Planning of Sustainable Industrial Area: A Case Study of Ubhrat, Navsari District

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***Abstract*— Industrial development is one of the major aspects of regional development. But industrial development has to be planned and site should be suitable. Due to lack of proper site conditions studied for existing conditions, developed industrial areas are perceived with various problems like inefficient land uses, infrastructure shortcomings, and development issues, in long term. In the present context, this study aims at analyzing the potential for planning of a sustainable industrial development, in the Ubhrat site of Navsari district of Gujarat state. It analyses the site-specific important indicators such as existing land uses, connections, development in neighborhood, basic infrastructure and openness, etc, for evaluating site conditions. This study also highlights opportunities and constraints of the site. Based on the study, planning level considerations are made for balanced industrial development.**

***Index Terms*— Sustainable Industrial Development, Industrial Planning, Site Suitability, Ubhrat, Infrastructure Planning**

I. INTRODUCTION

Industrialization is an important aspect of the economic development with growth in employment and regional Development. But such development if not organized and well managed can results in inefficient land use, infrastructure problems and environmental degradation. With growing industrialization and urbanization, the requirement for organized development of industrial areas is felt more closely. Now the study area of Ubhrat is having limited potential for the industrial development because of location, proximity and land resources but the area is getting under rapid urbanization because of industrial expansion of Navsari district. So, it is time to know about the land resource preferences of the study area for planned development. In the present study, existing land use of study area is discussed and planning concerns for Ubhrat are proposed.

II. STUDY AREA

Ubhrat situated in Navsari district of Gujarat is in proximity to the coastal belt region and in the zone of semi-active development. The region is well connected to towns and regional roads network. Open land and agricultural land with limited built-up area and developing area will propel the region to develop as an industrial region. The semi-active development in neighboring region can be seen as an advantage for developing the region for future industrial use. The land being available and relatively better position, Ubhrat can be developed as a planned industrial region.

Fig. 1. Study Area Boundary

III. DATA AND METHODOLOGY

Data Sources

The study is based on a combination of primary observation and secondary data sources:

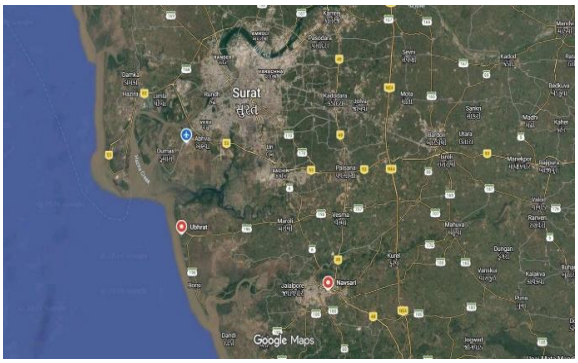

Fig. 2. Study Area Location

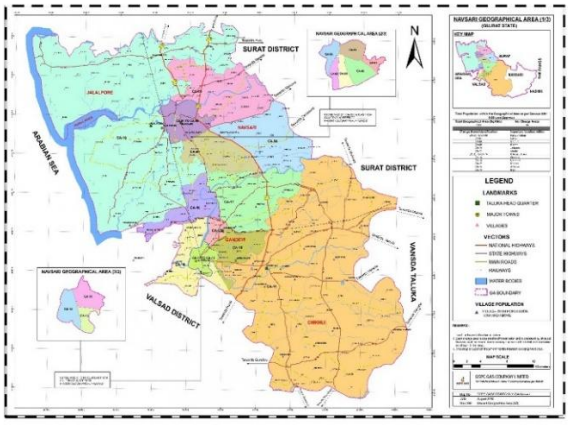

Fig. 3. Connectivity Map

- Site Observations Used for locational analysis, measuring the distance and understanding connectivity of Ubhrat with the neighboring areas.
- Google Maps Used for investigating the ground conditions, features of the natural environment and the physical characters of the study site.
- Google Earth Used to study ground conditions, natural features, and overall physical characteristics of the area.
- Government Portals (PNGRB and others) Used to get regional/infrastructure data, like networks and State context.
- Revenue Department Records Used for information on institutions existed in various places on land, land details and features, and jurisdiction of authorities.

Methodology

The methodology for this study will have three parts that would systematically identify, measure, compare and contrast all environmental factors impacting Ubhrat, an upcoming industrial area.

