

## **Mining as Regional Development Led Vulnerability: A Case Study of Rural Areas of Raniganj Coalfield Region**

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### **ABSTRACT**

Mining in India has played very important role in the economy. But the other consequences have also been detrimental to the local community and environment. Raniganj is one of the oldest coalmines in India, which lies at the western part of the Burdwan district being less fertile and rich in coal. While the eastern part of this district is endowed with very fertile alluvial soil. In this backdrop, this paper seeks to analyse the mining as regional development led vulnerability through some selected indicators of socio-economic development and vulnerability in the rural areas of community development blocks of Burdwan district. It is found that the areas which are dominated by the mining and related industries are more vulnerable than the areas which are dominated by the agriculture.

**Key Words :** Mining, Regional Development, Socio-Economic Development, Vulnerability

### **INTRODUCTION**

Natural resources have not always been an asset for the region or country though it plays a very important role in the economic development for some countries or regions but on the cost of people's right (Elena and Jesper, 2011, November). Therefore it is also seen with 'curse' (Sach and Warner, 1995). The Middle-East maybe one such example of getting benefit in terms of development from natural resources, especially in mineral oil. In many cases the countries with abundant natural resources develop very slowly by resource export led growth than resource scarce nations. On the other hand the country like Venezuela, Peru, Nauru island, etc. "Arguably countries like Australia, Botswana and Norway have gained enormously over long periods from their natural resources, while in some countries, such as Angola and Sierra Leone, natural resources have been at the heart of violent conflicts with devastating effects for society" (Elen and Jesper, 2011). The mining and export in developed and developing countries have resulted differently and thus it is unjustifiable to see the mining led

development with the same lenses.

As far as mining in India is concerned, it falls into the trap of resource curse since the colonial period. Yes, there has been some development in the mining regions in terms of power generation, infrastructure for extraction and transportation of minerals in that period and contribution to the national economy during post independence period, but largely the mining areas remained deprived of what they deserved to be and a dualistic structure of economy (Friedmann, 1966) continued on the surface. There needs to maintain the balance of mineral extraction or alteration in physical and human environment. However, it has largely been one way action for a long and still continuing with some compensation. Further, this kind of human action has led to socio-cultural, economic and environmental vulnerability.

Development of a region is to be done through the regional planning, a technique to evaluate the potential of sub-natural areas and to develop them to the best advantages of the nation as a whole (Mishra, 1992). However, it is also to be kept in mind that development

for whom at the cost of whom'. Mining activities are expected to bring positive impacts like attraction of better infrastructure and communication facilities, health and education facilities, employment and livelihood opportunities, and overall development of the mining areas. However, as mostly the mining areas are the traditional areas of inhabitations of indigenous people with forest and rich environment, it has mostly been experienced that the development has costed the natives of the resource rich regions in many forms like change in landuse, land degradation, air, water and noise pollution, loss of soil quality, changes in local ecosystem, change in displacements and land alienation; traditional landuse, economy and culture, destruction of social system, lifestyle; socio-cultural disturbances, joblessness, migration of locals due to land alienation and displacement, economic, livelihood and environmental impacts, psychological pressure caused due to displacement and marginalization, loss of traditional home and common property resources, crime against women and insecurity, forced engagement in menial jobs, health problems, etc. since the focus has been on primarily on overall growth and development of the national economy than the balanced and equitable development. This way the people under such conditions in the resource regions have always been suffering from vulnerability.

Vulnerability is a state of a given population system or place of being exposed to the hazard that affect the ability to prepare for defend, respond and recover from it. While socio-economic vulnerability is a type of vulnerability where a given population cannot cop up with any kind of jolt occurred by nature or manmade (inequalities due to poverty, poor health facilities, low socio-economic status, low educational level, poor public infrastructure and poor living standards) (Lee 2013; Cutter 1996; Cutter et al. 2003; Adger et al. 2004). Mining led displacement has led to severe disruption in the normal lives and livelihood of the affected people (Areeparampi, 1996). 30 miners lost their lives in accidents in the Bagdigi mines in Jharkhand. More than 500 abandoned mines in Jharia and Raniganj Coal Fields in Jharkhand and West Bengal make cause for subsidence, excavated pits, overburdens soil and area affected by fire. These issues must be addressed for balanced and beneficial development (Mehta, 2002).

Kudermukh Iron Ore Company Limited (KIOCL) is a big example of environmental destruction in India. Every year many mine workers lose their lives in mining

accidents in India. Wide spread illegal mining and lack of effective government supervision in the government and private mines accentuates the problem (OECD, 2002). The problems are related to land such as loss of biodiversity, economic loss or loss of livelihood due to displacement and encroachment of agricultural land, Impact on water resource (in term of water availability and quality); environmental and health and safety related problems. Open cast mine has significant impact on land as compared to underground mine (Dhruv, Dhruv, and Sameer, 2013). Besides these impacts there are several impacts like social and cultural is not even counted. The result is under-used economic potential and weakened social cohesion. Regional development through regional planning aims to of accelerating the process of social advancement of the community through the technique of economic and social planning, though it is restricted to the given region area of the country.

No doubt mining has great contribution for the economic development as growth centers with centres of power generation for railways and industries and centres of mineral export from India before and after independence. Though the development was being shown by the quantified figures, at the same time there was no figure through which vulnerability and its impact could be assessed out mitigation plan could be worked out. Regional development was an attempt to uplift the extreme areas like hilly, desert, plateau, etc. by giving special attention of the government by making planning and polices in 60s and 70s having less consideration on vulnerability. Therefore, it is necessary to see the other side of the mining as regional development, i.e., level of vulnerability for proper mitigation and resilience for a sustainable livelihood among the affected people. From some previous studies, it is conceived that mining area has always been vulnerable in terms of social, environmental, economical, where the native people have been more vulnerable establishing a relationship between mining as regional development and various aspects of vulnerability.

### **Objectives:**

In the above backdrop, the study aims to examine the mining as regional development led vulnerability in the rural areas of Burdwan district. The rationale behind taking rural areas is that the mining activities are mostly in rural areas or rural areas have mostly been affected. The objectives are to study the block wise levels of

development of Burdwan to assess the pattern of vulnerability in the study area and to examine the relationship between mining induced regional development led vulnerability.

