

# **Sustainability and Resilience in Resource Systems: *Indicator Frameworks & Policy Directions***

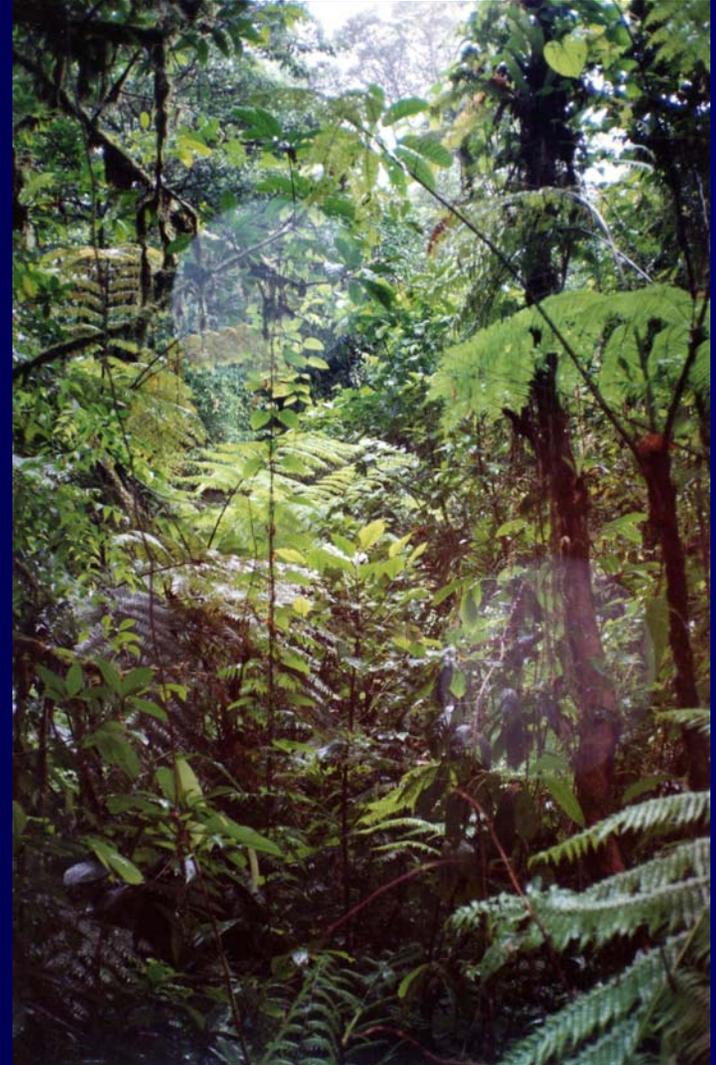
**Tony Charles**

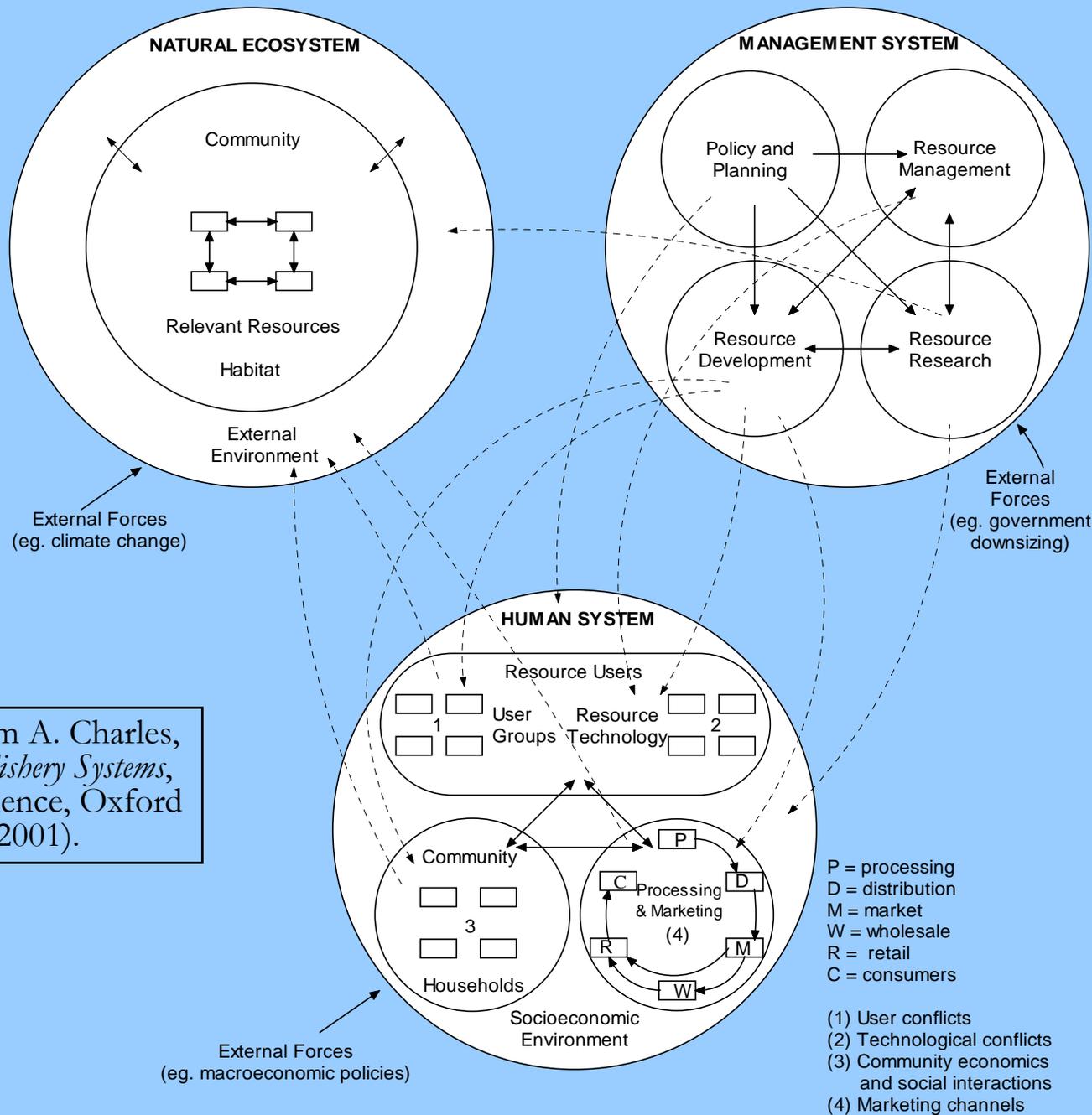
**Saint Mary's University  
Halifax, Canada**

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# Natural Resource Systems

- *Natural System:*
  - Natural Resources
  - The Ecosystem
  - The Biophysical Environment
- *Human System:*
  - Resource Users
  - Households and Communities
  - Social/Economic Environment
- *Resource Management System:*
  - Policy and Planning
  - Integrated Management
  - Development and Research

