

ASSESSMENT OF SAFETY SCENARIO OF PEDESTRIAN INFRASTRUCTURE FOR PATNA

JIVESH UJJWAL

DR. RANJA BANDYOPADHYAYA



NATIONAL INSTITUTE OF TECHNOLOGY PATNA

2 PRESENTATION OUTLINE

NEED FOR THE STUDY

OBJECTIVE

DATA REQUIRED

METHODOLOGY

RESULTS

CONCLUSIONS



TIPSE 2019 NEED FOR THE STUDY

3

- Walking is an integral part of any travel by public transport facility
- People take walking trips for recreation and health benefits



Ideal



Existing

NEED FOR THE STUDY

4

- Available footpath is not usable forcing pedestrians to walk on carriageway – with high speed vehicles
- It is a major safety hazard for the pedestrians – Increasing pedestrian crashes



TIPCE 2019

OBJECTIVE:

5

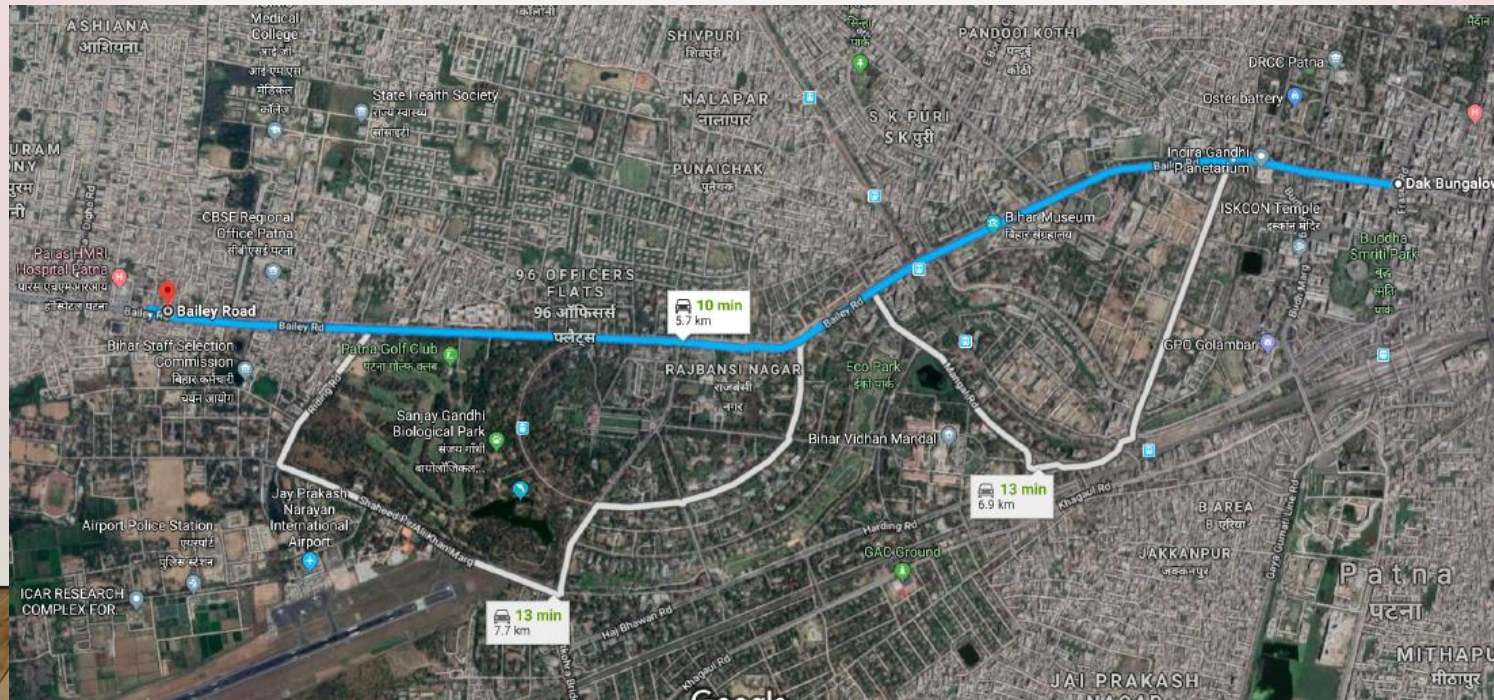
1/8/2019



-
- To assess the present pedestrian infrastructure scenario of Patna in terms of their availability and usability.
 - To understand the pedestrians perceived comparative importance of various parameters of pedestrian infrastructure facility.
 - To assess the perceived walkability index of pedestrian infrastructure facility and variability of perception among different age groups.

