



City Center of Yangon, June 2015

## Urbanization and environmental changes in transitional economies of Southeast Asia

Peilei Fan, Associate Professor @ Michigan State University, July 18, 2017

LCLUC SARI International Regional Science Meeting in South/Southeast Asia, Chiang Mai, Thailand

# Urbanization and sustainability under global change and transitional economies: Synthesis from Southeast, East, and North Asia (SENA)

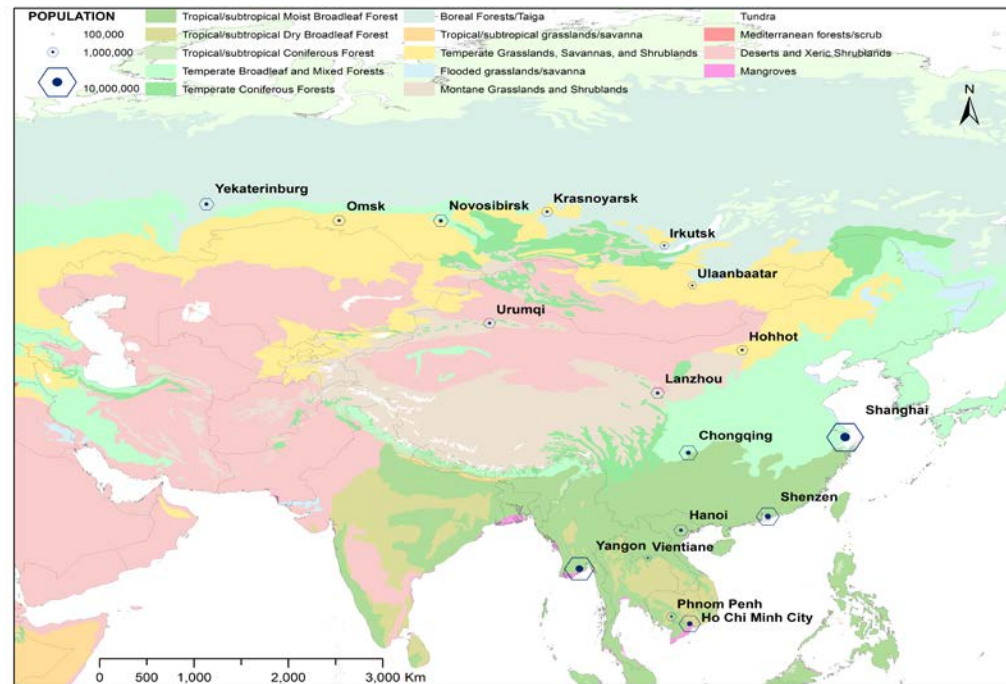


Grant #: NNX15AD51G  
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## Study Context:

- SENA countries constitute a region that is significant in both natural and socioeconomic dimensions:
  - a land area of 25.4 million km<sup>2</sup> population of 1.54 billion in 2010
- experienced liberalization, macroeconomic stabilization, restructuring and privatization, and legal and institutional reforms over the past three decades
- urbanization at various but mostly tenacious speeds, exert tremendous pressure on social, economic, and environmental sustainability, especially under the increasingly visible climate change.



17 urban systems overlaid on the Ecoregion coverage (8 biomes in 7 countries)

## Research Questions:

1. What are the spatiotemporal changes of urban expansion within transitional economies?
2. What are the key socioeconomic and biophysical drivers of urbanization and urban sustainability? More specifically, which institutional mechanism is unique and crucial? How well do our models and data explain these changes through the interactions and feedback mechanisms of human and natural systems?
3. How well can we predict the changes in urban LCLUCs and functions based on the derived structure and functions of LCLUC, human systems, and natural systems?
4. What socioeconomic and institutional adaptations have been implemented and how effective have they been? What policy recommendations can be offered to enhance urban sustainability in the near future?

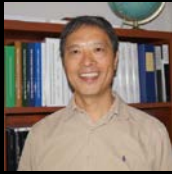
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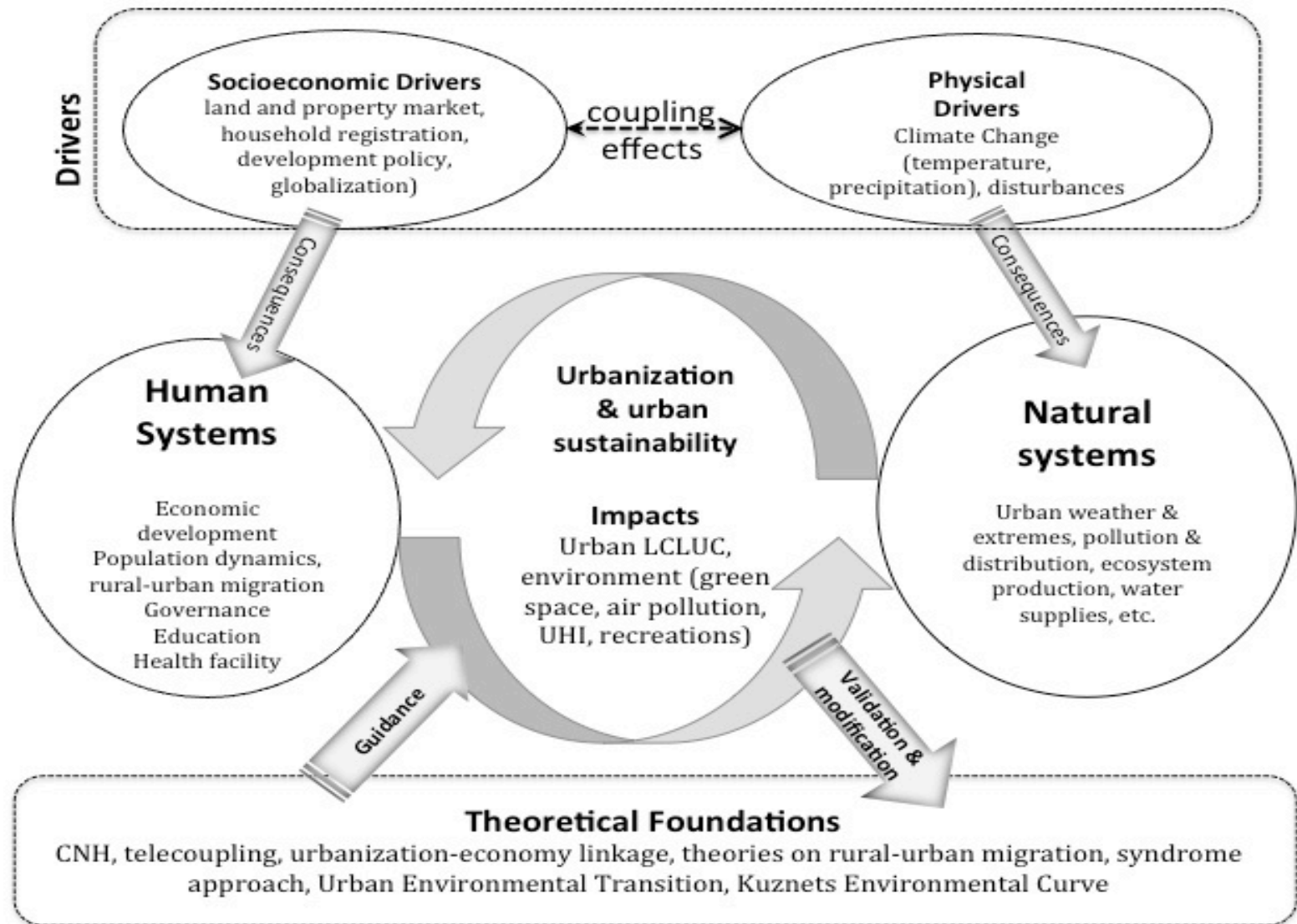
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## Conceptual framework

for understanding drivers, process, and impacts of urbanization and sustainability

# HYPOTHESES

- *H<sub>1</sub>: Large variations of urbanization exist in time and space, which are particularly associated with population size, geographic location, and the level of economic development.*
- *H<sub>2</sub>: Socioeconomic transformation reflected by policy shifts and increasing links with global communities have exerted different degrees of influence on urban expansion and sustainability*
- *H<sub>3</sub>: Global climate change has affected urbanization in different climate zones and biomes in different ways, with urbanization in some biomes experiencing a much faster pace than in others.*
  - *climate change: important driver for rural-urban migration for vulnerable climate hot spots*
- *H<sub>4</sub>: urban ecosystems (e.g., urban green space, urban heat island (UHI), ecosystem production, and pollution) directly connected with urbanization processes and socioeconomic, and can be partly explained by existing theories (e.g., UET, KEC)*
  - *institutional arrangement can alter the curve*

## Tasks:

### Data Integration:

- Database of LCLUC, socioeconomics, and environmental variables at multiple spatial and temporal scales (multiple sources)

### Knowledge Synthesis:

- construct quantitative indices for spatial, human, and natural systems of 17 cities
- perform statistical and modeling analyses to quantify the interactions and feedbacks

### Forecast Synthesis:

- model and predict the changes of the urban LCLUC, human, and natural systems beyond 2016 with sound scenarios of climate and land cover changes, populations, economic growth, and possible planning and policies.
- Two workshops in the region: gathering expert opinions from policymakers and local collaborators on plausible scenarios

# MAJOR SYNTHESIS WORKING-IN-PROGRESS AND FINDINGS:

1. Urban LCLUC: Patterns and characteristics, method
  - Diverging patterns at different spatio-temporal scales (North Asia, Mongolia Plateau, SEA)
  - Methodological advancement: Bayesian sequential learning for global urban land mapping, hybrid mapping, informal settlement mapping, multidisciplinary methods for mapping historical land use changes
2. Drivers and spatial determinants
  - Economic development: post-industrialization and globalization
  - Institutions (for transitional economies)
    - revision of Harvey's theory due to the strong role of government
  - More nuanced analysis of relationship between urban land use and urban environment quality
3. Impacts
  - Methodological contribution: urban green accessibility index and urban walkability index
  - social equity dimension need to be assessed => planning implication (broader impact of our research)
  - Coupled Nature Human system: urbanization and hydrology
4. Forecast (Future scenarios) & synthesis
  - 2 workshops focus on SENA cities scenarios (Yangon and HCMC)
  - Synthesis workshop in UB, Mongolia in June 2017



City Center of Hanoi, January 2016

## Urbanization and environmental changes in Southeast Asia

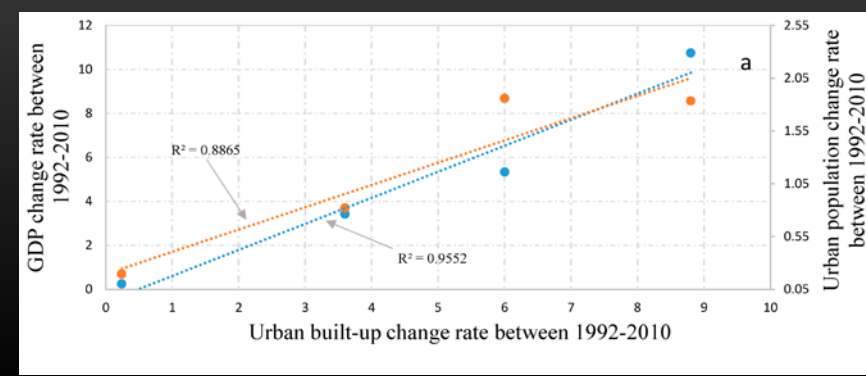
1. 4 transitional economies in Southeast Asia
2. Vietnam
3. Yangon

**remote sensing** 

Article  
**Urban Built-up Areas in Transitional Economies of Southeast Asia: Spatial Extent and Dynamics**