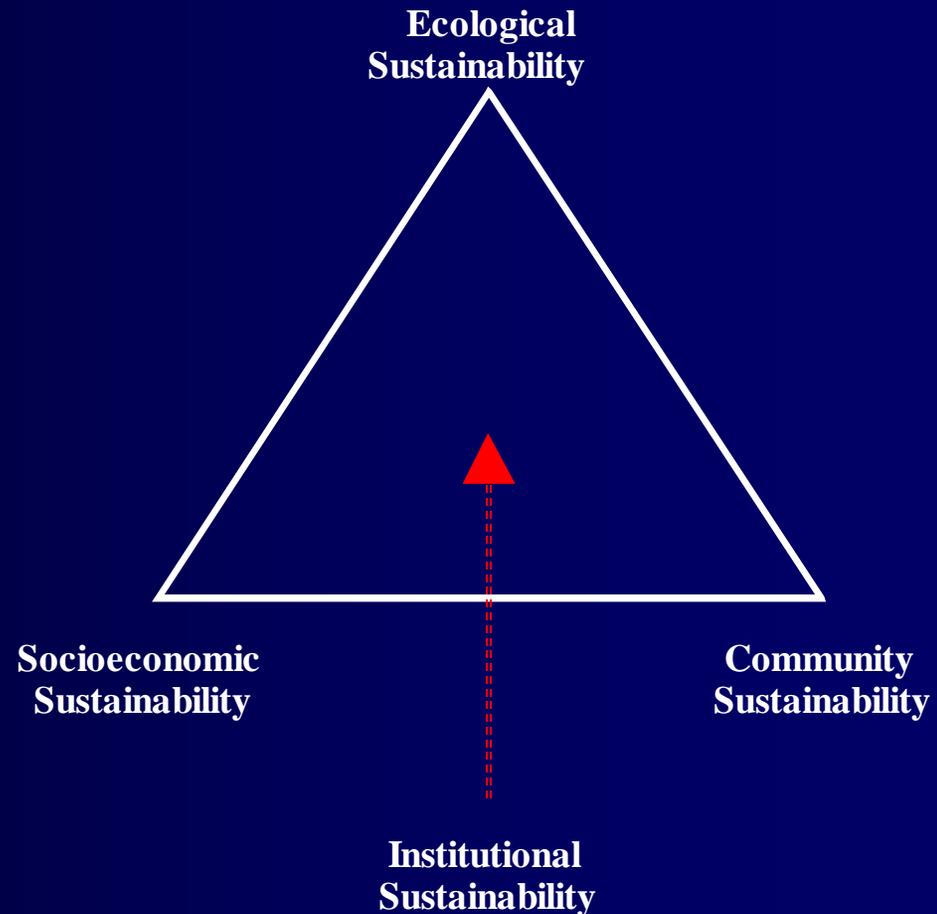




Adapted from A. Charles,  
*Sustainable Fishery Systems*,  
 Blackwell Science, Oxford  
 UK (2001).

# Sustainability in Resource Systems

An integrated view of sustainability requires attention to four major aspects: ecological, socioeconomic, community & institutional. Assessment processes can monitor all of these components...



# Resilience in Resource Systems

- Resilience is a property of a resource system (including ecological, human & management components) that reflects its capability to persist or ‘bounce back’ following unexpected shocks to the system



# Resilience Components

- Ingredients of a resilient natural resource system:
  - ☑ Resilient ecosystem
  - ☑ Resilient human communities
  - ☑ Resilient socioeconomic structure
  - ☑ Resilient management institution



# Indicator Frameworks

Indicators are:

- tools for systematic monitoring of ecozones and resource systems
  - Key variables in a dynamic model
  - What policy makers and stakeholders think is worth tracking
- 
- Ecological Indicators
  - Socioeconomic Indicators
  - Community Indicators
  - Institutional Indicators



# Indicator Design Issues

## Comprehensiveness

- One component vs. Integrated approach

## Level of Aggregation

- Multiple indicators vs. single “index”

## Scale

- what indicator framework will be best to apply at community, regional, national, international levels to monitor sustainability and resilience?

# Sustainability Indicator Examples

## **Ecological Indicators:**

- *Status of Exploited Natural Resources*
- *Status of Non-Target Species*
- *Environmental Quality*

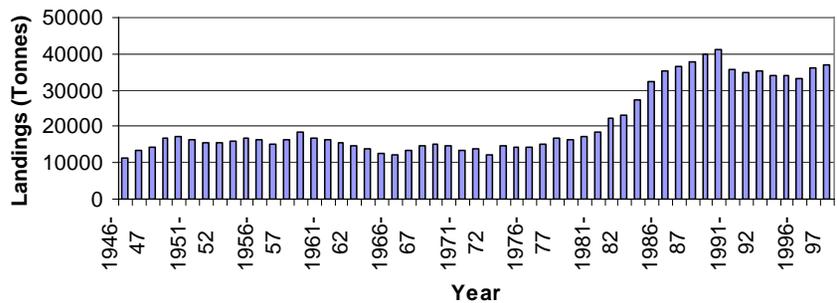
## **Socioeconomic & Community Indicators**

