UNEP

Integrated Environmental Assessment Training Manual for the Arab Region

Module 5

Integrated analysis of environmental trends and policies

Sessions at a Glance

Session 1: Introduction

Session 2: Spatial and Thematic Boundaries

Session 3: An Analytic Framework for IEA

Session 4: Step 1. What is happening to the Environment and Why?

Session 5: Step 2. What are the consequences for the environment and humanity?

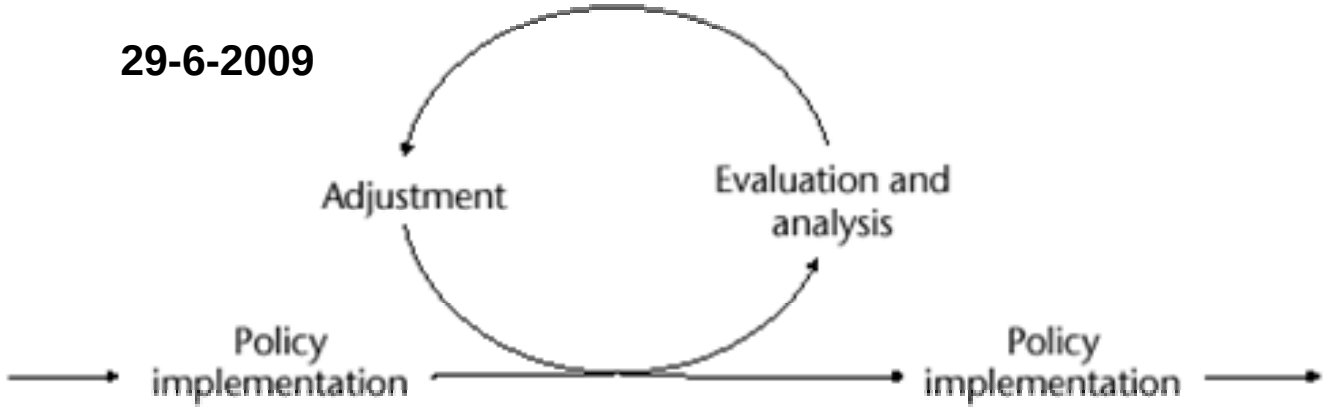
Session 6: Step 3. What is being done and how effective is it?

“The main objective of laws is to regulate the interests of all. Such laws are not divine, hence if they are found to contradict with such interests or if they cause harm to a bracket in society, they can be amended accordingly so as to realize their intended goals”.

H.H. Shaikh Khalifa bin Salman Al-Khalifa

Prime Minister- Bahrain

29-6-2009



Federal Laws concerning the environment in Abu Dhabi

- Law no 23 of 1999: **Concerning Exploitation, Conservation, and Development of Living Aquatic Resources (17 October 1999).** (the purpose of this law is to protect and develop aquatic resources in the UAE via a set of regulatory procedures that include the establishment of a registration committee.
- Law no 24 of 1999: **concerning Protection and Development of the Environment (17 October 1999).** This was the first comprehensive law on the environment in the UAE at a federal level and entered into force in February 2002.
- **Law (1) of 2002: Concerning Regulation and Control of the Use of Radioactive Sources and Protection against its Hazards as amended. (**January 2002). This law was initially the responsibility of the ministry of energy (water and electricity sector). By virtue of decree (39/4) dated 17 January 2005, the mandate shifted to (FEA).
- **Law no (11) of 2002: concerning the Regulation and Control of International Trade in Endangered Species of Wild Fauna and Flora (26 October 2002).**

LawNo	قانون لسنة	موضوع القانون	ملف رابط
11	2002	قانون اتحادي رقم (11) لسنة 2002 بشأن تنظيم ومراقبة الاتجار الدولي بالحيوانات والنباتات المهددة بالانقراض	PDF File
10	2002	قانون اتحادي رقم (10) لسنة 2002م في شأن مزاولة مهنة الطب البيطري	PDF File
24	1999	قانون اتحادي رقم (24) لسنة 1999 في شأن حماية البيئة وتنميتها	PDF File
23	1999	قانون اتحادي رقم (23) لسنة 1999 م في شأن استغلال وحماية وتنمية الثروات المائية الحية في دولة الإمارات العربية المتحدة	PDF File
7	1993	قانون اتحادي رقم (7) لسنة 1993 بإنشاء الهيئة الاتحادية للبيئة المعدل بالقانون الاتحادي رقم (30) لسنة 2001	PDF File
42	1992	قانون اتحادي رقم (42) لسنة 1992 بشأن إنتاج واستيراد وتداول البذور والتقاوي	PDF File
41	1992	قانون اتحادي رقم (41) لسنة 1992 في شأن مبيدات الآفات الزراعية	PDF File
39	1992	قانون اتحادي رقم (39) لسنة 1992 في شأن إنتاج واستيراد وتداول الأسمدة والمصلحات الزراعية	PDF File
38	1992	قانون اتحادي رقم (38) لسنة 1992 في شأن إنشاء المشاتل وتنظيم إنتاج واستيراد وتداول الشتلات	PDF File
6	1992	قانون اتحادي رقم (6) لسنة 1992م بتعديل بعض أحكام القانون الاتحادي رقم (5) لسنة1979م في شأن الحجر الزراعي	PDF File
7	1992	قانون اتحادي رقم (7) لسنة 1992م بتعديل بعض أحكام القانون الاتحادي رقم (6) لسنة 1979م في شأن الحجر البيطري	PDF File
21	1981	قانون اتحادي رقم (21) لسنة 1981 في شأن إنشاء الهيئة العامة لإدارة موارد المياه في دولة الإمارات العربية المتحدة	PDF File
2	1981	قانون اتحادي رقم (2) لسنة1981 بإنشاء المؤسسة العامة لتسويق الإنتاج الزراعي	PDF File
6	1979	قانون اتحادي رقم (6) لسنة 1979م في شأن الحجر البيطري	PDF File
5	1979	قانون اتحادي رقم (5) لسنة1979 م في شأن الحجر الزراعي	PDF File

