Analysis of urban informality and economic vulnerability among informal vendors in Jaleswar town

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***Abstract*— This research work represents an analysis of the informal economy in Jaleswar Town of Balasore district of Odisha. This research work examines the economic vulnerability and sustainability of informal street vendors by using the concept of umbra and penumbra. This research work is based upon the surveyed data collected from different categories of street vendors in Jaleswar Town and analyses operational cost, profit structure and a stress-strain based economic vulnerability to evaluate the livelihood stability. Here, the umbra represents the dark area of informal economy where vendors are highly vulnerable. These vendors are characterized by low economic adaptive capacity, and unstable income conditions, while the penumbra represents semi stable zone, where low vulnerable vendor groups exist. These vendors have higher economic adaptive capacity and greater economic flexibility.**

The analysis of this research work reveals significant differences in the profitability and economic sustainability across different types of vendor groups. This indicates informal economy in Jaleswar Town is showing heterogeneous pattern rather than uniform pattern. This paper provides a quantitative analysis of the dual nature of the informal economy and offers policy-relevant insights for sustainable urban development in small Indian towns like Jaleswar.

***Index Terms*— Informal economy, Steet vendors, Umbra, Penumbra, economic vulnerability, sustainable urban development, Jaleswar.**

I. INTRODUCTION

The informal economy is also called as grey economy or shadow economy. it comprises those economic activities which occur outside the purview of formal economic framework but plays a significant role in the development of livelihoods of many, especially those regions which are climbing the steps towards development. This informal economy emerges as a clandestine yet formidable force in the intricate tapestry of global economy. These economic activities are defined by its unofficial nature as they occur outside the formal framework, but it helps to develop many livelihoods [12].

Jaleswar is a semi urban area, which is geographically located in the northern part of Balasore district. This town represents a perfect example of an economy which is mainly driven by informal economic activities. There are no major industries, factories or large-scale companies in and around Jaleswar, which will give permanent formal jobs for the people [10]. The formal sectors and opportunities for regular salaried work are also limited. Because of this gap, a large section of the population relies on informal activities to earn a living [10].

For understanding the informal vendor's economic variability in a scientific way, this study applies umbra and penumbra concept. The conceptual foundation of this approach has been derived from the concept of solar eclipse. Here, the sun denotes the formal economy, the moon denotes the representatives of informal economic activities and the earth represents the socio-economic system affected by their interaction. When the moon is partially or fully obstructed by the sun's light, then it forms different zones of shadow. These shadows represent varying degrees of livelihood stability within the informal sector [2].

The umbra represents a dark area zone which is highly characterized by high operational costs, regular economic shocks and high degree exposure to market uncertainty. Informal street vendors who fall in this zone are highly vulnerable. These vendors operate under intense economic stress and face persistent risks to income continuity and business survival [3], [12]. On the other hand, penumbra represents a semi-stable zone between informality and economic stability. Vendors who fall in this zone are low vulnerable vendor. These vendors are quite resilient to strong economic strategies, stable profit structures and they have diversified economic strategies [2], [4]. These vendors exhibit greater economic flexibility and are better able to absorb external shocks.

In the context of Jaleswar town, the informal economy possesses a heterogeneous internal structure where a segment of vendors remains trapped within the umbra zone of high economic instability and another segment operates within the penumbra zone, representing livelihood resilience and functional sustainability [11], [12].

A. LITERATURE REVIEW

The definition of informal economy is quiet flexible and it can vary. It refers to activities which generate income but occurs outside the purview of government regulatory frame works. This can be simply understood as earning money that is not reported for tax, social security, or labor law purposes, excluding illegal or criminal activities [7], [9].

Globally research works estimates that 2 out of 3 billion workers i.e. around 61% are part of the informal sector. These works also reveal that around 92% of workers are in informal jobs, earning low wages with little to no social protection [6]. The studies also found that despite economic growth the workers faced poor safety, medical and social security condition [6], [9].

The informal economy plays significant role in India due to its widespread presence and impact on various aspects of the Indian market. With its vast population, India's informal economy sector absorbs a large share of the workforce and offers lower-income groups and in rural areas where formal employment is limited [1], [5]. This reliance on the informal economy highlights the

structural challenges in India's labor market i.e. underemployment, informalization, and a lack of job creation in the formal sector [5]. Rather than precarious, the internal structure of informal economy is quite heterogeneous in nature. Here some participants enjoy economic sustainability by using livelihood opportunities provided by informal economic framework while some participants even struggle to gain economic stability staying within the same economic frame work.[7], [9] Such vulnerability varies according to location, skill level and access to market networks.

Building on this perspective, the research work uses the conceptual framework of umbra and penumbra to analyses the variation of vulnerability within the informal economy. During a solar eclipse, the umbra represents darkest shadow zone which is formed by the convergent rays of the sun and penumbra represents the lighter shadow formed by the divergent light rays from the sun. in this context, umbra is a dark zone where informal vendors face unstable earnings, low stress absorbing capacity and high exposure to market shocks. Eventually these vendors become highly vulnerable in informal economy. At the same time penumbra represents a semi stable zone between economic stability and functional sustainability. Here the informal vendors exhibit stronger economic sustainability and flexibility. Thus, they exhibit low vulnerability in informal economy [8]. Therefore, applying the umbra–penumbra framework to Jaleswar provides a spatially grounded understanding of how economic stress and resilience are distributed among informal vendors.

B. OBJECTIVES

- To analyse the degree of vulnerability among the informal street vendors of Jaleswar Town.
- To analyse the heterogeneous internal structure of informal economy of Jaleswar town by using umbra and penumbra concept

C. STUDY AREA Jaleswar block is one of the 12 blocks of Balasore district. It is located at the northern most part of the district i.e. 21.8284°N and 87.2177°E. The block is characterized by its flat terrain with an average elevation of 12.9 meters above sea level. It is located approximately 50-60 km away from the Bay of Bengal and the placer gold river of India i.e. Subarnarekha River which originates from Chot Nagpur plateau in the Ranchi district of Jharkhand flows through the block. Thus, the block is a part of fertile coastal plain. The total area of the block is approximately 246.03 square km. it has 35 Gram Panchayats and one municipality area i.e. notified area council. The Jaleswar town falls within the administrative boundaries of Jaleswar Municipality.

