FIG WORKING WEEK 2019

22–26 April, Hanoi, Vietnam

"Geospatial Information for a Smarter Life and Environmental Resilience"

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"Geospatial Information for a Smarter Life and Environmental Resilience"

Spatial Planning Influences Mangrove Forest Development in Kim Son District of Ninh Binh Province

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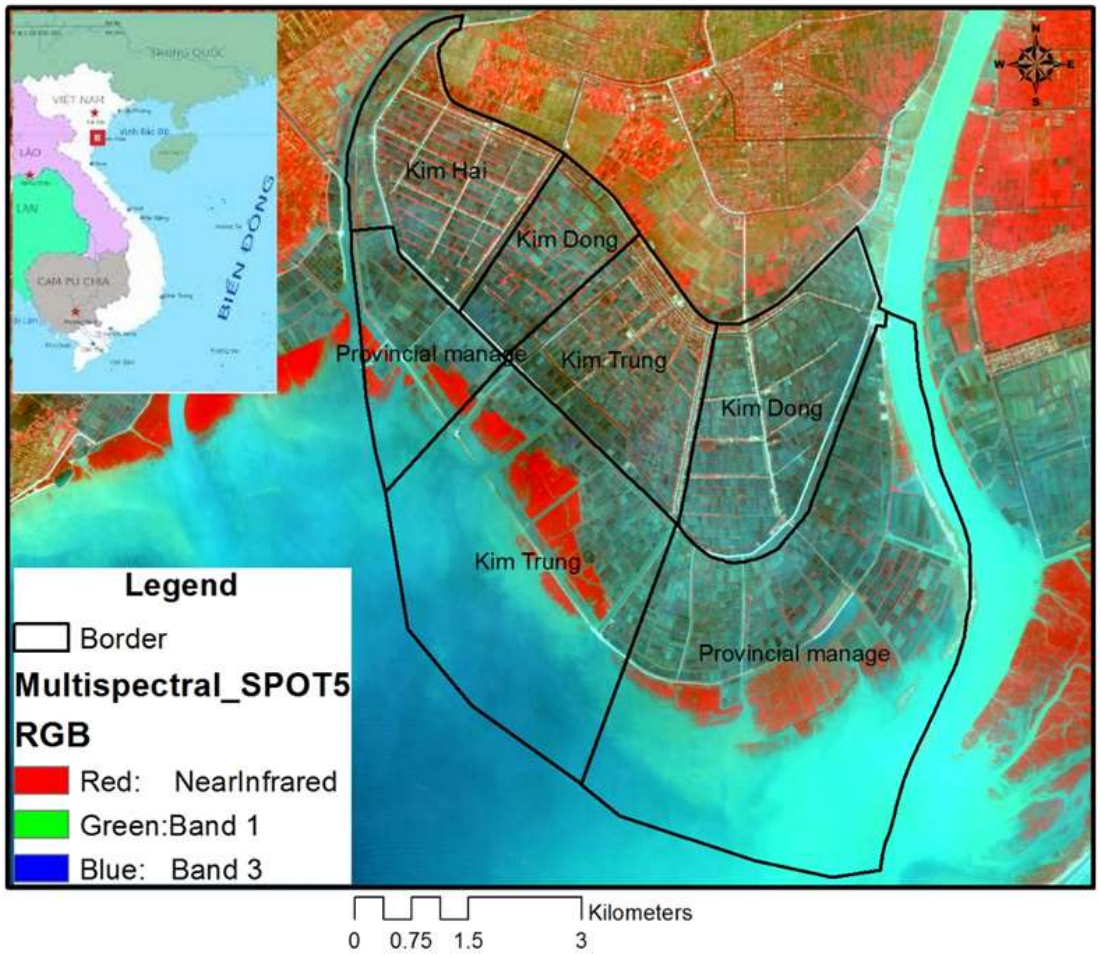
Content

Introduction

- Mangrove forest importance,
- What pressures are put on the forest?
- Mangrove planting is key for forest development,
- Benefits of using remote sensing for studying mangroves.

