



MANAGEMENT OF DISASTER THROUGH KNOWLEDGE MANAGEMENT SYSTEM: A CASE STUDY ON SAMBALPUR DISTRICT, ODISHA

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ABSTRACT

Odisha is one of the hazard-prone state and suffers both natural and man-made hazards extensively threatening millions of lives and causing large-scale losses. Disaster management in India also saw a paradigm shift after 2002 from – the 'humanitarian relief and rehabilitation of victims to the 'holistic management of disasters' viewpoint. The present research addressed this absence of information related to hazards and disasters affecting the district-level Sambalpur. This research aimed to find out some aid in the management of disasters at the district level by collecting and synthesizing all related information about disasters that occur in Sambalpur using an integrated approach. The research used publicly available tools as well as data from credible sources (e.g., government reports). To full-fill the aim, the research compiled information about disasters in the Sambalpur district and prepares a spatial database. Based on socio-economic factors – population density and working population, exposure of the blocks was calculated. Risk and exposure to it assisted in making a vulnerability map of the district at the block level. Based on vulnerability, blocks were prioritized for the policy-makers to ease their management in pre-during and post-disaster situations. The result of this paper would assist policy makers to take proper and quick decisions for the management of the blocks making their management efficient and effective and it could be replicated for other districts of Odisha and India.

KEYWORDS: Hazards, Disaster, Vulnerability and Disaster Management.

INTRODUCTION

India is one of the hazard prone countries given its physical as well as socio-economic conditions (NDMA 2020). It suffers both natural and man-made hazards extensively. Floods, droughts, landslides, snowstorms, hurricanes and cyclones occur regularly. These hazards threaten millions of lives and cause large scale of financial, agriculture, infrastructure, environmental and productivity losses that significantly hampers India's overall development.

Odisha, a state of India, has been facing widespread and extensive damages almost every year due to natural calamities and manmade disasters such as cyclones, floods, droughts, landslides, forest fires and road accidents etc. (OSDMA 2020). In Odisha, the institution responsible for disaster management in the state is Odisha States Disaster Management Authority (OSDMA) (Bahadur et al. 2016). It was set up by the Government of Odisha as an autonomous institute on 28th December 1999 in the after math of Super Cyclone. The western part of Odisha, being an underdeveloped region, is particularly affected. Sambalpur district, one of the prominent districts in Western Odisha, is also prone to both natural and man-made disasters. Unfortunately, there is hardly much information available on these disasters affecting the Sambalpur district, which can be found at one integrated platform for the decision-makers to use in the decision-making (Nair and Gupta 2011). Information in integrated form could be useful for the decision-makers of Sambalpur immensely in managing the district well. The present research addresses this gap of Absence of information related to hazards and disasters affecting the Sambalpur district. It aims to aid in the management of disasters at district level by collecting and synthesizing all related information about disasters that occur in Sambalpur district using integrated approach.

1. To compile the information about disasters in Sambalpur district and map each of them.
2. To integrate the different disasters risks within the district in order to understand the combined risk (block-wise).

3. To map the different socio-economic factors that could be related to disaster management of the district (block-wise).
4. To map the exposure and vulnerability within the district (block-level).
5. To prepare a block wise priority map for the disaster management within the district.

The information associated with disaster management in India is limited in public domain (Sam et. al. 2017). Seneviratne, Baldry and Pathirage (2010) identified that the key factors influencing disaster management and noted gap in the management of information and the knowledge generated to enhance the process of disaster management. Nair and Gupta (2011) noted lack of integration in the knowledge generated for different disasters (natural and man-made). They observed lack of integration in the disaster management plan and stated that this gap would not allow the district official to perform their centralized duties and function smoothly. To function well, they need multi-disciplinary understanding of all disasters that occurs in their district.

The outputs of this research would assist the decision-makers at district level in managing the disaster efficiently and effectively.

THE STUDY AREA

Sambalpur district is in the western part of the state of Odisha in India (Figure 1). The district lies between 20°40' to 22°11' N latitude and 82°39' to 85°15' E longitudes. The district is surrounded by relics of Eastern Ghats in its south and south-east. The district is bounded by Deogarh District in the East, Bargarh and Jharsuguda Districts in the west, Sundergarh District in the North, and Subarnapur and Angul districts in the South (District Irrigation Plan of Sambalpur March 2016).

