



Identification of a New Industrial Area Based on a Macro-Level Analysis – a Case of Bokaro District, Jharkhand, India

Bimal Chandra Roy, Satyaki Sarkar, Rajan Chandra Sinha, Indraneel Srivastava

Abstract: Locating a new industrial area involves a strategic decision that covers several criteria with consideration for socio-economic benefits and environmental sustainability alongwith technical, and political issues. These different criteria are described using a number of indicators in terms of quantity and quality with some possible uncertainty. Decision making thus requires appropriate tools for data collection, analysis and knowledge management to address this multidisciplinary situation. This paper tries to find out the comprehensive method for industrial site location, a sustainable approach for finding the most suitable solution. Identifying the location determinants and site suitability models used for allocating an industrial site is observed to be an essential aspect of siting of industry, as such; level of decision making is dependent on predefined constraints. Multicriteria decision making method (M.C.D.M) seems to be a consistent and efficient solution which forms the basis for locating multiple sites for industrial activity in any delineated area.

Keywords: Land Appropriation, Location Determinants, Site Suitability, Predefined Constraints, Multicriteria Decision Making (M.C.D.M)

I. INTRODUCTION

The basic conventional methods of placing the industry closer to settlement and agglomeration were implemented with an intention of boosting the economic growth by providing greater employment opportunity to the area. The need of revitalization and rejuvenation of urban life lead to an ideology that development and urban planning should go hand in hand. The main pull factor for locating an industry has always been the availability of raw materials needed for production and processing of goods in order to achieve desirable outputs. However it is witnessed that there are some other significant and momentous factors which are to be considered before finalising the location of the site for the industry. In the last 20th Century, Mankind saw tremendous growth in technology advances in Industrial and Production Sector with exponential use of natural resources and environment to meet up the ever-growing needs and demands.

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At global scale, Mining and Manufacturing sector predominates most of industries all around the globe. Manufacturing sector became an integral sector involving production and labour inside developed countries over the Industrial Revolution, upsetting preceding mercantile in addition to feudal establishments. This happened through many successive speedy advances inside technology, like the production steel and coal. after the Industrial Revolution, perhaps a third of world's economic output comes from manufacturing companies. The mining industry considered key for the development associated with civilization, which has been depend on the iron and bronze in the earlier time. Mining operation, which involves extraction Various minerals from the earth crust, comes in second only to agriculture since the world's oldest and crucial activity. Within the last few years, mining industries are developing quickly. And ideal sites intended for new plants are stalled due to the development associated with countryside (rural areas) and also the rising worry over environmentally friendly and legalities. The challenge is to identify a place for the modern industry closer to place associated with mining to cut back the item cost. Therefore, selecting the place (site selection) for the new energy plant must be done cautiously and take into many factors under consideration. Although Industries have revolutionized the economy and living standards of human beings over time, Industry siting on the land has a negative impact on overall living environment, soil structure and local ecosystem. Land degradation, depletion of fauna and flora and pollution are some global issues which are directly related to industrial land siting.

Industrial Revolution that took place in 18th Century lead to Modernization of Trends in Urban Planning. There was advancement in Transportation, Public Utilities etc. Industrial Site Selection process was pioneered in the 18th Century England with the introduction of Factory towns/Mill towns and garden city as a planning practice.

a. Every amenity of Urban Life was sacrificed to the requirements of Industries.

b. Railroads and Ships joined the factories and waterfronts became the industrial core of the city
Factory Town Concept failed because of increase in even working-class population, problems of public health and safety, environmental issues, no land use standards for future development. Garden City Concept failed because of defined railway line and green belt buffer between Industries and City Centre, there was more influx of people & factories and increasing urban structure of the city in all directions.



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From physical planning point of view process of selection of site and land use is defined in terms of zoning. Industrial Zoning is the process of dividing land into zones in which various industrial setup may be permitted or prohibited. The type of zone determines whether planning permission for a given development is granted. Zoning may indicate the size and dimensions of the plotted land as well as the form and scale of factories. Perspective Plan provides an overall vision for preparation of detail plan of land use and various development prospects in the local area. It acts as a guide for local governing body. Industrial Location Plan, Resource Mapping are a part of Perspective plan which contributes to overall Regional Development. India is a country gifted with a great variety and extent of natural resources, labour force, mineral deposits, agriculture. Agriculture and Manufacturing sector are some of the largest industries contributing to India's booming economic growth. While Agriculture and Manufacturing industries are spread all over India, Mining sector is confined to areas with Mineral Deposits. Eastern India is rich in mineral ores whereas Western India has rich deposits of Lignite resources. A mineral based industry largely affects the surrounding living system since the environment is disturbed by excavation, mining and processing of minerals. Manufacturing Industry on the other hand requires continuous inflow of raw materials and prefers close proximity with its needed resources. Hence to identify a Industrial Zone, a number of decision making criteria which are favorable for industries should be considered keeping in mind minimal possible use of physical resources and minimum possible impact on ecosystem and environment. Jharkhand is a State in eastern part of India which contributes to 37% of country's total raw mineral deposits. It has been a targeted destination for various industrial power houses from state owned to private conglomerate such as TATA, NTPC, SAIL, CIL etc. in the past. Being a rich state in natural resources, mineral deposits, agricultural land, Jharkhand has huge potential for Industrial Establishment in the future.

