

# Investigating land-use/cover changes along the East-West Economic Corridor in Vietnam, Laos, and Thailand

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# Objective

- Research question: what, if any, is the impact of improved transportation routes on land-use/land-cover change.
  - Has land-use/cover change taken place within the corridor?
  - Has urbanization taken place? What is the nature of urbanization (extension of already urban areas or rural urbanization)?
  - Are cross-border “teleconnections” evident in the corridor?

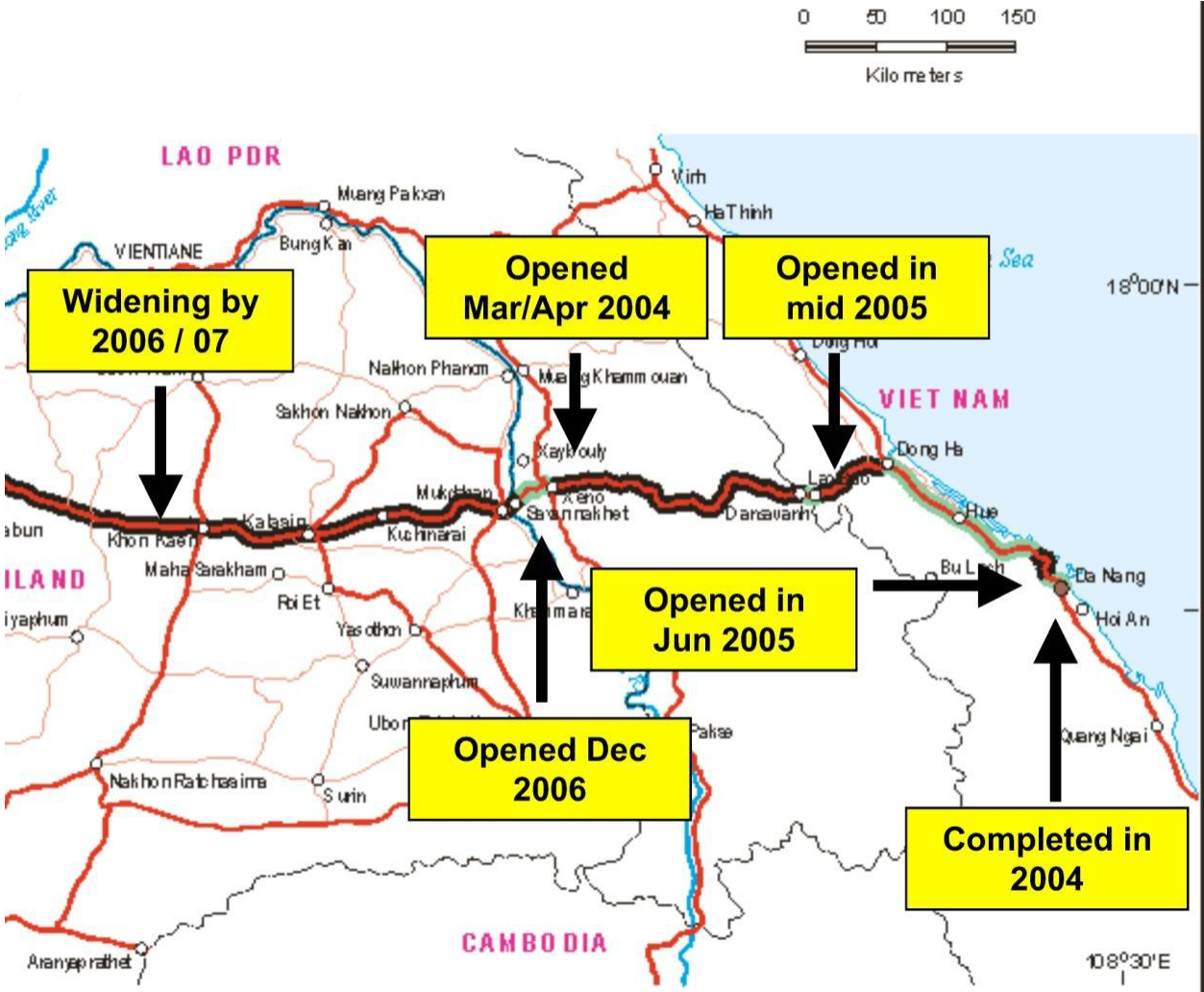
# Study Area:

## The East West Economic Corridor from Khon Kaen, Thailand to Da Nang, Vietnam

- Initiated in 1992
- Objective: improve the regions connectivity and key sectors of the economy through improving the transportation infrastructure
- Funded by ADB, Japan, local countries



# Upgrades and extension of the EWEC



# Background

- Central Vietnam
  - Poorest region of the country
  - Two historical urban areas
    - Hue – ancient capitol
    - Da Nang
      - 3<sup>rd</sup> largest city
      - Deep water port
      - Dynamic city government
  - New urban area:  
Dong Ha, Quang Tri Province



- Southern Laos:
  - One of poorest regions of Laos
  - Largest urban area Savannakhet
  - Lacking infrastructure and connectivity to other parts of SE Asia



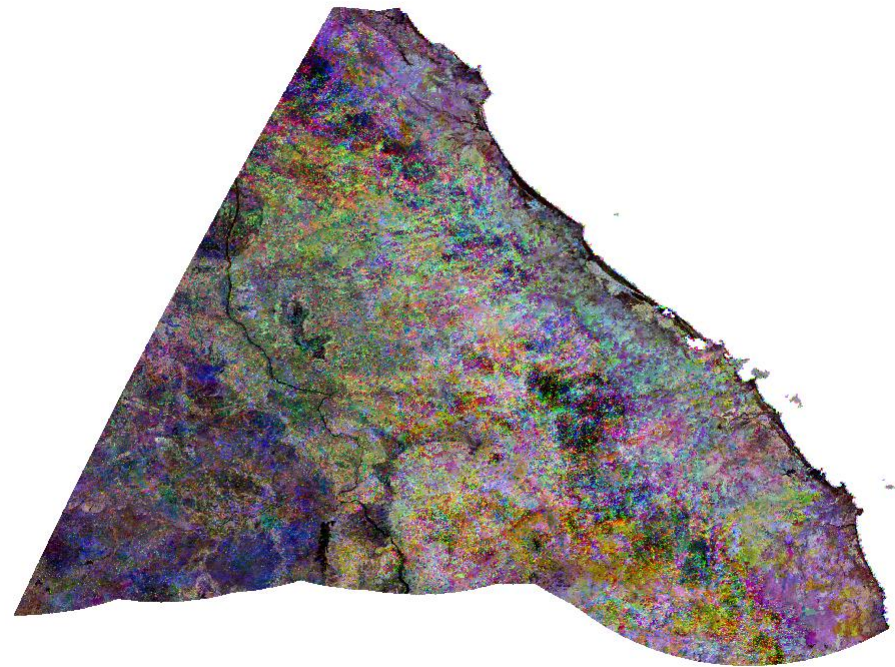
- Northeast Thailand:
  - Poorest region of Thailand
  - Poor agriculture potential
  - Not well connected to Bangkok
  - Largest urban area: Khon Kaen





# Methods

- Land-use/cover change analysis
  - Hypertemporal analysis of MODIS EVI 16 day composite data from 2002 to 2014 to identify areas of recent change
  - Landsat TM and ETM+ multi-date analysis to explore:
    - Details of recent changes
    - Longer change trends (1980s to present)
  - High resolution image analysis
    - Ground truth for medium resolution data
    - Evidence to support changes



“Hypertemporal” MODIS EVI data  
July 2002 to February 2014 – 262 scenes  
(100 km buffer around EWEC)

# Methods cont'd

- Fieldwork
  - Ground truth data collection
  - Interviews with province and district officials
    - Impact of EWEC
    - Recent changes – drivers of those changes
  - Village/commune level research
    - Livelihood systems
    - EWEC
    - Recent changes

