



# Using Fishermen Survey to Build the *Know-how* on Fishing Gears in Norway

Paritosh C Deshpande  
NTNU, Norway  
Circular Ocean Conference, Ålesund  
19th April, 2018



# Outline



- Overview of Circular Ocean
- Impacts of lost fishing nets
- Material Flow Analysis (MFA) of fishing nets
- Overview of fishing sector in Norway
- Research questions and methods
- Results from Fishers Survey
- Conclusion

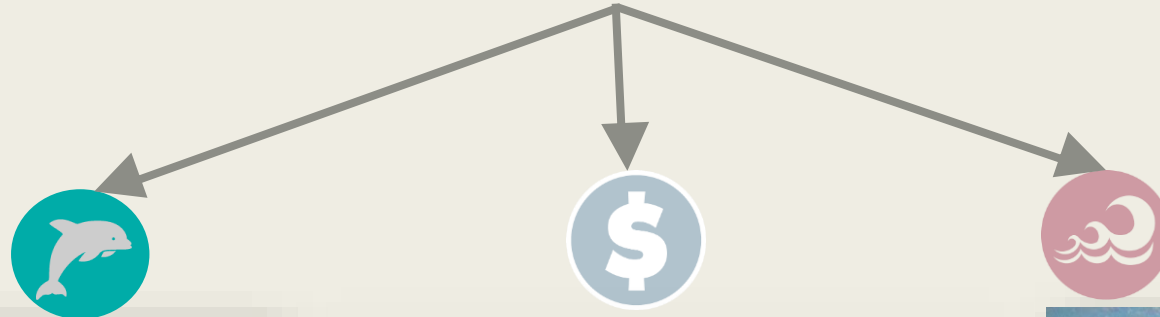
# Ideology behind Circular Ocean

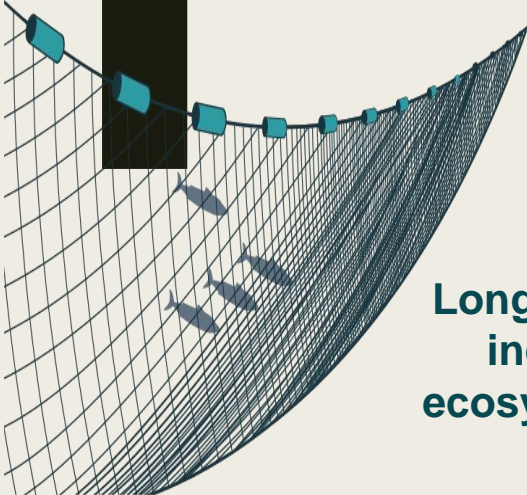
Inspiring Communities to realise the hidden **economic opportunities** of discarded **fishing nets** and ropes in the Northern Periphery & Arctic region



**LOST FISHING  
NETS!!**  
*Why it Matters??*

# Impacts of Abandoned and Lost Fishing Gears





The total economic damage of marine plastic waste is estimated at almost **€12 billion per year**, including environmental, commercial and clean-up costs

Experts believe that entanglement by fishing-related gear is **the most harmful type of litter** to seabirds, turtles and marine mammals

Long term effects on marine life include impacts on marine ecosystems that ultimately leads to **loss of biodiversity**




Up to **12.7 million tons of marine plastic** waste enters the oceans each year due to poor waste management practices




Over **33 000 nets** are estimated to be lost European fisheries annually due to bad weather conditions, gear conflict and ocean currents

Plastic material absorbs persistent organic pollutant, if ingested by marine organisms, may **enter the food web**



By 2025 there could be **155 million tones of plastic** in the ocean, representing one ton of plastic for every three tons of fish



Approximately **640,000 tons** of fishing gear are lost globally each year



# Material Flow Analysis on Fishing Nets

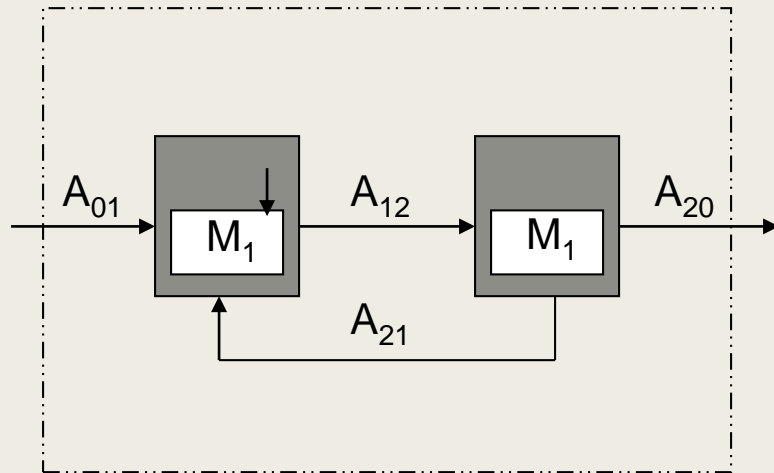
What is the typical life-cycle system of different fishing nets used by commercial fishing fleet in Norway?

