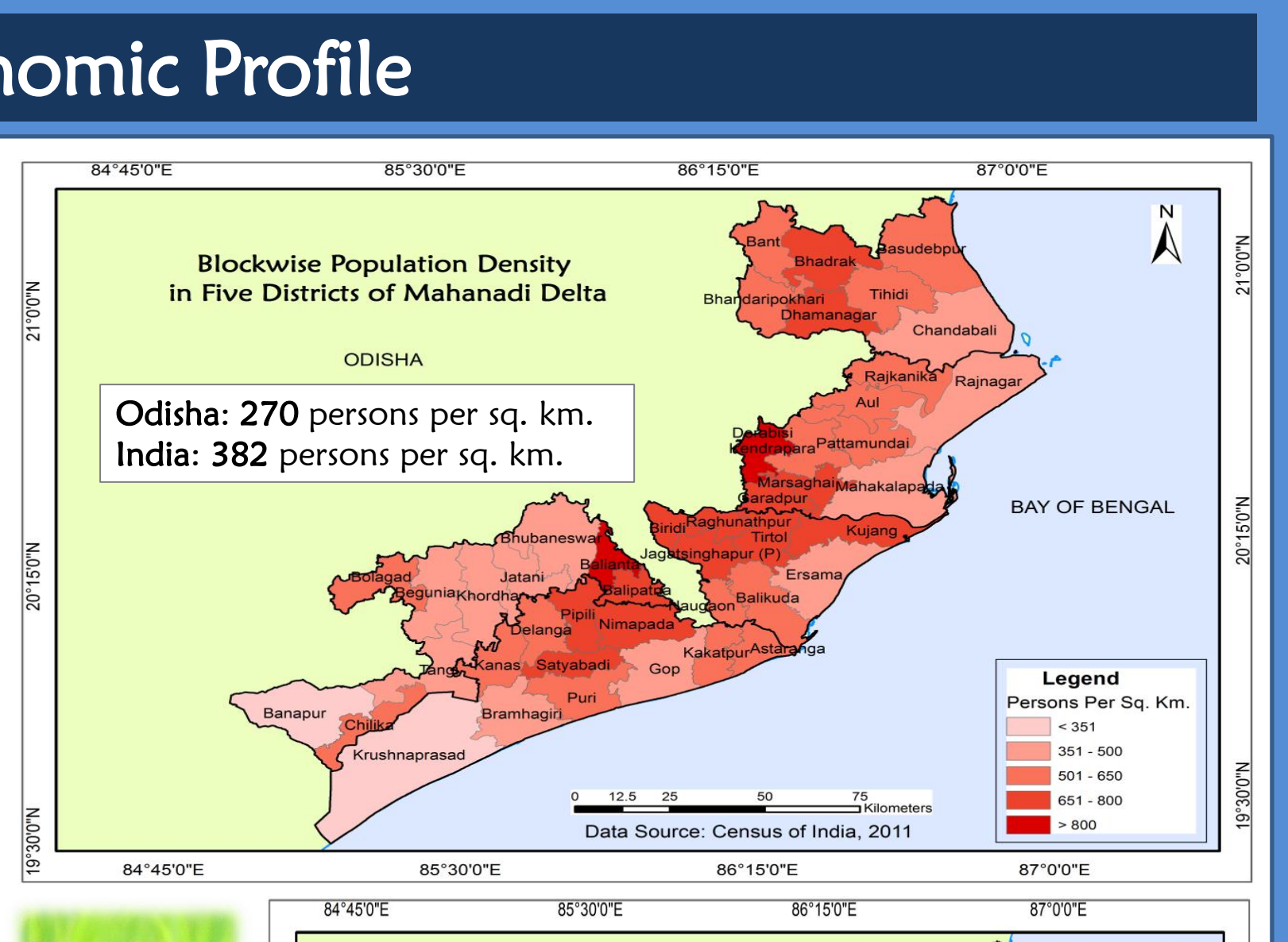
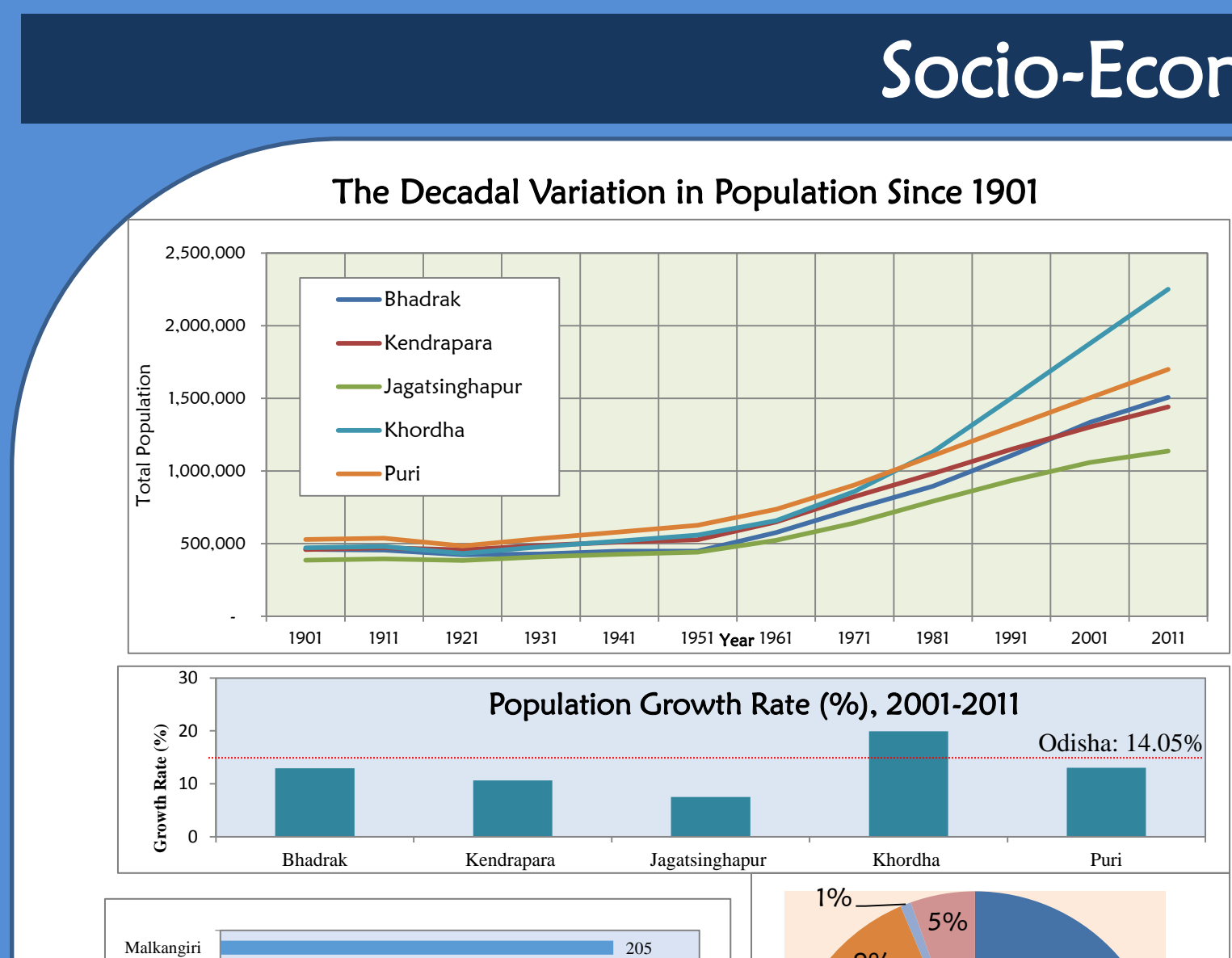