6

- Bailey road from *Shaguna More* to *Dak Bunglow Chauraha*.



METHODOLOGY

7

Identification of important walkability parameters

- Comparative importance Survey
- AHP to assess factor weightage

Assessment of pedestrian perceived walkability index

- Walkability perception study
- Calculation of walkability index using AHP criteria weights

Infrastructure Survey to assess stretch wise walkability

- Survey segments
- Calculation of walkability considering equal weightage of parameters



8

Pedestrian Infrastructure Survey

Comparative Importance Survey

Pedestrian Perception Survey

PEDESTRIAN SURVEY PARAMETERS

1/8/2019



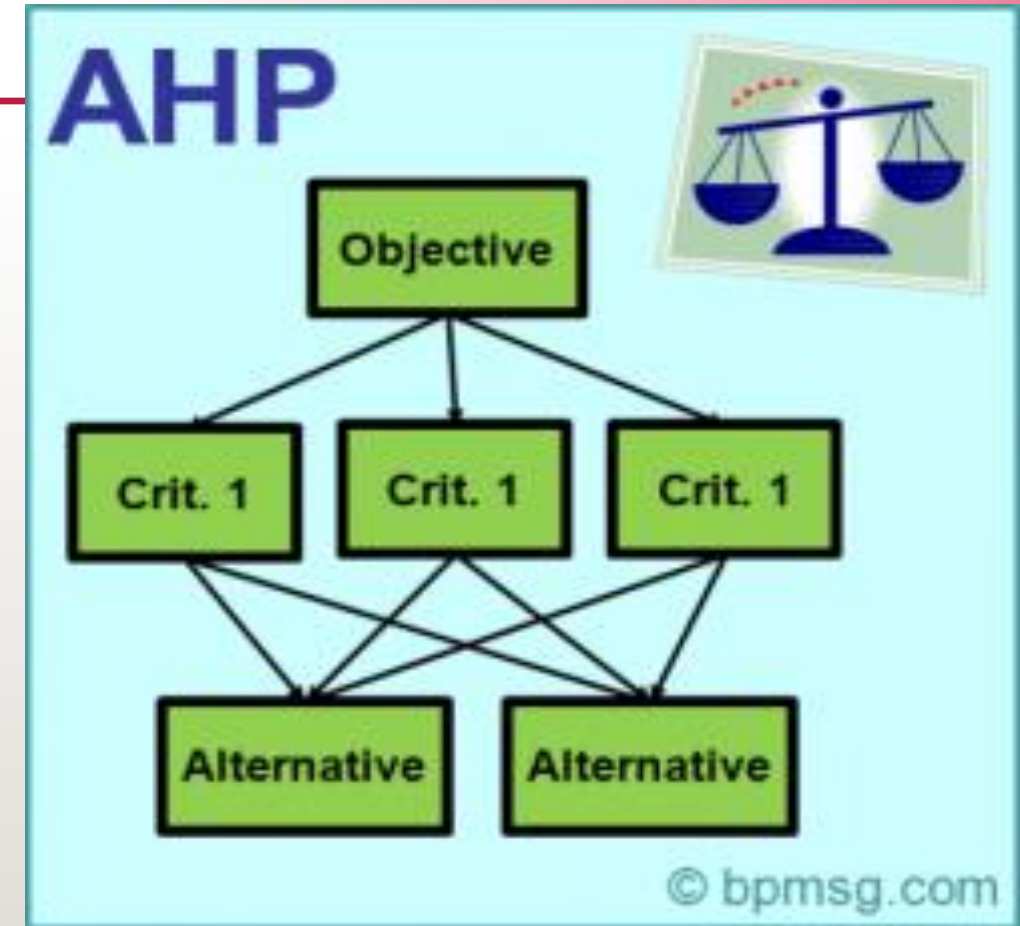
9

Parameters	Parameter Description
AWI	Availability of proper walking infrastructure
AFP	Accessibility to footpath
FPW	Footpath width
CH	Frequent change of footpath height
AR	Presence of access ramp
SQ	Surface quality of footpath
NL	Night time lighting condition
CL	Cleanliness of footpath
SH	Availability of shade
EN	Walking path encroachment or obstruction
MB	Motorist driving behaviour
S	Safety (in terms of chance of accident)
CR	Availability of pedestrian Crossings
MS	...

