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LOGICAL AND STRUCTURED ESTIMATION OF MASS-GATHERING FOR EFFECTIVE MANAGEMENT

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Abstract

The mass-gathering event like Kumbh-Mela and Padharpur Wari fetches millions of crowd which makes the overall management a challenge. A temporary city needs to be established to accommodate the crowd with all infrastructure and facilities like roads and parking, electricity, sheds, toilet and sanitation, water supply, public announcement, mobile towers, sign boards and road maps, CCTV point, watch towers, police control rooms, medical assistance rooms, ambulance, fire-extinguishers and other disaster management arrangements, Bari catting – fixed and movable etc. This is not possible without the perfect estimation of crowd and pattern. The researchers adopted very logical and structured estimation method for the Kumbh-Mela and forecasted the numbers and patterns of crowd as well as vehicles. The paper illustrates how the estimation and counting of pilgrims and vehicle was done before the actual Kumbh-Mela, at Trimbakeshwar, Nashik. It helped the *Nagar Parishad* planning the Kumbh-Mela successfully as estimation was close to the reality. The overall Kumbh-Mela was performed in disciplined and successful manner, without any chaos. There was no incidence of stampede, congestion, or no contagious diseases were observed. It explains the logical and structured estimation method which can be replicated to any mass-gathering mega event to plan and execute successful mega-events.

Keywords: Pilgrim, Estimation, Mega-event, Mass-gathering, Kumbh-Mela

Introduction:

The mass-gathering event like Kumbh-Mela and Padharpur Wari fetches millions of crowd for short period of time. Recently a grand mega-event named Kumbh-Mela was organised in Nashik and Trimbakeshwar. Kumbh-Mela is the confluence of all our cultures, knowledge and spirituality. It is the jamboree of renouncers (*Sanyasis, Vairagis, Udasinas*), ascetics (*sadhus*), saints and holy men to spread the love, unity, knowledge, brotherhood, spirituality. All these values are poured from kumbh, a pot filled with nectar of life, and this kumbh never dries or goes empty. Kumbh make us realize the importance of nature, mother earth through the lyrical flow of holy rivers. It is symbol of confluence of nature and humanity. It rejuvenates the faith and gives eternal energy to our mind and body as Kumbh which never dries. It is just not a congregation of peoples or fair, instead it is festival of knowledge, spirituality, asceticism and devotion.

Earlier the shape of Kumbh-Mela festival was small. Number of Devotees and *Sadhus* participating in Kumbh-Mela are increasing by many folds than the previous Kumbh-Mela at each place. Development of infrastructural facilities like transport, modes of communication, etc. has facilitated *Sadhus* and Devotees across the corner of world to participate in Kumbh-Mela. Facilities like *Sadhugram*- dwelling camp, parking, health &sanitation, electric supply and water supply are provided on temporarily for millions of Devotees and Sadhus. Devotees come a long way to participate in Kumbh-mela with utmost faith and with intend of earning holy acts. They are eager to have glimpse of *Shahi* procession of *Akhadas*.

Many people come to Kumbh-Mela for rendering service to the Sadhus and Devotees, run *annachatras*, make donations as well as volunteered for services like health, sanitation, divers/life guards etc. The Government and Administration has to work minutely on each and every aspect of kumbh for the convenience of *Sadhus* and Devotees. Such holy events are always a challenge for the local management and police. No wonder that the administration were targeting the mammoth gathering of 15 milion people visiting the city of Nashik and Trimbakeshwar only in single day of each of the three *Shahi Snan* days – in the backdrop that the population of Nashik city is 1.6 million only and the Trimbakeshwar being a tiny town in the laps of Sahyadris. This underlines the massive temporary infrastructure that has to be readied for the pilgrims inside the city areas to ensure hygiene, safety and security of every person in the city that has the radius of around eight km from central part of the city.

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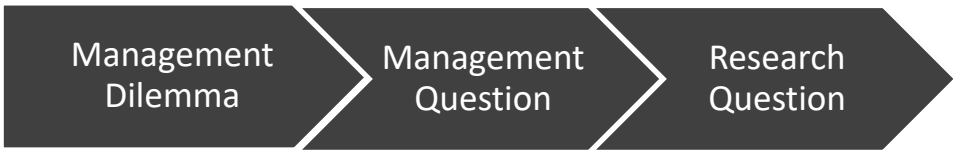
Figure 1: Research Question Development Process



Systematic process was followed to derive 'Research Question' from 'Management Dilemma' as shown in Figure 1. The dilemma in front of the *Nagar Parishad* and local management was whether law and order will be maintained on all the important days (called as *parvani*) and all the holy events will be conducted in silence. Management question was to identify the days of *parvani*, know all the holy events during those days, forecast the population attending those events and functions, how to define routes for holy-rallies so that there will not be any chaos, stampede, traffic congestion, and parking arrangements for the vehicles coming from outside of the city etc. Further, all the necessary temporary infrastructure like roads, electricity, sheds, toilet and sanitation, water supply, public announcement, mobile towers, sign boards and road maps, CCTV point, watch towers, police control rooms, medical assistance rooms, ambulance, fire-extinguishers and other disaster management arrangements, Bari catting – that to be fixed and movable, were need to be planned and erected.