As per the 2011 Census, the block has a population of 177,743 (90,917 males and 86,826 females), with a sex ratio of 955 females per 1,000 males and a child sex ratio of 960. SCs constitute 19.7%, and STs 9.7% of the total population. The literacy rate stands at 75.1% (male: 82.85%, female: 67.4%), and the population is predominantly Hindu (93.38%), followed by Muslims (4.6%) and Christians (0.21%). Jaleswar Municipality covers 12.14 sq. km and includes 17 wards and 144 villages. Its population is 25,747 (13,095 males and 12,652 females), with a sex ratio of 966 and a child sex ratio of 963. The literacy rate is higher at 81.46% (male: 87.65%, female: 75.05%). Hindus comprise 80.22% of the municipal population, Muslims 17.48%, while SC and ST populations account for 7.48% and 9.56%, respectively. Figure 1 shows the location of the study area.

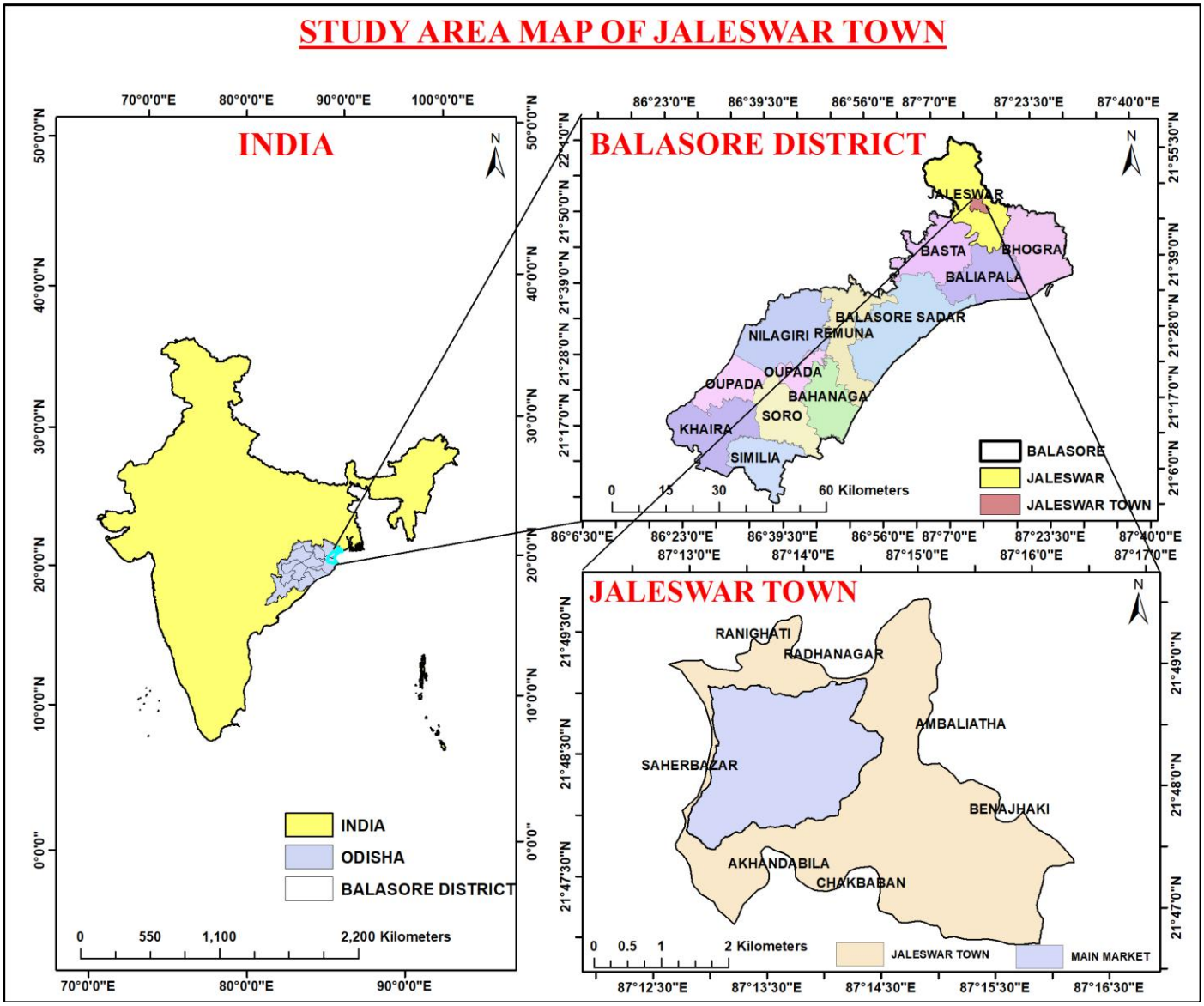

Figure 1. Location map of the Jaleswar town
(Source: Generated by the author based on the Census of India, 2011)

II. RESEARCH METHODOLOGY

This research work is based upon a field survey of 90 vendors from Jaleswar Area. The determination of sample size was based on the diversity of economic activities in the region and the feasibility of conducting detailed survey. This survey is based on qualitative research method where a purposive sampling technique was used. This is a type of non-probability sampling method.

A. DATA COLLECTION

The data was collected through field surveys. All the respondents were above the age of 18 years. Data were collected by using a structured questionnaire, observations and semi structured interviews. The questions were designed to collect information on: (1). Vendor's operational costs (stress) of two months, (2). Vendor's profits (strain) of two months, (3). Quantitative data such as Rent, Electricity, Raw materials costs and Remuneration and (4). Qualitative data such as challenges faced by vendors.

B. DATA ANALYSIS

The operational cost (*stress%*) and profit (*strain%*) and *Economic vulnerability ratio* were calculated for each vendor by using survey data. To calculate the "change in percentage%" of operational cost and profit of two months data and economic vulnerability ratio following mathematical formulas were used.

Change in operational cost (*Stress%*) was calculated by using Eq. (1) =

$$\frac{(Operational\ Cost_{September} - Operational\ Cost_{August})}{Operational\ Cost_{August}} \times 100 \qquad (1)$$

Change in profit *(Strain%)* was calculated by using Eq. (2) =

$$\frac{(Profit_{September} - Profit_{August})}{Profit_{August}} \times 100 \qquad (2)$$

Calculation of Economic Vulnerability: The Vulnerability ratio of each vendor was calculated by taking the ratio of *stress%* and *strain%* of each vendor. The formula was:

Economic Vulnerability Ratio **was calculated by using Eq. (3) =**

$$\frac{Stress\%}{Strain\%} \qquad (3)$$

By using the above formula, the Economic vulnerability ratio values of 90 vendors were calculated and the observed values ranged from -0.12865 to 2.727273. To divide these 90 informal vendors into two categories, we have calculated theoretical equilibrium threshold i.e. 1. It stands for a constant ratio when stress% and strain% are equal. By using this, 90 vendors were classified into two categories:

- **Highly Vulnerable Vendors:** Out of 90 vendors, there are 33 vendors are falling in this category. Their Vulnerability ratio values are ≤ 1 and range of vulnerability ratio is -0.12865 to 1. This indicates that they are highly exposed to economic stress and they are in umbra zone.
- **Low Vulnerable Vendors:** Out of 90 vendors, there are 57 vendors are falling in this category. Their Vulnerability ratio values are > 1 and range of vulnerability ratio is 1 to 2.727273. This indicates that they have relatively stronger resilience against economic stress and falling in penumbra zone.