Definition of Jenkins, 1978

- Policy is a set of interrelated decisions taken by a political actor or group of actors concerning the selection of goals and the means of achieving them within a specified situation where these decisions should, in principle, be within the power of these actors to achieve.

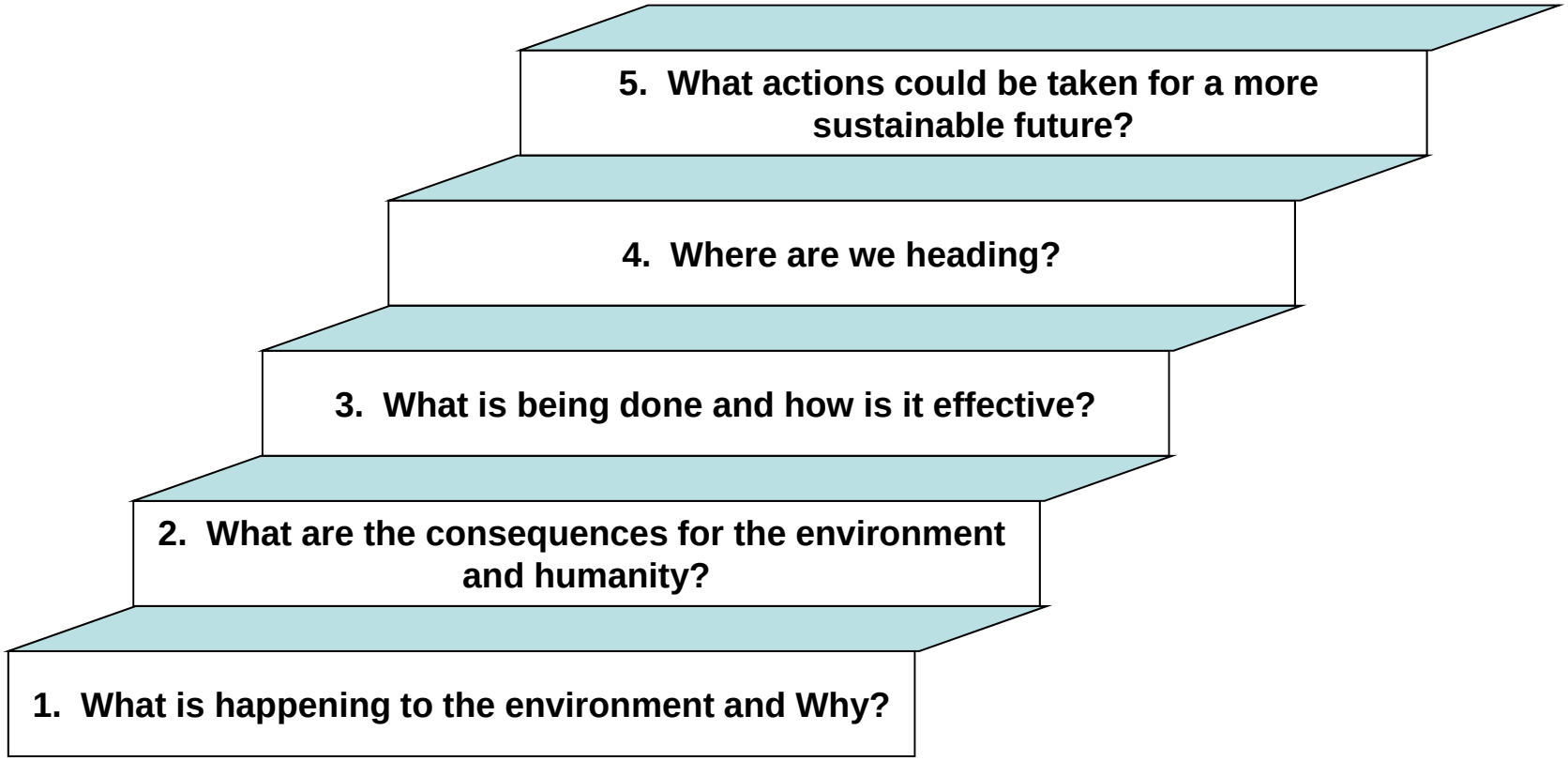
- Stated: like a political statement. E.g. protected areas statement.
- Implied: in another policy, to guarantee the preservation of the environment, e.g. using lead-free petrol in vehicles.
- Perceived: water meters on groundwater wells, and increasing electricity tariffs.
- Done: enforcement of legislation. Air pollution measuring devices.

