



LOCAL SELF-GOVERNMENT INSTITUTIONS AND CLIMATE CHANGE: THE CASE OF MEENANGADI PANCHAYAT IN KERALA

A.K. NIRUPAMA
University of Kerala (India)
aknirupama@gmail.com

Abstract: India faces significant vulnerability to the effects of climate change, attributed to its varied geography, substantial population, and reliance on agriculture. The nation encounters numerous climate-related challenges, including more frequent and severe extreme weather events like heatwaves, droughts, floods, and cyclones. Dealing with this intricate matter necessitates a comprehensive and cooperative strategy that extends beyond conventional top-down governance models. Local governments have a vital role in formulating and executing climate change adaptation strategies. They assess local vulnerabilities, identify priority areas, and formulate plans to build resilience and reduce risks. This can involve measures such as infrastructure improvements, land-use planning, water management, and public health initiatives tailored to the specific needs of the community. Local governments often collaborate with stakeholders, including businesses and residents, to achieve greenhouse gas reduction targets. India has pledged to become carbon neutral by the year 2070, and achieving carbon neutrality is a complex and multi-faceted endeavour that requires coordinated efforts across sectors and levels of government. The carbon-neutral Meenangadi in the Wayanad district of Kerala is a perfect example of successful local self-government taking measures to achieve carbon neutrality.

Keywords: climate change, local self-government, Kerala, Meenangadi model, carbon neutral panchayat.

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INTRODUCTION

Climate change is a global phenomenon with local consequences. This global crisis has contributed to more risk factors than ever which involve frequent natural disasters, displacement of people, inequalities, health risks, rising sea levels, food insecurity and so on. It is also a challenge to the developmental aspirations of a hugely populated country like India. Climate change will increase the risks of death, injury and ill health and disrupt livelihoods in low-lying coastal zones due to cyclones and coastal and inland flooding, storm surges and sea-level rise. Increased river, coastal and urban floods could cause considerable loss of life and widespread damage to property, infrastructure and settlements. India, as a large emitter of greenhouse gases and one of the world's most vulnerable countries to projected climate change, is now facing climate change and its impacts, such as water scarcity, heat waves and drought, heavy storms and floods, and the resulting negative effects on health and livelihoods.

Climate change requires collaborative governance approaches involving partnerships between local governments, community organisations, businesses, and other stakeholders. A multilevel governance is required to address this complex problem. It is a concept that acknowledges the necessity for coordination and cooperation across different levels of government, spanning from local to global, and involving diverse sectors and stakeholders when addressing complex issues like climate change. This approach recognises the interdependence of various players and systems, including governments, international bodies, corporations, civil society, and local communities. Instead of a top-down approach, multilevel governance underscores the importance of inclusive and participatory decision-making processes that engage numerous actors at varying levels. This inclusive approach is vital for effectively identifying and putting into action solutions to urgent environmental and societal problems (Pangalos 2023).

By fostering collaboration and engagement, local governments can develop inclusive and effective climate change strategies that reflect the needs and aspirations of the local community.



Local governments play a vital role in collecting and analyzing data related to climate change impacts and trends at the local level. This data informs decision-making, helps prioritise interventions, and facilitates effective monitoring and evaluation of climate change initiatives. Local governments have the opportunity to raise awareness among community members about climate change and its impacts. By fostering climate literacy, local governments empower citizens to take action and make informed choices. It is important to note that the capacity and resources of local governments can vary, and they may face challenges in implementing climate change initiatives. Therefore, supportive policies, capacity building, and financial assistance from higher levels of government are crucial in enabling local governments to address climate change at the local level effectively.

The National Adaptation Plans (NAPs) adopted under the UNFCCC acknowledge the emphasis on local governance. Local actors are given additional weight in the NAPs when it comes to their role as those who carry out climate change adaptation (Gregorio et al. 2019). Being the level closest to the people, local governments have context-specific knowledge about their regions. They could be an essential force behind and enabler of local adaptation, hence enhancing national efforts. Local government, on the other hand, is constrained by resource shortages and is at the bottom of the multi-level governance system (Adger et al. 2003).

The importance of public participation in addressing climate change has been featured in international statements like the Rio Declaration 1992 at the United Nations Conference on Environment and Development (UNCED). The declaration included specific objectives for involving citizens in climate action (Principle 10). Its significance was once again given stress by the Intergovernmental Panel on Climate Change (IPCC) Special Report on the impacts of global warming (Hugel, Davies 2020). To improve the ability to manage risks associated with climate change, it explicitly identified public participation in adaptation planning (IPCC 2018).

This paper delves into the complexities of how local self-governments address climate change, emphasising the effective contribution of public participation. The case study centers on the Meenangadi Panchayat, the first carbon-neutral panchayat



in Kerala. While existing literature discusses the role of local self-bodies in addressing climate change, no prior study specifically focuses on the Meenangadi Panchayat, which stands out as one of the few successful local self-bodies in India taking grassroots initiatives against climate change. Recognised with the Carbon Neutral Vishesh Panchayat Puraskar by the Ministry of Panchayati Raj for outstanding efforts in achieving net-zero carbon emissions, the panchayat is establishing a carbon-neutral learning lab for knowledge sharing (Raghunath 2023).

The paper is structured into different sections. Following the methodology, the focus shifts to the significance of local self-government bodies in addressing climate change, advocating for climate-responsive local governance. The subsequent section examines climate change in India, with a specific emphasis on its impact in the state of Kerala. The final part forms the core of the study, evaluating the carbon-neutral project in the Meenangadi Panchayat, located in the Wayanad district of Kerala. The study aims to highlight the proactive measures adopted by a local self-government body to mitigate the impacts of climate change, utilising the case study of the Meenangadi Panchayat.

METHODOLOGY

Situated in the Sulthan Bathery Block of Kerala's Wayanad district, the Meenangadi panchayat encompasses a population of 34,601 and comprises 8,199 housing holdings distributed across 19 wards, as per panchayat records. The economy of Meenangadi is predominantly agrarian, with agriculture serving as the primary source of income for its residents. The cultivation of three main crops – pepper, coffee, and rice – is a significant aspect of the local agricultural activities. Notably, 50 per cent of the district's land area is dedicated to plantations and various agricultural practices, emphasising Wayanad's predominantly agrarian nature. Designated as one of the "climate change hotspots" in the state, according to the Kerala State Action Plan on Climate Change (SAPCC), the Wayanad district faces particular vulnerabilities associated with climate change.



According to the SAPCC report, there is a concerning forecast that the minimum surface temperature in the Western Ghats region may experience an increase of 2 to 4.5 degrees Celsius by the year 2050. This rise in temperature poses a potential risk to paddy production and thermo-sensitive crops such as cardamom, coffee, tea, and black pepper, which are staples in Wayanad. Additionally, threats to the region include unscientific mono-cropping, unsustainable tourism, quarrying, and the flourishing real estate industry. The culmination of these factors has prompted the selection of the district for a community-based climate change adaptation and development program. Within the Wayanad district, the Meenangadi panchayat has voluntarily taken on the initiative to become the first carbon-neutral panchayat in the state.

Officially initiated on June 5th, 2016, the Meenangadi carbon-neutral project was introduced with a broader objective of serving as a model for implementing similar initiatives throughout the entire Wayanad region and the larger state of Kerala. The government had established a five-year timeline for achieving this goal, but implementation of certain schemes of the project were delayed due to the challenges posed by the Covid-19 crisis. The data for this study was gathered during the period of 2020-2021. Field surveys were undertaken during this period and it was revealed that the panchayat had effectively implemented numerous proposed initiatives by that time. Currently the project has started its second phase by launching a climate literacy campaign as per official data from the panchayat.