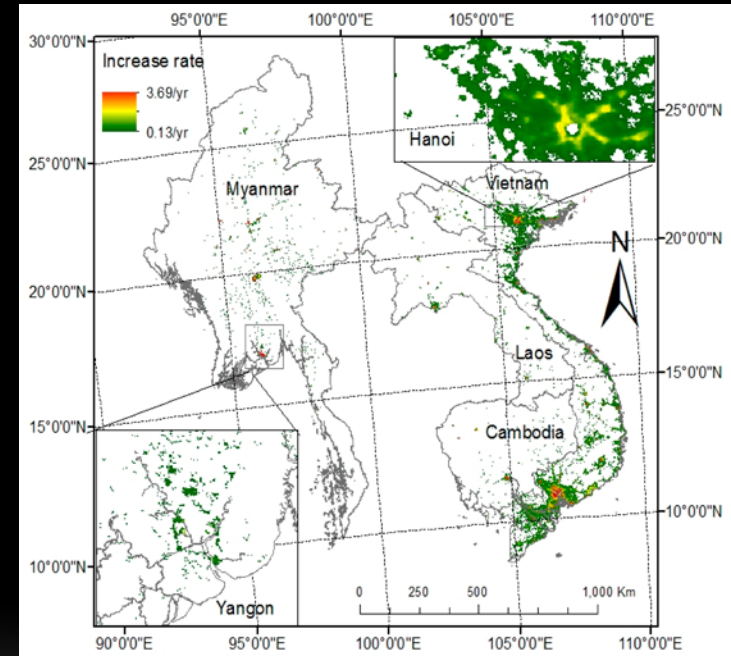
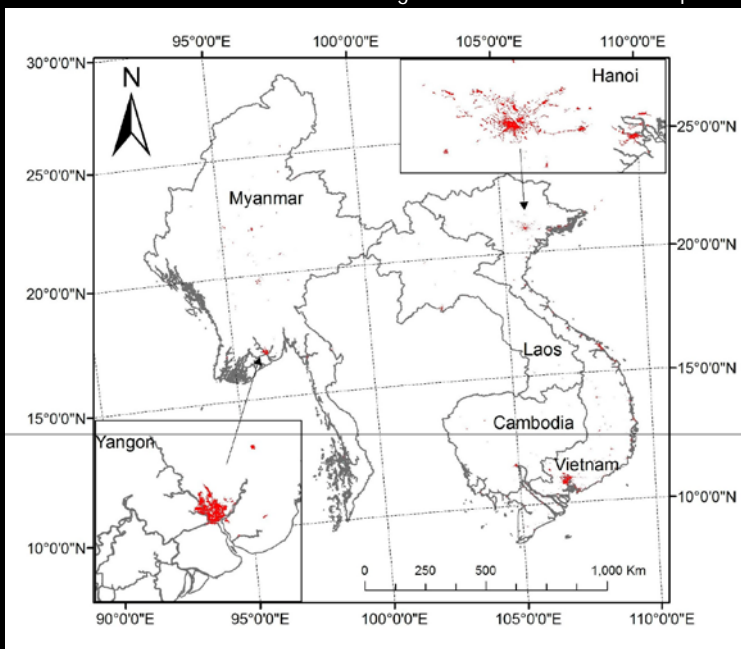
Zutao Ouyang <sup>1,\*</sup>, Peilei Fan <sup>2</sup> and Jiquan Chen <sup>3</sup>

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Urban built-up land in Vietnam, Cambodia, Laos, and Myanmar in 2010 with a spatial resolution of 30 m. The area around cities of Hanoi and Yangon were shown as examples.

The increasing trends of DMSP/OLS NTL brightness in 1992 to 2010



**Urbanization in SE Asia (Method and Findings)**

- We combined **multiple remote sensing data**, including Landsat, DMSP/OLS night time light, MODIS NDVI data, and other ancillary spatial data, to develop a 30-m resolution urban built-up map of 2010 for transitional economies in Southeast Asia.
- Vietnam had the highest proportion of urban built-up area (0.91%), followed by Myanmar (0.15%), Cambodia (0.12%) and Laos (0.09%). Vietnam was also the fastest in new built-up development (increased ~8.8-times during the 18-year study period), followed by Laos, Cambodia and Myanmar, which increased at 6.0-, 3.6-, and 0.24-times, respectively.
- The increasing rate of built-up area is closely correlated with the increasing of urban population and GDP.





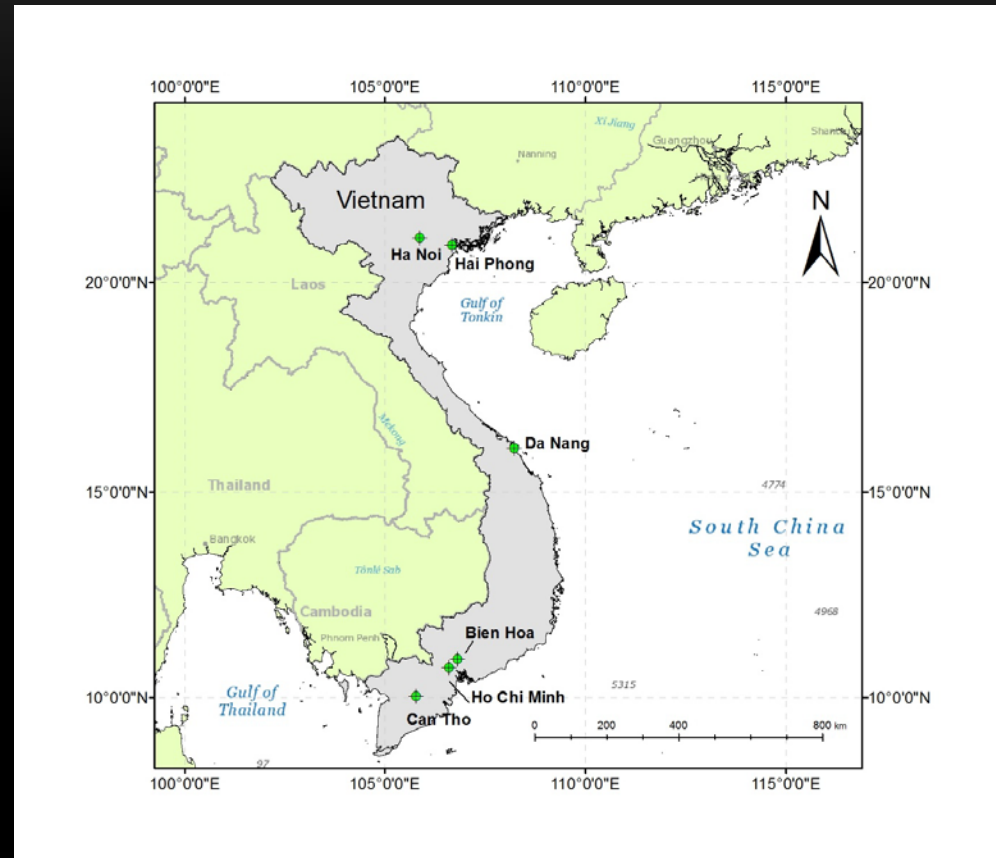
City Center of Hanoi, January 2016

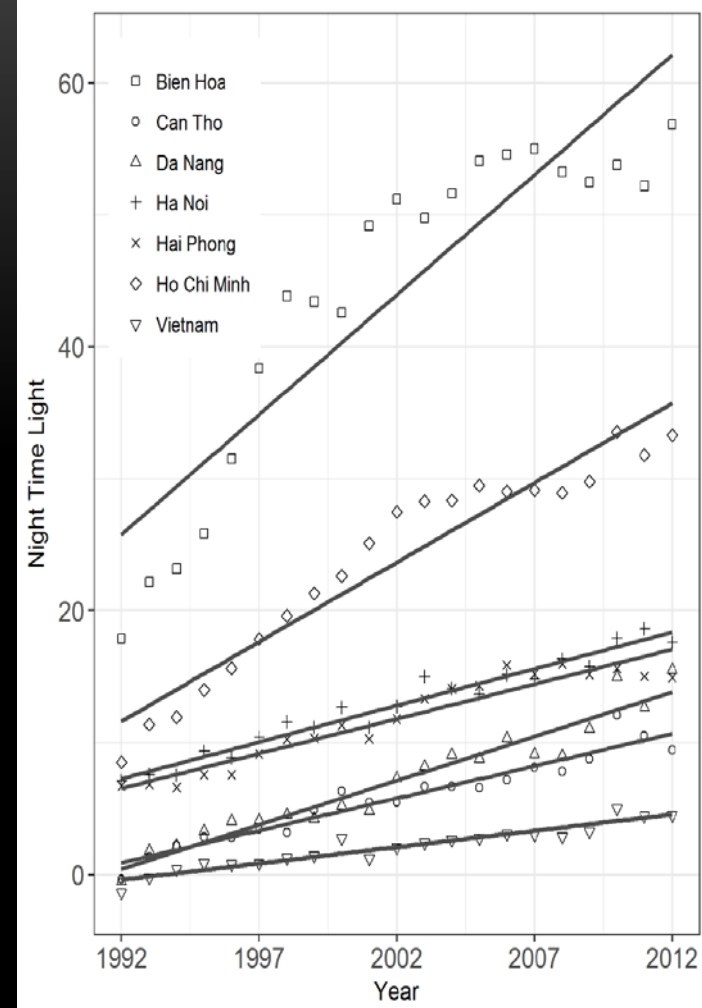
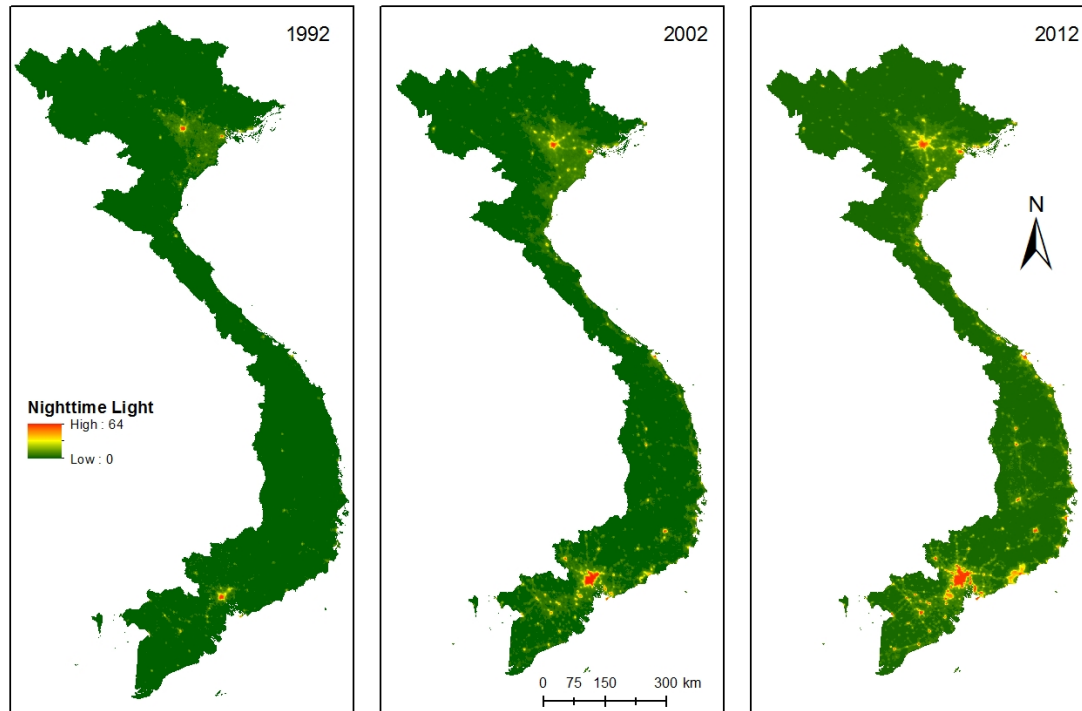
# URBAN TRANSFORMATION AND ENVIRONMENTAL CHANGES OF TRANSITIONAL ECONOMIES: VIETNAM AFTER DOIMOI (1986-2015)

Peilei FAN, Zutao YANG, DUONG Nguyen Dinh, HANG Nguyen Thi  
Thuy, Jiquan CHEN, Hogeun PARK

# Research Questions

1. What has been the spatio-temporal pattern of urban development in Vietnam after the economic reform?
2. What are the most distinguished environmental changes under such rapid urbanization in Vietnamese cities?
3. What are the major driving forces for urban transformation in Vietnam? In particular, how did market, institutional, and globalization contributed to such transformation? And how has urbanization affected other aspects of people's life, such as environmental and social conditions at the national level?



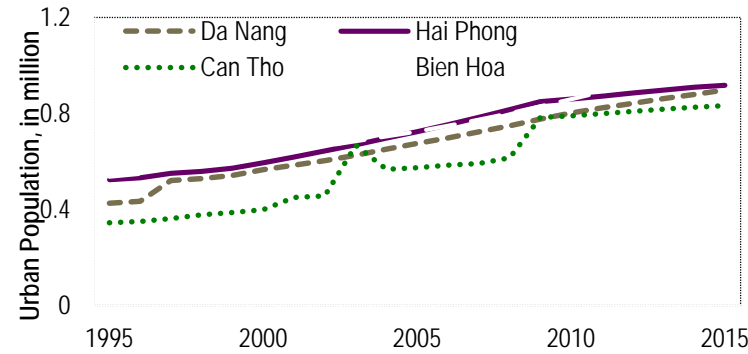
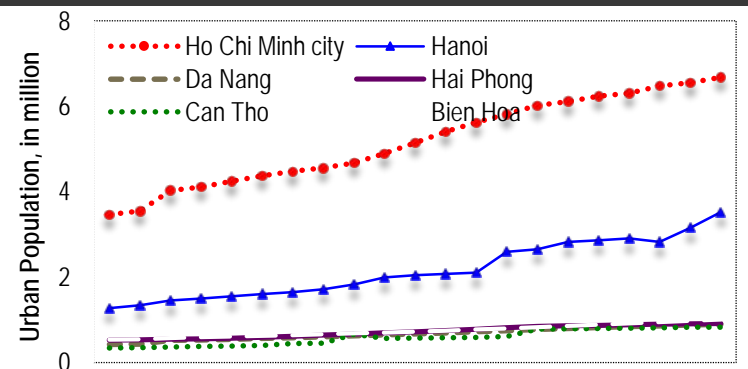


the spatial distribution nighttime light in original DN values of Vietnam in 1992, 2002, and 2012, which shows a rapid urbanization process and the emergence of urban clusters in Vietnam.