For all above planning and implementation, to know the probable crowd attending the event, was the key point. 10million people attended the Kumbh-Mela at Haridwar in 1998, 40 million in Nashik in 2001, whereas 120 million in Allahabad in 2013 over 2 months and 30 million on a single day.[1] So it was crucial to know the population that attended the event last time, the increase in total population in the country and accordingly additional population that will attend the events, thus forecasting gross population for the events. Further, the awareness about the event worldwide was to attract additional strength to the event from all over the globe. Increase in transport infrastructure was also crucial factor effecting more population attending the event. The research question was to map and apprise number of vehicles and in turn population coming from outside of the city.

Review of Literature:

This study interrogates pilgrims' motivations, activities and experiences of the 2013 Kumbh-Mela pilgrimage, in Allahabad, India. It adopts an interpretive paradigm by so doing it responds to Eade's (1992) call for in-depth analyses that unveil the multifaceted nature of the pilgrim. The findings indicate that motives encompass a need for *spiritual connectivity* (devotion) and *spiritual knowledge attainment* (from saints). Two key activities occupied participants' time: *serving self* which included engaging in prayer, meditation, bathing in the revered River Ganges, listening to spiritual discourses, as well as *serving others* which entailed voluntary service endeavors. Descriptions of the experiential component encompassed experiences of *spirituality* and *social unity*. The study problematizes the nexus between pilgrimage tourism and participants perceived sense of solidarity. (Buzinde, Kalavar, Kohli, & Manuel-Navarrete, Nov. 2014)

Mass gatherings including a large number of people, makes the planning and management of the event a difficult task. Kumbh-Mela is one such, internationally famous religious mass gathering. It creates the substantial challenge of creating a temporary city in which millions of people can stay for a defined period of time. The arrangements need to allow this very large number of people to reside with proper human waste disposal, medical services, adequate supplies of food and clean water, transportation etc. (Baranwal, Anand, & et.al., Managing the Earth's Biggest Mass Gathering Event and WASH Condition: Maha Kumbh Mela (India), April 2015)

The Kumbh-Mela in India is the largest mass gathering in the world which witnessed close to 100 million visitors in 2013. An event of this magnitude presents challenges. Increased population density, reduced hygienic conditions and exposure to environmental pollutants pave the way for easy transmission of pathogens. Due to the possibility of epidemics, the primary focus should be on identifying the potential risk factors and implementing appropriate preventive measures. The context of religion and psychology of the pilgrims is also closely associated with the evolution of the risk factors and so forms an important part of the discussion. We provide a brief background to the Kumbh-Mela with a description of the existing and potential risk factors that require our attention. (Sridhar, Gautret, & Brouqui, Feb. 2015)

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Kama Maclean has taken the photograph 'Kumbh-Mela Women' during the Allahabad Kumbh-Mela in 2001. It is copyrighted. It is collectable and apparently, a wise addition to an investment portfolio. It is also as example of how images of the traditional have become desired, frame-able objects, fine art mementos to our own modular, more complete modernity. It was images such as this raised a long-standing issue for the managers of the Kumbh-Mela: did photographers have a right to enter the Mela grounds and take photographs as they pleased? How did the presence of international media crew affect the festival, and the ways in which people perform their rituals? (Maclean K. , Sept. 2009)

On 10 February 2013 a stampede at a railway station in Allahabad, killed 36 passengers and injured many more. The victims were pilgrims returning from the Kumbh-Mela, a 55 day Hindu festival where tens of millions of people congregate once every 12 years at the confluence of the Ganga, Yamuna, and (mythical) Saraswati rivers for a dip in the holy waters. Unlike spontaneous mass gatherings, which are inherently conducive to stampedes, the Kumbh-Mela stands out as a highly organized, well-orchestrated, administrative accomplishment. What makes it less unusual are the unforeseen gaps—forged by jurisdictional blind spots—common to disaster planning everywhere. (Greenough, May 2013)

Mass gatherings including a large number of people, makes the planning and management of the event a difficult task. Kumbh-Mela is one such, internationally famous religious mass gathering. It creates the substantial challenge of creating a temporary city in which millions of people can stay for a defined period of time. The arrangements need to allow this very large number of people to reside with proper human waste disposal, medical services, adequate supplies of food and clean water, transportation etc. Methods: We report a case study of Kumbh-Mela, 2013 which focuses on the management and planning that went into the preparation of Kumbh-Mela and understanding its water, sanitation and hygiene conditions. It was an observational cross-sectional study; the field work was done for 13 days, from 21 January to 2 February 2013 (Baranwal, Anand, & et.al., April 2015)

Efficient management of large crowded events is always a challenge. Successful Management of such events largely depends on the use of technologies. There are many business cases where the use of latest technology can vastly improve their management. In recent times, many types of identification and sensor devices, including RFID tags, have been developed. Such technologies, combined with appropriate backend database systems, can be used to improve the crowd and event management. Hajj, an annual pilgrimage to Mecca, is a very large and unique gathering, which attracts millions of pilgrims for two or more weeks. Despite tremendous advancement of technology and its availability, Hajj continues to be managed manually. There are many aspects of Hajj which are worth researching. The aim of this paper is to identify appropriate technologies which can be used to improve the management of large gatherings such as those of Hajj and Kumbh gatherings in India (Yamin, Huang, & et.al., Dec. 2008)