Then average monthly operational cost, profit, stress%, strain% and economic vulnerability ratio for both low and highly vulnerable vendors have been calculated. Based upon all the calculations, the below Table-1 and Table-2 have been created for low and highly vulnerable vendors by using MS-Excel. These tables have been used for further analysis

Table 1. Operational characteristics and economic vulnerability of low vulnerable vendors

NUMBER OF VENDORS	OPERATIONAL COST		STRESS %	PROFIT BY VENDOR		STRAIN %	ECONOMIC VULNERABILITY RATIO	VULNERABILITY
	AUGUST	SEPTEMBER		AUGUST	SEPTEMBER			
1	57700	72800	26.16984	37000	42000	13.51351	1.936568458	Low Vulnerable
2	154000	203200	31.94805	95000	120000	26.31579	1.214025974	Low Vulnerable
3	73700	75750	2.781547	59000	60000	1.694915	1.641112619	Low Vulnerable
4	26500	36000	35.84906	7000	8500	21.42857	1.672955975	Low Vulnerable
5	48500	51500	6.185567	35000	37000	5.714286	1.082474227	Low Vulnerable
6	26200	28100	7.251908	9500	10000	5.263158	1.377862595	Low Vulnerable
7	81700	94800	16.03427	59000	68000	15.25424	1.051135591	Low Vulnerable
8	90000	112800	25.33333	70000	85000	21.42857	1.182222222	Low Vulnerable
9	26400	21100	-20.0758	12000	10000	-16.6667	1.204545455	Low Vulnerable
10	266500	316200	18.64916	190000	220000	15.78947	1.181113196	Low Vulnerable
11	41300	43200	4.600484	28000	29000	3.571429	1.288135593	Low Vulnerable
12	188100	194200	3.242956	120000	123600	3	1.080985292	Low Vulnerable
13	77500	85000	9.677419	57000	62000	8.77193	1.103225806	Low Vulnerable
14	30000	35000	16.66667	15000	16500	10	1.666666667	Low Vulnerable
15	135000	200000	48.14815	72000	100000	38.88889	1.238095238	Low Vulnerable
16	96000	85500	-10.9375	70000	65000	-7.14286	1.53125	Low Vulnerable
17	95000	105200	10.73684	35000	37500	7.142857	1.503157895	Low Vulnerable
18	613000	663200	8.189233	150000	155000	3.333333	2.456769984	Low Vulnerable
19	53000	55000	3.773585	15000	15500	3.333333	1.132075472	Low Vulnerable
20	32000	30000	-6.25	15000	14500	-3.33333	1.875	Low Vulnerable
21	163300	143200	-12.3086	28000	25000	-10.7143	1.148805879	Low Vulnerable
22	12400	14500	16.93548	6500	7000	7.692308	2.201612903	Low Vulnerable
23	22500	32700	45.33333	18000	22000	22.22222	2.04	Low Vulnerable
24	34500	37700	9.275362	17500	19000	8.571429	1.082125604	Low Vulnerable
25	15200	16300	7.236842	7500	8000	6.666667	1.085526316	Low Vulnerable
26	32200	34300	6.521739	28000	29500	5.357143	1.217391304	Low Vulnerable
27	47000	52300	11.2766	24000	25500	6.25	1.804255319	Low Vulnerable
28	12400	13600	9.677419	5500	6000	9.090909	1.064516129	Low Vulnerable
29	33000	38000	15.15152	9000	9500	5.555556	2.727272727	Low Vulnerable
30	27700	30100	8.66426	9500	10000	5.263158	1.646209386	Low Vulnerable
31	164500	214600	30.45593	55000	65000	18.18182	1.675075988	Low Vulnerable
32	83300	88700	6.482593	42000	44000	4.761905	1.361344538	Low Vulnerable
33	54000	44000	-18.5185	18000	15000	-16.6667	1.111111111	Low Vulnerable
34	60700	65800	8.401977	35000	37000	5.714286	1.470345964	Low Vulnerable
35	154300	204500	32.53402	82000	95000	15.85366	2.052146169	Low Vulnerable
36	126800	158000	24.60568	50000	55000	10	2.460567823	Low Vulnerable
37	81400	91600	12.53071	35000	37000	5.714286	2.192874693	Low Vulnerable
38	81100	86200	6.288533	40000	42000	5	1.257706535	Low Vulnerable
39	153800	163900	6.56697	50000	53000	6	1.094495015	Low Vulnerable
40	60000	70000	16.66667	15000	17000	13.33333	1.25	Low Vulnerable
41	50800	55900	10.03937	25000	27000	8	1.25492126	Low Vulnerable
42	136200	116300	-14.6109	70000	66000	-5.71429	2.556901615	Low Vulnerable

43	155700	135700	-12.8452	38000	35000	-7.89474	1.627060587	Low Vulnerable
44	72500	75600	4.275862	24000	25000	4.166667	1.026206897	Low Vulnerable
45	25600	26800	4.6875	7000	7200	2.857143	1.640625	Low Vulnerable
46	45000	52000	15.55556	18000	20000	11.11111	1.4	Low Vulnerable
47	461500	511600	10.8559	37000	40000	8.108108	1.338894908	Low Vulnerable
48	814800	865000	6.161021	85000	90000	5.882353	1.047373589	Low Vulnerable
49	515000	585200	13.63107	38000	43000	13.15789	1.035961165	Low Vulnerable
50	158500	208700	31.67192	65000	80000	23.07692	1.372450053	Low Vulnerable
51	30700	35800	16.61238	12000	13000	8.333333	1.993485342	Low Vulnerable
52	41800	46900	12.20096	22000	24000	9.090909	1.342105263	Low Vulnerable
53	21500	26500	23.25581	7000	8500	21.42857	1.085271318	Low Vulnerable
54	16500	19500	18.18182	7000	8000	14.28571	1.272727273	Low Vulnerable
55	150000	186000	24	44000	52000	18.18182	1.32	Low Vulnerable
56	246000	306000	24.39024	60000	70000	16.66667	1.463414634	Low Vulnerable
57	105000	125000	19.04762	35000	40000	14.28571	1.333333333	Low Vulnerable