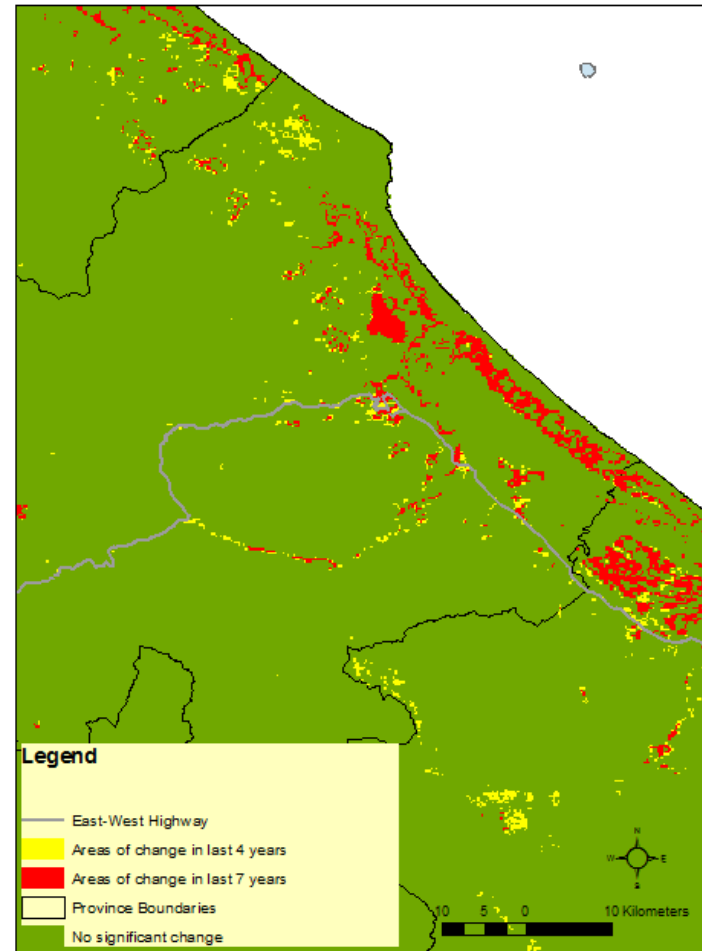
# Results

- EWEC Impacts to date
  - Transportation infrastructure upgraded
  - Increased tourism from Thailand to Laos and Vietnam
  - Slight increase in exports (reported 4% to 5% increase from Thailand, little from Laos)

