

Dovetailing Smart Streets

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With the launch of Smart Cities initiative, projects of varied nature leveraging technology have been conceptualized and planned for implementation across the country. Smart streets is one such measure which is common amongst the projects underway. There are several measures planned for implementation; this paper looks at major ones and their likely impact once these are implemented within a stretch in a planned way.

The first and the foremost requirement for such a project is to understand the customer for such initiatives i.e. end users. If the requirements of these end users i.e. “Voice of Customer” get translated on ground with an initiative, it can bring in the transformation which projects within Smart Cities initiatives intend to achieve.

For an initiative like smart streets, the customers are as listed below

- Citizens using the streets.
 - Driving through street stretch.
 - Parking vehicles and using street as pedestrians.
 - Purely pedestrian.
- Shopkeepers / Showroom along the street.
- Street vendors.
- Infrastructure maintenance staff (electric / telecom /water / sewer / storm water lines)
- Buses & commercial Vehicles.
- Bus stops & pavement area /advertisers.
- Parking lot users for commercial areas /hospitals/Nursing homes on street stretch

In order to make the usage of the street segments pleasant for all these users; some specific measures are needed, which become a part of “smart offerings” of the street stretch. This papers explores some of these.

The users of the street as mentioned above visualize the smart street project with hope to get a pleasant experience on those for the time they spend there. End users and the business group users both have expectations. In event the end user expectations and project provisions have a synergy the initiative becomes a success.

Smart Street – Case of Nagpur

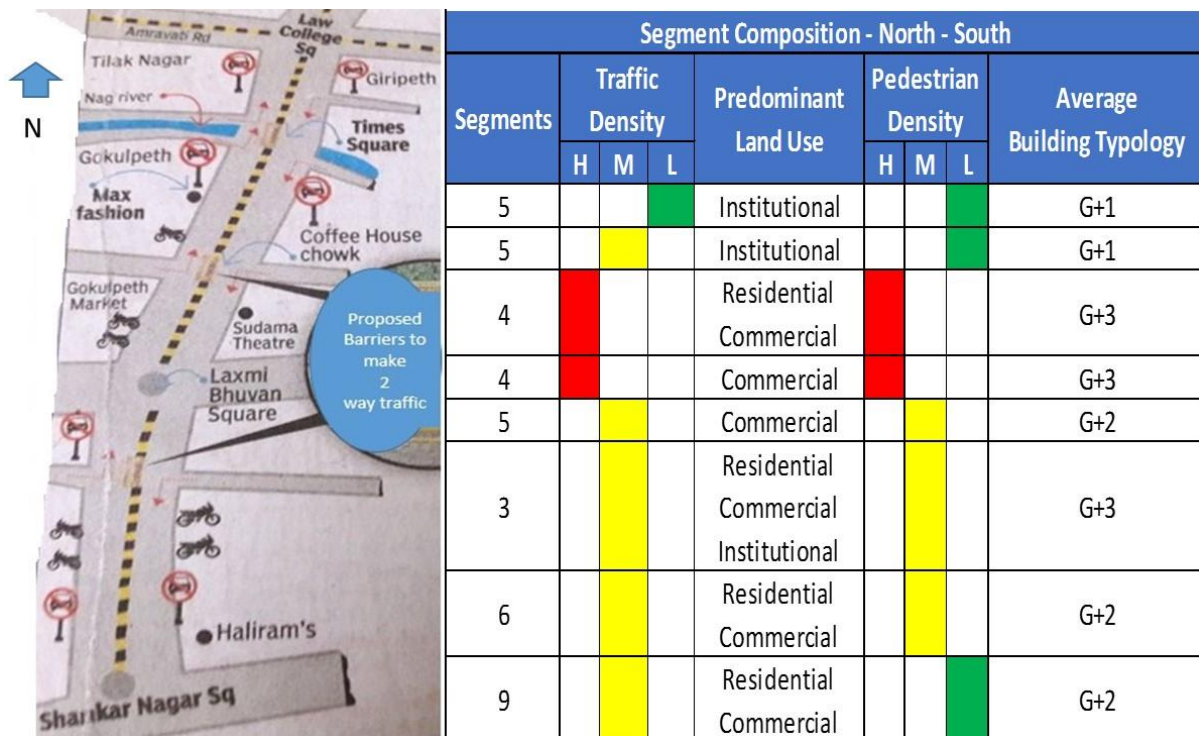
The City of Nagpur is one amongst first 100 cities in currently on going Smart Cities program in the country. The Nagpur Municipal Corporation has planned a 6.1 km stretch of a road in western part of city to be developed as “Smart Street”. The selected stretch passes through a mix of built-up spaces along the route comprising of residential / commercial /Institutional / recreational / entertainment usage to name a few. Such a mix generates a heterogeneous traffic mix within the segments of roads that falls within this stretch. The road stretch also acts as a route to the users who pass this stretch on way to their work place / residences. Table 1 outlines the road components along the smart street planned at Nagpur.

Table 1- Road stretches along Smart Street.

Smart Street Road Stretches	
Junctions with traffic signals	7
Cross roads without Signal	12
Lanes merging from Left / right(T Junctions)	16
Total Road Segments	41

The street segments described above have got a mix of traffic that gets generated. The traffic variations are also seen in particular hours of day, particular weekdays, festival days to name a few parameters. Being designated as Smart Street there is need to provide optimal provisions to fulfil the end user desires along this delineated road stretch which intends to distinguish it from other roads within city. Some of the segments constitute a land use along them which generates both pedestrian and vehicular traffic simultaneously. Illustration 1 below provides a snapshot of the smart street segments on above parameters.

