

An aerial photograph of Quy Nhon, Vietnam, showing a coastal city with a river, a large dam, and a bridge. The city is built on a peninsula, with a river flowing through it. A large dam is visible in the foreground, and a bridge spans across the water. The background shows a vast expanse of water and a clear sky.

Coastal urban climate resilience planning in Quy Nhon, Vietnam

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Tokyo, Dec 7, 2015

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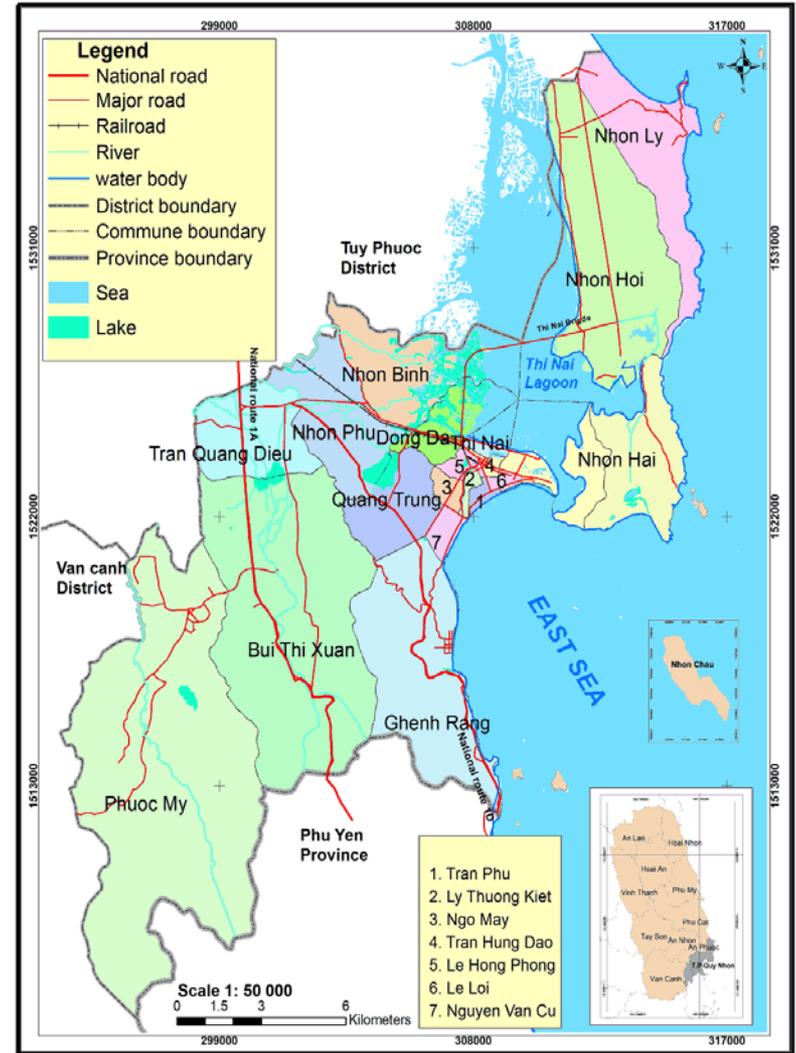
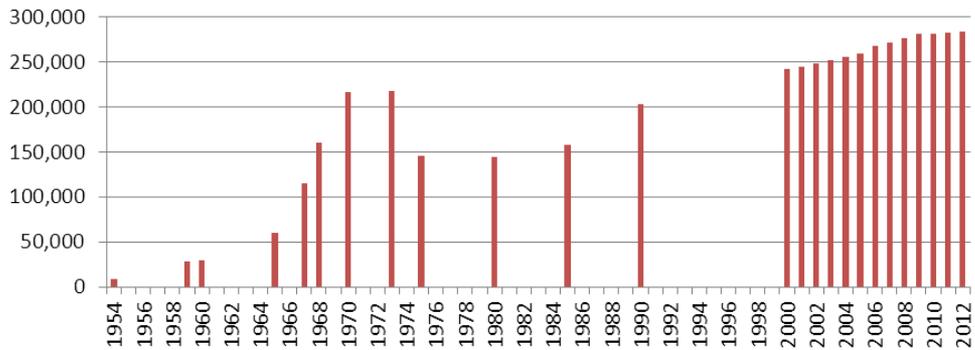
Introduction

- ▶ The city of Quy Nhon
 - ▶ Urban planning in Quy Nhon
 - ▶ Climate change and sea level rise
 - ▶ Natural hazards and environmental risks
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The city of Quy Nhon

