



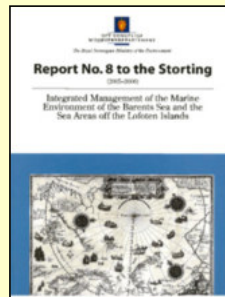
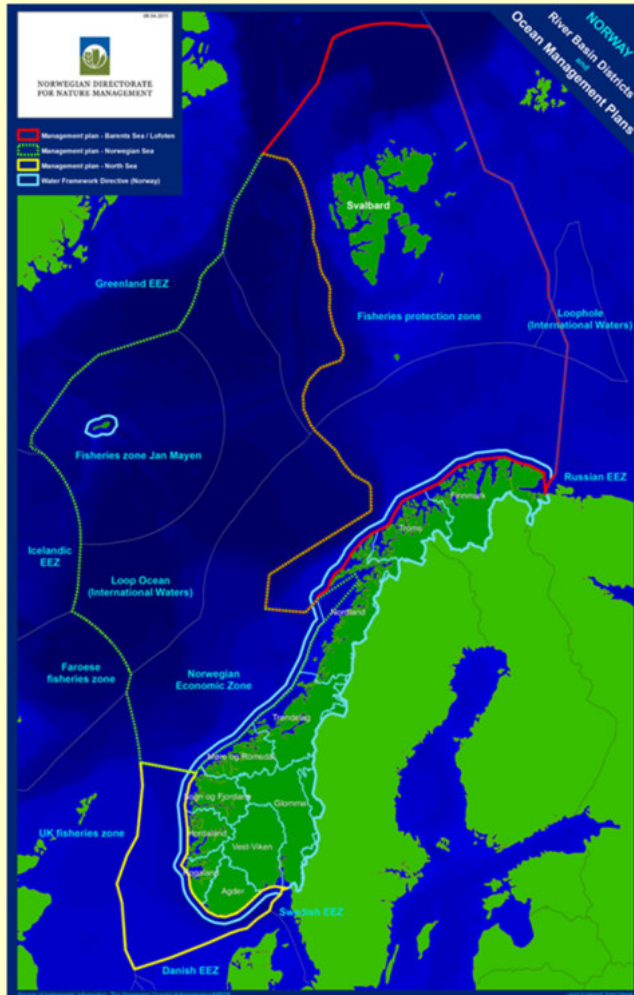
# Integrated Management Plans for Norwegian Sea Areas

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ABC  
Rovaniemi, 12 October 2018

**Background**

# Management plans for Norwegian Sea Areas

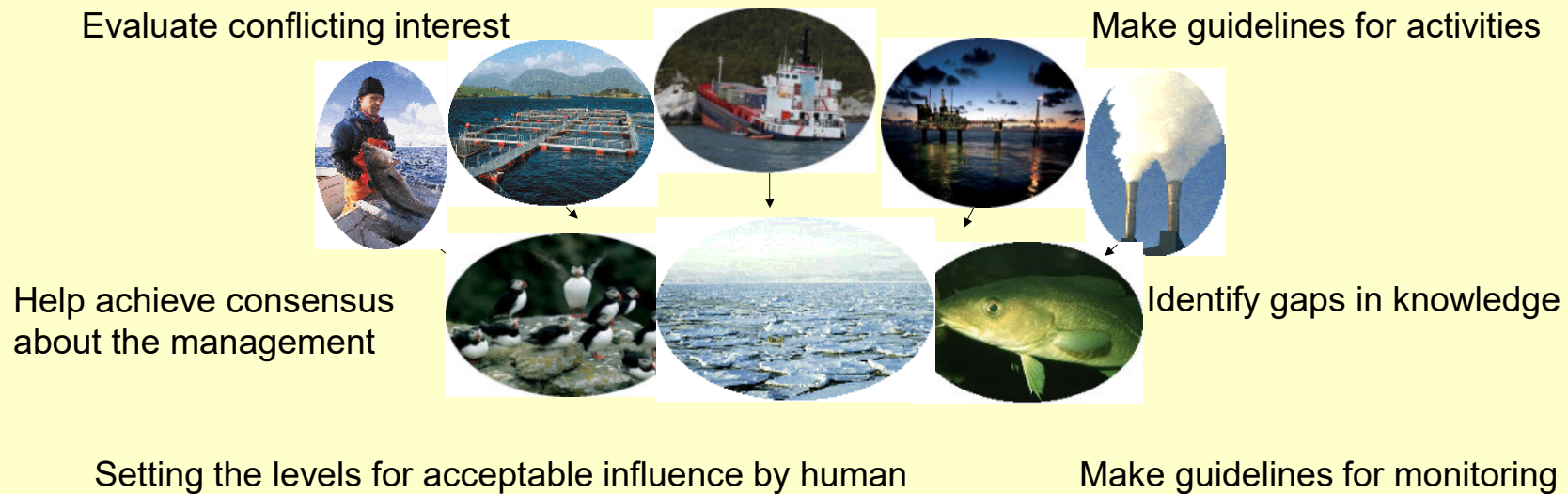


- Integrated Management plan for the Barents Sea and Lofoten (2006):  
Follow up – updated in 2011.  
Revision in 2020
- Integrated Management plan for the Norwegian Sea (2009):  
Follow up – updated in 2017, next update 2020
- Integrated Management plan for the North Sea – Skagerrak (2013)  
Follow up – update 2020



# Need for comprehensive, ecosystem-based management

The purpose of the **Integrated Management Plans** is to provide a framework for the sustainable use of natural resources and goods derived from the area and at the same time maintain the structure, functioning and productivity of the ecosystems of the area.



- This requires close coordination between the objectives of the management plan and the legislation that applies to the geographical area of the plan.

**Who?**

## The target audience

- The management plans are intended to be instrumental in ensuring that **business interests, local, regional and central authorities, environmental organisations and other interest groups** all have a common understanding of the goals for the management of Norwegian sea areas.
- Strengthening international cooperation: share experience gained through the present management plans in the work on integrated management of the marine environment within the framework of the **OSPAR** Commission and the EU, **ICES, Arctic Council, bilateral Norwegian-Russian processes** etc.
- ....

**What and where?**

# The ecosystem approach

- **The ocean environment**

- Ocean current
- Water masses (physical + chemical properties)
- Sea ice
- Ocean floor topography/condition

