

FORM C

PROPOSAL FOR APPROVAL FOR TAKING UP CONSULTANCY

Please refer to Statues SA38 for more details

1. **TITLE OF PROPOSED PROJECT:** "Central Sector Scheme on Conservation and Management of Mangroves and Coral Reef"
2. **Principal Consultant**
  - (a) **Name:** Dr. Nitin S. Sawant
  - (b) **Designation:** Assistant Professor
  - (c) **Department:** Zoology
3. **CLIENT:**
  - (a) **Firm:** Goa Forest Department, Government of Goa
  - (b) **Address for communication:** O/o Principal Chief Conservator of Forest, VAN Bhavan, Altinho, Panaji – Goa, Government of Goa
  - (c) **Contact person in the Organization:** Principal Chief Conservator of Forest, Governemtn of Goa.
4. **Name, Designation and Department of the staff members involved in the consultancy (including students)**  
Dr. Nitin S. Sawant
5. **Name and Address of Outside Expert (if any) involved in the consultancy:** Mr. Mayur Gawas (M.Sc, Phd, ongoing)
6. **Whether the consultancy shall make use of any University facilities such as equipment or laboratory:** NA
7. **Time schedule**
  - (a) **Duration (Weeks, months or years):** 01 year
  - (b) **Starting Date:** On receipt of approval of the project/financial approval
8. **Estimate of charges**

**Honoraria to consultant (s), staff of laboratory and others:**

(a) <b>Consultant share:</b> Rs. 80,000.00	
<b>Other member share:</b>	
(A) Procuring high resolution images and processing:	Rs. 60,000.00
(B) Salary: Rs. 20,000 X 3 months	Rs. 60,000.00
	<u>Total: Rs. 1,20,000.00</u>

  - (b) **University share (as per SA38.2.vii):** NIL
  - (c) **Cost of materials used in carrying out consultancy:** Rs. 75,000/- (software's etc)
  - (d) **Computer charges:** NA
  - (e) **Charges for use of laboratory equipment and instruments:** Rs. 75,000.00  
(Purchase of imageries)
  - (f) **T.A./D.A. for visit to sites:** Rs. 60,000/- (Travel, Boat hire etc)
  - (g) **Administrative/overhead charges to be paid to the University (@15%):** Rs. 75,000.00
  - (h) **Miscellaneous:** Rs. 15,000/-

Total amount of Rs. 5,00,000.00

*[Signature]*



9. Give a brief description of the work to be done that includes scope of the work, Receivables from the client and deliverables to the client. (As annexure I)

#### DECLARATION BY CONSULTANT

- A. I shall ensure that the proposed consultancy project does not affect my regular academic, research and related activities and other duties which are assigned to me by the University.
- B. Number of Consultancies at present with me/each one of us do not exceed four in number.
- C. This is to certify that there is no close vendor to whom payments are to be made from the consultancy project funds, or any such issue leading to conflict of interests.
- D. I have agreed to share the honorarium as per following distribution.

Name: Mr. Mayur Gawas

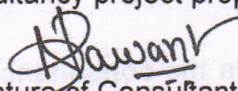
Proposed share:

(A) Procuring high resolution images and processing: Rs. 60,000.00

(B) Salary: Rs. 20,000 X 3 months Rs. 60,000.00

**Total: Rs. 1,20,000.00**

- E. I undertake to abide by all the provisions of Statute SA-38 in connection with the consultancy project proposed herewith.

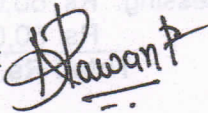
  
Signature of Consultant

(Separate forms may be submitted if the consultants are from different department)

#### DECLARATION BY HEAD OF THE DEPARTMENT

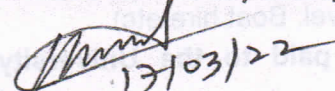
- A. For the present consultancy the CLIENT GOA FOREST DEPARTMENT, GOVERNMENT OF GOA has requested the services of DEPARTMENT OF ZOOLOGY, GOA UNIVERSITY (Letter may be placed for record) and these faculty members may be permitted to take up the consultancy work.
- B. Based on the expertise available in the Department, following member (s) of the Department have been assigned the present consultancy work.

