



SAWADDEE KA

GOOD MORNING

KUZU ZANGPO

ATRANS SYMPOSIUM

RISK ANALYSIS AND MANAGEMENT: A CASE STUDY ALONG PHUENTSHOLING - THIMPHU HIGHWAY

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OVERVIEW

- Introduction
- Literature review
- Methodology
- Objectives
- Types of losses
- Conclusion and Recommendations

INTRODUCTION

- Land transportation is the only means of communication in Bhutan.
- Two highways, namely, Thimphu-Phuentsholing highway (AH48) and Thimphu-Trashigang highway are the two important highways.
- The earlier researchers have found that Thimphu–Phuentsholing Highway is the most important highway and the most critical highway in terms of road blockages.

INTRODUCTION CONTD.

- Thimphu-Phuentsholing highway is the main route for travelling and transportation of goods.
- The observation and media reports indicated that road blockages and accidents are of concern to the society.
- The study includes both road blockages and accidents for risk analysis.

LITERATURE REVIEW

- Sato. Y et al., (2005) defines risk as a factor of change causing social loss and impede the achievement of a goal.
- Cheki. D & Shibayama. T, (2007) defines risk as the combination of the probability, or frequency of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.
- Risk management is the act or practice of dealing with or controlling the risk.

CONTD.

- A stepwise process consisting of *risk assessment* and *risk control*.
- risk assessment further consists of the risk analysis and risk evaluation
- risk control consists of the risk decision and risk monitoring
- A Road accident is defined as an accident which occurred as a result of the vehicle being in a state of motion on the road and causing injury to a person.

OBJECTIVES

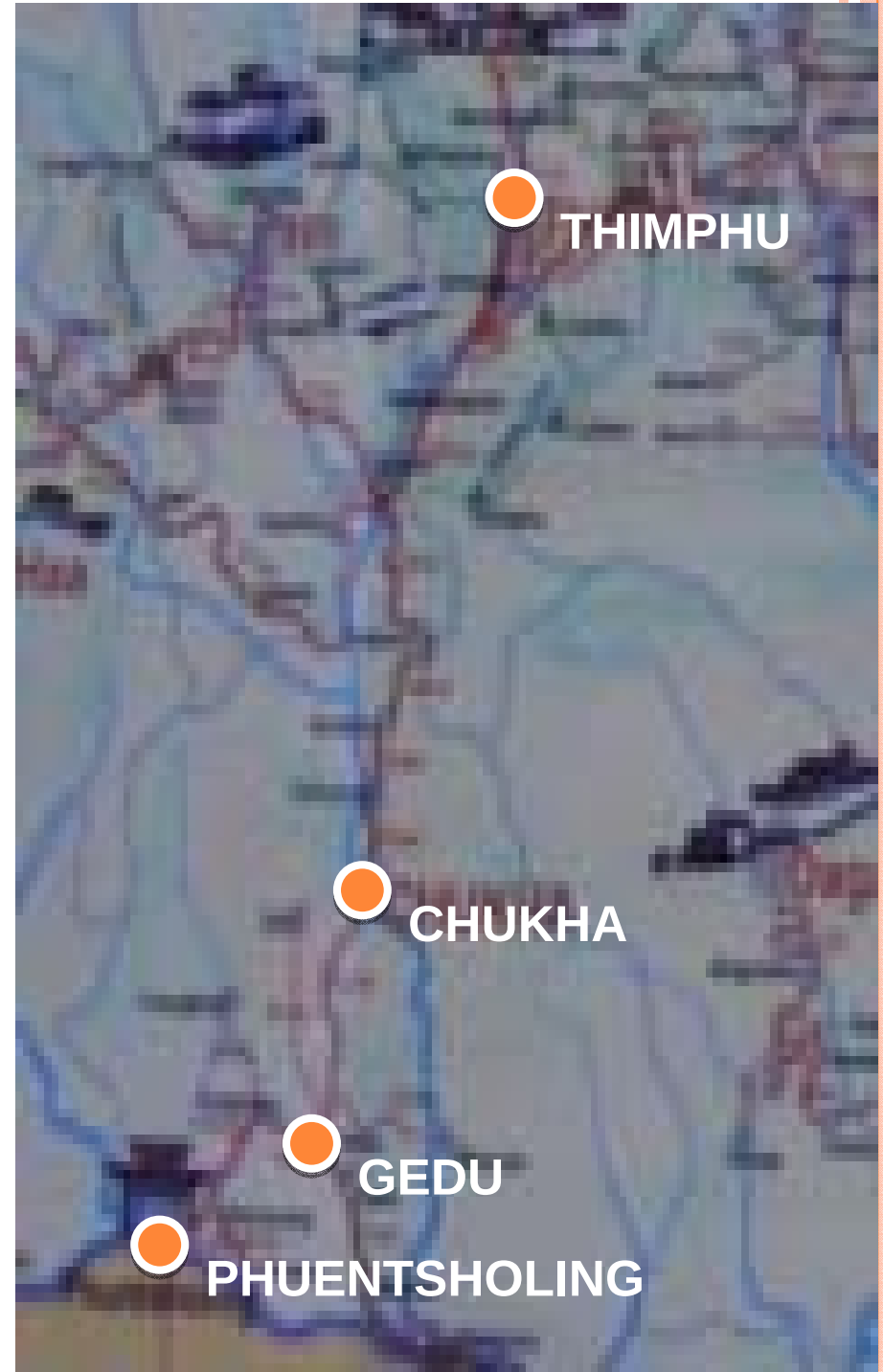
- The main objective of the study is to determine the risk on the roads and its socio economic impact.
- The other specific objectives are to:
 - Determine the risk along the road
 - Determine the losses due to accidents and road blockages
 - Determine the effect of the risks on the society
 - Determine the effect of the risks on the economy of the country
 - Develop efficient road operation management system.

