Systems Approach Framework Introduction

Josianne G. Støttrup
Grete E Dinesen

jgs@aqua.dtu.dk

www.baltcoast.net

A SYSTEM APPROACH FRAMEWORK FOR COASTAL RESEARCH & MANAGEMENT

BONUS-BaltCoast received funding from BONUS (Art 185), funded jointly by the EU and Baltic Sea national funding institutions

Systems Approach Framework

➢ What is **Systems Science**?

Interdisciplinary study of systems in general aiming to explain patterns and principles.

- From analysis of component parts of an object

Scientific Method

- Investigates what objects are
- Iterates between hypothesis and proof

…….to the ordering of and relationship between the objects that connect them to a whole ……to observe an object from a higher level of organization to fully comprehend the object

System Approach

- Investigates how systems function
- Iterates between resolution and accuracy

Hopkins et al. 2011

Systems Approach Framework

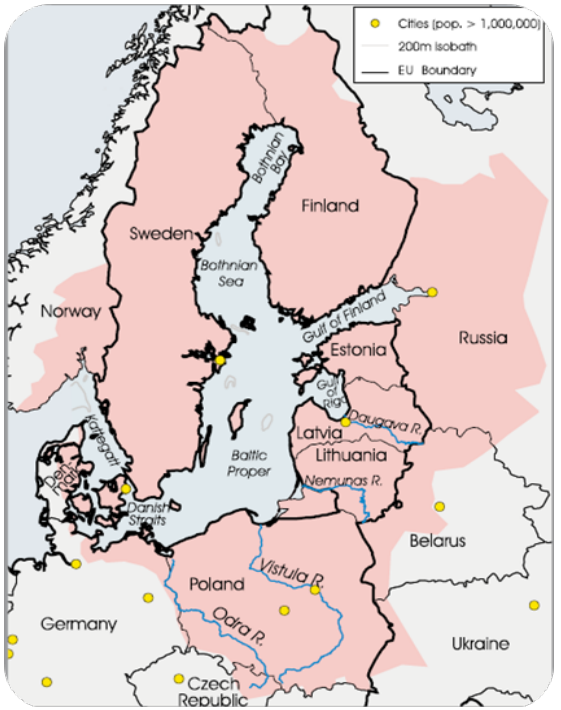
Ecosystem – a natural unit consisting of all plants, animals and micro-organisms in an area functioning together with all the non-living physical factors of the environment.

System - holistic view; you can first truly understand an object by looking at the interconnecting objects and how they are interact. Couples with the social and economic elements.

Systems Approach Framework

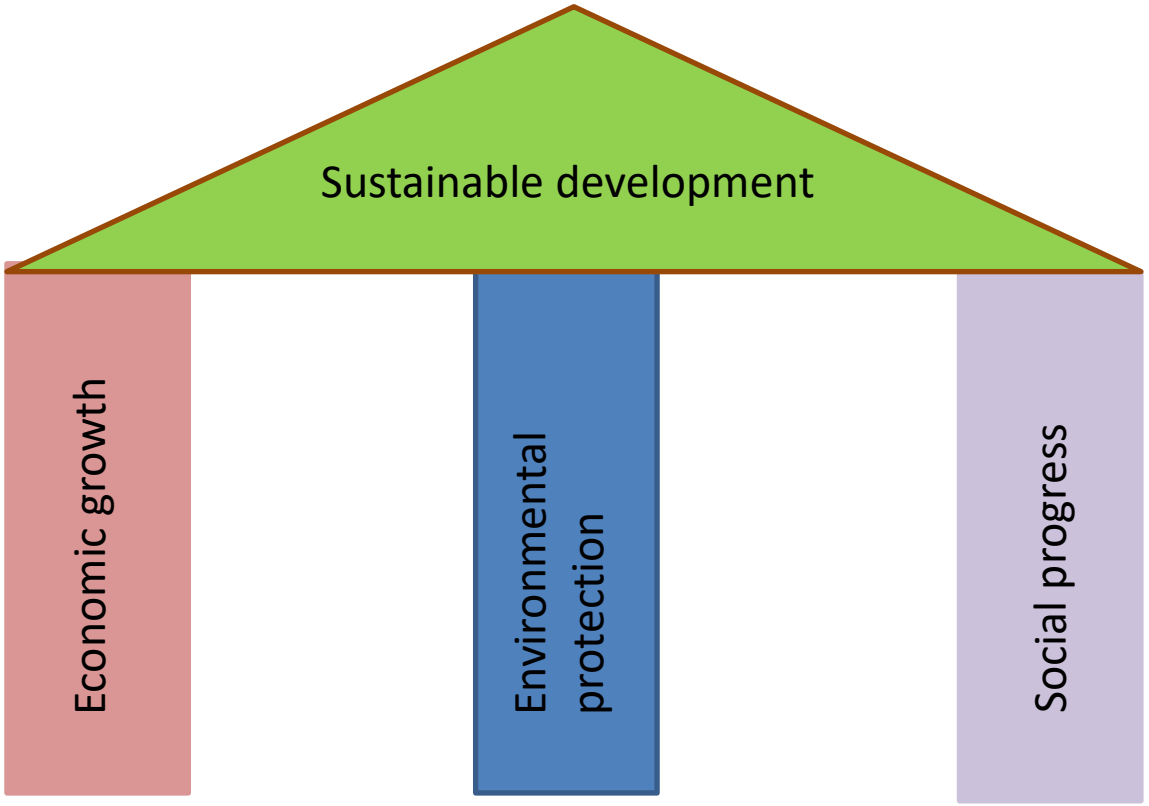
Systems thinking

- ➢ Process of understanding how things influence one another within a whole
- ✓ Interdisciplinary
- ✓ Cross boundary
- ✓ Complex
- ✓ Non-linear dynamics



Systems Approach Framework

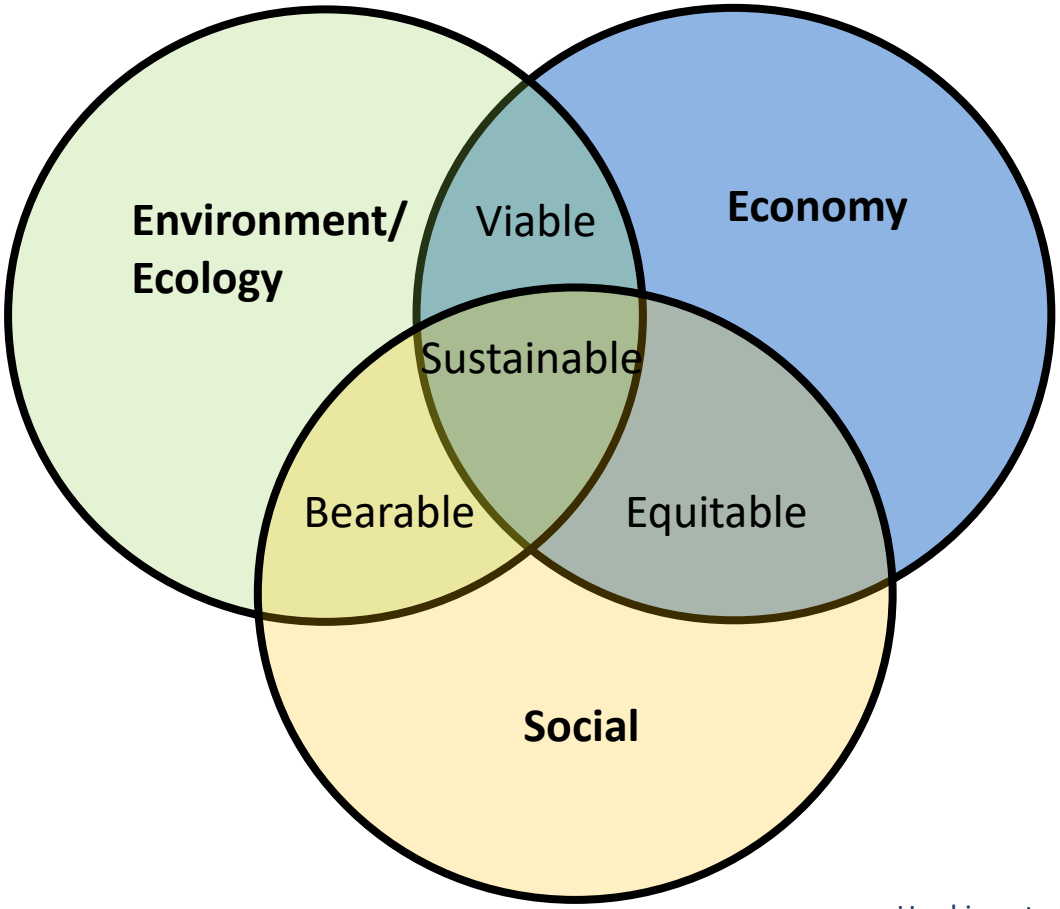
- The three pillars for sustainable development.



