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An Environmental Impact Assessment of the "Third Mumbai" Initiative and MMRDA Expansion in Pen Taluka

Pranav K. Mhatre[1]

[1] *Masters of Engineering in Civil Engineering, University of Mumbai, At- Dhaulpada, Po- Amtem, Tal- Pen, Dist- Raigad, 402106*

Abstract - *Mumbai Metropolitan Region (MMR) begins its eastward push into Pen Taluka to develop its "Third Mumbai" (Karnala-Sai-Chirner New Town). In this paper, ecological feasibility for superimposing dense urbanization on this vulnerable flood-prone coast, having highly mineralized aquifers and estuarine tides of Pen-Taluka Region, has been assessed. In this "Proxy Project Assessment," notifications (2024-2025) for Pen-Taluka regions, combined with various data from industrial projects of neighboring regions (JSW Steel and Cementation Adani), form this investigation.*

The results reveal a critical Over-allocation of the region's environment beyond its capacity. This Virar-Alibag Multi-modal Corridor Project will thus act as an "Artificial Dam" and will disconnect the natural East-West drainage system of the Western Ghats Range. At the same time, the diversion of the Amba River's main water entitlement of 126 MLD to heavy industry will cause a short-term deficit of potable water for this emerging mega-city. In addition to this, the cumulative dredging activities by industries to extract more than 6 million cubic meters of sediment per annum will weaken the estuary's natural flood protection system. This research work will thus conclude by stating that if the saline "Kharlands" are developed without their own independent water supplies and without implementing their "No-Build" buffer zone around the riverbanks, this will cause regular floods and make the groundwaters saline around this mega-city.

Key Words: Third Mumbai, Environmental Impact Assessment, Pen Taluka, KSC New Town, MMRDA, Amba River, Hydrological Disruption, Carrying Capacity, Salinity Ingress.

1.INTRODUCTION

The Mumbai Metropolitan Region (MMR) is witnessing a paradigm shift with its strategic move to the east with the opening of the Mumbai Trans Harbour Link (MTHL). This project revolves around the construction of the Karnala-Sai-Chirner (KSC) New Town, commonly referred to as "Third Mumbai," which redefines the Pen Taluka ecological hinterland into a dense urban artery. What began as a "Rest of the Region" RoR Green Buffer has now turned against itself with Pen being the epicentre for a spate of aggressive conversions in terms of land use with projects like the Virar-Alibag Multi-modal Corridor (VMMC).

Nevertheless, such a process of urbanization is set on a collision course with the biophysical context of the region at large. The region of Pen Talaka, for instance, is not a tabula rasa but a complex hydrological region with a high concentration of saline aquifers, so-called Kharlands, and the active floodplain of the river Amba. The land-use intervention of linear transportation infrastructure and high-density foundations on top of such a fragile, closed estuary has systemic risks, such as hydrological obstruction or the "Artificial Dam" effect and, more importantly, the irreversible salinization of groundwater there. This research will critically evaluate the environmental carrying capacity of the region at large with regard to such developments to demonstrate the "Land Use Conflict" that exists within the Third Mumbai vision process with regard to the threats of mere flooding or resource depletion, respectively.

2. STATUTORY AND REGULATORY FRAMEWORK

The shift of Pen Taluka from an agricultural buffer zone to a strategic urban point is integrated with the systematic development pattern of land usage policy. In the past, the 1996-2011 Regional Plan had designated the area a "Rest of the Region" (RoR) region, which safeguarded the intertidal Kharlands areas into Green Zones (G1/G2) in order to retain the balance between the natural environment and the region. Nonetheless, the approved Regional Plan (2016-2036) triggered a shift in the approach, adding 'Growth Centers' while overlaying 'Industrial Zones' on agricultural zones.