"First ever large-scale Site Selection Practices at Regional level for industrial establishment in Jharkhand was witnessed during early 20th Century when TATA Sons, a National level conglomerate with the help of geologist Charles Page Perin from Pittsburgh, US identified suitable site for siting up India's first steel plant (TISCO) in East Singhbhum Area which had extensive varieties of Minerals & Resources ideal for steel-based industry establishment." Many new Industrial Sites were identified in Jharkhand for Mining, Mineral Processing, Finishing Products, Manufacturing in 1960-1980s. New industrial site identification process starts with defining many establishing criteria put forward by investors and stakeholders.

A. NEED FOR THE STUDY

- a. To encourage investments in the study area by locating best industrial site with minimal impact on surroundings for future industrial development.
- b. Empowering entrepreneurs, promoters, Industrial decision makers by creating safe, supportive environments that foster collective prosperity, innovation and adaptability to local conditions.

II. DELINEATION OF AREA FOR SITING OF INDUSTRIES

Delineation of the study area is the first step for preparing the regional development plan. Ministry of Environment and Forests, Government of India has already proposed rules and regulations in which criteria has been defined for Areas to be avoided for Siting of Industries. Application of these criteria will lead to delineation of land which is available in the study area

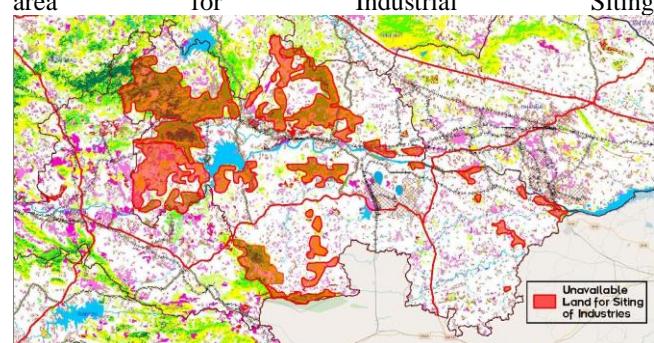


Figure 1 – Unavailable land for siting of industries after considering the restrictions on forest land: (forest conservation act, 1980). – reserve, protected and communal forests, restrictions on prime agricultural land: areas characterized by extensive agriculture landuse, agriculture production areas, command areas of irrigation projects

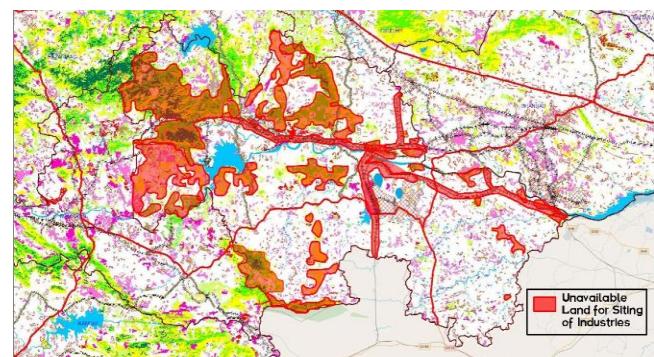


Figure 2 – Right-of-way of the railways- a railway property adjacent to the site, is a, restriction on industrial development - at least 800m – 1500m from no development zone.

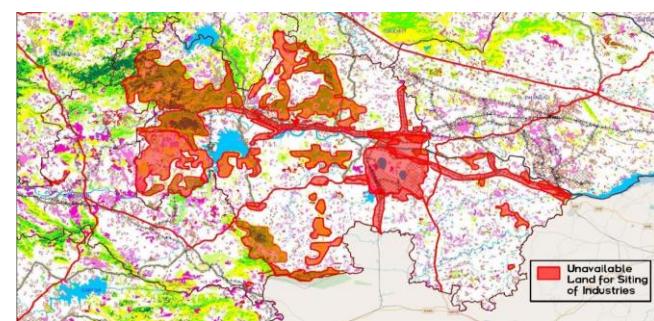


Figure 3 – Restrictions on siting near major settlements - any major settlement notified limit is within 20 km, the spatial direction of growth of the settlement (5 – 10 km radius), restrictions on siting near airport areas - the heights of the buildings should be regulated and no objection certificate is required from Airport Authority of India.

