Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh

A Research proposal on

"Ecosystem health assessment by developing quality index for Satchari National Park"

Date of Submission: 24/01/2025

Contents

Ecosystem health assessment by developing quality index for Satchari National Park

Introduction:

The health of ecosystems is essential for preserving biodiversity, controlling the climate, supplying clean water and air, sustaining human livelihoods, and guaranteeing resilient and sustainable habitats for all living things. Ecosystem health is “the state or condition of an ecosystem in which its dynamic attributes are expressed within the normal ranges of activity relative to its ecological state of development” (Arefin et al., 2011).Making decisions about how best to maintain a forest can be facilitated by evaluating the health of the ecosystem. We have selected **Satchari National Park, Bangladesh (SNP)**. SNP, is a region rich in biodiversity. The SNP is regarded as a severely disturbed forest because of increased encroachment and reliance. Satchari National Park has a rich flora and fauna. More than 200 tree species have been identified, including ones typical of tropical evergreen forest such as Garjan (Dipterocarpus turbinatus), Chapalish (Artocarpus chaplasha), various figs (Ficus sp.), and Jarul (Lagerstroemia sp).(Nishorgo comanagement network website). Numerous endangered species are part of the richness of the wildlife of Satchari National Park. Hollock Gibbons, Bengal Slow Loris, Capped Langur, and different deer and wild boar are important animals. Its vast biological variety is further enhanced by the over 200 bird species that call it home, including Red Junglefowl and Oriental Pied Hornbills, as well as a plethora of reptiles and amphibians.This forest's biodiversity, which includes its flora, wildlife, and their biotic interactions, is dwindling daily. It's critical to understand the present state of this forest in order to take the appropriate action to stop its decline and preserve the only remaining ecosystem. We will evaluate all land use by

calculating a quality index by following a method described in(Prova et al., 2023).

Objectives:

Our study's primary goal is to determine the forest's present state in terms of its ecological, biodiversity, social issues, and tourist situation. Given the intense human strain this forest is under, it is critical to understand its current state in order to help with management decisions. Our research will assist in determining the forest's most crucial and vulnerable locations from every angle.

Literature Review:

The evaluation of ecosystem health is a developing discipline that is essential to comprehending the sustainability and vitality of natural habitats. Creating a thorough quality index is necessary for Satchari National Park in Bangladesh, a biodiversity hotspot, in order to monitor and maintain its ecological integrity. The 243-hectare park was created in 2005 and is distinguished by its abundant wildlife and plant diversity, which includes more than 200 bird species, some endangered animals like the Hollock Gibbon, and a wide variety of tree species including Garjan and Agarwood.The evaluation of ecosystem health is a developing discipline that is essential to comprehending the sustainability and vitality of natural habitats. A rich variety of tree species, indicating a healthy and stable ecosystem(Prova et al., 2023)Creating a thorough quality index is necessary for Satchari National Park in Bangladesh, a biodiversity hotspot, in order to monitor and maintain its ecological integrity. The park was created in 2005.

Satchari National Park in Bangladesh, recognized for its rich biodiversity and critical ecological significance, presents an ideal site for ecosystem health assessment through the development of a quality index. A high rate of natural regeneration, which is crucial for maintaining ecological

balance. The diversity and abundance of tree species are indicators of the park's health, and their findings suggest that protecting these natural processes is vital(Arefin et al., 2011)
Such an index not only aids in monitoring and managing the park's natural resources but also provides a framework for sustainable conservation practices.

The adverse effects of human activities such as logging and agricultural encroachment, which have altered the landscape and affected biodiversity. (Sharif Ahmed Mukul et al., n.d.)

An excellent location for evaluating the health of an ecosystem by creating a quality index is Bangladesh's Satchari National Park, which is known for its abundant biodiversity and vital ecological importance. A foundation for sustainable conservation techniques is also provided by such an index, which helps in managing and monitoring the park's natural resources.(Sharif Ahmed Mukul et al., n.d.)

Methodology:

1.1 Study site:

The SNP located in Chunarughat Upazila of Habiganj district, between
24°5' to 24°10' N latitude and 91°25' to 91°30' E longitude. It was declared as National Park in 2005 with an area of 242.91 ha. It became a part of a co-managed eco-tourism project under its Nishorgo initiative.

1.2 Index of Forest Biotic Integrity:

Using a straightforward random sample technique, we will identify the plot where the plot size will be (30*30) m2. For our study, we will gather 60 plots, or 2.22% of the entire forest area. This index will be calculated using six different variables, including bird abundance, monkey abundance, tree height, basal area, tree volume, and above-ground biomass.

1.3 Socioeconomic Index:

We will utilize a semi-structured questionnaire to gather socioeconomic data, with particular attention on gathering the following information: gathering of forest products, The amount of time spent gathering forest goods, the pursuit of forest products, age, education, and income.

