

# Integrating Disaster Risk Reduction and Urban Planning: Evidence from Class III City- Rajgir, India

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## ABSTRACT

*The purpose of this paper is to explore the role of urban planning and built environment disciplines in disaster risk reduction. Many pieces of evidence are available to illustrate that every year natural calamities cause a generous measure of harm to many cities in the entire world. Better lifestyle and employment are attracting the migrants towards emerging cities, which are predominantly vulnerable due to their peril inclination towards areas like, along streams, seismic zones and many others. Dangers are particularly high in low and mid-income nations like India where a major portion of the populace in urban communities lives in ghettos and extreme weather events have tremendous effects in urban zones. This situation demands a high need in identifying how the urban planning and its related disciplines can contribute towards disaster risk reduction. Therefore this article follows disciplines of urban design and disaster management, to elaborate the concepts of disaster risk reduction at the locality level for the collective development of Rajgir, a class III city in Nalanda district of Bihar, India. The mixed methodology with multidisciplinary approach has been used to address this emerging topic, therefore this paper is based on the reviews of academic literature, journals, conference papers and reports produced by various institutions along with field analysis. Finally, this article reveals present ways to deal with hazard administration, investigating parts of disaster risk reduction, and the organizations and coordinated effort required in current procedures of urban planning the organizations and coordinated effort required in current procedures of urban planning.*

**Keyword:** - Disaster Risk Reduction, Urban Planning, Urban Resilience, Rajgir.

## 1. GLOBAL URBANIZATION AND INDIA

The Urban area has conveyed heroic opportunity to various people group searching for better occupations, organizations, and prospects for improved living conditions. By 2008, without precedent for history, a larger portion of the world's tenants lived in urban communities than in country zones [1]. The 2007 report of United Nations Population Fund (UNFPA) predicts the number of individuals living in urban areas will ascend from 3.6 billion in 2011 to five billion in 2030. Furthermore, the UNFPA estimates that the greater part of the total populace development from 2010 to 2030 will occur in urban ranges. A 2014 report from Department of Economic and Social Affairs of the United Nations Secretariat affirms that Africa and Asia are urbanizing speedier than any other and are anticipated to wind up 56 and 64 for every cent urban by 2050 [2]. Continuing populace development and urbanization are anticipated to add 2.5 billion individuals to the world's urban populace by 2050, and just three nations—India, China, and Nigeria—together are relied upon to represent 37 percent of the anticipated development of the world's urban populace somewhere around 2014 and 2050. India is anticipated to include 404 million urban inhabitants, close to half of the world's urban occupants dwell in moderately little settlements of not exactly less than 500,000 inhabitants, while only around one in eight live in the 28 mega-cities with more than 10 million inhabitants [2]. Better lifestyle, employment, an assortment of financial advantages, and similar other factors are behind the quick development of urban ranges far and wide. As the pendulum of human improvement swings progressively far from the country to the city, we see that fast urbanization and populace development are consolidating to make colossal new difficulties for the compassionate group and pushing us out of our customary

range of familiarity to manage an abnormal new urban world [3]. The Indian cities who often considered as “*heartbeat of commerce*” and places of vibrant life is now transformed into the most dangerous places on earth due to the little presence of the authorities have and lack of basic social amenities, food security, policing, running water, sewerage and respect for building codes [4]. Extreme weather events and disasters like quakes, surges, and dry spells have tremendous effects in urban zones and serious risk to sustainable development planning, hence an increasing anxiety for city architects and authorities. As around the world frequency of calamities has nearly quadrupled amid the previous 30 years and there is common agreement that urban debacles are expanding exponentially [5, 6]. The deadliest *2005 floods in Mumbai and Gujarat, Assam in 2012, Uttarakhand in 2013, Jammu and Kashmir in 2014, and 2015 floods in Chennai* exhibited us that like all other countries of the world, the urban metabolism has collapsed in India [7-10]. That’s why many policy and strategy archives insinuate this need, including the Millennium Declaration and, the Hyogo Framework for Action 2005–2015, and Rio+20 world conference which urges Indian governments to address the issue of catastrophe risk in different sector work [11- 13]. Being a party of many international treaty, the *National Mission on Sustainable Habitat* was launched in 2010 to draw necessary action plans to achieve sustainability of human habitats and further many schemes were launched with rationale of developing physical infrastructure under *National Common Minimum Programme* which includes *Jawaharlal Nehru National Urban Renewal Mission, ( JnNURM)* and later *Atal Mission for Rejuvenation and Urban Transportation (AMRUT)*. [14, 16] All though the focus towards urban planning and disaster risk reduction shifted after *Rio+20* world conference, however, in India, the principal endeavor at setting urban administration standards and measures was made in 1963 by the *Zakaria Committee*, which set out the physical standards and comparing consumption standards for five administrations, i.e. water supply, sewerage, storm water waste, urban streets, and road lighting [17]. Subsequently other government agencies/institutions like the *Town and Country Planning Organisation (1974), Planning Commission (1983, 1999), Operations Research Group (1989), Ministry of Urban Development, Government of India (1991), Central Public Health and Environmental Engineering Organisation (1999)*, and state governments have come up with norms for different service [17]. Historically, the major purposes of cities were to provide protection and defense for their inhabitants [18]. Thus city planning has always been an act of risk reduction and quality life improvements. However despite a number of efforts state of urban service delivery in India’s cities and towns is far poorer than is desirable for India’s current income levels. Considering that the Indian economy has been one of the fastest growing economies in the world aspirations and standards are raising, the current state of service delivery is simply unacceptable due to the emergence of more and more threats and inadequate management of cities protective and defensive function, many cities are characterized by increasing risk and disaster.