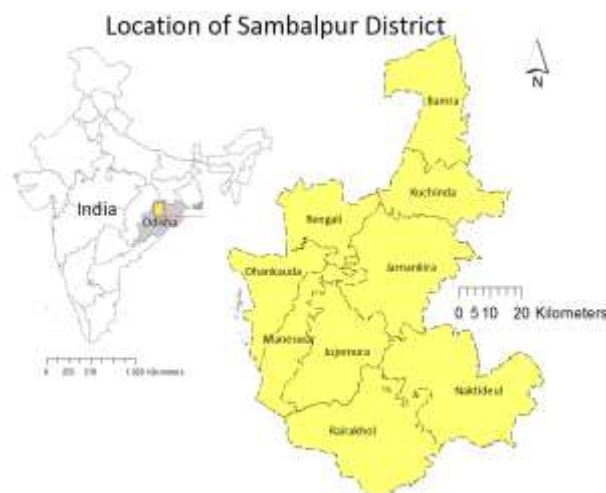


Figure: 1 the Area Under Study in the Present Research

Sambalpur falls into dry sub-tropical climate zone. The district comes under Eastern plains agro-climatic zone. It is located in the upstream of Mahanadi River basin. The area under the Hirakud Dam Project Command Area has a fairly developed agriculture sector that also helps develop other sectors.

The present study is primarily based on secondary data. The research used latest available data from credible sources in the public domain to keep transparency in the research process. To maintain the credibility of research, present work used data from responsible government authorities named

1. Building Materials and Technology Promotion Council (BMTPC 2006, 2004)
2. National Disaster Management Authority (NDMA 2020)
3. National Institutions of disaster Management (NIDM 2020)
4. Vulnerability Atlas of India (www.bmtpc.org)2020
5. Odisha State disaster management Authority (OSDMA 2020 and 2021)
6. Odisha State disaster management Authority (OSDMA IIPH-BBSR 2016)
7. District disaster management Authority (DDMA 2020)
8. Census of India 2011 and some non-governmental resources have also been used to get local news of Sambalpur district e.g. local newspapers.

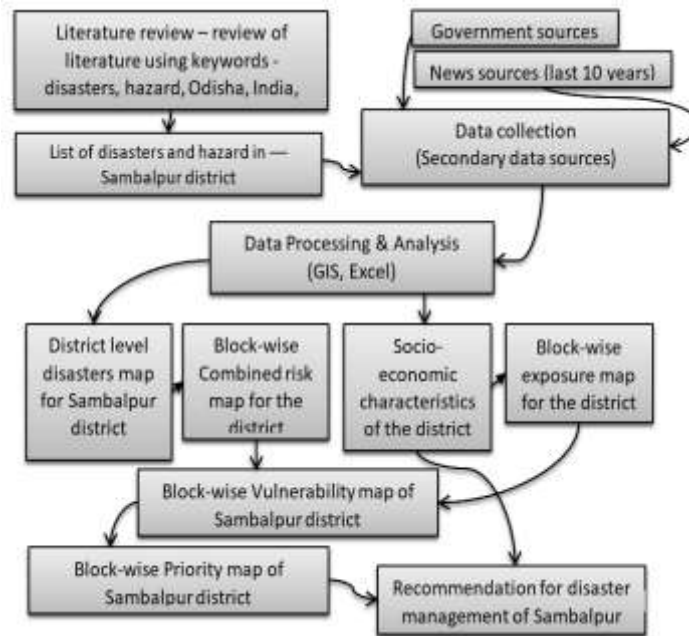


Figure: 2 The Methodology used in present study

Faisal and Khan (2018) Geographic Information System (GIS) applications could be used to understand patterns of disasters over time and space. They further stated that these tools could assist in solving complex planning and management problem and guide in the decision making.

RESULTS AND DISCUSSION

Sambalpur primarily experiences five types of natural disasters such as Drought, Flood, cyclone, Earthquake and Heat waves etc.

