

## Optimal Management of Parking Accumulation in Hilly Area

Dr. Umesh Sharma<sup>1</sup>, Dr. S.N. Sachdeva<sup>2</sup>, and Er. Sandeep Singh<sup>3</sup>

<sup>1</sup>Associate Professor, Deptt. Of Civil Engineering, PEC University of Technology, Sector-12, Chandigarh, India

<sup>2</sup>Professor, Civil Engineering Department, National Institute of Technology, Kurukshetra

<sup>3</sup>Research Scholar, Deptt. Of Civil Engineering, PEC University of Technology, Sector-12, Chandigarh, India

**Abstract:** *Parking is a subject of great concern in today's scenario and is an integral part of the transportation policy. Due to the growth in per capita income, the tendency to purchase a private automobiles and their use is causing a concern for parking policy formulation. Even after up-gradation of highways free flow of traffic is not possible, especially in hilly regions. The present work involves the study of parking problem in Sarkaghat town which is a Nagar Panchayat as well as Tehsil Head of Mandi District in Himachal Pradesh. NH - 70 and SH – 19 passes through the heart of the town which provides breakthrough to kangra District via Hamirpur District. With the upturn of vehicle population and addition of educational institutions, the traffic volume has increased and equivalently parking demand. The extensive study was carried out to determine the parking characteristics and the outcomes have been made to ensure a comprehensive solution.*

**Keywords:** *Hilly area, centre of town, crucial parking characteristics and no provision of widening of road.*

### 1. Introduction

Thoughtless parking guidelines have dented the cities, economy, and aesthetics. Management should take reasonable-market charges for on-street/curb parking, utilise the subsequent income to recompense for district public facilities and take away the requirements for off-street parking [1]. TCRP Report 95 (2003) [2], the chapter-18 in this report “Parking Management and Supply” emphasises on how commuters reply to variances in the supply and availability of vehicle parking, with fluctuations that might arise as a result of instable land use patterns, modifications of governing policy or attempts to control the supply of parking. Information on normal baseline parking characteristics is also incorporated. Objectives of Parking Supply Management offers an outline of the prominence of parking supply and availability and the objectives assisted by their management.

Willson and Shoup (1990) [3] have reviewed several empirical studies of how employer paid parking affects employees' travel choice. It was concluded that parking subsidies increase solo driving. It was also found that when parking subsidies were removed, a significant amount of solo drivers shift to carpools and/or transit. The case studies reviewed reveal that ending employer-paid parking reduces the number of solo drivers by between 19 and 81 percent, and reduces the number of autos driven to work by between 15 and 38 percent.

Arnott and Rowse (1999) [4] developed a model which simulate the vacant on-street parking space give the policy recommendation that the per time unit parking fee should be set to reflect the value of the parking congestion externalities. Calthrop and Prost (2004) [5] developed a model, integrating it into a private off-street market, which alters on-street parking policy and uses time restrictions in the place of meter fees. The outcome is that when the off-street market is competitive, on-street fees are more efficient than simply time restrictions. When on-street parking is free, albeit subject to a time restriction, too many drivers choose to engage

in socially wasteful searching for on-street spaces. In contrast, with a meter fee, the relative benefit of parking on-street is reduced, and total search costs can be optimised.

Theoretically, Investigators throughout the world have confronted the parking with altered parameters including size of the city, population density, parking fee, socio-economic situation of the city, central business district (CBD), convenience of modes of transportation, zoning plan and land use and the extent and effect of planning are the major factors which influence the parking characteristics [6]; However the resulting concerns are quite similar.

1. Absenteeism of prearranged/planned parking space results in precious road space is being used for vehicular parking. Obviously, the demand for parking has increased in alarming proportion around the corners of the cities including work/activity centres/ CBD's. In a congested urban area, a considerable fraction of journey time is lost in looking for parking space.

2. Need of Dynamic pricing.

Areas where vehicle owners have no private parkings for their vehicles and where car parking spaces are a scarce commodity, run-off parking often takes place along sections of road, residential streets, foot paths and green verges of the roads which causes frequent traffic jams. This problem is required to be solved proactively by managing on-street parking at prominent places. The following two sub-heading will enlighten the prevailing situation of the study area.

