3RD ATRANS Symposium
STUDENT CHAPTER SESSION

TRAFFIC SCENARIO ANALYSIS: A CASE STUDY IN PHUENTSHOLING CITY

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Overview

- Introduction
- Methodology
- Traffic Scenario in Phuentsholing city
- Short term plan of action
- Long term perspective plan for traffic and transportation
- Conclusion
- References

Introduction

- The transport sector has witnessed remarkable growth in the last forty six years since Bhutan launched its first five-year development plan
- With globalization and rapid socio-economic development, the need for an efficient transportation system and facilities has also gained significance
- However, many towns in Bhutan have been built without proper planning of road networks

Cont....

- Since Phuentsholing is one of the most economically vibrant city in the country, the vehicular traffic has increased drastically over the years
- But the transport facilities within the city has not kept pace with the increasing number of vehicle population in the city
- Such shortcomings has led to acute shortage of traffic facilities like parking spaces and other problems like traffic congestions on a regular basis

Cont….

- Further, a study on the traffic scenario in Phuentsholing city has never been carried out because of which planners are left with inadequate information about the traffic demand and trends of the city
- The paper has been directed towards an in-depth study of the traffic scenario of Phuentsholing city with an aim to formulate appropriate recommendations to improve the traffic situation in the city

Location and background of study area

- The transportation need associated with Phuentsholing is concentrated within the city's core area
- The study area comprises important commercial, residential and office colonies of Phuentsholing city

Station 1

Station 2

Station 3

Methodology

1. Methods for collection of traffic (O-D) data
2. Methods of presentation of O-D data

Methods of Collecting O-D data

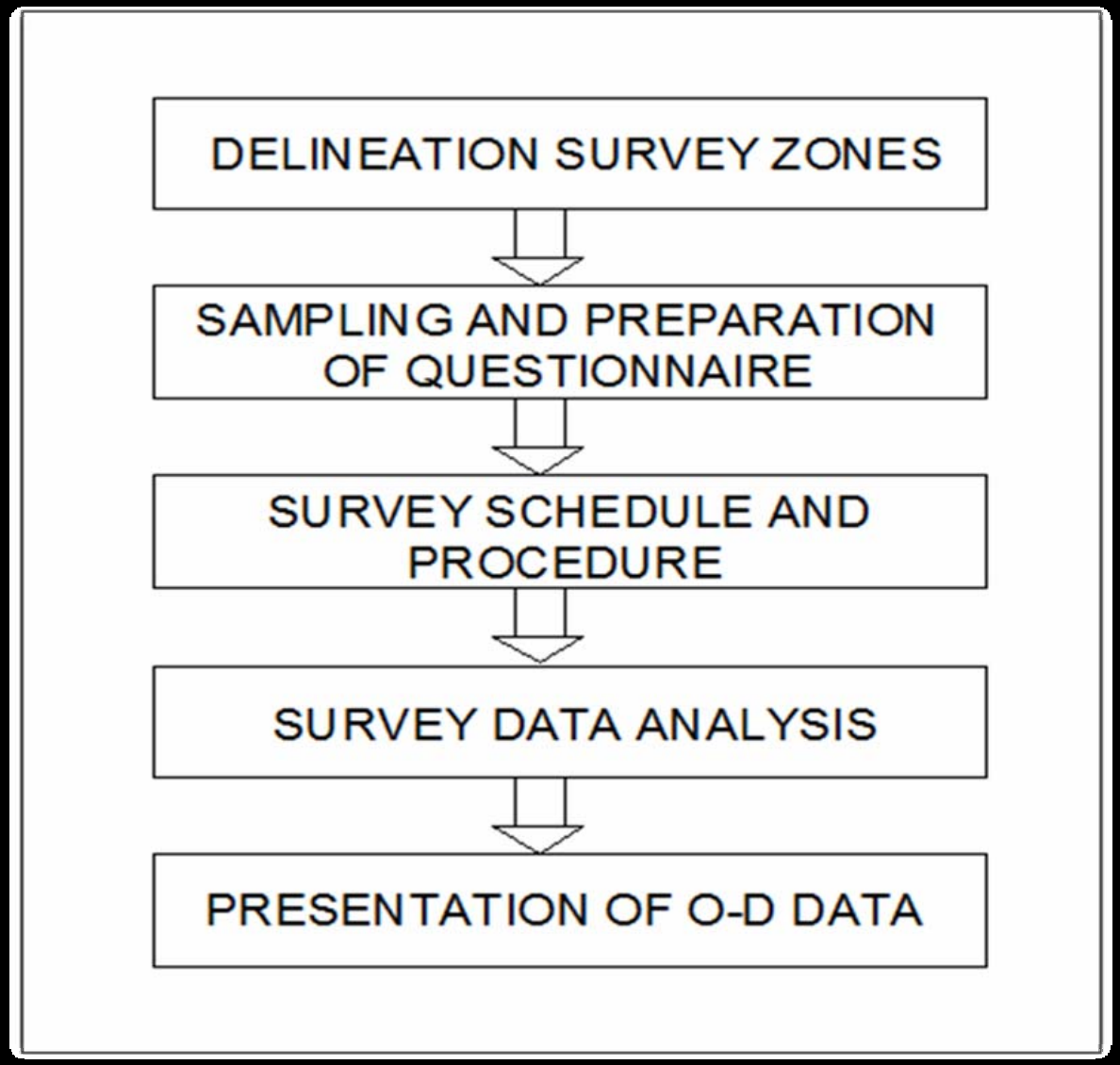
1. License plate method
2. Return post card method
3. Home interview method
4. Road side interview method

