A Dissertation Report

On

IMPACT OF INDUSTRIES ON URBAN FRINGE

By

AYUSH SRIVASTAVA

(UNIVERSITY ROLL No. 1210106007)

Under the Guidance of

Prof. Mohit Kumar Agarwal

BABU BANARASI DAS UNIVERSITY

COLLEGE OF ARCHITECTURE & PLANNING

1. Introduction

1.1.Overview

Industrialization is considered to one of the most important tipping points in progress of mankind's progress as much as the discovery of fire, animal husbandry and agriculture have been. Industrialization has not only changed the speed and mode of production of goods but also the infrastructure and growth patterns of civilizations as well as way of living. This paper attempts to trace the roots of industrialization, its beginning and progress in Indian cities. Textile industry in India specifically has been significant through centuries and this paper will concentrate on its journey through the years. The case-study of Bombay textile industry has been taken to understand industrialization, its effects, its eventual downfall and transformation in the recent decades.

1.2.Industrialization and Industrial Revolution

Industrialization in its definition is a shift of an agrarian society to a production based industrial economy for the manufacturing purpose. Mass production of goods and infrastructure takes place for providing goods and services to businesses and individuals. Employment opportunities for workers, growing markets and economy are characteristics of a newly industrializing economy.

The first industrial shift in economy and production took place in mid-18th century to 19th century in parts of Europe and North America is called the Industrial Revolution. Mode of production shifted from hand-production to water and steam powered machines.

1.3.Key features of Industrial Revolution

Growth in Economy- Technological advancements and mechanization meant faster and more economic ways of mass production of consumer goods. This led to an exponential and rapid growth in economy.

Urbanization- New industries in and around urban centers meant more employment opportunities and the promise of improved lifestyle. This attracted the rural populous to the cities in vast numbers, this shift of rural to urban population is called urbanization.

Transportation- Railroad, and roadway system of transportations saw immense development during this era owing to technological advancements, and as a means of transporting produced goods in cheapest and fastest ways.

There were however widely criticized negative effects of Industrial revolution in Europe and North America. Overcrowding due to rapid growth in population, poor living conditions, poor working conditions in factories, and child labour are to cover to cover a few ill effects of Industrial revolution.

1.4.Industrial Revolution Effects in India/ De-industrialization

Before the industrial revolution, international markets were dominated with Indian silk and cotton goods. However during the industrial revolution in mid-18th to early 19th century, the rising power and spread of textile industries in Europe dominated world markets. For industrialization to flourish in these countries there was need of cheap labour and raw material, which eventually led to the beginning of colonization. As the west industrialized their textile production, there was a dramatic fall in exports from India.

Traditionally weaved textile from India despite this was in demand in European countries, and by the end of end of 18th century East India company established political and economic power over the tradition weavers' villages. The weavers were exploited by being paid less wages, controlled distribution of goods and being tethered to East India Company by loans. Indian exported textile in Europe was charged with taxes and at the same time European textiles were forced in Indian markets for cheaper prices. While India had been exporting textiles up to 33 percent in 1810s, by the end 1870s it was importing 50 percent cotton goods.

Industrial revolution in the west thus led to the downfall of the textile industry in India often referred to as **'De-industrialization'**.

1.5.Industrialization in India

In the newly powerful industrial centers such as Bombay and Calcutta Indian merchants who had made fortune on trades to China started establishing new textile industries in the mid-19th century. The first cotton mills in Bombay and Ahmedabad and Jute Mills in Bengal and Kanpur all started around the 1850s. These mills created job opportunities for workers who came from nearby villages and returned to their villages only for the harvest season. There were long term employed 'jobbers' who exploited these villagers financially to get them employed at the industries. For the first time like in Europe industrialization brought working jobs for women in textile industry. The European agencies in colonial India then concentrated on the tea, coffee, indigo and jute acquisition. Therefore the Indian merchants established textile industries producing cotton yarn rather than fabric and was exported to China so as not to give completion to the Manchester goods in UK.

1.6.Need of Study

Main reason for study of Industries and it's Impacts is to asses the major factor of Environmental Changes in an Urban Area along with all the benefits of Urban Growth. This exercise benefits in redevelopment of Urban Fringe along with the newer areas for construction of industries.

1.7.Aim

To assess Impact of Industries on an Urban Fringe.

1.8.Objectives

- To study current scenario of existing Industrial City Area.
- To Study Government policies for Industrialization Growth
- To Study Environmental Impact of an Industrial area around it's nearby towns/cities.
- To Study Growth of economy and Infrastructure due to Industrial Growth.

1.9.Scope of the Study

- The conclusion of the study is to providing guidelines, framework, and strategies for development of towns around an industrial area and Improve environmental health.
- The parameters for assessing Impact of Industries like economic growth, growth in Infrastructure and environmental Impact.

1.10. LIMITATION OF STUDY

The study is limited to specific Industries along with it's Impact on nearby areas.

2. STUDY 1 – Transforming Morbi: from harsh industrial inheritance to a livable urban fabric

2.1.INTRODUCTION

It's the 21st century and industrialization is not only on its peak but beyond it. With China being the world's largest manufacturing country and also the world's largest emitter of CO2 (Lin & Sun, 2009) the air pollution problem within its cities is one of the top environmental concerns (Chan & Yao, 2007). Urban air pollution influences both the health of citizens and development of the cities. (He, Huo & Zang, 2002). In the urban design realm let's call it the livability and the imageability of cities. So, while industrialization has changed the landscape of many of these industrial cities, the deep structure of each of these cities is quite refined. Also, what is crucial to each of these cities is its people-city interaction which seems to be lost in the dusty milieu. Illustrating an example of Beijing (Fig.1) one can see that the cities environment has been disturbed by the toxic gases which is stealing away the right of people to roam around freely without the fear to their health. These toxic gases are released by a number of industries which are heavily reliant on coal burning as way of producing energy (A recent study by University of Leeds also states that "coal burning as origin to Northern China Apocalypse"). In a similar context, India is not far behind.

