

SETTING UP OF A PERMANENT MONITORING STATION IN THE WESTERN GHATS

Objective : Monitoring and analysis of indicators of systemic (trace gas induced) and cumulative (weather/climate, biogeochemical changes, Anthropogenic inputs etc.) environmental changes in mountain regions and the continuous monitoring of air quality in the Western Ghats regions by establishing a permanent Geo-environmental observatory (GEOBs).

Being one of the four watersheds of India, the Western Ghats feed the major perennial rivers like Godavari, Krishna, Netravati, Periyar, Chalakkudy etc. It is characterized by extremely rich biodiversity, intricate human-ecological affinities, escalating developmental pressures, diminishing resources and high vulnerability to climate change. The peculiar orographic features of Western Ghats and the dense forests play an important role in regulating the climatic processes. The forests store large quantity of water and carbon in vegetation and soil and exchange carbon with the atmosphere through photosynthesis and respiration. A better understanding of the changes taking place can be achieved through continuous monitoring of various processes operating in the area. This can be obtained through installing Geo Environmental Observatories (GEOBs) and its continuous monitoring.

GEOBs involves co-located research conducted by interdisciplinary teams using continuous measurements of land-atmosphere exchange of water and carbon, green house gas dynamics, aerosols, particulate matters and seasonal changes in soil moisture, pore water chemistry and linkages to the biosphere and surface and groundwater systems and associated long term evolution of the soil, underlying parent material from which it forms and fractured bedrock permeated by these flows. Hence the interfaces among different compartments in the environment are crucial, which provide fertile ground for interdisciplinary research. The data from the research proposed by establishing GEOBs is expected to support basic geosciences research and provide quantification of environmental processes for the assessment of environmental impacts due to climate change. It is planned to establish the GEOBs in this area of Western Ghats, falls in the Periyar River Basin. The high range mountain landscape of Periyar basin includes the Eravikulam National Park (ENP) near Munnar as the highest plateau in the

Western Ghats with montane cloud forests as the undisturbed core area and moist forests of Idamala-Pooyamkutty valleys in the western slope and dry deciduous Muthirapuzha-Chinnar valleys in the eastern slopes. The location is ideal for establishing the GEOBs and to monitor the weather/climate parameters as well as atmospheric pollutants. Since the area falls in the pristine forest lands of Western Ghats, the data can be used for comparative purposes with any International Standards. Actually the project is conceived to concentrate on 4 major areas:1) **Climate and Weather monitoring**, 2) **Land Resources and Land use studies**, 3) **Water resources and Hydro geochemistry** and 4) **Biodiversity and terrestrial ecosystems**.

WESTERN GHATS: HIGHLY VULNERABLE TO CLIMATE CHANGE IMPACTS

Western Ghats also known as **Sahyadri** is a mountain range that covers an area of 140,000 km² in a stretch of 1,600 km parallel to the western coast of the Indian peninsula, traverse the states of Kerala, Tamil Nadu, Karnataka, Goa, Maharashtra and Gujarat. It is a UNESCO World Heritage Site and is one of the eight "hottest hot-spots" of biological diversity in the world. It is a biodiversity hotspot that contains a large proportion of the Country's flora and fauna; many of which are only found in India and nowhere else in the world. According to UNESCO, Western Ghats are older than Himalayan Mountains. It also influences Indian monsoon weather patterns by intercepting the rain-laden monsoon winds that sweep in from the south-west during late summer. Research on Climate Change and its related realms are very important for the Western Ghats that affects the nominal life of people of the different states. Kerala state is the best example for this, which faces severe drought and floods in recent years. Also abnormal events are happening in the climatic conditions in the State. Kerala state has been declared a drought affected state in 2016. The rainfall deficiency in southwest monsoon was ~ 34 % and expected deficiency of rainfall during northeast monsoon is ~ 69 % in 2016. But ironically, the state is a flood affected one in 2018, which was now confirmed even by The UN, due to the climate change phenomenon. **The UN chief Antonio Guteress cited the recent devastating floods in Kerala as he issued a grave warning about consequences of inaction over climate change and called for more leadership and greater ambition for climate action."Climate change is the defining issue of our time – and we are at a defining moment. We face a direct existential threat. Climate change is moving faster than we are – and its speed has**

provoked a sonic boom SOS across our world," Guterres said in a landmark speech at New York on climate action.

The water related problems have been reported in several districts of Kerala. Recent trends in rainfall shows the decreasing trend in the number of rainy days and increasing trend in the high intensity rainfall events. This essentially point to the need of detailed studies pertaining to the climate change aspects. As such there are no mechanisms to monitor the changes and its impacts in the Western Ghats. Hence it is highly essential to establish a 'GEObs' at an ideal location in the Western Ghats, as it is the dominant physiographic feature and climate regulator. We started the preliminary steps to construct GEObs in the High Altitude region of the Periyar River basin ie, at Sankhumalai, Munnar in the Western Ghats. **This research Observatory at Munnar will serve as a primary source of data for several atmospheric, climate change and geo environmental studies.** An array of field instruments will be set up to monitor weather, climatic parameters including amount of rainfall, atmospheric conditions, air quality, greenhouse gas emissions, soil characteristics and chemistry, and geochemical fluxes. With the data generated we may be able to assess the various processes operating in the Western Ghats, and contribute towards understanding of physiochemical and biological processes responsible for sustenance of the Western Ghats. The various instrumentation setup proposed in the GEObs is shown as Fig: 1. The observatory will also contribute the data for climate change studies in International and National level and help climate scientists to design climate mitigation and adaptation strategies relating to climate change and its related realms.

