A global-to-local model approach to assess future land use dynamics: An application to Vietnam

Presentation prepared for the session on Innovation of Models across Agro-Environmental Scales, Agro Environ 2012, 1-4 May 2012, Wageningen.

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Introduction

- Land plays a crucial role in Vietnamese development:
  - Agriculture makes up 21% of GDP
  - 41% rural population share
- Vietnam is very vulnerable to climate change:
  - Expected sea level rise between 35-44 cm in 2060
  - 13% of paddy rice area in Mekong Delta expected to be affected by inundation and salinity (IFPRI).
  - High risk of extreme weather events (typhoon and storms).
- After accession to the WTO in 2007, Vietnam's economy has become increasingly integrated with the world economy.

Objective and context

- To support policy makers in the discussions on the future of land use in Vietnam.
- Results can be used as input for development strategies and policies, in particular:
  - Green Growth Strategy (under development)
  - Social Economic Development Strategy (2011-2020)
  - Reducing greenhouse gas emission in Vietnam's agriculture by 2020
  - REDD
- Funded by the Climate and Development Knowledge Network (CDKN) and Dutch Ministry of EL&I.
- Vietnamese partner: MARD/NIAPP.

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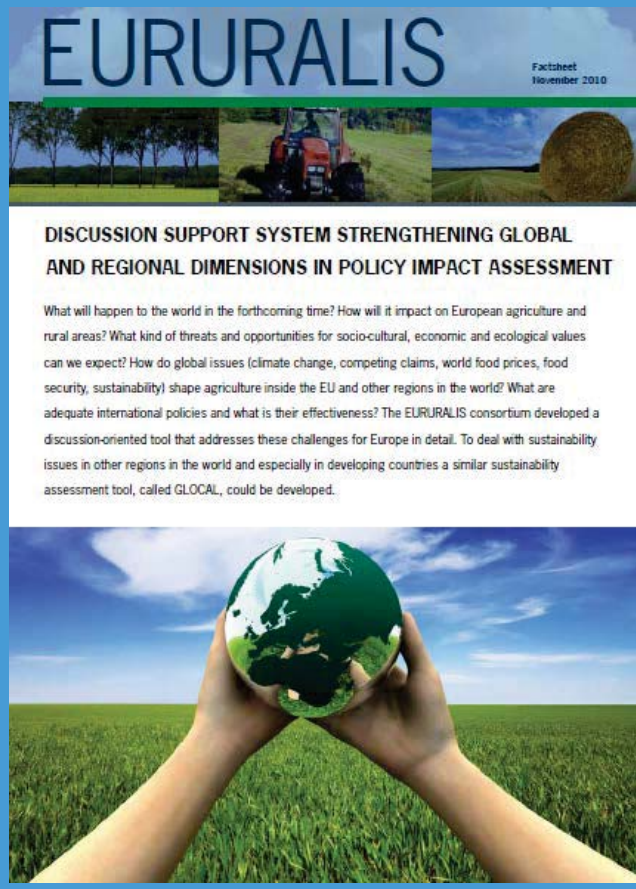
Methodology: Global-to-local modelling

- Analyse future land use by means of a combination of:
  - Global-to-local economic model
  - National-to-local land use model
- Based on approach developed by Verburg *et al. (*2008) as part of the EURURALIS project to analyse land use in Europe.
- First application to a developing country.