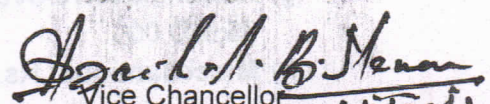
(a) Dr. Nitin S. Sawant

  
Signature of the Head of the Department

Department of Zoology  
Goa University  
Taleigao Plateau, Goa-403 206

The present consultancy project has been registered in RDRM and the reference number is GU/D-RDRM/consult/GFD/NSS/2001094/50/2021-22

  
Signature of In-charge RDRM  
Approved/Not Approved

  
Vice Chancellor  
24/09/2022





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Office of the Dy. Conservator of Forests,  
**Research & Utilisation Division,**  
Aquem, Margao-Goa, 403 601

**Phone/Fax: - 0832-2750099**

**E mail: [dcfru-forest.goa@nic.in](mailto:dcfru-forest.goa@nic.in)**

No. 1/DCF/RES/42/2021-22/ 2313

Dated :- 16 -02-2022

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To,

Dr. Nitin Sawant,  
Asst. Professor,  
Department of Zoology,  
Goa University,  
Bambolim, Taleigao Plateau.

Sub :- Central Sector Scheme on Conservation and Management of Mangrove and  
Coral Reefs – reg.

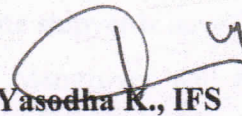
Sir,

As Mangroves sustain eco-system in saline and marshy areas and house, a variety of birds, amphibians and fish found in Swamps eco-system. Forest Department of Goa is intending to invite Research proposal on the topic :-

1. Procurement of imaginaries and preparation of Mangrove maps and identification of degraded and valuable mud flats for plantation and protection.
2. Monitoring of change/assessment of mangrove cover in every two years by GIS mapping techniques.

Your proposal may be submitted at the earliest for scrutiny and approval by the Regional Advisory Committee (RAC) of the Department.

Yours faithfully,

  
**Yasodha K., IFS**

Dy. Conservator of Forests,  
Research & Utilisation Division  
Margao Goa

“स्वच्छ भारत नितळ गोंय”

Towards Cleaner and Greener India

Goa Forest Department 24 X 7 Helpline No: (North Goa) 0832-2228772 (South Goa) 0832-2750246

Please visit: [www.forest.goa.gov.in](http://www.forest.goa.gov.in)



## Conservation and Management of Mangrove and coral reefs (Central Sector Scheme)

### INTRODUCTION

Mangroves are salt-tolerant forest ecosystems of tropical and subtropical intertidal regions. The largest mangrove areas located in Asia, extending over 6.8 million ha and represents about 34-42% of the world's total. Total 46 true mangrove species belonging to 14 families and 22 genera are found in Indian mangrove habitats. 11 out of 80 mangrove species in the world are at an elevated threat of extinction, out of which only 2 species namely, *Sonneratia griffithii* (critically endangered) and *Heritiera fomes* (endangered) exist in India. All other mangrove species in India are in the IUCN category of least concern and only one species *Brownlowia tersa* is in the category of near threatened species.

Goa is situated in the Central-West Coast of India, borders the Arabian sea and extends from North to South. The total length of Goa coast is approximately 105 km. About 16 mangroves and few associated species have been recorded from the Goa coast. There are seven estuaries fringed with mangroves along the Goa coast. There exist an intricate network of creeks and backwaters. A luxuriant growth of mangroves and associated swamps can be observed along (Sofawi, A. B., Nazri, M. N., & Rozainah, M. Z. (2017)).

Chorao island has a thick mangrove cover along the Mandovi estuary. Considerable Mangrove cover can also be seen along Cumbarjua canal. Mangroves of Mandovi-Zuari Estuarine complex in Goa are among the best Mangrove forests on the west coast of India. 90% of the Mangroves in Goa are distributed along the Mandovi and Zuari estuaries (Giri, C., Long, J., Abbas, S., Murali, R. M., Qamer, F. M., Pengra, B., & Thau, D. (2015)). Mandovi-Zuari estuarine complex harbours variety of mangrove plant species.