## 2. METHODOLOGY AND SIGNIFICANCE

To identify the functions of disaster management in urban settings and explore congruence between these expectations and performance of destination disaster management, this research was based on mixed methodology with interdisciplinary approach in which the data and information has been synthesizing in the accumulated state of knowledge on similar or related data to the disaster risk reduction and urban Planning [19]. Thus this article is based on the study, involving compilation and analyses of information and data from official documents, research papers, reports, media reports and articles and multiple field analysis. For risk and vulnerability assessment, physical, socio-economic, housing, community, and institutional preparedness, related parameters were identified. Indeed, various studies have been completed to appraise the urban planning and disaster risk reduction by covering distinctive arrangements of urban communities, diverse sorts of dangers, distinctive time spans, and distinctive resource estimations. All these studies affirm that such hazard is expanding and that with the expanding changes in the atmosphere, the hazard will essentially ascend in the coming decades, but all these studies are limited to mega cities and tier one or tier two cities. There is still a literature gap for emerging small class III city like *Rajgir*. Thus this article examines the evidence from *Rajgir*, a class III city in Nalanda district of Bihar, India and evaluates how complexity and urban security interrelate.

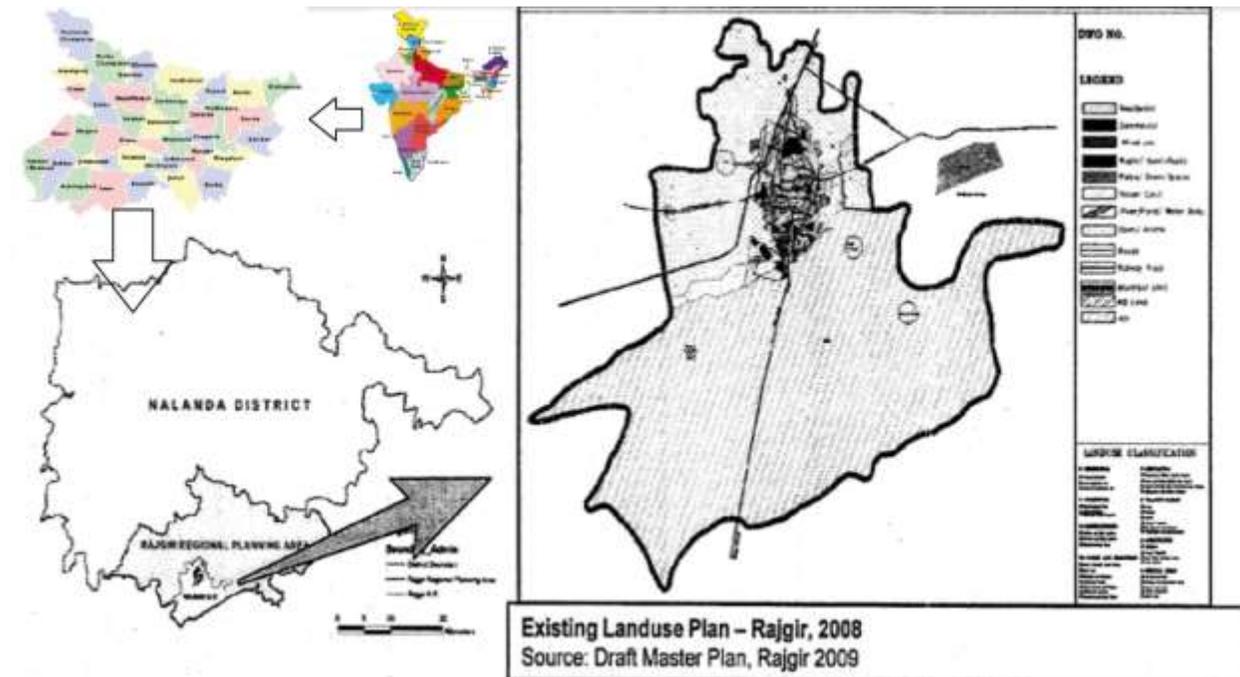
## 3. LITERATURE REVIEW

The literature confirms the separation of the two fields of risk reduction and planning, and the reality is that in general the: “*linkages between urbanization and disaster are weakly theorized and estimated*” [18, 20, 21]. Most of the articles concentrate essentially on auxiliary issues identified with the post-debacle situation of outstandingly large-scale calamities, taking a gander at general safety issues for reconstruction program or large-scale engineering