Methodology: Global-to-local modelling

Scenarios

MAGNET
Global economy model

CLUE
Spatial land allocation model

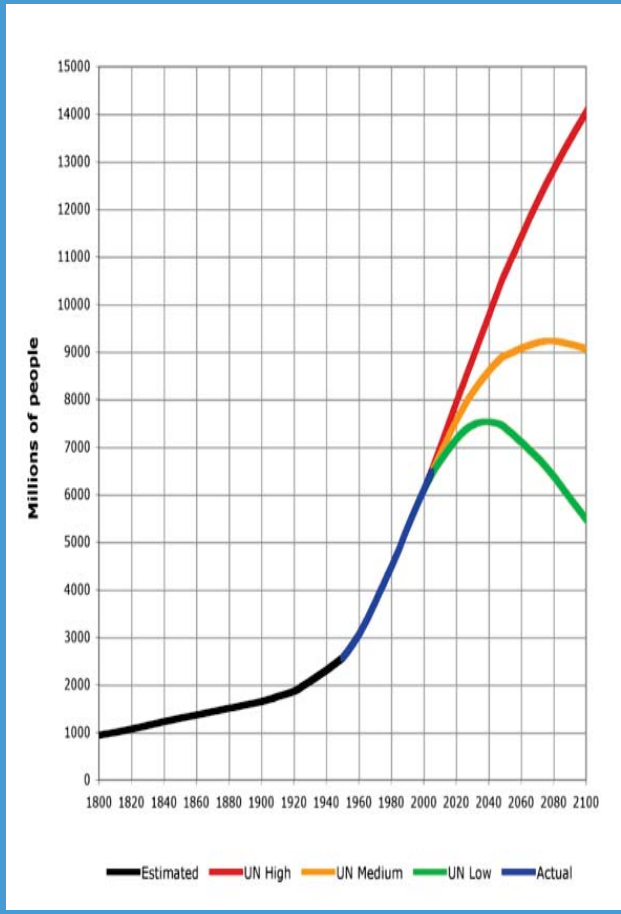
Indicators

Three scenarios: 2010-2030

- 'business as usual'
- High climate change impact scenario
- High growth scenario

Global drivers of land use change in Vietnam: Economic growth, Population growth, Yields and tech change.

Spatial development in Vietnam: Land use targets, Protected areas, Urbanisation.



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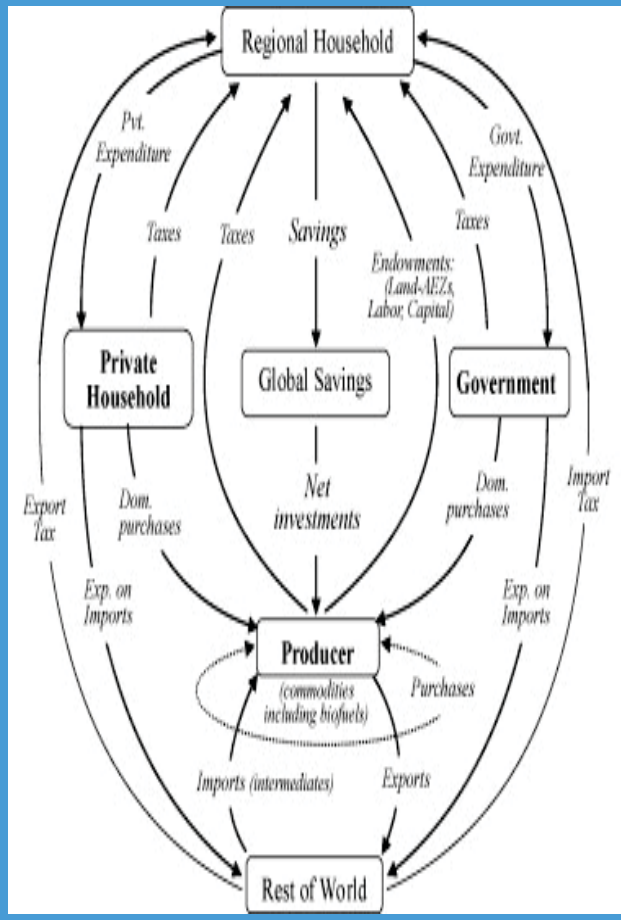
- Computable general equilibrium (CGE) model to simulate global economic development and trade.
- Covers 129 countries, including Vietnam (GTAP based).
- Models effect of global drivers on the Vietnamese economy
- Models the **demand** for land.