Combined disaster risks within Sambalpur

This map shows the risk of each block in Sambalpur district for each of the natural disaster that occurs within the district (Figure-3).

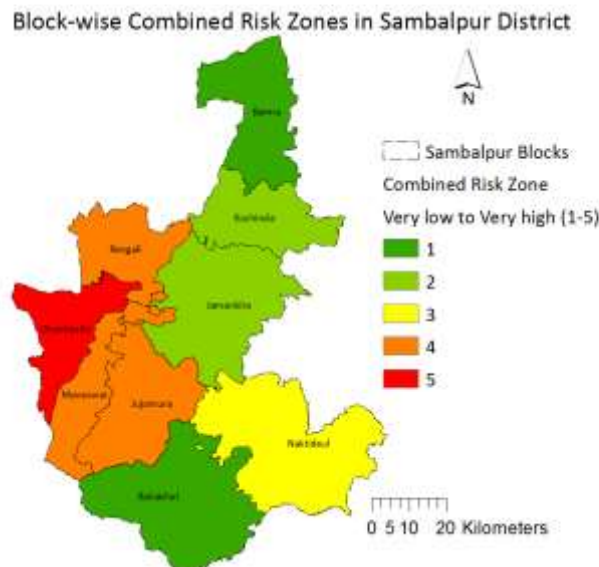


Figure 3: Combined Risk Zone in Sambalpur

Figure 3 and Table 1 shows the combined risk of each block in the Sambalpur district. Based on this combined risk, the blocks have been grouped into risk zones (1-5). Dhankauda is in the highest risk zone followed by Rengali, Maneswar and Jujumura (Group 4 risk zone). Bamra and Rairakhol experience the least combined risk (Figure 4-8).



Table-1: Combined risk of each block in the Sambalpur district

Blocks	Overall weighted risk	Risk Zone within Sambalpur
Bamra	2.5	1
Kuchinda	2.7	2
Jamankira	2.7	2
Rengali	3.0	4
Dhankauda	3.2	5
Maneswar	3.0	4
Jujomura	3.0	4
Rairakhol	2.5	1
Naktideul	2.9	3

In Sambalpur, all the blocks except Naktideul experiences low risk in the case of severe drought; in fact Naktideul faces very low to low risk of severe category drought. Rengali and Dhankauda experience high risk for heat waves. Cyclonic winds are similar across all the blocks of Sambalpur except Naktideul which faces moderate to high risk for cyclonic winds. Dhankauda, Jujomura and Naktideul faces moderate risks for earthquakes while Maneswar faces low to moderate risk of the same; rest of the blocks experience low risk for earthquake.

Socio-Economic Condition Within Sambalpur

Table 2: Basic population characteristics and work and occupation (Census of India 2011)

Sambalpur District			
Total		Urban (%)	Rural (%)
Basic Population Characteristics			
Total Pop	10,41,099	30	70
Males	5,26,877	30	70
Females	5,14,222	29	71
Pop(0-6)	1,17,848	28	72
Total SC	1,91,827	30	70
Total ST	3,55,261	10	90
Literates	7,03,691	33	67
Literacy Rates	77	83	73
Work & Occupation			
Main Workers	3,36,854	29	71
Marginal Workers	1,68,986	10	90
Total Workers	5,05,840	23	77
Cultivators	86,800	4	96
Agricultural labourers	1,60,798	3	97
Household Industry workers	59,288	13	87
Other Workers	1,98,954	50	50

The district experienced decadal population growth of 11.9% during 2001-2011 (Census 2011). During this period, the urbanization growth rate in the district was 21.4% while the rural growth rate was 8.32% (Table 2).

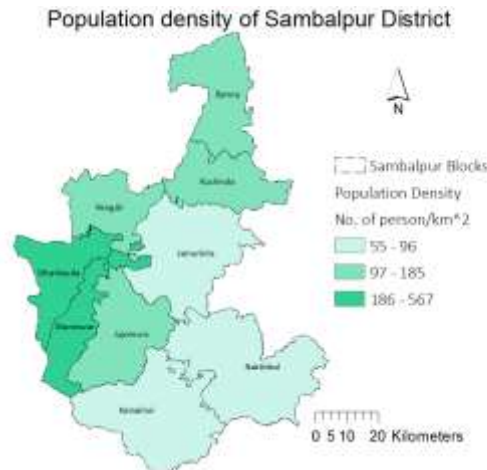


Figure 4: shows population density within the Sambalpur district.