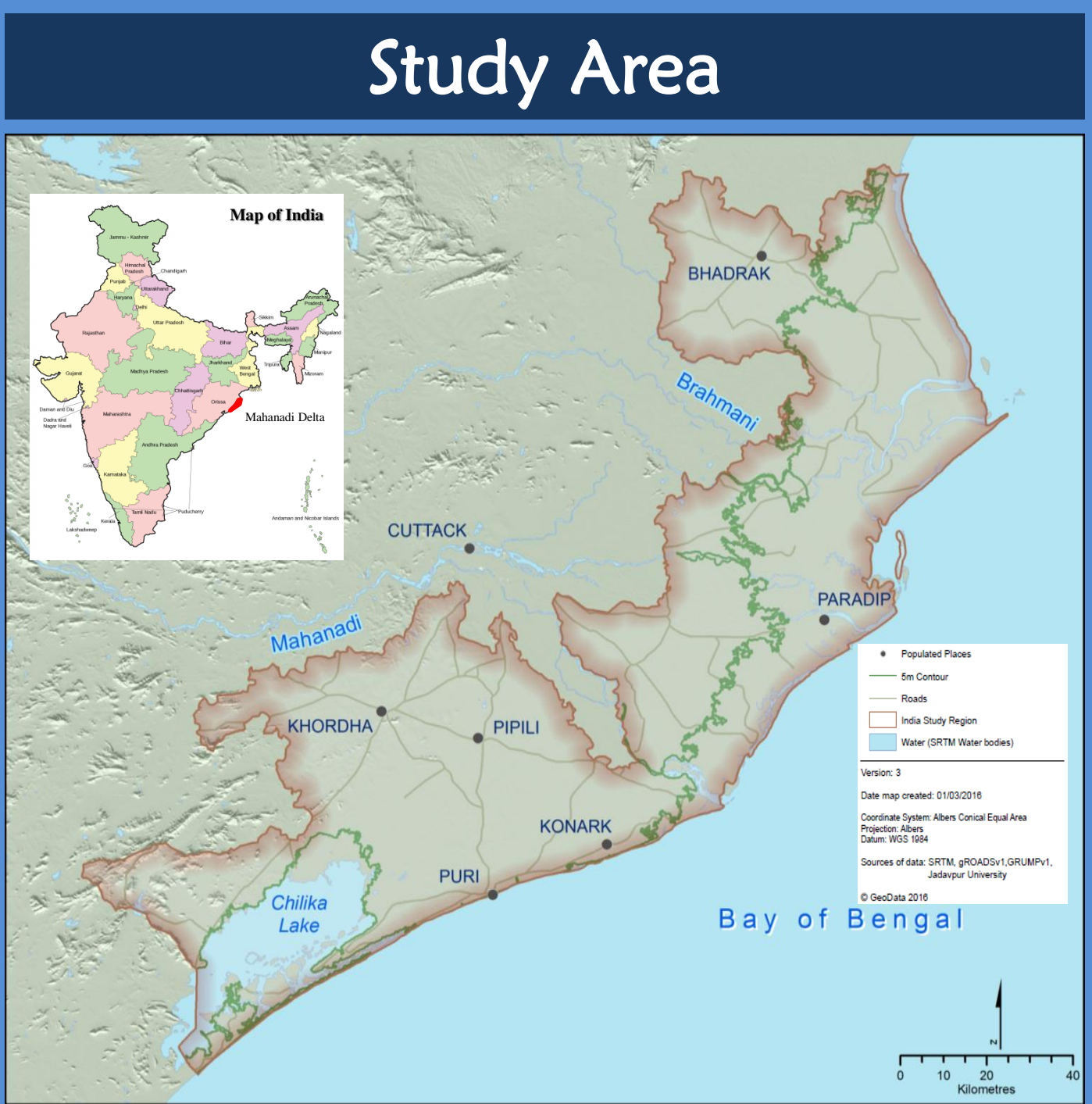