What are the typical annual purchase, repair and disposal patterns of fishing nets used by commercial fishing fleet in Norway?

What are the scientific estimates of plastic quantities entering in the ocean as ALDFG from Norwegian commercial fishing fleet?

Scientific estimates of annual quantities of plastic polymers (PP, PE and Nylon) collected at end-of-life facilities in Norway?

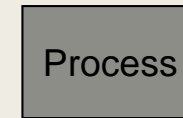
# What is an MFA system?



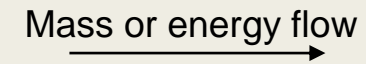
System boundary:



Elements (parts):



Interactions:



## System variables:

Stocks

$M_1, M_2$

Flows

$A_{01}, A_{12}, A_{20}, A_{21}$



# Material Flow Analysis: Objectives

MFA's are used for:

- **Early recognition** of future stocks and flows (accumulations, depletions...)
- **Priority setting** for environmental protection, resource conservation and waste management
- **Design** of goods, processes, and systems (green design, eco-design, design for recycling...)





# Ports in Norway

- 25,148 km (approx. 15500 miles) long coastline
- There are 600 total and 83 major ports in Norway
- Coastline has number of small ports, quays and jetties because of the geography
- Fishing ports in Norway are organised as municipal or inter-municipal enterprises that act as landlords with some quays being privately owned
- Many ports lack waste-handling data and plan for handling and management of fishing gear resources

| Total catches  |                            |       |                    |
|----------------|----------------------------|-------|--------------------|
|                | (1 000 tonnes live weight) |       | Share of EU-28 (%) |
|                | 2008                       | 2016  | 2016               |
| <b>EU-28</b>   | 4 910                      | 5 011 | 100.0              |
| Belgium        | 22                         | 27    | 0.5                |
| Bulgaria       | 8                          | 9     | 0.2                |
| Denmark        | 691                        | 670   | 13.4               |
| Germany        | 207                        | 241   | 4.8                |
| Estonia        | 98                         | 72    | 1.4                |
| Ireland        | 205                        | 230   | 4.6                |
| Greece (*)     | 84                         | 75    | 1.5                |
| Spain          | 853                        | 860   | 17.2               |
| France         | 490                        | 525   | 10.5               |
| Croatia        | 49                         | 72    | 1.4                |
| Italy          | 232                        | 193   | 3.8                |
| Cyprus         | 2                          | 1     | 0.0                |
| Latvia         | 158                        | 115   | 2.3                |
| Lithuania      | 157                        | 106   | 2.1                |
| Malta          | 1                          | 2     | 0.0                |
| Netherlands    | 376                        | 368   | 7.4                |
| Poland         | 116                        | 197   | 3.9                |
| Portugal       | 224                        | 181   | 3.6                |
| Romania        | 0                          | 7     | 0.1                |
| Slovenia       | 1                          | 0     | 0.0                |
| Finland        | 119                        | 163   | 3.2                |
| Sweden         | 230                        | 198   | 4.0                |
| United Kingdom | 588                        | 700   | 14.0               |
| Iceland        | 1 306                      | 1 070 | -                  |
| Norway         | 2 367                      | 1 873 | -                  |
| Turkey         | 463                        | 301   | -                  |

# CAPTURE FISHERY : TOTAL CATCH (t/yr)

Source: Eurostat (2017)

