A Case Study on Chhath Puja, 2013

Mass Gathering Event Management

Year 2013

Bihar State Disaster Management Authority

2nd Floor, Pant Bhawan, Bailey Road, Patna-1

बिहार सरकार

Team Members

1. Shri Anil K. Sinha, IAS (rtd.)
   Vice Chairman, Bihar State Disaster Management Authority

2. Amit Prakash
   Project Officer (Environment & Climate Change)

3. Vishal Vasvani
   Project Officer (Human Induced Disasters)

4. Ali Ahmed Rayeeni*,

   * Volunteer and Postgraduate from (2011-13), Disaster Management (TISS)

Table of Contents

List of Tables

List of Figures

1. Acknowledgement

Human life has the greatest value. Every effort has to be made in order to reduce mishaps that involve or possesses a potential to cause loss of life or even injury, damage to environment and property. Hence, it becomes imperative for the government authorities to take all possible steps to plan ahead the events that may take any unfortunate turn.

Any study dealing with a complex subject as this requires a leadership, suggestion and guidance from experts. Bihar State Disaster Management Authority (BSDMA) acknowledges sincerely the interest and the concern that Shri Nitish Kumar, Hon'ble Chief Minister of Bihar cum Chairman of BSDMA has shown in this subject matter. The team also thanks Shri Anil. K Sinha, IAS (rtd), hon'ble Vice Chairman, BSDMA, whose constant inspiration, guidance and encouragement led it to undertake this study

The Authority extend its gratitude to Shri Manish Ranjan and Shri K.K.Jha, 9Bn NDRF and their entire team, who extended all possible operational and logistical support during the data collection phase. We will also take this opportunity to thank officials of District Authority, Patna and Patna Municipal Corporation.

Our sincere acknowledgement goes to Ali Ahmed Rayeeni, a graduate from batch 2011-13, Disaster Management) from Tata Institute of Social Sciences who volunteered to extend his contribution to the study by assisting in data collection. We also thank Shri Anand Bijeta, Project Officer, BSDMA, who helped us by giving valuable suggestion on streamlining the study.

2. Abstract

Chhath Puja is the biggest festival for the people of Bihar living within Bihar or across the country or world. The festival is often referred to as "Mahaparv". The festival roughly spreads over a period of four days involving many rituals. In the last two days, the devotees gather along the bank of river Ganga or any other water body to take the holy dip and offer their prayers to Sun God.

The last two days, where the devotees gather around the water bodies, especially river Ganga, is a difficult situation for the administration to tackle. The number of people and the place where they gather (besides recognized Ghats) are difficult to predict. Given the hazards such as fire, flood, earthquake and many other man-made hazards may trigger disasters.

Such events of mass gathering need special planning and execution involving a thoroughly efficient management. Realizing the importance and the sensitivity of the event, Bihar State Disaster Management Authority undertook a quick case study of the event in the year 2013. The method of study follows a qualitative case based research. It aims to identify all the processes, the decision makers, the on-field officials involved in execution, the good practices observed and the gaps identified.

Key Words: Mass Gathering Event, Crowd Management, Disaster Management, Chhath Puja

3. Introduction

a. Problem Statement

India is a country of many religions, faiths, festivals and events. Owing to its around 1.2 billion populations, there are mass gathering events being organized at various levels involving large number of people. In such situations, governments and administration seem to be struggling to make fool proof arrangements for such events. Due to unforeseen circumstances, there have been many unfortunate incidents happening causing loss of lives, damage of property, mental agony etc. However there are some good practices adopted by governments in organizing such events. The research aims to identify such practices and put them in a form that is replicable in other such events.

b. Significance of the problem

In large congregations, many people go missing, and in some cases die in instances such as stampedes, fires and collapse of buildings. For example, during 1997 and 2005, several hundred Hajj pilgrims died of fire or stampede (Yamin, 2005). The things have been no different in Indian perspective. The table below shows some of the major mishaps that caused people loss of lives and damage to property.

Date	Place	Trigger	Injured	Dead
26th Aug, 2003	Ardh Kumbh Mela, Nashik	Chaos while looting silver coins thrown at crowed	57	39
25th Jan, 2005	Mandra devi Temple, Maharashtra	Electric Short Circuit leading to blast	Not Available	300
18th Dec, 2005	Relief Distribution, Tsunami, TN	unorganized relief distribution	37	42
3rd August, 2008	Nainadevi temple, HP	Rumor of Landslide	47	162
30th Sep, 2008	Chamunda Devi Temple, Jodhpur	Rumor of Bomb Blast	60	150
14th April, 2010	KumbhMela, Haridwar, UK	Car lost control creating chaos in crowd	17	9
18th Nov, 2012	ChhatPooja, Patna	Rumor of live		17

		electric wire falling in water on Ganges Ghat		

Table 1: Past Events

Now when we look at each of the incidents, and their causes, we find it that a small trigger can cause huge impact. Many of the incidents were caused by something that could have been prevented very well. Also, these incidents took place at the place where there were huge crowd gathering. There is always a possibility of mishap at such gathering. The worst affected people are elderly citizens, women and children. The record shows that these groups of people form the major chunk of affected population and in year 2008 alone, 325 people lost lives in such incidents. A planned effort in such congregations, if precautionary and preparedness steps are taken, the lives can be saved.

c. Background of the problem

With a population with over 1.2 billion people, India is world's second most populated country with some of the areas with highest population density. It can overtake china by the end of the decade. At the same time India is also a land of diverse people, language, culture, creed, caste, religion, geographies, climatic conditions and economy.

Different regions, religions and faiths have their own ways of celebrating their festivals. Generally these celebrations end up becoming an event of mass gathering. These events are observed with large number of turnouts, within a short span of time in a very limited space with limited resources. With such events, it becomes imperative for the governments to get involved and make arrangements to keep the events as smooth as possible. They need to prepare themselves according to all aspects of Disaster Management, mass casualty management, media relations, security of people, care for vulnerable groups etc. If the events see turnouts in many thousands and millions, there has to be a proper planning for it. There is a huge surge in the demands of consumable and infrastructure. Many of such infrastructural developments need huge investments and they also need to be justified against the safety, sustainability and effectiveness. Hence the planned exercise has to be logically executed without burdening the people, the place and the existing infrastructure. There have been significant technological advancements in last few decades in terms of communication and security. The geospatial and satellite technologies, RFID and other tracking mechanism along with advanced computer systems have made it easier to manage any event, track people and help make a planned effort towards event management.

Chhath Puja is one of such events that see a sudden surge of people coming to Bihar and gather around all the possible water bodies to offer their prayers. The pressure on all the public and private infrastructures

shoots very high for a very short span of time. However, it lasts only for 2 days. Looking at the various such events that are being organized worldwide such as Haj, we find that there are many systematic efforts with incorporation of technology, involvement of efficient human resources and infrastructures have been made to make the events a disaster free event.

d. Objective of the study

The overall objective of the research is to derive the good practices adopted during the Chhath Puja, 2013, identify the gaps in planning and lesson learned and recommend improvement wherever required. India witnesses large number of religious and cultural festivals that, many a times, mark their observance in large numbers (RathYatra at Puri, DurgaPooja, Ramzanetc). Thus it becomes imperative for the administration to plan these events in a way to reduce any unprecedented incidents. The experiences from pasts have shown that any flaw in planning could result in widespread panic and deaths. Thus this research will be dedicated to lessen the same in the future events by developing a model plan of action for mass gathering events.

e. Rationale of Study

The most basic rationale that can be put forward in the given premise is its ability to replicate in many of the mass gathering events in India. The similarity in infrastructural requirement, the crowd behavior, the turnout of events etc. make this study worth being undertaken. Various governments plan such events, implements strategies and execute them on the ground with partial, no or total success. In view of such planned effort already made, the study will supplement the event planners, the governments at various levels of administration to keep note of the important sub-events and to minimize failure at any point of the event.

4. Literature Review

a. Event of Mass Gathering

An event of Mass Gathering is generally characterized by huge number of people accumulating in a very limited space in a short span of time. Such events, though observed within a limited time, sometimes attract a crowd, many times the total population of the city. Some of the key issues that have been identified during such mega events are associated to the following (Frykberg, 2003);

- Disaster management planning and rehearsal
- Integration of local, regional, and national resources into a disaster management system
- Hospital Emergency Incident Command Systems (HE- ICS)
- Communications and security
- Media relations
- Protection of service delivery personnel and facilities
- Detection and decontamination of biological, chemical, and radiation exposure
- Triage principles and implementation
- Logistics of medical evaluation, stabilization, disposition, and treatment of victims
- Record-keeping and post disaster debriefing, critique, and reporting
- Critical incident stress management (CISM)
- Published research and experience in disaster management

Such events involve a number of stakeholders including event organizers, tourism practitioners, policy makers, event volunteers, risk, emergency and security forces, emergency management and business continuity practitioners, professional associations, community partners and relevant stakeholders, with the government administration emerging as the biggest player (Kishore, 2012). With so many stakeholders involved, a survey research conducted during one such event revealed the following challenges (Kishore, 2012);

- Safety and Security
- Crowd and Group Behavior
- Lack of Public Awareness and Education
- Impact of Social Media
- Likelihood of injury or death
- Disease outbreak
- Damage to property and environment

- Public image

Though some of the issues identified are not relevant to Indian context, most of them, remain a challenge throughout the world irrespective of culture and nature of event.

While issues related to food, water and sanitation, environmental, physical and technical hazards, epidemiological and infectious disease surveillance and health promotion are some of the most important aspects, the perspective of event planning and management in context of public safety, risk assessment, drug and alcohol control, excessive use of force by administration/authority, weather, structural failure, riots, disease outbreak, casualties and injuries, mob mentality etc. are key areas where strict and prompt actions are required.

b. Sustainable efforts

Provision of urban services, facilities and infrastructures, referred to as one of the most demanding challenges facing contemporary urban planners and managers (Kammeier, 2008). In his paper, Kammeier refers to the changes brought about by these mass gathering events that are temporary in nature as 'pulsar effects'. Examples from global meeting of IMF in Bangkok few years ago, where school children were given five days holidays and business were asked to shut down and Beijing Olympics 2008 that underwent a resettlement of nearly 3.5 lakhs people, show that government takes temporary measures to cope with the immediate effects of temporary special event. But at the same time, there is a pertinent question whether these efforts are needed and are sustainable?

Special events always require special management measures, including non- routine investments of public resources, in order to cope with the special events that are usually short-term as such but may have potential for longer- term benefits. The conditions of 'pulsar effects' may lead to serious imbalances between public and private investments and their efficient and equitable use for certain periods of time and in certain areas. The challenge is to avoid such imbalances or, once they occur, to manage them in the best possible way. There is enough evidence that this can be done, but it requires very capable management (Kammeier, 2008).