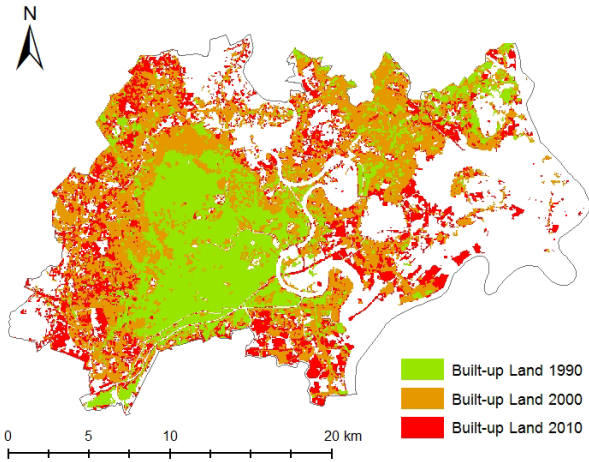
The annual change of mean night time light (relative value from 1-64) in the six selected cities as compared the whole country

# Urbanization of HCMC and Hanoi

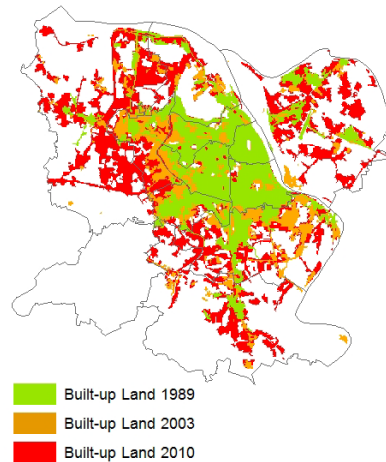
- urban built-up land expansion (left),
- Population growth (right)

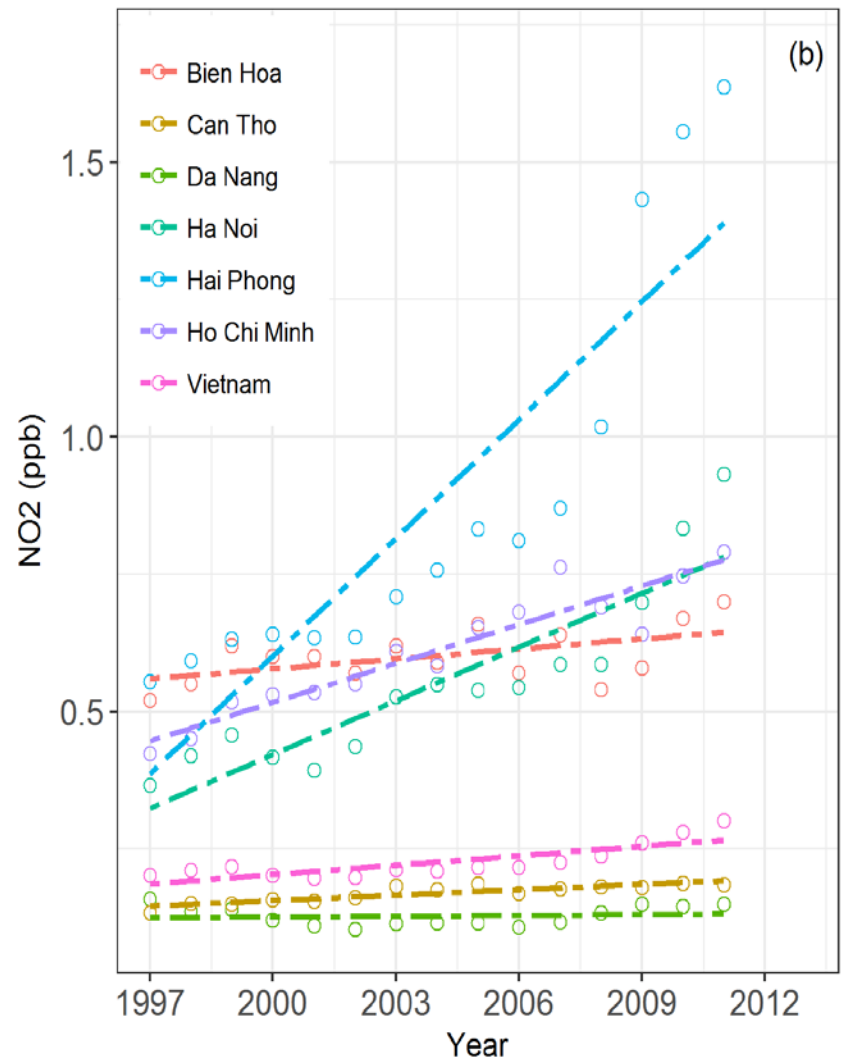
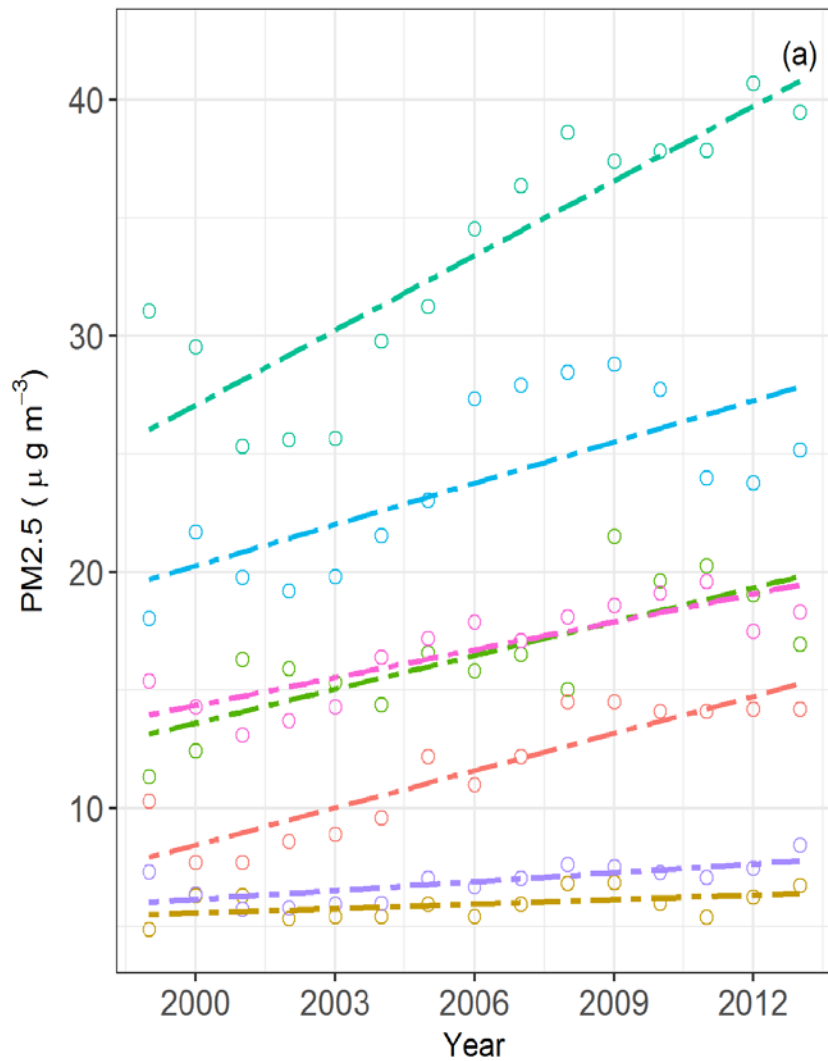


Ho Chi Minh City

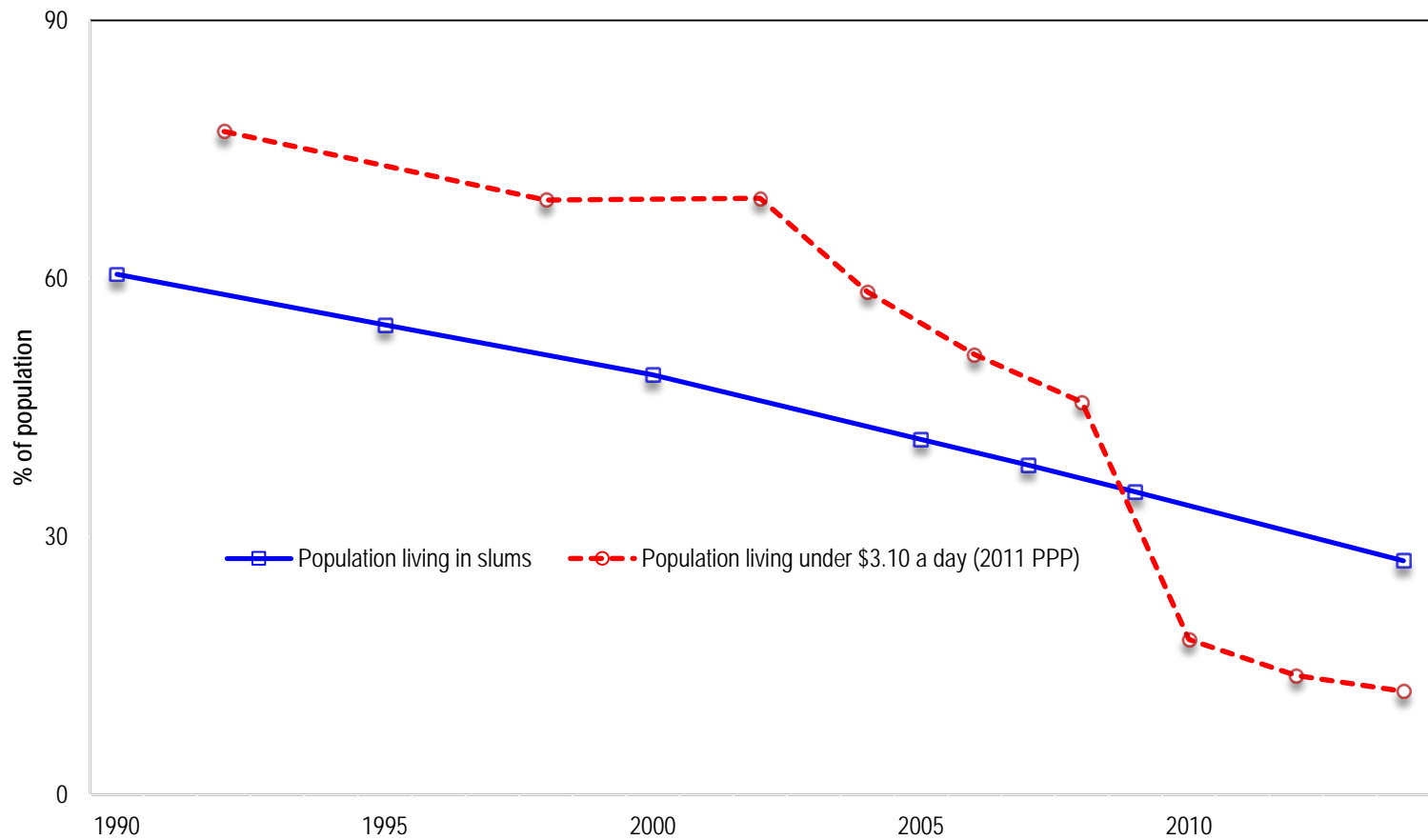


Ha Noi City





The annual mean of air pollutant in the six selected cities as compared the whole country.