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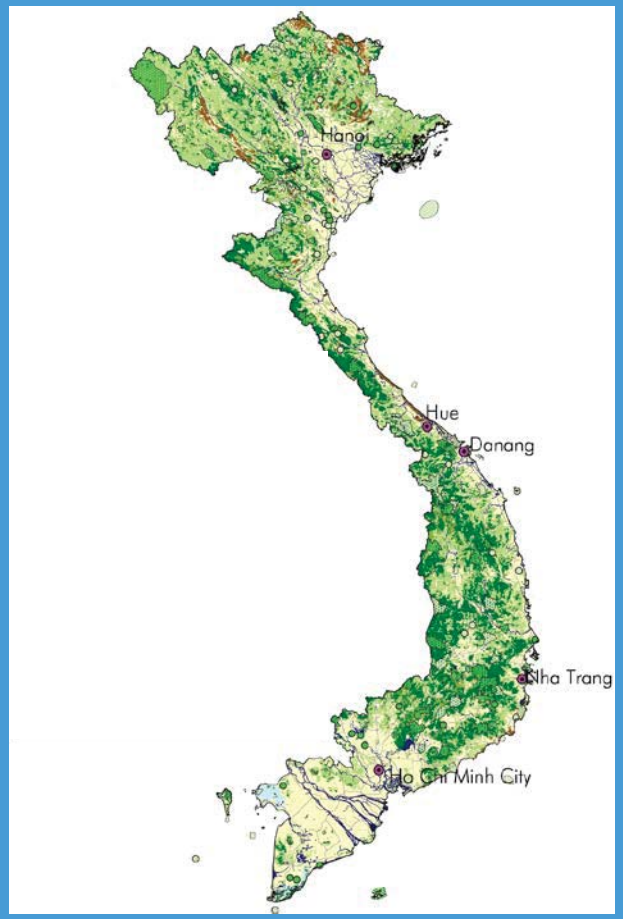
Indicators

- Downscales aggregate land use information from MAGNET to the 1x1 km2 spatial resolution.
- Uses GIS information on: elevation, slope, rainfall, distance to roads to spatially allocate use of land.
- Incorporates assumptions on spatial policies in Vietnam:
  - Land use targets
  - Protected areas
  - Urbanisation



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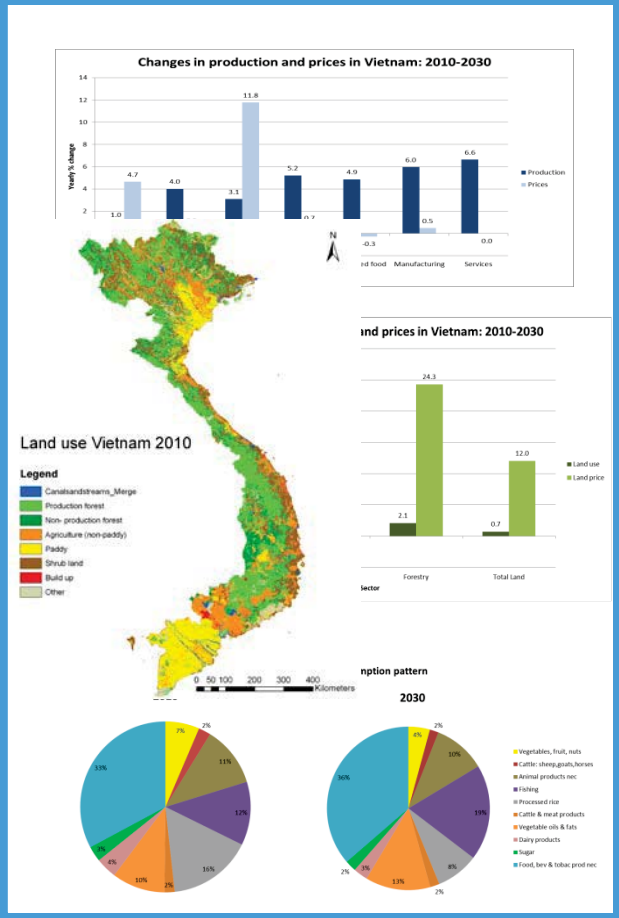
Indicators