(Source: prepared by the author using primary survey responses from Jaleswar's vendors and MS Excel)

Table 2. Operational characteristics and economic vulnerability of highly vulnerable vendors

NUMBER OF VENDORS	OPERATIONAL COST		STRESS %	PROFIT BY VENDOR		STRAIN %	ECONOMIC VULNERABILITY RATIO	VULNERABILITY
	AUGUST	SEPTEMBER		AUGUST	SEPTEMBER			
1	63200	65300	3.322785	24000	26000	8.333333	0.398734177	Highly vulnerable
2	71300	81200	13.88499	55000	70000	27.27273	0.50911641	Highly vulnerable
3	15000	17000	13.33333	7500	9000	20	0.666666667	Highly vulnerable
4	31000	31200	0.645161	12000	15000	25	0.025806452	Highly vulnerable
5	52000	50000	-3.84615	28000	25000	-10.7143	0.358974359	Highly vulnerable
6	105200	108100	2.756654	64000	67000	4.6875	0.588086185	Highly vulnerable
7	40000	42000	5	12400	14000	12.90323	0.3875	Highly vulnerable
8	49200	54300	10.36585	13000	15000	15.38462	0.673780488	Highly vulnerable
9	24500	26000	6.122449	9500	12000	26.31579	0.232653061	Highly vulnerable
10	15000	16000	6.666667	7000	8500	21.42857	0.311111111	Highly vulnerable
11	28500	31700	11.22807	7000	8500	21.42857	0.523976608	Highly vulnerable
12	10300	12400	20.38835	4000	5000	25	0.815533981	Highly vulnerable
13	12400	13000	4.83871	6500	7000	7.692308	0.629032258	Highly vulnerable
14	31800	34000	6.918239	15000	17000	13.33333	0.518867925	Highly vulnerable
15	21600	23700	9.722222	9500	11000	15.78947	0.615740741	Highly vulnerable
16	26000	21900	-15.7692	14000	10500	-25	0.630769231	Highly vulnerable
17	38000	41000	7.894737	18000	20000	11.11111	0.710526316	Highly vulnerable
18	36900	34000	-7.85908	15000	13000	-13.3333	0.589430894	Highly vulnerable
19	95300	97400	2.203568	30000	32000	6.666667	0.330535152	Highly vulnerable
20	66500	71600	7.669173	25000	28000	12	0.639097744	Highly vulnerable
21	42700	45800	7.259953	20000	22000	10	0.725995316	Highly vulnerable
22	80600	82700	2.605459	18000	20500	13.88889	0.187593052	Highly vulnerable

23	87500	90700	3.657143	27000	28000	3.703704	0.987428571	Highly vulnerable
24	54500	56700	4.036697	29000	38000	31.03448	0.130071356	Highly vulnerable
25	90400	91500	1.216814	30000	31000	3.333333	0.365044248	Highly vulnerable
26	85500	86500	1.169591	22000	20000	-9.09091	-0.128654971	Highly vulnerable
27	65600	66700	1.676829	15000	16000	6.666667	0.25152439	Highly vulnerable
28	80000	77200	-3.5	28000	25000	-10.7143	0.326666667	Highly vulnerable
29	56000	71200	27.14286	23000	30000	30.43478	0.891836735	Highly vulnerable
30	613000	633300	3.311582	40000	45000	12.5	0.264926591	Highly vulnerable
31	61200	66500	8.660131	20000	25000	25	0.346405229	Highly vulnerable
32	20400	25700	25.98039	9000	12000	33.33333	0.779411765	Highly vulnerable
33	31500	33500	6.349206	9000	12000	33.33333	0.19047619	Highly vulnerable

(Source: prepared by the author using primary survey responses from Jaleswar's vendors and MS Excel)

III. DISCUSSION

A. Spatial Distribution of Informal vendors

Figure 2 displays the distribution and location of 90 vendors in the Jaleswar town area with relation to the main market area. All the vendors are indicated as point features. The yellow color region represents the Jaleswar town area and the light blue color region represents the Main market area of Jaleswar town. From the Fig.2 we can clearly see a noticeable concentration of vendors in and around the main market area.