- *Traditional Economic Measures*
- *Natural Capital Measures*
- *Distribution of Benefits*

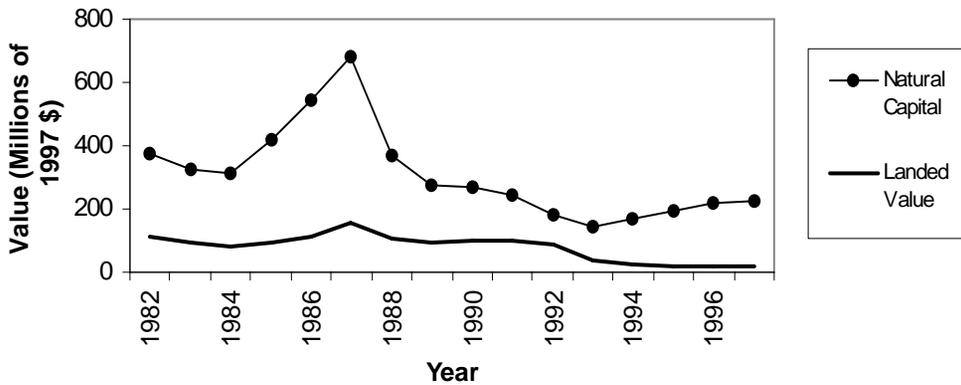
## **Institutional Sustainability Indicators**