This study utilised both primary and secondary data. Primary data was collected through reports from Thanal (NGO), government documents, telephonic interviews (for local self-body representatives, Director of NGO Thanal, Haritha Karma Sena workers etc.) and field surveys through questionnaire for gathering feedback from the residents of the locality. The field survey was conducted online through Google Forms considering the challenges of Covid-19. Given that the data collection took place online, it was subject to certain limitations. Notably, obtaining data from individuals aged 60 years and above proved impossible, as the questionnaires were distributed exclusively through Google Forms. Limited digital literacy posed a constraint for this method of data



collection. The study also relied on secondary data collected from books, newspapers, and journals.

For gathering primary data, stratified random sampling was done based on the socio-economic profile of the people. The sample consisted of 104 respondents residing across nineteen wards of the panchayat. Samples were categorised on the basis of age, gender, education, and occupation/primary source of income. Among the respondents, 61.2 per cent were male, while 38.8 per cent were female. Age-wise, 50.5 per cent fell within the 20-40 years range, 33 per cent were aged between 40-60 years, and 12.6 per cent were 60 years and above. In terms of education, 33 per cent had completed SSLC, 29.1 per cent held a degree, 21.4 per cent had education below SSLC, and 16.5 per cent had pursued post-graduation. Regarding occupation, 28.4 per cent were engaged in agriculture or business, 24.5 per cent were daily wage workers, 22.5 per cent were students, 8.8 per cent had government jobs, another 8.8 per cent were involved in other professions, and 6.9 per cent were primarily responsible for household work.

LOCAL GOVERNANCE AND CLIMATE CHANGE

In the twenty-first century, a significant challenge faced by humanity is to effectively address the environmental and societal consequences of climate change through governance processes (Brasseur, Pluijm 2013). The United Nations Framework Convention on Climate Change (UNFCCC) National Adaptation Plans (NAPs) play a crucial role in spearheading the global response to climate change impacts, particularly in low-income regions that bear a disproportionate burden. The primary objective of the NAP process is to facilitate the implementation of climate change adaptation measures by national and subnational authorities (UNFCCC 2012). The NAP process relies on the concept of multilevel governance to facilitate effective and systematic climate change adaptation (Gregorio et al. 2019). However, the lack of adaptive capability at the subnational level can hinder the successful implementation of climate change adaptation measures. To ensure successful adaptation, every level of the



multilevel governance system must possess the necessary capacity to carry out climate change-related activities (IPCC 2018). Local governance plays a crucial role in shaping effective adaptation policies as it involves the political and institutional processes responsible for decision-making and implementation within a specific subnational region (Williams et al. 2020). Polycentric governance, which involves the decentralisation of power, is essential for the functioning of the multilevel governance system (Ostrom 2011). Empowering local governments significantly enhances their ability to respond to climate change challenges (Forsyth, Evans 2013). The scope of local governance is comprehensive and encompasses all stakeholders involved in decision-making and policy planning, including networks, informal institutions, and communities (IPCC 2018). As per research, institutional hurdles and resource constraints can have a significant negative impact on local governance (Ojwang et al. 2017; Rosendo et al. 2018). In order to deal with the effects of severe global warming, it is urgently necessary to improve local governance's capacity for climate change (Baker et al. 2012; Rosendo et al. 2018; IPCC 2018).

The impacts of global warming are increasingly evident at regional and local levels (Intergovernmental Panel on Climate Change 2007). International agreements like the United Nations Framework Convention on Climate Change and the Kyoto Protocol have historically formed the basis for global and national endeavours to address climate change (United Nations Framework Convention on Climate Change 1992). However, since the late 1990s, there has been a growing recognition of the importance of shifting focus towards understanding and addressing the local causes and effects of climate change (O'Riordan, Jager 1996). Countries like Australia have taken steps to address local climate challenges. For instance, they established the Local Adaptation Pathways Programme (LAPP), which provides funding to local governments to conduct climate risk assessments and develop adaptation strategies. Additionally, Australia developed a National Climate Adaptation Framework to enhance its efforts in addressing climate change impacts at the national level (Baker et al. 2012).



Multilevel governance recognises the importance of collaboration between national, regional, and local governments to implement national climate policies effectively. However, implementing climate change actions faces various challenges, including limited expertise, funding constraints, lack of devolved authority, inadequate support from central governments, and policy misalignment. The absence of suitable national policy and regulatory frameworks can hinder the successful implementation of climate plans at the local or regional levels. Involving local governments in climate change initiatives may democratise and boost public participation. Several supporting factors must be present for adaptation to be successfully included into local development processes. Local stakeholders, including local governments, communities, civil society, and businesses, must be widely and consistently involved. The decision-making process needs to be collaborative. Additionally, there has to be more targeted messaging and awareness-raising about climate change since it is important for local actors to understand why they may need to make alternative choices or use different or additional resources to build their livelihoods. Additionally, appropriate information must be gathered and used to guide local-level adaptation decisions (OECD 2009).

There are several reasons why national governments should strengthen their engagement with local authorities and stakeholders regarding climate change. First, involving local authorities allows for the effective implementation of nationally-driven policies at the local level. Second, local governments can integrate climate resilience into urban infrastructure and development through local policy and urban planning changes. This approach enables testing and learning at the local level, leading to the dissemination of successful techniques between cities and regions and potentially influencing national and international actions (Corfee, Morlot 2009; Bulkeley, Betsill 2005). Various institutional frameworks can link national and local efforts to combat climate change. In some cases, national policies may mandate the creation of local climate plans in countries like China or Norway. Alternatively, a bottom-up, locally led approach allows for autonomous local actions to generate innovative ideas and policies, which can then be tested and improved before being scaled up

regionally or nationally. This approach has been observed in countries like the US, where national policy for climate change may be relatively weak. A third approach, known as “hybrid”, involves close collaboration between national (or regional) and local governments to facilitate two-way learning and cooperation.

In assessing the distribution of vulnerability and implementing adaptation strategies, local institutions play a crucial role (Naess et al. 2005). Theoretically, this role might give local institutions the freedom to customise adaptation to local circumstances. In reality, local administrations frequently operate as implementing agents for higher governmental levels. Local institutions in Norway, for instance, are said to have minimal incentives for proactive management. Local institutions still have “room to manoeuvre” and can act rapidly when opportunities (or risks) present themselves, even in the capacity of an implementation agent (Critchley, Scott 2005; Naess et al. 2005).

Climate change can be addressed in many ways by panchayats. They will be able to concentrate on climate risk factors that are unique to their communities and create tailored solutions to local needs. For revenue, rural households depend on a diverse variety of livelihood activities. Panchayats are well positioned to recognise the combination of initiatives needed to create more stable livelihoods in the farm and non-farm sectors for households in various socioeconomic situations. Panchayats can be useful forums for combining local expertise and policies with the activities of various state departments and public assistance programs. Since panchayats are closer to their constituent publics than other state agencies, they can act as an open governance unit for communities requiring access to a number of government benefits, monitoring the actions of various state agency officials, and engaging in climate risk reduction and adaptation decision-making. Through a variety of policies, panchayats have the ability to mobilise appropriate responses to mitigate and respond to climate change. The first step towards putting panchayats at the centre of local climate adaptation coordination is to create policy mechanisms that understand their importance. The key is to provide panchayats with the tools, support, and discretionary authority they need to respond to climate change and local needs in creative, locally-



driven ways. Many existing development and social programs have the ability to provide significant synergies with efforts to respond to climate change. Greater expertise in organising local climate responses would increase local governance capabilities by improving the partnership between panchayat leaders and various government authorities, as well as widening the creative possibilities for the public to envision and enact solutions to local challenges (Fischer 2017).