Types of Environmental Policy

- Environmental policy is either Proactive, so as to avoid an environmental problem, or Reactive, as a response to an environmental problem.
- It is either a (restoration) or an (enhancement). This either influences the State, Pressures, and Drivers.
- It is also an Adaptation to or a mitigation of the environmental Impacts via changing human behavior possible through legislation, regulation, science, and technology



Steps of Integrated Environmental Assessment



Steps 1, 2 and 3

- Step 1: What is happening to the environment and why?
  - Compile and analyze **status and trends** of the environment, including pressures and driving forces

- Step 2: What are the consequences for the environment and humanity?
  - **Analyzing impacts** of environmental change on ecosystem services and human well-being

- Step 3: What is being done and how effective is it?
  - Identify **policies that impact the environment, policy gaps** and opportunities for policy innovation

Discussion: Reflecting on the Steps of IEA

(15 minutes)

- In small groups, discuss whether the questions proposed reflect your understanding of what should be covered by SOE and policy analysis? If they do not, how would you rephrase them?

- In your opinion, given your experiences to date, is it more advantageous to treat SoE assessment and policy analysis in a combined way or separately in an IEA report? Why?

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Setting Spatial Boundaries

Resource Unit versus Jurisdictional

Table 2: Comparing SoE reporting in regions with ecosystem versus political boundaries (modified after Pintér, Zahedi and Cressman 2000).

Ecounit boundary	**Advantages** • More meaningful interpretation of environmental trends relevant to specific ecosystems. • Better understanding of ecosystems as functional units. • Direct connection to ecosystem-scale policies.
	Disadvantages • Limited availability of some data expressed at the scale of ecounit (particularly socio-economic data). • Political complexity arising from analysis of resources under shared jurisdiction.
Jurisdictional (political) boundary	**Advantages** • More uniform regulatory environment. • More simple data collection. • Direct connection to jurisdiction-wide policies.
	Disadvantages • Resource-specific trends masked by data collected on the level of political jurisdiction. • Difficulty detecting differences in ecosystem impacts of specific policies.

Thematic versus Sectoral Approaches

- **Thematic approach:**
  - A more traditional approach; i.e., water, air
  - Challenge is that different themes can be impacted by the same policies or sectors

- **Sectoral approach:**
  - i.e., transportation, agriculture, energy
  - Challenge is that one environmental theme can be impacted by multiple sectors

Discussion: A Context for IEA

- With your neighbour, discuss the contexts of previous reporting processes you are aware of.

- Having considered the contexts of previous reporting processes, what is the best context for a new reporting system in your country—ecosystem or jurisdictional focus, thematic or sectoral approach?

- How might a new IEA be designed to minimize the “cutting the cake dilemma”? Discuss issues related to analysis of transboundary environmental problems.

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Benefits of Using an Analytic Framework

- ✓ helps **position the environment** in relation to issues of (sustainable) development;
- ✓ helps establish **cause-effect relationships**;
- ✓ becomes a **communication tool** for engaging a multisectorial and multidisciplinary group;
- ✓ provides a roadmap and **systematic checklist** for the report-writer.

