

Landscapes of Resistance: Ecology and Economy in the VVSR

ANEERUDHA PAUL, GEORGE J JACOB

Abstract

This paper would like to explore the landscapes in the periphery of the Mumbai Metropolitan Region, in Vasai-Virar, where communities are involved in farming and fishing. They engage in producing flowers, vegetables, fruits and fish, sold in local markets throughout Mumbai. Farmers in this region organise their livelihood within small individual landholdings in the form of farmhouses that are completely dependent on decentralised systems of ponds and lakes for water to irrigate their lands; while the fishing community organises themselves as cooperative societies that own boats, land for drying and net weaving and other supporting infrastructure. The interdependency that communities, the geography, their livelihoods are set in, forms an important argument in this paper.

The local authority—the Vasai-Virar Municipality, has designated these land parcels as plantation zones to protect them from exploitation and safeguard the area from flooding and other disasters. The MMRDA prepares the regional plan for the metropolitan region; the current plan has designated lands, earlier protected under the plantation zone, to be replaced by zones where new forms of urbanisation financed by intense global capital can be encouraged. The plan prepared by the authorities is unable to recognise these numerous small scale entrepreneurial farm activities as being productive, whose existence needs to be encouraged in our cities.

While the resistance by the community continues, this paper would like to support their ongoing agitation by documenting the productivity of these landscapes. Over the years, this area of over 75 sq km has

evolved into a complex ecological system comprising farmlands, lakes, ponds, backwaters and mangroves. With the dwindling of agricultural activities due to lack of support by authorities, this paper would like to make a case for their continued existence and for similar productive landscapes to create a resilient urban framework for Mumbai and the metropolitan region.

Introducing the Plantation Zone; History and Ecology

The topography of the metropolitan region of Mumbai is characterised by a thin strip of the coastal plain in the west, with the sensitive ecological ranges of the Western Ghats rising sharply in the east. Endowed with a naturally sheltered harbour, fertile land, this region historically developed into the most favoured destination for trade and agriculture. The location of the region eased trade between the western coast and the mainland. The presence of Buddhist caves and, stupas; followed by Mughal, Portuguese and Maratha forts, indicates this region's strategic importance. The area under consideration in this study is the coastal belt of the Vasai Virar sub-region (VVSR). The VVSR now forms a periphery of the Mumbai metropolitan region (Figure 1). Documented history and archaeological remains of this region indicate the Mughals, Portuguese, Marathas, and British influence. Earlier during the Ashokan Times, the region was known as Sopara, while the Portuguese renamed it Bassein, shifting the port down south at the mouth of the River Vaitarna. The Marathas defeated the Portuguese in 1818. It is later that the British established the Mumbai port south of Bassein, thus the region losing its importance as a port for trade.

This region's coastal belt, called the plantation zone, is a thin 5km strip of fertile alluvial soil primarily engaged in multi-crop

production. This thin coastal strip is interjected with inland creeks and mangroves used for inland fishing. The belt is also characterised by water bodies that historically were the primary water source for drinking and agriculture. On the east of this fertile coastal belt are the low-lying mudflats and salt pans.¹ Some of these mudflats are used for rice cultivation during the monsoon, but currently, most of them are being reclaimed by builders and developers to build new townships. To the east of this land lies the rapidly developing urbanizable zone, which connects to the city of Mumbai via the western suburban railway line.

The coastal region comprises agricultural settlements, inter-tidal zones, mudflat and salt pans continuing to be rich in agricultural produce (presently vegetables and flowers) and fish, both coastal and inland variety. In this zone, the agricultural settlements are organised as gaothans or as clusters of farmhouses outside the gaothans. The fishing settlements are adjacent to the coast, with sheltered spaces for boats. The farming and fishing (Kolis) communities, the original inhabitants, continue to reside and operate in the region. The East Indian Christians and Hindus are the predominant communities in this region. Among the fishing community, there are also the Mangela Kolis, who are a sub-caste, and identify themselves independently of other communities. While the market settlements like Sopara, show a good prominence in Muslim Trading Communities, the region also has a good share of tribal communities predominantly employed as labour in construction sites while few are engaged in farming and fishing activities.

¹ IN HISTORY, IT IS RECORDED THAT THE PRIMARY CROP GROWN IN THIS REGION WAS RICE (GAZETTEER 1882), WHICH WAS THEN PROFITABLE.

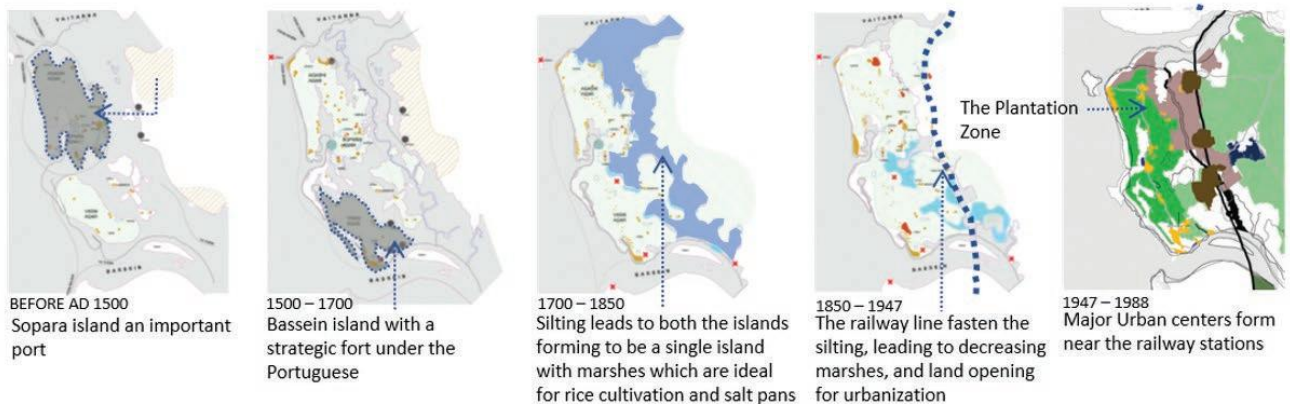
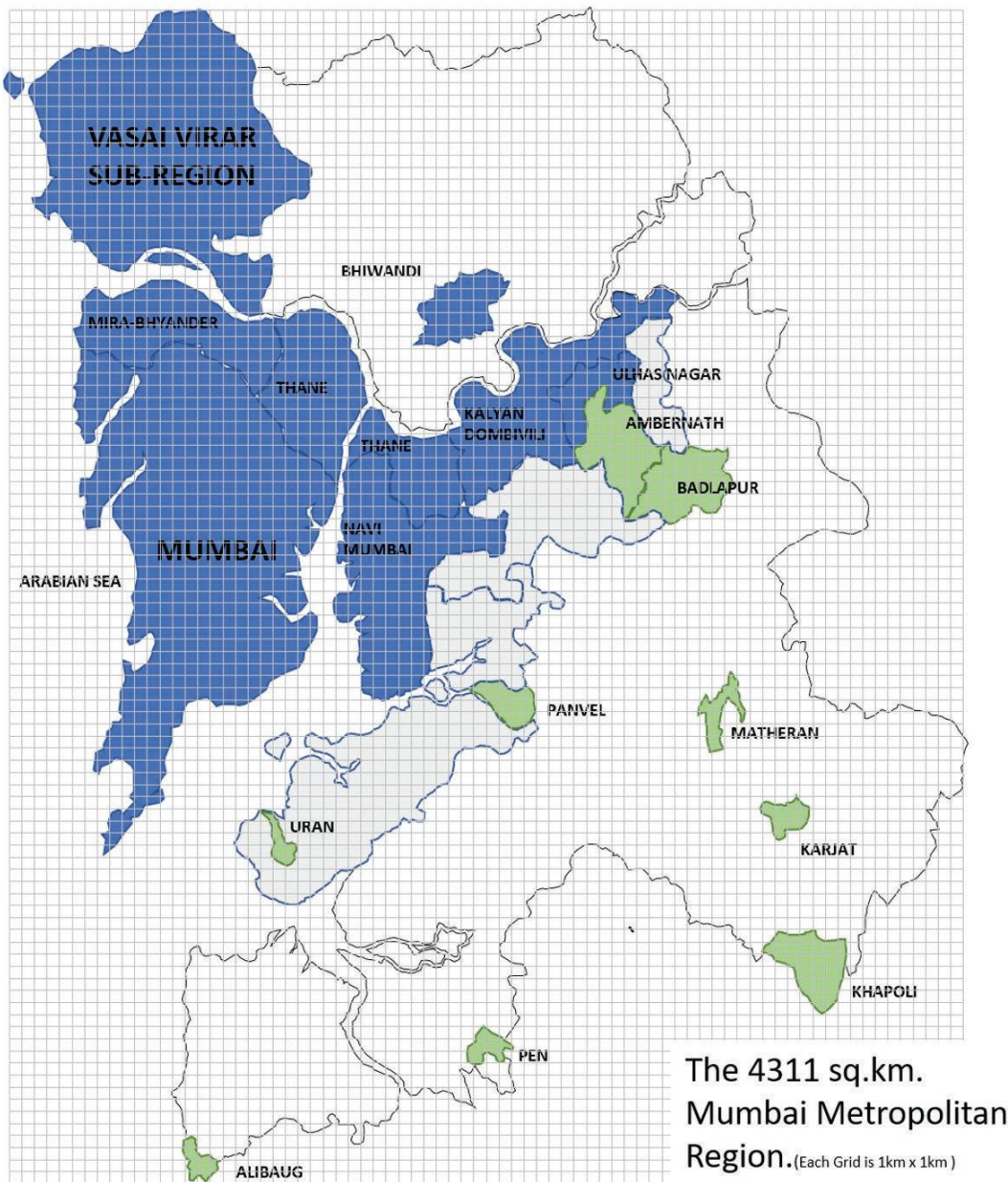


