS) at Dongdok

Hours	Minutes			
6				
7	00	20	40	55
8	10	25	40	
9	00	20	40	
10	00	20	40	
11	00	20	40	
12	00	20	40	
13	00	20	40	
14	00	20	40	
15	00	20	40	
16	00	20	40	
17	00	20	40	
18	00			

7

Interview



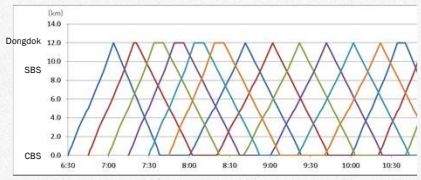

10

Output

- Timetables are installed on selected bus stops
- On-time operation at bus stops is conducted
- VCSBE manages bus operation by using Digital Tachograph or GPS
- Number of passengers is increased

8

Diagram



9

Summary of Small Interview Survey at CBS for Tongpong (No. 30) and Nongteng (No.49)

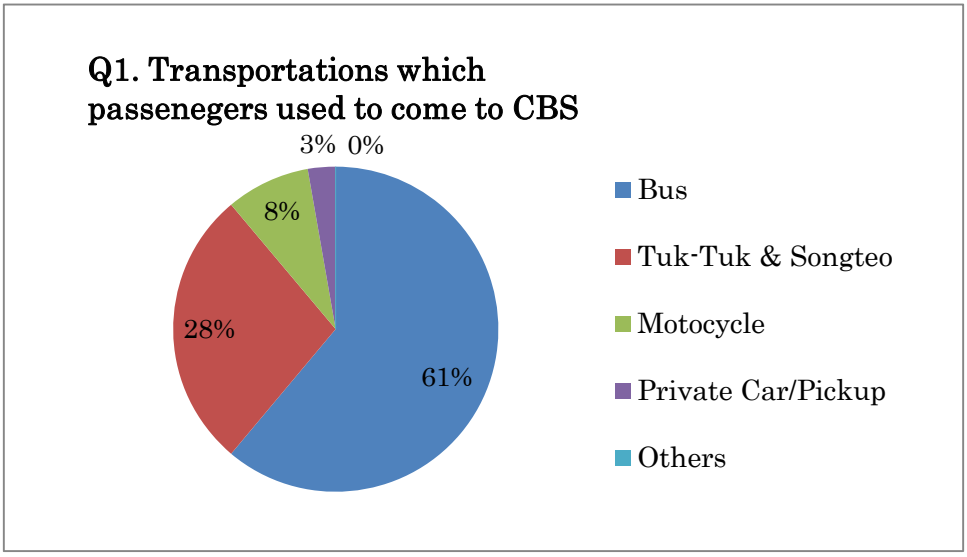
1. Date: 30 January, 2014

2. Number of Interviwee: 36 in total at CBS waiting in the Buses

Route	Number	Col %
Tongpong (30)	29	51%
Nongteng (49)	7	4%
Total	36	100%

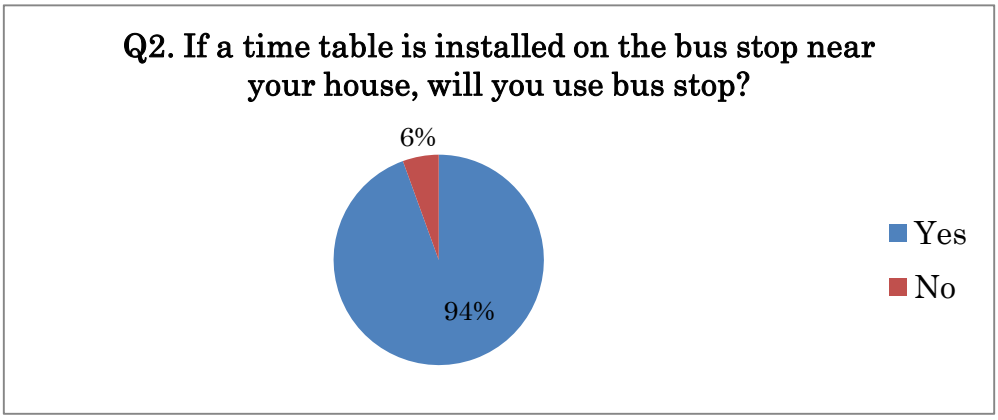
3. Q1: Mode to CBS

Bus	Tuk-Tuk & Songteo	Motocycle	Private Car/Pickup	Others	Total
22	10	3	1	0	36
61.1%	27.8%	8.3%	2.8%	0.0%	100%



4. Q2: Time table

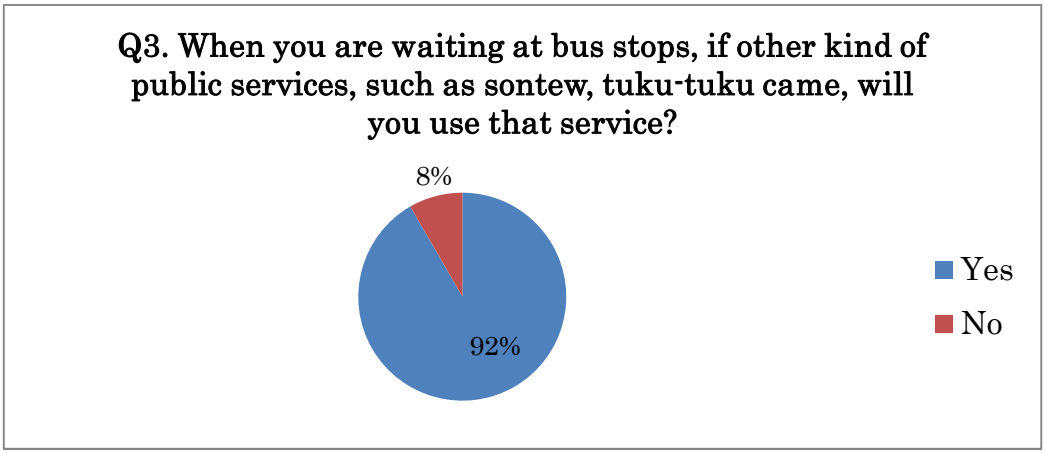
Yes	No	Total
34	2	36
94.4%	5.6%	100%



Summary of Small Interview Survey at CBS for Tongpong (No. 30) and Nongteng (No.49)

5. Q3: Priority of Public Bus for passengers.

Yes	No	Total
33	3	36
91.7%	8.3%	100%

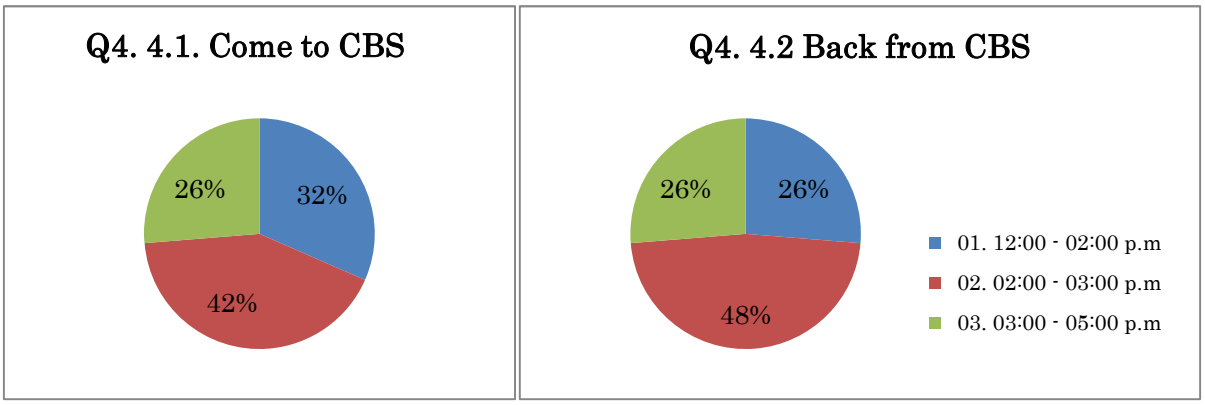


6. Q4-1: Deprture Time to CBS

Time	Number	Percentage
01. 05:00 - 08:00 a.m	6	31.6%
02. 08:00 - 09:00 a.m	8	42.1%
03. 09:00 - 11:00 a.m	5	26.3%
Total	19	100%

7. Q4-2: Departure Time to home

Time	Number	Percentage
01. 05:00 - 08:00 a.m	5	26.3%
02. 08:00 - 09:00 a.m	9	47.4%
03. 09:00 - 11:00 a.m	5	26.3%
Total	19	100%



Bus Service Quality Indices

Date: 4 February, 2015, Wednesday, 3:00pm
Place: VCSBE Meeting Room

Agenda

1. Criteria to Measure Level of Service
   Mr. KUNIMASA Yoshiro

2. Discussion

Participants:

VCSBE	Mr. Khamphoune Temerath, Director Mr. Bounpone Fongmany, Deputy Director Mr. Vanly Vanchalern, Deputy Director Mr. Bouapha Phetvixai, Deputy Director Mr. Thanongsy Dethvongsone, Bus Operation Plan
DPWT/VC	Mr. Somsanid HUATHONGKHAM
JICA Project Team	Mr. Kunimasa Yoshiro, Vice Team Leader/Bus Service/Human Resource Development 2 Mr. Yashiro Shuichi, Transport and Traffic Plan Mr. Chanthala VORRASING, Engineer Mr. Sitthiphon Chanthothavong, Engineer Assistant Ms. Thepsouda Nanhdavong, Secretary

Criteria to Measure Level of Service

4 February, 2015

Kunimasa Yoshiro

Issues to be Discussed

- Updated Level of Service Quality Indices
- How to set criteria of bus service level ?
  1) Internal Target of VCSBE
  2) Agreement with DPWT
  3) Agreement with MPWT
  4) Target of Medium term business and investment plan
  5) Announce to Citizens

Bus Service Quality Indices for VCSBE (as of April 2013)

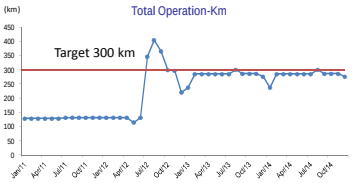
Quality criteria	Index	2011	2012	2015 (Target)
Network	Total operation length	128km (February)	366km (September)	300km
Operation	Operation Number (Roundtrips per day)	177 (2010) 190(Feb 2011)	263 (September)	211 (Preliminary)
	Carrying capacity (Pop-km per day)	155,300 (February)	364,700 (September)	331,000 (Preliminary)
Passenger	Number of Passenger (Pop per day)	6,270 (February)	9,540 (September)	10,000
	Passenger per Roundtrip (Pop per roundtrip)	16 (February)	18 (September)	20

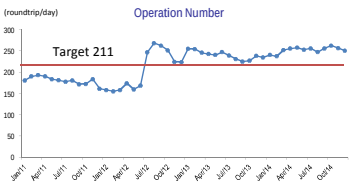
Note: Passenger per vehicle is calculated total bus service in Vientiane capital, including Big bus, small bus and electric bus

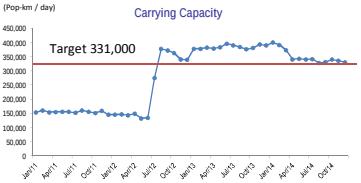
3

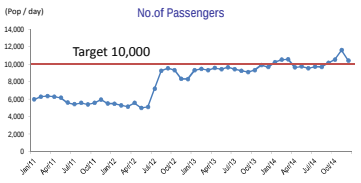
Updated Bus Service Quality Indices for VCSBE (as of December 2014)

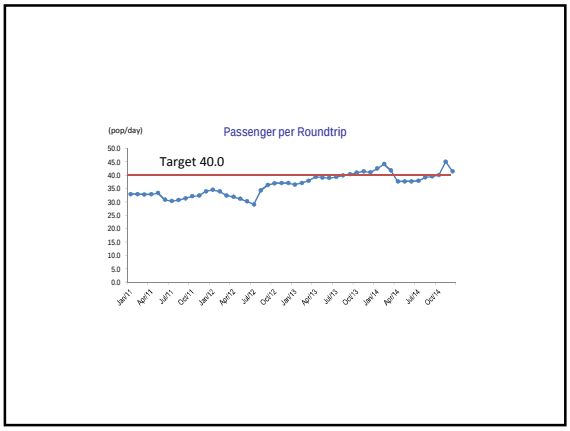
Quality criteria	Index	2011 (Before New Bus)	2012 (After New Bus)	2013	2014	2015 (Target)
Network	Total operation length	128km (Feb)	366km (Sep)	286km (Sep)	286km (Sep)	300km
Operation	Operation Number (Roundtrips per day)	190 (Feb)	263 (Sep)	225 (Sep)	256 (Sep)	211 (Preliminary Survey)
	Carrying capacity (Pop-km per day)	161,000 (Feb)	373,600 (Sep)	377,700 (Sep)	333,000 (Sep)	331,000 (Preliminary Survey)
Passenger	Number of Passenger (Pop per day)	6,270 (Feb)	9,540 (Sep)	9,100 (Sep)	10,140 (Sep)	10,000
	Passenger per Roundtrip (Pop per roundtrip)	32.9 (Feb)	36.3 (Sep)	41.6 (Sep)	39.6 (Sep)	40