A particular case of a city called Morbi, in the Gujarat state of India, is taken into consideration for the current research. Gujarat has 33 percent of the large-scale ceramic industries with 55% of the total capacity and 83% of the small-scale units of India with 97% of the total capacity of Small Scale Industries (SSI) units and 80% of the total sanitary units with 75% of the total capacity of ceramic units of India. (Status Report on Sanitary ware, Government of India, 2000). Out of 730 ceramic units of Gujarat, 43% units are in Rajkot district. Morbi, in Rajkot district accounts for 37.33%. This shows a very high degree of concentration of the ceramic units not only in the state, but also in the district. It is considered to be the most important center of modern organized ceramic industry contributing 70% to India's gross ceramic production and 5% of world's needs. One can only imagine the density of industries and the nature of air pollution that occurs in an area of 625 sq.mts. (Fig.2 &3)

Ceramic has been an ancient art that has grown with the human civilization and through the years the manufacturing has led to production of hazardous air. Air pollution abatement has been a constant concern for the ceramic industry over the last four decades. The multiplicity of materials involved, numbering in the hundreds of fluxes and refractories for the manufacture of many different types of glasses and ceramics, results in gaseous as well as particulate matter (Bozsin, 2012).

Specific in the case of Morbi, due to availability of charcoal at a cheaper rate in western India, refractory industries are using charcoal-derived producer gas for kiln and furnace heating, and approximately 126 charcoal-based producer gas units are in operation in Morbi as per a news reported by Times of India in 2013. There have been also many petitions filed by social activists and environmentalist to stop the running of the coal gasifiers as they are polluting the air with toxic gases harming the lives of people, also to stop the dumping of ceramic wastes haphazardly in low lying areas plus to provide for a green belt development around the industries.

Thus, understanding the above scenario that the city is experiencing, this research really is a call to arms to Landscape Designers, Environment Planners and Urban Designers to strategize the way we build human environments in industrial cities with grave environmental problems. And to create sustainable communities with balanced and harmonious built environment.