The Maharashtra Government Notification of 2019 made this transition official and assigned the Mumbai Metropolitan Region Development Authority (MMRDA) the role of Special Planning Authority for the entire taluka area, overriding local planning powers in municipalities. Since then, legislative actions have made this "Dual-front" approach to urbanization even stronger in reality. The Notification of October 2024 marked nine coastal villages to be incorporated into the Karnala-Sai-Chirner (KSC) New Town and assigned an upgraded role to MMRDA to become

a New Town Development Authority (NTDA). Simultaneously, the September 2025 Notice issued the initiation of a Development Plan for the 'Extended Notified Area' of the hinterlands to guarantee that the entire area is opened to development and overrides the CRZ Notification of 2019 regarding Coastal Zone Conservation.

Table 1. Chronology of Statutory Interventions in Pen Taluka

Date	Notification / Document	Issuing Authority & Key Impact on Pen Taluka
09/2019	MMR Extension Notification	UDD, Govt. of Maharashtra Appointed MMRDA as SPA for entire Pen Taluka, superseding local bodies.
10/2024	KSC New Town Notification	UDD, Govt. of Maharashtra Designated 9 coastal villages of Pen as part of "Third Mumbai" (KSC New Town). Appointed MMRDA as NTDA (New Town Development Authority).
09/2025	Notice of Intention to Prepare DP	MMRDA Declared intention to prepare a Development Plan (DP) for the "Extended Notified Area" covering the remaining villages of Pen not in KSC New Town

3. ENVIRONMENTAL BASELINE STATUS

The region of concern, Pen Taluka, is a very complex transitional zone of hydro-geology in terms of its Kharlands being under saline conditions and also being under the tidal estuary of the Amba River. An independent scientific analysis confirms that there is a very poor environmental condition prior to any proposed urbanization in the region. The Amba River is the major river in the region that drains water out of it and is rated as “Class E” meaning it is unfit for drinking. This situation has happened because of a lot of industrial effluent being drained into the river as well as high seawater intrusion. Data from Water Quality Index analysis has recorded COD of as high as 375 mg/L as well as TDS of as high as 31,116 mg/L, hence showing hypersaline conditions that would not be suitable even for irrigation purposes. The estuary in terms of ecology is under a high level of stress. There have indeed been very high records of diatoms Coscinodiscus oculus-iridis being in a huge amount of mass of 3.5×10^5 cells l^{-1} in ecological surveys—indicating very acute conditions of eutrophication induced as a result of industries upstream as well as domestic sewage. In parallel to these conditions in ecology, the region’s air quality has indeed reached saturation as far as its contaminants measured in PM_{10} have already reached a level of 109 $\mu g/m^3$ in terms of NAAQS standards—already much above a safe threshold of a resilient environment of "Third Mumbai".

Table 2. Baseline Environmental Stress Indicators

Indicator	Current Level (Recorded)	Standard / Limit	Status
Air Quality (PM10)	109 $\mu g/m^3$ (at Pen Village)	100 $\mu g/m^3$ (NAAQS)	Non-Attainment
Chemical Oxygen Demand (COD)	110 - 375 mg/L	10 mg/L	Severely Polluted
Traffic Level of Service	Class "F" (Forced Flow)	Class "C" (Stable Flow)	Saturated / Jammed
River Water Classification	Class "E"	Class "A" or "B" (Potable)	Unfit for Drinking

