

POLLUTION FROM *MSC ELSA 3* IMPACTS INDIA AND SRI LANKA

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On 25th of May 2025 at 7:50 hours local time, the *MSC Elsa 3*, a Liberian-flagged container ship *en route* from Vizhinjam to Kochi in India, capsized about 38 nm south-west off Kochi (9.1875°N, 76.0816°E) in the state of Kerala, India, and then sank with ~640 containers onboard. The ship's cargo included 13 containers of hazardous materials, notably calcium carbide, sulphur, and hydrazine-based plastics, as well as 84 t of diesel and 367 t of furnace oil (Kerala State Disaster Management Authority, 2025). Among the 643 containers onboard were 71,500 sacks of tiny plastic pellets known as nurdles. Plastic nurdles are pre-production plastic pellets, <5mm in diameter, used in manufacturing. Nurdles are typically made of hydrophobic polymers, such as low-density and high-density polyethylene and polypropylene. They are extremely lightweight and hydrophobic, and can float and drift long distances on ocean surfaces. Nurdles are non-biodegradable, meaning they can persist indefinitely and accumulate in the environment (see Galgani & Rangel-Buitrago, 2024).

The containers ruptured upon sinking, releasing nurdles and other potential contaminants into the Arabian sea. Immediate measures were taken by the Kerala state and the Indian government. Responses included a state disaster declaration and high alerts across coastal districts. The Indian Coast Guard placed oil-boom vessels and aircrafts in position to aid with the containment of pollutants. Fishing was also banned in a 20 nm zone around the vessel, primarily as a precautionary measure to protect both marine life and human health due to the risk of contamination from the spill (Fidra, 2025). Despite these measures, the Southwest Monsoon, which begins in early June, accelerated the dispersal of pollutants. Between 27th May and 12th June 2025, the plastic nurdles spread from the wreck site off Kerala's coastline in India, moving approximately 900 km towards the southern states of India and northern and western shores of Sri Lanka (Figure 1). This paper outlines the timeline of nurdle dispersal from the date of the wreck until late June 2025.

27th May 2025: Thiruvananthapuram city (8.524°N,

76.937°E) and coastline including Kochu Veli beach (9.939°N, 76.271°E), Thumba beach (9.931°N, 76.267°E), and Vettukad beach (8.467°N, 76.976°E), Kochi, Kerala, India

Within 48hr of the vessel sinking, beaches in Thiruvananthapuram city were blanketed with loose pellets (Fidra, 2025). Loose nurdles were also found in large numbers on adjacent beaches (Shaji, 2025).

27th May 2025: Kanniyakumari district, Kerala, India

Large quantities of 25kg bags full of plastic nurdles began washing ashore (The New Indian Express, 2025).

28th May to 4th June 2025: Ashoka beach (8.383°N, 76.976°E) and Varkala beach (8.736°N, 76.703°E), Kovalam city, Kerala, India

White nurdle "snowdrifts" and nurdles still packaged in plastic sacks washed ashore at Ashoka Beach and Varkala, with white foam also observed on Ashoka Beach. Nurdles on the beach were being washed back into the sea (Ayyappan, 2025).

2nd to 5th June 2025: Manukudi beach (8.086°N, 77.490°E), Chothavilai beach (8.094°N, 77.455°E), Kanyakumari district, Sri Lanka

Nurdles, some loose but most still packaged in partially intact sacks, drifted ashore on Manakudi and Chothavilai beaches. An estimated 858 bags (~25 kg each) of nurdles were found at 36 out of 42 coastal villages in Kanyakumari district in Tamil Nadu state of India (Rabi, 2025; TenNews.in, 2025; The Hindi Bureau, 2025).

10th June 2025: Dhanushkodi Flamingo Sanctuary (99.179°N, 79.418°E), Ramanathapuram city, Tamil Nadu, India

Eighty bags of nurdles (~2t) were washed ashore (The Times of India, 2025).

