

Increased Accessibility, Landscape Changes, Rural Transformations, and Urbanization: Impacts of the East-West Economic Corridor from Da Nang, Vietnam to Khon Kaen, Thailand

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Background. This project investigates the impact that the “East-West Economic Corridor” (EWEC) from Da Nang, Vietnam (Figure 1 and 2), to Khon Kaen, Thailand, is having on land-cover and land-use in three different, yet contiguous, countries with different political histories and different current policies. The EWEC is being developed under the Asian Development Bank’s Greater Mekong Subregion (GMS) Integration Policy (Asian Development Bank 2012). This policy grew out of initiatives started in the early 1990s when the six countries of the GMS, China, Vietnam, Laos, Cambodia, Thailand and Myanmar (Burma) started construction on a system of roads, mainly running in the north-south and east-west directions, with the aim of improving the regions connectivity and key sectors of the economy through improving the GMS’s transportation infrastructure (ADB 2010). Fox et al. (2009) discuss some of the initial effects of part of the North-South Economic Corridor on northern Laos, where the growing of rubber trees has expanded in response to demand from China. This project focuses on impacts of the “East-West Economic Corridor (EWEC), also referred to as Route 9, which runs along a 1,600 kilometer route and connects the countries of Myanmar, Thailand, Laos, and Vietnam. Figure 3 illustrates the extent of the EWEC that will be investigated and the dates that upgrades and improvements were made in the corridor.

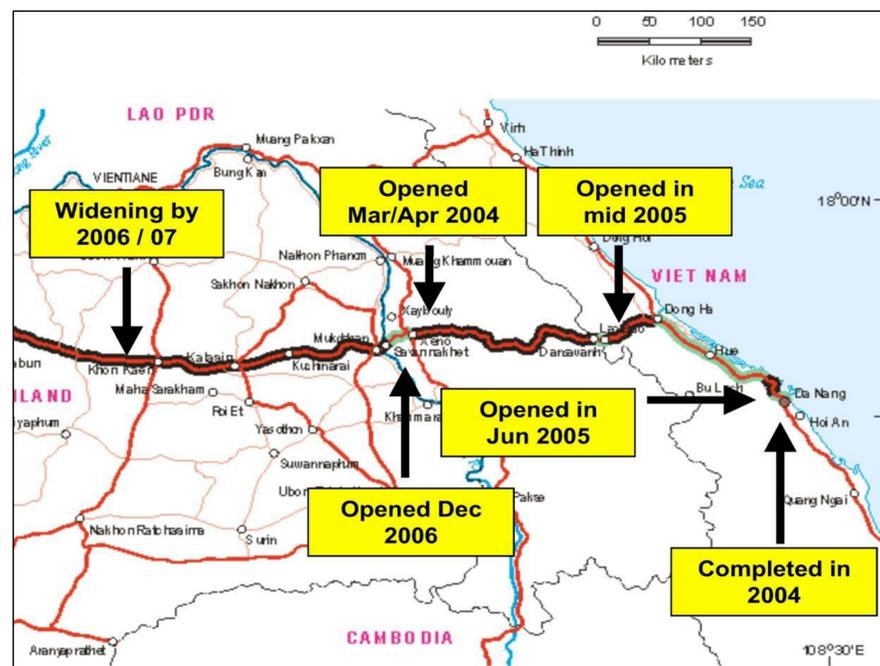


Figure 3. The EWEC from Da Nang, Vietnam, to Khon Kaen, Thailand and dates when upgrades on the road were completed. (Verbiest 2007)

The section of the road that this project focuses on runs from the seaport of Da Nang in the central part of Vietnam, north through the historical Vietnamese capital of Hue to Dong Ha, west to the Laos border crossing into Laos at Lao Bao, Vietnam, and Dansavanh, Laos, across southern Laos and crossing into Thailand at the city of Savannakhet, Laos, and Mukdahan, Thailand, and west across eastern Thailand through the city of Kalasin to the city of Khon Kaen. Upgrades on this section of the EWEC were completed by 2007. The route passes through six urban areas, agricultural dominated coastal plains, areas of tropical montane moist forest where swidden cultivation is practiced, and across areas where permanent agriculture is practiced in a drier, savanna type setting.

Goal, Hypotheses, and Research Questions. The ultimate goal of this project is to identify the role that the EWEC plays in the changing landscape of central Vietnam, southern Laos, and eastern Thailand, and its influence on the region’s land-cover/use changes and urbanization processes.

