



DISCOVERY

(International Multidisciplinary Refereed Research Journal)

(Peer-reviewed, Refereed, Indexed & Open Access Journal)

ISSN:

DOI:

IMPACT FACTOR:

Environmental Monitoring in an Educational Setup using Geospatial Technology

Dr. Sana Rafi¹, Saleem Uddin², Zakir Ali Hyderi³

¹Senior Program Associate, Operations, Avanti Fellows, sana188550@st.jmi.ac.in

²Lecturer, University of Technology and Applied Sciences,
Sultanate of Oman, saleem.uddin@shct.edu.om

³Assistant Professor, IIMT College Greater Noida, zahyderi@gmail.com

DOI No:

DOI Link:

Abstract

Educational system helps children in their development by providing safe space and creative environment to nurture their talent and adds human capital in the country's economy. Such institutions also act as shelter homes during disaster emergencies therefore; their safety is an essential component. Prevention is always less costly and more effective than cure. Providing safe educational facilities is one of the principal components to minimize risks for exposed population and other elements at risk to have more capable, resilient and responsive community.

In this paper an attempt has been made to assess disaster resilience and safety in Jamia Millia Islamia University with special reference to chemical hazards. This study would help the administration, students, teachers and other employees to plan and respond more effectively to emergencies and to build a safer and more resilient infrastructure and community. We have used Buffer and spatio-temporal analysis to assess the Risk Zonation of the area in and around Jamia Campus. Results have shown that Western part of Jamia Campus is under hazard zone due to water treatment and waste management plant and North portion of Jamia Campus is more prone as compared to its southern portion.

Introduction

Educational reforms play an important role in moulding a nation's future by facilitating all round development of its future citizens. It is responsible for the economic, social, and political growth and development of society in general; therefore safety of critical infrastructures is an essential component. Sivaprakash defined Hazards as the "The possibility of danger in any circumference"[1] and chemical

hazards may be defined as those where the potentially hazardous energy is released through disruption of the molecular bonding as a result of chemical reaction (usually a reactive chemical hazard) as perHaSPA (Health and Safety Professionals Alliance) [2]. There are two main types of chemical hazards, reactive and toxic. Whatever be the type of chemical hazard, we should always be aware of and understand the hazards, risks and appropriate controls for reactive chemicals and an understanding of acute and chronic exposure. Jamia Millia University located in Okhla region of South-east district of Delhi is one of the significant universities in India, which is susceptible in terms of chemical hazards due to its surroundings infrastructure as well as internal conditions. A Delhi Jal board Water Treatment Plant located in the North West side, and Okhla Waste Management area (in which an incinerator is operational) located in south-west side of Jamia campus and the chemical uses (for study) and their disposal within the campus pose serious chemical hazard to the residents as well as Jamia's community. The harmful effects of incinerators have been studied by many for instance, according to Glorennec and others, the emissions of Sulphur dioxide (SO₂), Hydrochloric acid (HCl), Particulate Matters, Lead, Mercury, Cadmium and Dioxins from an incinerator has severe health impacts [3]. Which in Valberg, et al., (1996) words can be explained as, when the air gets polluted because of the emission of toxic chemicals and atmospheric dispersion, the humans become exposed to airborne chemicals which leads to carcinogenic and noncarcinogenic effects [4]. Rigas indicated that accidents are classified due to the hazardous substances based on three different types; they are dispersion, fire and explosion [5]. They effects on, nervous system, liver, kidneys, heart, lungs, skin, reproduction and respiratory symptoms, irritation of the skin, nose, and eyes, gastrointestinal problems, fatigue, headache, psychological problems and allergies are further elaborated by Rushton [6]. The location of the university itself demands the assessment of Chemical hazard.

Research Question

- Are we Future ready?
- Are we ready to fight any disaster?
- Are we prepared to respond effectively in the case of emergencies?
- Are we living in a safer and resilient infrastructure?
- Are we a responsive community?

Study Area

Jamia Millia Islamia University lies at 28° 33' 41.9652" N latitude and 77° 16' 52.5288" E (Figure 2) longitude with an elevation of about 215 m. It is in Okhla locality of the south-east district of Delhi, India, and was established in 1925. It caters an area of 215.85 acres of which total land allotted accounts for 8,46,43 sq.m whereas main campus covered an area of about 1,24,002.07 sq. m. Jamia Millia University is one of the big Universities in India, comprises of 9 faculties, 39 departments, 30 centers and 7 schools, large number of teachers, professors and other university staffs, huge number of

buildings and constructions. More than 21,490 students are currently enrolled in the university of which 3490 were school students, 241 (1%) were foreign students in 2011-12 batch [7]. The immediate surrounding of the university comprises of Okhla residential area which is densely populated region. The Jamia campus is bounded by New Friends Colony, Zakir Nagar and Joga Bai extension in North, Batla House in North-East and east, Sukhdev Vihar in West, Haji Colony, Jasola Vihar in South and south-east, and Noor Nagar Extension in South-East.