Panchayats have the potential to become vanguards for the development of climate responses at the grassroots by enabling the formulation of locally-driven projects and integrating the broader range of sectoral programs undertaken by central and state government agencies. Investing in more empowered, open, and responsive governance at the local level can consolidate panchayats as a fundamental building block for citizens to engage in climate planning processes. These efforts will enable India to blaze a path of innovation in decentralised approaches to 'smart' climate adaptation. Each Grama Sabha, District Panchayat, Municipality and Corporation should create an area-specific strategy for climate resilience. This study will recognise local-level adaptation needs that aim to mitigate local-level climate risk, vulnerabilities and ways to improve resilience.

The state of Kerala has a tradition of effectively executing different development strategies with the local self-government machinery at the grassroots level and can thus also integrate these development projects from the viewpoint of climate change. The State highlights the need to improve officials' capacity to handle the effects of climate change and future adaptive and mitigating strategies in order to incorporate climate aspects in their departmental planning and day-to-day organisational and monitoring activities. The Meenangadi panchayat is setting an example of how local self-governments can effectively contribute to combating climate change impacts. This study elaborates on the approaches employed by the Meenangadi panchayat in addressing climate change.

Climate change poses an ongoing challenge to global social and economic sustainability, livelihoods, and environmental governance. The increase in greenhouse gases in the atmosphere causes rising temperatures, resulting in unpredictable weather



patterns, including flash floods, droughts, and rising sea levels. It is crucial to establish consistency and coordination between policies and actions at the national, state, and local levels. India's adaptive capacity varies based on factors such as water availability, food security, human and social capital, and the ability of the government (at state and national levels) to provide support during challenging situations. When adaptive capacity is limited, the risk of displaced persons, deaths and destruction from heat, floods, and storms, as well as disputes over natural resources and properties, is higher. The harsh consequences of climate change will intensify challenges to development, especially in India, Bangladesh, Maldives, Sri Lanka and other South Asian countries. India is now one of the world's most disaster-prone countries due to natural disasters and vulnerabilities resulting from economic, social, and environmental circumstances. The Palli village in Jammu's Samba district is also moving towards carbon neutrality by entirely using solar energy (Ashiq 2023). There are more examples in India like the state of Sikkim claims to be carbon-neutral state and is on its way to carbon-negative stance (Dutta 2023).

CLIMATE CHANGE IN KERALA

As per the State Action Plan on Climate Change 2023–2030, nine districts in Kerala have been identified as particularly vulnerable to the impacts of global warming and climate change. These districts, namely Wayanad, Kozhikode, Kasaragod, Palakkad, Alappuzha, Idukki, Kannur, Malappuram, and Kollam, face high disease prevalence, have a sizable vulnerable age group in the population, and lack adequate healthcare and relief services. The report predicts an increase in extreme rainfall events, affecting different districts, natural resources like fisheries, forests, and water, as well as socio-economic systems such as agriculture and health (The New Indian Express 2022).

Kerala, a region renowned for its mild and pleasant climate, once remained untouched by the harsh weather conditions experienced in other parts of the world. However, it is now bearing the consequences of climate change. Unprecedented heavy



rainfall, flooding, prolonged dry spells, and fatalities from heat waves and sunstrokes were unheard of in the past. While the signs of climate change were already evident through increasing hot days and water shortages, the defining calamities were the August floods of 2018 and the damaging landslides and heavy rains in the northern districts in 2019. The uncontrolled degradation of the ecologically fragile Western Ghats, rivers, mountains, and wetlands has exacerbated the impacts of climate change in Kerala. Global warming has made Kerala's delicate ecosystem highly susceptible to extreme weather conditions, impacting various sectors and people's livelihoods.

Kerala, with a population constituting 2.76 per cent of India's total, experiences a high population density at 859 persons per km², three times denser than the rest of the country. It spans an area of 38,863 km², making it the twenty-first largest Indian state by area and the thirteenth largest by population. The state's high population density and urbanisation lead to increase per capita energy demands and carbon intensity in developmental aspects. Kerala's growth experience sets it apart from other states in India. Despite not experiencing the typical "rapid" economic growth in per capita GSDP, the state has achieved commendable social indicators comparable to those of developing countries. This unique developmental process has been referred to as the "Kerala development model". The state benefits from various natural resources, including forests, wildlife, water resources, and minerals. However, in recent years, the natural resource base has weakened, leading to far-reaching effects. Kerala is now experiencing the impacts of climate change, affecting different geographical regions and sectors of the economy. This includes increasing temperatures, extreme seasonal rainfall causing floods and water shortages, coastal degradation, agricultural losses, reduced seafood catch, increased pest incidents, and rising sea levels affecting coastal cities (State Action Plan on Climate Change 2014). Extensive forest clearance and the lack of structural integrity will contribute to a significant erosion of biological diversity. Large parts of inland marsh forests and mangroves have now been turned into crop fields/aquaculture areas in particular, resulting in the local disappearance of many endemics (Varghese, Kumar 1997).



Agriculture areas, in particular paddy fields, declined at an unprecedented pace for non-agricultural activities in particular. Most of the rivers are dried up. The quality of river water is further compromised by the discharge of municipal and agricultural waste and the lack of sanitation in rural areas.

The state faces various forms of developmental and environmental challenges. Climate change, meanwhile, accelerates these problems into more nuanced ones. Water scarcity, the frequent occurrence of vector and waterborne diseases, extensive forest and biodiversity loss, and declining agricultural productivity are prevalent issues that may become more critical in the future. Despite various programs and policies implemented, these problems have not been effectively resolved. Therefore, local climate change adaptation strategies should focus on post-containment measures, ensuring the stability of the state's existing natural resources against the impacts of climate change, and adopting adaptive behaviours based on present and future knowledge of climate change consequences.

Kerala heavily relies on climate-sensitive sectors like agriculture, fisheries, and forestry due to its socio-economic characteristics. The state faces a multi-hazard profile, making it more susceptible to climate-related threats such as floods and droughts. With a coastline of 590 km, approximately 63 per cent of it is at risk of extreme sea erosion (Najib 2020). The state is vulnerable to numerous severe climate events, such as flooding, storm waves, torrential downpours associated with cyclones, periodic droughts, sunstrokes, and sea level rises. The frequency and severity of weather-related extremes are rising in the state. Vulnerable habitats like Mangroves, Shola forests, and Tropical evergreen forests are also present in the state. Due to its location along the seashore and steep gradient along the western slopes of the Western Ghats, Kerala is particularly exposed to changing climate dynamics. The most disadvantaged areas of the state are those who, by their livelihoods, are subjected to climate change and, at the same time, are least capable of responding to address the impacts of climate change. The most exposed people in the state to climate change are farmers, fishermen and indigenous people whose livelihoods are exposed and are less resilient to tackling climate change. Climate



change impacts are evident across various sectors, including agriculture, fisheries, land and biodiversity, water resources, and health.