Today the Kumbh-Mela in Allahabad, India, is a major Hindu religious pilgrimage and the largest religious gathering in the world. In 2001, according to the government of Uttar Pradesh, 30 million pilgrims were drawn to the confluence on the banks of the rivers Ganga and Yamuna on the most auspicious day for bathing, as per the stars. In an impressive feat of organization and administration, the first Mela of the new millennium was managed successfully. It also refers to the case of Pakistan's management of Hajjis, "that the overall control of the pilgrimage **...**This point may seem pedantic, but technically, the Kumbh-Mela in Allahabad is not invented". (Maclean K. , 2008)

The formation of Hindu places of pilgrimage was largely shaped through important rituals that were performed at a specific location. Kumbh-Mela is a mass Hindu pilgrimage. It occurs four times every twelve years and rotates among four locations in India: Allahabad (Prayag) at the confluence of Ganga and Yamuna and mythical Saraswati River, Haridwar along Ganga River, Ujjain along the Kshipra River and Nasik along the Godavari River. So Kumbh-Mela is practically held every three years across the four locations. It is attended by millions of people on a single day. It is the largest religious gathering on Earth. The main & common reason for one to attend the holy festival of Kumbh-Mela is to take dip in Holy River for taking human out of the circle of life & death (stage known as *Moksha*). Pilgrims & *Sadhus* in great number from around the world visit here to liberate themselves. A ritual bath at a predetermined time and place is the major event of this festival. Other activities include religious discussions, devotional singing, mass feeding of holy men/women and the poor, and religious assemblies where doctrines are debated and standardized. The paper includes the background, unique tradition, management and modern makeover and changes of this age-old festival (Gupta & Voda, 2010)

This study sought to document perceived crowding levels across a series of urban park and recreation events and determine if perceived crowding varied across different types of attractions (or subzones). The study also

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examined the role of perceived crowding in influencing visitor attitudes toward crowd management strategies. Findings indicated that, overall, event crowding was perceived positively and that the presence of other people enhanced visitor experiences. There were variations in perceived crowding across different event subzones. (Mowen, Vogelsong, & Graefe, 2003)

Objectives:

i. To identify most holy day prior to Kumbh-Mela when maximum pilgrims visit the Shiva-temple in Trimbakeshwar.
ii. To map and apprise the actual number and class of vehicles coming to the town from all entry points.
iii. To map and apprise the actual number of pilgrims taking *Darshan* in the temple.
iv. To estimate and forecast of the number of pilgrims as well as number and class of vehicles that may attend the forthcoming mega event.

Methodology:

The most holydays prior to Kumbh-Mela were identified as *Shravni Somvar*[2] and *Mahashivratri* when maximum pilgrims across India visit the Shiva-temple. So Mahashivratri was identified for the mapping, from the past experience of decades, by local management, the *Nagar Parishad* of Trimbakeshwar.

Vehicles came from three directions to the town, from Nashik, Jawhar and Pahine, as shown in Figure 2.

Figure 2: Entry points to the town

Source: Google Map

Then the students were identified and divided into 3 groups to count the actual vehicles entering from these three entry points. The count was done category wise. Also the count was noted on hourly basis to understand the trend. Each group worked in 3 shifts of six hours, starting from 4 am, to avoid fatigue and ensure joy during the research work.

The counting of pilgrims taking *darshan* in the Shiva-temple was the most tedious jobs. The temple has three doors. The East (front) door is allotted for general queue; the North (left) door is allotted for VIP and native people of Trimbakeshwar. The South (right) door is for exit only. Please see Figure 3 for the Entry & Exit doors of the temple and Figure 4 for the plan and doors of the temple.

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Figure 3: Entry and Exit doors to the temple

Figure 4: Plan of the temple

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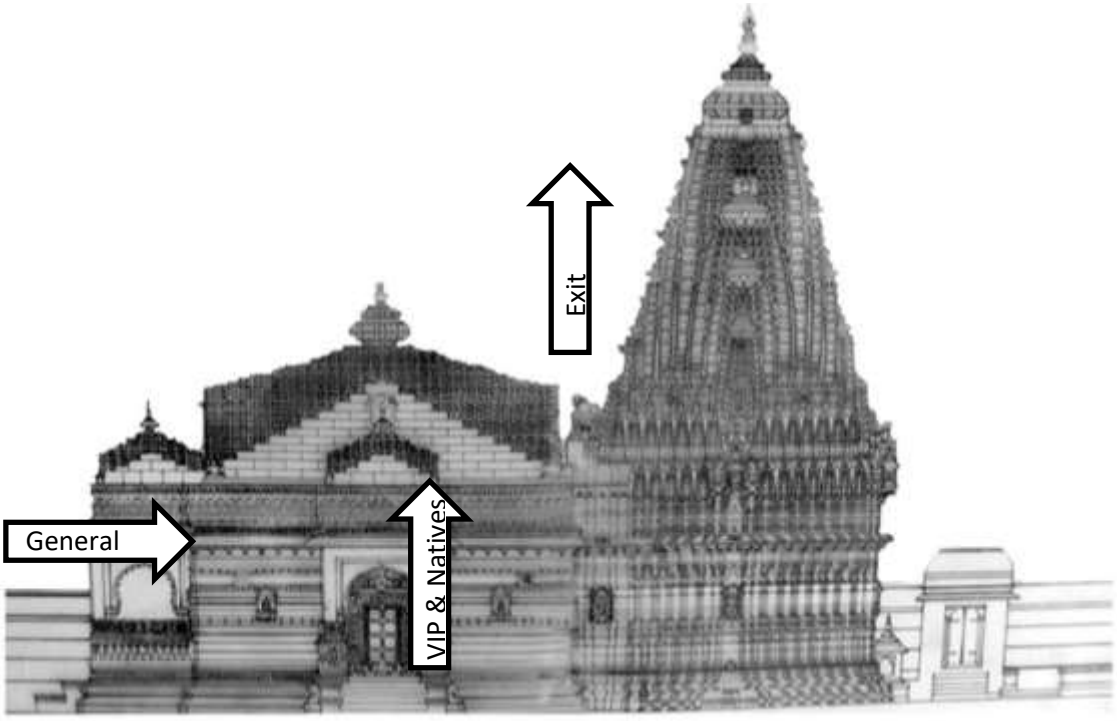