1.4 Index of forest soil:

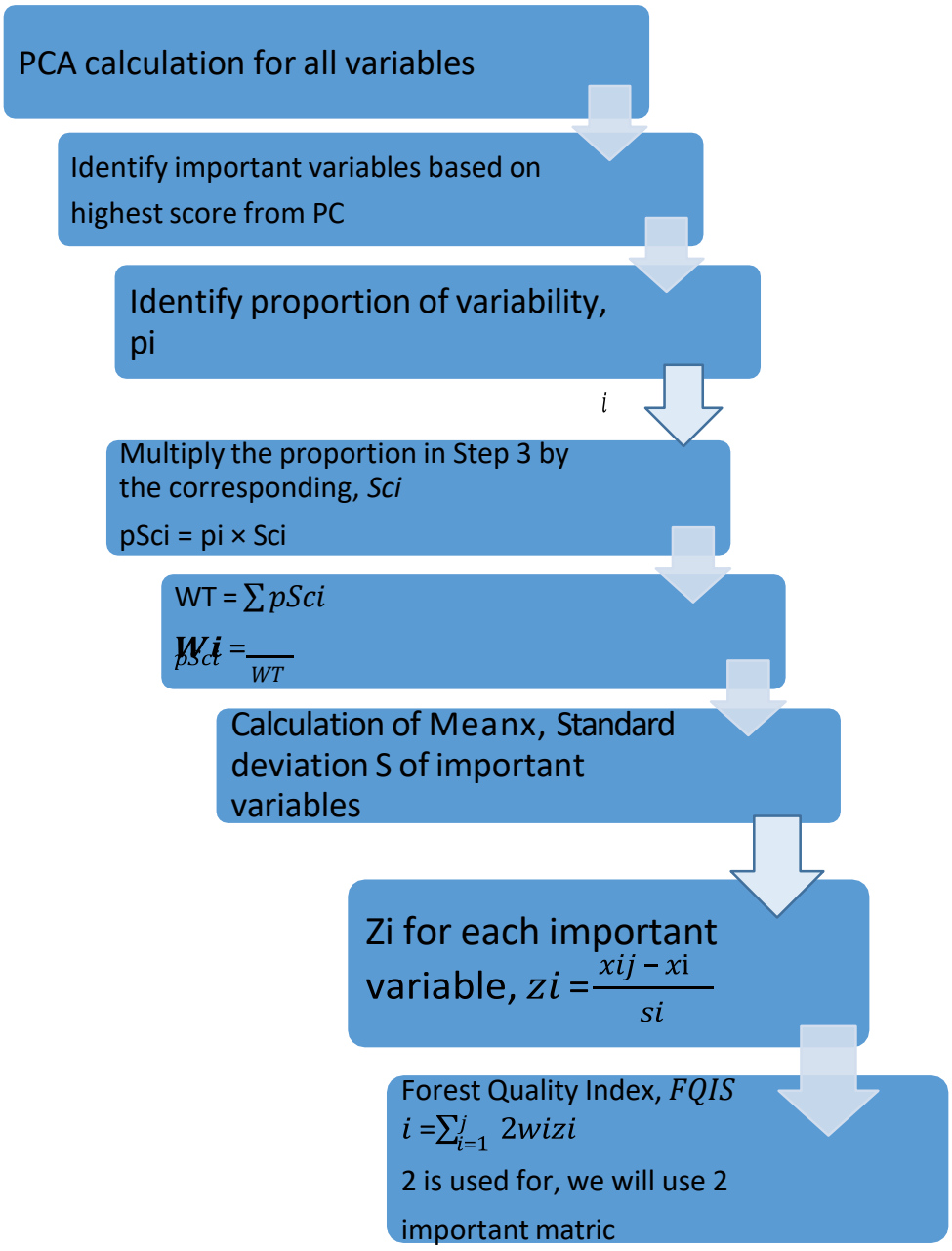
To determine the bulk density, moisture content, porosity, pH, and C, we will gather soil samples.

1.5 ecotourism index:

We will gather the following information to determine the eco-tourism index: Level of tourist satisfaction, age, perception of the ecology, occupation, education, and amount of time spent.

1.6 Statistical analysis and developing of SNP's quality index:

Based on the land use pattern of SNP, individual quality index will be calculated for high forest, low dense forest, degraded land and waterbody then an overall quality index will be calculated for this forest based on the method described in F.Hanum *et al*,.2019. The steps are as following:


PCA calculation for all variables
Identify important variables based on highest score from PC
Identify proportion of variability, pi
i
Multiply the proportion in Step 3 by the corresponding, *Sci*
pSci = pi × Sci
WT = $\sum pSci$
$Wi = \frac{pSci}{WT}$
Calculation of Meanx, Standard deviation S of important variables
Zi for each important variable, $zi = \frac{xij - xi}{si}$
Forest Quality Index, $FQIS$
$i = \sum_{i=1}^{j} 2wizi$
2 is used for, we will use 2 important matric