## METHODOLOGY

The present study is conducted on the basis of secondary data sources. Secondary data have mainly been obtained from Census of India 2011 including District Census Handbook of Burdwan, and Statistical Handbook of Burdwan.

For assessing development, indicators from agriculture, industrial and infrastructural sectors have been taken. Similarly the indicators related to exposure, sensitivity and adaptive capacity have been considered for obtaining the vulnerability index. Indicators are given in Table 1 and Table 3.

Standardized Z-Score method has been used to derive the composite index of development. In this method, diverse indicators comprising various issues are standardized and combined as composite index to see the position of each study unit not in sectoral but holistic manner.

The formula for the construction of composite index is:

$$\Sigma Z = X_1^s + X_2^s + X_3^s \dots\dots\dots + X_n^s$$

where, Composite Index -  $\Sigma Z$

X = Indicator

$$X^s = \frac{\bar{X} (X\mu)}{X\sigma}$$

Mu ( $\mu$ ) = Mean, Sigma ( $\Sigma$ )=Standard Deviation

Where,  $\Sigma Z$  is the row total of the standardized values of indicators and  $\Sigma_n$  is the total number of indicators.

The scores have been classified into three classes based on equal interval as High, Medium and Low categories.

Vulnerability index has been obtained through the following formula:

(Exposer Index + Sensitivity Index) – Adaptive Capacity Index

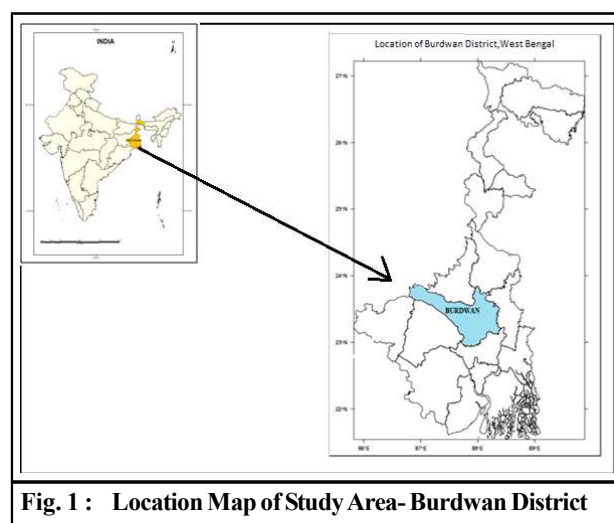
Where each index has been the row total of normalized values of all indicators falling under each component (Exposer Index, Sensitivity Index and Adaptive Capacity Index) following the same formula explained above for the construction of development index.

Cartographic techniques have also been used for the illustration of spatial patterns and relationships.

## Study Area:

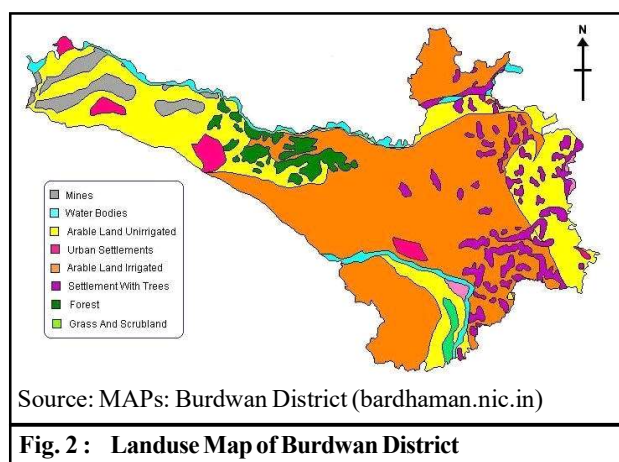
Burdwan is one of the most important districts of the State of West Bengal in terms of size and span. It is located between 23°53' N and 22°56' N latitude and between 88°25' and 86°48' E longitude. The district has a total area of 7024 sq. kms and is bordered by Birbhum in the north, Murshidabad in the north-east, Nadia in the east, Hooghly and Bankura in the south and Purulia district in the south-east. As per the Census of India, 2011, total population of the district was 7717563 with 39.9 per cent urban population. The sex ratio was 945 (rural-954) and literacy rate of 76.2 per cent (rural literacy (72.6%).

The district of Burdwan is in advantageous location in being girdled by three major rivers – the Hooghly on the east, the Ajay on the north and the Damodar on the south. The climate of this district is tropical. The weather is hot and humid. The average summer temperature is 35-40 degree Celsius and average winter temperature is 18-22 degree Celsius. The hottest month in Burdwan district is May and the coldest month is January.



**Fig. 1 : Location Map of Study Area- Burdwan District**

The district has 6 (six) Sub-divisions, viz. Asansol, Durgapur, Burdwan Sadar (North), Katwa, Kalna and Burdwan Sadar (South). There are 31 (Thirty-One) Community Development (C.D.) Blocks, 9 (Nine) Municipalities and 2 (Two) Municipal Corporations in the district. The remaining are classified as Census or Non-Municipal Towns numbering 85.



**Fig. 2 : Landuse Map of Burdwan District**

There is one fundamental difference in the eastern and western parts of Burdwan district, which leads to different kinds of development- agricultural and industrial in nature, which can be understood by the landuse map given in Fig. 2. The eastern part of the district is having of rich alluvial soil and is suitable for intensive cultivation of paddy, wheat, potatoes and other crops and vegetables. Most of the area is utilized as irrigated arable land. This part is also a constituent of rice bowl of eastern India and very developed as has been a part of Green Revolution initiative. On the other hand, the soil of the western part of the district is reddish and is not that fertile having unirrigated arable land. This region is a cradle of important coal mine like Raniganj Coalfield (constituted by more than 100 collieries) spreading in Andal, Asansol, Barabani, Durgapur, Jamuria, Kulti, Raniganj, Salanpur and Pandabeswar, and other industries like IISCo Kulti, Durgapur Plant, Alloy Industry at Durgapur, Durgapur Power Ltd, Burnpur Iron and Steel Plant, Chittaranjan Locomotive, Hindustan Cables, etc. with some large urban centres, like Durgapur, Asansol, Burdwan, Chittaranjan, Raniganj, Burnpur, Andal, etc.