METHODOLOGY

- Data collection and Data analysis
- Identification of risks

DATA COLLECTION

- From different traffic police branches (Phuentsholing, Thimphu, Chukha and Gedu)– types of accidents, its causes and the types of vehicle involved.
- From Revenue and Customs (at Rinchending check-post)– types, quantities, rate and amount of goods
 - Location of goods being transported



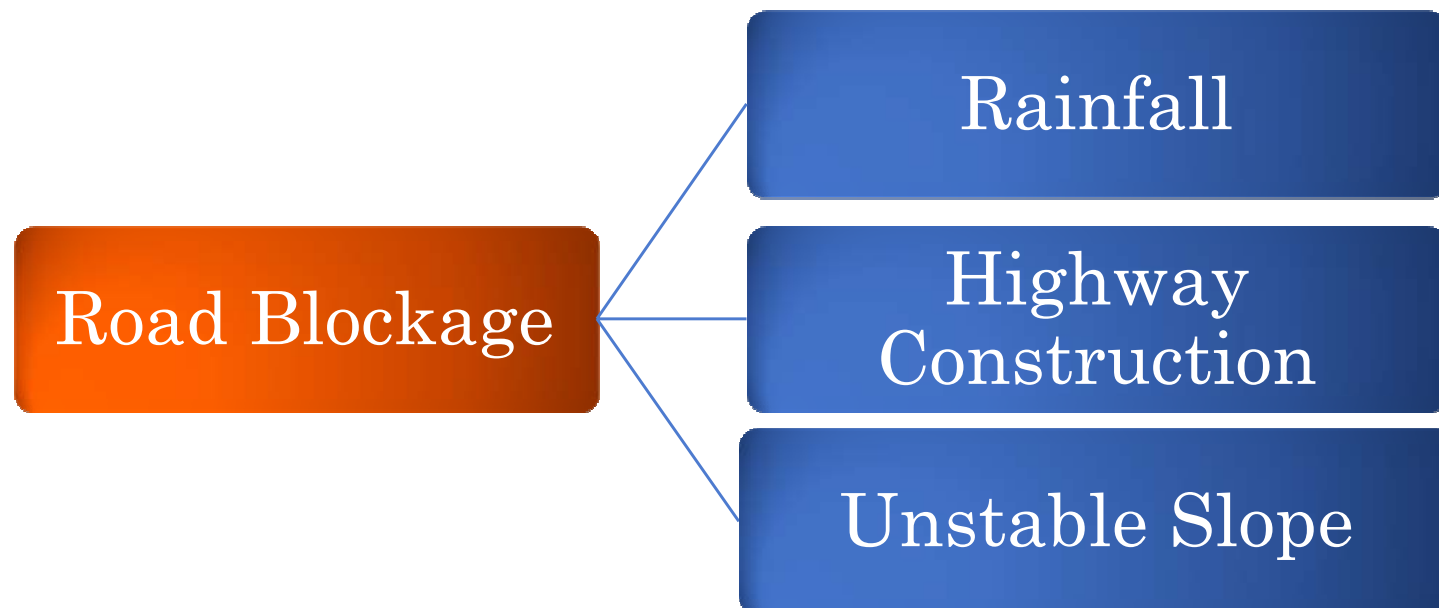