4. ANALYSIS OF DEVELOPMENT DRIVERS

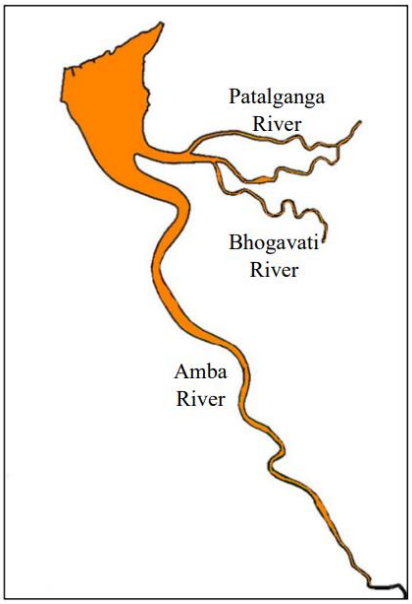
The degradation of Pen Taluka is a result of a "coordinated assault" on it carrying capacity because of the implementation of four mega-infrastructure projects simultaneously in that area. The Virar-Alibag Multi-modal Corridor (VMMC) project is a "backbone connectivity" project that requires 1,566 hectares of land diversion, including CRZ-I ecologically sensitive lands, for "raising an embankment that splits" this region physically. Alongside this project is the KSC New Town Notification (2024) that identifies nine coastal villages as "No Development Zones" and "marks them as High-Density Urbanizable Zones," thus setting up high-rise development on saline lands that are prone to high tides and NLDS flooding.

The effects on the hinterland are more apparent in the Raigad Pen Growth Centre (formerly Orange Smart City), where 434 hectares of irrigated multi-crop farmland, accounting for 50% of the area, will transform into impervious logistics parks, substantially increasing the runoff coefficient in the Bhogeshwari basin. The problem is multiplied by the 'Industrial Pincer' in the estuary mouths: the expansion of the JSW Dolvi project from the current 10 MTPA capacity to 15 MTPA on the northern side, and the proposed cement terminal project from the southern side at 5 MTPA capacity.

5. IMPACT ASSESSMENT: HYDROLOGY AND FLOOD RISK

Pen Taluka's hydrology system, determined by its East-West drainage of the Amba river basin, stands threatened in its very existence by this new North-South line of infrastructure development. Virar-Alibag Multi-modal Corridor (VMMC), being this project's linear "Artificial Dam," has its elevated levees crossing over existing natural drainage routes of the Western Ghats. Unless extensive cross-drainages (such as viaducts built over these drains) are done, this barrier will disrupt this overland runoff, resulting in this marginal area being regularly flood-swept downstream, particularly in Vadkhal. Such flood potential, too, gets aggravated from this systemic floodplain erosion, particularly since both "Raigad Pen Growth Centre & JSW Dolvi Phase III Project" involve turning over more than 250 hectares of pervious farmland or Kharlands into this industrial hard topping area, reducing this entire area of West Pen to having no flood control capacity whatsoever.

Fig 1. Major River Bodies in Pen Taluka



In addition, the Amba Estuary is prone to the "Pincer Effect," where the reclamation on the North Bank (JSW) and South Bank (Adani) at the same time reduces the width of the river mouth. The extension of the Dharamtar Jetty requires the Capital Dredging of 4.15 million cubic meters of the Amba Estuary bed, contributing substantially to the "Tide-Lock Effect," where the high tide locks the river's discharge and causes the flood level at all times to rise coinciding with the monsoon peaks, making the new KSC Town vulnerable to submergence.

6. IMPACT ASSESSMENT: WATER SECURITY AND SALINITY

The first and foremost abiotic barrier in the "Third Mumbai" proposal is Water Security. The region's hydrological resources are severely over-exploited, and the freshwater discharge of the Amba River is resource-cruelly diverted extensively in favour of heavy industries; thus, there arises a "zero-sum conflict" between this resource and the "demand of the proposed metropolitan region." The hydro-chemical assessment of estuarine waters has rated "Poor to Very Poor" quality, "Very high COD of 375 mg/L, and TDS of 31,116 mg/L. Such values demonstrate hyper-saline conditions sustained by seawater invasion into freshwater resources, rendering the Amba River unsuitable even for the proposed metropolitan region's non-potable use, except through expensive desalination processes.