FIGURE 1—HISTORICAL AND ECOLOGICAL EVOLUTION OF VVSR

“This zone witnesses a large internal migration in search of affordable housing due to real estate values in Mumbai and its suburbs.”

Historically the region has been known for its agricultural produce comprising grains, fruits, predominantly bananas and coconuts, vegetables and flowers. Farmers sell the produce in the local market, as well as in markets in Mumbai city. The produce is highly-priced and popular in the city because it is cultivated with minimal use of fertilisers and pesticides. However, in recent times farmers have started introducing pesticides as incidences of crops being infested are on the rise. The locals attribute this to the increasing urbanisation in the region, which has taken a toll on groundwater quality and, subsequently, soil fertility. This has also hit the inland fishing activities, especially fishing in the estuary, where certain fish species have ceased to exist anymore. The fish catch along the coast of this region is substantial, the majority of which is exported or sent to Mumbai.

As stated earlier, the eastern edge of the plantation zone is the urbanizable zone inhabited by the middle-class community who primarily work in Mumbai. This zone witnesses a large internal migration in search of affordable housing due to real estate values in Mumbai and its suburbs. There is a large amount of speculative housing development by private builders, developers, and government housing agencies to cater to these demands. There are typological variations from medium-sized group housing schemes by small and medium-sized private developers to larger, city-scale private development of infrastructure, with exclusive amenities like clubhouses, entertainment parks, international schools, etc., where large and gated housing projects are being conceived. These projects lure people with the peace of suburban life in landscaped environments that are artificially constructed in already established sensitive ecosystems. Simultaneously on the eastern fringes of the urbanizable zone, along the Western Express Highway, are small developers who convert agricultural land for non-agricultural purposes, sub-plotting them to be sold to new immigrants in the region, developing huge swaths of informal housing.

