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Government of Puducherry

Department of Science, Technology and Environment

REPORT OF ONE DAY WORKSHOP ON

BUILDING CARBON-NEUTRAL PUDUCHERRY: GREEN HOUSE GASES ASSESSMENT

22.03.2024

CRYSTAL HALL, HOTEL ATITHI, PUDUCHERRY

Organized by

Puducherry Climate Change Cell
Government of Puducherry

Supported by

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Department of Science & Technology
Government of India

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INTRODUCTION

Over the last two decades, especially after the Paris Agreement, there is a drastic increase in a concentrated global effort, including in India, to tackle the pressing issue of climate change by significantly reducing emissions. This endeavor is driven by the recognition that every nation must play its part in meeting global emission reduction targets. At the 26th Conference of the Parties (COP26) of United Nations Framework Convention on Climate Change in November 2021, held in Glasgow, India made a commitment to reach net-zero carbon emissions by 2070. In continuation to this, the Government of Puducherry pronounced its pledge to curtail its carbon footprint and achieve carbon neutrality by 2047 during the Conference of Union Territories on October 26, 2023. To achieve this, Government departments in Puducherry are actively engaged in formulating and executing comprehensive, long-term strategies aimed at achieving net-zero emissions.

In light of these commitments, it's crucial to assess and evaluate the effectiveness of our visions, plans, and policies, including their implementation. This assessment is vital to ensure that we are on track to meet our targets. Implementing a robust mechanism for tracking the real impact of our policies and actions, such as greenhouse gas (GHG) assessment or GHG inventorying, is essential. This serves as a foundation for informed decision-making, enabling us to identify priority areas for emission reductions, set achievable targets, and track our progress over time.

A comprehensive GHG assessment empowers us to develop evidence-based policies, strategies, and interventions that are tailored to the specific context of Puducherry and are in alignment with broader sustainable development objectives. By systematically evaluating our emissions and their sources, we can identify opportunities for improvement and refine our approach to mitigating climate change. This ensures that our efforts are not only effective but also efficient in driving positive environmental outcomes while supporting the overall development agenda of the region.

In this context, the Puducherry Climate Change Cell (PCCC) functioning in the Department of Science, Technology and Environment, Government of Puducherry conducted one day training Workshop on 22.03.2024 at Crystal Hall, Hotel Athiti, Puducherry on the topic "Building Carbon-Neutral Puducherry: Green House Gases Assessment" for government officials and other concerned stakeholders to address emission assessment interventions like the carbon foot-print, GHG inventorization, etc. The program was supported by the Department of Science and Technology, Government of India through the National Mission for Strategic Action on Climate Change (NMSKCC).

The objective of the workshop is to provide thorough scientific understanding of GHG inventory, carbon sequestration and net zero policies and preparation of Department level GHG inventory. The resource persons from Centre for Sustainability and Climate Studies, Pondicherry University, Puducherry, Auroville Consulting, Auroville and Industrial Energy Assessment Cell, IIT Madras made presentations on various aspects of Green House Gases during the technical sessions.

The workshop witnessed active participation from 90 attendees, comprising representatives from various government departments and academic institutions. The diverse mix of participants ensured a rich exchange of ideas and perspectives throughout the event. The technical sessions were designed as an interactive and participatory event, encouraging attendees to engage in discussions and share their experiences. Case studies relevant to the Union Territory of Puducherry were presented, allowing participants to explore real-world scenarios and understand how climate change issues manifest at the local level.

Overall, the workshop served as a crucial platform for fostering collaboration, sharing knowledge, and building capacity among stakeholders involved in climate change mitigation efforts in Puducherry. By enhancing the understanding of greenhouse gas assessment techniques and promoting informed decision-making, the workshop aimed to catalyze efforts towards achieving a carbon-neutral future for the region.