### **1.1 Location of study**

Sarkaghat is town and a Nagar Panchayat in Mandi District in the Indian State of Himachal Pradesh. It is located at 31° – 42' N and 76° – 44' E and has an average elevation of 911 metres. The total population is 78469. It has an area around 130 sq.km.

The geography of the Himachal Pradesh presents considerable challenges to the development of transport infrastructure. Nevertheless state has made significant progress in road connectivity in the last few decades. Himachal Pradesh has the highest road density among all the hill states of India. The present road density of Himachal Pradesh is 40.59 km/Sq.km which is as high as in comparison to India road density i.e 1Km/Sq.km.

Himachal has three airports and only two narrow gauge tracks. So the road remain the main mode of transportation in state.

The exact area of study were: NH – 70 (Kerb Parking), Old Bus Stand Sarkaghat and Hospital Parking

### **1.2 Challenging aspects**

The right of the way of the town street is utilized not only for the movement of the vehicles, but as terminal for them as well. With limited spaces available for parking and increase in parking demand, the motor vehicle transportation scenario in city has been emanating alarming signals as traffic congestion and traffic jams are witnessed on and off the road.

The parking of the vehicles along the curb is not at all solution to the parking issues as the parking demand has gone very high and curb parking is too small to sustain the parking demand. It has been found that, regardless of the width of the street, curb parking reduces its capacity varying from 43 to 47 percent for narrow streets

## **2. Methodology/Data Collection**

The data collection in the field consists following:

### **2.1 Parking Accumulation:**

For all the three locations average of 7-day accumulation study is presented in table – 1.

TABLE I: Accumulation Summary Sheet of NH - 70 (Kerb Parking), Old Bus Stand Sarkaghat and Hospital Parking

Time (1)	Car/Jeep (2)	M. Cycle/ Scooter (3)	Bicycle (4)	Auto-rickshaw/ Cycle rickshaw (5)	Truck/ Tempo (6)	Total (7) = (2+3+4+5+6)	Equivalent PCU's (8)
8:00 – 9:00 am	80	81	27	6	24	218	212
9:00 – 10:00 am	99	130	25	5	20	279	242
10:00 – 11:00 am	80	112	25	3	15	235	196
11:00 – 12:00 pm	51	80	22	2	14	169	146
12:00 – 1:00 pm	60	69	18	3	14	164	149
1:00 – 2:00 pm	70	86	16	4	17	193	176
2:00 – 3:00 pm	76	71	15	2	13	177	159
3:00 – 4:00 pm	66	66	15	4	13	164	149
4:00 – 5:00 pm	63	63	20	4	11	161	139
5:00 – 6:00 pm	61	61	21	2	14	159	141
6:00 – 7:00 pm	74	74	16	3	22	189	162
7:00 – 8:00 pm	58	58	12	4	24	156	146

## 2.2. Parking Duration:

The average parking duration sheet is presented in table – 2.

TABLE II: Average Parking Duration for Car/jeep and Two-wheelers

Parking Duration	Car/Jeep		M. Cycle/ Scooter	
	Volume/Number	Percentile	Volume/Number	Percentile
1 hour	108	36.66	153	39.43
2 hours	89	29.97	101	26.03
< 3hours	47	15.82	63	16.24
>3 hours	53	17.84	71	18.30
<b>Total Vehicles</b>	<b>297</b>		<b>388</b>	
<b>Long Time Parking</b>	<b>53</b>		<b>71</b>	
<b>Short time Parking</b>	<b>244</b>		<b>317</b>	