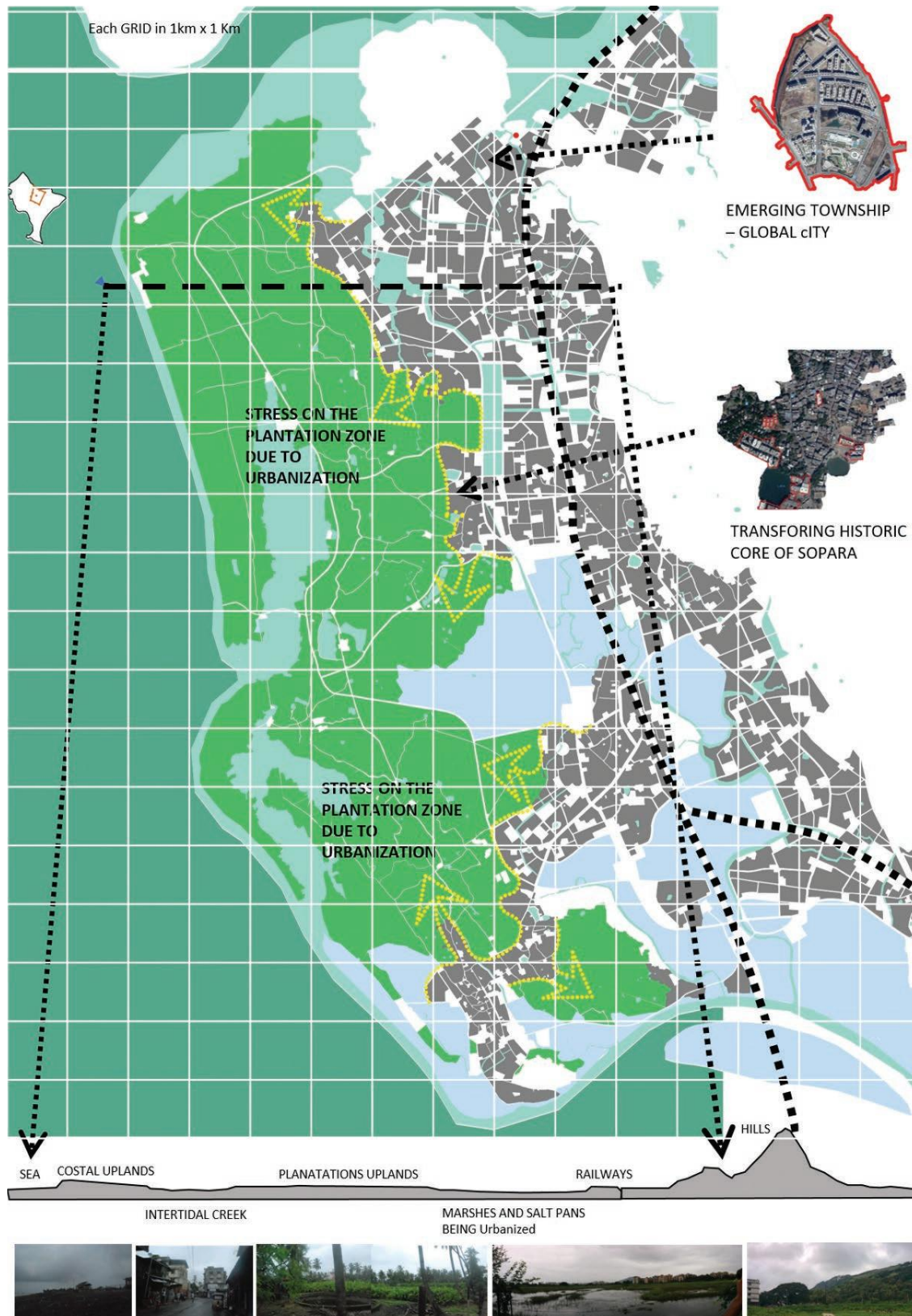


FIGURE 2—THE RELATIONSHIP OF THE PLANTATION ZONE AND THE URBANIZABLE ZONE

While the development in this region has happened at a phenomenal pace, the infrastructure, especially water, has not been augmented. This has put immense pressure on the groundwater source of the plantation zone, where both quality and quantity is fast depleting. In addition, there has always been a constant attempt made by the local planning authorities to reduce the boundary of the plantation zone and urbanise it. The local community of farmers has resisted this move as a threat to their livelihood. Over three decades, the inhabitants, earlier organised as gram panchayats, have resisted moves by urban local bodies and state urban development authorities to include them within the jurisdiction of the municipal corporation. Recently in a long-drawn judiciary battle, some of the villages have been incorporated in the municipal corporation area. However, fortunately for the local community, the municipal corporation's development plan recognises this area as the plantation zone, which has separate development control regulations from the urbanizable zone. Figure 2 shows the relationship of the various zones of the Vasai Virar sub-region and their relationship.

Livelihood and Ecology

In this background, this paper would try to map the existing livelihood of the region, its relationship to ecology, and the present nature of transformation that such activities are undergoing. The plantation zone seems to be spatially layered into four types of settlement fabrics associated with different livelihood activities. The first layer runs along the state highway and other parallel north to south links and has houses with farms adjacent to them. The houses with farms ranging from three acres to a quarter of an acre grow vegetables, flowers and fruits through the year.

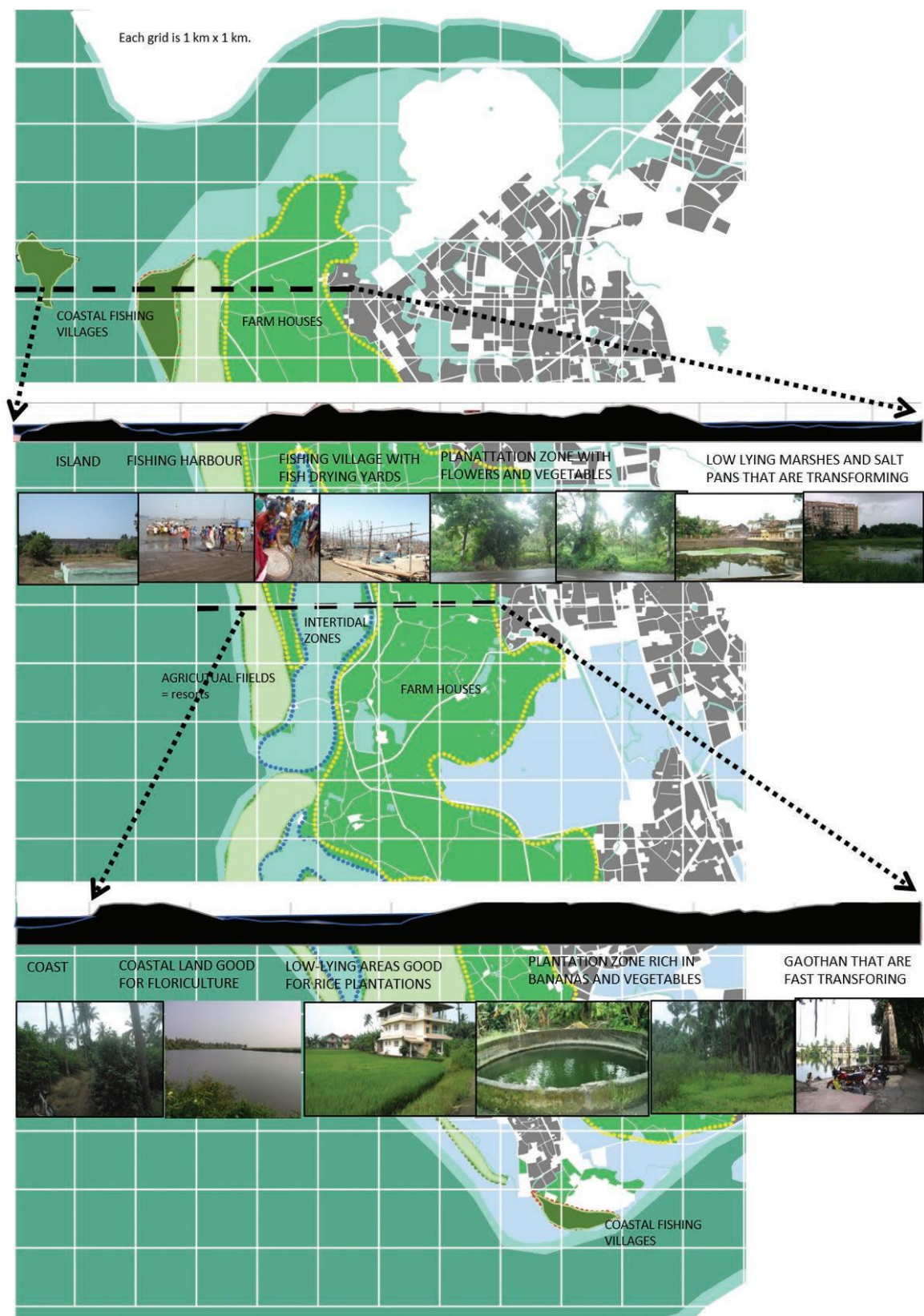


FIGURE 3—THE SECTION OF THE RICH ECOSYSTEM FOUND IN THE PLANTATION ZONE

“Due to the over-dependence of the urbanizable zone on the water of the agricultural zone, the groundwater conditions have deteriorated.”

Over the years, these farms have been divided and subdivided as the family grew, reducing the effective acreage per family. Off the main streets, it is observed that there are bigger holdings of contiguous agricultural land. Most of these houses attached to farmland have water bodies known as ‘baukhals’ used to irrigate the fields. There are some agricultural fields which are dependent on village lakes and ponds. The complete plantation zone of the Vasai Virar sub-region has a population of two hundred thousand, which does not depend on piped water but these networks of lakes, ponds, and ‘baukhals’ that can provide sufficient water for drinking and agriculture. Due to the over-dependence of the urbanizable zone on the water of the agricultural zone, the groundwater conditions have deteriorated.

Historically, these settlements were organised either as gaothans with the church, school, markets, etc., often heritage in character and the centre of activity or as houses built by subdividing agricultural fields. However, in recent years, this part of the plantation zone has seen many speculative development cases of bungalow housing schemes through a similar process of sub-dividing agricultural fields.

The second type of settlement fabric observed is concentrated with houses clusters and the agricultural fields at a distance. The agricultural holding in such cases might be larger. This area is extremely rich in horticulture and floriculture. In some belts where the fields do not retain any water, there is a predominance of horticulture, as the returns from this are more. These agricultural plots have wells and water bodies to serve their water requirements. This fabric is observed behind the belt of the coast. However even these areas are slowly transforming with houses being built within the agricultural plots. It has seen a mushrooming of many coastal resorts, restaurants, primarily for recreation tourism, catering to Mumbai and its surrounding

people. While some of the resorts belong to locals, a lot of them belong to outsiders. This type of tourism has negative implications for this area as they pollute the area with noise, garbage, sewage, etc. Apart from using groundwater of this region to maintain exclusive swimming pools.