Introduction

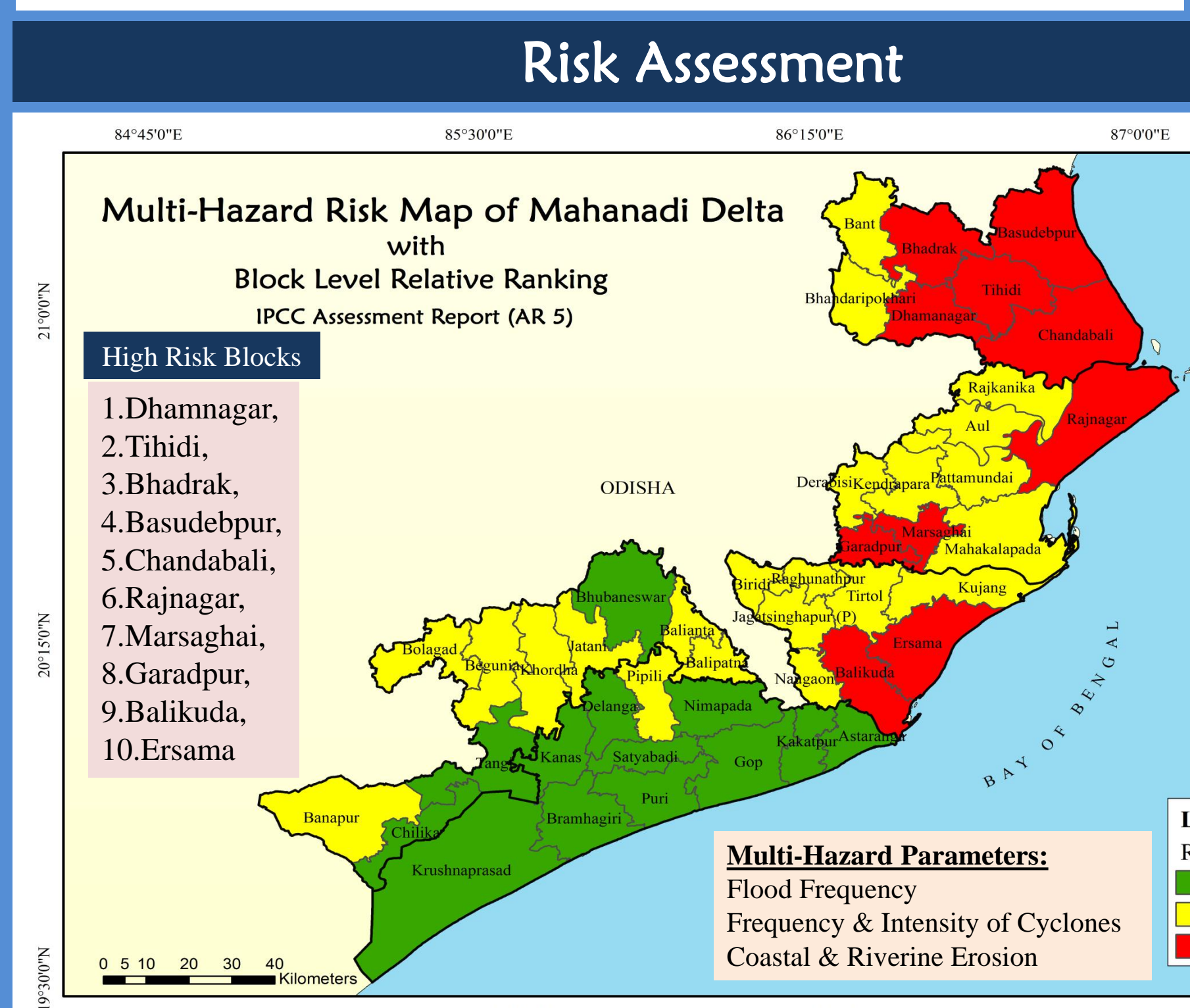
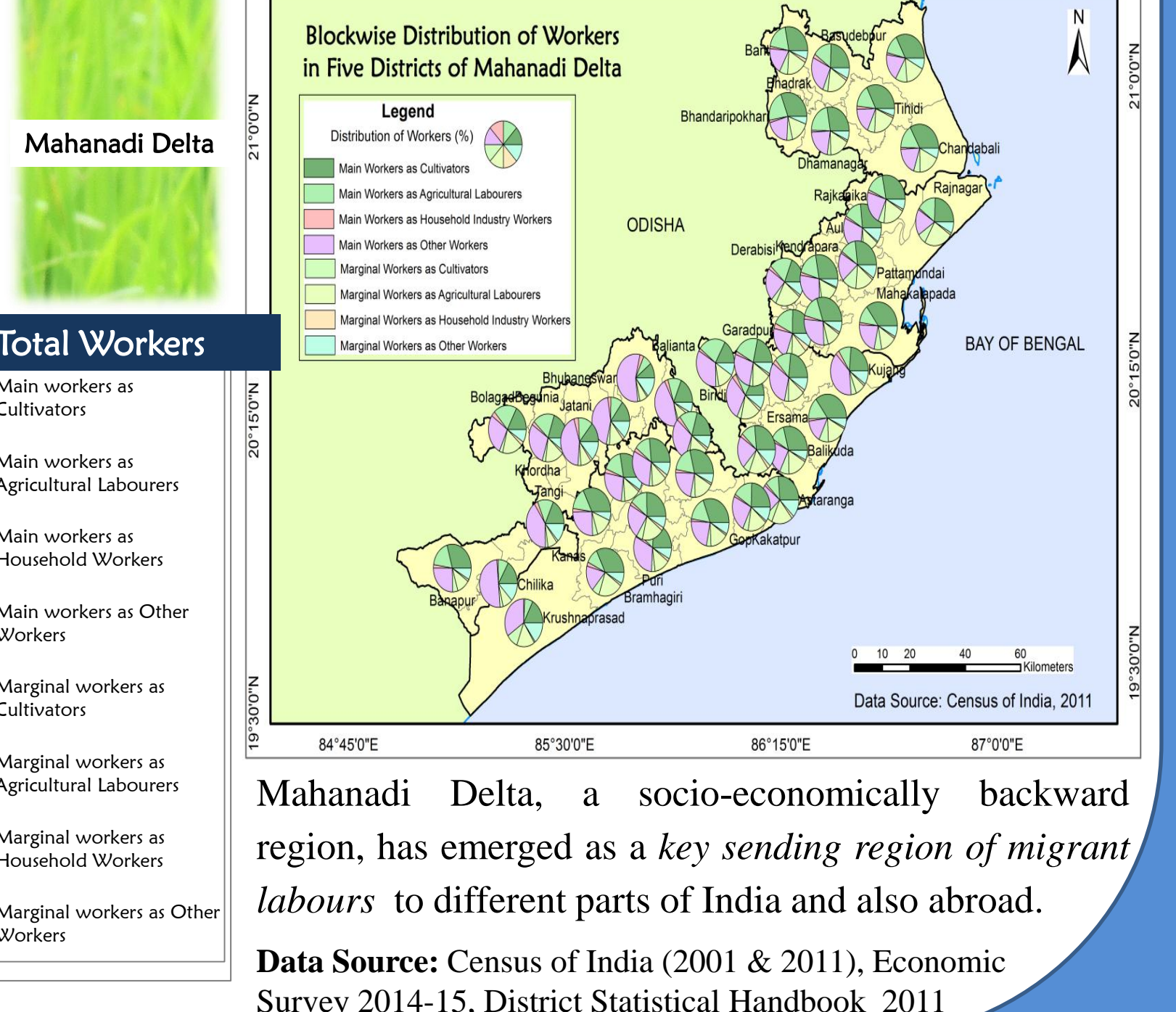
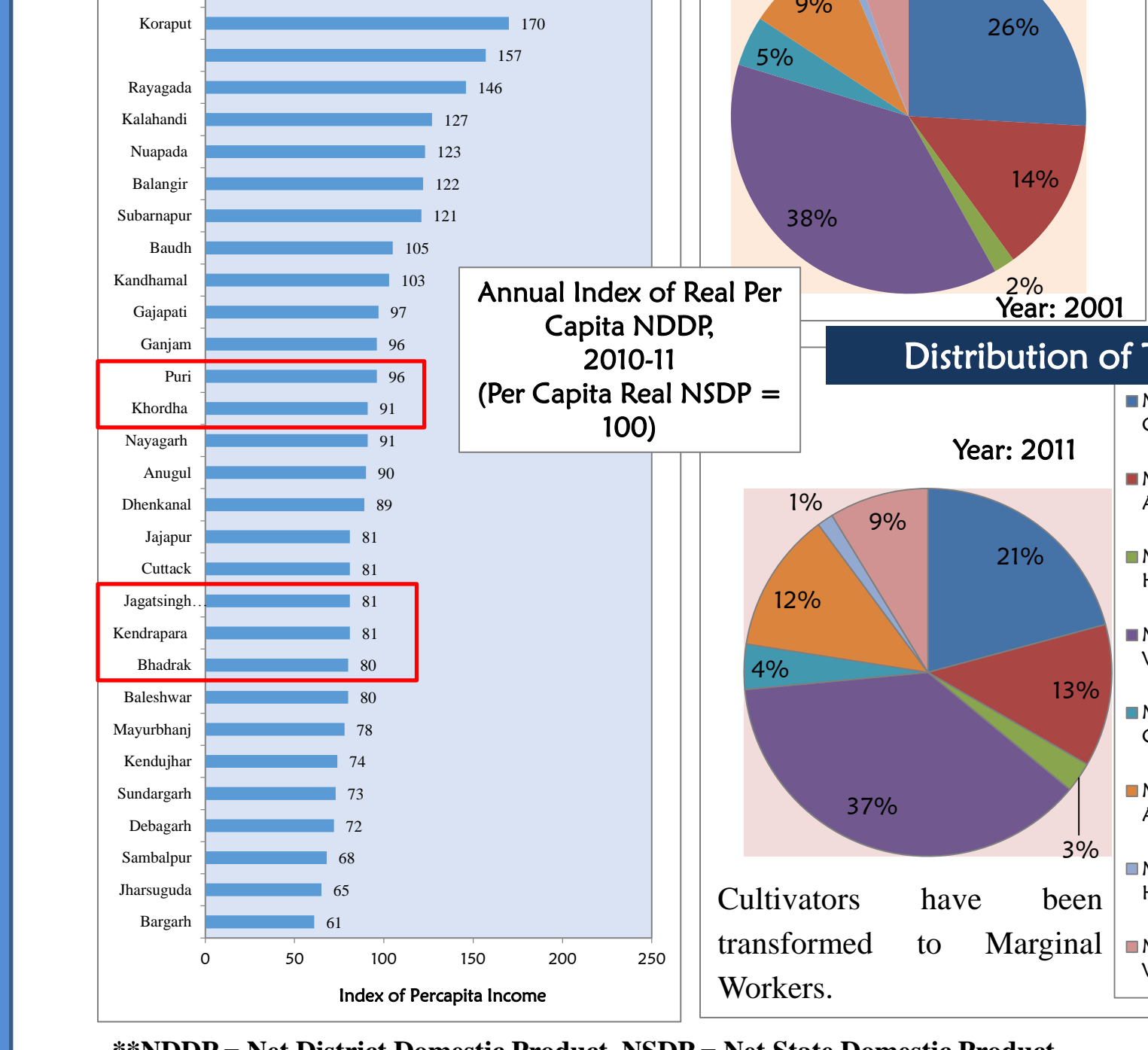
- Agriculture and fishery sectors of natural resource based economy of deltas are increasingly becoming unprofitable due to Climate Change.
- This results in large scale labour migration, in absence of alternative livelihood option in the Mahanadi delta, Odisha, India.
- Labour migration increased manifold in the coastal region of Odisha in the aftermath of super cyclones of 1999 and 2013.
- The present research discusses whether migration can be considered as an adaptation option when the mainstay of livelihood, i.e. agriculture is threatened by repeated flooding, sea level rise, cyclone and storm surges, salinization of soil and crop failure due to temperature stress imposed by climate change.



