

# The Søndeled Fjord system, Risør, Norway

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**ExtendSim Model coding:** Guillaume Lagaille, 1point2, France

## Model front end:



**Main objective of SPICOSA:** Develop and test methodology to construct integrated ecological-social-economic models for coastal systems assessment, merging science and policy.

**The Policy Issue to be investigated in Søndeledfjord, to develop and test a SPICOSA-type integrated model:**

How to increase local economic benefits from tourism, while minimizing negative impacts on local coastal cod stock and conflicts with local users of the fjord system.

## Model runs / Scenarios

A total of five scenarios were chosen to represent management options in the model:

- Scenario 1: No birds, seals or eel fishing (protecting 0- and 1 group cod)**
- Scenario 2: No cod fishing at all (protecting cod all through the year)**
- Scenario 3: No commercial cod fishing through the year**
- Scenario 4: Stock enhancement (production and release of 100.000 0- and 25.000 1-group cod)**
- Scenario 5: Five star service level on accommodation dedicated for fishing tourists and allow 2500 new 2<sup>nd</sup> homes**

## Model results from running scenarios, as %-difference from Baseline run.

In scenarios 2 and 3 cod stock (2-10 yearclasses) are only allowed to approximate double its biomass.

Parameter	Yearly data	Baseline run	Scenario 1 % -change	Scenario 2 % -change	Scenario 3 % -change	Scenario 4 % -change	Scenario 5 % -change
<b>Cod stock:</b>							
2-10 yearclass		30.6 ton	48.1	96.6	109.2	74.1	-10.2
Annual yield		20 ton	34.2	-88.7	-5.1	121.6	-4.1
Commercial fishers		10.4 ton	49.3	-100	-100	112.9	-10.3
Fishing tourists		2.1 ton	88.2	-100	215.0	221.5	33.1
<b>Conflict factor</b>		3.5	-0.4	2.8	-0.4	-2.3	0
<b>Tourist days:</b>							
Total		252 035	0.8	-1.2	3.1	2.0	0.9
2 <sup>nd</sup> home owners		167 267	0.4	0.8	0.8	0.9	-0.1
Fishing tourists		5 036	24.5	-100	54.6	60.6	51.9
<b>Local economic benefits (LEB):</b>		In NOK 1000					
Total		73.209	1.2	-2.8	2.2	4.4	1.6
2 <sup>nd</sup> home owners		14.218	0.4	0.8	0.8	0.9	-0.1
Fishing tourists		2.520	24.5	-100	54.6	60.6	51.9
Commercial fishers		0.166	49.3	-100	-100	112.8	-10.3

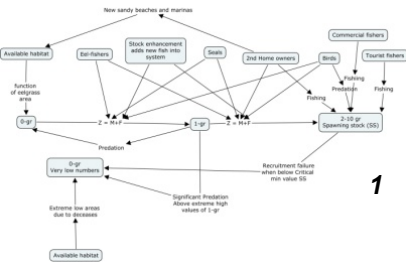
## Model input:

- Cod recruitment
- Seal and bird populations
- Baseline tourist numbers
- Accommodation capacity
- Other user groups
- Regulations

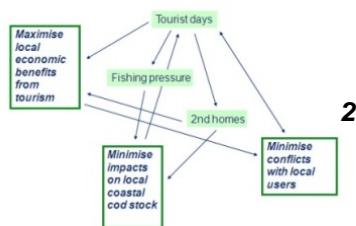
## Model output:

- Status local cod population
- Local economic benefits
- Economic benefits tourist category
- Conflict indicator

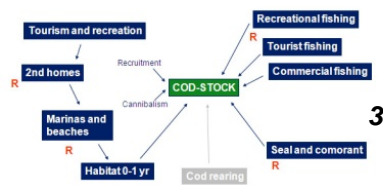
## Model connections (examples 1-4):



## Policy issue & examples of links



## Factors affecting cod stock



## Local economic benefits from tourism



**Conclusions:** The model is a first attempt at an integrated quantitative approach towards understanding the interactions between economic, ecologic and social aspects of nature-based tourism in a Norwegian coastal municipality. The study has highlighted some challenges for such model development and implementation, particularly related to data requirements and availability, interdisciplinary CZM approaches and the linking of science and policy. The results from running scenarios should be used cautiously, but indicate that increasing the availability of coastal cod for tourists is one possible strategy. Several measures for implementing such a strategy have been explored. Some challenges related to the municipality's possibility to translate the provided knowledge from model and scenario-runs into actual policy measures remains: 1) Some of the most effective policy instruments investigated must be implemented by regional/national authorities, e.g. in fisheries; 2) Measures not in line with locals' conceptions of fairness may not receive enough support in the municipal council; 3) Even just proposing some of the policy measures may initiate or increase conflict-levels.