## Commercial Fishing Fleet, Norway

**Total fishing vessels** ≈ 6000

**Fishing Gears Used:** Gillnets, Longlines, Midwater and Bottom Trawls, Pots, Seines, and surrounding nets

### Deepwater/Ocean Fishing Vessels

**Fishing Vessels** ≥ 28 meters

**Total Vessels** : 503

**Fishing Gears Used:** Midwater and Bottom Trawls, Purse and Danish Seines, Gillnets, Longline

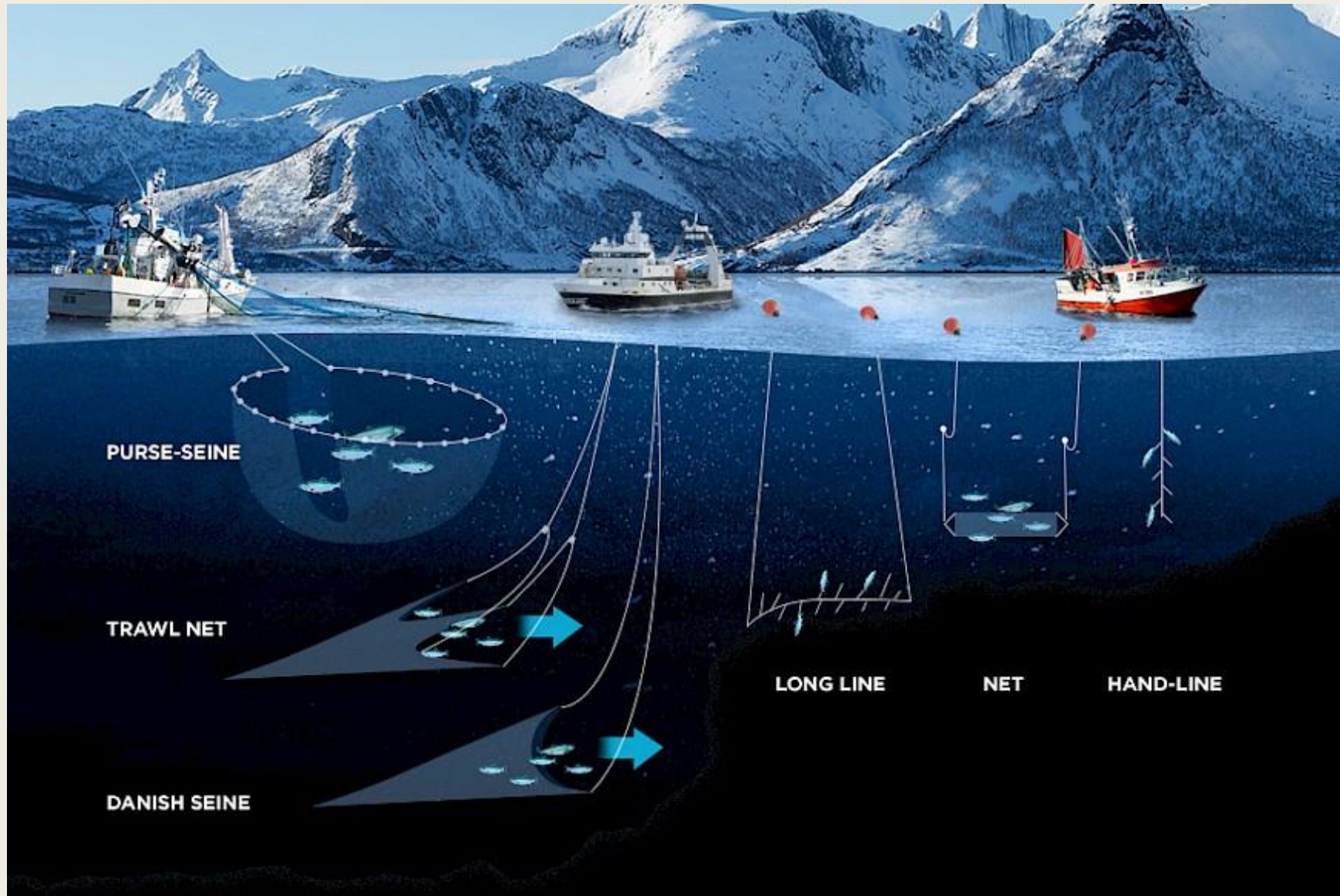