### Literature Review:

Planning for regional development involves identifying the regionalism present, demarcating the region, determining the need of the region, formulating the plan, implementing the plan within the framework of government set up and reviewing the implementation of the plan (Mishra *et al.*, 1974). The general goal of regional development is to reduce regional disparities by supporting (employment and wealth-generating) economic activities in regions. The policies tend to try to achieve these

objectives by means of large-scale infrastructure development and by attracting inward investment. Though the region of Asia and Pacific has been dynamic but require new policies for the inclusiveness and well being and environmental and other development goals (OECD, 2020). Any kind of development related projects work differently in different regions (developing and developed). Even in developed regions there are much new concern (under mining projects) related benefits sharing that are coming together which needs consideration (Patrik and Nanna, 2015). In developing countries like India, past policies have failed to reduce regional disparities significantly and have not been able to help individual lagging regions to catch up, despite the allocation of significant public funding. Therefore, inequalities would be larger at the outset of the development process. But, the reason behind growing inequalities in a post-industrial phase needs to be addressed anew (Myrdal, 1957). Inequality in term of social and economic status is directly proportional to the rate of vulnerability of any disaster or negative impact of any project. In mining regions most affected groups are the indigenous people or the people who are living there.

Vulnerability can be defined as the conditions and circumstances of a region or community which make them susceptible to a particular physical, social, economic and/or environmental process. Some of the elements that can influence environmental vulnerability in mines are exposure to toxic and hazardous pollutants, reduced access to clean air, water, and sanitation, as well as inappropriate forms of waste management (ISDR, 2004: 16). Dwyer *et al.*, 2004) had developed a methodology to assess the vulnerability of individuals within households to risk from natural disasters. Their study was focused on measuring vulnerability; they have selected thirteen vulnerability indicators such as age, income, gender, employment, residence type, household type, tenure type, health insurance, house insurance, car ownership, disability, English language skills and debt/savings as well as two hazard indicators like residence damage and injuries, etc. Their study was expected to contribute to the ongoing development of vulnerability assessments that assist decision makers in safeguarding communities. With future refinements and developments this approach has the potential to contribute to policy development affecting natural hazard management at a government level.

Mining sectors strengthen the national economy one side and simultaneously may create new set of problems

at the local community. First of all, it brings about significant demographic change due to heavy influx of various levels of manpower from outside causing severe social disbalance, infection of new diseases from outside, price rise due to tremendous pressure on local resources, increased living cost, severe disruption in local livelihood and economy, anti-social activities, germination of social evils, unemployment among locals due to required special skill (Rawasdeha *et al.*, 2016, p. 499).

The District Human Development Report, Burdwan 2011 also finds that the human development in mining areas has absolutely not impressive despite housing modern industrial units leading to the establishments of schools and health care facilities and having poor alternatives to livelihood opportunities. Similarly, work participation rates are lower in these areas than the other areas with agricultural activities (DHDR, 2011, p. 300).

## RESULTS AND DISCUSSION

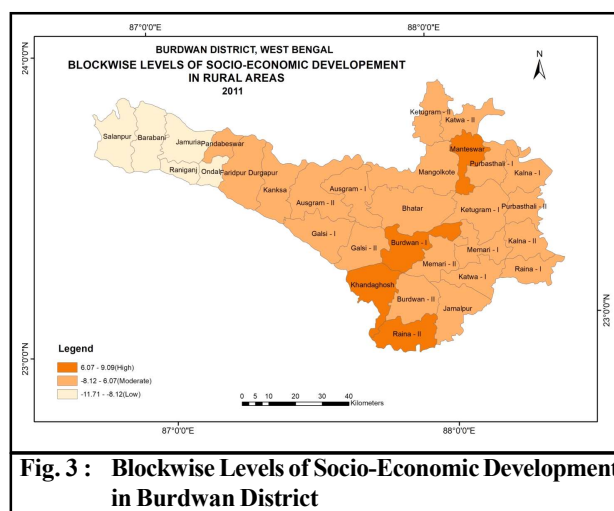
### Patterns of Levels of Development and Vulnerability in Burdwan District:

Bardhaman district is known as the rice bowl of South Bengal. It is one of those five districts where new technology in agriculture was adopted in the mid '60's leading to the so called the Green Revolution. The land is highly fertile especially in the eastern part of the district, and interestingly the all high developed blocks are found in this region. There are also some moderately developed blocks in this region, while the western part of the district is characterized by infertile agricultural land and seen with least developed blocks though this area is abundant with rich coal mines and hub of heavy industries around Durgapur - Asansol belt developed in the Second Plan period.

As discussed previously, there are 16 indicators taken to see the levels of development. The Fig. 2 shows the block wise levels of development in across the district into excluding Municipal Corporations and Municipality. The spatial pattern of development There is more number of blocks which are moderately developed and few are high and low developed. Development has very clear boundary and there is a recognizable micro region within the district. The southern part is seen to be developed in three blocks Burdwan-I, Khandaghosh, Raina-II and Mateswar at the north-eastern part. The western part of the district including the blocks Salanpur, Barabani, Jamuria, Raniganj and Ondal has low level of development. Rest entire part of the district shows the

moderate level of development. The spatial pattern of levels of development matches with the ground reality. The least developed blocks lie under western part of the Burdwan districts. As it is mentioned earlier that the area is abundant with mines and industries, it is evident that the region has not benefitted from these as the data reflects. Coal mines and industries of these regions have not brought about the desired expectations here. The so called 'Census Towns' are fully dependent on the main city even for their basic need such as education, health and other facilities. Generally, on the population of 5000 (one census town/colliery), there is only two government primary schools and one dispensary available. On 5 to 7 collieries there is only one hospital and the condition in terms of maintenance is poor. For serious health issues, people require to go to the main city for private health center.