## National poverty and urban poverty in Vietnam, 1990-2014

Note: According to WB (2017), "Population living in slums refers to the proportion of the urban population living in slum households. A slum household is defined as a group of individuals living under the same roof lacking one or more of the following conditions: access to improved water, access to improved sanitation, sufficient living area, and durability of housing." (WB, 2017)

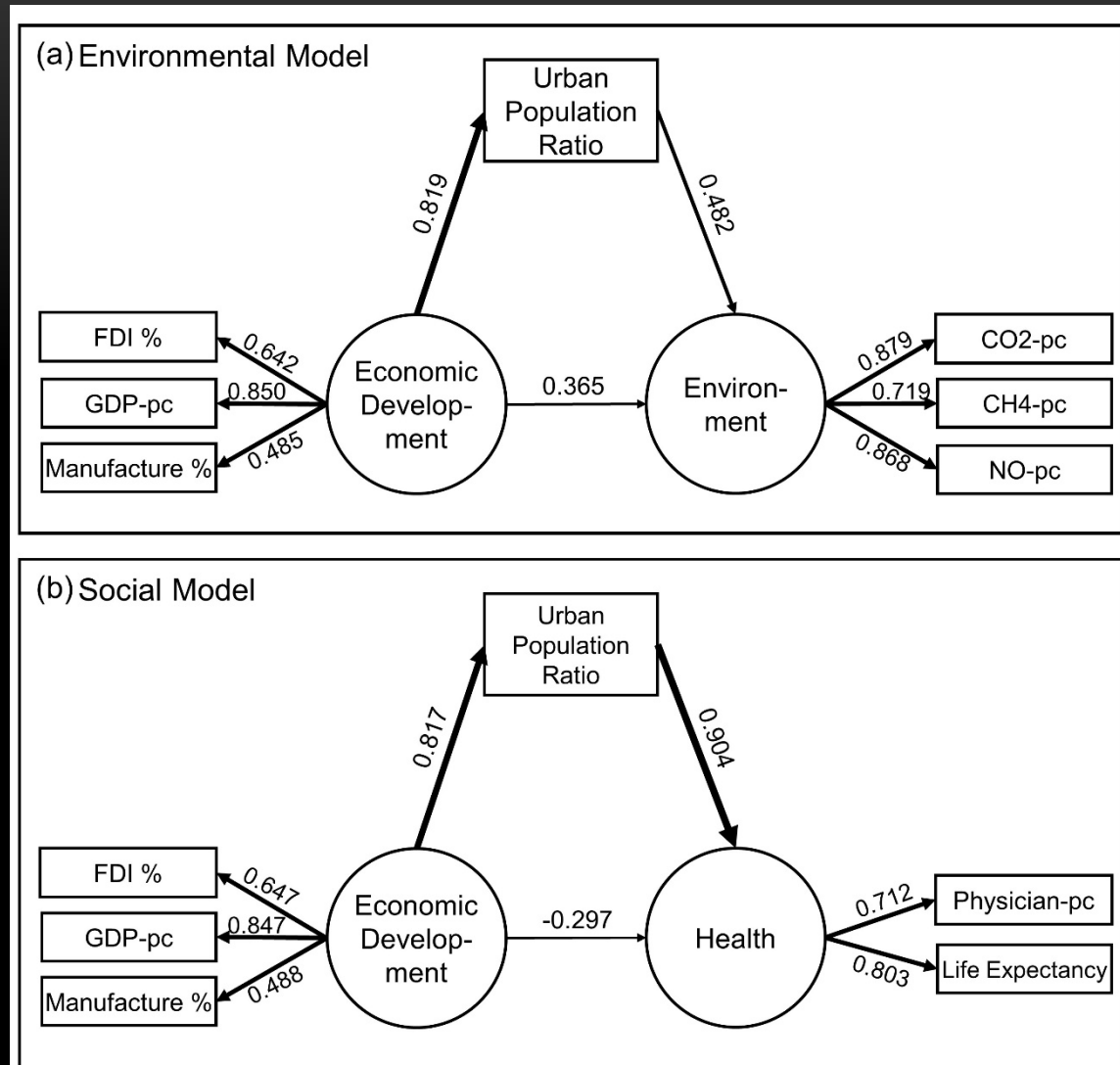
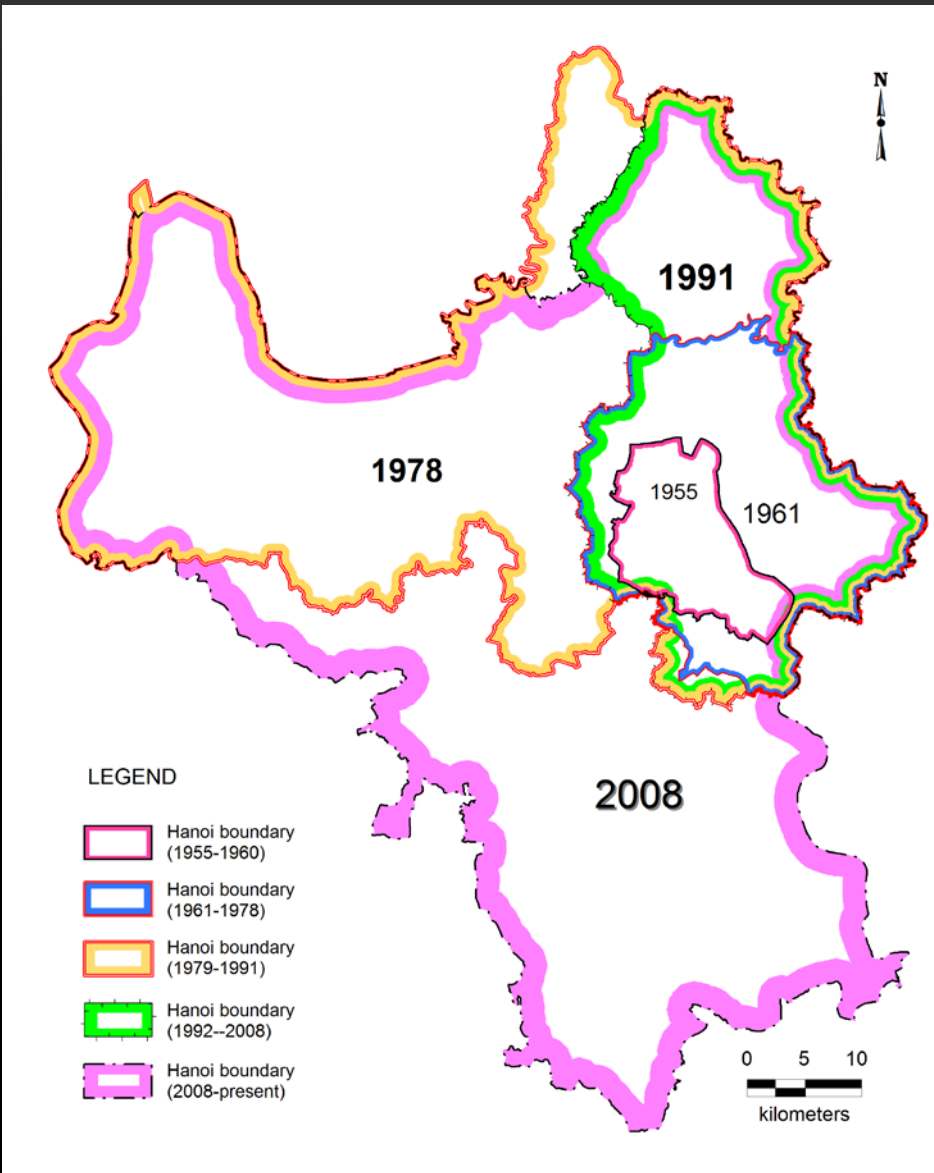


Fig. 6. Partial least squared structural equation modeling (PLS-SEM) of economic development, urbanization, environmental conditions, and social conditions in Vietnam (1980–2015). The latent variables are exhibited in circles and the squares are measured variables.



Other issues:

1. Role of the government
2. Globalization
3. Migrants

<= Administrative boundary change of Hanoi: 1955-2015

Hanoi's administrative boundary was adjusted four times after the Anti-French Resistance War was over in 1954

1954: a total area of 152.2 km<sup>2</sup> and a total population of 0.53 million

2008: a total area of 33485 km<sup>2</sup> and a total population of 6.45 million in 2008,



# CONCLUSIONS

1. Vietnam has urbanized rapidly since the economic reform started, as reflected by urban land expansion and urban population growth.
2. In particular, large urban agglomerations, especially Ho Chi Minh City and Hanoi, experienced more rapid urban land expansion and population growth than the rest of the country.
3. Urban environment in large cities all deteriorated yet urbanization helped to alleviate poverty.
4. Urbanization in Vietnam has been driven by the economic development of the nation, including the global force, i.e., by the inflow of the foreign direct investment; further, economic development and urbanization have worsen the environmental conditions and improved social conditions.



Shwedagon Pagoda, Yangon, Jan. 2016

# EXTREME CLIMATE EVENTS, GLOBALIZATION, AND CAPITAL RELOCATION: URBANIZATION AND SUSTAINABILITY IN YANGON, MYANMAR

Peilei Fan, Jiquan Chen, Zaw Naing, Zutao Yang, Khaing Moe Nyunt,

Zin Nwe Myint, Jiaguo Qi, Soe Myint

# STUDY AREA: YANGON CITY

- Population: 5.1 Millions
- Previously - Capital, Capital relocation to Nay Pyi Taw (NPT)
- Still a Commercial City / Port City / Economic Hub
- Military Governed for over 50 Years (Since 1952)
- Mis-management Practices (Land Use)
- Downtown Colonial Heritage
- Very High Land Speculation
- Different Land Ownership Types
  - Free-Hold Land and Lease Land



# DATA & METHOD

## *Urban land data and processing*

- land use data of Yangon of 1990, 2000, and 2009 from Landsat Image data of sensors TM, ETM+ and OLI
- five land use classes: water, forestland, crop land, barren land, and developed land, using an object-oriented method as described in Ouyang et al (2016)

## *Environmental data and processing*

- air pollution data of fine particulate matter (PM<sub>2.5</sub>), NO<sub>2</sub>, and CO from 1997 through 2012 based on remote sensing estimation

## *Socioeconomic and population data and processing*

- population and economic development, including total, urban, and migrant population, GDP, GDP per capita (GDPpc), percentages of primary, secondary, and tertiary industries of GDP, and foreign direct investment (FDI),

## *Data and analysis on extreme event, globalization, and capital relocation as drivers for urban transformation*

- Cyclone Nargis: derived a map of flooded croplands and severely impacted areas to Yangon
- Globalization: collected data such as trade, foreign direct investment (FDI), foreign tourist
- Capital Relocation: collected data on population in the resettlement area of Nay Pyi Taw and the pre-existed towns around Nay Pyi Taw from Department of Human Settlement and Housing Development (DHSHD); interviewed experts on impact of capital relocation on Yangon



## • an expert panel

- with 20 local experts from Myanmar, mostly based in Yangon in Summer 2015
- government officers, planners, and university professors in urban planning, economic development, and environment
- All participants were divided into three groups and each identified development stages of Yangon after 1988 and provided their own three possible future scenarios for Yangon