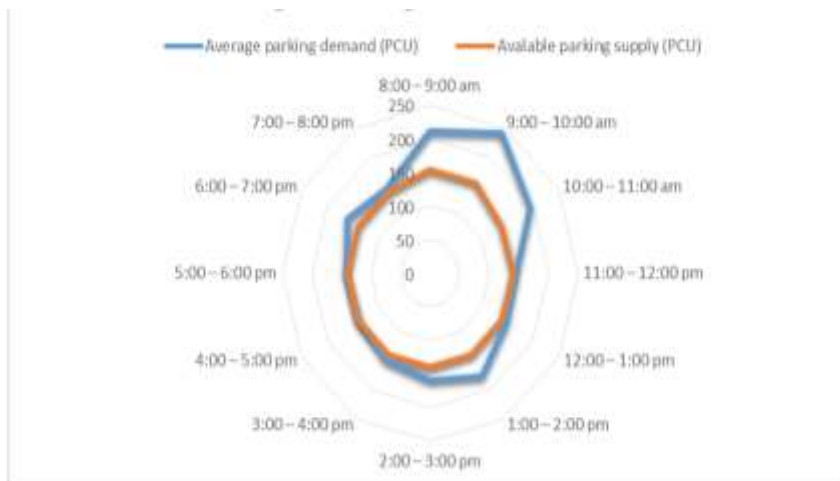


Fig. 1: Parking Accumulation Chart

### 3. Data Analysis

The findings obtained from the data collected in the course of investigation are following:

#### 3.1. Demand

The demand of parking is higher by 173 percent than the available supply. Explained in following;

1. Maximum accumulation of vehicles at NH – 70 (Kerb Parking), Old Bus Stand Sarkaghat and Hospital Parking occurs between 9:00 – 10:00 am with volume of 242 PCU. The figure – 1 will present the rest of the variations of accumulation throughout the day.

2. Parking Supply: taking into account the space required for parking as well as manoeuvring of cars i.e. minimum of 250 sq.ft. (23.25 sqm). The capacity in terms of equivalent car spaces has been worked out for the parking areas.

The total of 140 spaces (in PCU) are available in all of three parking areas.

#### 3.2. Duration

Short time parker are higher by 452 percent than long time parkers; elaborated in table – 2.

### 4. Conclusion and Recommendation

The study was conducted in in the heart of the town as well as peripheral portion. Being a built-up area on the both sides of the road there is no provision of widening of road. Only precautionary measures and dynamic pricing strategies can be taken effectively which shall be helpful in providing smooth flow of traffic without causing much inconvenience to the vehicles. Visitor are unaware about the traffic characteristics as traffic signs are absent.

On the basis of this study, it is recommended that:

1. In the fig. - 2 area marked with red colour a multi-storey car parking i.e. 5 storey (under consideration of town and country planning department) adjoining to sainik rest house can be constructed and utilized with ground floor used as scooter/M. cycle parking.

2. In the fig. – 2 parking lot area marked with orange colour near to tempo/truck union on NH – 70 is to be developed by putting a retaining wall on the back side which will provide an area of 15,000 sq.ft. and is recommended strictly for parking of tempo/truck.

3. In fig. - 2 area marked with blue colour (old bus stand) is recommended to be used partially for car/jeep and scooter/motorcycles.

4. The ground floor of mini-secretariat building can be utilized for car/jeep in block – 1 (5057sq.ft.) and motorcycle/scooter in block – 2 (3315sq.ft)

5. The existing bus stand must be shifted to newly constructed bus stand near Barchwar and this area can be strictly utilized as parking (16,950sq.ft.)

6. In the fig. - 2 the area marked with blue colour adjoining to sub-judge court may be developed as parking by putting a retaining wall on school side (GSSS Sarkaghat) and a road side which leads to Laka village, having area of 2500 sq.ft. should be used for parking.

