

# **The Role of Waterways in Promoting Urban Resilience: The Case of Kochi City**

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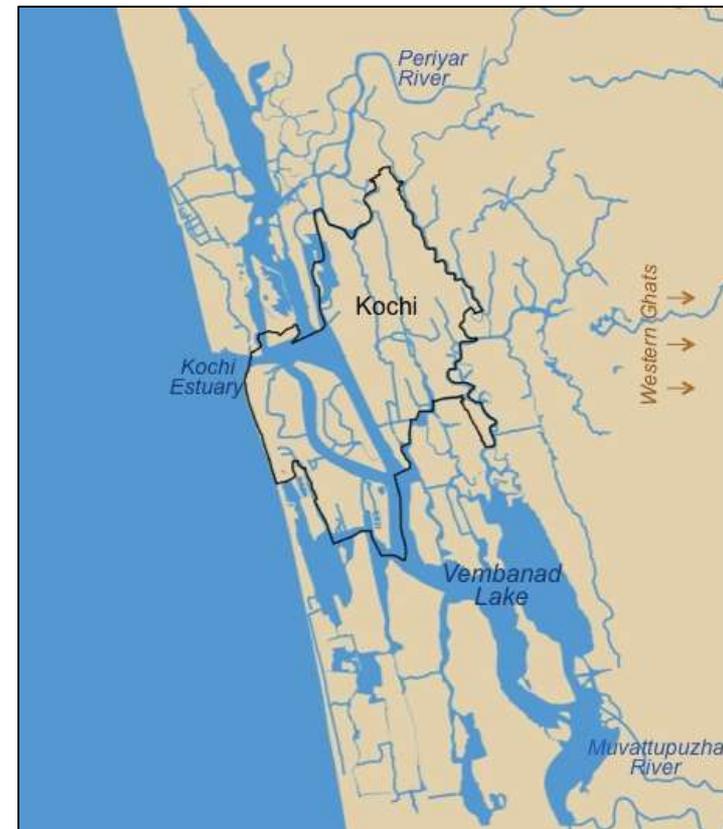


# Introduction

- The battle on climate change is increasingly becoming local
- As per the IPCC fifth assessment report (IPCC,2014),  
*“In urban areas climate change is projected to increase risks for people, assets, economies and ecosystems, including risks from heat stress, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea level rise and storm surges (very high confidence). These risks are amplified for those lacking essential infrastructure and services or living in exposed areas”*
- The issue is more serious in coastal/riverine cities that are often more vulnerable to climate change than others
- In India the approach to urban planning has been land centric with very little acknowledgement for water bodies or wetlands
- Current regulatory structure has mostly left out most of the urban water bodies, causing the cities to grow over the water bodies and its functional parts

# Kochi

- Largest city in Kerala and the second largest along India's western coastline, after Mumbai
- One of the fastest growing urban hubs in the country , it forms part of a rapidly growing contiguous urban region
- Kochi is the regional economic hub & Ernakulam district, within which the city lies, is the largest contributor to the state's GDP and has the highest share of industrial units in the state
- Kochi witnessed a rapid population growth during the past 30 years. The average decadal growth in Kochi Corporation is 7.83%, whereas the nearby municipal areas registered decadal average of 18.65%, and the adjoining Panchayaths had an average decadal growth of 12.13%