Method-study site and data

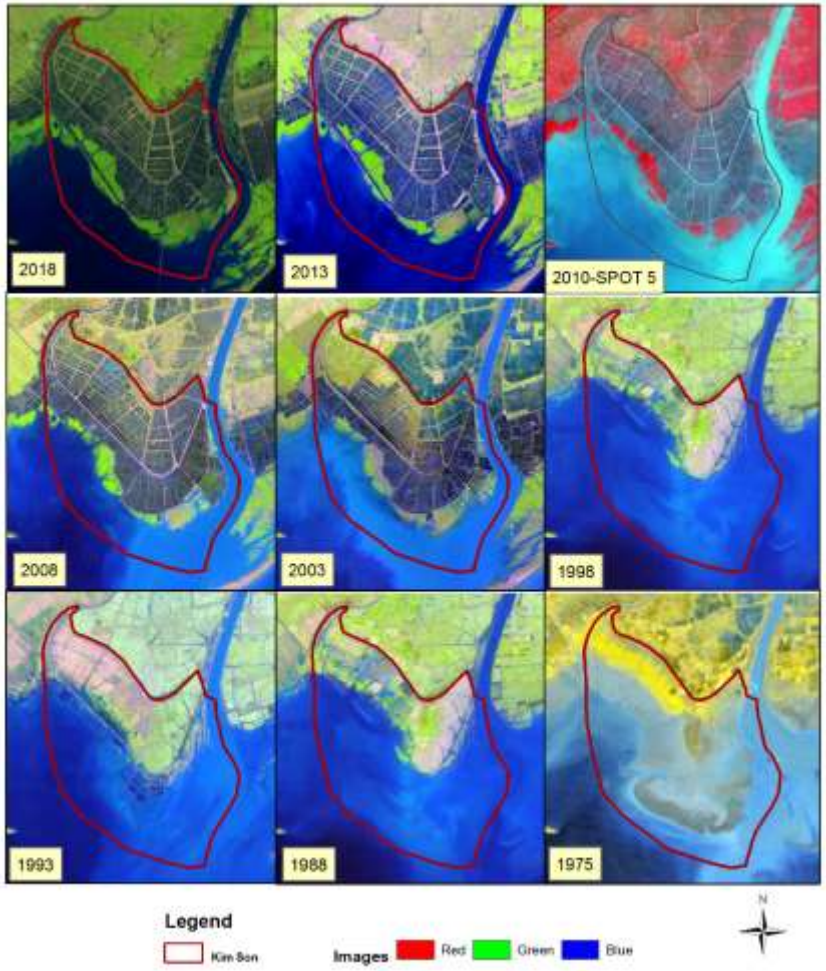


- Kim Trung's population is 169,000. The area is 215 km^2 ,
- The main economy is based on agriculture (rice) and aquaculture (shrimps, clams, fish etc.).
- Approximately 80 m of new land is created annually out to sea (Mai 2010).

