Project submitted by Goa State Authority on "Study of short and long-termimpact of Climate Change on Biodiversity of Protected area in Goa by setting up of Automatic Weather Stations".

Goa State Authority has submitted a funding proposal through Statistical Cell of MoEF&CC vide latter No. 2-76-WL-2021-Vol.I-FD/2017 dated 12.08.2021 amounting to Rs.65 Lakhs.

2. The objectives stated are to ensure real time mapping and monitoring of various weather parameters including temperature, humidity, wind speed, rainfall etc. through Automatic Weather station, Rain Gauges for scientific management of Forest and Wildlife areas in Goa and to ascertain impact of climate change on biodiversity of forests in Goa. The weather station will be located at five locations in forests areas. The project will be implemented by the Goa Forest Department.

3. The cost components mainly consist of equipment to set up the automatic weather station. This study, it has been submitted, will provide real time weather data which will be used for scientific management of forest and wildlife areas and to ascertain and study impact of climate change on Biodiversity, amongst other benefits.

4. The project proposal was placed in the 15th Executive Committee meeting of National CAMPA held on 20th October, 2021 where it was recommended for approval under the provisions contained in section 5(b) (iii) of the CAF Act 2016, subject to the condition that the proposal is vetted by Climate Change Division of MoEF & CC to ensure synergy.

5. In view of the above, the proposal may be forwarded to Climate Change Division of this Ministry for vetting of the same so that the project can be timely implemented.

6. Submitted please.

Ajeeta 20/10/2021

(Ajeeta Longjam)
Assistant Inspector General of Forests

Jt. CEO/CEO (NA)

May kindly advice.

26/10/2021

ASC (RS)

Adv (JRB)

Ruchika 26/10

545896/2021/CC

Government of Goa
Office of Principal Chief Conservator of Forests
Forest Department
Goa Van Bhawan, Old IPHB Complex;
Altinho, Panaji Goa – 403 001

No.2-76-WL-2021-22-Vol.I-FD/2107 Date: 12/08/2021

To,
Chief Executive Officer
National Authority, CAMPA
New Delhi- 110003

Sub:- Invitation of proposals from States/UTs with regard to facilitating scientific, technological and other assistance as required by State Authorities-reg.

Ref:- MoEF&CC's letter No. 13-28/2018-CAMPA dated 23rd July, 2021

Sir,

Please find enclosed the project proposal for *Study of the short- and long-term impact of Climate Change on Biodiversity of Protected Area in Goa by setting up of Automatic Weather Stations.* Total financial outlay of the project is Rs. 65,000,00/- (Rupees Sixty-Five Lakhs Only). The proposal is submitted for kind consideration/ approval.

Yours faithfully

Santosh Kumar, IFS
Principal Chief Conservator of Forests
& CEO, State CAMPA

Encl. Project proposal

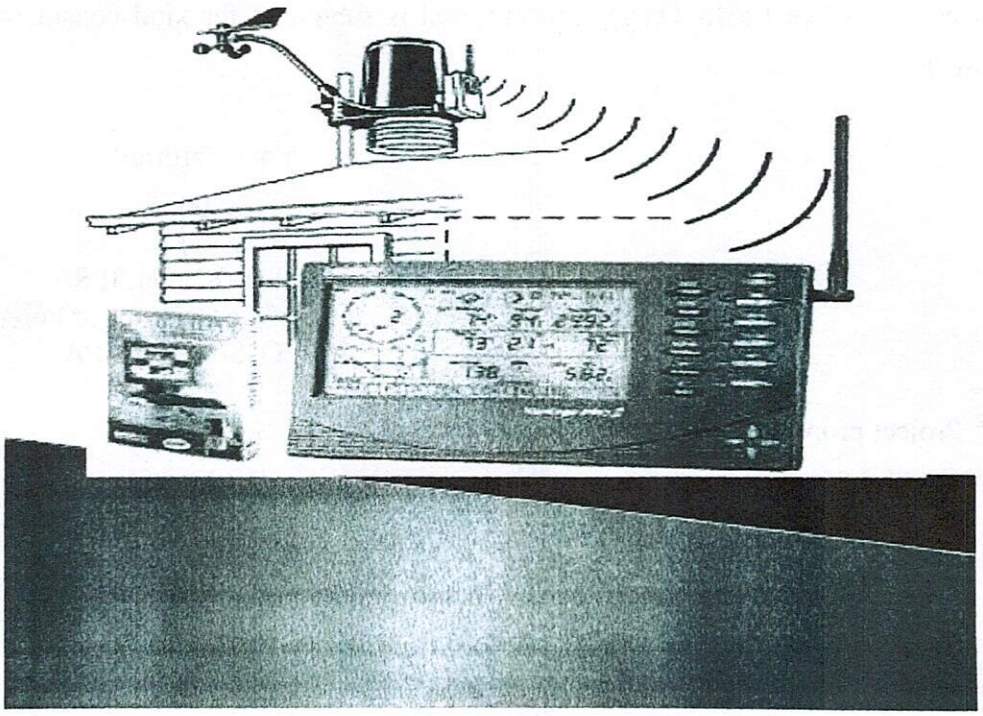
GOVERNMENT OF GOA

FOREST DEPARTMENT

VAN BHAWAN – ALTINHO – PANAJI – GOA

PROJECT PROPOSAL

Study of the Short & Long Term Impact of Weather/Climate Change on Biodiversity of Protected Area in Goa by setting up of Automatic Weather Stations