More students were allotted for the counting at temple as each pilgrim was to be counted. So 2 students were actually doing the counting at each door and the groups were altered after every hour. Counting machines or Finger Counters (Ref. Figure 5) were provided to the students so that they just have to click once when one pilgrim enters from particular door. The total count was noted after every half an hour, to know the count as well as understand the pattern.

Tools Used:

The finger counters were used for the mapping at every counting location. For vehicle count at every entry point, separate student was counting each category of vehicle with the help of the finger (Tally) counter. After every hour, the total count was noted in the format. At entry gate of the temple, one student was counting with the help of the finger counter and other students were entering the total count, after every half an hour, in the format.

Figure 5: Finger (Tally) Counter

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Data Collection:

The category wise vehicle entry count and pattern was as follows from each entry point. The counting was closed at 8 pm as the number of vehicles entering reduced drastically and was not safe for the students to be present at the counting location, as those were outside the town. Table 1 shows category wise vehicle entry data from three entry points. Table 2 shows category wise cumulative vehicle entry data from three entry points. Table 3 shows ccumulative vehicle entry from all sides. Graph 1 shows category wise vehicle entry data from three entry points and Graph 2 shows cumulative vehicle entry from all sides

Table 1: Category wise vehicle entry data from three entry points

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Time	Nashik						Pahine						Jawhar					
	2W	3W	Car	SUV	Truck	Bus	2W	3W	Car	SUV	Truck	Bus	2W	3W	Car	SUV	Truck	Bus
4:00-4:30																		
4:31-5:00	18	2	55	17	8	9	8			1			1		1	1		
5:01-5:30																		
5:31-6:00	35	8	44	31	7	5	15		1		3		9		4	6		
6:01-6:30																		
6:31-7:00	74	5	52	41	7	14	12		2	2	4	1	35		24	7		1
7:01-7:30																		
7:31-8:00	106	10	102	54	13	22	17	4	9	3	3	3	49	1	16	24	2	2
8:01-8:30																		
8:31-9:00	117	10	98	45	12	32	46	5	4	3	7		111	2	26	27	5	
9:01-9:30																		
9:31-10:00	211	19	98	45	11	28	83	6	21	3	13	1	90	3	14	5	4	3
10:01-10:30																		
10:31-11:00	355		167	80	16	35	85	6	22	9	6	2	96	6	5	11	4	4
11:01-11:30																		
11:31-12:00	450		128	70	35	41	71	11	27	20	8	1	124	2	6	15	20	12
12:01-12:30																		
12:31-01:00	412		154	101	13	32	101	15	30	15	10	1	118	7	12	14	5	4
01:01-01:30																		
01:31-02:00	330		180	131	19	33	80	12	28	8	8	2	75	7	13	15	9	4
02:01-02:30																		
02:31-03:00	300		92	95	10	43	67	17	33	6	4	1	81	9	28	20	16	6
03:01-03:30																		
03:31-04:00	139		87	83	16	41	51	10	21	25	7	2	71	11	24	13	7	6
04:01-04:30																		
04:31-05:00	167		129	100	11	33	84	15	20	5	4	2	48	6	12	17	2	2
05:01-05:30																		
05:31-06:00	148		69	82	9	29	56	4	4	2	5	1	79	7	8	3	3	3
06:01-06:30																		
06:31-07:00	121		83	85	11	34	63	2	9	5	3	2	89	8	11	14	8	2
07:01-07:30																		
07:31-08:00	79		96	70	7	22	48	3	3	1	1	2	47	4	7	9	4	3
08:01-08:30																		
08:31-09:00																		
09:01-09:30																		
09:31-10:00																		
10:01-10:30																		
10:31-11:00																		
11:01-11:30																		
11:31-12:00																		
Total	3062	54	1634	1130	205	453	887	110	234	108	86	21	1123	73	211	201	89	52

Source: Primary Data

Table 2 : Category wise cumulative vehicle entry data from three entry points

Vehicle count - categorywise - 4am to 8 pm						Vehicle count - categorywise - 4am to 8 pm						Vehicle count - categorywise - 4am to 8 pm					
Vehicle Entry from Nashik						Entry from Pahine						Entry from Jawhar					
2W	3W	Car	SUV	Truck	Bus	2W	3W	Car	SUV	Truck	Bus	2W	3W	Car	SUV	Truck	Bus
3062	54	1634	1130	205	453	887	110	234	108	86	21	1123	73	211	201	89	52