With regard to climate change, the hotspot analysis of districts in Kerala is calculated on the basis of the following considerations: vulnerability to threats, impacts on wildlife (floods and droughts) and impacts on the lives, livelihoods and well-being of local people. In defining hotspots, the degree of vulnerability of climate-sensitive industries, indigenous communities and the poor performance of the Human Development Index were also considered. Alappuzha, Palakkad and the hilly districts of Wayanad and Idukki are the main climate change hotspot regions of Kerala (State Action Plan on Climate Change 2014). Climate-change-induced floods are becoming an annual problem in Kerala. The state, which previously experienced consistent monsoon rainfall, is now facing severe floods in August due to heavy rains. Many experts and opinion leaders attribute these devastating floods, now occurring annually, to deforestation and changes in land use patterns. Ecologist Madhav Gadgil's Western Ghats studies have been referenced in this regard. According to him, "We lack climate literacy and there is an urgent need to study the impact of global warming and climate change on Kerala". The state's potential to survive severe weather conditions has been eroded by deforestation, urbanisation, plantations and tourism. The rapid urbanisation in the state is another cause that has contributed to forest degradation. Significant demands for capital for construction and development projects have been raised on urbanisation. Since 1980, the explosion of stone quarries in the state has been phenomenal. Based on a study conducted by the Kerala Forest Research Institute in 2017, the state of Kerala has a total of 5,924 quarries. A legislative assembly subcommittee was formed to assess the ecological impact in the state after the 2018 flood and found that the number of unauthorised quarries along the 458-kilometre stretch of the Western Ghats in Kerala is nearly ten times higher than the number of licensed quarries (Onmanorama 2019).

The Government of Kerala has been working on the State Action Plan on Climate Change (SAPCC) to resolve climate change issues at state level with the development of the National Action Plan on Climate Change through its 8th Mission

to address climate change concerns. The Kerala State Action Plan on Climate Change was drafted by the Environment and Climate Change Directorate (DoECC) with input from various departments, agencies and institutions. This was endorsed by the government of India in 2014. As a significant state vision plan, SAPCC brings climate change problems at the forefront of sustainable development in order to preserve the quality of life of the people of the state. In particular, SAPCC discussed the identification of state-specific vulnerabilities in climate change, the preparation of effective adaptation and mitigation options to resolve climate change problems, prioritisation and financial options. Its key goal is to integrate climate change policies into the framework of State Level Planning and Development and to reduce the state's risk associated with current and future climate change (Directorate of Environment and Climate Change 2020).

The Department of Environment and Climate Change formulated the SAPCC with the technical assistance of UNDP India. A detailed and structured approach to the creation of a State Action Plan was adopted by the Department of Environment and Climate Change, which included the formation of a State Level Steering Committee, identity sectoral task groups, coordinated National Level Workshop, reviewed literature, public consultation workshops in three state physiographic zones and consultation of individual stakeholders.

State level monitoring and assessment shall be carried out in two ways: *a)* the Department of Environment and Climate shall organise state level climate change initiatives; *b)* the State Steering Committee shall conduct a prompt progress review of the various SAPCC activities. The Department of Environment and Climate Change, as a nodal agency of the State for climate change-related activities, will organise the planning of annual programmes with goals and delegated tasks for SAPCC implementation activities with the State holders and the line departments. The Department will also be responsible to the State Steering Committee for collecting monitoring reports on programme performance based on the Ministry of Environment and Forest frameworks of indicators and common assessment structure. The Department of Environment and Climate Change will also establish a State Level Work



Plan for the implementation of SAPCC. The implementation of SAPCC will also be tracked and reviewed at different levels under the auspices of the State Steering Committee, requesting timely progress from different stakeholders of the Climate Change Department on the various activities of the SAPCC. Coupled with a grassroots level approach of Participatory Planning whereby the developmental programmes are identified and implemented through the local self-government institutions, which may emerge as effective agencies for the implementation of SAPCC. Functional committees are to be constituted under each local self-government (LSG) for planning, implementation and monitoring of various projects and looked into climate change perspective (Directorate of Environment and Climate Change 2020).

The LSGs must be important participants in the making of SAPCC since they have precise knowledge of the functional challenges during implementation. The LSGs and state governments must ensure that women and children, civil society, experts, the “Malayali diaspora”, local information institutions and the media are included in all certain phases of policy formulation and preparation. Rather than making specialised departments for climate change, every department must be provided with a “checklist” of project requisites in alignment with SAPCC during planning and implementation. The successful implementation of a SAPCC is not feasible as a standalone plan. It necessitates integration into various sectoral plans and policies, requiring a coordinated effort from multiple state departments. Throughout these years, SAPCC has successfully developed the state’s capacity to comprehend climate change issues. It has encouraged the examination of developmental policies and plans through a climate lens, effectively bringing the matter of climate change from international negotiations and national policies to the subnational and local levels. There have been notable progressions in the perspectives and scientific comprehension of climate change since SAPCC 1.0. Particularly, regional apprehensions regarding climate change have evolved. The year 2018 marked unprecedented rainfall extremes and extensive flooding in Kerala. Concurrently, climate science has made strides since Kerala SAPCC 1.0, witnessing numerous developments in international climate negotiations and commitments from countries worldwide,



including India. The progression from Kerala SAPCC 1.0 includes: utilisation of enhanced climate model projections, evaluation of the impacts of climate change on the forest sector through a dynamic global vegetation model, incorporation of a risk framework derived from the Intergovernmental Panel on Climate Change (IPCC 2014), policy stocktakes subsequent to Kerala SAPCC 1.0, proposition of strategies and monitoring mechanisms for Kerala SAPCC 2.0. Kerala SAPCC 2.0 has incorporated enhanced climate model projections and vulnerability assessments to propose strategies, actions, and monitoring mechanisms. The Kerala State Action Plan on Climate Change 2023-2030 (Kerala SAPCC 2.0) designates nine districts as particularly vulnerable based on overall inherent vulnerability. The plan outlines mitigation strategies aiming to prevent approximately 57,000 ktCO₂ emissions from various sectors by 2030. The districts classified in the 'high' vulnerability category include Wayanad, Kozhikode, Kasaragod, Palakkad, Alappuzha, Idukki, Kannur, Malappuram, and Kollam (The Hindu 2022).

CARBON NEUTRAL MEENANGADI PANCHAYAT

Wayanad, being a place where nature and people's livelihoods are closely interconnected, is experiencing recurrent floods and landslides, mainly due to changes in land use patterns and extensive deforestation. The displacement of people from hillsides is not a suitable solution. Instead of displacement, it is essential to focus on helping the local community adapt to these changes. Both short-term and long-term measures are required for this purpose. The government and social organisations have a responsibility to promote climate literacy among the local residents. Wayanad faced significant challenges during the floods of 2018 and 2019, and it is currently dealing with various environmental issues caused by factors like deforestation, unsustainable tourism, encroachment on tribal land, human-animal conflicts, and poorly planned developmental initiatives. To address these issues effectively, a permanent risk reduction strategy should be implemented to ensure the region's sustainability and resilience.