solutions [20, 21]. General disaster studies tend to focus, not on the actual vulnerability, but on the hazards, themselves, addressing scientific aspects and related technical solutions, such as expensive high-tech prediction systems, whilst socially-oriented disaster studies look mainly at the social causes of vulnerability and poverty. The latter often neglects planning (including housing) as being vitally important risk reduction measures, since it is perceived as a purely physical tool [21]. There have been many endeavors to characterize the expression "disaster". ISDR (2009) has characterized disaster as a "serious disruption, of the functioning of a society, causing widespread human, material, or environmental losses, which exceed the ability of the affected society to cope using only its own resources" [22]. Similarly "National Disaster Management Authority, Government of India" through its "DM Act 2005" distinguished a debacle means a "catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area " [23]. Some authors have stressed disaster as a social event and believe that impact of disasters can be reduced or prevented with the proper adoption of the disaster risk reduction strategies [24, 25]. Disaster risk reduction (DRR) includes the systematic development and application of policies, strategies, and practices to avoid (prevention) or limit (mitigation and preparedness) the adverse effects of hazards [26]. It has been recognized that all people and communities are vulnerable to hazards in fluctuating degrees and all have inherent abilities to diminish the vulnerability [26]. According to *W. Neil Adger*, the vulnerability can be identified as the conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of a community to the impact of hazards [28]. It has been identified that the consequences of a disaster are very less if it happens in a place where people are well protected and the consequences are very high if it happens in a poorly protected environment. As can be seen, the disaster risk can be minimized by the elimination of the unsafe conditions, in terms of people, property, and infrastructure [29, 30]. Furthermore, population expansion, urbanization, inappropriate developments and global climate change has made the world increasingly unsafe and therefore it is essential to expand risk reduction measures to prevent or reduce the impact of future disasters. Therefore disaster risk reduction should entail measures to curb disaster losses by addressing hazards and people's vulnerability to them, throughout the disaster management cycle. It is also evident that there are strong complementarities between humanitarian action and DRR [31]. Both recognize the need to affect governance and the importance of a participatory process and social mobilization. Humanitarian action's primary goal is the protection and enhancement of livelihoods and the betterment of the daily living conditions of individuals and communities. On the other hand, DRR's main goal is the protection of assets (human and physical) and services from major external shocks such as natural hazards [23]. Significant physical damages occur from these shocks to building areas and urban components and in this way urban planning and environment experts have a fundamental part in the amendment of physical harms of debacles [32, 33]. Development specialists can get included later on the advancement of alleviation measures including improving construction regulations, benchmarks, new materials, and development advances in danger and hazard ranges by having associations with providers, foundations, and powers. Therefore it is important to identify the nature and the composition of built environment before moving on to the contribution to the disaster risk reduction. According to Chang, 2010 urban planning is a basic segment of the country's economy, additionally a key giver in a disaster administration and relief because design and construction of structural projects for example seawalls, drainage systems and quality infrastructure, imposing building regulations and codes, land use planning, and zoning requirements are mainly required in the prevention and mitigation activities [35]. As indicated by *Donald*, 2000, the engineering community of urban planners has a profitable part in finding and advancing objective and adjusted answers for existing unbounded dangers. *Afedzie, Richard, and David*, 2010, excessively distinguished the significance of enhanced designing for structures and framework so as to minimize the unfriendly effects of calamities. However as per *Christine Wamsler*, "development people often do not perceive risk reduction as their sphere of activity and because specialised development units and activities in the urban planning sphere are rare, and frequently of low priority, urban planners working within international aid organizations tend to have a particularly weak sense of ownership of risk reduction" [34]. As a result, the subject to risk reduction is not properly integrated into their curricula. Traditionally, architecture, engineering, and surveying have been identified as main built environment disciplines and this leads to the historical separation and related lack of education and experience on the part of urban planners in the field of risk reduction. As a result, people perceiving the planning sector as one of the most difficult development sectors with which to work, since knowledgeable and experienced experts are uncommon. Realizing this fact, as per the *Kibert*, "the academics and professionals in planning, civil engineering, economics, ecology, architecture, landscape architecture, construction and related fields are responsible for discovering ways of creating a more sustainable built environment" [38]. Therefore it is clear that there is a high relationship between the disasters and the built environment disciplines.

#### 4. STUDY AREA

Rajgir is a city and a notified area as well as sub-division of Nalanda district in the Indian state of Bihar [39]. It is famous for religious tourism and cultural heritage sites because it is frequently referred in Jain and Buddhist scriptures and hence blessed with rich and glorious history [40]. As per the Bihar tourism department, this city is hotspot for tourism as it comes under “*Buddhist Circuit, Tirthankar Circuit, Islamic/Sufi Circuit and Nature and Wildlife Circuit of tourism*”.



**Figure 1:** Land use plan for Rajgir city (Adopted from Delineation of Rajgir Regional Planning Area, Urban Development and Housing Department Govt. of Bihar, 2015)

##### 4.1 Historical Perspective

Rajgir was the first capital of the kingdom of Magadha during the 6th century BC [41]. “*Cakravartin Ashoka*” built monasteries, sanctuaries and *Viharas* here [42]. Since *Lord Buddha* spent many years and also delivered sermons here. He was also treated by *Jivak* when he was wounded by *Devdutta* [43]. Lord Mahavira spent fourteen years of his life at Rajgir and Nalanda, spending chaturmas (i.e. 4 months of the rainy season) at a single place in Rajgir (Rajgriha) and the rest in the places in the vicinity [44]. Thus Its relationship with *Lord Buddha* and *Lord Mahavira* praises this city. The principal Buddhist board instantly after the *Mahaparinirvana of Lord Buddha*, to pen down his lessons, was likewise held at Rajgir.

##### 4.2 International importance

The spread of Buddhism resulted in the establishment of many monasteries in this area. *Vishwa Shanti Stupa*, built in 1969 by the government of Japan is one of the 80 peace pagodas constructed for spreading international peace and non-violence [45].

##### 4.3 Natural and recreational importance:

Located in close proximity to Rajgir Hills, this small hill town is covered with lush green forests. The Rajgir Hills contain hot springs, which contain some medicinal properties that help in the cure of many skin diseases [46]. The Rajgir Sanctuary is home for many wild animals viz. Wild bear, Leopard, Hyena, Barking Deer, and Nilgai [47].