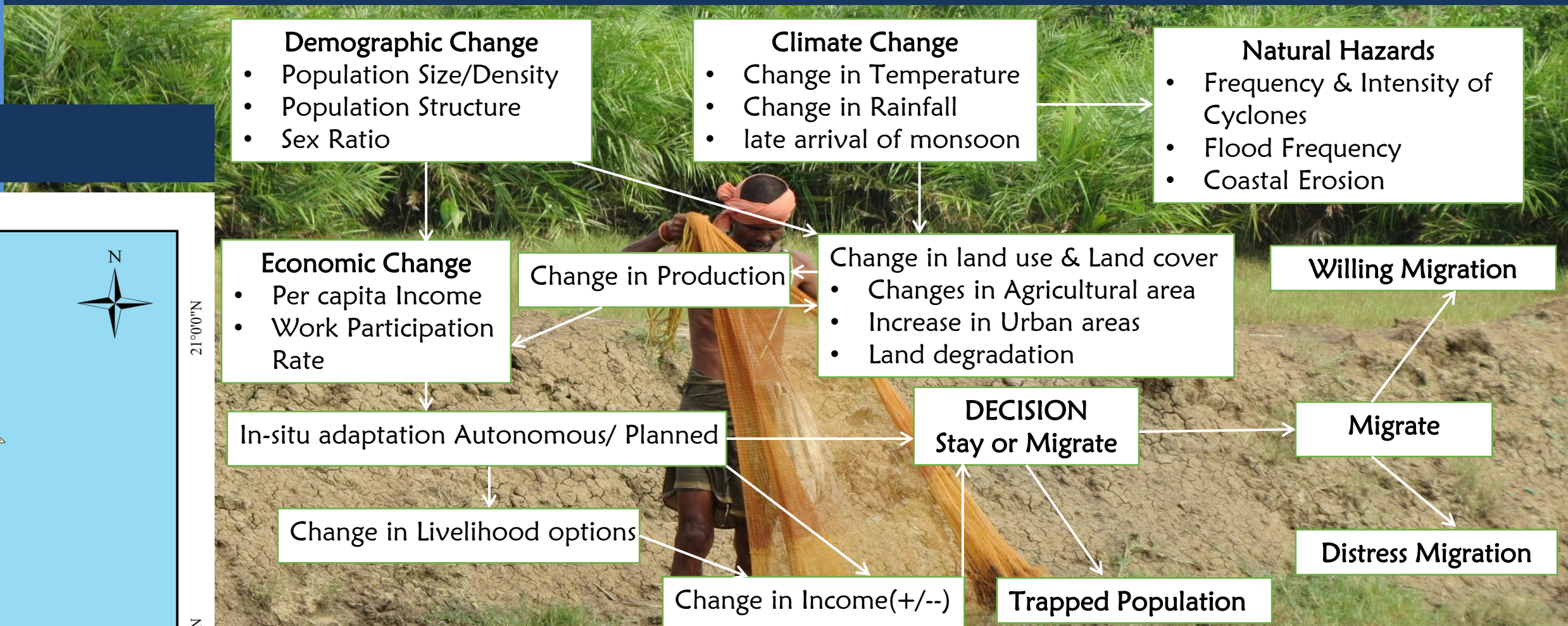
Methodology

- Migration has been analysed in the context of climate change using the concept of risk, represented as probability of occurrence of hazardous events, degree of vulnerability of the area as well as migration analysis using the indirect methods (vital statistics and census survival ratio).
- The methodological framework of **Risk Assessment** has been designed by analyzing the term vulnerability in terms of sensitivity and adaptive capacity (IPCC AR5) with an equal weightage to the components and GIS overlay.
- Risk (R) = f [Hazard (H), Exposure (E), Vulnerability (V)] (IPCC AR5, 2014)
- or, Risk (R) = f [Hazard (H), Exposure (E), Sensitivity (S), Adaptive Capacity (AC)]
- The estimation of **Net Migration** (the difference of in-migration and out-migration of an area in a period of time) has been done using indirect method, in absence of data on place of birth and place of enumeration.
- The average estimation of **Census Survival Ratio** method at district level and **Vital Statistics** method at block (sub-district) level have been applied to estimate the net migration of the study area.

- Mahanadi Delta is drained by a network of three major rivers: Mahanadi, Brahmani and Baitarani into the Bay of Bengal.
- The coastline of the delta is about 200 km long which stretches from south near Chilika to north up to Dhamra River.
- Using SRTM 30m digital surface elevation data, area within 5m contour from the coast line has been extracted within the vicinity of Mahanadi delta.
- The total study area is 13137.679 Sq. Km. The 5m contour spread across 45 Blocks of Khordha, Puri, Jagatsinghpur, Kendrapara and Bhadrak districts. Chilika lake falls within 5m contour line.

