Diagnostic assessment tool for restoration strategies of Nananmangalam Urban Reserve Forest, Chennai, India

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ABSTRACT

Major countries around the world have an untapped resource opportunity laying within their geographical region: the restoration of forest landscapes. "Forest landscape restoration" is the process of regaining ecological functionality and enhancing human wellbeing across cleared or degraded forest landscapes of the region. It can result in a variety of land use, ranging from vast tracts of dense natural forests, to high yield agroforestry systems, to a mosaic of wooded areas amid productive agricultural fields or dense urban development like urban reserve forest, open space reserves, parklands, avenues, building setbacks, etc. Forest landscape restoration does not call for increasing tree cover beyond what would be ecologically appropriate for a particular selected candidate landscape location. The objective of this technical paper is to explore the use of "The Diagnostic Assessment Tool for restoration strategies of Nanmangalam urban reserve forest, Chennai, India ". The methodology of the tool consists of three questionnaire tabs *(Diagnostic - Motivate, Diagnostic - Enable, Diagnostic - Implement)* and a summary table called "Key Success Factors". The three questionnaire tabs help decision-makers and restoration supporters analyze the existence of key success factors within a current or future restoration project. In particular, it helps them focus their efforts on the most important factors to get in place before large amounts of human, financial, or political capital are invested. When applied periodically every few years once a restoration effort is underway, this tool can help implementers adjust and refine their policies and practices as a means of adaptive management.

Introduction

Urbanization is one of the major reasons for the destruction of natural vegetation. The acceleration of urban construction and population growth changes the urban environment despite India being on the list of predominately active forest landscape restoration countries. The rapid growth of urban population and global climate change calls for the elaboration and evaluation of different adaptation and mitigation strategies in this anthropogenic-modified climate circumstance that the well being of the Indian urban population through landscape planning and design especially for the rapidly growing metropolis of Chennai.

Chennai Metropolitan Area (CMA) records 3% in the average annual rate of change of population size and Thirty Second in the ranking of urban agglomeration with more than 5 million inhabitants as per WUP, 2014. Presently, the Government of Tamil Nadu proposes to expand Chennai Metropolitan Area from 1,189 Sq.km to 8,878 Sq.km, to counter the effect of an ever-increasing population and to regulate development in fast-growing suburban ar-

eas. To create infrastructure at par with economic activities, care for environmental protection, and safeguarding fertile agricultural lands of the two districts of Kancheepuram, Tiruvallur and Arakkonam Taluk of Vellore District. Due to the expansion of the urban limits in the past decades, nearly 100 species of native trees and shrubs disappear from the Chennai region. Today, the open space reserves and protected urban reserve forest in the city and suburban area are the only reserves available for forest landscape restoration of native tree stands and testimony to the endangered tropical dry evergreen forest type of this region. Hence, the "Restoration Diagnostic Assessment Tool" will be an effective scientific method to regain ecological functionality and enhance human well–being across cleared or degraded forest landscapes of the city and its region.

Fig. 1. Steps to conduct Restoration Diagnostics
Source: (World Resource Institute and IUCN)

Literature Review

History indicates that forest landscape restoration is possible in big and small ways. Many countries - including Costa Rica, Niger, South Korea, Sweden, Singapore, Thailand, and the United States – have recovered the best possible forest landscape during the past century in a manner that could be considered "successful" in terms of being phenomenal and gearing up stakeholder benefits. Landscape restoration in India will improve the lives of women, unemployed youth, landless people, and small and marginal landholders, according to researchers with World Resources Institute (WRI). WRI India said, recommending the widespread application of such nature-based solutions to climate change in other degraded areas with about 30% of India's total geo-

graphical area being affected by land degradation, India has high stakes to a level of leadership role. Local people should be at the core of changes, actively designing and implementing landscape restoration projects. In Sidhi, a resource-rich but largely impoverished district in central India, most people depend on forests and the land to survive. That makes Sidhi typical of the dozens of underdeveloped landscapes in India and worldwide (Ruchika Sing *et al.,* 2020). Changes in forest composition, land degradation, rising temperatures, and desertification have made it harder than ever for people there to thrive. Land restoration could benefit people in Sidhi economically and ecologically. But we wanted to ensure that its primary beneficiaries would be tribal and Indigenous peoples, women, and other marginalized groups that are heavily dependent on forests, the commons, and unproductive land for their sustenance.