### Coastal Fishing Vessels

**Fishing Vessels** ≤ 15-18 meters

**Total Vessels** : 5446

**Fishing Gears Used:** Midwater Trawls, Danish Seines, Gillnets, Longline, Pots and Traps

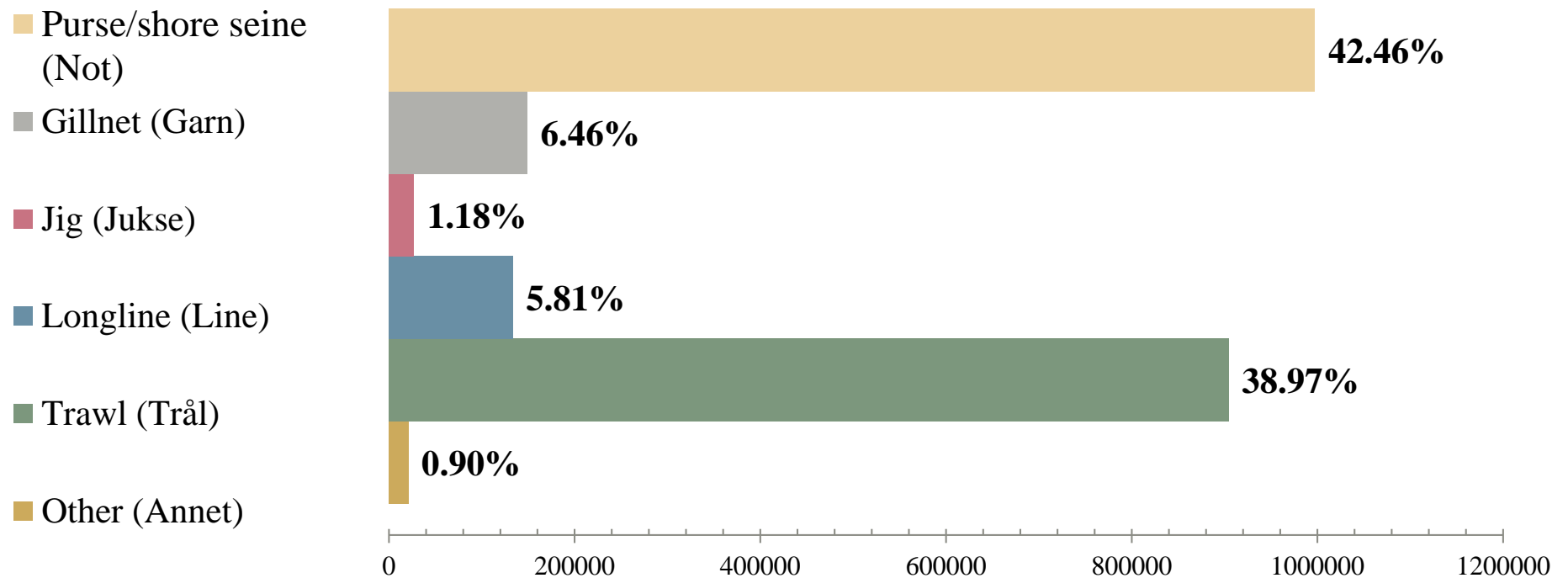
# Commercial Fishing Nets : Norway



Source: Vista Analyse AS (2018)

# Annual Catch Capacity of Various Fishing Gears, Norway

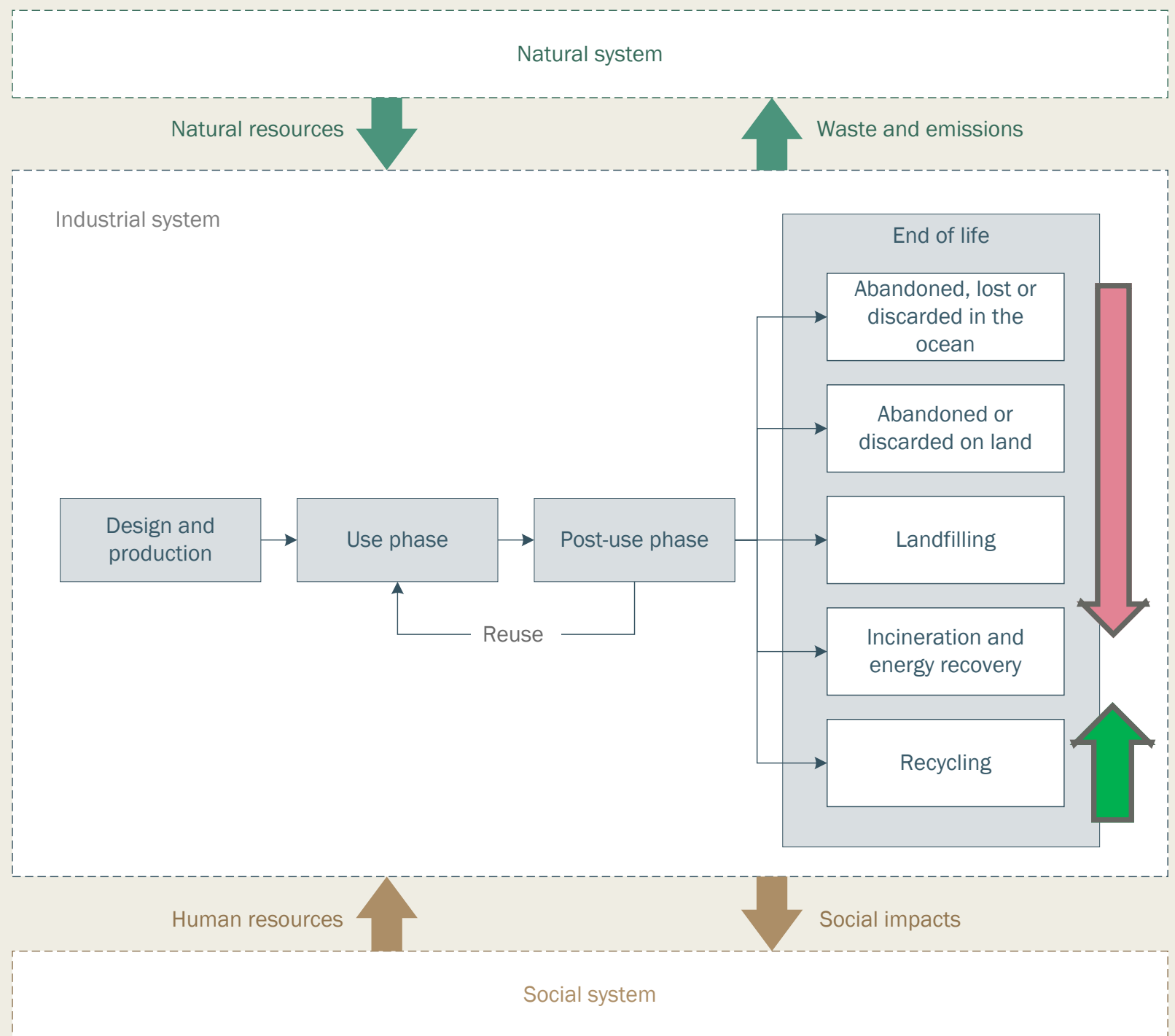
Average quantity of catch landed per year from 2007 to 2016, using different fishing gear type