Table 3. Regional Water Budget Deficit Analysis

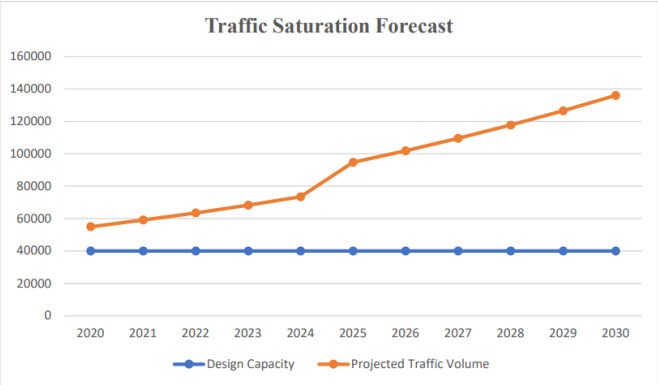
Demand Category	Volume (MLD)	Data Source
Industrial Demand (JSW Dolvi Phase-III)	126.0	*JSW Dolvi EIA (2024)*
Industrial Demand (Reliance Patalganga)	~17.0	*Reliance EC Compliance (2024)*
Residential Demand (Projected Third Mumbai)	40.5	*Est. for 300,000 population @ 135 LPCD*
Total Projected Demand	183.5	-
Existing Allocation (JSW Agreement)	160.84	*JSW Dolvi EIA (2024)*
Net Deficit	-22.66	*Immediate Shortfall*

Geologically speaking, "The proposed KSC New Town Area has been identified over 'Kharlands,' topographically characterized by freshwater 'lens' sitting below an overlying saline 'aquifer system' approach for high-rise construction requires 'deep-pile foundations' and can lead to rupture of an impervious clay 'aquitard,' initiating an uncontrollable process of upward saline migration of freshwater resources into 'wells' drilled within nearby housing." The proposed "water harvesting and storage in housing roofs for flood management and arresting wastage of this precious resource" is turned ineffective through ground truthing that indicates "fine coal dust laden coal barges, operating without an extended roof top overhead protection and oriented toward closely approaching housing, result in coal dust settling over housing roof tops." The above conditions make "Third Mumbai" face an "immediate and permanent shortage of supply of potable water.

7. CUMULATIVE IMPACT ASSESSMENT

Standard EIAs adopt a project-by-project approach and thus will not be able to capture the system failure of carrying capacity of Pen Taluka. The current study uses the CIA approach to assess the "Pincer Effect" of synchronized industrial expansion along both banks of the Amba Estuary. The North Bank is dominated by the JSW Dolvi Steel expansion to 15 MTPA, combined with the Dharamtar Jetty, while the South Bank is facing the Adani Cementation Bulk Terminal (5 MTPA) development. Such a twin-bank incursion severely reduces the estuarine flood plain, thereby constricting the discharge of monsoon runoff and enhancing the flood risk upstream. Equally significant, the hydrologic stress gets exacerbated by the gigantic dredging. Thus, IWAI DPR confirms that 3.4 million cubic meters of maintenance dredging will be required to deepen the channel for 8,000-tonne vessels and that will cast a permanent "turbidity curtain" blocking sunlight and collapsing the primary productivity. Biological evidence of this is confirmed by the recorded bloom of Coscinodiscus oculus-iridis; already, the estuary has been eutrophic owing to nutrient loading. Further, the airshed of the area is saturated; the baseline studies record PM_{10} levels of more than 100 $\mu g/m^3$ driven by fugitive coal dust and traffic LOS of "F" (Jammed) in NH-66. In superposition, a new metropolis upon this saturated industrial corridor creates an ecologically unsustainable "toxic cocktail" of risks for the project.

Chart 1. Traffic Saturation Forecast



8. SOCIO-ECONOMIC IMPLICATIONS

The urbanization of Pen Taluka represents a huge socio-economic displacement, marked by the deliberate oblivion of indigenous economies. “Inland fishing as an activity does not take place in Amba River” is contended by government plans, especially in the NW-10 Detailed Project Report, as a criterion for industrial shipping. However, a reality check on a social audit indicates that 18 fishing coops remain operative on this same part where huge shipping is proposed. "Regulatory Invisibility" is a phenomenon that denies rehabilitation policies to its 8,000 fisher families whose habitats are sabotaged by wake waves from 8,000-ton barges and by dredging-related turbidity.

