

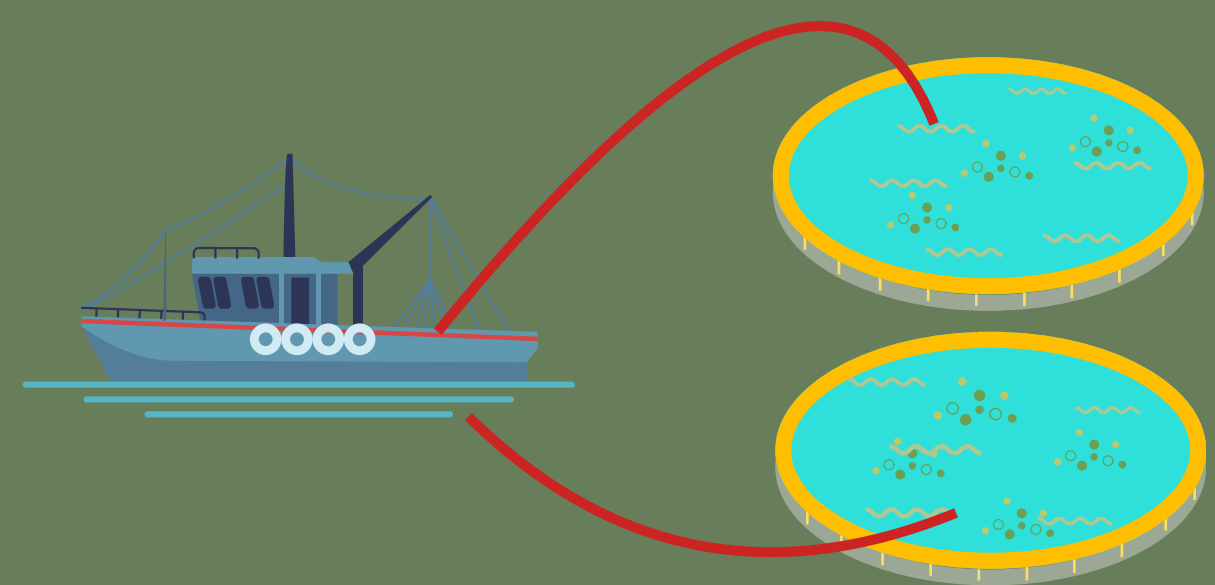


BAMBOO FEEDING PIPES

Plastic replaced by bamboo

BACKGROUND

Current Practice



- Feeding tubes transport fish pellets from the barge to the aquaculture system.
- They are currently made from polyethylene (PE) in various sizes (e.g., 32–110 mm diameter, 2.9–7 mm wall thickness).
- The tubes are connected using screwed or electromagnetic joints, although seamless designs are preferred.

Problem

- Traditional plastic feeding pipes release significant amounts of microplastics due to erosion caused by transporting food pellets.
- In Norway alone, fish farms are estimated to generate over 325 tons of microplastics annually.
- Through consumption of seafood, microplastics eventually make their way into the human body. Studies suggest that humans may ingest between 0.1 to 5 grams of microplastics per week, depending on diet and environmental exposure.