Source: (Fiskeridirektoratet, 2015)

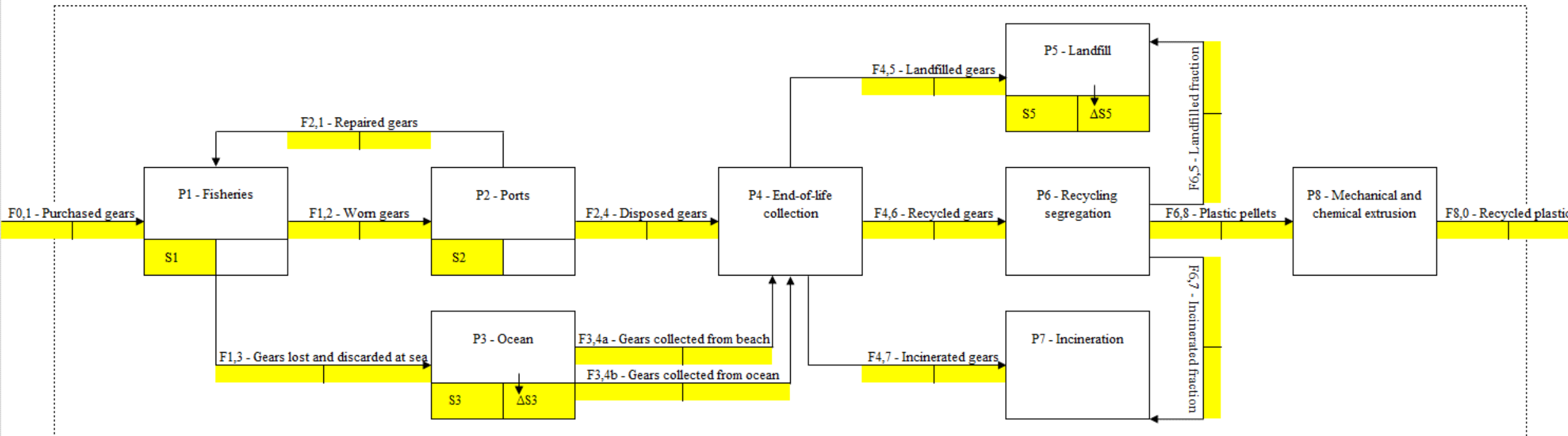
# System Life Cycle for Fishnets Norway

(Deshpande and Aspen, 2017)



# Material Flow Diagram for Fishing Nets

Draft of the Material Flow Analysis (MFA) model



Flows and stocks of fishing gear [ton/yr] (average 2015-2016)



# Relevant Stakeholders

| Stakeholder Type  | Pre-Use<br>/Purchase | Use-Phase | End-of-Life<br>(EOL) | Other |
|---|----------------------|-----------|----------------------|-------|
| Fiskeridirektoratet   |                      |           | X                    | X     |
| Barrents Watch/Coast guards   |                      |           | X                    |       |
| Ports and harbors   |                      | X         | X                    | X     |
| <b>Fishers and fishermen associations</b>   | X                    | X         | X                    | X     |
| Relevant NGO's, research & consultancy companies (FFL, SALT, Hold Norge Rent, etc.) | X                    |           | X                    | X     |
| Fishing net suppliers and manufacturers   | X                    |           |                      |       |
| Waste management companies  |                      |           | X                    |       |
| Waste collection and recycling companies  |                      |           | X                    |       |
| Literature and other sources  | X                    |           | X                    | X     |