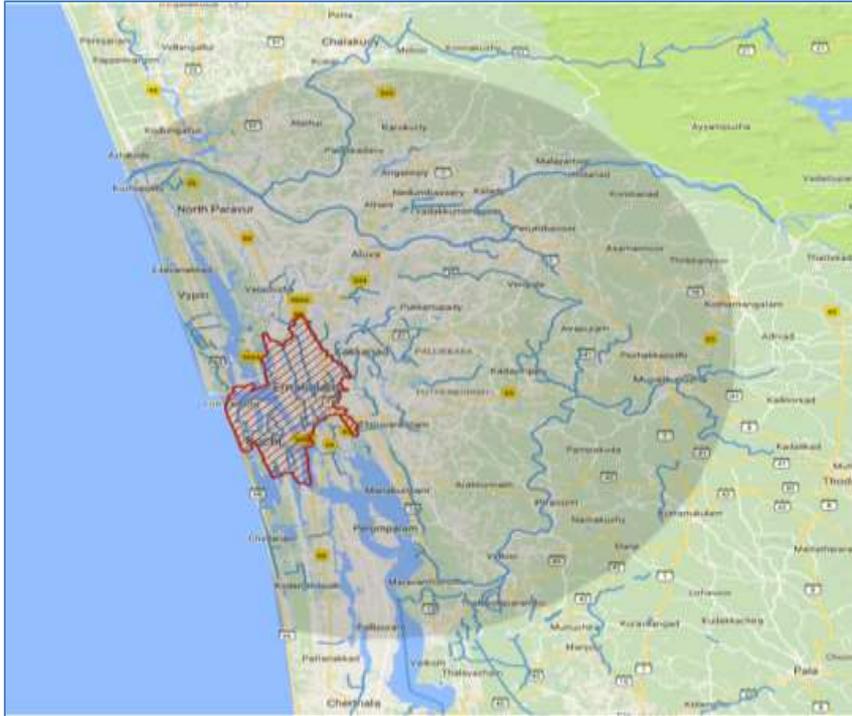


- Kochi has a flat terrain interspersed with canals and is flanked by backwaters. Sloping from east to west, the average altitude varies from 7.5 MSL in the eastern fringes to less than one meter
- The city characteristically has a predominance of water sheets in its land utilization pattern
- Water sheet constituted by canals, backwaters, rivers etc accounts for a sizable proportion of land use. The percentage share of area under this category was as high as 23.4% in 1981 but has been reducing over time
- Many of the inner city canals have become victims of encroachment and neglect through silting, reclamation, fly tipping and disposal of untreated sewage and industrial effluents, making them unsuitable for navigational purposes and incapable of offering flood protection or supporting water ecosystems and the economies dependent on it