The perspectives of special and temporal dimensions and the associated cause and effect chains are common across all such events. So the key questions that need to be answered first are the following;

1. How should the planners cope with the pulse events?
2. Does our traditional focus on spatial planning adequately equip us to respond successfully to peak and recurrent demand in a context where the time dimension is uncertain, unexpected and unpredictable?

3. How should we deal with the post- event situation – the 'hand-over' syndrome – when the city has to return to normality?

4. Who are the other players in coping with pulsar effects?

5. If that traditional focus is inadequate, which are the important skills to be utilized or developed?

6. Whatever is defined as 'normality', do we not need a method for distinguishing routine events from more special and truly unique events? And

7. Must we not consider the preparatory phases as much as the 'hand-over' or 'aftercare' aspects?

Speaking of the sustainability of such events, the planning and management can vary from deep green ecological fundamentalism to energy conservation or social equity, environmental economics to reasonably long amortization periods of major public private investments (Kammeier, 2008).

c. Technological Innovation

Many of the problems in the management of large and crowded events, especially those of religious nature, are associated with the movement of people. This poses many challenges (Yamin, Huang, & Sharma, n.d.). These movements need to be strictly monitored and controlled to keep the even organized.

The activities and behavior of crowd cannot be forecasted or determined. It is just through the vigilance that they can be monitored. The task may include managing and administering many activities such as checking and controlling traffic movements, payment of toll taxes, and monitoring and managing patients, parking, monitoring the overall law and order, incident reporting and incident response. Thus, role of technology becomes very crucial.

d. Chhath Puja[1]

Chhath puja is the biggest religious festival that people of Bihar celebrate. The festival attracts all the people of Bihar origin from all over the world and the country to get back to their mother land and observe the pious festival along with their family members. The festival involves all the devotees to offer prayers to Sun God on the banks of River Ganga and other water bodies. Chhath is an ancient Hindu festival and only Vedic Festival dedicated to the Hindu Sun God, Surya and Chhathi Maiya (ancient Vedic Goddess Usha). The Chhath Puja is performed in order to thank Surya for sustaining life on earth and to request the granting of certain wishes. The rituals of the festival are rigorous and are observed over a period of four days. They include holy bathing, fasting and abstaining from drinking water (Vratta), standing in water for long periods of time, and offering prashad (prayer offerings) and arghya to the setting and rising sun. Although it is observed most elaborately in Bihar, Jharkhand, Eastern UP and

---

[1] http://en.wikipedia.org/wiki/Chhath accessed at 4.59 PM, 12th November, 2013

the Terai regions of Nepal in modern times, and is more prevalent in areas where migrants from those areas have a presence, it is celebrated in all regions and major urban centers in India.

Figure 1: Chhath Pooja Ghat

This, however, sometimes creates a difficult situation for the district administration and other authorities to tackle. Last year, despite the possible arrangements from the government and the civil society, a stampede occurred on one the Ghats, killing 19 people and injuring many.

e. Mass Casualty Management

An event of Mass Gathering dealing with crowd management also associates itself closely to Mass Casualty Management. Mass casualties after disasters are characterized by such numbers, severity, and diversity of injuries that they can overwhelm the ability of local medical resources to deliver comprehensive and definitive medical care to all victims (Frykberg, 2003).

An effective Mass Casualty Management Plan requires an establishment of base line, that is, an assessment of current system's capacity against which planned changes can eventually be measured. A second key initiative should be taken to provide a detailed understanding of the hazards and risks specific to the country. Emphasis should be placed on gathering retrospective data on previous incidents. This

should not be limited to large-scale disasters but also to those of smaller scale such as major traffic or industrial accidents, mudslides or floods that do not require national intervention, fires and building collapses, and so on. It should also include a forward-looking component assessing risk in the future from elements such as unsafe urban development, or changes in weather patterns. Coupled with the baseline assessment, the information provided by this hazard analysis and risk assessment will provide a solid basis for the subsequent process of planning, and for the allocation of resources. This will help in development of a comprehensive Mass Casualty Management Plan (WHO, 2007).

This also necessitates the development of training modules and guidelines, monitoring, surveillance and early warning, stockpiling, collaboration with NGOs and corporate sectors as partners and thus finally developing a culture of community preparedness (WHO, 2007). While addressing any mass casualty event, it is worth noting that Disaster management poses challenges that are distinct from normal practice. It requires a paradigm change from the application of unlimited resources for the greatest good of each individual patient, to the allocation of limited resources for the greatest good of the greatest number of casualties. This is achieved most effectively by planning and training for disasters, through both internal hospital drills and regional exercises involving all community resources. Rescue, decontamination, triage, stabilization, evacuation, and definitive treatment of casualties all require the smooth integration of multidisciplinary local, state, and federal assets. This would include (but not be limited to) pre-hospital services, the media, emergency management and public health agencies, transportation and communication resources, the military, and health care delivery facilities and personnel (Frykberg, 2003).

5. Approach of the Study

a. Guiding Principles of the Study

i. **Objective of the project**: The basic objective of the study is to know the series of events right from the planning and management up till the reverse logistics. This ensured that each and every perspective of the event was captured.

ii. **Expectations from the Stakeholders:** An event of such a large scale involves numerous stakeholders' right from the government administration, line department, the civil society organizations, the NGOs, the local corporate and private establishments. It becomes imperative to determine the expectations of each of the stakeholders from others, contributions made by each one of them, the suggestion for further improvement and the overall impression of the event.

iii. **Data:** The data collected were in general qualitative in nature. The general tool for data collection was open ended semi-structured questionnaire, personal interview and group discussion.

b. Framework of Study

Chhath Puja is called the Mahaparva or the greatest festival for the people of Bihar. Earlier, when the proximity to the River Ganga was quite near, the Ghats saw huge turnouts. But gradually, the river changed its course. So, people sought for other water bodies in and around the city to offer the prayers to Sun God. Hence, there was a variation in turnout in population and its concentration in other parts of the city. Despite all these changes, the administration recognized Ghats along the whole span of 32 kilometers from Patna City to Digha and prepared accordingly.

There was a very unfortunate incident happened at Adalatganj Ghat last year resulting in many casualties. This necessitated a need of a thorough analysis of previous event's data, gaps/shortcoming and flaws in the planning and management. The extrapolation of data based on the analysis of the previous event's data helped determining the needs at the present one.

Once the need assessment was done, the planners base their whole plan and management of the event with the assessed data. It was very important to determine how the assessed data was utilized in planning and management of the event.

Plan would be plans unless backed by practically implementable ideas. Once the planning phase was over, all the stakeholders came into the picture to coordinate and execute the event as per the plan. Thus it required a multidimensional approach.

Post event analysis is crucial from point of view of determining the overall success or failure of the even management. It also helps figuring out the good practices, the gaps and lesson learned. Based on these collective data, an ideal model can be developed.

Chhath Puja Case Study Framework

| Gaps identification for previous year | Need Assessment based on gaps | Planning based on Need Assessment | Execution of Plan and coordincation among stakeholders | Gap identification and recommendation to bridge the gaps | Documentation |
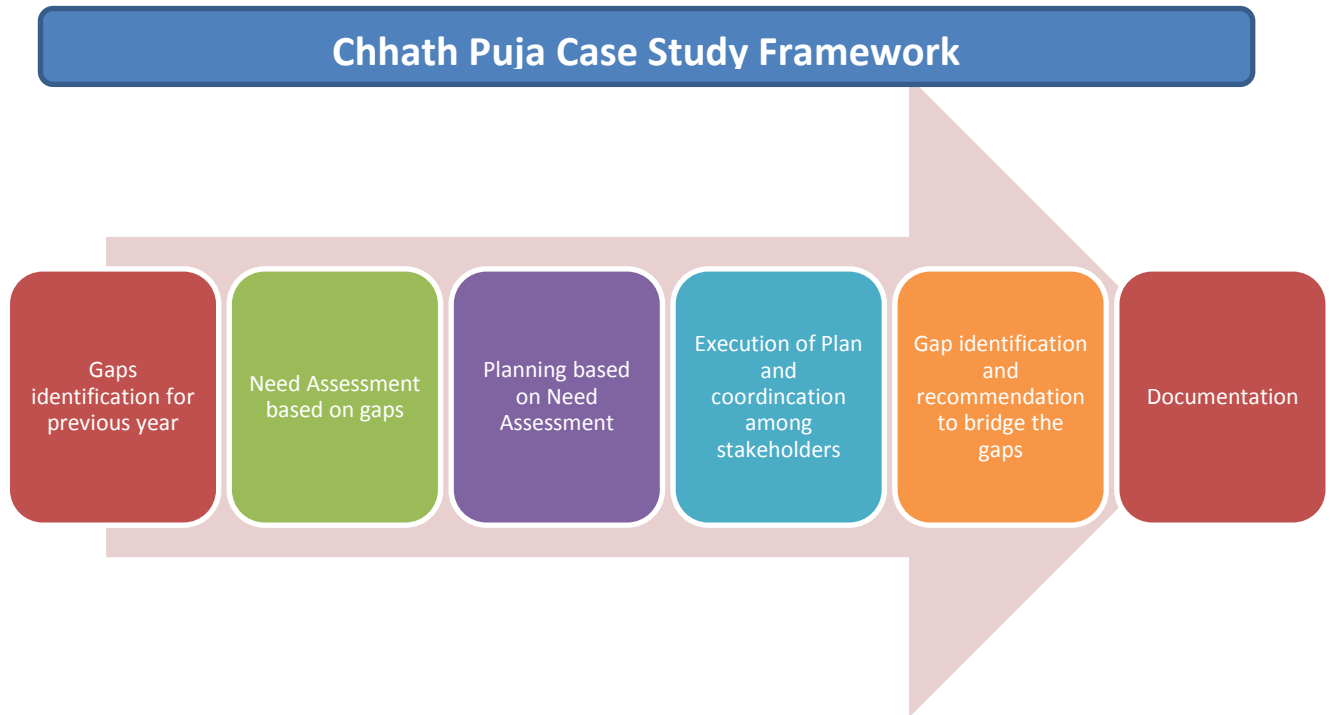
Figure 2: Study Framework

c. Information Need Matrix

Since it is a case study which is explorative in nature, it is very important to determine the source of information and the type of information needed. This will greatly be influenced by the availability of data, and the on-field situation. The need matrix is divided into the following categories;

- The government administration
- Patna Municipal Corporation
- The local groups
- The NGOs and CSO's

6. Research Methodology

The basic objective of the research is to study the good practices adopted during the chhath Puja 2013, identify the gaps in planning and lessons learned. The study was conducted in the following sequence;

An analysis of planning and management done in the previous year

Thorough literature review on Mass Gathering events

Data Collection from field and from government offices

Data Analysis

Identification of Gaps, good practices etc.