Possible solution

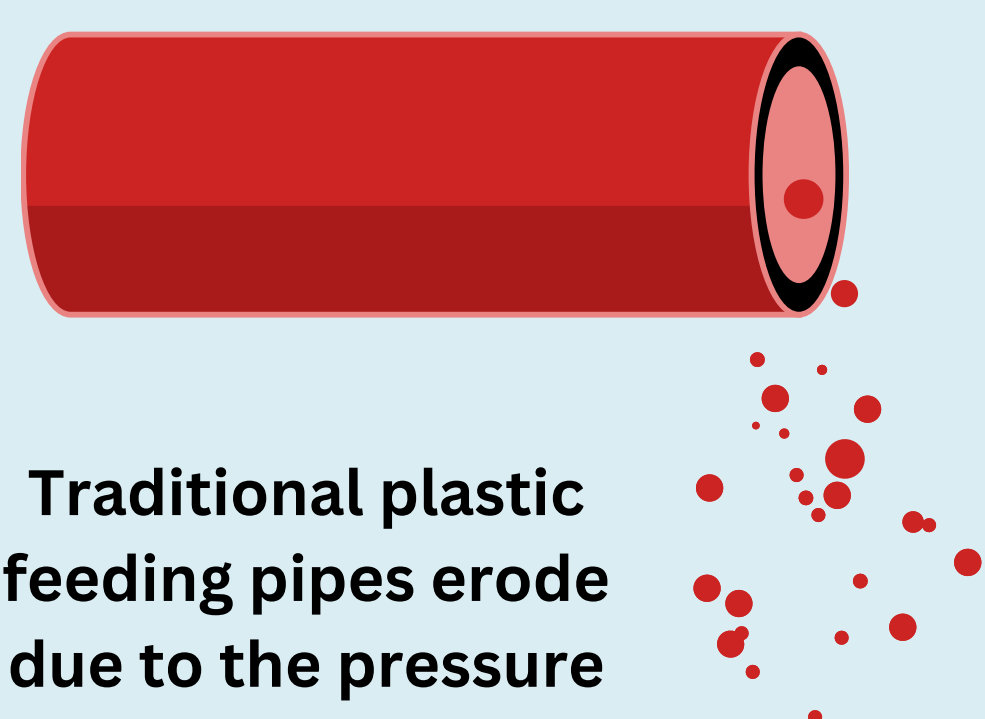
- Replacing traditional plastic feeding tubes with biodegradable materials to reduce microplastic pollution in aquaculture.
- PLA, TPS, and PHA could be options but they struggle with long-term water exposure—often losing strength or breaking down prematurely.
- Bamboo has natural durability, water resistance, and biodegradability.
- Bamboo can last in aquatic conditions for over a year, making it a practical and sustainable alternative to conventional plastic pipes.

Attacking the root of the problem

Utilizing bamboo for feeding tubes aligns with the first principle of the waste hierarchy—Prevent—by replacing conventional plastics with a sustainable, biodegradable alternative.



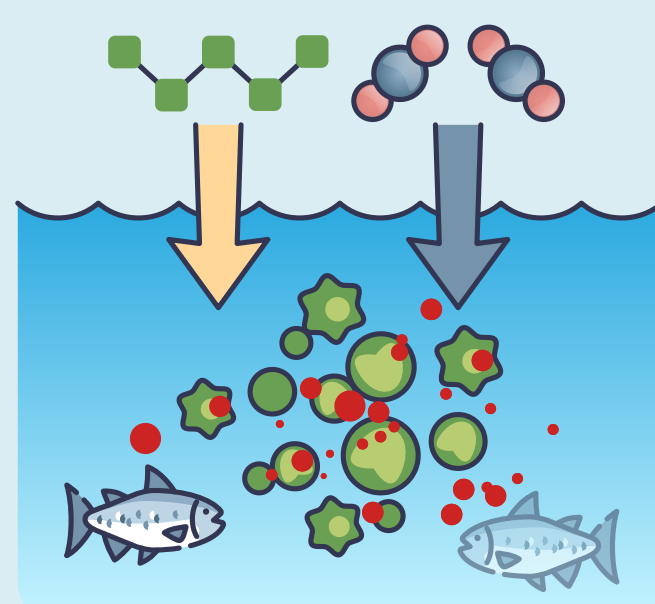
STORYBOARD OF THE PROBLEM



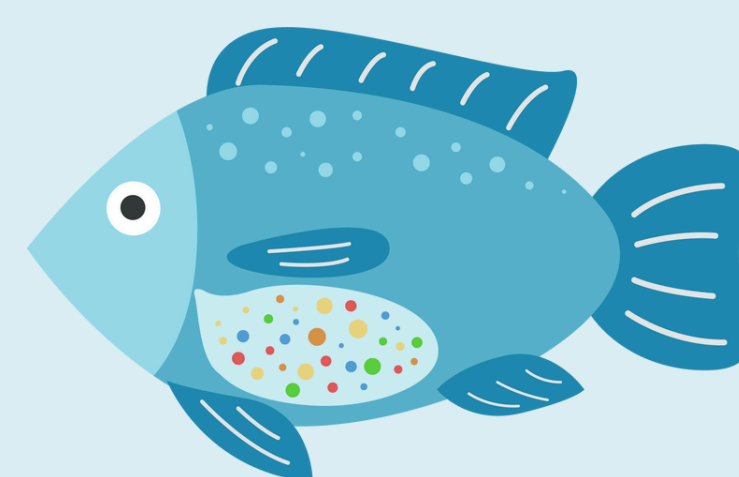
Traditional plastic feeding pipes erode due to the pressure and friction caused by feed pellets.



