KSDMA
Kerala State Disaster Management Authority

Consultation Workshop
KERALA HEAT PROJECTIONS

4th March 2024, Thiruvananthapuram

Technical Partners

GeoHazards International | Woodwell Climate Research Center | GeoHazards Society India

Heat Projections for Kerala
Consultation Report
MARCH 04, 2024

Executive Summary

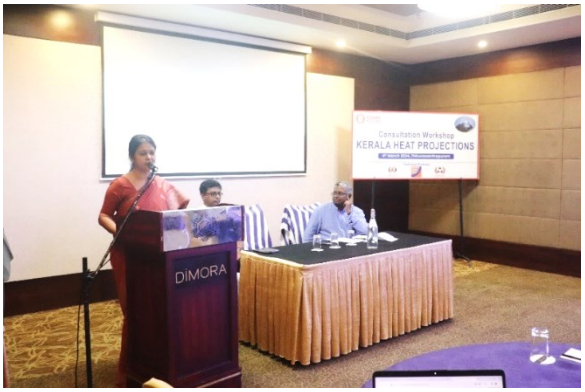

Figure 1: Inaugural Session

The Consultation Workshop on Heat Projections for Kerala, held at Hotel Apollo Dimora, Thiruvananthapuram, on March 4, 2024, marked a significant milestone in addressing Kerala's vulnerability to intense summer heatwaves. Organized by GeoHazards International in collaboration with GHS, Woodwell Climate Research Centre, and KSDMA, the workshop aimed to unveil comprehensive heat projections and discuss strategies for climate resilience and adaptation.

The inaugural session, attended by esteemed delegates including Ms. Tinku Biswal IAS and Dr. Sekhar L Kuriakose, emphasized the government's commitment to addressing climate change challenges. Technical sessions featured presentations by experts from Woodwell Climate Research Centre, IMD, International Centre for Free and Open-Source Software (ICFOSS), and GeoHazards International, providing detailed insights into heat projections, temperature forecasting, environmental monitoring, and green infrastructure solutions for heat island mitigation.

The interactive discussion session underscored the importance of collaborative efforts, streamlined climate modelling techniques, and interdisciplinary approaches in enhancing climate resilience and disaster preparedness. Key recommendations include advocating for high-resolution climate models, fostering consortiums for research and practical applications, and promoting proactive initiatives for climate adaptation.

The workshop concluded with a call to action, urging organizations to propose projects that leverage projected data to bolster climate resilience and disaster management in Kerala. The collective efforts showcased during the workshop exemplify a collaborative approach toward addressing the pressing challenges posed by rising temperatures and shifting climate patterns, paving the way for a more resilient and sustainable future for Kerala.

Technical Sessions

SESSION 1 –Dr. Alexandra Naegele and Dr. Abby Lute, Woodwell Climate Research Centre