- Economic indicators:
  - Sectoral growth
  - Structural change
  - Trade
  - Prices
  - Food security
- Land use indicators:
  - Land use maps



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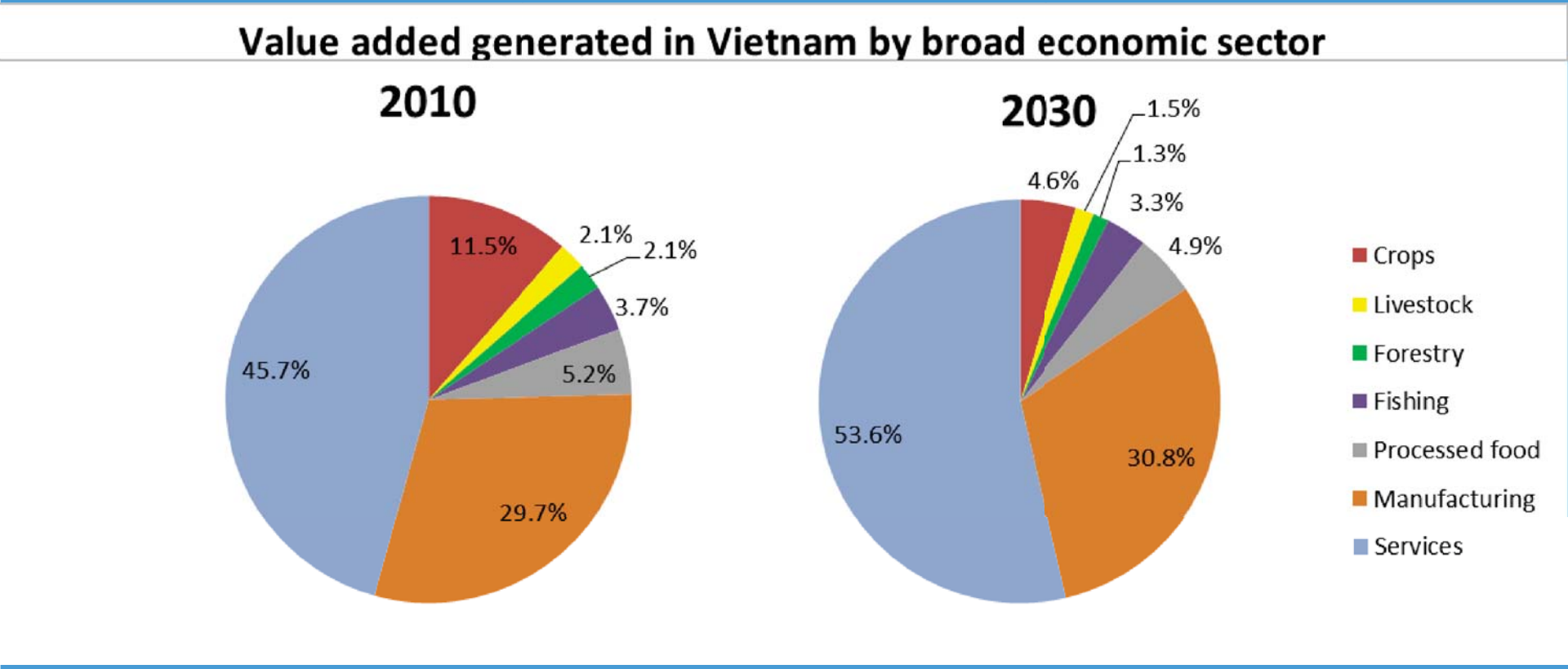
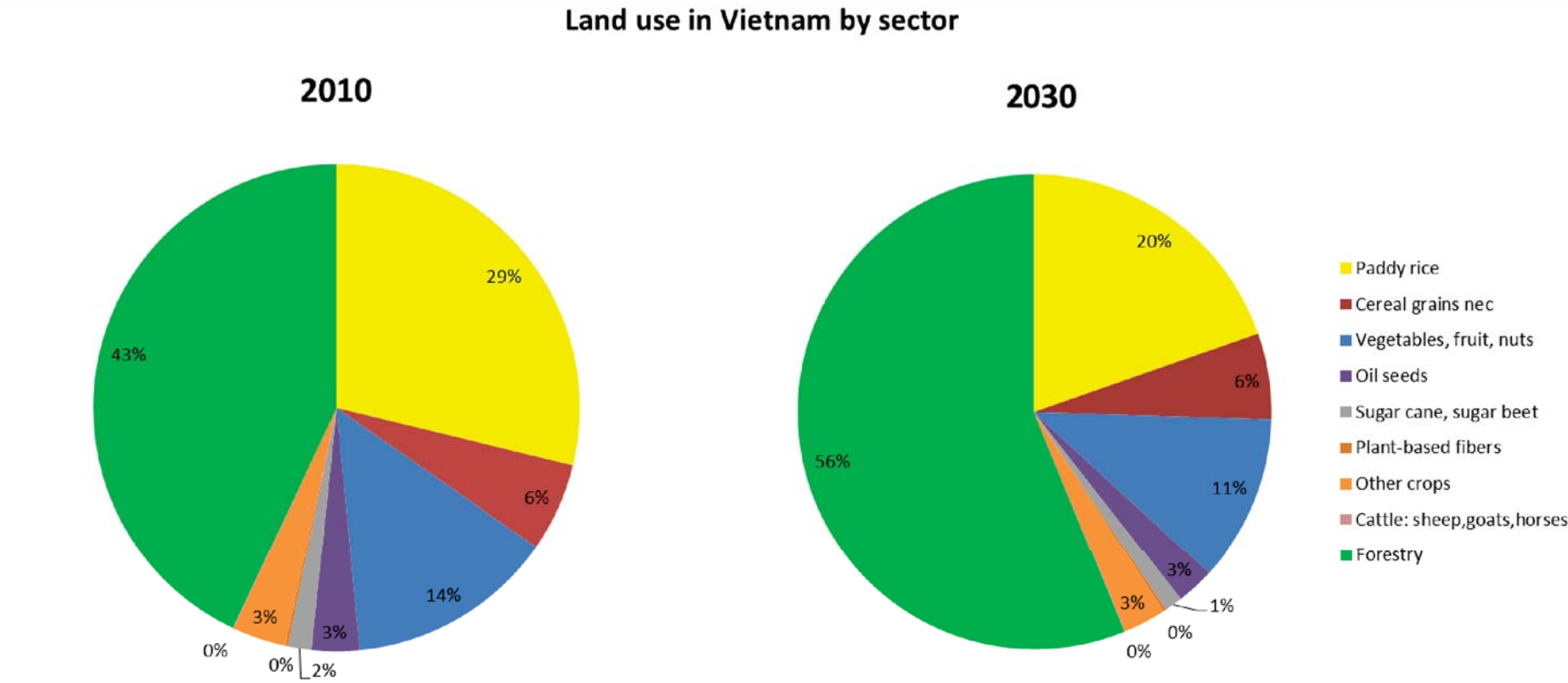
MAGNET Baseline Results (preliminary)