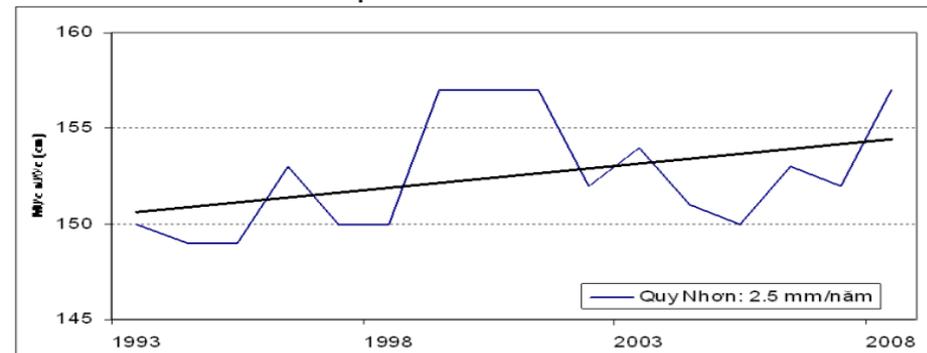
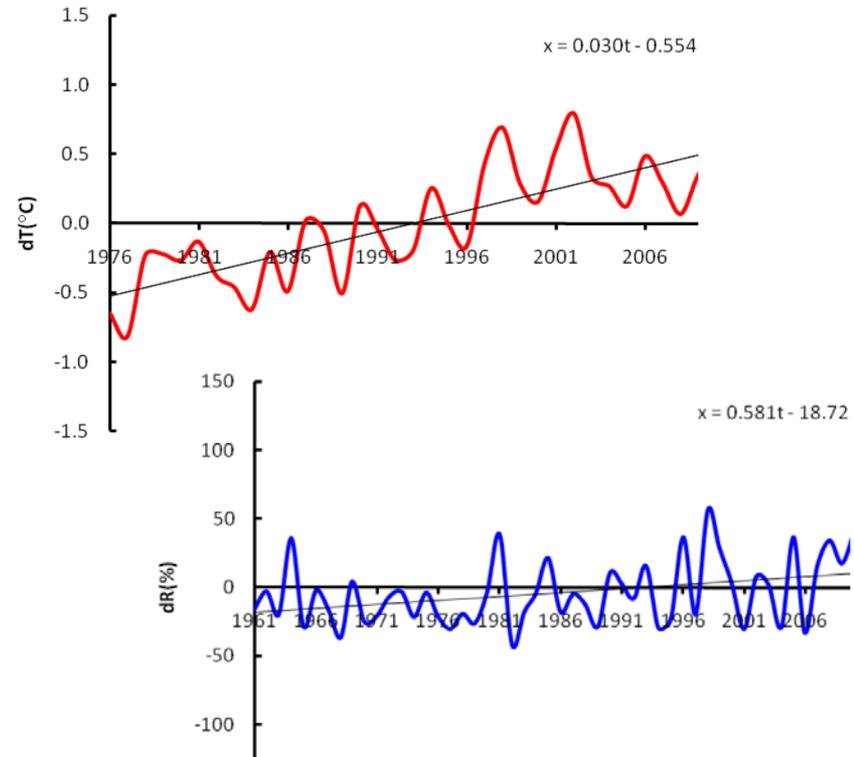
- Total area of 285.5 km²
- Population of 283,000 people (2013)
- Coastal city – level III (1986), level I (2010)

Population Growth (1954 - 2012)



Climate change and sea level rise

- Increasing in mean temperature
- Increasing in mean rainfall
- Sea level rise with 2.5mm per year
- Increasing big events: storms with heavy rainfall



Natural hazards and environment risks

- Increasing the flood problems (eg. the big flood events in 2009 and 2013)
- Lost of mangrove forest
- Coastal erosion
- Sand movement



Key research questions

- ▶ Where are urbanisation and shoreline modifications taking place? Where they are likely to take place in the future?
 - ▶ What problems are caused by urbanisation and shoreline modification in the context of climate change planning?
 - ▶ From local perspectives, what are possible solutions for climate-resilience planning in Quy Nhon?
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Data and methods

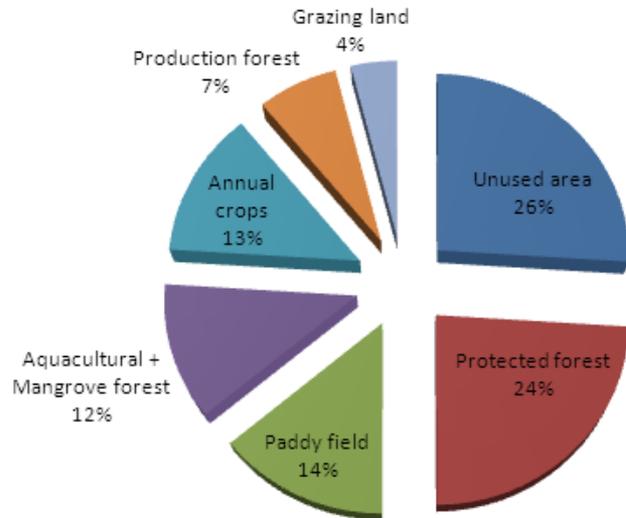
- ▶ Satellite images: Landsat in 1973, 1992, 2002, 2005 and 2013
- ▶ Topographical maps, land use maps
- ▶ Methods:
 - Remote sensing: image processing
 - GIS: Urban expansion
 - Spatial analysis: Multiple Logistic Regression
 - Focus group discussion: urban resilience planning