Recommendations and documentation

Figure 3: Research Methodology

a. Research Area

The research area is the stretch of 32 kilometers of area along the bank of Ganges and its tributaries in the city of Patna.

b. Unit of Analysis

The primary units of analysis for the study were the departments under the government system and the other organizations playing a role in the planning, management or execution of the event. The smallest units of analysis were the individuals who held a post of responsibility or represented an organization.

c. Research Question

The study dealt with the following research questions;

1. How was Chhath Puja, 2013 planned, managed and executed?

2. Based on the experience from other events of mass gathering, how can gaps identified can be bridged resulting in a model for Mass Gathering Event Management?

The first question clearly deals with the overall organization of the Chhath Puja, 2013. This will call for detailed study of planning and execution of the event and getting perspective and experiences from all stakeholders.

The second question is rather exploratory in nature and can be determined by the success/failure, the evolution of the practices and the gaps identified during the execution of the event. Once done, connecting all the loose ends and incorporating the best practices evolved, a model plan for such events can be determined. This model will be generic in nature and scalable at the same time.

d. Research Design

The study focusses on how the event has been organized and why has it been done that way2. At the same time, here has been no dedicated model developed for the efficient management of mass gathering events. Hence the research takes on an exploratory approach. Additionally, the behavior of the stakeholders involved cannot be manipulated. Hence, according to Yin (Yin, 2003), the present study qualifies for a case study design. It will follow a single case study design3.

e. Sampling

The study adopted a non-probabilistic purposive sampling in the case of Government Administration, the other government authorities and the NGOs and local groups. The same in the case of private players, the corporate and the NGO/CSO was based on a mix of non-probabilistic purposive sampling and snow ball non probabilistic sampling method.

f. Development of Instruments

In case study research, the measurement instrument used to maintain consistent focus and a rigorous approach is the study protocol (Yin, 2003). The protocol is more than just a list of questions to be asked during data collection4. Yin suggests the following protocols that have been included in data collection.

- An overview of the case study project: Project objectives and relevant readings on the Mass gathering and crowd management along with mass casualty management were done.
- Field Procedures
- Case study questions: These questions were purely based on the subject area of the respondents.

---

[2] Yin, 2003: He mentions that case study is preferred strategy when "how" and "why" research questions are posed.
[3] Yin, 2003: Defines this case structure as type3.
[4] Yin, 2003: Page 69

- Guide for case study report: organizing data, putting them into a specific format and documentation.

g. Data Analysis

Once the data was obtained, the analysis was done by organizational level logic model (Yin, 2003). As explained by Yin (Yin, 2003), the logical model traces events taking place in an organization. The data analysis in this method should consist of tracing the actual events taking place in an organization with the close attention to the chronology of the event. So in the research, emphasis was given to the order in which the event was taking place (as explained by the interviewees) and their association with the preceding and the following activities along with other associated activities in the explanation.

7. Planning and Management

a. Risk Assessment

The district administration under the chairmanship of District Magistrate, Patna carried out a detailed assessment of existing risks. The following risks were identified;

- Boat Accidents/ drowning
- Flooding
- Rumors
- Civil unrest
- Electrocution
- Crowd Management
- Bomb blast
- Medical Emergencies/ threat to public health
- Fire/ Display of fire works

b. Stakeholders

1. District Administration:

   The District Administration is the heart and soul of the planning and management of the whole event. Headed by the District Magistrate, the administration coordinated the whole of the event with different government departments other stakeholders.

2. Patna Municipal Corporation:

   Patna Municipal Corporation (PMC) is one of the biggest stakeholders in the whole planning process of Chhath Puja every year besides the state and district administration. It broadly undertakes the following tasks;

   - Preparation and dressing of link roads
   - Minor repair of roads
   - Barricading (temporary)
   - Special drive for cleanliness
   - Facilitations to NGOs and private and public organizations for CSR Activities.

3. Local Groups

   Local groups are part of the community and they help administration implement any plan. In Patna, there are a number of local groups existing based on the locality and the nearby Ghats. They are one of the most significant stakeholders as they know the requirement and dynamics of

the crowd the best and help administration and other government and non-governmental authorities to implement the plan and manage it.

4. Private/Public Enterprises and NGOs

The other stakeholders consist of Public and private organizations such as public and private sector banks, LIC, Petrochemical Corporates etc. They contribute to the public conveniences such as mobile toilets, urinals, drinking water, lighting, cleaning of Ghats etc. They adopt the Ghats and maintain it throughout till the festival is over. NGOs and multilateral organizations such as IFRC station their services such as first aid booths in and around the Ghats to provide basic medical service whenever needed.

c. Risk Reduction Measures

i. Identification of Dangerous Ghats

Owing to the plethora of risk involved, many crucial decisions were taken to minimize the risks. The foremost step in the process was to identify the dangerous Ghats along the river Ganga and other water bodies. All the Ghats were inspected by the concerned Executive Officers at a width of 10 feet (from banks to water) and the depth of the water at this distance was recorded. Many of the Ghats were as deep as 25 feet or had marshy land and hence were categorized as dangerous. There were also suggestions for inspection as the water level could change. Corrective measures for the repairable Ghats were also identified and included barricading, construction of steps, cleaning, lighting etc.

दैनिक हिन्दुस्तान 7-11-13

चैंपियनशिप की खिताबी भिड़ंत का उद्घाटन करेंगी जयललिता | स्पोर्ट्स

समाहरणालय, पटना (जनसम्पर्क शाखा)

छठ पर्व के अवसर पर आवश्यक सूचना

1. कृपया असुरक्षित/खतरनाक घाटों पर न जायें। सुरक्षित घाटों/स्थानों पर पूजा करना ही श्रेयस्कर होगा।
2. असुरक्षित/खतरनाक घाटों पर प्रवेश प्रतिबंधित रहेगा।
3. छठ पर्व के दौरान निजी नाव के परिचालन पर प्रतिबंध रहेगा। कृपया छठ पूजा के लिए नाव का प्रयोग नहीं करें।
4. छठ घाटों एवं उसके सम्पर्क पथों पर आतिशबाजी करना या पटाखा चलाना प्रतिबंधित है।
5. किसी प्रकार की संदिग्ध/लावारिस वस्तु के पाये जाने पर इसकी सूचना तुरंत प्रतिनियुक्त दंडाधिकारी/पुलिस पदाधिकारी/थानाध्यक्ष/ जिला नियंत्रण कक्ष को दें तथा उसे न छुएँ।
6. गंगा घाट तक जाने के लिए कुछ लोग वाहन का भी उपयोग करते हैं। वाहन का उपयोग करने वाले को गंतव्य तक पहुंचने के लिए जिला प्रशासन मदद करेगी। वाहन चालकों से अनुरोध है कि अपने वाहनों को कतार में चलायें, ओवर टेकिंग न करें। वाहन निर्धारित स्थल पर ही पार्क करें।
7. प्रशासन द्वारा छठ के अवसर पर यातायात की विशेष व्यवस्थायें की गई हैं। सर्वसाधारण की सुविधा हेतु इसका अनुपालन किया जाय।
8. सुरक्षा की दृष्टि से गंगा घाटों पर पानी में बैरिकेडिंग की जाती है। श्रद्धालुओं व स्नानार्थियों से जिला प्रशासन अनुरोध करती है कि बैरिकेडिंग के आगे नहीं जायें और दुर्घटना से बचें।
9. किसी प्रकार की अफवाह पर ध्यान न दें। सूचना की सही जानकारी के लिए जिला नियंत्रण कक्ष, पटना की दूरभाष संख्या:- 0612-2219810, 2219234 एवं पुलिस नियंत्रण कक्ष, पटना का दूरभाष संख्या:-0612-2201977, 2201978 पर सम्पर्क किया जा सकता है।

पटना सदर अनुमंडल के खतरनाक घाट

1. बी.एन. कॉलेज घाट 2. मिश्री घाट 3. कदम घाट 4. वंशी घाट 5. जजेज कोर्ट घाट 6. अदालत घाट 7. बांकीपुर क्लब घाट 8. सिपाही घाट 9. अन्टा घाट 10. मीनार घाट 11. जहाज घाट 12. शिवा घाट 13. बुद्ध घाट/सिपाही घाट/बघवा घाट 14. स्कूल घाट/नहर लख घाट/रामजीचक हथुआ इक्लेव घाट।

पटना सिटी अनुमंडल के खतरनाक घाट

1. आदर्श घाट 2. मितन घाट 3. सीता घाट 4. खाजेकलां घाट 5. टेढ़ी घाट 6. कोषव राय घाट 7. भिरचाई घाट 8. कच्ची घाट 9. अदरख घाट 10. नुरुद्दीनगंज घाट 11. शिव घाट 12. महावीर घाट 13. नया पंचमुखी चौराह घाट 14. नया मंदिर घाट 15. त्रिवेणी घाट (फतुहा) 16. कटया घाट एवं सीढ़ी घाट (फतुहा)

दानापुर अनुमंडल के खतरनाक घाट

1. रामजीचक नहर घाट 2. रामजीचक बाटा घाट 3. हथुआ इनकलेभ घाट 4. रामजीचक जहाज घाट 5. सप्लाई डिपो घाट 6. महावीर टोला घाट (मनेर) 7. दुघैला घाट (मनेर)

बाढ़ अनुमंडल के खतरनाक घाट

1. उमानाथ घाट 2. सल्लु घाट 3. गौरी शंकर घाट 4. खान साहब घाट 5. धोबी घाट 6. संगत घाट 7. राघोपुर घाट (बखियारपुर)

पी.आर.-9027 (जिला) 13-14 | सरकारी सेवा जन सेवा का माध्यम है। धर्म ईमान की तरह इसे भी निभाते रहें। | जिलाधिकारी, पटना