The population density of Sambalpur district was 158 persons per km² in 2011. The population density ranged between 55-567 persons per km² among all the blocks of the district. Western part of the district has dense population (Figure 4). Dhankauda had highest population density (567 persons per km²) followed by Maneswar (366 persons per km²). Naktideul had least population density (55 persons km²) followed by Rairakhhol (67 persons per km²) and Jamankira (96 persons per km²). The density of population decreases from west and north-west to east (Figure 4).

Figure 5 shows the occupational structure of Sambalpur District. People are largely involved in agricultural activity; 49% of the total main workers is either cultivator or works as agricultural labourers. Around 12% of the population is involved in household industries and rest 39% is engaged as other workers.

Table 3: Exposure of blocks in Sambalpur district based on primary socio-economic factors

Total population density		Working population	Overall exposure	Exposure zone
Bamra	Moderate	High	High	4
Kochinda	High	Moderate	High	4
Jamankir	Low	High	Moderate	3
Rengali	High	Moderate	High	4
Dhankauda	Very high	Very High	Very High	5
Maneswar	Very high	Very High	Very High	5
Jujomura	Moderate	Moderate	Moderate	3
Rairakhhol	Low	Very Low	Low	2
Naktideul	Very low	Low	Very low	1

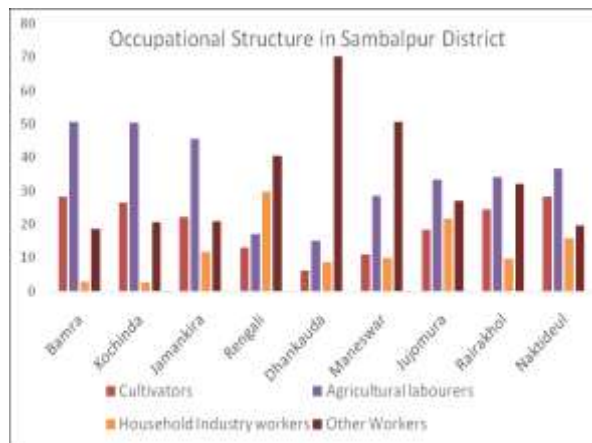


Figure 5: Occupational Structure in Sambalpur District.

Vulnerability Assessment Within Sambalpur

Among the socio-economic factors taken in present research, blocks were first studied for the exposure using primary factors (population density and working population). Table 3 shows the exposure of blocks in the Sambalpur district due to primary factors.

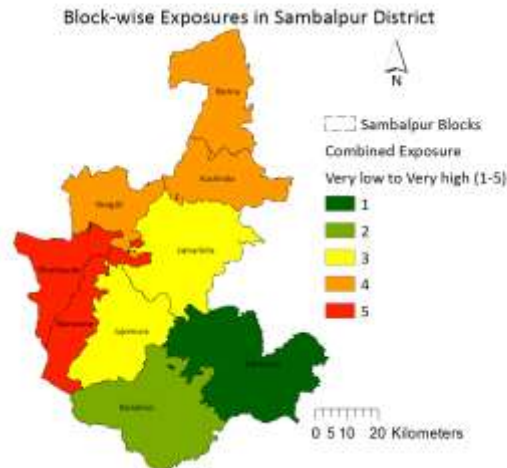


Figure 6: Combined Exposure in Sambalpur District

Dhankauda and Maneswar have highest exposure to the disasters based on their population density followed by Kochinda and Rengali (Figure 6). Rest of the blocks showed either moderate or low exposure as per their population density.