In Goa, mangrove areas have been reclaimed for building houses, bridges, industrial units, roads, jetties, infrastructure for tourism etc. Patto is a unique example where mangroves were cut down to accommodate to build government and private offices. Many private shipyards have flourished along the estuaries of Goa by reclaiming mangrove areas. True Mangroves and mangrove associates are found at Zuari, Mandovi, Chapora, Terekhol, Talpona, Galgibag and Salim Ali Bird Sanctuary. (Singh, I. J., Singh, S. K., Kushwaha, S. P. S., Ashutosh, S., & Singh, R. K. (2004)). These places are far from one another and the mangrove species diversity varies from one place to another, due to factors such as climate, tidal factors and anthropogenic pressures. Sixteen true

*[Signature]*



mangrove floral species have been observed along the sea coast in saline swamp and the adjacent regions at these sites.

## **OBJECTIVES**

- 1) Procurement of imageries and preparation of Mangrove Map and identification of available mud flats for protection.
- 2) Monitoring of change/assessment of Mangrove cover by GIS mapping techniques.

## **Methodology**

For mapping and monitoring of mangroves at local, regional, and global scales, freely available Landsat scale (30 m) satellite data is found to be suitable.

The regional analysis of the area can be performed using Google Earth Engine and Classification and Regression Tree (CART) algorithm. The Google Earth Engine provides an online platform with data, software, and computing infrastructure for data analysis.

Qualitative validation can be performed with the help of local experts and high-resolution satellite data such as Quick Bird and IKONOS (Giri, C., Long, J., Abbas, S., Murali, R. M., Qamer, F. M., Pengra, B., & Thau, D. (2015)

## **Significance of the Study**

This study will provide valuable information about the distribution of mangrove forest, which is critical for better understanding and therefore preserving the mangroves. Mangrove habitats is crucial to maintain the ecosystem services and functions for the well-being of mankind (10). The study will also help to understand mangrove area to plan the strategies to monitor and protect biodiversity. Data can be utilized for better management and also to provide mitigation measures.

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## REFERENCES

- 1) Singh, I. J., Singh, S. K., Kushwaha, S. P. S., Ashutosh, S., & Singh, R. K. (2004). Assessment and monitoring of estuarine mangrove forests of Goa using satellite remote sensing. *Journal of the Indian Society of Remote Sensing*, 32(2), 167-174.
- 2) Jagtap, T., 1985. Ecological Studies in Relation to the Mangrove Environment Along the Goa Coast India. Shivaji University, Kolhapur, India. Ph. D. thesis.
- 3) Sahu. SC., Suresh. HS., Murthy. IK., Ravindranath. NH., (2015). Mangrove Area Assessment in India: Implications Of Loss Of Mangroves.
- 4) V.K .Dhargalkar., R. D'Souza., D.P. Kavlekar., A.G. Untawale., MANGROVES OF GOA, 30 June 2011, Published by Mangrove Society Of India.
- 5) Saddhe, A. A., Jamdade, R. A., & Kumar, K. (2016). Assessment of mangroves from Goa, west coast India using DNA barcode. *SpringerPlus*, 5(1), 1-10.
- 6) Singh, A. K., Ansari, A., Kumar, D., & Sarkar, U. K. (2012). Status, biodiversity and distribution of mangroves in India: an overview. *Uttar Pradesh State Biodiversity Board. Marine Biodiversity: One Ocean, Many Worlds of Life*, 59-67.
- 7) Giri, C., Long, J., Abbas, S., Murali, R. M., Qamer, F. M., Pengra, B., & Thau, D. (2015). Distribution and dynamics of mangrove forests of South Asia. *Journal of environmental management*, 148, 101-111.
- 8) J.K. Singh., Structural Characteristics Of Mangrove Forest In Different Coastal Habitats Of Gulf Of Khambhat Arid Region Of Gujarat, West Coast Of India.
- 9) R. Kumar., Conservation and management of mangroves in India, with special reference to the State of Goa and the Middle Andaman Islands.
- 10) Jagtap, T.G., 1987. Seasonal distribution of organic matter in mangrove environment of Goa, 103-106 pp.
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- 13) Pawar, T. A., & Kolapkar, R. (2013). Mapping of Mangrove area of Curtorim Village-South Goa District-Goa-India-Using Remote Sensing and GIS Techniques. In *National conference on biodiversity: status and challenges in conservation- 'FAVEO'* (pp. 94-96).

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