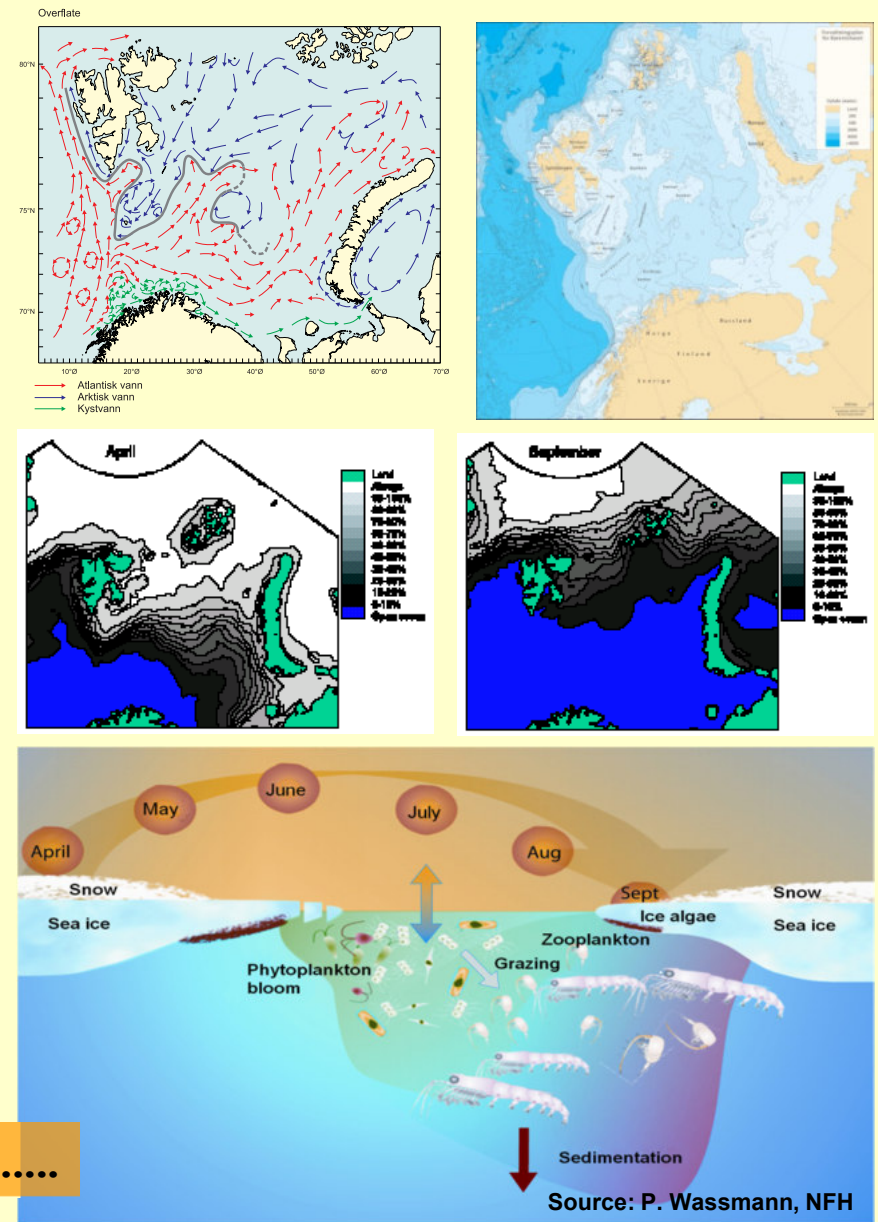
- **Biology**

- Productive areas
- Dynamics/Processes
- Transport of organisms to the area
- Migration in/out

- **Activities and impact factors**

- Climate
- Ocean acidification
- Pollution
- Fisheries
- Petroleum
- Shipping
- Introduced species

*... have to be considered together in a management plan .....*





**Class Asteroidea**



*Crossaster papposus*

**Class Gastropoda**



*Clione limacina*

**Class Demospongia**



*Haliclona* sp.



Family Axinellidae

**Class Scyphozoa**



*Haliclystus auricola*

**Class Malacostraca**

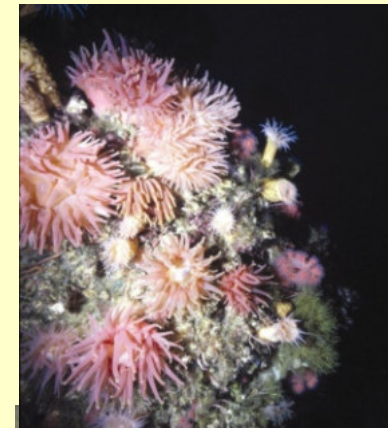


Amphipod



*Paramphithoe hystrix*

**Class Anthozoa**



*Hormanthia nodosa*

# Other groups

**Class Osteichthyes**

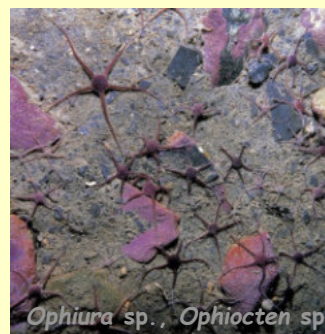


*Gymnelus retrodorsalis*



Arctic lump sucker  
(*Eumicrotremus spinosus*)

**Class Ophiuroidea**



*Ophiura* sp., *Ophiocten* sp.



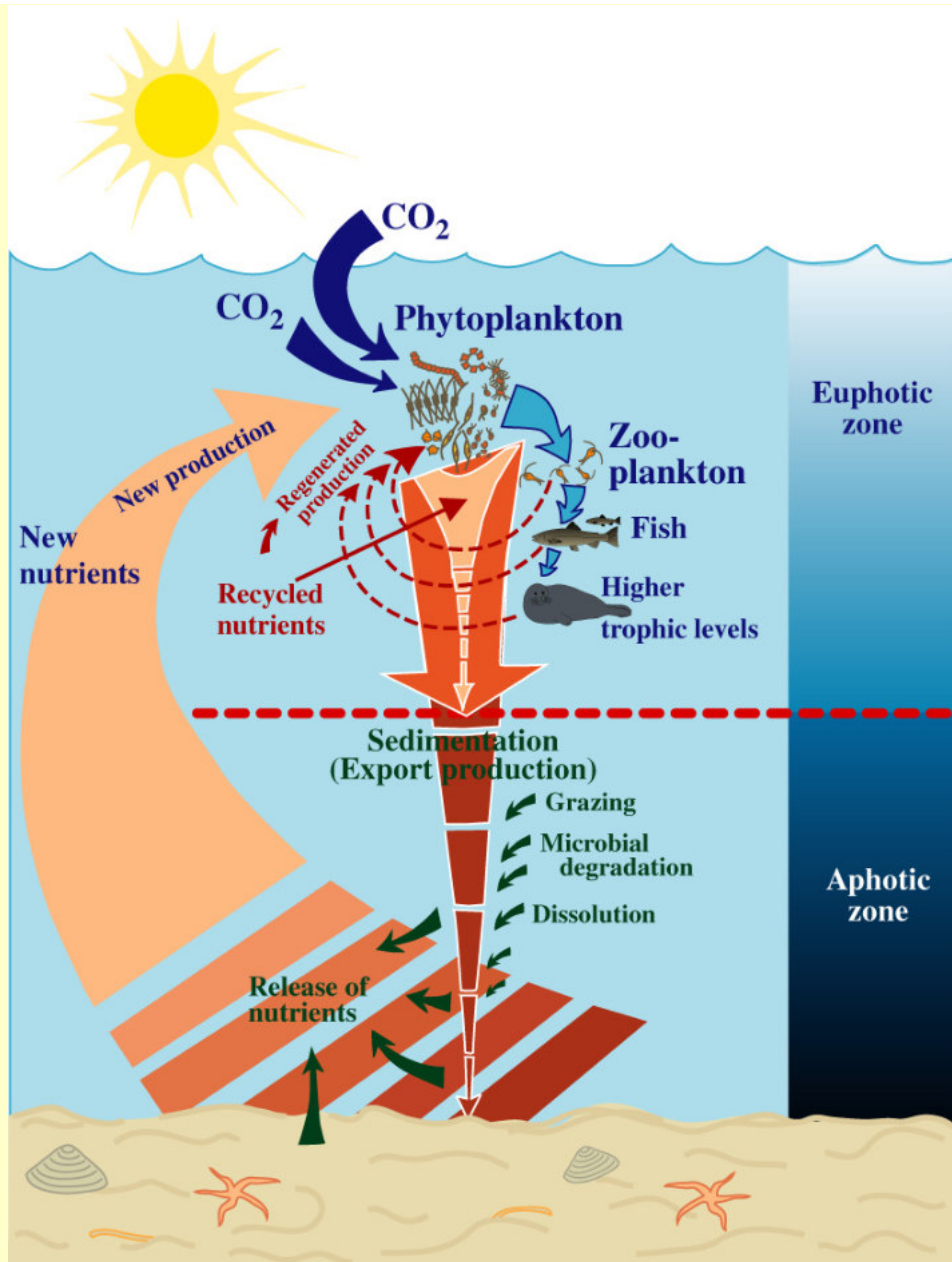
*Gorgonocephalus* sp.