(pop/day)
Passenger per Roundtrip
Target 40.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Jan'11
Apr'11
Jul'11
Oct'11
Jan'12
Apr'12
Jul'12
Oct'12
Jan'13
Apr'13
Jul'13
Oct'13
Jan'14
Apr'14
Jul'14
Oct'14

App4 Workshop Materials

Act 2-4 Plan and Review Bus Routes and Bus Stop Locations Responding to Community Demand

	No.	Date	Seminar / Workshop	Page
	1	9 Sep, 2014	1. Overview of GIS 2. ArcGIS Basics 3. Understanding GIS Data 4. Coordinate Systems 5. Working with Arc Map	App4-318
	2	11 Sep, 2014	6. Creating New Features, Digitization and Managing Map Layers 7. Using Coordinate Systems 8. Symbolizing, Layout, Labeling 9. Data and Map Exporting and Printing	
	3	16 Sep, 2014	10. Data Conversion to/from GIS (Google Earth, AutoCAD,…) 11. Importing GPS Data 12. Geo-database 13. Editing GIS Data 14. Projection and Transformation of GIS Data	
	4	18 Sep, 2014	15. Performing Simple Analysis (Spatial, Network, Tracking Analysis, etc.) 16. Preparing Base Map 17. Preparing Bus Route Map, Bus Stop 18. Working with Multiple Data Frames	

The Project to Enhancement the Capacity of Vientiane Capital State Bus Enterprise

Name of Training : GIS Training (ArcGIS) for Public Bus Service

Overall Training Objective : (1) To make counterpart officials familiar with ArcGIS software in using it for utilizing in planning, analysis, operation, etc. of their activities.

Training Materials: Handouts, User Manuals, Tutorial Videos and Demonstration on Computer

Venue : Computer Room, Faculty of Engineering, NUOL

Training Program

	ArcGIS Training		
Objective	:	▪ To make familiar with **Basic Function of GIS** for analysis and operation of software, and develop M**edium Level** human resources for using GIS for various planning, operation and management purpose (route planning, bus stop planning, accessibility analysis, making various maps for planning, operation and management of public transportation.	
Date	:	September 09, 11, 16 and 18, 2014	
Time	:	9:00 ~ 12:00	
Training Method	:	Lecture and Practice on the Computers	
Trainer / Instructor	:	Dr. Bhoj Raj Pantha, JICA Project Team	
Targeted Trainee	:	Officials of MPWT ▪ DPWT, Vientiane Capital ▪ Planning and Budget Division, DOT, MPWT ▪ Traffic Management Division, DOT, MPWT ▪ Land Transport Division, DOT, MPWT ▪ Vientiane Capital State Bus Enterprise ▪ Traffic Police, Vientiane Capital ▪ Others	
No. of Targeted Trainee	:	Max. Ten (10)	
Requirements	:	1. Basic computer operational knowledge 2. Hardware and Software: **Hardware**: Laptop Computers with Microsoft Windows environment **Software**: ArcGIS 10.X Version (Commercial or Trial Version) 3. Trainees shall affiliate in Transportation / road related division	
Training Items (Tentative) ** Training items are subject to revise considering the performance level of trainees		1st course	1. Overview of GIS
			2. ArcGIS Basics
			3. Understanding GIS Data
			4. Coordinate Systems
			5. Working with Arc Map
		2nd course	6. Creating New Features, Digitization and Managing Map Layers
			7. Using Coordinate Systems
			8. Symbolizing, Layout, Labeling
			9. Data and Map Exporting and Printing
		3rd course	10. Data Conversion to/from GIS (Google Earth, AutoCAD,…)
			11. Importing GPS Data
			12. Geo-database

			13. Editing GIS Data
			14. Projection and Transformation of GIS Data
		4th course	15. Performing Simple Analysis (Spatial, Network, Tracking Analysis, etc.)
			16. Preparing Base Map
			17. Preparing Bus Route Map, Bus Stop
			18. Working with Multiple Data Frames
Expected Output	:	Familiarization with GIS software, basic tools & functions, simple map creation, map saving & printing, simple analysis (Bus Stop Spacing), etc.	

Particpants List of GIS Training (ArcGIS) for Public Bus Service

SN	Name	September 9, 2014	September 11, 2014	September 16, 2014	September 18, 2014	Organization	Departmnet	Position
		1st Training Course	2nd Training Course	3rd Training Course	4th Training Course			
1	Mr. Khamsavang THEPPHOMMACHANH	√	√	√	√	VCSBE	Division of Planning and Budgeting	Officer
2	Mr. Thanongsy DETVONGSONE	√	√	√	√	VCSBE	City Bus Section	Chief
3	Mr. Somsanith HOUATHONGKHAM	√		√		DPWT	Traffic Management Department	Officer
4	Mr. Phimpho ZAMOUNTY	√	√	√	√	NUOL	Faculty of Engineering	Student
5	Mr. Khayphavanh OUDOMSACK	√	√	√	√	VCSBE	IT Section	IT Expert
6	Mr. Khamphone LUANGDY	√	√		√	Traffic Police	Vientiane Capital	Chief
7	Mr. Sisouphanh PHOMMANIVONG	√	√	√	√	NUOL	Faculty of Engineering	Lecturer
8	Mr. Phongsavanh INTHAVONG	√	√	√	√	NUOL	Transport	Lecturer
9	Mr. Baengchan PHOUMMECHAN	√	√	√	√	DPWT	Transport	Officer
10	Mr. Vannalate NORKEO	√	√	√	√	DPWT	Transport	Officer
11	Mr. Saythavone SIHANATH	√	√	√	√	DPWT	Transport	Officer
12	Mr. Poutthasay SIRISACK	√	√	√	√	DOT	Division of Planning and Budgeting	Technical officer
13	Mr. Vannitha KIMANIVONG	√				DPWT	Transport	Officer
14	Mr. Vernsone PHENGSOULITH		√	√	√	NUOL	Faculty of Engineering	Instructor
15	Mr. Khametin SUPHUNSY		√	√	√	NUOL	Faculty of Engineering	Student
16	Mr. Thongthep KEOSILA		√		√	NUOL	Faculty of Engineering	Student
17	Mr. Dethmany OANSOUVANH			√	√	DOT	Transport	Staff

The Project to Enhance the Capacity of Vientiane Capital State Bus Enterprise in Lao PDR

Training on Geographic Information System (GIS) for Public Bus Services

Dr. Bhoj Raj Pantha
JICA Project Team

September , 2014

1. Overview of GIS

GIS Overview

Contents

- What is *GIS?*
- Major GIS Functions
- GIS Approach
- Benefits of GIS
- Components of GIS
- Use of GIS
- GIS Software
- ArcGIS
- Computer System Requirements
- Introduction to ArcGIS (Operations and Tools)

What is GIS? (1/3)

A GIS is a computer-based system that provides the following four sets of capabilities to handle georeferenced data:

1. Data capture and preparation
2. Data management, including storage and maintenance
3. Data manipulation and analysis
4. Data presentation

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.

- ESRI

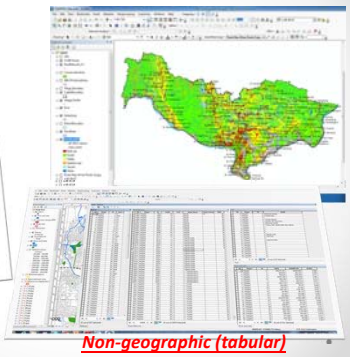
What is GIS? (2/3)

- Furthermore, GIS
  - Links databases and maps
  - Manages various information about places, objects, etc.
  - Helps answer questions such as:
    - Where is it?
    - What else is nearby?
    - Where is the highest concentration of 'X'?
    - Where can I find things with characteristic 'Y'?

What is GIS? (3/3)

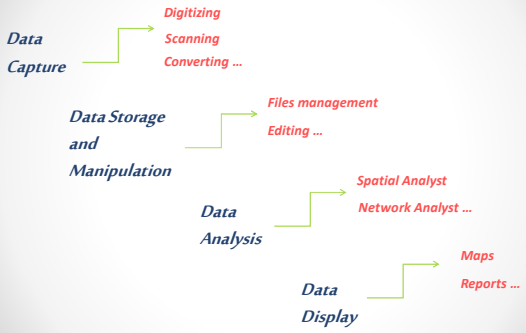
Spatial Data
refers to where things are, or perhaps, where they were or will be

Geographic



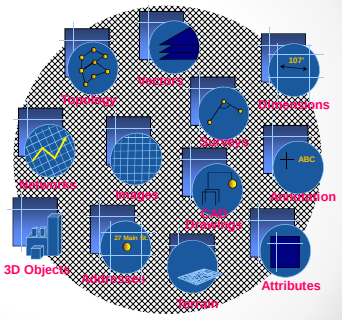
Non-geographic (tabular)

Major GIS Functions

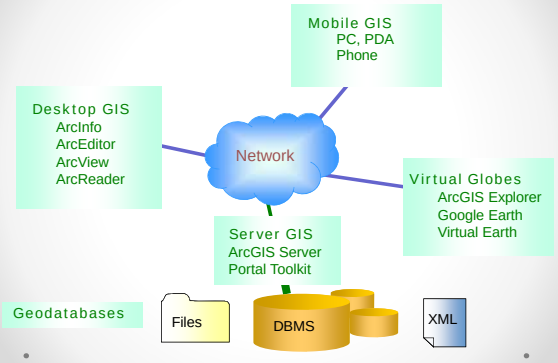


GIS provides Data Integration

- Roads
- Land Parcels
- Population
- Utilities
- Land Mines
- Hospitals
- Refugee Camps
- Wells
- Sanitation
- Many more!



GIS as infrastructure



Two fundamental types of data

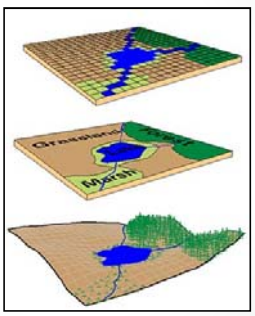
- Vector
  - A series of x, y coordinates
  - For discrete data represented as points, lines, polygons
- Raster
  - Grid and cells
  - For continuous data such as elevation, slope, surfaces
- A Desktop GIS is able to handle both types of data effectively!

Data Representation

Raster
(Image)

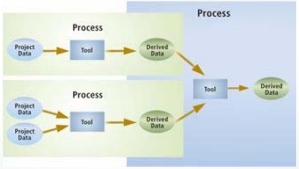
Vector
(coordinated data)

Real World
(3D representation with actual location)



Other features of a GIS

- Produce good cartographic products (i.e. maps)
- Generate and maintain metadata
- Use and share geoprocessing models
- Managing data in a geodatabase using data models for each sector



The Geographic Approach (1/3)

The Geographic approach consists of five steps;
Step 1: Ask
Step 2: Acquire
Step 3: Examine
Step 4: Analyze
Step 5: Act

Five Steps of Geographic Approach

Step 1: Ask

Approaching a problem geographically. What is the problem you are trying to solve or analyze, and where is it located?

Framing the problem

The Geographic Approach (2/3)

Step 2: Acquire

After clearly defining the problem, it is necessary to determine the data needed to complete your analysis and ascertain where that data can be found or generated. (Digitization from images, importing from other sources, field survey, etc.)

Satellite Imagery

Step 3: Examine

You will not know for certain whether the data you have acquired is appropriate for your study until you thoroughly examine it.

Examining after Digitization

The Geographic Approach (3/3)

Step 4: Analyze

The data is processed and analyzed based on the method of examination or analysis you choose, which is dependent on the results you hope to achieve.

Analyzing the current condition of Land Use in Vientiane

Step 5: Act

The results can be shared through reports, maps, tables, and charts and delivered in printed form or digitally.