Types of Frameworks

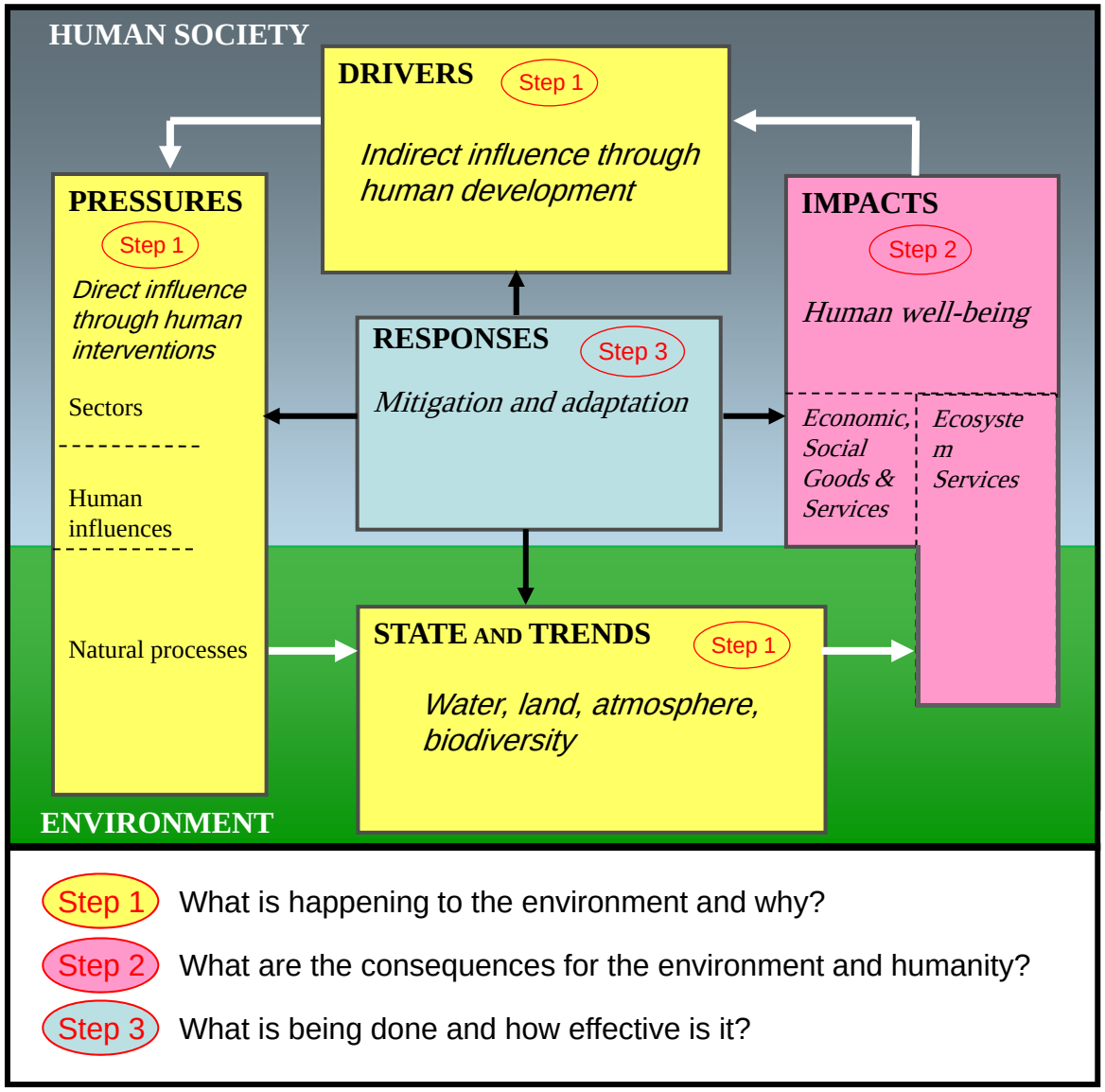
- DPSIR (Driver – Pressure – State – Impact – Response)
- Vulnerability
- Ecosystem Well-being
- Capital-based
- Sectorial
- Issue-based

