Introduction to integrated models for protection and management of water resources

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BlueAdapt

Integrated models, integrated assessment models, bioeconomic models:

Type of scientific modelling that tries to link main features of society and economy with the biosphere and atmosphere into one modelling framework.

Integrated processes: economy, ecosystem functions, land use, agriculture, greenhouse gas emissions, education, health, infrastructure etc.

Disciplines integrated: ecology, economics, earth sciences, engineering, social sciences etc.

Assessing large, complex, and long-term societal and environmental challenges

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Some features of integrated models

- Dynamic models, scenarios
- Policy relevance
- Ex-ante analysis
- Good for ’what-if’- analysis: studying consequences of alternative social developments or new policies
- Spatial scales: vary from local to regional and to global
- Extensively used as tools in climate research and policy analysis – e.g. cost-benefit integrated assessment models, e.g. DICE (William Nordhaus)

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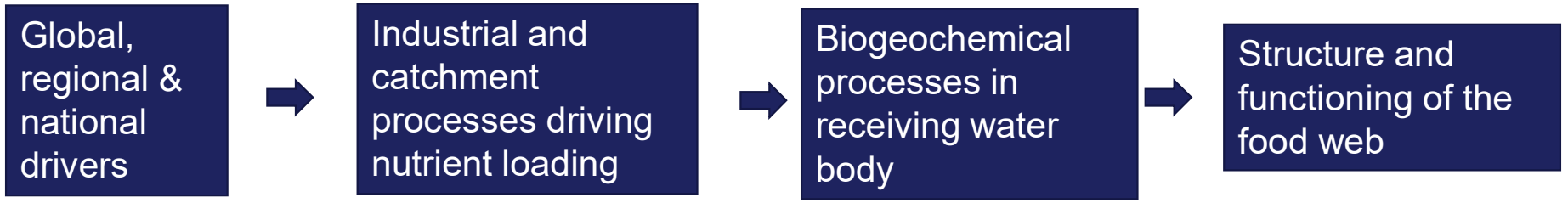
Integrated models in Blueadapt-project

Environmental challenge addressed: nutrient loads & eutrophication

Modelling frameworks were developed to study the consequences of ongoing and future societal developments and policy alternatives on future state of our aquatic environments.



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Global, regional & national drivers

Nutrient leaching & loads entering aquatic ecosystem

Biogeochemical processes

Ecological outcomes

SSPs
Regional extensions of the Socioeconomic scenarios
Time: 2020- 2100

RCPs
Downscaled Climate scenarios
Time: 2020-2100

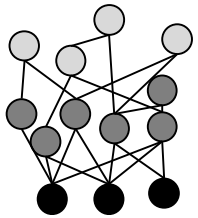
SPA
Policy assumptions, BSAP, adoption of new technol. etc.

VEMALA-model
- Soil processes
- All nutrient loads from land, waste water treatment and industrial outlets
- Time step: daily

Boundary loads
Exchange with neighbouring marine areas

FICOS
3D hydro-dynamic, biogeochemical model

ECOSPACE
Process model on interactions between species, lower and higher trophic levels



HMSC
Joint Species Distribution Model (JSDM)
Phytoplankton

HMSC-fish
JSDM
Fish stocks

Tools developed in Blueadapt-project

- Analyses at different spatial scales:
  - Local analysis
  - Regional: The Archipelago Sea and its catchment area
  - National level: Inland waters