Public Bus Route and Bus Stop Planning based on Population Density

Benefits of GIS (1/2)

GIS benefits organizations of all sizes and in almost every industry. There is a growing awareness of the economic and strategic value of GIS. The benefits of GIS generally fall into five basic categories:

- Cost Savings and Increased Efficiency

Example: Maintenance optimization and vehicle routings

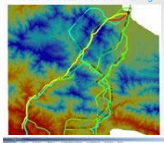
- Better Decision Making

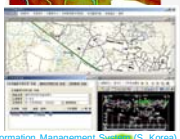
Example: for infrastructure planning and management through simple to sophisticated analysis.

- Improved Communication

Example: GIS-based maps and visualizations greatly assist in understanding situations

Evaluation of various alternative road routes for better decision making





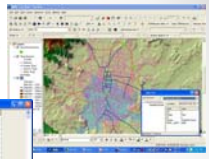
Highway Information Management System (S. Korea)

Better Communication with the aid of Map (Road Slope Disaster Management)

Benefits of GIS (2/2)

- Better Recordkeeping

Example: Record keeping in GIS such as utility facilities, land management and asset management



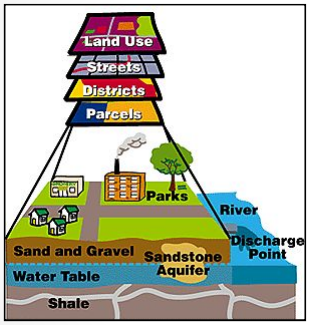
Various traffic management data

- Managing Geographically

Example: Managing projects geographically. Modeling and designing can be done in GIS

Public Bus Tracking System using GIS, GPS and Internet

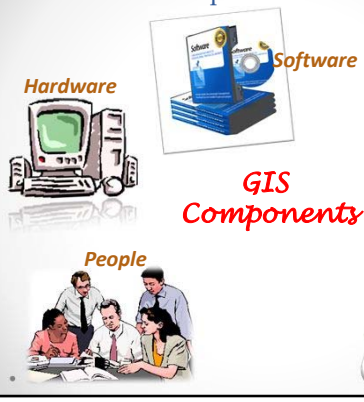
Abstracting the Real World by GIS



Technologies for acquiring surface and underground information:

- Remote Sensing
- Satellite Imagery
- Aerial Photography
- GPS
- etc.

Components of GIS



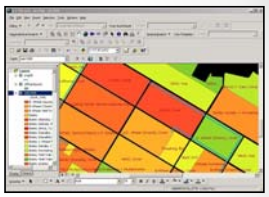
Use of GIS

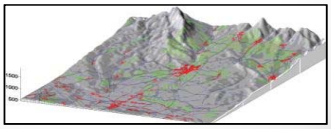
GIS used in multiple disciplines:

- Agriculture
- Archaeology
- Architecture/Landscape Arch.
- Business
- Environmental Science
- Engineering
- Military Science
- Natural Resource Management
- Geography / Geology
- Meteorology
- Oceanography
- Law Enforcement
- Public Health
- History / Sociology
- Urban/Regional Planning
- ....and many more

Agriculture

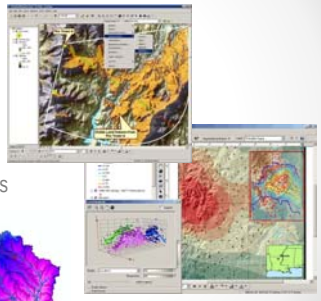
- o Farm management
- o Pest/Disease tracking
- o Crop monitoring
- o Yield prediction
- o Soil analysis

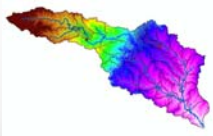




Natural Resource Management

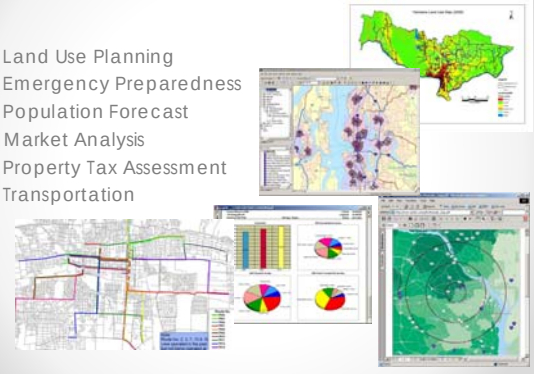
- Forestry
- Ecology
- Mining
- Petroleum
- Water Resources





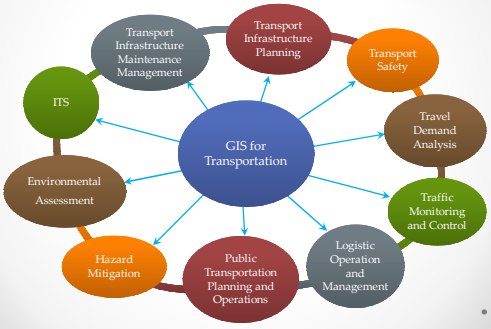
Planning and Economic Development

- Land Use Planning
- Emergency Preparedness
- Population Forecast
- Market Analysis
- Property Tax Assessment
- Transportation



GIS for Transportation (GIS-T)

Many GIS-T applications were implemented at various transportation agencies in the past two decades:



GIS Software

Commercial Software

- ArcGIS
- MapInfo
- Manifold
- AutoCAD
- ERDAS Imagine
- ENVI
- Global Mapper
- TransCAD
- Etc...

Open Source Software

- Grass GIS
- Q_GIS
- ILWIS
- JUMP GIS
- Etc...

2. ArcGIS Basics

ArcGIS

ArcGIS Product

1. ArcInfo
2. ArcGIS Desktop
3. ArcEditor

ArcGIS Extensions

i. Spatial Analyst
ii. 3D Analyst
iii. Network Analyst
iv. Data Interoperability
v. Geostatistical Analyst
vi. Survey Analyst
vii. Tracking Analyst
viii. Maplex
ix. ArcScan

Version of ArcGIS Desktop

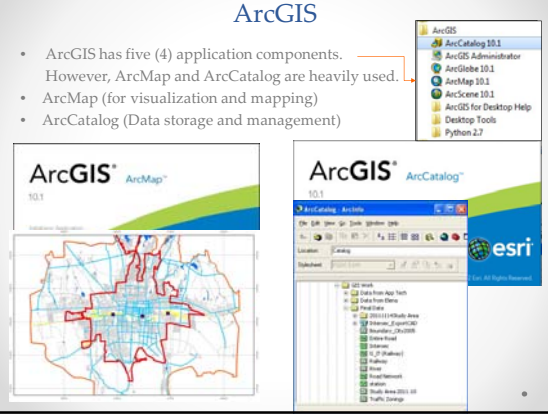
ArcGIS 3.XX
ArcGIS 8.XX
ArcGIS 9.XX
ArcGIS 10.XX

Computer Systems Requirements (for ArcGIS 10.1)

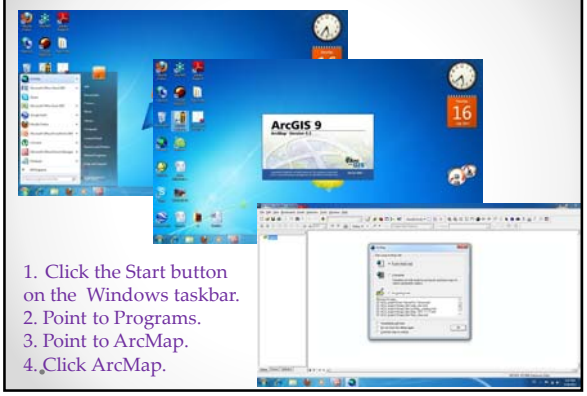
Supported Operating System	Windows Server (32-bit) Windows 7 , 8 / Vista / XP (32-bit& 64-bit)
CPU Speed	1.6 GHz recommended or higher
Processor	Intel Core Duo, Pentium 4 or Xeon Processors 1 GB minimum, 2 GB recommended or higher
Memory - RAM	2 GB of RAM (recommended)
Display Properties	24 bit color depth (recommended)
Screen Resolution	1024 x 768 (recommended) or higher at Normal size (96dpi)
Swap Space Determined by the operating system	500 MB minimum
Disk Space	2.4 GB
Video/Graphics Adapter	24-bit capable graphics accelerator
Networking Hardware	Simple TCP/IP

ArcGIS

- ArcGIS has five (4) application components. However, ArcMap and ArcCatalog are heavily used.
- ArcMap (for visualization and mapping)
- ArcCatalog (Data storage and management)

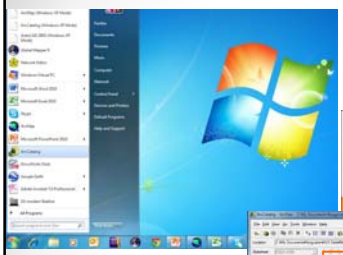


Starting ArcMap



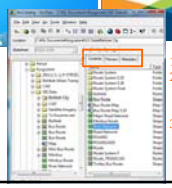
1. Click the Start button on the Windows taskbar.
2. Point to Programs.
3. Point to ArcMap.
4. Click ArcMap.

Starting ArcCatalog



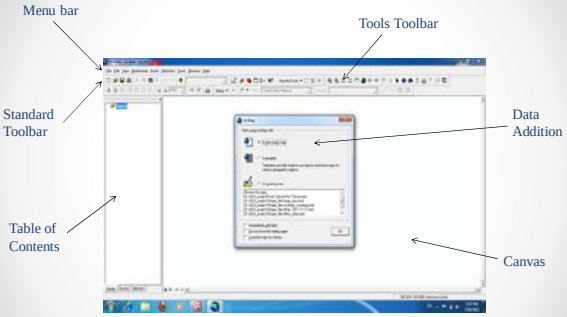
ArcCatalog act as a databank. All types of data can be checked in ArcCatalog. Also it provides;

1. Click the Start button on the Windows taskbar
2. Point to Programs
3. Point to ArcCatalog
4. Click ArcCatalog



1. Contents: List of data
2. Preview: Map (geography) and Table (Attribute)
3. Metadata

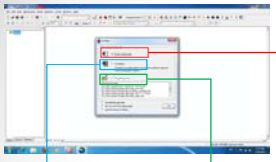
ArcMap Interface



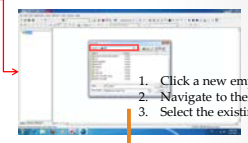
Opening Map

Three options are available

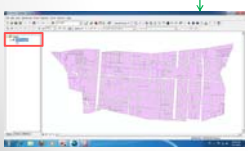
i. A new Empty Map
ii. A Template
iii. An Existing Map

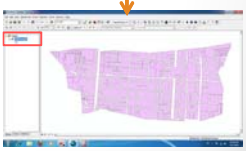


Standard pre-designed map format

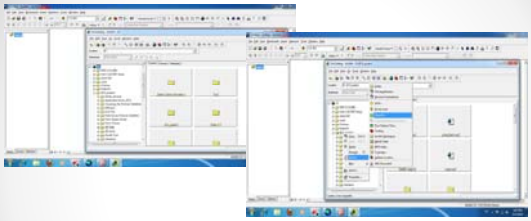


1. Click a new empty map
2. Navigate to the folder
3. Select the existing file





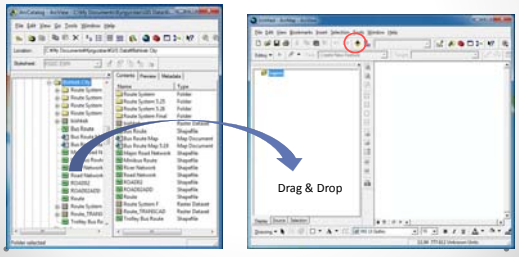
Creating GIS file



1. Click a new empty map
2. Navigate to ArcCatalog
3. Select the folder to create a new file
4. Navigate to New and click Shapefile
5. Write Name of Feature
6. Select Feature type you want to create (point/polyline/polygon etc.)
7. Define Coordinate System (click Edit)
8. Select /import/new coordinate system
9. Select GCS or Projected Cord. System
10. Select Type of system (eg. UTM)
11. Select you geographical zone (for UTM)
12. Click OK

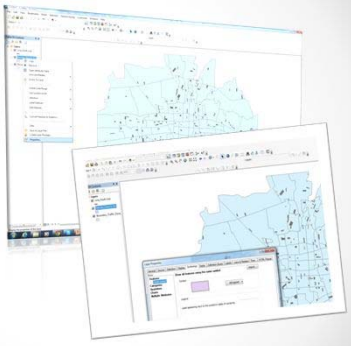
Creating New GIS Map

- Open a new empty map
- Click ArcCatalog (or click +) to add data in the map
- Navigate data in ArcCatalog
- Select the data (double click or drag data from ArcCatalog drop to ArcMap