AUGUST 2021

1. Title of the project:

Study of the short and long term impact of weather and climate change on Biodiversity of Protected Area in Goa by setting up of Automatic Weather Stations.

2. Introduction:

i. Goa is located on the west coast of India between 15° 48' and 14 ° 53' North latitude and 74° 20' and 73° 40' East longitude with a geographical area of 3702 sq. km.

ii. As per the State of the Forest Report published by the Forest Survey of India, the forest cover of Goa is 2,219 sq. km. Which is 60.04% of the State's geographical area.

3. Forest and wildlife of Goa:

i. The forests of Goa are typical of the Western Ghats (Southern Maharashtra and Karnataka).

ii. There is diversity in the forests due to the variation in altitude, aspect, soil characters, slope etc. As per Champion and Seth (1968) Classification of Forest types of India, the forests of Goa fall in the following types:-

(a) Estuarine vegetation consisting of mangrove species along narrow muddy banks of rivers [4 B/TS1 and 4B/TS2]

(b) Strand vegetation along the coastal belts

(c) Plateau vegetation confined especially to the low altitude

a. Open scrub jungle (5.E7)
b. Moist mixed deciduous forests [3B/C2]
c. Secondary moist mixed deciduous forests [3B/C2/2SI)
d. Sub-tropical Hill forests [8A/C2]

(d) Semi-evergreen and evergreen forest.

a. Semi-evergreen forests [2A/C2]
b. Lateritic Semi-evergreen forests [2 E4]
c. Evergreen forests [1A/C4]

iii. Goa presents a diversity of endemic species, habitats and ecosystems.

iv. Goa is under the influence of two global biomes – the marine biome of the Arabian sea and the terrestrial forest biome of the Western Ghats. Within this geographical canvas are a wide range of ecosystems and habitats e.g. forests, ghats, alluvial plains, coasts, rivers, estuaries, mangroves, wetlands etc.

v. The ecophysiology of the habitats is governed by complex ecological and metereological conditions. There are normal habitats and extreme habitats (like the rock pools and the salt pans).

vi. There are microhabitats which are equally important – e.g. the termite mounds which play a significant role in the decomposition of plant litter. The status of biodiversity in each of these habitats varies, depending naturally on a variety of genetic and environmental factors. Each habitat faces its own peculiar mix of pressures on its biodiversity.

vii. The typical flora and fauna of the State is attached at Appendix I.

4. Protected Area Network of Goa

i. With 20% of its total geographical area dedicated for the proliferation of wildlife, the state of Goa has 6 Wildlife Sanctuaries and 1 National Park. These protected areas are provided with complete protection to the fauna & flora to conserve the unique biodiversity of the State.

ii. These are :

Name of the protected area	Area	Location
Bhagwan Mahavir National Park	107	Sanguem, Dharbandora
Cotigao Wildlife Sanctuary	86	Canacona
Bondla Wildlife Sanctuary	8	Ponda, Sattari, Dharbandora
Dr. Salim Ali Bird Sanctuary	1.8	Tiswadi
Madei Wildlife Sanctuary	208.48	Sattari
Netravali Wildlife Sanctuary	211.05	Sanguem
Total	755.31	

5. Stakeholders:

i. The stakeholders of this project/ work will be Forest Department, India Meteorological Department, Goa University, Researchers from various Institutions and others.

6. Objective of the project:

i. To ensure real time mapping and monitoring of various weather parameters including temperature, humidity, wind speed, rainfall, etc. through Automatic Weather Station, Rain Gauges for scientific management of Forest and Wildlife areas in Goa.

ii. To ascertain impact of climate change on biodiversity of forests in Goa.

7. Benefits:

i. Forest Department will get real time weather data which will be used for scientific management of forest and wildlife areas and to ascertain and study impact of climate change on Biodiversity.

ii. The study will enable the department to have a clear idea of the water deficient areas in the forests and will provide invaluable data for resolving the problem like availability of water throughout the year for wildlife/ soil and moisture conservation.

iii. Real-time weather data may be input to expert systems, management models or simple applications to support the decisions for scientific management of forest and wildlife areas.

iv. Weather/ Climate data collected over a long period may be used to assess probability and risk of extreme events and to compute statistics of the relevant weather events.

v. In many cases, weather data collected for specialized studies which may provide information related to pest management, and fire danger rating systems etc.

vi. Short and long term data may be shared with specialized Institutions/ Organisations for specific studies.