**Class Crinoidea**



*Heliometra glacialis*

Photos: B. Gulliksen & E. Svensen



## Conceptual view on interactions and processes in Arctic marine ecosystems

(after Keck and Wassmann)

# Objectives with different "functions"

## Examples

- Strategic/overarching objectives
  - Overriding considerations
- High-level operational objectives/qualitative descriptors
  - Management actions
    - Specific guidelines
  - Environmental status
    - Desired state of the environment

**Management** of the Barents Sea–Lofoten area will ensure that diversity at ecosystem, habitat, species and genetic levels, and the productivity of ecosystems, are maintained. **Human activity** in the area will not damage the structure, functioning, productivity or dynamics of ecosystems (St. meld. nr. 8 (2005-2006)).

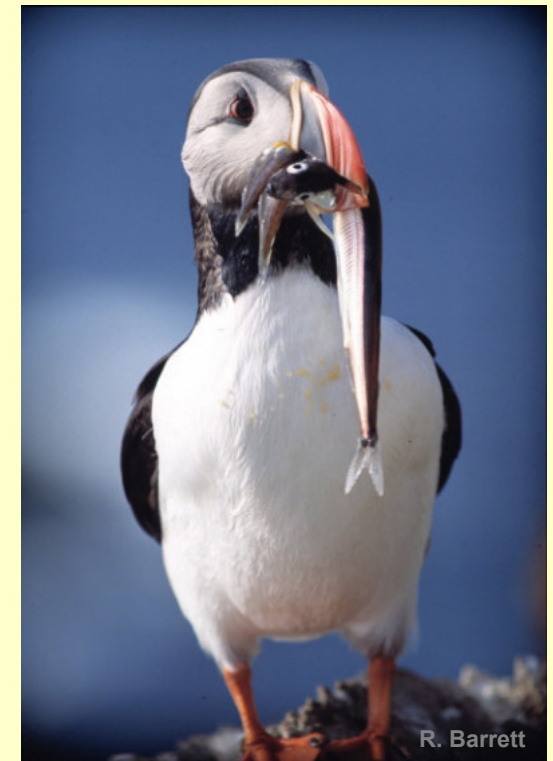
A representative **network of protected marine areas** will be established in Norwegian waters, at the latest by 2012. This will include the southern parts of the Barents Sea–Lofoten area. (St. meld. nr.8 (2005-2006)).

Harvested species will be managed within safe biological limits so that their spawning stocks have **good reproductive capacity**. (St. meld. nr.8 (2005-2006)).

# Coordinated and systematic monitoring

The plan opens for an expanded and coordinated monitoring of the environment

- Monitoring system based on **indicators**, **reference values** and **thresholds for action**
- Updated knowledge about changes in the state of the environment
- Researchers and authorities can make cross-sectoral assessments and implement necessary measures to improve the environment



The Atlantic puffin (*Fratercula arctica*) may be an indicator of the availability of small pelagic fish.



# Integrated Ecosystem Assessments ++

- Description of ecosystems and status of biological diversity and habitats
- Pressures and impacts on the environment
  - Description of activities
  - Climate change, ocean acidification and pollution
  - Environmental effects, incl. cumulative
- Conflicts of interest and coexistence between industries



Photo: N. Øien

# Risk evaluation

- Models and risk analysis are being used as tools to estimate risk.
- Important to be aware of the pros, cons and limitations of these tools.
- Risk will also change over time
  - due to change in traffic volume
  - implantation of measures
  - lessons learned from accidents
  - new technology
  - etc



- Focus on different aspects of risk
  - the probability of accidental discharges
  - the probability of oil contamination
  - the risk of damage
  - the risk of damage-related costs



# Particularly valuable and vulnerable areas that require special attention

The most important criteria for selecting the areas were:

- whether it supports **high production** and **high concentration** of species
- whether it includes a large proportion of **endangered** or **vulnerable** habitats
- whether it is a **key area** for species for which Norway has a special responsibility or for endangered or vulnerable species
- whether it supports **internationally** or **nationally** important populations of certain species all year round or at specific times of the year