Systems Approach Framework

SAF aims to develop a structure for processing and evaluating multidisciplinary information to enable policy makers, in collaboration with citizens/stakeholders, to make sustainable solutions concerning the coastal zone to improve:

- Ecological sustainability
- Economic efficiency
- Social equity



Hopkins et al. 2011

J. Dréo (https://commons.wikimedia.org/w/index.php?curid=1587372)

Systems Approach Framework

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.

SAF Handbook

Systems Approach Framework

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?

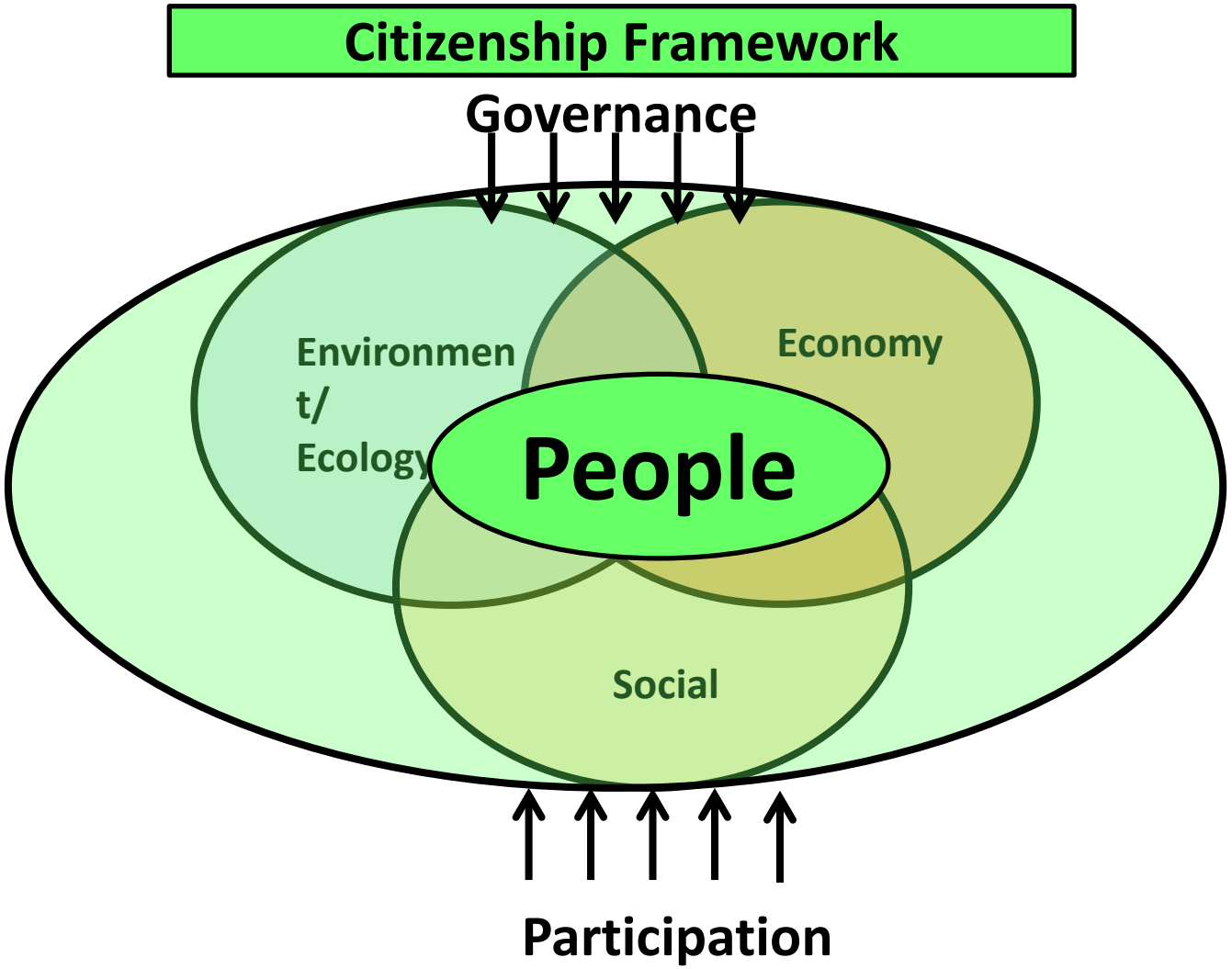
Systems Approach Framework

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.

Systems Approach Framework

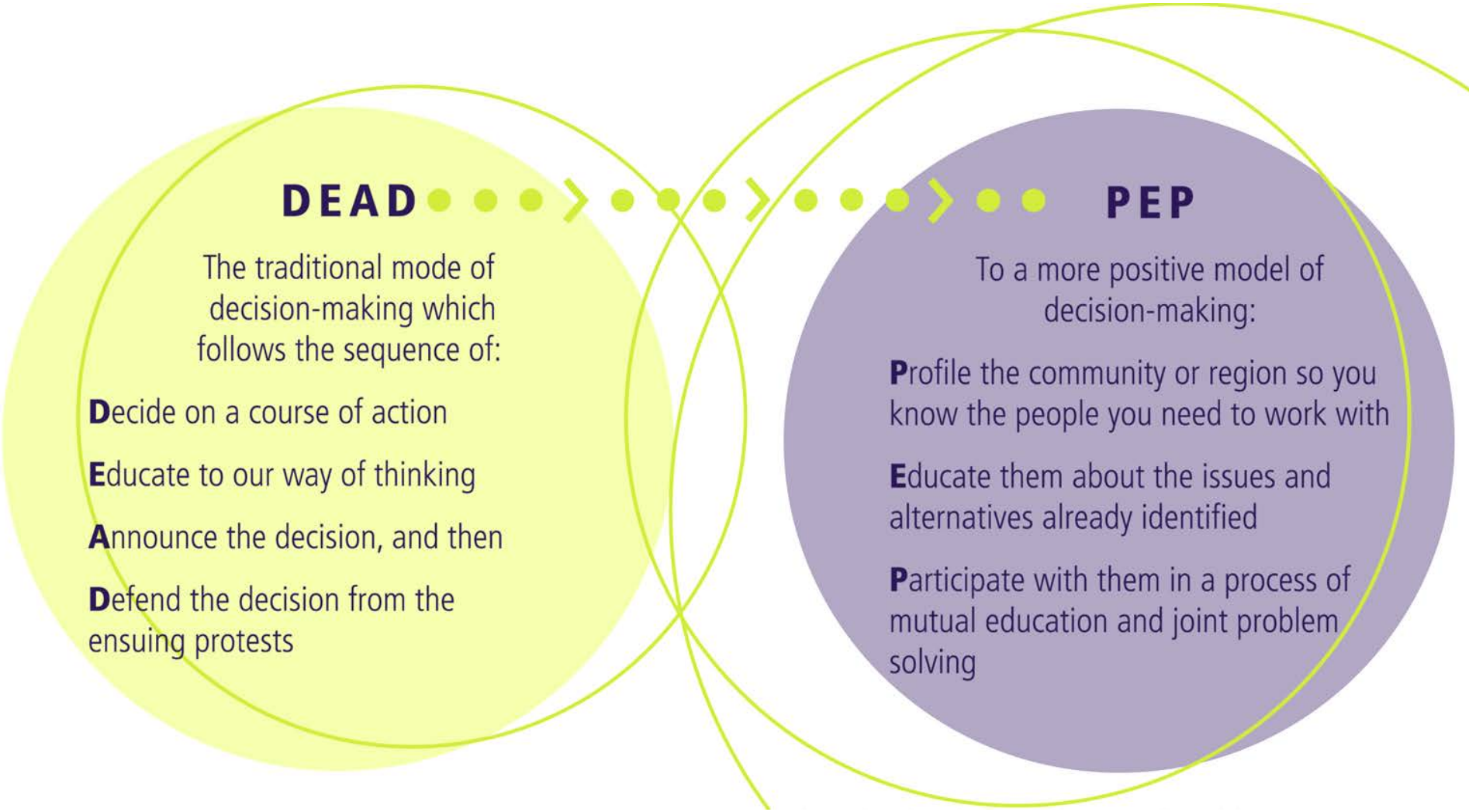
The three pillars of sustainability should be integrated with citizen participation and embedded in a robust governance framework.