7. Parking signs to facilitate the user must be installed in the whole town.

8. Dynamic pricing strategies should be opted. Pricing of parking space should base on the availability of space.

9. Shopkeepers/employers/employees should be encouraged/forced to park and rides or park and walk schemes

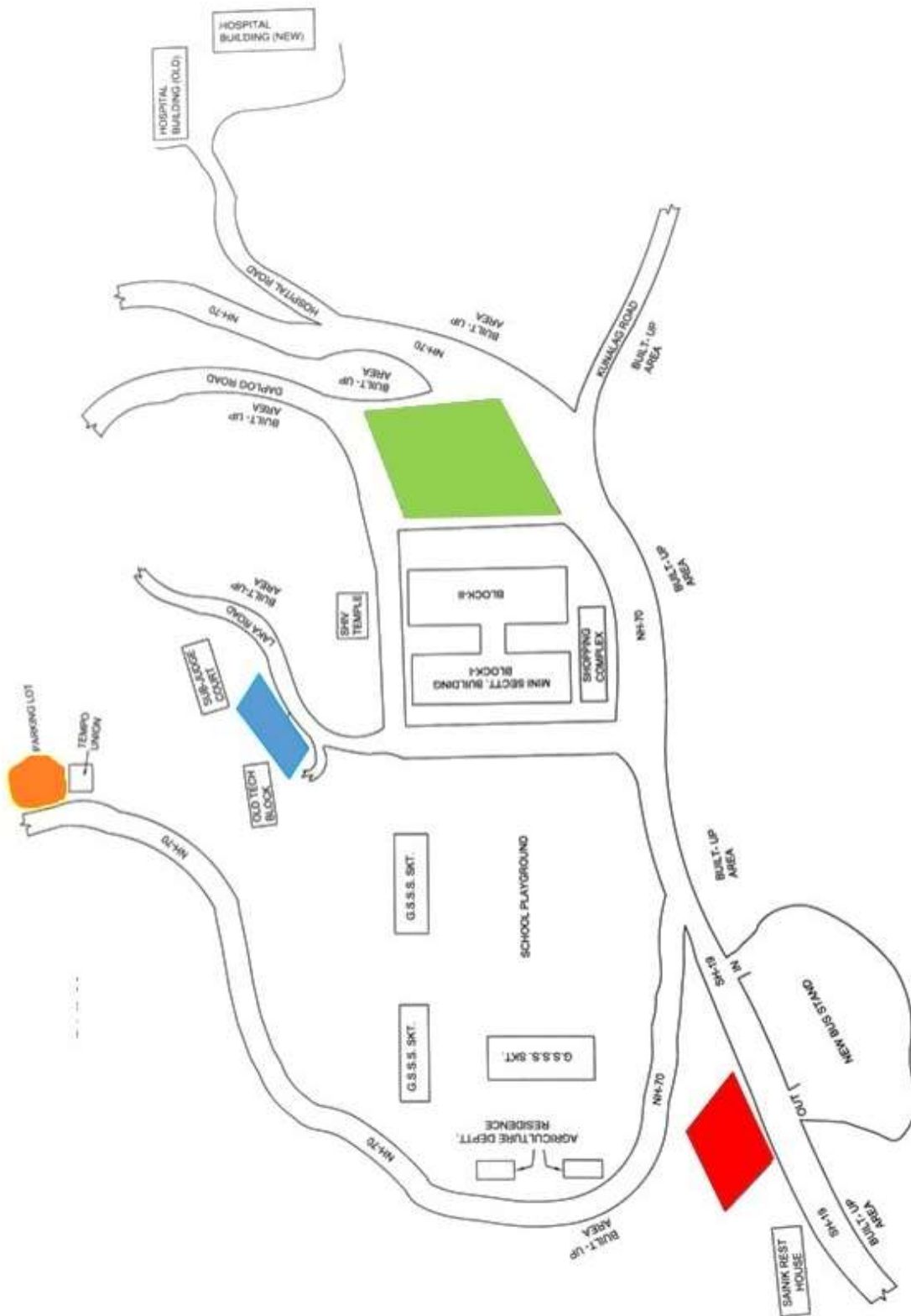


Fig. 2: Map Showing Details of Sarkaghat Town

## 5. References

- [1] Shoup, D.; (2005); "The High Cost of Free Parking", APA Planners Press
- [2] Kuzmyak, J., R., et. al.; (2003) "Chapter 18—Parking Management and Supply", *Traveler Response to Transportation System Changes*, Transportation Research Board; Washington, D.C.
- [3] Willson, W., R., and Shoup, C., D. (1990). Parking Subsidies and Travel Choices: Assessing the Evidence. *Transportation*, 17, 141-157.  
<http://dx.doi.org/10.1007/BF02125333>
- [4] Arnott R. and Rowse J. (1999), "Modelling parking", *Journal of Urban Economics* 45, 97-124.  
<http://dx.doi.org/10.1006/juec.1998.2084>
- [5] Calthrop E. and Proost S. (2004), Regulating on-street parking, ETE working paper 2004-10, CES, K.U. Leuven.
- [6] Priyanka Kolhar; "On Street Parking Management Plan and Cost-Benefit Analysis for Dharwad City, Karnataka, India"; *International Journal of Engineering Research and Applications (IJERA)* ISSN: 2248-9622; Vol. 2, Issue 3, May-Jun 2012, pp.1654-1665.