#### 4.4 Tourism Importance:

Buddhist Monasteries, as well as Hindu and Jain's temples situated in and around Rajgir, has developed the area as a favorite tourist destination. As Rajgir is the venue for various meals/events and festivals like *Malmas Mela* (held every three years), *Buddha Jayanti*, *Mahavir Jayanti*, *Makar Sankranti* and other cultural events like *Rajgir Dance Festival*, a festival of classical and folk dances organized by Bihar State Tourism Department every year in the month of October [48].

#### 4.5 Physiography & Topography

Rajgir is a Class-III town in the district of Nalanda, with an area of 61.6sq.km. and a population of 41587 according to Census 2011. The town is a part of the proposed planning region which occupies 11.8% of the total land area [49]. This city has a rugged topography that sometimes proves unfavorable for agriculture, yet agriculture is the main occupation here [50]. Thus it is divided into two main parts which include “*Hills Land of Rajgir and Giriya*” - which consist of two parallel ridges extending around 65 km and “*cultivated Agriculture Land*” – mostly uneconomic holdings, fragmented land [51, 52]. The *Phalgu* river flowing through Nalanda is considered sacred for the Hindus with the other rivers in Nalanda include *Mohan*, *Jiraiya*, *Kumbhari*. This district is located within the Mid-Ganga basin, in the southern margin of the Gangetic plains, and soil can be characterized by four types of soil viz. Clay loam, fine loam, loam and coarse loam, mainly derived from an alluvial deposit of southern Ganga Plain. The majority of rock are the crystalline rocks exposed in Rajgir Hills and forming the bedrock slopping towards north consist of *phyllites and quartzites along with pegmatitic intrusions* [51-53]

### 5. SECTOR ASSESSMENTS OF RAJGIR

Urbanization shapes up significant physical, natural, socio-social, financial and political changes which imply that urban regions are not at all like country territories. Thus Rajgir can be therefore portrayed by particular physical, natural, socio-social, financial and political elements. It is important to comprehend these highlights with a specific end goal to deliberately and thoroughly investigate the corresponding relationship between urban communities and catastrophes in a methodical and far-reaching way. The whole drinkable water demand for Rajgir city is met through groundwater sources for the most part by bore wells. As per the district groundwater report 2011, the net groundwater accessibility is around 2024 hectare meter [54]. Usually, in summer the ground water tables decay to numerous feet's so water shortage emerges. Essentially this city does not have any underground sewerage framework. As an outcome, the sewage streams into open channels and *nallahs* and inevitably into water bodies in and around the town. It is clear that the present system scope is insufficient and represents a potential danger to general wellbeing and cleanliness. Sewerage treatment plant (STP) and the sewage accumulation framework should be shaped for improvement of the environment. The town does not have a systematic stormwater system, as a result of this city always witnesses water logging. Invasion of water/sewerage into the current open *nallahs* in every one of the regions and nonappearance of isolated sewerage and tempest water framework makes bottlenecks in the framework. To set up a powerful framework for tempest water seepage along these lines lessening water logging amid the storms and gathering of the overflow for usage amid the dry seasons. Also, there is no segregation or scientific disposal of the waste gathered and all waste is dumped in many open locales in the town. The road network in this city is also below average and the state of the streets is not up to the fancied level because of ignoble upkeep. Inadequate parking leads to on-street parking affecting the travel. The town likewise does not have a proficient public transport framework.

**Table -1** Urban Characteristics of Rajgir City

Physical features	Urban characteristics	Result	Source
Population density	Inhabitants density and overpopulation	Increased	Rajgir City Population Census 2011 Report
Land coverage and vegetation	Built-up surface area	Increased	Rajgir Regional Planning Area Report 2015
	Size, location, and distribution of green and recreational areas and Tree coverage	Reduced	

	Access to affordable space 'Consumption' of land	Increased	
Architecture	Height of buildings and Shape of buildings (increased)	Increased and more varied	Visual Inspection during Field Survey
	Construction techniques	(less traditional, more advanced)	
	Distance between buildings	Reduced	
	Street layout and street orientation	Become Denser	
Infrastructure	Infrastructure network density and connectivity and dependency on infrastructure network	(increased, more congested)	Rajgir Regional Planning Area Report 2015
Waste and waste water	Amount of waste	Increase	Official Records of Rajgir Nagar Panchayat
Social inequality	Segregation of different population groups Gender equality	Increase	Rajgir City Population Census 2011 Report and Field Survey
Diversity of people	Population diversity/heterogeneous communities	Increase	

### 5.1 OVERALL ASSESSMENT

**Table -2** Sectorial Assessment of Rajgir City as per Urban and Regional Development Plans Formulation & Implementation Guidelines, 2014

Sr	Parameter	Indicators	Ratings
1.	Status of Infrastructure and Service Delivery Levels	a. Coverage of Water Supply	Average
		b. Per Capita Availability of Water	Good
		c. Continuity of Water Supply	Average
		d. Coverage of Individual Toilets	Poor
		e. Door to Door Collection of Solid Waste	Poor
		f. Collection Efficiency of Solid Waste	Poor
2.	Financial Management	a. Resource Distribution	Below
		b. Growth in Revenue Income	Poor
3.	Poverty Level	a. Population Below Poverty Line (BPL)	Poor
4.	Organization Structure	a. Staffing pattern, availability of sufficient staff, competency level of existing staff for implementing proposed projects	Poor
5.	Leadership	a. Leadership quality, awareness and understanding regarding urban sector, proactive approach for implementing reform measures	Poor
6.	Economic Development Potential	a. Potential for Development, linkages to the state capital and other cities, status of existing infrastructure	Average
7.	Environment Sustainability	a. Status of Environment, quality of water, air,	Poor
8.	Participation	a. Level of Participation from Citizen/Citizen Forums/Welfare Association in municipal affairs	Poor