As far as the developed areas are concerned, Khandgosh, Raina II and Burdwan I fall within it, where Raina II CD Block is part of the Khandaghosh Plain, which lies in the south-western part of the district. The river Damodar flows through these areas except Burdwan I. The region has alluvial soil of recent origin (Census of India, 2011). Unlike the rest of Burdwan district, which lies to the north of the Damodar River the Khandaghosh-Jamalpur-Raina area lies on the alluvial plains between the Damodar on its northern/ eastern side and the Dwarakeswar River. Therefore, the fertility of this area is high that has made this region prosperous since long period of time. The region has also good net irrigated area. Burdwan I has very good accessibility, where medical facilities are also good. The Municipality



**Fig. 3 : Blockwise Levels of Socio-Economic Development in Burdwan District**

of Burdwan was set up in 1865 as it had become a principal town and civil station in the region (Burdwan Municipality).

Development and Planning Department, 2011 says that Burdwan has been well known for prosperity gained

from a successful transformation into a local economy that has been thriving on a continuous interactive coexistence between agriculture and industry. It has also been the priority of the Central and State Governments since the advent of the planning era. As plan shifted from

**Table 1 : Indicators of Socio-Economic Development in Burdwan District, West Bengal, 2011**

Sr. No.	Name of CD Block	Sex Ratio (Rural)	Literacy Rate (Rural)	Females Literacy Rate (Rural)	% of Main Non-Primary Workers (Rural)	% of Main Workers (Rural)	Female Work Participation (Rural)	% of Villages Having Medical Facilities	% Of Villages Having Educational Facilities	% of Villages Having Drinking Water	% of Villages Having Post Office	% Villages Having Telephone	%Villages Having Transport Communications	%Villages Having Banks	%Villages Having Agricultural Credit Societies	%Villages Having Approach to Pucca Road	% of Cultivable Area To Total Area	% of Irrigated Area To Total Cultivable Area	Composite Index
1.	Salanpur	944	71.1	61.1	89.0	68.6	10.2	55.07	85.51	100	15.94	98.55	40.58	7.25	1.45	57.97	63.27	44.04	-8.900
2.	Barabani	931	68.0	56.7	67.3	61.7	12.5	52.17	97.83	100	17.39	91.3	41.3	2.17	0	78.26	72.52	36.58	-11.469
3.	Jamuraia	916	67.8	56.6	51.6	62.6	12.5	76.32	97.37	100	21.05	92.11	57.89	5.26	2.63	36.84	65.7	21.92	-11.720
4.	Raniganj	917	70.3	59.3	90.0	69.9	9.9	50	83.33	100	16.67	100	75	0	0	91.67	26.24	54.25	-9.949
5.	Ondal	879	76.9	66.8	90.7	73.8	9.8	66.67	91.67	91.67	41.67	91.67	66.67	8.33	0	83.33	29.72	30.29	-8.129
6.	Pandabeswar	935	71.9	62.7	78.3	72.2	10.1	85.71	100	100	0	92.86	71.43	0	0	78.57	55.04	38.31	-4.857
7.	Faridpur Durgapur	927	73.3	64.8	63.4	60.9	13.9	56.25	97.92	100	25	100	58.33	6.25	2.08	81.25	70.94	17.56	-3.136
8.	Kanksa	947	72.5	63.9	47.2	54.6	29.4	59.74	93.51	100	11.69	100	46.75	7.79	5.19	75.32	54.75	39.96	-5.123
9.	Ausgram -II	955	68.0	60.4	29.2	56.9	29.9	59.8	95.1	100	26.47	94.12	58.82	8.82	21.57	38.24	60.51	65.59	-4.992
10.	Ausgram -I	972	69.4	62.3	25.3	50.9	30.2	67.24	100	93.1	34.48	89.66	56.9	8.62	22.41	41.38	80.31	80.63	-4.259
11.	Mangolkote	954	68.0	62.0	23.1	74.0	13.4	53.08	95.38	100	40.77	100	58.46	20.77	29.23	50.77	80.27	81.1	3.499
12.	Ketugram -I	947	68.0	62.9	26.0	73.0	8.5	100	100	100	40.32	98.39	70.97	11.29	11.29	75.81	78.08	94.82	6.070
13.	Ketugram -II	931	66.0	59.8	27.6	79.7	10.7	67.27	100	100	32.73	89.09	61.82	10.91	10.91	65.45	85.3	92.03	-1.748
14.	Katwa -I	943	69.9	64.5	37.9	83.2	8.5	74.6	95.24	100	28.57	98.41	63.49	14.29	19.05	53.97	83.93	83.8	3.575
15.	Katwa -II	937	69.2	63.5	33.4	86.3	8.7	47.62	93.65	95.24	31.75	100	73.02	7.94	15.87	44.44	82.27	81.71	-2.669
16.	Purbasthali -I	934	77.3	71.5	49.6	81.7	16.5	46.15	96.7	100	9.89	100	50.55	9.89	26.37	59.34	85.39	72.68	3.416
17.	Purbasthali -II	940	70.3	64.7	36.1	78.0	19.3	57.95	100	98.86	25	95.45	30.68	15.91	23.86	48.86	77.41	96.26	0.452
18.	Manteswar	963	73.1	67.9	29.0	78.8	12.0	82.35	98.53	100	32.35	100	58.09	8.09	21.32	48.53	86.46	87.72	6.199
19.	Bhatar	962	71.5	65.1	25.3	75.6	22.6	74.04	100	100	37.5	94.23	80.77	3.85	19.23	56.73	80.25	88.69	5.534
20.	Galsi -I	937	71.3	63.5	33.9	56.9	24.3	57.65	92.94	100	22.35	95.29	62.35	5.88	11.76	32.94	78.38	92.39	-4.980
21.	Galsi -II	969	70.1	62.6	31.9	61.5	26.2	82.19	98.63	100	24.66	100	63.01	8.22	15.07	20.55	93.28	99.37	2.904
22.	Burdwan -I	965	74.8	68.2	45.5	70.8	20.4	82.67	93.33	98.67	24	97.33	80	10.67	40	61.33	82.14	92.69	9.095
23.	Burdwan -II	981	73.7	66.6	45.5	69.8	23.8	67.47	96.39	100	25.3	97.59	60.24	10.84	19.28	54.22	79.52	89.39	5.769
24.	Memari -I	973	73.9	67.0	40.1	74.6	29.2	71.17	93.69	100	15.32	100	57.66	9.01	17.12	39.64	82.08	94.35	4.479
25.	Memari -II	964	74.6	67.4	26.9	71.5	23.6	48.86	93.18	97.73	18.18	100	61.36	7.95	29.55	47.73	84.1	74.16	0.952
26.	Kalna -I	961	74.9	68.2	34.6	73.6	20.4	56.12	95.92	100	21.43	94.9	61.22	14.29	32.65	37.76	75.28	91.92	3.779
27.	Kalna -II	979	76.5	70.1	32.6	76.5	23.8	53.57	92.86	100	14.29	98.21	38.39	9.82	18.75	42.86	88.24	87.15	2.096
28.	Jamalpur	980	74.1	67.4	25.1	74.8	25.8	60.33	97.52	100	25.62	100	56.2	10.74	16.53	48.76	78.13	78.87	4.860
29.	Raina -I	958	80.2	74.4	30.6	70.3	16.0	62.73	95.45	100	23.64	100	64.55	5.45	24.55	46.36	81.34	92.69	5.706
30.	Khandaghosh	950	77.3	70.2	27.8	72.6	18.4	60.75	98.13	100	28.97	95.33	73.83	13.08	21.5	57.01	82.47	97.54	7.025
31.	Raina -II	953	81.5	75.0	29.8	73.7	16.1	50.57	95.4	100	24.14	91.95	75.86	10.34	28.74	56.32	82.55	99.58	6.519