Illustration 1: Smart Street Features



As seen in Illustration 1 above there are approximately. 20% of overall segments in the whole street which have got high degree of activity which induces the traffic leading to congestions. In event the duration of this congestion is longer the other segments along the street in general experience a spillover effect leading to overall traffic slowdown along stretch as a whole. The authorities have introduced forceful restrictions for 4 wheeler parking in these stretches along with blocking few 4 arm road junctions and converting them to T-Junctions to ease the traffic flow. Graphic in illustration 1 above shows these segments and corresponding usage in red color at row 3,4 in therein..

Identification of Smart Street Elements

The description above given for case of Nagpur holds well for other cities also needless to say other such roads within same city also face similar situations. The plans for first 20 smart cities constitute elements related to smart streets like smart parking, smart street lighting, Traffic monitoring through cctv to name a few. For success of initiatives like this one, there is a need to list out the end user problems and expectations for comfortable use of streets in order to plan for appropriate solutions. Table 2 below lists out some of these and the potential planning parameters evolving from the same to dovetail the solutions.

Table 2: Smart Street: End user expectations and Solution parameters.

End User	Expectation	Planning Parameters Evolving
Pass through users	Minimal signal wait time Steady speed drive	1. Control of vehicle count on heavy stretches.
Shopkeepers	Easy access to shop	

End User	Expectation	Planning Parameters Evolving
	Ease of getting stock from go downs	2. Information disseminations mechanisms
Pedestrians	Walking comfort	3. Emergency vehicle priority.
	Ease of crossing roads	4. Parking availability indicators.
	Bus stops approachable.	5. Signage's
	Directional signage for guidance	6. Geo referencing key landmarks like ATMs, Medical Shops etc.\
	Street furniture	7. Provision of garbage bins, Wi-Fi points, pay phone points,
Shoppers	Ease to park	8. Delineation of right of way elements.
	Minimal road congestion	9. Facility to book parking slots.
	Directional signage for guidance	10. Street maintenance.
Nursing Homes	Ambulance parking	11. Lift provision in nursing homes.
	Patient parking near clinic	12. Grouping of street vendors at specific locations.
Infrastructure maintenance	Access to manhole covers	
	Access to water/ power / telecom lines	

Solutions for Smart Streets.

The case of Nagpur Smart street points to end user parameter based solutions as need of the place. With advent of technology there are several possible solutions, however locating few selectively can help the administration do a balancing act to meet their as well as citizen expectations. In case of Nagpur project we see out of 41 road segments 8 segments do call for some intervention to regulate traffic, these are potentially needed at 3 out of 7 junctions which have traffic signals.

The information sharing forms one of main success factors on agility in infrastructure projects like the one under reference. The facilities like ATMs, Medical Shops, pathology labs, Nursing homes need to get distinguished on such road segments for easy accessibility. The coverage of mobile phones make these accessible with significant ease, if location information is mapped. The assistance of pedestrians, too, is point of consideration. A smart card or a **"City Card"** to use on shuttle bus service in congested segments shall encourage users to park vehicles at a distance and use the alternative transport. The card can become **souvenir for the city** and banks and other establishments too would like to join in promoting the same as cash card. Such options make these even more user friendly for parking across city, bus service at city, shopping / eateries considering the user segments on such road stretches.

Street maintenance too is of utmost importance as such core infrastructure elements like water / sewer / power/telecom lines form integral part. These need mapping and access for maintenance to minimize outages. The forced measures also need planning as capacity thresholds for these segments need monitoring. Retractable bollards and smart sensors along road junctions can help to watch extent of congestion with vehicle volume information on road stretches. Use of these before signal can force stop further entry of vehicles or increase in green time of signal real-time in particular section of streets and guiding the traffic to adjacent lanes to ease the movement.

The locations of nursing homes / diagnostic centers / food plazas are key services where circulation facilitation is a key requirement. The abutting road areas need designated parking spaces exclusive for users like patients visiting hospitals. The shoulders along these road if paved with different color can distinguish these from other spaces making it easy for users to abide by the regulations like these. The information signage's form important guiding aid to users , the real-time information displays listing vacant parking lots and the congestion in segments ahead potentially helps the users to decide to take alternative routes or use available parking close by.

These smart street solutions can be categorized under following types with some of the potential works packages as listed below. Illustration 2 shows some of these graphically.

1. Traffic control solutions

- Vehicle density sensing mechanism at junctions
- Smart road marking to gauge street space availability Vs capacity with respect to flow.
- Forced mechanism like bollards to restrict movement during specific times
- Information displays like – parking spaces availability

2. Information Signage’s

- Locations of ATMs, Labs, etc. with geo referencing for mobile based access.
- Restrooms , bus stop locations

3. Right of way

- Demarcation of lanes, parking bays and pedestrian walk areas with colors.
- Provision of street furniture, use of solar lights, pezo electric cells on walkways.
- Clubbing of street vendors at select locations like bus stops.

4. Building regulation reforms

- Built up spaces used for medical facilities need designated patient parking areas
- Buildings housing nursing homes need to have elevators.

Illustration 2: Potential Smart Street Solutions



Conclusions

In recent times we have seen that the solutions on offer vary significantly in terms of value added features and mechanisms of information sharing. One key aspect in all “smart” initiatives is use of technology for provision of improved service to end user. It’s of utmost importance to gauge the requirement of the customers for such projects and provide the best suited solution which gets used by citizen with readiness to pay for the services it offers to establish the viability for initiatives like “Smart Streets”.