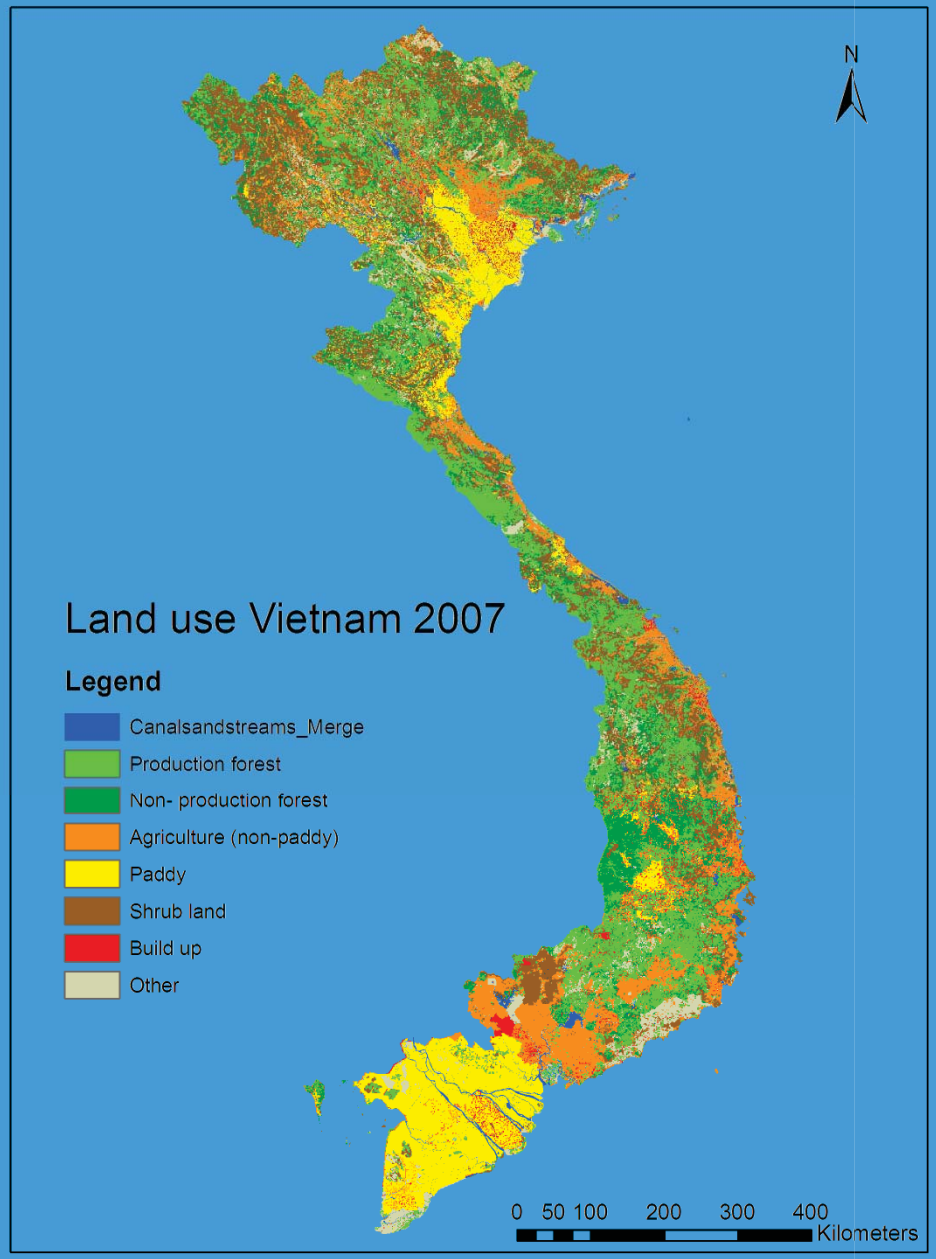
Structural change in Vietnam towards services and manufacturing and away from primary agriculture (especially crops, but also livestock and forestry)