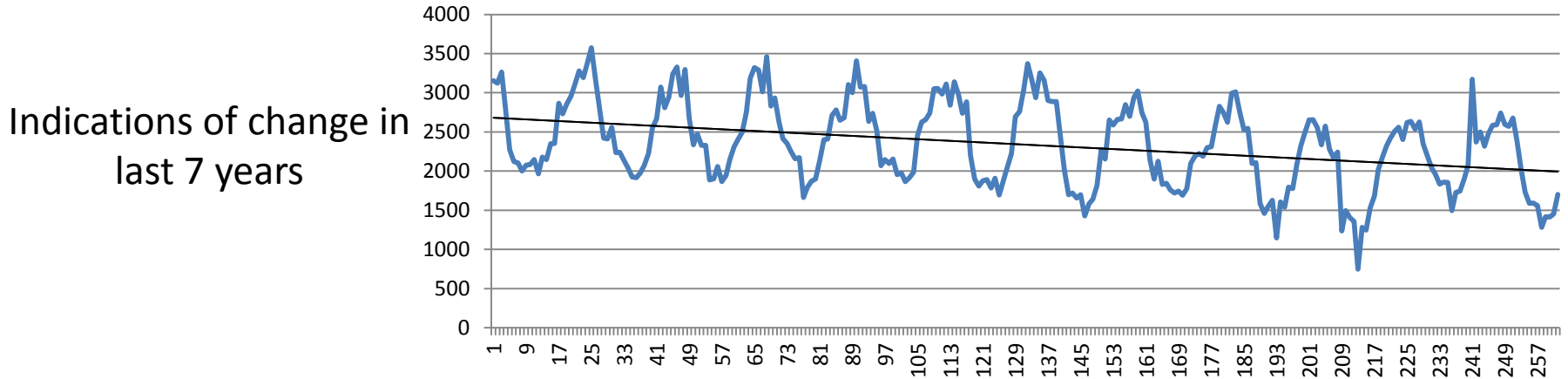
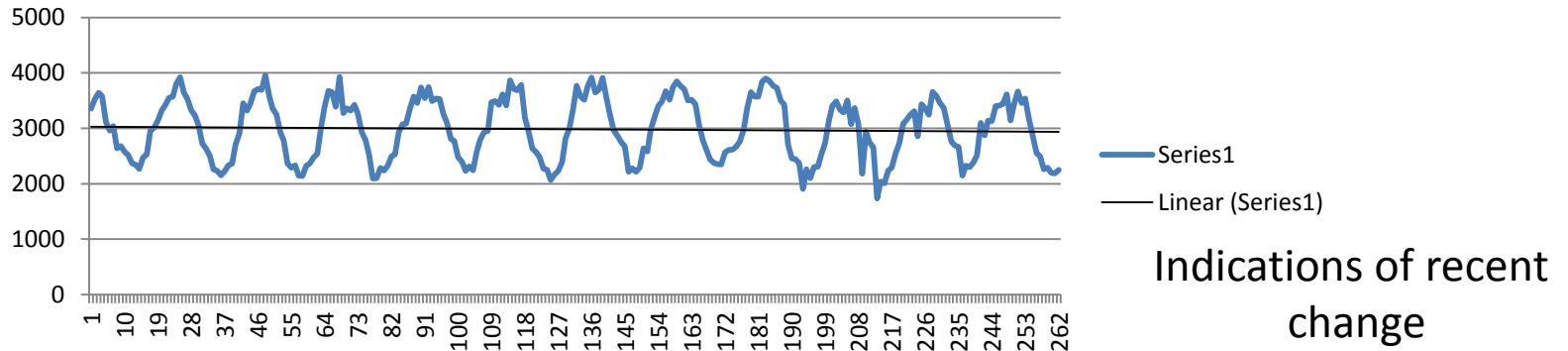
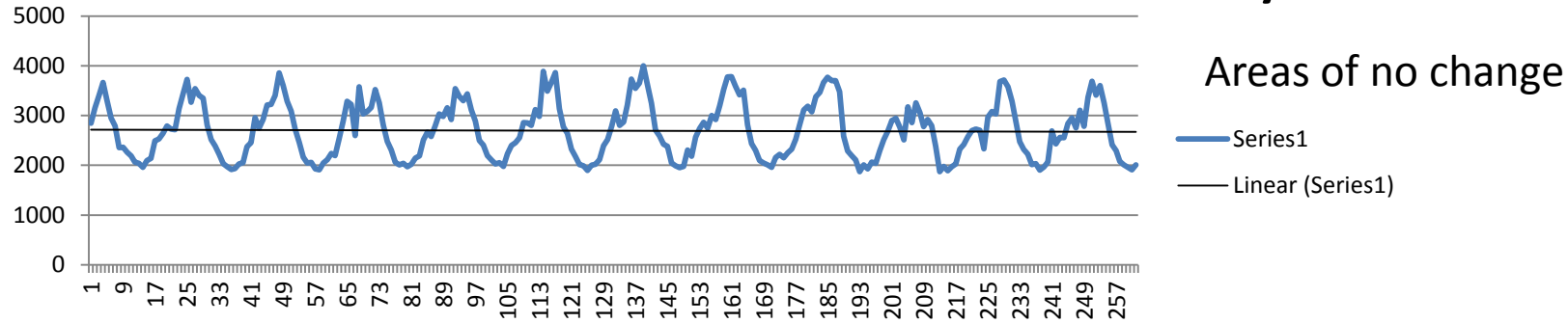


# Indications of Land-Cover Change

- Hypertemporal analysis
  - Identified areas of change
  - Evidence of urban expansion from 2006
  - Evidence of rural urbanization since 2006 (especially along transportation routes)