To examine the vulnerability of blocks in Sambalpur district for the disasters that occur in the district, combined risk (Table 1) was compared with the exposure of the population (Figure 6). The comparison is given in (Table 4), which was used as base to calculate the vulnerability of each block (given in Table 4 and shown in Figure 7)

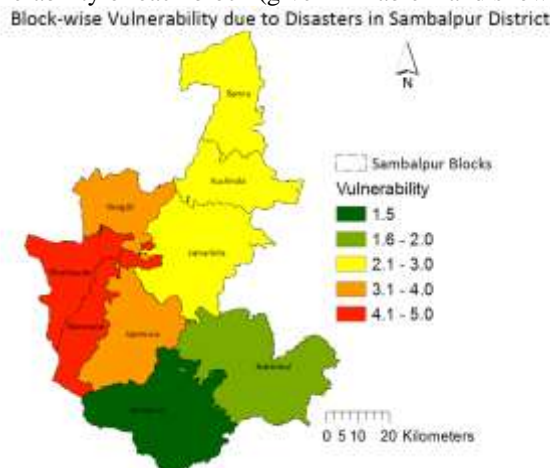


Figure 7: Block-wise Vulnerability due to disasters in Sambalpur District

Dhankauda and Maneswar are highly vulnerable blocks in Sambalpur district followed by surrounding blocks – Rengali and Jjumura (Figure 7).

Disaster Management Priority for policy-makers

Based on Exposure and vulnerability blocks were prioritised for the policy makers. Dhankauda showed very high risk as well as exposure, thus it has been kept in top of the priority list of the policy-makers while managing disasters in multiple blocks (Table 4 and Figure 8). Maneswar showed high risk but very high exposure. As a result, it has been kept second in the priority list of the policy-makers working in the disaster management of the Sambalpur district. These two districts are followed by neighboring block Rengali, which showed high risk as well as high vulnerability. Another neighboring block Jjumura showed high risk but moderate vulnerability; thus, it has been kept fourth in the priority list for the policy-makers. Kuchinda showed low risk but very high vulnerability; thus, it has been kept fifth in the priority list for the policy-makers. These blocks are followed by Bamra and Jamnkira, sixth in priority list – Bamra with very low risk but high vulnerability within the district due to high exposure and Jamnkira with low risk and moderate vulnerability.

Table 4: Comparing Risk Zones and Vulnerability of Blocks

Risk Zone		Exposure Zone	Vulnerability
Bamra	1	4	2.5
Kochinda	2	4	3
Jamankira	2	3	2.5
Rengali	4	4	4
Dhankauda	5	5	5
Maneswar	4	5	4.5
Jujomura	4	3	3.5
Rairakhol	1	2	1.5
Naktideul	3	1	2

Priority of Blocks for Disasters Management in Sambalpur District

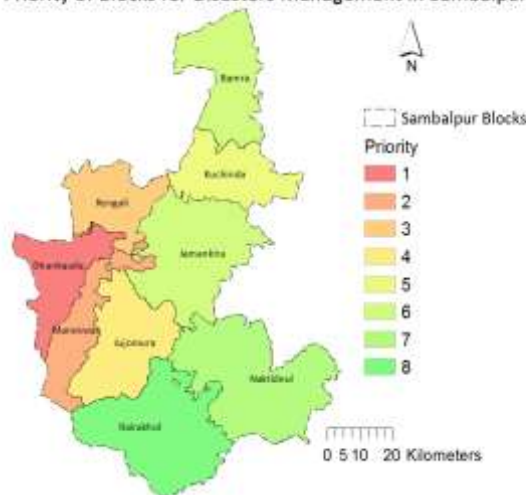


Figure 8: Priority map of Sambalpur District

Naktideul and Rairakhol are kept in seventh and eighth rank due to their lower risk and vulnerability among all blocks (Table 4 and Figure 8).

CONCLUSION

The present research addressed the absence of information related to hazards and disasters that affects the Sambalpur district and its availability in a format directly usable to the policy-makers. It aimed to aid the disaster management at district level by collecting and synthesizing all related information about disasters that occur in Sambalpur district using integrated approach. The study full-filled its aim by attaining all of its objectives.

Following are some major strengths of the present research that could be useful for disaster management at district level:

- Follows integrated and multi-disciplinary approach in disaster management.
- Managed to take the management of disasters at block level.
- Is transparent and credible in nature due to maintaining data-quality by using credible and publically available public data.

The research makes the process of disaster management easier for the policy-makers of the Sambalpur district.

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