5.2 Multi-Hazard Profile of Rajgir

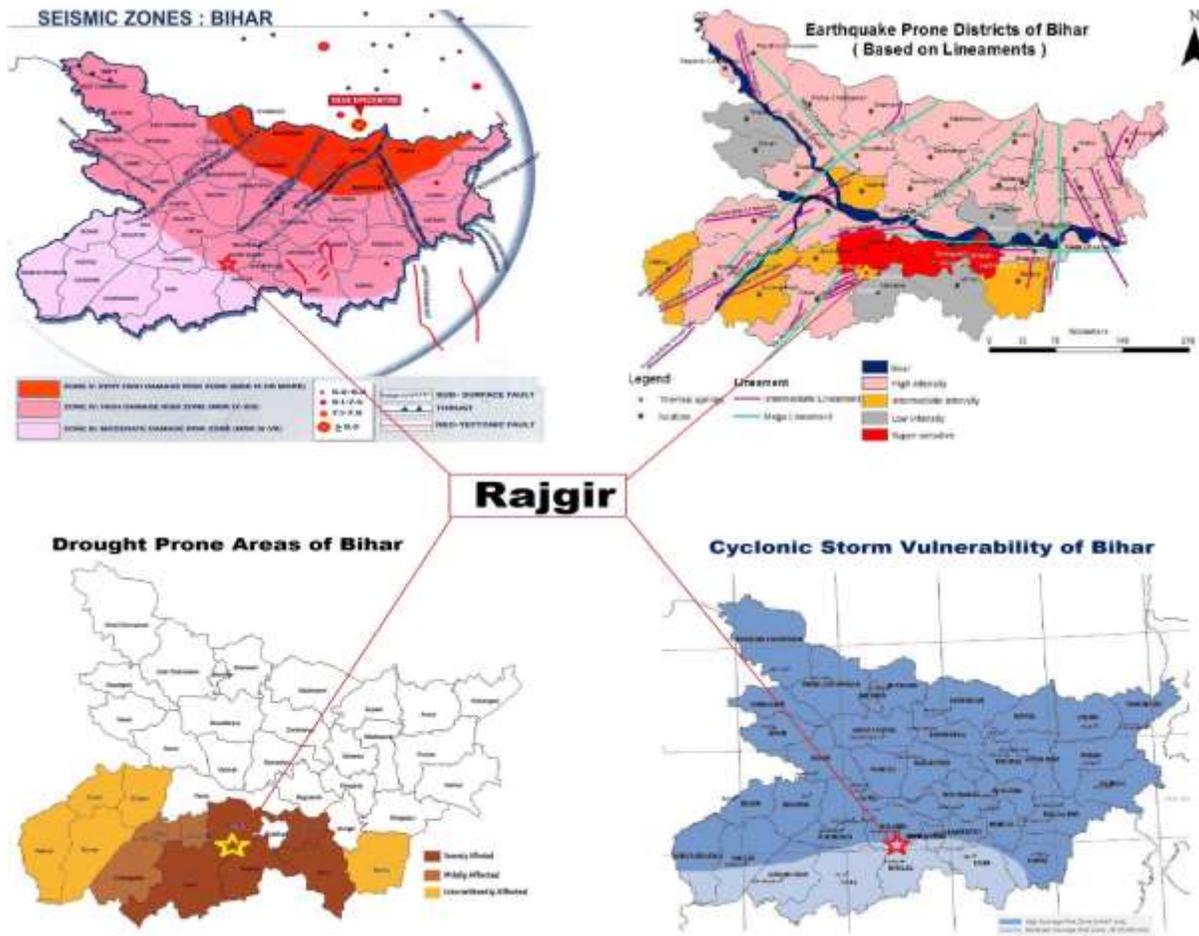


Figure 2: Multi-Hazard Profile of Rajgir (Image adapted from BSDMA, State Disaster Management Plan Section - I)

The topographical composition of Rajgir, its perimeter, its land, its water bodies, the climate and, most importantly, its position makes it most vulnerable and inclined to the greater part of the significant dangers: seismic tremor, surges, tornado, dry spell and fire. In some cases, two of the real hazards visit this city amid a similar period. This constitutes the multi-hazard profile of the city in the genuine feeling of the term. Being situated in the high seismic zone, Zone –IV roosted on the edge of the tectonic plate joining the Himalayan tectonic plate close to the *Bihar-Nepal Fringe* and having six sub-surface fault lines infiltrating through its Gangetic planes in four direction , Rajgir is vulnerable to the most noticeably awful sort of debacle caused by seismic tremor [55]. On the basis of lineament wise Earthquake Vulnerability, this city is most vulnerable and super sensitive city in Bihar (See figure 2) and the majority of the houses and buildings in Rajgir have not consolidated working by-laws, and don't have sufficient basic quality to withstand even a mild seismic tremor (See figure 3). After 2015, Nepal’s massive earthquake, scientists from the *National Geophysical Research Institute of India and Stanford University, United States*, analyzed the fault that separates the Asian and Indian continental plates may cause a 'mega earthquake' of this century as the dead fault of Himalayas are getting activated [56]. So the tremor will antagonistically influence an expansive number of houses and business. It will disturb the ordinary urban life and activity for a significant length, with a genuine effect on business and work. The danger of flooding and urban flooding to the city has lessened impressively because of check dam on tributaries like *Parmar river* and another main river *Phalgu, Mohan, Jirayan and Kumbhar* of the Nalanda district [57]. However, low-lying zones of the city get overflowed amid the rainstorm because of poor drainage system in the city and unique hydrogeology of this area [58]. Since the average annual rainfall of city is 1002.2 mm and 92.55 % of the rainfall is received during June to October by the southwest monsoon, so the lower parts of this city through which national highways and state highways are crossing, gets