Against the backdrop of all these problems, which will become severe in the future, it is important to bring new programmes at the local self-government level so that further risks from climate change can be addressed. The ongoing warming trends and changing rainfall patterns in India pose a significant threat to the country's development, as they have adverse effects on vital natural resources like water, forests, coastal areas, and mountains, which are crucial for over 70 per cent of the rural population. To achieve India's ambitious goals outlined in the Intended Nationally Determined Contributions (INDCs) under the Paris Agreement 2015, it is essential for our future growth efforts to follow a "Carbon-Neutral" approach. This means aiming for "net zero emission" of greenhouse gases (GHGs) resulting from human activities.

The district's total land area is predominantly divided into three main categories: forest land (39.62 per cent), plantation land (39.02 per cent), and agricultural land (10.94 per cent). Meenangadi, located in the central part between Kalpetta and Sulthan Bathery, is one of the 25 Grama Panchayats (Local self-government) in the Wayanad district. According to the Census-2011, Meenangadi has a population of 34,601 residing in 8199 households, with a population density of 646 persons per square kilometre. Approximately 23 per cent of the total population consists of tribal communities, heavily dependent on non-timber forest produce and agriculture. Some find work in coffee plantations in Kerala and Karnataka. These tribal populations are highly susceptible to climate change due to their reliance on climate-sensitive crops and forest resources. Around 94 per cent of the non-forest land is used for agricultural purposes, with less than 1 per cent lying fallow and about 6 per cent classified as non-agricultural land. According to the biodiversity register, prevalent ecosystem habitats in Meenangadi Grama Panchayat include wetlands, forests, plantations, and homesteads (Thanal 2018). Following the post-Paris climate commitments, Dr. T.M. Thomas Isaac, a renowned economist and former Finance Minister of Kerala, aimed to set an inspiring example for the entire country. He selected the Wayanad district, known for its vulnerable crops like coffee, paddy, and pepper due to climate change, to launch a community-based



climate adaptation project called “Carbon Neutral Wayanad”. The pilot project was initiated on June 5, 2016, at the local self-government (LSG) level.

The Meenangadi Grama Panchayat took the lead in becoming a model Panchayat for the Wayanad district and the entire nation. The “Carbon Neutral Panchayat” initiative is a unique pilot project supported by the Kerala State government. The concept of carbon neutrality revolves around achieving a balance between carbon emissions from human activities and carbon sequestered in natural sinks or pools, resulting in net zero carbon emissions. The idea behind the “Carbon Neutral Grama Panchayat” involves promoting zero carbon development, nature conservation, self-sufficiency in food and energy, economic prosperity, and overall local self-government development. It emphasises the importance of reducing greenhouse gas (GHG) emissions from various socio-economic, developmental, and lifestyle practices to control global temperature levels effectively. To achieve carbon-neutral development, sustainable practices and offsetting measures are integrated into the development processes. Additionally, carbon sequestration, which involves capturing and storing atmospheric carbon dioxide in organic matter, plays a crucial role in this endeavour (Creating a Carbon Neutral Meenangadi Grama Panchayat 2016).

The Carbon Neutral Panchayat project aims to effectively manage human-caused carbon emissions by implementing environmentally friendly methods and sustainable development techniques. These include adopting green technologies, promoting sustainable energy consumption, improving forest management, responsibly managing natural resources, enhancing soil productivity through agroecological practices, and providing community-level preparedness training and capacity building for farmers and local communities. The vision of the “Carbon Neutral Meenangadi Grama Panchayat” project is to reduce carbon emissions resulting from human activities by encouraging sustainable practices and lifestyle choices in the region. Panchayat leaders in Wayanad district and experts across Kerala collaborated to strategise the post-Paris Agreement discussions and design a path toward a carbon-neutral economy. The need for such an initiative was driven by Meenangadi’s



diminishing paddy fields and vulnerability to climate insecurity, particularly in the agricultural sector, which relies heavily on cash crops like coffee and pepper. The project is intended to be a grassroots movement focusing on the comprehensive development of Meenangadi Panchayat, with the ultimate goal of becoming carbon neutral (Creating a Carbon Neutral Meenangadi Grama Panchayat 2016). A Core Committee was formed, comprising representatives from Meenangadi Panchayat, Thanal (an environmental activist group which has a vision of “People, Planet and Sustainability”), the Department of Zoology (Kannur University Mananthavady Campus), Kerala Suchitwa Mission, and other relevant departments. Specialist Task Forces were created under the central committee, focusing on different intervention sectors. These Task Forces were responsible for planning, strategising, guiding, and supervising the project. The resource team included specialists from various fields, organisations, and the scientific community, while a technical support team provided technical assistance.

Apart from the core committee, the project received support and collaboration from various stakeholders, including M.S Swaminathan Research Foundation (MSSRF), Government departments, educational institutions, youth clubs, members of the Kudumbasree (women’s self-help groups) and volunteer groups. Technical assistance was provided by organisations such as Kerala Forest Research Institute (KFRI), Kerala Agricultural University (KAU), and Academy for Climate Change Education and Research (ACCER-KAU) for the “Carbon Sequestration Estimation” studies in the panchayat. During data collection, several Government departments, including the Department of Soil Survey and Soil Conservation, Kerala State Electricity Board, Motor Vehicle Department, and Road Transport Offices of Sulthan Bathery, Kalpetta, and Mananthavady, supported the project. The Land Use Board and the Department of Statistics and Economics also contributed vital information for preparing the spatial database. The Police Department, Meenangadi Circle, provided assistance for field studies related to the transport sector. Additionally, support and technical inputs from UNICEF helped focus on women and children in climate change matters. Various educational



institutions, such as the Department of Zoology (Kannur University Mananthavady Campus), the University of Calicut, the University of Arizona, and the Manipal Academy of Higher Education, collaborated with ‘Thanal’ in different phases of the research project. Student volunteers from National Service Scheme (NSS) units in Government Higher Secondary School-Meenangadi, National Institute of Technology – Calicut, Government Engineering College – Mananthavady, Govt. Polytechnic-Meenangadi, Institute of Human Resource Development for Electronics College-Meenangadi, and St. Mary’s Higher Secondary School-Sulthan Bathery, along with Student Police Cadets from Government Higher Secondary School-Meenangadi, were actively involved in primary data collection. Carbon Neutral Technical Cell and Green Army International mentors provided training and orientation sessions for the students and volunteers before their fieldwork. Local youth volunteers and members of Kudumbasree units in Meenangadi Grama Panchayat played a significant role in supporting various field surveys. Their participation was crucial in fostering a sense of ownership and responsibility among the local community for the campaign.

The first step of the project was calculating the total emission from different sectors that are being released in the day-to-day activities of the people in Meenangadi Panchayat, using international guidelines and methodology. There are no factories in the panchayat. The emissions are mainly from the energy sector. Total emissions were calculated from soil, and wastes from households and vehicles. A comprehensive survey was carried out, following international guidelines, to assess the types of vehicles and their usage duration, making it the second significant source of emissions. The survey involved conducting a house-to-house investigation to gather relevant data on vehicles in the area. The Panchayat collaborated with “Thanal” to estimate pollution in various sectors using globally accepted methods. A pollution sequestration survey was then conducted to assess the existing trees’ capacity to capture emissions. And it was found that over 15,000 tonnes of CO₂ equivalent must be offset by Meenangadi panchayat in order to reach “carbon neutrality”. The best ways to reach and maintain carbon neutrality are to



reduce emissions, enhance carbon stocks, and develop carbon credits and reserves. To tackle this issue, the Panchayat developed initiatives such as promoting high-efficiency stoves, reducing electricity waste, conducting energy audits, implementing solar energy programs, and adopting effective composting practices in different industries.

