

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL PRINCIPAL BENCH, NEW
DELHI

ORIGINAL APPLICATION NO. 657/2024

IN THE MATTER OF:

News Item titled "Swell waves likely to strike coastal areas over weekend" appearing in The Hindu dated 04.05.2024

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Respondent No. 3

Through

Dt.12-08-2025


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IN THE MATTER OF:

News Item titled "Swell waves likely to strike coastal areas over weekend" appearing in
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**REPLY BY WAY OF AFFIDAVIT ON BEHALF OF RESPONDENT NO. 3 NATIONAL
CENTRE FOR SUSTAINABLE COASTAL MANAGEMENT (NCSCM)**

Most Respectfully Sheweth:

I, **Dr. Purvaja Ramachandran**, aged about **57** years, **D/o G. V. Ramachandran** working
as **Scientist - 'G'**, National Centre for Sustainable Coastal Management (NCSCM),
Ministry of Environment, Forest and Climate Change (MoEF&CC), having Office at Anna
University Campus, Chennai-25, the deponent herein do hereby solemnly affirm and state
on oath as under: -

1. That I am competent to swear the present reply by way of affidavit on behalf of
Respondent No. 3, i.e, National Centre for Sustainable Coastal Management
(hereinafter also referred to as "NCSCM"), and I am aware of the facts and
circumstances of the case based on the record.
2. That I have perused the contents of the above captioned O.A. and I am duly
authorized to depose by way of the present affidavit.




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3. That the instant Original Application No. 657 / 2024 original application, registered *suo-moto* on basis of news item titled "Swell waves likely to strike coastal areas over weekend" appearing in The Hindu dated 04.05.2024, Hon'ble Tribunal is considering the issue of increasing instances of high-energy swell waves, which is a phenomenon also known as Kallakadal. Reason and remedial action need consideration in the matter
4. That the Hon'ble Tribunal by its order dated 01.07.2024, impleaded the answering respondent as Respondent No. 3 and issued notice and directed to file a response.
5. That the National Centre for Sustainable Coastal Management (NCSCM) was established by the Ministry of Environment, Forest and Climate Change (MoEF&CC) in 2011, as an autonomous institution to support the protection, conservation, rehabilitation, management, and policy advice of the coast.
6. It is submitted that the NCSCM supports the nationwide adoption of the Integrated Coastal Zone Management (ICZM) approach by utilizing decision support systems based on cutting-edge science and knowledge and through networking with communities, government structures, and relevant reputable national and international institutes
7. That it is respectfully submitted that the Kallakkadal or swell waves (surges), which are long-period waves generated far from the coast, influence coastal inundation, sediment transport, and overall coastal dynamics. It is caused by long waves, known as swells, which are generated by distant storms in the Southern Indian Ocean. These swells travel over several days and, when they reach the Indian coastline, create large waves that lead to unexpected coastal flooding. It is challenging to predict because the flooding happens without any significant changes in local weather, such as strong winds. The effect of swell waves on the




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Indian coast is significant, particularly along the southwest and central west coasts. In particular, during the pre-monsoon season (April-May), these waves are crucial for longshore sediment transport (LST) and have a significantly higher influence on the stability of the shoreline than that from wind waves. The variability of swell waves is also affected by climate indices such as the Indian Ocean Dipole (IOD) and El Niño Southern Oscillation (ENSO). Recent studies have shown that long-period swells from the Indian-Atlantic-Southern Oceans can lead to unexpected coastal inundation events.