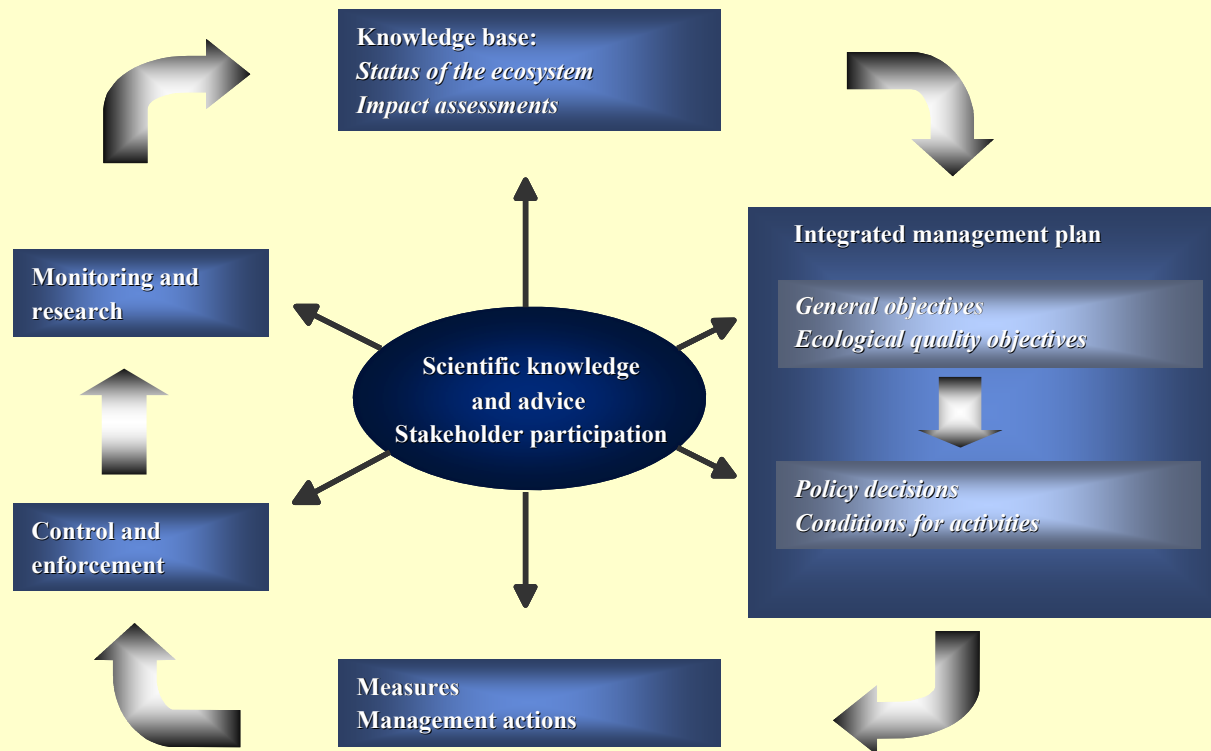


# Marine ecosystem services

Group	Marine ecosystem services
<b><i>Production services</i></b>	<ul style="list-style-type: none"> <li>Production /supply of food suitable for consumption</li> <li>Production / supply of non-edible products</li> <li>Supply of genetic resources</li> <li>Supply of marine resources for pharmaceutical, chemical and biotechnological industry</li> <li>Supply of decorative resources</li> <li>Supply of energy</li> <li>Supply of space and waterways</li> </ul>
<b><i>Cultural services</i></b>	<ul style="list-style-type: none"> <li>Recreational services</li> <li>Aesthetic services</li> <li>Contribution to science and education</li> <li>Maintenance of cultural heritage</li> <li>Inspiration for art and commercials</li> <li>Legacy of the seas (value of existence/heritage)</li> </ul>
<b><i>Regulating services</i></b>	<ul style="list-style-type: none"> <li>Climatic and atmospheric regulation</li> <li>Sediment retention</li> <li>Reduction of eutrophication</li> <li>Biologic regulation</li> <li>Regulation of hazardous chemicals</li> </ul>
<b><i>Supporting services</i></b>	<ul style="list-style-type: none"> <li>Maintenance of biogeochemical cycles</li> <li>Primary production</li> <li>Maintenance of food web dynamics</li> <li>Maintenance of biodiversity</li> <li>Maintenance of habitats</li> <li>Maintenance of ecologic resistance to change (resilience)</li> </ul>

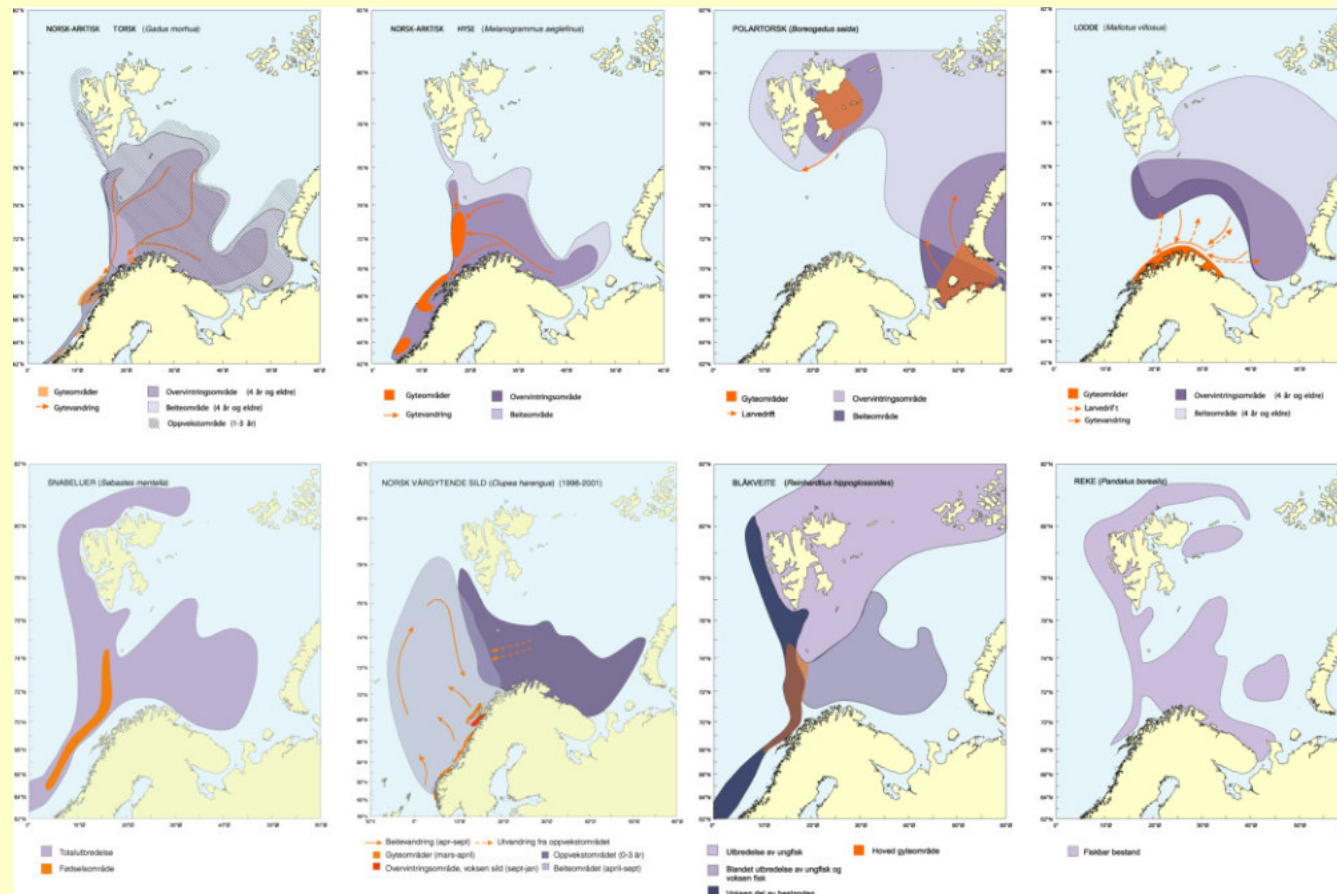


# Elements in an ecosystem-based approach to management



**When?**

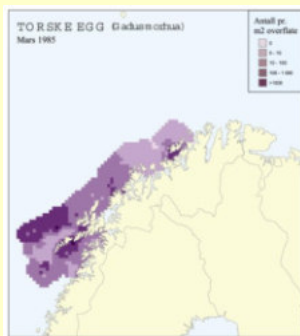
# The Barents Sea is one of the world's most important fishing areas (total importance)



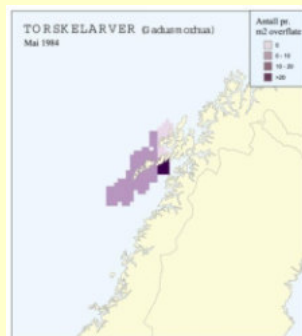
von Quillfeldt (2002)

# Northeast Arctic cod (importance of life stage)

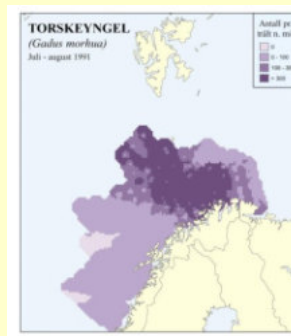
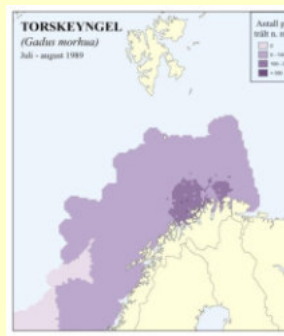
Eggs