Results and discussions

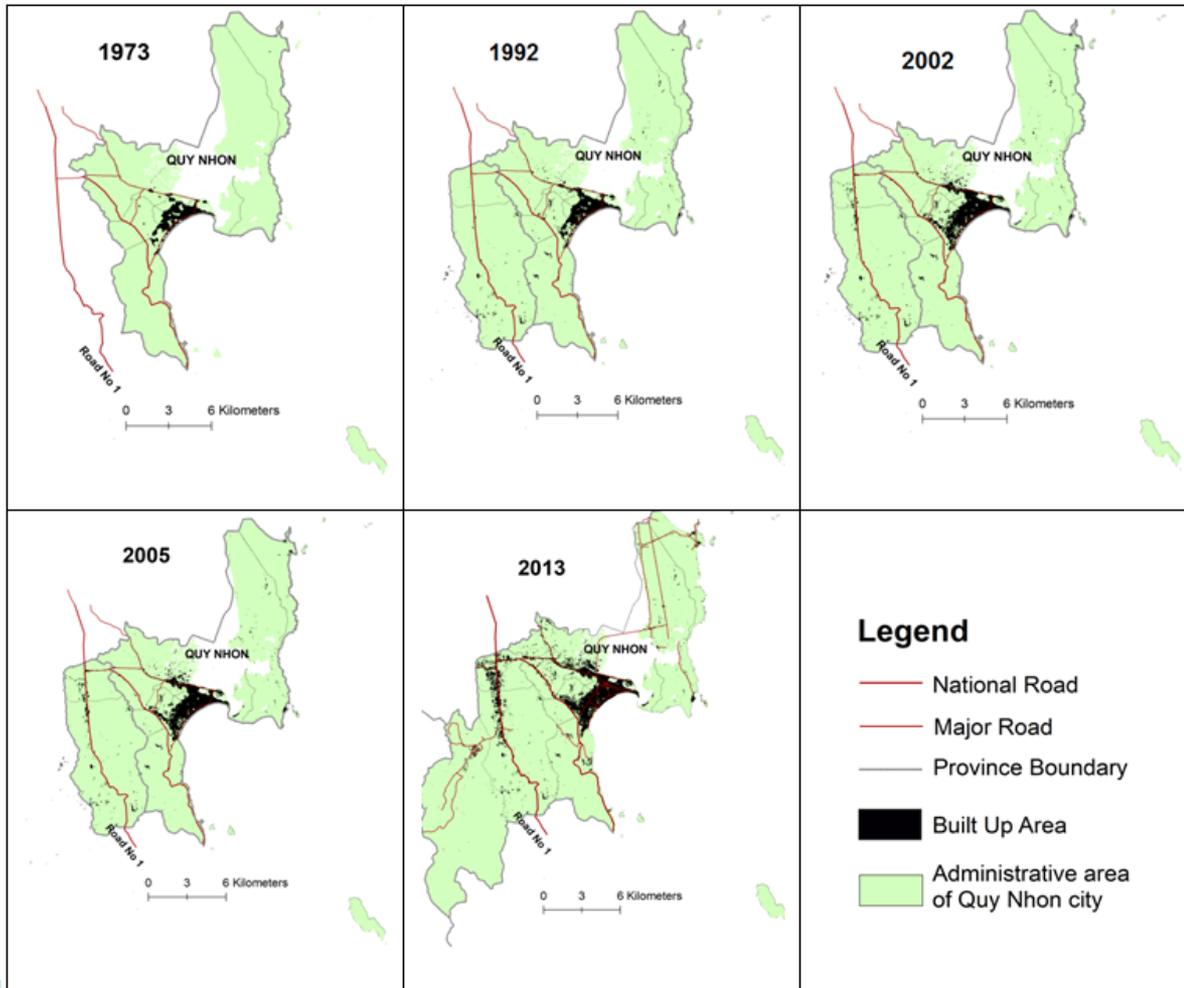
- ▶ Urban expansion
 - ▶ Population growth
 - ▶ Prediction of urban expansion
 - ▶ Shoreline modifications
 - ▶ Urban resilience planning
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Urban expansion (1973 – 2013)

Urban expansion on different land use types



- ▶ 2005 – 2010, urban expansion rate of 432 ha per year.