8. That Swell waves have a significant impact on the Indian coast, particularly in areas like Kerala. The sudden nature of these floods can damage homes, infrastructure, and disrupt the livelihoods of coastal communities, especially in low-lying areas like Alappuzha, Kollam, and Thiruvananthapuram. Understanding Kallakkadal is essential to develop early warning systems and raise community awareness, helping to reduce the impact of such flooding events. Notably, a significant event on March 31, 2024, led to severe flooding in Thiruvananthapuram, Kollam, Alappuzha, and Thrissur districts of Kerala and the evacuation of many households. The influx of swell waves also worsens coastal erosion, a persistent problem along the Indian coastline, especially in Kerala.
9. That more recently, INCOIS warned coastal states about the risk of high-energy swell waves originating from the Southern Ocean, which can lead to coastal flooding, infrastructure damage, and increased erosion. This warning was specifically in effect from May 4 to May 6, 2024, cautioning against potential coastal flooding and rough sea conditions that could affect local fishermen and residents. These high-energy swell waves, often referred to locally as "Kallakkadal", can reach heights of 2 to 2.5 meters and have been known to inundate low-lying coastal regions, causing damage to houses and other infrastructure.




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10. That the economic consequences of these swell events are considerable, leading to substantial damage to fishing vessels, homes, and infrastructure. Such damage often displaces communities, while disruptions to fishing operations result in a loss of income for fishermen and broader economic impacts on coastal regions. This situation highlights the urgent need for reliable forecasting and communication systems to alert coastal communities of approaching swell waves. INCOIS has addressed this by launching the Swell Surge Forecast System, which provides advanced warnings of such events. These early warnings are crucial for reducing the impact on both human lives and property.
11. That it is humbly submitted that the local communities can adopt several measures to effectively prepare for the impacts of swell waves. These include establishing evacuation routes, enhancing communication plans, building protective structures, and promoting community education: -

i. **Evacuation Routes:**

Establishing clear and accessible evacuation routes to higher ground or inland areas is crucial for community safety during swell wave events. These routes should be well marked, especially for residents in low-lying regions at higher risk of flooding. Regular drills to familiarize residents with these routes can improve preparedness and ensure an efficient response during emergencies.

ii. **Communication Plans:**

Developing robust communication plans ensures residents are promptly informed of potential dangers and warnings related to swell waves. These plans should involve methods for disseminating alerts through local media, community notification systems, and social media platforms to provide timely and effective communication during emergencies.




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iii. **Protective Structures:**

Constructing protective infrastructure is essential to reduce the effects of swell waves. Communities can implement structures like seawalls, revetments, groins, jetties, and breakwaters to diminish wave energy and minimize shoreline erosion. These protective measures should be designed based on local wave patterns and environmental conditions to maximize their effectiveness.

iv. **Beach Nourishment and Dune Restoration:**

Engaging in beach nourishment and dune restoration helps replenish sand and stabilize shorelines, creating a natural buffer against swell waves. Regularly replenishing eroded sand strengthens beach resilience and shields inland areas from flooding. Community involvement in these projects fosters awareness and shared responsibility for coastal health.

v. **Community Education and Training:**

Educating residents about swell wave safety, including how to identify warning signs and respond appropriately, is vital for reducing risk. Educational programs can include workshops on ocean navigation, basic first aid, and safety procedures during swell events. Early childhood education initiatives can involve young families in learning about coastal safety, helping to minimize panic and ensuring coordinated actions during emergencies.

vi. **Collaboration with Experts:**

Collaborating with marine contractors, scientists, and local government agencies can enhance the effectiveness of community preparations for swell waves. Such partnerships facilitate vulnerability assessments and




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resilience planning, ensuring that the measures taken are informed by scientific expertise and local environmental conditions.

vii. **Spatial Planning**

With successful implementation of a coastal/marine spatial plan supported by a digital elevation model, non-development zones can be identified along the coastline strictly to prevent development in areas vulnerable to flooding and erosion. Landuse regulations (e.g., Coastal Regulation Zone notification) can be implemented more stringently to restrict or prohibit development in high-risk areas. Comprehensive emergency response plans can be developed to address and minimize the impacts of potential disasters caused by swell waves.

12. That it is submitted that the Combination of multiple approaches, including structural measures, spatial planning, early warning systems, nature-based solutions, and infrastructure design, coastal communities can effectively adapt to the challenges posed by swell waves.