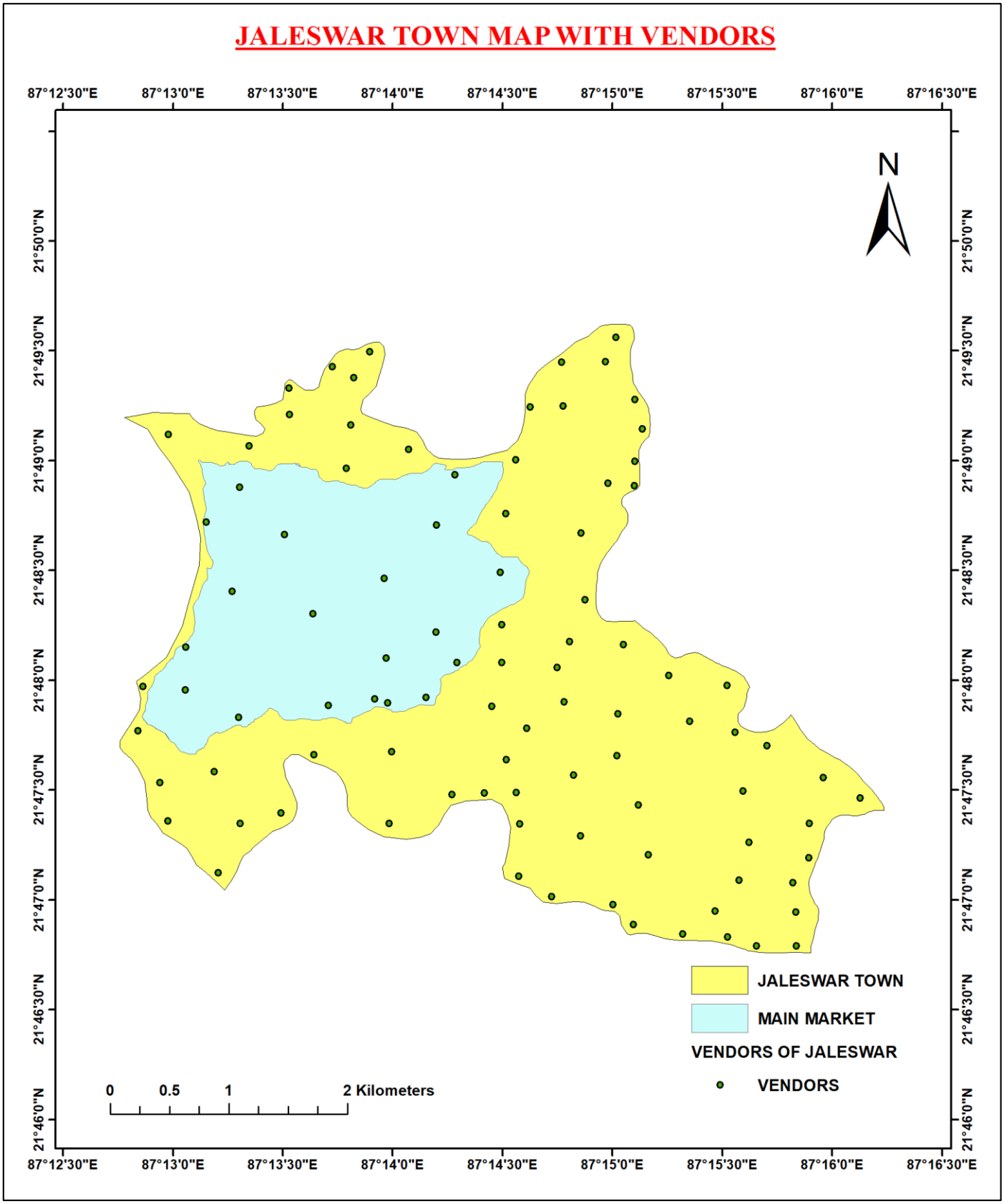

Figure 2. Spatial distribution of 90 vendors across the Jaleswar town
(Source: Generated by the author based on the conducted primary survey)

B. Spatial Pattern of Informal Vendor within The Jaleswar Town

Figure 3 represents spatial distribution pattern of informal vendors of Jaleswar town based upon their economic vulnerability with the help of Global Moran's I statistics. The calculated Moran's I value of 0.088, z-score of 3.744 and p-value of 0.000181, emphasize that the probability of having a random spatial arrangement of informal vendors within the Jaleswar town is less than 1%.

Here the Moran's I value is 0.088. It represents spatial autocorrelation of informal vendors' locations. The value is a positive number and the magnitude is moderate. Thus, it conforms that the distribution pattern is showing clustering pattern not random.

The z-score value is 3.744. In general, if the z-score value is greater than ±1.96, then the confidence level of statistical significance is 95%. The calculated z-score value of this research work is significantly higher than ±1.96. thus, it also conforms the existence of culturing pattern within the informal economy of Jaleswar town.

The p-value is 0.000181. It signifies that such a clustering pattern could arise due to many socio-economic factors such as operational cost variation, profit margin, stress-strain ratio differences, proximity to transportation network and daily customer foot fall. As the calculated value is below the conventional threshold value of 0.01, thus the very chance of the random spatial distribution of informal vendors is decisively rejected.

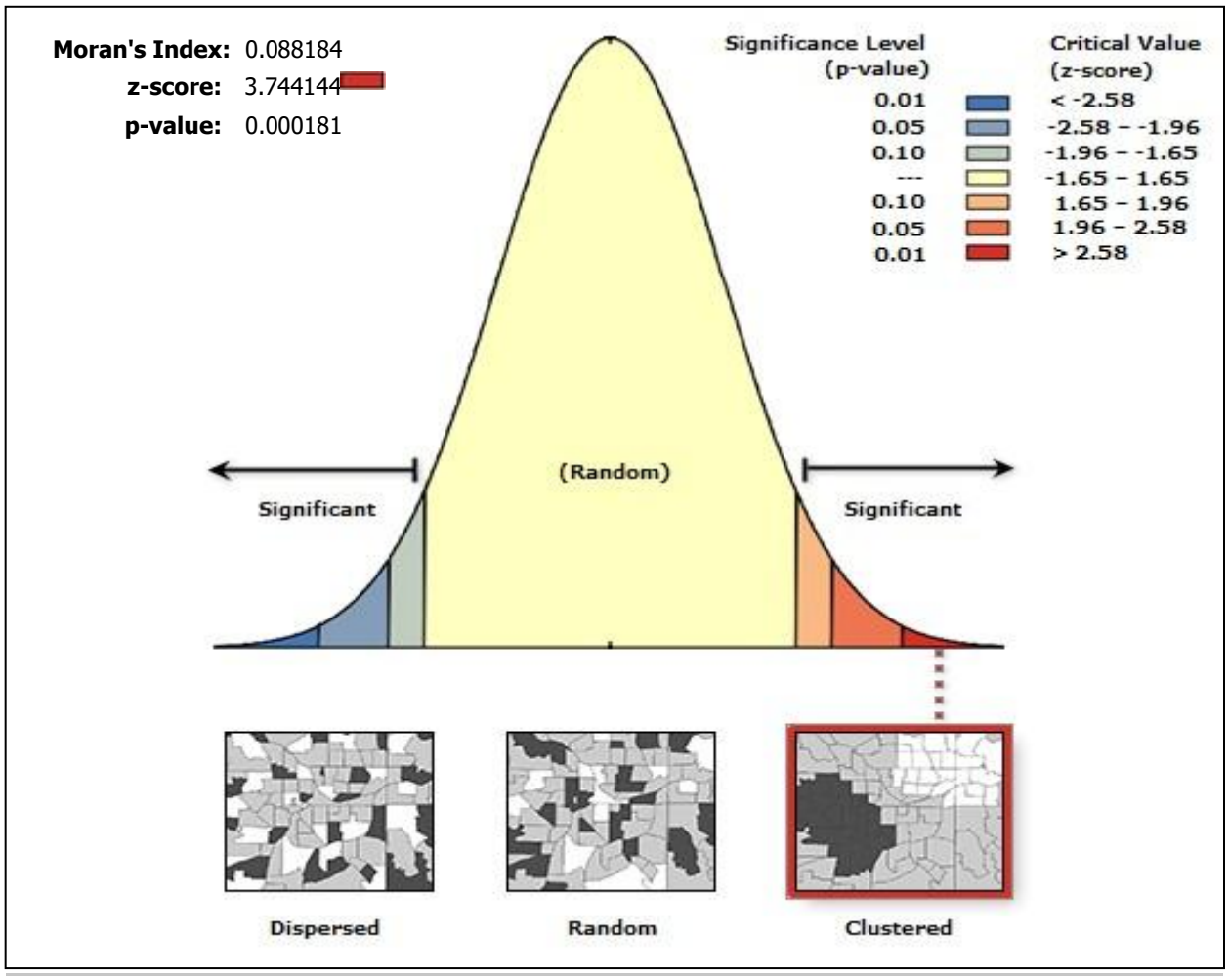

Figure 3. Spatial Distribution pattern of Informal vendors in Jaleswar town
(Source: Calculated and generated by the author by using application of ArcGIS)

