SYSTEMS ANALYSIS FOR SMART MOBILITY AND SAFER ROADS IN SOUTH AFRICAN CITIES

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CONTENT

- Motivation
- Objective
- Study area
- Methodology
- Results and discussions
  - Model
  - Mechanism for Policy Interventions
- Conclusions

MOTIVATION

In the contemporary world, sustainability in mobility is a challenge particularly in cities.

The dilemma ?

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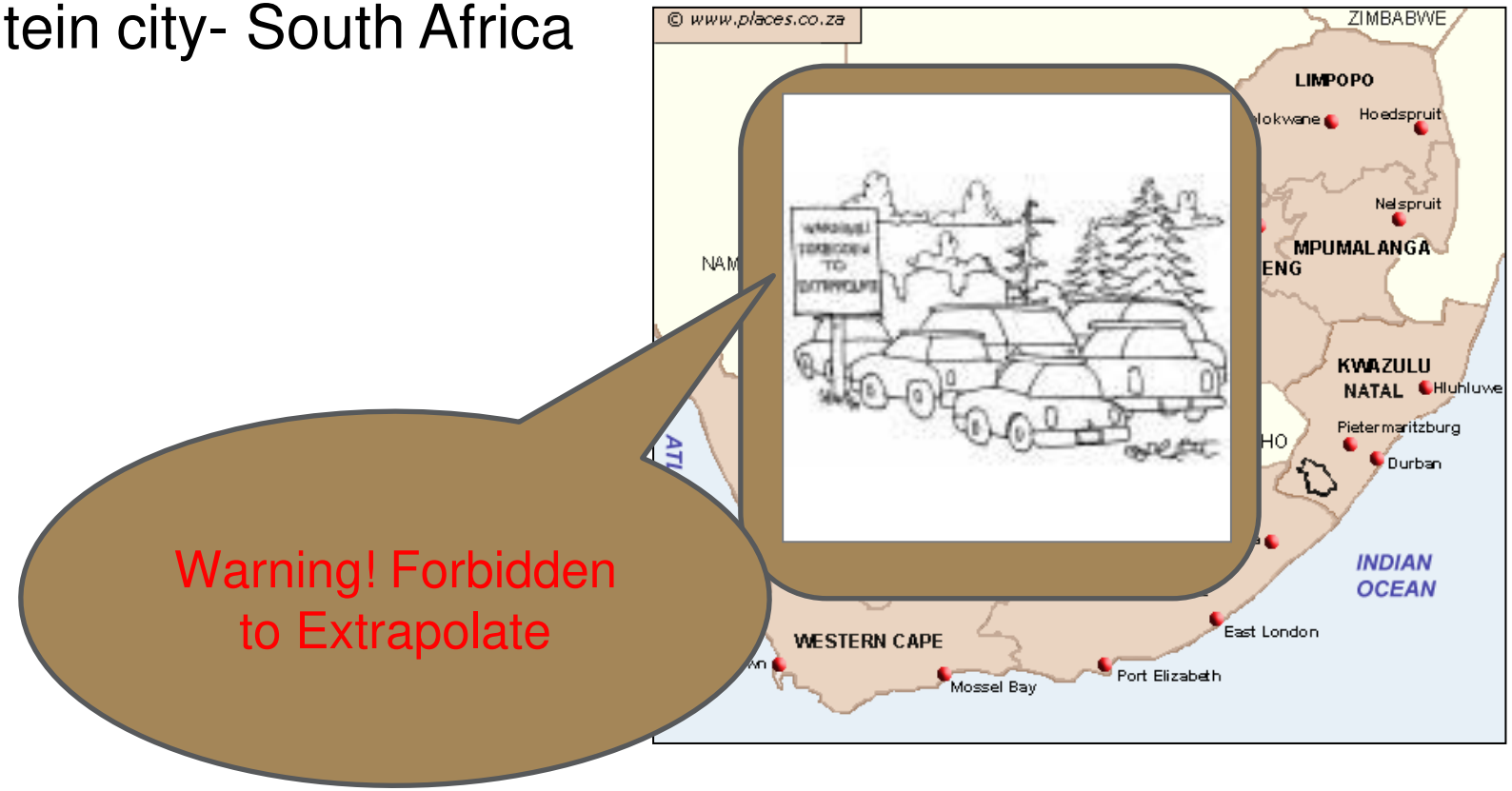
The individual gives priority to comfort and wants to be able to move around smoothly.
The society as a whole looks the transportation or movement to be managed in a sustainable way, i.e., with safety, practicality, and continuity (Hitachi, no date).

