Landscapes of Fear: Traffic Accident Severity Analysis of Dhaka Metropolitan Area, Bangladesh

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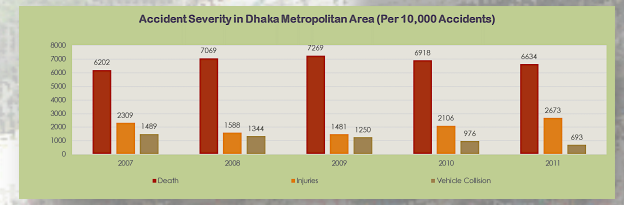
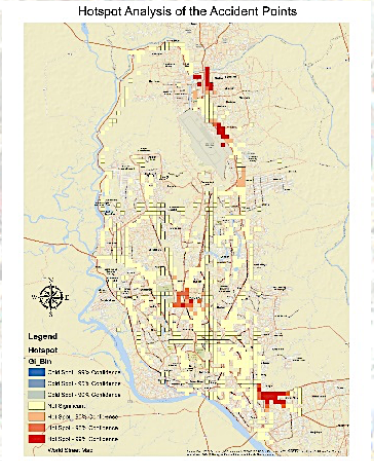
Basic Information of Dhaka Metropolitan Area

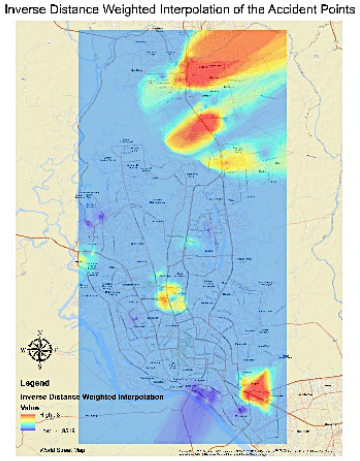
- Dhaka is the Capital of Bangladesh.
- Population is over **14.6 million**.
- Population Density **.15 million** per square mile.
- Divided into **92 wards** (Township Equivalent).



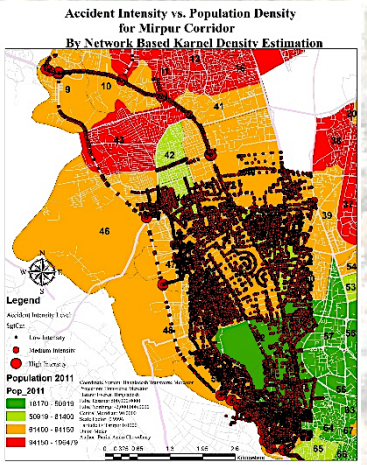
Spatial Statistics

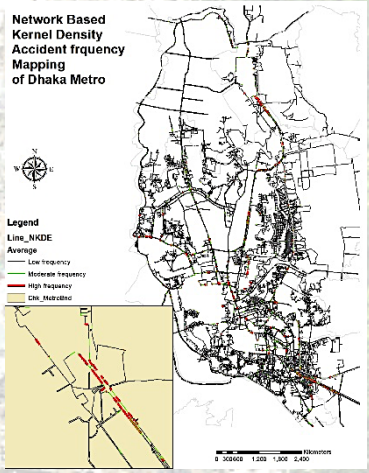
-**No Cold Spot**- Global Moran's Index **0.07 (p value 0.00)**





Network Based Kernel Density (NKDE) Findings





Objectives & Methodology

-**Hotspot and Inverse Distance Weighted methods** to identify most vulnerable accident locations.

-. **Global Moran's I** to calculate spatial autocorrelation .

-**Network Kernel Density Estimation** to find the relationship of crash density with land use.

-**Correlation Matrix analysis** among the population, No. of accidents on those wards and area.

-**Understanding zoning character** of the most vulnerable wards.

-**Multinomial Logistic Regression** to understand the impacts of built environment factors on accident severity.

Correlation Matrix & NKDE Findings-

- Ward population density and No. of Accidents- **r = .34 (P-0.00)**, Area and No. of accidents- **r = .54 (P-0.00)**
- Vulnerable wards (Township Equivalent) **-1,17,19,37,39,40,84**.
- Mixed **(Commercial Educational, Commercial Residential)** Zoning.

Multinomial Logistic Regression Model

Note- Total Observations=2716, chi-square value =1362.062 (df 42), Likelihood Ratio=1044.669 (df 42) & Pseudo R=.37.

			Death/Fatal Accident		Extensive or Minor	
Independent Variables	**Category**	**Reference Category**	**Sig.**	**Exp(B)**	**Sig.**	**Exp(B)**
Type of Intersection	No Intersection	Railway Crossing, Roundabout or Staggered	0.000	2.057	0.000	1.174
	3-Way/ T junction		0.003	2.341	0.001	1.022
	4-way		0.281	1.821	0.628	1.280
Traffic Control System	Uncontrolled	Police and Traffic Signal Controlled	0.001	1.577	0.001	1.096
	Police Controlled		0.605	0.750	0.000	0.795
	Traffic Signal Controlled		0.003	1.427	0.687	1.320
	Median & Pedestrian Crossing		0.340	2.564	0.524	1.866
Type of Collision	Pedestrian Collision	Striking Something beside, on or with a standing car	0.000	11.125	0.770	9.788
	Rear-End Collision		0.000	4.183	0.000	2.920
	Head on Collision		0.000	5.153	0.001	3.630
	Right Angle, Rollovers or Side Collision		0.001	3.385	0.003	2.413
Direction of the Traffic Flow	One Way	Two Way	0.003	1.831	0.003	2.141
Presence of Road Divider	Exists	Does Not Exist	0.000	0.147	0.000	0.138
Condition of the Weather	Good	Foggy or Rainy	0.969	0.341	0.971	0.744
Lighting Condition	Day time	Night Time (With or Without Traffic Light)	0.002	0.699	0.002	1.041
Geomatric Description of the Road	Straight & Plain	Peak or Slope	0.646	0.567	0.428	0.387
	Curvy & Sloppy		0.587	0.489	0.098	0.112
Condition of the Top Layer of the Road	Dry	Wet & Muddy	0.619	1.835	0.612	0.421
General Observation of the condition of the Road	Good	Rough and Under Construction	0.301	0.311	0.342	0.522
Road Classification	City & Feeder Road	National & Regional Highway	0.000	0.439	0.002	0.851
Road Type	Normal	Bridge & Speed Breaker	0.641	2.894	0.000	2.830

Conclusion

- Uniform, clustered accident severity points.
- Accident severities have relationship with built environment factors.
- Land use, population have relationship with accident frequencies.

Selected References

Anderson, T.K., 2009. Kernel density estimation and K-means clustering to profile road accident hot spots. Accidental Analysis & Prevention 41, 359–364.

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Lord, D., Mannering, F., 2010. The statistical analysis of crash-frequency data: a review and assessment of methodological alternatives. Transportation Research Part A 44 (5), pp. 291–305.