Source: Primary Data

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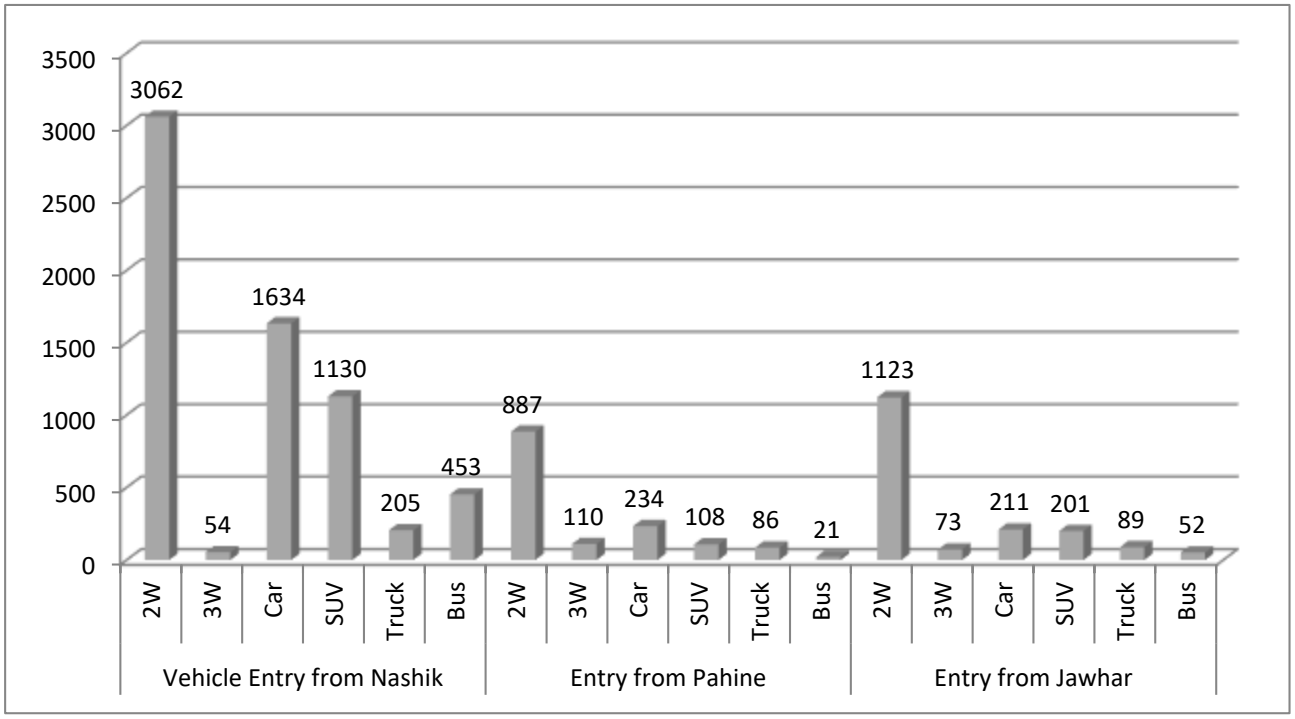
Graph 1: Category wise vehicle entry data from three entry points



Source: Primary Data

Table 3: Cumulative Vehicle Entry from All sides

Cumulative Vehicle Entry from All sides					
2W	3W	Car	SUV	Truck	Bus
5072	237	2079	1439	380	526

Total	9733

Source: Primary Data

Graph 2: Cumulative vehicle entry from all sides

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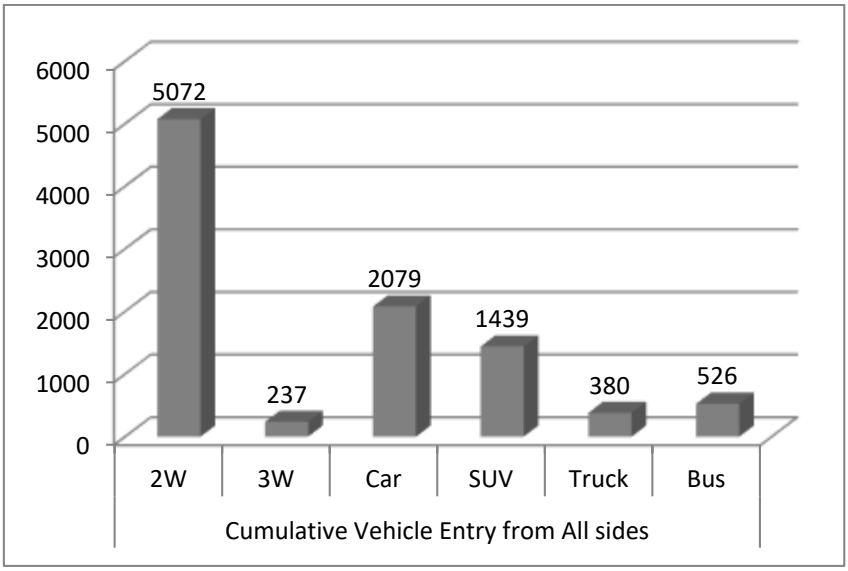

Source: Primary Data

Table 4 shows vehicle occupancy consideration and Table 5 shows category wise cumulative pilgrims' entry data from three entry points

Table 4: Vehicle Occupancy consideration

2W	2
3w	4
Car	5
SUV	7
Truck	50
Bus	55

This was the occupancy considered category wise, for the calculation purpose.