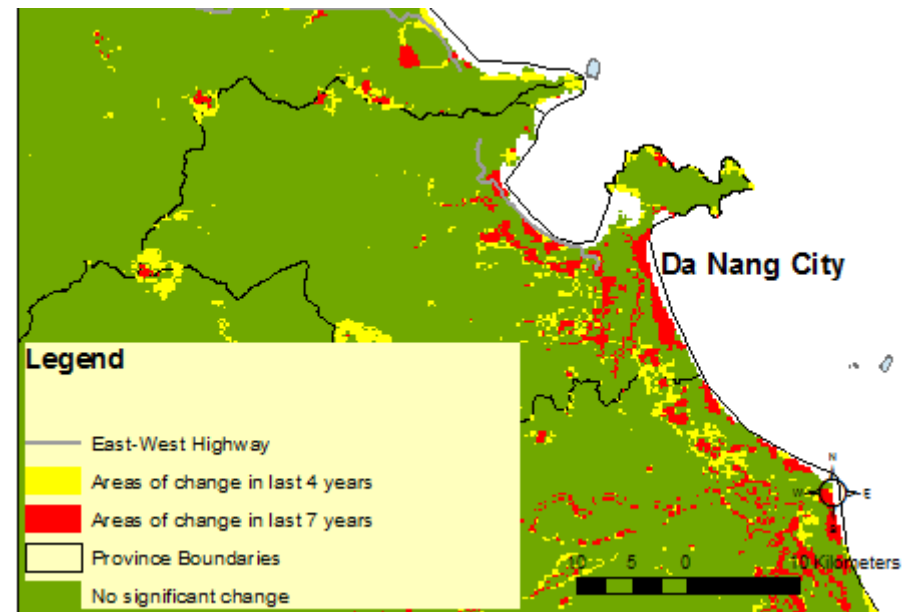


# Examples of Hypertemporal EVI Analysis



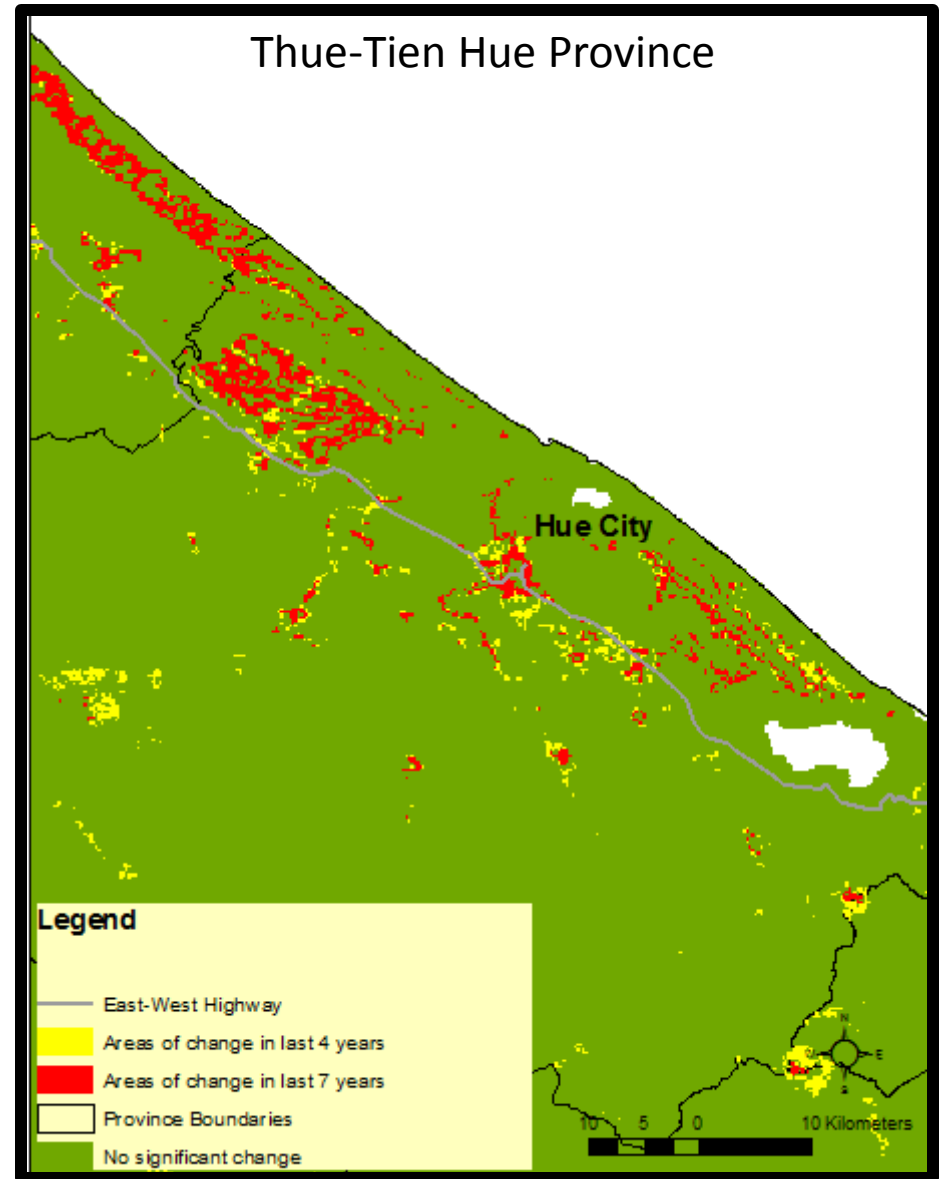
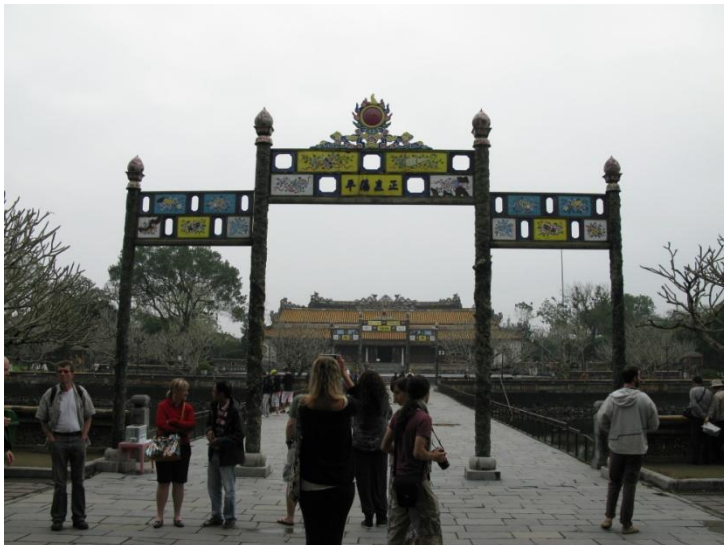
# Changes in Urban Areas

- Da Nang
  - Expansion of residential areas
  - Infilling of urban areas
  - New industrial zones
  - Expansion of tourism infrastructure
  - Only 2 rural districts left (out of 7)