State Government of Western Australia, 2004.

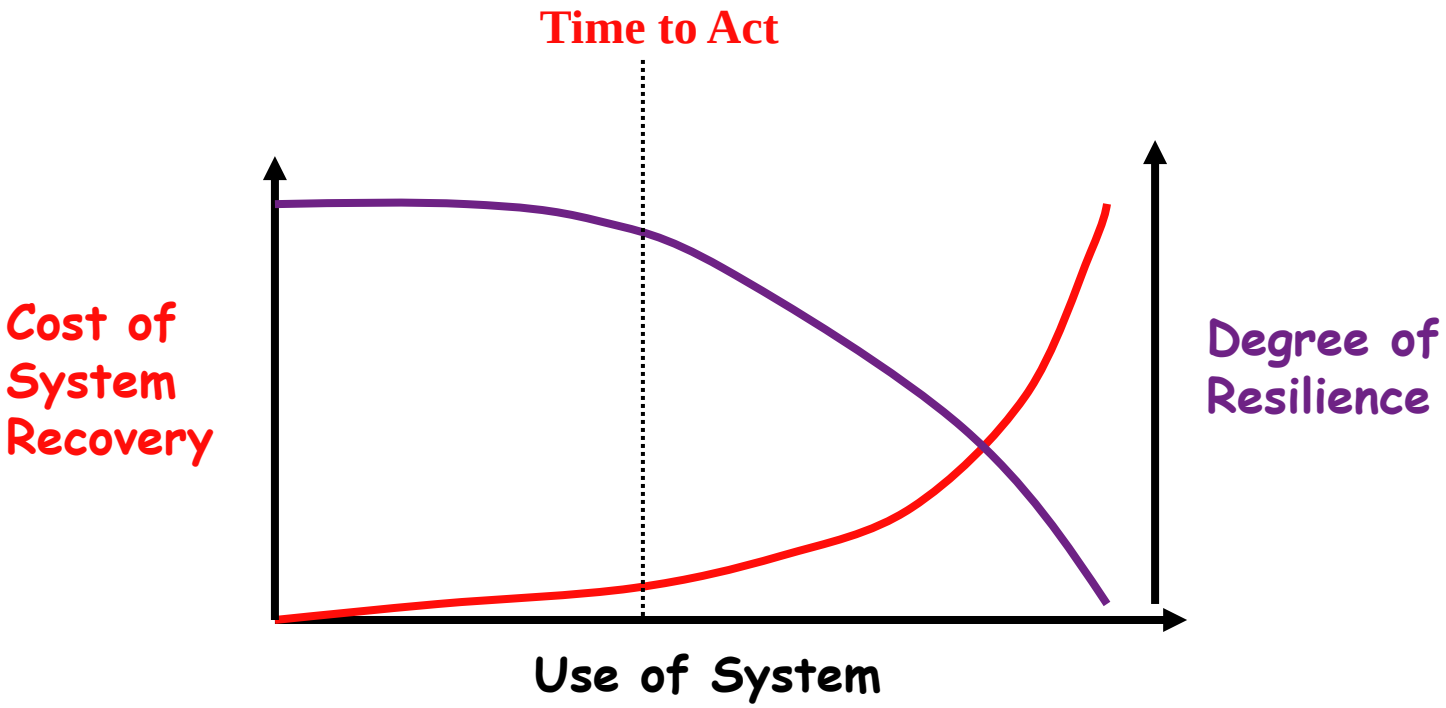
Systems Approach Framework

Evolution towards a more postitive decision-making model.



State Government of Western Australia, 2006.

Systems Approach Framework

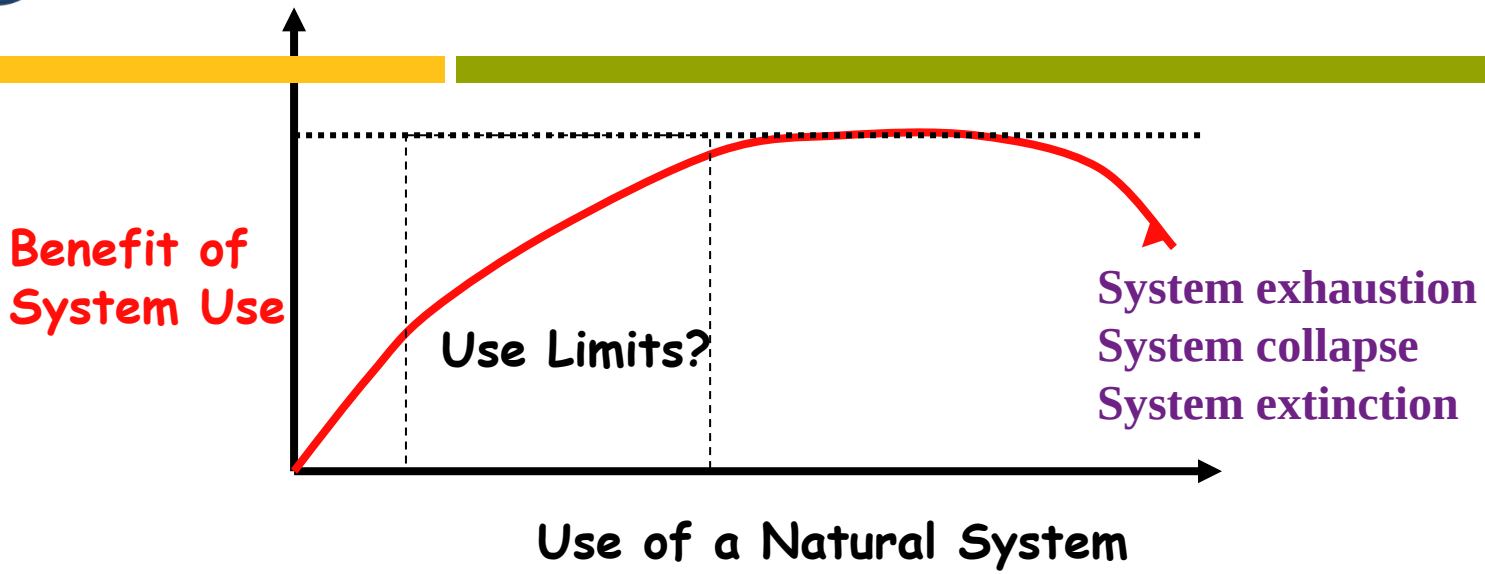


SPICOSA SAF would make the scientific-economic models to guide Management on:

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

From:Tom Hopkins

Systems Approach Framework



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

Systems Approach Framework

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:

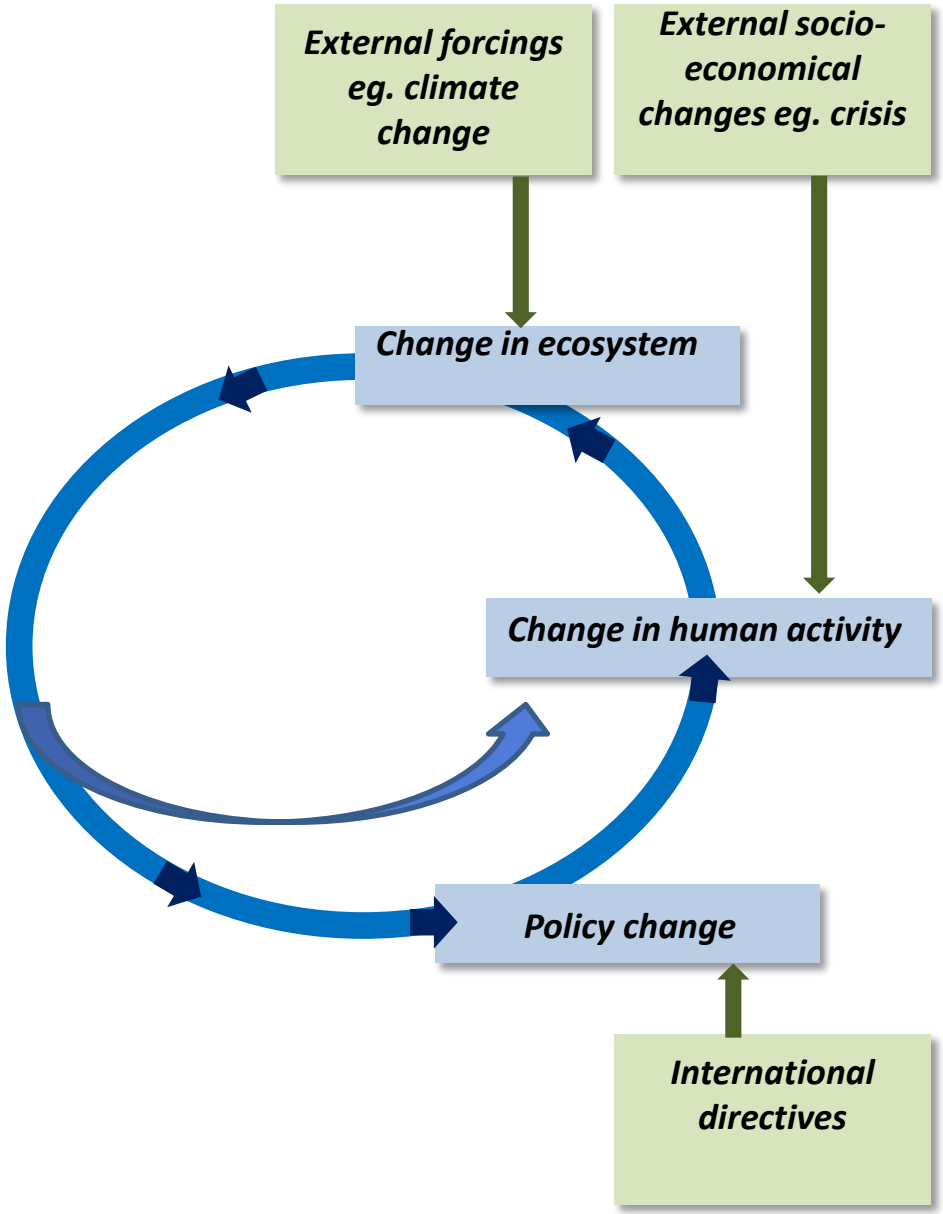
- A tool in itself
- A replacement for legislation
- A quick exercise
- Something which can be implemented by a single person

From: Tom Hopkins

Systems Approach Framework

Default loop

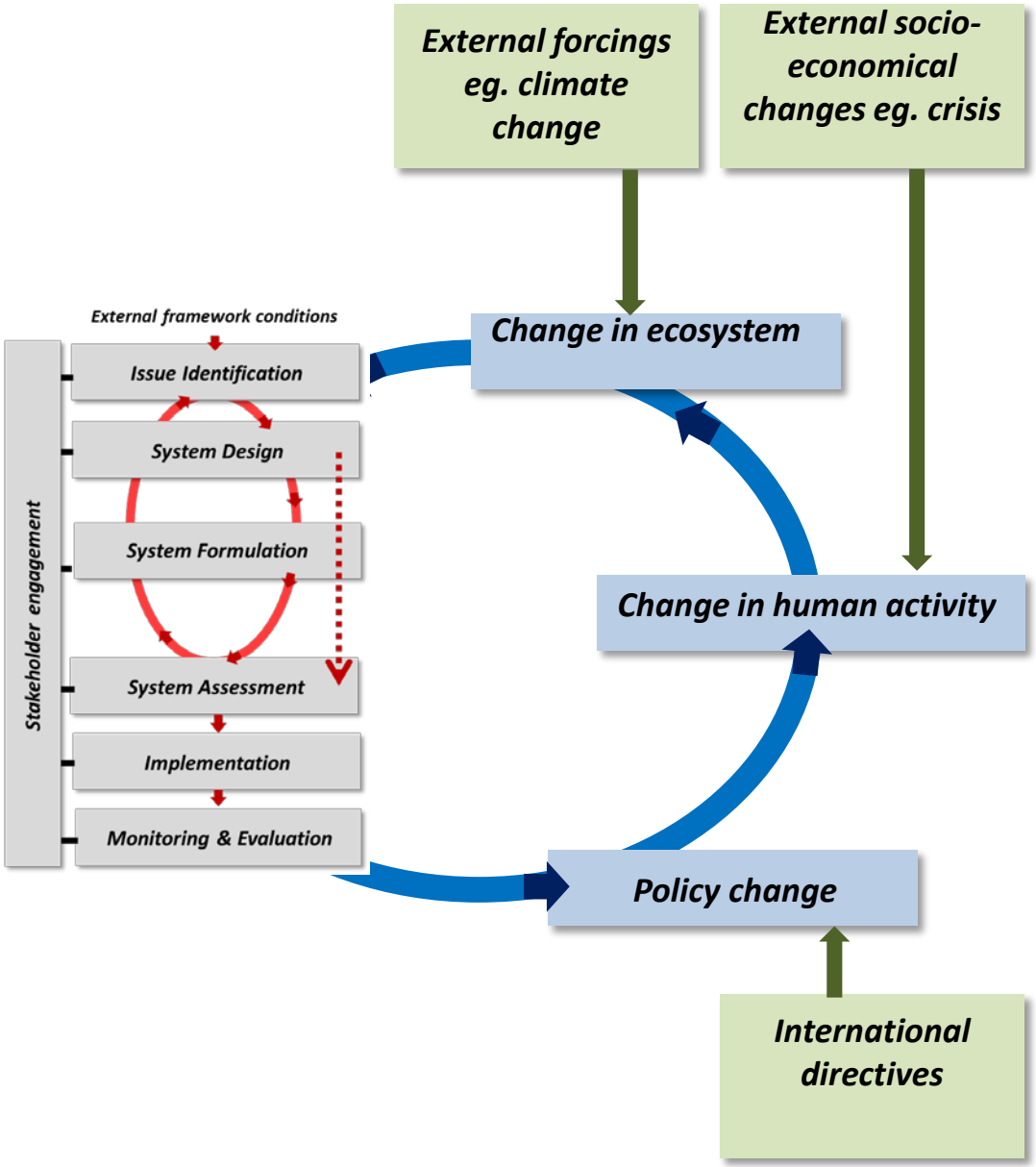
The loop may start at any point depending on the external forcing. A change in ecosystem functioning may directly affect changes in human activities or result in a change in policy.