OBJECTIVE

To investigate how **smart mobility and relatively safer roads** can be achieved by applying the **systems thinking process**, i.e., based on the analytical logics by considering the inter-linkage and interaction of the control parameters and their variables based on systems thinking approach.

STUDY AREA

Bloemfontein city- South Africa



METHODOLOGY, DATA AND ANALYSIS

- Survey research methodology was employed
- Discussion with people and experts, involved in the urban planning process in South African cities
- Review of the IDPs

Data

Primary data:

Sample size: 270
Number sample areas 6 suburbs

Secondary data:

Published /unpublished documents/literatures from authentic organizations

Evaluation of Indicators

The performance of the indicators, factors and smart mobility characteristic indices of the city were measured by

$$WI = \frac{\sum(wi * Xi)}{\sum Xi}$$

Where WI = General weighted index of a parameter.
wi = index values assigned to each indicator/factor by the respondents.
Xi= Number of respondents favoured a value of the indicator/factor

Methodology Continued….(Modeling)

Conceptual **SYSTSEM DYANIMICS (SD)** models based on the causal relations among the various factors and indicators influencing smart mobility of the city were developed by using SD modelling principles.

RESULTS AND DISCUSSION

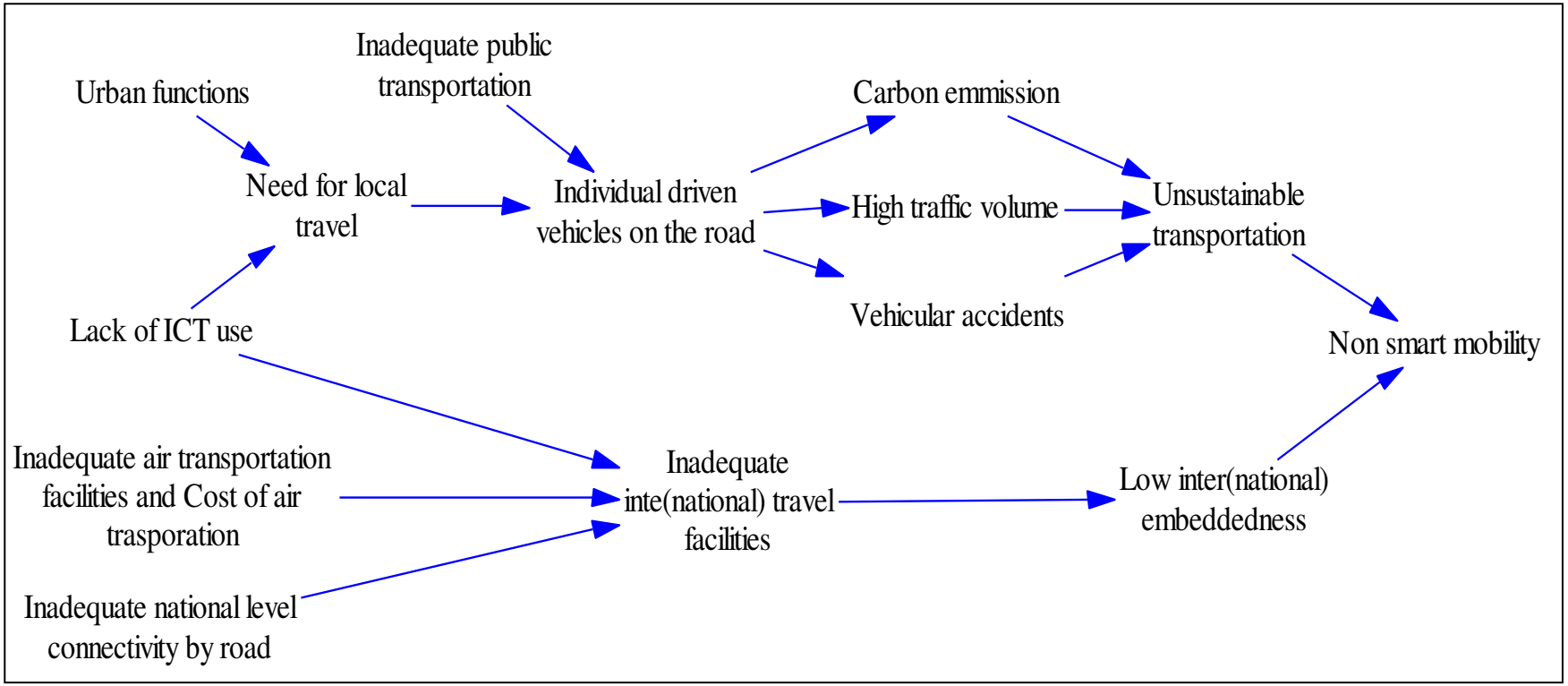


Figure 1 Current status of mobility in Bloemfontein city

Current Status of Mobility

Performance of mobility indicators

Smart mobility indicator	SII	Smart mobility factor	SFI	Smart Mobility Index SMI
Public transport network per inhabitant	-1.5	Local accessibility Public transport	-1.68	0.06
Access to public transport	-1.5			
Quality of public transport	-2.0			
Air transport (local)	1.1			
Air transport of passengers (international)	1.5	(Inter)national accessibility (physical movement)	1.11	
Air transport of freight	-1.3			
Green mobility share	-2.0	Sustainable, innovative and safe transport systems	-0.45	
Traffic safety	1.5			
Use of economical cars	-1.5			
Computers in households	2.0	Availability of ICT-infrastructure Computers in households	1.25	
internet access in households	0.5			

Measured in a scale of index values -3 to +3

Key causal relations and conceptual SD model

The development of smart mobility is envisaged to be based on four major reinforcing causal feedback loops, involving factors such as:

- sustainable, innovative and transportation system,
- local accessibility
- availability of ICT infrastructure and international accessibility
- availability in ICT infrastructure leading to reduction in local transportation needs.