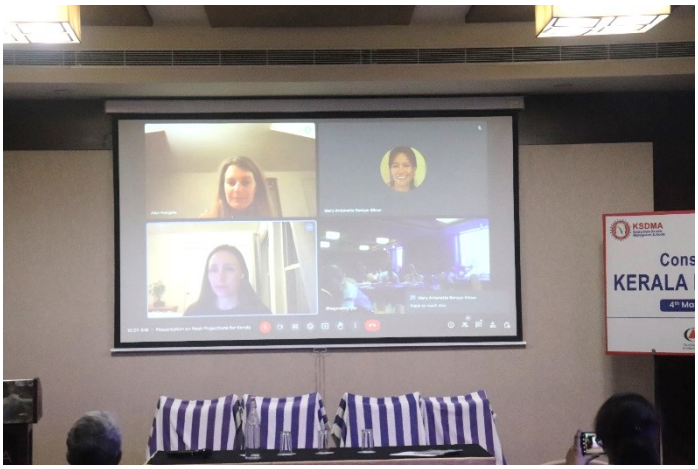

Figure 2: Woodwell presentation on Heat projections

Dr. Alexandra Naegele and Dr. Abby Lute delivered an extensive presentation on Heat Projections for Kerala. Utilizing advanced statistical downscaling techniques based on the methodology outlined in Karger et al. (2017), Woodwell climate experts processed historical and future climate data spanning from 1970 to 2060. This approach enabled the creation of high-resolution maps depicting heat projections under the SSP 5-8.5 Scenario, a widely-recognized emissions scenario for climate modeling. Collaborating with KSDMA, observed temperature data specific to Kerala were integrated into the analysis to ensure the accuracy and relevance of the projections. This comparative analysis provided deeper insights into how projected temperatures align with historical observations and local conditions.

The resultant statewide maps provide detailed information on projected temperature changes across Kerala for recent and future average time periods. These maps, with a spatial resolution of 30 arc seconds (~1 km), offer a granular view of temperature variations, enabling stakeholders to identify regions at higher risk of extreme heat events. Furthermore, the study generated monthly average temperature projections for distinct 20-year warming periods (2020-2040, 2040-2060) for each warming level. This temporal granularity allows policymakers and planners to anticipate and prepare for temperature trends over specific timeframes, aiding in the development of targeted adaptation strategies.

Key discussions

The presentation commenced with a detailed presentation of the findings derived from the temperature data downscaling project. The project meticulously employed an ensemble of 17 models, each boasting varying resolutions ranging from 0.75 degrees to 2 degrees, drawing from the CMIP6 dataset. Projections were meticulously crafted for both the SSP245 and SSP585 emission scenarios, providing a comprehensive outlook on the anticipated temperature trends for the Kerala region.

The findings unveiled during the workshop revealed crucial insights into the future temperature dynamics of Kerala, including:

Near Future (2020-2040): Anticipated warming of approximately 0.5°C across most locations in Kerala.

Mid-century (2040-2060): Projections indicated a more substantial warming trend, ranging between 1 and 1.5°C, contingent upon the emissions trajectories adopted.

Noteworthy observation: The projections exhibited a commendable level of accuracy in capturing seasonal cycles, thereby enhancing the reliability and applicability of the findings.

SESSION 2 – Shri. Arun Kumar V H, Scientist C, Indian Meteorological Department (IMD)

Shri. Arun Kumar delivered a comprehensive presentation on temperature forecasts and heat wave-related products offered by the IMD. He provided an overview of extreme temperature events, defining and examining heatwaves' characteristics and physical mechanisms. Shri. Arun Kumar highlighted factors contributing to heatwave occurrence, including local weather patterns and geographical features. Using research and climatological data, he elaborated on India's heatwave climatology, discussing historical trends and IMD's forecast and warning processes. The session concluded with insights into current trends and future projections of heatwaves in India and Kerala, emphasizing the importance of proactive measures in mitigating their adverse impacts.

Figure 3: Shri Arun Kumar, IMD

Key discussions

Temperature Scenario of Kerala: It has seen that 1- 3°C rise in monthly mean maximum temperature during the last 50 years.

SESSION 3 –Mr. Shafeek P M, Technical Coordinator, ICFOSS

Mr. Shafeek, the Technical Coordinator from ICFOSS, provided an overview of the LoRaWAN-based AWS/ARG deployment initiative in Kerala. ICFOSS, established by the Government of Kerala, focuses on implementing innovative environmental monitoring solutions. Mr. Shafeek explained the architecture of LoRaWAN technology, highlighting its role in cost-effective data transmission for environmental monitoring. He also discussed microclimate modeling and showcased the deployment of Automated Weather Stations and UV Monitoring Stations for real-time data collection.

Key discussions

Mr. Shafeek shared insights into the Carbon Neutral Kattakada Project, led by ICFOSS. This initiative aims to achieve carbon neutrality in Kerala's Thiruvananthapuram district by 2050, twenty years ahead of the Indian government's target. Kattakada's potential as the first carbon-neutral Assembly constituency in India demonstrates Kerala's commitment to sustainable development and environmental stewardship.