Method-study site and data

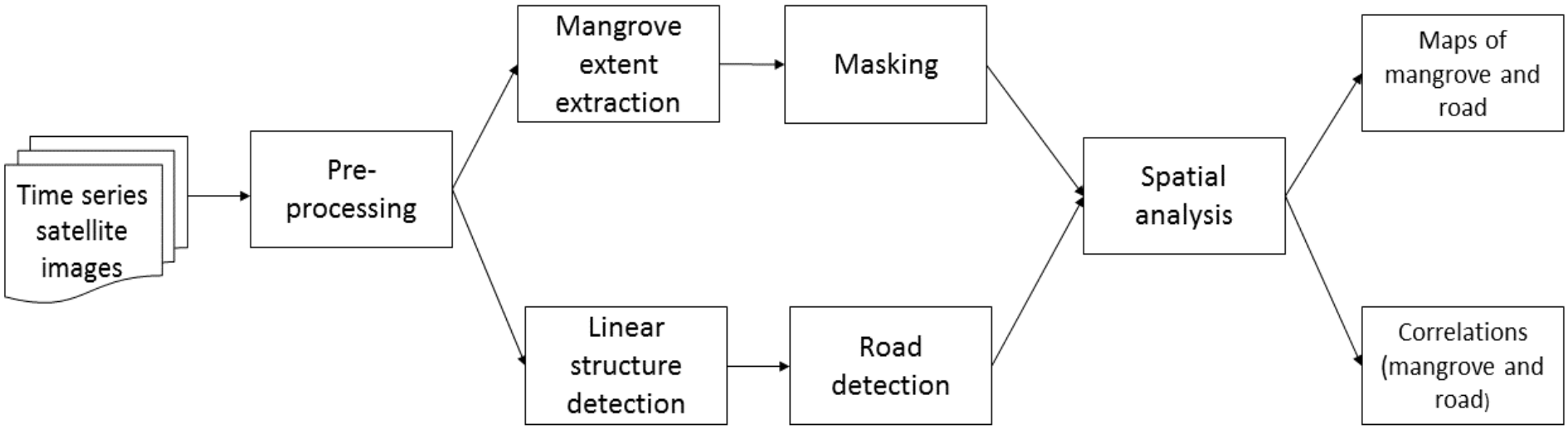
Satellite sensor	Date of acquisition	Pixel size	Spectral resolution	Band used
Landsat OLI_TIRS	2018-Oct-06 2013-Oct-08	30 m	11 band	3,4,5,6
SPOT 5 HRG 2	2010-Oct-22	10 m	4 band	1,2,3,4
Landsat TM	2008-Nov-11 2003-Jul-9 1998-Oct-15 1993-Nov-02 1988-Nov-04	30 m	7 band	2,3,4,5
Landsat MSS	1975-Aug-07	60 m	4 band	4,5,6,7