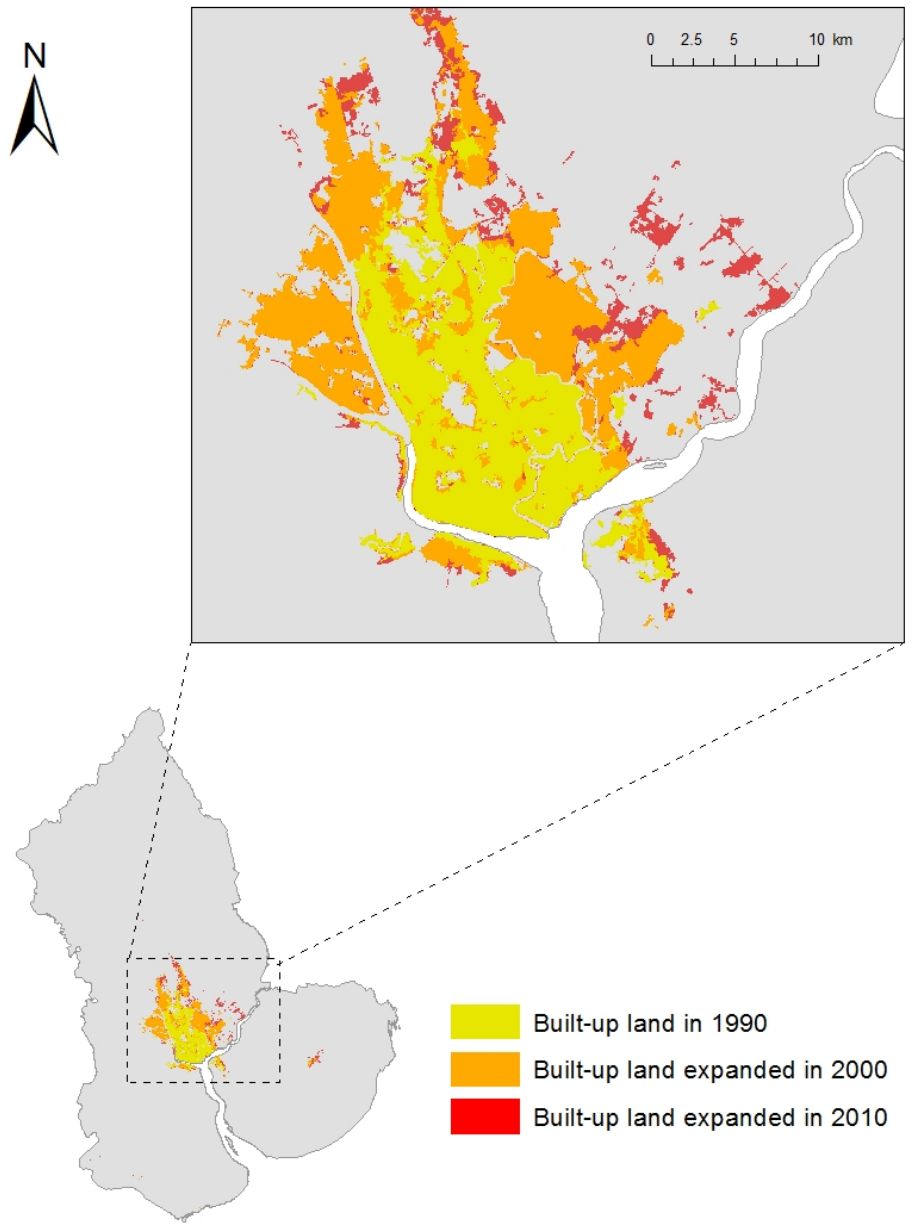
# Urban expansion and development

1990: 161 km<sup>2</sup>  
 2000: 289 km<sup>2</sup>  
 2009: 329 km<sup>2</sup>

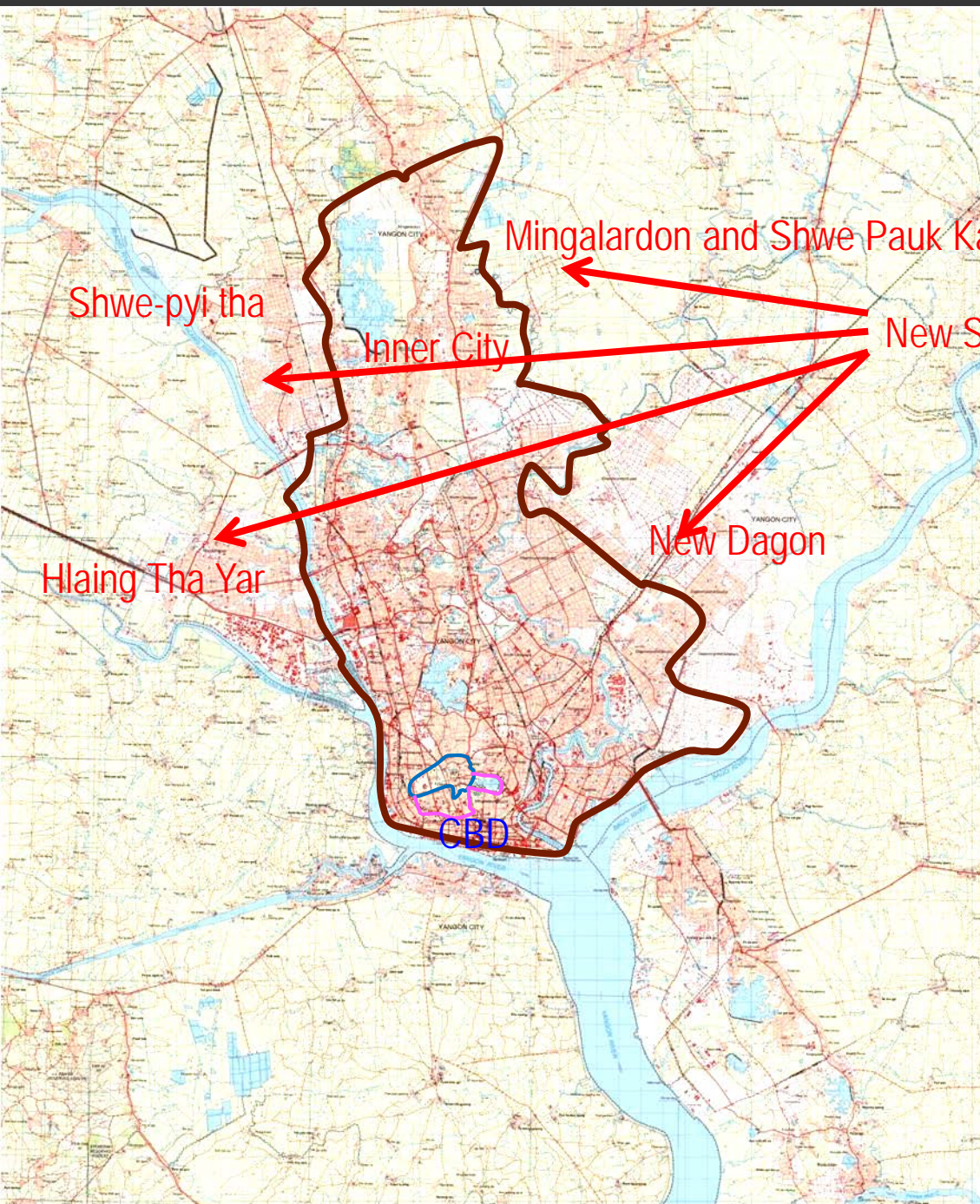
- Major stages of urban development (88-15)
- 1988-early 1992:
    - Policies on the construction of new town played a major role
  - Early 1992 to 2005
    - Private sector became the major force for development
    - Land speculation started in 1991 as people lost trust in the strength of local currency and felt safer to invest in land
  - 2005-2015 (current)
    - Policy on the relocation of capital affected Yangon seriously
    - 2008: Natural disaster (Cyclone Nargis) caused a huge inflow of rural migrants into Yangon
    - Yet, private sector still plays a strong role

1990							
2000	Land use	Water	Green Land	Farm Land	Urban Built-up Land	Bare Land	Total
	Water	38	87	88	7	0	220
	Green Land	43	1777	474	27	1	2322
	Farm Land	96	815	5694	10	0	6615
	Urban built-up land	15	29	128	117	0	289
	Bare land	0	2	1	0	0	3
	<b>Total</b>	<b>193</b>	<b>2709</b>	<b>6385</b>	<b>161</b>	<b>1</b>	

2000							
2009	Land use	Water	Green Land	Farm Land	Urban Built-up Land	Bare Land	Total
	Water	190	43	47	2	0	281
	Green Land	9	2022	157	9	1	2198
	Farm Land	19	245	6365	9	1	6640
	Urban built-up land	2	11	47	270	0	329
	Bare land	0	0	0	0	0	1
	<b>Total</b>	<b>220</b>	<b>2321</b>	<b>6615</b>	<b>289</b>	<b>3</b>	



- Built-up land in 1990
- Built-up land expanded in 2000
- Built-up land expanded in 2010



## Urban spatial structure

Low standard & unhygienic residential areas were developed in the 1990s, without any proper drainage, sewage, and garbage collection systems.



# Urban environmental challenges

(1) challenges in urban service provision and distribution, such as garbage collection, drainage system, and water supply  
 some outer areas lack the garbage collection services and garbage usually blocks the drainage

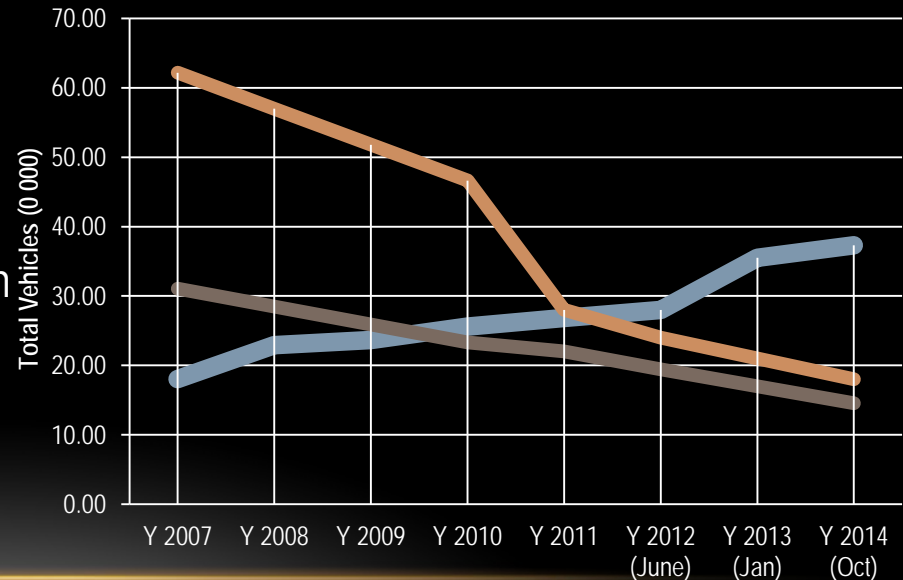
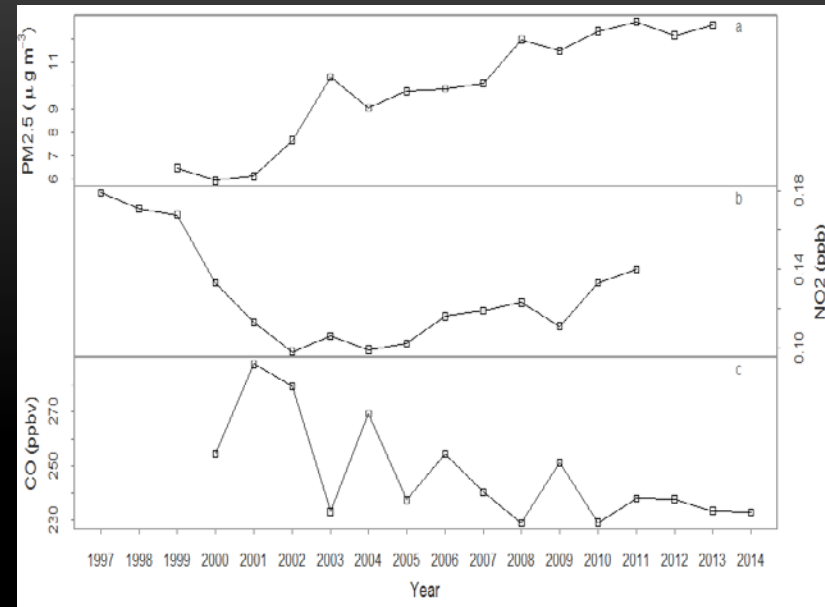
(2) traffic congestion

2010: relaxation of car import  
 increase of vehicles number inversely proportional to decrease of driving speeds

(3) the urban flooding, and unique geophysical and natural setting of Yangon in the river delta and in Asian Monsoon region

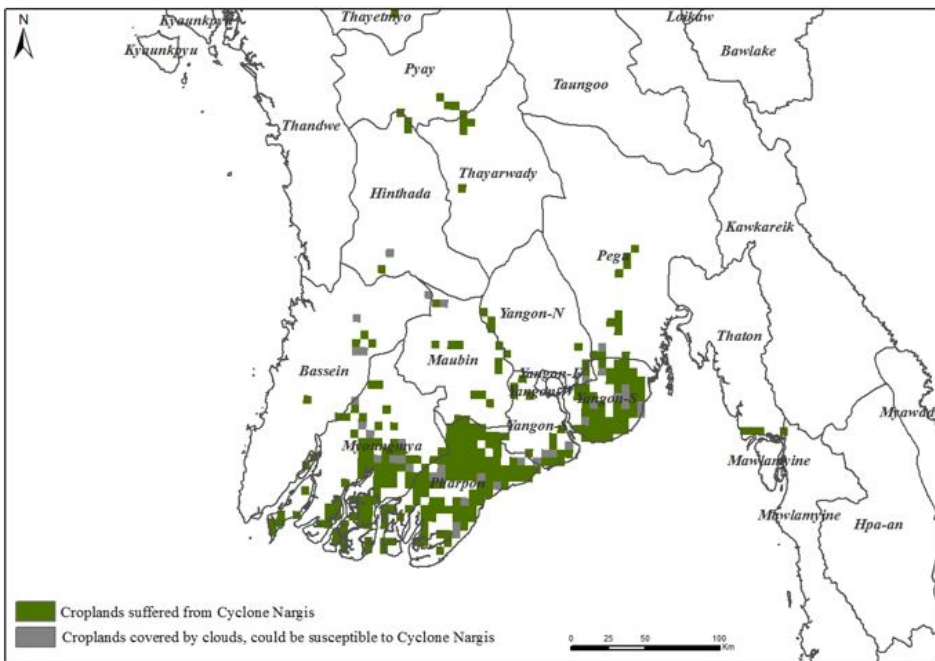
(4) green space

the garden of the East in the colonial city  
 => socialist government era: corner playground  
 => privatization of public green spaces



— Total Vehicles in Yangon (0 000)  
 — Yangon's average speed with private cars at peak hours (km/hr)  
 — Yangon's average speed with buses at peak hours (km/hr)

### Mapped croplands suffered from Cyclone Nargis in 2008



### Driver: Extreme event of Cyclone Nargis

Table 4. Area of influenced croplands after Cyclone Nargis.

Regions	Areas (km <sup>2</sup> )
Yangon-South	30.5
Pyapon	26.25
Myaungmya	17

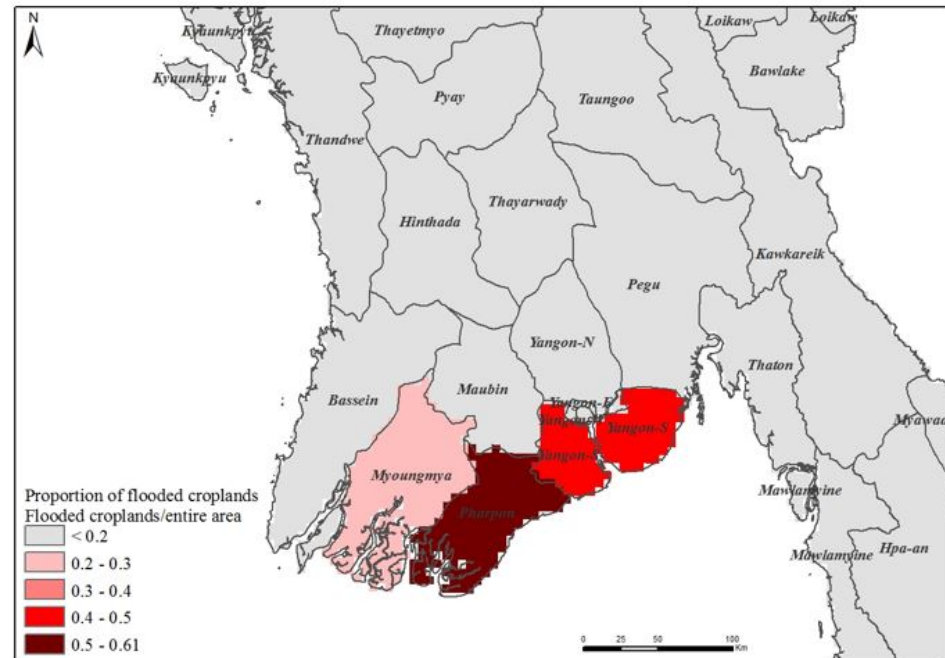
Fig. 4a Croplands suffered from the Cyclone Nargis, 2008 in the low-lying delta of Myanmar

Fig. 4b Regional proportion of flooded croplands.

