A PROPOSAL ON
CITIZEN CLIMATE EDUCATION AND EARLY WARNING SYSTEM

Building Community Resilience to climate change impacts

Submitted By
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1. BACKGROUND

Wayanad is the district in the north-east of the Indian state of Kerala, with administrative headquarters at the municipality of Kalpetta.. The Wayanad Plateau forms a continuation of the Mysore Platue. It is set high in the western ghats with altitudes ranging from 700 to 2,100 meters. Vellari Mala, a 2,240 m (7,349 ft) high peak situated on the tri-junction of Wayanad, Malappuram, and Kozhikode districts, is the highest point in Wayanad district. The district was formed on 1 November 1980 as the 12th district in Kerala, by carving out areas from Kozhikode and Kannur districts. An area of 885.92 km^2 in the district is forested. Wayanad has three municipal towns—Kalpetta Mananthavady and Sulthan Bathery . The Kabani River a tributary of the Kaveri, originates at Wayanad. Wayanad district, along with the Chaliyar valley in the neighbouring Nilambur (Eastern Ernad region) in Malappuram, is known for natural gold fields which are also seen in other parts of the Nilgiri District. The Chaliyar river, which is the fourth longest river of Kerala, originates on the Wayanad Mountains. The historically important Edakkal Caves are located in Wayanad district. UNESCO has declared the Nilgiri Biosphere Reserve of the Western Ghat mountains of India as a World Heritage site. Wayanad is adjacent to this "biodiversity hotspot" of the world and some parts of the Wayanad district itself form parts of Biosphere Reserve.

The high altitude district is characterised by the cultivation of perennial plantation crops and spices. The major plantation crops include coffee, tea, pepper, cardamom and rubber. Coffee based farming system is a notable feature of Wayanad. Coffee is grown both as pure crop and as mixed crop along with pepper. Pepper is grown largely along with coffee in the north eastern parts of the district, especially in Pulpally and Mullankolly areas. Coffee in Wayanad (66,999 ha.) shares 33.65 per cent of the total cropped area in the district and 78 percent of the coffee area in the state. Other major crops are rubber (63,015 ha.), coconut (59,452 ha.), cardamom (38,348 ha.), tea (31,792 ha.) cassava and ginger. A recent increase in the area under coconut cultivation is noticed in the lower elevations. The paddy fields of Wayanad are set in the valleys between hillocks, and only a single crop is harvested each season. Paddy is cultivated on 22,772 hectares of land. Now, there is a sudden shift of crops to plantain crops and most of the paddy fields are now filled with plantain of various kinds.

Ginger cultivation in Wayanad has also substantially increased in recent times and the ginger produced is mainly marketed in the form of green ginger. Homestead farming assumes importance in this district. The average size of holdings is 0.68 ha. A variety of crops including annuals and perennials are grown in these small holdings. These crops include coconut, areca nut, pepper, vegetables, tuber crops, drumstick, papaya, etc. and fruit trees like mango and jack.

2. LANDSLIDES IN WAYANAD

Wayanad is at risk of natural disasters such as drought, forest fire landslides and floods Landslides became regular during the past 6 years during monsoon seasons. Since 2018, the district recorded an increase in the number of extremely heavy rainfall leading to landslides and floods. Located in the Western Ghats mountain range, its hills consist of faulted and eroded mountain

edges of the Deccan Plateau. Geological evidence suggests that this region was shaped during the breakup of the supercontinent Gondwana. As a result of this breakup, the Deccan Plateau was formed from basalt rocks, leading to the rise of the Western Ghats. Geophysical data indicates that the mountainous area of Wayanad emerged along the west coast of India during the late Jurassic to early Cretaceous periods (150Ma) when India separated from the African continent. Though Wayanad is primarily drained by eastward flowing river Kabani 5 other rivers also originate from the mountains of the district. The **Iruvanjipuzha** and Chaliyar rivers, both originating in the Camels Hump Mountains of Western Ghats, flow westward towards the Arabian Sea due to the steep gradient from east to west. Numerous smaller streams drain the region into these rivers, often carrying a substantial volume of water during the monsoon months.