Source: Census of India, 2011

**Table 2 : Block Level Socio-Economic Development in Burdwan District**

Levels of Development	No of Blocks	Name of the Blocks
High (6.07 – 9.09)	4	Burdwan -I, Khandaghosh, Raina -II, Manteswar
Moderate (-8.12 – 6.07)	21	Ketugram -I, Burdwan -II, Raina -I, Bhatar, Jamalpur, Memari -I, Kalna -I, Katwa -I, Mangolkote, Purbasthali -I, Galsi -II, Kalna -II, Memari -II, Purbasthali -II, Ketugram -II, Katwa -II, Faridpur Durgapur, Ausgram -I, Pandabeswar, Galsi -I, Ausgram -II, Kanksa
Low (-11.71-8.12)	5	Ondal, Salanpur, Raniganj, Barabani, Jamuria



agriculture to heavy industry and industrialization through simultaneous transformations in agriculture and industry, this district received a focal attention in the state because of rich resource and agricultural potential. This is one of the first fifteen CADP (Command Area Development Program) districts to experiment with HYVs and Green Revolution agriculture and one of the few districts in the country to established heavy industries in the public sector (Development and Planning Department, 2011).

The vast disparities among the block are in educational, infrastructural, agricultural, demographic and in term of other amenities. If we talk about the agriculture it is already mentioned that the soil of the eastern part of

the Burdwan are more fertile than the west. It is a big factor among other in regional disparity in the district. However, the Overall Livelihood Index of 2001 has had different picture unlike the Rural Development Index (DHDR, 2001). In that the low developed regions are among top 8 blocks in Livelihood Index (DHDR, 2001). But when educational, health and other indicators of rural regions are compared to it, it falls under low developed area (in rural context). Most of the blocks with high level of development have less number of census towns and *vice-versa*. There is relation between high Census Towns and low development of the region. CT towns are the mining collieries as mentioned earlier are restricted