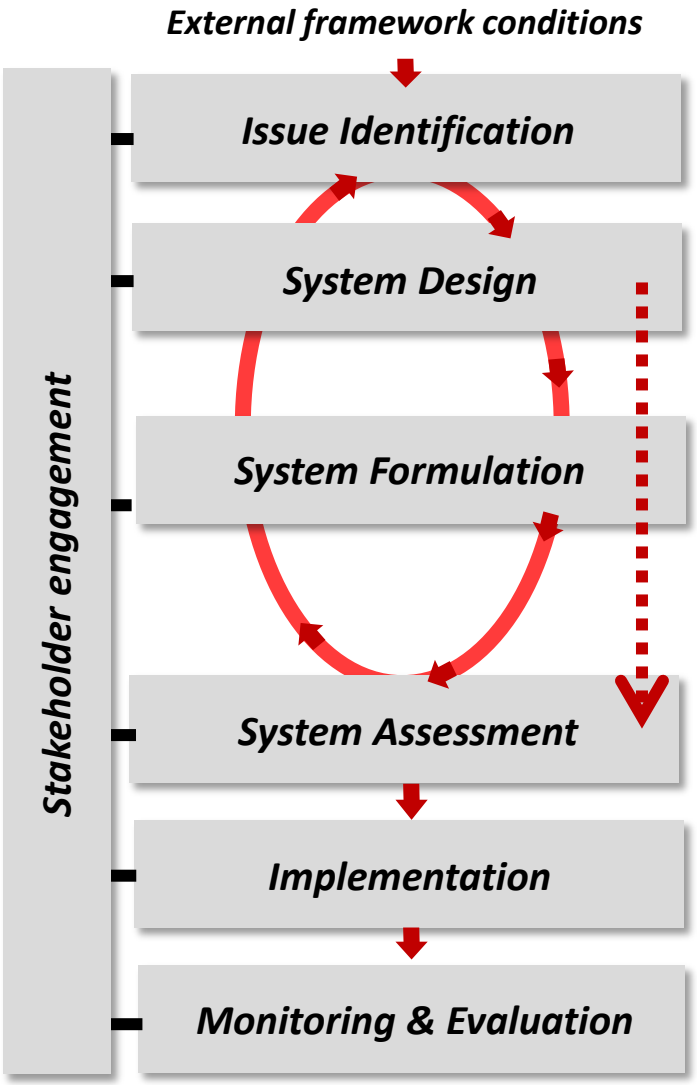
Systems Approach Framework

The SAF ICM loop:

SAF with the ESE assessment

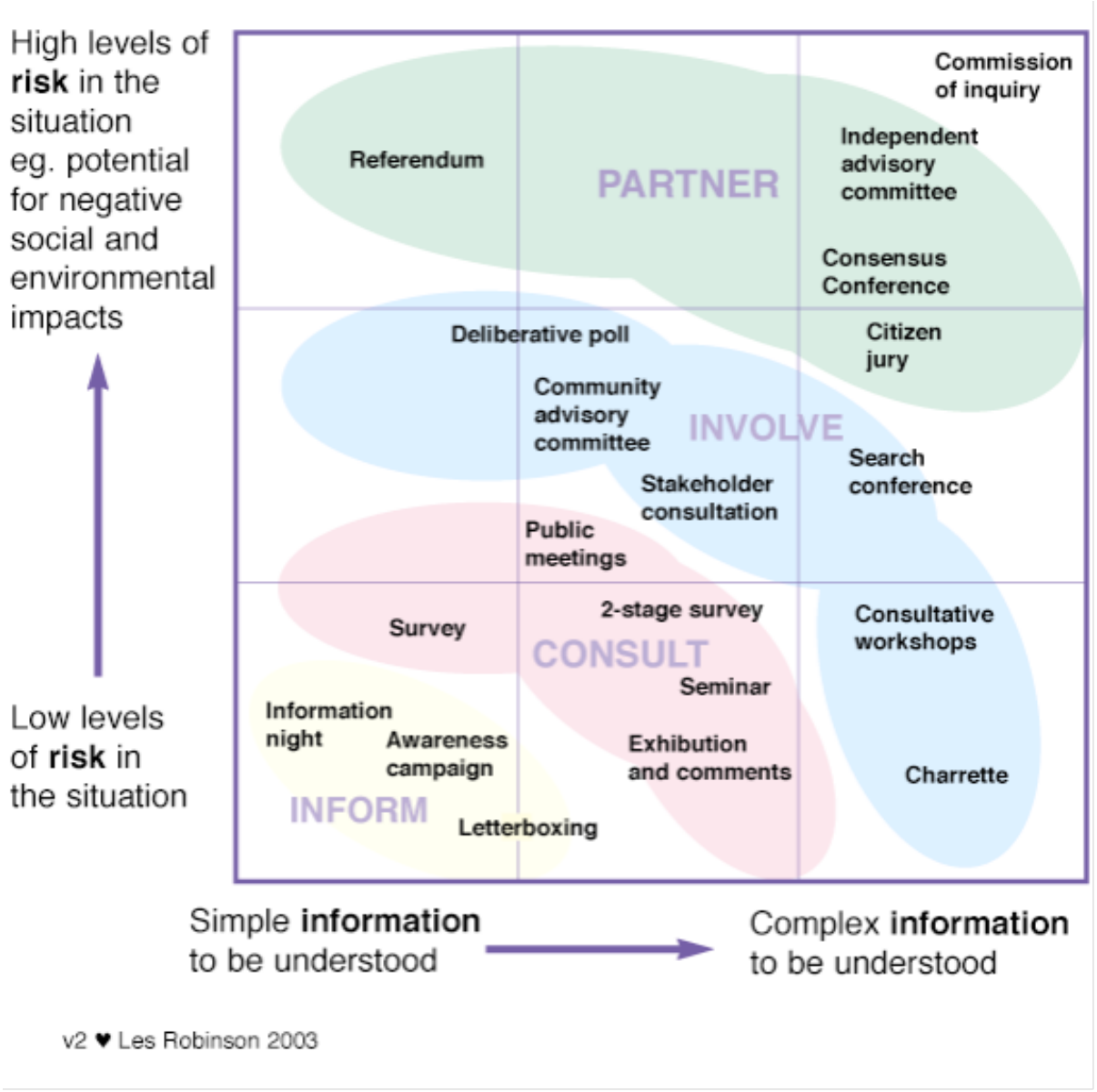


Systems Approach Framework

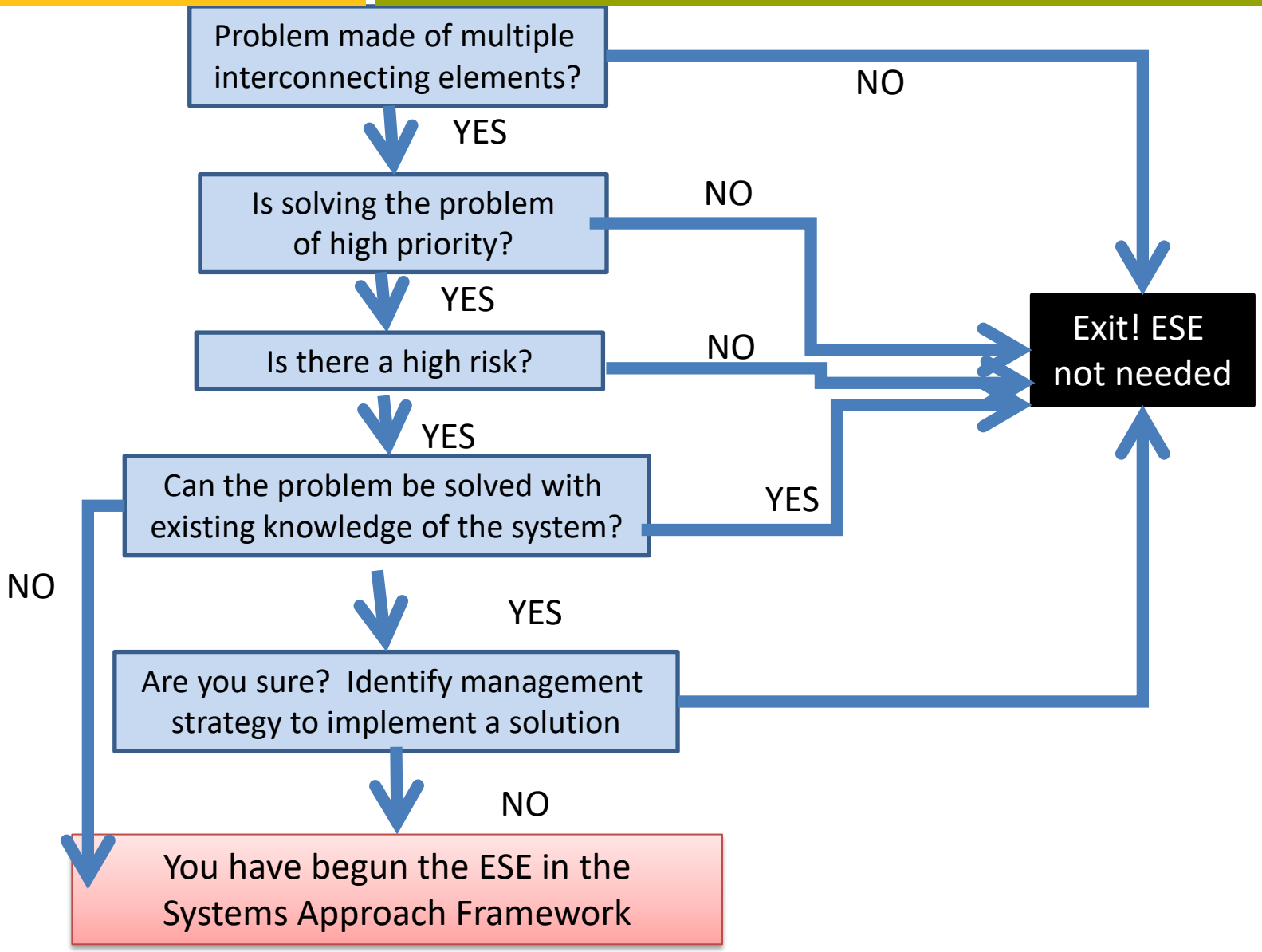


Systems Approach Framework

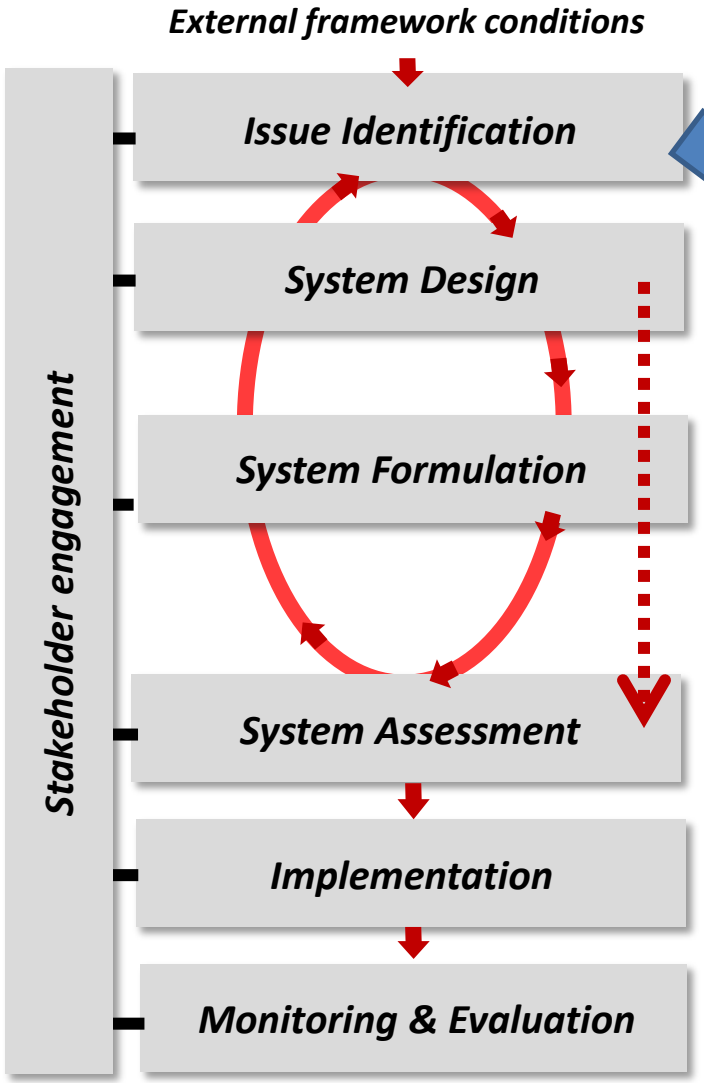
Do we need to run an SAF ESE assessment?



Do we need to run an ESE assessment?



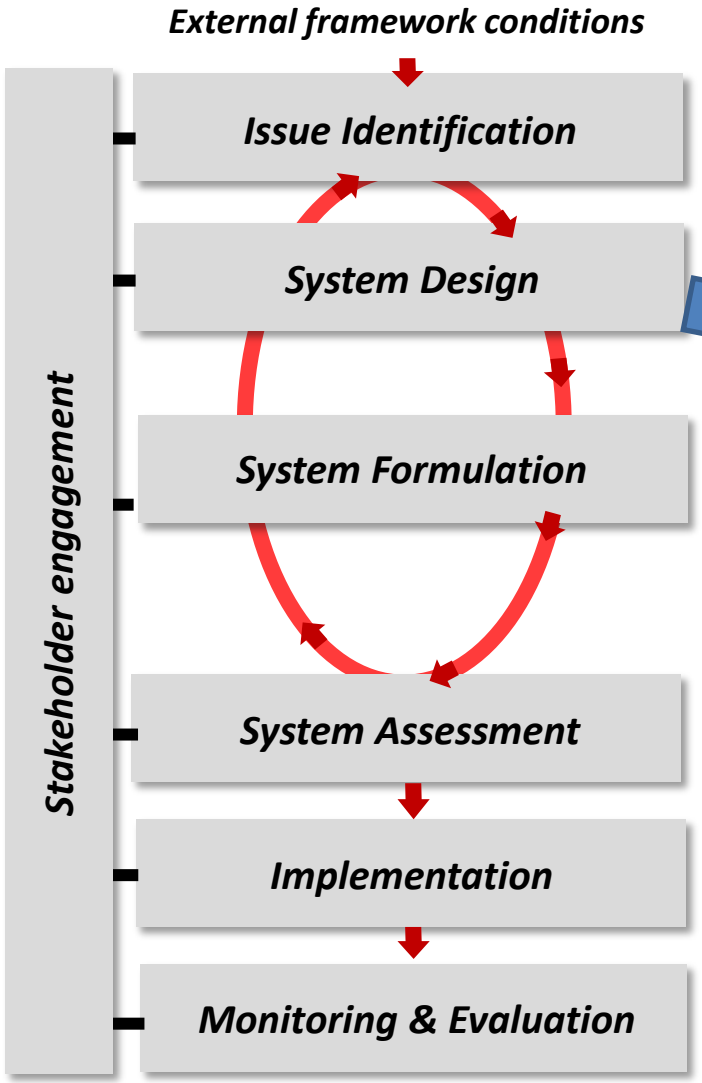
Systems Approach Framework



- list human activities;
- map institutions and stakeholders;
- list Ecosystem Service;
- engage stakeholders (SH) and conduct consultations;
- map SH preferences;
- prioritise and ID/select issues;
- identify relevant social, economic, environmental components and dependencies (DPSIR, CATWOE).
- history of previous consultation or development