Database

This study is based on primary as well as secondary datasets. Secondary data consists of spatial datasets such as topographical Sheet No: 53 H/6/SW of Delhi with scale of 1:50000 and base map of Jamia Millia Islamia campus prepared using Satellite Imagery. Non-spatial dataset consists of 50 questionnaires filled by the university students, teachers, nonteaching staff, lab attendants and campus residents, Interviews of 10 residents of surrounding localities, Ground truthing and Soil and Water Testing has also been done. Secondary datasets consist of Published reports, research and newspaper articles.

Methodology

To assess disaster resilience and safety of Jamia Millia Islamia, Two maps of Jamia and its surrounding of (Fig 1) and of 2018 (Fig 2) has been prepared to see the changes that have occurred over the past 28 years. Then 50 students intuitively selected from Jamia were interviewed about the chemical use and their health impacts. 50 residents in nearby areas were also selected randomly and interviewed for collecting information about chemical hazard units in the surrounding of Jamia which are directly or indirectly effecting the campus and its population. Teachers and Lab attendants, non-teaching staff of maintenance were also interviewed to get acquainted with the building infrastructure, disposing of waste, fire yard hydrants, fire extinguishers, and other related information such as to analyze the vulnerability and capacity in terms of physical, socio-economic, and institutional preparedness. Related maps have been prepared using toposheet and satellite imagery to have a pictorial representation as well as patio-temporal analysis.

Results

Fig 1 and 2 showcases how land use of Jamia's neighbourhood has changed in past 28 years. In 1990, it was less populated. There was a clear demarcation of sewage treatment plant over Okhla disposal land in 1990 but now the whole area is under use for dumping, managing and treating waste. The figure 3 clearly shows that the Western part of Jamia Campus is under hazard zone due to water treatment and waste management plant. The figure 4 shows that the buffer around these laboratories indicates that the North portion of Jamia Campus is more prone as compared to its southern portion. Figure 3 shows Delhi's Jalboard Water Treatment Plant which is located at distance of meters away from Jamia Campus and 800 meters buffer around it in which chlorine is used, which is highly

hazardous both to health as well as to environment. If any chemical spill or explosion would occur in this fragile location, major portion of north-west side of Campus would be under its threat.

Chlorine comes under the hazard label, “Poison Gas, Oxidizer, Corrosive” which is informed as “Strong Oxidizing Agent, Water-Reactive” as per the reactivity alert. Chlorine has the rate of onset immediate to hours while persistence is minutes to hours. It explosively reacts as either a liquid or gas with alcohols, molten aluminum, saline and bromine pentafluoride and other reactions. According to the experts from GUIDE 124 [Gases - Toxic and/or Corrosive - Oxidizing], it is recommended that spill or leak area must be isolated for at least 100 meters (330 feet) in all directions as an immediate precautionary measure. If tank, rail car or tank truck is involved in a fire, isolation is required for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. Chlorine is considered as highly poisonous gas and causing very high degree of health hazard; it may be fatal if inhaled. The eyes, nose, chest and throat may sting or burn following exposure to chlorine. Agitation, anxiety, coughs with bloody sputum, dizziness, a feeling of suffocation, nausea and vomiting are common. Dermal exposure may result in blisters, irritation, pain and sweating.

Figure 3 is also showing 600 meters of buffer around Okhla waste management (WMP) plant which is the source of heavy metals, poisonous gases and other chemicals. Actually a STP, an Incinerator and a Compost plant are co-existing over the area of Jasola Vihar locality commonly known as Okhla Disposal Land. Where around 116 acres of barren land is lying contaminated and vacant in this location. These Plants releases many chemicals and leads to their accumulation. The major problem is that Okhla sewage treatment plant (capacity: 170 Million Gallon a day, MGD), Okhla compost plant (Capacity: 200 ton per day), and Waste to energy plant (waste Management Plant having Capacity: 2000 ton per day, produces 16MW electricity per day) are situated few meters away from the campus which are contributing to various environmental and health problems in nearby areas as well as to the Campus of Jamia Millia Islamia effecting health of the students [8]. The roads are occupied with 300-350 trucks during day which further accentuate this problem. Initially the waste management and disposing plants were came into existence for treating and disposing only domestic waste but these plants are also treating industrial and all other types of waste which results into release of unpleasant odour which is highly hazardous as well as others chemical pollutants making the life highly uncomfortable.

