Recycling and Valorization of Discarded Fishing Nets in Odisha: A Sustainable Approach

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1. Identification of Waste Material

Odisha, with its extensive coastline along the Bay of Bengal, has a thriving fishing industry that generates significant amounts of discarded fishing nets. These nets, primarily made from synthetic polymers such as nylon and polyethylene, contribute substantially to marine pollution. Abandoned, lost, or discarded fishing nets, commonly referred to as "ghost nets," pose severe environmental hazards, entangling marine life and disrupting local ecosystems.

In Odisha, where traditional and mechanized fishing practices coexist, the improper disposal of waste fishing nets leads to microplastic pollution, biodiversity loss, and navigational hazards. Given their high-strength polymer composition, discarded fishing nets offer potential applications in material recycling and valorization. Addressing this issue through innovative recycling solutions aligns with Odisha's commitment to sustainable development and marine conservation efforts.

2. Proposed Recycling/Valorization Method

A promising approach for recycling discarded fishing nets in Odisha is their conversion into high-value products through mechanical and chemical recycling processes. Two key valorization methods include:

Mechanical Recycling Process

1. **Collection and Cleaning:** Retrieval of discarded fishing nets from coastal areas, fishing harbors such as Paradip and Dhamra, and marine environments, followed by cleaning to remove biological contaminants and debris.
2. **Shredding and Melting:** The nets are shredded into small fragments and melted down for extrusion.
3. **Reprocessing into New Materials:** The processed material can be used to manufacture new fishing gear, textiles, carpets, and plastic-based consumer goods.

Chemical Recycling Process

1. **Depolymerization:** Chemical treatment breaks down nylon-based fishing nets into monomers.

2. **Purification and Polymerization:** The recovered monomers are purified and repolymerized to produce high-quality nylon, suitable for textile and industrial applications.
3. **Sustainable Products:** The regenerated nylon can be used for eco-friendly apparel, sporting equipment, and automotive components.

Applications of Recycled Fishing Nets in Odisha

1. **Eco-Friendly Textiles:** Collaborations with Odisha's textile industry, including handloom sectors, to create sustainable clothing using regenerated nylon fibers.
2. **Marine and Industrial Equipment:** Recycled plastic can be repurposed into new fishing gear, benefiting local fishing communities in Puri, Gopalpur, and Chandipur.
3. **3D Printing Materials:** Processed plastic granules can be used in additive manufacturing, supporting Odisha's emerging tech and innovation hubs.
4. **Construction Materials:** Reinforcement fibers for composite materials in the construction industry, particularly in coastal infrastructure projects.
5. **Consumer Goods:** Production of eyewear, accessories, and reusable packaging solutions to support Odisha's growing emphasis on sustainable tourism and local handicrafts.

3. Feasibility Evaluation

Technical Feasibility

- **Process Efficiency:** Mechanical and chemical recycling processes for synthetic polymers are well-established, offering high recovery rates.
- **Scalability:** Recycling operations can be implemented at both local and industrial levels, with potential for expansion in Odisha's coastal districts.
- **Technology Readiness Level (TRL):** Mechanical recycling is at TRL 8-9, while chemical recycling processes are advancing towards full commercialization.
- **Quality of Recycled Material:** High-quality recycled nylon from fishing nets meets industry standards for various applications.

Economic Feasibility

- **Initial Investment:** Requires moderate to high capital for collection, cleaning, and recycling facilities, which can be supported by Odisha's industrial and marine development programs.

- **Operational Costs:** Cost-effective logistics and economies of scale can improve profitability, especially if integrated with government-led waste management initiatives.
- **Revenue Generation:** Demand for sustainable materials in the fashion, automotive, and construction sectors supports a profitable market.
- **Government Incentives:** The Odisha government, under initiatives like the Integrated Coastal Zone Management Project (ICZMP), can provide subsidies, tax credits, and grants for marine waste recycling initiatives.
- **Market Demand:** With rising consumer interest in sustainable products, recycled fishing nets have strong market potential in Odisha's growing eco-tourism and sustainable fashion industries.

Environmental Impact

- **Waste Reduction:** Helps mitigate marine plastic pollution and protects Odisha's rich marine biodiversity, including species in the Chilika Lake and Bhitarkanika National Park.
- **Carbon Footprint Reduction:** Recycling synthetic polymers significantly lowers CO2 emissions compared to virgin plastic production.
- **Sustainability:** Supports circular economy principles by repurposing waste into valuable materials.
- **Biodiversity Conservation:** Reduces entanglement risks for marine life and prevents habitat destruction along Odisha's coastline.
- **Lower Microplastic Pollution:** Recycling reduces the degradation of synthetic fibers into microplastics, minimizing ocean contamination.

4. Conclusion

The recycling and valorization of discarded fishing nets present a viable solution to marine plastic pollution in Odisha. Through mechanical and chemical recycling processes, these nets can be transformed into high-value materials, supporting sustainable industries. This approach is technically feasible, economically viable, and environmentally beneficial, promoting circular economy practices and ocean conservation.

By integrating fishing net recycling into Odisha's waste management strategies, leveraging financial incentives, and engaging local communities, industries and policymakers can contribute to reducing plastic waste while creating sustainable economic opportunities. As technological advancements continue to improve efficiency and cost-effectiveness, the

widespread adoption of fishing net recycling in Odisha will enhance its impact on environmental sustainability and material innovation.