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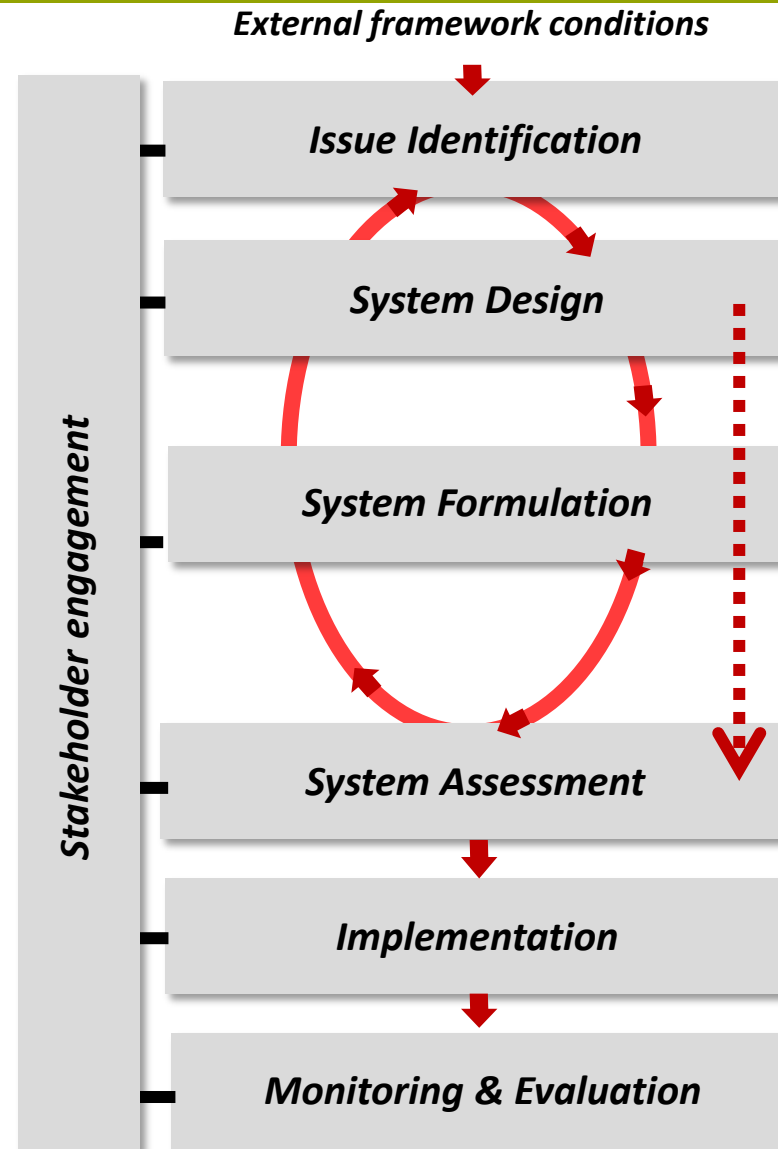
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## SYSTEM APPROACH FRAMEWORK (SAF) FOR COASTAL RESEARCH AND MANAGEMENT: FROM THEORY TO PRACTICE



# System Formulation Step

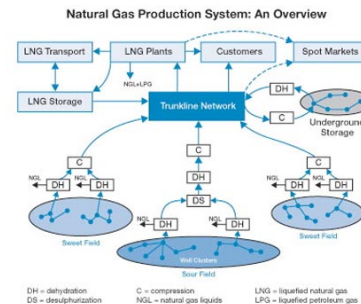
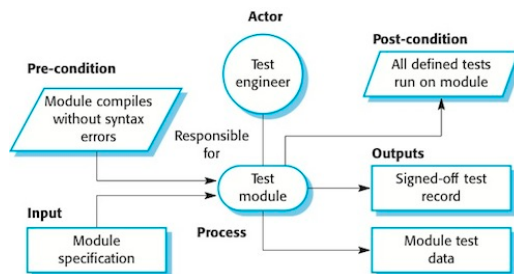
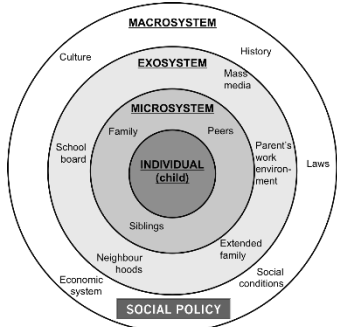
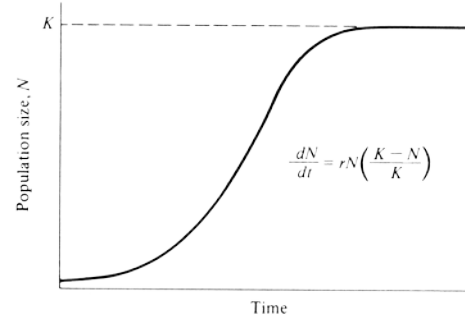
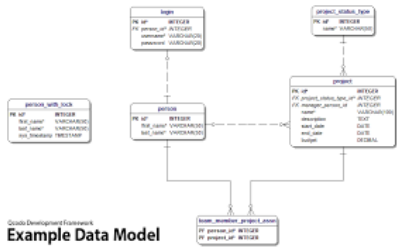
- The purpose:
  - to systematically organize the quantification and the interpretive analyses of the Virtual System;
- Leads to:
  - the construction of **models** that can simulate system behavior;
- Essentially, the Formulation Step defines:
  - how to **represent the functionality** of the Virtual System for simulation/interpretation
  - by selecting the **most relevant** inputs, processes, and internal interactions
  - and by **assembling** these into functional components that can be independently modelled and calibrated.