Planting trees is one way to reduce the extra CO₂ Eq gap. According to the assumption that a fully grown tree will store roughly 25 kg of carbon per year, the Panchayat will need to plant about 6,00,000 trees to make up the gap of 15,000 tonnes. To achieve additional sequestration power, the Panchayat aimed to increase tree density and decided to introduce a unique model called “tree banking”. With the help of the Tree Banking Scheme, it is possible to guarantee monetary incentives in terms of funding liquidity and annuity. Under the tree banking model, the Panchayat offered free saplings to willing farmers. A recipient of this arrangement will provide the cooperative bank with a pledge of the trees on his or her home or farm in exchange for short-term loans and advances. The Bank may approve short-term, low-interest loans with terms of up to two to three years based on the valuation report. Trees should be at least ten years old, at least 50 cm in circumference, and 5-8 metres tall. The residents are given Rs 50 for each tree is given to the residents as per the tree banking scheme. It is like an interest-free loan. The state government supported this initiative by depositing ten crores as a pledge in the cooperative bank. The tree species to be planted were identified based on a study by Thanal, including neem, cinnamon, mango, Indian rosewood, tamarind, bamboo, jackfruit, and others. As part of the project, the local government had already planted around 4 lakh trees in previous years. However, financing the tree planting program based on the Meenangadi tree banking model posed a significant challenge, and some form of green fund support would be necessary to encourage financial institutions to invest in tree planting (Isaac 2020). Till now, only in two wards of the panchayat, wards 1 and 2 (choothupara and Appad respectively) are given money as per the scheme. It is yet to be implemented in the rest of the wards.



Around twenty nurseries were established to facilitate the planting of trees in the Panchayat. To maintain ecological balance, different tree species were chosen rather than planting the same type throughout the area. The distribution of tree saplings was based on the specific needs of the residents, focusing on species native to the Western Ghats. In total, nearly three lakh trees were planted in the Panchayat as part of the carbon-neutral project. The Panchayat's motivation to undertake the carbon neutral project stemmed from their existing engagement in various activities, such as supporting tribal communities to cultivate their own land through initiatives like agro-root and agro-veg since 2005. Additionally, afforestation efforts were carried out in areas like "Manikavu", a Shiva temple spread over 48 acres of land, which was transformed into a man-made forest through the "Punyavanam programme". An area of four acres was reserved for the temple, while the remaining 44 acres were planted with approximately 115 varieties of trees. The Panchayat also sought to afforest the approximately 58 traditional "kaavu" sites in the area, and studies were conducted with the reports duly submitted.

To monitor and oversee tree planting and maintenance, the Panchayat delegates the responsibility to the Haritha Karma Sena. When individuals apply to join the scheme, the Haritha Karma Sena conducts site visits and submits field reports to the Panchayat. Based on the survey, the Mahatma Gandhi National Rural Jobs Guarantee Scheme (MNREGS) team supplies and plants saplings in the designated areas. The Panchayat uses GPS to register each planted sapling through the Haritha Karma Sena, enabling easy tracking. The "Annuity on Newly Planted Saplings" initiative aims to protect and maintain the newly planted trees for at least two decades. The MNREGS team conducts three visits annually to the sites to ensure proper care and replace any lost or damaged saplings. After three years, the Panchayat hands over the relevant documents to the Cooperative Bank, proposing them for the annuity program. Additionally, the project promotes agroforestry – an integrated agricultural system that combines food crops, seasonal tree crops, and livestock on the same land. The Panchayat can allocate



fallow land to marginal farmers or farmer groups interested in practising agroforestry collectively.

Afforestation and effective waste management have significantly contributed to the reduction of emission levels in the area. Extensive research was carried out on vegetation and its preservation, leading to the banning of quarries and the promotion of eco-tourism. Quarrying activities were prohibited after submitting a request to the district Collector. As part of the “Green Campus” initiative, wastelands in schools were converted into thriving green areas. The preservation of bamboo was also prioritised, with the planting of 44 different varieties of bamboo species found in the Western Ghats within the premises of UPS Manikavu School and along the banks of the major rivers in the Panchayat. The successful implementation of the project was made possible through substantial academic support, with various surveys and research conducted. The project’s vision extends beyond merely reducing carbon emissions; it also aims to foster economic development for the people in the Panchayat through initiatives like tree banking and supporting shade coffee growers by branding and directly selling their coffee at higher prices. The active participation of students from high schools and colleges was remarkable, as they were deeply involved in conducting most of the door-to-door surveys.

The survey conducted reveals that 53.2 per cent of the respondents have received awareness about the carbon-neutral project through educational institutions. It includes any member of a family along with the respondents themselves. Increasing awareness through educational institutions should be done so as to ignite younger minds about the consequences of climate change and the need to bring carbon-neutral projects. Meenangadi Panchayat is a testing ground for creating a “Sustainable Development Framework” that is supported by science and meets all of the demands of the populace by mainstreaming climate change. Following the Paris Agreement, discussions for developing low-carbon infrastructure gained centre stage at the Conference of Parties-21 (COP21). India has pledged to cut its GHG emission intensity by 33-55 per cent from 2005 levels by 2030. The best method for solving the issue is to improve livelihood prospects and foster socio-economic resilience through adaptation measures. This project is



distinctive because of its guiding philosophy. Kerala has traditionally served as an example for other states to follow in a number of areas, including health, education, and environmental preservation (Thanal 2018).

According to the Kyoto Protocol (1997), the following gases are referred to as “greenhouse gases”: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs) (OECD 1998). Every year, several sectors estimate the amount of these gases that are emitted into the atmosphere. The Intergovernmental Panel on Climate Change (IPCC)¹⁰ refers to four major sectors that should be included in national inventories: energy, industrial processes and product use (IPPU), agriculture, forestry and other land use (AFOLU), waste, and transportation, with each sector being further divided into a number of categories. The hardest element for local self-government is to create a research approach that is “tailor-made” for calculating GHG emissions while carefully following the IPCC criteria for each contributing sector. The Meenangadi project evaluated the total carbon emissions from AFOLU (Agriculture, Forestry, and Other Land Use), waste, transportation, and electricity. Estimates of the total carbon content of the soil, homestead, forests and coffee plantations were made (Thanal 2018).

The goal of this project is to create a community-based climate change adaptation model that can be replicated around the globe with the help of local self-governance and a state government. There are a number of challenges for this campaign cum research project, which include the following: The number of major greenhouse gases included in the emission inventory was limited to three: carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (NO). Similarly, the assessment of carbon sequestration was restricted to the carbon in soil, the above- and below-ground biomass of homestead trees, and the carbon locked up in forests and plantations. The primary data collection process was highly challenging. The procedure of creating an emissions inventory for the transport industry is challenging, and Meenangadi’s residents’ internal traffic emissions were the only ones considered. Popular tourist spots and significant state and national routes draw vehicle traffic to this area. While



Meenangadi's mobility needs and automobile ownership rates are still relatively modest, both are rising. Pollution management in the transportation sector is outside the purview of local self-government; but, on a trial scale, the introduction of e-rickshaws and the enhancement of infrastructure facilities will have a favourable impact on total emission reduction efforts. According to estimates, the transport industry in Meenangadi is responsible for around 45 per cent of all GHG emissions (Thanal 2018).

