



# Module 5



## Understanding ecosystem state and impact

The DPSIR is a widely used framework for understanding and reporting ecosystem condition

This module begins with presentation, then engages participants in thinking about how DPSIR might apply to the local catchment they have just visited





# Module 5



## A conceptual framework for understanding ecosystem state and impact





# DPSIR

- **Driving Force-Pressure-State-Impact-Response (DPSIR) framework; an effective tool for analyzing dynamic interactions of human society and the environment**
- **This module focuses on driving forces (D), pressures (P), state (S), and impact (I)**
- **The response (R) component will be used later in the workshop**

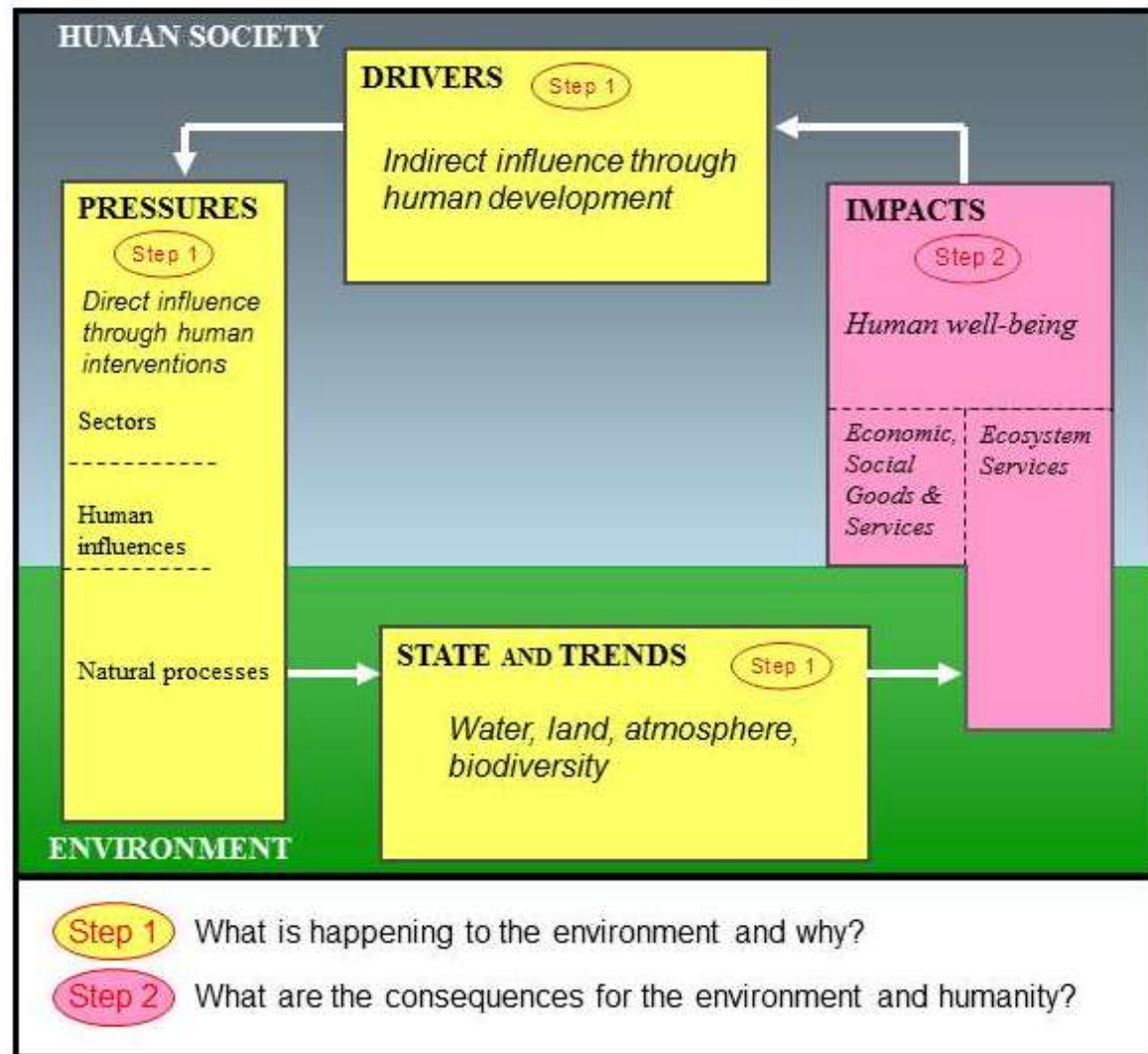




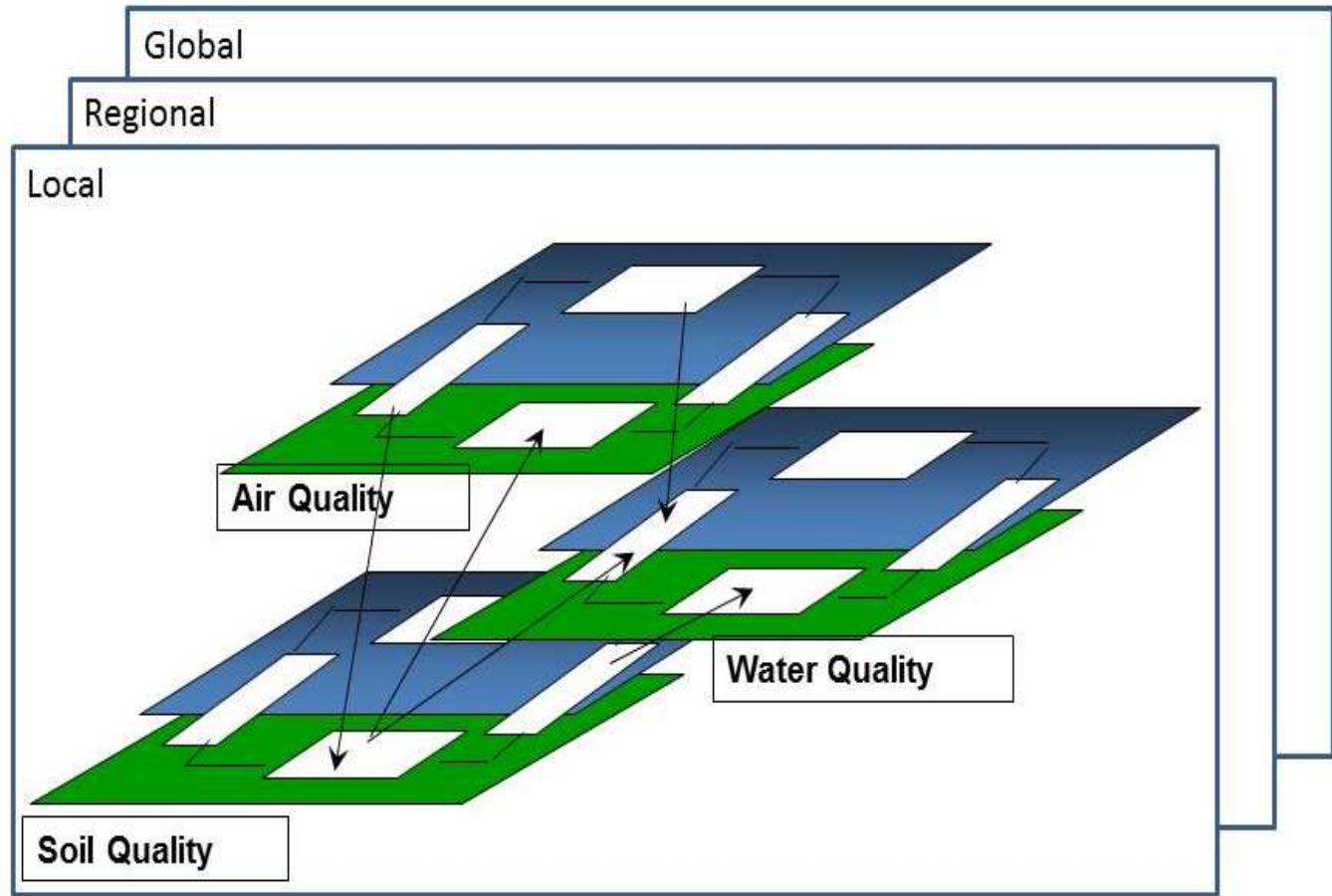
# DPSIR

- ***State*** results from natural and anthropogenic forces of change called ***Pressures***
  - Natural forces occur largely without human intervention (e.g., volcanic eruptions or background erosion)
  - Anthropogenic pressures are human activities that change ecosystem conditions; typically defined as negative forces (e.g., emission of a pollutant into a river)
- ***Drivers*** are societal forces of change that set up anthropogenic pressures (e.g., changes in consumption that increase polluting activities)
- ***Impacts*** affect human well-being and ecosystem ability to provide goods and services





- Environmental state and trends result from multiple interacting forces of change
- Changes in ecosystem condition can result in cascading impacts



- **Global and regional trends and processes often directly influence direction and rate of change in local ecosystems**



# Guiding Questions

- **What is happening to our ecosystem?**
- **Why are observed changes occurring?**
- **What are consequences for the ecosystem and human society?**