On a positive note, there are isolated cases of agro-tourism attempts that have been made by entrepreneurial families. What remains a paradox is that while there is an immense potential in this zone for heritage tourism, eco-tourism and agro-tourism, such possibilities have seldom been encouraged by the government authorities.

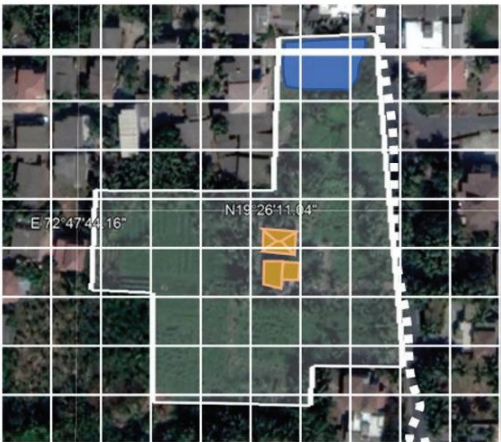
In both the cases of settlement fabrics, a study of agricultural families (Figure 3,4,5 and 6) has been conducted to understand the nature of their present livelihoods. One type has been that of the farmhouse, where the family has a large landholding. The second type is where the house and the agricultural field is separated. Similarly, in this case, families with large and small landholding have been studied.



FIGURE 4—TRANSECT SHOWING CASE-STUDIES OF FARMERS

Mr. Francis Lopez

Size of Plot	3.15 acres
Structure of Family	2 brothers
Estimated Income from Argiculture	INR 3,00,000
Inputs for Agriculture	Labour, Fertilizers and Pesticides
Types of Produce	Coconut



Mr. Vikas Naik

Size of Plot	.5 acres
Structure of Family	Single family where agriculture is not the primary source of income
Estimated Income from Argiculture	INR 2,40,000
Inputs for Agriculture	Labour, Pesticide and Fertilizers
Types of Produce	Hibiscus Planatation, Hibiscus



FIGURE 5—FARMER STUDY: FARMHOUSE TYPE PLANTATION

Mr. Victor D, Britto**Size of Plot**

House Size-1.9 acre, Farm Size-4acre

Structure of Family

4 brothers sharing resources and practicing agriculture together. However agriculture is not the primary income of the family.

Estimated Income from Argiculture

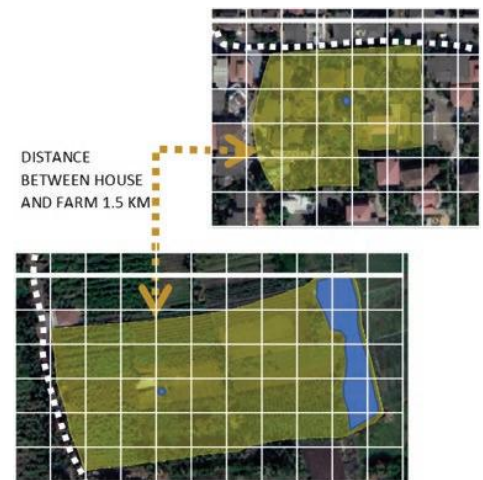
INR 30,00,000

Inputs for Agriculture

Labour, Fertilizers and Pesticides

Types of Produce

Champa, Bananas, Rose



EACH GRID IS 20M X 20M

**Mr. Prakash Kini****Size of Plot**

Farm Size-1acre

Structure of Family

Though there are many brother, they have now separated and the family is involved in agriculture.

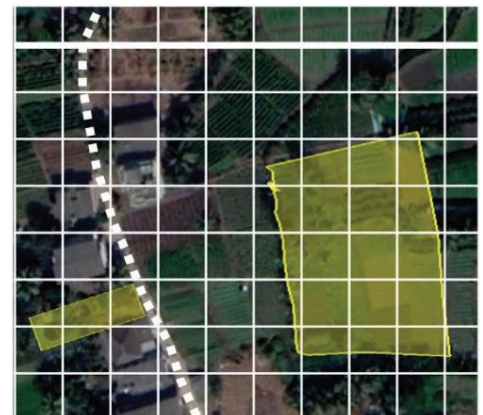
Estimated Income from Argiculture

INR 9,00,000

Inputs for Agriculture

The family members are involved in the farming activity and do not employ any labour, Pesticide and furlizers are bought

EACH GRID IS 20M X 20M



EACH GRID IS 20M X 20M

Types of Produce

Hibiscus, Tulsi Plantation



FIGURE 6—FARMER STUDY: FIELD AND DETACHED HOUSE TYPE PLANTATION

Philip Mustan, Fishermen, Age - 75, Member - Vasai Taluka Masya Mar Sangha

Mode of Fishing Practice

Owens a six cylinder boat, where he goes for fishing with approximately 15 members. One trip in nearly of 10 days, after which the catch is divided in 20 parts. The owner of the boat gets 4 parts and the rest one part each goes to the other members. Each trip require fuel, ice and food stock for 10 days amounting to INR 80,000. The earning of each participating member conservatively is INR 2,00,000. For the owner it is 4 times more.

Role of Co-operative Society

The role is limited to being able to procure tax subsidies for fuel. For loans to make capital investments, the National Co-operative Development Corporation does play a role. However the interest rate maybe as high as 14%.

Context and Location of House in Village



THE VASAI FISHING VILLAGE WHERE THE COMMUNITY HAS COLLECTIVE RIGHT OVER LAND (EACH GRID IS 100M X 100M)

Area of Operations



The zone of fishing extends to 125 nautical miles from Vasai to Jafarbad, upto depth of maximum 50 meters



A SIX CYLINDER BOAT

FIGURE 7—FISHING COMMUNITY: STUDY OF THE HOUSE, VILLAGE AND THE FISHING FIELD

The third type of settlements fabric is created by the fishing villages adjacent to sheltered coastlines. These are in the form of clusters, within which there are the settlement areas with houses, fish drying yards, docking area for boats, industrial infrastructure like cold storages, ice factory, auction hall, etc., all owned by fishing cooperative societies. In the case of Vasai fishing village, which is large, it has a boat building and repair facility along with the village. The fishing settlements, unlike in other cases, do not have individual rights over their houses but have collective rights over their settlements, which are protected by laws and regulations as they are recognised as an indigenous community. It must be noted that these indigenous communities conduct coastal fishing as an economic and livelihood activity throughout the country.

Among the fishing community, there are families that are well to do and are a part of groups and cooperatives that own bigger boats that are powered by six cylinders and the others who have smaller boats that have a single cylinder. The cooperatives play a role in providing resources and loans either on a credit or cash basis to the fishing families.

The fourth are areas where inland fishing is practised within intertidal creeks and mangroves. Incidents of inland fishing are also observed in inland lakes and ponds in the plantation zone. Local entrepreneurs and contractors control this activity. This activity is controlled at every stage, from introducing fish seed to feeding and monitoring their growth in the pond that is not much dependent on the vagaries of nature; it is a growing activity in the region.