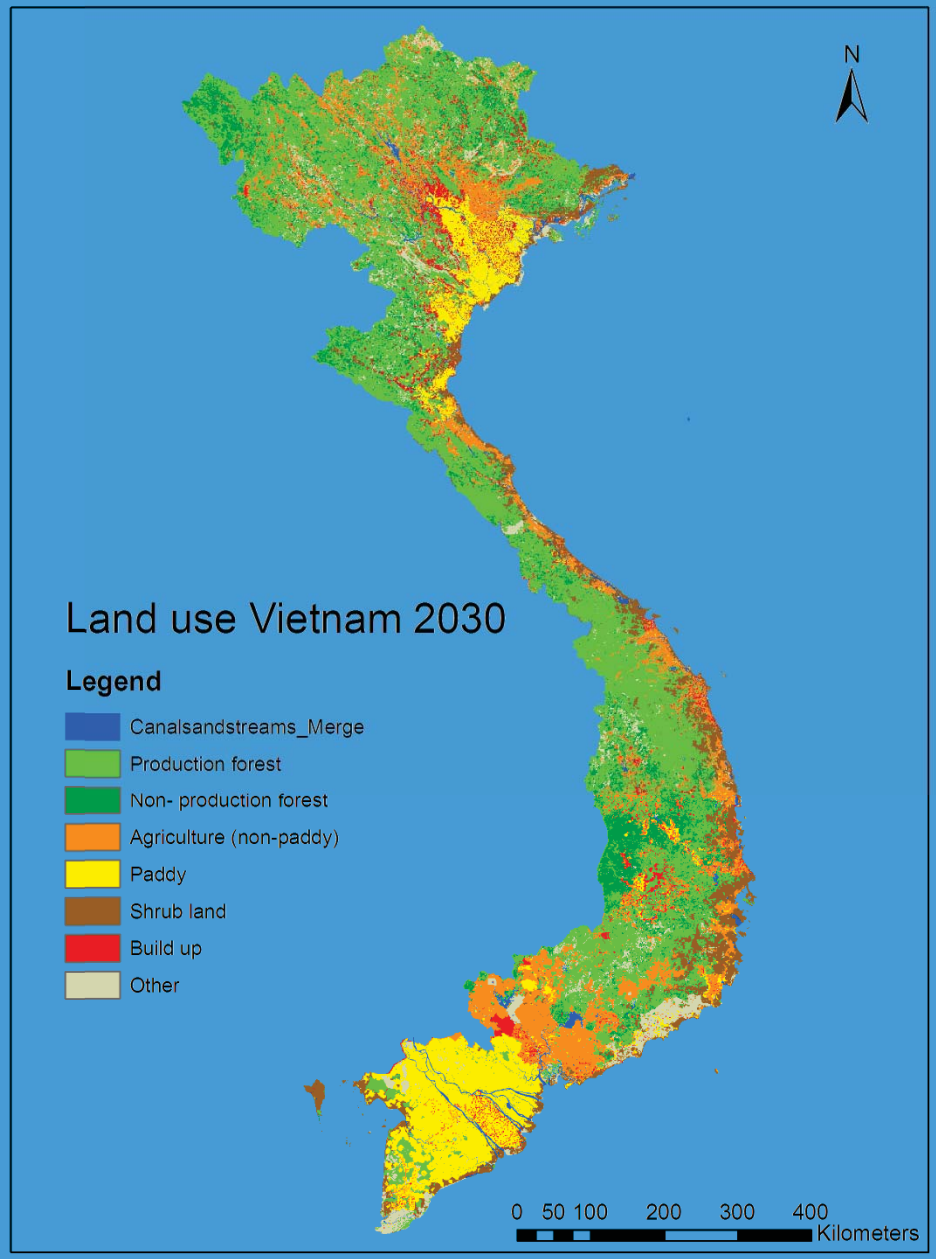


MAGNET Baseline Results (preliminary)

The share of land used by forestry increases while land used by paddy rice and other agricultural sectors decreases.