AREA



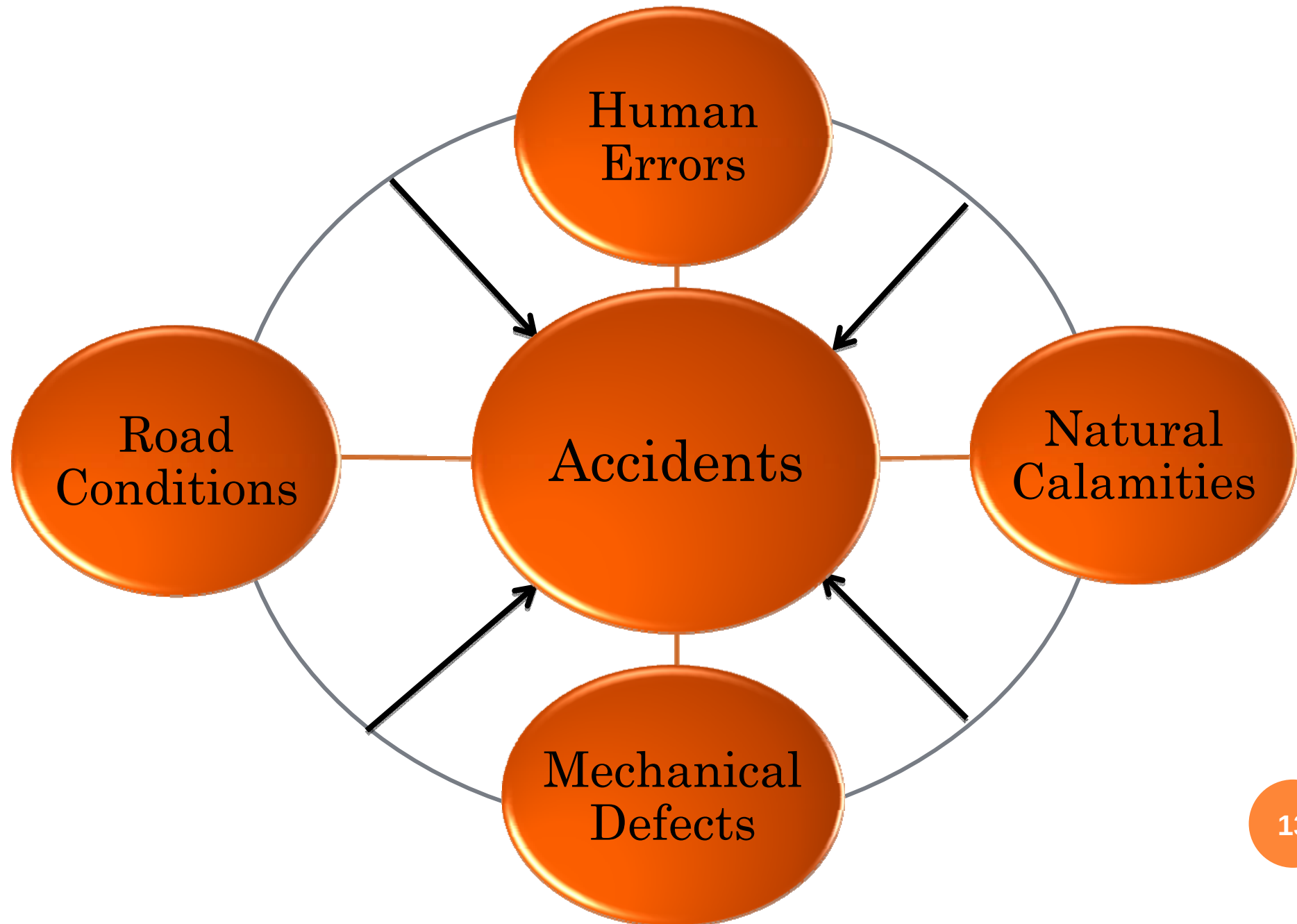
RISKS



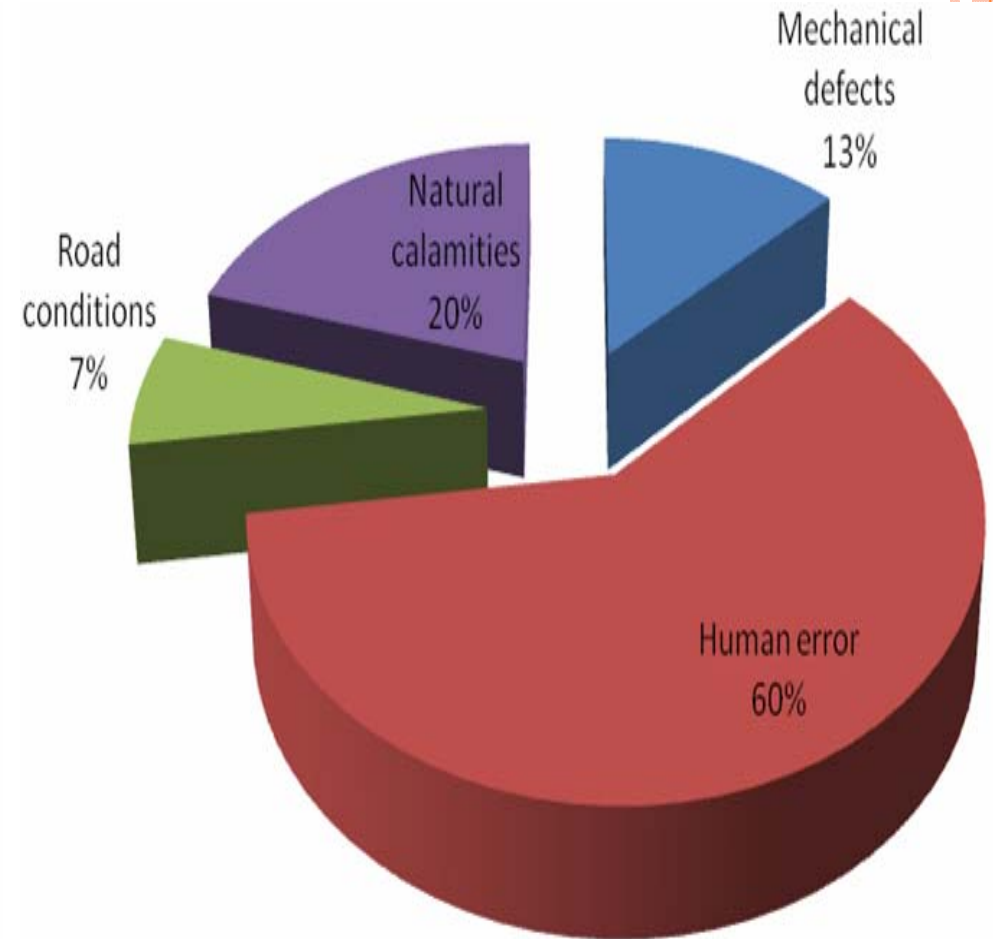
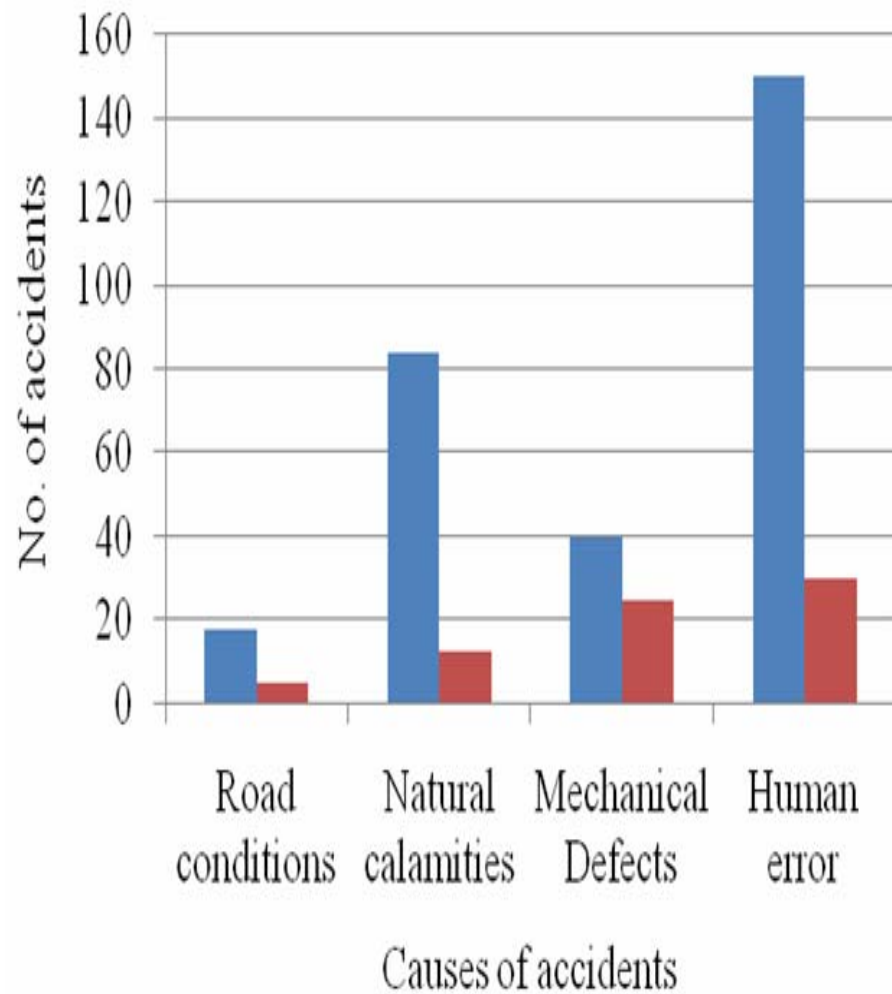
(Based on traffic police data 2004 – 2009)