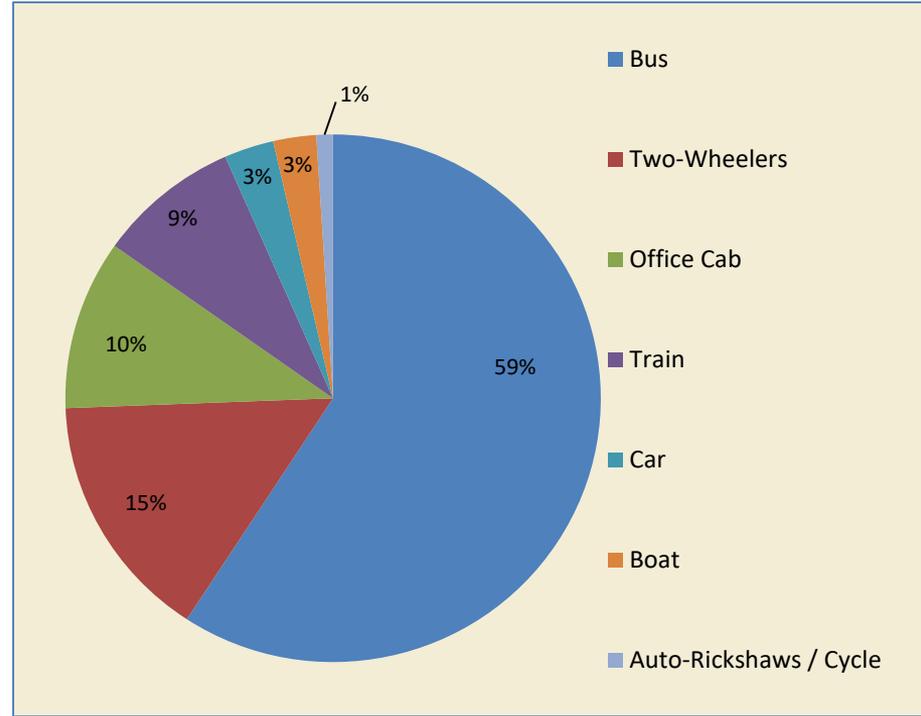
# Transportation in Kochi

- Kochi has all four modes of transport – road, rail, air and water
- The city road network has a broken gridiron pattern with main emphasis on north-south axis and minor roads giving the east west connection
- The share of public transport has been declining in the recent past and presently accounts for 49% (2015) down from 60.2% in 2013
- The declining share of public transport and growth in private ownership of vehicles has heavily clogged the city
- Kochi had registered a CAGR OF 12.2% in number of registered vehicles between 2002 and 2012 which is the second highest growth rate among all the million plus cities in India
- Kochi is the employment hub within the region with more than 50 per cent trips to the area for work purposes
- The city attracts a floating population of workers from distances up to 25km

## Approximate travel to work radius for Kochi's working population



## Mode choice in commuting for work



- Most of the city roads have a right of way less than 5 m. In terms of carriage width, most of the city roads are either single lane (56.6 %) or less than single lane (16.3%)
- The city lacks a local rail system but is connected to the suburban towns through Mainline Electric Multiple Unit (MEMU) trains
- The city now has a metro rail system; 18 km of the first phase from corridor from Aluva to Petta (25.61 km) is already operational and works are proceeding on extensions of the same to Tripunithura . The phase two of the project would connect JLN Stadium to Info Park and Phase three is expected to run from Aluva to Angamaly
- Transport by waterways as we discuss in the subsequent section remains marginal and limited