The Meenangadi Grama Panchayat's major carbon sinks are forests, homestead trees, and homestead coffee. Forests and Homestead trees cover 72 per cent of carbon stores. Based on the baseline calculation of total emissions and sequestration for the base year 2016-17, it is assumed that the difference between total emissions and sequestration is 11,412.57 tonnes of CO₂ equivalent, and it can be considered the "Carbon Balance" for the base year 2016-17 for Meenangadi panchayat. Over 15,000 tonnes of CO₂ equivalent must be offset by Meenangadi in order to reach "carbon neutrality". The best ways to reach and maintain carbon neutrality are to reduce emissions, enhance carbon stocks, and develop carbon credits and reserves.

Switching to energy-efficient equipment has the potential to reduce electricity consumption, according to surveys. About 11 per cent of the total emissions would be reduced by using energy-efficient lighting, such as LED bulbs, which would result in a net reduction in GHG emissions from the energy sector of 2.3 per cent. According to the survey conducted, 90 per cent of the respondents in the Meenangadi Panchayat use LED lights in their houses. In areas like the Panchayat Office, Bus Stand, Agriculture Office, Village Office, and other public utility locations, Meenangadi Grama Panchayat intends to start a process for installing mobile charging hubs that use solar power. Promoting the use of solar-powered lights will be one way to accomplish this goal. Each home should receive financial support for at least one solar lighting unit, which can be increased if the beneficiary so chooses, in order to spark interest in solar lighting. The survey conducted reveals that only 11.8 per cent of the respondents use solar power in their homes. The panchayat encounters challenges in providing subsidies for



solar power independently. The support for such initiatives comes from projects undertaken by the Kerala State Electricity Board (KSEB), which operates at the state level and cannot be specifically tailored for Meenangadi panchayat alone. Around 70.6 per cent of the respondents use cooking gas for their daily use, and 22.5 per cent use firewood. 10 per cent of the energy sector's GHG emissions are attributable to the combustion of firewood. Domestic garbage, cow dung and cow urine can be used to make cooking gas and enhanced liquid manure, which can be fed to the biogas plant. Additionally, this will aid in regulating the 0.7 per cent of total GHG emissions that come from livestock waste (Thanal 2018).

The Energy Park, a hub where renewable energy sources produce electricity and are delivered to the power grid, is another project idea that has been floated. The Panchayat bus stop and office building's roof will be used to collect light, which will then be turned into electricity. This will compensate for the grid-based electricity used by companies, offices, and institutions working in the Meenangadi Grama Panchayat's Panchayat Office Building. The energy park, a symbol of Carbon Neutral Meenangadi, will educate and teach the public on energy conservation, energy-saving technology, carbon neutrality ideas, etc. The Energy Park is anticipated to result in net GHG savings of 2 per cent. Projects like the construction of an energy park pose a challenge for the panchayat to invest in independently. Collaborative efforts with various governmental agencies, such as the Bureau of Energy Efficiency under the Government of India in Thiruvananthapuram, are required to undertake such initiatives. The primary obstacle preventing the realisation of the Energy Park concept was the absence of designated priority for panchayats, resulting in project implementation delays. Composting of organic and agricultural waste is the key component of the technique for enriching soil carbon levels. Composting needs to be promoted at both community and household levels. Composting on a broad scale as soil additives should be encouraged so that soil health can be improved by raising soil carbon levels. 948 tonnes of waste are added to emissions each year. It contributes to about 3 per cent of the Panchayat region's overall GHG emissions. A 100 per cent decrease



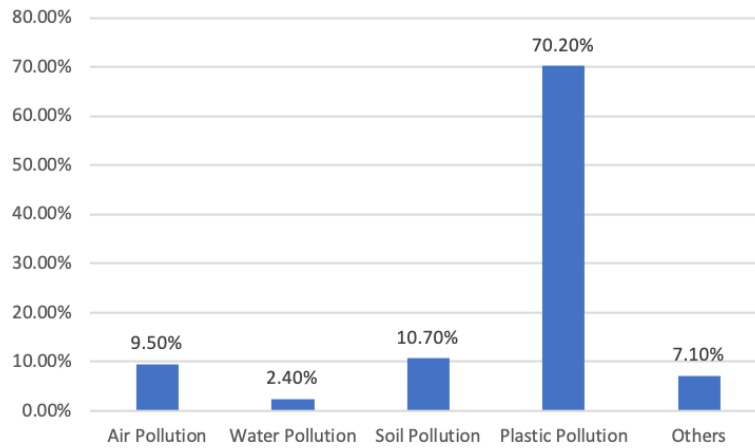


Fig. 1. *Decreased levels of pollution in the panchayat.*

is feasible with the right technology and procedures in place. Composting and biogas systems that are decentralised and located at the source can handle food waste and resource recycling. The Panchayat must make it mandatory for everyone to take little steps to cut back on the use of plastics and disposable goods in order to conserve energy and resources. The survey shows that 82.4 per cent of the respondents use eco-friendly bags for purchases. It is an achievement since a large percentage of the respondents are using eco-friendly bags. The Panchayat is responsible for creating regulations for the disposal of plastic waste and for finalising the fees that will be assessed to store owners, retailers, and other businesses that sell plastic goods and plastic-packaged items.

According to figure 1, 70.2 per cent of the respondents have said that plastic pollution has decreased in the panchayat, 10.7 per cent said that soil pollution has been reduced, 9.5 per cent said that air pollution has been reduced, 7.1 per cent said that other forms of pollution has been reduced and 2.4 per cent said that water pollution has been reduced. By interviewing Haritha Karma Sena secretary, it could be understood that by 10th-15th of every month, plastic wastes are collected from every house in the panchayat covering all the nineteen wards. For

each ward two people go for collecting plastic wastes. The residents pay an amount of 100 rupees every three months to the Haritha Karma Sena for collecting plastics. Yearly it becomes an amount of rupees 400 per household. There is a shredding unit in Meenangadi for shredding the plastic wastes. It is then used for road tarring purposes. Also, from almost 900 shops including hotels, plastics wastes are being collected every 30th of the month. Plastic pollution has therefore reduced to a larger extent and also roads are clean as people are not throwing plastic covers and packets”. A total of 21 workers are working in the Haritha Karma Sena presently and the lack of proper funds makes it difficult to function at certain times. It is imperative to create climate literacy among the people so that people care about the environment too in their day-to-day life activities. Unfortunately, this is lacking in Kerala. Therefore, grassroots-level initiatives like in Meenangadi Panchayat can create awareness among the people about the consequences of climate change and hence the rate of climate literacy in the state can be increased if all local self-bodies take such an initiative. The Meenangadi project has been successful to a larger extent in creating awareness about the project and its goals and thereby educating them about climate change impacts. The graph represents the various means used by the panchayat to create awareness among the residents about the carbon-neutral project.