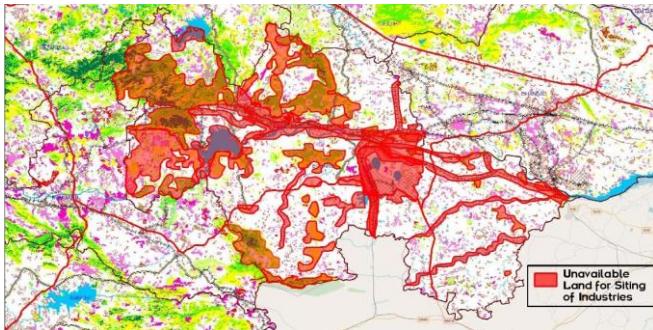


Figure 4 – Restriction on industrial siting on marshy, erodible land – site should be at least 1-3 km from highly permeable soil. It should be at least 0.5 km from flood plain affected by dam and present water bodies.

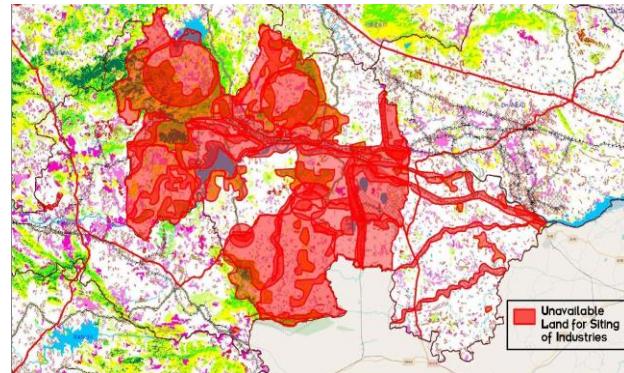


Figure 8 – Restriction on Human Footprint – Areas excluding urban areas with Global Human Footprint Rating between 11-20 (5-15 pph) Areas with Major share of population (at least 80%) of the area is dependent on agriculture as the major source of livelihood.

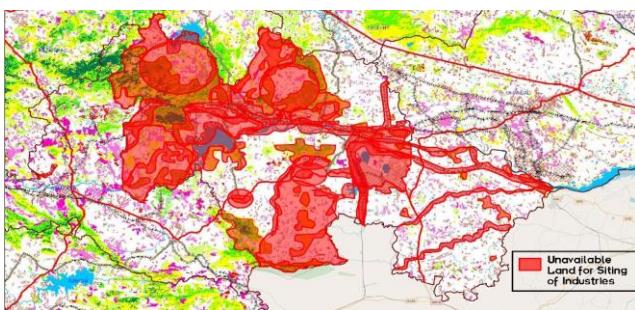


Figure 5 – All identified areas around protected areas and wildlife corridors around 25 km radius are to be declared as ecologically fragile under the Environment (Protection) Act

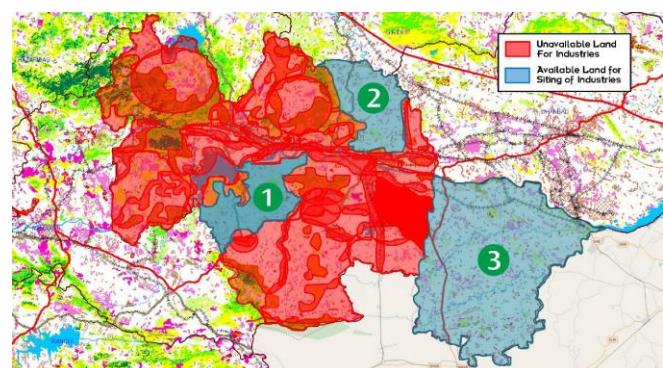


Figure 9 – The final delineated study area showing the available land for siting of industries.

Based on application of guidelines prescribed by the Government of India, The land has been subdivided based on elimination of unavailable land for siting to identify the present available land for siting of industry. Three (3) land parcel at district level can be identified. The profile of these land parcels at district level are as follows:

1) Area in Peterbar Subdistrict (206.75 sq. km) – Located near newly formed Ramgarh District. This area is connected by Ranchi – Dhanbad Express highway. It has Tenughat Reservoir and Garga Dam in nearby proximity which is the only water source in the surrounding areas

2) Area in Chandrapura Subdistrict (191.81 sq. km) - Located near the coal capital of India Dhanbad. This area is in proximity to GT Road and Delhi Kolkata Rail Corridor. Damodar River crosses this area which is water source in the area.

3) Area in Chandankiyari Subdistrict (485.35 sq. km) - Located in the eastern part of Bokaro District. This area is located near Purulia District. It has NH18 and centrally located SH9 Raghunathpur – Bokaro Road which connects to Raghunathpur, Purulia and Burnpur areas of West Bengal. The area has tributary of Damodar River which is the major water source. Small rural areas are located on the banks of these rivers.