Mapping the various food produce

This part of the paper would map the region's produce along with the networks associated with them. As stated earlier, this region is rich for its produce in fruits, vegetable, flowers and fish. However, in this paper, we will trace bananas and coconuts that form the majority of fruit produce in the region. Vegetables, flowers, and fish will be studied as independent sets. Figure 8,9, and 10 represent the networks of each of these produces. In some cases, the networks overlap, which have also been represented.

Coconuts - The 20km coast of this region are dotted with coconut plantations. While some of the plantations house resorts, some others are grown around flower and vegetable plantations. Most of these plantations are given in contract to agents who buy the bulk produce from the farmers. Typically, a coconut tree contract might annually cost around INR 800, and an acre of coconut plantation would fetch annually INR 80,000.

Flowers – A variety of flowers grown in this region are sold in the local and city markets in the Mumbai region. The flowers grown in this zone in abundance are rose, mogra, champa and hibiscus. These are grown in farmhouses as well as on agricultural fields. Farmers try to practice horticulture in this zone, as this is a profitable source of income. Some variety like champa and rose can be priced around INR 12,00,000 per acre annually. However, the growth of these flowers is dependent on the nature of the topography, water retention capacity, etc. Like in the case of vegetables, there are local agents who buy the produce and sell it in the markets of Mumbai.

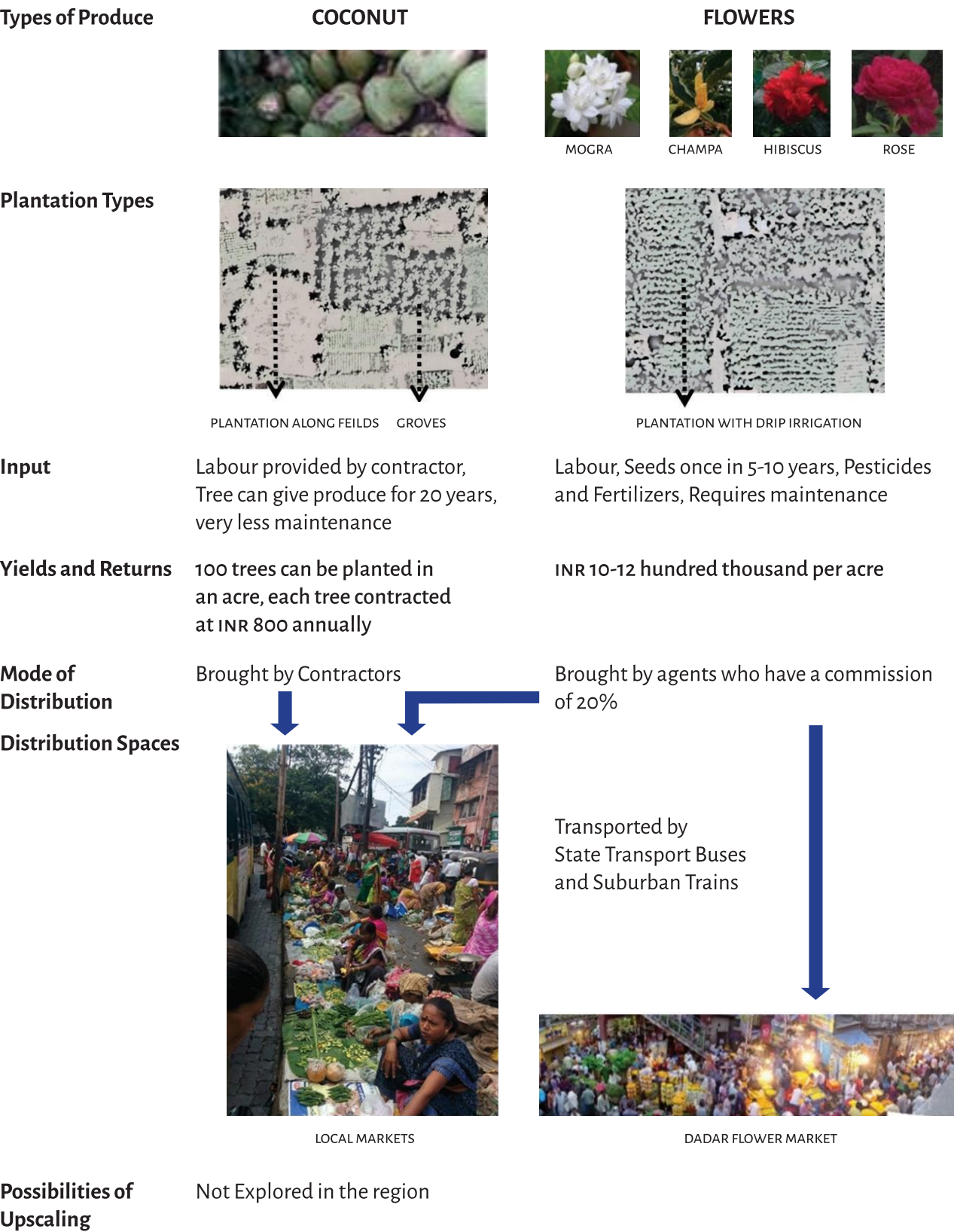


FIGURE 8—PRODUCE STUDY: COCONUTS AND FLOWERS

Types of Produce

BANANAS



BIN BONDH

ALICHI

HAZARI

RAJALI

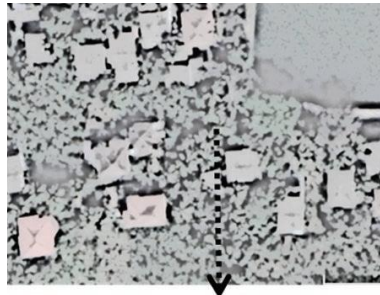
VEGETABLES



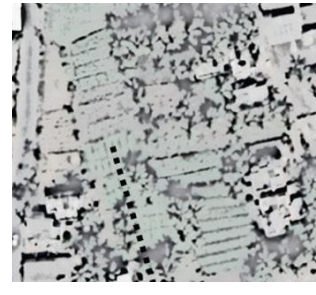
LADIES FINGER

BRINJALS

Plantation Types



BANANA PLANTATION IN FARM HOUSES



LAND USED FOR SEASONAL PLANTATION OF VEGETABLE

Input

Banana sapplings, Fertilizers, Pesticides, Labour, does not require high maintenance

Seeds, Fertilizers, Pesticide and, Labour

Yields and Returns

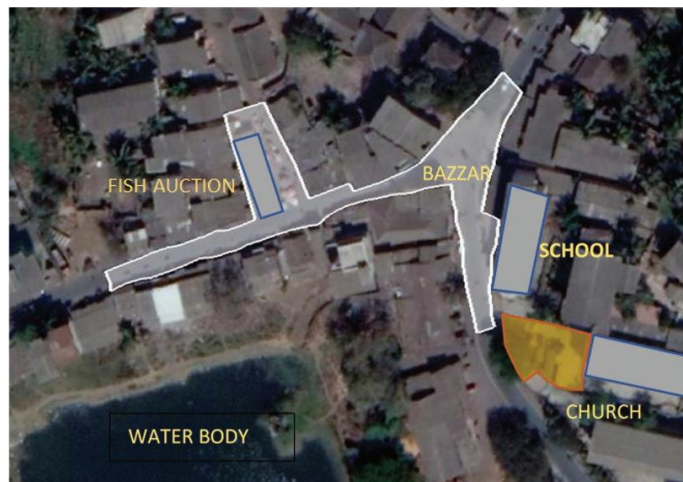
Depending on the variety of bananas yields can vary from INR 4-8 hundred thousand annually

Mode of Distribution

Local Agents buys the produce in the morning and sell it at the city and local market. They have a commission of 20%



Distribution Spaces



Possibilities of Upscaling



SUKHELI (SUN DRIED BANANAS)



BANANA CHIPS

Some of the produce is packaged and sold as organic produce in Mumbai

FIGURE 9—PRODUCE STUDY: BANANAS AND VEGETABLES

Bananas— The region has seen the production of six types of bananas, most of which are indigenous in nature. The bananas are grown abundantly as a part of the house and farm produce. The labour is either employed, at Rs. 200-250 per day, or the family members work on the farms. Over time the dependence on chemical fertilisers and pesticides for these plantations have increased. Through interaction with local farmers, it is understood that they are not dependent on any form of agricultural loans in this region. The agricultural produce is either by local agents or by small retailers.

