Marine and Coastal Management
Sharing Norway’s Experience from Coexistence Between Fisheries and Other Users of the Sea

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Namibia Phosphate Mining
June 2014
Norwegian Sea Areas

Source: Directorate for Nature Management
Our most important tools for collecting data on the ecosystem

The research vessels

1. **HÅKON MOSBY**
   - Built: 1980
   - 701 GRT., L.o.a: 47.2 M
   - Owner: UNIVERSITY OF BERGEN

2. **DR. FRIDTJOF NANSEN**
   - Built: 1993
   - 1444 GRT., L.o.a: 56.8 M
   - Owner: NORAD

3. **G.M. DANNEVIG**
   - Built: 1979
   - 171 BGRT., L.o.a: 27.9 M

4. **G.O. SARS**
   - Built: 2003
   - 4067 GRT., L.o.a: 77.5 M

5. **JOHAN HJORT**
   - Built: 1990
   - 1828 GRT., L.o.a: 64.4 M

Institute of Marine Research
750 Employee

5 large Research Vessels
Oil industry and fisheries, Norwegian experience.
Fisheries was the most important industry in Norway when oil exploration started 45 years ago.

A few years later the fast growing offshore petroleum industry took the lead as Norway’s economically most important industry.

The situation is similar in many other countries.

Petroleum is an unrenewable resource that will be important for a limited period of time, while fisheries represent a renewable resource with a potential of development and increased production.
Petroleum provinces on the Norwegian Continental Shelf
Integrated Management Planning

Ecosystem-based

Assessment of cumulative environmental effects

Purpose:
Sustainable use of fish and other natural resources
Safeguarding of the environment
Particularly valuable areas for fish: Cod, Haddock, Herring, Capelin
Development stages of marine fish larvae

The different stages have different sensitivity to pollution and environmental factors

(Atlantic Halibut)
Particularly valuable areas for seabirds
**Need for knowledge improvement**

- Fish stocks and fishery
- Seabird distribution
- Seabed, coral reefs etc.
- Geological mapping
- Screening of hazardous chemicals in sediments, water column and living marine organisms (according to standard procedures)
MAREANO
(Marine Area Database for Norwegian sea areas)

Started due to the need for decisional background data in Norwegian management

main products:

- Detailed bathymetric maps
- Fine-scaled information about sediment types, habitats, and geological features
- Distribution of benthic fauna, biodiversity, communities, and production
- Environmental status for sediments
- Area database for Norwegian coastal- and offshore areas – available for all
Summary:

- The integrated management planning approach considers both environment and economic activity through an ecosystem approach.

- Provides a predictable framework for economic activities.

- Safeguards the especially valuable and vulnerable areas against pollution.

- Introduces more coordinated and systematic environmental monitoring and mapping, strengthening the basis for future decisions and measures.
Norwegian seafood exports 1988-2013

Aquaculture: 42.3 Billion NOK
Fisheries: 19.2 Billion NOK
Net cash flow to the State from the petroleum activities

- Statoil dividend
- Royalty and area fee
- SDFI
- Environmental taxes
- Taxes
- State net cash flow

Bill. NOK 2012 value

How can we share the Norwegian experience?
Regional approaches in the Nansen Programme
Political ambition for co-existence between the fisheries and other users of the sea both in Norway and other countries

Knowledge about environmental conditions is an important factor
Legislation and regulations are often in place but the systems for auditing, control and enforcement are not fully implemented.
The Cabinda study:
Significant contamination by Petroleum related chemicals out to 1 km from the drilling site (red dots, barium a tracer for drilling fluid)
Levels of contamination is comparable to the North Sea levels in the 1980’s
Crustacea
GE-1

Pythonichthys microphthalmus
GE-1

Mollusca
GE-1

Echinoidea
GW-2

Crustacea
GW-3

Ophiuroidea
GW-2

Mollusca
GW-1

Polychaeta
GE-3
Fish and Invertebrates
SIMPLIFIED FOOD CHAIN

PHYTOPLANKTON

ZOOPHANTON

SMALL FISH & JUVENILES

FISH

SEA MAMMALS

NUTRIENTS

USED FOR CAGING EXPERIMENTS
Water column Monitoring

In situ deployment of fish, mussels and passive samplers to monitor accumulation and effects of contaminants.
Experience from Caging Experiments

- Fish cages using light to attract food organisms has successfully been used in environmental monitoring both offshore and in coastal waters.

- Fish has been kept in cages up to 1 year without additional feeding.

- Growth rates up to 0.7% per day has been recorded.

- 3 different species - Cod, Saithe and Haddock - have successfully been tested in caging experiments.

- Can use fish from a group with "known history".

- Blue mussels and passive samplers can be attached to the cages.

- Multiple sampling is easy, in some experiments cages have been sampled every 6 weeks over a 6 months period.
Remote sensing of the ocean using acoustics

1) Using multi-beam echosounders to obtain detailed maps of sea bottom
Deepwater coral reef in Ghana Investigated using the Videograb
Coral reef
450 meters depth
What's in the barrel?

Clean water