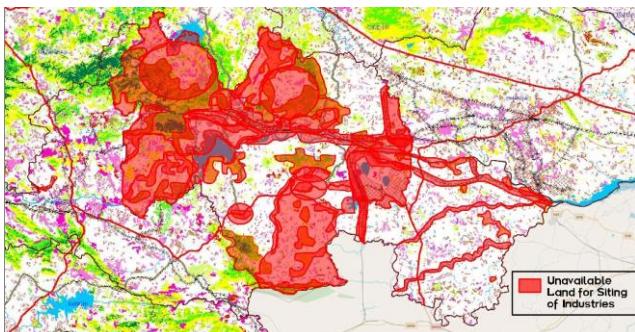


Figure 6 – Restrictions in hazardous zones - Areas susceptible to man-made and natural disasters include areas with high-risks of earthquakes, floods, tsunami, , mining excavation sites, mining & quarry land, mineral dumping land etc.

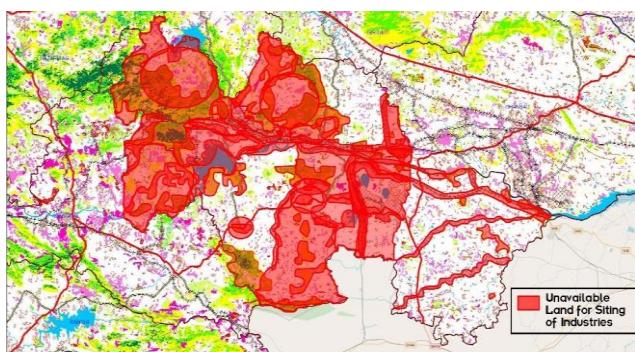


Figure 7 – Restrictions as per CPCB - Environmental Atlas for Bokaro District prepared by Bokaro (EIA) Environmental Impact Assessment Authority for Air and Water Polluting Industries.

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III. RESEARCH METHODS

This method evaluates the multiple criteria which are conflicting in decision making. Since siting an industrial location is a very complex socio economic problem, this method facilitates groups or individual decision maker by assigning a weight to each criteria under consideration.

The desired criteria were identified based on a primary survey for industrial decision makers conducted in the study area. The targeted population included Directors, General Managers, Project Managers of various established industries in the area

A. MULTI – CRITERIA DECISION METHOD

Industrial site selection criteria identified based on primary survey of industrial decision makers are-

- a. Availability of Resources (JSAC Resources Plan)
- b. Landcover and Landuse (Existing Landcover Map) c. Type of Wasteland (JSAC Wasteland Layer)
- d. Proximity to Transport Corridor (JSAC Transport) e. Land Pricing (Govt of Jharkhand)
- f. Terrain, Slope, Topography (JSAC Slope Layer)
- g. Environmental Attributes (Bokaro Environmental Atlas)
- h. River Proximity (JSAC Water Bodies Layer)

Questionnaire was designed into yield comparison matrix from total sample collected. The following was aspects were surveyed from the participants: -

A. 1. Relative comparison between two criteria at a time in order to yield a matrix.

Land Pricing	7	5	3	1	3	5	7	Proximity to Transport Corridor
	Extremely Important	Highly Important	More Important	Equal Importance	More Important	Highly Important	Extremely Important	

A. 2. Ranking which is to be given to individual criteria under the Scheme Site Selection Priorities of Decision Makers 3) Personal Opinion and Suggestion about various Infrastructure Priorities in a New Industrial area or a new industrial landuse distribution/arrangement.

B. CALCULATION OF COMPOSITE SUITABILITY FUNCTION (S)

B.1 For individual criteria maps – The Criteria maps depicts suitability scale after consultation from MCDA and primary survey of Industrial Decision Makers. The Suitability Function for each is the product of adjusted weight (w) calculated for that individual criteria, the assumed suitability scale (x) from highly suitable to least suitable areas, the reclassified thematic layer (c) processed from raw data obtained.

$$S = \sum w_i x_i \times \prod c_j$$

B.2 For Final Suitability Map – After generation of criteria maps the summation of reclassified thematic layer (from Overlay analysis) is multiplied by the summation of adjusted weights (w) and assumed suitability scale.

B .3 Calculations to compare the criteria

Defining Multi – Criteria Problem, Decomposing the Problem into hierarchy of criteria for 8x8 Matrix, Calculation

of Priority Eigen Vector Normalization of Values – Finding Consistency Index and Consistency Ratio, Calculation of Weights for Criteria based on Priority Eigen Vector, Defining Suitability Score and Scale Calculation of Suitability Function

No of Comparisons = 28

Based on the survey, individual criteria are compared and the sum of each column is calculated in order to normalise the values in the next step.

