

Prudent Design of Road Catering to Practical Nuisances

Saumil Barolia ,Sunny Goklani

School of Building Science and Technology, CEPT University, Kasturbhai Lalbhai Campus, Navrangpura, Ahmedabad, India

sbarolia@yahoo.com, india.sun999@gmail.com

Abstract—Functionality of the commuting infrastructure systems well defines the character of a city. Inefficient road design leads to unorganized traffic movement and eventually accidents. Extreme cases facing these problems cannot be resolved by implementing traditional solutions like removing encroachments or banning vehicular traffic, as these completely dissolve the philosophy of the road. This calls for an innovative yet feasible approach. This paper caters this issue by analysing practical problems in a holistic manner, thereby suggesting self sustaining tools, which can replicate themselves globally.

Keywords: Nuisance, Hazard, sustainable, Integrated design.

I. INTRODUCTION

Road or any form of infrastructure sustains when the people using it are safe and secure. The accountability for the same shall be in the hands of the designer and not the users. The road design shall stand true for every user, who has the freedom to utilize it in the manner he wishes to. This philosophy can be potentially beneficial while designing new roads, but is vice versa in case of existing roads.

Indian roads, especially the ones in CBD areas face tremendous traffic problems, which arise due to inefficient road design and ad hoc traffic management. Conventional approaches have been applied and failed as a result of their myopic classification of problems. It is interesting to involve hawkers in the solution system and perceive how innovative sustainable modules can be designed to troubleshoot specific set of problems and bring an intelligent environment friendly solution.

This approach includes perceived nuisances viz. hawkers in the road design itself and creates a safe commuting atmosphere without sacrificing the cultural essence of the road system.

A. Road Systems and hazards:

Broadly classifying, an Indian city road consists existence of three mutually dependent systems, namely:

1. Vehicular movement.
2. People inhabiting along the roads (shopkeepers, servants, hawkers, etc).
3. Pedestrians who keep the second system running (customers).

Each one of them are subjected to their own hazards. An ideal road will incorporate factors responsible for all these hazards in its design.

Table I

IDENTIFICATION OF INDIVIDUAL SYSTEM HAZARDS

HAZARDS		
Vehicular movement	Roadside temperory inhabitants	Pedestrains
<i>Pedestrians</i>	<i>Irrational movement of vehicles</i>	<i>Motorists</i>
<i>Cyclists</i>	<i>Hawkers</i>	<i>Condition of footpath/walkways</i>
<i>Slow moving vehicles</i>	<i>Anti-social activities</i>	<i>Non enforcement of traffic rules</i>
<i>Bullock cart/cattle movement</i>	<i>Illegal parking (blocking interface between the pedestrian and the store)</i>	<i>Junctions</i>
<i>Pavement quality</i>	<i>Filthy environment</i>	<i>Inadequate width of walking paths</i>
<i>Junctions</i>	<i>Noise as well as air pollution</i>	<i>Irregular parking</i>
<i>Shop extensions</i>	<i>Orientation w.r.t sun rays</i>	<i>Encroachments</i>
<i>Hawkers</i>	<i>Authority misuse</i>	<i>Crossing the road</i>

Complexity of Hazards:

It has been found that hazards are interrelated. Systems and mutual hazards form a vicious circle making it is impossible to incorporate all the hazards and their solutions in a single road system. Hence, the solution lies in identifying nuisances, that are found almost everywhere in any Indian city.

The prime nuisances considered, in order to keep the orientation very specific, are:

1. Pedestrians
2. Cyclists
3. Hawkers

As per statistics ^[1], it is clear that considered nuisances are not a cause of the problem, rather are on the receiving end of it.

Table II

FAULT ANALYSIS	
CAETEGORY RESPONSE	% OF FAULTS / INCIDENTS
<i>Driver</i>	<i>77.91</i>
<i>Design</i>	<i>17.4</i>
<i>Mechanical defect in vehicles</i>	<i>1.4</i>
<i>Bad roads</i>	<i>1.2</i>
<i>Pedestrians</i>	<i>1.36</i>

Category wise fault analysis

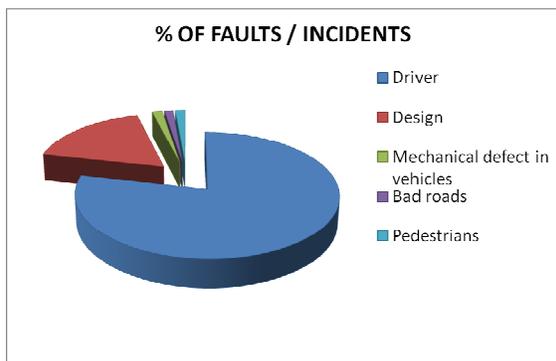


Figure I: Cause of Accidents

At the same time, let us consider their importance, and how if they are a nuisance:

Cyclists, pedestrians and bus traffic attract street hawkers. Therefore, Indian city roads are default natural markets for them. Hence, irrespective of space availability, they will block the road sides to set up their stalls. This completely changes the situation on practical front which was never considered during designing then.