# Local/Traditional Ecological Knowledge (LEK)

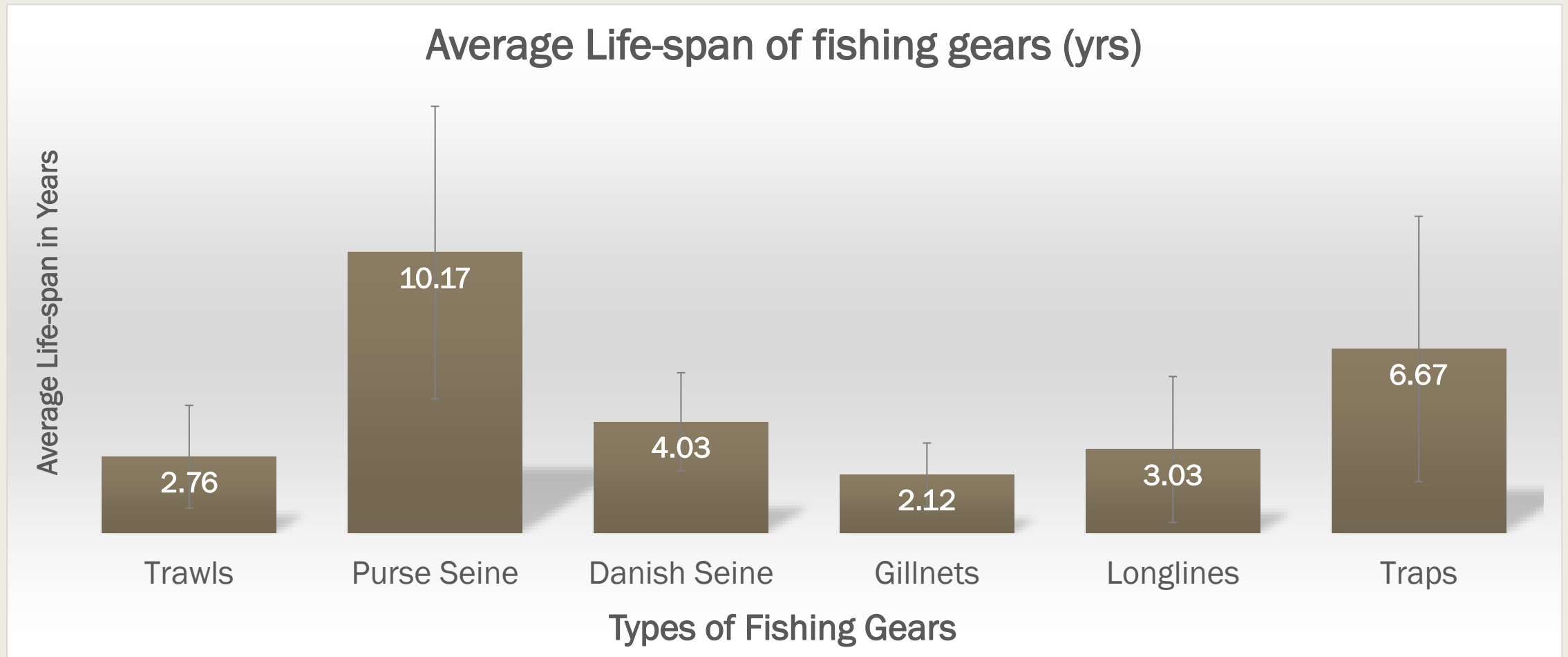
(Berkes, F. (1993), Stevenson, (1996), Freeman, et al. (2000))

- **Local ecological knowledge (LEK/TEK)** describes aboriginal, indigenous, or other forms of traditional knowledges regarding sustainability of local resources.
- LEK is a cumulative body of knowledge and beliefs tied to a place, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment.
- Johannes R (2000) coined a term **Local Fishers Knowledge (LFK)**,
- LFK is similar to local ecological knowledge in that it is tied to place, is acquired through experience and observation, and may be acquired over a single lifetime or passed down over many generations. Unlike local ecological knowledge, LFK includes **non-ecological knowledge** related to fisheries, including but not limited to **business aspects of fishing, economics, social dynamics, and local fishing culture.**