This study used road side interview method for the collection of data

Methods of Presentation of O-D data

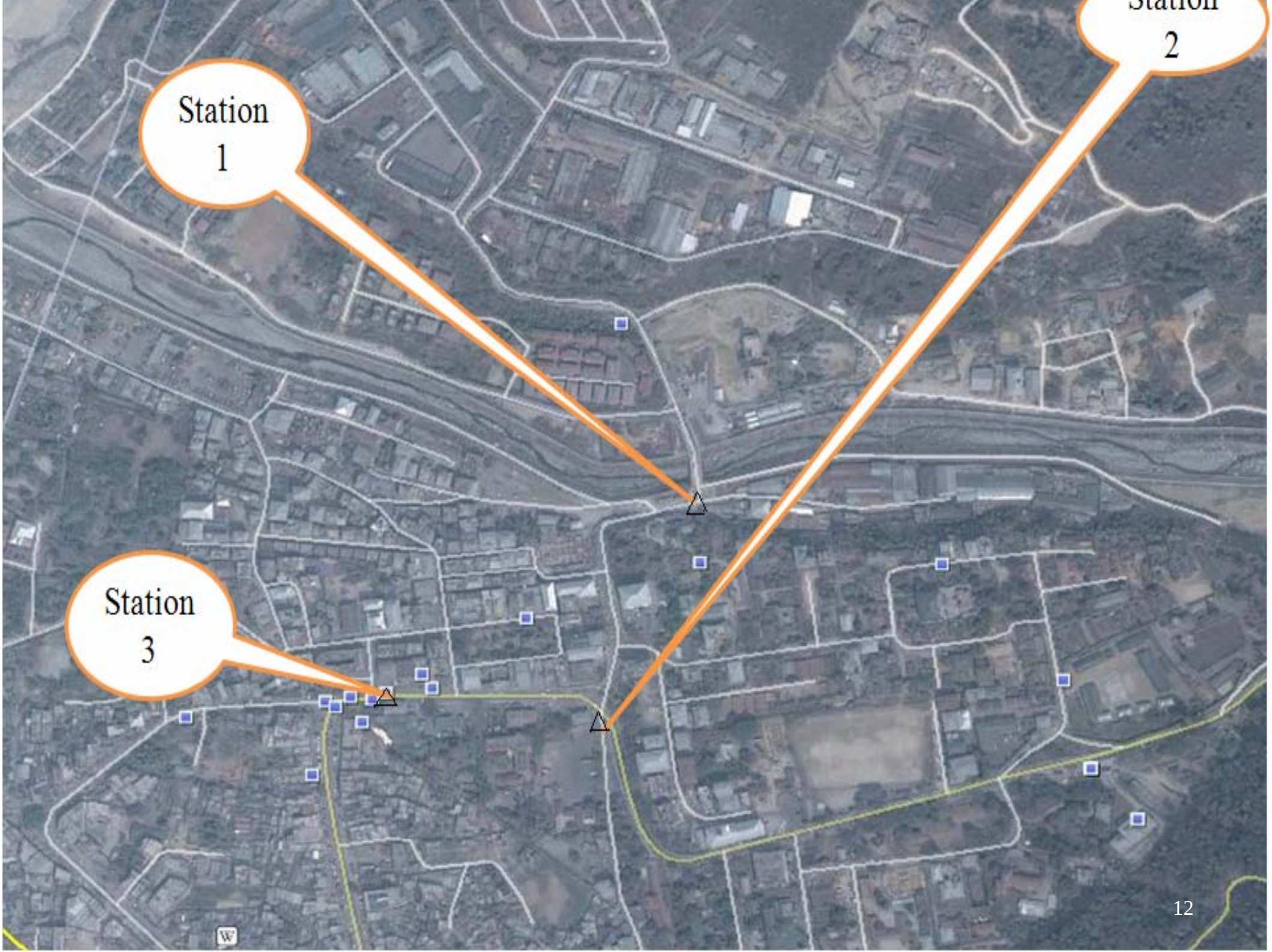
1. O-D matrix
2. Pictorial representation
3. Graphical representation
   (bar graph and pie chart)

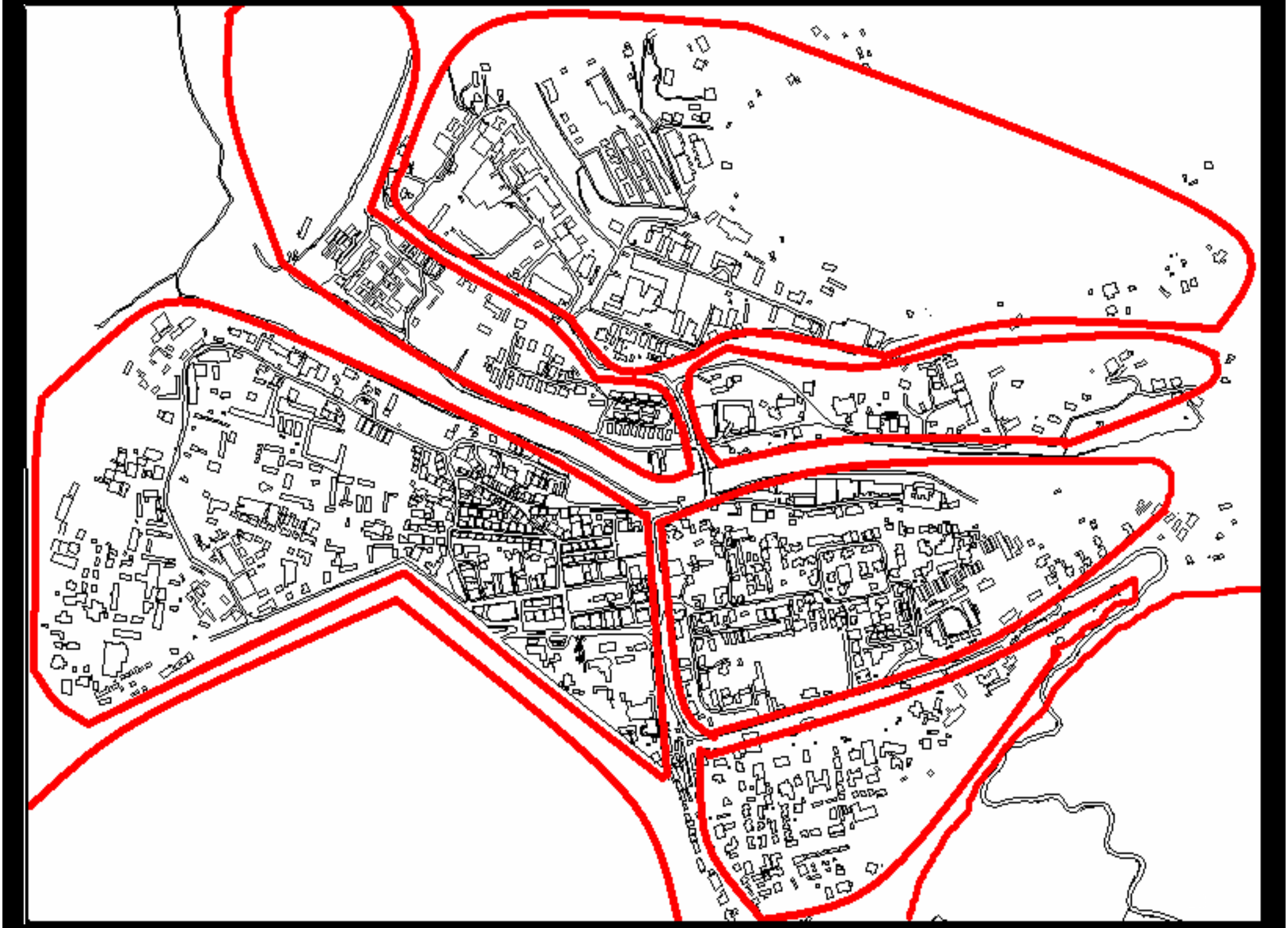
Transportation Demand survey method for Phuentsholing



Delineation of Survey zones

- The study area has been divided into eight zones in order to simplify the origin-destination survey
- The zone system was based on a number of considerations such as geographic location, compatibility with the traffic zones and operational network currently used in Phuentsholing


Station
1
Station
2
Station
3



Sampling plan and preparation of Questionnaire

An accuracy of 1 in 5 is attempted for this study

The format of the survey questionnaire was designed for collecting the following traffic information:

- Form identifiers: date, location, time, and surveyor initials
- Vehicle type: two wheeler(Motor cycle, Scooter), light vehicle(van, jeeps, cars, taxis), medium vehicle (coaster bus, DCM), heavy vehicle (trucks, bus, trailers, heavy machines)
- Journey information: trip start and end locations (i.e. origin and destination), trip purpose activity, and travel direction.
- Type of weather
- Vehicle occupancy including driver plus passengers
- Vehicle Registration number

APPENDIX B

ORIGIN - DESTINATION SURVEY

DATE: DAY: STATION: NAME OF THE INTERVIEWER: Sheet no:

SL No	Weather	Time	Vehicle Type	Passenger no.	Origin	Destination	Route followed	Trip purpose	Remarks
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									

Survey schedule and procedure

- The survey was conducted at the designated location on 25th September 2010 (Friday) from 7:30 am to 5:30 pm at the three cordon stations with three surveyors and a traffic police at each station
- The sites were configured to allow for multiple interviews to be conducted simultaneously at the stations in a queue instead of side parking
- The survey data collection resulted in 6,749 valid surveys

Data collecting by O-D surveyors

Survey data analysis

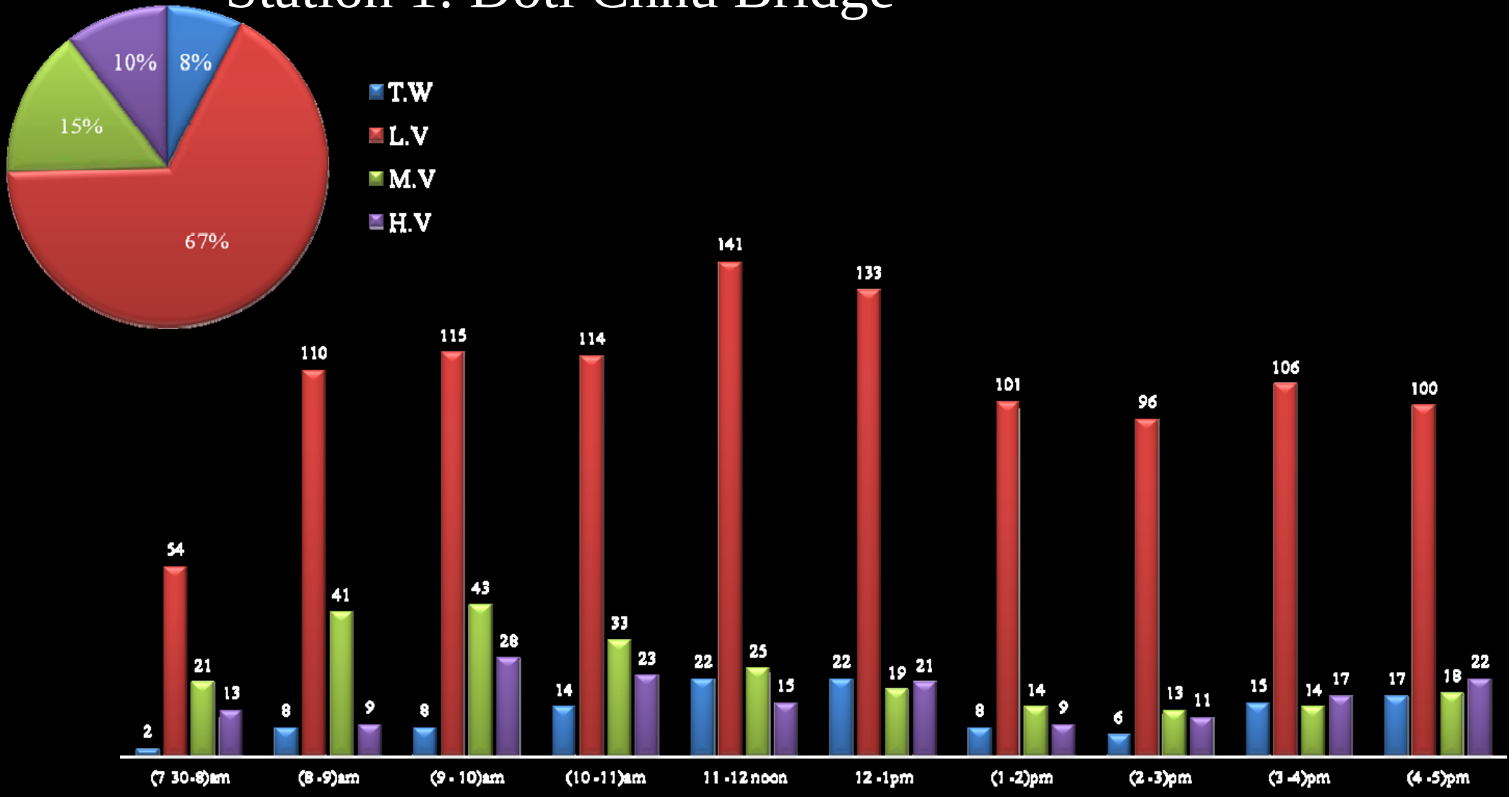
- The resulting O-D data includes all external to external trips, and all external to internal trips for the study area.
- Analysis techniques in this study include general manual count of the data and detailed investigation of the data
- The analysis provides detailed information about the travel behavior characteristics of the city

Presentation of O-D data

1. Mode of transport
2. Trip purpose
3. O-D matrix
   - ❖ Route Assignment (Desire lines)
4. Combined analysis of O-D data from the three stations