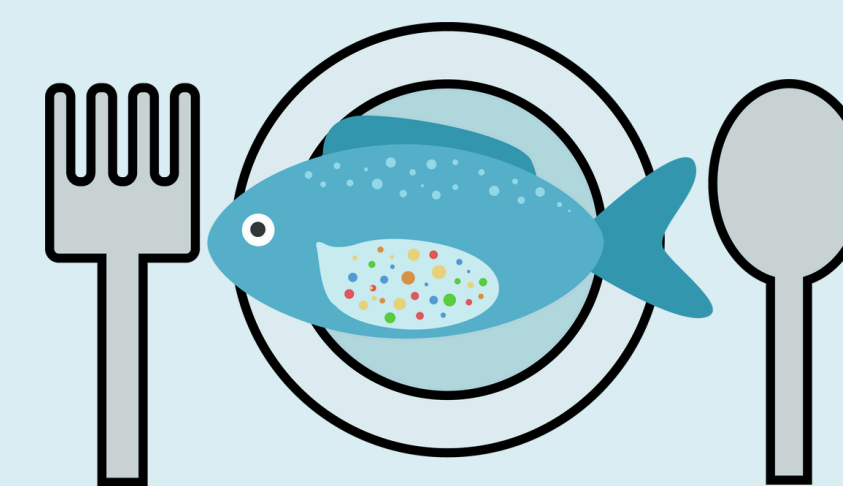
Microplastic particles flow out of the pipes and into the ocean



A result of this is microplastics swarming around with the food pellets in the aquaculture systems



This will lead to accumulation of microplastic in the tissues and organs of the fish



Over time, microplastics and the toxins they carry, will build up in marine organisms. These pollutants can then move up to the food chain and potentially end up in the human body

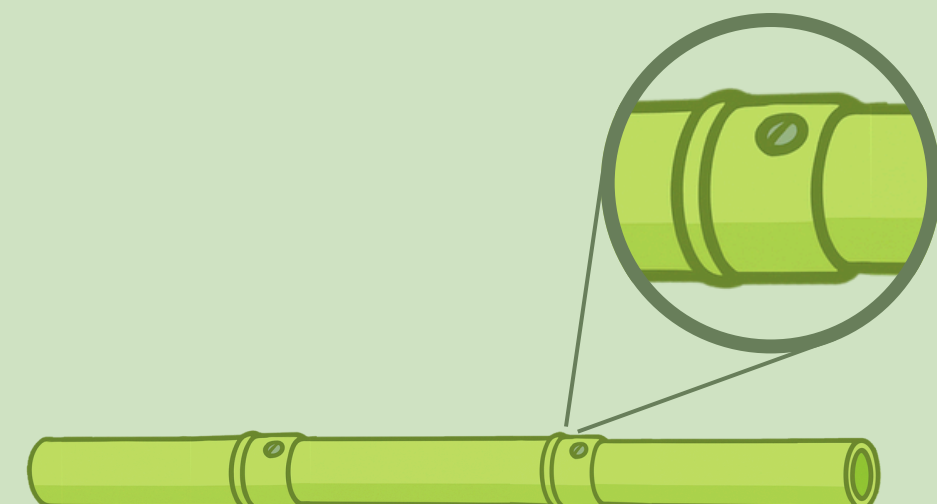


PE plastic is very durable and does not decompose, and will persist in the ocean for decades and harms marine life in the long term

