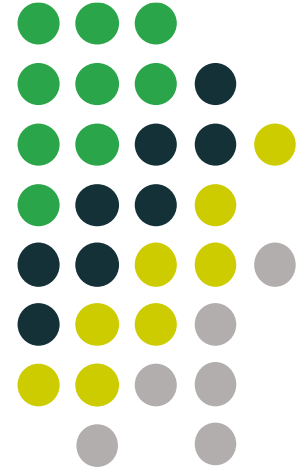


# Application of tidal flows in intelligent traffic management during peak hours; case study of Nairobi Thika Highway



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# STRUCTURE OF PRESENTATION

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Application of Intelligent transportation systems is the way to go

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- Motivation and objectives of the research
- Tidal flow concept
- Case study and results
- Microsimulation analysis
- Conclusion and Recommendations

# MOTIVATION

Most cities experience peak time traffic congestion

Situation between 7:00-9:00 am and 5:00-8:00 pm.



# RESEARCH OBJECTIVES

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There is a pressing need to economically deal with peak traffic jam

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- ❖ Assessment of the daily directional dynamism of the level of service.
- ❖ Establishment of a suitable proportionality ratio for directional splitting of the lanes.
- ❖ Traffic flow simulation on the highway with the tidal flow operation in place and evaluating traffic management options at the tidal flow outlets.
- ❖ Proposal of methods of effecting the tidal flow operation



# TIDAL FLOW CONCEPT

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It is a cost effective tool to increase capacity of a road

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- ❖ A tidal flow operation- Traffic management process whereby the carriageway width is shared between two directions of travel in near proportions to the flow in each direction.
- ❖ Justified where 65 per cent or more of traffic moves in one direction during peak periods
- ❖ Remaining lanes for the lighter flow should be adequate for that traffic.

# ADVANTAGES OF TIDAL FLOW OPERATION

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Maximizes the effectiveness of the use of existing infrastructure

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- ❖ Additional lane in peak directions at a very low cost compared to the construction of such a lane.
- ❖ An additional lane implementation in a short time as opposed to a new construction.
- ❖ A new lane can increase public transport ridership because high quality bus service can be provided.
- ❖ Users will realize significant savings in operational and time costs.

# STUDY AREA

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Tidal operations ensure fair allocation of infrastructure space

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- ❖ The highway is a divided multilane highway with four lanes on each direction and a median between. Adjacent to the highway is a two-lane service lane on both directions
- ❖ The section of the highway that notoriously experiences directional peak congestion (Kasarani-Globe round about) was chosen.



# METHODOLOGY

In tidal operations, distinct periodic and predictable traffic behavior is a necessity.