B. Methodology:

The methodology (explained stagewise in Fig II) is developed by identifying intermediate phases needed to be achieved as the process flows towards achieving the final objective. The framework developed for this is as follows:

Phase 1: (Nuisance identification and screening)

The process begins with identification of root causes for the entire nuisance developing on roads. By the end of this phase, the actual nuisances on the road under consideration are identified. This is followed by a detailed analysis on each of these nuisances and thus enlisting them as per their impact and importance in day to day life. The screened nuisances thus generated are worked upon in further steps.

Phase 2: (Developing Solutions)

This phase provides a guide way towards developing solutions to mitigate all the screened nuisances. This includes developing specific solution strategies having feasible options, developing prudence through sustainability considerations and design plan as well as implementation planning.

Phase3: (Implementing developed solutions)

There are three possibilities of implementation, namely, Implementation in form of Guidelines; Implementation in form of Pilot application and/or Implementation in form of long term plan.

An important step here is defining roles and responsibilities to the concerned people, so that a level of accountability is maintained throughout the process.

Implementation in form of Guidelines may consist of developing guidelines for authority and community. The authority may either implement it for its own purpose or can enforce it as a law on the community.

Implementation in form of Pilot application will include a set of applications that are ready applied currently. Prior to application, approvals shall be received form authority as well as community. To start with, site identification would take place for application of idea; to follow, a reconnaissance survey, would accompany details for the detailed design. The survey process shall include Stakeholder survey, hurdles, authorities involved, feasibility and consequences.

The implementation process follows, as the execution of planned designs take place. Normally, processes and projects end here, which is a wrong practice. Instead, the same should continue with constant reviews and evaluation of the implemented project. If the results are found satisfactory then, long term plans should be accelerated and replication of pilot project should be carried out on wider base. If not then serious reviews and corrections are to be incorporated in the pilot application itself and a major feasibility check should be made on long term proposal.

The methodology ends at a review and correction process, which in nature though, is a recurring process.