CAUSES OF THE ACCIDENTS

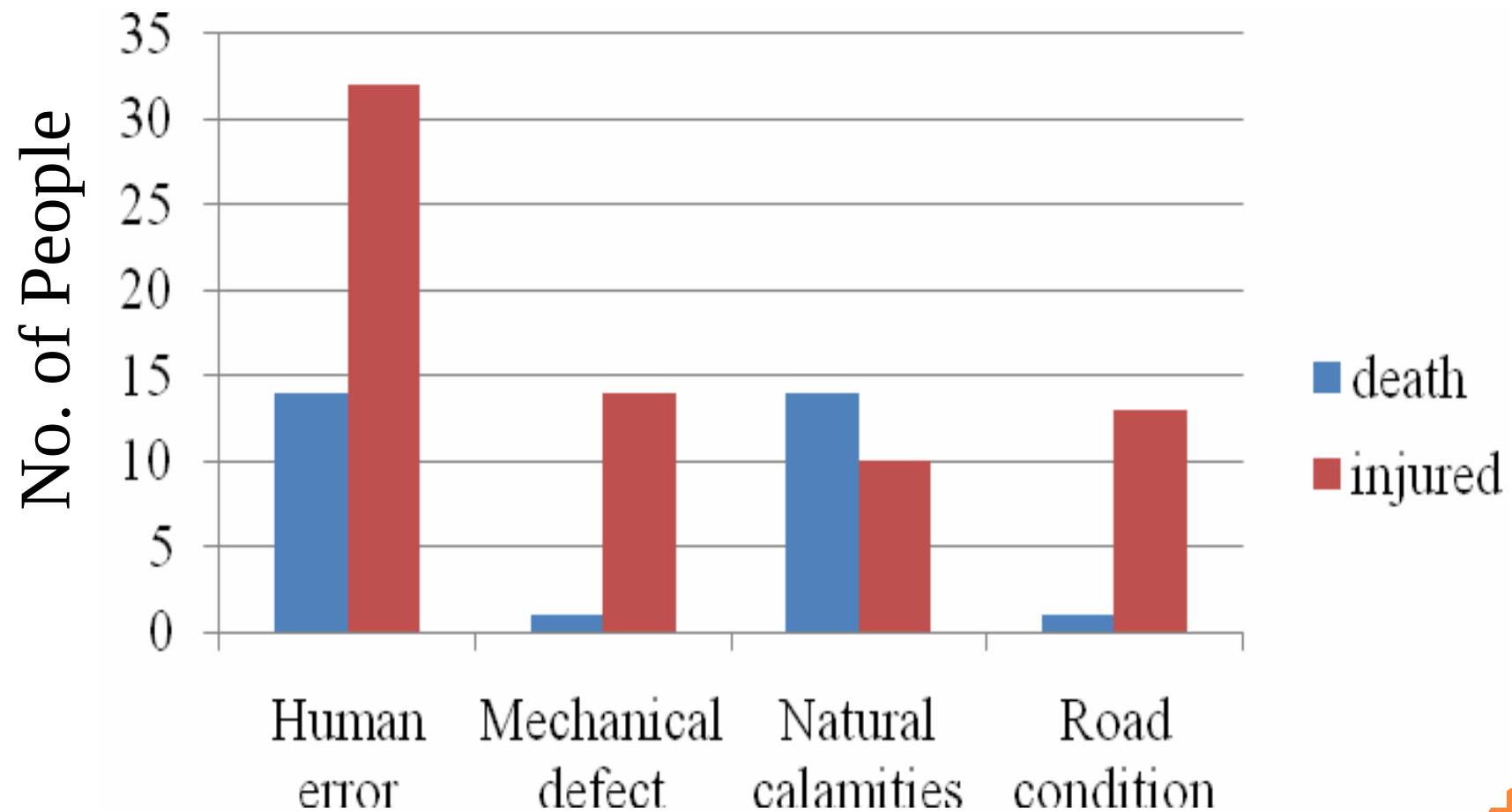


NUMBER OF ACCIDENTS VS. CAUSES



Percentage of accidents due to different causes

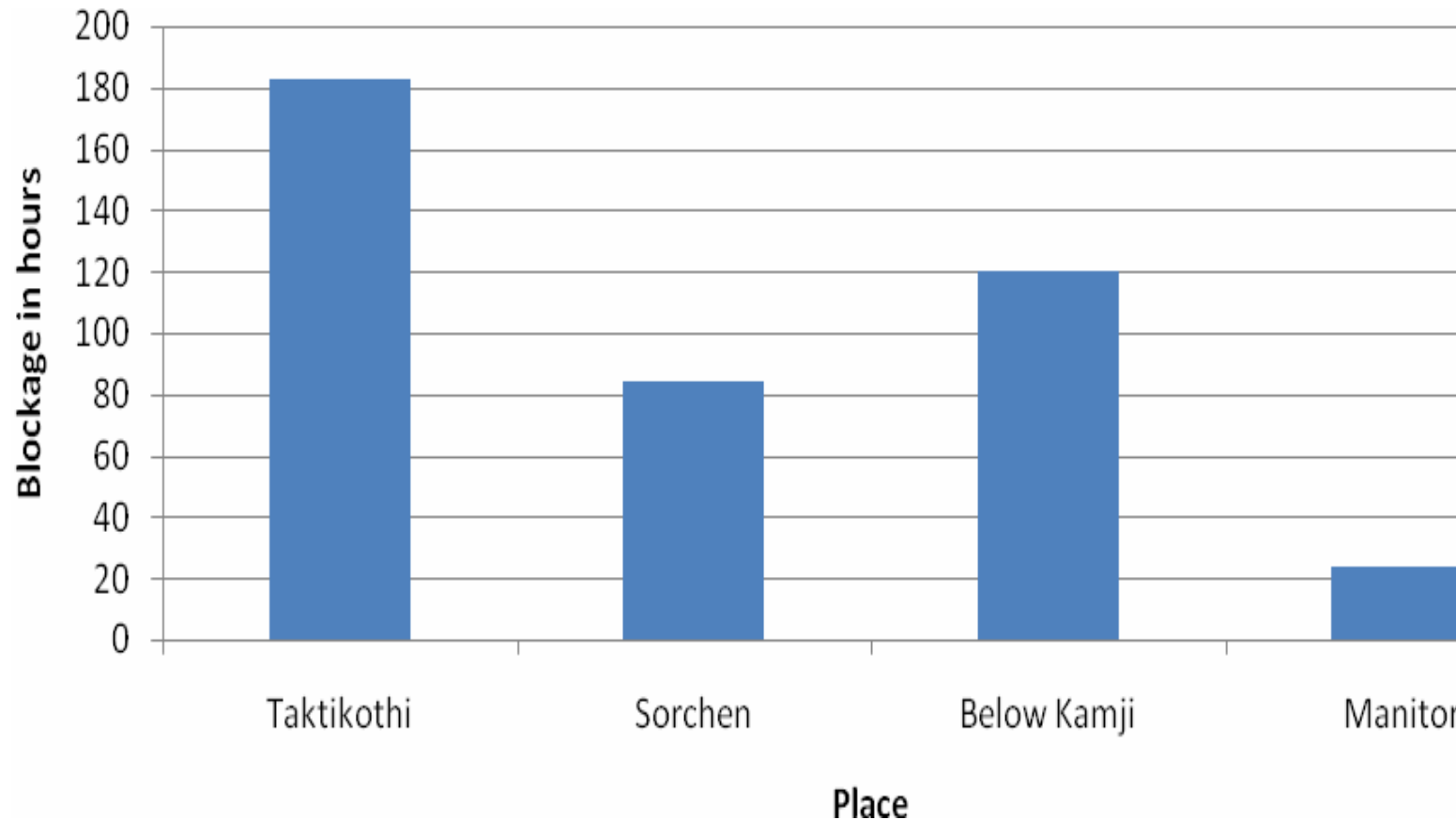
DEATH AND INJURIES CAUSED BY ACCIDENTS



LOSS DUE TO ROAD BLOCKAGE

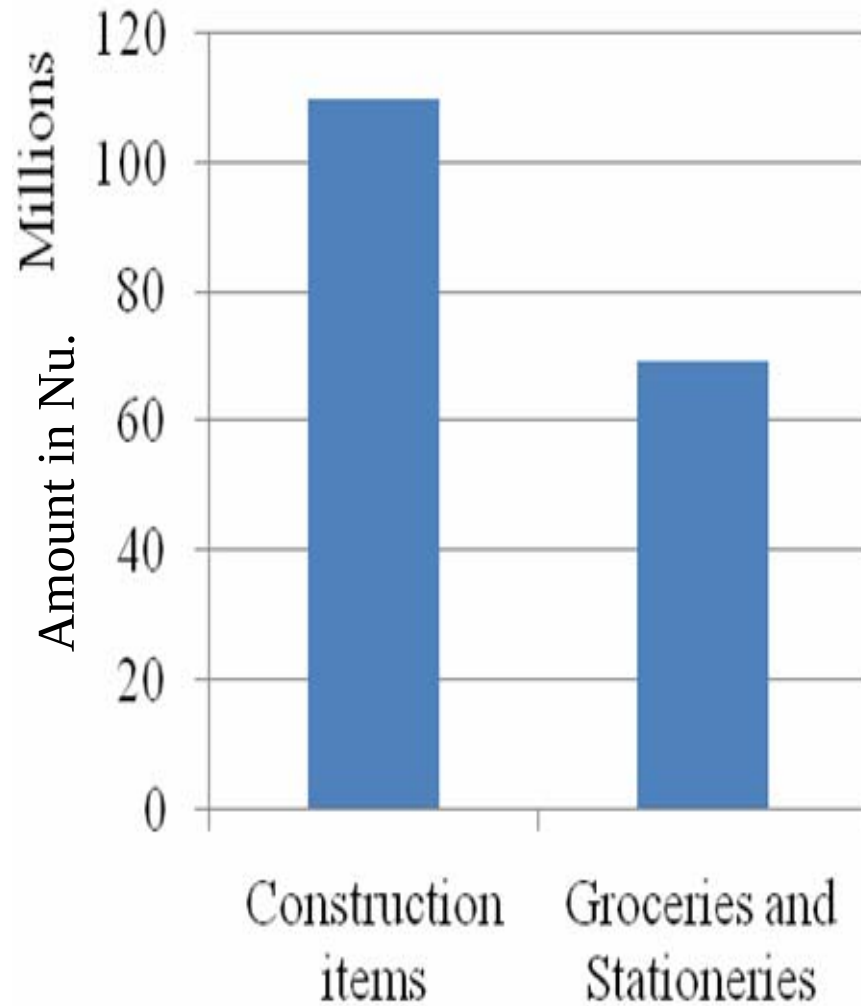
- Most of the goods are being transported from Phuentsholing as it is the only dry port.
- All construction materials for the mega power project constructions and other construction activities are transported through Thimphu-P/ling highway.
- P/ling-Thimphu highway has the highest volume of passenger bus transport and other vehicles.
- Road Blockage will delay goods and construction activities.