Figure 4: Published List of Dangerous Ghats

Figure 5: A Dangerous Ghat

Figure 6: A dangerous Ghat in Digha Region with marshy land

Figure 7: Gandhi Ghat properly prepared for Chhath

Figure 8: TN Bannerjee Ghat
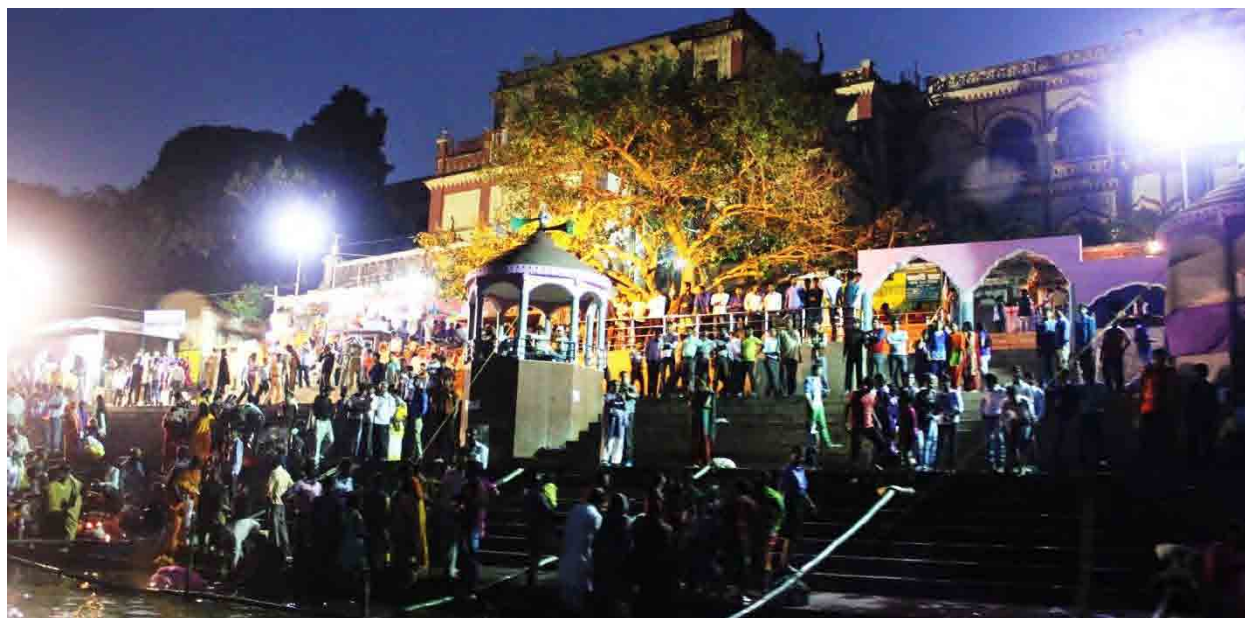
Figure 9: Pictures from some of the Ghats

The names of the dangerous Ghats were also published in the prominent newspapers. They were the following

Serial	Sub-Division	Name of Ghat
1	Patna	B.N College Ghat
2		Mishri Ghat
3		Kadam Ghat
4		Vanshi Ghat
5		Judges Court Ghat
6		Adalat Ghat
7		Bankipur Club Ghat
8		Sipahi Ghat
9		Anta Ghat
10		Meenar Ghat
11		Jahaj Ghat
12		Shiva Ghat
13		Buddha Ghat/ Sipahi Ghat/ Badhwa Ghat
14		School Ghat/ Nahar Lakh/ Ramji Chak Hathuwa enclave Ghat
15	Patna City	Adarsh Ghat
16		Mitan Ghat
17		Seeta Ghat
18		Khajekala Ghat
19		Tedhi Ghat
20		Koshav Rai Ghat
21		Mirchai Ghat
22		Kacchi Ghat
23		Adrak Ghat
24		Nuruddinganj Ghat
25		Shiv Ghat
26		Mahaveer Ghat
27		Naya Panchmukhi Chauraha Ghat
28		Naya Mandir Ghat

29		Triveni Ghat (Fatuha)
30		Kattaiya Ghat and Seedhi Ghat (Fatuha)
31	Danapur	Ramjichak Nahar Ghat
32		Ramjichak Bata Ghat
33		Ramjichak Jahaz Ghat
34		Hathwa Enclave Ghat
35		Supply Depot Ghat
36		Mahaveer Tola Ghat (Maner)
37		Dudhaila Ghat (Maner)
38	Barh	Umanath Ghat
39		Sallu Ghat
40		Gauri Shankar Ghat
41		Khan Sahab Ghat
42		Dhobi Ghat
43		Sangat Ghat
44		Radhopur Ghat (Bakhtiarpur)

Table 2: List of Dangerous Ghats

ii.   Construction of Pontoon bridges (Peepa Pul) and repairing of roads

Since there is a huge movement of people across the streams of the river Ganges, the administration constructs bridges to make the movement more convenient. But unfortunately, the bamboo bridges that were constructed last year were damaged during a stampede that happened on one the Ghats in Patna. Hence, to make the bridges more stable, the administration constructed pontoon bridges instead. The width of the bridges was sufficient and they were carpeted to avoid any traps. There was one pontoon bridge constructed at Patna collectorate Ghat and two at Mahendroo Ghat. The officer in-charge also ensured that there would be no electrical wiring running through the bridges. The bridge at the Collectorate Ghat was bifurcated to make arrangements for inward and outward traffic. But in Mahendroo Ghat, there were separate pontoon bridge for inward and outward flow. Special care was taken to ease out the traffic on the bridges.

Figure 10: Pontoon Bridge at Collectorate Ghat

Besides the bridges, the Executive Engineer, RCD also undertook the task of minor repairing of the roads and clearing of encroached roads. The roads leading to Badi Devi Ji, Maroofganj, Mangal Talab and Patna Junction roundabout were repaired.

Figure 11: Sand Sacks around the Ghats

iii.   **Temporary Constructions/ other repairs**

To keep the devotees out of the dangerous water levels and to ensure their safety, temporary railing and bamboo structures "chali" was constructed on the Ghats. Also, the executive engineers were issued the orders to ensure that all the Man holes and the catch pits were fully covered so as to avoid any incidents.
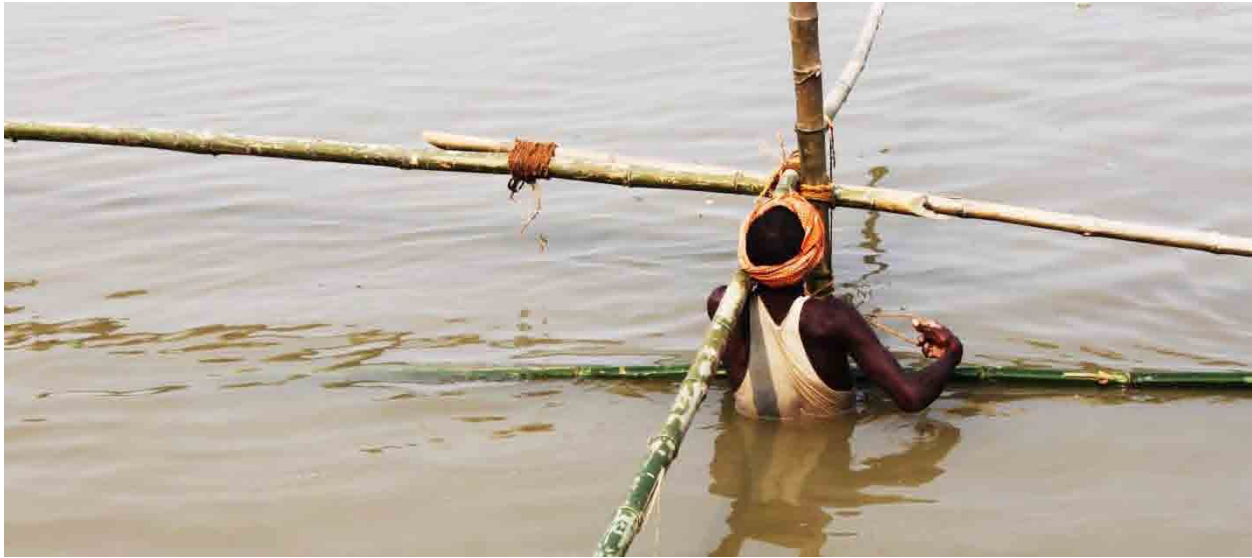

Figure 12: Barricading at Ghats

iv.   **Police control, Safety and Security**

The event of mass gathering such as this one attracts people of all age groups, gender, and social status. Hence, keeping the civil situation in an order is a challenge. At the same time, miscreants try all possible means to create chaos including rumors.

Figure 13: Police Patrolling on Ashok Rajpath

Realizing this fact, the government took a decision to depute police officers, police force, civil defense, armed forces etc. along all the Ghats. Besides, patrolling force was deputed in the river as well as the routes leading to these Ghats. Police patrolling was done from 10 AM to 9 PM on 8th November and from 3 AM till the end of the Vrat at 16 identified places. Each patrolling force had 1-4 armed police.

Sl no	From	To
1	Digha	St Michael School
2	St Michael School	Kurji More
3	Kurji More	LCT Ghat
4	LCT Ghat	Rajapur Pul
5	Rajapur Pul	Baans Ghaat
6	Baans Ghat	Children Park More
7	Children Park More	Kargil Chauk
8	Kargil Chauk	Patna College
9	Patna College	NIT More
10	NIT More	Rani Ghat
11	Rani Ghat	Tripoliya
12	Tripoliya	Gaighat
13	Gaighat	Adarsh Ghat
14	Adarsh Ghat	Nandgola Ghat
15	Nandgola Ghat	Naya Mandir Ghat
16	Within Gandhi Maidan	

Table 3: Deputation of Gashti Dal

Civil Defense and Home Guards were also deputed on selected Ghats on the given dates. To keep a vigil over the movements of the people, the administration had installed CCTV cameras (though very limited) and made arrangements for videography in the areas with high population movement and the ones having narrow pathways. There was additional patrolling done in the Patna City area owing to large number of Ghats in the area. All the officials on duty were instructed to send status report to the control room on regular basis. Owing to recent bomb blasts and terrorist activities in the state, the police had included a sniffer dog squad in its patrolling force. Watch towers fitted with videography were installed in some of the areas for better coverage. To have a better control over miscreants over roads, a precautionary measure, there was a ban on sale of alcohol products.

Figure 14: Dog and Bomb Squad in action

In regard to the drowning cases during the festival, district authority ensured presence of motor boat, launch, sailors, boats and trolls as Ghats as per the requirements determined by the officer in-charge. The District Control Room had also arranged a deep diver with 5 assistants and a mahajaal. Also, since the divers were stationed in Sultanganj, they were facilitated with vehicles to make them reach the accidents spots when there was any emergency.

Figure 15: Safety Equipment and Communication systems at Ghats

Figure 16: NDRF Rescue team

Figure 17: Rescue team in action

National Disaster Response Force (NDRF) emerged as one of the strongest forces to act

v.   Electricity

Since the movement of the devotee extended beyond the sunset and in wee hours of the next day. Hence a proper arrangement of illumination becomes very crucial. Similar to the previous year, illumination and lighting for the main roads, the road connecting the Ghats and other connecting roads were to be undertaken by the local groups/institution and other companies. Else, in their absence, the same was undertaken by the administration in coordination with PESU. PESU was also responsible for maintenance and repair of lose wires. It was also instructed to get all the temporary electricity lines properly examined and checked by Engineers (electricity). There are altogether 66 high mast lights in the city. But they are not well maintained. Hence, the DM had issued orders to get the lights repaired or fixed wherever required.

