

Doctoral Thesis (Abridged)

博士論文（要約）

Assessment of urban ecosystem services in Pyin Oo Lwin, Myanmar

（ミャンマー・ピンウルウインの都市生態系サービスの評価）

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ABSTRACT

Myanmar is undergoing a rapid urban transition largely without a functional and comprehensive urban policy framework. This has resulted in an extensive and largely uncontrolled land use and land cover (LULC) change, and the loss of urban green spaces (and the ecosystem services they provide). Such urban challenges have prompted city authorities and national decision-makers to steer urban development towards a sustainable, climate resilient, and low-carbon future through the development of proper urban plans and policy frameworks.

At the same time, Myanmar's national government has embarked in an effort to transition to a green economy. Investing in natural capital and sustainable cities are two of the three key priority areas in enabling green economic transitions in the country. In urban contexts, the development and maintenance of green spaces and green infrastructure could become a major intervention for facilitating sustainable urban development and green economic transitions. This is because urban green spaces such as parks, urban forests, and urban farms provide numerous ecosystem services that can enhance the quality of life of urban residents.

However, despite some relevant efforts in major cities such as Yangon, Mandalay and Nay Pyi Taw, there is little initiative and capacity to deal with such urban sustainability challenges in most secondary cities of the country. This is especially concerning considering the significant urban growth expected in Myanmar's secondary cities, which will most likely be on par with the growth of the already fast-expanding large cities. Thus ensuring the sustainable urban development of these emerging secondary cities would be instrumental for the sustainable urban transition of Myanmar. Developing an evidence base for secondary cities would provide useful information to both formulate proper urban plans and policies, and to develop solutions to facilitate a green economy transition.

The aim of this thesis is to understand how urban ecosystems can contribute to a green economy transition in Myanmar, focusing on Pyin Oo Lwin, a secondary city. Detailed objectives include to:

- (1) Understand the green economy discourse in Myanmar and how cities are featured in this discourse;
- (2) Assess and value in economic terms the ecosystem services that different green spaces provide to urban residents in Pyin Oo Lwin;
- (3) Provide policy recommendations on how urban ecosystems can contribute to a green economy transition in Myanmar.

To fulfil these research objectives, this thesis adopts mixed method approach that combines institutional analysis, expert interviews with key green economy stakeholders (23 expert interviews), remote sensing analysis for land use/cover (LULC) change (QGIS software), ecological surveys (41 biomass surveys), soil sampling (66 soil samples), and surveys with green space users and surrounding residents: (users: 125 urban park visitors, 78 monastery visitors, 65 golf course visitors, 141 urban farmers; surrounding residents: 181 across all green spaces). Economic valuation methods include market prices, travel cost method (TCM), hedonic pricing method (HPM), and contingent valuation method (CVM).

For (1) a combination of institutional analysis and expert interviews is used to elicit the perspectives of the different stakeholders about the drivers, priorities, challenges and future opportunities associated with green economy processes in the country. Results suggest that many different stakeholders are involved in the current green economy processes in Myanmar, and are connected in multiple ways. Some of the major challenges to successfully achieve green economy transitions include the lack of capacity, followed by funding and technology constraints. Although cities are becoming a key element of the green economy debate, they are overlooked in the current green economy implementation processes. Based on the analysis five interrelated critical points are identified for ongoing and future green economy efforts are, namely (a) strengthen specific functions within the stakeholder network (e.g. technical assistance); (b) involve meaningfully underrepresented stakeholders (e.g. from private sector and local government); (c) strengthen the visibility of certain thematic areas; (d) strengthen capacity building and public awareness; (e) promote coordinated and inclusive policy formation and implementation approaches.

For (2) the remote sensing analysis suggest an extensive land transformation in the urban and peri-urban area between 1988-2018. The built-up area expanded 5-fold expansion between 1988 and 2018 (from 7.19% of the total city area, to 35.50% in 2018) mainly at the expense of green spaces such as urban/peri-urban forests and farms. Based on a series of different techniques it is found that urban green spaces provide numerous provisioning, regulating and cultural services. Carbon storage (a regulating service) is provided in differing degrees between the different green spaces such as the park (383.67 t/ha), golf course (208.45 t/ha), monasteries (277.14 t/ha), seasonal farms (123.22 t/ha), and coffee farms (355.64 t/ha). In terms of provisioning services, the market analysis of farm products in different types of urban farms suggests that nurseries provide the highest economic values (USD 6,908.09/ha) followed by coffee farms (USD 2,489.20/ha) and seasonal crop farms (USD 3,358.53/ha). In

terms of cultural services all green spaces provide multiple ecosystem services related to biophilia, aesthetic appreciation, social cohesion and recreation, but with the levels of cultural service delivery depending between green spaces. According to the TCM and CVM analysis the value of these ecosystem services are: USD 0.42/ha/visit for the botanical gardens, followed by USD 12.57/ha for monasteries, and USD 3.31/ha for the golf course. Through the application of the hedonic pricing method the economic value of urban green spaces is elicited using the property values of the surrounding houses, with the highest values associated with the botanical gardens, followed by the golf course and the monasteries.

For (3) the high ecosystem service delivery from most green spaces suggests that investing in urban green spaces can have multiple positive outcomes during the green economy implementation process in Myanmar. For example, investing to improve the quality of the botanical garden, golf course and monasteries and improve the access of users can enhance both visitation rates and generate green employment related to landscaping and tourism. Developing proper urban plans and policies would be necessary to address the uncontrolled urbanization in Myanmar and conserve urban green spaces to achieve a sustainable urban development. Understanding the economic value of urban green spaces (and the ecosystem services they provide) can provide important information to decision-makers and practitioners on how to prioritize green spaces for sustainable urban development according to the needs of the urban residents and the local government.