SD model for smart mobility

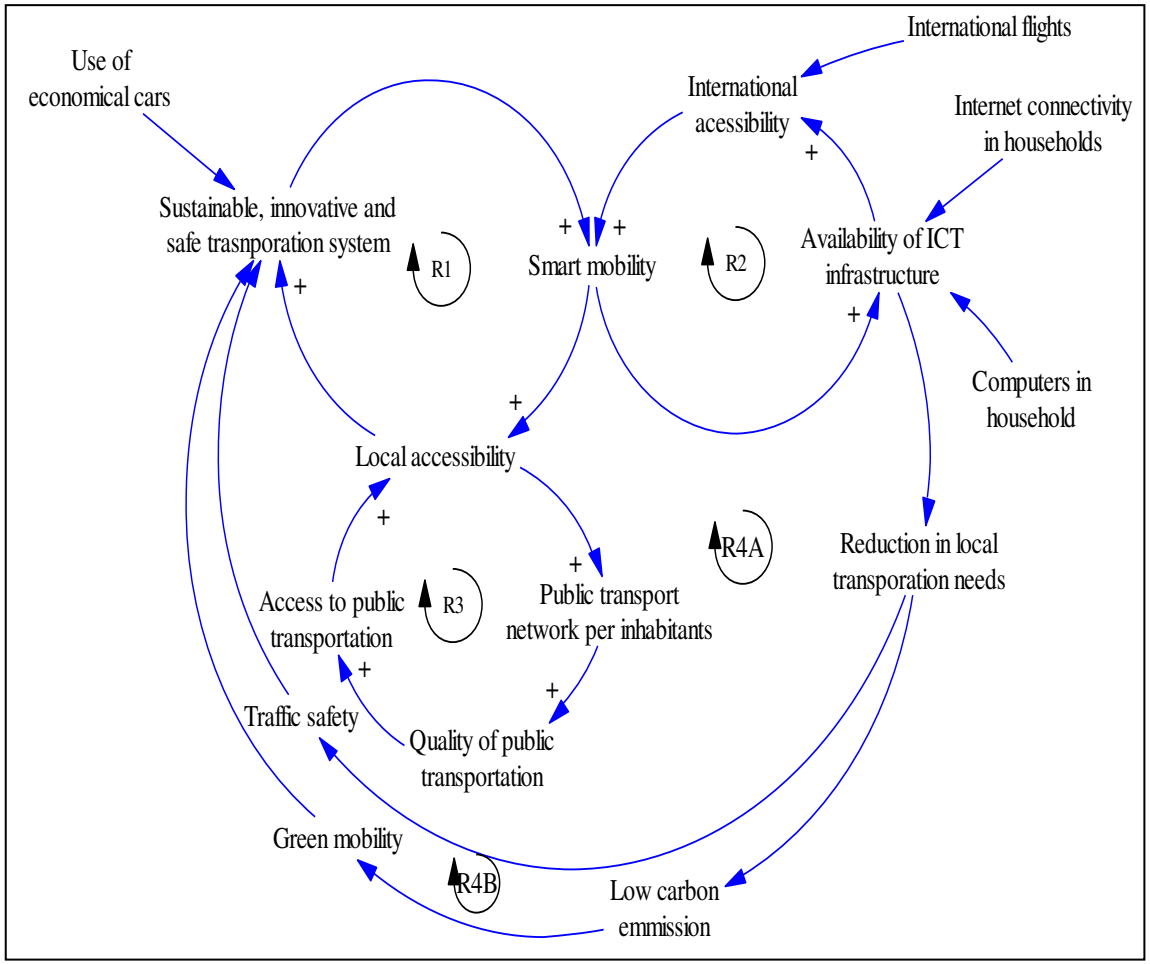


Figure 2 Causal feedback relations for smart mobility in Bloemfontein city

Mechanisms for developing Policy interventions

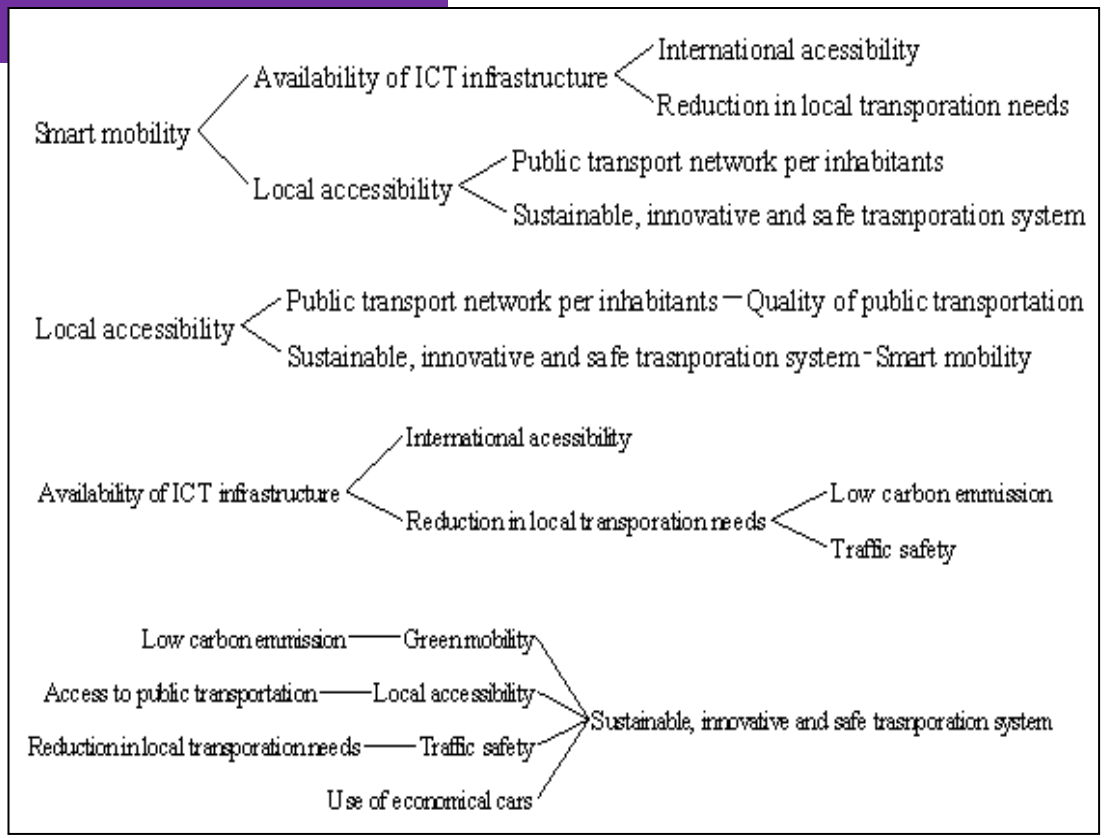