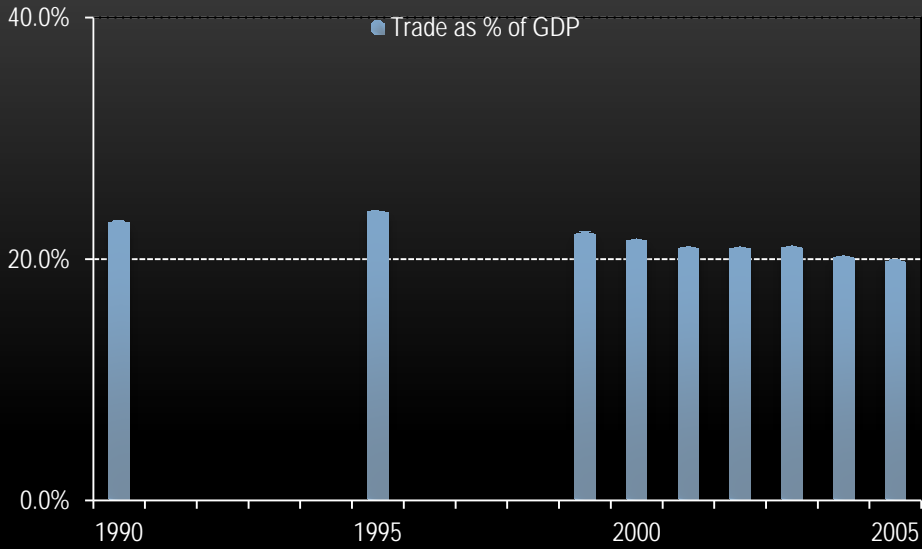
### The worst natural disaster in the recorded history of Myanmar

- At least 138,000 casualties
- K62,988,000,000 (US\$10 billion) damages
- Ayeyarwady and Yangon: most affected regions
- >=90% of the rural-urban migrants who worked in the garment or construction sectors are from Ayeyarwady, many of whom lost their livelihood by the Cyclone Nargis.
- They usually settled down in informal settlements in Yangon-South, which is not served well for urban services.
- Reliable data on migrants due to Nargis is not available through official statistics.
- future research: collect data through survey to evaluate the impact of the extreme events on rural-urban migration

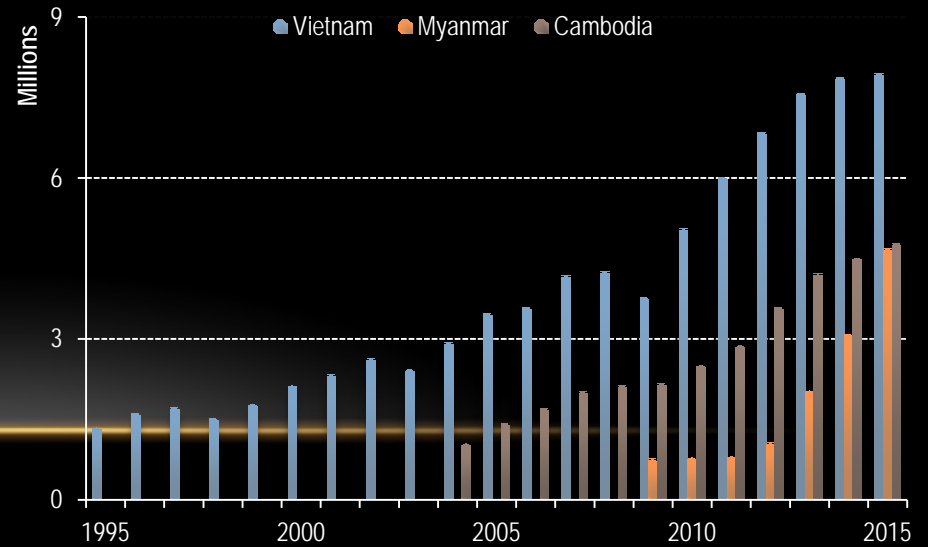
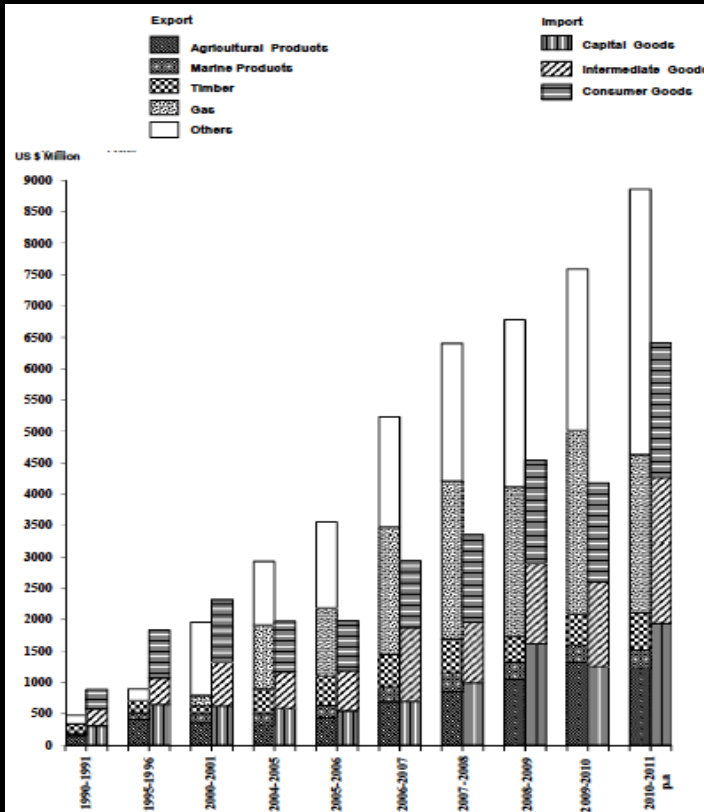
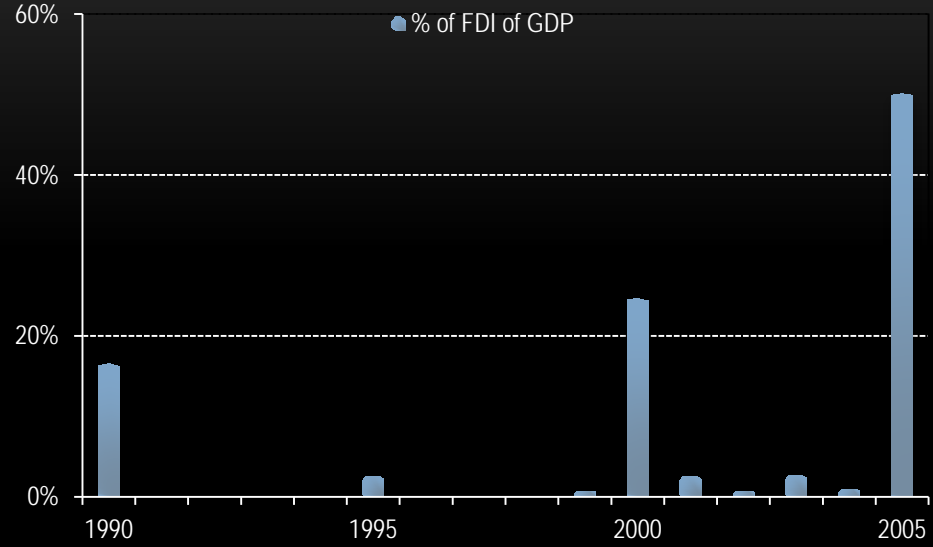
### Regional flooded croplands proportion







Driver: Globalization - Trade, FDI, and tourism



- over the 500,000 population of NPT, government workers counted about 80,000, with 65,000 were relocated from Yangon to NPT
- little more than 1% of Yangon's total population => little impact from the population perspective on Yangon
- Real impact: privatization of the public property (former government buildings and properties were leased mostly to private sector for commercial usage)

## Driver: Capital Relocation

### Resettlement in Nay Pyi Taw from 2003 and 2011

Resettlement Area	Area (ha) (net)	No. of land plots	Estimated population	Density (pop/ha)	Established year
Thapyae-gone	407.52	977	4885	11.99	2003-2009
Shwenatha	232.29	1194	5970	25.70	2006-2009
Nyaung-Pingyisu	210.85	472	2360	11.19	2007-2011
Shwekyar-pin	1176.04	4221	21105	17.95	2009-2011
<b>Total Resettlement</b>	<b>2026.7</b>	<b>6864</b>	<b>34320</b>	<b>16.93</b>	

Source: Department of Human Settlement and Housing Development (DHSHD), 2011

### Increase of population in 3 pre-existed towns around NPT 2004-2007

Town (urban)	Area (ha)	2004		2007	
		Population	Density	Population	Density
<b>Pyinmana</b>	826	85,324	103	133,970	162
<b>Hleway</b>	355	34,000	96	51,222	144
<b>Tatkone</b>	433	66,000	139	51,706	119
<b>Total</b>		185324	113/ha	236897	a

Source: Department of Human Settlement and Housing Development (DHSHD), 2011

# CONCLUSION

- Rapid urban expansion of Yangon (mostly from farm land and mainly in the 1990-2000)
- Urban expansion without proper planning and management
- Environment challenges
  - Garbage, water supply, drainage – UET (low-income cities)
  - Flooding – natural setting makes it prone to flooding, common to major cities in delta regions
  - Traffic – (ubiquitous at various levels of economic development)
  - Green space – UET (middle income cities)
- Major drivers examined
  - Extreme climate event (Cyclone Naris)
  - Globalization (trade, FDI, tourism)
  - Capital relocation (impact not from population but from the urban land left behind)
- Urbanization in transitional economies (recap)
  - 1) a dramatic turn from the historic anti-urban attitude,
  - 2) a hybrid approach relying on both the institutional intervention and the market mechanism,
  - 3) a deep-felt impact from globalization in the form of either foreign direct investment (FDI) or overseas development assistance (ODA)
  - 4) urban resilience to both natural and socioeconomic shocks and the importance of telecoupling

Scenarios  
Workshop (1)  
Yangon  
June 20, 2015



**Yangon Workshop on Urbanization and Sustainability in SENA**

**Objectives**

- Building Yangon Urbanization and Sustainability Research Network for future collaboration
- Major causes of urban development of Yangon
- Future development trends of Yangon
- Unique characteristics of Yangon from other cities in Myanmar
- Identify data & knowledge gaps and create data inventory for sustainable urban development for Yangon

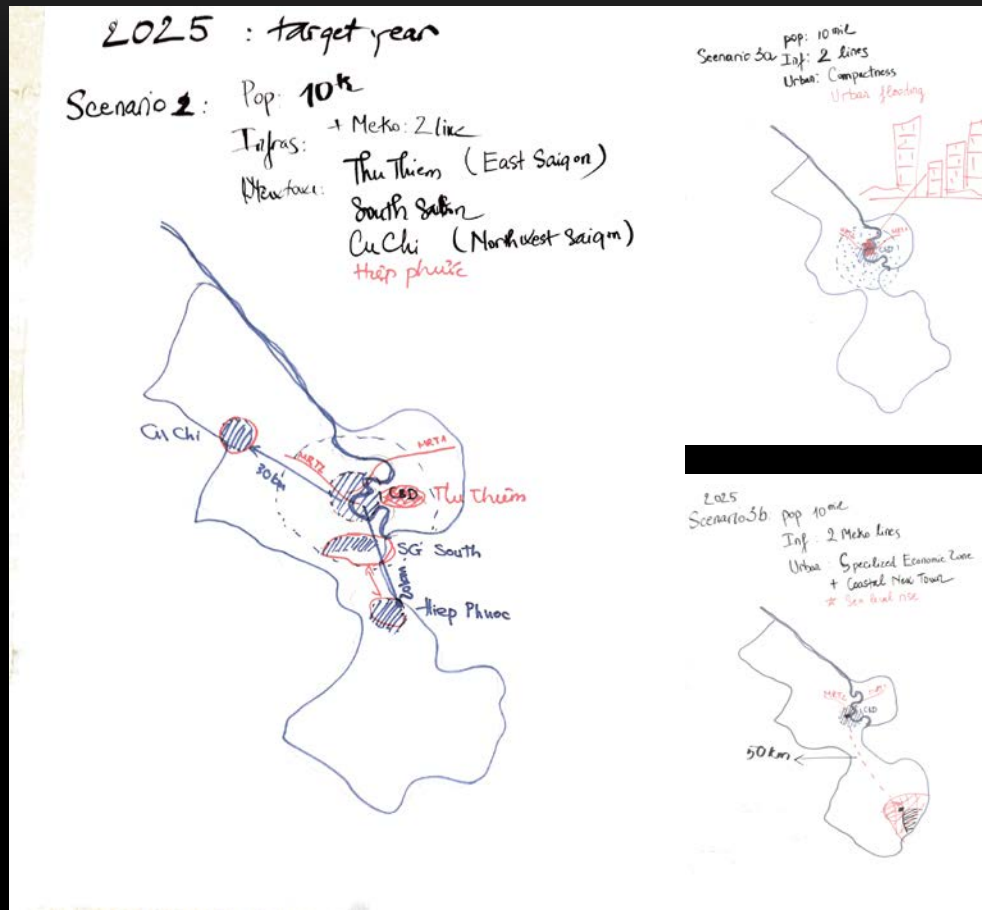
Co-hosted by Mandalay Technology and CGCEO, MSU. (20 participants, with 17 from Myanmar, from academics, government ministries, local government, and companies)

**Outcomes**

- Shared and exchanged ideas, data, and knowledge on urban development of Yangon (patterns, causes, impacts, future scenarios)
- Discussed existing and future geo-spatial data products (land, climate, population & socioeconomic can be generated from the project)
- An established network for future collaboration for grants, projects, publications, and exchange of scholars

# Scenarios Workshop (2)

## Ho Chi Minh City Nov. 4-6, 2015



### Objectives

- Discuss the **major causes** of urban expansion, the **main impacts and consequences** of urbanization, and the **possible future development scenarios** for cities
- Phnom Penh, Ho Chi Minh City, Hanoi, Vientiane, and Yangon of Southeast Asia; Shanghai, Shenzhen, Chongqing, Lanzhou, Hohhot, and Urumqi of China;
  - Siberian cities (Irkutsk, Novosibirsk, Omsk, Yekaterinburg, and Khabarovsk) and Ulaanbaatar.