Ethiopia recognizes the key role forestry plays in setting the country on a sustainable and green continuous sentence. The current 15.5 percent forest cover is inadequate to provide an economic and ecological support system in this mountainous and climatically precarious country. While protecting the existing 17.35 million hectares of forest, Ethiopia also intends to undertake large scale afforestation and reforestation to increase total forest cover to 30 percent by 2030. Afforestation and reforestation are also key to alleviating the pressure on natural forests (M EFCC, 2017). Analysis from these and other historical case studies in all complemented from peer-reviewed literature suggests that a successful restoration process exhibits three common themes, they are as follows:

A clear motivation

Decision-makers, landowners, and/or citizens were inspired or motivated to catalyze processes that led to forest landscape restoration.

Enabling conditions in place

Several ecological, policy, social, and institutional conditions were in place that created a favorable context for forest landscape restoration.

Capacity and resources for sustained implementation

Capacity and resources were mobilized to implement forest landscape restoration on a sustained basis on the ground.

S148

Eco. Env. & Cons. 27 (August Suppl. Issue) : 2021

Within each theme, this research paper points to several factors that were present- either naturally or through a human action-in case where forest landscape restoration occurred. We call these "Key Success Factors" for forest landscape restoration (Craig *et al.,* 2015).

Methodology

The Restoration Diagnostic Assessment Tool is a three-step process for developing strategies for successful landscape restoration:

1. Users define the scope or geographic boundary within which to apply the diagnostic such as urban reserve forest, open space reserve, parks, etc.
2. Users conduct an assessment to identify which key success factors are in place and which are not, within the landscape being considered for restoration.
3. Users identify which policies, incentives, and practices would address the missing factor.

When applied before initiating a restoration process. The Restoration Diagnostic Tool can help decision-makers and stakeholders focus their efforts on getting the missing key success factors in place – before large amounts of human, financial, or political capital are invested. When the findings are applied periodically as landscape restoration is in effect through adaptive management. As a result application of the diagnostic may increase the likelihood of the forest landscape restoration will be successful (MEFCCC, 2017).

Study Area, Analysis and Results

About the study area and its features

The Nanmangalam urban reserve forest is selected as the candidate landscape for forest landscape restoration is located in the southern part of Chennai measures 321 hectares with central coordinate as 12 degrees 55'43" N and 80 degrees 10'30" E. The habitat comprises hillocks, plains with scrub vegetation, abandoned stone quarries, two freshwater ponds, Eucalyptus plantations by the Department of Forests -Tamil Nadu State, seasonal flood plains, and Tamil Nadu State Greening and Biodiversity center. The soil type is red loamy and rocky, Average annual rainfall range between 1200 mm to 1500 mm,

with annual average precipitation of 1317.3 mm, Decadal temperature ranges between 20 degree centigrade and 45-degree centigrade, with an annual mean temperature of 28.6-degree centigrade, tropical dry evergreen forest type.
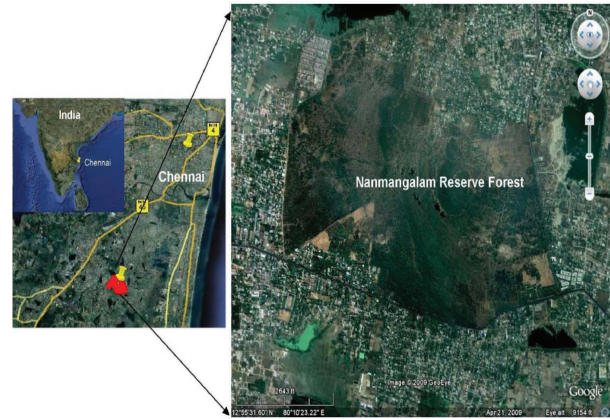