As shown in figure 2, 48.3 per cent of the residents have received awareness through gram sabha meetings, 19.5 per cent through seminars conducted in the panchayat as part of the project, 12.6 per cent through other means, 8 per cent through sessions or talks, 6.9 per cent through house campaigns and 4.6 per cent through panchayat meetings. Education institutions in the Meenangadi panchayat have a significant role in creating awareness to the people about this project. More than half of the respondents (67.6 per cent of the respondents) have said that they have done activities in their homes as part of the project. Most of the respondents who have done activities in their households did planting tree saplings, creating composts, segregating plastic wastes so that they are collected by the Haritha Karma Sena of the panchayat, waste tanks for dumping organic wastes, biogas, usage of paper pens etc. Vegetable farming in



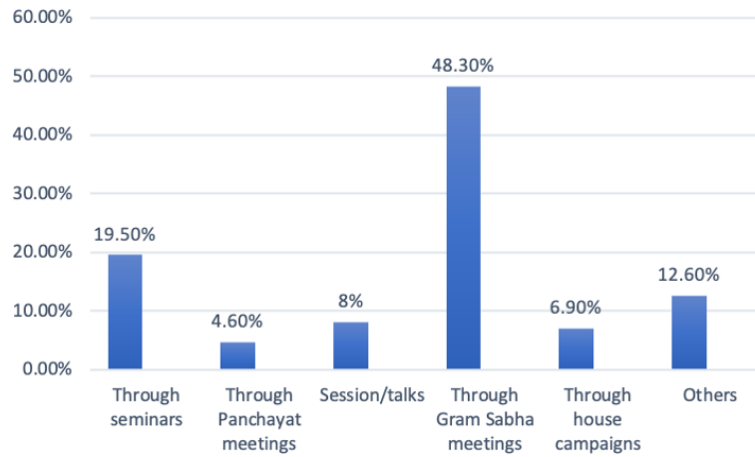


Fig. 2. Graph showing the means of awareness creation about the carbon-neutral project.

households has been practiced by 34.4 per cent of the respondents. Involving local governments in climate change initiatives may democratise and boost public participation. Figure 3 depicts the ways through which the residents in Meenangadi panchayat has been actively participating in the implementation of the project in one way or the other. It shows that 79.2 per cent has engaged in various activities for the project like reducing plastic usage, not littering, campaigning activities, planting tree saplings, participating in gram sabha meetings, waste management especially plastics, awareness creation for neighbors and relatives etc. Also, 11.7 per cent participated through educational institutions and a few people through kudumbashree, youth clubs, as elected representatives etc. Increased participation of people is the goal of decentralised governance and Meenangadi panchayat has succeeded to a larger extent in bringing more people to participate in its policies and actions.

From the survey it was revealed that 92.1 per cent of the respondents support the Meenangadi carbon neutral project and 84.4 per cent of the respondents believe that this project would be a model for other panchayats in Kerala as well as India as a whole. In the survey, when the respondents were asked whether they had felt any kind of a positive change in their lives

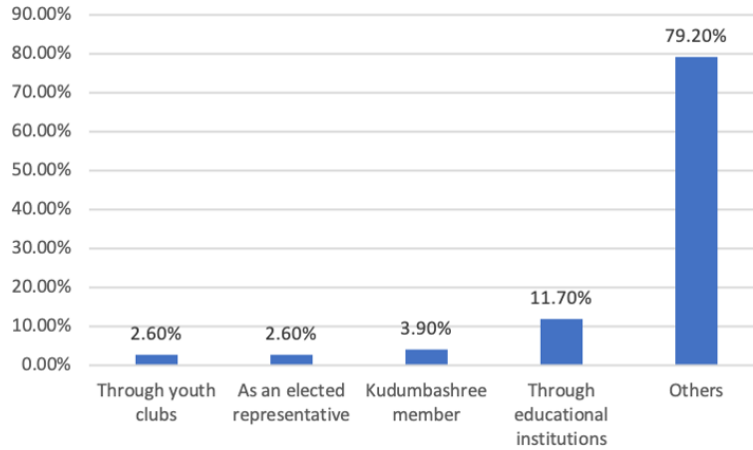


Fig. 3. Active participation of people in implementing the project.

after this project was implemented, the majority of them said yes. They say waste management is done excellently, especially plastic waste. They feel the air has become cleaner because people do not burn plastics like they used to. The degradable and non-degradable wastes are being separated in the houses by the people themselves and the non-degradable wastes, such as plastics are being collected by the Haritha Karma Sena. The food wastes and other biodegradable wastes are managed in the house itself by creating compost pits, biogas etc.

According to Beena Vijaya, the former President of Meenangadi Panchayat,

while several aspects of the project are being implemented, some of the promised plans are yet to be put into action. The panchayat serves as a testing ground to become a model for addressing climate change and to extend the initiative to other panchayats in Wayanad, aiming to make the district carbon neutral. Meenangadi panchayat has been involved in activities for sustainable development, even before officially joining the carbon-neutral project. In the second phase of the project, the extent of carbon sequestration achieved will be assessed.

The panchayat has achieved success in waste management and tree planting. But there are certain political and technical challenges in implementing some goals of the project. “One of the major challenges faced while implementing this project was the emission calculation from vehicles which passes through the National Highway stretching 57km through the panchayat. A question of where to accommodate these emissions arose and it was not accounted in the panchayat emissions. Thus, there were certain methodological challenges to calculate the emissions”, opined Mr. Jayakumar C., Director of Thanal.

The carbon neutral project in Meenangadi has faced delays due to factors such as the Covid-19 pandemic and the Panchayat elections in 2020. Despite these challenges, the panchayat has made significant progress in reducing carbon emissions through tree planting, proper waste management, and energy-efficient measures like using LED bulbs. However, data collection to measure the exact reduction in carbon emissions was hindered by Covid-19 restrictions. Additionally, the distribution of funds under the tree banking scheme was postponed due to the elections to avoid potential political issues. New staffs and coordinators for the project are yet to be placed since the new party has taken office (UDF has won the panchayat election 2020, replacing LDF). Nevertheless, the current President, K.E Vinayan, emphasises the importance of policy continuity in a democratic setup and ensures that the carbon-neutral project will continue in Meenangadi.

CONCLUSION

Climate-responsive local governance is the need of the hour. The significance of local self-governments in strategic climate-resilient planning is often overlooked, despite their crucial role in project execution. The Meenangadi carbon neutral project is a test to see how local self-government bodies can act as a catalyst to address climate change. A project like this at the grassroots level is the first of its kind in India. Meenangadi panchayat was able to create awareness among the people about the project and the consequences of climate change which is the most important



yet difficult task. The project has succeeded in afforestation and waste management at a larger scale, and many other activities are also done, as mentioned earlier. Some schemes of the project are yet to be implemented. The panchayat has its own challenges like lack of technical expertise, lack of adequate funds, political issues within the panchayat, Covid-19 etc. Overcoming such challenges requires support from various sectors of the government. Institutions at the grassroots level should be given more autonomy and funds to act more independently.

The decision-making capabilities of the local self-governments are constrained by the lack of readily available skills and knowledge resources at its level. Additionally, global climate agreements and developments rarely consider the perspectives of local self-governments. Limited legislative powers also hinder the ability of these bodies to act as custodians of their local environment, leading to challenges in preventing damage such as water source contamination, illegal tree felling, and quarrying. To address these issues, there is a pressing need to empower local self-governments at the district, block, and local levels, promoting enhanced community participation for the effective implementation of climate-resilient measures. They must be important participants in the making of SAPCC since they have precise knowledge of the functional challenges during implementation. The local self-governments and state governments must ensure that women and children, civil society, experts, local information institutions and the media are included in all certain phases of policy formulation and preparation. Every department should receive a project checklist aligned with the State Action Plan on Climate Change (SAPCC) during the planning and implementation stages. Enterprising local self-government level projects and developments, such as the Carbon Neutral Meenangadi Project in Wayanad district, are the state's flagship climate resilience-building programmes. Since Carbon Neutral Meenangadi is a pioneering project, it's critical to monitor its effects and share lessons learned with other local self-governments and communities.



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