The hypothesis underlying the research is that different government policy agendas are the main driver of land change along the EWEC. In order to test the hypothesis the following research questions will be addressed:

- Has LCLUC occurred within the vicinity of the road since upgrades were completed? Where and how much?
- Has urbanization taken place along the road? If so, what is the nature of the urbanization? (Is it continuous urbanization (e.g. infilling, edge expansion, or spontaneous growth) or is it the “rural urbanization” noted by Rigg (2001)? Where does it fit on the “continuum” proposed by Seto et al. (2012)?)
- Are urban-rural teleconnections evident in the EWEC (Seto et al. 2012)? If so, are urban-rural teleconnections cross-border or oriented within each country?
- Are there discernible differences between urban-rural transformations between the three countries? What are the differences?
- Do past development paths followed by different countries impact on LCLUC along the road?
- What are the different countries’ government policies related to LCLUC and urbanization within the EWEC? How do these policies, and their impacts, differ between the countries?



Figure 1. Da Nang Beach (2003)

Figure 2. Da Nang Beach (2012)

Methods.

Remote Sensing: Data for three time periods will be analyzed:

Period 1 and 2: 1982 – 1990 and 1990 – 2000 – Landsat and SPOT data. Identify spatial-temporal patterns of regrowth using a hybrid decision-tree classifier. Identify high to very low (and vice-versa) vegetation changes and changes in intermediate land-cover types (Leisz and Rasmussen 2012). Patch metrics in conjunction with post-classification change analysis to identify changes in land-use patterns (Leisz et al. 2005).

Period 3: 2000 – 2012 - Landsat, SPOT, MODIS data. Hypertemporal analysis of MODIS data will be done (Park 2010). Hypertemporal analysis of MODIS data identifies year-on-year changes to land-cover (Figure 4). Landsat and SPOT data will be analyzed using same methods as for Period 1 and 2, hypertemporal output will be used as additional input to hybrid classification of Landsat and SPOT data for this period.

Urban areas (periods 1, 2, 3): Landsat and SPOT data. Multi-step classification algorithm utilizing change vectors of Tassel-Cap brightness, greenness, and wetness will be used to identify land-cover change in each urban area (Seto et al. 2002). Landscape metrics for each area will be used to describe urban growth (Seto and Fragkias 2005).

Fieldwork: Yearly to collect (1) ground truth; (2) community level information re: LC/LU change (focus groups); (3) livelihood and land-use changes (structured surveys); (4) policy changes (officials), perceptions of reasons for land-use/cover change (semi-structured and in-depth interviews).

Social Economic: time series population data; agricultural census data; economic growth data; country specific policies; regional policies; institutional change; local level (village, commune, district) interpretations of policy and relevant changes; infrastructure changes, village, commune, district level livelihood system changes.

Integrative Analysis: Drivers of land cover/land use change, rural, urban, and peri-urban nature of the EWEC within each country will be investigated by analyzing the remote sensing, fieldwork survey, and socio-economic data in tandem using GIS available tools and spatial statistics. The census, livelihood data, infrastructure information, road density, and LCLUC data will be integrated to develop an index of urbanicity for the current and previous time periods. This information will be analyzed to identify how urbanicity has changed from the baseline period to the present day. Teleconnections between known urban areas, urban-rural areas, and urban-“rural urbanized” (Rigg et al. 2008) areas will be identified through an analysis of road and other transportation network connectivity and LCLUC data in conjunction with fieldwork collected survey responses. The role borders play will be especially focused on. An agent based model will be developed as a tool for analyzing the roles that different countries’ policies, including borders, have on the urban changes and on LCLUC.

Expected Outcomes. The project responds to the need in the GMS to understand the impact that the EWEC and other economic corridors are having on land-cover / land-use in the region and the way that urbanization is spreading within the corridors. The work will provide a unique set of data on LCLUC within the corridor, changing urbanicity within the corridor, and urban teleconnections within, and potentially outside, the EWEC. The analysis will provide a better understanding of the role that roads play in influencing land-cover and land-use changes and the role that they play in the GMS urbanization processes. This information will also be valuable to the global understanding of land change and urbanization processes.

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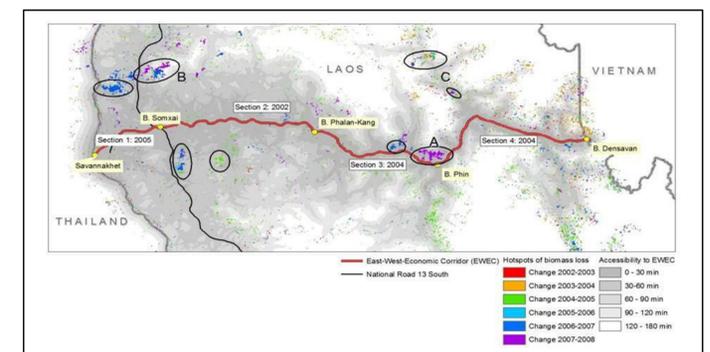


Figure 4. Overview of hotspots of deforestation within the Laos EWEC corridor based on a sudden drop of EVI yearly means from one year to the next.