BLOCKAGES AT DIFFERENT LOCATIONS

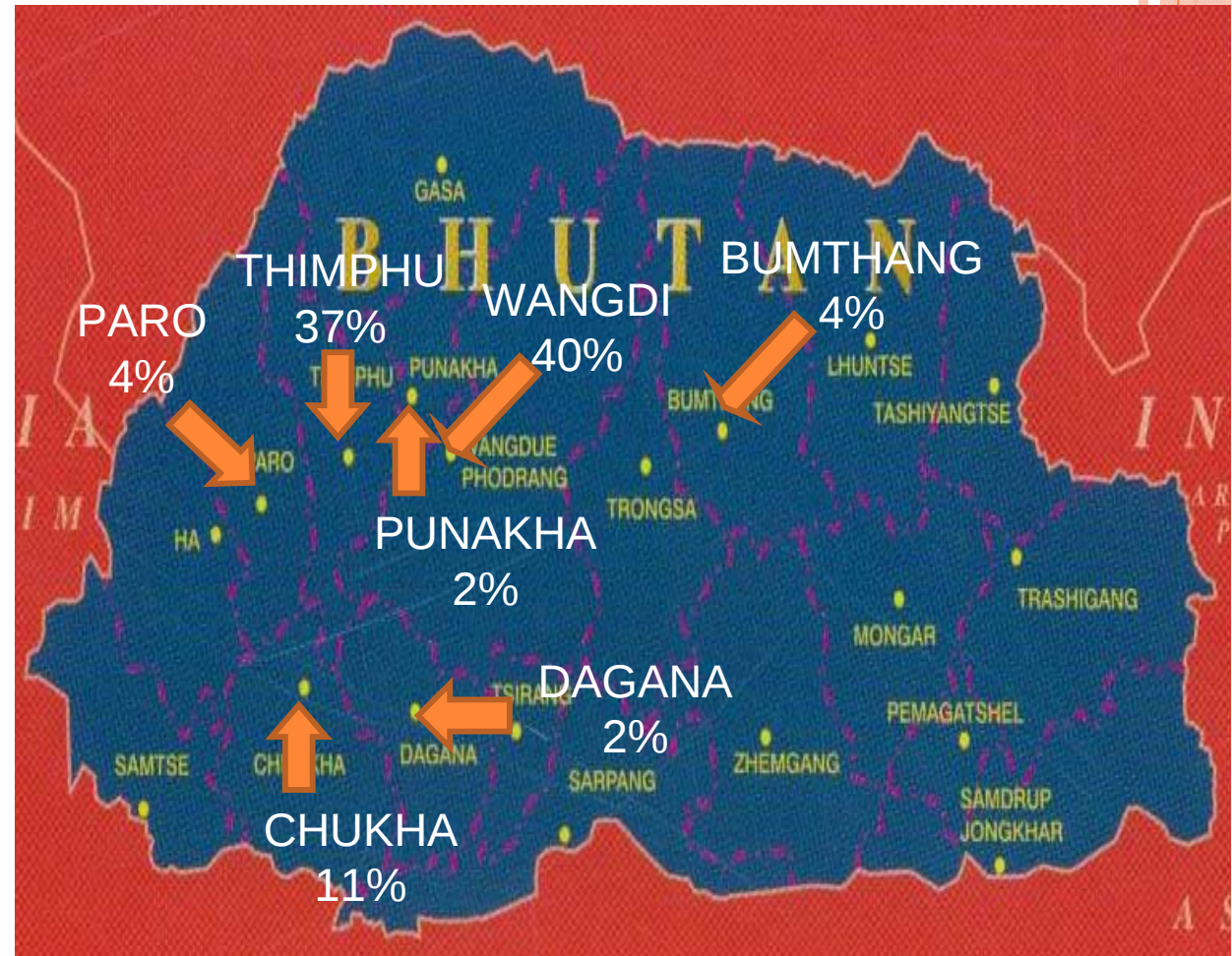


(Based on traffic police data from 2004 to 2009)

GOODS TRANSPORTED TO DIFFERENT DZONGKHAGS



Types of goods



Goods transported to different dzongkhags

RISK ANALYSIS

- Losses due to road blockages
- Total number of hours blocked in a year = 387 hours
- Total days blocked in a year = $387/24 = 16.125$ days
- Rate of blockage per day = $16.125/364 = 0.0443$

RISK ANALYSIS CONTD.

Name of route	Total days blocked in a year (1)	Rate of blockage per day (2)	Total traffic volume per day (3)	Total heavy vehicle volume per day (4)	Total vehicle loss per day (5)=(2)*(3)	Heavy vehicle loss per day (6)=(2)*(4)
Sorchen – Jumja	16.125	0.0443	1018	226	45.097	10.012

Name of route	Heavy vehicle loss per day (no.) (A)	Distance (km) (B)	Freight loss per day (Nu) $C=(A*B)*6.53$	Amount of goods per day (Nu) (D)	Fare loss per day (E)	Total loss (Nu) (C+D+E)
T/phu-P/ling	10.012	179	11703	50466159	202996	50,680,858

Total loss due to road blockage = Nu. 50.68 million

RISK ANALYSIS CONTD.

- Losses due to accidents
- Total traffic volume per day = 1018 nos

Year	No. of accidents (A)	total traffic volume per day (V)	Length (L) (km)	Accident rate $A_r = (A/(365*V*L)*10^6)$
2009	99	1018	179	1.488

- Accident rate for the year 2009, $A_r = 1.488$

RISK ANALYSIS CONTD.

- Probability of loss due to accident
$$\begin{aligned} &= \text{Total fare loss per day} * \text{Freight loss} * A_r \\ &= (202996 + 11703) * 1.488 \\ &= \text{Nu. } 319,472.112 = \text{Nu. } \mathbf{0.32 \text{ million}} \end{aligned}$$
- Total loss per day due to accidents and road blockage = $(0.32 + 50.68) = \text{Nu. } \mathbf{51 \text{ million}}$
- Bhutan's GDP per day = Nu. 434.92 million
- Due to accidents and blockage,