SCHEDULE OF EVENTS

Time	Events
10.30-10.40	Welcome Address *by Shri. K. Kalamegam, Environmental Engineer, Department of Science, Technology and Environment, Puducherry.*
10.40-11.00	Key Note Address *by Dr. A. Muthamma, I.A.S., Secretary to Government (Science, Technology and Environment), Puducherry.*
11.00-11.30	Introductory Remarks about the workshop *by Thiru. Toine van Megen, Co-Founder of Auroville Consulting, Auroville*
11.30-12.30	Demystifying Climate Change *by Dr. Mathimaran Natarajan, Centre Head & Coordinator, Centre for Sustainability and Climate Studies, Pondicherry University, Puducherry.*
12.30-13.30	"Net Zero carbon emission strategies" *by Thiru. Raghav Nandakumar, Team lead – Sustainability and climate services, Auroville Consulting, Auroville*
14.00-14.45	Case Studies on GHG Inventory *by Thiru. Dhipankumar Kanakasabapathi, Senior Manager, Industrial Energy Assessment Cell, IIT Madras*
14.45-15.45	Methodology for calculating GHG Emissions *by Thiru. Arun Venkatraman, Auroville Consulting, Auroville*
15.45-16.30	Hands on Exercise *by Thiru. Mohan Murali, Senior Analyst, Auroville Consulting, Auroville*
16.30-16.55	Q&A Session
16.55-17.00	Vote of Thanks *by Dr. R.Sagaya Alfred, Senior Scientific Officer, Department of Science, Technology and Environment, Puducherry.*

WORKSHOP PROCEEDINGS

INAUGURAL SESSION

The inaugural session of the workshop on "Building a Carbon – Neutral Puducherry: Greenhouse Gases Assessment commenced with an Invocation, invoking blessings for the endeavor ahead, on 22.03.2024 at Crystal Hall, Hotel Athiti, Puducherry.

Recognizing the significance of Greenhouse Gas Assessment as a pivotal instrument in gauging Puducherry's carbon footprint, the session aimed to chart a course towards sustainable practices for the region's low carbon future.

Shri. K. Kalamegam, Environmental Engineer, Department of Science, Technology and Environment, Puducherry delivered the welcome address and set the stage for the workshop by briefing the guests and participants about the background of the workshop.

Dr. A. Muthamma, I.A.S., Secretary to Government (Science, Technology and Environment), Puducherry in her Keynote address urged that we were compelled to collectively address one of the most pressing challenges of our time – "climate change", and to work on all possible means of mitigating our emission prone "business as usual" to a more sustainable pathway that would ensure "nature as it was". Given the urgent need to address climate change, collaborative discussions and knowledge sharing among government departments, experts, and stakeholders are crucial. Further, Secretary emphasized that by identifying innovative solutions, best practices, and policy measures, we can accelerate progress towards carbon neutrality in Puducherry. Achieving carbon neutrality requires a clear understanding of our current emissions and strategies to offset them. This involves reducing emissions to the maximum capacity and offsetting any remaining emissions through sustainable practices such as afforestation, renewable energy adoption, and carbon sequestration. This workshop serves as a productive platform for fostering collaboration and initiating steps towards building a carbon-neutral Puducherry.

Shri. Toine van Megen, Co-Founder of Auroville Consulting, Auroville delivered the Introductory Remarks and highlighted the comprehensive nature of Puducherry's policy, which included provisions for net metering, virtual net metering, and gross metering. He expressed optimism about Puducherry's ability to achieve the target of one crore rooftop solar systems, given the availability of suitable roofs in the region. He presented the

importance of the workshop, citing a graph from a report by the World Watch Institute to illustrate the challenges posed by current consumption levels. He deliberated the historical context of CO_2 emissions, mentioning the significance of the commercial steam engine in triggering the industrial revolution and subsequent emissions. He accentuated the link between energy consumption and economic growth, emphasizing the need for sustainable energy solutions. He also pointed out the global energy consumption trends and stressed the importance of conservation, efficiency, and renewable energy adoption. He outlined the characteristics of a modern electricity grid and showcased examples of solar energy implementation in Puducherry, including rooftop solar installations and the net metering policy.

TECHNICAL SESSIONS

SESSION I: DEMYSTIFYING CLIMATE CHANGE

BY DR. MATHIMARAN NATARAJAN, CENTRE HEAD & COORDINATOR, CENTRE FOR SUSTAINABILITY AND CLIMATE STUDIES, PONDICHERRY UNIVERSITY, PUDUCHERRY

In Session I of the workshop titled "Demystifying Climate Change," Dr. Mathimaran Natarajan from Pondicherry University emphasized the increasing relevance of climate change education, even at the school level. He highlighted the importance of understanding climate change and greenhouse gases to effectively address environmental challenges. Dr. Natarajan discussed various sources of greenhouse gas emissions, both natural and anthropogenic, stressing the need to maintain a balance to prevent detrimental effects on the environment. He emphasized the significance of transitioning to renewable energy sources to mitigate greenhouse gas emissions effectively.

Furthermore, Dr. Natarajan explained the crucial role of greenhouse gases in maintaining Earth's stability when in balance and the adverse consequences of exceeding this balance, such as global warming. He elaborated on the concept of global warming potential (GWP) and its calculation, emphasizing the necessity of comprehending these terms. Additionally, Dr. Natarajan provided insights into Earth's history, discussing past temperature fluctuations and sea level changes, underscoring the importance of monitoring current global mean temperatures.