OUR SOLUTION

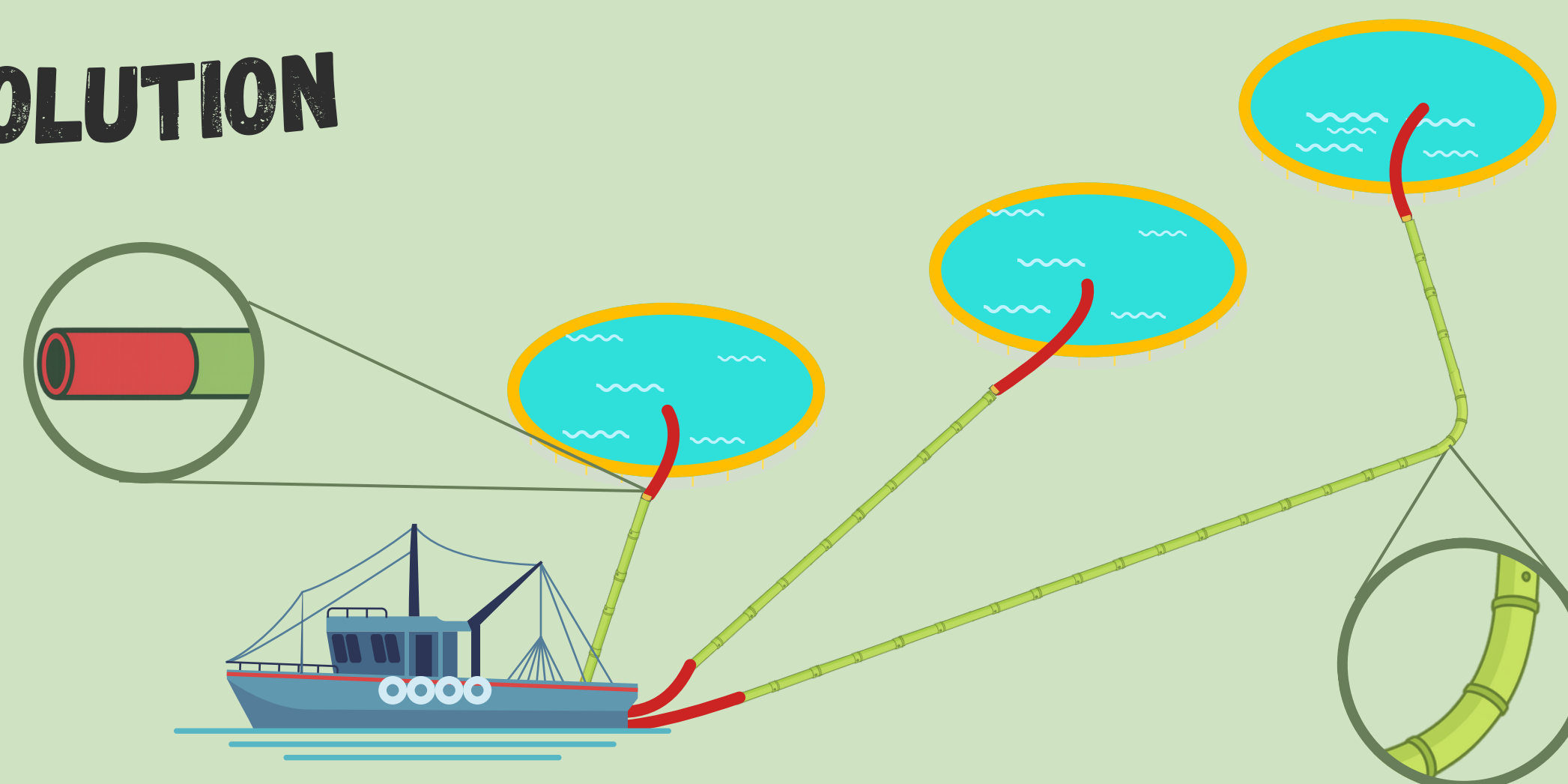


Sourcing bamboo (*Dendrocalamus asper*, *Guadua angustifolia* or *Phyllostachys edulis*) from suppliers



Forming the pipe through a telescopic assembly of bamboo segments

HDPE connectors are attached to the bamboo pipe ends to provide flexibility when linking to fish cages and supply vessels.



Bamboo's flexibility allows curved layouts using short, connectable segments for easy assembly.