2.4 INSTRUMENTATION SETUP IN GEObs

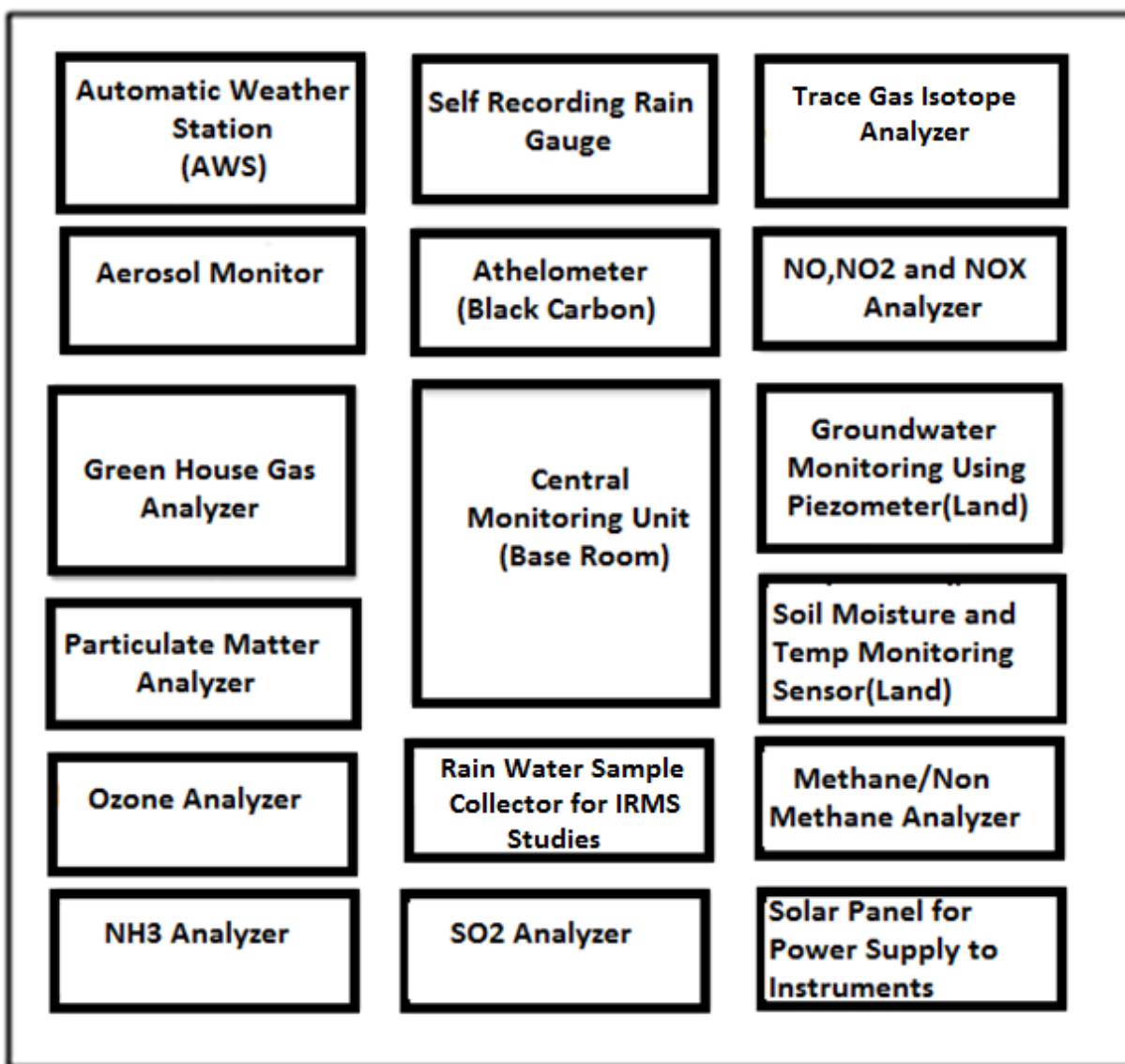


Fig: 1 Instrumentation set up for GEObs

SPACE IDENTIFIED FOR SETTING UP THE GEObs

The space identified for the establishment of GEObs is the open grass land area (10°08'33" N and 77°01'48.5" E, Altitude 2001 m amsl), located outside the Eravikulam National Park area, Rajamalai and inside the Mankulam reserve forest area under the administrative control of Dept. of Forest and Wildlife, Govt. of Kerala. The Kerala Police have their Wireless Repeater Station (Jack II) here and hence electricity is available in the premises with the support of Kannan Devan Hills Plantations Limited (KDHPL). The proposed site is currently accessible by road and the location is just 1 km distant from the highest peak (Anamudi) in the Western Ghats. This place receives heavy rainfall during southwest monsoon. During December and January the temperature drops to -4 to -7° C. It is an ideal location to establish a high altitude GEObs and to deploy various instruments related to Climate change studies in Southern Western Ghats. An area of 400 m² (approximately 10 cents) of open land space is required from the Dept. of Forest and Wildlife for the permanent construction of the GEObs with the highly Sophisticated instruments as mentioned.