Co-hosted Ho Chi Minh City Institute of Resources Geography, Vietnam Academy of Science and Technology (HCMIRG of VAST) and Center for Global Change and Earth Observations (CGCEO), Michigan State University (MSU)

### Outcomes

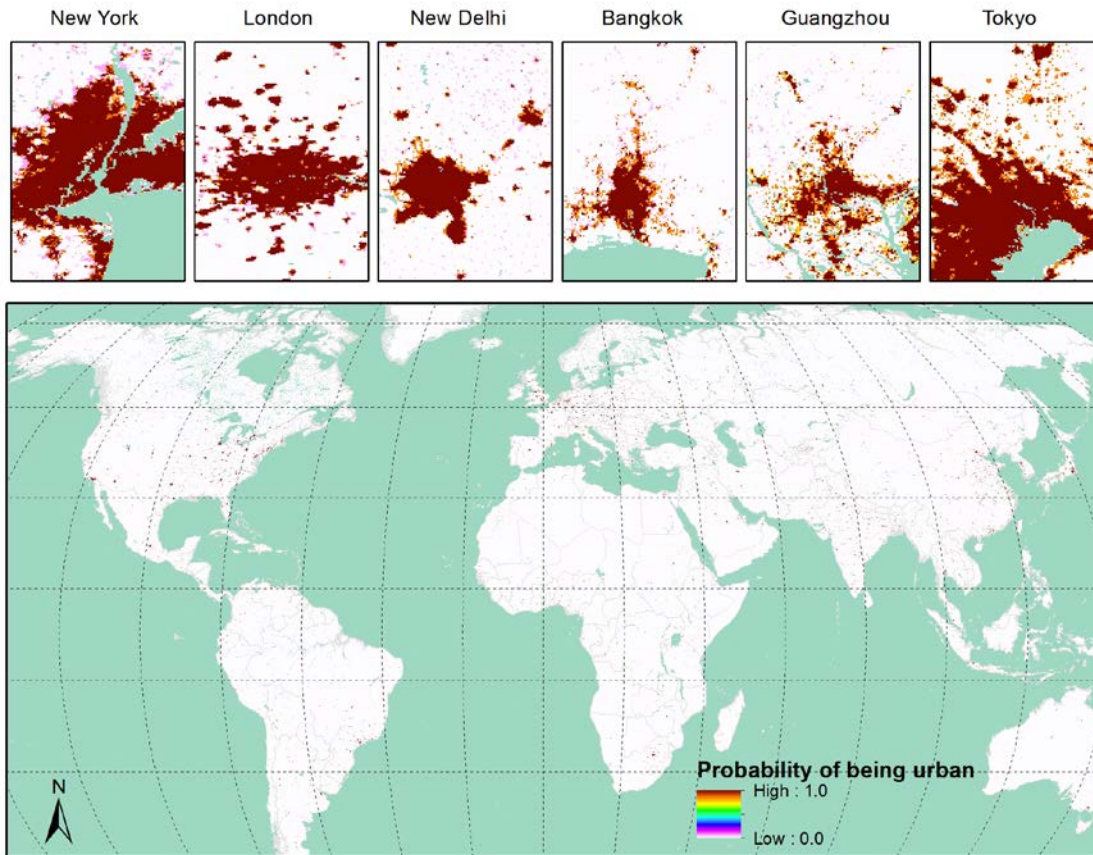
- Shared and exchanged opinions and knowledge on major causes of urban expansion in the past thirty years.
- Discussed the impact and consequences of urbanization in China, Vietnam, Laos, Mongolia, and Myanmar.
- Proposed possible development scenarios in future

1. Mapping uncertainty of global urban land with Bayesian sequential learning
2. Urban green space affect PM2.5?
3. Urbanization on hydrology

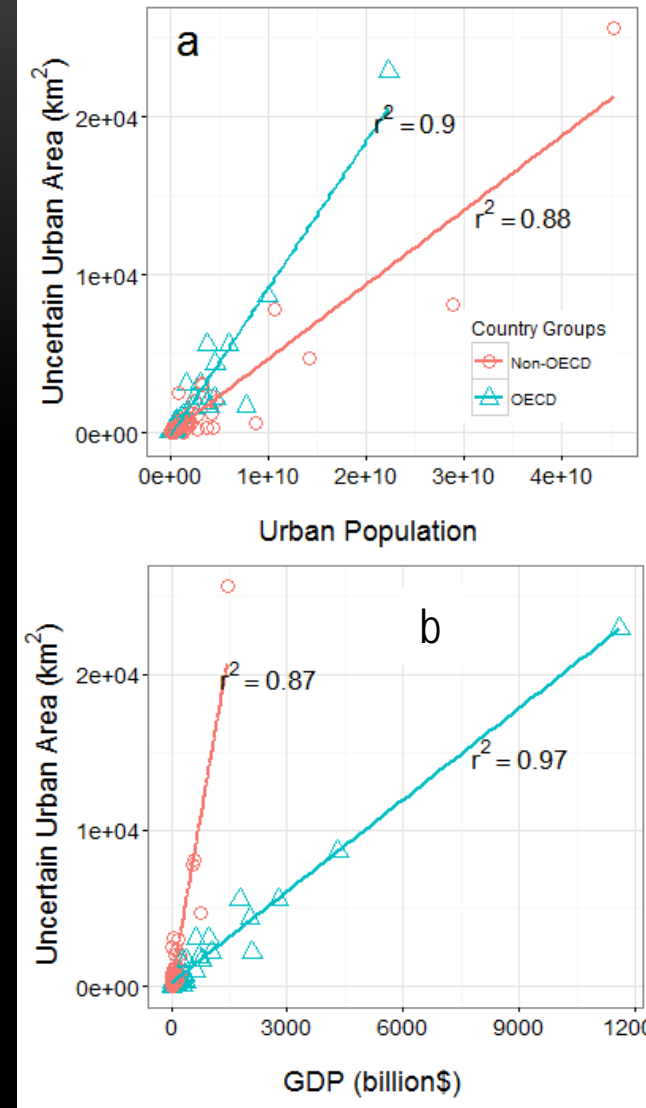
EXAMPLES OF SENA RESEARCH THAT MAY  
BE RELEVANT FOR SE ASIA

# Mapping global urban land with Bayesian sequential learning: towards a big data solution (submitted)

Zutao Ouyang, Peilei Fan, Jiquan, Chen, Raffaele Laforzezza, Joseph P. Messina, Vincenzo Giannico, and Ranjeet, John



The hybrid global urban probability maps resulting from Bayesian sequential updating with six enlarged city areas



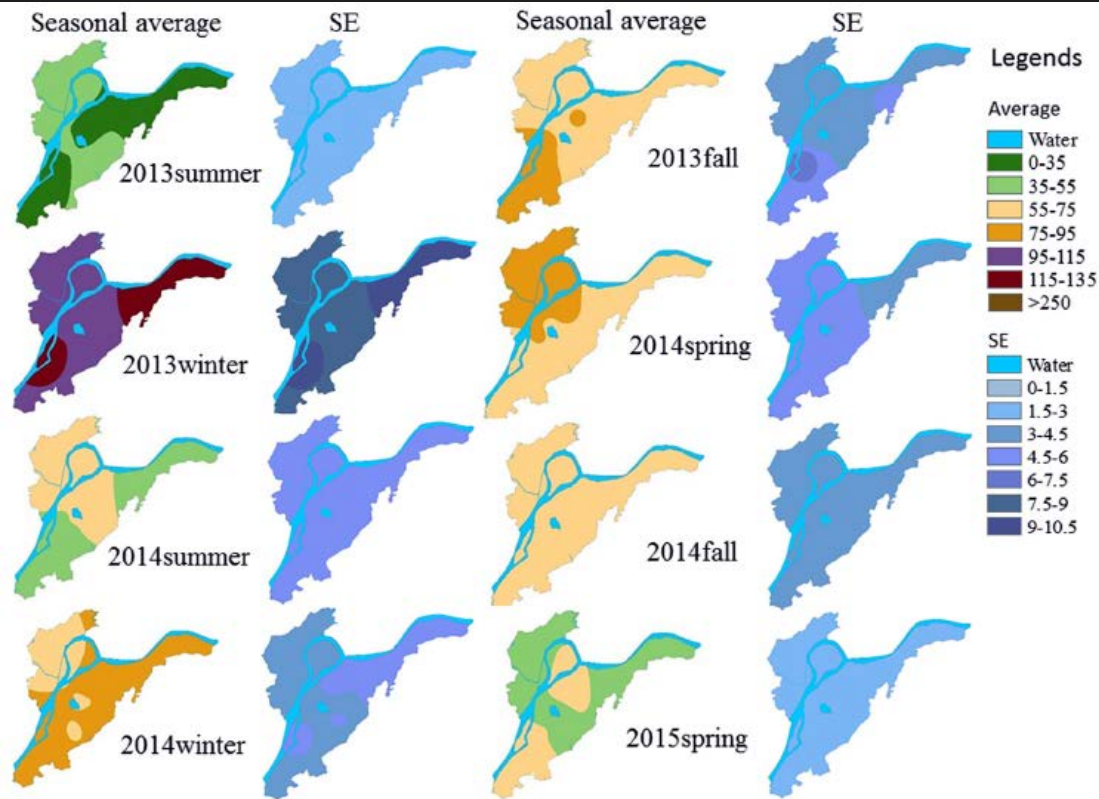
The relationship between country-level total uncertain urban areas and GDP (a), and urban population (b)

## Main highlights//findings:

- Through Bayesian sequential analysis, a hybrid global urban probability map was developed by integrating five existing global urban maps in 2000.
- More data in the future can be integrated to further improve the map, and finally evolve into a big data solution.
- Total uncertain urban areas in countries was related to economic and urbanization level, with distinct differences OECD country groups and non- OECD country groups

## RESEARCH

## Open Access

Do green spaces affect the spatiotemporal changes of PM<sub>2.5</sub> in Nanjing?Jiquan Chen<sup>1,2\*</sup>, Liuyan Zhu<sup>1</sup>, Peilei Fan<sup>3,2</sup>, Li Tian<sup>4</sup> and Raffaele Laforzza<sup>5,2</sup>

**Fig. 4** Spatial changes in the mean and variation (standard error (SE)) of PM<sub>2.5</sub> concentration over four seasons during the study period from July 2013 to May 2015. The inverse distance weighted (IDW) method was used in the spatial interpolations with the exponential distance of 12 and 9 as the number of points

**Objective:** to understand the impact of green space on PM<sub>2.5</sub>'s spatio-temporal distributions in urban landscape (figure below) by using a case city of Nanjing (Chen et al, 2016).

**Hypothesis:** green vegetation had the potential to reduce PM<sub>2.5</sub> concentration was accepted at specific seasons and scales.