11th June 2025: Delft Island (9.517°N, 79.683°E), Sri

Lanka

Nurdles washed up on Delft Island (News 1st, 2025a; The Week, 2025).

12th June 2025: Mannar beach (8.836°N, 80.054°E), Sri Lanka

Dozens of 25 kg bags and loose nurdles were found along a 2 km stretch of Mannar beach. Two bags were damaged, but the remainder were intact (Rodrigo, 2025). Nurdles were also seen washing ashore on the coasts of Delft and Jaffna (The Week, 2025).

13th June 2025: Jaffna Peninsula (9.667°N, 80.002°E), Kilinochchi coast (9.4°N, 80.4°E), Nainativu Island (9.417°N, 79.833°E), and Chilaw region (7.576°N, 79.795°E), Sri Lanka

Nurdles and other debris were washing ashore on Delft Island, Jaffna peninsula, Nainativu and Mannar with minor traces also found on the Kilinochchi and Chilaw coasts (The Week, 2025). Beach cleanups commenced at Jaffna and Mannar (News 1st, 2025b).

17th June 2025: Puttalam beach (8.025°N, 79.831°E), Kaltura beach (6.567°N, 79.983°E), Galle beach (6.053°N, 80.220°E), Sri Lanka

Cleanup operations were underway on beaches in Jaffna, Kilinochchi, Mannar, Puttalam, Gampaha, Colombo, Kalutara, and Galle districts, with contributions from more than 5,500 civilians (Daily Mirror, 2025; News 1st, 2025c).

22nd June 2025: Wadduwa beach (6.927°N, 79.861°E), Colombo, Sri Lanka

Plastic nurdles washing ashore near Wadduwa beach, south of Colombo city, were described as a severe environmental hazard. These nurdles were mixed with sand and other debris, and spread across kilometers. Workers used sieves to filter the sand, separating the beads from the shells and debris in water-filled containers, before bagging and transporting the waste to Colombo (Rak, 2025).

Nurdle dispersal from the wreck of *MSC Elsa 3* off the coast of Kerala, India, created a transboundary environmental disaster, impacting the coastlines of both India and Sri Lanka. This event only exacerbated the pollution experienced by Sri Lanka, as a similar incident where the *M/V X-Press Pearl* caught fire off the coast of Colombo on 20th May 2021, released toxic

chemicals and ~1,680t of nurdles near the country coastline (de Vos *et al.*, 2022). Similarly, an explosion on the *MV Wan Hai 503* on 9th June 2025, 44nm from Azhikkal (11.915°N, 75.348°E), off the coast of Kerala, released fuel and hazardous chemicals into the environment, further adding to the pollution of Indian shores (Rodrigo, 2025).

The Potential Impacts of Plastic Nurdles on Sea Turtles and their Habitats

Approximately 445,970t of nurdles enter the environment each year globally (Galgani & Rangel-Buitrago, 2024) and have the potential to affect sea turtles in aquatic and terrestrial habitats. Nurdles have been found in the gut contents of stranded, and/or bycatch, post-hatchling/oceanic juvenile loggerhead turtles (*Caretta caretta*) in the Pacific Ocean (Duncan *et al.*, 2021). However, the same has not been observed in stranded turtles in the Indian Ocean to date. Hence, although ingestion of nurdles in the marine environment can occur, the impact on the health of an individual turtle and population-level scale of this threat remains largely unknown.

Nurdles spilled from the *X-Press Pearl* were still present in beach substrates 40 months after the wreck, and continued to release secondary microplastics and nanoplastics as a consequence of weathering (Perera *et al.*, 2026). Plastic additives in nurdles can leach into the beach environment (Iftikhar *et al.*, 2024) and potentially affect developing sea turtle embryos (Sousa-Guedes *et al.*, 2023). Additionally, weathering can alter the physicochemical properties of nurdles and increase their sorption capacity for pollutants. If nurdles are later ingested by marine wildlife, sorbed pollutants can then leach into the gut and result in acute and chronic toxic effects (see Jiang *et al.*, 2021).