- *Financial and Organizational Sustainability*

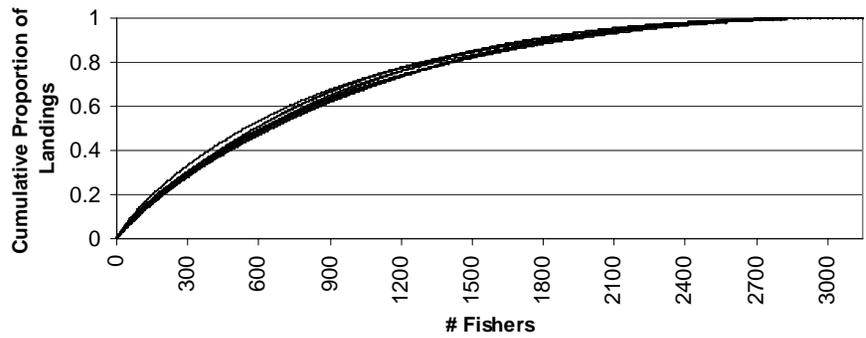
**Nova Scotia's Lobster Landings**



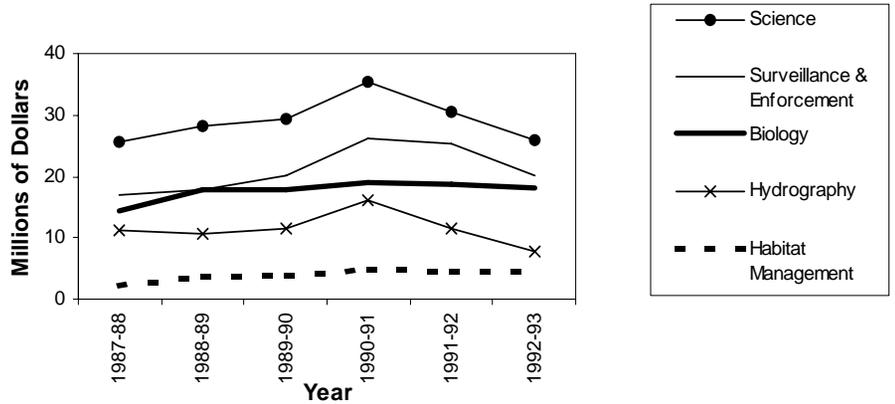
**Value of NS Cod Stocks**



**NS Lobster Landings Distribution (1989-1999)**

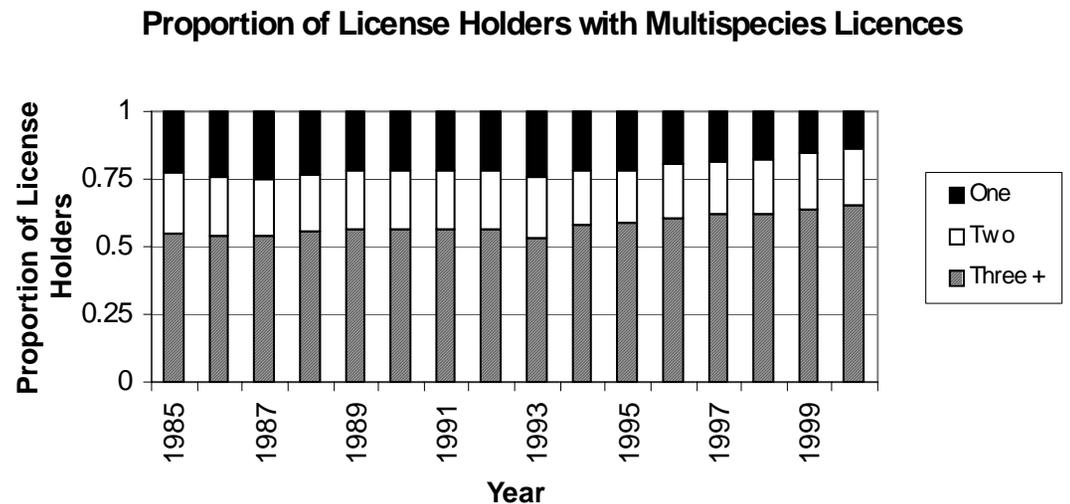


**DFO Scotia-Fundy Expenditures**



# Resilience Indicator Examples

- Age Structure of Resource Users
- Access to Multiple Natural Resources
- Economic Diversification
- Biodiversity
- Benthic Integrity



# Policy Directions

## 1. Resource management:

- Developing a robust and adaptive management portfolio
- Applying the precautionary approach

## 2. Structure and interactions:

- Co-management and community-based management
- Diversifying livelihoods and resource uses

## 3. Information and monitoring:

- Developing and utilizing the knowledge base
- Monitoring sustainability and resilience

## 4. Institutional arrangements:

- Sustainable and resilient institutions
- Institutional effectiveness



# Robust Management

- provides reasonable success in meeting societal objectives, even with incorrect understanding of the resource, its environment and dynamics, as well as an imperfect capability to control use of the resource...
- reduces sensitivity of resource use outcomes to uncertainty, and to management capability



# Robust Management

- Adaptive Management Portfolios
  - e.g., Multiple management tools, Precautionary Approach
- Self-Regulatory Incentives and Institutions
  - e.g., Appropriate Use Rights, Community-Based Management
- Traditional / Ecological Management
  - e.g., Habitat Protection, Protected Areas
- Livelihood/Income Diversification
  - e.g., Maximize Benefits per Resource, Diversify the Economy



# Institutions

Resource management institutions are:

- (1) suitable organizational structures within which people interact and manage themselves – e.g., management agencies, associations of resource users or markets;
  - (2) suitable sets of rules and constraints, adopted by society to govern the behaviour of resource users and the management of the natural resource.
- Successful resource management is unlikely in the absence of attention to institutional arrangements.
  - This involves sustainability, resilience of the institution itself, and effectiveness of the institution in managing the resource system for sustainability and resilience.

# Messages

1. Sustainable development needs a multi-dimensional view, including ecological, socioeconomic, community and institutional components of sustainability.
2. Natural resource strategies must enhance resilience in the ecosystem, the economy, communities, and institutions.
3. Uncertainty is a dominant feature in natural resource systems, so there is a need to ‘live with uncertainty’.
4. This requires a Precautionary Approach, and management portfolios that are adaptive and robust.
5. The move toward sustainability and resilience requires a focus on *natural capital* – this broadens the ‘old’ view of resource management that paid attention only to extracting the resource.