Figure 18: Illumination at Ghats(1)

Last year, an unfortunate incident had happened at Adalatganj Ghat due to rumors leading to shutting down of electricity supply on the Ghats. The electricity department did not verify the rumor and hence it resulted in a stampede. Hence this year, the department had taken strict measures to avert such incidents. Accordingly, the department would not take any action until and unless any of such incidents were reported or verified by the officers deputed on the field.

Figure 19: Illumination at Ghats (2)

vi.   Fire Brigade

Fire tenders were stationed near the Ghats attracting large number of devotees. The stationing was done by the Fire Officer, Patna near the District Control Room, Patna City, Mahendru, Gandhi Ghat, Digha, Danapur and other crowded places. There were, however many places that were beyond the reach of the fire tenders.

vii.   Traffic Control

Traffic control is one of the key aspects of success of such events. There is a huge inflow and outflow of people on the streets and main roads. The population largely consists of women and children. Almost everyone carries the "Prasad" which is quite heavy and makes the movement on the road quite difficult. Besides the boat movement in the river further makes it difficult for the devotee offering prayers on the bank of the river to do so. Hence the traffic management this time was done at both the places, i.e. movement on roads and movement in the water.

पटना, 7 नवंबर 2013 **दैनिक जागरण | 7**

बिहार सरकार

पुलिस अधीक्षक का कार्यालय (यातायात), पटना

आवश्यक सूचना

छठपूजा- 2013 के अवसर पर पटना शहर में दिनांक- 08.11.2013 एवं 09.11.2013 को यातायात व्यवस्था

इस वर्ष छठपूजा के अवसर पूजा करने वालों की सुविधा के लिये दिनांक- 08.11.2013 को दोपहर 12.00 बजे अपराह्न से 19.00 बजे संध्या तक एवं दिनांक-09.11.2013 को सुबह 02.00 बजे से पूर्वाह्न 08.00 बजे तक यातायात व्यवस्था निम्न प्रकार है :-

गेट नं०-93 घाट:-

आशियाना दीघा रोड से आने वाले सभी छोटे वाहन गेट नं0-93 में प्रवेश कर घाट के किनारे अवस्थित निर्धारित पार्किंग स्थल पर अपना वाहन पार्क कर वहाँ से पैदल घाट के लिये प्रस्थान करेंगे।

कुर्जी मोड़ से राजापुर पुल तक की व्यवस्था:-

यह मार्ग बड़ी वाहनों, बैलगाड़ी एवं ट्रैक्टर के लिये प्रतिबंधित रहेगा। सभी छोटी वाहन कुर्जी मोड़ अथवा राजापुर पुल घाट से सीधे घाट की ओर जाकर पार्किंग स्थल पर पार्क करेंगे तथा वहाँ से छठव्रती एवं उनके परिजन पैदल घाट तक जायेंगे।

बोरिंग कैनाल रोड:- यह मार्ग बड़ी वाहनों, बैलगाड़ी एवं ट्रैक्टर के लिये प्रतिबंधित रहेगा। बोरिंग रोड चौराहा से राजापुर पुल की ओर जाने वाले वाहन दानापुर, गांधी मैदान अशोक राज पथ में राजापुर पुल से बायें एवं दायें सीधे घाट तक चले जायेंगे तथा घाट पर निर्धारित पार्किंग स्थल पर पार्क करेंगे तथा वहाँ से छठव्रती पैदल घाट तक जायेंगे।

दानापुर पुल से लेकर पुलिस लाईन गोलम्बर तक की व्यवस्था

यह मार्ग पैदल छठ व्रतियों एवं वाहनों के लिये खुला रहेगा। सभी छोटे वाहन बाँस घाट से सीधे घाट तक जायेंगे एवं घाट पर अवस्थित पार्किंग स्थल पर वाहन पार्क करेंगे तथा वहाँ से छठव्रती एवं उनके परिजन पैदल घाट तक जायेंगे।

कोतवाली से पुलिस लाईन रोड:-

यह मार्ग बड़ी वाहनों, बैलगाड़ी एवं ट्रैक्टर के लिये बन्द रहेगा। इस पर भी छठ व्रतियों को लेकर आने वाली कार, जीप टैम्पू एवं रिक्शा अशोक राज पथ में आकर वायें बाँस घाट से होते हुये गांधी मैदान में वाहन पार्क कर कलेक्ट्रेट घाट अथवा किसी अन्य घाट पर जायेंगे।

कारगिल चौक

एक्जीबिशन रोड, फ्रेजर रोड, एवं वीरचंद पथ से आने वाले सभी छोटे वाहन गांधी मैदान के द्वारा से प्रवेश कर गांधी मैदान में अपने वाहन को पार्क करेंगे तथा वहाँ से छठव्रती घाटों के लिये लिये प्रस्थान करेंगे। कारगिल चौक से आगे किसी भी छोटे वाहन को अशोकराज पथ में एवं कलेक्ट्रेट रोड में प्रवेश की अनुमति नहीं होगी।

पटना कॉलेज :-

सब्जी बाग मोड़, गोविन्द मित्रा रोड, मखनियों कुआँ एवं खजाँची रोड से आने वाले सभी वाहन पटना कॉलेज के मैदान में पार्क कर छठव्रती वहाँ से पैदल घाट तक जायेंगे। कोई भी वाहन सब्जी बाग से कारगिल चौक की ओर तथा पटना कॉलेज से साईंस कॉलेज की ओर नहीं जायेंगे।

साईंस कॉलेज :-

एनीबेसेंट रोड, रमना रोड, कुनकुन सिंह लेन एवं अशोक राज पथ के पश्चिम से आने वाली सभी वाहन साईंस कॉलेज में आकर पार्क रहेगें तथा वहाँ से छठव्रती गाड़ी पार्क कर पैदल विभिन्न घाटों के लिये प्रस्थान करेंगे। कोई भी वाहन एन0आई0टी0 मोड़ से आगे प्रवेश की अनुमति नहीं होगी।

पीपा पुल :-

छठव्रतिया का सुविधा के लिय पटना कलक्ट्रेट के घाट में एक पीपा पुल तथा महेन्दू घाट में दो पीपा पुल का निर्माण कराया गया है। छठव्रतियों से अनुरोध है कि वे गांधी मैदान में अपना वाहन पार्क कर वहाँ से पैदल अपनी सुविधानुसार संबंधित घाटों पर पंक्तिबद्ध तरीके से पीपापुल का उपयोग करते हुये घाट तक जायेंगे।

बंकाघाट की ओर जाने वाली वाहन:-

जिन छठ व्रतियों का वाहन बंका घाट की ओर जाना चाहेंगे वे भिखारीठाकुर पुल या मीठापुर पुल से करबिगहिया होते हुये पुरानी बाईपास या न्यू बाईपास से होते हुये बंकाघाट जायेगी।

गायघाट की ओर जाने वाली वाहन:-

वैसे बड़ी/ छोटी वाहन जो छठव्रति को लेकर कंकड़बाग कॉलोनी से गायघाट की ओर जाते हैं, वे वाहन सीधे धनुकी मोड़ जायेगी और गंगा पुल होकर विस्कोमान गोलम्बर से गायघाट की ओर चली जायेगी और पुल के नीचे जाकर वाहन पार्क करेगी। वहाँ से छठव्रति पैदल घाट जायेंगे। किसी भी परिस्थिति में यह गाड़ी गायघाट जाने वाली मार्ग में यानि अशोक राजपथ से उत्तर की ओर नहीं जा सकेगी। यह मार्ग मात्र पैदल जाने वाली छठव्रतियों के लिये सुरक्षित रहेगा।

गंगा सेतु पुल पर वन-वे व्यवस्था

गांधी सेतु पुल होकर काफी संख्या में छठव्रती गंगा पुल होकर हाजीपुर जाते हैं, जिससे यातायात की समस्या उत्पन्न हो जाती है। वर्तमान में गंगा सेतु पुल पर मरम्मति कार्य चल रहा है। जिससे कहीं-कहीं एक ही फ्लैंको से वाहनों का आवागमन हो रहा है। छठ व्रत के अवसर पर यातायात समस्या उत्पन्न न हो इसे देखते हुये दिनांक-08.11.2013 को 18.00 बजे से दक्षिण से उत्तर की ओर यातायात का परिचालन होगा और 17.00 बजे के बाद उत्तर से दक्षिण की ओर यातायात आयेगी। इसी प्रकार दिनांक-09.11.2013 को 02.00 बजे से दक्षिण से उत्तर की ओर यातायात जायेगी एवं पूर्वाह्न 06.00 बजे से उत्तर से दक्षिण की ओर यातायात का परिचालन होगा। पुलिस अधीक्षक, वैशाली से अनुरोध किया जायेगा कि वे रामाशीष चौक पर यातायात को रोकने की व्यवस्था करेंगे।

दीदारगंज एवं कोईलवर से यातायात संचालन की व्यवस्था

छठव्रतियों की सुविधा हेतु दीदारगंज से पश्चिम एवं कोईलवर से पूरब राष्ट्रीय उच्च पथ एवं न्यू बाईपास, बिहटा पटना मार्ग पर दिनांक-08.11.2013 के 12.00 बजे दोपहर से संध्या 07.00 बजे तक एवं 09.11.2013 को रात्रि 02.00 बजे से पूर्वाह्न 07.00 तक व्यवसायिक वाहनों ट्रक, ट्रैक्टर आदि (छठ व्रतियों के वाहन को छोड़कर) के परिचालन पर प्रतिबंध रहेगा।

व्यवसायिक वाहन एवं मिनी बस की व्यवस्था

नगर बस सेवा :- स्टेशन, जी0पी0ओ0 होते हुये बेली रोड से दानापुर या खगौल जाने वाली बस किसी भी परिस्थिति में गांधी मैदान नहीं आयेगी। ये वाहन स्टेशन से ही अपने गंतव्य स्थल की ओर जायेगी।

टैम्पू एवं अन्य वाहन :- पटना सिटी की ओर से जाने वाली टैम्पू गायघाट से दक्षिण मुड़कर विस्कोमान गोलम्बर होते हुये पुरानी बाईपास में आयेगी एवं गांधी मैदान से सिटी की ओर जाने वाली अन्य वाहन गांधी मैदान से एक्जीबिशन रोड होते हुये राजेन्द्र नगर पुल से बहादुरपुर गुमटी होते हुये बाईपास अगमकुआँ से सिटी चौक तक जायेगी। यदि कोई वाहन (छठ व्रतियों के वाहन को छोड़कर) गायघाट से अशोक राजपथ में किसी कारणवश जाती है तो गांधी चौक से लोअर रोड में डायवर्ट हो जायेगी। किसी भी परिस्थिति में अशोक राजपथ होते हुये सीधे गांधी मैदान की ओर नहीं आयेगी।