# What is a model?

- Different definitions, but in essence:
  - Graphical, mathematical (symbolic), physical, or verbal **representation or simplified version** of a concept, phenomenon, relationship, structure, system, or an aspect of the real world.
- The objectives of a model include:
  - to facilitate understanding by eliminating unnecessary components,
  - to aid in decision making by simulating 'what if' scenarios,
  - to explain, control, and predict events on the basis of past observations.





# Formulation Step tasks (1)

## 1. Data preparations (Inputs):

- Identify inputs and useful variables, assess relevance, and assemble metadata;
  - *Output: a table of the input metadata and functions necessary for the simulation analysis.*
- Acquire, analyse and use the Input data;
  - *Output: refined Input Table and documented sets of data in a form usable to the simulation.*
- Get data for model assessment

## 2. Make and test (component) models:

- Describing the model at process and functional level
  - *Output: A description of the model in diagrams and tables.*
- Make and test functional units
  - *Output: Implementation of model functional units in software.*
- Assemble and test the simulation sub-models
  - *Output: Implementation of sub-models in the selected software.*



## Formulation Step tasks (2)

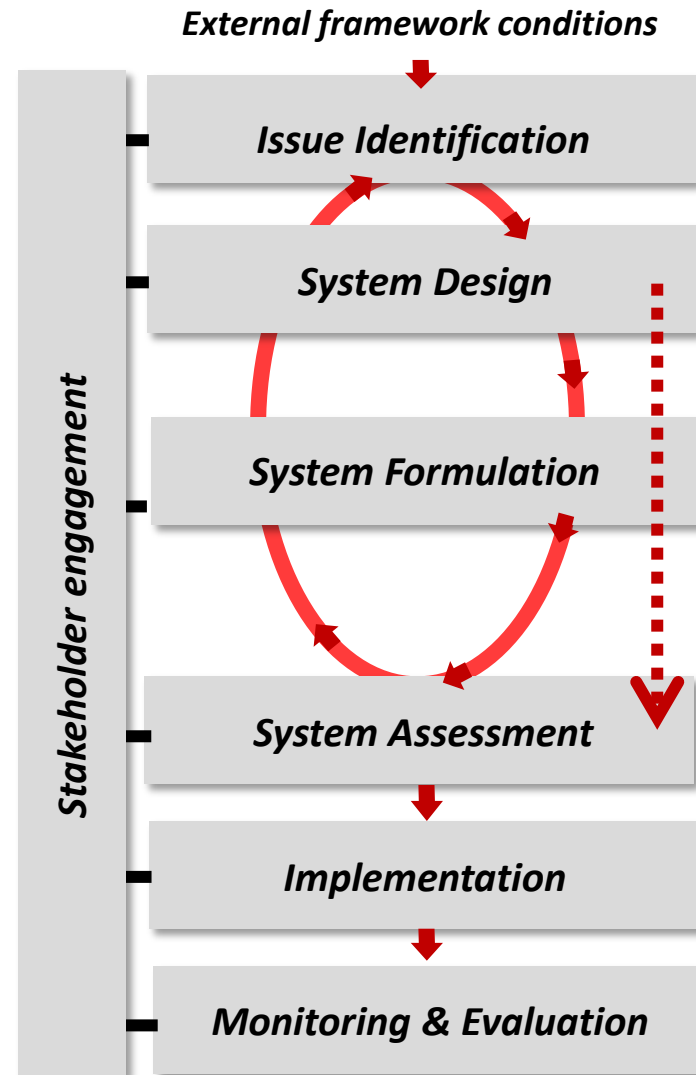
### 3. Document the model development

- Document the simulation model
  - *Output: Technical report describing the model and its testing, including all the primary and secondary products of your work [e.g. initial and revised conceptual diagrams, revised input table, revised processes and functional component table, documentation of processes, approximations, validations, sensitivity tests, calibrations, linkages].*
- Specify model outputs
  - *Output: Identify the model variables that might be used for model testing, Specify the system outputs for both qualitative and quantitative analyses. The result of this sub-task will be included in the conceptual model diagrams.*
- Analyse the economic dimensions of the Coastal Zone system and identify suitable economic assessment methodologies
  - *Output: The result of this sub-task will be documented decisions about approaches and methods for economic assessment*



# System Assessment Step

- The purpose:
  - To construct the Simulation model;
  - Conduct the Interpretive Analyses;
  - Prepare scenario results for stakeholders;
- Leads to:
  - A tested system model against data (validated);
  - Simulated scenarios;
  - Complete interpretive analysis;
  - A document which comprehensively describes the model.





# Assessment Step tasks

## 1. Model components

- Prepare the models for coupling
  - Review models relative to Assessment objectives
  - Integrate any links to other models or products of analyses.
  - Run Models separately for purposes of Interpretive analyses
  - *Output: component models with external sources of data included; component models which when run individually, represent their sub system in a sufficiently realistic manner.*
- Conduct model interpretive analysis
  - *Output: Documentation showing the interpretive analysis of the all the component models.*

## 2. System Simulations

- Construct simulation model
  - *Output: calibrated and validated simulation model of the system.*
- Run scenario simulations
  - *Output: simulation output values from the simulation model that reflect changes caused by applying the scenarios.*

## 3. Output preparation

- Complete interpretive analysis
  - *Output: documentation of the validation process and application of scenarios on the simulation model. A document which comprehensively describes the model.*



- For a full description of the SAF steps, refer to Coastal SAF Handbook at <http://www.coastal-saf.eu/>
- Teaching material is available on the BaltCoast web-page: <http://www.baltcoast.net/training/summer-schools/teaching-material-2017.html>