flooded [57]. Thus this city must, therefore, be prepared to deal with the risk of flooding. It is an incongruity of circumstance that a city, so rich in water bodies, additionally experiences serious dry seasons [36]. Bihar frequently confronts dry spell circumstance of various scales/levels that characteristically prompt to starvation circumstances; this city is no exceptions to it [58]. This circumstance fundamentally happens when the summer monsoon gets decline and which causes rate takeoff of occasional precipitation from the typical [59]. Despite the fact that the North Bihar plain gets a lot of precipitation, yet when the yearly precipitation is even 25 percent not exactly the typical, dry spell circumstances win. Regularly the issue of the dry season and surges wins all the while. Drought and dry season has been significantly influenced this city water sources, like deduction of *Hot Spring* flow and thus had brought lower water levels in lakes, channels, and lessened stream flow in rivers [60]. This abatement in accessible water had prompted to a diminishment of a few wetlands, groundwater exhaustion, and even effect water quality. As a result, the deficient water supply had cause decrease in crop production and vegetable cultivation [59]. In Rajgir city, because of its rich cultural and religious history, many such events like *MALMAS Mela, Rajgir Mahotsav, and Kanwar Yatra* organized [61-63]. These events turnouts in many thousands and millions, there have 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.



**Figure 3:** Existing Various Buildings in Rajgir City

## 6. THE FULL PICTURE OF GROWING RISKS IN RAJGIR CITY AND NEED OF URBAN PLANNING WITH DISASTER RISK REDUCTION

Rajgir is vulnerable to numerous catastrophes and several elements contribute to urban vulnerability. It is their compounding and correlated effects that make urban disaster risk reduction a challenge. Below table 3 explains (on the basis of hazard analysis) degree of risk and vulnerability involved in this city.

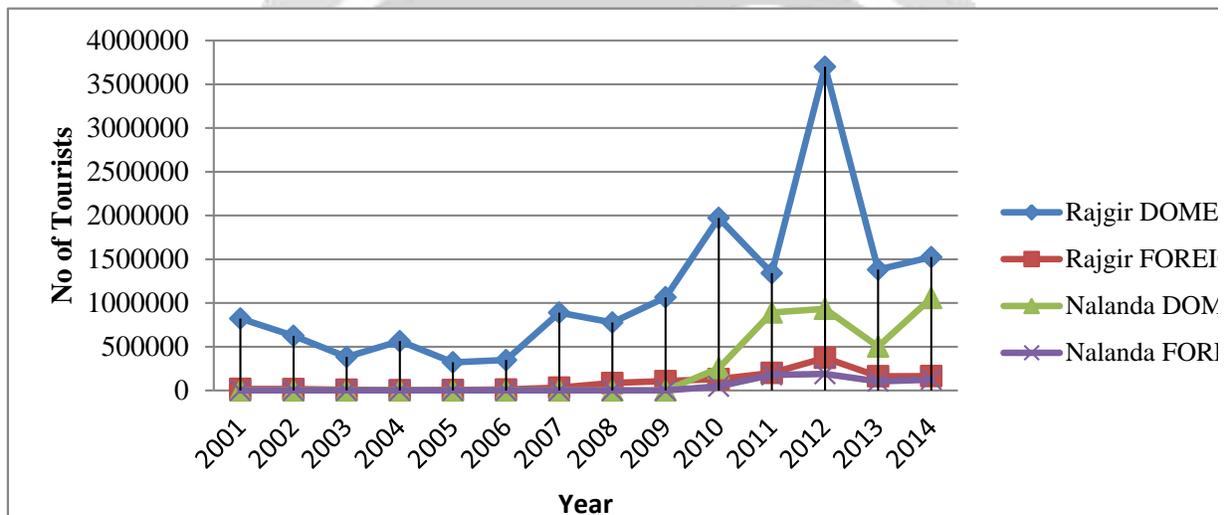
**Table 3:** Vulnerability Matrix of Rajgir

Disaster	Risk	Area worst hit	Sector worst affected	Population	Property
Earthquake	High	All	Structure + Infrastructure	All	Livestock + structure + wealth
Flood	Moderate	Largely Rural	Agriculture + Infrastructure	Largely threshold & marginalized section	
Drought	High	Largely Rural	Agriculture		
Lightning, Hailstorm	low	Largely Rural	Agriculture + Infrastructure		
Stampede	High	Rural+Urban	Structure + Infrastructure	Marginalized threshold	structure + wealth
Industrial Hazard	Nil	Localised	Beneficiaries	causality varying with nature of hazard	