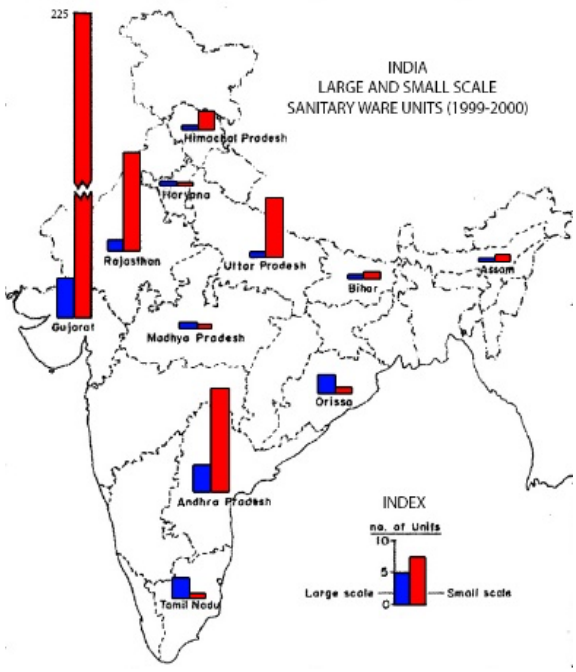


Fig. 2. Ceramic Industry Density in India

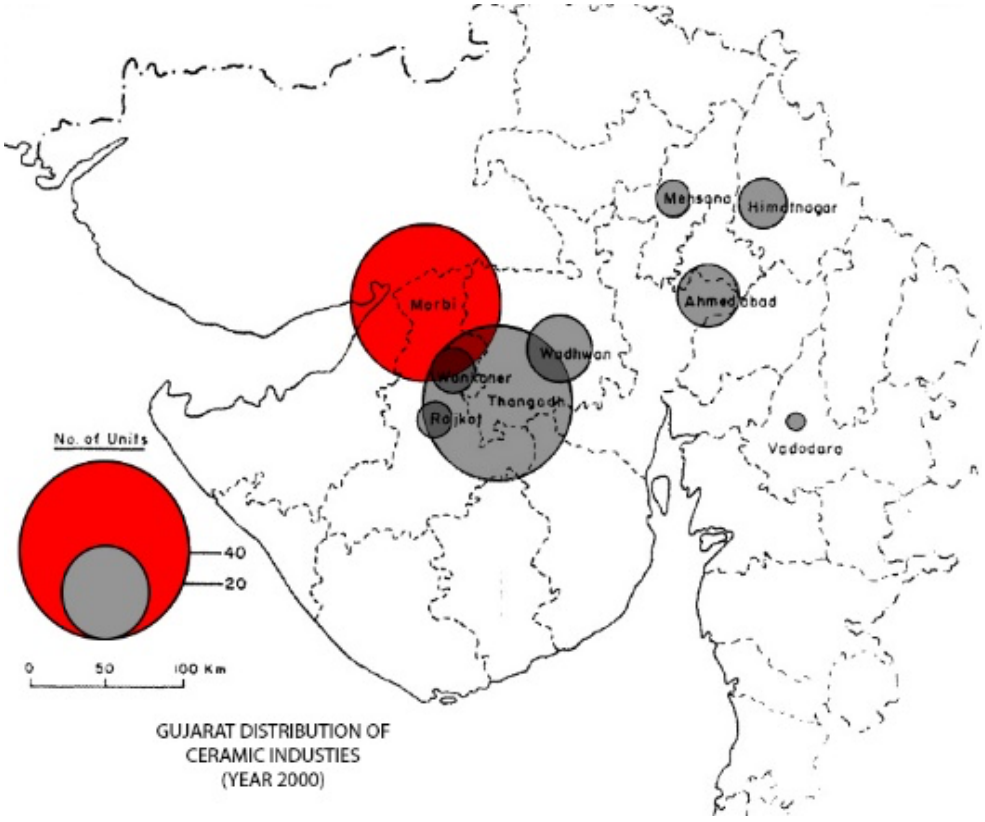


Fig. 3. Ceramic Industry distribution in Gujarat State.

2.2.INTRODUCTION TO SITE

2.2.1. About the City

Morbi, a city and a municipality in Morbi district in the Indian state of Gujarat is about 230 km. from Ahmedabad and about 65 km. from Rajkot. It is situated on the Kathiawar peninsula. (Fig.4) The town

of Morbi is situated on the river Machhu, and is 35 km from the sea. In 2006, the city's population was determined to be 250,000. Its chief products are cotton and grain. The city-state of Morbi and much of the building heritage and town planning is attributed to the administration of Sir Lakhdhiraji Waghji, who ruled from 1922 to 1948. Sir Waghji, like other contemporary rulers of Saurashtra, built roads and a railway network (of seventy miles), connecting Wadhwan with Morbi and the two small ports of Navlakhi and Vavania, for exporting the state's production of salt and cloth. During the British Raj era, Morbi State was one of several princely states governed by the Jadeja dynasty of Rajputs. It was classified as an 11-gun salute state. Morbi-Wankaner Urban Development Authority has come about in the year 2012 for the expansion of the Industrial Belt. (Fig.5)

Fig. 4. Location of Morbi

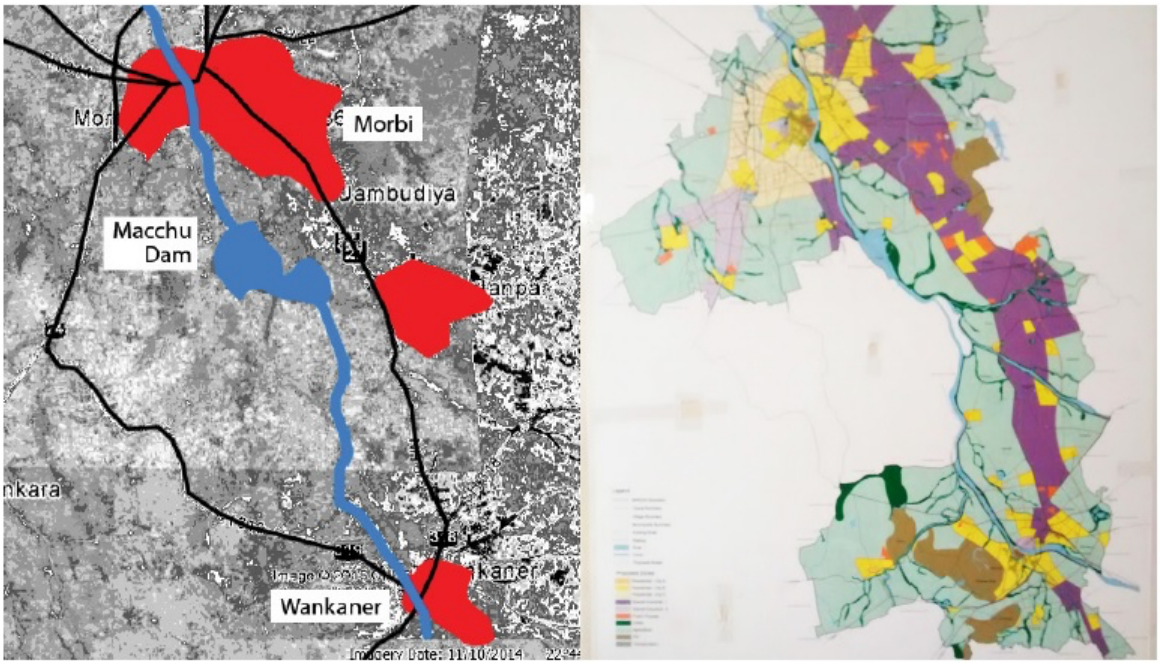


Fig. 5. Existing and Proposed Masterplan of Morbi-Wankaner Urban Development Authority.

2.2.2. History of the City

Morbi at that time was controlled by late Shri Lukhdhirji Bapu in 1925-26, a gentleman from Maharashtra who came with a perception to start a ceramic unit (for roofing tiles). This man was none other than the pioneer Shri Parshuram Canpule and with the help of the state started roofing tiles industry. After this the group never looked back and started stoneware pipe pickle unit, sanitary-ware crockery, glaze tiles and refectories located at Than, Wankaner, Morbi and Sihor and the brand name "Parshuram" has become a household name not only in India but also abroad now today's Morbi still remembers this great man and pays high honor to him for his handwork in up lifting of Morbi, Than

& Wankaner. Without aim and his clear vision Morbi would have never become a big cluster of smash especially in roofing tiles, glazed tiles, sanitary ware & mosaic industries as Morbi develop the diversification side also remain and today. Ajanta & Samay are big names in clock industries today.