13. The Government of India, in coordination with national institutions and state agencies, has taken several proactive steps to address the risk posed by swell waves along the Indian coastline. The key measures are as follows:

(i) *Forecasting system and alert dissemination:*

Indian National Centre for Ocean Information Services (INCOIS) under the Ministry of Earth Sciences (MoES) has operationalized a real-time High Wave and Swell Surge Warning System for the entire Indian coast by providing swell height, direction, and time of impact in advance of 3 days and alerts disseminated to the State Disaster Management Authority, Fisheries




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Departments, Port Authorities and local communities through the Sagar Vani app, SMS, emails, and audio-visual media

(ii) Preparation of shoreline management plan and coastal protections

The National Centre for Sustainable Coastal Management (NCSCM) under MoEF&CC and other national and state institutions are preparing shoreline change maps at a 1:25000 or better scale for the identification of high erosion sites and preparing Shoreline Management Plans (SMPs) for erosion-prone areas with the integration of swell wave-induced erosion assessments. NCSCM is proposing the suitable mitigation interventions to protect the erosion along the coastal regions, including the swell wave affected areas. NCSCM and other authorized government organizations are also providing the CRZ maps to direct local CRZ authority to restrict unregulated development in Coastal Regulation Zones and high-risk areas.

(iii) National Coastal Mission and Integrated Coastal Zone Management Plan

National initiatives of National Coastal Mission and Integrated Coastal Zone Management Plan are promoting the eco-shields such as mangrove plantations and dune restoration to reduce the coastal flooding by the swell waves and other events.

Integrated Island Management prepared by NCSCM is effective in enhancing the resilience of India's small islands to swell waves by combining ecosystem-based approaches, sustainable infrastructure, and community-led disaster preparedness.

The Ministry of Environment, Forest, and Climate Change launched the 'Mangrove Initiative for Shoreline Habitats & Tangible Incomes (MISHTI)' scheme to promote and conserve mangroves as a unique, natural eco-system



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with very high biological productivity and carbon sequestration potential, in addition to acting as a bio shield. Operational Guidelines for the Implementation of MISHTI Activities have been created and sent to the States to aid in the planning process. MISHTI aims to restore/reforest about 540 km² of mangroves throughout nine states and three union territories during a five-year period from 2023-24 onwards.

(iv) Disaster Risk Reduction and Institutional Coordination

The National Disaster Management Authority (NDMA) has directed State Disaster Management Authorities to integrate swell wave hazards into District Disaster Management Plans (DDMPs). To ensure effective response, control rooms at both district and state levels are activated during high wave alerts. Furthermore, inter-agency coordination among IMD, INCOIS, SDMAs, and Port Trusts has been institutionalized to strengthen preparedness and timely action in coastal districts.

Under the project entitled Enhancing Climate Resilience of India's Coastal Communities, NCSCM has developed vulnerability maps for coastal landscapes of three coastal states of Odisha, Andhra Pradesh and Maharashtra, by integrating ecosystem-centered and community-based approaches into coastal management and planning. Successful implementation of these activities help to reduce the impact of coastal flooding caused by swell wave.

(v) Capacity building through research and modelling support

National institution such as NCSCM, INCOIS, NIOT, and other technical institutions have undertaken various research studies to improve the accuracy of the swell wave predictions and forecasting through the numerical modelling



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studies and the deployment of field based instruments for regular monitoring the swell waves.

14. That the present Reply by way of affidavit may kindly be taken on record and into consideration, and the Hon'ble Tribunal may pass appropriate order(s), direction(s) as deemed fit and proper under the facts and circumstances of the present case.
15. That the Answering Respondent seeks leave to make additional submissions, if required, during the course of the proceedings as and when directed by this Hon'ble Tribunal.

DEPONENT

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Verification

Verified at _____ on _____ that the contents of the above reply affidavit are true and correct to best of my knowledge and belief and nothing material has been concealed therefrom.



DEPONENT

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