10 ANALYTIC HIERARCHY PROCESS (AHP)

- AHP is used for deciding weightage of different parameter based on importance survey based on scale of relative importance.

Intensity of importance	Definition	Explanation
1	Equal importance	Two factors contribute equally to the objective
3	Somewhat more important	Experience and judgement slightly favour one over the other.
5	Much more important	Experience and judgement strongly favour one over the other.
7	Very much more important	Experience and judgement very strongly favour one over the other. Its importance is demonstrated in practice.
9	Absolutely more important.	The evidence favouring one over the other is of the highest possible validity.
2,4,6,8	Intermediate values	When compromise is needed



AHP – COMPARATIVE IMPORTANCE MATRIX

	AWI	AFP	FPW	CH	AR	SQ	NL	CL	SH	EN	MB	S	CR	NS
AWI	1	9	9	9	9	7	5	5	9	3	9	1	5	3
AFP	1/9	1	1	3	3	1/3	1/5	1/5	3	3	1/5	1/9	1/5	1/7
FPW	1/9	1	1	3	3	1/3	1/5	1/5	3	3	1/5	1/9	1/5	1/7
CH	1/9	1/3	1/3	1	1/3	1/5	1/7	1/7	1/3	1	1/7	1/9	1/7	1/9
AR	1/9	1/3	1/3	3	1	1/3	1/7	1/5	1	3	1/7	1/9	1/5	1/7
SQ	1/7	3	3	5	3	1	1/5	1/3	3	5	1/5	1/7	1/3	1/5
NL	1/5	5	5	7	7	5	1	3	7	7	1	1/5	3	1/3
CL	1/5	5	5	7	5	3	1/3	1	5	7	1/3	1/5	1	1/3
SH	1/9	1/3	1/3	3	1	1/3	1/7	1/5	1	3	1/7	1/9	1/5	1/7
EN	1/3	1/3	1/3	1	1/3	1/5	1/7	1/7	1/3	1	1/7	1/9	1/7	1/9
MB	1/9	5	5	7	7	5	1	3	7	7	1	1/5	3	1/3
S	1	9	9	9	9	7	5	5	9	9	5	1	5	3
CR	1/5	5	5	7	5	3	1/3	1	5	7	1/3	1/5	1	1/3
NS	1/3	7	7	9	7	5	3	3	7	9	3	1/3	3	1



12 AHP – COMPARATIVE IMPORTANCE MATRIX

Parameters	Criteria Weights
AWI	0.213864
AFP	0.024388
FPW	0.024388
CH	0.010924
AR	0.017385
SQ	0.037665
NL	0.09044
CL	0.064087
SH	0.017385
EN	0.014818
MB	0.088882
S	0.206456
CR	0.064087
NS	0.125234

- Consistency Index (CI) 0.15
- Index of Consistency (IC): 1.57
- Consistency Ratio (CR): $CI/IC = 0.09$ (9%)

Inconsistency of 10% or less implies that the adjustment is small as compared to the actual values – Predictions are trustworthy

IMPORTANT FACTORS – PEDESTRIAN PERCEPTION

TIPSE 2019

1/8/2019



13

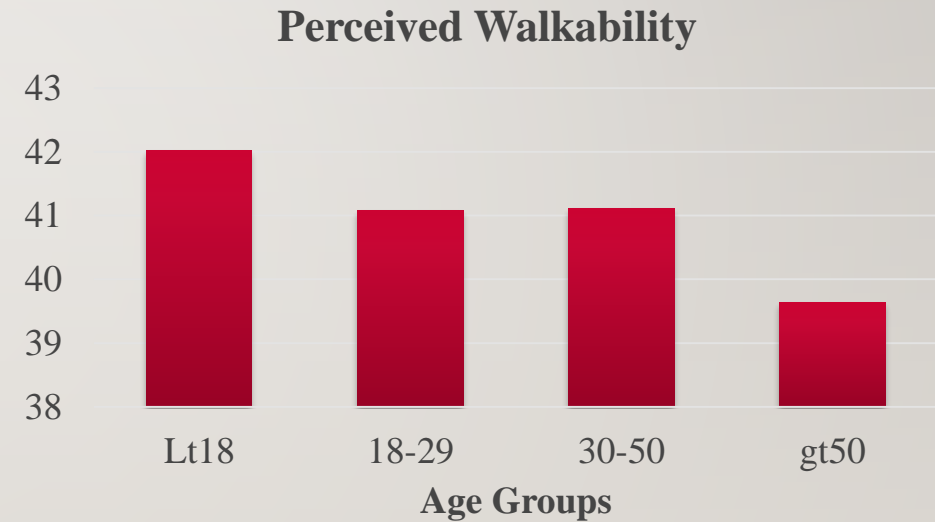
Parameters	Parameter Description
AWI	Availability of proper walking infrastructure
NL	Night time lighting condition
CL	Cleanliness of footpath
MB	Motorist driving behavior
S	Safety (in terms of chance of accident)
CR	Availability of pedestrian Crossings
NS	Security during walking