Today Morbi proudly owns approximately 150 mosaic industries/200 roofing tiles/100 glazed tiles/50 sanitary wares/6 ceramic cluster units/5 units/2 big clock industries/one big home appliance unit/big cosmetic unit and lots of ancillary units depending upon above Morbi annual turnover is reported to be around 800-900 crores and that in an area of 25 kms x 25 kms the above facts positively indicate the positive thinking of dashing entrepreneurs. There are around 600 ceramic manufacturing units with production worth 40,000 million rupees (4,000 core) annually. Thus, the ceramic and pottery industry of Gujarat has come a long way from its early Indus Valley Civilization to the most modem times by adopting advanced technologies, machineries methods processes, inventions, designs and colors at various stages of production and raw material handling including the marketing of the products.

2.3.SITE STUDY

2.3.1. Livability of the City

For analyzing the livability of the city several maps were generated that would help in developing the understanding of the cities livability. The Topography Map, Soil Map, Geomorphology Map were studied to understand the physiography of the city. Land and Road Classification Map and Socio-Economic Profile of the city was mapped to understand the type of land, population spread and the kind of population of the city. Also, maps were generated to demonstrate and identify Ground level concentration of SPM, Ecologically sensitive areas and areas with land pollution. All these maps help us identify the natural forces that govern the city, the identity of the city through its land and dense network of streets, and finally the effects of all of it on the city.
Some of the inferences are:

2.3.1.1. Land-Use

The left-hand side is primarily residential and the right-hand side is primarily industrial. In between the industries there is wastelands and in between the residential areas there is scrublands. As we can see there are barely any parks for public.

2.3.1.2. Transport and Connectivity

The major road that cuts across the city and is the reason for major industrial development is the NH8A. The roads are divided into primary, secondary and tertiary. The usage pattern of each road on the different banks of the river is different. Mostly trucks and 4-wheelers are found in the right bank and 2-wheeler, rickshaws and cycle on the left-hand side of the bank.

2.3.1.3. Socio-Economic Profile

Most of the richer class says south of the city and the lower income group are present in the center and north. In the industrial side the large-scale industries are on the north, whereas the small-scale industries are south. The Socio-economic profile has been mapped based on characteristic such as

plot sizes, sizes of house, character of house and quality of roads, size of industries will help identify the kind and quality of intervention.

2.3.1.4. Air Pollution Concern

The ground level SPM map shows that the area of most concern is situated in the North of the Industries. Apart from this, referring to the National Ambient Air Quality Standards (Central Pollution Control Board 2009) the requirement for PM10 (Particulate matter 10) is 60µg/m3 for industrial area. But according to an EIA (Environment Impact Assessment) report by M/S T.R. Associates for a proposed ceramic industry which is centrally located in the city, the PM10 count recorded by them is 75µg/m3, which is 15µg/m3 higher than the standard.

2.3.1.5. Degrading Vegetation Concern

The vegetation of the region is Open-Scrub type, but within the empty pockets of residential neighborhoods, one would find degraded scrublands with almost no vegetation. Also, amongst the empty pockets within the industries are wastelands that have over the years been dumped by a lot of ceramic wastes, rendering the land to be unusable.

2.3.1.6. Land Pollution Concern

Talking about land pollution, the land in and around the industrial areas is quarried for sand and clay, leaving them to become stagnant ponds of water post monsoon, that then breed mosquitoes. Also, the fired ceramic wastes are dumped haphazardly, which is harmful for the land as they are non-biodegradable.

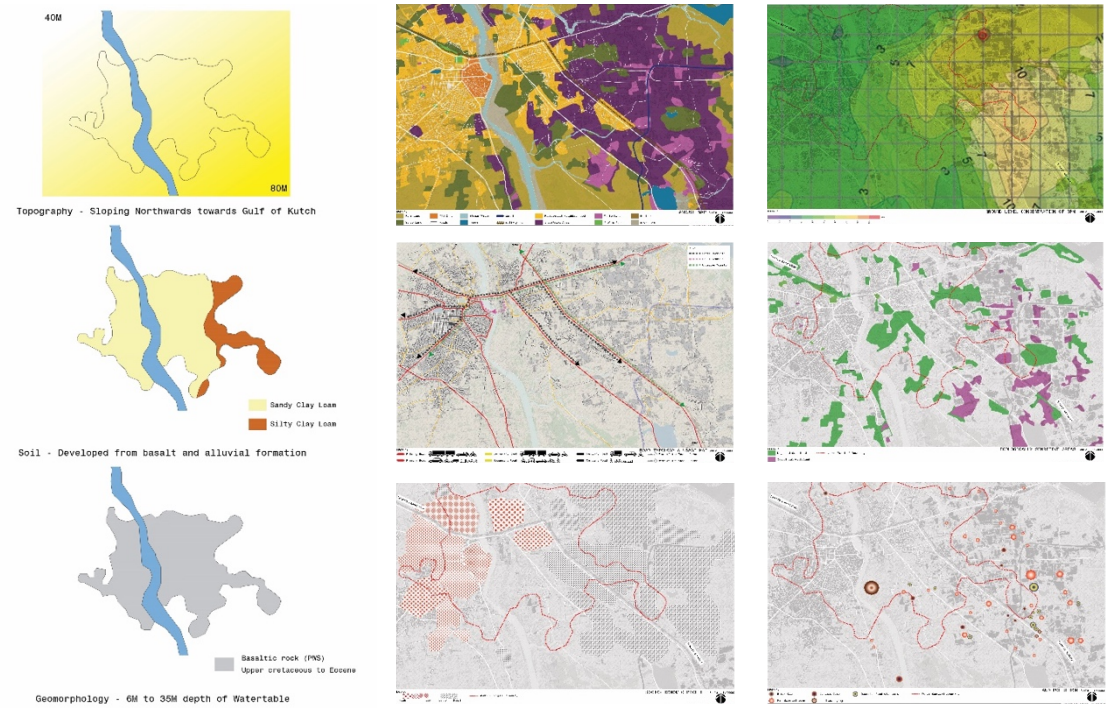


Fig. 6. Maps generated to understand the livability of Morbi.