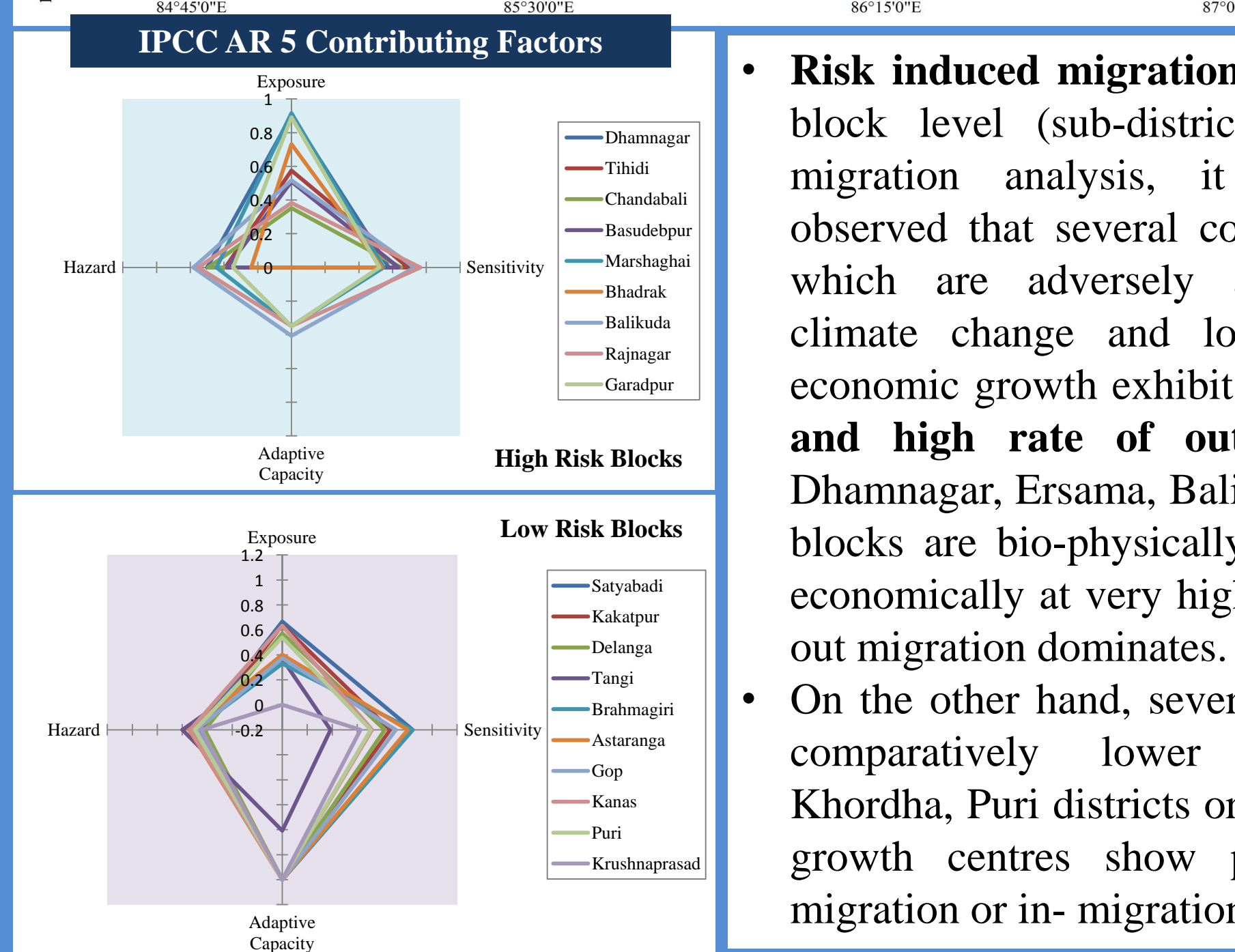


Conceptual Framework : Migration as an Adaptation to Climate Change