SESSION 4 – Dr. Mary Antonette Beroya-Eitner, GeoHazards International (GHI)

Figure 4: Dr. Antonette presenting on Heat Islands

During her presentation, Dr. Antonette provided a comprehensive overview of the Role of Green Infrastructure in Heat Island Mitigation. She began by defining the concept of a heat island and elaborating on its causes and characteristics, emphasizing the heightened temperatures observed in urban areas due to factors such as urbanization, impervious surfaces, and lack of vegetation cover. Dr. Antonette then transitioned to discussing Green Infrastructure, outlining its various components and highlighting its potential in mitigating urban heat islands. She emphasized the importance of incorporating natural elements such as trees, green roofs, and permeable surfaces into urban landscapes to counteract the heat island effect. Furthermore, Dr. Antonette detailed how Green Infrastructure enhances urban resilience by providing shade, reducing surface temperatures, and promoting natural cooling mechanisms such as evapotranspiration.

Key discussions

Through case studies and examples, she illustrated the effectiveness of Green Infrastructure in mitigating heat islands and fostering sustainable urban development. Dr. Antonette's presentation underscored the critical role of Green Infrastructure in creating more liveable, resilient, and climate-resilient cities.

Conclusion

Figure 5: The Workshop Participants

The consultation workshop served as an invaluable forum for fostering interdisciplinary dialogue and knowledge exchange about the critical subject of heat projections for Kerala. Through the Consultation of robust scientific findings and collaborative deliberations, the workshop underscored the urgency of proactive measures in supporting climate resilience and disaster preparedness within the region.

Venue and Workshop materials

The workshop was conducted at the conference hall of the Hotel Apollo Dimora in Thiruvananthapuram. As part of the workshop registration, all participants received environment friendly materials including a cloth bag, a plantable notebook, and a Seed pen along with the concept note. plantable paper and pens have the potential to support reforestation efforts, thereby enhancing soil health, preserving wetlands, improving water quality, and safeguarding animal habitats, while also mitigating landfill waste.

Figure 6: Eco-friendly material for workshop

Next Steps

To foster collaboration and proactive initiatives, organizations were encouraged to join forces and propose projects utilizing projected data to enhance climate resilience and disaster management in

Kerala. KSDMA mentioned that they will encourage united efforts to effect tangible change in addressing climate change challenges.

Media Coverage of the Workshop

Two examples of the media coverage in English Language newspapers are below.

Kerala may warm by 0.5 deg until 2040, 1.5°C by mid-century, say expert projections

Updated - March 06, 2024 at 11:27 AM.

Projections based on temperature data downscaling carried out by climate risk experts from India and abroad BY OUR BUREAU

Temperature projections for Kerala suggest that most locations may see a warming of 0.5°C in the near future (2020-2040) and an increase between 1°C and 1.5°C by mid-century (2040-2060), depending on emissions trajectories. These projections, unveiled during a two-day consultation/workshop held here, accurately captured seasonal cycles.

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These are based on a temperature data downscaling project for the Kerala region carried out by climate risk experts from the Woodwell Climate Research Centre in collaboration with GeoHazards International (GHI), GeoHazards Society, and the Kerala State Disaster Management Authority (KSDMA). The findings were presented to climate scientists and technical experts from government agencies and academic institutions during the workshop held here on Monday and Tuesday.

Ensemble of 17 models

The maximum temperature, using CMIP6 (Coupled Model Intercomparison Project), was statistically downscaled based on an ensemble of 17 models with varying resolutions from 75 degrees to 2 degrees. The objective of CMIP is to better understand past, present and future climate changes arising from natural, unforced variability or in response to changes in radiative forcing in a multi-model context. The CMIP6 envisages 'runs' from around 100 distinct climate models.

