### Production Capacity

| Year | Production Capacity |
|---|---|
| **Year 1** | 0% (Construction Phase) |
| **Year 2** | 10-20% (Pilot Testing) |
| **Year 3** | 40-60% (Gradual Scale-up) |
| **Year 4** | 80-90% (Near Full Capacity) |
| **Year 5+** | 100% (Full Operations) |

By Year 5, the plant is fully operational and generating stable annual revenue at maximum designed capacity.

### Rationale:

**Fishmeal & Fish Oil Revenue**

- China's demand for fishmeal is growing, leading to premium pricing.
- Optimized extraction methods increase output from 20,000 MT → 22,000 MT.
- China imports price for high-quality fishmeal: $850–$1,200 per MT.

**Organic Fertilizer Output & Pricing**

- Increased biomass conversion efficiency yields 42,000 MT vs. original 40,000 MT.
- China's organic farming subsidies support higher pricing.

**Biogas Revenue Adjustment**

- Higher efficiency (3.5M $m^3$ vs. 3M $m^3$).
- China's bioenergy tariffs allow $1.10/$m^3$ instead of $1.00/$m^3$.

**Recycled Plastics Revenue**

- Optimized sorting & pelletizing → +500 MT output.
- Premium-quality recycled plastics price: $450/MT.

### Break-even Estimate

| Item | Value |
|---|---|
| **Total CAPEX** | $53M |
| **Annual Gross Revenue (Year 5+)** | $31.3M |
| **Operating Costs (~50% of revenue)** | ~$15M per year |
| **Net Annual Profit (Post-Year 5+)** | ~$16.3M |
| **Break-even Estimate** | $53M ÷ $16.3M ≈ **3.25 years** (adjusted to **4–6 years** for market fluctuations) |

### Market Feasibility & Case Studies

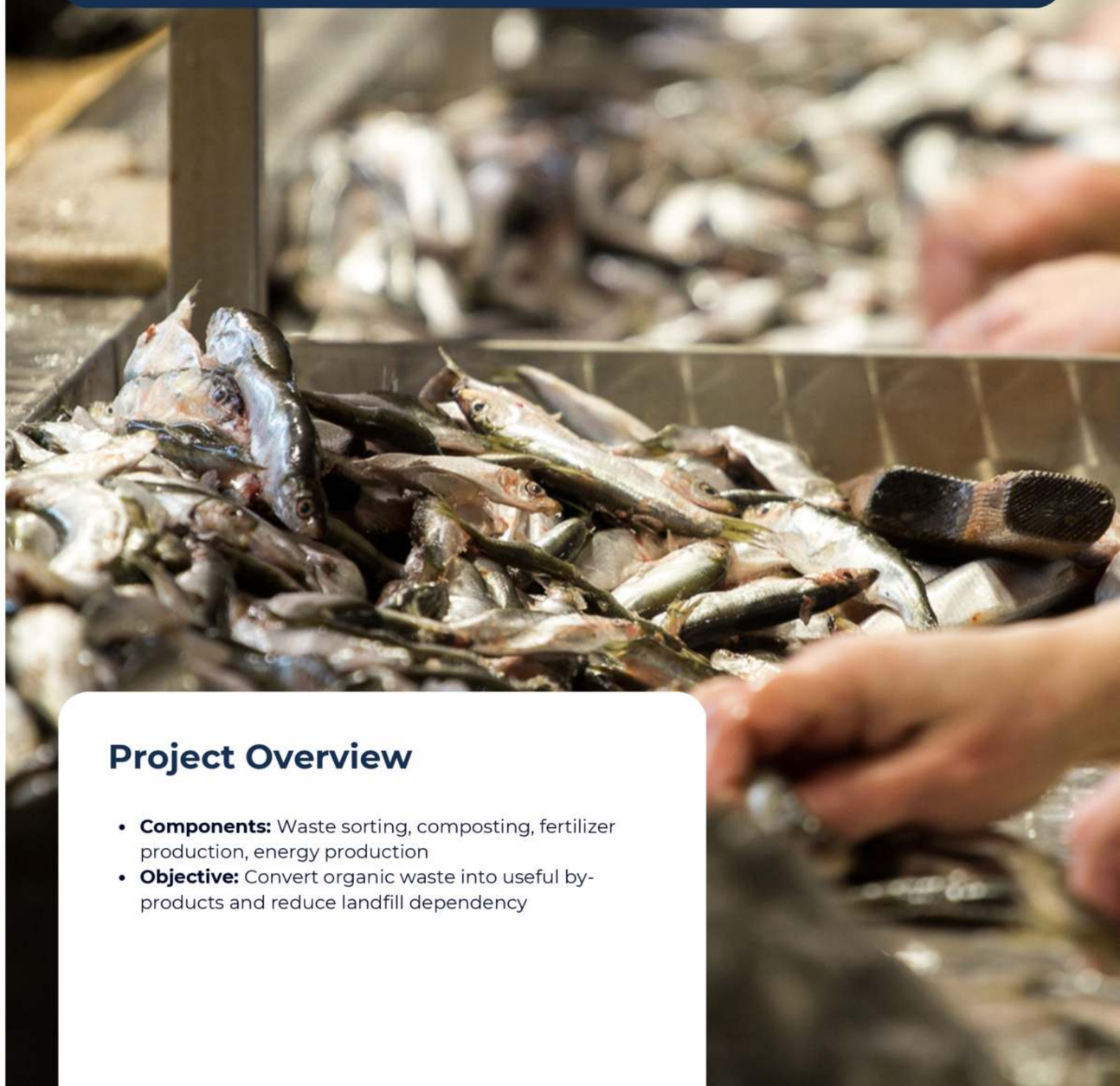
### Demand Analysis

| | |
|---|---|
| **Fishmeal & Fish Oil:** | High demand from aquaculture farms & pet food industries in PNG, China, and SE Asia. |
| **Organic Fertilizer:** | Growing demand from PNG's agriculture sector. |
| **Biogas & Renewable Energy:** | Opportunity to supply local industries & fisheries. |
| **Recycled Plastic:** | Market for export or domestic packaging reuse. |