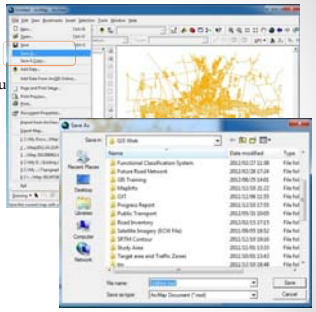
Working in ArcMap

- Data Display
- Color Management
- Data Layer Arrangement (Up and Down)
- Data Labeling
- Setting Data Frame Properties
- Setting ArcMap Toolbar
- Inserting Pictures and Objects
- Layer On / Off
- Zooming In/Out
- Map Refreshing
- Importing Data from GPS



Saving a New Map

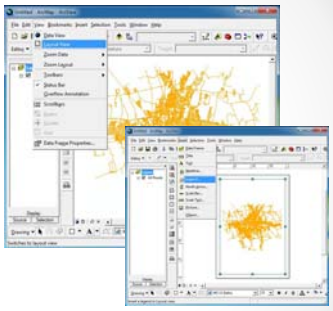
1. Click to File
2. Click "Save" or "Save As" or "Save A Copy"
3. Navigate to the folder where you want to save map



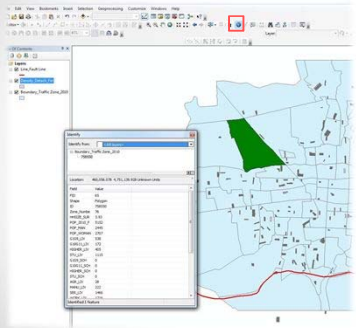
Note:
Save: without changing Name
Save As: Can be changed File Name
Save a Copy: Can be saved in even in older version of GIS

Setting Map Layout

- Go to View
- Click Layout View
- Set Page Set Up and Printer
- Insert Legend, Map Title, North Arrow, Scale etc.
- Set Extend of Data Frame
- Adjust map within the designed layout frame

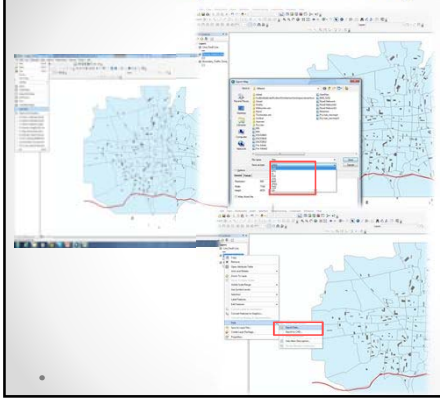


Checking Information on the Map Window



- Click the Identify button on the Tools toolbar
- In the map window, click on a feature to view information about it.

Export Data and Map



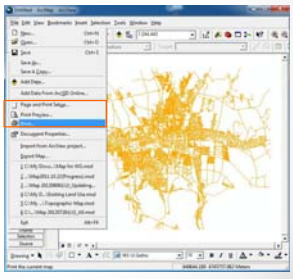
Export Map

Export Data

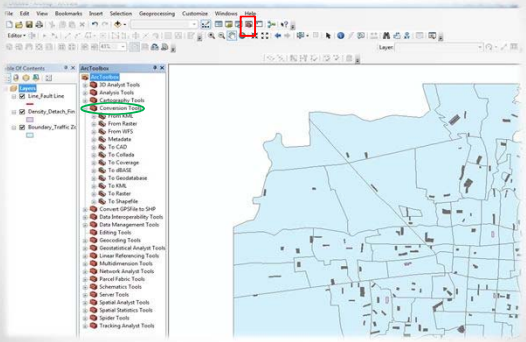
Map Printing

Map can be printed both from Data view mode and layout view mode. However, printing from layout view mode is recommended because you can print map with scale bar, legend, map title, etc. from layout view mode.

i. Click File
ii. Set Page and Printer Setup if it is not set already
iii. Check Print Preview before printing
iv. Click Print

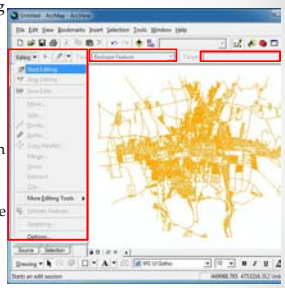


GIS Data Conversion



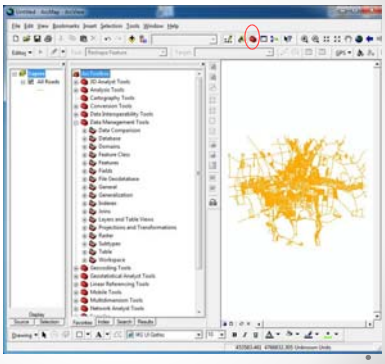
Editing GIS Data (Shape File)

- GIS Shapefile data can edit (creating a new feature, merging, easily in ArcMap window.
- Go to Editor Toolbar
- Select the file you want to edit
- Check the file you selected is displayed in Target Combo-Box
- Enable Snapping Option if you wish
- Select type of editing
- Possible editing button will automatically activated based on file type you wanted to edit
- Click "Save Edits" to save data
- Click "Stop Editing" when you finish the editing task



Introduction of ArcToolbox

- Click to ArcToolox Tool either from ArcMap or ArcCatalog
- Select the toolbox which you want to use

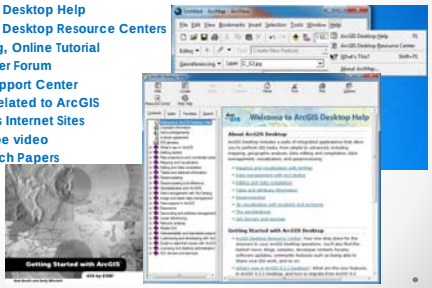


Geo-referencing of Images or non-geo-referenced data

- Images or scanned copy of old maps, drawings or documents can be digitized and can be used as GIS Data for various purposes.
- However, to use them properly, it is necessary to geo-referenced them geographically.
- GIS has a tool to do georeferencing which help to regenerate old maps/documents as digital GIS data.

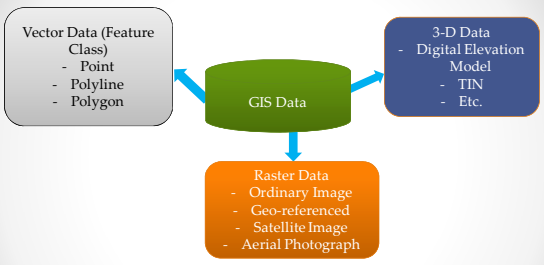
Mastering in ArcGIS

- **Various materials are available for mastering in ArcGIS and some of them are as below;**
  - i. ArcGIS User Manual
  - ii. ArcGIS Desktop Help
  - iii. ArcGIS Desktop Resource Centers
  - iv. Training, Online Tutorial
  - v. ESRI User Forum
  - vi. ESRI Support Center
  - vii. Blogs related to ArcGIS
  - viii. Various Internet Sites
  - ix. YouTube video
  - x. Research Papers
  - xi. Books
  - xii. Etc.

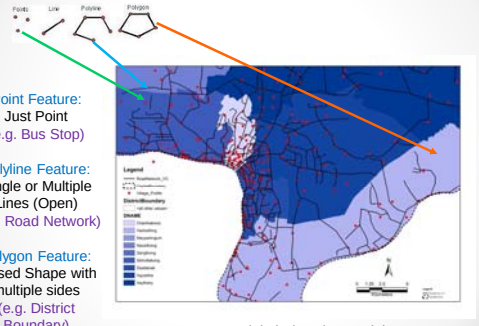


3. Understanding of GIS Data

GIS Data



Vector Data GIS Data



Point Feature:
Just Point
(e.g. Bus Stop)

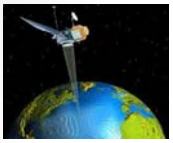
Polyline Feature:
Single or Multiple Lines (Open)
(e.g. Road Network)

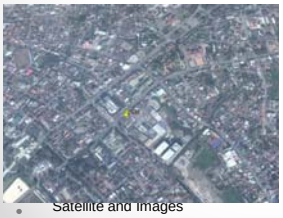
Polygon Feature:
Closed Shape with multiple sides
(e.g. District Boundary)

Digital Elevation Model (DEM)

Topographical Contour

Raster GIS Data

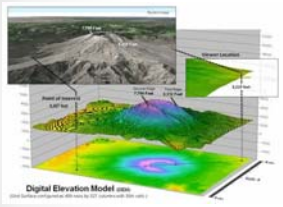




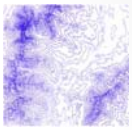
Satellite and Images

Aerial Photograph

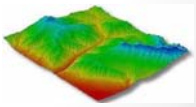
3-D GIS Data



Digital Elevation Model (DEM)



Topographical Contour



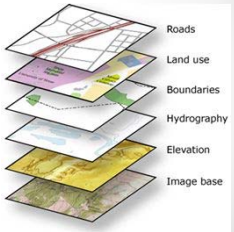
Triangulated Irregular Network (TIN)

4. Coordinate Systems

Coordinate System (1/7)

1. What are map projections?

- Within ArcGIS, every dataset has a coordinate system, which is used to integrate it with other geographic data layers within a common coordinate framework such as a map. Coordinate systems enable you to integrate datasets within maps as well as to perform various integrated analytical operations such as overlaying data layers from disparate sources and coordinate systems.



Coordinate System (2/7)

2. What is a coordinate system?;

Coordinate systems enable geographic datasets to use common locations for integration. A coordinate system is a reference system used to represent the locations of geographic features, imagery, and observations such as GPS locations within a common geographic framework.

Each coordinate system is defined by:

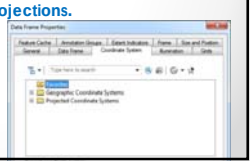
- **Its measurement framework which is either geographic (in which spherical coordinates are measured from the earth's center) or planimetric (in which the earth's coordinates are projected onto a two-dimensional planar surface).**
- **Unit of measurement (typically feet or meters for projected coordinate systems or decimal degrees for latitude–longitude).**
- **The definition of the map projection for projected coordinate systems.**
- **Other measurement system properties such as a spheroid of reference, a datum, and projection parameters like one or more standard parallels, a central meridian, and possible shifts in the x- and y-directions.**

Coordinate System (3/7)

3. Types of coordinate systems

There are two common types of coordinate systems used in GIS:

- A global or spherical coordinate system such as latitude–longitude. These are often referred to as geographic coordinate systems.
- A projected coordinate system based on a map projection such as transverse Mercator, Albers equal area, or Robinson, all of which (along with numerous other map projection models) provide various mechanisms to project maps of the earth's spherical surface onto a two-dimensional Cartesian coordinate plane. Projected coordinate systems are sometimes referred to as map projections.



Coordinate System (4/7)

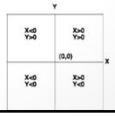
4. What are geographic coordinate systems?

- A geographic coordinate system (GCS) uses a three-dimensional spherical surface to define locations on the earth. A GCS is often incorrectly called a datum, but a datum is only one part of a GCS. A GCS includes an angular unit of measure, a prime meridian, and a datum (based on a spheroid).
- A point is referenced by its longitude and latitude values. Longitude and latitude are angles measured from the earth's center to a point on the earth's surface. The angles often are measured in degrees (or in grads). The following illustration shows the world as a globe with longitude and latitude values.

Coordinate System (5/7)

5. What are projected coordinate systems?

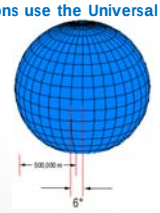
- A projected coordinate system is defined on a flat, two-dimensional surface. Unlike a geographic coordinate system, a projected coordinate system has constant lengths, angles, and areas across the two dimensions. A projected coordinate system is always based on a geographic coordinate system that is based on a sphere or spheroid.
- In a projected coordinate system, locations are identified by x, y coordinates on a grid, with the origin at the center of the grid. Each position has two values that reference it to that central location. One specifies its horizontal position and the other its vertical position. The two values are called the x-coordinate and y-coordinate. Using this notation, the coordinates at the origin are x = 0 and y = 0.