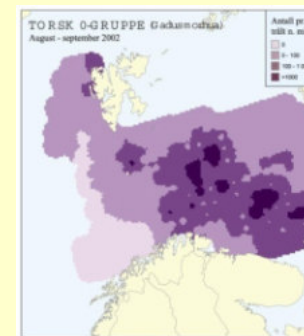
Larvae



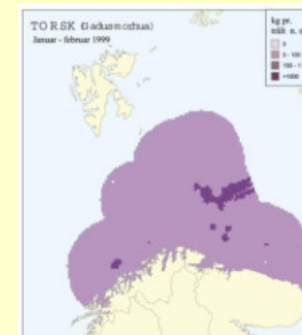
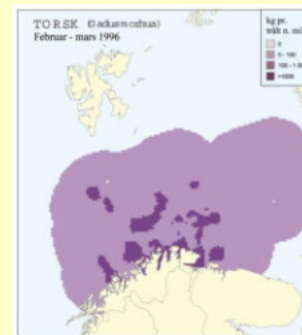
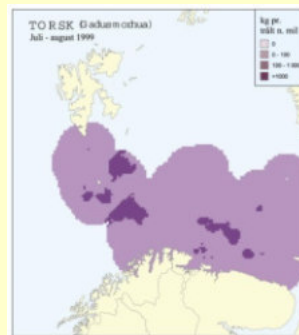
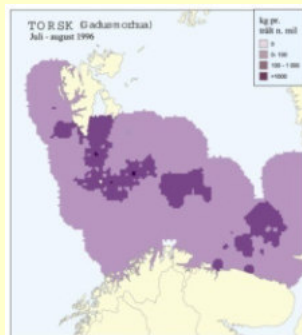
Fry



