Linking ecological and socio-economic monitoring in the Dutch Wadden Sea Region (1)

Tim van Oijen
Wadden Academy’s tasks:

• to identify gaps in cross-domain knowledge in order to assist in the sustainable development of the Wadden Sea Region;

• to promote a coherent research programme at regional, national and international level and;

• to promote information supply and knowledge exchange within and between research institutes, government, industry and social organisations.
Research themes

Geoscience

Society and cultural history

Climate and water

Ecology

Social and spatial economics
Board

Dr Hessel Speelman, Prof. Jouke van Dijk, Prof. Jos Bazelmans, Prof. Peter Herman and Prof. Pavel Kabat.
Resilience of the Wadden Sea Area

Social resilience

Ecological resilience

Wadden Sea Area’s resilience

Economic resilience
Wadden Area employment (LISA 2007)

- culture, leisure, environment
- care
- education
- government
- business serv
- financial
- transport
- hotels etc
- retail
- construction
- energy
- manufacturing
- mining
- fisheries
- agriculture

Legend:
- green: mainland coast
- red: Wadden isles
- blue: Waddenarea
Tourism

Development tourism share in total employment
(1996-2007; source LISA)

- Netherlands (left axis)
- Mainland coast (left axis)
- Wadden isles (right axis)
Spatial-economic science perspective

- Which economic sectors are problematic?

- Where are the opportunities for innovation and sustainability?

- To what extent can tourism and recreation be an economic base? What is the added value of the UNESCO World heritage?

- What are the revenues and threats of natural gas extraction, salt mining, power plants, harbour activities?

- How big is the social-economic value of human co-use of nature?

- What are the effects of (autonomous) developments like sea-level rise for natural assets and the socio-economic and spatial living environment in the Wadden area? Opportunities or threats?
Management challenges

- Managing change: conservation of natural values in a changing system
- Matching scales of governance and natural system → attention to cumulative effects
- Deal with the decreasing predictability of the system related to climate change
Cumulative effects: cooling water

De Jager, 2011
Monitoring

• Strong need for monitoring of the ecological system in conjunction with the socio-economic system

WaLTER
Linking ecological and socio-economic monitoring in the Dutch Wadden Sea Region (2)

Pim Vugteveen
Marieke Van Katwijk
Rob Lenders
Etiënne Rouwette
Lucien Hanssen
WaLTER project

• Main aim: developing an integrated monitoring network for the Dutch Wadden Sea based on stakeholder needs

• Enhanced understanding of (eco)system functioning in conjunction with human use

• This requires coupling of human (socio-economic) and ecological components
Properties complex systems

- Widely accepted that self-organization, complexity, variation, sensitivity to initial conditions and uncertainty (adaptive cycle) are inherent properties of linked social and natural processes;

- Change is an intrinsic property;
  - can be slow, extensive, pervasive and subtle (“presses”)
  - can be sudden transitions through rare or ‘shock’ events (“pulses”);

- Resource management strategies must somehow reflect these properties in the pursuit of sustainability (adaptive management);

Consensus view holds that for many of today’s environmental issues, the environment is best understood and studied as a Social–Ecological System (SES)
Core components for analyzing social-ecological systems:

- Resource system (Wadden Sea)
- Resource units (shellfish)
- Users (fishermen)
- Governance system (fishery policy)
Combining SES Model with DPSIR-framework

Based on Collins et al 2011, Chapin et al 2006, Ostrom 2009

EXOGENOUS INFLUENCES & CONTROL VARIABLES
Political and economic ↔ Biogeophysical

GOVERNANCE TEMPLATE

SOCIO-ECONOMIC TEMPLATE

ECOLOGICAL TEMPLATE

Pulses & presses

Slow & large variables

Fast & small variables

SOCIO-ECONOMIC SERVICES

RESPONSES

(POTENTIAL FOR) HUMAN WELLBEING

ECOSYSTEM GOODS & SERVICES TEMPLATE

Slow & large variables

Fast & small variables
WaLTER setup

- **WP1**: Inventory monitoring needs
- **WP2**: Conceptual models - Ecology
- **WP3**: Conceptual models - Socio-economy
- **WP4**: Developing dataportal
- **WP5**: Data analysis
- **WP6**: Drawing monitoring plan

**A. Analysing information needs**

**B. Analysing scientific basis**

**C. Existing monitoring efforts**

**D. Preconditions for designing monitoring plan**
WP1 - Analysing information needs

- Inventory of strategic knowledge agenda’s
- Survey amongst stakeholders (N=133)

Knowledge Agenda’s (n=586)

- Governance: 18%
- Ports & Energy: 4%
- Climate & Safety: 12%
- Nature: 40%
- Fisheries: 6%
- Wadden-quality: 20%

Survey WaLTER (n=463)

- Governance: 22%
- Ports & Energy: 18%
- Climate & Safety: 5%
- Nature: 6%
- Fisheries: 8%
- Wadden-quality: 41%
WaLTER development

Example: From Carr et al 2011

- Identify & select key indicators:
  - ecological AND socio-economic:

  Example:
  - Key performance indicator: Fish species population size
  - Ecological and demographic variables: Nutrients and primary productivity, Larval production, recruitment, behavior, Growth rates
  - Oceanographic and meteorological variables: Surface and internal waves, mixing, water temperature, tidal bores, Light levels, turbidity, Current patterns, winds, ENSO, PDO, climate change
  - Exogenous influences & control variables: Political and economic factors, Biogeophysical factors (potential for), Human wellbeing

From Carr et al 2011
Socio-economic base indicators

- Population + migration by age, sex, household, education, village/neighbourhood, housing, etc;
- Labour force by occupation, education, age, residence, commuting distance, etc.;
- GDP and employment by sector, firm size, location;
- Emission and environmental indicators;
- R&D, innovation, sustainability, entrepreneurship, social cohesion;
- Income, unemployment and social security benefits by age, occupation, education, sex, residence, etc.
Summing up

- WaLTER can support adaptive governance of the Dutch Wadden Sea:
  - explicitly link socio-economical and ecological components to use ecosystem services concept;
  - provide instrument to enhance understanding of social-ecological system dynamics;
  - offer an accessible data portal for a broad range of stakeholders;
  - facilitate networked monitoring & research;
  - support good governance by offering information geared to societal challenges (e.g. sustainable tourism).