Coordinate System (6/7)

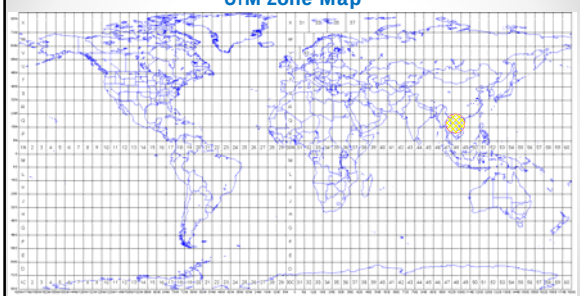
6. Universal Transverse Mercator

The Universal Transverse Mercator (UTM) system is a specialized application of the transverse Mercator projection. The globe is divided into 60 north and south zones, each spanning 6° of longitude. Each zone has its own central meridian. Zones 1N and 1S start at 180° W. The limits of each zone are 84° N and 80° S, with the division between north and south zones occurring at the equator. The polar regions use the Universal Polar Stereographic coordinate system.



Coordinate System (7/7)

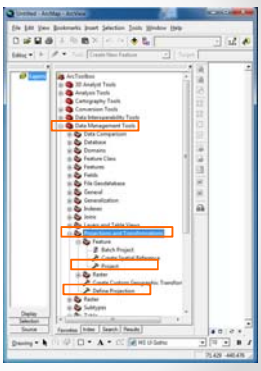
UTM Zone Map



Defining Coordinate System in ArcGIS

I. Coordinate system is very much important in GIS. If you wrongly define the coordinate system, the object you locate in geography will be either located in wrong place or does not display. Unless you have defined several GIS files in a same coordinate system, you can not displayed them in a same map.

II. ArcGIS has a tool <<Projections and Transformations>> for defining, projection and transformation of GIS file from one coordinate system to another.



Thank You Very Much for Your Kind Attention

Course: 2nd
Day: 2nd
2014/09/11

Creating New Features

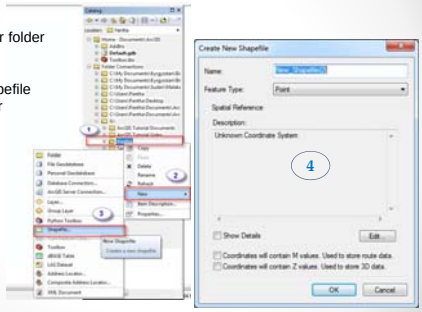
1. Basic Steps

i. **Creating new shapefile (Point, Polyline, Polygon, ….)**
ii. **Defining Coordinate System for New Shapefile**
iii. **Adding Fields as you need**
iv. **Opening New Shapefile in editable mode**
v. **Setting Editing Environment**
vi. **Draw Features**
vii. **Inputting Information on newly drawn features**
viii. **Saving New Shapefile (after editing)**

Creating New Features

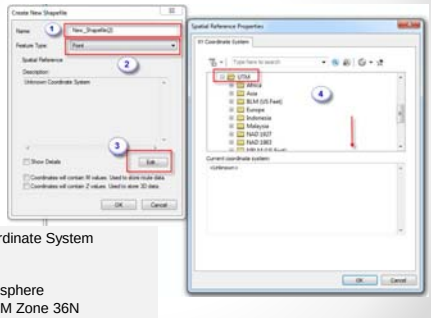
i. Creating new shapefile (Point, Polyline, Polygon, ….)

(1) Right Click your folder
(2) Click New
(3) Click Shapefile
- Create New Shapefile window will appear



Creating New Features

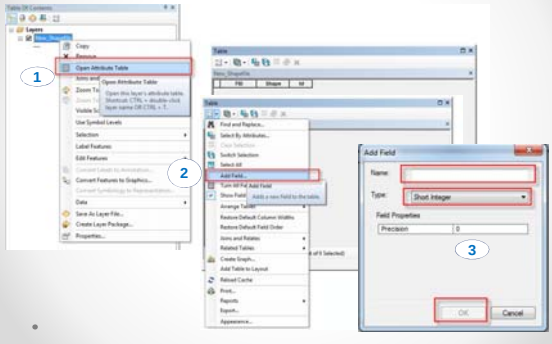
ii. Defining Coordinate System for New Shapefile



- Projected Coordinate System
- UTM
- WGS 1984
- Northern Hemisphere
- WGS 1984 UTM Zone 36N

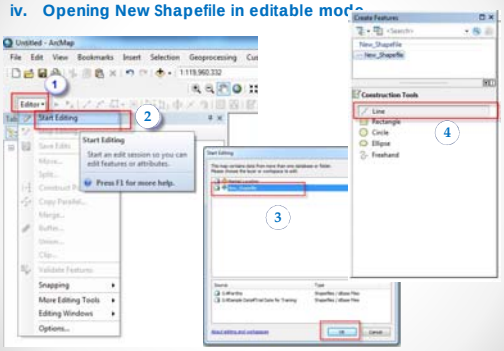
Creating New Features

iii. Adding Fields as you need



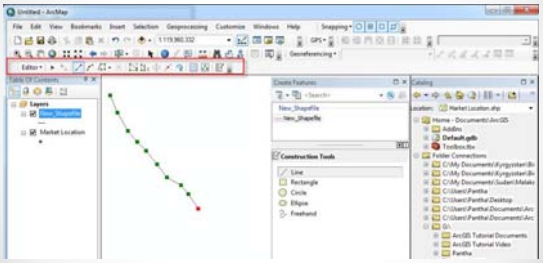
Creating New Features

iv. Opening New Shapefile in editable mod



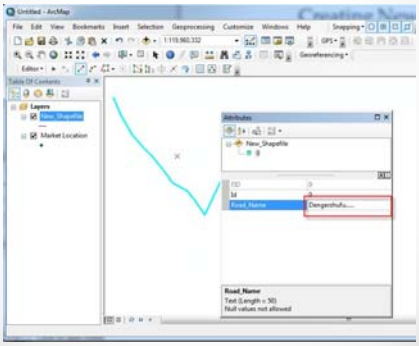
Creating New Features

V & vi. Setting up Environment and Draw Features



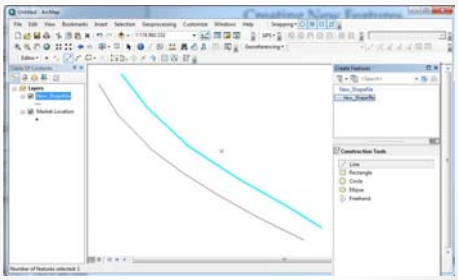
Creating New Features

vii. Inputting Information on newly drawn features



Creating New Features

viii. Saving New Shapefile (after editing)



Georeferencing and Digitization

A. Georeferencing

Georeferencing is a process to define the dataset such as scan image and photographs using known map coordinates and assigns it a coordinate system. This allows for the dataset to be viewed, queried, and analyzed with other geographic data.

Steps:

1. In ArcMap, add the layers residing in map coordinates, then add the raster dataset you want to georeference.
2. To display the Georeferencing toolbar, **click the Customize menu, and click Toolbars > Georeferencing**.
3. In the table of contents, **right-click a target layer (the referenced dataset) and click Zoom to Layer**. It may be helpful to set your Data Frame Properties Extent used by full extent command to your target area, so that the Zoom to Full Extent tool will automatically zoom to the full extent of the target area.

Georeferencing and Digitization

A. Georeferencing Steps (continued):

4. From the Georeferencing toolbar, click the Layer drop-down arrow, and click the raster layer you want to georeference.
5. Click the Georeferencing drop-down menu and click Fit To Display. This displays the raster dataset in the same area as the target layers.
6. Click the Add Control Points tool to add control points.
7. To add a link, click a known location on the raster dataset, and click a known location on the vector layer(s) in map coordinates (the referenced data). You can also add your links in the Magnification window or the Viewer window. If you are using polygons as your referenced layer, you can open the Effect Toolbar to adjust the transparency as you add your links.

Tip: Press ESC to remove a link while you're in the middle of creating it

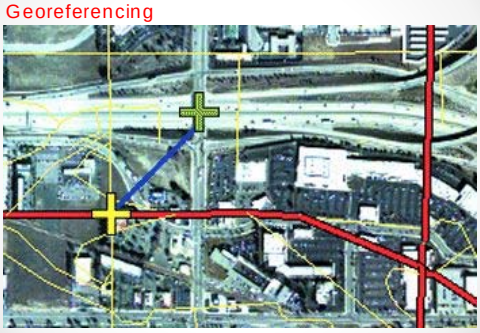
Georeferencing and Digitization

A. Georeferencing, Steps (Continued):

8. Add enough links for the type of transformation you will apply. You need a minimum of 3 links for a first-order polynomial or adjust transformation, 4 links for a projective transformation, 6 links for a second-order polynomial, and 10 links for a third-order polynomial or spline transformation.
9. Click the View Link Table button to evaluate the transformation. You can examine the residual error for each link and the RMS error. If you're satisfied with the registration, you can stop entering links.
10. You can delete an unwanted link from the Link Table dialog box.
11. Click the Georeferencing drop-down menu and click either Update Georeferencing or Rectify. Updating the georeferencing will save the transformation information with the raster and its auxiliary files. Rectifying will create a new file with the georeferencing information.

Georeferencing and Digitization

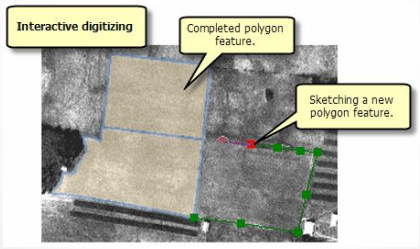
A. Georeferencing



Georeferencing and Digitization

B. Digitation

Digitization is a method to convert the raster data into digital vector data by overwriting on the georeferenced raster data.



Georeferencing and Digitization

Digitization / Create New Features

Basic Steps

i. **Create new shapefile (Point, Polyline, Polygon, ...)**
ii. **Definine Coordinate System for New Shapefile**
iii. **Add Fields in attribute table as you need**
iv. **Opening New Shapefile in editable mode**
v. **Setting Editing Environment**
vi. **Draw Features**
vii. **Inputting Information on newly drawn features**
viii. **Saving New Shapefile (after editing)**

LAO PEOPLE'S DEMOCRATIC REPUBLIC

THE PROJECT TO ENHANCE THE CAPACITY OF VIENTIANE CAPITAL STATE BUS ENTERPRISE

GIS TRAINING REPORT

SEPTEMBER 2014

Prepared by:

Bhoj Raj PANTHA

KATAHIRA & ENGINEERS INTERNATIONAL (KEI)

TABLE OF CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

Japan International Cooperation Agency (hereinafter referred to as "JICA") has been implementing the project to enhance the capacity of Vientiane Capital State Bus Enterprise (hereinafter referred to as "the Project") since December 2011. The main objective of the Project is to improve the public bus services in Vientiane Capital including expansion of coverage of the public bus services in the Capital.

Enhancement of capacity of human resources of Vientiane Capital State Bus Enterprise (hereinafter referred to as "VCSBE") is one of the targeted outputs of the Project for improvement of the public bus services. Different kinds of activities are being implemented to enhance the capacity of VCSBE staff and staff of other concerned organizations such as Department of Transport (hereinafter referred to as "DOT") staff under Ministry of Public Work and Transport (hereinafter referred to as "MPWT"), Traffic Police, Department of Public Work and Transport (hereinafter referred to as "DPWT") staff of Vientiane Capital and other stakeholders such as professors and students of National University of Laos (hereinafter referred to as "NUOL") through workshop, seminar, technical training, etc. GIS training is one of the technical training which was planned for enhancing the capacity of staff of counterpart officials and officials from other concerned organizations for utilizing GIS for planning, operation and management of public transportation (hereinafter referred to as "the Public Bus Services"). The Public Bus Services in Vientiane capital has a long history however there is still need of systematic planning and operation of the Public Bus Services for the efficient, reliable, and informatics public bus services.

1.2 GEOGRAPHIC INFORMATION SYSTEM

A Geographic Information System (hereinafter referred to as "GIS") is a computer-based system which has various capabilities such as creating new data, data management, data storage, data modification, data analysis and data presentation in the form of map and table. GIS is an analytical and mapping software combined with a powerful database of map information. Map information stored in GIS can be visualized in the form of map, table, and chart. The information can also be printed and exported easily. All the information stored in GIS are geographically referenced with defined coordinate system so that each and every object can be located geographically. In the recent days, GIS has been emerging as a powerful tool for planning, analysis and management in the various fields such as infrastructure planning and management, urban and regional planning, landuse management, utility management, water resources, environmental science, agriculture, forestry, disaster management, meteorology, business marketing, health and crime control. The benefits of GIS are generally categorized into five basics categories; (i) better efficiency, (ii) better decision making tool, (iii) better communication using map and table, (iv) better data storage, and (v) data with geographic information.

