



Ecosystem Services Valuation and Integration into the Policy at the Local Level in Karnataka

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Introduction

Ecosystem services provide a number of direct and indirect benefits to human beings. The Millennium Ecosystem Assessment (MEA) provides the basic conceptual framework and the linkages between ecosystem services and human well being on the global scale. (Wang et al, 2017). The MEA framework has developed four groups of ecosystem services: *provisioning services* (products obtained from the ecosystem, for example food, freshwater, fuel wood etc), *regulating services* (benefits obtained from the regulation of ecosystem processes, for example climate regulation, disease regulation, water regulation etc.), and *cultural services* (non-material benefits obtained from ecosystems including recreation and ecotourism, aesthetic, inspirational, educational etc) and finally, *supporting services* are necessary for the production of all other ecosystem services. Ecosystem services have started with the utilitarian aspects of beneficial ecosystem functions as services in order to increase public interest in biodiversity conservation. Further, ecosystem services have increased attention to communicate the societal dependence on ecological life support systems (Daily, 1997). In the 21st century, the concept of ecosystem services has gained increasing attention in the field of science and social sciences. Meanwhile, ecosystem services contribute to human well-being without quantifying or valuing these services. Therefore, the decision makers have over-emphasized the benefits from deforestation or degradation of forest ecosystem services. This kind of perception has the unwanted effect of inhibiting preventive forest conservation and management. Therefore, we need an economic valuation estimation of the forest ecosystem

services for a better understanding of the decision makers on the one hand and the linkages between economics and environment on the other hand. In addition, the economics of ecosystem and biodiversity has provided some reasons why the valuation of ecosystem services including *first*, missing markets, *second*, imperfect markets and market failures, *third*, for some biodiversity goods and services, it is essential to understand and appreciate its alternatives and alternative uses. *Fourth*, the uncertainty involving demand and supply of natural resources, especially in the future, *fifth*, the government may like to use the valuation as against the restricted, administered or operating market prices for designing biodiversity/ecosystem conservation programmes and *sixth*, in order to arrive at natural resource accounting, for methods such as Net Present Value methods. Ecosystem and natural assets have been created for the flow of goods and services over time.

Urban ecosystems, such as urban wetlands, forests, parks and estuaries, can be characterised by the processes or functions that cause them. Most of the urban ecosystem research has focused on the role of species richness as a measure of biodiversity. Urban ecosystem contributes to public health and increases the quality of life of urban citizens, e.g. improve air quality and reduce noise. Most of the problems present in urban areas are locally generated, such as those created by the ever-increasing traffic. Often the most effective, and in some cases the only way to deal with these local problems is through local solutions. Urban ecosystem services can provide a comprehensive platform for discursive governance, co-creation

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of knowledge and stakeholder involvement in the elicitation of urban ecosystem services values. The urban ecosystem services framework has great potential to serve as a bridge between science and policy in the context of urban planning and environmental governance. Urban ecosystem services involve improving the quality of life by effecting proper urban environmental planning for sustainable cities. Moreover, valuing urban ecosystem services helps in the decision-making; for example, guiding land-use planning and efficient municipal budgets for major municipalities and metropolitan cities (Gomez Baggethun and Barton, 2013).

