Chapter 1
Environmental Management Ecosystem vs. Engineering System Theory Approach Modeling and Analysis: Risk Management System as a Managerial Tool

Ivelina Yordanova Zlateva
Independent Researcher, Bulgaria

Nikola Nikolov
Technical University of Varna, Bulgaria

Violin Stoyanov Raykov
Institute of Oceanology, Bulgaria

Mariela Ivanova Alexandrova
Technical University of Varna, Bulgaria

ABSTRACT

There are clear indications that the potential for improvement of the fisheries management in the Black Sea is more connected to innovative ecosystem preservation approach and systematic managerial measures than to innovative technology implications. The fisheries management in terms of sustainability has been identified as a complex task and any measure or management decision has a huge impact in any related matters – bio-ecological, socioeconomic and relevant authorities' enforcement costs. In order to define a simplified approach and unify the procedure of decision making the authors of the entire chapter will analyze possible future implications and simplification of the Ecosystem approach through the System Theory modeling, aiming to adapt this complex structure to open discrete system model with identified input and output, which gives an option for adaptive observation, based on the system's feedback and respectively new approach in analysis of the resource management process.

DOI: 10.4018/978-1-4666-8333-4.ch001

INTRODUCTION

A number of case studies and models have been developed, aiming a better understanding and better results in Marine living resources management and the current discussions are still approaching very detailed manner and comprehensive methodology of research and analysis.

Marine living resource management is identified to be a task with high level of complexity, which is not only aiming to achieve sustainable development of the resources, but also to ensure the balance between existing fishing opportunities and socio-economic elements in the fisheries sector. Any decision taken in this area of research has been identified to influence a number of related directions and is required to correspond to the following:

- *Safeguard Stock Reproduction for High Long-Term Yield;*
- *Lay the Foundations for A Profitable Industry;*
- *Share Out Fishing Opportunities Fairly;*
- *And Conserve Marine Resources (EC, 2014 a).*

In general:

Fisheries management can take the form of input control, output control, or a combination of both. Input controls introduce:

- ***Rules on Access to Waters:*** *To control which vessels have access to which waters and areas.*
- ***Controls:*** *To limit fishing capacity and vessel usage. Fishing effort management is a combination of limitations to the fleet capacity and the amount of time that can be spent at sea by that fleet. Often effort restrictions are applied in addition to the more generally used system of total allowable catches.*
- *Fishing effort restrictions have been introduced in a number of situations: under multiannual plans for the management of a specific stock or group of stocks, and more generally area-based.*
- ***Technical Measures:*** *To regulate gear usage and where and when fishermen can fish - Technical measures are a broad set of rules which govern how, where and when fishermen may fish. They are established for all European sea basins, but they differ considerably from one basin to another, in accordance with the regional conditions. The measures may include:*
  - *Minimum landing sizes and minimum conservation sizes*
  - *Specifications for design and use of gears*
  - *Minimum mesh sizes for nets*
  - *Requirement of selective gears to reduce unwanted catches;*
  - *Closed areas and seasons;*
  - *Limitations on by-catches (catches of unwanted or non-target species);*
  - *Measures to minimize the impact of fishing on the marine ecosystem and environment.*

Output controls mainly consist of limiting the amount of fish from a particular fishery through total allowable catches. Total allowable catches (TACs) or fishing opportunities, are catch limits (expressed in tones or numbers) that are set for most commercial fish stocks. The Commission prepares the proposals, based on scientific advice on the stock status from advisory bodies such as ICES The international Council for exploration of the Sea and STECF (Scientific, Technical and