# BellagioSTAMP:

## SusTainability Assessment and Measurement Principles

- **Guiding vision:** Assess sustainable development progress by how it **delivers and sustains well-being**
- **Assessments consider:**
  - Social, economic environmental systems, and interactions
  - Adequacy of governance
  - Risks & uncertainties across boundaries
  - Implications for decision making (e.g., trade-offs, synergies)
- **Sustainability assessments adopt:**
  - Time scale, capturing short and long-term effects of policy decisions and human activity
  - Geographic scope, local to global
  - Framework and indicators





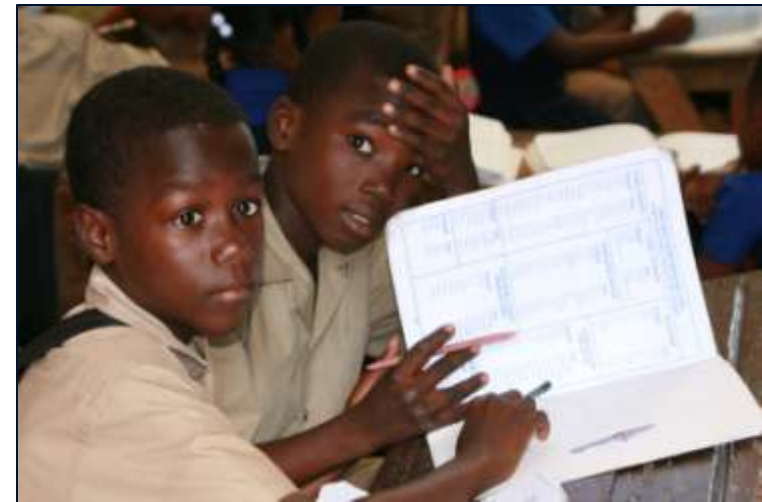


# Basis for Sustainability Assessments

- **Conceptual framework** that identifies the domains core indicators have to cover
- **Recent and reliable data, projections and models** to infer trends and build scenarios
- **Standardized measurement** methods
- Comparison of indicator values with **targets and benchmarks**
- **Transparency** accessible to the public

## Requires:

- **Repeated** measurement
- **Responsiveness** to change
- Investment in capacity
- Continuous learning and improvement





# Assessment Process

- **Ensure that data, indicators and results of assessment are accessible to the public**
- **Explain choices, assumptions and uncertainties**
- **Disclose data sources and methods**
- **Disclose sources of funding and potential conflicts**
- **Find ways to reflect views of the public and provide active leadership**
- **Engage early on with assessment users**
- **Provide continuity and capacity**





# Communication about Assessment

- **Judgment about “State” is based on assessment**
- **Communicating assessment**
  - Use clear and plain language
  - Present information fairly, objectively
  - Use innovative visual tools and graphics
  - Make data available in as much detail as is reliable and practical
  - Include broad participation in development of communication and in audience





# Priority Issue Identification Criteria

- We have to set priorities to take decisions
- Criteria for priorities
  - Relevance of the issue for stakeholders
  - Magnitude of impact on human well-being
  - Changing dynamics
  - New scientific insights
  - Potential future risk
  - Proximity of the issue to critical thresholds



# Comparing Examples of Prioritized Environmental Concerns

## 3 categories of primary and secondary environmental concern in coastal ecosystems

### Marine and freshwater quality

- Excessive nutrient loading and sedimentation due to poor **land-use practices**
  - Marine pollution from **sewage and industrial effluents**

### Habitat and community modification and degradation

- Loss of marine habitats and disruption of coastal processes
  - Land and coastal-based pollution

### Unsustainable use of living marine resources

- Over-exploitation of marine resources and inadequate monitoring
  - Use of destructive fishing practices

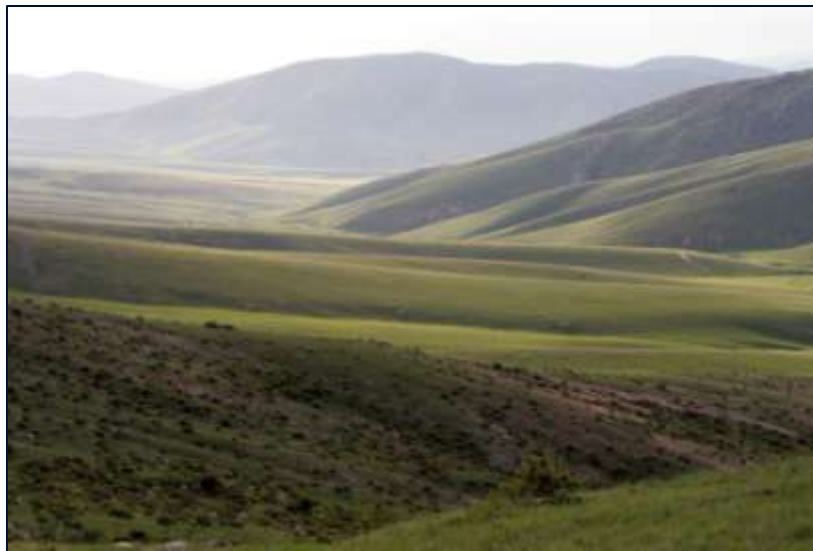
# Comparing Examples of Prioritized Environmental Issues