2.3.2. Image ability of the City

To be able to select a site for designing that encounters most of the problems that a ceramic city would face we would need to identify the problematic areas. To do so, above we have mapped the livability aspect. Overlaying the above maps with road typology, possible inactive or ecologically dead streets, with a matrix of diverse land uses have been selected. The path identified in green is an anticipated green trial one would take through the city. (Fig. 7) I have used my perception of the physical elements that have scope for ecological development along with the socioeconomic forces at play within each area of the city through the specific streetscapes in order to categorize them into street typologies which are:

- Industries: commercial areas: dumping areas
- Heritage: cross-over bridge: statues: riverside: industries
- Economic weaker section: railway station: scrublands
- Low income residence: heritage: market area: compact
- Medium income residence: farming areas
- High income residence: commercial areas: compact

One can conclude that the industrial areas have problems such as quarrying of soil, dumping of raw materials, expanse of underutilized spaces and lack of trees. Also, the area near the railway is sparse and underutilized. The residential area is very compact and to human scale with no footpath and lack of trees.

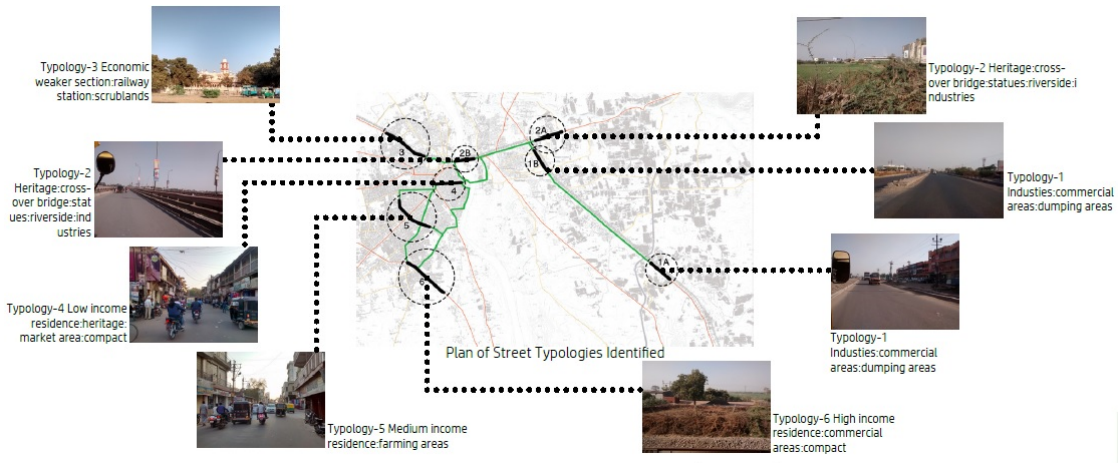


Fig. 7. Street Classification Map.

2.4. Design Approach

If we now create checklist of all that we have understood about the city and compare it with the major domains of urban planning theories i.e. social, economic, environmental and design, for a sustainable neighborhood we notice that Morbi lacks civic spaces, needs to restore its cultural heritage, have ecological protection, green spaces and green infrastructure. (Fig. 8)

Now the question arises as to how to answer these flaws in the design of the city of Morbi. Having been reading about importance of streets, I came across this very pivotal thought, which will now guide my research further.

"If we can develop and design streets so that they are wonderful, fulfilling places to be – community-building places, attractive for all people – then we will have successfully designed about one-third of the city directly and will have had an immense impact on the rest."