Nevertheless, the agricultural economy is dispossessed as well. The Raigad Pen Growth Centre identifies the irrigated multi-crop lands as industrial estates, leading the farming community to give up their lands in exchange for contract work as landless agricultural labourers. The health conditions in the region get worse as the community experiences a ‘double burden’ disease due to the fly-away coal dust that pollutes the rainwater harvesting mechanism—and the respiratory disorders caused by the same dust in the form of fly-away coal dust—and water-borne diseases due to the sewage-filled River Umbholi. The ‘Third Mumbai’ is thus on the verge of becoming an egalitarian region where the native population is relegated to the periphery of the development that leaches off their resources.

9. ENVIRONMENTAL MANAGEMENT PLAN & MITIGATION STRATEGIES

In order to prevent ecologically driven destruction, this research suggests that it is imperative to introduce a compulsory Environmental Management Plan (EMP) that needs to change the concept of "Conquest" to "Coexistence" in terms of planning. Some key interventions in the primary zoning would involve demarcation of the "Blue Line" No-Build Zone within 500 meters of the Amba River and the change in Kharlands from residential to Eco-Sensitive Zones (ESZs) to retain their concept of acting as flood water absorbers. Technical parameters would require that the "Stilts over Fill" concept be adopted in the Virar-Alibag MLC (VMMC) on wetland components instead of the current river embankment designs that resemble dams.

Imperatively, water resilience in KSC NT demands a legal "Net-Zero Water" policy that mandates 100% sewage recycling (Zero Liquid Discharge) to compensate for the industrial monopoly on the River Amba. To address the estuarine "Pincer Effect," a "Polluter Pays" Restoration Fund, charged on the Mumbai Port Trust and industrial establishments enjoying the "Clean Mumbai" regulatory favour, would cover biennial estuary desilting and mangrove re-establishment. Lastly, development control norms must ban deep foundation construction in a saline environment to avert aquifer penetration. The above no-negotiable correctives need to be implemented to avert the "Third Mumbai" becoming a disaster vulnerable burden in its own right.

10. CONCLUSION

From the evidence synthesis conducted in this research, it is evident that the “Third Mumbai" project implemented in Pen Taluka has overburdened the environment of this region. At present, the course of development is following a mistaken tabula rasa, neglecting the fact that the region is a fully loaded industrial corridor and a delicate hydrological basin. At the same time, the Virar-Alibag Multi-modal Corridor (VMMC) line represents a cross-wise obstruction in nature’s East-West drainage course, preparing for the conversion of this hinterland into a permanent backwater flood basin. On another hand, the location of the KSC New Town on the salt-bearing Kharlands without a guaranteed water supply represents a motivation of resource bankruptcy in face of the industrial grab of the Amba River.

The combined effect of "Industrial Pincer" (JSW/Adani) and dredging activities has resulted in ecological sterilization of the estuary, undermining its role as a natural barrier against flood threats. In a bid to prevent a dysfunctional living space, an operational paradigm shift between "Conquest" and "Coexistence" must occur. This requires an immediate and universal floodplain no-reclamation policy, "Stilts over Fill" for all linear infrastructural developments, and a mandatory Net Zero Water policy for all proposed township developments. Should this fail, "Third Mumbai" could well emerge as a curse—a space characterized by flood threats, a shortage of water, and dislocation of people.

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BIOGRAPHIES

Mhatre Pranav Kamalakar
- Masters of Engineering in Civil Engineering, University of Mumbai. (2022)
- Bachelor of Engineering in Civil Engineering, University of Mumbai. (2018)
- Diploma in Civil Engineering, MSBTE. (2015)