Table 3 : Indicators of Vulnerability in Burdwan District, West Bengal, 2011

Sr. No.	Name of CD block	Exposure			Sensitivity										Adaptation								
		% Area to Total Area of Bur wan	% Area of inhabited Villages	% of CT town area to total area of Block	Population Density per sq km (Rural)	% of 0-6 year Population (Rural)	% of population of CT towns to the total block	% of SC Population (Rural)	% of ST Population (Rural)	% of Population to total district Population of Burdwan	Decadal Growth Rate of the Block	% of Cultivators to Total Main Workers (Rural)	% of Agricultural Labourer to Total Main Workers (Rural)	% of live stock density	female literacy (Rural)	% of literacy rate (Rural)	% of female participation	% of villages having health facilities	Approach by pucca road	% of villages having Commercial and cooperative banks	% of villages having Drinking water	% of villages having Post office <sup>#</sup>	Transport communications <sup>\$</sup>
1.	Salanpur	1.47	92	15.97	909	12.32	37.84	29.07	13.1	2.27	4.31	5.91	5.12	7.40	61.1	71.1	10.21	55.07	57.97	7.25	100	15.94	40.58
2.	Barabani	1.85	100	15.68	611	13.25	35.88	30.14	17.4	1.60	11.96	14.39	18.27	8.34	56.7	68.0	12.49	52.17	78.26	2.17	100	17.39	41.3
3.	Jamuria	1.75	88	21.59	584	12.59	67.72	30.93	8.6	1.64	9.11	21.46	26.93	3.31	56.6	67.8	12.51	76.32	36.84	5.26	100	21.05	57.89
4.	Raniganj	0.34	100	56.99	944	11.87	45.13	40.26	14.8	1.47	4.74	4.08	5.93	38.44	59.3	70.3	9.89	50	91.67	0	100	16.67	75
5.	Ondal	0.36	92.3	32.10	1362	11.03	12.37	30.25	4.7	2.52	10.70	5.62	3.67	125.90	66.8	76.9	9.82	66.67	83.33	8.33	91.67	41.67	66.67
6.	Pandabeswar	0.411	93.3	67.06	872	12.25	93.46	25.30	15.6	2.13	10.47	7.10	14.60	20.74	62.7	71.9	10.13	85.71	78.57	0	100	0	71.43
7.	Faridpur Durgapur	1.83	94.1	14.92	640	11.92	26.36	32.56	7.4	1.53	9.85	15.96	20.60	26.17	64.8	73.3	13.89	56.25	81.25	6.25	100	25	58.33
8.	Kanksa	3.27	93.3	21.81	439	11.77	23.82	41.37	13.1	2.19	17.75	19.54	33.30	2.47	63.9	72.5	29.38	59.74	75.32	7.79	100	11.69	46.75
9.	Ausgram - II	5.02	96.2	10.68	419	11.40	53.68	37.87	14.4	1.98	10.74	23.20	47.61	4.41	60.4	68.0	29.88	59.8	38.24	8.82	100	26.47	58.82
10.	Ausgram - I	3.13	95.1	9.91	537	11.38	33.60	35.74	13.1	1.55	11.71	25.03	49.72	16.94	62.3	69.4	30.24	67.24	41.38	8.62	93.1	34.48	56.9
11.	Mangolkote	5.18	98.2	0.77	720	11.83	2.41	31.13	2.8	3.39	12.52	27.90	49.00	5.49	62.0	68.0	13.42	53.08	50.77	20.77	100	40.77	58.46
12.	Ketugram - I	2.72	93.5	0.00	853	12.70	0.00	25.79	0.6	2.12	13.40	26.91	47.08	10.44	62.9	68.0	8.50	100	75.81	11.29	100	40.32	70.97
13.	Ketugram - II	2.27	98.2	0.00	741	11.34	0.00	36.64	0.6	1.55	10.75	31.17	41.26	36.00	59.8	66.0	10.73	67.27	65.45	10.91	100	32.73	61.82
14.	Katwa - I	2.33	95.5	0.00	992	11.62	0.00	31.93	1.5	2.21	13.80	23.30	38.81	33.29	64.5	69.9	8.52	74.6	53.97	14.29	100	28.57	63.49
15.	Katwa - II	2.24	92.5	0.00	838	11.11	0.00	29.48	1.4	1.47	13.62	25.74	40.84	15.88	63.5	69.2	8.68	47.62	44.44	7.94	95.24	31.75	73.02
16.	Purbasthali - I	1.89	95.9	1.36	1125	10.51	2.14	30.35	4.6	2.65	13.06	16.86	33.58	19.88	71.5	77.3	16.46	46.15	59.34	9.89	100	9.89	50.55
17.	Purbasthali - II	2.71	97	0.00	1103	10.87	0.00	26.11	3.7	2.73	12.92	20.06	43.87	10.36	64.7	70.3	19.31	57.95	48.86	15.91	98.86	25	30.68
18.	Manteswar	4.24	94.4	0.00	778	11.30	0.00	23.95	2.9	3.09	11.19	23.57	47.45	9.41	67.9	73.1	12.02	82.35	48.53	8.09	100	32.35	58.09
19.	Bhatar	5.48	97.2	2.19	634	10.92	2.99	32.44	9.7	3.43	11.24	22.30	52.36	5.01	65.1	71.5	22.59	74.04	56.73	3.85	100	37.5	80.77
20.	Galsi - I	3.49	100	0.00	671	10.54	0.00	37.55	4.5	2.52	7.73	24.98	41.11	12.59	63.5	71.3	24.31	57.65	32.94	5.88	100	22.35	62.35
21.	Galsi - II	3.11	100	0.00	672	10.60	0.00	39.64	6.8	1.94	9.85	21.44	46.69	16.53	62.6	70.1	26.20	82.19	20.55	8.22	100	24.66	63.01
22.	Burdwan - I	3.2	98.7	0.00	777	11.02	0.00	31.01	6.0	2.61	20.08	17.20	37.27	22.65	68.2	74.8	20.37	82.67	61.33	10.67	98.67	24	80
23.	Burdwan - II	2.6	94.3	0.00	785	10.24	0.00	39.17	12.2	2.01	10.11	14.44	40.06	9.08	66.6	73.7	23.83	67.47	54.22	10.84	100	25.3	60.24
24.	Memari - I	2.62	99.1	0.00	1156	10.23	0.00	36.93	15.9	2.88	10.16	13.66	46.22	8.84	67.0	73.9	29.18	71.17	39.64	9.01	100	15.32	57.66
25.	Memari - II	2.65	98.9	0.55	804	10.36	0.00	23.92	18.4	1.97	10.75	21.02	52.05	7.88	67.4	74.6	23.65	48.86	47.73	7.95	97.73	18.18	61.36
26.	Kalna - I	2.3	99	0.00	1147	10.22	0.00	28.85	11.0	2.77	8.50	20.39	44.99	8.08	68.2	74.9	20.40	56.12	37.76	14.29	100	21.43	61.22
27.	Kalna - II	2.41	100	6.49	926	9.86	31.84	34.16	18.4	2.23	8.89	22.25	45.18	10.50	70.1	76.5	23.77	53.57	42.86	9.82	100	14.29	38.39
28.	Jamalpur	3.72	98.4	0.00	1013	10.41	0.00	36.08	15.2	3.53	9.43	21.69	53.17	7.88	67.4	74.1	25.79	60.33	48.76	10.74	100	25.62	56.2
29.	Raina - I	3.68	98.2	2.54	665	10.39	11.50	33.95	5.9	2.36	11.07	23.09	46.33	11.19	74.4	80.2	16.05	62.73	46.36	5.45	100	23.64	64.55
30.	Khandaghosh	3.74	96.4	2.11	714	11.18	5.33	38.81	2.3	2.47	11.16	22.67	49.56	8.80	70.2	77.3	18.37	60.75	57.01	13.08	100	28.97	73.83
31.	Raina - II	3.16	92.6	0.00	666	10.13	0.00	40.73	4.0	1.99	10.24	25.62	44.60	16.03	75.0	81.5	16.07	50.57	56.32	10.34	100	24.14	75.86

Source: Census of India, 2011

for mining. These areas have their own type of structure of buildings built by the government. The basis for the setting up such towns was to build that area to provide facilities for their employees. But the areas are not only inhabited by the employees but there are many other people also including local inhabitants and also belonging to weaker sections living here from generations as it attract poor people from other areas for their livelihood.

A colliery, which spreads over acres of land having 5000 population, usually has only one or two primary government schools. Mostly, neither it has middle school nor has the high school. People have to depend upon the municipal towns for getting higher education. There are institutions in the Census Towns, but are set up for the mining purposes. Having the status of Census Town, the facilities are not like that of a town.

