

# Planning Strategies for the Management of Industrial Hazards in a City: A Case of Loni, Ghaziabad

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**Abstract:** *Industrial hazards pose significant risks to the safety and well-being of residents and the environment in urban areas. This paper presents a comprehensive framework for planning strategies to effectively manage industrial hazards in the city of Loni, Ghaziabad. By analysing the unique industrial landscape and community needs of Loni, this study aims to provide practical and proactive approaches to minimize the potential impact of industrial hazards. Implementing these strategies requires a multi-faceted approach, involving collaboration between industries, local authorities, community representatives, and relevant agencies. By promoting responsible industrial practices, raising public awareness, and enforcing stringent regulations, the aim is to create a safer and sustainable environment for the residents of Loni, Ghaziabad. The findings and recommendations of this study can serve as a valuable resource for policymakers, urban planners, and stakeholders involved in industrial hazard management in Loni, Ghaziabad, as well as other cities facing similar challenges.*

**Keywords:** Hazard identification, Risk assessment, Zoning regulations, Land use planning, Emergency preparedness.

## I. INTRODUCTION

Industrial activities play a crucial role in economic growth and development, but they also pose inherent risks and hazards to the surrounding communities and the environment. The city of Loni, Ghaziabad, situated in the state of Uttar Pradesh, India, is no exception. With a significant industrial presence, Loni faces the challenge of effectively managing industrial hazards to safeguard the well-being of its residents and protect the local ecosystem.

The management of industrial hazards requires a proactive and comprehensive approach that encompasses various aspects, including hazard identification, risk assessment, emergency preparedness, regulatory compliance, public awareness, and stakeholder collaboration. By developing effective planning strategies, Loni can mitigate the potential adverse effects of industrial activities and ensure a safer and more sustainable environment for its residents.

The successful management of industrial hazards requires a combination of regulatory measures, community engagement, and infrastructure enhancements. It involves a collaborative effort between local authorities, industries, community representatives, and relevant stakeholders. The implementation of these strategies can significantly reduce the occurrence and impact of industrial accidents, protect human health, and preserve the ecological integrity of Loni.

## II. METHODOLOGY

The following research is focusing at developing providing hazard zonation map and planning recommendations. An area of 36 Km<sup>2</sup> has been considered that has major potential hazardous industries like Petroleum and petro-chemical industry. Various secondary data sources, such journal paper, government reports, case studies, etc., will be reviewed and arguments would be developed based on the findings. A mixed research method is adopted, wherein both quantitative and qualitative data is collected. For collection of data, primary survey would be conducted in industries aiming at collecting the information of major hazardous chemicals they store or use, their safety infrastructure, and awareness towards chemical disasters. Once the data gets collected, tools like MS Excel, Arc GIS, and ALOHA would be used to assess existing situation and vulnerability zone maps or hazard zonation maps will be developed. Based on the data analysis, the recommendations and proposals are provided.

### III. LITERATURE REVIEW

#### 3.1. Hazard Overview

“HAZARD is any substance, phenomenon or situation, which has the potential to cause disruption or damage to people, their property, their services and their environment”- Asian Disaster Preparedness Centre. “Hazard is a term associated with a substance that is likelihood to cause an injury in a given environment or situation. Industrial hazard may be defined as any condition produced by industries that may cause injury or death to personnel or loss of product or property”- Handbook of environmental risk assessment and management by Peter Calow, 2009.

#### 3.2. Types and Sources of Industrial Hazards

Industrial hazards are those that are associated with industries and related operations. Sources of such category of hazard can be chemical, highly inflammable petrochemicals, storage tanks, warehouses, transportation of hazardous substances, pipelines, etc. Toxic release, fire explosion, and explosion pressure are various actions that can be considered as hazardous for environment and humans(Arifa Nabi, S. and C. J. van Westen 2015).

#### 3.3. Causes of Industrial Hazards

According to Asian Disaster Preparedness Centre Report, 2015, industries employ different processes, use wide variety of raw material, produce intermediate products, and final products that can be hazardous in nature.

#### 3.4. Need of the Industrial Hazard Management

The Bhopal Gas Tragedy disaster raised a concern that the country needs stringent international standards formulated for environmental safety. In addition to this, there has to be some preventative strategies to reduce the probability of occurrence of similar industrial disaster (Broughton, 2005). In India, the industrialization process was rapid and poorly regulated. In most cases, the areas within the city that are reserved for light industries and commercial use, are given to hazardous units. The Bhopal Tragedy highlighted that encouraging industrialization in countries like India which is a developing country without concerning or referring safety regulations can result in catastrophic consequences. National, state, and local governments and other agencies must emphasize on viable and applicable techniques preventing such accidents. The prevention must talk about risk reduction in manufacturing plants and must focus on designing and safety rules and regulation. Local governments clearly should not permit industries to be situated adjacent to residential areas in an urban area. STP, public health infrastructure, mass casualty emergency response system should be provided. It was identified that India has less strict rules for the waste treatment coming from SSIs. New Delhi's Yamuna River is an example.