not to scale

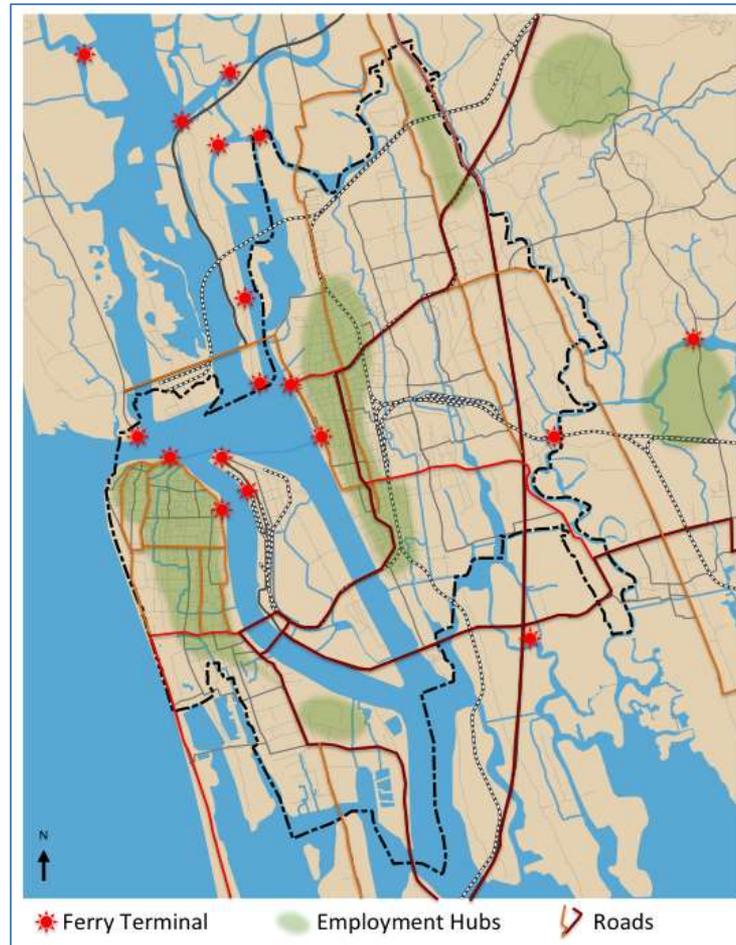


# KOCHI METRO RAIL

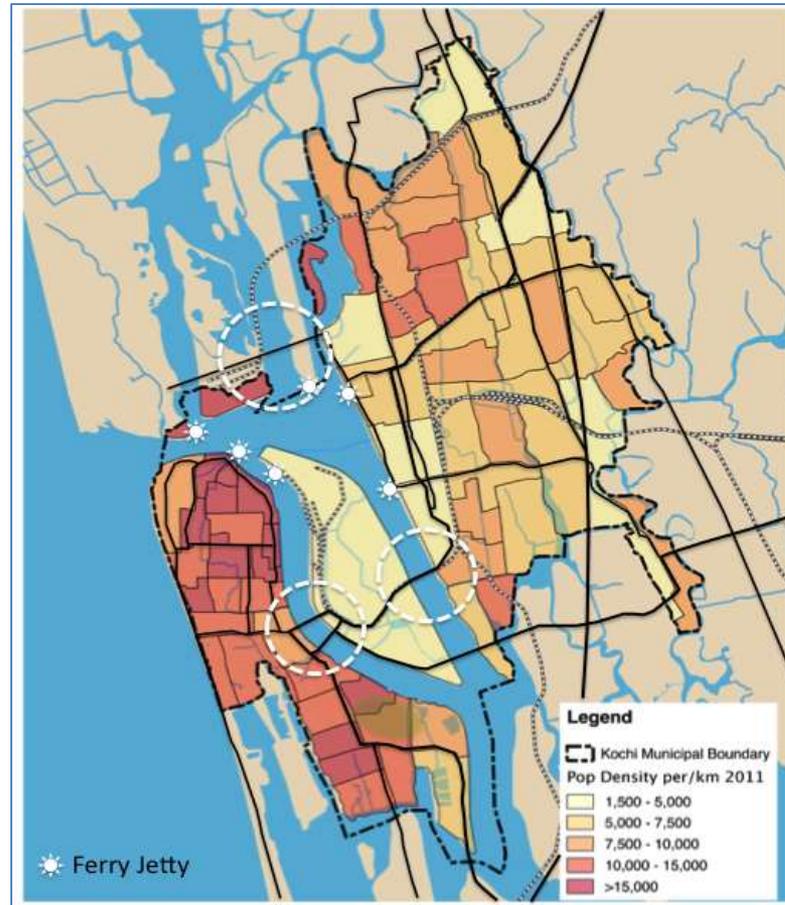
# Importance of waterways in transport system of Kochi

- Kochi's waterways present an alternative to release some of the pressure from the city's congested roadways. Owing to natural grid iron pattern the travel distance between various nodes is much lesser for waterways than road
- Although historically well endowed with canals and waterways, the popularity of waterways for transport has declined over time in the region
- Kochi, which had more than 60 jetties in the backwaters (CDIA, 2010), used to have an extensive ferry system, transporting passengers and goods to urban areas and nearby districts
- The construction of bridges connecting islands to the mainland, poor state of ferries and inadequate frequency of services were the most important factor in the modal shift from ferries to road-based transport
- The pre feasibility study for ferry services in Kochi (CDIA, 2010) reported that in 2008, over 2,200 daily bus departures were recorded from key island locations to the mainland, a number that would have increased henceforth