# Data Collection Methods

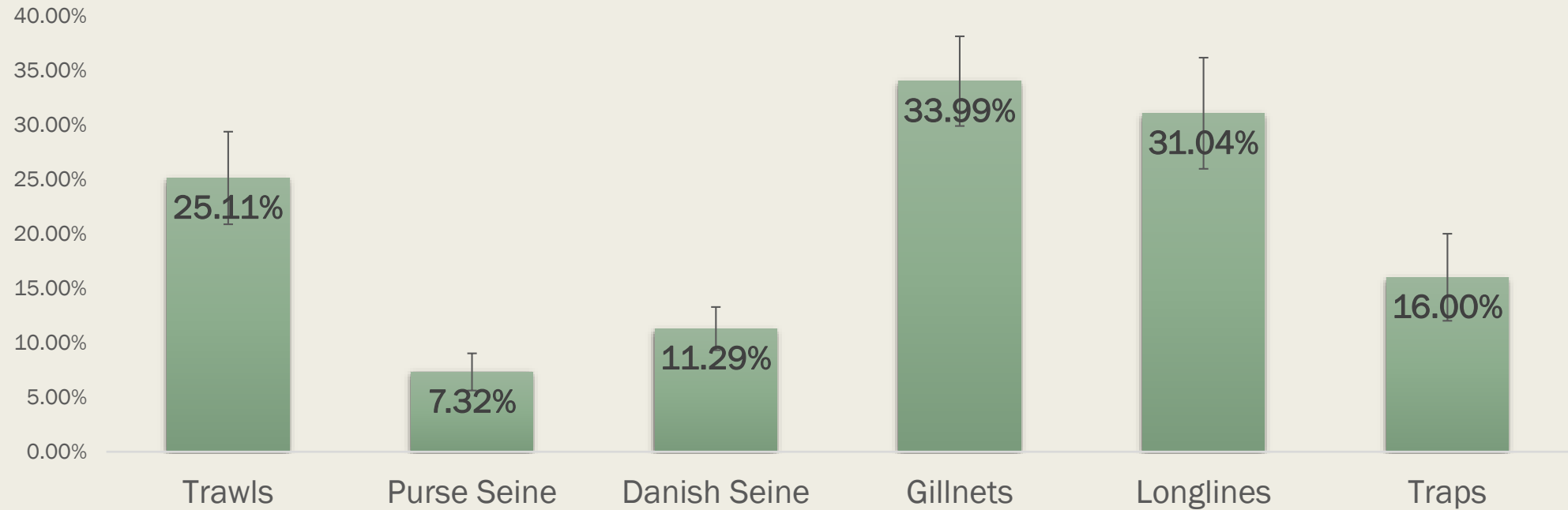
- Survey and questionnaire to obtain **LEK**
  - To understand patterns in commercial fishing and other LFK
  - 12 intuitive questions drafted with the help of experts
  - Conducted one-on-one survey on 112 commercial fishers in Norway over the period of 5 months
- Statistical analysis of the survey results