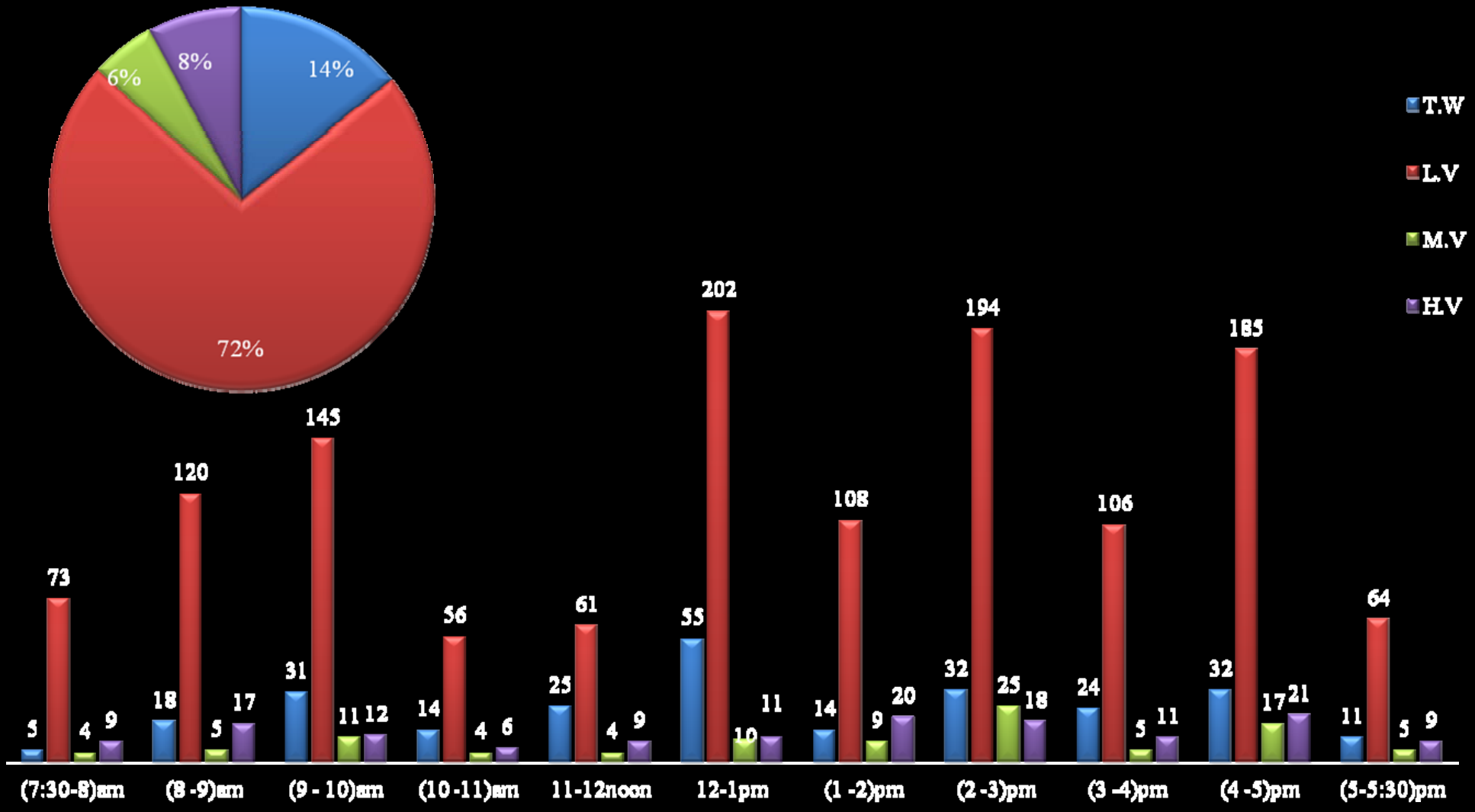
1. Mode of transport

- Station 1: Doti Chhu Bridge



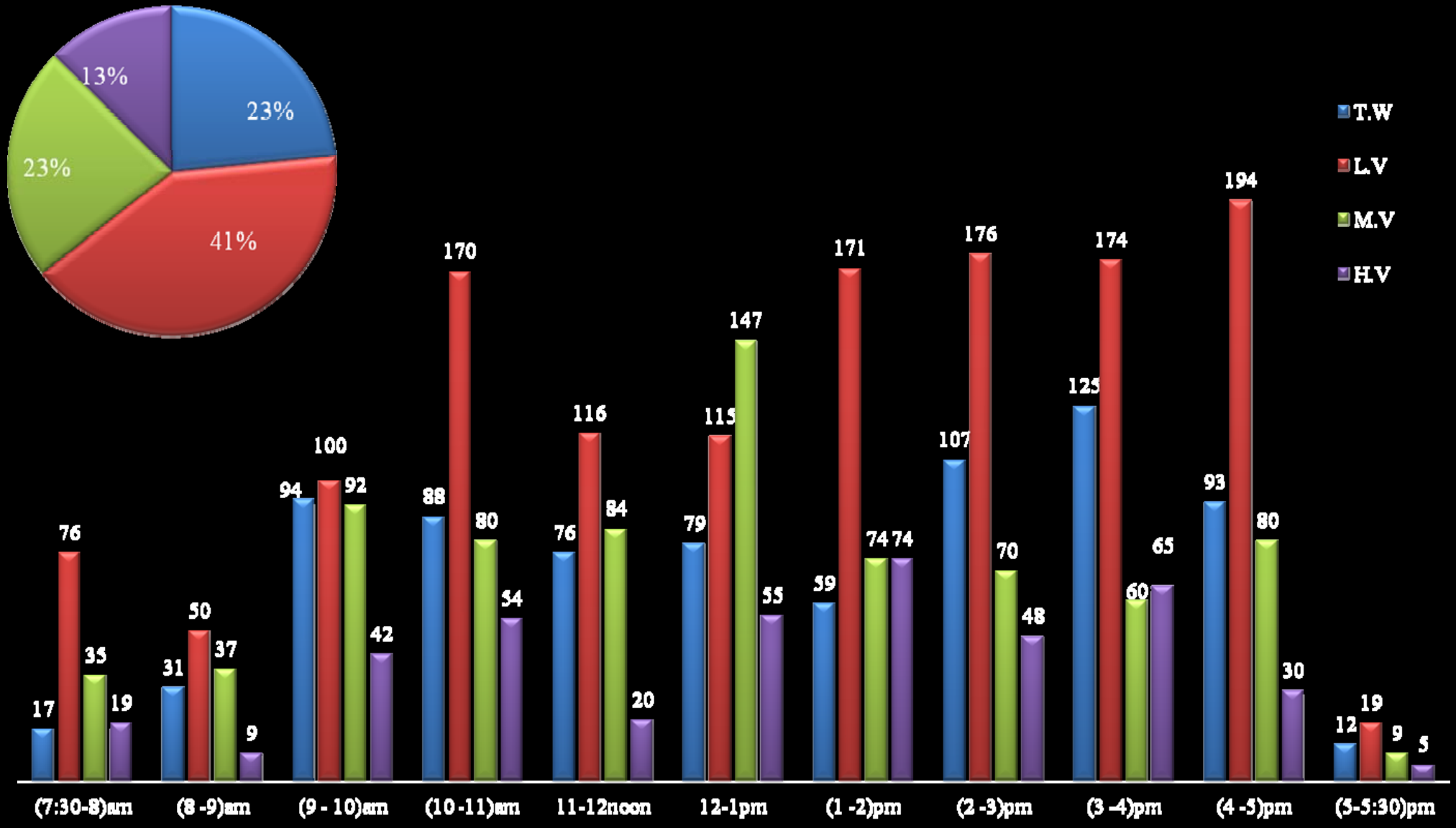
Peak hour – 11am to 12 noon

Station 2 : Phuentsholing City Round about