SAF Handbook + BaltCoast

Systems Approach Framework



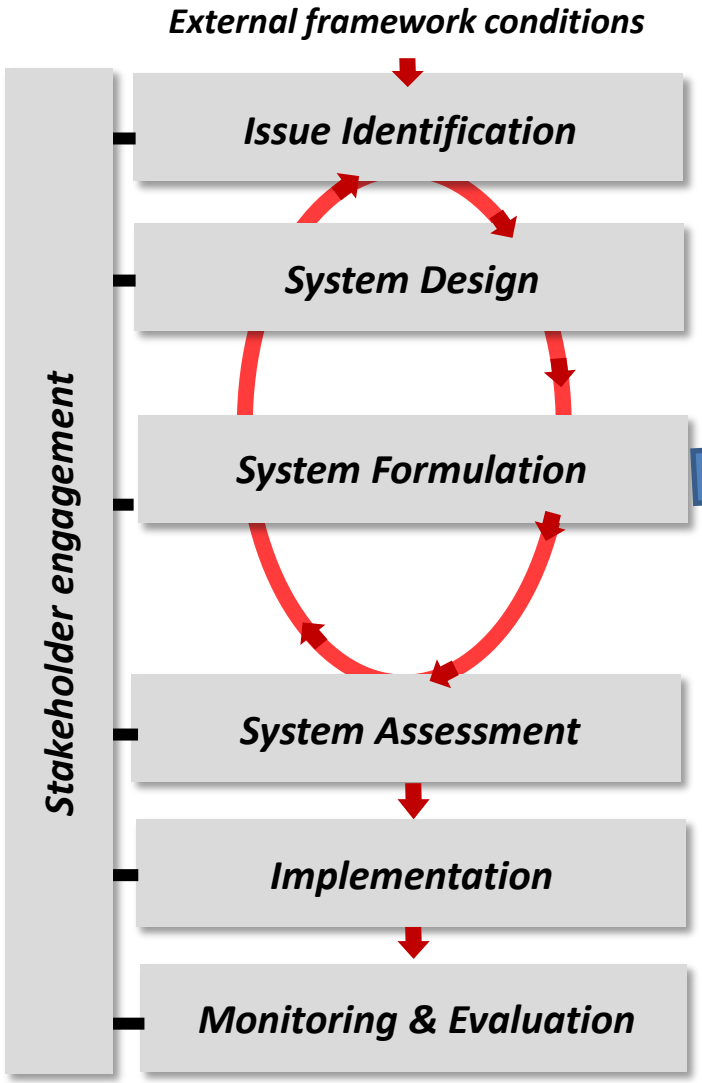
- develop a conceptual model;
- assess data availability and model resources;
- re-visit selected issue(s);

IF data is available:

- define administrative and virtual system boundaries and ESE linkages;
- define success criteria and indicators;
- assess the system state (Sustainability & Ecosystem Services);
- discuss and select potential scenarios with stakeholders;
- identify external hazards;

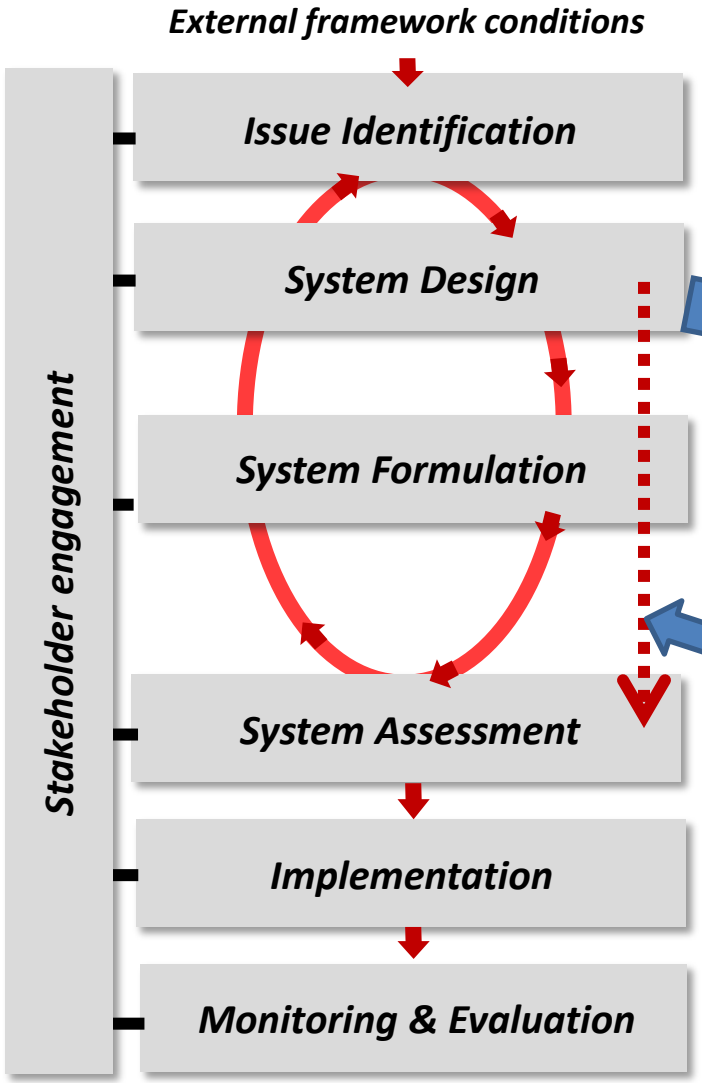
SAF Handbook + BaltCoast

Systems Approach Framework



- Identify and assemble data inputs and variables;
- formulate, document, hindcast/calibrate and validate each of the individual ESE model components (Environmental, Social, Economic) and auxiliary models;
- Link ESE model components into one system model;
- test sensitivity;
- validate ESE model;
- run scenario simulations

Systems Approach Framework

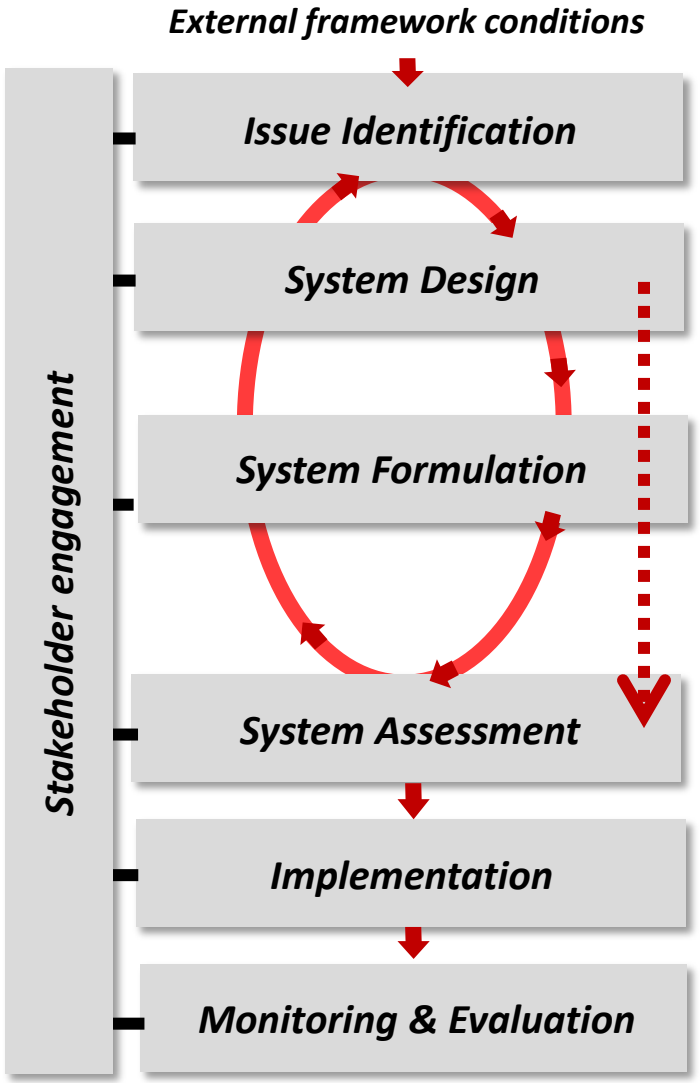


- develop a conceptual model;
- assess data availability and model resources;
- re-visit selected issue(s);