Similarly Figure 4 shows building with chemical uses (Chemical laboratories) as shown by black color point on the map in Jamia where chemicals are used either for research or study purpose. Chemical wastes generated in these laboratories are directly disposed of either in sinks, dustbins or in soils and thus pose serious hazard.

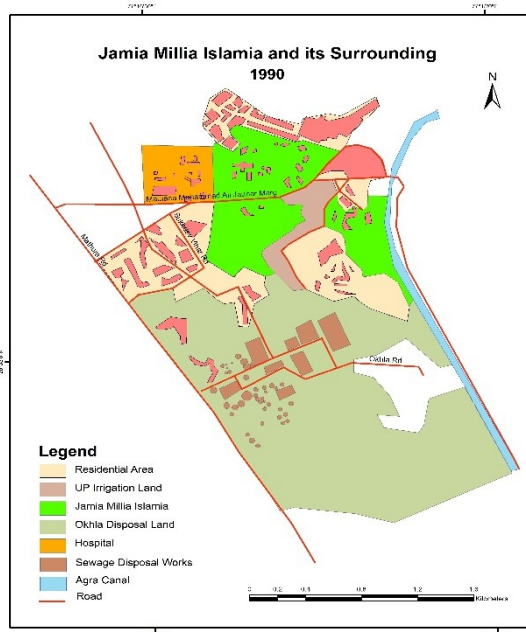


Fig 1



Fig 2

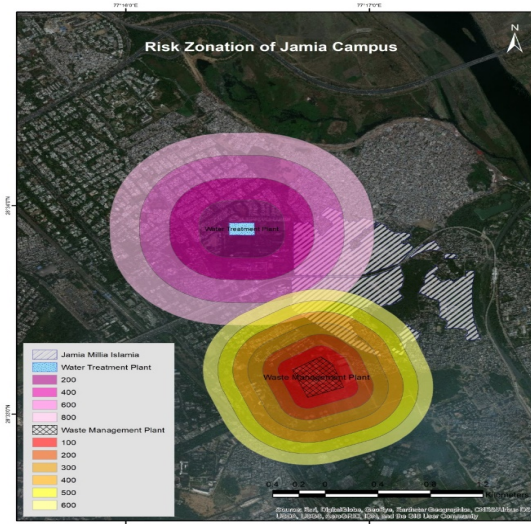


Fig. 3

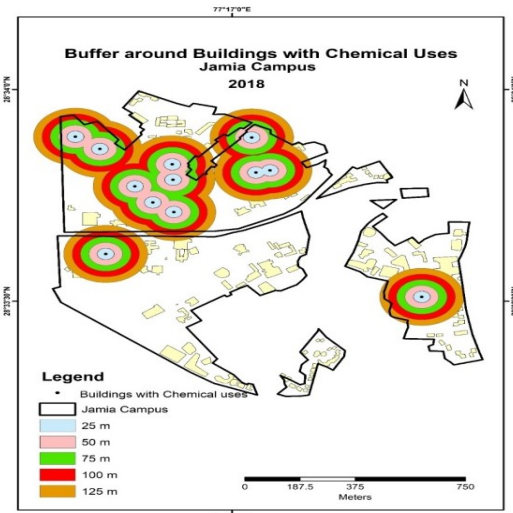


Fig. 4

The Figure 5 shows that 64 percent of the interviewed residents believe that chemical Hazards in neighborhood of Jamia do exist which may affect Jamia Campus directly or indirectly while 36 percent of respondents do not have the same perception. Likewise Figure 6 shows that 90 percent of the interviewed students believe that chemical Hazards in Jamia campus do exist which are affecting them and the Campus directly or indirectly. Many students have reported to be suffering from problems like breathing problem, eye reddening and irritation, allergies and lack of concentration in studies, only 10 percent of students do not have the same perception and are found to be confused while giving any statement in this regard.

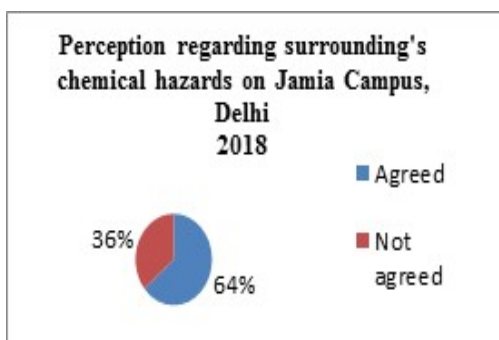


Fig. 5

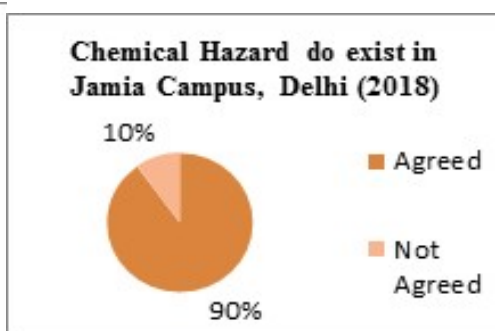


Fig. 6

Table 1 SWOT (Strength, Weakness, Opportunities and Threat) in Jamia Campus

The Jamia Millia Islamia University is full of strengths which may become opportunity in case of any disaster and a systematic approach may help to overcome from below mentioned weaknesses. For example, whole of the campus is having good communication and transportation facilities therefore response time in case of emergency may be reduced with the help of systematic institutional approach and proper decision-making