0-group



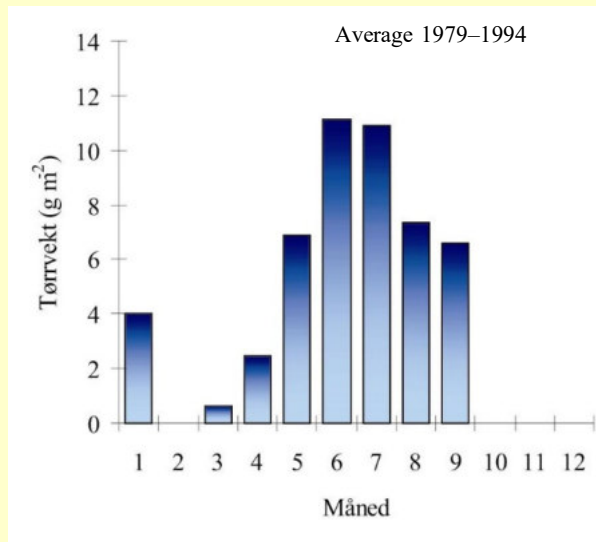
Adult



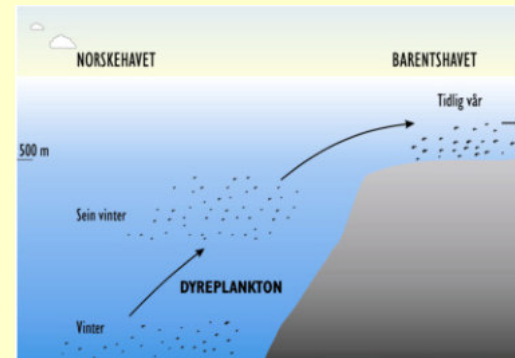
+ different life stage – different prey

# Plankton (changes throughout a year and between years)

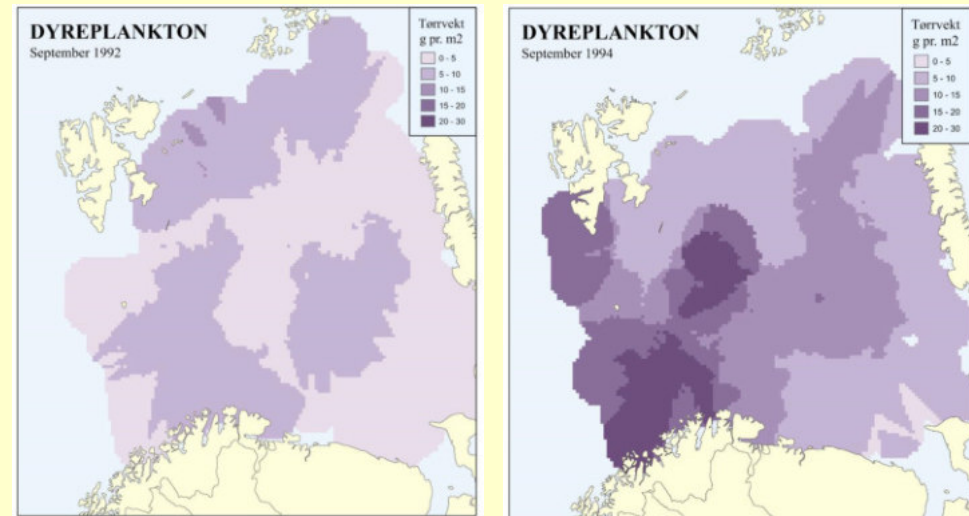
## Zooplankton – biomass



## Zooplankton – transport

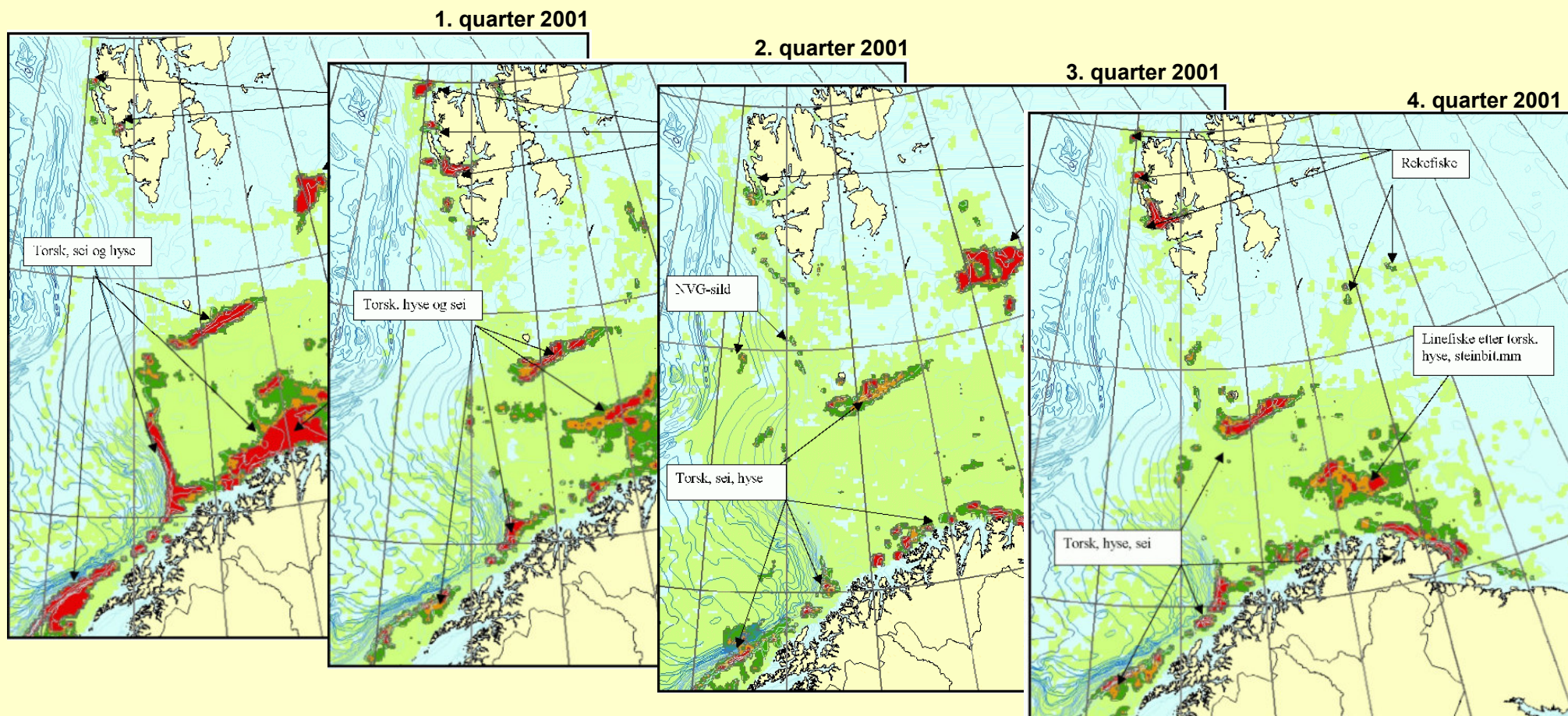


## Zooplankton – horizontal distribution



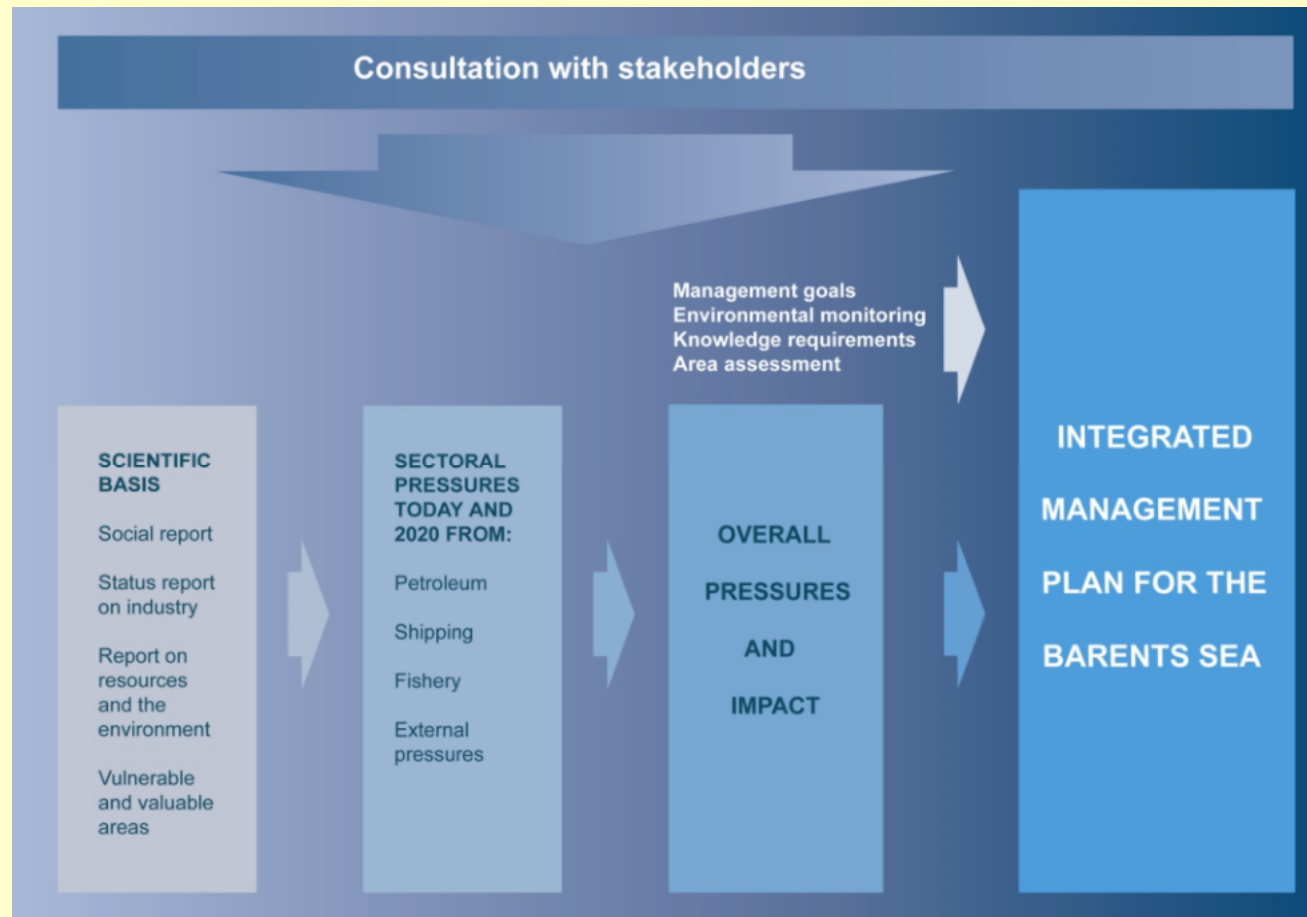


# The fishery activity



**How?**

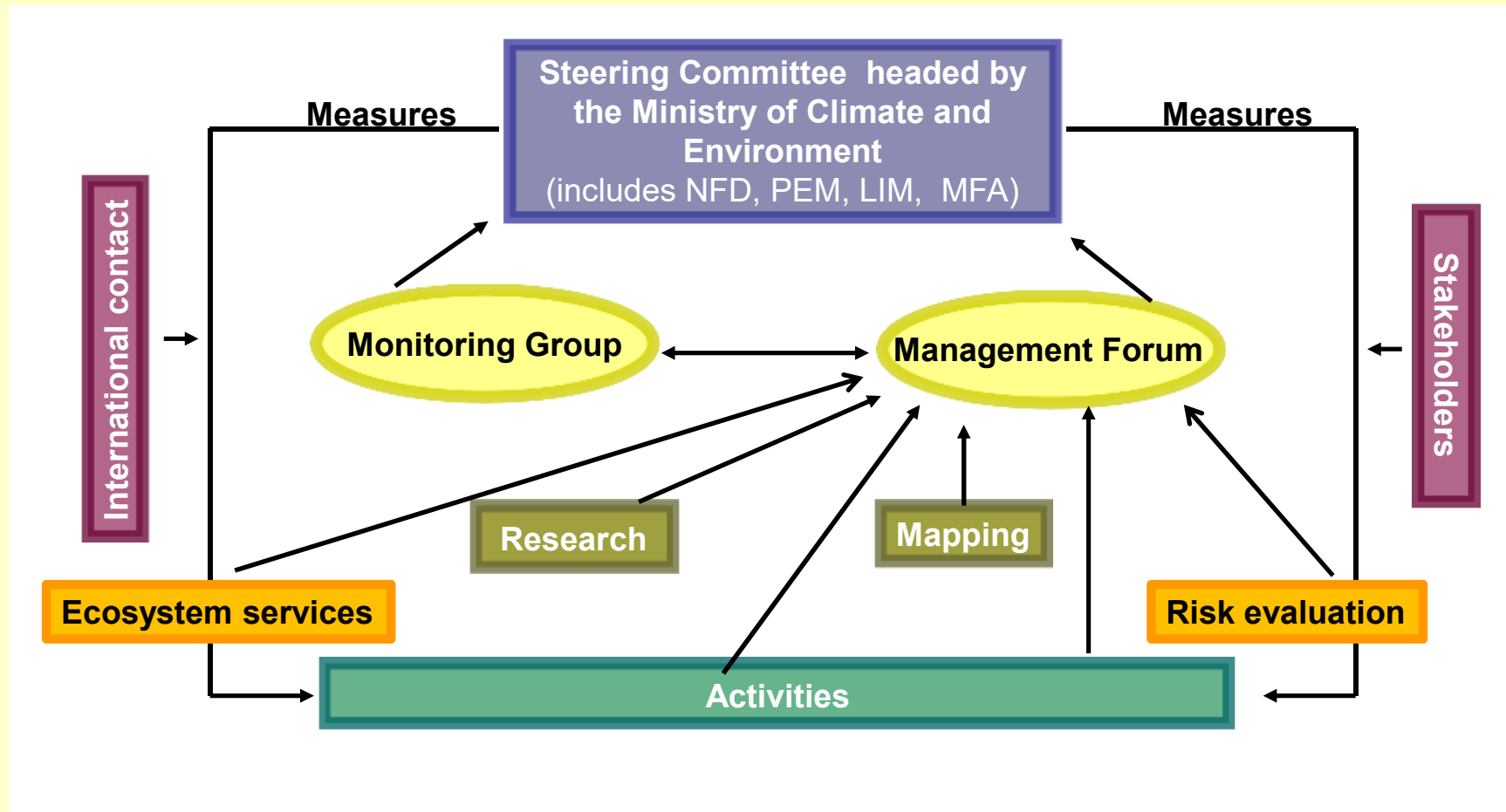
# The different steps of the Integrated Management Process





# The elements of the system for implementing the management plan

The different groups have a broad membership, with representatives from the relevant public institutions with responsibility for and expertise in the various sectors, but will also draw on expertise from other sources as necessary.