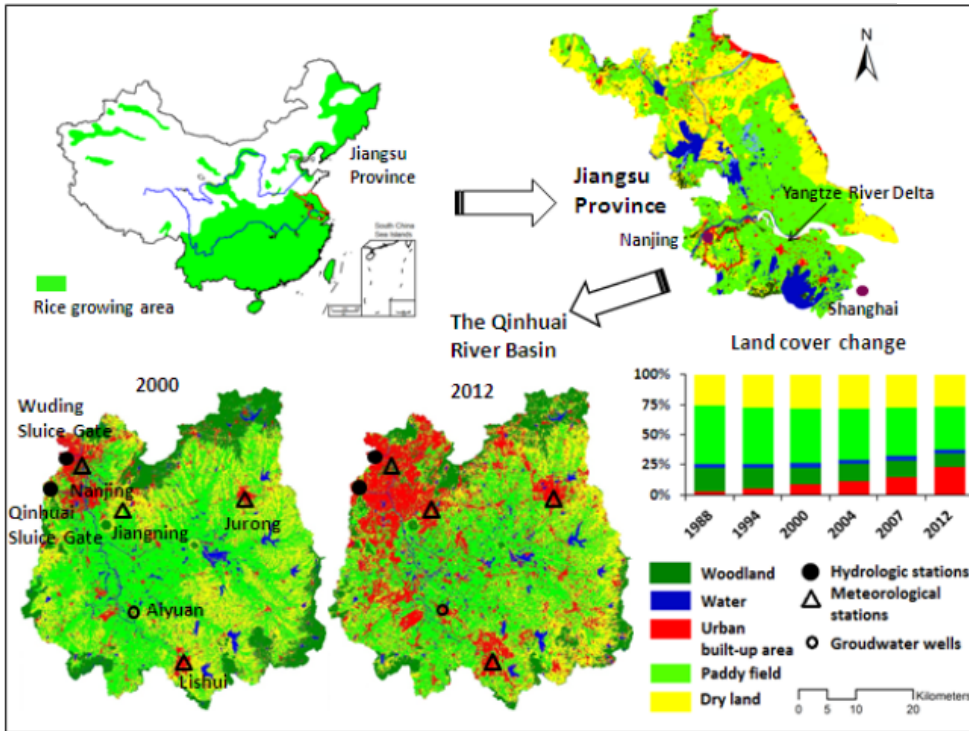
**Findings:**

1. The PM<sub>2.5</sub> concentration appeared very highly correlated ( $R^2 > 0.85$ ) with green cover in spring at 1–2 km scales, highly correlated ( $R^2 > 0.6$ ) in autumn and winter at 4 km scale, and moderately correlated in summer ( $R^2 > 0.4$ ) at 2-, 5-, and 6-km scales.
2. However, a non-significant correlation between green cover and PM<sub>2.5</sub> concentration was found when its level was  $>75 \mu\text{g}/\text{m}^3$ .
3. Across the Nanjing urban landscape, the east and southwest parts had high pollution levels.



## Urbanization dramatically altered the water balances of a paddy field-dominated basin in southern China

L. Hao<sup>1</sup>, G. Sun<sup>2</sup>, Y. Liu<sup>3</sup>, J. Wan<sup>4</sup>, M. Qin<sup>1</sup>, H. Qian<sup>1</sup>, C. Liu<sup>5</sup>, J. Zheng<sup>6</sup>, R. John<sup>7</sup>, P. Fan<sup>8</sup>, and J. Chen<sup>7</sup>



**Figure 2.** Watershed location, instrumentation, and land-use change patterns in the Qinhuai River basin, Yangtze River Delta in southern China. The insert map showing changes in land use derived from published data (Du et al., 2012; Chen and Du, 2014) (1988 and 1994) and Landsat 7 ETM+ images (2000–2012).

### Findings

1. We found that stream flow increased by 58% and evapotranspiration (ET) decreased by 23% during 1986–2013 as a result of a threefold increase in urban areas and a reduction of rice paddy fields by 27 %.
2. Attribution analysis, based on two empirical models, indicated that land-use/land-cover change contributed about 82–108% of the observed increase in stream flow from 353 +/- 287mm<sup>yr</sup>-1 during 1986–2002 to 556 +/- 145 during 2003–2013.
3. **The effects of land-use change overwhelmed the effects of regional climate warming and climate variability.**
4. The ongoing large-scale urbanization of the rice paddy-dominated regions, in humid southern China and East Asia, will likely elevate storm-flow volume, aggravate flood risks, and intensify urban heat island effects.

# Publications from the SENA project (2015-2017)

1. Fan, Peilei, Xu, Lihua, Yue, Wenzhe, Chen, Jiquan. (In press). Access of public green space in an urban periphery: the case of Shanghai. *Landscape and Urban Planning*. <http://dx.doi.org/10.1016/j.landurbplan.2016.11.007>.
2. Fan, Peilei, Ouyang Zutao, Basnou, Corina, Pino Joan, Park, Hogeun, Chen, Jiquan. (2017). Nature-based solutions for urban landscapes under post-industrialization and globalization: Barcelona versus Shanghai. *Environmental Research* 156, 282-283.
3. Fan, Peilei, Chen, Jiquan, Ouyang Zutao. (2017). Urbanization in Siberia: A Satellite View. *All Russia Economic Journal* 2017(7), 20-33 (In Russian). Фан П., Чен Дж., Уанг З (2017). Урбанизация в Сибири. *Взгляд со спутника//ЭКО*. - 2017. - № 7. - С. 20-33.
4. \*Park, H., Fan, P., John, R., & Chen, J. (2017). Urbanization on the Mongolian Plateau after economic reform: Changes and causes. *Applied Geography*, 86, 118-127.
5. \*Li, X., Messina, J. P., Moore, N. J., Fan, P., & Shortridge, A. M. (2017). MODIS land cover uncertainty in regional climate simulations. *Climate Dynamics*, 1-13. doi:10.1007/s00382-017-3563-7.
6. Liu, Y., Yue, W., Fan, P., Zhang, Z., & Huang, J. (2017). Assessing the urban environmental quality of mountainous cities: A case study in Chongqing, China. *Ecological Indicators*, 81, 132-145.
7. Wu, Y., Fan, P., Li, B., Ouyang, Z., Liu, Y., & You, H. (2017). The Effectiveness of Planning Control on Urban Growth: Evidence from Hangzhou, China. *Sustainability*, 9(5), 855-79.
8. Messina, J.P. Suepa, T., Snapp, S., Olson, J.M., Nejadhashemi, A.P., Murray, S., Moore, N., Frake, A.N., Fan, P., and U. Adhikari. 2017. Food System Resilience and Sustainability in Cambodia. *International Journal of Applied Geospatial Research*. 8(3), 53-75.
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10. \*Ouyang, Zutao, Fan, Peilei, Chen, Jiquan. (2016). Urban built-up areas in transitional economies of Southeast Asia: spatial extent and dynamics. *Remote Sensing* 2016(8), 819-38.
11. Liu, Y., Yue, W., Fan, P., Peng, Y., & Zhang, Z. (2016). Financing China's Suburbanization: Capital Accumulation through Suburban Land Development in Hangzhou. *International Journal of Urban and Regional Research*, 40(6), 1112-1133.
12. Chen, J., Zhu, L., Fan, P., Tian, L. & Laforteza, R. (2016). Do green spaces affect the spatiotemporal changes of PM2.5 in Nanjing? *Ecological Process* 2016 5:7.
13. Xie, Y., Wang, G., Wang, X., & Fan, P. (2016). Assessing the evolution of oases in arid regions by reconstructing their historic spatio-temporal distribution: a case study of the Heihe River Basin, China. *Frontiers of Earth Science*, 1-14.
14. Fan, Peilei. (2015). Producing and consuming urban planning exhibition halls in Contemporary China. *Urban Studies* 52(15): 2890-2905.
15. Liu, Yong, Yue, Wenzhe, Fan, Peilei, & Song, Yan. (2015). Suburban residential development in the era of market-oriented land reform: The case of Hangzhou, China. *Land Use Policy*, 42, 233-243.
16. Hao, L., Sun, G., Liu, Y., Wan, J., Qin, M., Qian, H, Liu, C., Zheng, J., John, R., Fan, P., & Chen, J. (2015). Urbanization dramatically altered the water balances of a paddy field-dominated basin in southern China. *Hydrology and Earth System Sciences* 19, 3319-3333.

## SI with Landscape and Urban planning

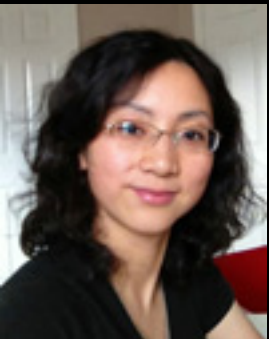
CALL FOR PAPERS: SPECIAL ISSUE ON "EVOLVING LANDSCAPES UNDER INSTITUTIONAL CHANGE, GLOBALIZATION, AND CULTURAL INFLUENCE IN CONTRASTING URBAN SYSTEMS"

Guest Editors:

Peilei Fan (Michigan State University, USA)

Jiquan Chen (Michigan State University, USA)

Jingle Wu (Arizona State University, USA)

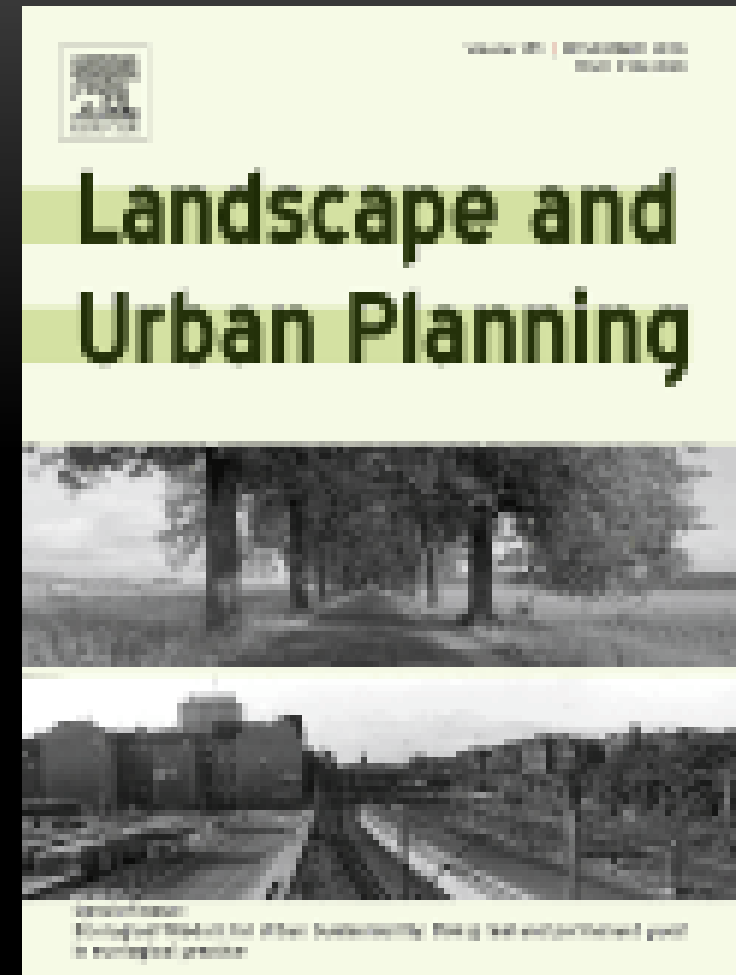


01/01/2017: Abstract deadline (title, abstracts, key words, bios)

09/01/2017: Submission of manuscripts

03/01/2018: Recommendations to the facilitating Co-Editors-in-Chief of LAND

<http://www.journals.elsevier.com/landscape-and-urban-planning/news/call-for-papers-special-issue-on-evolving-landscapes>



## SI with *Ecological Indicators*

CALL FOR PAPERS: SPECIAL ISSUE ON "FROM URBAN SPRAWL TO COMPACT GREEN CITIES – INDICATORS FOR MULTI-SCALE AND MULTI-DIMENSIONAL ANALYSIS"

Guest Editors:

Marina Artmann (Leibniz Inst. of Ecological Urban and Reg. Dev, Dresden, Germany)

Luis Inostroza (Technical University, Dresden, Germany)

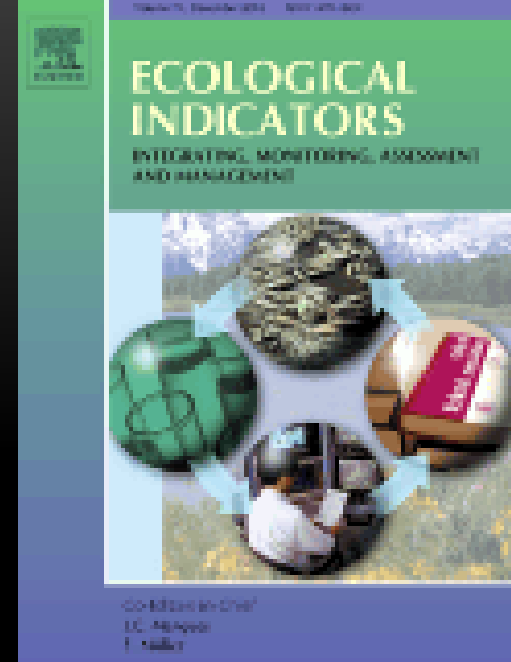
Peilei Fan (Michigan State University, East Lansing, MI, USA)



11/30/2016: Submission of manuscripts

09/01/2017: Publication of the SI

<http://www.journals.elsevier.com>





Walking trail in Doilnathanon, the highest mountain in Thailand, July 16, 2017

# THANK YOU!

Looking for collaboration in urbanization related issues (rural-urban connections, globalization, food transition, urban environment) in Southeast Asia (Mainland and Maritime)