Table 5: Category wise cumulative pilgrims' entry data from three entry points

Entry from Nashik						Entry from Pahine						Entry from Jawhar					
2W	3W	Car	SUV	Truck	Bus	2W	3W	Car	SUV	Truck	Bus	2W	3W	Car	SUV	Truck	Bus
6124	216	8170	7910	10250	24915	1774	440	1170	756	4300	1155	2246	292	1055	1407	4450	2860
				Total	57585					Total	9595					Total	12310

Source: Primary Data

Graph 3 shows category wise pilgrims' entry data from three entry points and Table 6 ccumulative People Entry from All sides. Graph 4 shows cumulative pilgrims' entry from all sides. Table 7 shows pilgrims entry for all the doors and Graph 5 pilgrims' entry from all the doors

Graph 3: Category wise pilgrims' entry data from three entry points

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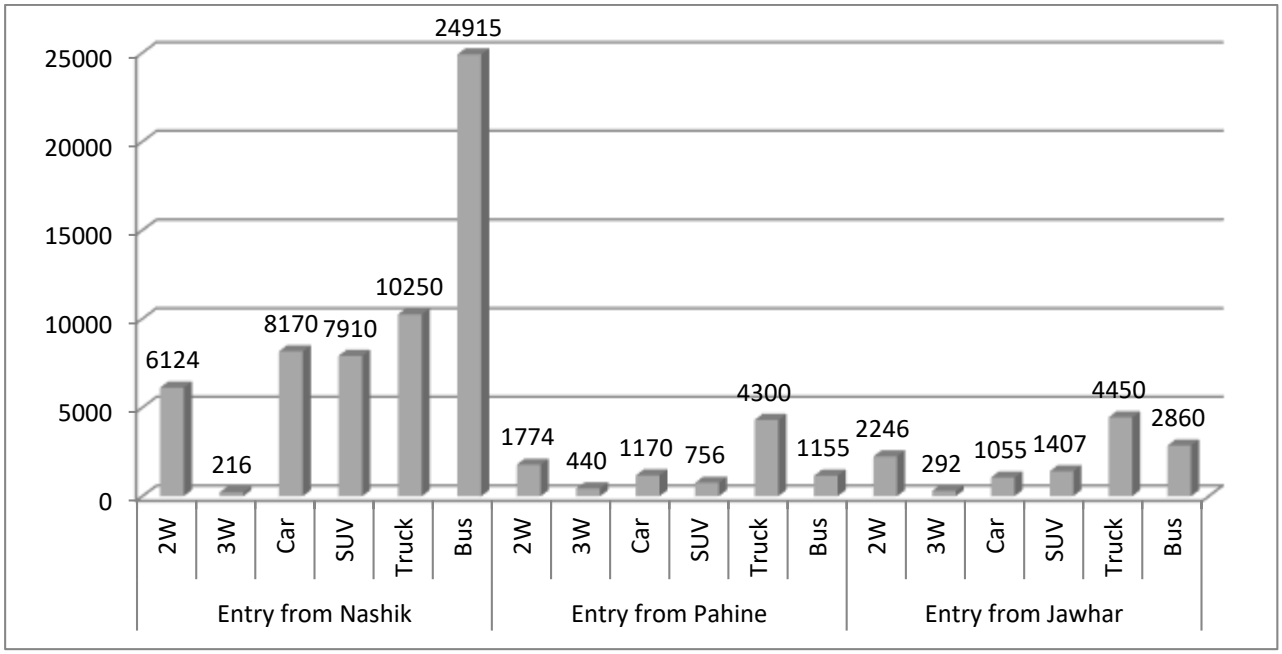


Source: Primary Data

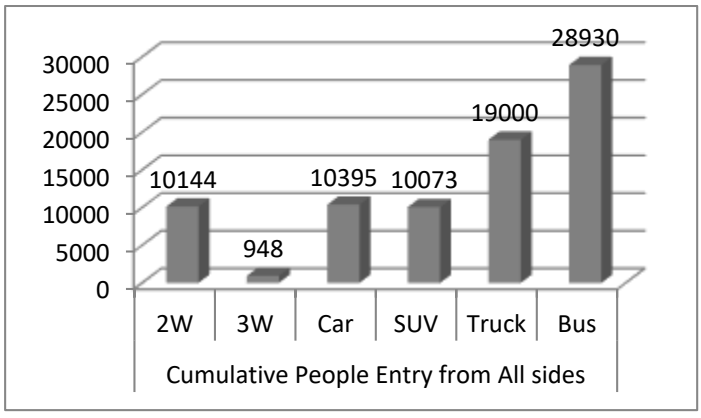
Table 6: Cumulative People Entry from All sides

Cumulative People Entry from All sides					
2W	3W	Car	SUV	Truck	Bus
10144	948	10395	10073	19000	28930

Total	79490

Source: Primary Data

Graph 4: Cumulative pilgrims' entry from all sides



Source: Primary Data

The table (7) shows the actual pilgrims who have entered from each door, in the interval of half an hour. The temple doors were closed from 12noon to 12:30 pm. for cleaning.