# Results: Average Life-span

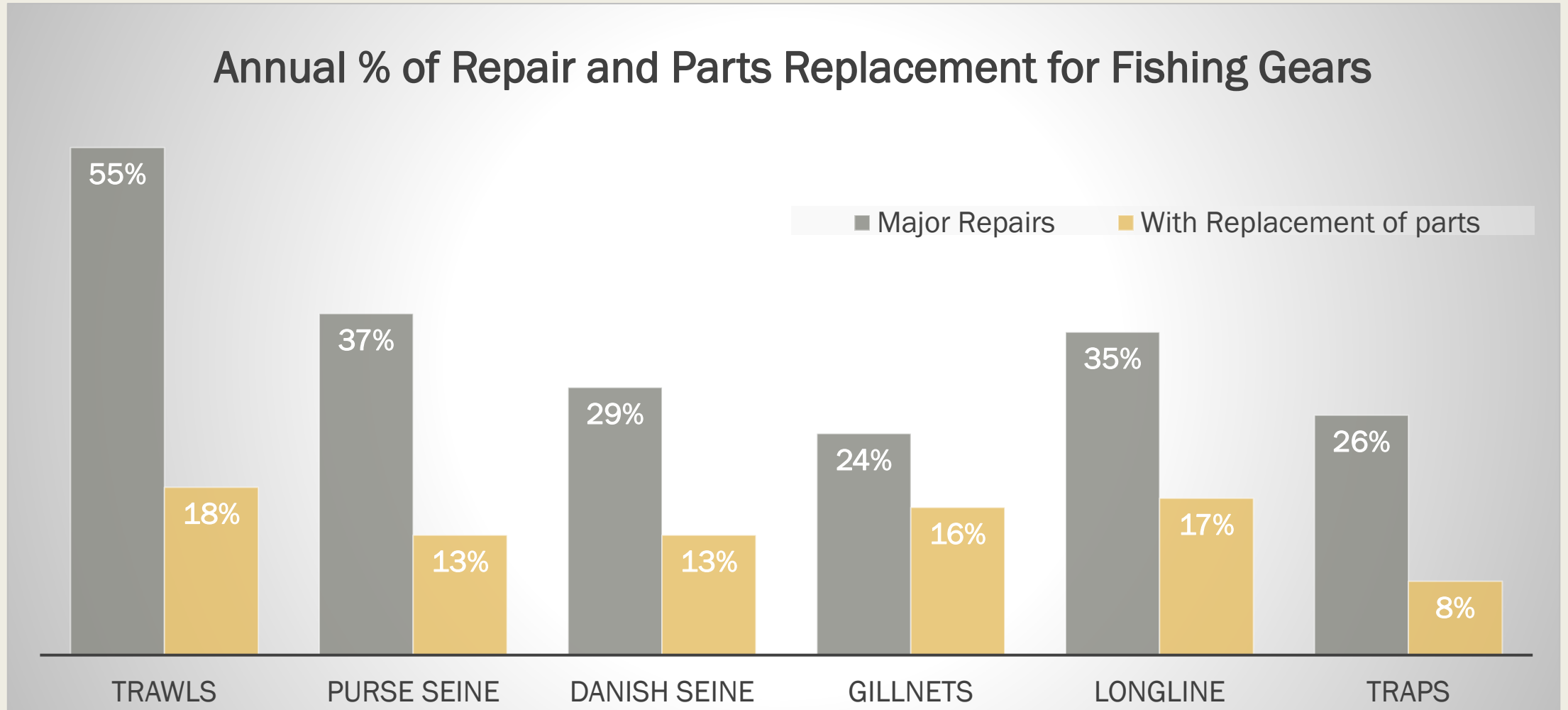


# Disposal Patterns of Fishing Gears in Norway

Annual % of fishing nets disposed in Norway

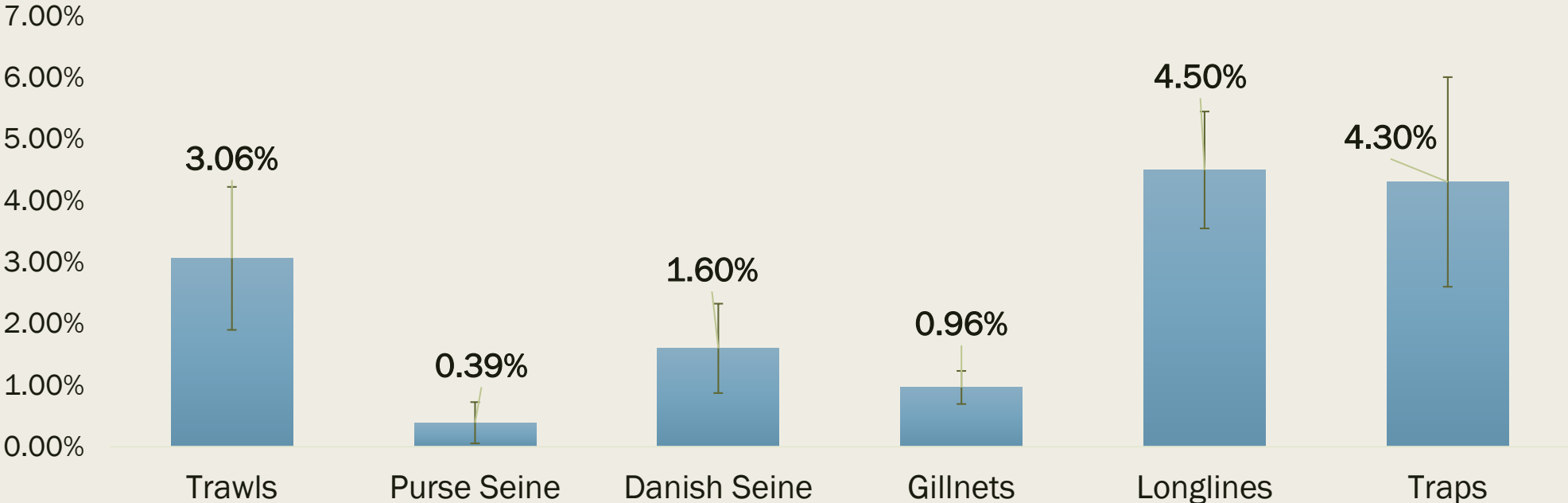


# Annual Repair % for Various Fishing Gears, Norway



# % Fishing Gears lost Annually in Norway

Annual % of fishing nets lost in Norway



# Conclusion

- Local fishers are the critical source to get more knowledge on fate and transport of various fishing gears.
- A simple *12-question* questionnaire proves to be an efficient method to build knowledge on fishing practices in Norway.
- This information on **purchase, repair and disposal** patterns can be used to design the efficient system of fishing net resources.
- Aid to more informed decision making in waste fishing gear handling and management to benefit fishers.
- Opportunity to create closed-loop solutions to minimize waste fishing nets in the Ocean avoiding ghost fishing.
- Easily reproducible elsewhere!



# Thank You!

# Questions??

**Paritosh Deshpande**

PhD Researcher

Department of Industrial Economics and Technology  
Management

Norwegian University of Science and Technology (NTNU)  
Trondheim, Norway

Email: [paritosh.deshpande@ntnu.no](mailto:paritosh.deshpande@ntnu.no)

<http://www.ntnu.edu/employees/paritosh.deshpande>