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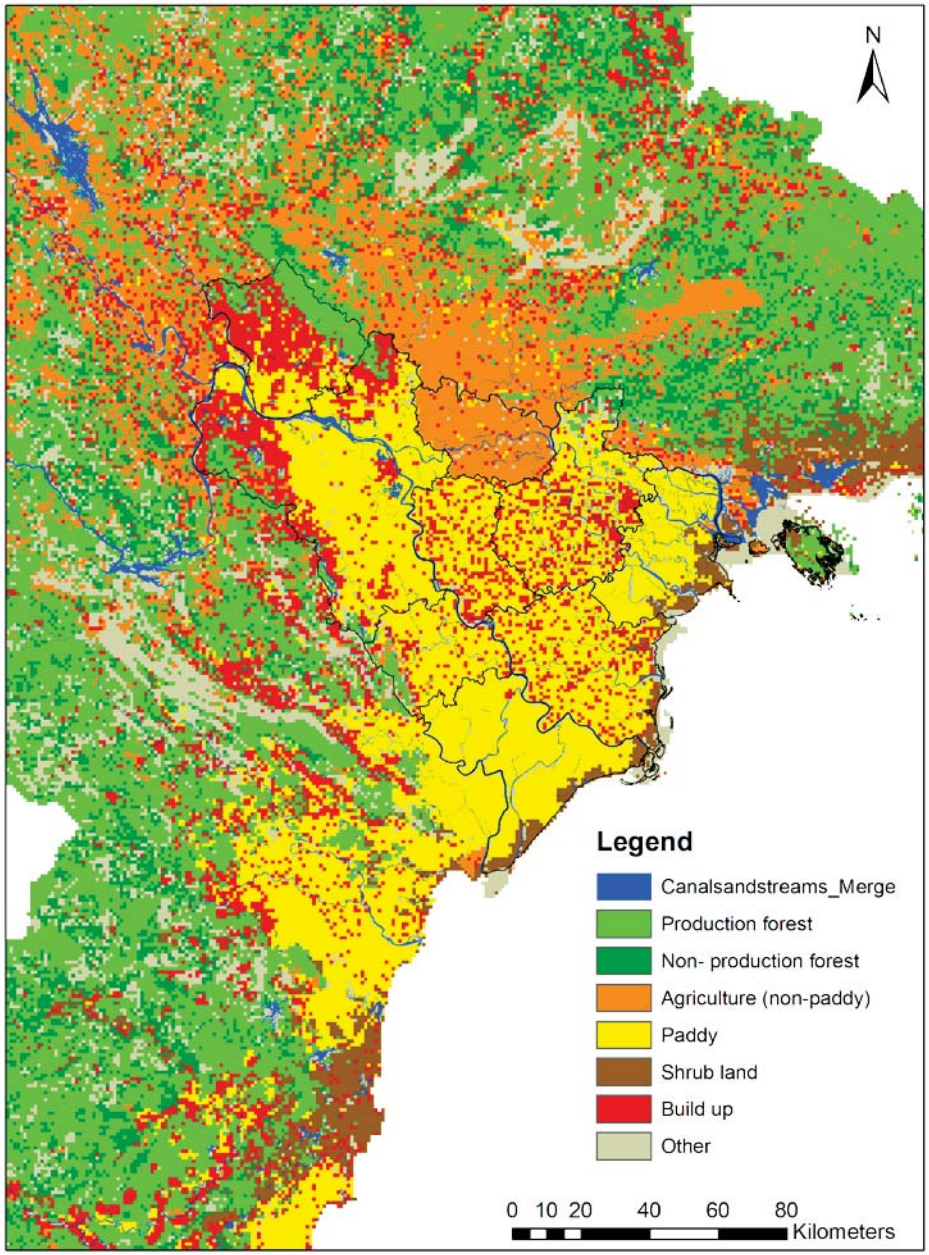
Land use Red River Delta 2030



Time series Red River Delta area 2007-2030

- Increase of Production forest (light green)
- Decrease of paddy areas (yellow)
- Increase of urban areas (red).
- Decrease of non-production forest (dark green).
- Constant agric. land (orange)
- Decrease in shrub land (brown).

Next steps

- Analysis of policy scenarios.
- Combination with flood maps to identify vulnerable areas and potential loss of agricultural land.
- Estimation of emissions from agriculture and land use change under various scenarios.
- Presentation of results at the Global Conference on Agriculture, Food Security and Climate Change, September, 2012.
- Application to other countries.

Thank you!

Questions?

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