8. Components of the project:

The following are the requirements and standards for Automatic Weather Station and all the stations will be operating in remote forest regions of Goa.

1. Telecommunications. GSM/GPRS networks will be used wherever they are available whereas satellite communications (such as IRIDIUM or ORBCOMM) may be used where GSM/GPRS networks are unavailable.
2. Power. Solar panels with backup batteries are a useful power source for AWS at remote areas.
3. AWS equipment. The cost of the data loggers and communication devices which can work over in extreme environments e.g., temperature and prolonged time with high humidity values.
4. AWS enclosure. These enclosures are small rooms made of suitable material like laterite stone or properly shielded pre-cast cabins so that inside temperature does not increase considerably, causing malfunction to the electronic equipment or batteries. High rainfall rates can cause water infiltration, so the connector and core hitches exposure to the environment must be minimal.
5. Earthing. AWS equipment is often damaged by lightning strikes. Appropriate conventional or maintenance-free earthing, could be very effective in the long run.
6. Calibration of sensors and maintenance of stations. Though AWS are generally unmanned by design, regular visits to a site are required to check its security, exposure conditions and for performing preventive maintenance. The costs of maintenance, calibration and running expenses for an operating AWS network far outweigh the initial purchase expense, so these expenses are kept in mind before finalising the site and installation of an AWS network. Calibration of sensors would be performed at least once or twice per year.
7. Safety. In remote regions, security of AWS equipment has become a major concern. It is quite common that there are many thefts of solar panels and batteries from the AWS sites. Hence watch and ward are required to be employed.

9. Working Area:

i. The weather station will be located at five locations in forest areas. The following are the ranges that are proposed for the stations:

	Name of the Protected Area	GPS Location of station
1	Bhagwan Mahaveer Wildlife Sanctuary & National Park	15° 22' 39.2" N 74° 13" 48.4" E
2	Bondla Wildlife Sanctuary	15° 26' 20.6" N 74° 06" 09.6" E
3	Cotigao Wildlife Sanctuary	14° 12' 57.89" N 74° 13" 54.94" E
4	Mhadei Wildlife Sanctuary	15° 35' 13.9" N 74° 11" 23.9" E
5	Netravali Wildlife Sanctuary	14° 58' 39" N 74° 07" 59" E

ii. The working areas selected for the station are open areas where there are no obstacles for accurate readings of weather conditions.

10. Financial implications:

i. The project will be implemented by the Goa Forest Department.

ii. The following are the financial requirements for the Automatic Weather Station project:

Sr. No.	Particulars	Quantity	Amount (in Rs. Lakh)
1	Telecommunications		
	GSM/ GPRS network establishment expenses	5	1.00
2	Power		
	Solar panels and storage battery	5	5.00
3	AWS equipment		
	Data loggers & devices	5	40.00
4	AWS enclosure		
	Construction of cabin	5	10.00
5	Earthing		
	Lightning arresters	5	5.00
6	Calibration of sensors		
	Computers for data collection	5	2.00
7	Safety		
	Fencing, fire equipment etc	5	2.00
	Total		**65.00**