Table 1 – Relative weights for various criteria

CRITERIAS	1	2	3	4	5	6	7	8
1	1	1	3	1	1/5	5	1/3	5
2	1	1	5	1/5	1/5	1	3	5
3	1/3	1/5	1	1/3	1/3	1	3	3
4	1	5	3	1	1	3	3	5
5	5	5	3	1	1	7	3	3
6	1/5	1	1	1/3	1/7	1	1/3	3
7	3	1/3	1/3	1/3	1/3	3	1	7
8	1/5	1/5	1/3	1/5	1/3	1/3	1/7	1

11.73 13.73 16.66 4.54 3.54 21.33 13.80 32

Each value of each cell is divided by the column sum to obtain a comparison matrix between the criteria.

Table 2 – Adjusted relative weights for various criteria

CRITERIAS	1	2	3	4	5	6	7	8	ROW SUMS
1	0.085	0.072	0.18	0.22	0.056	0.23	0.024	0.15	0.128
2	0.085	0.072	0.3	0.044	0.056	0.046	0.21	0.15	0.122
3	0.028	0.014	0.06	0.073	0.094	0.046	0.21	0.093	0.078
4	0.085	0.36	0.18	0.22	0.028	0.14	0.21	0.15	0.205
5	0.42	0.36	0.18	0.22	0.028	0.32	0.21	0.093	0.263
6	0.17	0.072	0.06	0.073	0.04	0.046	0.024	0.093	0.053
7	0.25	0.024	0.02	0.073	0.094	0.14	0.072	0.218	0.112
8	0.017	0.014	0.02	0.044	0.094	0.015	0.0103	0.031	0.038

The horizontal average of these cell results in a Priority Eigen Vector which describes the priority given by decision makers of one criteria over the other. With the help of the calculated priority vector, adjusted weights can be calculated and respective to each criterion can be allocated.

Table 3 – Adjusted relative weights for various criteria obtained from calculated Eigen Vector

Availability of Resources and Raw Materials (1)	ADJUSTED WEIGHT = $\frac{12.28\%}{20.5\% + 26.3\%} = 0.26239$	3rd
Landcover and Landuse (2)	ADJUSTED WEIGHT = $\frac{12.22\%}{20.5\% + 26.3\%} = 0.26111$	4th
Availability of Waste/Barren Land (3)	ADJUSTED WEIGHT = $\frac{7.8\%}{20.5\% + 26.3\%} = 0.16667$	6th
Proximity to Transport Corridor (Rail/Roads) (4)	ADJUSTED WEIGHT = $\frac{20.5\%}{20.5\% + 26.3\%} = 0.43803$	2nd
Land Pricing, Valuation (5)	ADJUSTED WEIGHT = $\frac{26.5\%}{20.5\% + 26.3\%} = 0.56623$	1st
Terrain, Slope, Topography (6)	ADJUSTED WEIGHT = $\frac{5.3\%}{20.5\% + 26.3\%} = 0.11324$	7th
Environmental Attributes (7)	ADJUSTED WEIGHT = $\frac{11.2\%}{20.5\% + 26.3\%} = 0.23931$	5th
Geomorphology, Geology & River Proximity (8)	ADJUSTED WEIGHT = $\frac{3.8\%}{20.5\% + 26.3\%} = 0.08119$	8th

C. RECLASSIFICATION OF SPATIAL LAYERS

Reclassification is an effective tool used in GIS for creating a categorical attributes in a dataset by classifying various features based on existing attributes.



Way to interpret an attribute to a map is done through GIS using two methods: -

Grid Overlay Method – It is method in which the attributes on the map are overlaid in Grid Iron Pattern. It is a useful method in order to find change the values of the map attributes. It is usually used for small area which are less than 50 sq. km, interpretation of area.

Polyline Overlay Method - It is a method in which the polyline boundary of spatial features is reclassified and interpretation. In this research, Polyline Overlay is used in order to compare different units, and to reclassify them to similar units for land suitability analysis to locate the best site.

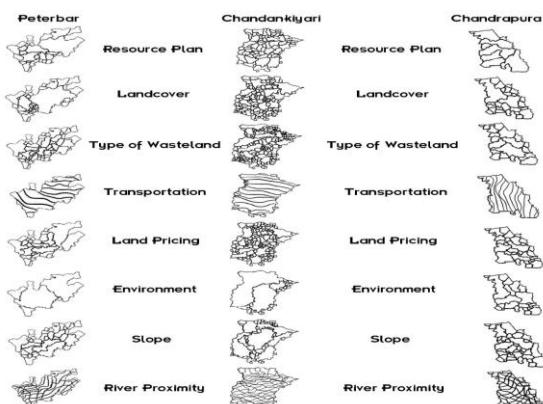


Figure 10 – Reclassified Map obtained for various spatial layers and predefined criterias