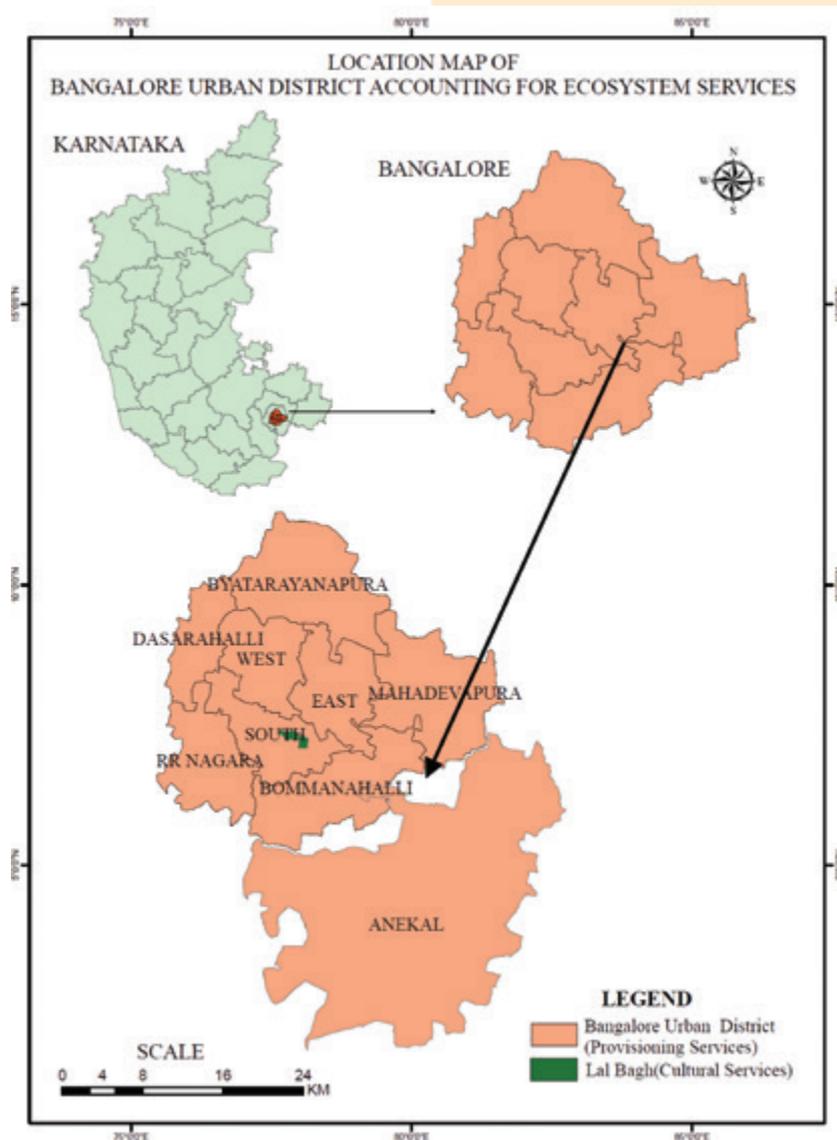
Urban Ecosystem Services in Bangalore

The cultural service was estimated for the Bangalore urban ecosystem (Lal Bagh) which constitutes the area of this study. Lal Bagh is spread over an area of about 240 acres in Bangalore city. It is one of the best botanical gardens in India. Lal Bagh has nearly 673 genera and 1,854 species of plants are found

in this area. It provides a number of ecosystem services such as provisioning, regulating and cultural services. Lal Bagh is an important natural and social capital of the society. The garden is the central lung space of Bangalore and a place of beauty which provides vigorous recreation to the public (see fig 1). This garden is a place for people to get close to nature in terms of walking, exercising, etc. Lal Bagh botanical garden was made initially as a private garden in an area of 40 acres by Hyder Ali, one of the legendary rules of old Mysore in 1760. The garden was further developed and completed in 1782 by Tippu Sultan, his son and also the ruler of the then Kingdom of Mysore. Subsequently, the British and Indian doyens of horticulture developed Lal Bagh and in 1856, it was given the status of a government botanical garden. Since then, it has emerged as an internationally renowned centre for the scientific study of plants.

The economic value of cultural services is often left out of the economic picture. Inadequacy of valuation techniques are

Fig 1 Study Area



another problem, especially for cultural ecosystem services. Ecotourism and recreation are main categories of cultural ecosystem services. Since the 1940s, many studies have been conducted on the economic value of cultural services, particularly the demand for recreation for natural areas. The conceptual idea of the Travel Cost Model (TCM) is that information on travel cost and number of visits with distance from a site of interest can be used to estimate its recreational use value. Specifically, it is considered that travel cost represents the people's willingness to pay to visit the site in question and serves as a proxy for its value. By measuring how visitation of a recreational site decreases with increasing travel cost, one can construct the demand curve for the recreational site and estimate its consumer surplus and total value. TCM is one of the most popular methods for estimating recreational value. It aims to convert the physical and social benefits produced by outdoor recreation into monetary terms (Ward and Beal, 2000). The travel cost method has been widespread in valuing numerous types of natural resources and environment. Recreational resource valuation may be one of the most high profile areas of TCM application. The travel cost method has been used by various recreational sites. The net benefits for visitors using a recreational site can be measured as a Consumer Surplus (CS). The CS is the difference between the total amount that consumers are willing and able to pay for goods or services and the total amount that they actually pay. It is the most commonly used measure of visitor net benefits. Using Poisson regression or Negative Binomial regression, the consumer surplus per trip per person was estimated as the negative inverse of the coefficient of the travel-cost variable from the regression. This study used the maximum likelihood method to estimate the above mentioned regression model for the recreation for Lal Bagh botanical garden.

The study used a sample size of 250, consisting of 220 local and 30 foreign visitors. The field survey was conducted over a two-month period from October 2014 to November 2014. Of the 300 questionnaires administered, only 200 (75%) were answered completely and used as the primary source data. A total of 50 (25%) questionnaires were partially answered. For Lal Bagh, a daily head count at various entry points to the park was undertaken for 50 days in order to establish the size of the population visiting the park. One percent of population of visitors was identified as the sample, which gave a sample size of 900 respondents, and 200 visitors were interviewed through the systematic random sampling method. The survey questionnaire used in this study consisted of two parts. The first part contained general information about the visitors including gender, education, marital status, age, income, place of living

etc., and the second part gave recreational aspects of the visitors.