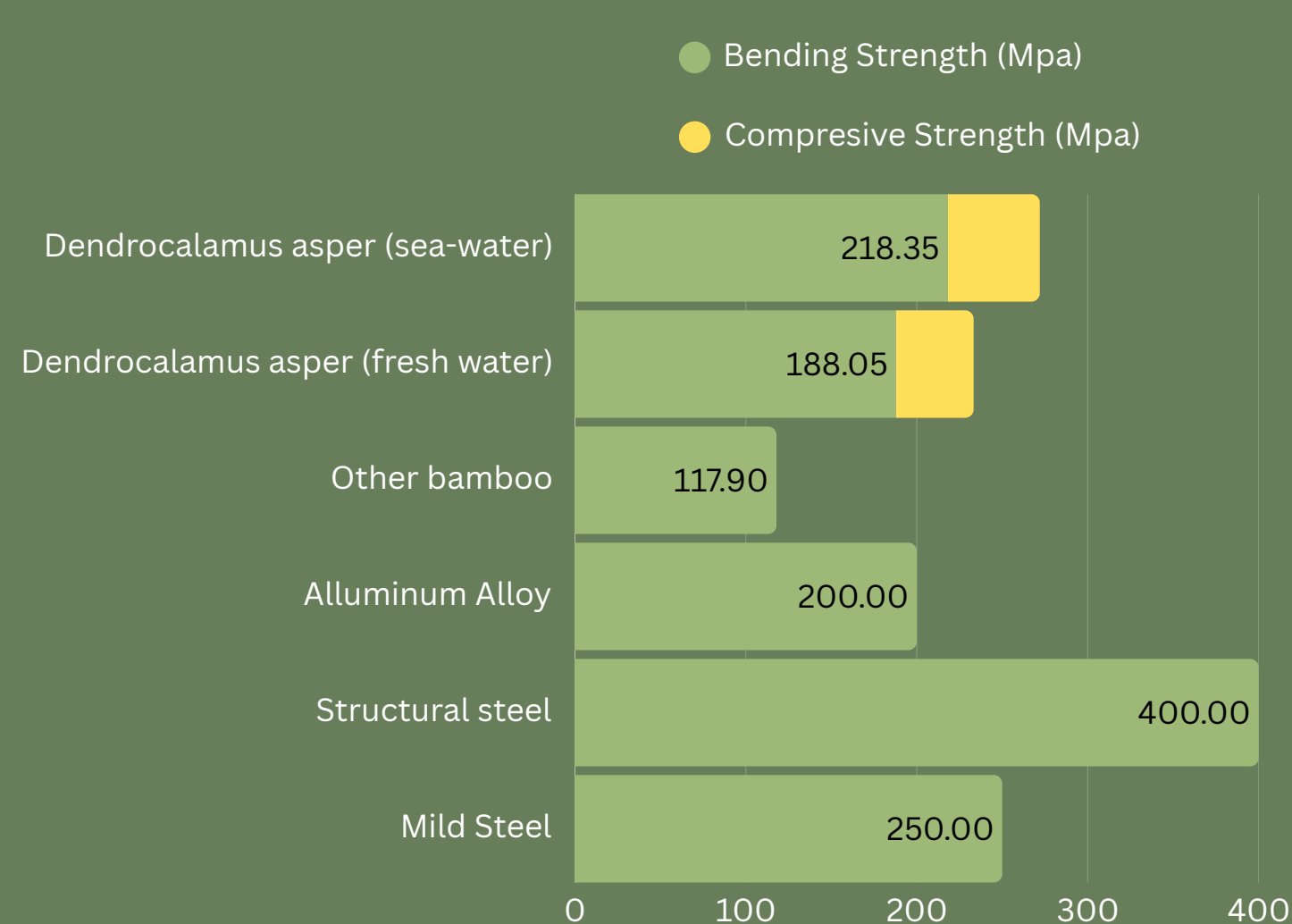
A sustainable solution for reusing the bamboo pipes: Ornamental structures in