Peak hour – 12 noon –1 pm

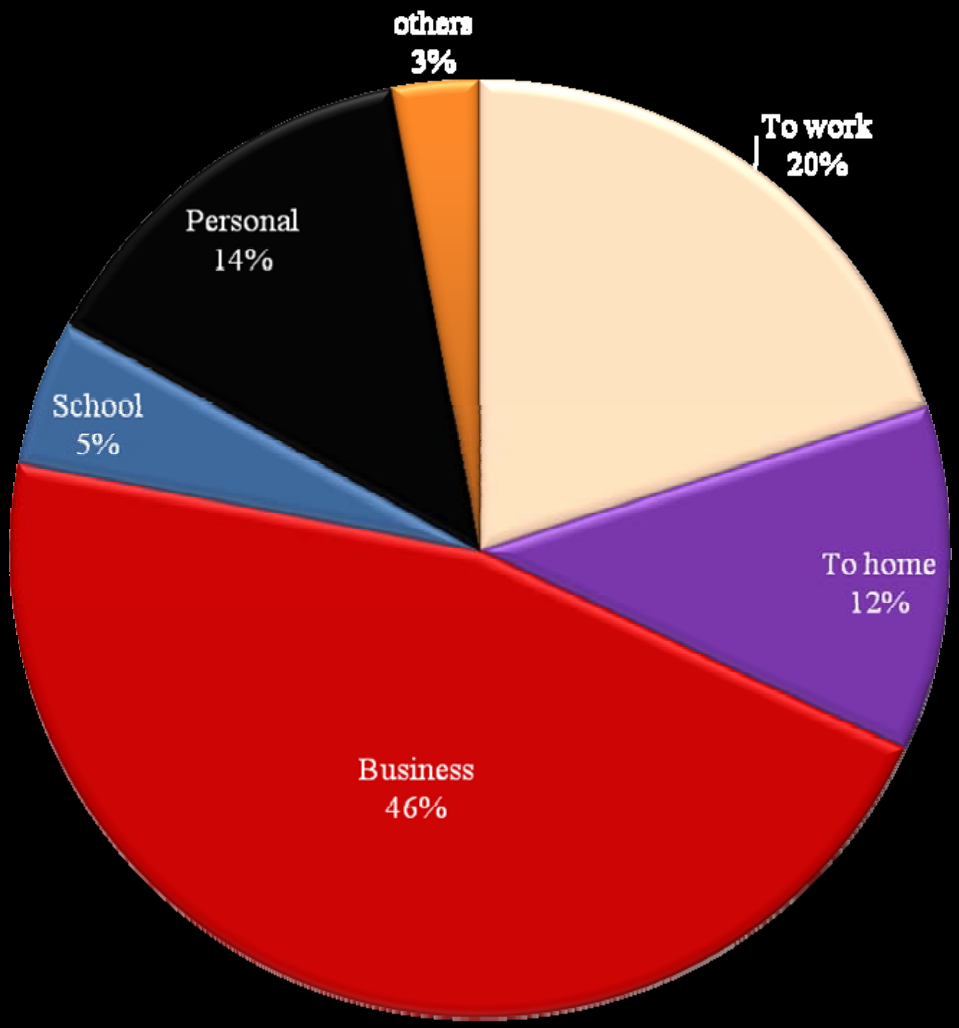
Station 3 : Bhutan Gate



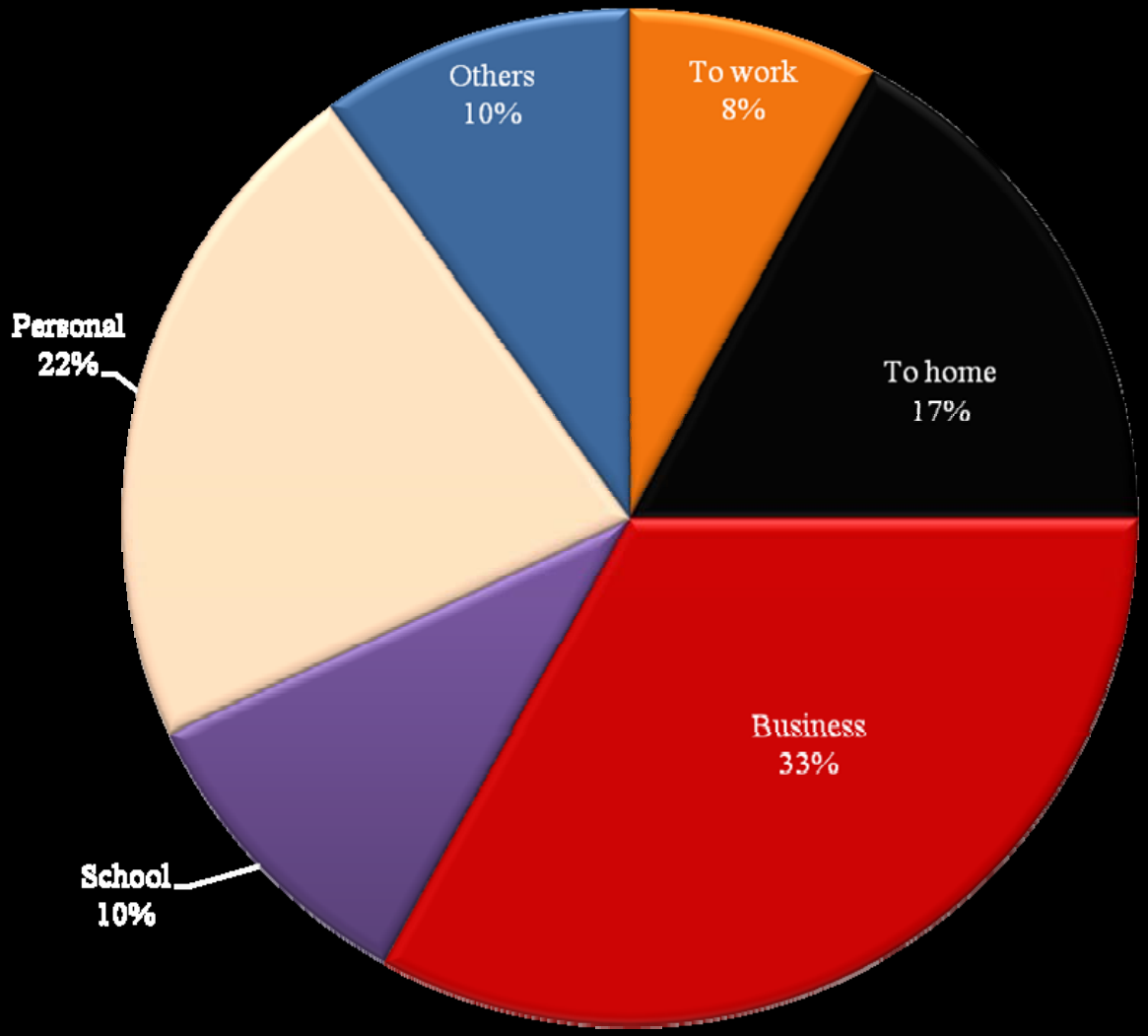
Peak hour – 3 pm–4 pm

Trip Purpose

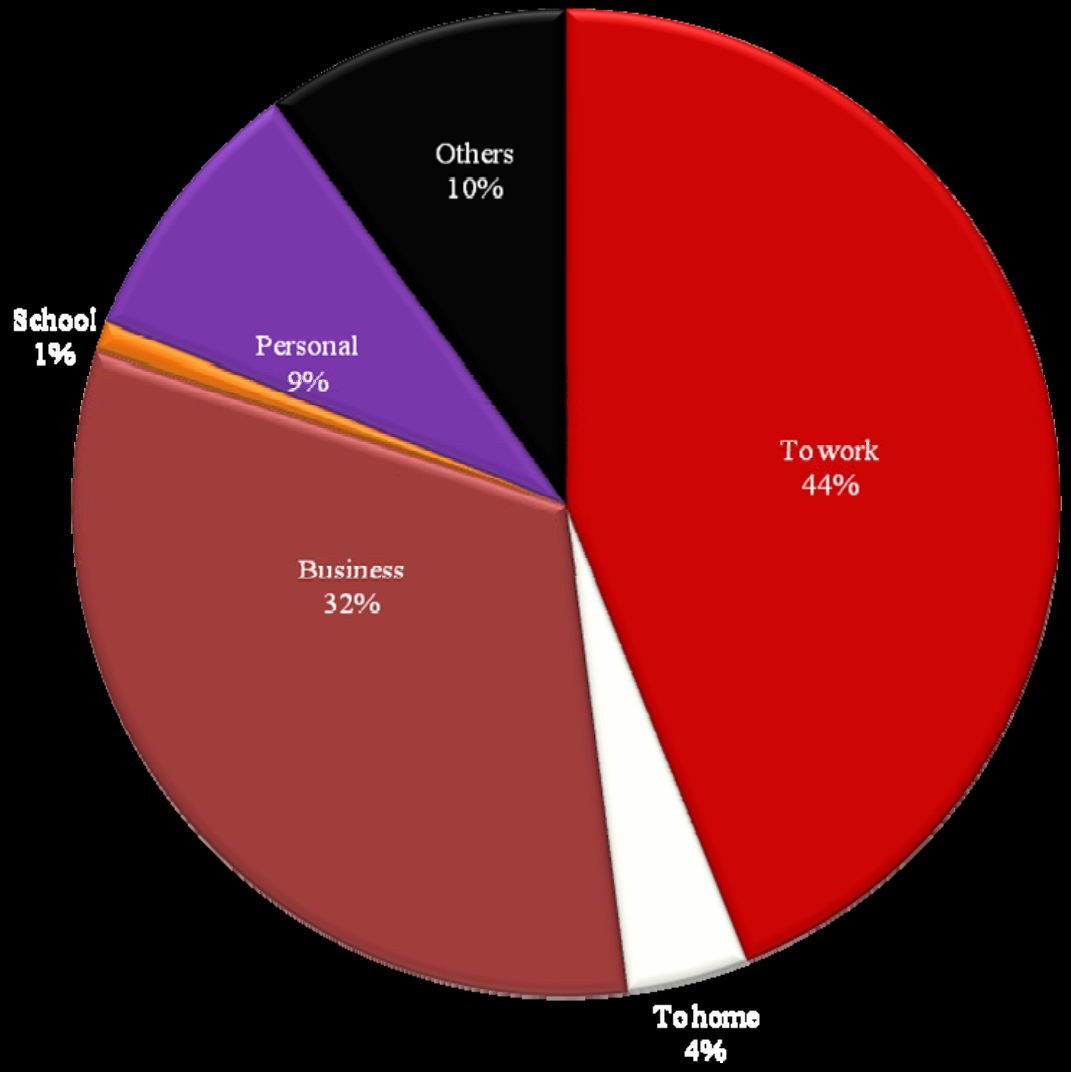