## Kochi's key employment hubs and road and ferry connectivity



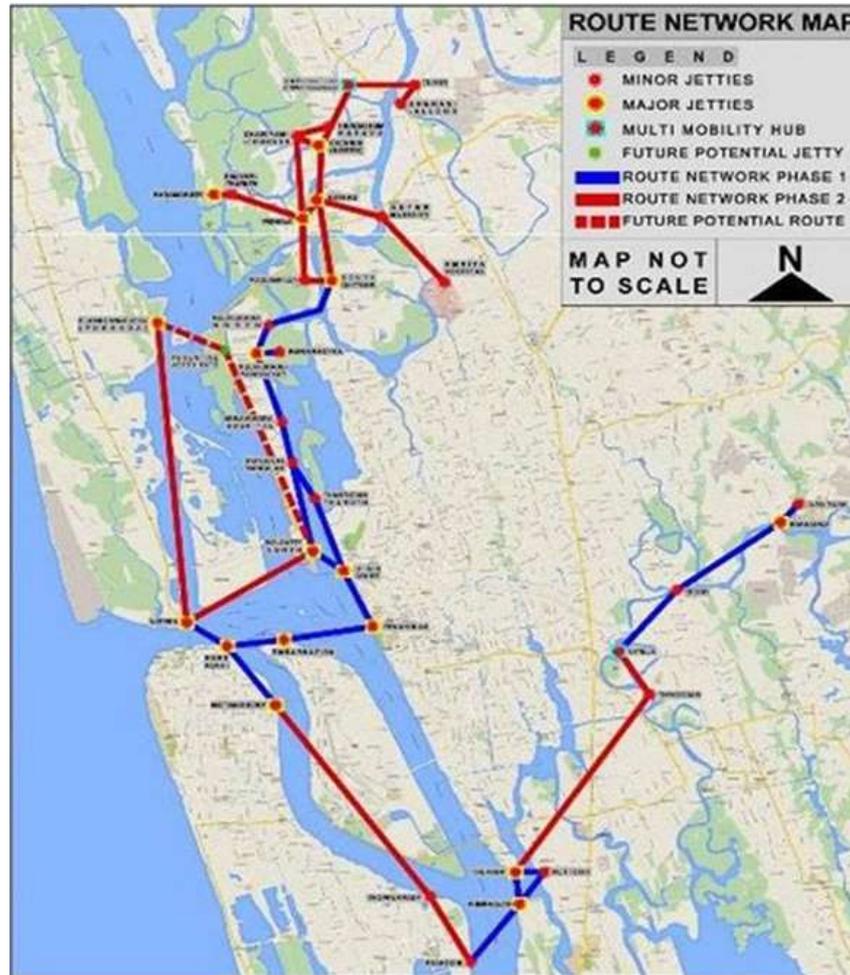
**Improved connectivity between the city centre and the densely populated areas of Fort Kochi/Mattancherry and Goshree islands on the west through new bridges and roadways (highlighted in white circles) has redirected passenger traffic from ferries to roads that allow for door-to-door connectivity.**



# Proposed Integrated water transport system- Water metro

- KMRL is planning to implement an integrated water transport project at a cost of Rs.747 crore with financial assistance from the German Bank, KfW
- Water transport to be integrated as a feeder service to the metro
- The project envisages the development of 16 identified routes, connecting 10 islands along a network of routes that span 76km
- The project intends to bring in a fleet of 78 fast, fuel efficient, air conditioned ferries plying to 38 jetties, 18 of which will be developed as main boat hubs, while the remaining 20 will be minor jetties for transit services
- The city also expects to have a Unified Metro Transport Authority (UMTA), an umbrella transport agency envisaged under the 2006 National Urban Transport Policy

# Phase 1 & 2 of proposed Kochi water metro project



# Global best practices for waterways development

How has other cities dealt with inland waterways development?

Two types of approaches-

- Development of inland waterways as a means to boost the local economy and maximize benefit; the economic agenda is the primary vantage point while highlighting the environmental benefits(lower emissions, ecological protection, and increased public awareness about environment) as additional takeaways
- Climate change adaptation and environmental protection as the primary vantage point

- In most countries, tourism is the 'go to' option for bringing economic development to a specific region endowed with waterways
- Castilla Channel, Spain - the town of Melgar de Fernamental capitalised on the economic aspects of tourism with the larger plan to recover the hydrological and environmental aspects of the Castilla channel; public-private initiatives as a solution for lack of private enterprise
- Italy's Navigli waterways in the Lombardi region - Tourism as the means to bring together the significance of the canal and the historic sites around it. Public private partnership was established to exploit the local canals through a defined natural, local and sustainable "tourist system"
- The other avenue that cities/nation states have chosen to revive and bring in investment to develop waterways is through freight transport. For example In Sweden, this was done by encouraging and investing in water freight movement in and around Lake Vanern area, where most of the freight movement was earlier dominated by road transport

- The other approach is to have environmental protection and climate change as the major theme for development of waterways
- The Room for the River program- Netherlands: making cities and communities along rivers and waterways safer and resilient to heavy water discharge from upstream or in case of high precipitation. To accommodate high water flow and deal with high water levels, dykes were relocated, depth of rivers were increased, creating high water channels, lowering floodplains, lowering groynes etc . Making “room for the river” allows landscapes along rivers to be restored in order to act as “natural water sponges”
- In Ireland, the national government took it on itself to maintain the biodiversity along with the waterways and set upped ‘Good Ecological Potential’ framework. The framework resulted in a majority of the canals being classified as ones with good ecological potential. Another major outcome has been the improvement of overall water quality in the waterways, which is directly linked to their use as multi-purpose amenity resources