S.No	Parameters	Indicators	Strength	Weakness	Opportunities	Threats
1	Hazards pertaining to Surrounding area	Okhla Waste Management Zone				
		Water Treatment Plant				
		Hospital				
		Surrounding Residential Area				
		Heavy Transportation				
2	Chemical Laboratories	Chemicals				
		Disposal of Chemicals				
		First Aid Kit and Medical Facilities				
		Ventilation				
		Fire Alarms and Extinguishers				
		Evacuation routes				

		Type of employment				
3	Preparedness	Vulnerability and resource mapping done				
		Awareness about Chemical Hazards				
		Students trained in disaster management				
		Students active in disaster management Initiatives				
4	Institutional capacities	Disaster Management plan, Response planning				
		Communication				
		Transportation				
		Firefighting capabilities				
		Medical Facilities				
		Search and rescue capabilities				

Conclusion

The study revealed that chemical hazard is found to be exist in Jamia Millia Islamia University. Various kind of hazardous materials like toxic substances, explosive chemicals, corrosive materials, Gases, flammable chemicals, heat sensitive materials, water sensitive chemicals etc. are used in many Laboratories of Jamia Campus and its surrounding especially in Delhi Jal board water treatment plant and Okhla waste management plant. Certain chemicals are source of disturbances in teaching and learning processes by effecting physical and mental health of people. Chemical risks may cause a considerable damage to the people and properties. Above all lack of adequate response, improper disposal of waste, lack of cleansing to remove waste material, lack of precautions while doing experiments in laboratories indicates incapacities that can enhance the risk of triggering chemical disaster.

In all we can conclude by analyzing Hazards, vulnerabilities and current response capacities, the administration, students, teachers, and other employees can more effectively plan and respond to

emergencies, and as a result built safer and more resilient community and infrastructure to any type of hazard.

Recommendation

Many things can be done to reduce the ill-effects of chemicals. Proper services needs to be provided in the laboratories of departments like chemistry, biosciences, biotechnology, Nano technology, center for basic sciences, chemistry laboratories in schools, sculpture and painting departments where chemicals are used. Proper storage of chemicals for safe handling is required. As Shivaprakash said that different types of chemicals must be stored in proper methods for safe handling [1]. The careless mistakes will create dangerous accidents and material losses also. Hazard, Land use mapping of the campus, incorporation of risk elements in developmental people's participation is advisable. Training programmes for the students as well as to the teachers can also be helpful.

References

1. Sivaprakash, P. and Karthikeyan, L.M., 2014. A study on handling of hazardous chemicals in engineering industries. *APCBEE procedia*, 9, pp.187-191.
2. HaSPA (Health and Safety Professionals Alliance)., 2012. The Core Body of Knowledge for Generalist OHS Professionals. Tullamarine, VIC. *Safety Institute of Australia*.
3. Glorennec, P., Zmirou, D. and Bard, D., 2005. Public health benefits of compliance with current EU emissions standards for municipal waste incinerators: a health risk assessment with the CalTox multimedia exposure model. *Environment International*, 31(5), pp.693-701.
4. Valberg, P.A., Drivas, P.J., Mc Carthy, S. and Natson, A.Y., 1996. Evaluating the health impacts of incinerator emissions. *Journal of hazardous materials*, 47(1-3), pp.205-227.
5. Rigas F, Sklavounos S. Major hazards analysis for populations adjacent to chemical storage facilities. *Process Safety and Environmental Protection*, 82(B5): 341–351.
6. Rushton, L., 2003. Health hazards and waste management. *British medical bulletin*, 68(1), pp.183-197.
7. Statistical Data Fact Sheet, Jamia Millia Islamia, 2011-13, 2012-13, and 2014-15.
8. Sameen, S., (2018). Environmental Issues and Challenges in Okhla Waste Management Zone, paper presented in national seminar on *Urban Environment in the 21st Century: Issues and Challenges*, Dept. of Geography, J.M.I.
9. www.jmi.ac.in.
10. www.ndma.gov.in