# Integrated Management Plan implementation

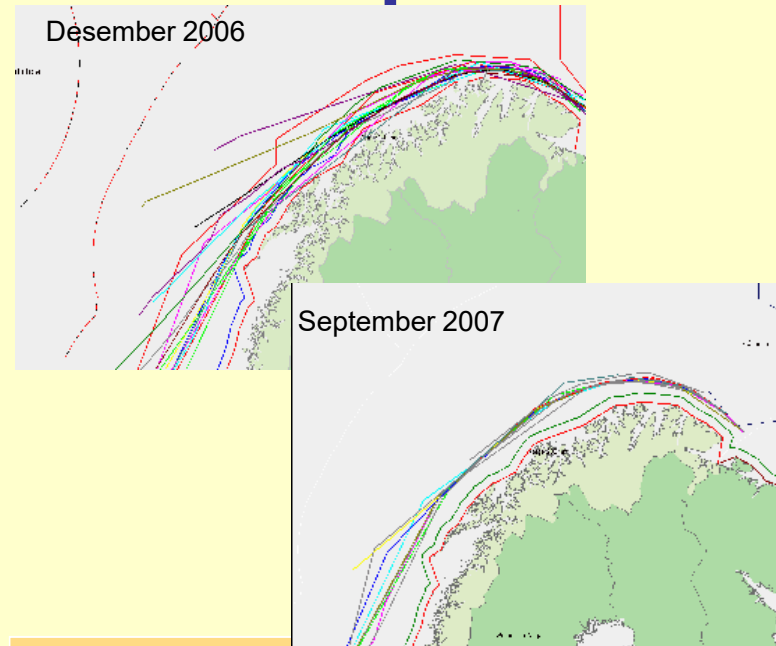
## Management by areas

Protected areas

Framework for petroleum activities

Establish mandatory lanes for shipping

Other geographical regulations



## Guidelines for activity

Time limitation

Volume limitation

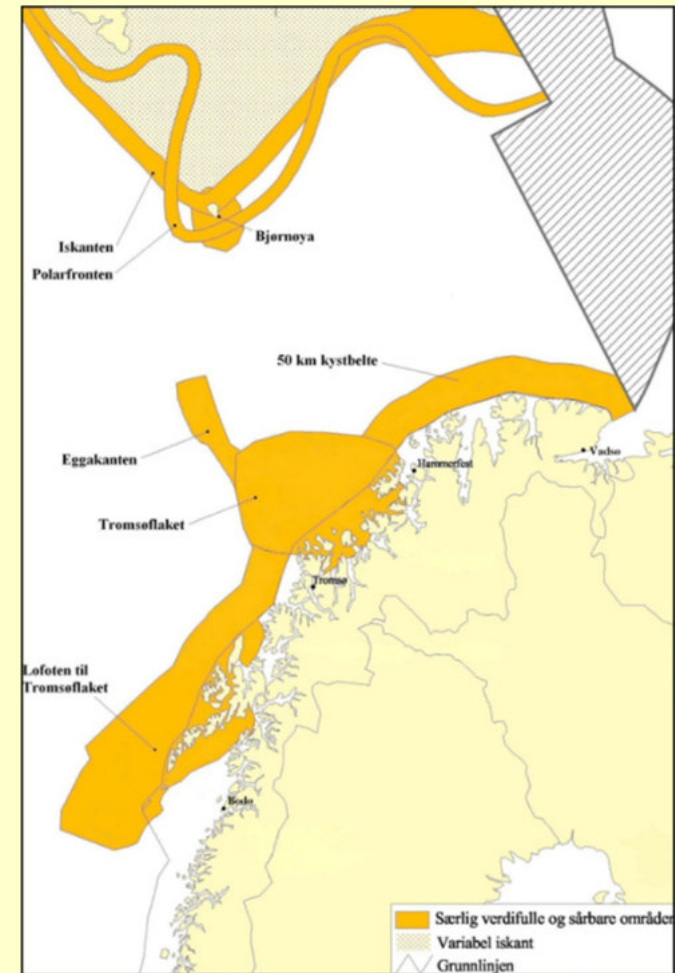
Equipment restrictions

Other demands upon technology

# Area based management



**Framework for petroleum activities**



**Valuable and vulnerable areas**

## Implementation cont.

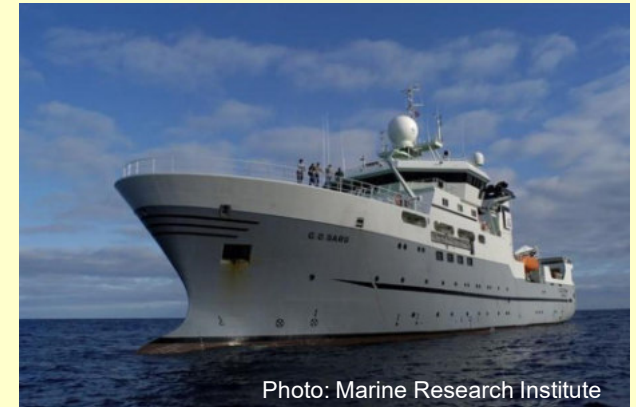
- Implemented through existing legislations
  - 2008 Oceans Resources Act
  - 1996 Petroleum Act
  - 2009 Biodiversity Act
  - 1981 Pollution Act
  - Etc.





