7 SRF international Workshop Presentation

Poster Presentation - Key Performance Indicators for Sustainable Urban Goods Distribution: Case of Jaipur City India

1. Key performance indicators (KPI) are essential and essential for diagnosis, simulation, and decision-making in urban freight sector
2. The hypothesis for this research was to evaluate the weights of individual KPI, which are assumed to vary across different commodities distribution
3. Analytic Hierarchy Process (AHP) techniques have used to evaluate KPI weights
4. The criteria used for KPI selection are based on four domains (1) economic indicators (2) social indicators (3) externalities indicators and (4) logistics performance indicators from literature.
5. This paper is based on primary face to face pen and paper-pencil survey with an expert group composed of shippers, transporters and social experts

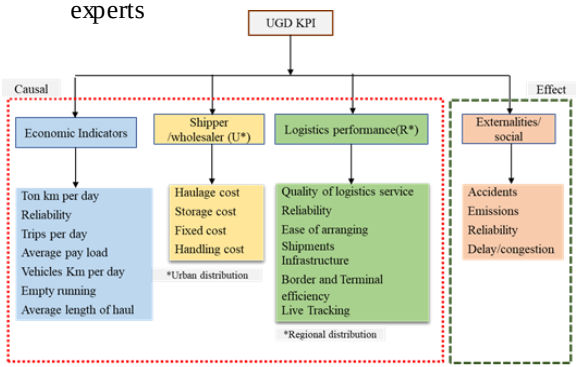

Fig1. KPI selected for stakeholders

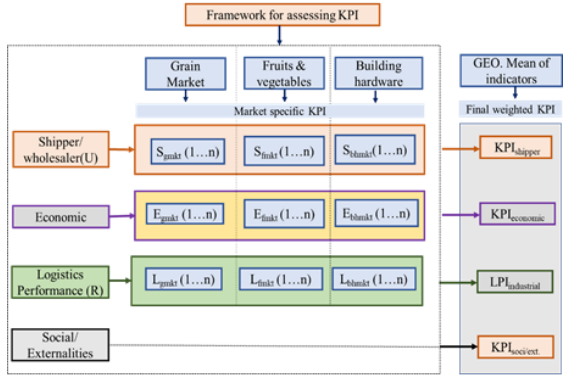

Fig2. Research framework

Table 1. Stakeholders sample size

S.No.	Market	Sample size
1	Fruits & vegetable wholesalers	22
2	Grain market wholesalers	21
3	Building material & hardware wholesalers	21
4	Transport operators	27
5	VKI industrial area	20
6	Social experts and academicians	19

1. AHP is a multicriteria decision-making technique that can help to express the general decision operations.

- Jaipur city extends to an area of 2939 sq.km.
- The decadal growth rate of Jaipur city is +35%. The gross population density of Jaipur is 64 PPH, and the workforce participation rate 34.7% .
- As per Jaipur master plan of year 2011 residential land use constitutes 44.8% (13825 ha), commercial 6.7% (2064 ha), industrial 6% (1862 ha), governmental 2% (602 ha), mixed land use 3.3% (1034 ha), public & semi-public 10.5% (3241 ha), recreational 11.3% (3461 ha) and circulation 15.4 % (4741 ha).

Table 2. Descriptive Statistics of freight handling areas

Freight generating areas		Tons handled Weekly/est.	Shipment freq. Weekly/est.
Aatish Market (Building Hardware & material)	N	21	21
	Mean	17.05	8.43
	Median	11.00	7.00
	Std. Deviation	14.041	5.912
Grain Market (NH-11)	N	21	21
	Mean	14.76	13.24
	Median	16.00	13.00
	Std. Deviation	5.61	4.51
Muhana Mandi (fruits & vegetables)	N	22	22
	Mean	23.41	18.09
	Median	17.50	19.50
	Std. Deviation	11.76	4.57
VKI (industrial products)	N	20	20
	Mean	565.70	37.90
	Median	536.50	36.00
	Std. Deviation	252.29	16.83

Table 3. Descriptive Statistics of transport operators (VKT/day)

Vehicle Type	Mean	Median	Std. Dev.
3W-CV	59.56	60.00	15.05
HCV	360.00	350.00	114.01
LCV	71.00	70.00	14.31
4W-CV	62.75	65.00	18.20
Total	118.26	70.00	126.48

Table 4. Social & Externalities indicators – AHP Weights

KPI	AHP Rating	
	Geometric Mean weightage	In (%)
Accidents	0.46	46%
Emissions	0.19	19%
Delay	0.13	13%
Congestion	0.17	17%

Table 5. Logistic performance indicators

LPI	AHP Rating	
	Geometric Mean of weights	In (%)
Border Efficiency	0.09	9%
Infrastructure	0.13	13%
Ease of arranging shipment	0.15	15%
Quality of logistics service	0.23	23%
Reliability	0.23	23%
Live Tracking	0.06	6%

Table 6. Shipper (wholesalers) specific indicators AHP weights

KPI	Grain market	Fruits & vegetable market	Building Hardware market	Overall AHP Rating	
				Average weights	In (%)
Haulage cost	0.37	0.30	0.35	0.34	34%
Handling cost	0.10	0.04	0.05	0.06	6%
Fixed cost	0.22	0.21	0.18	0.20	20%
Storage cost	0.17	0.44	0.46	0.33	33%

Table 7. Economic indicators –AHP Weights

KPI	Grain market	Fruits & vegetable market	Building Hardware market	AHP Rating	
				Average weights	In (%)
VKT	0.08	0.13	0.09	0.10	10%
TKT	0.12	0.26	0.27	0.20	20%
Reliability	0.25	0.35	0.12	0.22	22%
Avg. length of haul	0.08	0.04	0.06	0.06	6%
Avg payload	0.07	0.10	0.13	0.10	10%
Empty running	0.28	0.04	0.07	0.09	9%
Trips per day	0.12	0.07	0.14	0.11	11%

Conclusions

1) It is observed that economic indicators important for fleet operators are reliability in goods delivery by 22%, followed by TKT by 20%, while the average haulage length indicator is least important (6%).
2) For shipper specific KPI in urban goods distribution, it is that Storage cost and haulage costs of goods have almost similar weightage of 33% and 34% respectively while handling cost has minimum weightage of 6%. Policy intervention, which can enhance the load consolidation and haulage cost of goods have a direct implication on the efficiency of goods distribution.
3) In the case of logistics performance indicators, it is observed that the quality of logistics services and reliability of delivering goods have similar weights of 23% each, and they are the critical decision factors in efficiency, while live tracking of goods movement indicator is least important with 6% weightage only.
4) It is observed that Accidents and fatalities are the primary cause of concerns, which affects 46% of issues in goods distribution, followed by externalities by 19%. Freight transport policies need to be more oriented and focused on minimizing externalities and accidents.

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