- Station 1 : Doti Chhu Bridge



Station 2 : Phuentsholing City Round about



Station 3 : Bhutan Gate



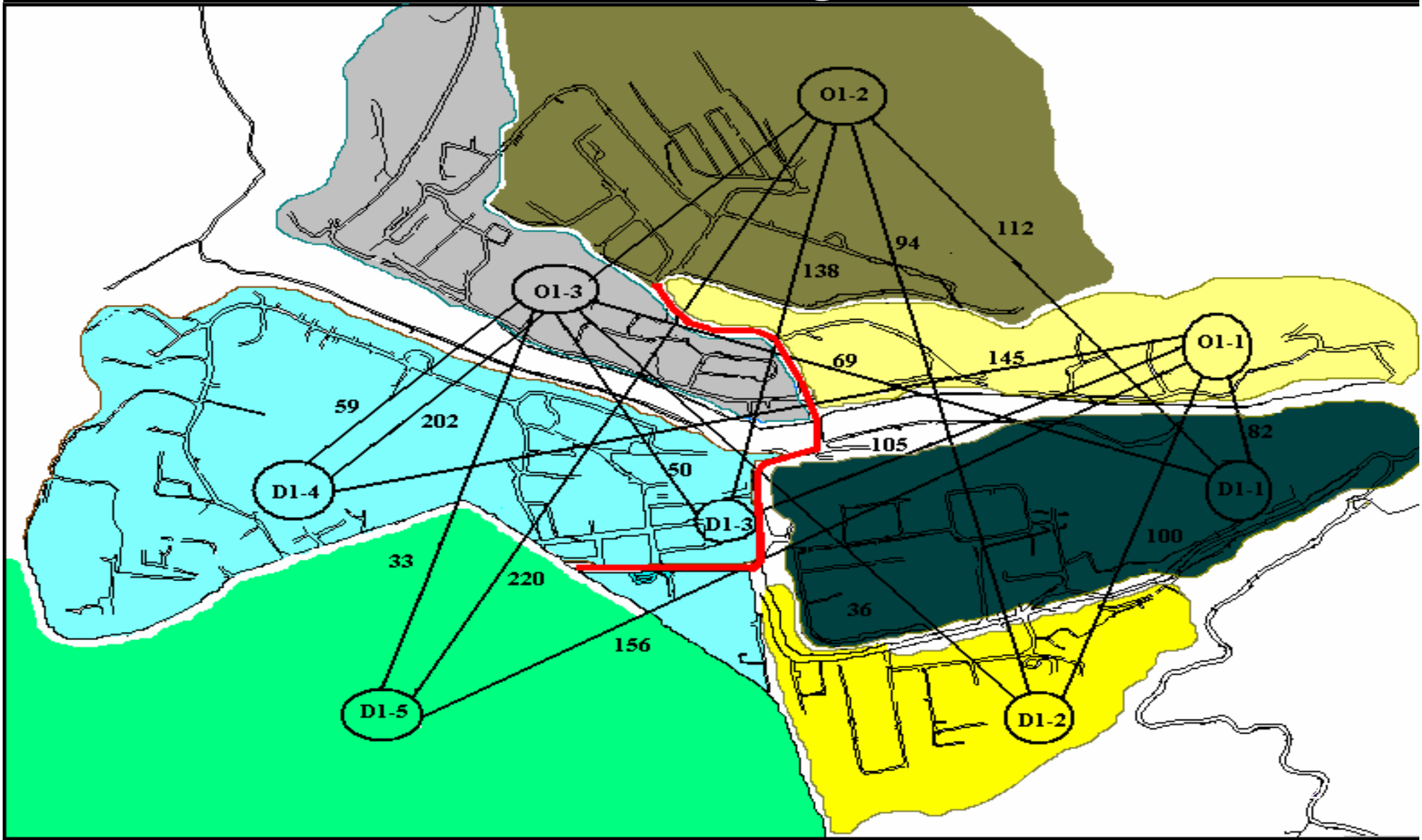
O-D matrix for station 1: Doti Chhu Bridge

