Systems Approach Framework
Introduction

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Who is familiar with Systems Approach?
- Ecosystems – a natural unit consisting of all plants, animals and micro-organisms in an area functioning together with all the non-living physical factors of the environment.
What is the **Systems Approach**?

**Scientific Method** -
- investigates what objects are
- iterates between hypothesis and proof

**Systems Approach** -
- investigates how systems function
- iterates between resolution and accuracy

Hopkins et al. 2011
**Definition:** Systems thinking

- is the process of understanding how things influence one another within a whole.

- Interdisciplinary
- Cross border
- Complex
Definition: **Systems thinking**

- an approach to problem solving, by viewing "problems" as parts of an overall system, rather than reacting to specific parts, outcomes or events and potentially contributing to further development of unintended consequences.

- focuses on cyclical rather than linear cause and effect.
• Aim of the SAF is to:
  develop and test a structure for processing and evaluating multidisciplinary and trans-disciplinary information to enable environmental managers and policy-makers make sustainable solutions concerning the coastal zone, in order to improve:
  • ecological *sustainability*,
  • economic *efficiency*,
  • and social *equity*.

Hopkins et al. 2011
Systems Approach Framework

- Economic growth
- Environmental protection
- Social progress

Sustainable development

IUCN: Adams 2006
Systems Approach Framework

Environment/Ecology

Economy

Social

Viable

Sustainable

Bearable

Equitable

J. Dréo

(https://commons.wikimedia.org/w/index.php?curid=1587372)
The Ecological System

We already talked about the ecological system.

We might consider anthropogenic activities as part of this system – nutrient and metal pollution, litter, fishing etc.
The Social System

As an environmentalist we might simply suggest the solution to stop fishing, but what effect would this have on the lifestyles of those who work in the fishing industry?
The Economic System

The use of resources in the coastal zone; their effect on the economy of the zone be it through sales or sustaining jobs in the system.
Christina Gillgren, 2006
**DEAD**

The traditional mode of decision-making which follows the sequence of:

- Decide on a course of action
- Educate to our way of thinking
- Announce the decision, and then
- Defend the decision from the ensuing protests

**PEP**

To a more positive model of decision-making:

- **P**rofile the community or region so you know the people you need to work with
- **E**ducate them about the issues and alternatives already identified
- **P**articipate with them in a process of mutual education and joint problem solving

Christian Gillgren, 2006
SPICOSA SAF would make the scientific-economic models to guide Management on:

When to act,   What to do,   How to do it

From: Tom Hopkins
Benefit of System Use

Use Limits?

Use of a Natural System

System exhaustion
System collapse
System extinction

Policy concern:
Minimizing controversy over the use and preservation of these systems

Economic concern:
Minimizing the cost of their use and the expense of their maintenance

Science concern:
Maximizing our ability to understand and predict their behaviour

From: Tom Hopkins

Hopkins-SPICOSA
Fig. 1. The human ecological footprint from 1961 to 2005 (Ewing et al. 2008). The Ecological Footprint is a measure of the demand human activity puts on the biosphere, or Biocapacity (the capacity of an area to provide resources and absorb wastes), in global hectares (ascending red line). In 1986, humanity's consumption began its overshoot with respect to the reference biocapacity of 1961, which has not remained constant but has declined (descending green line), corresponding to its lowered productivity potential relative to its original natural capital. Note that for some commodities the yield (quantity) has remained relatively constant but changed in composition due to technical advances in harvesting that have large unaccounted costs to the environment. From Hopkins, Bailly & Støttrup, 2011.
The SAF is
- A framework to allow a team to develop management strategy
- Based on interaction between science, policy and stakeholders
- Multidisciplinary
- Stringent in its application

The SAF is NOT
- A tool in itself
- A replacement for legislation
- A quick exercise
- Something which can be implemented by a single person

Hopkins, Spicosa
Systems Approach Framework

- External forcings eg. climate change
- External socio-economical changes eg. crisis
- Change in ecosystem
- Change in human activity
- Policy change
- International directives

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Systems Approach Framework (SAF)

- Change in user relationship
  - Issue Identification
  - System Design
  - Sys. Formulation
  - System Appraisal
  - System Output
- Implementation
- Changes in public perception & awareness

External forcings eg. climate change

External socio-economic changes eg. crisis

Change in ecosystem

Change in human activity

Policy change

International directives

ESE - assessment

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ESE assessment

- Issue Identification
- System Design
- Sys. Formulation
- System Appraisal
- System Output
Do we need to run an ESE assessment?

Problem made of multiple interconnecting elements?
- NO
- YES

Is solving the problem of high priority?
- NO
- YES

Is there a high risk?
- NO
- YES

Can the problem be solved with existing knowledge of the system?
- NO
- YES

Are you sure? Identify management strategy to implement a solution
- NO
- YES

You have begun the ESE in the Systems Approach Framework

Exit! ESE not needed
High levels of risk in the situation eg. Potential for negative social and environmental impacts

Simple information to be understood

Low levels of risk in the situation

Complex information to be understood
ESE assessment

- **Issue Identification**
- **System Design**
- **Sys. Formulation**
- **System Appraisal**
- **System Output**

Identifying the issue/s
Mapping stakeholders
Institutional mapping
Issue = problem

- Conflict between Human Activities
- Conflict between HA and Nature Protection

Needs to be solved = sustainable and acceptable to society

Can you think of an Issue?
ESE assessment

Systems Approach Framework

Issue Identification
System Design
Sys. Formulation
System Appraisal
System Output

Conceptual models
System boundaries
• Do we need to have a mathematical model?
• Do we have enough data?
• How complete a model?
• Can we include environmental, economic and social data in the model?
ESE assessment

- Issue Identification
- System Design
- Sys. Formulation
- System Appraisal
- System Output

Generating systems model
Calibration and validation
Preparing scenarios
ESE assessment

- Issue Identification
- System Design
- Sys. Formulation
- System Appraisal
- System Output

Linking ESE model components
System simulation of scenarios
Out preparation
ESE assessment

- Issue Identification
- System Design
- Sys. Formulation
- System Appraisal
- System Output

Running scenarios
Presenting to stakeholders
Evaluation
Deliberation of management options for Implementation
Questions?