Appendix I

List of important flora of Goa

Sl. No.	Scientific Name	Local/ Vernacular Name
1.	*Acacia catechu*	Khair
2.	*Adina cordifolia*	Hedu
3.	*Agele marmelos*	Bel.
5.	*Albizia lebbak*	Shiras
6.	*Albizzia odoratissima*	Kaloshiras
7.	*Alstonia scholaris*	Satvan
4.	*Amoora lawii*	Burumbi
8.	*Anacardium occidentale*	Kaju.
9.	*Anogeissus latifolia*	Dhaoda
10.	*Aporusa lindleyana*	Salai
11.	*Artocarpus integrifolia*	Phanas
12.	*Artocarpus lakoocha*	Otamb
13.	*Azadirachta indica*	Nimb
14.	*Barringtonia acutangula*	Men kumbyo
15.	*Bauhinia racemosa*	Apto.
16.	*Bauhinia wahilli*	Mavli
17.	*Bombax ceiba*	Savar
18.	*Bridelia retusa*	Khatem Asan.
19.	*Buchnania lanzan*	Chara
20.	*Butea monospermum*	Palas.
21.	*Callicarpa tomentosa*	Phalyo.
22.	*Callophylum inophyllum*	Undi.
23.	*Calycopteris floribunda*	Uski.
24.	*Carallia brachiata*	Panshi, Makad bhiran,
25.	*Careya arborea*	Kumbyo
26.	*Caryota urens*	Birlo mad
27.	*Cassia fistula*	Bayo, Balo.
28.	*Ceiba pentandra*	Savar
29.	*Cinnamomum zeylanicum*	Tikhi
30.	*Corypha umbraculifera*	Karetel
31.	*Dalbergia latifolia*	Shisham
32.	*Derris scandens*	Kanranj
33.	*Dillenia pentagyna*	Karmal.
34.	*Diospyros Montana*	Goiunda, Govimelu.
35.	*Diospyros paniculata*	Kuri.
36.	*Embelica officinalis*	Amla, Awalo
37.	*Erythrina indica*	Pongaro.
38.	*Ficus arnotianna*	Asti payr
39.	*Ficus asperrima*	Kharvat
40.	*Ficus bengalensis*	Vad
41.	*Ficus glomerata*	Rumad
42.	*Ficus Hispida*	Kalaumbar
43.	*Ficus religiosa*	Pipal.
44.	*Ficus tsiela*	Basri.
45.	*Flacourtia jangomonas*	Jangli Jagam.
46.	*Flacourtia montanna*	Chafra
47.	*Garcinia gummigutta*	Dhar ambo.
48.	*Garcinia indica*	Bhiran
49.	*Gmelina arborea*	Shivan
50.	*Grewia tillifolia*	Dhaman
51.	*Helicters isora*	Kivan
52.	*Holarrhena antidysentrica*	Kudo
53.	*Holigarnia arnottiana*	Bibo
54	*Holoptelia integrifolia*	Vamolo
55.	*Hopea wightiana*	Pav.
56.	*Hydnocarpus laurifolia*	Khast, Kavat.
57.	*Lagerstroemia lanceolata*	Nano
58.	*Lagerstroemia parviflora*	Taman
59.	*Lannea coromandalica*	Moi

60.	*Leea indica*	Jino
61.	*Luta graveolens*	Arod
62.	*Macaranga peltata*	Chandado.
63.	*Mallotus phillipinensis*	Bems, Sendri.
64.	*Mangifera indica*	Ambo
65.	*Manilkara hexandra*	Kirni
66.	*Melia azedarach*	Firnage nimb.
67.	*Mesua ferrea*	Nagchampho.
68.	*Mimusops elengi*	Onval

List of important fauna of Goa

Sr. No.	Zoological Name	English Name	Local Name
1	*Axis axis*	Spotted deer	Cheetal
2	*Bandicota indica*	Bandicoot rat	Kolindar
3	*Bos gaurus*	Gaur or Indian bison	Gavvo redo, Gavvo
4	*Canis aureaus*	Jackal	Kolo
5	*Cervus unicolor*	Sambar	Meru.
6	*Cuon alpinus*	Wild dog	Kolsundo, Deucolo
7	*Cynopterus brachyotis*	Indian fulvous fruit bat	Pakho
8	Delphinus tropicalis linn	Common Dolphin	Gaddo redo
9	*Felis bengalensis*	Leopard cat	Wagatti
10	*Felis chaus*	Jungle cat	Baul,
11	*Funambulus palmarum*	Three striped palm squirrel	Chani, Khar.
12	*Herpestes edwardsii*	Common grey mongoose	Mungoos, Munghas,
13	*Hyaena hyaena*	Striped hyaena	Yeul , Bhalu
14	*Hysterix indica*	Porcupine	Sal, Salinder
15	*Lepus nigricollis*	Black napped Hare	Soso
16	*Loris tardigradus*	Slender loris	Van manus
17	*Lutra lutra*	Common Otter	Udh,
18	*Lutra perspicillata*	Smooth coated Otter	Udh
19	*Macaca radiata*	Bonnet macaque	Khete, Makod.
20	*Manis crassicaudata*	Indian pangolin	Therio
21	*Megaderma spasma*	Indian false vampire bat	Vagul
22	*Melursus ursinus*	Sloth bear	Aswal, Vashel.
23	*Muntiacus muntjak*	Barking deer	Bhekaro
24	*Mus booduga*	Indian field mouse	Undir
25	*Otompos wronghtoni*	Wronghton's freetailed bat	Vagul
26	*Panthera pardus*	Leopard	Bibto Vag, Biblo.
27	*Panthera tigris*	Tiger	Danyo or Pattacho Vag
28	*Paradoxurus hermaphorditus*	Palm civet cat	Katanoor
29	*Petaurista petarauista*	Common flying squirrel	Ud pakho.
30	*Phocoena phoecoena*	Porpoise	
31	*Pipistrellus dormeri*	Dormers bat	Vagul
32	*Presbytis entellus*	Common Langur	Vanor
33	*Pteropus giganteus*	Flying Fox	Pakho