Reconnaissance  
survey



Data collection; traffic  
volumes



Data analysis

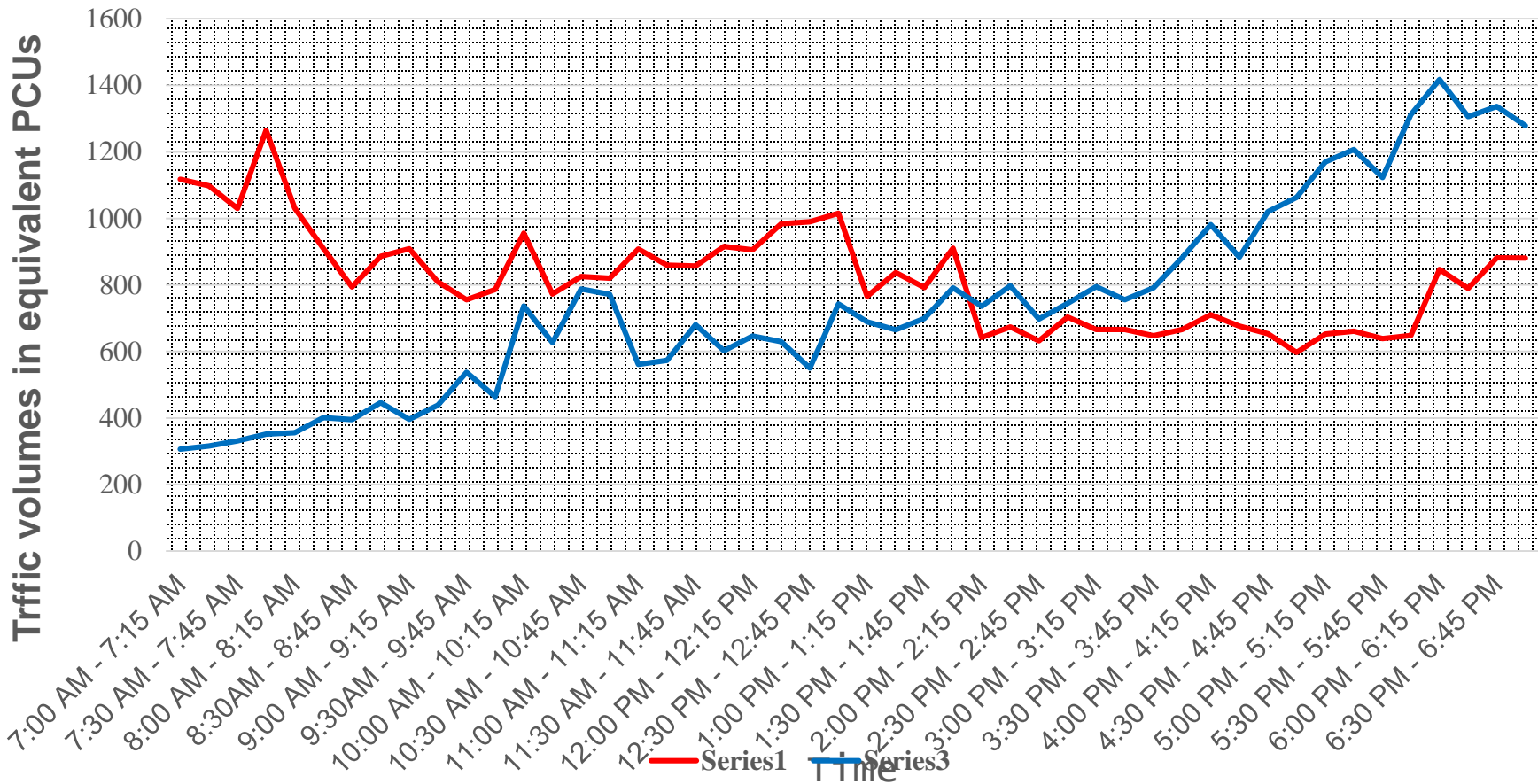


# DATA ANALYSIS



The case study highway experiences directional peak time congestion

comparison of traffic volume for the main highway between traffic approaching from Muthaiga Underpass (series 3) and traffic approaching from The Kenya Survey (series 1)



# ANALYSIS OF LEVELS OF SERVICE

Thika bound traffic is under free flow while Nairobi bound operates at Capacity during the morning peak



HOUR	Nairobi bound LOS	Thika bound LOS
7:00-8:00 AM	E	A
8:00-9:00 AM	D	B
9:00-10:00 AM	D	B
10:00-11:00 AM	D	D
11:00-12:00 AM	D	C
12:00-1:00 PM	D	C
1:00-2:00 PM	D	C
2:00-3:00 PM	C	D
3:00-4:00 PM	C	D
4:00-5:00 PM	C	D
5:00-6:00 PM	C	E
6:00-7:00 PM	D	E

# DISCUSSION

Morning tidal flow operation is justified with six(6) lanes bound for Nairobi



## Hourly PCUs

(Nairobi  
bound)

Hourly PCUs  
(Thika bound)

Ratio

TIME

7:00 AM – 8:00 AM

4511

1305

77.6/22.4

8:00 AM - 9:00 AM

3620

1598

69.38/30.62

5:00 PM – 6:00 PM

2601

4811

64.91/35.09

6:00 PM - 7:00 PM

3399

5339

61.10/38.91

# TIDAL FLOW SIMULATION ANALYSIS

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The end points of a tidal flow should have capacity to dissipate traffic

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- ❖ The evaluation for the ability of traffic to be dissipated at the end point and the arterial connectors to the CBD was done using simulation.
- ❖ PTV Vissim software was used for microsimulation of traffic.
- ❖ Different scenarios were explored to obtain the scenario with best traffic flow conditions and results recorded.

# SIMULATION DISCUSSION

Simulation tools are critical in the development and evaluation of new ideas, algorithms, and traffic control systems.



<b>Parameter</b>	<b>no restriction to forest road</b>	<b>with restriction</b>
Average stops(s)	0.57	0.19
Average speed (km/hr.)	37.3	52.01
Average Delay stop(s)	4.95	1.12
Total travel time(s)	28201.9	21602.1
Total delay (s)	13324.2	5722.44
Total stops (s)	547	189
Maximum queue length on main lanes(m)	48.27	15.3
Maximum queue length on tidal lanes(m)	75.06	44.75

# CONCLUSIONS AND RECOMMENDATIONS

Solution to peak time traffic congestion also requires an integrated approach.



## Conclusions

A tidal flow operation is justified for the morning peak since a marked directional imbalance is achieved at the hour of 7AM-8AM which is the peak hour.

Suitable hours of application of a tidal flow operation are between 7:00 AM-10:00AM

## Recommendations

Parking management, congestion pricing and park and ride services should be considered to manage traffic in the CBD so as to enable efficient application of a tidal flow operation.

# Tidal flow dissipation point

With proper safety measures, a tidal flow operation in the morning will ease peak congestion on highways