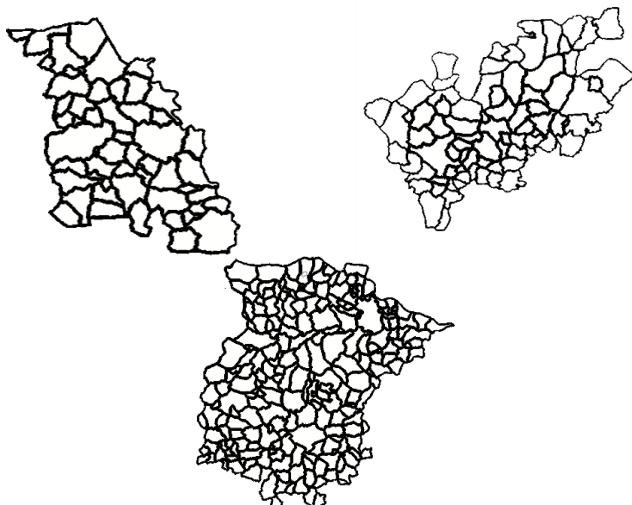


Figure 11 –Final Raster Criteria Maps

D. WEIGHTED OVERLAY METHOD

Overlay method is a GIS operation which uses the superimposing of multiple data sets, one over another layer and is helpful in identifying the relationship amongst the various attributes. A resultant new layer is created that combines the geometry and the attributes of all the input layers. The resultant sets of data are usually assigned with numerical values. These values then are mathematically merged together to create a new set of values for a single output layer

Overlay is a GIS operation that superimposes multiple data sets (representing different themes) together for the purpose of identifying relationships between them. An overlay creates a composite map by combining the geometry and attributes of the input data sets. Tools are

available in most GIS software for overlaying both Vector or raster data.

Before the use of computers, a similar effect was developed by Ian McHarg and others by drawing maps of the same area at the same scale on clear plastic and actually laying them on top of each other

Feature overlays from vector data are created when one vector layer (points, lines, or polygons) is merged with one or more other vector layers covering the same area with points, lines, and/or polygons. A resultant new layer is created that combines the geometry and the attributes of the input layers.

Raster overlay involves two or more different sets of data that derive from a common grid. The separate sets of data are usually given numerical values. These values then are mathematically merged together to create a new set of values for a single output layer

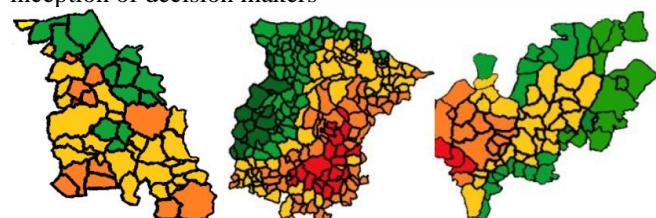
Table 4 – Weighted Overlay Table for criteria and their relative influence over each other

RANK	CRITERIA	INFLUENCE (%)
1	LAND PRICING	26.3
2	PROXIMITY TO TRANSPORT	20.5
3	AVAILABILITY OF RESOURCES	12.8
4	LANDCOVER AND LANDUSE	12.2
5	ENVIRONMENTAL ATTRIBUTES	11.3
6	AVAILABILITY OF WASTELAND	7.8
7	SLOPE, TERRAIN	5.3
8	RIVER PROXIMITY	3.8

The Weighted Overlay tool applies one of the most used approaches for overlay analysis to solve multicriteria problems such as site selection and suitability models. In a weighted overlay analysis, each of the general overlay analysis steps is followed. As with all overlay analysis, in weighted overlay analysis, you must define the problem, break the model into sub-models, and identify the input layers.

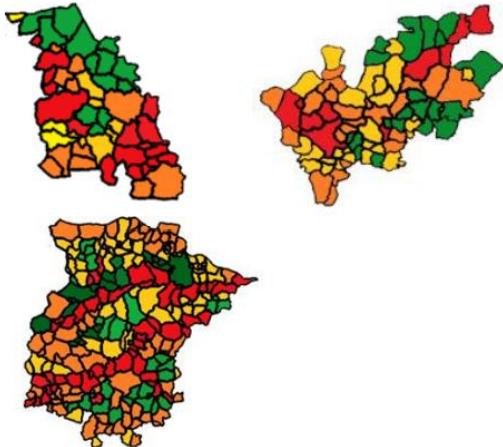
IV. RESULTS AND DISCUSSIONS

Land allocation for industries is a complex process as the analysis considers various parameters. The two different raster values cannot be added as the units are different for different parameters. All the parameters cannot be of equal importance. After normalising the data each parameter is referred with a numerical value. More the value assigned by weighted overlay method, more it is important for the site location. Since this study has undertaken a certain criteria approach for site allocation. Various suitability criteria map was generated based on calculations from primary survey. The suitability of each criteria was assumed based on inception of decision makers