# Waterways for increased resilience

- Kochi is highly susceptible to the risks of climate change
- For Kochi, the major expected threats are changes in the sea level, temperature and precipitation patterns (Murali & Kumar, 2015) (Kumar 2006) (ORNL & CUSAT, 2003). These effects could exacerbate existing vulnerabilities of the city
- Unplanned development, indiscriminate discharge of wastes and effluents by industries, lack of scientific waste management (especially of solid wastes), the presence of low-lying islands, and scarcity of funds are all factors likely to worsen the outlook
- Kochi has mostly considered and utilised its waterways as part of its network for storm water drainage and dumping wastewater; water navigation so far has remained underutilised
- Learnings from global best practices like 'Room for the river' in Netherlands and the Good Ecological Potential framework from Ireland provide some insights

- Water transport systems incur lower costs of development, management and maintenance as compared to road systems. Estimates indicate that the cost of establishing inland waterways are only 5-10 per cent that of 4-lane highways, while the maintenance cost is roughly 20 percent
- It should be also noted that the development of such a system is critical not only from an adaptation point of view but also for mitigating climate change
- Even by conservative estimates, implementation of ferry services in just five major routes in Kochi can lead to net emission savings to the tune of 7500 tonnes of CO2 annually
- Kochi also has the potential for being the principal node of hinterland connectivity through Inland waterways in Kerala
- NATPAC (2014) has reported that development of Cochin Port – hinterland connectivity through inland waterways would bring in an annual economic benefit of Rs 442 crore in addition to several other tangible and intangible benefits

- Revitalization of the waterways in Kochi could also contribute towards strengthening of the social and economic resilience of the city
- An efficient and integrated water transport system could provide an affordable public transport alternative to communities in the western islands, which are also some of the most economically vulnerable in the city, and provide them better access to economic opportunities, employment, health and social facilities
- Water based transport also holds great potential for the tourism industry in the city, which is already a favored tourist destination
- It is also opportune since the city is currently witnessing a socio-cultural revival with initiatives like Kochi-Muziris biennale
- Also crucial for disaster risk reduction and disaster management
- In addition to offering an efficient, affordable and low-carbon mode of transportation in the city, a water-based system adds another layer of redundancy to public provision of transport and safeguard connectivity and accessibility between people, resources and emergency services

- The current set of risks and vulnerabilities faced by Kochi with respect to its water system have been faced by local governments across the globe, including in developed countries
- As we saw, all the notable examples adopted by public institutions in collaboration with private stakeholders to overcome such risks. They revitalized their waterways by building larger economic and environmental programmes around them
- These programmes have not only improved the quality of respective waterways, they have also increased the region's economic and climate resilience
- Restoration of waterways can offer multiple co-benefits ranging from the delivery of an alternate affordable and clean transport system, environmental regeneration, boost to tourism and regional micro-economies and enhancement of natural storm protection and flood drainage mechanisms

# Limitations and Challenges to development of water ways in Kochi

## *Institutional Limitations*

- A range of agencies have jurisdiction over various aspects of the water transport system. The overlap of governance have led to institutional complexities and the inability, so far, to deliver a unified, coordinated system

## *Network Limitations*

- Lack of permeability within the urban fabric of the city through internal canals
- There is limited scope for extending these services to the inland canal system. This is because the naturally occurring inland channels in the east are narrower and have suffered much deterioration

## *Ecological Limitations*

- While there is need to restore and improve the natural waterways in the region to augment connectivity and build resilience, their suitability for transportation needs to be viewed with caution, taking into account the socio-ecological impact of action
- Site of high ecological pressure
- Large scale reclamation and dredging to make these systems navigable have already caused significant destruction of the mangroves which are important insustaining the ecological balance of the area in and around the backwaters

***Thank You***