Benchmark Case Study Analysis

Global and national case studies such as Kalundborg (Denmark), Ulsan (South Korea), and Dahej PCPIR (Gujarat) were analyzed to identify performance benchmarks:

- The industrial case studies were selected for the global as well as national scenario to take useful and practical information about industrial practices and planning for sustainability.

Parameter Identification

- Key parameters were defined to evaluate industrial performance, including industrial linkages, resource efficiency, and infrastructure integration.

Data Collection and Site Assessment

- This step involves collecting relevant data regarding the chosen region, such as: Existing Land Uses, Connectivity, Availability of Infrastructures and the surrounding Development. Such data was collected fromMaps, Field observations, and Government Sources.

Comparative Framework Development

- In addition to studying the subject area the system is benchmarked against a benchmark industrial system that provides relevant parameters and benchmarks for assessing the system.

Gap Identification Approach

- An analysis of differences between the benchmarks and existing conditions on site was done to help establish a baseline that would need to be improved.

Planning Input Formulation

- Using the analysis of gap, site potential, the required inputs for planning stage has identified that are: improve infrastructure to ensure access to site, organized industrial activities, ensure environmental monitoring through adequate structure and ensure sustainable urban planning approach.

IV. RESULTS AND DISSCUSSION

Existing Land Use

A significant portion of the area considered in this study consisted of open and agricultural land. Land with minimal to low build-up levels can offer a

strategic opportunity for planned industrial development. This is mainly due to the absence of densely occupied neighborhoods that would result in the need for costly and laborious development of new neighborhoods and infrastructure.

Connectivity and Location Advantage

Ubhrat lies approximately4.2 km from the closest access point to Highway No.48, which is a highway connecting two of India ‘s biggest cities, Mumbai and Ahmedabad, with an added connection to Surat and Other Cities in the Region.

The proposed project site is located at a distance of 28 Kms from Hazira Port. The Hazira Port is one of the biggest industrial ports of Gujarat engaged in loading and unloading of raw materials and finished goods.

Industrial Linkage Potential

Ubhrat is located at a reasonable distance from Hazira Industrial Area which is favorable for any further industrial integration. Industries in the region can benefit from:

- Availability of raw materials
- Opportunity for Industrial collaboration
- Scope for resource sharing

This indicates that Ubhrat has the potential to develop strong industrial linkages if planned properly.

Infrastructure Condition

The area of study does not have any particular infrastructure for industrial use. Hence it cannot be considered as an developed or a utilized industrial land. There exist no organized utilities, or pipelines running in any part of the area.

Benchmark Comparison Analysis

A comparison with global and national industrial benchmarks highlights significant differences in performance:

- Industrial symbiosis linkages range from 32 to 235 in global models, while regional clusters have only 5 to 10 linkages
- Water reuse efficiency in benchmark cases ranges from 85% to 95%, whereas regional systems operate at around 80%
- Energy efficiency in global models is approximately 85%, compared to 65% in regional clusters
- Waste recycling in benchmark cases ranges from 90% to 100%, while regional systems achieve around 70%
- Pipeline density in advanced systems ranges from 0.05 to 0.12, compared to 0.02 in regional clusters

This comparison clearly shows the gap between existing systems and benchmark industrial performance.

Gap Analysis

Based on the comparison, the following key gaps are identified:

- Limited industrial integration and low number of symbiosis linkages
- Lower resource efficiency in terms of energy and waste management
- Lack of pipeline-based infrastructure systems
- Absence of structured and planned industrial layout

These gaps indicate the need for a planned approach to improve industrial performance.

Performance Targets for Ubhrat

Based on benchmark analysis and site potential, the following target values are proposed for Ubhrat:

- Symbiosis linkages: 50
- Water reuse: 92%
- Energy efficiency: 88%
- Waste recycling: 98%
- Pipeline density: 0.10

V. CONCLUSION

The results of the present study have highlighted the importance of assessing the site conditions of urban centers before allowing further industrial development. Ubhrat has potential to sustain long-term as a place for industrial development with assessment. The comparison shows quite a substantial gap to benchmarks, suggesting that there are key areas to be targeted with strategic intervention and with clear benchmarks. The process of closing this gap should occur as efficiently and effectively as possible. Planning of the proposed industrial area was carried out considering efficient land usage, availability of public amenities, traffic management and availability of land for expansion. The whole framework for planning the industrial development with

infrastructure and resource development is detailed out and can be taken as an example for similar regions undergoing development.

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