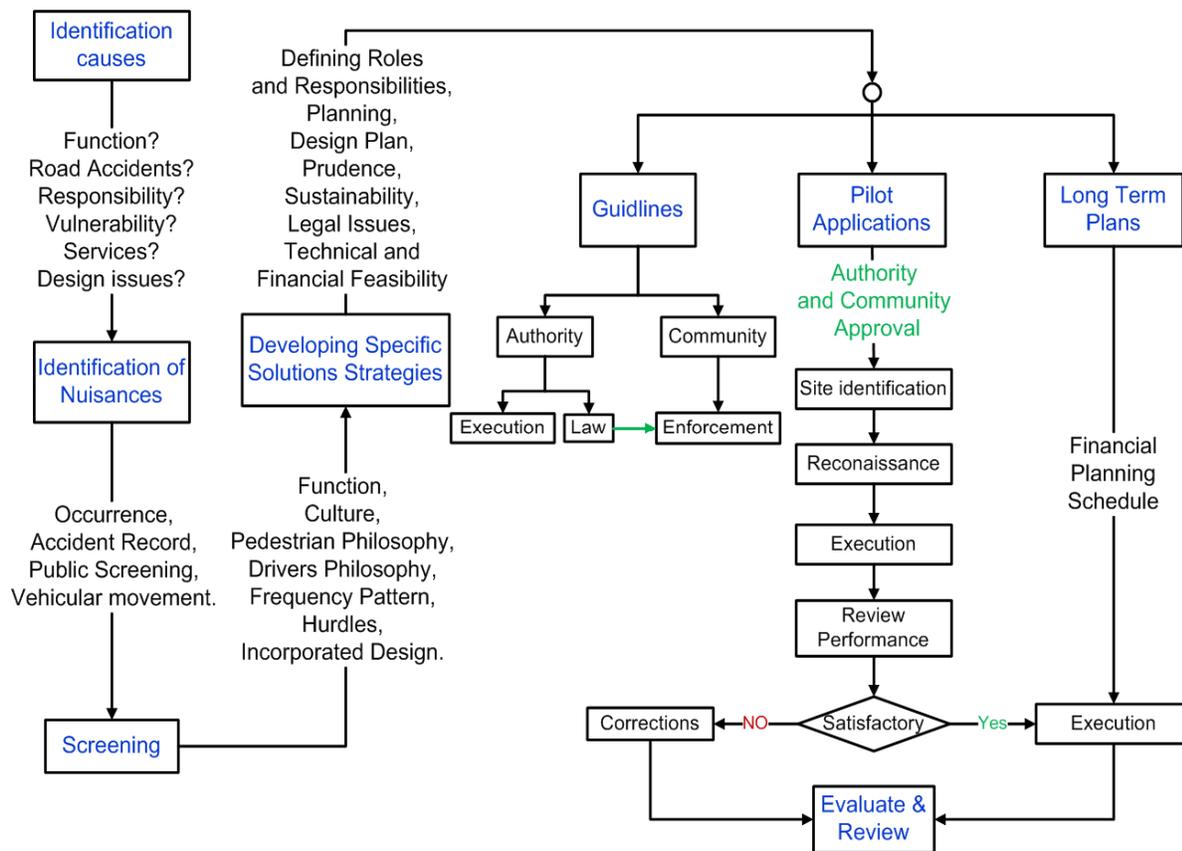


Fig II: Methodology process flow diagram

Case Study:

In order to apply this methodology and make it more pragmatic and specific, the stretch selected for case study is one of the busiest stretches in Ahmedabad city with extremes of considered practical nuisances which is the stretch between Teen Darwaza to Manek Chowk, Length: 400m.

The two sides of the road was divided into Sub stretch 1, From Divergence point (Manek Chowk) to Teen Darwaza and Sub stretch 2 (From Teen Darwaza to Divergence point (Manek Chowk)).

The visit was carried out between 1:30 PM and 5:30 PM (4 hours) which also included walk along the stretch. The study also included interaction with vendors/hawkers, pedestrians and shopkeepers, coupled with our own experiences.

Observations: (Sub Stretch 1)

Items that were mainly sold were bags, shoes, household items, sanitary items, ladies accessories, etc. The major things observed were inappropriate and irregular parking, authority misuse, pavement level differences, and inappropriately designed junctions, advertisement on roads, electrical hazards, and hawker mall. An important observation made that was the density of pedestrians increased on approaching Teen Darwaza.

Observations: (Sub Stretch 2)

Items that were mainly sold were kitchen utensils, surgical equipments, perfumes, crockery, etc. apart from there were banks, restaurants, and stationeries present on this stretch. The major things observed were that this stretch had lesser pedestrian density, the ambient temperature was warm yet comfortable, good pavement quality, inappropriately designed junctions, electrical hazards, irregular cycle parking, etc.

C. Solutions:

As a solution to incorporate practical nuisances, three stages of solutions are suggested, depending upon the support of authorities.

- 1) Providing guidelines
- 2) Pilot Application
- 3) Long term plan

Albeit, selection depends on extent of authority involvement, planning stage for three of them is kept clear.

1) Guidelines:-

No major scope for innovativeness is available under this option as guidelines are meant to be kept very simple and direct, and also much of the work in this field is done in the past.

We suggest following guidelines provided under IRC 103-1988: which include provisions for^[2]:

- Width of sidewalk
- Controlled crossings
- Zebra crossing
- Guardrail
- Grade quality
- Capacity, etc.

Other similar provisions can be referred from Indian road codes and British codes.

2) Pilot Application

Pioneering approach is Proposed under Pilot & Long term Application plans to develop specific solutions for similar problem facing highly dense & pedestrianised city market areas.

Following steps are suggested under Pilot application:

- a) Paint roads: To classify parking for two-wheelers & implementing laws to park in specified allocated areas, streetwise. Severe penalty to be proposed for improper orientation. This will organize the traffic, reduce road space wastage & induce better traffic sense in the user community.
- b) Retrofit capacities: Existing parking facilities, whose inadequacy leads to illegal parking on roads to be retrofitted through construction of multi-level mechanized parking on the same portion of land where ground-parking only exists.