Depending on the types, these bananas command a premium rate over the regular bananas in the local retail market as well as in Mumbai city. Unripe bananas are used for making bananas chips, which are then packaged and sold in retail markets. The Rajali type of bananas are ripened, sun-dried, packaged and sold. While this was a common practice among families earlier, now only a few families in the plantation zone are still involved.

Vegetables— The plantation zone is known for various vegetables like brinjal, broad beans, black peas, ladies finger, cauliflower, green jackfruits, mango, etc. While some of these vegetables are grown in farms-houses, most of them are grown in agricultural fields. Like in the case of bananas, there has been substantial use of chemical fertilisers and pesticides over the years. Small farmers sell their vegetables directly in local markets or markets in Mumbai city at a premium. Often these vegetables are sold in bulk in local markets in Nirmal, Arnala and Vasai. In the case of big farmers, there are local agents who buy the produce early in the morning, transport it by suburban rail to the city markets of Mumbai. The agents, as claimed by them, earn a commission of 20%. Some organised farms package the vegetables and sell them as organic produce at a premium in Mumbai, where there is a huge demand for health food.

Predominant Types of Produce

COASTAL FISHING



SURMAI



PRAWNS



POMFRET

INLAND FISHING



ROHU



WHITE PRAWNS

Plantation Types



SEA

FISH DRYING GROUNDS



PONDS FOR PRAWN FARMING

Input

Capital expenditure on boat,
Expenditure per trip on fuel, ice, food,
labour, customs fee, etc.

Capital Expenses for pond construction,
Maintaining Aeration Infrastructure,
Fish Feed.

Yields and Returns

**Depending on boat size, each trip
lasting from 6 to 1 days can earn
around INR 75000, 50000, 10000**

One ton of catch per acre

Mode of Distribution

Either Sold by Fisher woman in local
market, Brought by exporters

Brought primarily by exporters, some
sold as local auctions

Distribution Spaces



Possibilities of Upscaling

DRIED FISH, PACKAGED AND EXPORTED

PACKAGED AND EXPORTED

FIGURE 10—PRODUCE STUDY: FISHES, COASTAL AND INLAND

Fish – The primary fishing centres are in the villages of Naigaon, Vasai and Arnala. As stated earlier, fishing is organised as fishing cooperative societies formed by families in the villages. The cooperatives are formed based on communities like Christian Kolis, Hindu Kolis or the Koli Mangela in the case of Arnala.

‘The society provides diesel, ice, nets and storage to members, on a credit basis or in exchange of cash for non-members. This takes care of the initial investment required for a fishing trip, and return is paid when the captured fish is sold in the market. In case of breakage of the ship, the society procures loans from the District Centre Co-operative Bank for needy fishermen on the basis of the records of their case history of business and credibility. Their role also includes the procurement of subsidies for fishing activities from the government. But the problem is the decline in profits, within the fishing industry has begun with the removal of all available subsidies by the Government’ (Prajna 2006).

This region’s fish catch primarily consists of pomfret, king fish, bombay duck, mackerel, prawns, shrimps, etc. A lot of the fishes are exported to agents who buy the catch in bulk, while the remaining is sold in local retail markets. Packaging industries in Kaman and Vashi export the fish produce. Presently the exporters provide loans to the fishermen, thus monopolising the activity. A part of the fish, especially the shrimps, bombay duck, mackerel, are dried and sold in the non-fishing season. However, it must be mentioned that this form of coastal fishing faces a lot of challenges with the government allowing organised trawling activities by a large corporation in the same fishing grounds that these local fishermen use.

The inland fishing is organised as brackish water ponds, and the freshwater ponds owned by local entrepreneurs. The tehsildar’s office provides the lease for the brackish water ponds in the intertidal zone. In these brackish ponds, prawns are harvested, while the carps are harvested in a freshwater pond.

“There seems to be an implicit assumption that such ecological and productive regions should be replaced by activities that should serve the greed and fear of metropolitan cores.”

Even though the brackish ponds require a lot of maintenance, it has been observed that the harvest can be as high as one tonne per acre every six months.

It would be important to map the nature of spaces in which the produce of this region is sold or auctioned. Most of the produce is sold in local markets; in the case of small farmers, by themselves, or in the case of big farming families, retailers, who buy it from them based on the weight of the produce. Most of these markets form an integral part of the public space of such settlements, along with churches/temples and other institutions. These markets are active in the morning as well as in the evening. A lot of the produce is sold in markets in the urbanizable zone or markets in Mumbai. As already mentioned, the produce of this region, being local, has considerable demand in Mumbai and is always sold at a premium. The fish produce is auctioned in an auction hall/sheds that often form such markets. These auctions are active from the late hours of the night through the wee hours of the morning.

Possibilities of Imagining Alternative Futures

In the earlier section, the study of the productive nature of agricultural practice in this region is well established. Presently, VVSR is one of the largest ecological and productive regions for food and other such regions in the Mumbai metropolitan region. Yet this region is under a constant threat, as demonstrated amply in successive regional plans and development plans produced by various state and local authorities. There seems to be an implicit assumption that such ecological and productive regions should be replaced by activities that should serve the greed and fear of metropolitan cores. The primary question to such an approach is to what extent can we sustain the over-consumptive nature of such metropolitan centres, which devour resources, that it seldom produces and belches out pollutants and waste on a scale that is never experienced in human history. There are already signs of such cities not being able to handle

their own waste, like in the case of Mumbai. To add to that, many municipal corporations and councils in the periphery of Mumbai experience shortages of water and other resources. They continue destroying ecological / fertile agricultural lands for their growth, etc. This is not peculiar to Mumbai but is the case of most global cities experiencing high growth.

To change this requires a rethinking about the deeply ingrained duality of the urban versus the rural that our authorities have created over time. We need to move away from these binaries, which generate this duality in our thinking (Janssens 2008). We need to think of these as entities that need to have a simultaneous coexistence and make space for them in our imagination of sustainable cities. The present central government in India has tried to frame the National Rurban Mission under the Ministry of Rural Development, which mistakenly limits this mission to an existing cluster of villages (Shyama Prasad Mukerjee Rurban Mission, 2016). This paper believes that the 'rurban' needs to be integrated into our understanding of existing cities to make them centres of production rather than over consumptive spaces that are parasitic in their surroundings.

For this, our cities need to be entities that can maximise the production and management of their resources. They need to be conceived as ecosystems, where water, energy, waste and food cycles are connected and interlinked so that the city can reduce their ecological footprints. It is not that this has not been attempted. In the case of the city of Kolkata, the sewage of the city is naturally treated in the East Kolkata wetlands, where the treated sewage water is nutrient for fish and vegetables (Ghosh 2005). They are cultivated in abundance in this area, which is adjacent to the city's upcoming thriving office/commercial corridor. However, the pressures of urbanisation and our urban imagination do pose a threat to productive places like the East Kolkata Wetlands or the Plantation zone of the Vasai Virar Sub-region.