Wayanad has been experiencing natural calamities from 1882 onwards. According to Malabar Manual rainfall, in Vythiri during the years 1882, 1883 and 1884 there were 7,366 mm, 5,511 and 3,860 respectively. As per the revenue records in the year 1924 in Vythiri 2,780 mm rainfall was obtained during 14 days and in 1961 July 2,144 mm rainfall was recorded in 7 seven days and flooded several places. In recent years Kurichyarmala landslide occurred in 2018 where several houses damaged followed by Puthumala landslide in 2019 were 17 people died.

Mundakkai region(Meppadi Panchayath) in camels hump mountains is one of the most sensitive areas for landslides in the state and has reported an increasing number of deaths due to landslides over the years. In July 1984, a landslide in Mundakkai killed 14 people. In 1992, the Kappikkalam landslide caused the death of 11 people in two families. In 2019 a major landslide occurred at Puthumala in the same Meppadi Panchayath, where 17 people died and 5 persons were missed. In the new Mundakkai Chooralmala disaster over 336 people died and 397 people were injured, making this landslide the deadliest in Kerala's history. Seventeen families fully perished. Most of the victims were tea and cardamom estate workers, asleep when the landslides struck. More than 78 people remain unaccounted for. Among the survivors, at least five children lost both parents, while six others lost either their father or mother in the disaster. The landslides led to the mixing of muddy water and debris with the Chaliyar River, in which over 200 bodies or body parts were found.

Gaps in early warnings(The Problem)

Early warnings and knowledge about weather anomalies are an important adaptation tool for residents about disasters in flood and landslide-prone areas. There was a mismatch in the formal warning system and the actual rainfall intensity in the region due to sudden cloud burst events in recent times. In the case of the Mundakkai landslide though formal “orange rainfall alert” warnings were given by the government it has not reached out to the entire community according to the survivors. whereas the actual rainfall data crossed 300mm which is higher than the “red alert level”. Though the Local panchayat had given warnings on the previous day many people remained in the area which aggravated the casualty. In addition, the debris flow has reached nearly 8 Km downstream along the river which was never expected by people and authorities. In addition it is a fact that all the houses, and townships were located in the flood plain which was subjected to past landslides and flooding . Nearly 199 hec land areas were washed out in the

present landslide in which 135 hec of built up and 133. hec of plantations. The government estimated 2000 core for rebuilding the livelihood, infrastructure and other supportive structures for the victims. In future, such calamities are likely to increase and the cost of rebuilding that would be a burden for that state too.

All these factors point to the need for developing micro basin-based disaster preparedness interventions in the region with science-based solutions and community participation with an emphasis on early warning systems. This project proposal addresses the gap in early warning systems , lack of community knowledge on climate impacts..

3. GOAL

To educate people about climate change impacts and create an early warning system for landslides and floods in selected region of Wayanad with community participation.

4. OBJECTIVES

- To educate people about the impact of climate change in kerala and particular in Wayanad and the need for early preparedness
- To understand the disaster vulnerability of the selected area
- To assess the socioeconomic status and disaster vulnerability of households in the selected location
- To prepare a detailed map of the operational area and install the weather data collection equipment in the region.
- To develop a micro plan for disaster prepared ness , including identifying safe places, evacuation routes and equip the community volunteers for any future disasters
- To collect real-time weather data using Information Technology, evaluate and share early information enabling decision-making at the community level.
- To alert the stakeholders in taking adaptation measures in collaboration with authorities based on the alerts.

4. PROFILE OF HUME CENTRE FOR ECOLOGY

Hume Centre for Ecology Wildlife Biology (www.humcentre.in) is a registered non-profit research institute engaged in climate action at the community level with science-based solutions to build community climate resilience. It has developed a community-based weather monitoring system in Wayanad supporting the district administration and addressing climate change-based disasters. It also provides early weather alerts to farmers in the context of extreme weather anomalies.

The centre has a multi-disciplinary team of researchers experienced in disaster management, Meteorology, ecology, environmental science, geology and social science. The centre closely works with district disaster management agencies(DDMA) in Wayanad, Kannur and Malappuram districts. The centre has Mou with Ashoka University Delhi and MIT University Pune for student engagement in ecology and environment.

The current team strength is 16 in four programme areas such as climate Action, Ecosystem and wildlife, Science education and Food systems Research. It is registered under Trust Act and has 12A and 80 G registration under the IT Act and is registered under Niti Ayog, Government of India.