<p>1. Declining <b>Water Quality</b> in Rivers and Coastal Waters</p> <p>2. Increasing <b>Environmental Risks from Hazardous Materials and Wastes</b></p> <p>3. <b>Inadequate Water Supplies</b></p> <p>4. <b>Loss of Critical Habitats and Biodiversity</b></p>	<p>5. Declining <b>Coastal and Marine Resources</b></p> <p>6. Increasing <b>Land Degradation</b></p> <p>7. <b>Disturbed or Unpredictable Hydrological Regimes</b></p> <p>8. <b>Climate Change</b></p> <p>9. <b>Air Pollution</b></p> <p>10. <b>Noise Pollution</b></p>



# Focusing DPSIR Analysis

- Priority issues and concerns establish focus of **DPSIR**
- Must determine relationships among **specific ecosystem conditions**
- Conditions must be defined precisely enough to **select indicators** that describe **current state and development over time**



# Ecosystem states based on general concerns

<b>Theme</b>	<b>Issue</b>	<b>Ecosystem state examples</b>
<b>Water</b>	<b>Water shortage</b>	<b>Groundwater level Recharge rate</b>
	<b>Algal blooms</b>	<b>Concentration of nutrients Biological oxygen demand Turbidity</b>
<b>Theme</b>	<b>Issue</b>	<b>Ecosystem state examples</b>
<b>Land</b>	<b>Soil degradation</b>	<b>Risk of soil erosion Soil organic matter content</b>
	<b>Urbanization</b>	<b>Developed land</b>
<b>Theme</b>	<b>Issue</b>	<b>Ecosystem state examples</b>
<b>Biodiversity</b>	<b>Loss of natural habitat</b>	<b>Size of protected areas</b>
	<b>Invasive species</b>	<b>Number of invasive species Area affected by invasives</b>





# Questions

- **Any questions?  
Process seem clear?**
- **Could you identify a theme and develop a list of the most relevant issues to define ecosystem state for a catchment?**



# Apply DPSIR to the **Workshop** catchment

Identify 2 themes and develop relationships between issues and ecosystem states. Use information from the assignment of you

Theme	Issue	Ecosystem state examples
1.		
2.		



# Selecting Indicators

**Indicators need to be:**

- **Developed using an accepted conceptual framework**
- **Clearly defined**
- **Easy to understand**
- **Subject to aggregation**
- **Objective**
- **Developed with reasonable data requirements**
- **Relevant to users**
- **Limited in number**
- **Reflective of causes, processes or results**





# Discussion

Choose any one the following ecosystem services; build a set of indicators for the **workshop** catchment that meet criteria for good indicators. How will you assess these indicators? What time scale will be appropriate for measurement and adaptive responses? (30 min)

Elect a group spokesperson to present in plenary (15 min)

Ecosystem Service	Indicator	Measure	Time frame
Drinking water			
Flood avoidance			
Adequate water for irrigation			
Avoidance of downstream nutrient impacts			
Avoidance of downstream sedimentation			
High aquatic biodiversity			





# Reminder of indicator criteria for working groups

- **Developed using an accepted conceptual framework**
- **Clearly defined**
- **Easy to understand**
- **Subject to aggregation**
- **Objective**
- **Developed with reasonable data requirements**
- **Relevant to users**
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# Exemplary Drivers and Pressures

## DRIVERS

- Consumption and production patterns
- Demographics
- Science and technological innovation
- Economic demand, markets and trade
- Institutional and socio-political frameworks
- Distribution patterns

## PRESSURES

### Sectors

- Agriculture, fisheries and forestry
- Transport and housing
- Finance and trade
- Energy and industry
- Security and defence
- Science and education
- Culture

### Human influence

- Pollution
- Land use
- Resource extraction
- Modification and movement of organisms



## Adding drivers and pressures to the analysis

- Return to the one ecosystem service for which you developed indicators and measures; identify key drivers and pressures that affect that service (10 min)





## Discussion

- How much can we influence drivers you identified for this catchment?
- How useful is this DPSIR analysis if we cannot change drivers (much)?
- How much can we change the state by focusing on pressures?
- What ways might we as catchment managers influence pressures?
- On a percentage basis, how much do we feel we could improve state by focusing on pressures?







# Module 5



**Questions?**

**Is the logic clear?**

**Is this sufficiently active and engaging?**

**Are there ways you can see adapting it for your uses?**