PEDESTRIAN PERCEPTION SURVEY

14

- Pedestrian Perceived walkability for the major arterial in Patna considering infrastructure issues, safety and security perception is quite low (less than 50%)
- The walkability perception reduces with age



INFRASTRUCTURE ASSESSMENT (SURVEY)

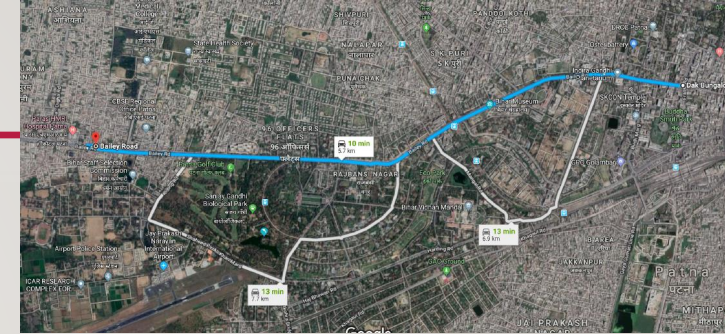
15

- Survey is done along the Bailey road for availability of infrastructure segments (stretch divided into 10 segments)

Parameter	Description
Availability of walking path	Taken as percentage length of total stretch
Length of footpath encroached	Taken as percentage length of total stretch
Designated pedestrian at grade crossings	Average distance between crossings
Average width of footpath	Variation from maximum width (2.5m)
Type of surface of footpath & cleanliness	Taken in 0 to 1 scale (poor to good)
No of height changes per km	Average distance between height changes
Night time lighting condition	Length having proper lighting

INFRASTRUCTURE ASSESSMENT (SURVEY)

16



- Survey is done along the Bailey road for availability of infrastructure segments (stretch divided into 10 segments)

Parameters/Stretch	Abbreviation	1	2	3	4	5	6	7	8	9	10
Availability of walking path	P1	70%	60%	30%	30%	30%	60%	70%	40%	70%	65%
Length of footpath encroached	P2	15%	25%	60%	60%	70%	80%	80%	30%	80%	70%
Designated pedestrian at grade crossings	P3	250	200	500	333.3	250	200	333.3	500	500	200
Average width of footpath	P4	1.8	1.8	2	2.5	2	2	2	1.5	1.5	2
Type of surface of footpath & cleanliness	P5	0.7	0.6	0.3	0.3	0.3	0.6	0.7	0.4	0.7	0.65
No of height changes per km	P6	166.6	125	111.1	90.9	166.6	125	125	166.6	250	166.6
Night time lighting condition	P7	60%	50%	80%	90%	90%	80%	70%	70%	60%	70%

INFRASTRUCTURE ASSESSMENT (WALKABILITY)

17

- Calculated by weighted average of percentage of infrastructure facility

Segments	1	2	3	4	5	6	7	8	9	10
Walkability	53.1	53.6	42.9	41.1	53.3	59.5	55.2	49.2	65.4	61.1

$$walkability (\%) = \frac{P1 + P2 + (\frac{200}{P3} \times 100) + (\frac{2.5}{P4} \times 100) + P5 \times 100 + P6/2.5 + P7}{7}$$

- Perceived and calculated walkability vary but variation is not much
- Critical stretches needing immediate attention is identified
- This stretches 3 & 4 is near Patna zoo and attracts many pedestrians



CONCLUDING REMARKS

TIRCE 2019

1/8/2019



18

- While assessing pedestrian infrastructure pedestrians value the safety, security and availability of proper infrastructure
- Cleanliness of the facility and night time lighting condition is also considered important
- Walking path encroachment, frequent footpath height changes are not given importance



19

THANK
YOU