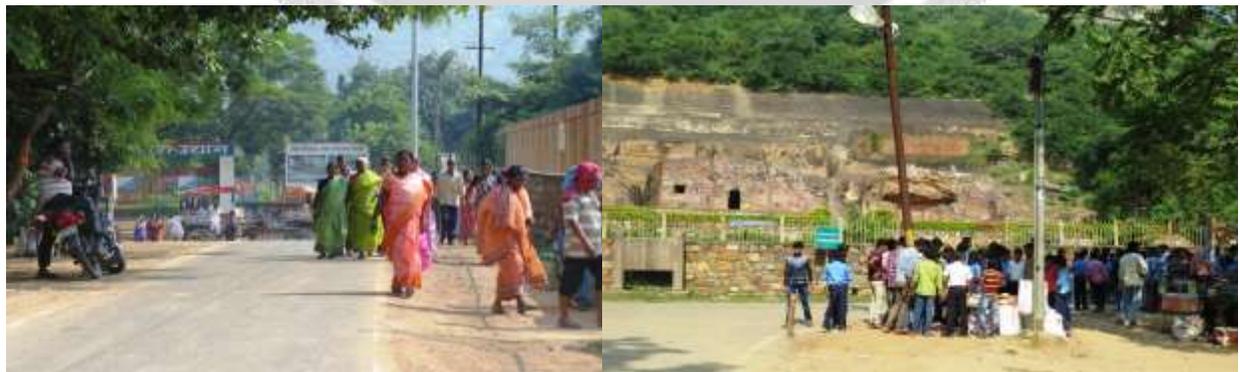
A city like Rajgir signifies compact and multifaceted systems of interrelated amenities. All things considered, this city confronts a developing number of issues that drive fiasco hazard. Techniques and strategies can be produced to address each of these issues, as part of a general vision to make this city more resilient and livable. Although there are significant numbers of risk however among the most significant risk drivers are:

**6.1 Tourism pressure**

The Indian tourism and hospitality industry has emerged as one of the key drivers of growth in the services sector in India [64]. For a state like Bihar, tourism is a potential game changer. It is a sunrise industry, an employment generator, a significant source of foreign exchange for the state and an economic activity that helps local and host communities [65]. Being nearest City from ancient ruins of Nalanda university, and its rich culture inherited from various dynasty and birthplace of and great personalities and several religions along with rich wildlife, birds and sanctuaries and immense agricultural activity, this city is contributing and assisting the Bihar state to aggressively pursue the promotion of tourism both internationally as well as in the domestic market [66]. Bihar tourism industry is thriving due to an increase in foreign tourist arrivals and a greater number of Indians traveling to domestic destinations than before (chart-1).



**Chart-1:** Trends of Domestic and Foreign Tourist Visit to Nalanda District (Source: Bihar Tourism, ( Available from [http://www.bihartourism.gov.in/data/Tourist\\_Data/2010%20&%202011&2012.pdf](http://www.bihartourism.gov.in/data/Tourist_Data/2010%20&%202011&2012.pdf) , )



**Figure 5:** Tourist from all different parts of India and world, including school students, who regularly comes to rajgir under education trip promoted by state government.

## 6.2 Unplanned urbanization is having increasingly devastating effects

The rapidly increase in footfall of tourists is overwhelming government institutions with the pressures of urbanization. To cater the need of tourism, this city expanding so rapidly, much of the growth is haphazard, far exceeding the capacity to adequately plan and control development. As a result, uncontrolled urbanization feeds the growth of slums, reinforces poverty, and diminishes its ability to deal with disasters. The urbanization has taken place without regard to protecting against extreme hazard events. Faced with the needs to provide housing infrastructure and services, cities developed haphazardly and often without any formal land use and urban planning process. Rising urban populations and enlarged density, which place pressure on land and amenities, aggregate settlements along unstable slopes arises due to illegal mining in Rajgir hills. Similarly, inadequate water resource management, drainage systems, and solid waste management have caused health emergencies like dengue, malaria. The decline of ecosystems, due to human activities such as road construction, pollution, wetland reclamation and unsustainable resource extraction, that threatens the ability to provide essential services such as flood regulation and protection.



**Figure 6:** Violation of Building codes during construction phase in Rajgir city

## 6.3 Social and Physical Degradation:

The overwhelming success of international and domestic tourism has given rise to a pressing demand for skilled and unskilled manpower; hence this city attracts many migrants [67]. New migrants and underprivileged usually move into the inner city, where buildings are old and in poor maintenance conditions, hence access roads are narrow and service delivery is difficult. These old buildings and the aging infrastructure constitute a constant threat to their occupants from hazards such as fires, floods, and earthquakes. A significant proportion of urban dwellers resides on highly vulnerable buildings where they are at high risk from multiple hazards and where access for emergency vehicles is often difficult and can be completely obstructed by building debris in case of a hazard event. Solutions to reduce social and physical vulnerabilities are social, politically and financially difficult to devise and implement. Reducing the social and physical vulnerability of these neighborhoods remains a formidable challenge to the authorities.

## 6.4 Overlooking the Urban risk

In Rajgir urban risk and another environmental risk from extreme hazards has largely been ignored by local authorities; compounding the problem, and chronically been neglected by state and national governments. Considering the way of the landscape in Rajgir, the act of delving bore well had a profound impact on groundwater hydrology and will influence the entire environment and its symmetry. Like a case of April 2016 in which hot Springs of this city was drying the warm water in these hot springs comes from centuries old, the torrent suddenly becomes thin. Many people blame the deep bore well of recently made park” Pandu Pokhar” has caused the further depletion of water table [68]. Although Central Ground Water Survey is still investigating the reason behind such incident, however, they also agree that deep bore wells of his park are one of the reasons for thinning of hot streams. Similarly, *Bihar State Tourism Development Corporation (BSTDC)* has begun the process for the construction of a

95 x 22 feet big statue of the Lord Buddha at *Ghora Katora* in Rajgir [69]. To support such big statue, it requires deep piling inside lake which may change the unique surface hydrology of this location [58]. Apart from its hotels, schools, hospitals, essential facilities, housing, commercial and institutional property continue to be designed and built with little regards to the safety to extreme hazards such as earthquakes and floods.