- Aquariums
- Bars
- Gardens
- Furniture
- Fence
- Wine racks

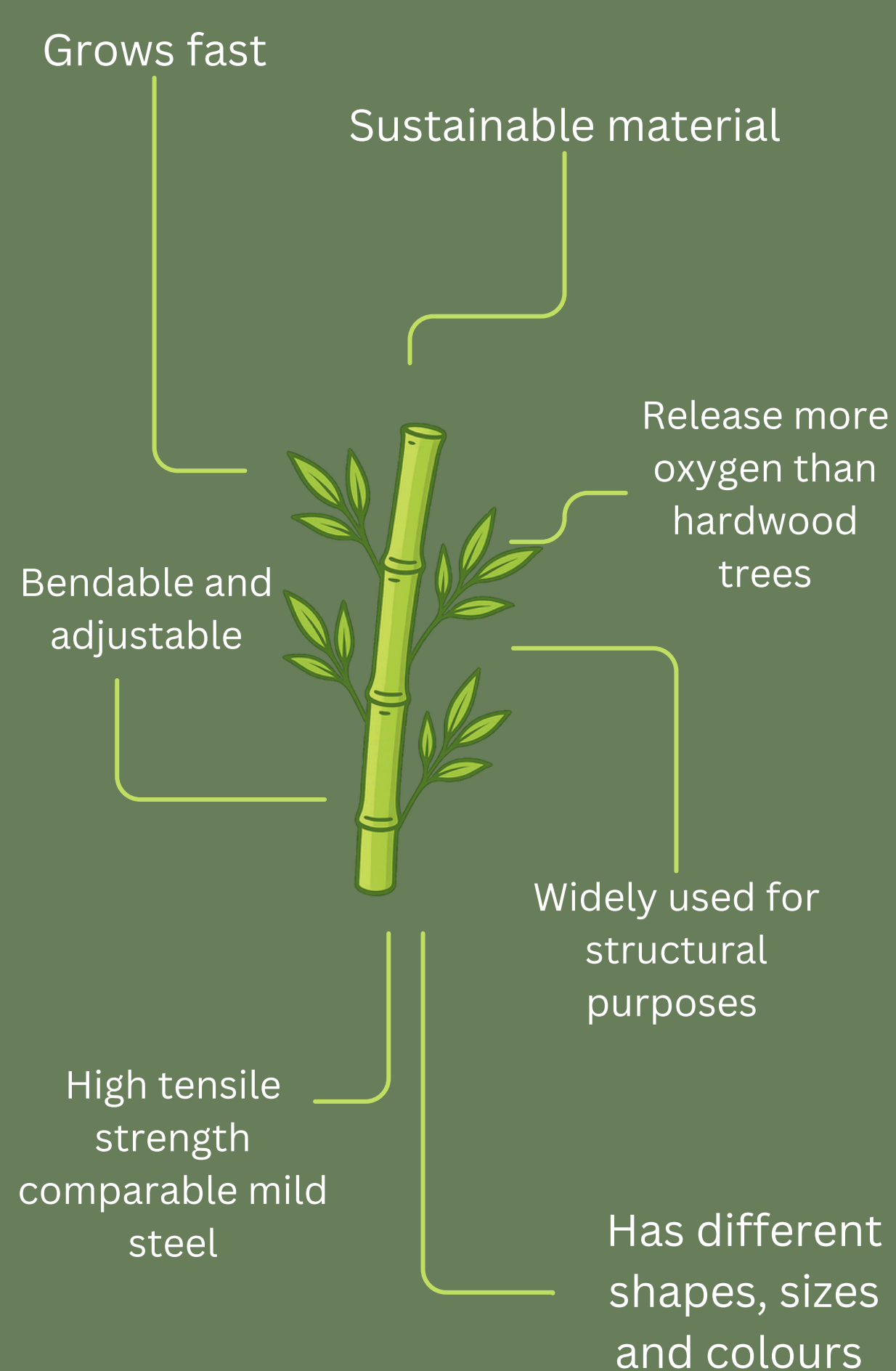
Why bamboo?

- Strong bamboo species allow flexible design
- Hybrid: bamboo tube + HDPE connectors
- Durable in seawater with heat treatment on the inner part
- Low energy use vs. plastic production
- Reduces plastic dependency in aquaculture

Mechanical Properties



Facts about bamboo



Design

- Each bamboo section measures 1.5–3.0 meters in length, with a diameter of 10–12 cm.
- Wall thickness of 10–15 mm ensures structural strength for transporting fish feed.
- Each feeding tube will consist of approximately 100–200 bamboo trunks, connected in a modular design.
- Inner nodes are removed using a metal rod or drill.

Treatment

- A basic heat treatment process is applied to:
- Smooth the inner surface of the bamboo by removing internal nodes and softening the fibers.
 - Enable gentle bending of the bamboo without compromising its structural strength, allowing the pipe to conform to the curved layout of the feeding system.

Benefit to Society

- Reduces microplastic contamination in farmed fish, ensuring safer seafood for consumers
- Minimizes plastic pollution in marine ecosystems, preserving biodiversity
- Supports sustainable fish farming practices
- Reduces reliance on plastics used and encourages eco-friendly aquaculture industry
- Supports regulations or nature conservation against excessive plastic use in aquaculture.
- Raises awareness of microplastic risks, driving consumer demand for sustainable seafood.

Future plans

- Build a prototype bamboo feeding pipe system and test in a controlled environment.
- Explore the use of biodegradable coatings to extend bamboo lifespan.
- Conduct a full Life Cycle Assessment (LCA) and Cost-Benefit Analysis.
- Investigate modular designs to further improve reliability and reduce failure modes.