Sustainable World Organization

CASE STUDY

# Fish Waste + Recycling + Fertilizer Processing Facility



## Project Overview

- **Components:** Waste sorting, composting, fertilizer production, energy production
- **Objective:** Convert organic waste into useful by-products and reduce landfill dependency

- Converts tuna byproducts into fishmeal, fish oil, and organic fertilizer.
- Implements waste-to-energy (biogas & biodiesel) from fish waste.
- Recycles plastic waste and packaging materials for secondary use.
- Uses advanced Chinese and global technologies for automation and efficiency.
- Financial modelling estimates break-even within 5-7 years with stable revenue streams.

## Technical Feasibility:

### Waste Generation & Processing Capabilities

*Assumptions per annum:*

- Fisheries and Marine feedstock: 100,000 metric tons
- Fish waste: 20,000 metric tons (20%)
- Plastic & packaging waste: 5,000 metric tons
- Sludge & wastewater: 10,000 metric tons

### Processing Outputs

| Waste Type | Processing Method | Output Product |
|---|---|---|
| **Fish Trimmings, Bones, Heads** | Fishmeal & Fish Oil Extraction | Fishmeal, Omega-3 Oil |
| **Organic Fish Waste** | Hydrolyzed Composting | Liquid Fertilizer |
| **Fish Sludge** | Anaerobic Digestion | Biogas, Fertilizer Pellets |
| **Plastic Packaging & Nets** | Mechanical Recycling | Recycled Plastics |
| **Wastewater** | Bio-filtration & UV Treatment | Recycled Water |

**Technology Integration:**

- Fishmeal & Fish Oil Extraction
- Organic Fertilizer Processing
- Waste-to-Energy Biogas Digestion
- Automated Recycling & Sorting

### Financial Feasibility & Revenue Model (Assumptions)

Cost Estimates (CAPEX) based on cost benchmarks from similar facilities in China, Norway, and Thailand.

| Item | Updated Cost (USD) |
|---|---|
| **Fishmeal & Fish Oil Processing** | $14M (Higher-end processing) |
| **Organic Fertilizer Plant** | $7M (Expanded capacity for local & export demand) |
| **Biogas & Biodiesel Unit** | $9M (Including anaerobic digestion & CHP units) |
| **Plastic Recycling & Sorting** | $6M (China's automated sorting & pelletizing tech) |
| **Industrial Wastewater Treatment** | $5M (Advanced filtration & energy recovery) |
| **Land & Infrastructure** | $12M (Additional logistics & cold chain) |
| **Total CAPEX** | $53M |

Higher CAPEX due to automation, advanced wastewater treatment, and expanded logistics taking into consideration improving efficiency and long-term cost savings.

### Refined Revenue Streams & Output Estimates

| Product | Estimated Output (MT/year) | Market Price (USD/MT) | Annual Revenue (USD) |
|---|---|---|---|
| Fishmeal & Fish Oil | 22,000 MT (+2,000 MT via better extraction efficiency) | $850 per MT (Higher value for premium fishmeal) | $18.7M |
| Organic Fertilizer | 42,000 MT (Optimized bio-waste processing) | $150 per MT | $6.3M |
| Biogas Sales | 3.5M $m^3$ (Higher anaerobic digestion efficiency) | $1.10 per $m^3$ (China's bioenergy market) | $3.85M |
| Recycled Plastics | 5,500 MT (Better recovery via automated sorting) | $450 per MT | $2.48M |
| Total Revenue (Year 5) | - | - | $31.3M |

## **Case Study:** Biomar Group (Norway)

https://www.biomar.com


**Sustainability Initiatives:** Biomar is committed to sustainable practices, including the use of fish waste for fishmeal, fish oil, and other by-products.

**Overview:**

- **Location:** Norway (with operations in multiple countries).
- **Operations:** Biomar is one of the world's leading producers of fish feed, and it actively processes fish waste into fishmeal, fish oil, and other sustainable products. While Biomar primarily focuses on fish feed production, its supply chain includes facilities that process fish waste into valuable by-products.

**Solutions Offered**

**1. Fishmeal and Fish Oil Production**

- Process: Fish trimmings and by-products are processed into high-quality fishmeal and fish oil.
- Output: Used in aquaculture feed, pet food, and dietary supplements.
- Reference: Biomar sources fishmeal and fish oil from sustainable fisheries and processing facilities.

**2. Organic Fertilizer Production**

- Process: Fish waste is converted into organic fertilizer through composting or enzymatic hydrolysis.
- Output: Sold to agricultural markets for soil enrichment.
- Reference: Many fish processing facilities in Norway, such as those supplying Biomar, produce organic fertilizers.

**3. Biogas Production**

- Process: Anaerobic digestion of fish waste produces biogas, which is used for energy generation.
- Output: Biogas powers processing facilities and is sold to local energy grids.
- Reference: Norway's focus on renewable energy has led to the adoption of biogas systems in many fisheries processing plants.

**4. Recycled Plastics**

- Process: Fishing nets, ropes, and plastic packaging are collected and recycled into new products.
- Output: Recycled plastics are used to manufacture new fishing gear or other plastic items.
- Reference: Norway has initiatives like Nofir (a recycling company) that specialize in recycling fishing-related plastics.