PARCOHUT:

It is a path-breaking concept, as our suggestion could revolutionize the existing system to its optimum activity & capacity in an aesthetic & comfortable manner. It's a one-pack solution, which is applied in a 'module' form and the module can be repeated throughout,(Refer Fig III) irrespective of the stretch-length. A typical module includes Canvas roofing, which encloses the walking space, provides shade to the pedestrian area & keeps temperature cool. Also, this will mark the boundaries for the hawkers, as specific hawker lane will be a part of the module. Moreover, as the major use pattern consists of cycles on the roads, majorly used by workers in shops; the module is equipped with cycle stand at its exterior. Cycles will be parked in an inclined fashion in the cycle-stand, which will also reduce the horizontal road-space. Thus this is a revolutionary module, which when repeated is capable of solving the mammoth problem.

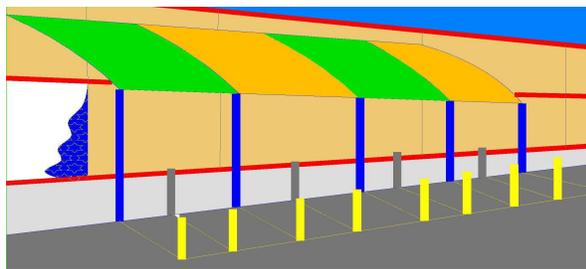


Figure III : Conceptual Sketch of PARCOHUT Module

Advantages:

- ✓ Shaded Walking area
- ✓ Increased walking space
- ✓ Oriented parking
- ✓ Less road-space usage in cycle parking
- ✓ Optimum space utilization

FOLD-HAWK:

It is another such idea which will accompany PARCOHUT, in the hawker lane. Inspiration of the idea is from: Sleeping coaches in Indian railways, which are vertically & horizontally foldable. (Refer Figure IV)

This structure would facilitate accommodating hawkers by selling space to them on running meter basis. This would imply maximum usage of vertical space and thus reducing the horizontal space usage on the hawker lane. Reference: FOLD-HAWK sketch

Advantages:

- ✓ Hawkers incorporated in design
- ✓ One-time income for government
- ✓ Foldable market form
- ✓ Higher width of Pedestrian walkway.

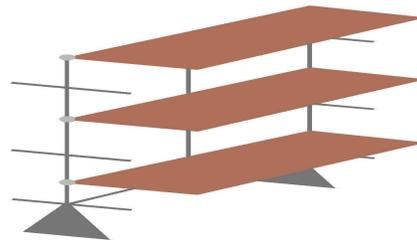


Figure IV : Conceptual Sketch of FOLDHAWK Module

Both PARCOHUT & FOLD-HAWK are structures that are portable & can be shifted in tandem.

3) Long term Plan

Suggested Long term plan requires a couple of things to be assured as pre-requisites:

- i) Multilevel parking to be setup at start & end of the stretch.
- ii) Hawker mall concept, to be appreciated at junctions.

Once these are done, it should be kept in mind that:

- Road should not be designed for two & four wheelers; rather should be designed primarily as a pedestrian-walkway
- Facilitating relocation of shopkeepers while renovation would take place.

Following steps are to be followed in tandem with each other:

1. Three Walkways to be installed post Massive renovation.

2. Massive renovation: Shops on each stretch, on both sides of the road to be reconstructed with G+2 structures instead of standing old & ground structures.
3. Two elevated walkways on each side, arranged at a vertical height separation same as the floor height.
4. Occupation-wise floor differentiation for better oriented & consumer-friendly shopping experience. E.g.: 1st floor on sub stretch 2 to serve only Garments & Utensils.
5. When above step completed on both sides, a 'STREET ROOF' concept can be incorporated, as the warm sunlight of continental climate prevails over the shopping area most of the year.
6. As a consideration for the physically handicapped, in the newly constructed G+2 structures, lift at 100m, i.e. 5 nos. to be provided.
7. Thus, 400 m. long walkways would ease the congestion & pressure on existing road by almost two-thirds.

This would transform the experience on the roadside markets from Unorganized Sector to an organized retail one.

Advantages:

- ✓ Wider walking space
- ✓ Road open for motor vehicles
- ✓ Organized retail experience
- ✓ Economic opportunities
- ✓ Hawkers turning shopkeepers
- ✓ Road design: An All-in-One Solution

Conclusion:

Problems in pedestrianised busy congested market roads can no longer be solved by conventional solutions, which are tried and failed. Rather innovative product design & solutions like these may only be turn out to be solutions of tomorrow. Suggested solutions target root problems and have potential to be applied globally on similar situations successfully.

ACKNOWLEDGMENT

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