आपातकालीन सेवा :- अग्निशामक, एम्बुलेंस एवं मरीज लेकर आने वाली वाहनों पर कोई प्रतिबंध नहीं रहेगा।

उक्त सभी प्रतिबंध दिनांक-08.11.2013 के दोपहर से 12.00 से 19.00 बजे तक एवं दिनांक-09.11.2013 के पूर्वाह्न 02.00 बजे से 09.00 बजे पूर्वाह्न तक लागू रहेगा।

(जयन्तकान्त)	(मनु महाराज)	(डॉ0 एन0 सरवण कुमार)
पुलिस अधीक्षक, यातायात पटना	वरीय पुलिस अधीक्षक पटना	जिलाधिकारी, पटना

सू.ज.स.वि. 8986 (पुलिस) 13–14 बिहार

Figure 20: Traffic instruction and information published in newspapers

Learning from the previous year, where there was huge flux of traffic, inwards and outwards, even two to three days prior to the event, hence special attention was given to traffic management at busy areas between 5th and 9th of November. Since assistance from the Thana level was inadequate, additions forces were deployed to keep the traffic movement under control. Strict control was made over the parking of the vehicles along the roads and making identified location available for parking. It was also observed that on the first day, the traffic police did not allow unauthorized parking on the Ashok Rajpath that leads to Patna city. Continuous announcements were made on regular basis for not parking the vehicles on the approach roads. Adequate barricading was done to regulate traffic flow towards the Ghats in the peak hours.

To reach the message about the changed traffic plan for the given days, there was detailed information published in the popular newspaper dailies from the office of Superintendent of Police (Traffic). The information included the timings for restricted traffic movements along with the timings.

Additionally, plying of private boats in the river during the festival causes a lot in convenience to the devotees and at the same time cause accidents. Hence, this year the administration had banned the operation of private boats.

viii. Medical facilities

Learning from the serious chaos that was created in Patna Medical College Hospital (PMCH) last year, this year Medical service was considered the most important domains to be looked into. All the important Ghats were equipped with lifesaving drugs and a medical team consisting of a doctor, a paramedical officer and 2-3 supporting staffs. EMRI 108 service was also pulled in on several locations. To make the services available to all the people if emergency situation arose, 24 hours emergency medical service including Operation Theater was made available at PMCH, Nalanda Medical College Hospital, Indira Gandhi Institute of Medical Sciences, Kurji Hospital and Guru Gobind Singh Hospital, Patna City and many other major recognized hospitals. Special security arrangements including one police officer and 5 constables were made at the hospital to keep the situation under control under any unfavorable circumstance. PMCH and IGIMS were also facilitated with Wireless equipped mobile thana. Also, special care was taken to ensure proper medical care at the Ghats having pontoon bridges.

Figure 21: Medical Facilities at Ghats

Figure 22: Red Cross team at one of the Ghats

The following were the Ghats/ centers for stationing Ambulances

Ambulance Station	Nos.
District Control Center	2
Patna City Control	1
Danapur Control	1
Colletorate Ghat	1
Mahendru Ghat	1
Patna College Ghat	1

Table 4: Stationing of Ambulances

ix. **Awareness and Sensitization**

The district authority carried out very limited awareness activities. This included putting up banners and posters of do's and don'ts and important phone numbers. These posters were displayed on the approach roads and some of the Ghats.
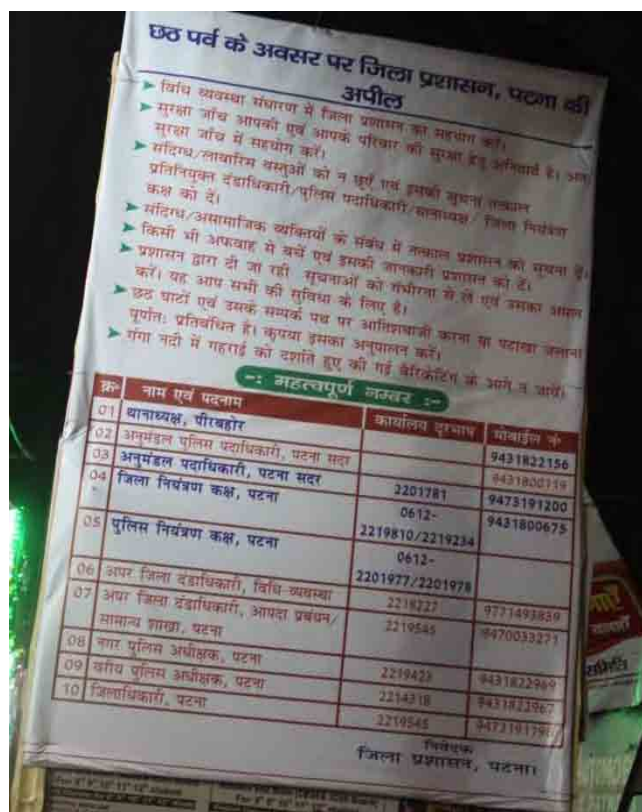

Figure 23: Public awareness and display of Do's & Don'ts

x.   **Sanitation, Cleanliness & Water Supply**

The major problem that the devotees generally face is the absence of cleanliness at the Ghats. Hence the Patna Nagar Nigam had taken all possible steps under the supervision of Chief Engineer to clean the Ghats that had been identified and install temporary structures for ease of public such as railing and "Chaali". Junior Engineers and Assistant Engineers were given responsibilities of a particular number of Ghats to monitor on constant basis.

Figure 24: Ghat cleaning Drive in progress

The PMC has also ensured continuous water supply to all devotees throughout the festival. The water supply through municipal corporation pumps was continued beyond the normal hours to cope with the surge in demand. Additionally, water tankers were stationed at the busy approach roads to cater to the need of devotees.

xi.   Communication and PA Systems

The PA system at Ghats was maintained by the Puja Samitis. Most of the Ghats had more than one Puja Samitis with their own set of PA system. This tended to create a confusion, lack in clarity of announcements, repetition of same announcement and misusing the PA system at one or two places.

Figure 25: Public Announcement System at one of the Ghats

Figure 26: Akash Vani, Patna at Gandhi Ghat

Through BSNL hotline, Akashvani has set up a quick communication channel that would monitor the Ghats and aired the commentary on their observation through the radio between 4:00 PM to 5.30 PM. The major issue with the commentary on Radio was that it did not make any announcement related to Disaster Management related topics. It, however claimed to use the channel for monitoring, in case there was any incident.

xii. **Pollution Control**

Having recognized the importance of clean environment, the administration along with Bihar State Pollution Control Board (BSPCB), Department of Environment and Forest and Patna Municipal Corporation, tool many initiatives to inhibit pollution in any form.

Figure 27: Awareness and Appeal by BSPCB and Campaign for Gangetic Dolphin Conservation

There was wide publicity of the pollution reduction measures by the BSPCB. These included the following points;

a. Banning of noise pollution in any form, such as loud speakers, sound amplifiers, fireworks, crackers, PA system, musical instruments etc. between 10 PM and 6 AM.

b.   No display of cracker, fireworks, speakers, horn etc. in 100 meters radius of Silence Zones such as hospital, education institution, religious places, court etc.

c.   High sound crackers were totally banned.

The display of fireworks was banned in and around Ghats. Besides, the department of Environment & Forest carried out a campaign to safeguard the Gangetic Dolphines on the various Ghats.

xiii.   Corporate Social Responsibility

Towards making the corporates and other private players feel their responsibilities towards the society, the administration along with the Patna Municipal Corporation, requested all the major businesses in and around Patna to contribute. Hence, players like LIC, SBI, other private and public sector banks, National Power Grid Corporation, and other major companies had adopted many Ghats and undertook all the significant works such as temporary construction of changing room for women, mobile toilets and urinals, street lights, barricading, cleaning of Ghats, Solid Waste Management and cleanliness etc.

Figure 28: Changing Room for Women under CSR by LIC

8. Good Practices

1. The identification of dangerous Ghats was done very carefully. This ensured that the devotees did not flock to the dangerous Ghats.

2. Almost every Ghat had barricading that prevented the devotees to step deep inside the river and also provided a support while they bathed.

3. The NDRF implemented the following four-tier system for effective response;

    a. Onsite management example – keeping people away from deep water.

    b. Control on the Ghats and onsite- Medical first response

    c. Approach Road Management

    d. Prepositioning of response teams as designated centralized locations for swift movement

4. Usage of Pontoon Bridges instead of Charchari/ bamboo based bridges reduced the risk of stampede significantly

5. Security and Law & Order was held very important. The positioning of Gashti Dal between the designated areas around Ghats, the approach roads etc. gave confidence to the general public to carry out the prayer even in off hours.

6. Since most of the devotees used the roads to walk down to the Ghats carrying heavy objects used in the offerings, traffic police had significantly been able to reduce the burden of vehicles on the roads by allotting parking places, designating routes and approach roads, and issuing clear instruction to the public by all possible means.

7. Banning the private boat movement in the river while the festival was in progress helped in averting boat accidents.

8. Temporary changing room arrangements for women was done at major ghats

9. There was continuous announcement on PA system giving information on

10. The organizations such as Power Grid Corporation of India, LIC, and many public and private corporations were roped in for providing public convenience at various Ghats through their Corporate Social Responsibility initiatives. In coordination of Patna Municipal Corporation, many of such enterprises had adopted Ghats and provided services such as solid waste management, illumination, Public Announcement Systems, bathing spaces for devotees and specially women, drinking water, temporary toilets and urinals, and cleanliness of Ghats.

9. Gap identification

1. The list of dangerous Ghats were very promptly prepared and forwarded to all concerned authorities. Still, there were instances where devotees flocked to unrecognized Ghats.

2. The barricading that was done along the recognized Ghats was inadequate. Also, at many places, people moved out of the barricading into the river in search of less crowded spaces.

3. On one of the Ghats, the sewers were continuously emptying sewage and solid wastes just adjacent to the place where people were offering prayers. This could attract widespread skin disease and other public health concerns.

4. Though Pontoon bridges were constructed and roads were dresses, there were concentrated only in and around some of the most popular Ghats in eastern Patna. Many of the Ghats in western Patna, near Digha and adjoining areas, were very slippery and had dangerous slope that could lead to casualty of many forms.

5. Due to lack of clarity in the ownership and maintenance of High Mast Light, many of the lights were not working.

6. Though there administration claimed to have illuminated all the approach roads and Ghats with lights, many of the Ghats towards the western Patna were poorly illuminated. This caused inconvenience to the public returning after the 1st Argha.