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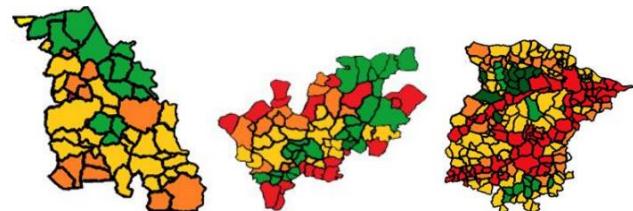
GOVT RESOURCES DEVELOPMENT PLAN (1)			
WLC RESULTS ($S = \sum WX$)	INDEX (DISTANCE IN METERS)	SCALE	SUITABILITY SCORE (1-10)
0.20991 - 0.26239	0-5000	HIGHLY SUITABLE	8-10
0.15743 - 0.20991	0-10000	MORE SUITABLE	6-8
0.10495 - 0.15743	0-15000	MODERATELY SUITABLE	4-6
0.05247 - 0.10495	0-20000	LESS SUITABLE	2-4
0.05247 - 0.02623	0-30000	LEAST SUITABLE	1-2



LAND PRICING (5) – GOVT RATES FOR INDUSTRIAL DEVELOPMENT (2017)			
WLC RESULTS ($S = \sum WX$)	INDEX (INR PER DECIMAL - 40.47 sq.m.)	SCALE	SUITABILITY SCORE (1-10)
0.45298 - 0.56623	75000-85000	HIGHLY SUITABLE	8-10
0.33973 - 0.45298	85000-95000	MORE SUITABLE	6-8
0.22649 - 0.33973	105000-115000	MODERATELY SUITABLE	4-6
0.11324 - 0.22649	125000-135000	LESS SUITABLE	2-4
0.05662 - 0.11324	135000-145000	LEAST SUITABLE	1-2



LANDCOVER AND LANDUSE (2)			
WLC RESULTS ($S = \sum WX$)	INDEX	SCALE	SUITABILITY SCORE (1-10)
0.20888 - 0.26111	OPEN WASTELAND	HIGHLY SUITABLE	8-10
0.15666 - 0.20888	BUILDPUP LAND (RURAL)	MORE SUITABLE	6-8
0.10444 - 0.15666	AGRICULTURAL LAND/ VEGETATED AREA	MODERATELY SUITABLE	4-6
0.05222 - 0.10444	TWO CROP/CURRENT CROP LAND	LESS SUITABLE	2-4
0.026111 - 0.05322	TREE CLAD/ BUILTUP AREA/WATER BODIES	LEAST SUITABLE	1-2



TYPE OF WASTELAND (3)			
WLC RESULTS ($S = \sum WX$)	INDEX	SCALE	SUITABILITY SCORE (1-10)
0.13336 - 0.16667	INDUSTRIAL WASTELAND	HIGHLY SUITABLE	8-10
0.10002 - 0.13336	BARREN ROCKY/STONY WASTELAND	MORE SUITABLE	6-8
0.06668 - 0.10002	LAND WITH OPEN SCRUB	MODERATELY SUITABLE	4-6
0.03334 - 0.06668	LAND WITH DENSE SCRUB	LESS SUITABLE	2-4
0.01667 - 0.03334	PAST FALLOW LAND	LEAST SUITABLE	1-2

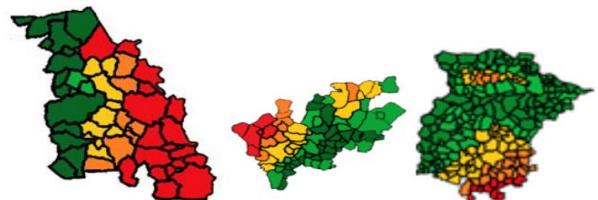
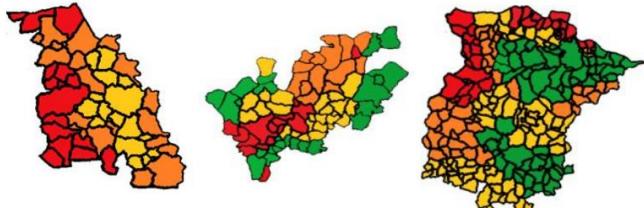


Figure 12

PROXIMITY TO TRANSPORT CORRIDOR (4) – ROADS/RAIL				
WLC RESULTS ($S = \sum WX$)	ROAD DISTANCE (m)	RAIL DISTANCE (m)	SCALE	SUITABILITY SCORE (1-10)
0.35042 - 0.43803	0-500	0-3000	HIGHLY SUITABLE	8-10
0.26281 - 0.35042	0-600	0-2500	MORE SUITABLE	6-8
0.17521 - 0.26281	0-700	0-2000	MODERATELY SUITABLE	4-6
0.08766 - 0.17521	0-800	0-1500	LESS SUITABLE	2-4
0.04380 - 0.08766	0-1000	0-500	LEAST SUITABLE	1-2