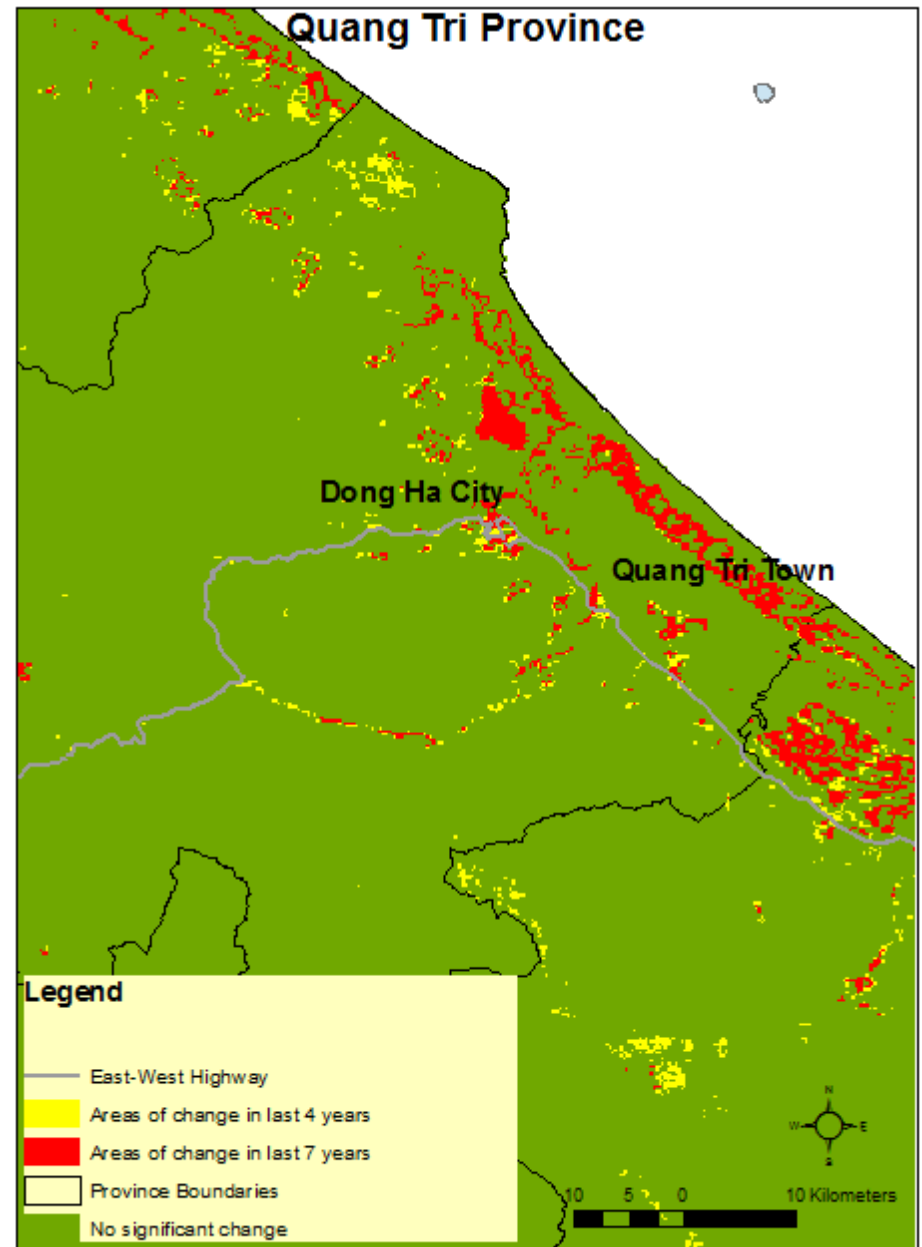


- Hue

- Urban growth in last decade
- Infilling of urban areas
- Expansion of city
- Tourism driven
- Industrial zones not as successful as in Da Nang



- Dong Ha, Quang Tri Province
  - Quang Tri town expanded
  - Dong Ha newly constructed in last decade
  - Evidence of rural urbanization within Quang Tri





# Rural Urbanization

- Areas in special economic zone between Laos and Vietnam and village areas along major highways in corridor showing evidence of urban like growth (infrastructure development, change in the orientation of livelihood activities)



# Southern, Laos

- Savannakhet has grown – evidence it is further expanding
- Profited from ‘Friendship bridge’
- Increased tourism
- New university



# Northeast Thailand

- Undergoing rapid changes from rural focus to urban
- Regions land-use staying the same; land-cover transitioning to greater tree cover
- People focusing on ‘urban type’ livelihoods
- Most recently some FDI industries relocating from Bangkok



# Conclusion

- Indications of LCLUC in the corridor
- Indications of urban growth
- Indications of rural urbanization
- EWEC has increased connectivity between countries
- Further LCLUC analysis informed by fieldwork will help clarify these initial conclusions



[Driving on the EWEC](#)

# Appendix

- Hypertemporal analysis
  - Unsupervised clustering (K-means) of the image into 59 clusters
  - Harmonic analysis; looking for clusters where significant decrease in EVI from one year to next
  - These are areas of change
  - Compared these areas to high resolution imagery
  - Busted apart these clusters and reclassified them
  - Final output shows areas in urban and rural areas where EVI decreased or stayed the same or increased