Urbanization

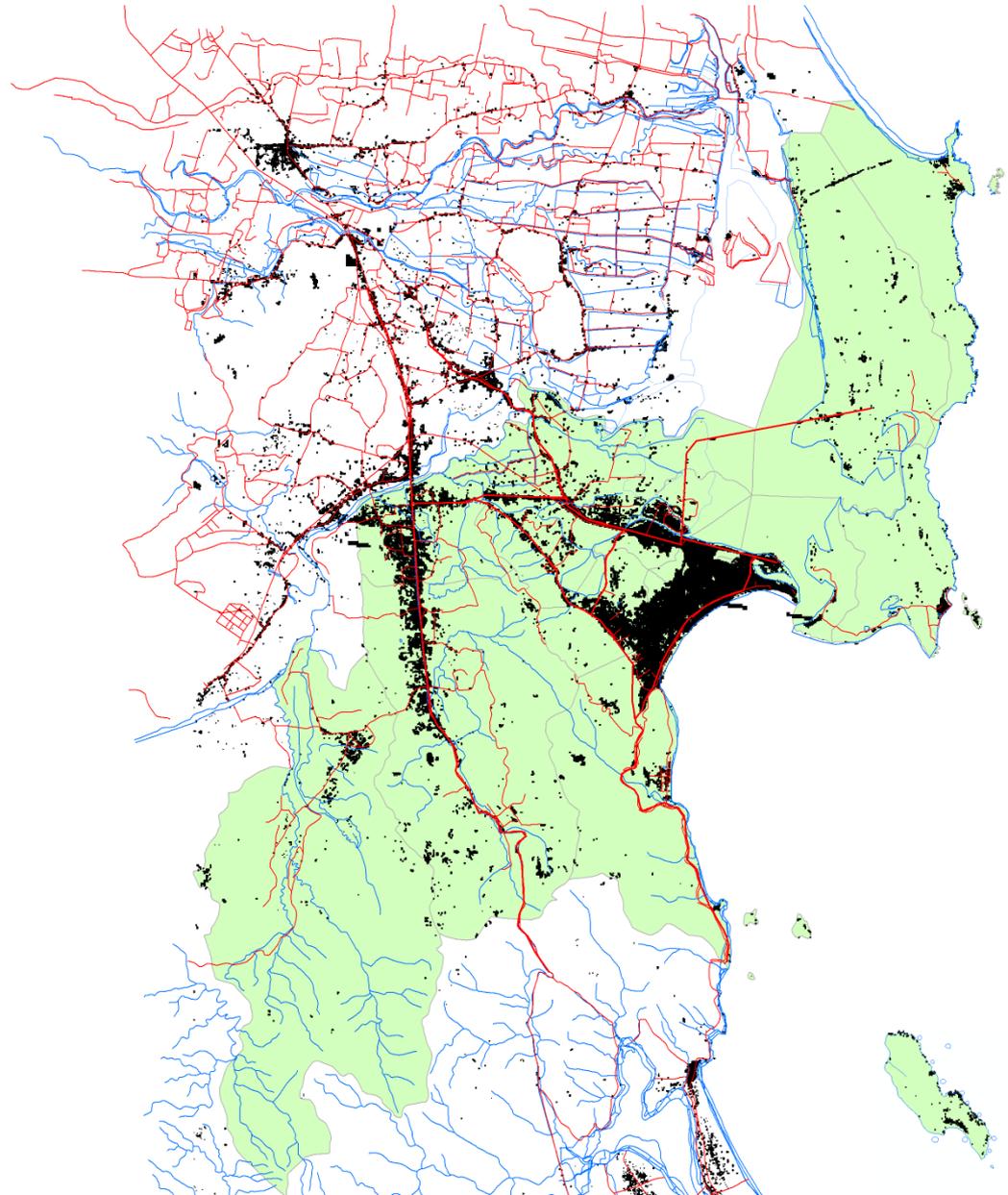
Năm 1973

Năm 1992

Năm 2000

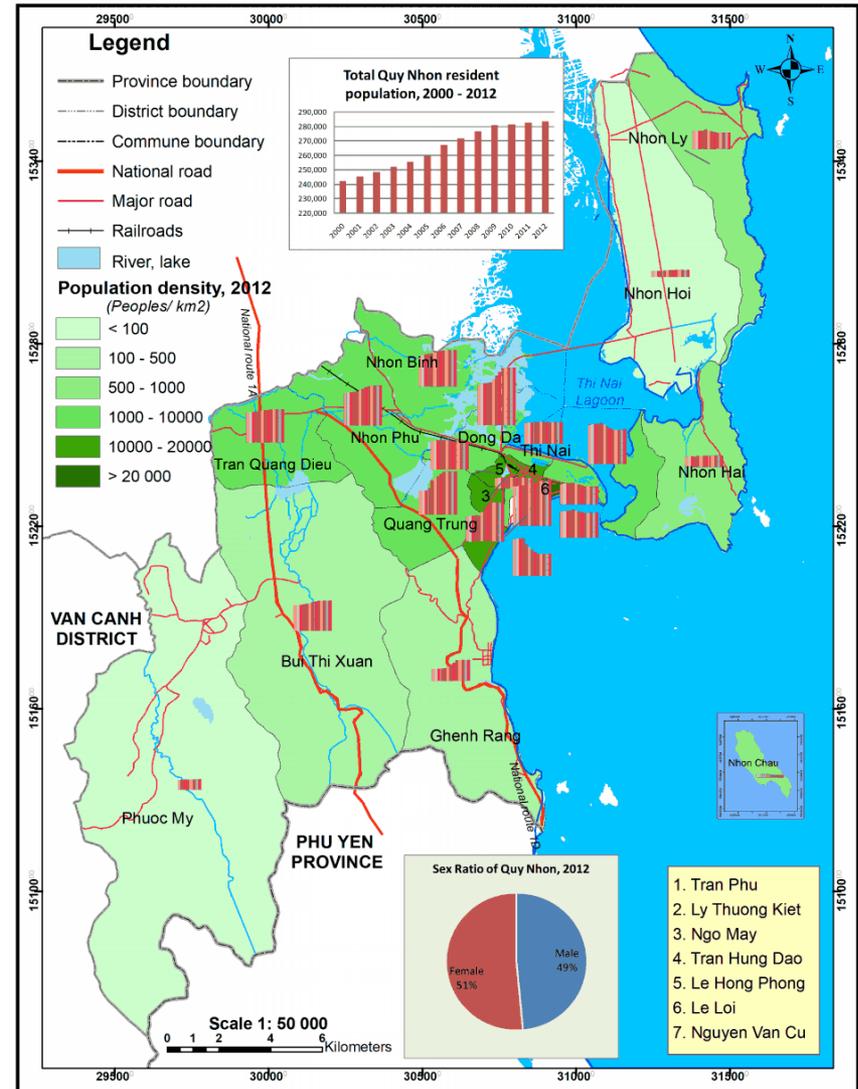
Năm 2005

Năm 2013



Population growth

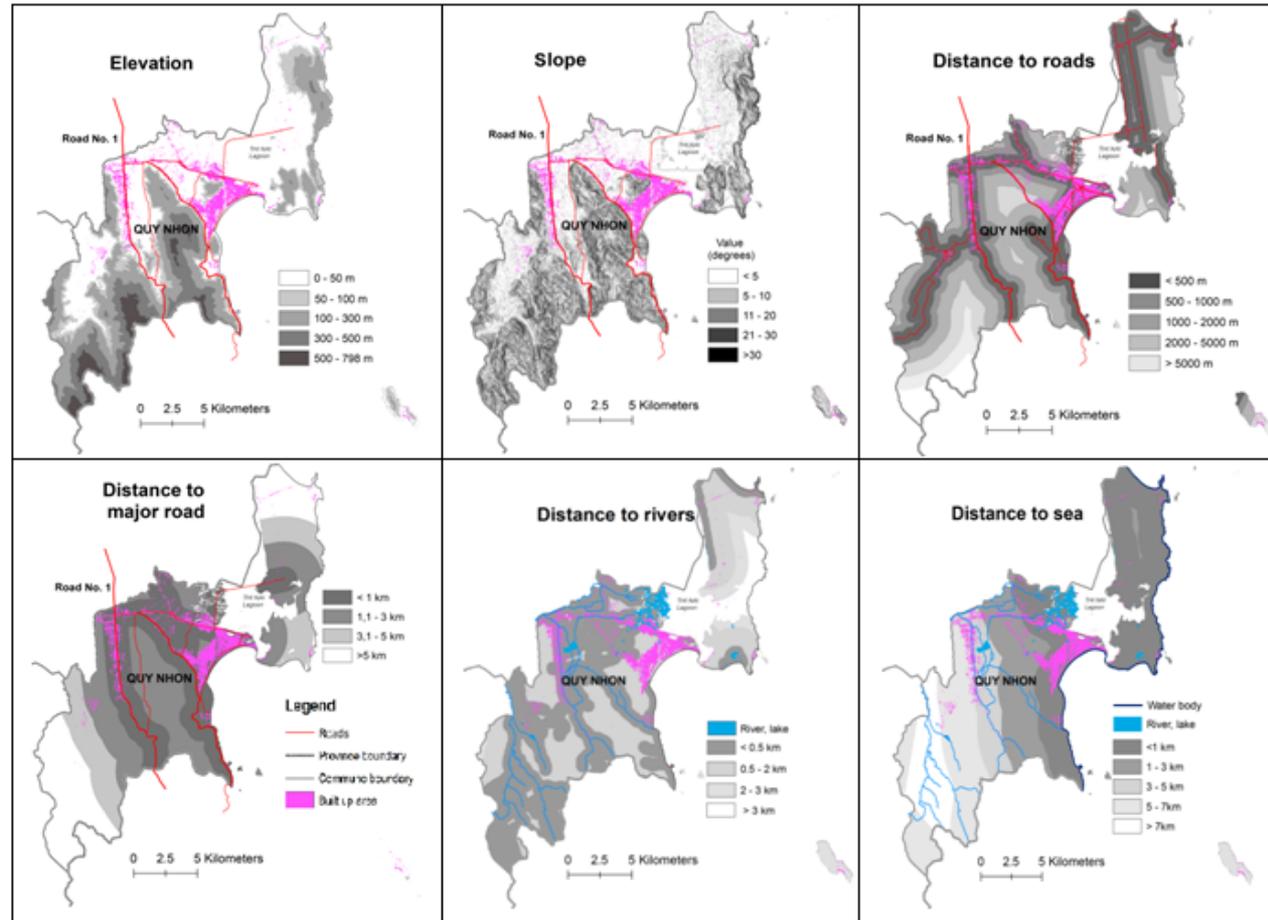
- ▶ Over the last decade, the population has growth rapidly from 241,830 inhabitants in 2000 to 283,403 inhabitants in 2012. Different communes have different trend of population growth.