Key Findings of the Study

Table 1 indicates that nearly half of the respondents were first time visitors to Lal Bagh as per the survey. About 19.5% visited twice and 12.5% visited Lal Bagh more than 5 times. About 5.5% visited Lal Bagh 3 times and 7.5% visited 4 times. Just 3.5% visited Lal Bagh 5 times. Table 2 indicates that the most important aspect of travel is the cost incurred while travelling from their home to the recreational site. About 32% spent more than Rs 500 to reach Lal Bagh. About 22%, who mostly stayed in the vicinity of the park, spent less than Rs 100 to reach the park. About 20.5% spent between Rs 100 and Rs 200 and 11.5% between Rs 200 and Rs 300 to reach Lal Bagh. About 9.5% incurred an expense between Rs 400 and Rs 500 and a mere 4.5% spent Rs 300 to Rs 400 to reach the park. Consumer surplus is estimated, for instance, consumer surplus individual divided by sample average visits per year. Table 3 shows that 73% of the respondents were willing to pay a higher entry fee to improve Lal Bagh and the rest 27% said they were not willing to pay anything above the existing Rs 10 as entry fee. The consumer value per trip for Indians was Rs 54 while for foreigners it was Rs 145 for visiting Lal Bagh. This study found that consumer surplus of foreigners is more than twice that of domestic visitors to the Lal Bagh botanical garden. It estimates that the total social benefits of Lal Bagh amount to Rs 4.4 million as presented in table 4.

Table 1: Number of Visits per Year to Lal Bagh

Number of visits per year to Lal Bagh	Percentage
One time visit	51.5
Two times	19.5
Three times	5.5
Four times	7.5
Five times	3.5
More than five times	12.5
Total	100.0

Source: Author estimate based on primary survey

Table 2: Visitors' Money Spending per Visit to the Park

Money spending per visit	Percentage
Less than Rs 100	22.0
Rs 101 to Rs 200	20.5
Rs 201 to Rs 300	11.5
Rs 301 to Rs 400	4.5
Rs 401 to Rs 500	9.5
Above Rs 500	32.0
Total	100.0

Source: Author estimate based on primary survey

Table 3: Visitors Willing to Pay for Recreation Site

Willing to pay	Percentage
Yes	73.0
No	27.0
Total	100.0

Source: Author estimate based on primary survey

Table 4: Consumer Surplus of the Visitors (in Rs.)

Variables	In Rs
Consumer surplus per visit per person (Indian)	Rs 54.00
Consumer surplus per visit per person (Foreigners)	Rs 145.00
Total Social Benefits	Rs 4.4 million

Source: Author estimate based on primary survey

Policy Suggestions

An implementation of ecosystem services valuation in policy decisions is very poor at the local, national and international level. A number of research findings suggest steps with policy implications in various sectors such as forestry, agriculture, water resources, climate and marine. For example, landscape and biodiversity management for sustainable livelihood to the forest dependent communities; valuation of ecosystem services is a vital contribution in the water policy in the context of understanding of quantity and quality of water ecosystem services for designing better water resource management at the local and national level. Ecosystem services valuation is also an important contribution to climate related policies like, quantification of carbon sequestration by various types of forests, wetlands and reserved forests. In addition, regulating ecosystem services is playing an important role in the climate adaptation and mitigation strategies. Further, ecosystems services valuation is the basic foundation for environmental and natural capital accounting at the national and international level.

Based on the results of this work and the discussions, the following suggestions and recommendations can be made.

- This work is the first of its kind conducted in Bangalore. It is therefore hoped that this work will be among the trend setters in the field of research in Bangalore and it will equally be interesting to compare and contrast the findings of later researchers to this study.

- Government planners envision Lal Bagh as an eco-tourism destination. Keeping in view the large amount of consumer surplus and recreational value of Lal Bagh, the local governments can justify a larger annual budget for managing the park. This study shows that if the quality of facilities in Lal Bagh improves, it will attract more visitors and in turn, generate greater revenue. This calls for the government to reallocate monies for park improvement.
- Alternatively, the local government could also consider introducing an entry fee to access Lal Bagh. The entry fee would generate revenue to improve facilities.
- A general motivation is that ecosystem accounting can provide information for tracing changes in the ecosystem and linking those changes to economic and other human activities. A particular motivation for the development of ecosystem accounting stems from the concern that economic and other human activity is leading to an overall degradation of the ecosystem and, consequently, there is a reduced capacity for ecosystems to continue to provide the services that people are dependent on.
- Since ecosystem accounting requires the development of datasets pertaining to specific geospatial areas, it can provide information for the assessment of integrated policy responses at the level of detail, for example in the management of river basins, fisheries, protected areas and agricultural areas.

References

- Daily, G. (1997). *Nature's services: Societal dependence on natural ecosystems*. Washington, D.C. Island Press.
- Gómez-Baggethun, E. and Barton, D.N., 2013. Classifying and valuing ecosystem services for urban planning. *Ecological economics*, 86, pp.235-245.
- Millennium Ecosystem Assessment (2005). *Ecosystems and human well-being* (Vol. 5, p. 563). The UN. Washington, DC: Island Press.
- Wang, Z., Deng, X., Song, W., Li, Z. and Chen, J., (2017). What is the main cause of grassland degradation? A case study of grassland ecosystem service in the middle-south Inner Mongolia. *Catena*, 150, pp.100-107.
- Ward, F.A., Beal, D.J., (2000). *Valuing nature with travel cost models: A manual*. Edward Elgar: Cheltenham, UK p. 258.