$$\begin{aligned} \text{Percentage loss} &= (51 / 434.92) * 100 \\ &= \mathbf{11.73\% \text{ of GDP per day}} \end{aligned}$$

CONCLUSION

- Road accident and road blockage are identified as main risks along Phuentsholing-Thimphu highway.
- Socio-economic effects of the risk along study area was conducted through the analysis.

CONCLUSION CONTD.

- Accident-prone areas are identified:



CONCLUSION CONTD.

- Main reason for the accidents was indicated as human error, followed by the natural calamities
- The reasons for causing road blockage was identified mainly due to heavy rainfall, unstable slope and highway construction.



CONCLUSION CONTD.



- The total loss of Nu. 51 million per day (11.73% of GDP loss per day) was estimated.

RECOMMENDATIONS

- To reduce accidents, educate the road-users about traffic rules and regulations through public awareness.
- Strict implementation of traffic rules and regulations with proper speed limits and sign boards.
- To manage the road safety, form a group to investigate about the road blockages.
- To prevent soil erosion, plantation of trees must be done and good quality retentions must be built.

RECOMMENDATIONS CONTD.

- For water management, proper drainage must be provided.
- Machines used must be environmental friendly.
- Safety rails to be provided along with the construction of roads.
- As Bhutan lies in an earthquake-prone zone, all road design and construction to be based on seismic design practices.

An aerial photograph of a town nestled in a valley. The town features numerous buildings with red-tiled roofs, interspersed with green trees. In the background, steep, forested mountains rise under a cloudy sky. The text 'Khob Khun Ka' is overlaid in a large, black, serif font at the top of the image.

Khob Khun Ka

Thank you.

Kadrinchey