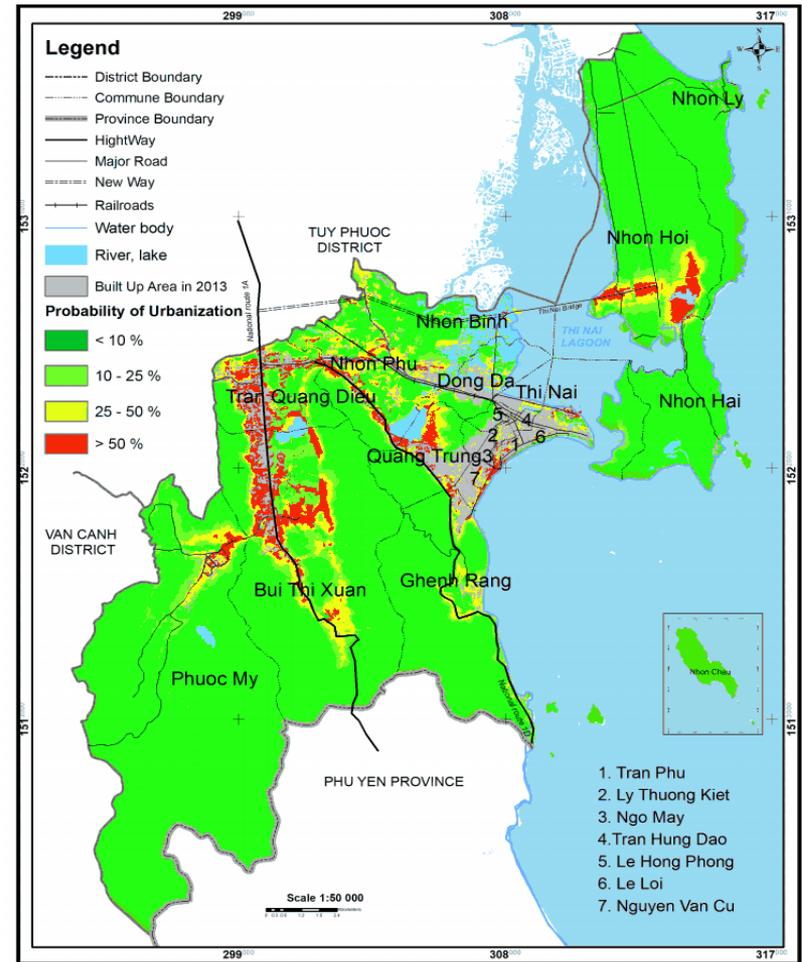
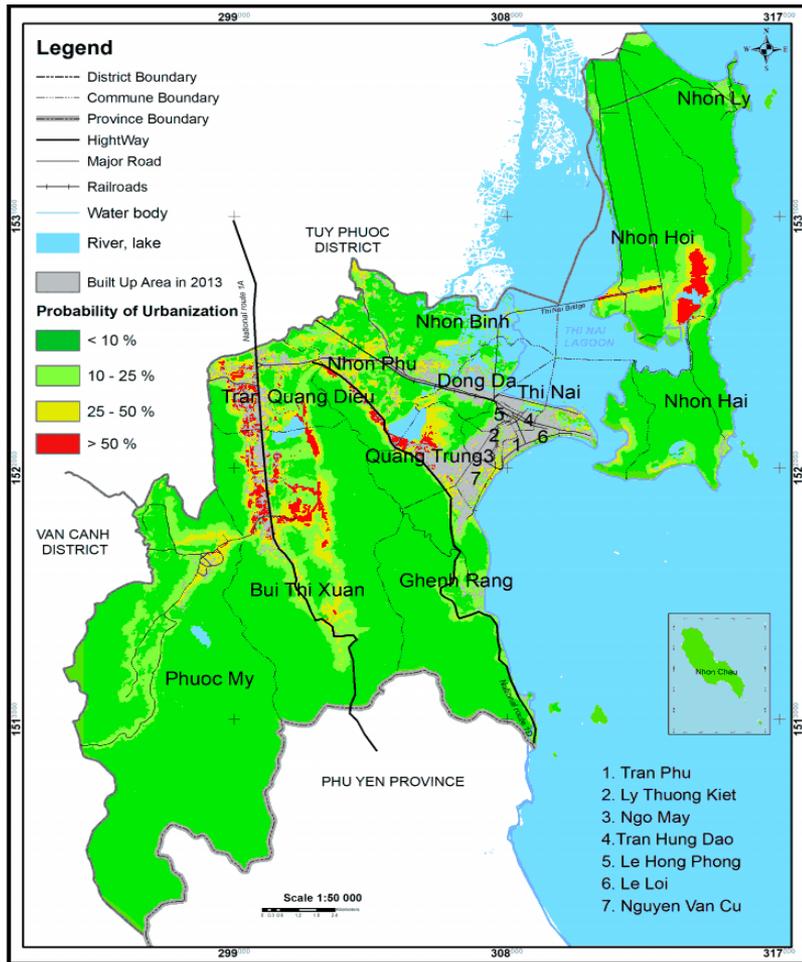
Multiple logistic regression