Discussion: Frameworks

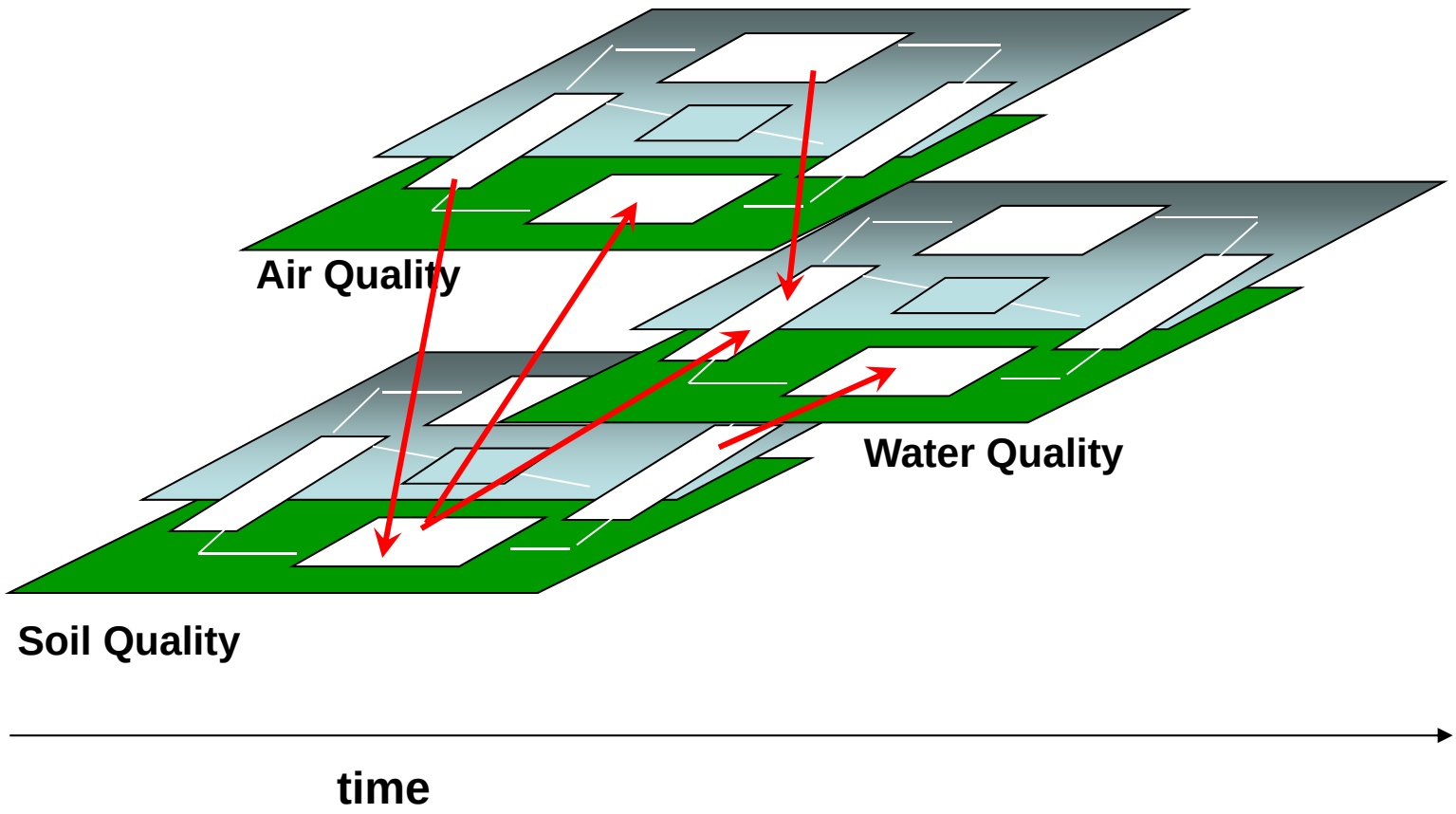
(20 minutes)

- With your neighbour, discuss what, if any conceptual framework you have had the opportunity to use in your work (10 minutes)
- Identify and explain the framework to your colleague; draw a diagram if applicable.
- What was your experience with the framework?
- When reconvening in plenary, prepare to comment on frameworks in your list that seem to be new to others (20 minutes).