Addressing the effects of climate change, Dr. Natarajan highlighted the critical global temperature limit of 1.5 degrees Celsius and stressed the need to consider various scenarios and models for predicting future temperature changes. He urged the audience to incorporate this understanding into policy formulation and action plans for addressing environmental challenges, particularly in the UT of Puducherry. Dr. Natarajan's comprehensive presentation underscored the importance of understanding Earth's history, current climate conditions, and the potential impacts of climate change on a global scale.

SESSION II: NET ZERO CARBON EMISSION STRATEGIES

BY THIRU. RAGHAV NANDAKUMAR, TEAM LEAD – SUSTAINABILITY AND CLIMATE SERVICES, AUROVILLE CONSULTING, AUROVILLE

Dr. Raghav Nandakumar, Team Lead – Sustainability and Climate Services, Auroville Consulting, Auroville commenced his presentation by sharing a succinct historical account of climate change. He clarified that the objective was not to delve into intricate scientific details but rather to ensure comprehensive comprehension among the audience.

Reflecting on the past, Dr. Raghav underscored the evolution in awareness regarding climate change. Just five years earlier, the terms "net zero" and "climate change" were unfamiliar to many. He emphasized the significant shift, noting the current widespread familiarity with these terms.

The narrative then transitioned to pivotal moments in scientific history. Dr. Raghav elucidated on the groundbreaking work of scientists such as Svante Arrhenius, who first detected the rise in global temperature in 1896, and Guy Callendar, who, in 1938, provided evidence linking temperature increase to carbon dioxide emissions from burning fossil fuels.

Further, Dr. Raghav highlighted the contributions of Charles David Keeling, who, in 1958, developed a device to measure carbon dioxide levels in the atmosphere. Keeling's research demonstrated a correlation between rising carbon dioxide levels and global temperature increase, providing crucial evidence of human-induced climate change.

The narrative then shifted to the development of computer models by Japanese scientist Syukuro Manabe in 1967. His models accurately predicted the impact of increasing carbon dioxide emissions on global temperatures, solidifying the scientific consensus on climate change.

Dr. Raghav emphasized the significance of physical evidence, highlighting the groundbreaking discovery of air samples trapped in Antarctic ice cores. These samples provided a historical record of atmospheric composition over 150,000 years, corroborating the scientific understanding of climate change. By 1988, a global consensus among scientists had emerged, acknowledging the reality of climate change and its attribution to human activities such as burning fossil fuels.

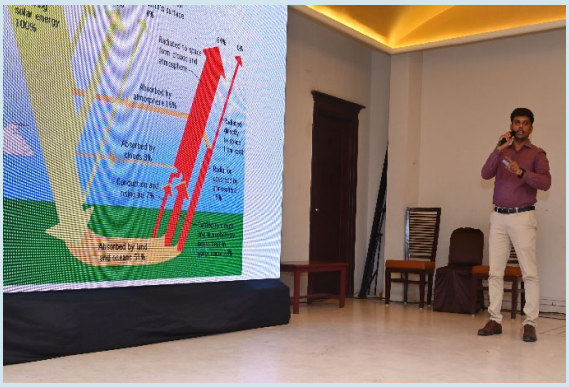
Regarding the scientific consensus on Climate Change, Dr. Raghav indicated that it is widely accepted that climate change is real and caused by human activity. Dr. Raghav reported that a group of scientists form a panel known as the Intergovernmental Panel

on Climate Change, convenes annually to gather data from around the world on global warming and climate change, which is then published in the IPCC journal. The question of what actions should be taken in response to this consensus, leading to the formation of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. This agreement, signed by 198 countries, aims to address climate change through annual meetings where governments discuss and debate solutions.

Dr. Raghav highlighted disagreements among countries regarding emissions, particularly regarding the responsibility to act on climate change. He also mentioned discussions on the causation of emissions and the subsequent effects of climate change, emphasizing the importance of holding responsible parties accountable for addressing climate change. Finally, Dr. Raghav concluded by emphasizing the importance of understanding this historical context in addressing contemporary environmental challenges, India's vulnerability to climate change and the multitude of risks it faces, including cyclones, droughts, and heatwaves.