Allan Jacobs

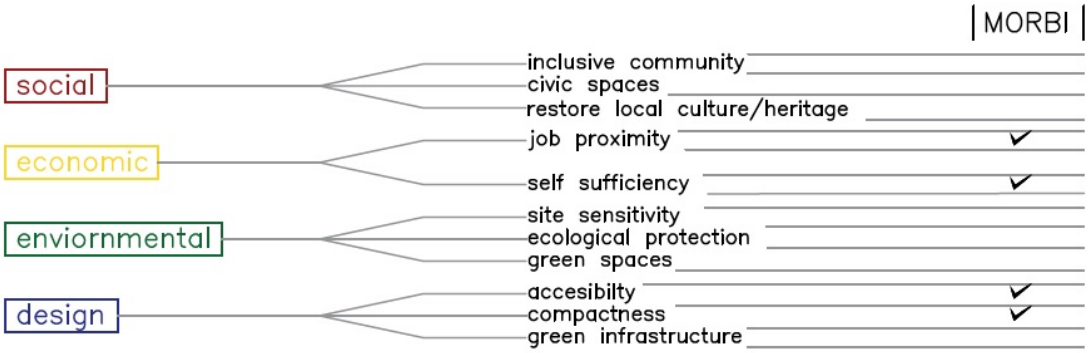


Fig. 8. City Systems Chart for Morbi

Streets are often the most vital, yet underutilized public spaces in cities. 80% of the urban open space of Morbi is in the form of streets. It is rightly said that if we transform streets, we will transform 1/3rd of the city. As the physical aspects of a city greatly contribute to its perception by visitors and inhabitants alike. When moving through a city through its streets – be it on foot or in a car – elements of the urban landscape stand out in different ways to different people, and that is what creates a mental 'image 'in our minds that stays with us. For an inhabitant who knows the city, or a visitor who is new there, the perceived image is a combination of the physical qualities and the socio-economic indicators of those qualities. Kevin Lynch defines the elements which contribute to the image of any city – paths, edges, districts, landmarks, and nodes in which path is what we tread on. Also after understanding green streets, these streets which not only will enhance the imageability, but also the livability. For the current scenario of Morbi, the design should be able to attempt to cater to 2 typologies:

2.4.1. Industrial Street:

Source of air pollution: Vision for Industrial area - Let not the industrial areas of the city be unexplored. Allow for the natural systems to coexist so as to keep the rest of the city resilient from pollution. (Fig. 9)

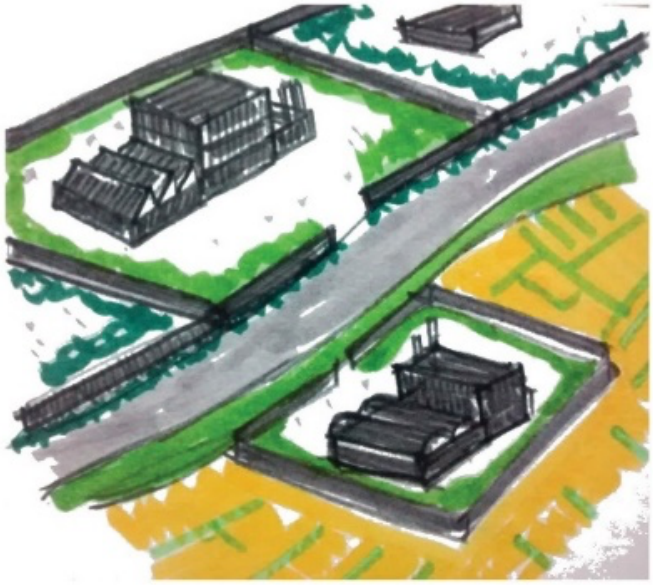


Fig. 9. Vision for Industrial Area

2.4.2. Residential Street near Industrial Area:

Impact of air pollution: Vision for Residential area - Expand the areas tree canopy and public gardens on public underutilised lands, degraded scrublands as well as private lands. As well as add interesting landscape features on public streets for an active visual experience. (Fig. 10)

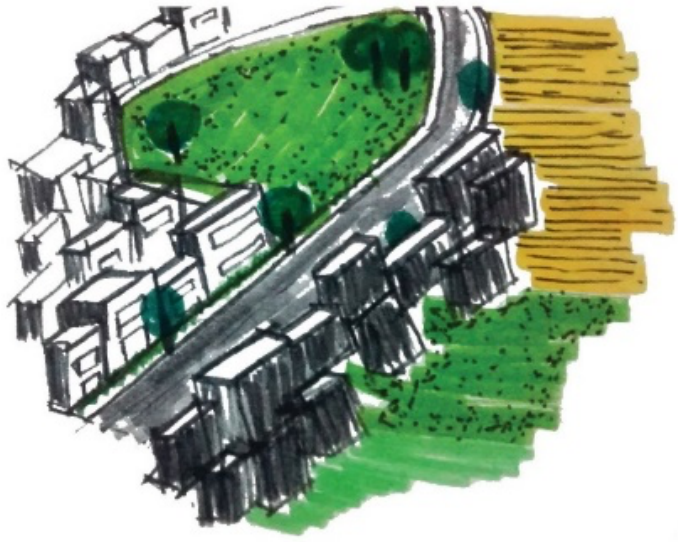


Fig. 10. Vision for Residential Area

Ultimately transforming Morbi from harsh industrial inheritance to a livable urban fabric.

2.5.CONCLUSION AND WAYFORWARD

It surprising to know that no kind of in-situ planning or design solution has been thought of for industrial cities. Especially as they reek of all kinds of pollution evils. One can only imagine the life of people who reside in such cities. In brief, Industrial cities redesign is important for the future of the city as whole. Not just for its economic contribution. But also, social, environmental and aesthetics.