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“We need to respect and recognise the uniqueness of a place created by distinct topographical, climatic, flora and fauna characteristic, all encompassed as a dynamic working ecological system.”

To create an alternative imagination, we need to respect and recognise the uniqueness of a place created by distinct topographical, climatic, flora and fauna characteristic, all encompassed as a dynamic working ecological system. This is opposed to the homogenising tendency of modern urbanisation, which imagine sites as a neutral receptor that can be used to locate programs of housing, industry or commerce, interchangeably. Patrick Geddes, in his book ‘*Bio-polis*’, observes the relationship between topography, human activity and livelihood (Geddes). Throughout history, such relationships have been established in our settlements. In many cases, such relationships still exist in our settlements. To sustain our cities, we need to conserve and find new ways of interpreting this relationship in contemporary times. We need to evolve symbiotic relationships between our new city and patterns that already exists on the site of such cities. In most cases, these patterns closely connected to nature are also places where marginal communities work and live. In many cases, they have been associated with this for a long period in history. Our cities need to recognise them as entrepreneurs who can contribute to making our cities self-sustainable. Figure 11 tries to diagram the possibilities of an alternative future that evolves complex city to create environmentally rich ecologies and a contained system. This can be achieved with the help of knowledge ecosystems that help collect real-time data and recognise the contribution that communities can make to evolve and maintain these complex systems. Central to this imagination is recognising the heterogeneous approach that can be possible when we integrate existing natural and human ecosystems into the design of our cities.

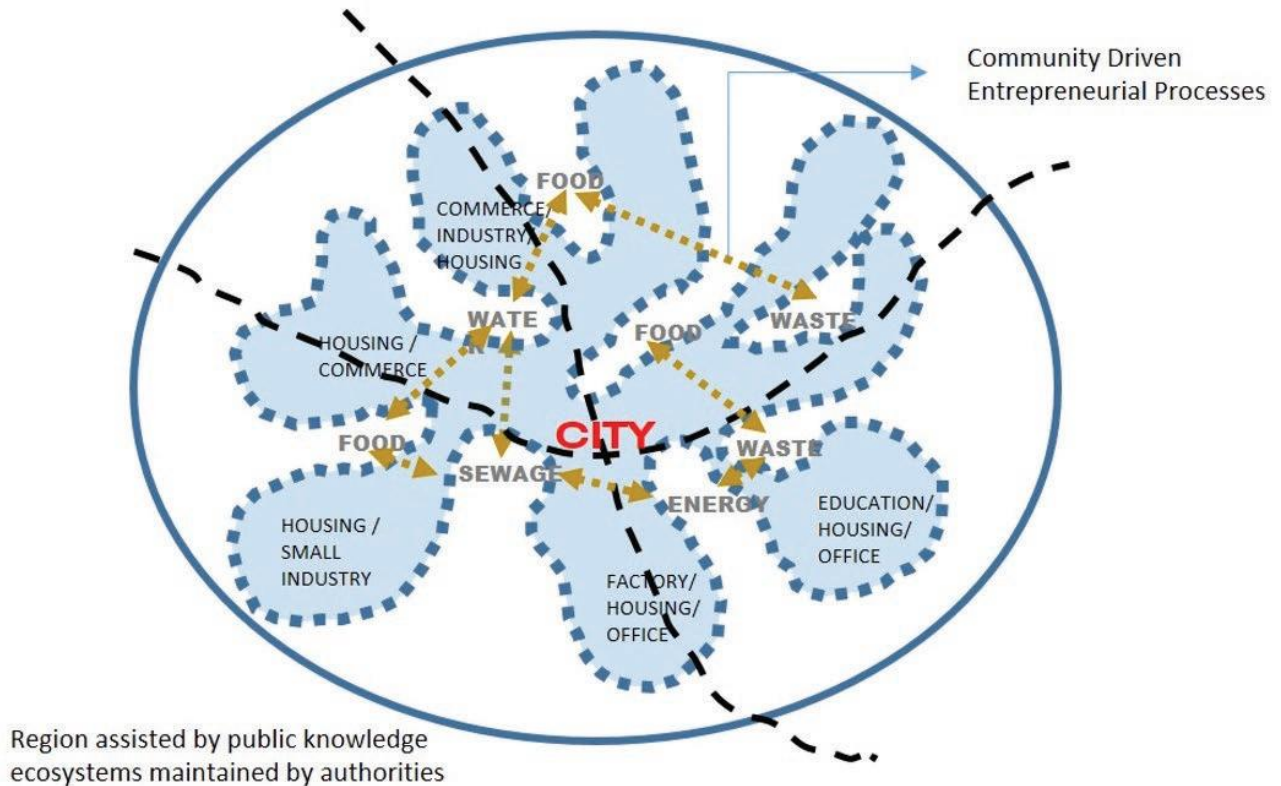


FIGURE 11—POSSIBLE ALTERNATIVES TO COEXISTENCE, ECOLOGY AND THE CITY

In the case of Mumbai, we need to recognise this city and its region as an important fishing and agro-centre dependent on a fertile ecological system that needs to be protected, as much as it is the financial capital of the country. We need to evolve processes that are beneficial to these activities as well as to the city. Presently it is well known that the solid waste and sewage that the city produces are in a proportion that it cannot handle. Yet, the possibilities of treating the solid-waste to create organic fertilisers that can be used for sustainable agriculture and sewage water as fish feed are well known. To encourage such activities, we need to validate the livelihood of people who are already involved in recycling waste in our city. We need to encourage them as entrepreneurship is critical to achieving a self-sustaining city and enabling new jobs in the service sector of the global city. Often, it is seen that the presence of these marginalised livelihood activities are indicators of the health and well-being of our cities.

Spatial and Built Implications

In this section, it might be interesting to speculate the spatial and built implications that might be possible if we were to conceive the city through the lens suggested in the earlier section of the paper. In such an approach, landscapes that are simultaneously ecological and productive need to be recognised and integrated into the process of planning our cities. These landscapes, especially in the case of Mumbai, would be rivers and riverine systems, forests, coastal ecosystems like mangroves, lakes, steep mountain slopes, etc. that can play an important role in the urban ecology by integrating them into our cycle of using water, energy, or treating waste. In such cases, these landscapes can be used to develop a symbiotic relationship with the city while safeguarding them as they are vital to the city's health and should be protected from speculation. However, this paper does not suggest that these systems be only protected, like some of the environmentalists' demand, but that the city should explore ways of integrating them into its ecosystem. To exemplify, in the case of the Mumbai region, mangroves that are vital to the city can be given licenses for a type of fishing that could co-exist. In this case, to protect such systems, the city may need to provide transferable development rights, if communities stay in them or own the land there, to other parts of the city that are supported by the infrastructure of transport and allied services. These are places where higher densities can be encouraged. This might be made applicable for the plantation zone of the Vasai Virar Sub-Region to save it from the immediate pressure of the urbanizable zone. Such an approach can be applied to any city with sensitive ecological systems that need to be safeguarded and owned by private entities.