SLOPE, TOPOGRAPHY, TERRAIN (6)			
WLC RESULTS ($S = \sum WX$)	INDEX (SLOPE CLASSES - DEGREE)	SCALE	SUITABILITY SCORE (1-10)
0.09059 - 0.11324	0-4	HIGHLY SUITABLE	8-10
0.06794 - 0.09059	4-6	MORE SUITABLE	6-8
0.04529 - 0.06794	6-8	MODERATELY SUITABLE	4-6
0.02264 - 0.04529	8-10	LESS SUITABLE	2-4
0.01132 - 0.02264	10-12	LEAST SUITABLE	1-2

Figure 13



ENVIRONMENTAL ATTRIBUTES (7) – ENVIRONMENTAL ALIAS - CPCB			
WLC RESULTS ($S = \sum WX$)	INDEX	SCALE	SUITABILITY SCORE (1-10)
0.19144 - 0.23931	Z4WL (NO RISK ZONE)	HIGHLY SUITABLE	8-10
0.14358 - 0.19144	Z4Wm (LOW RISK ZONE)	MORE SUITABLE	6-8
0.09572 - 0.14358	Z4Wh (LOW RISK ZONE)	MODERATELY SUITABLE	4-6
0.04786 - 0.09572	Z2Wh (MEDIUM RISK ZONE)	LESS SUITABLE	2-4
0.02393 - 0.04786	Z1Wh (HIGH RISK ZONE)	LEAST SUITABLE	1-2



RIVER PROXIMITY (8)			
WLC RESULTS ($S = \sum WX$)	RIVER DISTANCE (IN METERS)	SCALE	SUITABILITY SCORE (1-10)
0.06495 - 0.08119	0-1000	HIGHLY SUITABLE	8-10
0.04871 - 0.06495	0-800	MORE SUITABLE	6-8
0.03247 - 0.04871	0-600	MODERATELY SUITABLE	4-6
0.01623 - 0.03247	0-400	LESS SUITABLE	2-4
0.00811 - 0.01623	0-200	LEAST SUITABLE	1-2

Figure 14

A. SITE SUITABILITY INDICES

The data assumed and generated through Spatial Analyst Tool in ArcGIS is to be overlaid to generate the final suitability map. The criteria maps symbolize the reclassified result of weighted criteria obtained through survey, this processed data acts as a measure of suitability in the criteria map. The overlay of all the eight criteria maps along with the assigned influence factor of each criteria will result in the final suitability map when processed with the help of weighted overlay tool. Site suitability is a decision support to spatial planning mechanism, hence best selected site should be recommended for industrial setup in the region.

The present analysis concludes that there are many areas which are suitable for industrial siting but the best area can be determined by readings obtained for each area in the spatial analyst tool in GIS. Delineated region located in the Chandankiyari Region is the best site.

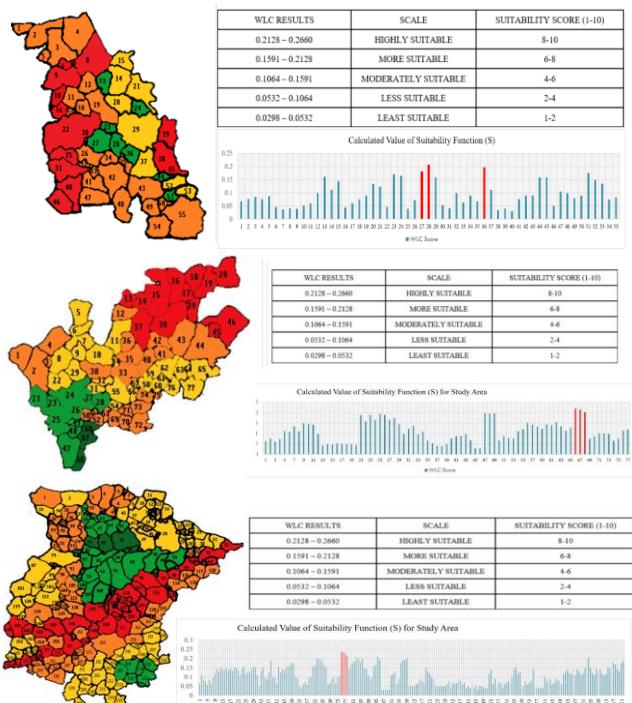


Figure 15 – Final Land Suitability Map for Siting of Industries (in Vector Form)

V. CONCLUSION

As industrial site location involves regional planning with spatial profile, it involves a huge set of feasible alternative solutions. The maximum number of alternatives is eliminated through various screening and elimination methods. The remaining alternative feasible sites are thus reduced to a minimum number, are further analyzed through weighted overlay method. This study uses GIS and MCDM for development of a suitability index, which finally identifies the most suitable site for the, subjective to the parameters, limitations and typology of the industries considered for this study. The methodology thus adopted in this study may find its applicability to a wider and different region having the similar parameters and socio-economic profile.

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