FQISi for each category such as

FQIS1 for forest biotic integrity index

FQIS2 for forest soil index

FQIS3 forest hydrology index

FQIS4 forest socio − economic index

FQIS5 ecotourism index

Then an overall quality index will be calculated by following formula,

$$\boldsymbol{FQI} = \sum_{i=1}^{c} FQIS$$

$\boldsymbol{FQI}$ =

1 if FQISI < −1.5,

2 if − 1.5 ≤ if FQISI ≤ −0.5,

3 if − 0.5 ≤ if FQISI ≤ 0.5,

4 if 0.5 ≤ if FQISI ≤ 1.5,

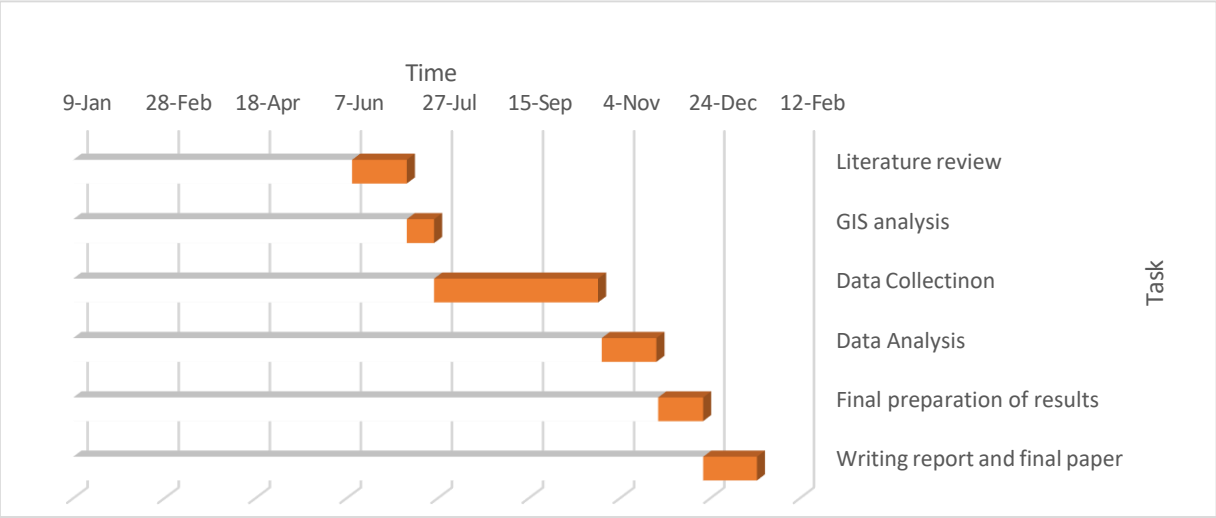
5 if FQISI > 1.5

Where 1 (worst), 2 (bad), 3 (moderate), 4 (good), 5 (excellent)

1.7 NDVI calculation:

To assess the accuracy of our quantitative index in different land use we will judge it by calculative the NDVI to see whether this calculation is correct or not.

1.8 Time Frame:



1.9 Team's profile and responsibilities

Supervisor:

Dr. Mohammed Abu Sayed Arfin Khan

Professor

Department of Forestry and Environmental Science

Shahjalal University of Science and Technology; Sylhet-3114; Bangladesh

Email: khan-for@sust.edu , nobelarfin@yahoo.com

Correspondent:

Afif Anjum

B.Sc (Hons) 4 th year 1st semester,

Department of Forestry and Environmental Science

Shahjalal University of Science and Technology, Sylhet.

Responsibility: Field work, lab work, data analysis, report writing.

Email: afifanjum7@gmail.com

Expected outcome:

I. An ecosystem health index for each of the SNP's various land uses will be provided by our study.

II. Additionally, this will offer a thorough ecosystem health index that will assist us in understanding By taking into account the flora, fauna, soil, water, social factors, and tourism, what is the current state of the forest.

Conclusion:

To sum up, the evaluation of ecosystem health is critical to the maintenance of biodiversity, the control of climate change, and the support of human welfare. With its great biodiversity and ecological value, Bangladesh's Satchari National Park serves as an excellent example of the necessity of these assessments. Even though the park is well-known for its wide variety of plants and animals, it nevertheless confronts many difficulties, such as habitat damage and encroachment. Using a quality index evaluation to understand the ecosystem's current condition is essential to putting successful conservation measures into practice. Making well-informed decisions to prevent further deterioration and guarantee the long-term sustainability of this priceless environment may be accomplished by utilizing approaches described in earlier research and customizing them to Satchari National Park's particular features.

Reference:

Arefin, K., Rahman, M., Uddin, M. Z., & Hassan, A. (2011). Angiosperm flora of Satchari National Park, Habiganj, Bangladesh. *Bangladesh Journal of Plant Taxonomy*, *18*(2), 117–140. https://doi.org/10.3329/bjpt.v18i2.9298

Prova, S. J., Ahsan Talucder, M. S., & Uddin, M. S. (2023). Diversity of Plant Species in Moringa-Based Homestead of Jaintiapur Upazila in Sylhet District. *SAARC Journal of Agriculture*, *21*(2), 119–129. https://doi.org/10.3329/sja.v21i2.68578

Sharif Ahmed Mukul, by, Belal Uddin, M., & Rahman Tito, M. (n.d.). *STUDY ON TH E STATUS AND VARIOUS USE S OF INVASIVE ALIE N PLANT SPE CIE S IN AND AROUND SATCH ARI NATIONAL PARK, SYLH E T, BANGLADE SH* (Vol. 28, Issue 4).