DPSIR Analytical Framework for Integrated Environmental Assessment

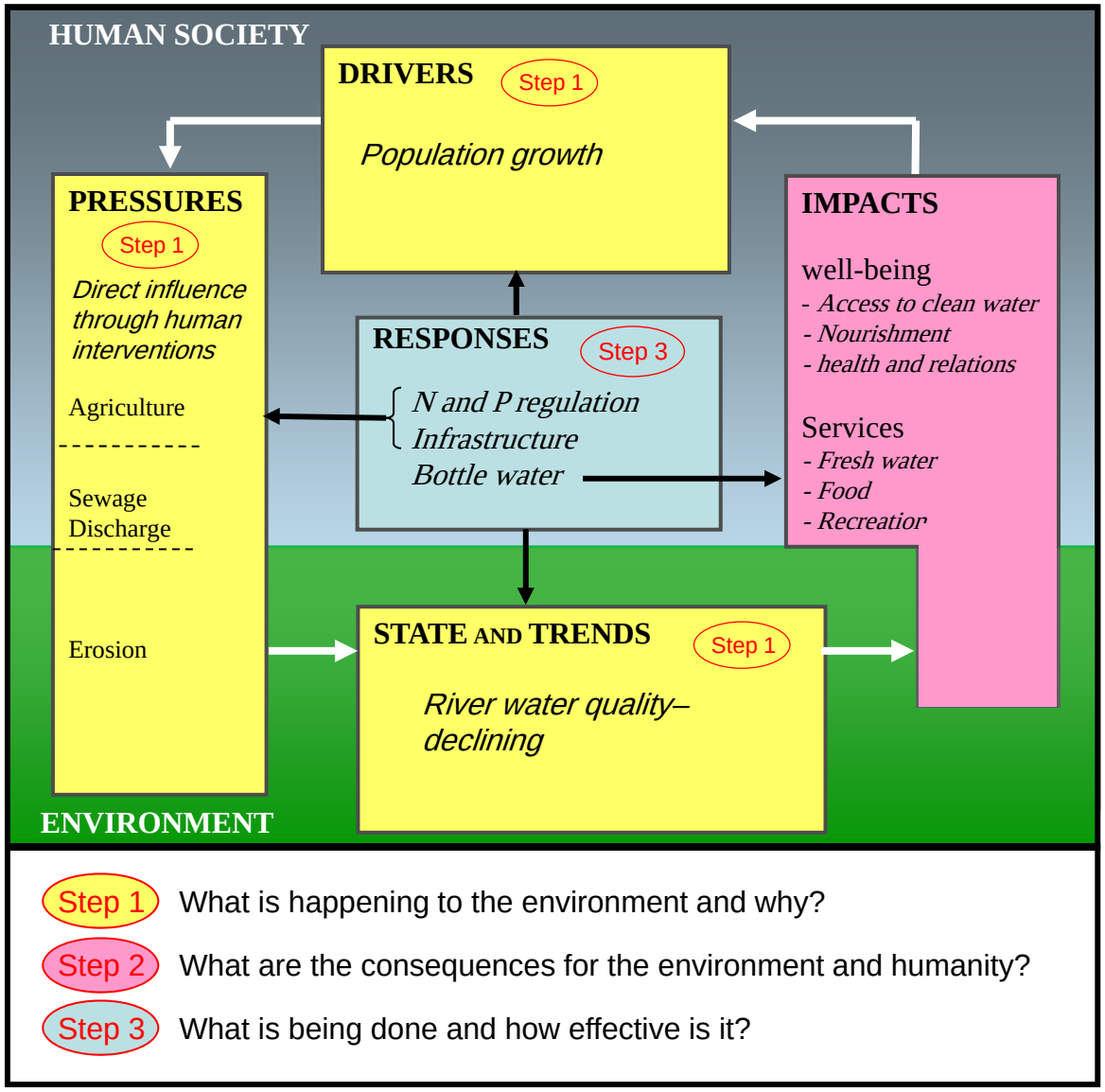


Inter-linkages among environmental issues



An integrated story should not stop at understanding the causality chain for a specific issue. Integrated environmental assessment also looks for linkages among environmental issues