7. The rescue boats stationed at several locations by the district administration was poorly manned and they were not in accordance with the need. (Big sized boats manned with one person and a diver). It seemed practically difficult for the boats to carry out any rescue operation.

8. There were concentration of resources at very few Ghats such as Darbhanga House, Collectorate Ghat and Gandhi Ghat. The resources were much needed at the Ghats towards the Digha side as it had multiple folds more number of devotees offering prayers in along the river coast.

9. Though the administration had banned display of fireworks near the Ghats; there were widespread violations of the rule. In several instances, it was observed that despite the presence of police force, people burst crackers.

10. The public address systems (PA Systems) were not well managed. In many of the Ghats such as Darbhanga House, the PA systems were installed by multiple sources (Puja Samitees). They misused the system to certain extent. There was a lack of clarity in the voices as multiple voices could be heard at the same time announcing different things.

11. Availability of first aid counter at major Ghats was not observed. IFRC, Bihar Branch had however put 3 first aid booths at different Ghats and NDRF had a Medical Response team at Gandhi Ghat.

12. The medical teams at different Ghats were not connected to the PMCH and CMO office. Hence they had limited coordination and connectivity.

13. The Bihar Fire Service had though stationed fire tenders at significant locations, there were roads, streets and pandals that were still inaccessible. In such circumstances, if fire occurred, it would be very difficult for the fire men to put out the fire.

14. At certain level, it was observed that the whole preparedness for the event could have been done in a much better way by effective coordination between different stakeholders. Some of the on-field staffs, such as that of Medical Team were not very clear on each aspect of preparation.

15. All the stakeholders in the area were not properly identified and mapped by the administration. E.g. there was a lack of clarity on mapping and allotment of role of Civil Defense.

16. There was a lack of clarity on the role of media. Though media persons were present everywhere in the field, they could have been more effective if they were instructed and briefed by the Authorities to flash and highlight important information about the control room numbers, dangerous Ghats, the crowd, the traffic and safety measures along with important phone numbers. Additionally, the announcements by the All India Radio at Gandhi Ghat could have been put to better use if they incorporated the announcement on safety measures and on-field situations.

10. Recommendations for Chhath Puja

1. **Monitoring and surveillance** should be an utmost priority in and around the event area with implementation of manual as well as technological means (CCTV). With the recent bomb attacks at Bodhgaya and at Patna, the area has become very active in terms of terrorism. Also, the general monitoring of traffic and unlawful behavior of certain groups becomes very difficult. Hence a proper surveillance is necessary. This Chhath Puja had very little implementation of electronic monitoring mechanism.

2. **Awareness and Sensitization** on various aspects of disaster management, mass casualty management risks, hazards etc. for all the stakeholders and general public is a must. The district administration had installed few banners and posters on Do's and Don'ts, but they seem inadequate as most of the posters are hung high on the lampposts and are hardly readable in evening.

   Also, Awareness and Sensitization program on Mass Gathering Event Management, Mass Casualty Management and basics of Disaster Management should be carried out **for the field officers and staffs** who would be deputed on the field. This will enable the officials to have a better understanding of the gravity of the situation and give them an ability to respond in a better way under unforeseen incidents.

3. There should **be forces present at the entry or near the dangerous Ghats** so that people's entry could be prevented.

4. The **barricading** should be done in such a way that **it covers the full length of the Ghats**. At the same time, the police force present at the site must not allow anyone from going beyond the barricading.

5. All the **sewage and solid wastes** that get emptied in the river should be **halted** for a couple of days during Chhath Puja so as to provide clean water and healthy environment for the devotees. Also, since the offerings at Ghats generate a lot of solid waste generally unattended by the devotees, there needs to be a proper mechanism working on a gap of few hours to **keep filtering these solid wastes from the water.**

6. Even **distribution of resources** based on the number of people gathering on Ghats is a better way to handle incident of any form. In this event, most of the resources were concentrated at some major Ghats.

7. The **western Patna** had many Ghats that were **highly populated** in the evening. Special security, medical, Law & Order etc. arrangements should be done at such places that are expected to be significantly crowded.

8. Even though the administration along with many other stakeholders had installed **lights** on Ghats, they were still **inadequate**. Since sun set quite early, proper lighting of roads and Ghats should be done to provide extra convenience to the devotees and to keep a vigil on miscreants.

9. There should be **strict monitoring of the Pooja Samitis** and the local groups. They tend to violate many rules specially the misuse of PA systems. The Administration should **issue a guideline** for all the Puja Samiti and grant them **permission to operate**.

10. Medical facility is a must. Every effort should be made to **station a first aid counter at all the designated Ghats**. Else, the major hospitals and the clinics should be encouraged to take initiative to station their first aid booths between major Ghats and crowded areas.

11. The doctors should be trained in the skills related to Mass Casualty Management. At the same there is a need to connect all the major hospitals wirelessly and provided with a communication station.

12. There has to be a **centralized inquiry booth** in each locality well connected to all the Ghats. This will be significantly helpful for the people.

13. There are significantly important **other water bodies in the city areas** which are now preferred location for devotees to offer their prayers. The administration should give due importance to these water bodies also as they may also pose similar threat to people.

14. On the completion of the event, the PMC should take proper care of reverse logistics, especially the solid waste management, and restoring the ghats to normal.

Figure 29: Barricading at a ghat in Digha

11.   General Recommendations for Mass gathering Event Management

i.   Hazard Identification

- The foremost step of mass gathering event management planning is identification of hazards in the vicinity
- The hazards may vary from place to place but will include earthquake, floods, uncontrolled crowd, fire, bomb blast, public health hazards such as food poisoning, accident prone areas, etc.

ii.   Risk Assessment

Based on the hazards identified, a proper risk assessment should be carried out based on demographic, environmental, and socio-political factors. The risk can be identified based on

- Event type, duration and location
- Time, day and season of the event
- Expected crowd numbers; age of crowd; mood of crowd
- Weather and local hazards
- Surveillance for public health & sanitation. (Fogging, hospital preparedness, solid waste management).

iii.   Awareness and Sensitization

- Stress should be given on public awareness and sensitization.
- Adequate measures should be taken to ensure proper dissemination of Do's & Don'ts specific to hazards among the public through various Information, Education and Communication (IEC) materials. If possible, leaflets on the same should be widely distributed with all the information on emergency numbers and maps showing public amenities and emergency services locations.
- Clear information on safe exits and route maps should be displayed at important junctions
- Electronic display boards should be placed at busy locations along with PA system speakers.
- To prevent rumors, proper information on real time basis should be provided to public.

- These signboards should also be used as media to spread awareness on Do's & Don'ts', announcement on any emergency situation, lost and found, public amenities information etc.

- Blown up maps of the area displaying important places such as police stations, hospitals, open spaces etc. should be displayed on billboards.

- Emergency numbers (police, fire service, medical service, ambulance, NDRF etc.) should be displayed at all the locations.

- Also, information on public amenities, and helpline numbers should be regularly announced on PA system

- Adequate numbers of "May I Help You" counters should be set up at strategic locations such as entry and entry routes, airports, railway stations, bus stands, auto stands and event areas to answer basic queries of public

- One "Lost & Found" booth should be set up at strategic location in the area of event.

iv. Crowd Management

A mass of individuals/ people may have the following characteristics:

- Individuals attempt to move faster than normal.
- Interactions between individuals lead to formation of groups within the crowd.
- Exits become arched and clogged.
- Escape is slowed by fallen individuals serving as obstacles.
- Individuals display a tendency towards mass or copied behaviour.
- Alternative or less used exits are overlooked.

Crowd management may include

- Traffic control,
- Controlled access to restricted areas,
- Lost person reports, and
- Assistance for emergency service.

Provision of trained personnel to provide security and access to staff, authorized personnel and officials is recommended. Crowd management can best be achieved by;

- Training of security/volunteers in crowd control.

- Specific entrance and exit points clearly identified and displayed at site.
- Establishment of uni-directional flow of attendees/devotees.
- Avoidance of overcrowding with adequate filtering, limited entry and public address measures.
- Adherence to fire safety protocols.
- Emergency exits free from obstruction.
- Available fire and site evacuation plans.
- Crowd modelling based on space of movement, clear direction, available time and flow of crowd needs to be done.

The following strategies can also be adopted for efficient crowd management:

- Making traffic/crowd flow one way.
- Segregation of crowd based on vulnerable groups, VIPs, Media etc.
- All emergency services like fire fighters, security, police, NDRF, First-aiders will stationed near the venue to avoid any eventuality.
- Restricted vehicular movement within event area.
- Use of coaches and buses to reduce private vehicle usage and any potential problems which large vehicles may present, for example access difficulties, parking requirements, potential road blockages.

v. **Traffic Management**
- A proper display of direction and important information will reduce chaotic situations in such events.
- Vehicle movement needs to be closely monitored and regulated in the area of event.
- Restriction on vehicles in crowded area, their diversion to some other non-crowded routes and permission to ply only small non-polluting vehicles such as "Thela" and manual Rickshaw should be given
- Also, the following points need to be kept in mind for regulating traffic:
    1. Clear and visible signs and directions at important places
    2. Wide entry and exit routes
    3. Sufficient parking space

vi. **Medical Aid and Hospital Preparedness**
- Evaluate, plan and prioritize medical healthcare needs for the mass gathering including:

- o Planning for the number and location of on-site First Aid Posts and medical facilities.
- o Human resource planning, e.g. ambulance, paramedics, emergency physicians, nurses, first aid volunteers, safety/security officers
- o Planning for provision of medicines, beds etc.
- o Education and training of healthcare personnel/volunteers
- o Co-ordination with local hospitals and nearby districts for additional medical assistance.
- o Defining a chain of command and communication strategy (public and media).
- Establishing First Aid Posts at strategic locations within the event area
- The management of First Aid Posts should be done by doctors, paramedics, trained volunteers, district administration, and Red Cross
- Alert should be sent to hospitals of neighboring districts and towns for assistance during mass casualty.
- The administration should have the ambulance database handy.
- Allocation of certain number of beds in the government hospitals as well as the private ones should be done well in advance to address any emergency situation.
- A network of hospitals doctors and health care centers need to be developed who would work in the period of event
- Stock piling of different groups of blood and emergency medicines along with list of possible donors should be kept ready.

vii. Fire Services

- Temporary fire station should be set-up at strategic locations based on the flow of the crowd and the density of shops and other establishments.
- Bike mounted firefighting equipment should be installed at all the important locations to increase accessibility of areas where fire-tenders can't reach.
- There needs to be specialized and dedicated team ready to respond to any emergency. Prepositioning of the officers and staffs should be done for the entire period.
- Additional water pipes should be laid and water drums should be kept at regular intervals to meet the demands for firefighting.
- Fire extinguishers should be installed at the places where the congregation is within an enclosure/ temporary structure/religious places or halls.