9hrs 30 minutes O-D matrix for station 1

Origin	Destination				
	D1-1	D1-2	D1-3	D1-4	D1-5
O1-1	82	100	105	145	156
O1-2	112	94	138	202	**220**
O1-3	69	36	50	59	33

Route Assignment

- Station 1 : Doti Chhu Bridge



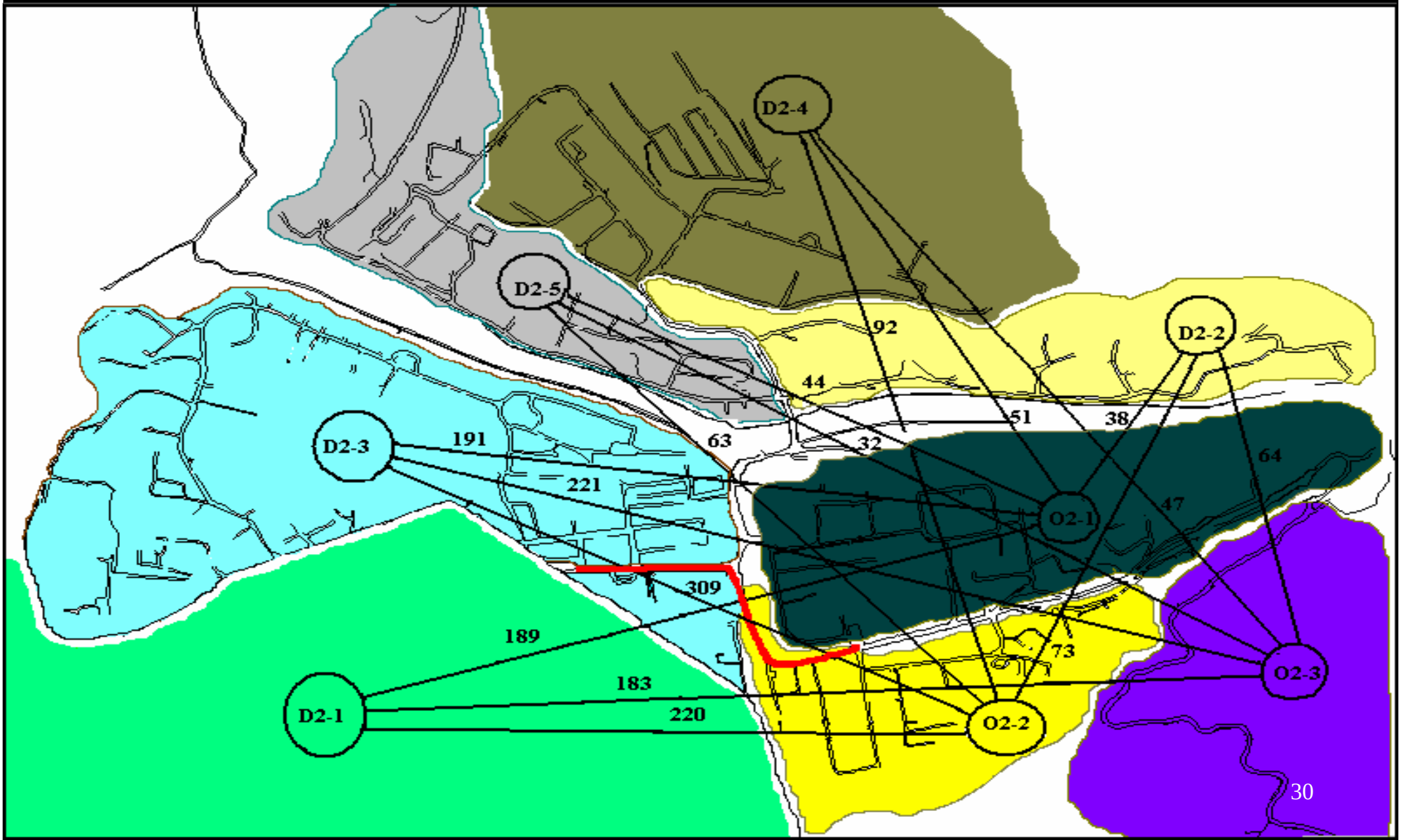
Traffic situation at Critical stretch

O-D matrix for station 2: Roundabout

9hrs 30 minutes O-D matrix for station 2

Origin	Destination				
	D2-1	D2-2	D2-3	D2-4	D2-5
O2-1	189	38	191	51	44
O2-2	220	73	**309**	92	63
O2-3	183	64	221	47	32