2 TRAINING IMPLEMENTATION

2.1 TRAINING PROGRAM

In the various surveys and hearings from the public people, it is revealed that the public people are willing to ride the Public Bus Services if the buses are operated with more planned way such as fixed time table, location of bus stops and provision of para-transit from the residential area to the bus stops. Planning of bus stops by using land use, location of public facilities and population distribution is one of the most effective approaches. Since GIS can handle and analyze various geo-spatial data, the ultimate training goal is set to make trainees familiar in using GIS for bus stops planning. The general flowchart of bus stop planning which was used in the training is shown in Appendix-1. It is anticipated that the gained knowledge by the trainees will be disseminated to their co-workers in the future.

Since organization of this kind of GIS training (i.e. focusing in transportation planning) in MPWT is the first time, the basic GIS training plan has been prepared considering the capabilities of trainees in using GIS. The GIS training program is shown in **Table 2.1.1**.

Table 2.1.1 Training Program

		GIS Training	
Name of Training	:	GIS Training (ArcGIS) for Public Bus Service	
Objective	:	▪ To make familiar with **Basic Function of GIS** for analysis and operation of software, and develop M**edium Level** human resources for using GIS for various planning, operation and management purpose (route planning, bus stop planning, accessibility analysis, making various maps for planning, operation and management of public transportation.	
Date	:	September 10, 12, 17 and 19, 2014	
Time	:	9:00 ~ 12:00	
Venue	:	Computer Room, Faculty of Engineering, NUOL	
Training Method	:	Lecture and Practice on the Computers	
Trainer / Instructor	:	Dr. Bhoj Raj Pantha, JICA Project Team	
Targeted Trainee	:	(i) Officials of MPWT ▪ DPWT, Vientiane Capital ▪ Planning and Budget Division, DOT, MPWT ▪ Traffic Management Division, DOT, MPWT ▪ Land Transport Division, DOT, MPWT ▪ Vientiane Capital State Bus Enterprise ▪ Traffic Police, Vientiane Capital (ii) Others (National University of Laos)	
No. of Targeted Trainee	:	Max. Ten (10-15)	
Requirements	:	1. Basic computer operational knowledge 2. Hardware and Software: **Hardware**: Computers with Microsoft Windows environment **Software**: ArcGIS 10.X Version (Commercial or Trial Version) 3. Trainees shall affiliate in Transportation / road related division	
Training Items (Tentative)		1st	1. Overview of GIS
			2. ArcGIS Basics

** Training items are subject to revise considering the performance level of trainees		course	3. Understanding GIS Data
			4. Coordinate Systems
			5. Working with Arc Map
		2nd course	6. Creating New Features, Digitization and Managing Map Layers
			7. Using Coordinate Systems
			8. Symbolizing, Layout, Labeling
			9. Data and Map Exporting and Printing
		3rd course	10. Data Conversion to/from GIS (Google Earth, AutoCAD,…)
			11. Importing GPS Data
			12. Geo-database
			13. Editing GIS Data
			14. Projection and Transformation of GIS Data
		4th course	15. Performing Simple Analysis (using Geoprocessing Tools)
			16. Preparing Base Map
			17. Preparing Bus Route Map, Bus Stop
			18. Working with Multiple Data Frames
Expected Output	:	Familiarization with GIS software, basic tools & functions, simple map creation, map saving & printing, simple analysis (Bus Stop Spacing), etc.	

2.2 PARTICIPANTS (TRAINEES) OF THE TRAINING

JICA Project Team has requested to targeted organization to nominate the trainees who fulfilled the requirement of trainees as indicated in the training program. The trainees of GIS training are shown in **Table 2.2.1**. The number of participants from the NUOL is relatively large because the limit of maximum number was not set for NUOL since the training was conducted by using NUOL training facilities in free of cost. Both professors and students from NUOL were joined the training.

Table 2.2.1 Trainees of GIS Training

SN	Name	Organization	Departmnet	Position
1	Mr. Khamsavang THEPPHOMMACHANH	VCSBE	Division of Planning and Budgeting	Officer
2	Mr. Thanongsy DETVONGSONE	VCSBE	City Bus Section	Chief
3	Mr. Somsanith HOUATHONGKHAM	DPWT	Traffic Management Department	Officer
4	Mr. Phimpho ZAMOUNTY	NUOL	Faculty of Engineering	Student
5	Mr. Khayphavanh OUDOMSACK	VCSBE	IT Section	IT Expert
6	Mr. Khamphone LUANGDY	Traffic Police	Vientiane Capital	Chief
7	Mr. Sisouphanh PHOMMANIVONG	NUOL	Faculty of Engineering	Lecturer
8	Mr. Phongsavanh INTHAVONG	NUOL	Transport	Lecturer
9	Mr. Baengchan PHOUMMECHAN	DPWT	Transport	Officer
10	Mr. Vannalate NORKEO	DPWT	Transport	Officer
11	Mr. Saythavone SIHANATH	DPWT	Transport	Officer
12	Mr. Poutthasay SIRISACK	DOT	Division of Planning and Budgeting	Technical officer
13	Mr. Vannitha KIMANIVONG	DPWT	Transport	Officer
14	Mr. Vernsone PHENGSOULITH	NUOL	Faculty of Engineering	Instructor
15	Mr. Khametin SUPHUNSY	NUOL	Faculty of Engineering	Student
16	Mr. Thongthep KEOSILA	NUOL	Faculty of Engineering	Student
17	Mr. Dethmany OANSOUVANH	DOT	Transport	Staff

2.3 MATERIALS AND METHODS OF THE TRAINING

2.3.1 Training Materials

Trial version of ArcGIS 10.2 which is fully functional for 60 days were downloaded from ESRI website and installed in twelve (12) desktop computers of NUOL computer room and three (3) laptop computers of the trainees for the purpose of the GIS training. Since most of the trainees have attended the GIS training first time, training materials were prepared covering from overview of GIS to simple analysis in GIS. Therefore, the training materials contain from very general to very specific information related to GIS. Presentation handouts particularly prepared for this GIS training, GIS User Manuals (in PDF), explanatory notes of some contents, etc. were provided to each trainee. The following training materials were used in the training;

- ArcGIS Software (trial version)
- Handouts prepared specifically for this GIS training
- Software user manual
- Explanatory notes (flowchart for analysis)
- Sample data for practicing in GIS

Furthermore, ArcGIS has "ArcGIS Desktop Help" within the installed GIS software and it is accessible even without the internet connection. ArcGIS Desk Help was also used when more detailed explanations were necessary.

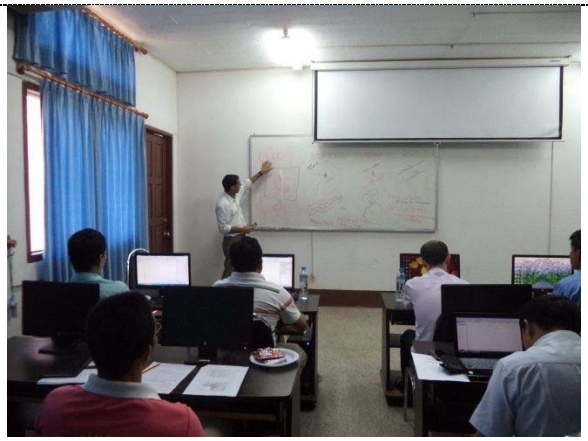
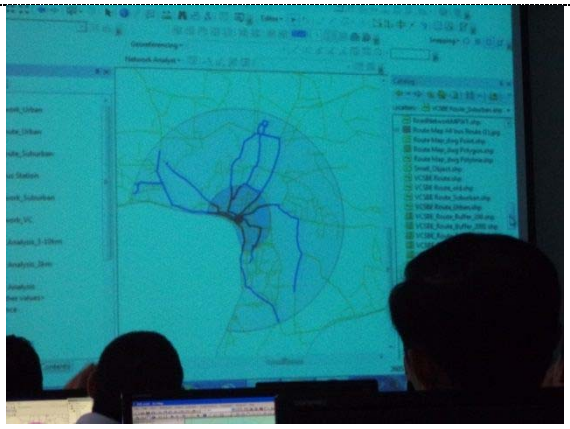
2.3.2 Training Method

The training was conducted from 9:00 to 12:00 on September 10, 12, 17 and 19, 2014. Trainees were taught by classroom type of lecture / presentation delivered by the trainer by using projector and whiteboard. After each lecture or explanation, trainees were practiced same topics on the computers using installed GIS software. The trainer showed the demonstration of each procedure of training item on the projector screen and trainees followed the same steps. Furthermore, trainer has guided the trainees to perform the work in GIS directly on their computer by visiting each trainee's desk.

As for the evaluation of effectiveness of the training, pre-training and post-training evaluations were conducted at the beginning of the training course (i.e. on 10 September, 2014) and at the end of the training course (i.e. on 19 September, 2014) respectively. Some of the training activities are shown in the below photographs.

Table 2.3.1 Glimpses of GIS Training Implementation

	
Opening of GIS Training Course by Team Leader	Encouraging Words to the Trainees by Team Leader
	
Lecturing	Assisting to Trainees

	
Concentrating on Lecture of Trainer	Demonstrating Bus Stop Planning Procedure
	
Explaining Geoprocessing Tools	Displaying the Output of the Analysis

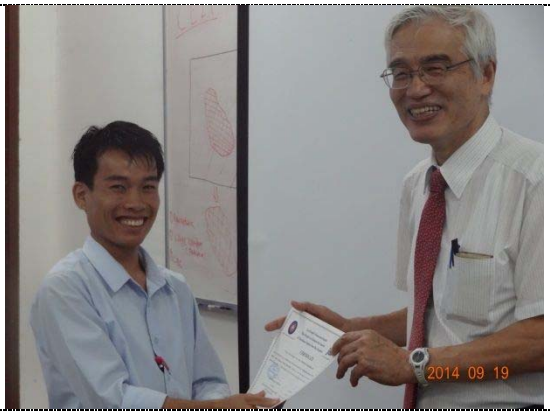
2.4 OUTCOMES OF THE TRAINING

2.4.1 Overall Evaluation

The contents of the GIS training courses have covered from beginner's level to medium level. Based on the observation of skills of the trainees on the last day of the training, it is understood that trainees knows about operating basic functions of GIS. However, to be master in GIS, continuous practice is needed. Also, GIS exercises have done by using the real data for solving relevant problem of transportation in the Vientiane Capital. Therefore, it is believed that trainees can use GIS for their regular office work in planning and management of transportation related work.

2.4.2 Certificate Award

After completing the GIS training course successfully, trainees were awarded by training certificate. The JICA Project team leader has awarded the certificate to the trainees.

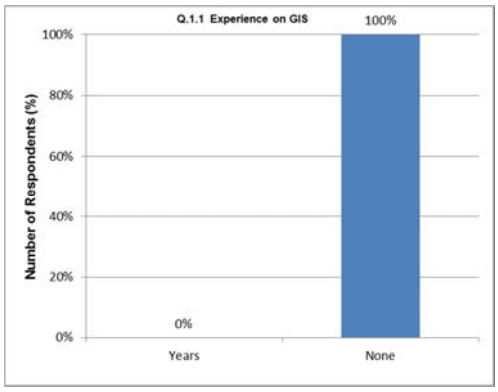
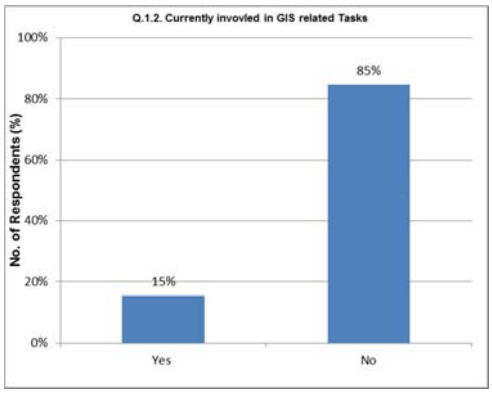
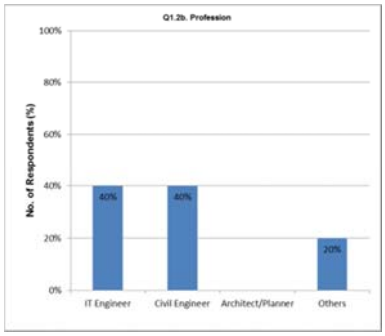
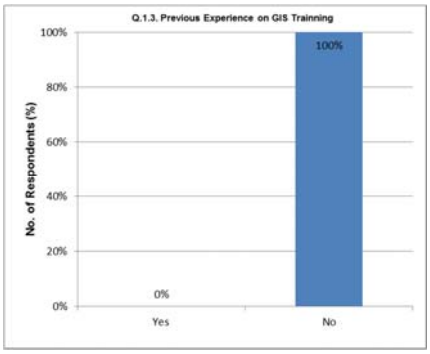
	
Awarding Certificate by Project Team Leader	Cheerful Moment after the Hardworking

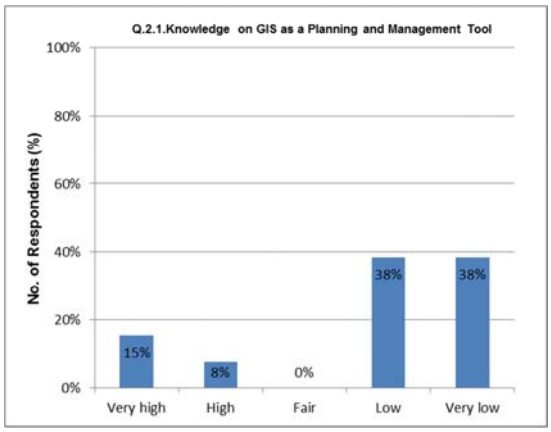
2.4.3 Self-Evaluation of Trainees

Questionnaire surveys were conducted at the beginning and end of the training. Trainees were evaluated by themselves before and after the training by conducting questionnaire survey.