5. ABOUT THE PROJECT

The project is to understand the landslide vulnerability of the selected area in selected locations of Wayanad and to educate people about climate change impacts and prepare them for any possible disasters. The project focus on working in a micro-watershed basin by installing manual and automatic rain gauges for monitoring rainfall intensity and generating early information about landslides to the local community.

Initially, through data collection, the socioeconomic status and disaster vulnerability of households will be assessed. The data collected shall be analysed with scientific tools and dissemination of the locally specific weather information will be finally disseminated to the public in the particular area with community participation. Along with this, the community will be empowered to assess landslide possibilities through systematic weather monitoring and knowledge dissemination. The community will be prepared to reduce loss during a disaster. The programme will be implemented with the support of Local Self Governments, the District Disaster Management Committee (DDMA) and other stakeholders.

6. INNOVATION

Establishment of a community-based early warning system in connection with natural calamities such as floods and landslides to reduce human and resource loss using IoT based weather monitoring instruments which does not require any human assistance, by giving series of climate education sessions for understanding climate crisis.

7. NEED AND JUSTIFICATION

The occurrence of landslides and floods is occasional in Wayanad due to heavy showers within a span of a short time in the district. The recent natural calamities in Wayanad is reminding us to adopt a suitable strategy for local-specific and decentralized activities with people's participation based on micro-level real-time weather data. We identify that lack of decision making by people at the onset of a disaster actually contributed for increased causalities. This is primarily because people are not knowledgeable about climate change impacts. So it is important to invest on building knowledge dissemination among people to enhance disaster preparedness. The timely effective early warning system for possible landslides and floods and the adaptation of quick survival measures with the support of learned communities with the help of Local Self Government under DDMA is the most successful and low-cost model for the mitigation. The model will then be available for replication in other areas.

8. IMPLEMENTING AREA

The area of implementation will be the two landslide highly landslide-prone areas in Wayanad district were thousands of people are living in mountain slopes such as the slopes of Manikunnumala, Kurumbalakotta and Thrissilery region of Wayanad. So far no efforts have been made to relocate people from these locations. so it is important to develop a possible early warning system enabling communities to build practices that build their confidence.

9. PROJECT PERIOD

The project period will be two years from the date of starting the project and system will be tested over a monsoon season to evaluate the efficiency. However, a post-project support of another one more years would be required at a low scale to monitor the equipment related to early warning system, maintenance etc until the community themselves are capable of managing the system independently. This might require a three-year support.

10. ACTIVITIES AND TASKS

ACTIVITIES	TASKS
• Public awareness building	1.Public awareness building, session of climate change
• Study the landslide vulnerability of the location	1.Demarcate watershed/basin 2.Development of Mobile applications and Software. 3.. Develop the landslide susceptibility map. 4.Geotechnical analysis and modelling to assess the landscape vulnerability-slope, drainage, overburden, soil type, rock characteristics.
• Study the social vulnerability of people and scale the disaster vulnerability of the community	1.Baseline survey, land use and socio-economic data of households
• Prepare a micro-level management plan for possible disasters	1.Preparation of Micro plan at Panchayath level for disaster plan- Field studies, Geo-spatial analysis
• Formation of Community Managers network	1.Formation of community managers Group. 2. Training to the Community Managers and data processors
• Establishing community base a weather monitoring system	1.Gridding the area and identification of data collection location. 2.installation of equipment - Manual rain

	gauges, IOT based Automated rain gauges, minimum maximum thermometers, hygrometers, soil thermometers, river gauge. 3. Initiate data collection
• Establishing the analysis system	1.Develop protocols and design systems to collect data - climate indicators-rainfall, temperature, humidity, soil temperature, soil moisture – data analysis and periodic dissemination of results - with a feedback loop Processing of daily data and analysis.
• Disseminate information	Daily weather updates and alerts
• Participatory development of an disaster preparedness guideline with panchayath	1.Presentation of the micro plan and results of the initial survey of the operational area. 2.Three months report - presentation to community managers and stake holders 3..Disaster preparedness training, panchayath members, RRT, ERT, Fire & rescue, Kudumbasree etc. 4.Develop an evacuation plan with spatial mapping of houses and shelters through a participatory process with Grama Panchayath and DDMA. 5..Develop plan and location for shelters with panchayath and DDMA

11. TECHNOLOGY

- **IoT** based rainfall monitoring device for collecting hourly information about rainfall data.
- Hydrological data collection in every 1 sq.km area.
- Micro level daily manual data collection of weather conditions, soil temperature and soil humidity.
- Data processing by an expertise of Geo specialist by using ArcGis platform.
- Geo-tech modelling of landslide probability to understand possible runout distances.
- Software for data analysis and mobile app for information dissemination to the end users.