Table 7: Pilgrims entry for all the doors

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Temple Darshan- Mahashivratri 17/02/2015			
Time	General	VIP & Native	Total
4:00-4:30	208	32	240
4:31-5:00	236	251	487
5:01-5:30	217	317	534
5:31-6:00	209	303	512
6:01-6:30	218	390	608
6:31-7:00	332	261	593
7:01-7:30	276	334	610
7:31-8:00	354	333	687
8:01-8:30	350	255	605
8:31-9:00	340	295	635
9:01-9:30	69	217	286
9:31-10:00	191	206	397
10:01-10:30	282	238	520
10:31-11:00	294	266	560
11:01-11:30	368	214	582
11:31-12:00	248	345	593
12:01-12:30	0	0	0
12:31-01:00	360	321	681
01:01-01:30	315	333	648
01:31-02:00	245	348	593
02:01-02:30	265	371	636
02:31-03:00	465	288	753
03:01-03:30	494	319	813
03:31-04:00	476	215	691
04:01-04:30	450	207	657
04:31-05:00	304	189	493
05:01-05:30	391	168	559
05:31-06:00	403	187	590
06:01-06:30	357	210	567
06:31-07:00	349	351	700
07:01-07:30	240	395	635
07:31-08:00	298	480	778
08:01-08:30	371	573	944
08:31-09:00	286	402	688
09:01-09:30	22	202	224
09:31-10:00	384	246	630
10:01-10:30	210	45	255
10:31-11:00	209	70	279
11:01-11:30	494	28	522
11:31-12:00	251	19	270
Total	11831	10224	22055
Grand Total	22055		

Source: Primary Data

Graph 5: Pilgrims entry from all the doors

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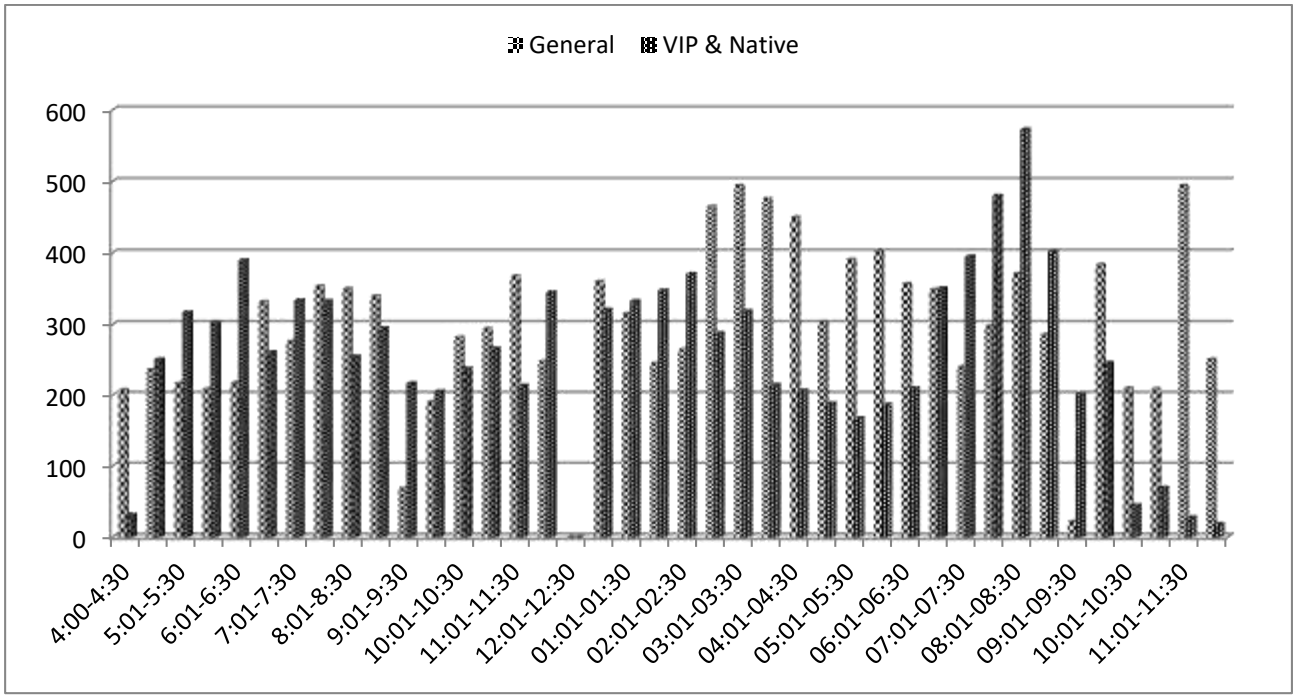

Source: Primary Data

Findings:

From Nashik side, 3062 two wheelers, 54 auto-rickshaws, 1634 cars, 1130 SUVs, 205 truck-tempos & 453 buses entered in the town during the time span of 4 am to 8 pm. From Pahine (Ghoti) side, 887 two wheelers, 110 auto-rickshaws, 234 cars, 108 SUVs, 86 truck-tempos & 21 buses entered in the town during the time span of 4 am to 8 pm. From Jawhar side, 1123 two wheelers, 73 auto-rickshaws, 211 cars, 201 SUVs, 89 truck-tempos & 52 buses entered in the town during the time span of 4 am to 8 pm (Refer Table 1 & 2). Please refer Graph 1 for the trend of vehicles.

From all entry sides, 5072 two wheelers, 237 auto-rickshaws, 2079 cars, 1439 SUVs, 380 truck-tempos & 526 buses entered in the town during the time span of 4 am to 8 pm (Refer Table 3). Please refer Graph 2 for the overall trend of vehicles. Overall 9733 vehicles entered the town on the day of Mahashivratri.