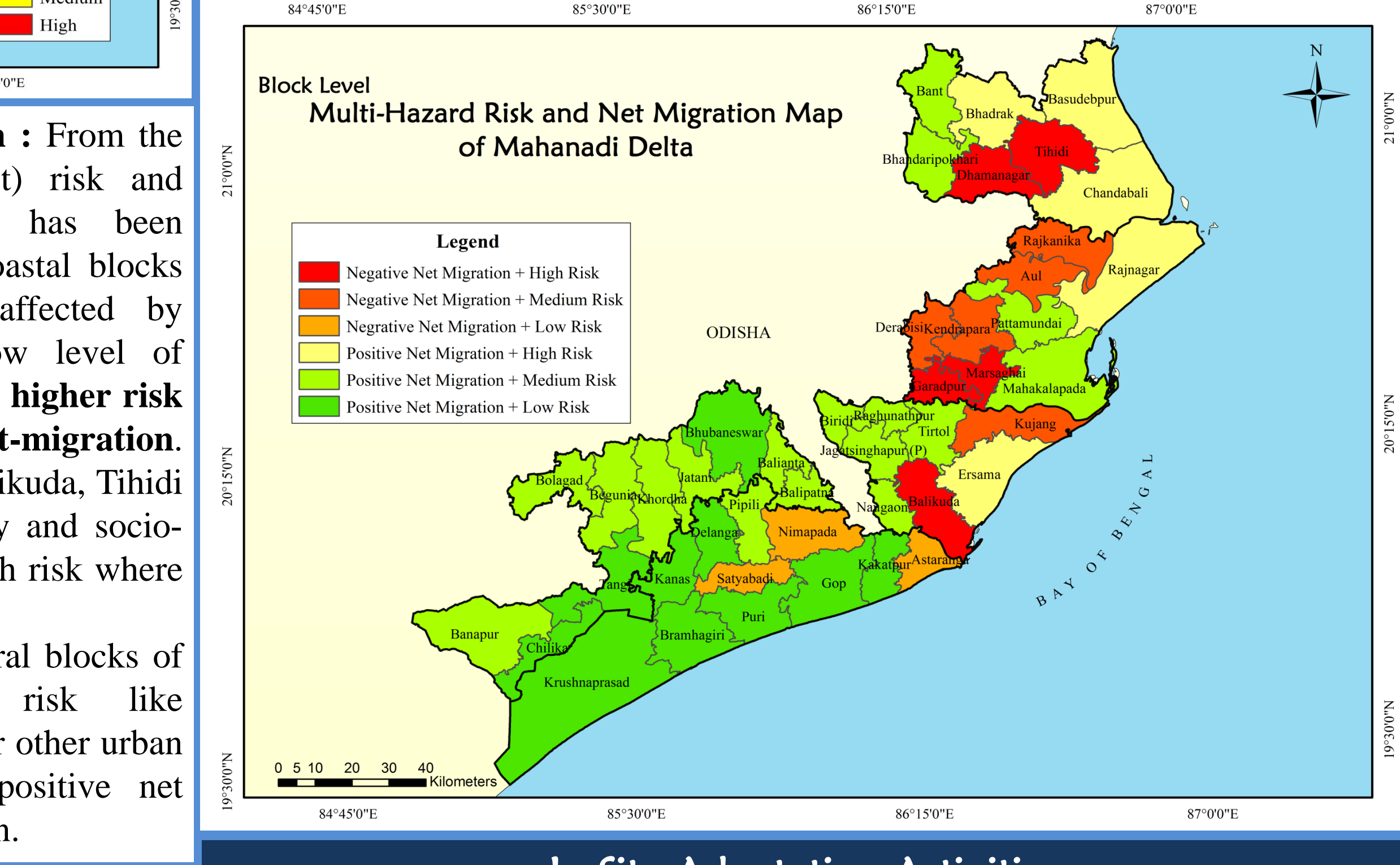
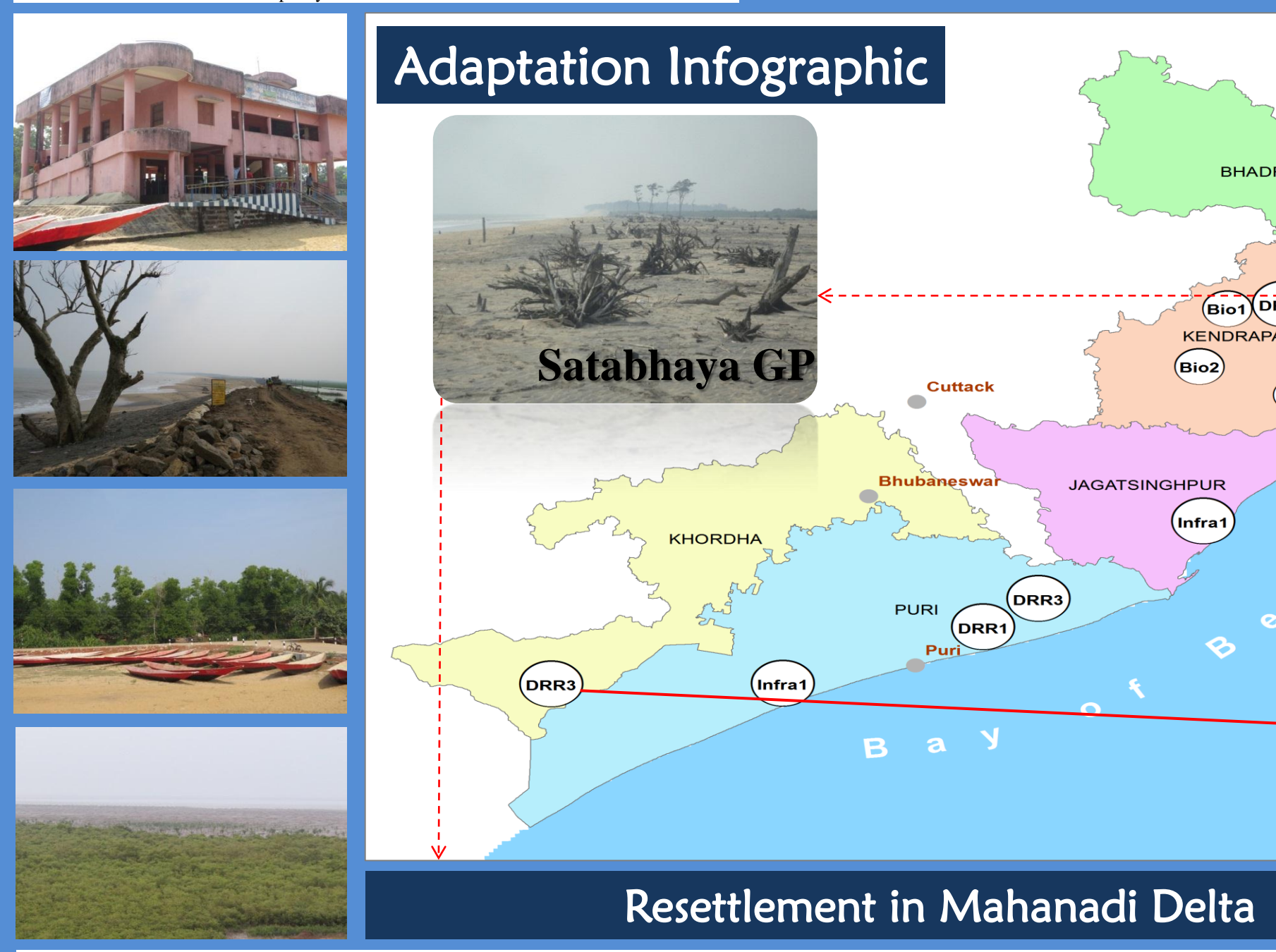
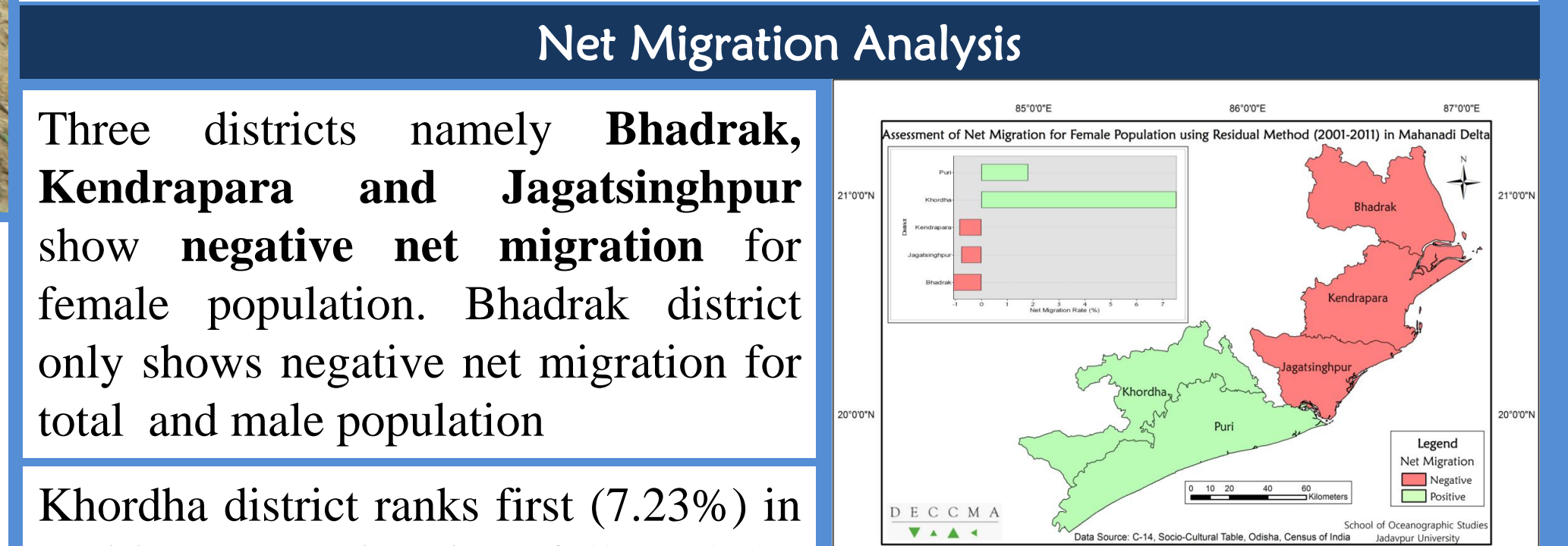