SESSION III: CASE STUDIES ON GHG INVENTORY

BY THIRU. DHIPANKUMAR KANAKASABAPATHI, SENIOR MANAGER, INDUSTRIAL ENERGY ASSESSMENT CELL, IIT MADRAS



In Session III of the workshop, Mr. Dhipankumar Kanakasabapathi, Senior Manager at the Industrial Energy Assessment Cell, IIT Madras, elucidated the significant role of energy consumption across various sectors, including transportation, agriculture, and waste

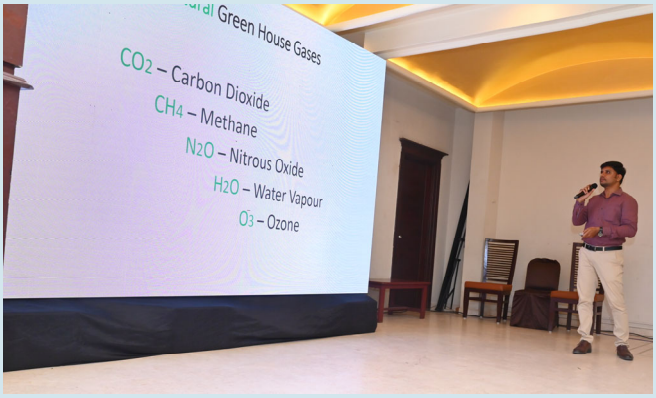
management. He underscored energy as the primary source of emissions, thus emphasizing the need for efficient energy management.

Mr. Dhipankumar provided an overview of greenhouse gases and their impact on the Earth's atmosphere, explaining the greenhouse effect and its contribution to global warming. He highlighted common energy sources and their associated carbon dioxide emissions, ranging from electricity to petrol and diesel.

The presentation emphasized the importance of energy efficiency and conservation, distinguishing between technological advancements and behavioral practices aimed at reducing energy consumption. Practical measures to improve energy efficiency in building structures, such as optimizing heating, cooling, and lighting systems, were discussed.

Mr. Dhipankumar emphasized the significance of accurately quantifying energy usage for effective conservation initiatives, particularly in industrial settings. Insights from energy audits were shared, including recommendations for utilizing energy-efficient appliances and implementing motion sensors to regulate lighting in commercial buildings.

Overall, the session provided valuable insights into energy consumption, efficiency, and conservation measures, highlighting the importance of comprehensive strategies to mitigate greenhouse gas emissions and promote sustainable energy practices.



Furthermore, specific examples of energy conservation measures implemented in markets are discussed, with a focus on optimizing lighting and utilizing energy-efficient pumps. The necessity of accurately quantifying

energy consumption is emphasized, with various measures proposed to suit different utilities and processes within industries.

Additionally, a comparative analysis of various fuel types used in trucks was presented, taking into account factors such as fuel efficiency and emissions. The importance of monitoring energy usage through diverse methods, including energy meters, to monitor consumption and identify conservation opportunities was underscored.

In conclusion, Mr. Dhipankumar highlighted the critical importance of quantifying and monitoring energy usage while implementing tailored conservation measures to optimize efficiency across diverse sectors. He emphasized understanding energy usage patterns, quantifying emissions, and adopting measures to enhance energy efficiency and conservation throughout society.

SESSION IV: METHODOLOGY FOR CALCULATING GHG EMISSIONS

BY THIRU. ARUN VENKATRAMAN, AUROVILLE CONSULTING, AUROVILLE

Mr. Arun Venkatraman, Auroville Consulting, Auroville delivered a comprehensive presentation on methodologies and numerical analyses for conducting greenhouse gas (GHG) inventories and assessments. The presentation was structured to provide a deep understanding of climate change dynamics, historical backgrounds, and practical measurement techniques to gauge its impact.

Mr. Arun elaborated on the historical context of climate change and discussed various measurements used to understand its impact. This segment provided crucial insights into the evolution of climate science and the severity of the current climate crisis.

Consideration was given to the significant impact of transportation and electricity consumption on carbon emissions. He highlighted the importance of assessing and mitigating these emissions to combat climate change effectively. The presentation emphasized the need for future planning to understand the impact of various activities on carbon emissions and the importance of considering multiple factors within primary companies to develop comprehensive sustainability strategies.

He highlighted the need for improvement in response strategies, particularly focusing on circular frameworks and responsibility enhancement. He emphasized the importance of data improvement and continuous enhancement strategies for emissions analysis.

The discussion progressed to methodology, where the speaker elaborates on emissions factors and their impact on different activities. Various scenarios, such as electricity consumption and transportation, are analyzed to understand their carbon emissions. The speaker emphasizes the need for standardized procedures for emissions measurement and reporting.