- Banning or very limited usage of combustible materials should be done in the area. This should be properly monitored by the security personnel.
- Display of fireworks/ crackers should be allowed only in open spaces and away from gathering/densely populated areas.
- Wherever temporary structures are to be constructed, they should be done using "Fire Retardant Solution".
- Public should not be allowed to use incense sticks at a densely crowd area.

viii. **Temporary Structures/ illumination/ lighting**

- There can be temporary hazards such as damaged approach roads, bridges, pedestrian ways, subways etc.
- These temporary hazards can easily be removed by dressing of roads, repairing of bridges, proper tiling of pedestrian ways, repairing of other structures such as walls etc.
- In the events around any water bodies (such as Chhath Pooja, Durga Pooja, Harihar Kshetra Mela etc.), temporary bridges have to be constructed to ease out traffic on few identified paths. The bridges need to incorporate safety aspects in terms of strength, width, length etc.
- Since the public activity in such events continue even at late evening hours, the roads should be properly illuminated and the area should be lighted with adequate street lights. This will even help curbing anti-social activities.

ix. **Water supply**

- Safe drinking water is one the basic requirements and adequate measures should be taken to ensure its constant supply during the period of event.
- Water supply though tankers, temporary pipelines and regular underground pipelines should be made available to people
- Quality of drinking water should be a high priority. Waters tanks should be chlorinated.
- Temporary outlets/taps for drinking water and bathing should be provisioned separately to meet surge in demands.

x. **Sanitation and Solid Waste Management**

- Adequate numbers of garbage containers should be placed at all locations. The containers should be emptied frequently, at least twice a day, to maintain a clean and safe

environment. The number of containers will depend on the size of the event, the population density, crowd movement and the amount of waste generated per day.

- The placement of these dustbins at strategic positions likes near the venue, near vending shops, market places etc. will help keeping the area clean

- The municipal corporation should ensure that there is availability of adequate sweepers and waste disposal units covering the entire area and sweeping is done every day before the crowd movement starts.

- Daily timely pick up and disposal of solid waste should be made.

- Waste disposal sites/ landfill sites should be identified well in advance and it should be out of the vicinity of the city.

- To prevent open air defecation, zero discharge toilets need to be constructed. Additionally, adequate number of mobile toilets should be arranged.

- The drainage system of the city/ event area should be properly inspected to unclog it so as to prepare the area for any unprecedented hydrological event such as flash flood or cloud bursts.

- Regular fogging, sprinkling of bleaching powder and other pest control measures should be taken to contain communicable/ non communicable diseases.

- A Health Inspector should be deputed in major areas to supervise the sanitation and solid waste management related activities.

- Regular and frequent cleaning of Ghats and areas around water bodies should be carried out.

- Filtering of pollutants and waste material from water bodies should be done regularly to prevent diseases and skin related ailments.

- Green initiatives such as banning of polythene bags during event period and use of paper bags, clothed carry bags etc. should be promoted.

xi. **Capacity Building of stakeholders/ volunteers**

- The city/ town where the event is being held should identify the volunteers group such as NCC, Red Cross volunteers, students from local schools and colleges with training these groups can be excellent resources for responding to any unforeseen events and they can be helping hands to police.

- The Police officials should be given basic refresher on disaster management and imparted training on behavioral skills as they would be interfacing very closely with general public.

xii.   Special Care for vulnerable groups

- In general, elderly citizens, pregnant women and children form a very sensitive and vulnerable group of the society. Hence, they need special care and attention.
- Hand pulled rickshaw, thela, and battery operated vehicles etc. should is made available to such groups.
- Temporary/ permanent changing room for women near the Ghats should be provided for privacy and to reduce anti-social activities.

xiii.   Law and Order, Safety & Security

- In planning and throughout all stages of the event, a close coordination and working relationship should be maintained amongst:
  - District administration;
  - Health and medical services;
  - Other Police and other emergency services (Fire fighters); and
  - Other security services, for example Civil Defense, Home Guard, NCC, Scouts & Guides.
- Police patrolling needs to be beefed up during the event with mobile vans and temporary check posts positioned strategically to contain anti-social activities such as chain snatching, eve-teasing, looting, vandalism etc.
- CCTV should be installed at important junctions, markets, bus stands, railway stations and event areas to have better monitoring mechanism. The CCTV system should be having sufficiently large back up periods (72 hrs or more).
- Watch towers can be constructed at important places for constant monitoring of the event area.
- These events are soft targets for terrorists. Hence to be ready for any unprecedented situation, Home Guards, NDRF along with bomb squad and sniffer dog squad should be stationed at strategic locations in the area.
- NDRF has a highly developed team of divers and motor boats. They should have their presence in and around the Ghats.

xiv.   Incident Command Centre (ICC)/ Control Room

- To monitor, manage and make decisions, a dedicated center needs to be established.
- An Incident Command Center will also act as an Emergency Operation Center.

- It will house the CCTV display/monitoring units, the communication equipment such as satellite phones, fax, fixed line and mobile phones, computers, laptops, internet connectivity, video calling facility, power back-up, trained technical staffs and important decision makers (in proper shifts round the clock)
- ICC will also control the PA system and coordinate between the Lost and Found Booth and the security.

xv. **Electricity Supply:**

- The entire area should be divided into zones for electricity supply based on extent and duration of event.
- Adequate substations (based on load) and transformers need to be installed.
- There should be mobile transformers readily available to meet any sudden surge in demand.
- There should be no wiring very close to the water bodies. This will minimize chances of live wires falling into water thus increasing risk of electrocution.
- Electric guarding should be properly done so as to cut-off electricity supply in event of breach in wiring.
- Places where wires come in close vicinity of people, usage of PVC conduit pipes should be used.
- Use of MCB and copper wiring further reduces any chance of electrical overloads
- A proper planning of electricity supply and network of High Tension wires and Low Tension wires should be made so as to avoid heavy crisscrossing at major/ crowded junctions.
- The entire street light should be repaired and additional temporary street lights should be installed.
- Power back-up with provision of adequate generator should be done to avoid any blackout.

xvi. **Use of Technologies**

The governments should start investing on technologies such as

- Geospatial technology for mapping of the space for better planning and quicker response,
- RFID (Radio Frequency Identification) to check movement of people,

- Good Public Addressing system,

- Enhanced Information Technology to visually monitor the space such as surveillance camera/CCTV etc.

- Cyber security team should be on high alert monitoring popular social media sites so as to prevent rumors and incorrect information to public.

- There should be ban imposed on improper announcement systems and keep a check on unnecessary replication of the same information. Inappropriate announcements add to rumors and create confusion.

- Information regarding the place, weather, traffic, route, public amenities etc. is made available to public on internet and through mobile apps.

xvii. **Media Relations**

- The administration should plan a dedicated time and place for disseminating the information on regular basis from the field.

- The media personnel should be given strict instruction on type of information that needs to be disseminated.

- Regular briefing of media by administration should be made to help developing a better coordination between media personnel and administration.

- Media - print, voice or visual - is an organized means of reaching a large number of people, quickly, effectively and efficiently. The suggestive, informative and analytical role of the media must form a key component of disaster education, before a disaster, educating people about the hazard, prevention and self-help during the disaster. Media can play important role in the following areas:

    - Early warning to the people

    - In making appeal to the people

    - In preventing rumors and panic management

    - In controlling law and order situation

    - As replacement of established communication network

xviii. **Involvement of local groups**

- Administration should identify clearly the roles and responsibilities of the local groups and issue clear instructions to them in discharging their part of duty in collaborative and accountable manner.

- The administration needs to ensure that there is no mushrooming of such local groups thus causing conflict, civil unrest and confusion.

xix. **Post Disaster Incidents Management**

- A comprehensive Disaster Response Plan should be ready with all the departments.
- Prepositioning of specialized teams such as that of NDRF, Civil Defense, Search & Rescue team, First Aid team, Logistics Management team etc. should be as a precautionary and preparedness measure.

xx. **Reverse Logistics/Exit Plan**

- As mentioned earlier, these events of mass gathering are temporary in nature. Hence, a clear exit plan and reverse logistics need to be included in the planning process. This is needed to bring the city or the locality back to state of normalcy.

xxi. **Documentation**

- A proper documentation of each and every aspect of event should be done right from the beginning/ planning phase extending up to the event execution and exit.
- Documentation is most helpful toolkit to learn from the past and implement the good practices evolved during the last event, and the need assessment for future events.

12.   Conclusion

Chhath Puja is the biggest festival for the people of Bihar and it is often referred to as Mahaparva. The significance and importance of this festival can simply be assessed from the fact that people from all over the India and abroad, come back to their motherland to celebrate this festival. The railway runs a number of special trains to cater to the need of the public.

There is no doubt about the fact that being of so much significance, the festival also becomes very sensitive from security, politics and social perspective. Hence the government authority leaves no stone unturned in order to make this event flawless. Also, owing to previous years deaths in stampede has raised serious questions on the planning and management of the even in the future.

In a sharp contrast to last years' preparation, the district authority was highly alert. It did a thorough planning incorporating element of Disaster Management, Mass Gathering Event Management, and Mass Casualty Management. There was a major improvement in every perspective of the event planning, execution and management.

However, there were minor gaps observed. During the data collection period, many of the stakeholders pointed out some of the gaps that could have caused any unforeseen event. The present case study has taken in consideration many of such gaps and suggested recommendations to minimize or bridge the gaps.

Any event of mass gathering, especially religious one, is a soft target for terrorists and natural disasters as the former consists of a number of women, children and elderly citizens. Hence, very careful, methodological steps need to be taken so as to make such events completely flawless and incident proof.

13. Bibliography

1. Yamin, M., 2005. A framework for improved hajj management and research.

2. Yamin, M., Huang, X. & Sharma, D., WIRELESS & SENSOR TECHNOLOGY AND CROWD MANAGEMENT.

3. Frykberg, E.R., 2003. Disaster and mass casualty management: a commentary on the American College of Surgeons position statement. Journal of the American College of Surgeons, 197(5), pp.857–9. Available at: http://www.ncbi.nlm.nih.gov/pubmed/14585426 [Accessed March 11, 2013].

4. Kishore, S., 2012. Toronto Host City : Mass Gatherings Risks and Perception Applied Research and Innovation Centre. , (July).

Bihar State Disaster Management Authority

2nd Floor, Pant Bhawan, Bailey Road, Patna, Bihar, PIN- 800001

Phone: +91 (612) 2522032 Fax: +91 (612) 2532311

Email: info@bsdma.org, website: www.bsdma.org