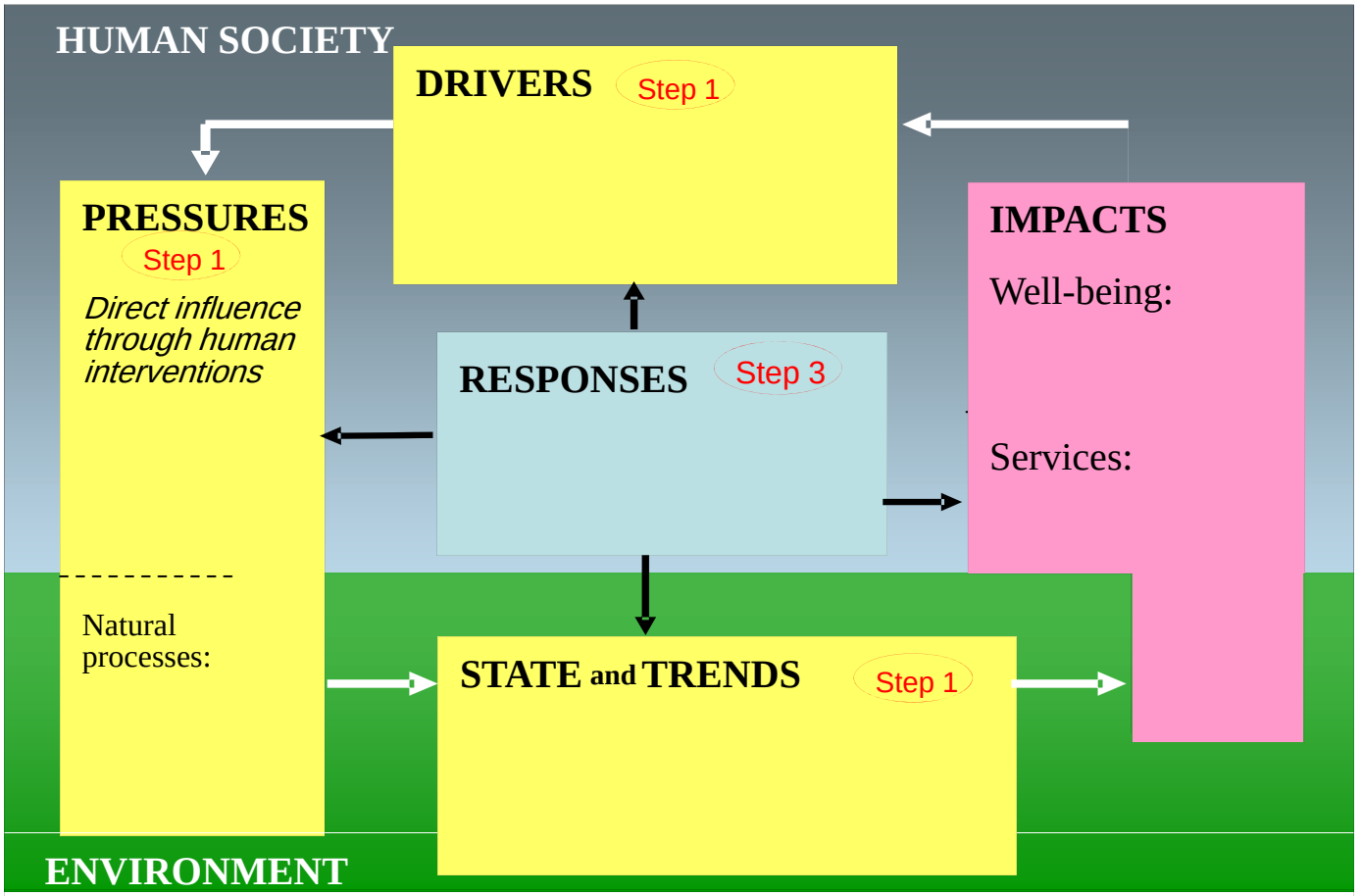
Example – Telling an Integrated Story



Homework (or Exercise)

Using the template sheet provided, do the following:

- Select one specific environmental issue that can be classified as an environmental *state. How has this state changed over time?;*
- Identify a societal *pressure* directly affecting the environmental state. What natural disturbances might be causing your environmental state to change?;
- Identify general societal *drivers* with broad influence on the pressure and environmental state;
- Given the change in your environmental state, what are some of the key *impacts* (ecosystem services and on human well-being); and
- What policy responses were directed at restoring or enhancing the environment (e.g., had influence on the environmental state, pressures and driving forces). What policy responses helped communities and businesses to adapt to the environmental impacts?



Step 1 What is happening to the environment and why?

Step 2 What are the consequences for the environment and humanity?

Step 3 What is being done and how effective is it?

Case Study Illustrate DPSIR Framework:

Solid Waste Management in Bahrain

(A case under development)

Courtesy of:

Prof. Ibrahim Abdel Gelil
Director, Environmental Management program
Arabian Gulf University
Manama, Bahrain

Solid Waste Management in Bahrain: A key issue for policy action

- Daily generation of municipal solid waste in Bahrain is estimated to be around 1,000 ton per capita per annum.
- The per capita waste generation has been growing at a rate of 14 per cent per annum.
- The country suffers from limited land area.
- Proximity of the only existing landfill (in Askar) to urban expansion.
- The only existing landfill lacks sound engineering structure and management.
- Lack of recycling program to reduce the amount of land-filled wastes.

What is Happening to the Environment? What is the Problem?

- Growing volume of solid waste
- Single option for solid waste disposal—land filling
- Limited land area for waste disposal by land filling
- Environmental degradation and public health hazards

DPSIR Analysis

Driving Forces	Pressures	State	Impacts	Responses
• Economic development and changes in consumption patterns • Limited land area • Urbanization	• Growing rate of waste generation • Open burning • Single landfill • Proximity of the existing landfill to urban expansion	• Air pollution • Pollution of underground water • Land degradation	• Environmental degradation • Adverse impacts on public health • Climate change	• Privatization of collection and transportation services • A new RFP was issued

What is Being Done?
The Societal Actions Taken

- Two private companies were contracted to provide collection, street sweeping and transportation of MSW.
- A request for proposals from the private sector was issued by the Government to:
  - Develop a new waste management system, and
  - Upgrade the existing landfill.

Objectives for Policy Solutions

- Protection of the environment and public health, through:
- Specific goals such as:

  Waste Minimization

- Should be time-bound and measurable
  - Reduce the amount of waste reaches to the landfill by 25 per cent by year 2010, or
  - Increase the percentage of recycling to 40 per cent by year 2010

Alternative Policy Options (examples)

- Waste Minimization:
  - Public education campaigns
  - Promote Recycling (Provide economic incentives to recycling industries)
  - Develop standards for packaging materials.
  - Promote separation at source.
- Assess the feasibility of other treatment technologies such as Waste-to-Energy or Composting.

Who are the Stakeholders? The “Policy Network”

- Who are they in this case?
  - State
    - **The five Governorates;**
    - **The legislative councils; and**
    - **The commission for the protection of marine resources, environment and wildlife**.
  - Market
    - **The private SWM contractors;**
    - **The Recycling Industries;**
    - **The packaging industries; and**
    - **The financial sector.**
  - Citizen
    - **The NGOs; and**
    - **The public.**

How Effective is it?

- We need policy analysis studies to answer this question.
- It is too early to do so as the process is still ongoing.