Fig. 2. Location Map of Nanmangalam urban reserve forest, Chennai

Analysis

Field trips were made during eight weeks to get the questionnaire answered about the Nanmangalam urban reserve forest from the community and stakeholders to key in the format of the Excel-base tool "key success factors" questions for each category (motivate, enable, implement) of forest landscape restoration. The record of clarifying comments, information, or data is filled in the spreadsheet. This information helps to justify, responses, serve as a reminder of underlying rationale, or highlight where significant data gap exist. As the questionnaire tabs are completed, responses automatically appear on the summary table. Thus revealing the measures to be taken care of or adopted for the selected candidate landscape for forest landscape restoration.

Results

The results are shown below (Table 1) for the Nanmangalam urban reserve forest landscape restoration. Diagnostic – Motivate: Benefits are greater in prospect, Awareness and crisis events are not present, Legal requirements do partly exist, but are not enforced. Diagnostic – Enable: Basic Ecological parameters are greater in prospect except for invasive plants and animals that can impede restoration. Market conditions for forest products are declining,
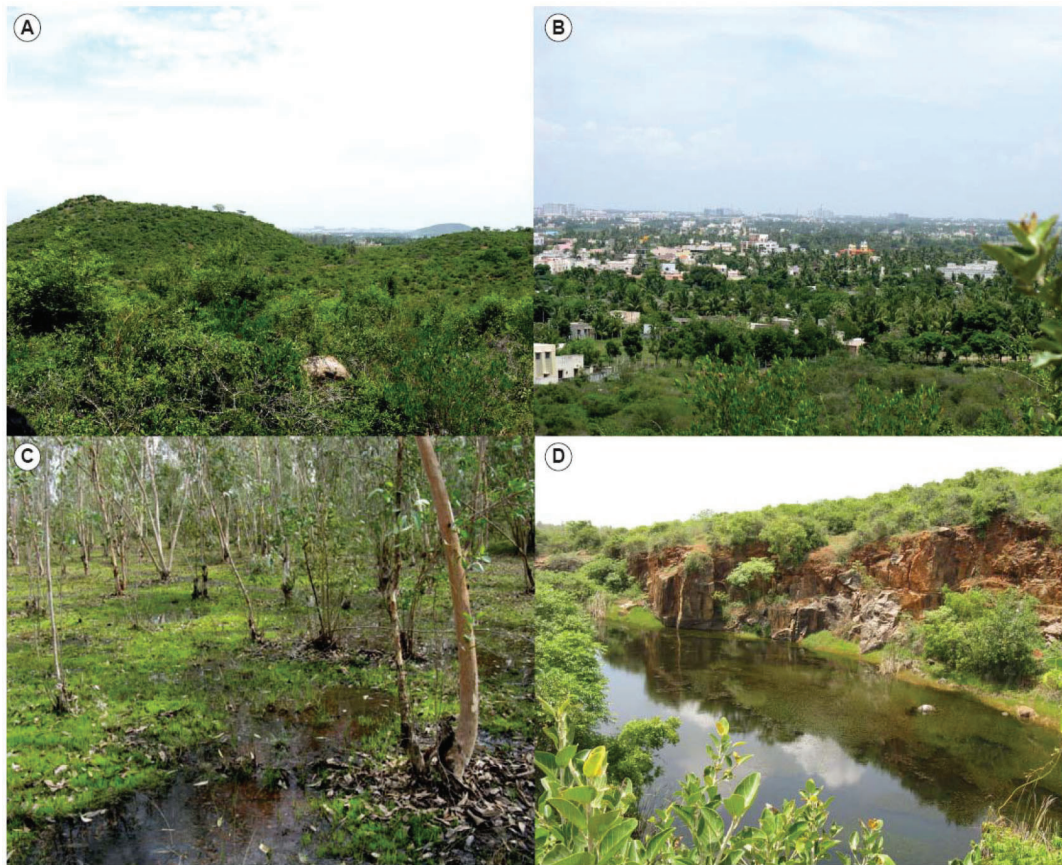
Fig. 3A. A view of the dense scrub forest; B) Forest boundary and the expanding city; C) Seasonally flooding eucalyptus plantation; D) Abandoned stone quarry in the forest. (Photo courtesy: Prabakaran Nehru)