# Sector-based actions

- The fishery authorities' responsibility is to
  - continue to develop an **ecosystem-based management** regime for harvesting biological production
  - bring down a considerable illegal, unreported and unregulated fishing (**IUU fishing**)
  - **rebuild** certain **fish stocks** that have been severely depleted
  - **increase a general knowledge** of distribution and ecology of relevant species
  - **reduce by-catches** and **damaging of benthic communities** by fishing gears, development of selective fishing gear such as sorting grids etc.
- Maritime transport is to a large extent regulated by international laws which therefore also function as a framework for how Norway can regulate maritime transport in the Norwegian waters.

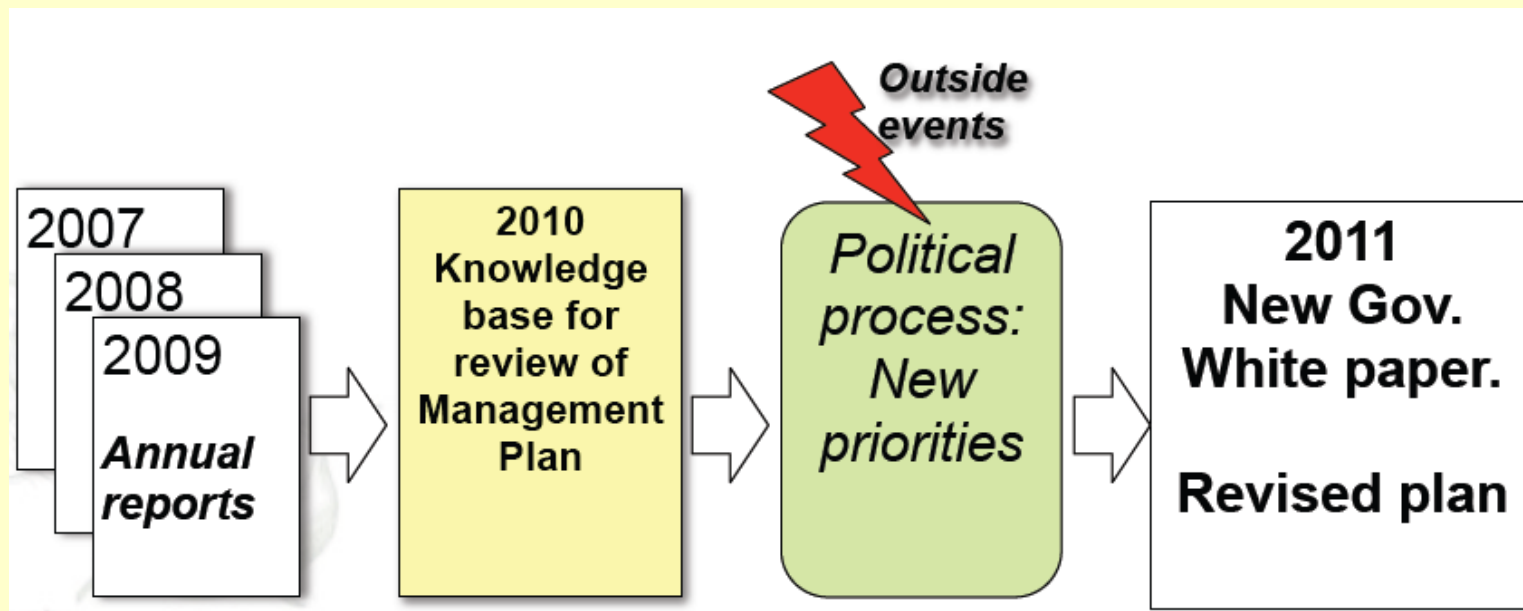


# Update/revise

An Integrated Management Plan is to be updated and revised on a regular basis.

Norwegian managements plans are updated every four year and revised every 12 year.

Next update/revision for all plans: 2020.



Update of the Barents Sea

Source: A.H. Hoel

# Conclusion

# Before and after the management plans

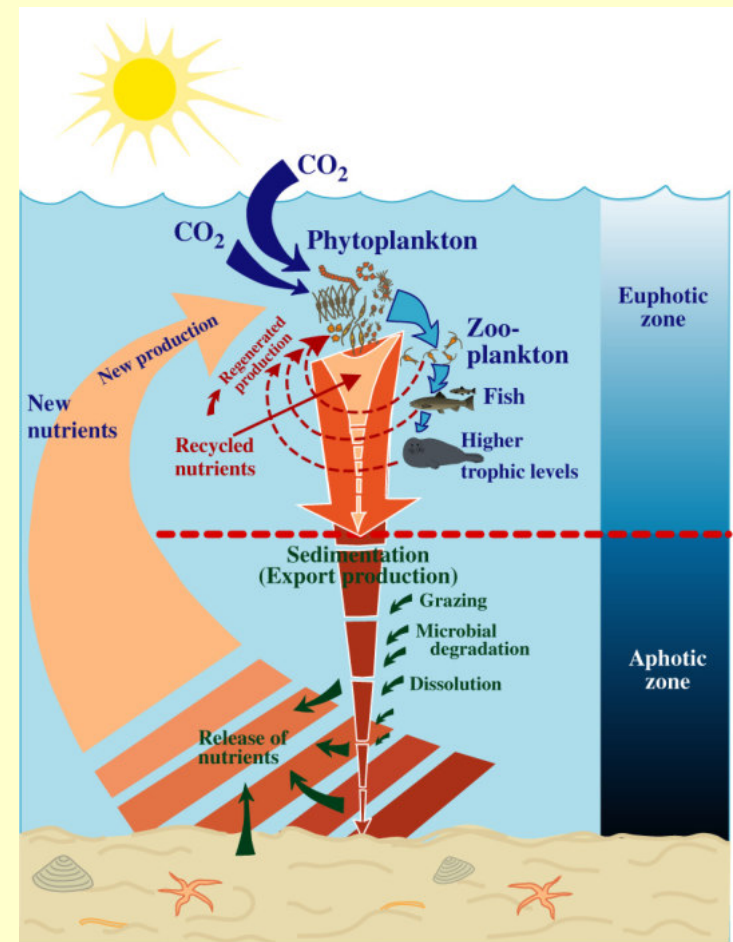
From	To	Barents Sea plan
Individual species	Ecosystems	Barents Sea as ecosystem
Small scale	Multiple scales	Barents Sea – sub areas, concrete spots
Short time frame	Long time frame	Scenario 2020
Sector management	Integrated management	Combined assessment of impact of oil and gas activities, shipping and fisheries
Management and research divided	Knowledge based management	Knowledge gaps identified, monitoring needs identified, priorities set based on management needs
Sector measures	Cross sector cost-benefit analysis	Optimal risk management across sectors



# Some challenges

- Will we ever be able to predict ecosystem responses?
- How much do we need to know in order to take sound decisions?

## Conceptual view on interactions and processes in Arctic marine ecosystems



(after Keck and Wassmann)

Thank you for your attention!



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Photo: C.H. von Quillfeldt