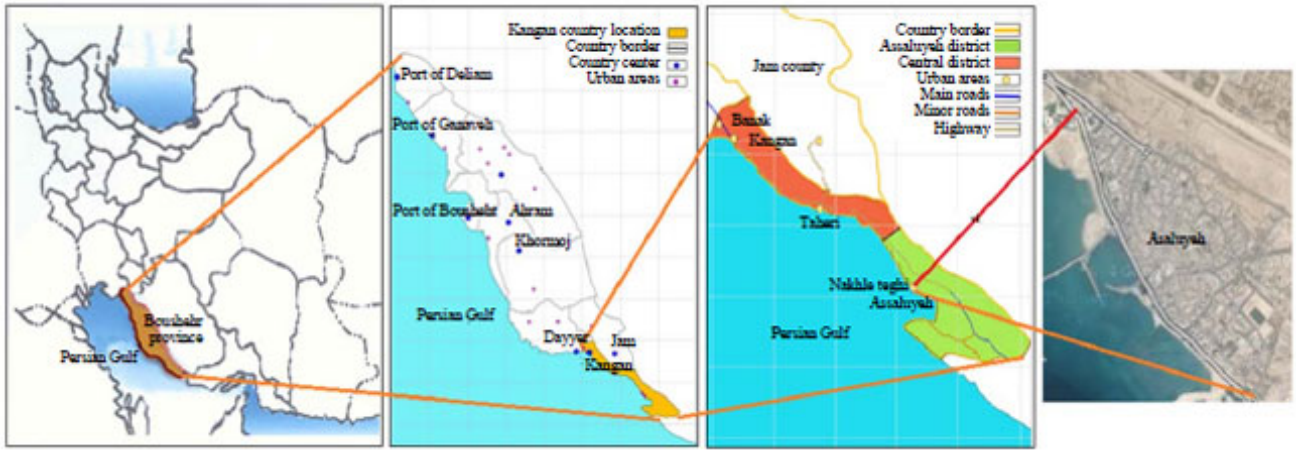
And in conclusion we have presented two distinct strategies for the city of Morbi, redesigning streets in industrial and residential areas and converting them into green streamers that run throughout the city, which not just help to raise the aesthetic but also ecologically benefit the city. The root of this solution has been derived from urban planning strategies involving connected open space systems. And to affirm this approach of retrieving an industrial city, one should reclaim its people and land with environment centric approaches.

3. STUDY 2 – Assessing Impact of Industrialization on Urban Expansion in Surrounding Cities (Case Study: Assalouyeh, Iran)

3.1.INTRODUCTION

Urban expansion in Iran has always been based on industrial development and therefore a major part of the problems concerning the site selection and establishment of industries around the cities are related to the process of industrialization and urbanization in this country (Moallemi, 2003). In Iran, the natural resources of oil and gas in many areas, has provided the basis for the development of industrial structures and industrial centers in those areas (Anbari and Mallaki, 2011). Political and economic decisions of governments regarding the creation of industrial zones can also have either positive or negative consequences for surrounding towns and villages (Rezaei, 2005). Meanwhile, the physical effects of development of South Pars Special Zone, as the most important and the largest energy project in Iran are largely ignored.

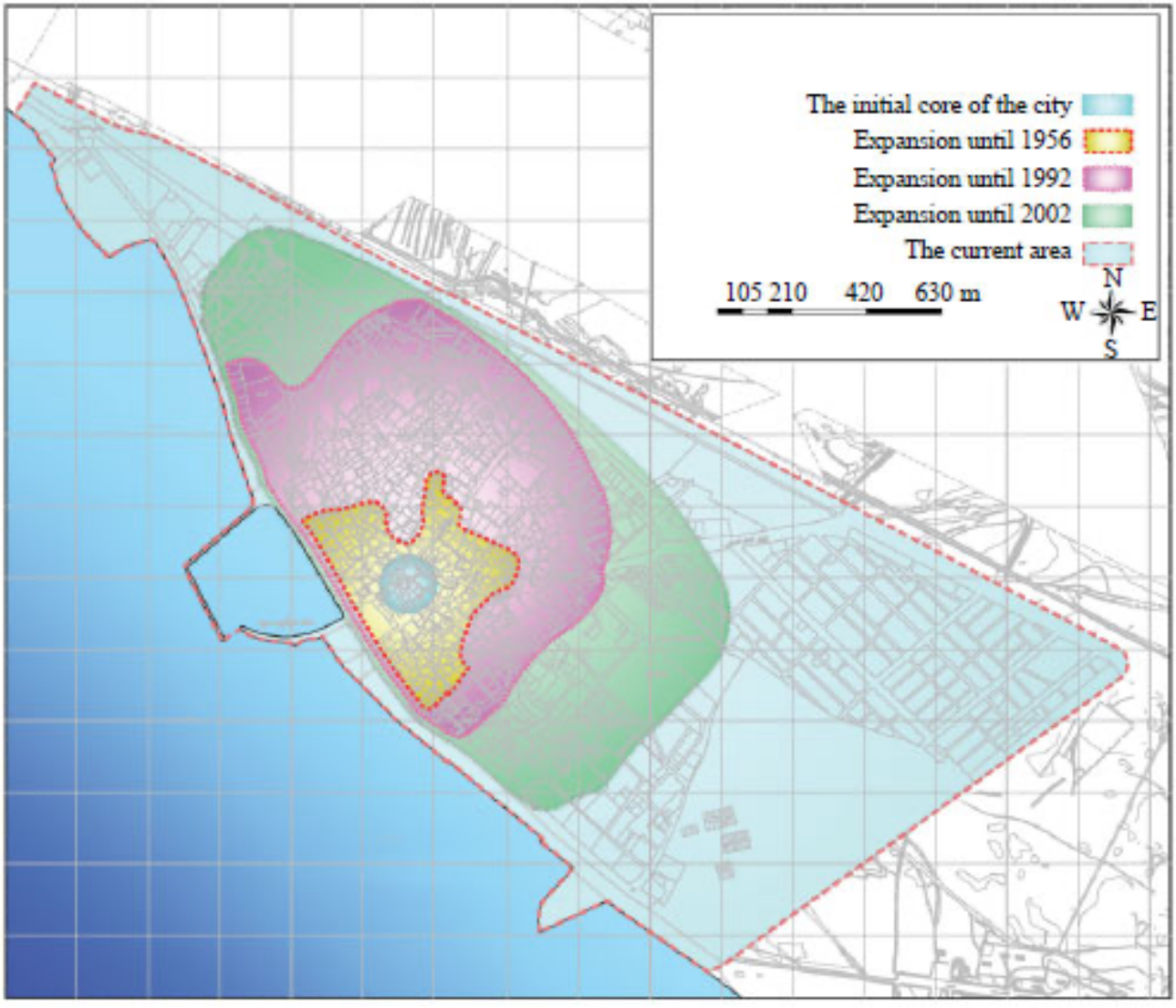
In recent years, the creation of South Pars Special Zone as a regional and national growth pole and the establishment of various operation units in that area have paved the way for the rapid development and expansion of Assalouyeh (Mallaki, 2009). After the foundation and development of South Pars Special Economic Energy Zone in 1998 and unprecedented increase of domestic and foreign investment in the gas industry, petrochemical and related industries (PSEEZ., 2015), which meant the creation of a growth pole with a focus on energy, this area experienced an extraordinary rate of expansion. Assessing the physical impacts of this expansion on surrounding areas is an important issue that will be addressed in this study.