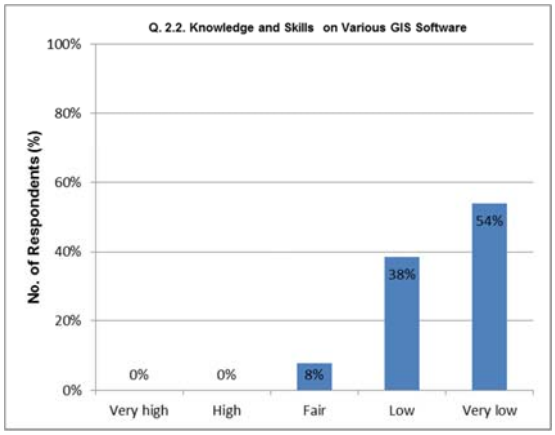
(1) Pre-Training Evaluation

Pre-training evaluation survey was conducted by asking sixteen (16) questions. The pre-training questionnaire survey results are summarized in **Figure 2.4.1**. The result of questionnaire survey reveals that only few trainees know about GIS and its capabilities in planning, analysis and management of various geospatial data before the training. Also, the survey result reveals that trainees have never attended GIS training in the past.

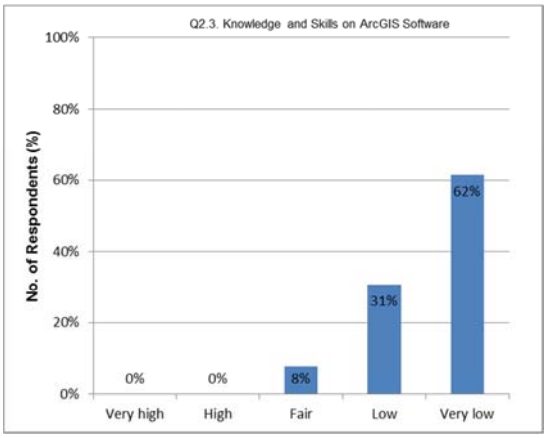
	
Q.1.1 Experience on GIS	Q.1.2 Are you currently assigned tasks related to GIS?
	
Q.1.2 Profession of the Trainees	Q.1.3 Attended GIS training courses in the past?



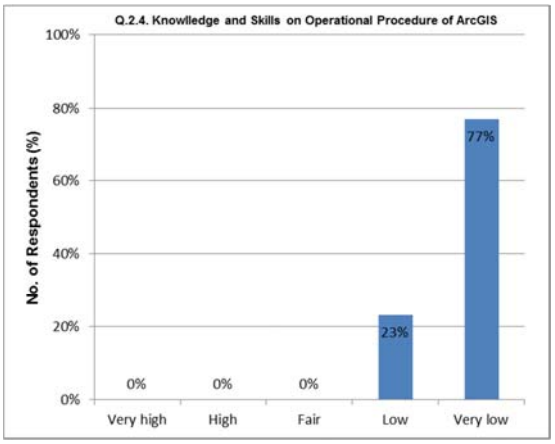
Q.2.1 Knowledge on GIS as a Planning & Management Tool



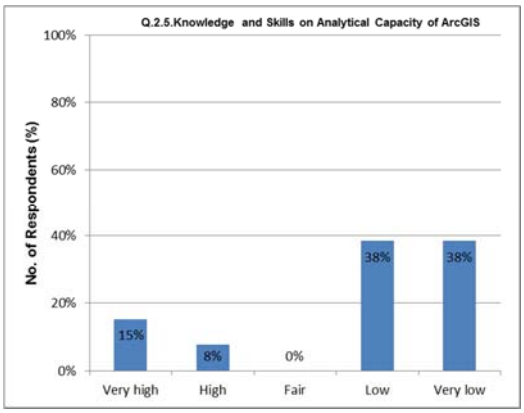
Q. 2.2 Knowledge and Skills on Various GIS Software



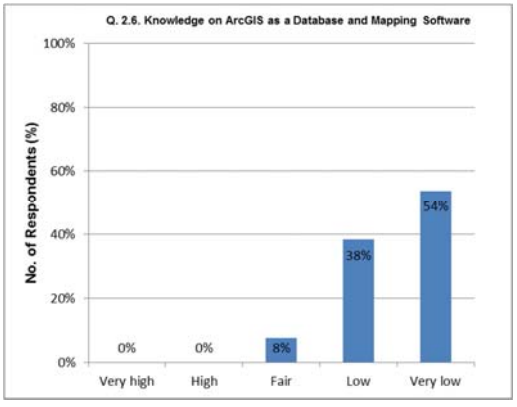
Q. 2.3 Knowledge and Skills on ArcGIS Software



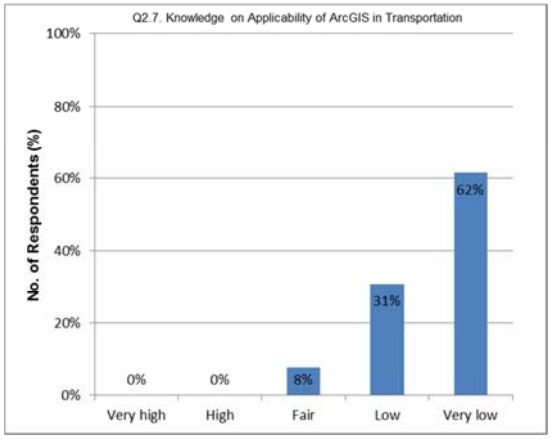
Q. 2.4 Knowledge and Skills on Operational Procedure of ArcGIS



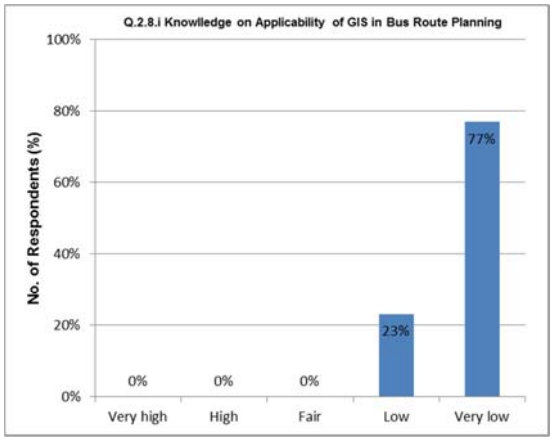
Q. 2.5 Knowledge and Skills on Analytical Capacity of ArcGIS



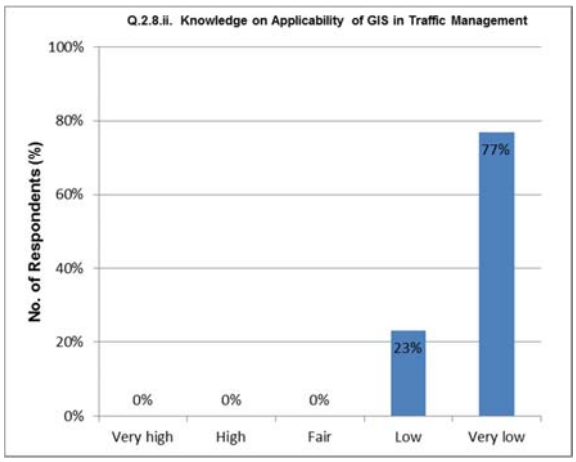
Q. 2.6 Knowledge on ArcGIS as a Database and Mapping Software



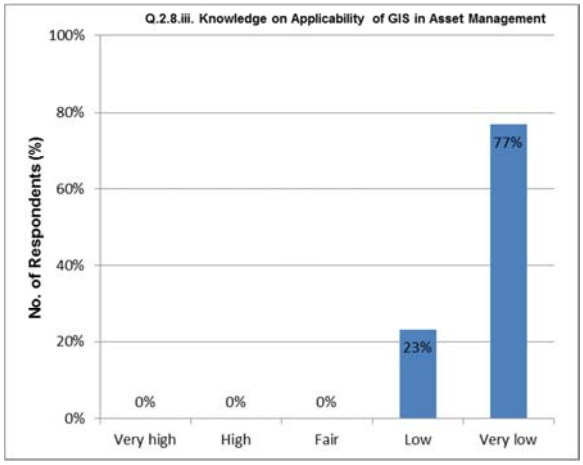
Q. 2.7 Knowledge on Applicability of ArcGIS in Transportation



Q. 2.8.i Knowledge on Applicability of GIS in Bus Route Planning



Q. 2.8.ii Knowledge on Applicability of GIS in Traffic Management

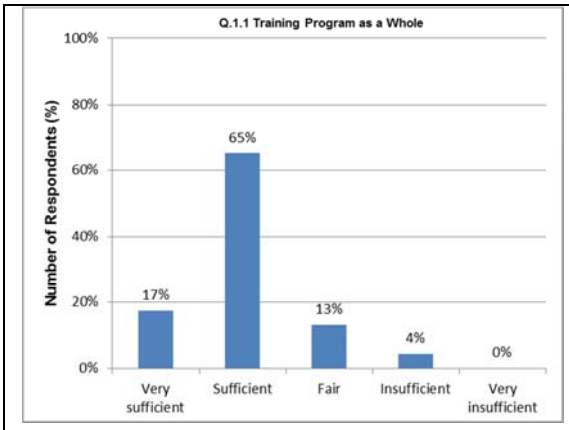


Q. 2.8.iii Knowledge on Applicability of GIS in Asset Management

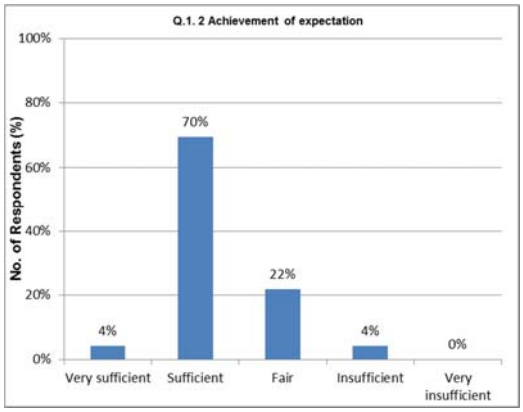
Figure 2.4.1 Results of Pre-Training Evaluation

(2) Post-Training Evaluation

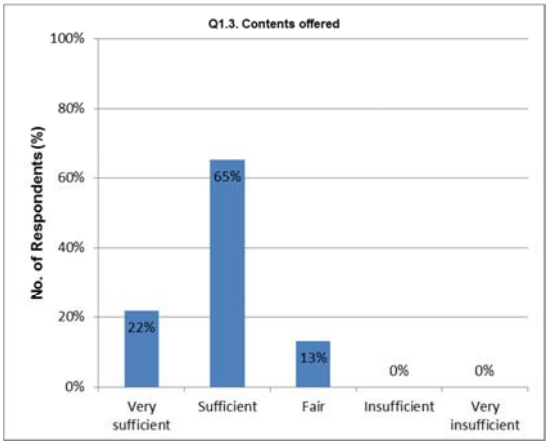
The results of post-training evaluation survey are summarized in **Figure 2.4.2**. The result of the questionnaire survey reveals that trainees are satisfied (>70% of the trainees) with the training program, achievement of the training, training course, duration of course, contents of the training and training method. Upon completion of the training courses, the trainees have improved their knowledge and skills on GIS significantly which can be compared from the results of pre-training and post-training evaluations. Another interesting finding of the questionnaire survey is the increase of number of responses as "applicable / related to the assigned task" of the question about "the task currently assigned and applicability of GIS" after the training; which implies that the trainees understood the capability of GIS after the training and believed that they can use GIS for their office work. Also, all trainees are willing to participate similar training either as follow-up training or next-level of this training.