IF no data is available:

- procure new information;
- IF this is sufficient for ESE modelling go back to 'IF data is available'.
- If not, discuss and select potential scenarios with stakeholders;
- go to System Assessment

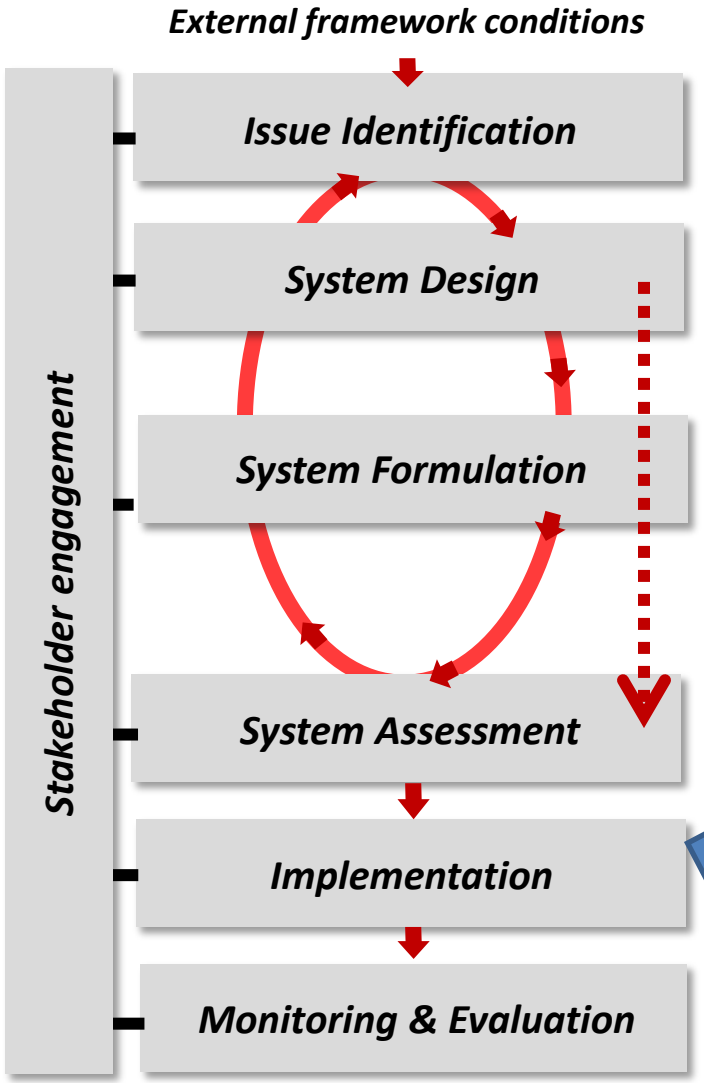
Systems Approach Framework



- prepare scenario results for stakeholders;
- visualize consequences of ESE model scenarios and/or ES and sustainability;
- conduct stakeholder meetings and discuss results;
- potential impacts and management options

SAF Handbook + BaltCoast

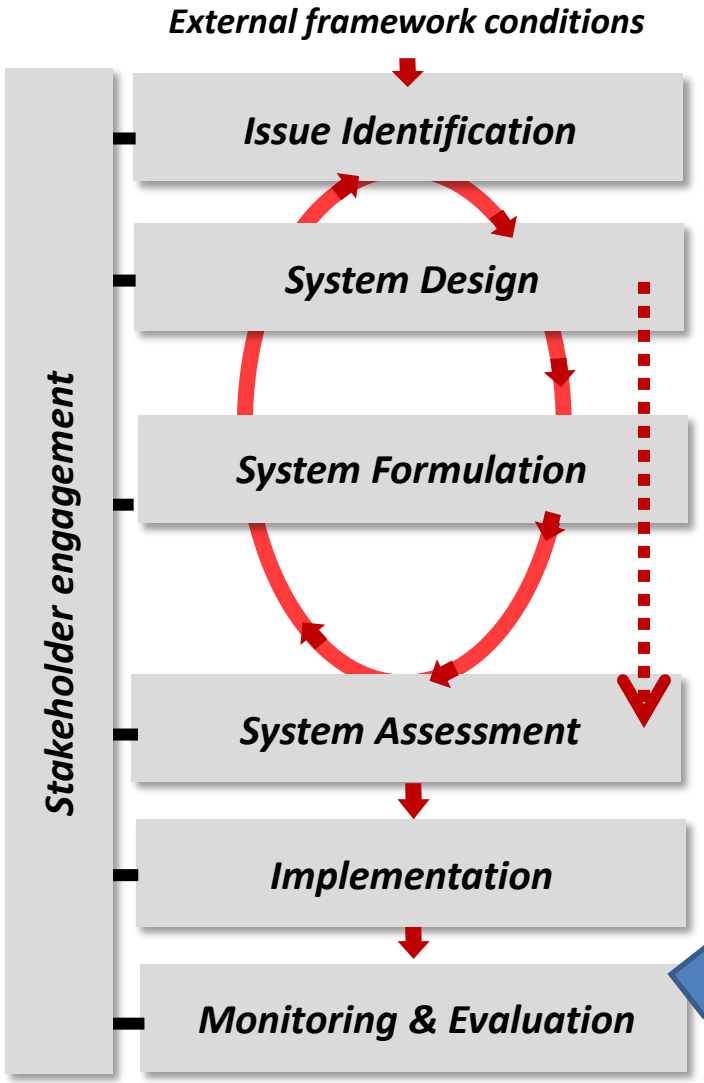
Systems Approach Framework



- Specify regulatory and financial requirements;
- obtain legal permits;
- identify mitigation measures to reduce;
- offset, or eliminate negative impacts;
- ensure pro-active public information, consultation and validation.

SAF Handbook + BaltCoast

Systems Approach Framework



- Ensure that required mitigation measures are implemented;
- evaluate whether mitigation measures are effective;
- assess if the objectives were reached (indicators);
- engage stakeholders regularly on progress, evaluate needs for re-iteration of the SAF process

SAF Handbook + BaltCoast

Systems Approach Framework

- In the next few days you will become acquainted with all the steps of the SAF
- Exercises will help you understand the process, the tools available and their implementation
- During this course we will demonstrate that SAF:
  - is an iterative process that aids collaborative decision making
  - provides a structure for identifying and engaging stakeholders
  - provides a structure for ensuring multi-disciplinary approach that facilitates towards environmental sustainability, social equity and economic viability
  - builds capacity among practitioners, public servants, local government, NGOs and the corporate sector
  - ensures citizen ownership of issues and outcomes, which is the best guarantee for compliance.

Thanks to all BaltCoast colleagues and C. Gillgren, who have contributed to the further development of the SAF

BONUS-BaltCoast received funding from BONUS (Art 185), funded jointly by the EU and Baltic Sea national funding institutions