#### 3.5. Urban Planning Approach

For the risk assessment of the industrial hazard, various methods have been used by researchers. The most common method among them is Analytical Hierarchy Process (AHP). This method developed by Saaty in late 1970 has designed to deal with the complex decision-making Problems including multi-criteria, in a wide range of application field mainly based on certain parameters that are taken into consideration for hazard assessment. A research paper has been opted to select an urban planning approach for proposal purpose.

### IV. STUDY AREA AND DATA COLLECTION

#### 4.1. Background of Loni

Loni is one of the tehsil in Ghaziabad District of Uttar Pradesh. The current average elevation of the town is 283 metres. It is considered as one of the fastest growing regions of Uttar Pradesh having a large concentration of industrial units contributing to the GDP of the State. These units comprise oil refineries, paper, textile, petrochemicals, and other chemical manufacturing industries of small, medium, and large scale. Loni industrial estate within the Loni Town limit is selected for study and risk assessment of hazards related to the industries. These hazards comprise explosion air pressure and toxic release in the industrial site of Loni, Ghaziabad.

#### 4.2. Data Collection

Before going on to the field, a fieldwork plan for data collection was prepared in order to save time and efforts. This comprises detailing out the information that were required to be gathered from Ghaziabad Development Authority, Municipal Corporation and other concerned departments. However, this information serve as a basis for the real site survey. The majority of the data was gathered from the field while interviewing the people. In addition to this, site visit also helped in getting the data regarding infrastructure shortage in Loni. This helped in analysing the problems in and around Loni and setting up the study objectives accordingly. The methodology was decided depending on the availability of the secondary information.

#### V. DATA ANALYSIS

ALOHA is the software used widely for hazard modelling in planning for and responding to chemical emergencies. ALOHA facilitates entering data about a real site or prone to chemical release and then it will develop a threat zone estimates for different hazards.

It has the capability to model flammable gas clouds, toxic gas clouds, jet fires, BLEVEs (Boiling Liquid Expanding Vapor Explosions), vapor cloud explosions, and pool fires.

This model considers the dispersion of gas in the atmosphere along with the wind- effect. ArcGIS Buffer Model: This model considers dispersion of gas in all direction without considering the impact of wind. This can be useful when the wind speed is very meagre and the dispersion of gas takes place in all directions (EPA and NOAA. 2017).

#### 5.1. Issues Identified in the Study Area

Issue 1: Service Buildings are in the Impact Zone

Issue 2: Traffic Congestion and Bottlenecks on the Approach Road to the Study Area

Issue 3: Residential Area are Falling under Critical Impact Zone

Issue 4: Negligence

#### VI. CONCLUSIONS AND RECOMMENDATIONS

##### 6.1 Recommendations

- Developing strategic policies to make sure that every industrial unit operate within the permissible technical and safety standards. In addition to this, proper allocation of resources for risk assessment and monitoring should be done.
- Rehabilitation and Resettlement initiatives can be undertaken by corporations under their CSR programmes.
- 150m buffer zone land should be given for social forestry.
- The proposed road and the widened road should be monitored regularly in order to discard any bottlenecks
- A body of government must be there to keep a check over organization in the operating phase.
- Social Campaigns to promote clean development should be organized frequently that innovatively address and educate people and local communities about the potential hazards in their region and how to tackle them.
- Campaigns and workshops for disaster management and mitigations for increasing awareness and increase their preparedness
- In order to prevent future industrial disasters, all sectors should come and work together in order to assimilate environmental emergency preparedness and response activities in strategies and sustainable development programs.
- Special policies for ensuring air tightness of every residential dwelling should be formed and no dwelling in dilapidated or under construction conditions should be prevented from being used by humans.

In the research, Loni was taken as a study town and in particular the residential area near IOCL industrial region for vulnerability assessment of buildings and population at different time of the day and thus to generate the risk map. The frequent occurrences of industrial accidents in India provoke the necessity for industrial hazard assessment. Industrial hazard assessment is also important for landuse planning. There is an urgent need to estimate the number of people residing in and around industrial area who might get affected by any accidents. Many developed countries have adopted

legislations for landuse planning taking risk as a criterion. Developing countries like India still now couldn't implement risk assessment in landuse planning mainly due to lack of centralized database information Thus the present research is an attempt to estimate the vulnerability and risk for industrial hazard and the utilization of the risk maps for future landuse planning. Hazard Identification and Risk Assessment: Conduct a thorough assessment of all industrial activities in the city to identify potential hazards. This includes analysing the types of industries, their processes, materials used, storage practices, and potential risks associated with each activity.

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