

**ENVIRONMENTAL AND CLIMATE VULNERABILITIES EXPOSED: A
LEGAL AND ECOLOGICAL ANALYSIS OF THE MV X-PRESS PEARL
DISASTER IN SRI LANKA**

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The MV X-Press Pearl disaster of May 2021 stands as one of Sri Lanka's most severe marine environmental catastrophes, exposing critical vulnerabilities in maritime safety, environmental governance, and climate resilience. This research presents a comprehensive legal and ecological analysis of the incident, which released approximately 1,680 tons of plastic nurdles, hazardous chemicals including nitric acid, and fuel oil into the Indian Ocean, causing widespread contamination along Sri Lanka's western coastline. The environmental consequences were unprecedented: mass mortality of marine life including fish, turtles, and dolphins; transoceanic microplastic dispersion affecting regional ecosystems; destruction of marine habitats and coral reefs; and severe socio-economic disruptions to fishing communities and tourism. The toxic discharge created persistent bioaccumulation risks expected to impact marine ecosystems for decades, raising critical questions about environmental liability. The study evaluates regulatory failures that allowed a vessel with reported chemical leaks to enter Sri Lankan waters and examines the landmark Fundamental Rights litigation (SC/FR Application No. 168/2021), which challenged the State's failure to prevent the disaster and protect constitutional environmental rights. The case revealed systemic weaknesses within the Marine Pollution Prevention Act, Coast Guard Act, and inter-agency coordination mechanisms, limiting containment and mitigation effectiveness. The litigation exposed gaps in environmental liability frameworks and compensation mechanisms for affected communities. In the context of accelerating climate change and globalized maritime trade, this incident underscores how warming oceans, intensified weather patterns, and increased shipping traffic heighten marine pollution risks with transboundary consequences. The findings highlight urgent needs for Sri Lanka to strengthen environmental governance by harmonizing national laws with international standards including MARPOL, UNCLOS, and the Hazardous and Noxious Substances Convention, while enhancing maritime monitoring and integrating climate-risk adaptation. This disaster serves as a turning point for climate-vulnerable developing nations, emphasizing that marine environmental protection requires proactive legal reform, institutional preparedness, and international cooperation.

Keywords: X-Press Pearl Disaster, Marine Pollution, Climate Vulnerability, Environmental Liability, Maritime Governance