Furthermore, He touched upon emissions from sources like LPG (liquefied petroleum gas) and their calculation methodologies. Different emission factors are discussed, and the importance of considering emissions reductions within company boundaries is emphasized.

Mr. Arun introduced a circular framework designed to guide organizations in implementing sustainable practices. This framework covered different categories and proposed implementation strategies tailored to specific organizational contexts. He emphasized the critical role of proactive measures in mitigating the adverse effects of human activities on the environment.

Following the presentation, attendees engaged in discussions regarding the practical implementation of the strategies outlined by Mr. Arun. There was consensus among participants regarding the importance of adopting sustainable practices and collaborating with stakeholders to drive meaningful change.

In conclusion, Mr. Arun Venkatraman provided valuable insights and actionable strategies for organizations to address emissions control and improve efficiency. His ideas were instrumental in advancing sustainability efforts and combating the global climate crisis. The tackling emissions control and improving efficiency required a concerted effort from all stakeholders involved.

SESSION V: HANDS ON EXERCISE

BY THIRU. MOHAN MURALI, SENIOR ANALYST, AUROVILLE CONSULTING, AUROVILLE

Mr. Mohan Murali, Senior Analyst, Auroville Consulting, Auroville elaborated on categorizing emissions into direct operations, Scope 1 - Direct emissions from sources owned and controlled by the department. Scope 2 - Indirect emissions from the generation of purchased electricity consumed at department facilities and Scope 3 - Other indirect emissions that occur as a consequence of the department's activities, but from sources not owned by the department. Examples: Scope 1: LPG, Diesel Generator, Fuel for the department (owned vehicles)

and Air conditioners; Scope 2: electricity consumption and Scope 3: various other activities such as vehicle usage, business travel, stationary purchases, food consumption, and waste management.

Murali detailed the critical nature of collecting precise and reliable data across these categories. The data quality was categorized as “High” for actual primary data supported with documents, records and bills, “Medium” for data verified for a sample set and then extrapolated to extract required data and “Low” for unverified and unsupported assumption for a sample set extrapolated to extract required data. He guided to use Greenhouse Gas accounting tool for efficient analysis, calculating emissions data and report generation / dashboard visualization over time.

Additionally, Mr. Murali mentioned the need of mitigation plans for reducing emissions, which may involve measures such as improving energy efficiency, adopting renewable energy sources, promoting sustainable transportation options, and enhancing waste management practices. Overall, Mr. Murali provided the importance of data collection, analysis, reporting, and mitigation planning in managing and reducing emissions effectively.

CLOSING REMARKS AND VOTE OF THANKS

BY DR. R.SAGAYA ALFRED, SENIOR SCIENTIFIC OFFICER, DEPARTMENT OF SCIENCE, TECHNOLOGY AND ENVIRONMENT, PUDUCHERRY.

Dr. R. Sagaya Alfred, Senior Scientific Officer at the Department of Science, Technology, and Environment in Puducherry, expressed deep gratitude to all participants and stakeholders for their active involvement in the workshop. He specifically recognized the indispensable support and guidance of Dr. A. Muthamma, I.A.S., Secretary to Government (Science,

Technology and Environment), Puducherry, and Shri. Yasam Lakshmi Narayana Reddy, Director, Department of Science, Technology. Their leadership was instrumental in organizing the event, which aimed to address critical issues surrounding climate change and work towards a sustainable future for Puducherry.

Dr. R. Sagaya Alfred highlighted significant presentations, starting with Mr. Toine van Megen's discussion on global emission scenarios, emphasizing the importance of understanding current and future projections, particularly in sectors like coal and transportation. He praised Dr. Mathimaran Natarajan's elucidation of fundamental concepts essential for effective climate change mitigation and adaptation strategies.

Acknowledgments were also extended to Mr. Raghav Nandakumar for his insights into net-zero carbon emission strategies, Mr. Dhipankumar Kanakasabapathi for his presentation on greenhouse gas inventory methodologies, and Mr. Arun Venkatraman for sharing methodologies to control emissions and improve efficiency within departments. He expressed gratitude to Mr. Mohan Murali for facilitating a hands-on exercise on greenhouse gas assessment.

In conclusion, Dr. R. Sagaya Alfred emphasized the urgent need for proactive measures to reduce emissions, underlining the collective responsibility of current and past generations. He thanked all contributors, workshop organizers, government officials, and scholars for their invaluable contributions to realizing a sustainable future. He urged continued efforts towards environmental consciousness and sustainability.

PARTICIPANTS

Sl. No.	Name and Designation	Department/ Organization
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PHOTO GALLERY


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