Route assignment for station 2



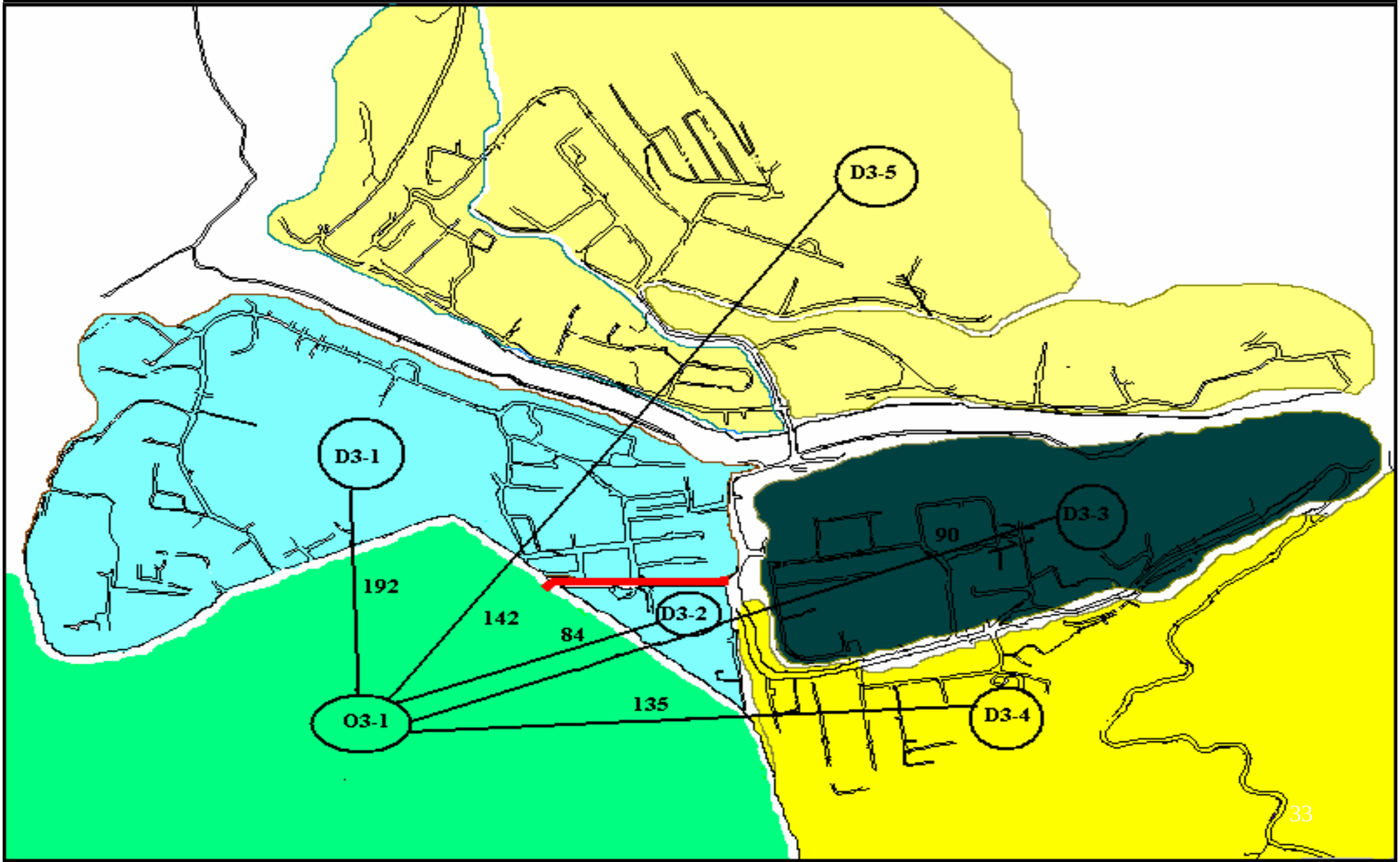
Traffic situation at Critical stretch

O-D matrix for station 3: Bhutan Gate

- Three and half hours O-D matrix for station 3 (7:30am to 11:00am)

Origin	Destination				
	D3-1	D3-2	D3-3	D3-4	D3-5
O3-1	**192**	84	90	135	142

Station 3 : Bhutan Gate



Traffic situation at Critical stretch

Combined Analysis of O-D data

- All 3-station's O-D data are combined with respect to particular time and analyzed.
- Combination with reference to peak hour of station 2(Roundabout) had the maximum traffic
- The time period (12noon to 1:00 pm) is found to be the most critical peak hour for the study area
- The most critical route – Zhung lam

Traffic Scenario in Phuentsholing city

The following are the findings from the study:

- The maximum mode of transport from all the three stations is Light vehicle
- The peak hour of travel in the city for traffic from station 1 is recorded as 11:00am to 12noon and 12noon to 1:00pm for station 2 and 3:00pm to 4:00pm for station 3
- The travel behavior characteristics of vehicles show that trips are made for mostly business related works

- Besides business-oriented trips, through trips through the city is one of the main reasons for the heavy traffic flow in the city

Station	Total vehicles	Through Traffic No.	Per Cent
Station 1	1601	493	31
Station 2	1817	592	33
Station 3	643	135	21

- It is indicated that the most critical flow of traffic is located at the round about because of which vehicles are stranded at the stretches leading towards the round about
- The highest time taken by a vehicle to maneuver through the round about was noted as three minutes when a load trailer (maximum dimension of the vehicle is 18 meters) is maneuvering the round about from the Zhung lam and then makes a U-turn from the round about

- During the three minutes taken by the trailer to maneuver the round about, assuming the average length of vehicles to be 4.12 m and a clear distance of 1.5 m between the vehicles, approximately 50 m of road stretch from stations 1 and 2 are stranded

- The traffic on the Zhung lam from station 3 will be stranded for approximately 94 m for a trailer to maneuver the roundabout
- The above scenario is generated for only one heavy vehicle maneuvering the round about. However during the most critical hour (12noon to 1:00pm) a total of 87 heavy vehicles are destined to meet at the round about from which 55 heavy vehicles originate from station 3
- During such time, the traffic in the city will be congested at critical stretches for almost about 2.5 kms from the round about

- If the growth rate of vehicle is assumed to be same as that of the year 2009 and the travel behavior of the traffic in the city remains the same, then the number of vehicles registered with RSTA is estimated to be 40,911 by the end of 2013 (coinciding with the end of tenth five year plan)
- This will ultimately increase the length of traffic jam to about 5 kms under these conditions because of which the traffic operations at the gate will freeze unless the traffic is diverted through a by-pass

Short term plan of action

The short term plan of action is aimed at:

- Optimizing the use of existing road network and infrastructural facilities
- Discouraging all traffic generating uses within the Phuentsholing city and shifting it to the periphery where adequate space is available for better planning of facilities
- Improve regulations and controls in order to optimize the use of transport facilities in the city

Recommendations

- The absolute mode of travel in the city has resulted in traffic congestion in the city. Other means of travel like walking and city bus services should be encouraged
- The city bus services should be made available at peak hours and the schedule drawn from the O-D matrix
- The study indicated business related and work related travel as the main purpose of travel. Therefore it is hereby recommended that the future planning and construction of office complexes, commercial complexes, health facilities, educational institutions and industries to be located away from the city centre

- At least one-fifth of the total traffic entering the city from the three stations (or entry points) are composed of through trips which further aggravates the traffic situation in the city
- The concerned authority should look at possibilities of diverting these through trips by a by-pass road
- In order to regulate heavy traffic, no through buses and trucks should be permitted to pass the round about for vehicles originating from station 1 (Norkhil lam). Instead the through traffic can be diverted through Pelkhil lam or Gaki lam.


STATION 1 (DOTI CHHU BRIDGE)
STATION 2 (ROUNDABOUT)
STATION 3 (BHUTAN GATE)

- All heavy vehicles to be restricted from entering the Zhung lam from the Bhutan gate during the critical peak hour (12noon to 1:00pm) in order to ease traffic at the roundabout
- Improvement of road junctions including the geometrics and road alignment to be given top priority especially the round about

Long term perspective plan for traffic and transportation

- A comprehensive traffic and transportation plan integrating it with land use plan and population distribution within the city is recommended to be prepared
- Such a plan should consider the traffic and transportation requirements of the urban area for the efficient movement of goods and passengers for the present as well as the foreseeable future
- As part of the plan, major traffic road and corridors in the city should be maintained for smooth traffic flow and to reduce travel time

- The major limitation is the lack of developable area for expanding the transport facilities. Therefore, in order to ease the traffic from the city center, a by-pass road or over head roadways which will collect the through traffic from the city and from across the border should be constructed for relieving the pressure on the present road network in the city

Conclusion

- The study indicated that lot more needs to done in our pedagogical approach of planning
- As the number of vehicles are expected to increase because of the economic boom the country is facing in recent times, the traffic related problems are expected to increase

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THANK YOU