value chain absent. Policy conditions are present but can be improvised. Social Conditions on people participation has to be strengthened, social benefits are great in prospect. Institutional conditions are not present. Diagnostic – Implement: Leadership potential exists in abundance from various NGOs, Corporate and Major Industries as corporate social responsibility activity but Knowledge, Technical design, Finance and incentives, and Feedback do not exist.

Conclusion

Thus, to conclude based on the results the relevant strategies are detailed as follows: Diagnostic – Motivate Awareness program; Crisis event adaptation, mitigation, and management techniques; Forest law amendment should be motivated at a greater level. Diagnostic – Enable: Forest law; rural extension; research and development; sustainable forest inten-

sification; Markets; Forest Policy amendment; Institutions participation and involvement to be enabled and encouraged. Diagnostic – Implement: Awareness Program; Innovation; Research and Development; rural extension; Forest law amendment; sustainable forest intensification; finance and promotional activities; spatial planning and monitoring to be implemented.

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S150

Eco. Env. & Cons. 27 (August Suppl. Issue) : 2021

Table 1. Restoration Diagnostic results for Nanmangalam urban reserve forest

RESTORATION DIAGNOSTIC SUMMARY

Theme	Feature	Key success factor	Response
Motivate	a. Benefits	Restoration generates economic benefits	Yes
		Restoration generates social benefits	Yes
		Restoration generates environmental benefits	Yes
	b. Awareness	Benefits of restoration are publicly communicated	No
		Opportunities for restoration are identified	No
	c. Crisis events	Crisis events are leveraged	No
	d. Legal requirements	Law requiring restoration exists	Yes
		Law requiring restoration is broadly understood and enforced	No
Enable	e. Ecological conditions	Soil, water, climate, and fire conditions are suitable for restoration	Yes
		Plants and animals that can impede restoration are absent	No
		Native seeds, seedlings, or sources populations are readily available	Yes
	f. Market conditions	Competing demands (e.g., food, fuel) for degraded forestlands are declining	Yes
		Value chains for products from restored areas exists	No
	g. Policy conditions	Land and natural resource tenure are secure	No
		Policies affecting restoration are aligned and streamlined	No
		Restrictions on clearing remaining natural forests exist	Yes
		Forest clearing restrictions are enforced	Yes
	h. Social conditions	Local people are empowered to make decisions about restoration	No
		Local people are able to benefit from restoration	Yes
	i. Institutional conditions	Roles and responsibilities for restoration are clearly defined	No
		Effective institutional coordination is in place	No
Implement	j. Leadership	National and/or local restoration champions exist	Yes
		Sustained political commitment exists	No
	k. Knowledge	Restoration "know how" relevant to candidate landscapes exist	No
		Restoration "know how" transferred via peers or extension services	No
	l. Technical design	Restoration design is technically grounded and climate resilient	No
		Restoration limits "leakage"	No
	m. Finance and incentives	Positive incentives and funds for restoration outweigh negative incentives	No
		Incentives and funds are readily accessible	No
	n. Feedback	Effective performance monitoring and evaluation system is in place	No
		Early wins are communicated	No

Source: (Parisutha Rajan, Minakshi Jain, Abdul Razak Mohamed 23-01-2018)
Note : Restoration Diagnostic Summary for Nanmangalam urban reserve forest is prepared using The Restoration Diagnostic Assessment Tool. Refer website : www.wri.org/restorationdiagnostic

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