C. Role of Transportation Network in the Informal Economy of Jaleswar Town

The Figure 4 displays the transportation spine of Jaleswar town area. Mainly NH-16 and the railway line which connects Jaleswar town with capital of Odisha i.e. Bhubaneswar and with capital of West Bengal i.e. Kolkata, play an important role in structuring the internal structure of informal economy in Jaleswar area. Jaleswar town is just 8–10 km far from the West Bengal border, which gives the area a strong cross-border trade advantage. This also helps in the quick and smooth movement of goods, people, and services. In the context of umbra-penumbra frame work, informal vendors belong to penumbra (semi-stable) zone are located densely along the transportation corridor. Their close vicinity to the transportation network ensures high profit, higher economic stability and enhanced business mobility.

On the other hand, vendors belonging to umbra (highly vulnerable darker area) zone are subsequently situated at the peripheral zone of transportation corridor. This spatial distribution limits their interaction with major market flows and restricts their access to market dynamics and high customer flow. Due to this these vendors experience higher transportation cost and weak economic linkages. Such kind of distribution intensifies their daily livelihood insecurity and reinforce their position within the dark zone of vulnerability.

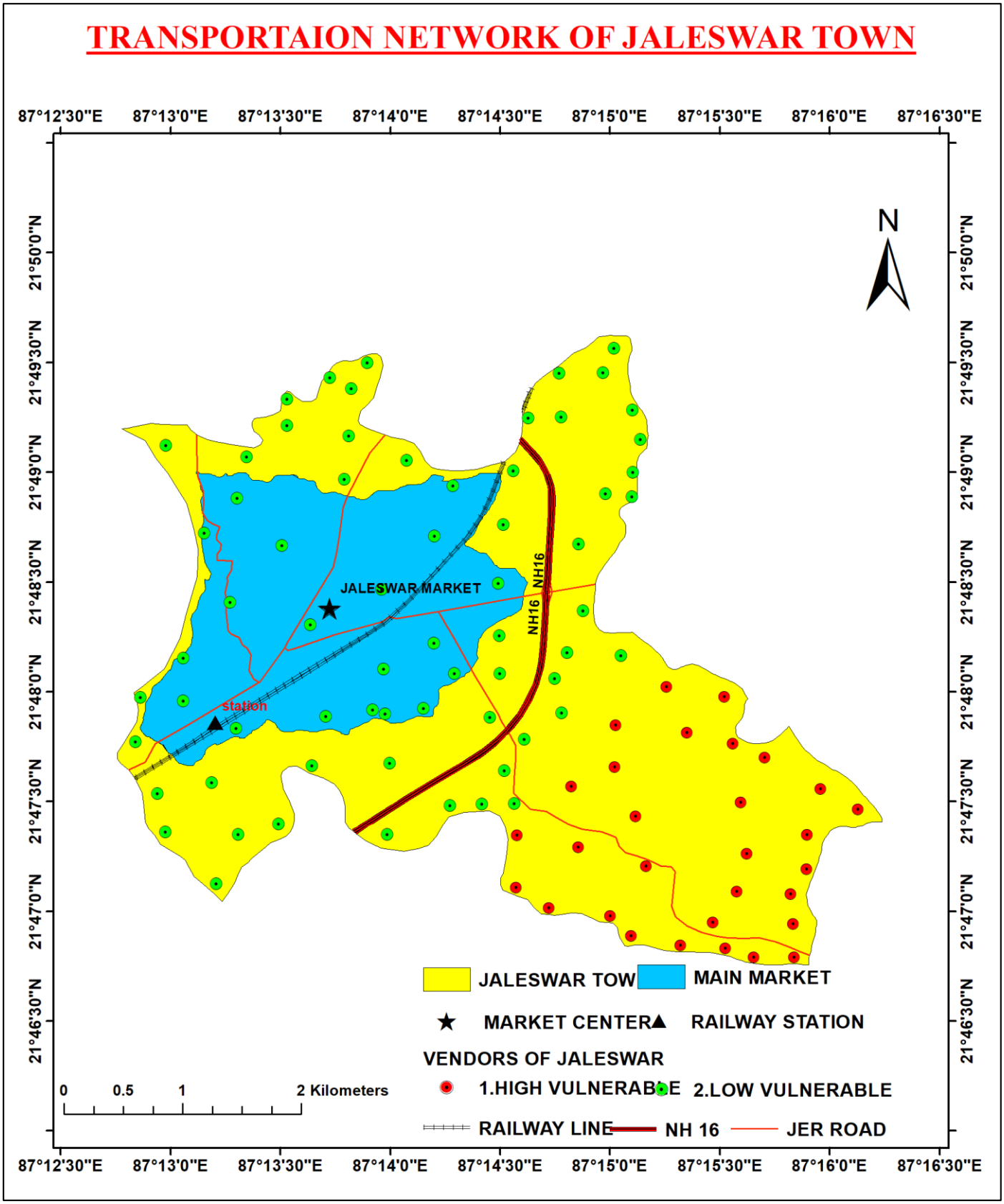

Figure 4. Transportation network and informal vendor concentration in Jaleswar town
(Source: Generated by the author based on the conducted primary survey and Census of India, 2011)

D. Classification of Informal Vendors based upon Economic Vulnerability score

Figure 5 represents the classification of 90 informal vendors based upon their respective economic vulnerability score. In the above map, vendors with low economic vulnerability score having stress-strain ratio range 1 to 2.727273 are represented as green point feature. On the other hand, vendors with high economic vulnerability score with stress-strain range -0.12865 to 1 are represented as red point features. The yellow region in the map displays the area covered by low vulnerable vendors and blue region in the map represents the area covered by highly vulnerable vendors. we can observe that all highly vulnerable vendors are deeply concentrated in the south-eastern part of the Jaleswar town. These vendors are quiet far from the primary market area due to which they face weaker market access, low customer foot fall and high economic vulnerability.

We can also observe the high concentration of low vulnerable vendors in the central and western part of the Jaleswar Town. Their closeness to the main market center as compared to highly vulnerable vendors is less. There for these low vulnerable vendors experience better economic stability, consistent demand, and stronger spatial integration with urban commercial activity.