**Table 4 : Vulnerability Index in Burdwan District, 2011**

Sr. No.	Name of CD block	Exposure Index	Sensitivity Index	Adaptive Capacity Index	Vulnerability Index
1.	0115-Salanpur	-1.9586	-4.142	-5.35847	-0.742105
2.	0116-Barabani	0.92229	0.0378	-6.78669	7.746769
3.	0117-Jamuria	-2.6952	-0.343	-5.00678	1.9685761
4.	0118-Raniganj	2.23767	-1.78	-3.13282	3.5901062
5.	0119-Ondal	-1.7588	1.8476	0.864147	-0.775352
6.	0120-Pandabeswar	0.72927	0.8517	-2.01767	3.5986059
7.	0121-Faridpur Durgapur	-1.0559	-2.65	0.237088	-3.942561
8.	0122-Kanksa	0.24065	2.9083	-0.13331	3.282253
9.	0123-Ausgram - II	1.88952	2.1191	-1.43064	5.4392981
10.	0124-Ausgram - I	-0.008	1.7018	-2.54481	4.2385408
11.	0125-Mangolkote	2.06371	2.3585	1.091353	3.33089
12.	0126-Ketugram - I	-1.4535	0.5306	4.505773	-5.428634
13.	0127-Ketugram - II	-0.2826	0.0735	-1.16572	0.956587
14.	0128-Katwa - I	-1.1121	1.457	0.946829	-0.601901
15.	0129-Katwa - II	-2.1576	-1.934	-4.69702	0.6053665
16.	0130-Purbasthali - I	-1.2473	-0.329	-0.33399	-1.242093
17.	0131-Purbasthali - II	-0.3246	-0.226	-2.2366	1.6863997
18.	0132-Manteswar	0.03997	-0.997	1.826488	-2.783055
19.	0133-Bhatar	2.06223	1.4075	3.553371	-0.083623
20.	0134-Galsi - I	1.26607	-1.653	-1.92475	1.538197
21.	0135-Galsi - II	0.96578	-1.023	-0.22801	0.170887
22.	0136-Burdwan - I	0.61469	1.6396	5.173429	-2.919126
23.	0137-Burdwan - II	-1.2885	-1.708	2.615442	-5.611439
24.	0138-Memari - I	0.28627	1.9544	1.221024	1.019669
25.	0139-Memari - II	0.27842	-1.498	-1.23469	0.0148887
26.	0140-Kalna - I	0.00092	-0.369	1.42511	-1.793196
27.	0141-Kalna - II	0.80674	1.4414	-0.84981	3.0979055
28.	0142-Jamalpur	0.92817	3.7135	1.957731	2.6839367
29.	0143-Raina - I	0.98585	-0.986	3.081381	-3.081315
30.	0144-Khandaghosh	0.42255	0.4939	5.271515	-4.35511
31.	0145-Raina - II	-1.3981	-1.209	5.311073	-7.918492

**Table 5 : Distribution of Blocks by Levels of Vulnerability in Burdwan District**

Levels of Vulnerability	No of Blocks	Name of the Blocks
High	3	Barabani, Ausgram II, Ausgram I
Moderate	23	Pandabeswar, Raniganj, Mangolkote, Kanksa, Kalna II, Jamalpur, Jamuria, Purbasthali II, Galsi I, Memari I, Ketugram II, Katwa II, Galsi II, Memari II, Bhatar, Katwa I, Salanpur, Ondal, Purbasthali I, Kalna I, Manteswar, Burdwan I, Raina I
Low	5	Faridpur Durgapur, Khandaghosh, Ketugram I, Burdwan II, Raina II



Table 6 : Ranking of Block's on Development Index and Vulnerability Index					
Name of CD Block	Composite Index	Rank of Block	Name of CD block	Vulnerability Index	Rank of Block
Burdwan -I	9.10	1	Barabani	7.75	1
Khandaghosh	7.02	2	Ausgram II	5.44	2
Raina -II	6.52	3	Ausgram I	4.24	3
Manteswar	6.20	4	Pandabeswar	3.60	4
Ketugram -I	6.07	5	Raniganj	3.59	5
Burdwan -II	5.77	6	Mangolkote	3.33	6
Raina -I	5.71	7	Kanksa	3.28	7
Bhatar	5.53	8	Kalna II	3.10	8
Jamalpur	4.86	9	Jamalpur	2.68	9
Memari -I	4.48	10	Jamuria	1.97	10
Kalna -I	3.78	11	Purbasthali II	1.69	11
Katwa -I	3.57	12	Galsi I	1.54	12
Mangolkote	3.50	13	Memari I	1.02	13
Purbasthali -I	3.42	14	Ketugram II	0.96	14
Galsi -II	2.90	15	Katwa II	0.61	15
Kalna -II	2.10	16	Galsi II	0.17	16
Memari -II	0.95	17	Memari II	0.01	17
Purbasthali -II	0.45	18	Bhatar	-0.08	18
Ketugram -II	-1.75	19	Katwa I	-0.60	19
Katwa -II	-2.67	20	Salanpur	-0.74	20
Faridpur Durgapur	-3.14	21	Ondal	-0.78	21
Ausgram -I	-4.26	22	Purbasthali I	-1.24	22
Pandabeswar	-4.86	23	Kalna I	-1.79	23
Galsi -I	-4.98	24	Manteswar	-2.78	24
Ausgram -II	-4.99	25	Burdwan I	-2.92	25
Kanksa	-5.12	26	Raina I	-3.08	26
Ondal	-8.13	27	Faridpur Durgapur	-3.94	27
Salanpur	-8.90	28	Khandaghosh	-4.36	28
Raniganj	-9.95	29	Ketugram I	-5.43	29
Barabani	-11.47	30	Burdwan II	-5.61	30
Jamuria	-11.72	31	Raina II	-7.92	31

Source: Calculated from Census of India, 2011

#### Pattern of Vulnerability in Burdwan District:

Vulnerability of things at risk is not always easily measurable or quantifiable especially for those of socioeconomic origins (Smith and Ward, 1998). The Vulnerability Index (VI) is the aggregate of selected indicators using the formula discussed in the methodology section. For obtaining vulnerability index, two kinds of data- negative (Exposure and Sensitivity) and positive indicators (Adaptive Capacity) – are taken.