Significant variables:

- ▶ Elevation
- ▶ Slope
- ▶ Dist. to roads
- ▶ Dist. to major roads
- ▶ Dist. to river
- ▶ Dist. to the sea
- ▶ Land use



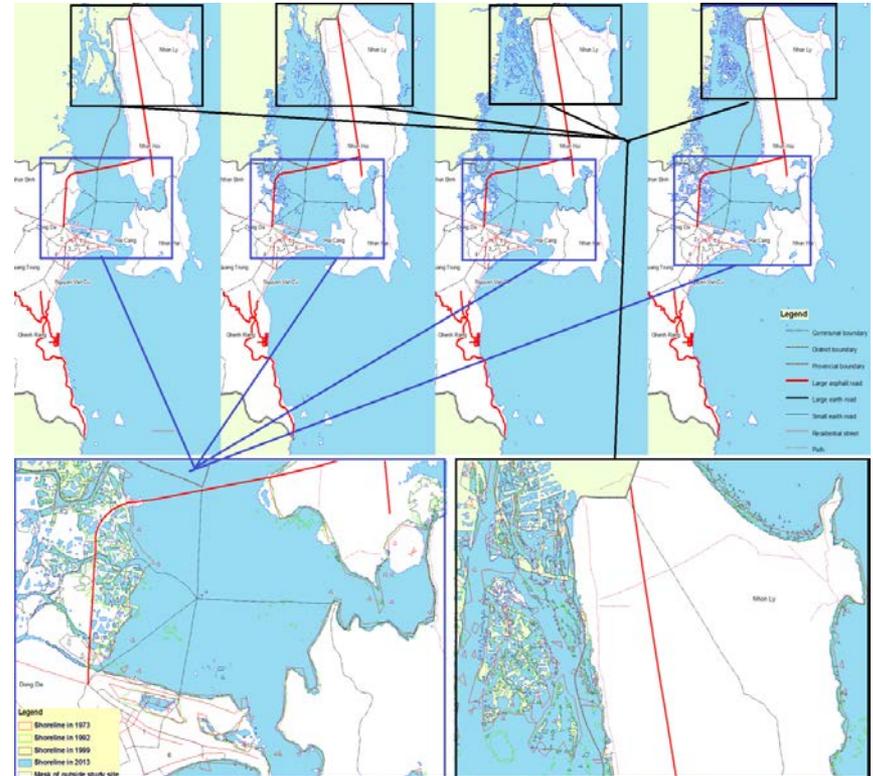
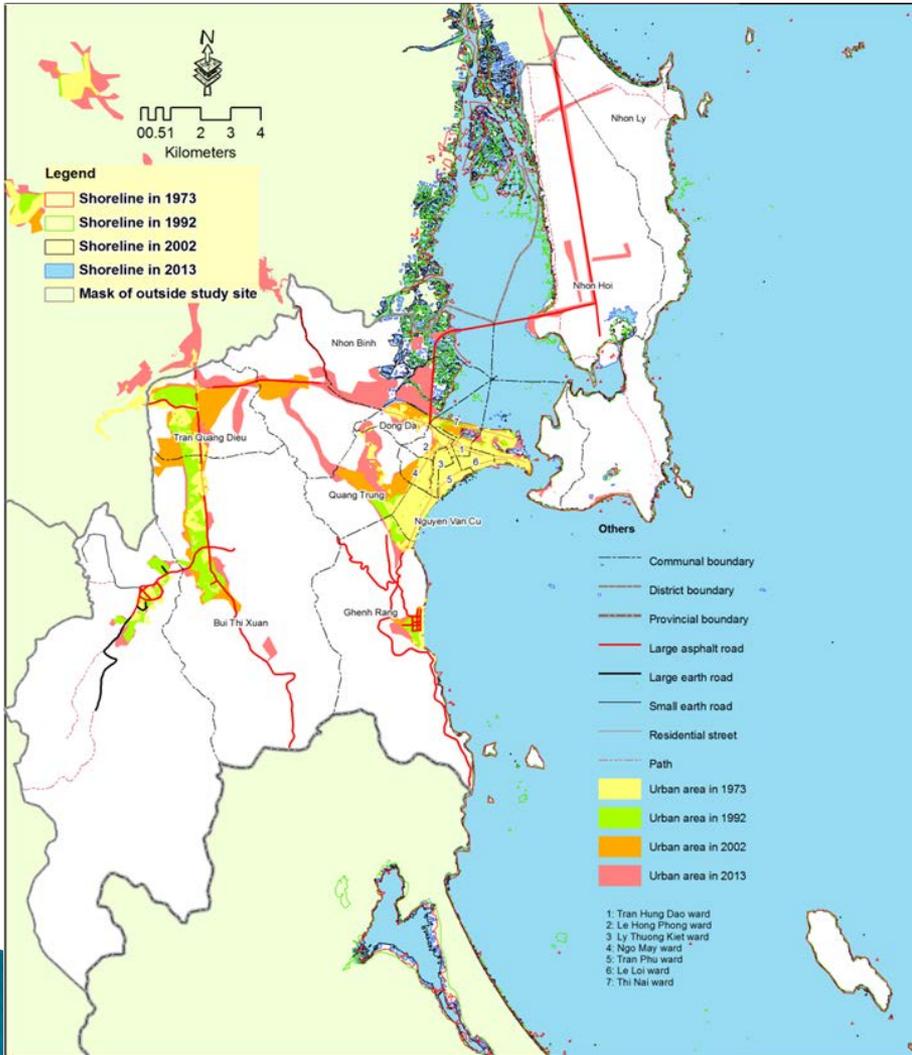
Prediction of urban expansion



Future scenario with present road situation

Future scenario with construction of new roads

Shoreline modifications



- ▶ Lost of mangrove forest
- ▶ Sea dyke construction to prevent soil erosion and storm attached to the village

Focus group discussion on Urban resilience planning

- ▶ Provincial Dept. Of Natural Resources and Environment (DONRE)
- ▶ Provincial Dept. Of Agriculture and Rural Development (DARD)
- ▶ Provincial Dept. Of Construction (DOC)
- ▶ City People Committee
- ▶ Quy Nhon University
- ▶ Climate change office
- ▶ ...



Urban resilience planning

- ▶ In the context of climate change and sea level rise, prior study must be carefully carried out before any construction



Coast with dyke in Ly Chanh



Coast without dyke in Ly Hung



River dyke in Nhon Binh area



Construction in the coast line

Urban resilience planning

- ▶ Risks may be caused by human activities rather than climate change
 - Construction of new roads
 - New urban area
 - Dyke construction



Conclusion

- In Quy Nhon city, urban has been expanded to flood-prone areas, which might accelerate flooding risks in the future. Shoreline modification due to human activities needs to seriously consider any potential impacts in the future. No urban construction should encroach on or replace the mangrove forest area which plays a vital role in the city's defense against the impacts of climate change.
- Urban systems – including ecosystems and infrastructure – have been developed without considering to the patterns of exposure of climate change and sea-level rise. To build a climate change resilience plan for Quy Nhon City, a concrete framework must involve all those components, including local people, local authorities and central government.



Asian Cities Climate Resilience

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More information
on our research
can be found at
<http://pubs.iied.org/10724IIED.html?c=urban>

Thank you for your attention!