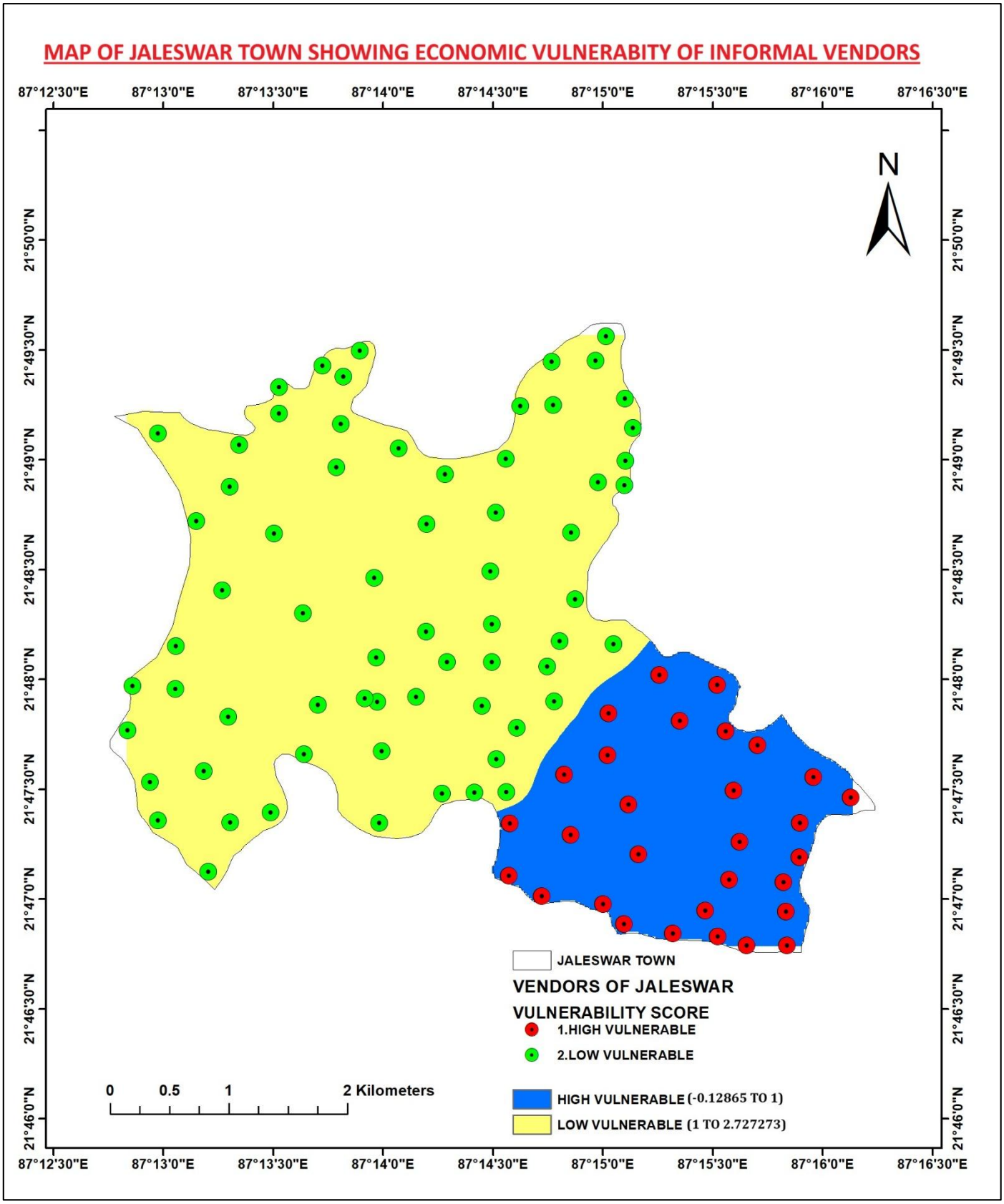

Figure 5. Classification of informal vendors based upon economic vulnerability score
(Source: Generated by the Author based on the conducted primary survey)

E. Umbra and Penumbra Framework within the Informal economy in Jaleswar Town

Figure 6 represents the penumbra and umbra zones of Jaleswar town based on the stress–strain economic vulnerability ratio of 90 informal vendors. From the above figure it is evident that the penumbra zone is represented by the blue region and the low vulnerable vendors are indicated by green points. This is a semi stable zone; hence vendors who are in this zone enjoy spatial advantages such as high economic adaptive capacity, income continuity, and operational flexibility. This enables them to withstand market fluctuations more effectively.

On the other hand, the pink shaded zone represents the umbra zone where informal vendors are located by red points. As we can see this zone is spatial detached from the main market area so vendors of this zone have lower integration with market dynamics and limited customer interaction. Such absences reduce their sales and increase daily income insecurities. Due to this they become more prone to the sudden economic shocks and move more towards the umbra zone of economic instability. This heterogeneous

internal structure within the informal economy of Jaleswar town highlights the need for location-sensitive urban planning strategies.