Figure 3 Cause and use trees for development of policy interventions

CONCLUSION

- Need to develop and improve public transport availability and particularly, smart public transport to suite the lower densities present in the city.

- Essential to improve the ICT infrastructure and hence connectivity required to further reduce the need for transport, particularly in the peak hours.

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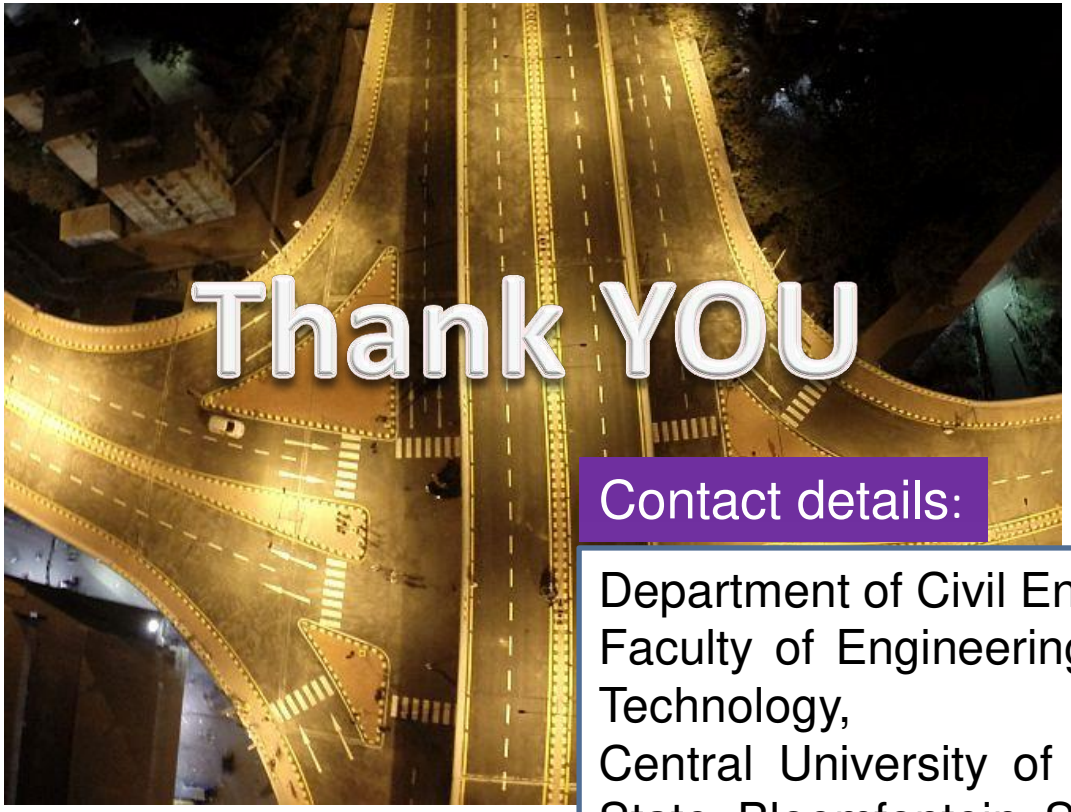

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Thinking Beyond…..