Migration Scenario

- Migration over past several decades in Mahanadi Delta has taken place for survival and livelihood opportunities.
- Intra-State migration is common whereas inter-state migration is mostly found for migrant labours.
- The number of male migrants dominates over female migrants.
- The age of the migrants ranged from 15-40 in the case of male and 26-40 in the case of female migrants.
- The migrants mostly belong to Below Poverty line (\$ 1.25 per day per person, World Bank, 2008) category, have low level of literacy, are small or marginal landowners and mostly unskilled.



- Rapid-onset events** like cyclones or floods have the potential to cause considerable damage to infrastructure and property, as well as resulting in loss of life, and are therefore often associated with **distress migration**.
- Slow-onset changes** like erosion, salinization, water scarcity/drought often stimulate permanent displacement as a first-order household adaptation. They may, however, initiate as **temporary migration** as a short-term adaptation.



Census Survival Method

Three districts namely **Bhadrak, Kendrapara and Jagatsinghpur** show **negative net migration** for female population. Bhadrak district only shows negative net migration for total and male population.

Khordha district ranks first (7.23%) in positive net migration followed by Puri (3.01%). Negligible in-migration can also be seen at Kendrapara (0.13%) and Jagatsinghpur (0.06%) particularly for male population.

Resettlement in Mahanadi Delta

Satabhaya Gram Panchayat: Migration as Adaptation

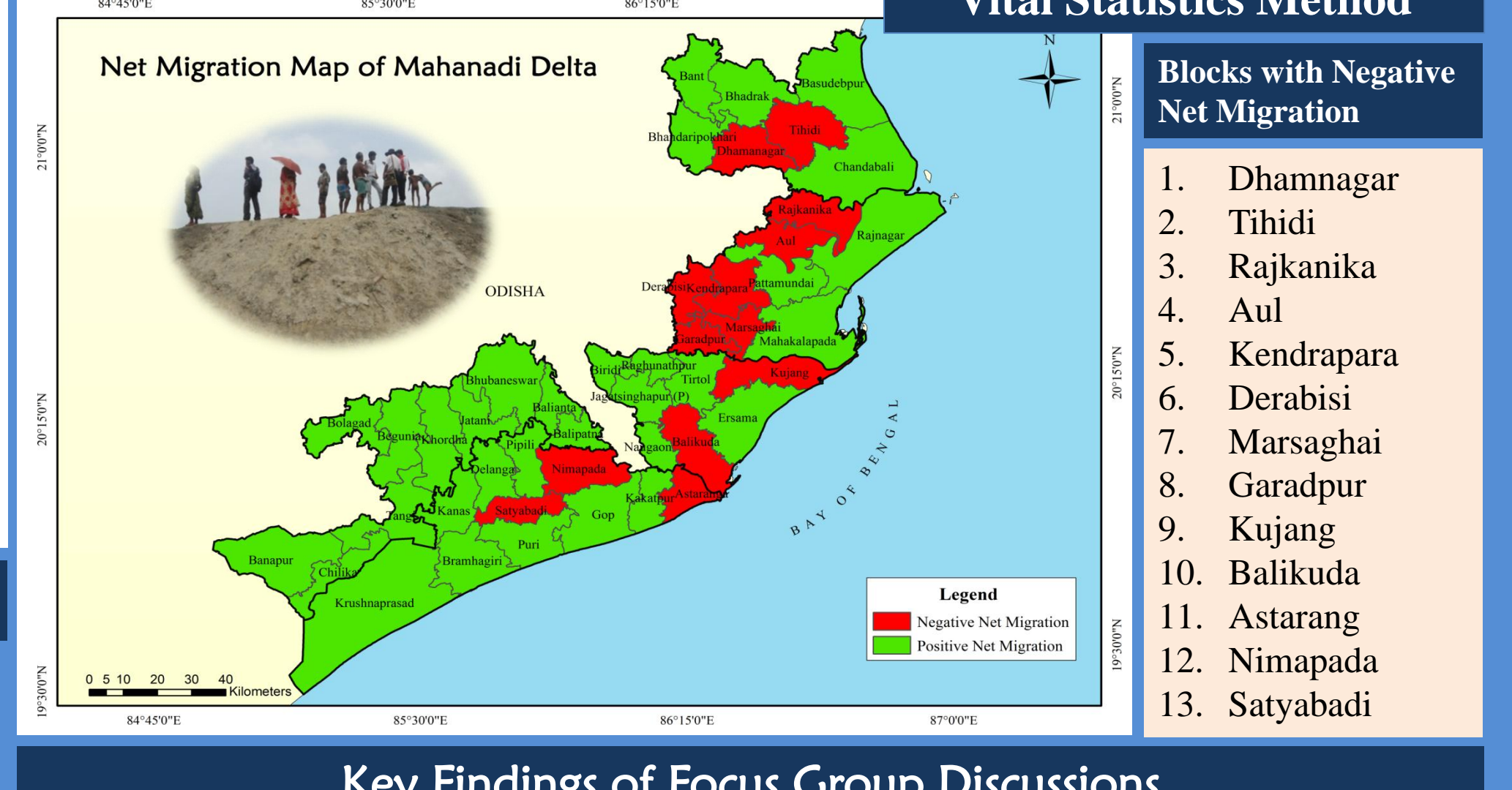
- 1930:** approximately leading to a land loss of 155 sq.km.
- Early 1980's:** the GP has lost the villages of Govindpur, Mahnipur and Kuanriora & **Mid 1990's:** two villages of Kharikula and Sarpada were lost.
- 2000:** a land loss of 165 sq.km.

[Source: Land Records of Satabhaya GP, Government of Odisha]

- Some of the displaced population temporarily resettled on government land and finally migrated to other areas sometime around 1986-88.
- Planned migration and resettlement is being carried out by the Department of Relief and Rehabilitation, Government of Odisha from the villages of **Satabhaya and Kanhupur of Satabhaya GP in Kendrapara district, to Bagapatia under Rajnagar Tehsil of the same district** (Revenue and Disaster Management, 2011).
- A total of **571 families** is proposed to be resettled. Villagers from Satabhaya and Kanhupur are planned to be relocated.

In Situ Adaptation Activities

- Road construction** including earthwork, concrete pavement, metalling, construction of box cell bridge pair casting, earthen embankment construction
- Mangrove restoration and mangrove fisheries implementation** by the community at different parts with help of NGOs generating alternative livelihood.
- Programme on **vegetable garden management, nutrition, income and self-reliance** in selective areas.
- Construction of Cyclone shelters** with the help of World Bank, State Govt., Red Cross and other NGOs
- Programme on **clean water, sanitation and hygiene facilities** (provision of community latrines, bathing cubicles), hand pump repair and chlorination, and in Cyclone affected villages of Odisha.



Key Findings of Focus Group Discussions

- The economy is largely agriculture based which are being increasingly affected by frequent floods, cyclones, salinization etc. and lack of transportation facilities/markets.
- The repeated crop loss and **lack of returns from existing livelihood** are forcing them to take up jobs in construction industry outside the state.
- Preferred destinations: **Internal destinations** are Chennai, Gujarat, Tamil Nadu and Kerala and **International destinations** are Qatar, Saudi Arabia and Dubai.
- A lot of women who have school education are now going to Puri, Bhubaneswar for work in small industry.
- Contractors and Early migrants provide a network for new migrants.
- Migration is bringing limited economic success.

Conclusion

The study indicate migration in sustaining rural livelihoods in Mahanadi Delta to a considerable extent. Both autonomous and planned migration to adapt to changing climatic vagaries are observed. With declining agricultural incomes and increasing inability of rural households to sustain with farming alone, the countryside in Odisha is witnessing an emergence of what one can term **"migrarian" livelihoods** – where migration and agriculture form the major providers (Sharma et al., 2014), accounting for more than 55-60 per cent of the annual incomes. NSS data shows that the dependence on domestic remittances has risen most strikingly in Odisha since the 1990s (Tumbe, 2010). In 2007-08, **rural Odisha received 14.25 billion dollar in domestic remittances, 6th highest in the country.** The benefits of remittances positively contributed to autonomous climate adaptation by the community. Migration either autonomous or planned are serving as a positive contributor to enhance the adaptation capacity of the community.

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