For approximation of the people occupancy in the vehicles, it was done by considering 2 people on two-wheeler, 4 people in auto-rickshaw, 5 people in car, 7 people in SUV, 50 people in truck-tempo and 55 people in bus (Refer Table 4).

From Nashik side, 6124 people came by two wheelers, 216 by three-wheeler, 8170 by car, 7910 by SUV, 10250 by truck-tempo and 24915 by bus. Thus total 57585 people came from Nashik side. (Refer Table 5). From Pahine side, 1774 people came by two wheeler, 440 by three-wheeler, 1170 by car, 756 by SUV, 4300 by truck-tempo and 1155 by bus. Thus total 9595 people came from Pahine side. (Refer Table 5). From Jawhar side, 2246 people came by two wheeler, 292 by three-wheeler, 1055 by car, 1407 by SUV, 4450 by truck-tempo and 2860 by bus. Thus total 12310 people came from Jawhar side. (Refer Table 5). Please refer Graph 3 for the trend of pilgrims.

10144 people came by two wheelers, 948 people came by auto-rickshaws, 10395 people came by cars, 10073 people came by SUVs, 19000 people came by truck-tempos and 28930 people came by buses, approximately (Refer Table 6). Please refer Graph 4 for the trend.

Approximately 79490, so 80000 people entered the town on the day of Mahashivratri. Based on the vehicle category, it is observed that most of the crowd was from lower and middle class families and very few from elite class.

Total 22055 pilgrims took actual *darshan* in the Shiva temple during the time-frame of 4 am to 12 mid-night. 11831 pilgrims took *darshan* via East (general) door while 10224 pilgrims took *darshan* from the North (VIP and native) door. Maximum *darshan* was taken by 944 pilgrims during the span of half an hour, which was 8

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pm to 8:30 pm (Refer Table 7). This defines the maximum capacity of *darshan* during the span of half an hour to be 1000 to 1200. Early morning from 5 am to 8 am and in the evening from 6:30 pm to 9 pm, rush of native pilgrims observed for the *darshan* in the temple. In the afternoon, rush was observed for general *darshan*. Please refer Graph 5 for the trend of *darshan*. So the overall rush or peak was observed during this time.

Conclusions:

From all entry sides, 5072 two wheelers, 237 auto-rickshaws, 2079 cars, 1439 SUVs, 380 truck-tempos & 526 buses entered in the town during the time span of 4 am to 8 pm. Overall 9733 vehicles entered the town, out of which close to 50% were two-wheelers. Almost 1000 large-sized vehicles entered the town, which needs large parking & turning space. This mapping and forecasting data will be useful for parking locations and parking allocation for all entry roads and parking allocation for each category of vehicles.

Further, 10144 people came by two wheelers, 948 people came by auto-rickshaws, 10395 people came by cars, 10073 people came by SUVs, 19000 people came by truck-tempos and 28930 people came by buses, approximately. Thus almost 80,000 people entered in the town on the day of Mahashivratri. Further, most of the crowd was from lower and middle class.

Total 22055 pilgrims took actual *darshan* in the Shiva temple during the time-frame of 4 am to 12 mid-night. 11831 pilgrims took *darshan* via East (general) door while 10224 pilgrims took *darshan* from the North (VIP and native) door. Maximum *darshan* was taken by 944 pilgrims during the span of half an hour. This defines the maximum capacity of *darshan* during the span of half an hour to be 1000 to 1200. Thus the maximum capacity of *darshan* of the temple is 50000 in the span of complete day, which is 24 hours. Further, this fact highlighted that all the pilgrims entering in the town are not taking or cannot take *darshan* in the Shiva temple.

Based on the mapping, the forecasting was that 10 times more pilgrims and sadhus will be in the town of Trimbakeshwar. So the crowd close to 0.8 to 1 million will be in the town during the peak time of *parvanis*. Further, number of vehicle forecasted was to be 8 to 10 times than the total count of Mahashivratri. So the *Nagar Parishad* and all other departments need to plan all the necessary temporary infrastructure like roads, parking, electricity, sheds, toilet and sanitation, water supply, public announcement, mobile towers, sign boards and road maps, CCTV point, watch towers, police control rooms, medical assistance rooms, ambulance, fire-extinguishers and other disaster management arrangements, food-stalls, Bari catting – that to be fixed and movable, and even time of erection, which can accommodate 1 million people with safety and hygiene.

Epilogue:

The *Nagar Parishad* of Trimbakeshwar has appreciated the methodology and hard efforts of the K.R. Sapkal College of Management Studies, its staff and students for the estimation and forecasting. It helped the *Nagar Parishad* planning the Kumbh-Mela successfully as forecasting of probable crowd and vehicles by the current research was close to the reality. The parking location were planned from a distance to the town and only State Transport service was allowed to reach the town, to avoid the congestion of traffic. As the estimation and forecast was perfect, overall Kumbh-Mela was performed without any chaos, in disciplined and successful manner. There was no incidence of stampede, congestion, chaos or contagious diseases observed.

Note:

1. As per the Imperial Gazetteer of India**.**
2. All the Mondays in Marathi month *Shravan;* this comes around the month of July-August. Third Monday is most holy Monday and hence most crowded.

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