Location of Assalouyeh

3.1.1. The main features of the South Pars Special Economic Energy Zone that led to its selection as industrial growth pole include:

- Proximity to South Pars gas field shared with Qatar
- Coast of this region is suitable for building docks and harbors necessary for the development of maritime activities, which themselves are prerequisite for other industrial and commercial activities.
- Apart from some small population centers with traditional activities (fishing and limited trading) there is no major activity in this area that can be regarded as inconsistent with growth pole development plans.



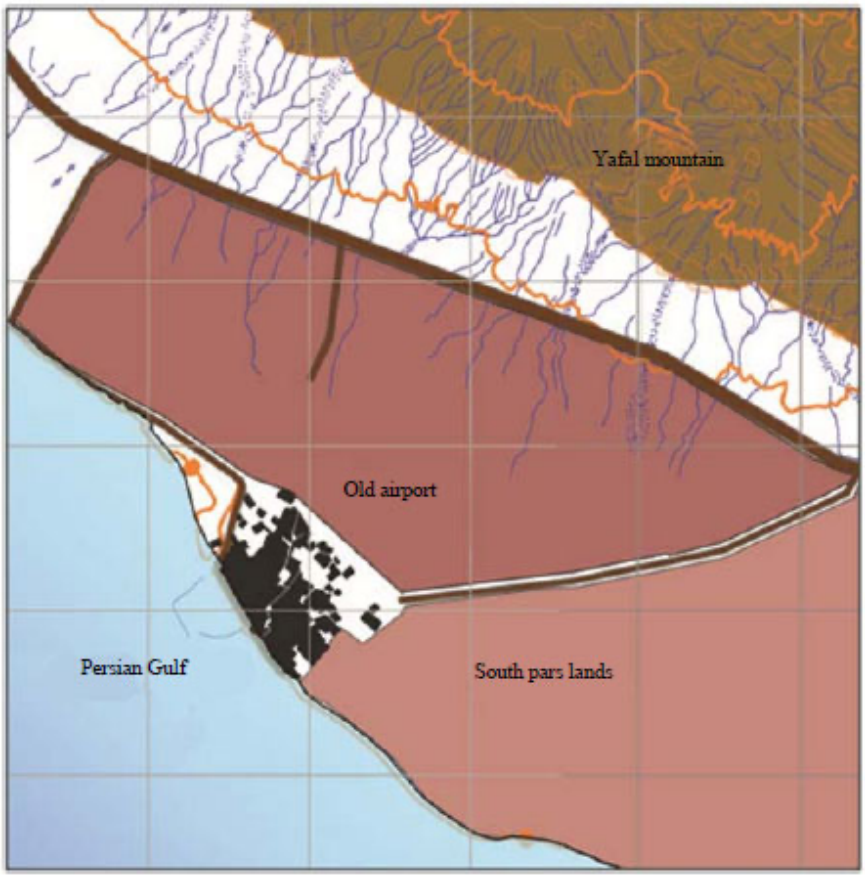
Stages of urban expansion in Assalouyeh from 1956-2011

3.2.Physical structure of assalouyeh city:

The city of Assalouyeh is comprised of 2 districts and 5 urban neighborhoods. District 1 includes neighborhoods 1, 2 and 3 and has 150.75 ha in area.

3.2.1. Industrial Street:

Source of air pollution: Vision for Industrial area - Let not the industrial areas of the city be unexplored. Allow for the natural systems to coexist so as to keep the rest of the city resilient from pollution.



Main barriers obstructing the physical expansion of Assalouyeh city

3.3.DISCUSSION

As mentioned in the introduction, many studies have been done on the effects of industrialization on geographical areas that a little Part of them is related to the physical and spatial effects. For this reason, we want to compare the results of this study are composed with the results of similar studies in terms of these effects.

The results of this study also showed that South Pars Special Zone adjacent to the city of Assaluyeh from the East has two major effects were:

- The creation of spatial limitations for the future development of Assalouyeh
- Constraints in the process of realization of the recommendations of the comprehensive plan

3.4.CONCLUSION

As conclusion of this study, the South Pars Special Zone has affected the physical development of Assalouyeh both directly and indirectly. Its direct impacts include the purchase of lands from local inhabitants and the change in their landuse and the spread of South Pars Special Zone territory over legal territory of Assalouyeh city, which disrupts the development implementation of a comprehensive plan and improving infrastructure, facilities and utilities for this city. Indirect impacts also include an increase in the population of Assalouyeh due to immigration, creation of workers settlements and change in the land prices, which create major housing problems for the local people, creation of urban sprawl, undermining and changing the function of streets and urban crossings and disrupt the normal flow of real estate market.