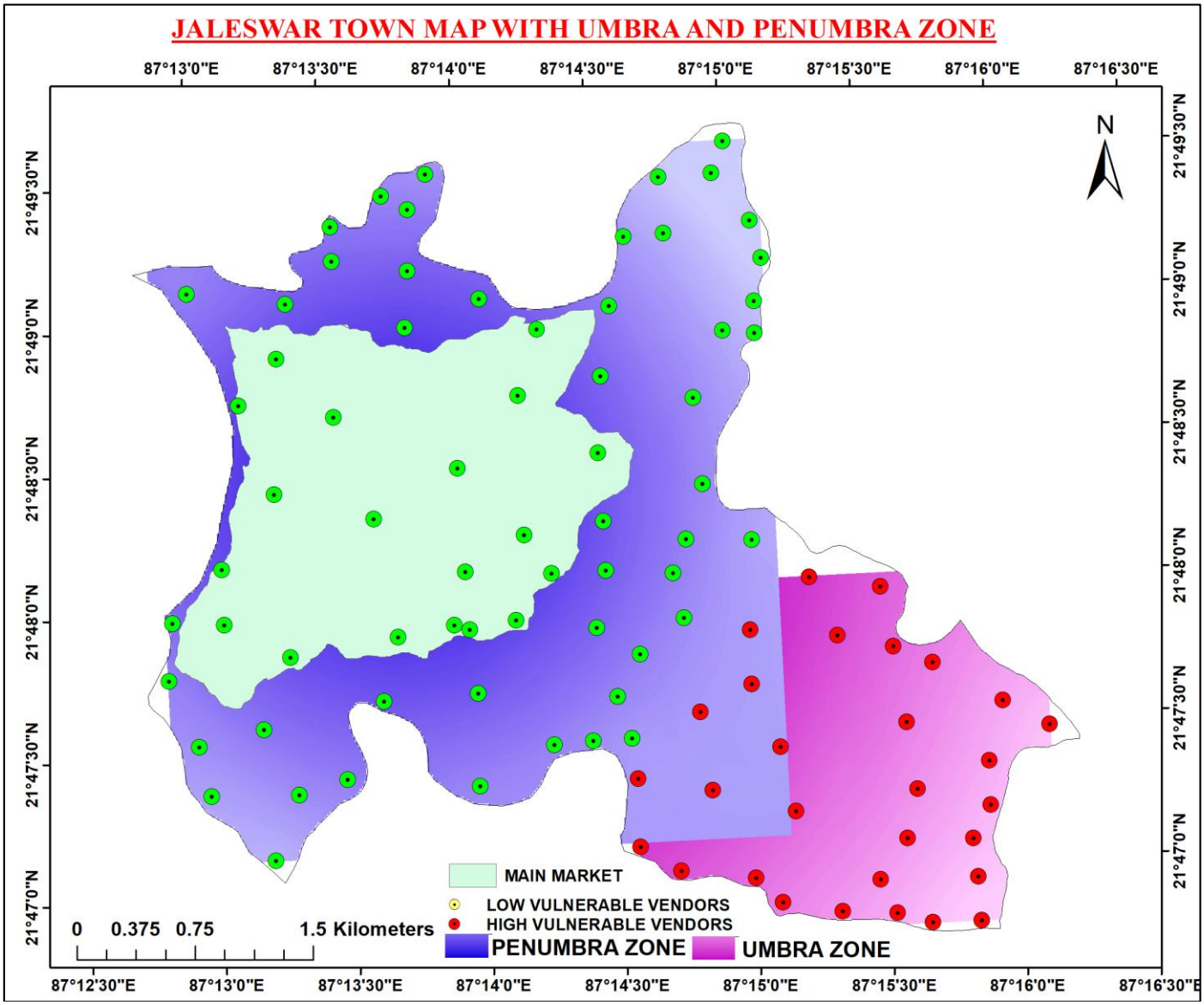

Figure 6. Umbra and Penumbra zones within the Informal Economy of Jaleswar Town
(Source: Generated by the author based on the conducted primary survey and ArcGIS)

F. Economic Characteristics of Informal Vendors in Umbra and Penumbra zones

Table 3. Various economic characteristics of informal vendors of umbra and penumbra zones

INDICATOR	LOW VULNERABLE(PENUMBRA)	HIGHLY VULNERABLE(UMBRA)
Total number of vendors	57	33
In percentage	63.33333333	36.66666667
Average Monthly Operational Cost	248532.4561	136436.3636
Average Monthly Profit	85426.31579	42557.57576
Mean Stress	12.08533766	5.910701688
Mean Strain	8.353913303	12.38554356
Mean Stress/Strain Ratio	1.481991121	0.468929239
Economic Stability	High	Low
Adaptive Capacity	High	Low
Business Continuity Risk	Low	High

(Source: Prepared by the author using MS Excel and data of Table 1 and Table 2)

Table 3 represents comparative economic analysis between low vulnerable (penumbra) and highly vulnerable (umbra) vendor groups. The table particularly represents the variation of internal economic structure of informal economy in Jaleswar town.

According to the data of Table 3, out of 90 informal vendors 57 vendors i.e. 63.33% belong to the low vulnerable category or penumbra zone and 33 vendors i.e. 36.66% belong to the highly vulnerable category of umbra zone. The dominance of penumbra zone's vendor over umbra zone's vendor suggests that informal economy in Jaleswar town is not fragile. It contains a large segment who are capable of sustaining their livelihood despite of regulatory exclusions and market uncertainties.

Low vulnerable vendors who are falling in the penumbra zone have higher average monthly operational cost (248532.6) and profit (85426.32) as compared to the highly vulnerable vendors who are falling in the umbra zone (136,436.36 and 42,557.58 respectively). From the higher profit margin of low vulnerable vendors, it is evident that in penumbra zone the integration of vendors with the market is very strong and they have superior financial buffering capacity.

The mean stress and strain percentage of low vulnerable vendors are 12.09 and 8.35 respectively. Whereas for the highly vulnerable vendors, the mean stress and strain percentage are 5.91 and 12.39 respectively. The economic vulnerability ratio i.e. means stress-strain ratio of low vulnerable (1.48) is also greater than the mean stress-strain ratio of highly vulnerable vendors (0.47). this difference indicates that the economic elasticity of penumbra zone's vendor maintain continuity despite of any kind of external economic pressure. On the other hand, the economic elasticity of umbra zone's vendor is fragile. It indicates that the accumulated economic pressure of umbra zone's vendor exceeds their livelihood adaptive capacity and they are exposed to income instability, business discontinuity, and occupational displacement. Thus, the umbra zone represents the core shadow of the informal economy and the penumbra zone constitutes a transitional resilience space.

IV. CONCLUSION

This research work analyses the internal structure of informal economy within the Jaleswar town by integrating economic vulnerability and umbra-penumbra conceptual frame work. The findings of this research work demonstrate that the function of informal economy is not at all uniform in nature. Its internal structure is heterogenous in nature marked with varying degree of economic vulnerability and resilience among the informal vendors.

The combined integration of operational costs, profit structures, and stress–strain ratios represents that informal vendors who are working under low adaptive capacity condition and with unstable income create umbra zone of high vulnerability. In contrast, informal vendors who are working with strong economical buffering and operational flexibility creates penumbra or low vulnerability zone.

The study further concludes that if stress is less than strain, then the vendor will face high economic vulnerability with low livelihood stability and unstable economic conditions. Whereas, if the stress of an informal vendor is greater than or equals to strain then the vendor will face low economic vulnerability with high livelihood stability and stable economic conditions.

Thus, the combined analysis of stress-strain ratio, proximity to transportation network, clustering pattern of informal vendors, operational cost variation and profit margin provides a robust analysis for understanding the dual structural character of informal economies in small urban town like Jaleswar.

From the policy and intervention point of view, this dual structure of informal economy carries crucial implications for sustainable urban development. Umbra zone vendors must be given work place security, social stability, government support and access to micro-credit chain. On the same time penumbra zone's vendors must be encourages to go into formal economic system.

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