Method-study site and data



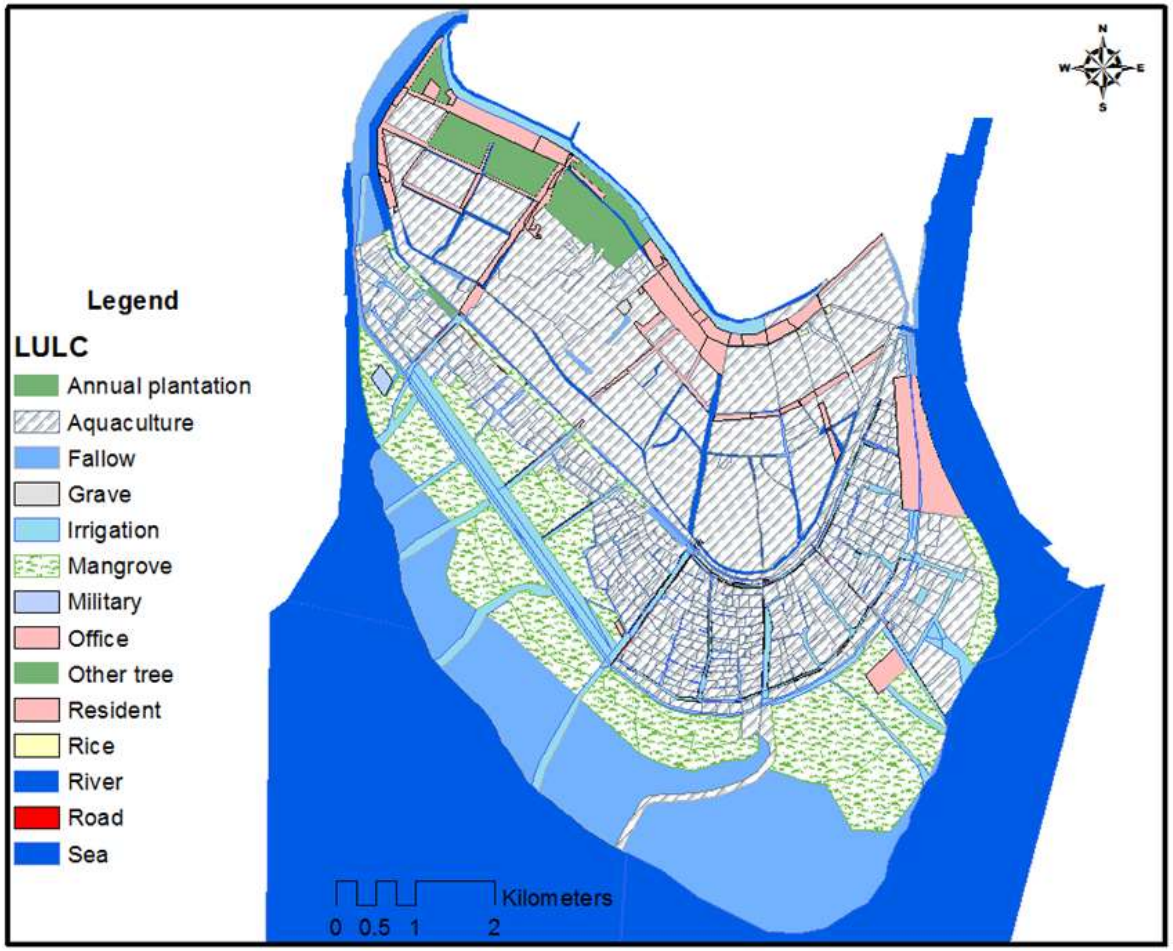
- Pre-processing a time-series of Landsat captured for Kim Son district every 5 years (except SPOT 5 year 2010 and the Landsat 2 acquired in 1975),
- At a glance we could see a change in mangrove forest and land extent.

Method- Study work flow



The SPEAR Lines of Communication (LOC) – Roads tool (Wollmer, 1970) in ENVI software was used to highlight roads to aid manual digitizing of the road system.

Method- Mangrove and road classification



- The Support Vector Machines (SVMs) (Ben-Hur et al., 2001), was applied for classification of all images.
- ArcGIS tools including spatial analyst tools, geostatistical analyst and statistics were used to determine correlations between road length (km) and mangrove extent (ha).