**Figure 7:** Illegal mining in Rajgir Hills



**Figure 8:** Poor drainage system and dumping of municipal waste in river channels

### 6.5 Weak institutional arrangements and political feasibility

This Rajgir City development plan included along with the Development Plan of Bodhgaya in accordance with the *JnNURM* toolkit, urban development plan formulation, and implementation (*UDPFI, 1996*) guidelines and in line with the relevant central and state govt. acts in 2006 [70, 71]. This mandatory City Development Plan (CDP) under *JnNURM* was expected to incorporate some basic principles of land use and take an integrated view of public transport and a housing including affordable housing for the poor, but the CDP became a hastily put together instrument for supporting project proposals. As politicians, administrators, and community leaders all face conflicting priorities, thus the DRR of this city almost invariably takes the back seat to other needs which may be considered more pressing or easier to solve.

### 6.6 Insufficient knowledge, experience, and capacity

Under the Mandatory provision of *DM Plan Under Section 31 of DM Act -2005*, Rajgir city is also covered in Nalanda district disaster management plan. But the existing scenario of the city reflects that this plan is significantly suffering from deficiencies in terms of inter-institutional coordination, warning systems, incident command, and control, resources for response, relief, recovery, and rehabilitation practice following urban disasters. Lack of specific funding/budget lines for disaster risk reduction, deficient data for hazards, impacts and vulnerabilities, gap between research and policy making, and complexity of distributed urban governance which makes decision making

a lengthy process and unclear borders between individual and institutional responsibilities to take necessary measures on the ground make situation even more complicated.

## 7. CONCLUSION

This article uncovers that mainstreaming risk diminishment in urban planning stands up to a substantial difficulty in integrating risk reduction in development planning. The absence of incorporation of urban planning and risk reduction is regularly the consequence of the gap or even anxiety between disaster individuals, development planners and urban organizers, which depends on contrariness between their related orders and disciplines. This inconsistency obstructs the foundation of more coordinated activities expected to decrease urban dangers. With the example of class III cities like Rajgir, it is evident that preparing India's cities for a rapid growth scenario will require a paradigm shift in planning for urban infrastructure and reforming the institutions for service delivery. Regional and urban planning have an important role to play in generating new spaces and in rejuvenating existing city spaces. Planning an urban space won't be any good if we approach it with tunnel vision. Each aspect of a city is intricately linked with the other. If we think of developing housing, there are several aspects like water supply, electricity, garbage disposal etc. to also look at. Holistic development needs to address economic growth, employment, social change. At the same time, it needs to deal with economic deprivation, environmental degradation, waste management, and proper utilization of space. With this article, it is also evident that urban planning in India must also draw upon India's rich heritage of culture and architecture. This is reflected in its urban morphology and building patterns that exist in the cities and towns of India. Cultural spaces mean to cater to the aesthetics of art, culture, theater, music and dance are crucial for broadening mental horizons not for "Disneyfication" of nature in the name of tourism. As urban renovation and urban rejuvenation can increase the economic and social potential while reducing their risk by incorporating structural and non-structural mitigation measures, Urban redevelopment can act as a powerful tool to reduce urban risk. Inadequate resources and incentives compromise disaster risk reduction action. Disaster risk reduction is a long-term, low-visibility process, with little guarantee of tangible rewards in the short term, either for politicians in affected cities or for donors. However, inaction brings further complication of the problem and further accumulation of risk, creating the need for future investments that are significantly costlier than those needed now. The need to establish an urban DRR practice goes beyond the noble humanitarian goal of saving lives. It defines the future of our cities in terms of the protection of their assets and the efficiency and capabilities of their services and governing structures. The most tangible incentives reside in mobilizing the human resources of communities and institutions. We must invest in developing the human potential for DRR through training of practitioners, competency buildings of professionals and decision makers, peer-to-peer sharing, and knowledge accessibility and valorisation of the human potential through recognition and dissemination of sound practices. Developing the human potential will enable communities and institutions to push the DRR practice forward. It would turn a liability into assets and challenge into an opportunity.

## 8. RECOMMENDATION

Based on the outcome of the study, following recommendations are also suggested:-

- Use of participative, integrated and broadened EIA for resilient urban Planning.
- Linking legal frameworks and agendas related to urban planning and environment protection.
- Improved enforcement of integrated legal planning frameworks through better education and payment of building control officers; vigilance by local groups; innovative low-income insurance systems; advice offered by 'barefoot planners'; creation of eco-parks; and integration of community organizations into city planning.
- Establishment of risk maps combined with databases related to urban settlement development.
- Support for local studies, providing data on the interconnection between local risk-accumulation processes and urban planning at the city, settlement, community, and housing level.
- Support for bottom-up processes focusing on urban disaster risk and the promotion of safe urban environments.
- Promote innovation and use of structural/physical protection, including engineering and architectural measures, for instance: the construction of disaster-resistant housing, infrastructure and services; mitigation works; and the modification of street widths, plot sizes, building arrangements, densities, and heights to reduce vulnerabilities.

- De-professionalisation of urban planning: work of ‘barefoot planners’ offering door-to-door advice on the secure upgrading of housing
- Promote innovation and use of protective non-structural planning measures, such as planting; evacuation plans; incentives to build safely (for example, tax inducements, exchanging rights and insurance schemes); land pooling and readjustments; and urban early-warning systems that include urban risk indicators for disaster forecasting.

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