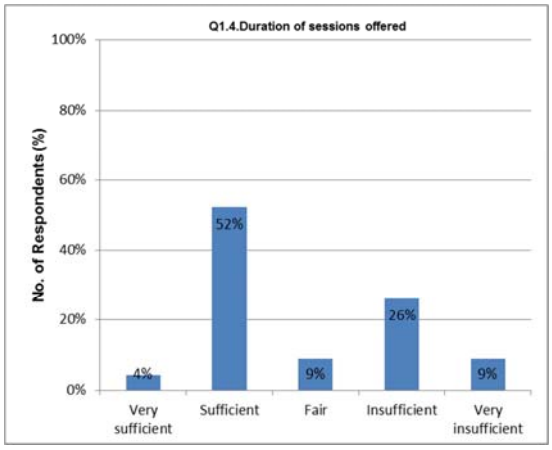
Q.1.1 Training Program as a Whole



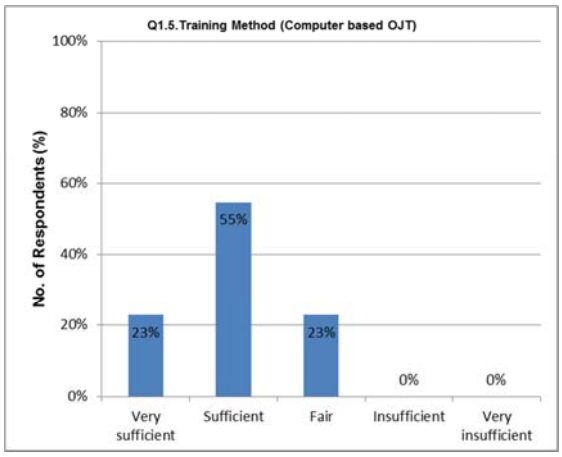
Q.1.2 Expectation Achievement



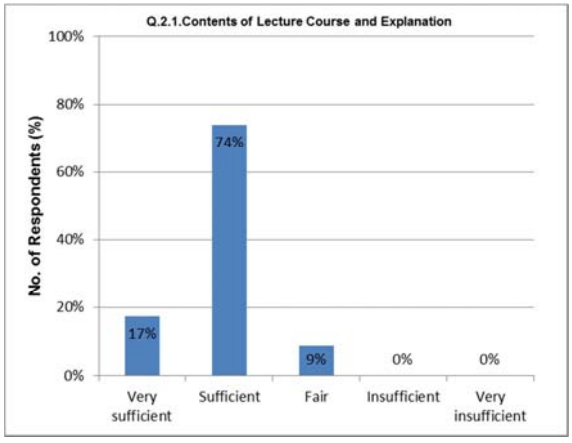
Q.1.3 Contents Offered



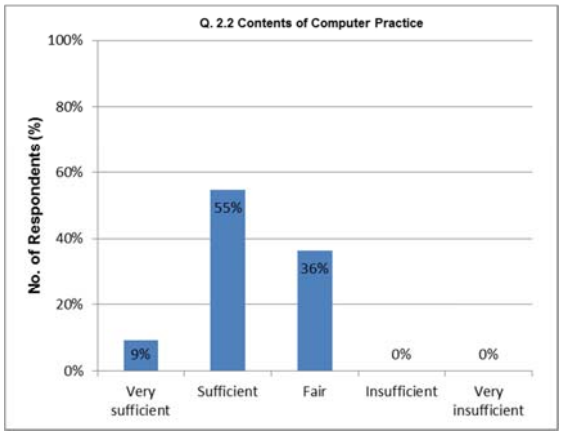
Q.1.4 Duration of Training Course Offered



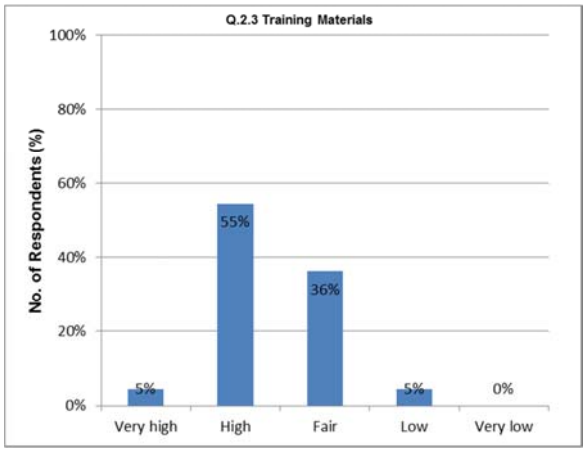
Q.1.5 Training Method



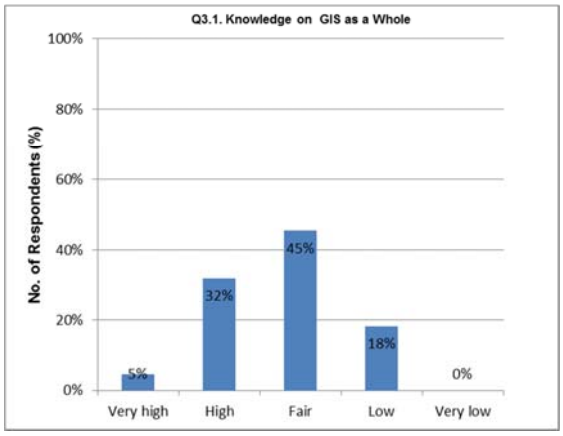
Q.2.1 Lecture Course and Explanation



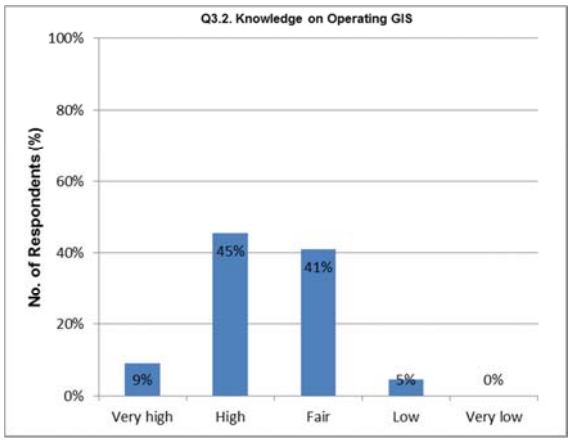
Q.2.2 Practicing on Computer



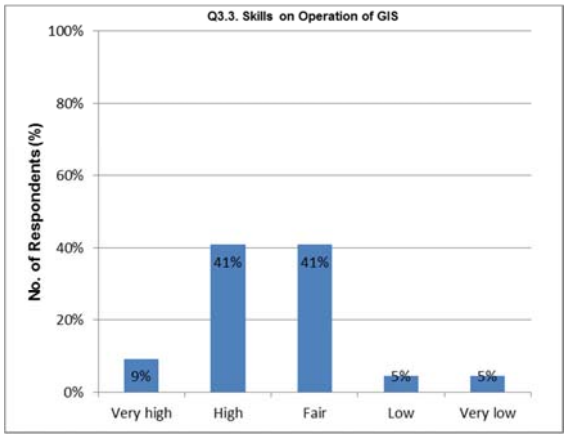
Q.2.3 Training Materials (Handouts, Manual, etc.)



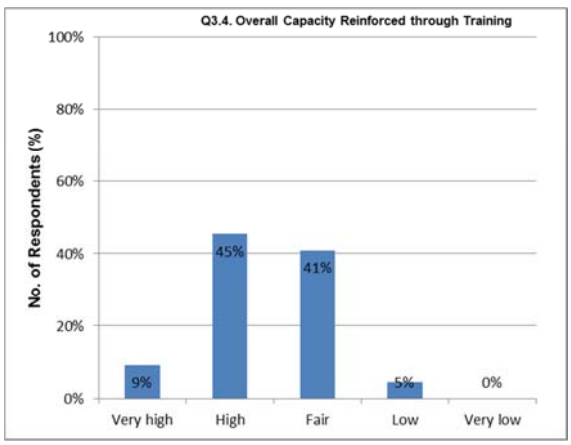
Q.3.1 Knowledge on GIS



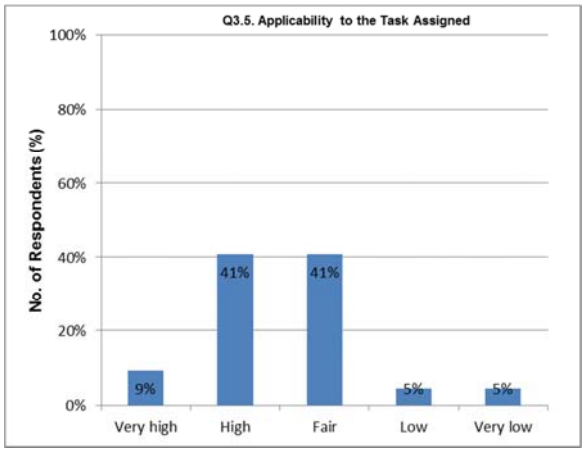
Q.3.2 Knowledge on Operation GIS



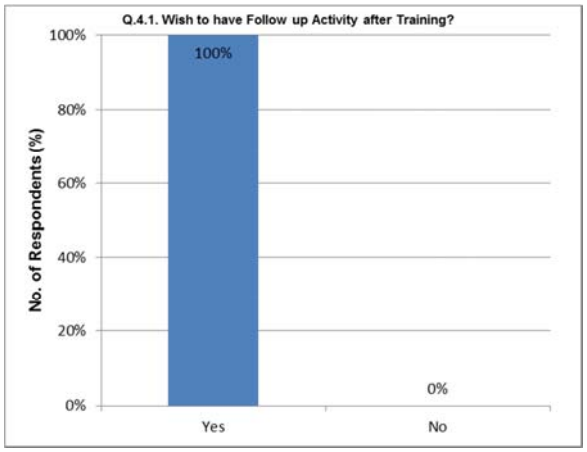
Q.3.3 Skills on Operation of GIS



Q.3.4. Overall Capacity Reinforced through Training



Q.3.5 Applicability to Tasks Assigned



Q.4.1 Follow Up Activity after Training

Figure 2.4.2 Results of Post-Training Evaluation

3 CONCLUSIONS AND RECOMMENDATIONS

Based on the observation during and after the implementation of GIS training the following conclusions and recommendations were made.

(i) The knowledge and skills of the trainees have been improved significantly.

(ii) The working speed of trainees during computer practice is relatively high.

(iii) Trainees are very much enthusiastic and motivated in learning GIS.

(iv) Continuous practice is required for further development of GIS knowledge. Therefore, it is highly recommended to keep on practicing the GIS software.

(v) As 100% of respondents are willing to attend follow-up training in the future, it is highly recommended to provide such training to them to foster their motivation and enthusiasm of GIS learning.

Appendix-1

General Flowchart of Deciding Bus Stop Spacing Planning

Steps	Activities	Data Required	Deliverable
I Defininining Urban and Suburban Area	Land Use Plan of Vientiane (2009); Population Density Map; Spatial Distribution of Urban Development → 1. Check the Adequacy of Information 2. Degree of Precision → Population Density Map and Spatial Distribution of Urban Development → Urban Area : within 3 km from CBS Sub-urban Area : Beyond 3 km	1. Landuse (2009) 2. Satellite Imagery or Google Earth or Base Maps	Urban Area: with 3km Suburban : beyond 3 km
II Defining Coverage Area	Distance from the Route Centerline (Left & Right): 200 m; 300 m; 400 m; 500 m → 1. Walking Distance 2. Spatial Distribution of Residential, Public & Commercial Area 3. Alternate Public Transport Route → Distance from Road (Route) Centerline: 500 m	1. Road (Route) Network 2. Satellite Imagery or Google Earth or Base Maps	Coverage Area: 500 m in either side along the route
III Defining Bus Stop Spacing	Bus Stop Spacing: 200 m; 300 m; 400 m; 500 m; 600 m; 700 m; 800 m → 1. Walking Distance 2. Spatial Distribution of Residential, Public & Commercial Area 3. Alternate Public Transport Route 4. No. of Potential Passengers per Stop → Bus Stop Spacing: Urban Area: 500 m Suburban Area : 750 m	1. Road (Route) Network 2. Satellite Imagery / Google Earth / Base Map 3. Population (density) by Village 4. Coverage Area	1. Location of Bus Stops (500 m and 750 m) 2. Population Coverage by Bus Service by Bus Stop and in Total