Method- Mangrove and road classification

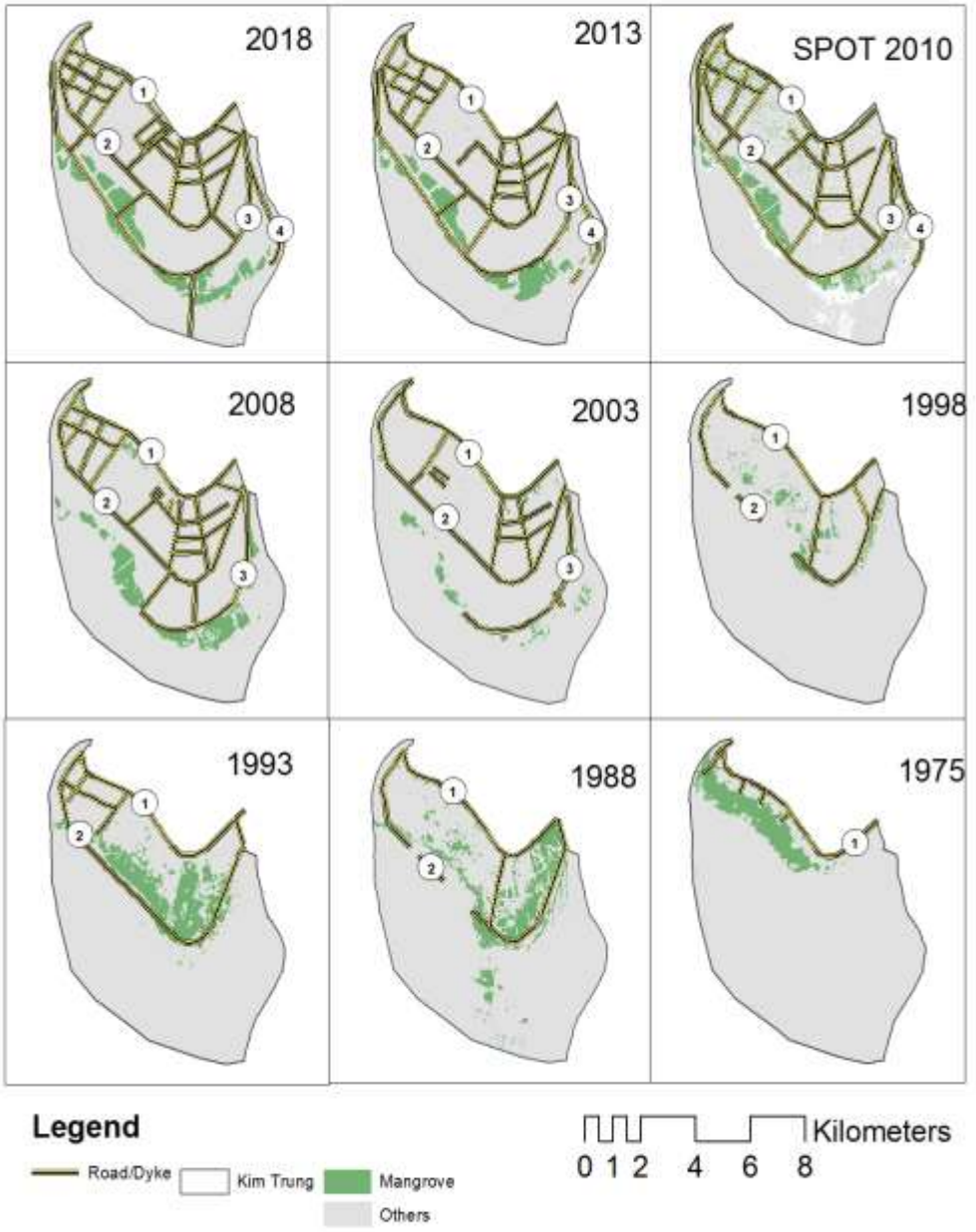
Confusion Matrix

Overall Accuracy = (34067/34664) 98.2778%
Kappa Coefficient = 0.9727

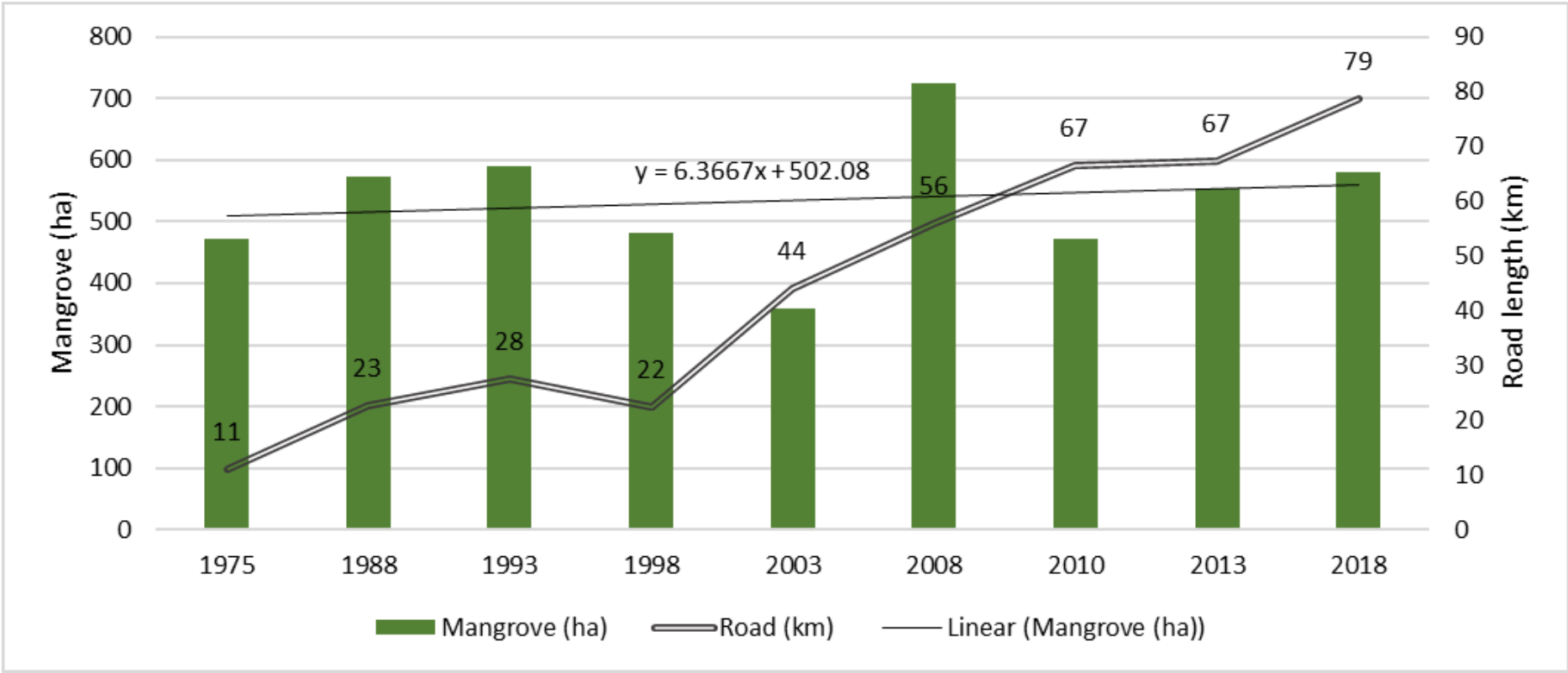
	Ground Truth (Pixels)				
Class	Mangrove	River	AquaCul	Resident	Road
Unclassified	0	0	0	0	0
Mangrove [Whi	3346	0	279	11	0
River [Green]	0	7659	90	0	0
AquaCul [Blue	0	0	18815	0	12
Resident [Cya	8	0	5	3085	159
Road [Yellow]	0	0	2	31	1162
Total	3354	7659	19191	3127	1333

Results

- The overall trend is that the initial mangroves were growing outside the dykes, then blocked by new dykes becoming degradation.
- Dyke 2 appears to have been broken within the 1993-1998 period.