A comparison has been done with observational data and projections in both the SSP245 and SSP585 scenarios. SSP refers to Shared Socioeconomic Pathways, a new set of climate scenarios developed with respect to the sixth IPCC report. SSP245 represents a medium pathway of future greenhouse gas

emissions, while SSP585 is an update of the CMIP5's RCP8.5 (Representative Concentration Pathway), or the highest baseline emissions scenario, combined with socioeconomic reasons.

Heat action plan

In her opening remarks at the workshop, Tinku Biswal, Principal Secretary, Revenue, Kerala, appreciated the efforts of the GHI and KSDMA and said she expected the elite group of participants to use the data productively. Hari Kumar, Regional Coordinator (South Asia), and Mary Antoinette, Project Manager, GHI, gave their inputs on the projections and urged the scientific community to use the data made available to refine the Heat Action Plan for the State. The second day of the workshop focussed on inputs for the revision and updating of the Heat Action Plan for Kerala, supported by the World Resources Institute.

THE NEW INDIAN EXPRESS

Temperature in Kerala to rise between 1 and 1.50C by mid-century

A migrant worker is using his iron tesla to escape from the heat of the scorching sun in Kochi (File | Photo A Sanesh)

Shainu Mohan Updated on: 05 Mar 2024, 8:50 am

THIRUVANTHAPURAM: In the wake of rising temperature in the run-up to summer season, the Kerala State Disaster Management Authority (KSDMA) with the help of two agencies, have come with the future heat projections for the state. On Monday, KSDMA organised a consultation workshop for stakeholders attended by various departments, agencies and NGOs who work on climate-related data.

KSDMA is gearing up to conduct a study based on the data with the help of the GeoHazards Society (a non-profit agency specialising in disaster risk reduction and climate change adaptation) along with GeoHazards International and Woodwell Climate Research Center to fix the average threshold temperatures. The temperatures will be categorised based on geography and for diverse sectors, including agriculture, water resources, transportation, energy and more.

The climate experts from Woodwell statistically downscaled historical and future climate data from 1970 to 2060. KSDMA has provided observed data of Kerala for comparisons and analysis of the projections. Woodwell has delivered statewide maps of heat projections for recent and future average time periods as specified by KSDMA.

The projected temperatures have monthly averages from the 20-year warming period (2020-2040, 2040-2060) for each warming level. A workshop was conducted to get the feedbacks from the scientific community, the state departments, and academic institutions, who work on climate-related data.

The projected temperatures provided by the study will be incorporated and utilised for updating the State's Heat Action Plan. "The national temperature threshold for heat-related warnings may not be right for Kerala and we need to come up with sector-specific, localised and geographical-based heat wave/temperature thresholds for the state. This is essential for developing an early warning system for heat waves. We aim to fix these thresholds with the help of various agencies by analysing and assessing the existing data on temperatures," said member secretary Shekhar L Kuriakose, KSDMA.

"We have shared the study findings with these agencies for deliberations to extend the research works to more fields of practical interventions and to plan and prepare better adaptation projects to help the state cope with extreme heat," he added.

Climate health vulnerability assessment study

The KSDMA jointly with the state health department has launched a climate health vulnerability assessment study that aims at making healthcare infrastructure resilient to climate change. "The study has already begun, and health is one of the significant sectors that need to be resilient to climate change and related stress. We need to bring a lot of operational changes," said Shekhar L Kuriakose. The study will assess and find out shortcomings and come up with recommendations to strengthen the overall resilience of healthcare facilities to climate change. It will be completed in November and the report will be incorporated into the heat action plan.

Temperature to rise between 1 and 1.50C by mid-century

The projections show that most locations in state can expect to see warming of 0.5°C in the near future (2020-2040), and between 1 and 1.5°C by mid-century (2040-2060) depending on emissions trajectories. The experts during the deliberations suggested that the projections could be improved further by using a smaller ensemble of the best resolution models.

GeoHazards International

Woodwell Climate Research Center

GeoHazards Society INDIA