The scale of nurdle spills around the world (reviewed by Sewwandi *et al.*, 2023; Galgani & Rangel-Buitrago, 2024) highlight the need for improved preventive measures, regulations for international coordination, and spill response (Galgani & Rangel-Buitrago, 2024).

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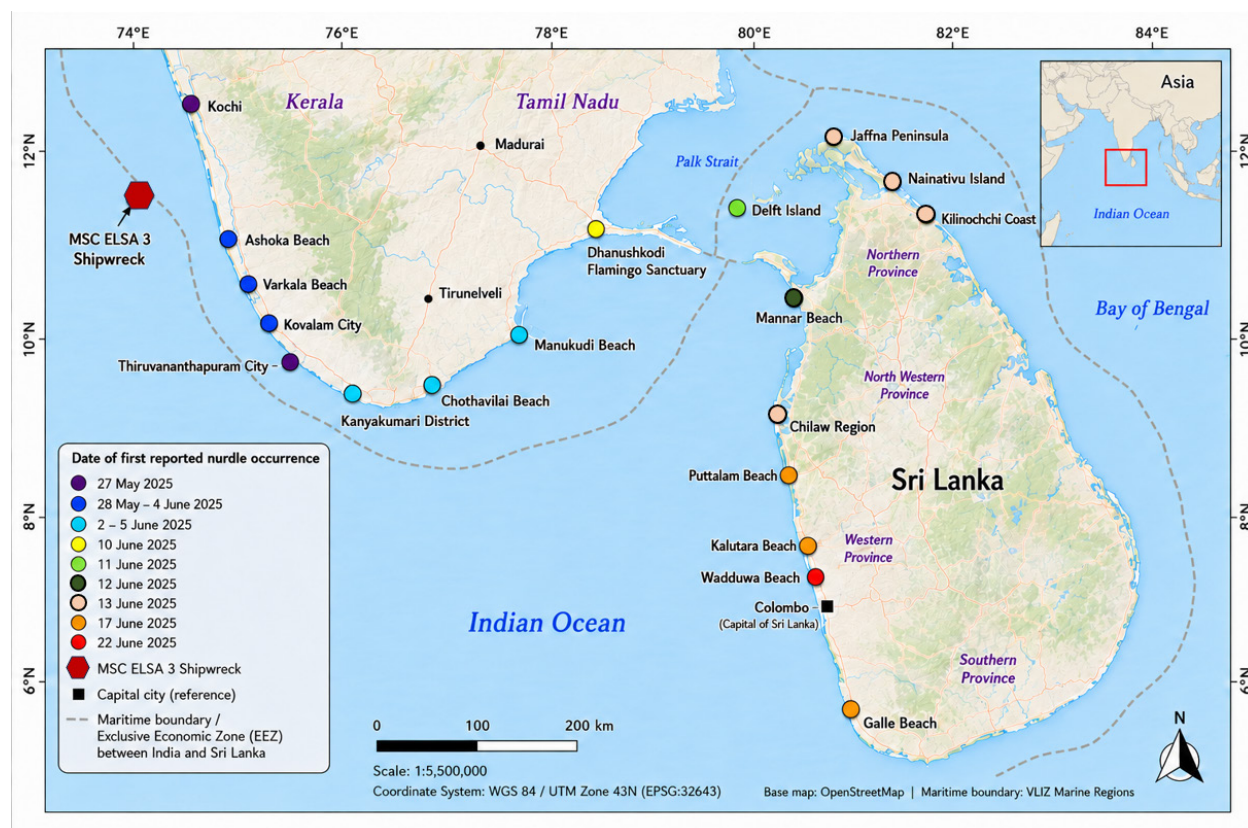


Figure 1. The Spatial Spread of Nurdles Along the Indian and Sri Lankan Coasts from the Wreck of the *MSC Elsa 3* off Kerala, India. (Map created using QGIS-based geospatial analysis.)

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