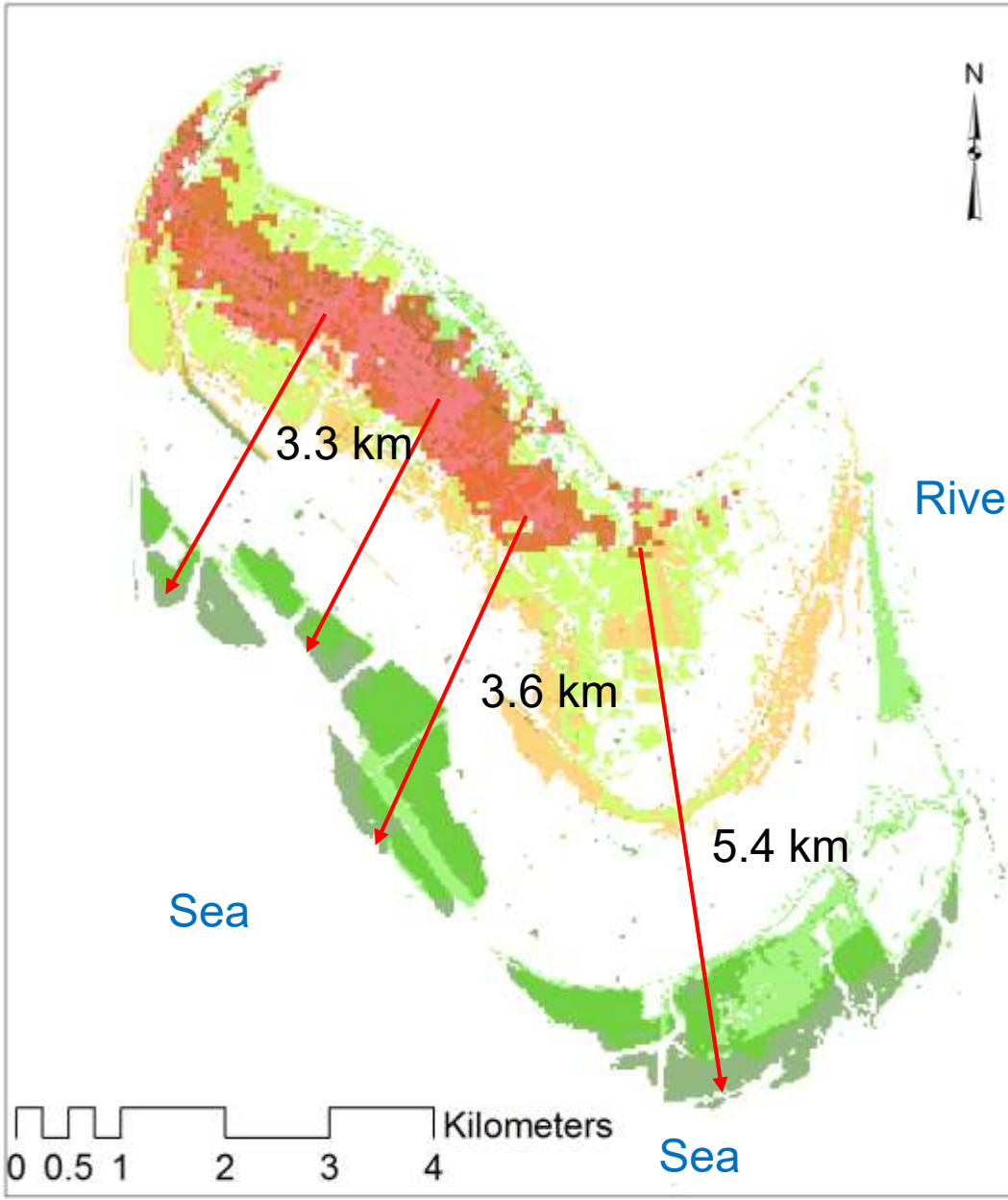


Results


800
700
600
500
400
300
200
100
0
Mangrove (ha)
90
80
70
60
50
40
30
20
10
0
Road length (km)
y = 6.3667x + 502.08
11
23
28
22
44
56
67
67
79
1975
1988
1993
1998
2003
2008
2010
2013
2018
Mangrove (ha)
Road (km)
Linear (Mangrove (ha))

Results

- ✓ Clear seaward movement of the mangrove forest every ten years between 1975 and 2018.
- ✓ Mangrove development showed fluctuation with gains and losses over the period.



Conclusion

- Nguyen Cong Tru's land reclamation created new land out to sea, and this happened in many regions along the Vietnam coastline.
- Building dykes is an effective way to reclaim land, but it can impact mangroves if they are contained because they need tide and sedimentation to survive.
- Remote sensing is an effective method to analyze spatial change in geographic features over a long period of time
- Climate change might have indirect effects on mangrove change with growth, but we did not assess climate change effects in this study

THANK YOU FOR YOUR ATTENTION