This would require that authorities involved would have to implement programs and strategies to enable the sustenance

of such activities, like fishing and agriculture, in the Mumbai region. As hinted earlier, the vvSR needs to encourage tourism to emphasise promoting the region's culture, ecology and agriculture, and not the present form of recreational tourism. Promoting the culture of food and cuisine in this region as a part of its intangible heritage assets would provide the impetus to conserve such activities. Spaces and institutions that can encourage this activity at a larger scale should be integrated as a part of its local and regional plan. There is immense potential to upscale the produce of this region by encouraging food processing and packaging industries. Infrastructure like fishing ports, cold storages should also be consciously augmented as a part of the local development plan. Sensitive water systems at all scales need to be conserved and protected to maintain the biodiversity of the place.

From these ecological and productive regions, there are learning that can be incorporated into the contemporary process of urbanisation. The complete system of manmade lakes, ponds and 'baukhals' that the Vasai Virar sub-region has evolved needs to be studied as a pattern that can be replicated in the urbanizable zone. Planning standards that have become homogenous through the country need to realise that a city region with an annual rainfall of more than 2500mm, needs more water catchment areas than just recreation grounds and playgrounds. These water catchment areas can become public spaces and places while simultaneously preserving the urban ecology of a city and its neighbourhood.

“VVSR needs to encourage tourism to emphasise promoting the region's culture, ecology and agriculture, and not the present form of recreational tourism.”

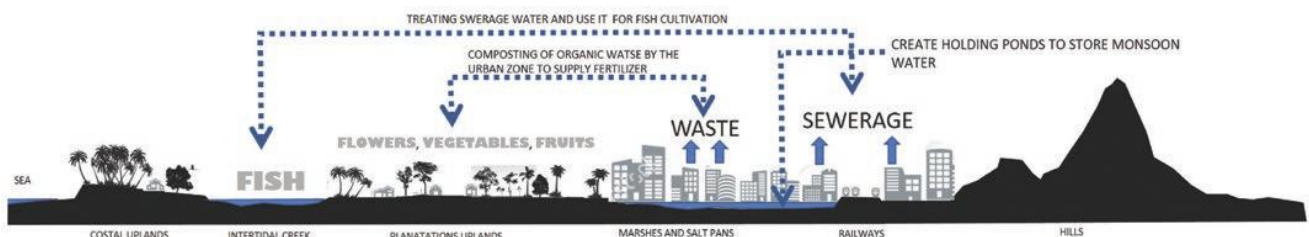


FIGURE 12—SENSITIVELY STRATEGISING THE TOPOGRAPHY FOR PRODUCTION AND CONSUMPTION TO CREATE CITY-ECOLOGIES

These can go a long way to meet the water demand of a growing city perpetually facing a shortage. Even the design response in the case of an existing natural water system in the urbanizable zone, based on the short-sighted response of concretisation and beautification, needs to be questioned. The water system of the plantation zone with a softer, permeable landscape and far more conducive to the growth of flora and fauna at its edge needs a far more sensitive response. While encouraging bio-diversity, these systems can recharge groundwater more successfully than those that have been concretised and beautified. Housing complexes in the city are landscaped with lawn and alien species of plants that are often harmful to the environment. There is a possibility to adopt indigenous varieties that encourage the growth of the diverse ecosystem, and promote our well-being. This approach requires expanding the material palette with which we build our contemporary cities. Our over-dependence on concrete and steel to building our cities needs to be interrogated. There might be other materials that are locally available that might be used in conjunction with these materials. Figures 12 and 13 represent the possible spatial relations that can be evolved in the case of the Vasai Virar sub-region at both the macro and micro scale.



FIGURE 13—RE-IMAGINING FUTURES

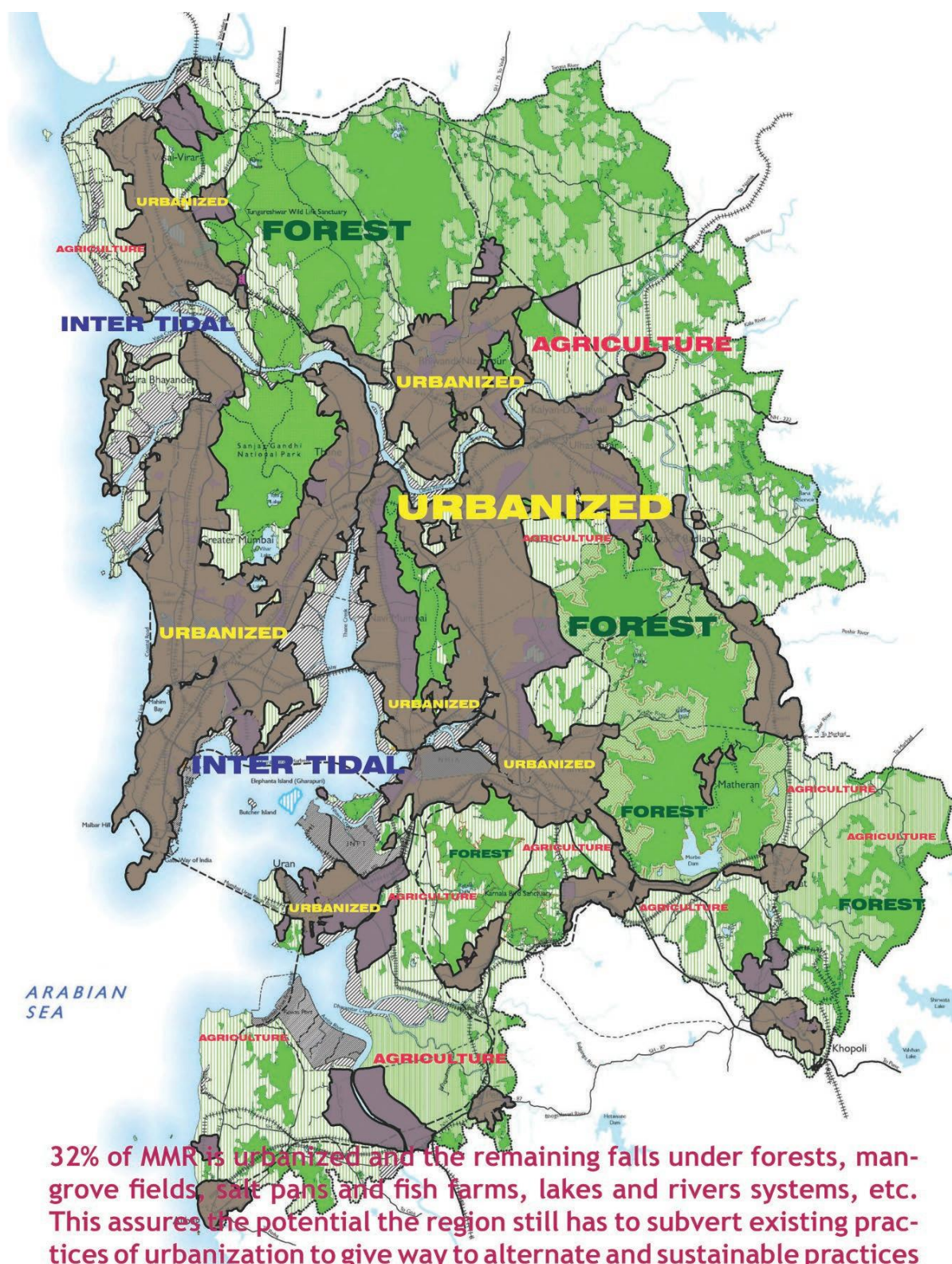


FIGURE 14—POSSIBILITIES OF INTEGRATING URBANISED SYSTEMS WITH ECOLOGICAL SYSTEMS IN MMR.
IMAGE SOURCE—REGIONAL PLAN 2016-36

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