12. IMPLEMENTATION

The project will be implemented by the Hume Center for Ecology and Wildlife Biology.

12.1 PROJECT PARTNERS

The project will be implemented in collaboration with the concerned Grama Panchayats, DDMA, and district Administration. The support system of LSGs such as the Disaster Management Committee,. shall provide support for the successful implementation of the project. The responsibilities of LSGs are local mobilization, creation of infrastructure facilities, coordination with Line Departments, local level monitoring etc.

13. LINKAGES

INSTITUTION	**SUPPORTING AREA**
DDMA	Issue early warning to people,
Local farmers/planters	Providing volunteers
ROTARY Members	community engagement, contacts and logistics
Local Organisations	community mobilisation

14. FINANCIAL ASPECTS (for one year)

PARTICULARS	**AMOUNT (Rs.)**
Awareness session on climate change and disasters Rs. 10000x 50 sessions	50,000.00
Mobile app and software development for data management	1,25,000.00
Geotech analysis for possible landslides(geology data, computer modelling etc)	2,25,000.00
Rain gauge Rs.1500 x 100 nos	1,50,000.00
IOT Rain gauge- Rs.5000X40 nos	2,00,000.00
Maximum minimum Thermometer = Rs.2500 X 100	2,50,000.00
Soil thermometer = 10 nos x Rs.3000	30,000.00
Soil humidity meter= 10 nos x Rs.2000	20,000.00
Training and awareness for stakeholders	1,50,000.00
Soil testing- Rs.300x100 nos (to understand soil stability in slopes)	30,000.00
installation costs of equipment	50,000.00
Remuneration for Geo Tech Analyst - @30,000 X 12 months	3,60,000.00
Project manager = @ 35,000 x 12	4,20,000.00
Paid Interns- 4 ppl x 10,000	4,80,000.00
Administrative Expenses @ 15%	3,88,500.00
Total for Year 1	**29,28,500.00**
2nd Year Total Cost	12,00,000.00
3rd Year Total Cost	10,00,000.00

15. TIMELINE

Sl. No.	Activity	Period (from date of approval)
01	Approval of the project	-
02	Preparation of micro-level management plan	2 Month
03	Public awareness building.	3 Months
04	Appointment of Community Managers	4 Months
05	Establishing weather monitoring system	5 Months
06	Establishing the analysis system	5 Months
07	Disseminate information	6 Months
08	Skill development for disaster sensing/detection	6 Months
09	Participatory development of evacuation plan	8 Months
10	Post project support (Optional)	12 Months after one year

16. EXPECTED OUTCOME

- An early warning system established in two of the highly landslide prone areas of the Wayanad district.
- Local capacity to adapt to extreme weather events enhanced
- A replicable model of science based solutions for landslide prone areas.

17. MONITORING

The project progress will be monitored by a group of experts and advisory committee members periodically. Additional technical expertise will be channelised from national institutes such as IIT Indoor, NIT Calicut etc. the progress will be updated to Rotary on a periodic basis.

18. RISK ANALYSIS

Peoples assessment of risk and understanding about climate change is an important aspect to make right decision at right time by people in a possible disaster event. This need to be built by educating community members about the impact of climate change and the need to move out to safer locations.

Any geo tech model has its own limitations on predicting landslides. Here we focus on rainfall based saturation model for early information about possible landslides. However based on the past four years' experience this model is capable for evacuation of people much advance.

19. CONCLUSION

The project could be a model for developing a community based weather monitoring and early warning system that can be replicated elsewhere. Technical experts from various institutes will be tapped in for making the project more effective and technically sound. Above all community

will be mobilised and educated about the impact of climate change and the need to take right decisions at right time in case of a possible disaster.

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