For obtaining vulnerability index, the following indicators have been used:

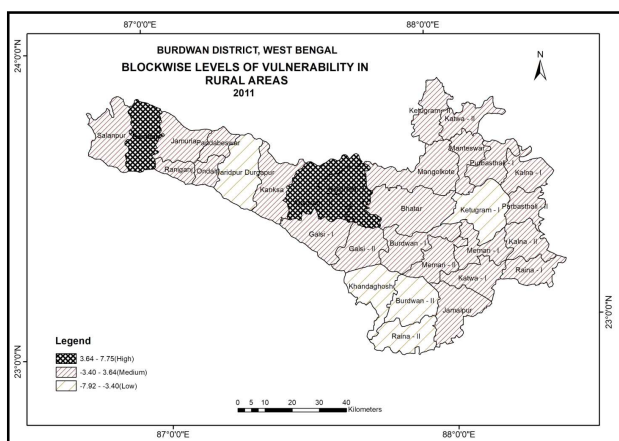
The spatial pattern of vulnerability in the district indicates that the western part of the district is more affected than the eastern part (Fig. 4). The big factor is that the western part of the area is dominated by mining and industries, while the eastern part is predominantly agriculture except Kalna-I. It indicates that people suffer from more vulnerability in the mining and industrial

regions. Basically the Asansol sub-division is in precarious situation. Only 5 blocks are under low level of vulnerability - Raina II, Burdwan II, Ketugram I, Khandaghosh and Faridpur Durgapur and the three blocks are contiguous at the south-western end of the district. This pattern reflects that the development has been transmitted to rural areas in Durgapur Faridpur, which is a major industrial hub. There are 23 blocks falling under moderate level of vulnerability.

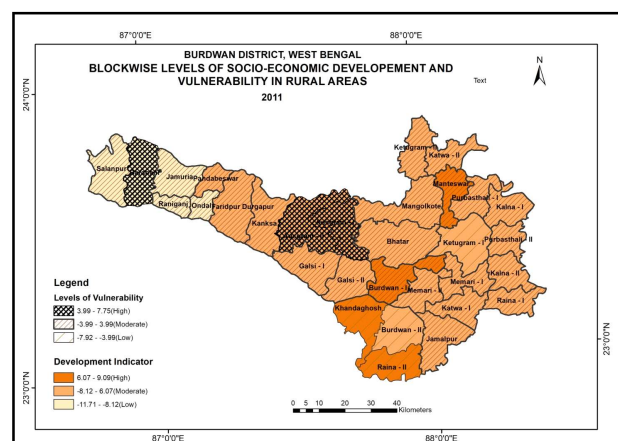
**Association of Mining as Development and Vulnerability:**

The association between mining as regional

development and vulnerability in terms of the levels of socio-economic development and the levels of vulnerability derived from selected indicators suggests to be inverse. The rank correlation reflects that there is a negative correlation between the levels of development and vulnerability with the correlation coefficient of -0.669 with a 2 tailed significance level of 0.01 (Table 7). It is graphically illustrated in Fig. 5, where associations of the levels of development and vulnerability across various blocks are lucidly expressed in spatial term. Here one may also understand the spatial relationships between these two. One important aspect to be noted here is that the agriculture led development has negative relationship



**Fig. 4 : Block wise Levels of Vulnerability in Burdwan District**



**Fig. 5 : Levels of Socio-Economic Development and Vulnerability in Burdwan District**

	Rank of Block on Development Index	Correlation Coefficient	Rank of Block on Vulnerability Index
Spearman's Rank Correlation			
		1.000	-0.669**
		Sig. (2-tailed)	.000
		N	31
	Rank of Block on Vulnerability Index	-0.669**	1.000
		Sig. (2-tailed)	.000
		N	31

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Levels of Socio-Economic Development	Levels of Vulnerability		
	High	Moderate	Low
High	-	Burdwan-I, Mateshwar	Khandgosh, Raina-II
Moderate	Ausagram-II, Ausagram-I	Bhatar, Faridpur Durgapur, Galsi -I, Galsi -II, , Jamalpur, Kalna - I, Kalna -II, Kanksa, Katwa -I, Katwa -II, Ketugram -II, Mangolkote, Memari -I, Memari -II, Pandabeswar, Purbasthali -I, Purbasthali -II, Raina -I	Burdwan- II, Ketugram-I
Low	Barabani	Salanpur, Jamuria, Raniganj, Ondal	-

clearly visible in the given table and map, which goes in positive direction with mining and related development. The crux is that mining as development has led to vulnerability in Burdwan district.

Mining areas have always been a vulnerable place for their natives including rural counterparts. Table 8 suggests that there more than half of the blocks are lying under moderate developed with moderate vulnerability. There is no block, which falls under high developed and high vulnerability though the combination of high developed with moderate and low vulnerability is there with less number of blocks. Similarly, there is no block falling in the category of low levels of development and low levels of vulnerability. The vulnerability is not only in term of economic but social, cultural and environmental also. Though the mining has a great contribution in economic sector of India, but in actual sense it is not there and found inverse relationship in terms of development for local inhabitants and rural areas. The most resourceful states are the most deprived states like Jharkhand and Chhattisgarh, and other south eastern part of India.

### Conclusion:

The above analysis indicates that the rural areas are socio-economically more developed in the fertile agricultural areas and the rural areas with mining and related industries are generally observed to have lower levels of development. Also, the rural areas including the local inhabitants are more deprived and vulnerable in and around the areas of mining and related industries than the agriculturally developed areas. It is to be noted that it is just in contrast to the overall scenario of the region in terms of development and vulnerability of aggregate area including urban areas. The District Human Development Report, 2011 suggest that the areas of mining and related industries are better off in terms of development and vulnerability. However, the data on rural area has different reality as has been discussed in this analysis and need attention for balanced regional and social development deviating from the general perception of development in the areas of mining and related industries.

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