Criteria for Assessment

Based on the problem definition, the contexts, the stakeholders and the policy objectives, assessment evaluation criteria must be established

Examples of Evaluation Criteria

- Economic Efficiency

  "in terms of costs and benefits"

- Capacity

  "does the environmental agency have the resources to implement the proposed policy, in terms of staff, skills, money, ...etc"

- Equity

  "Who suffers? and who benefits?"

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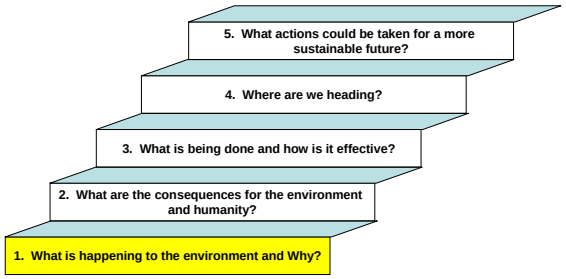
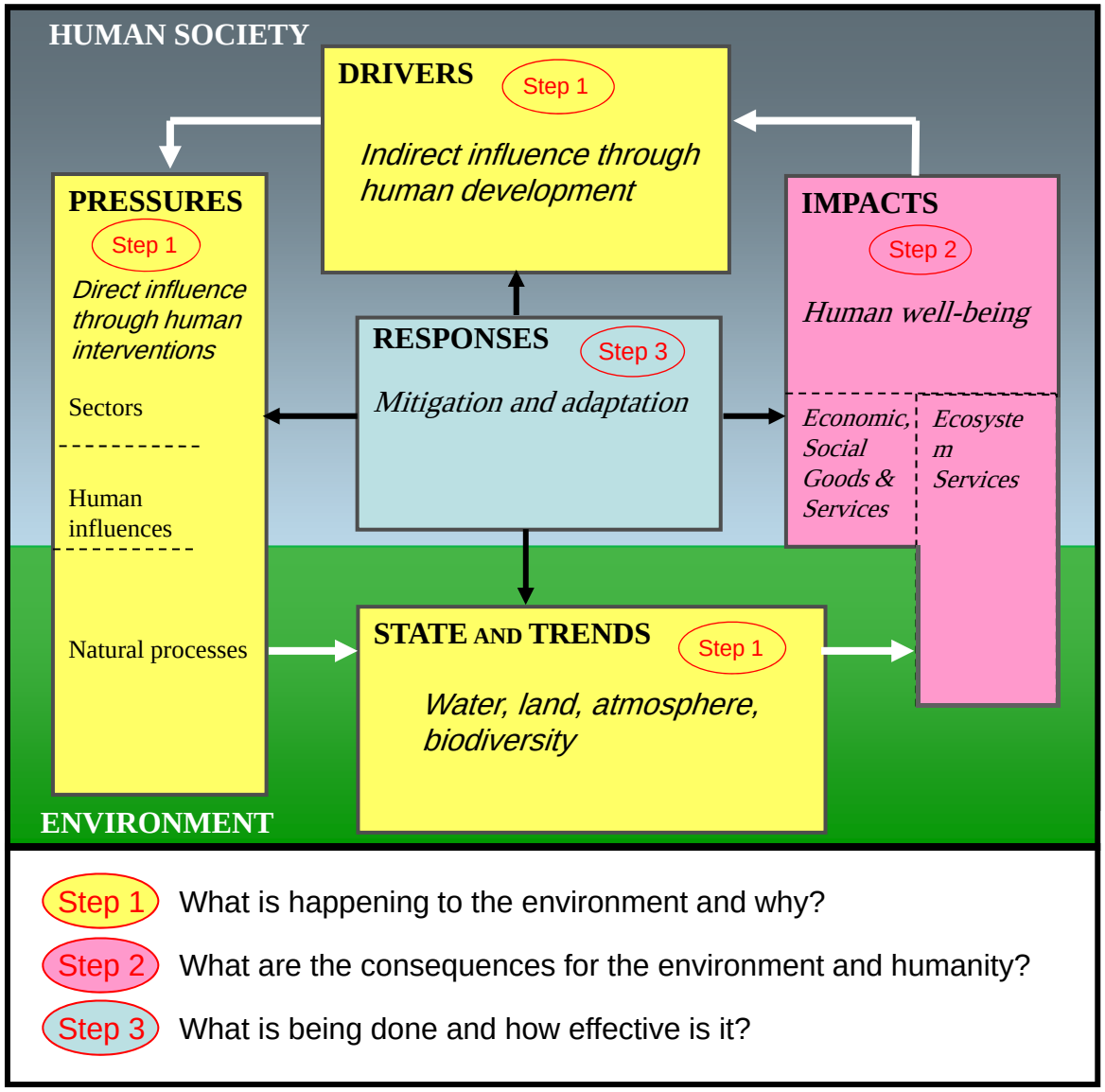


Step 1: What is Happening to the Environment and Why?



Step 1: What is Happening to the Environment and Why?

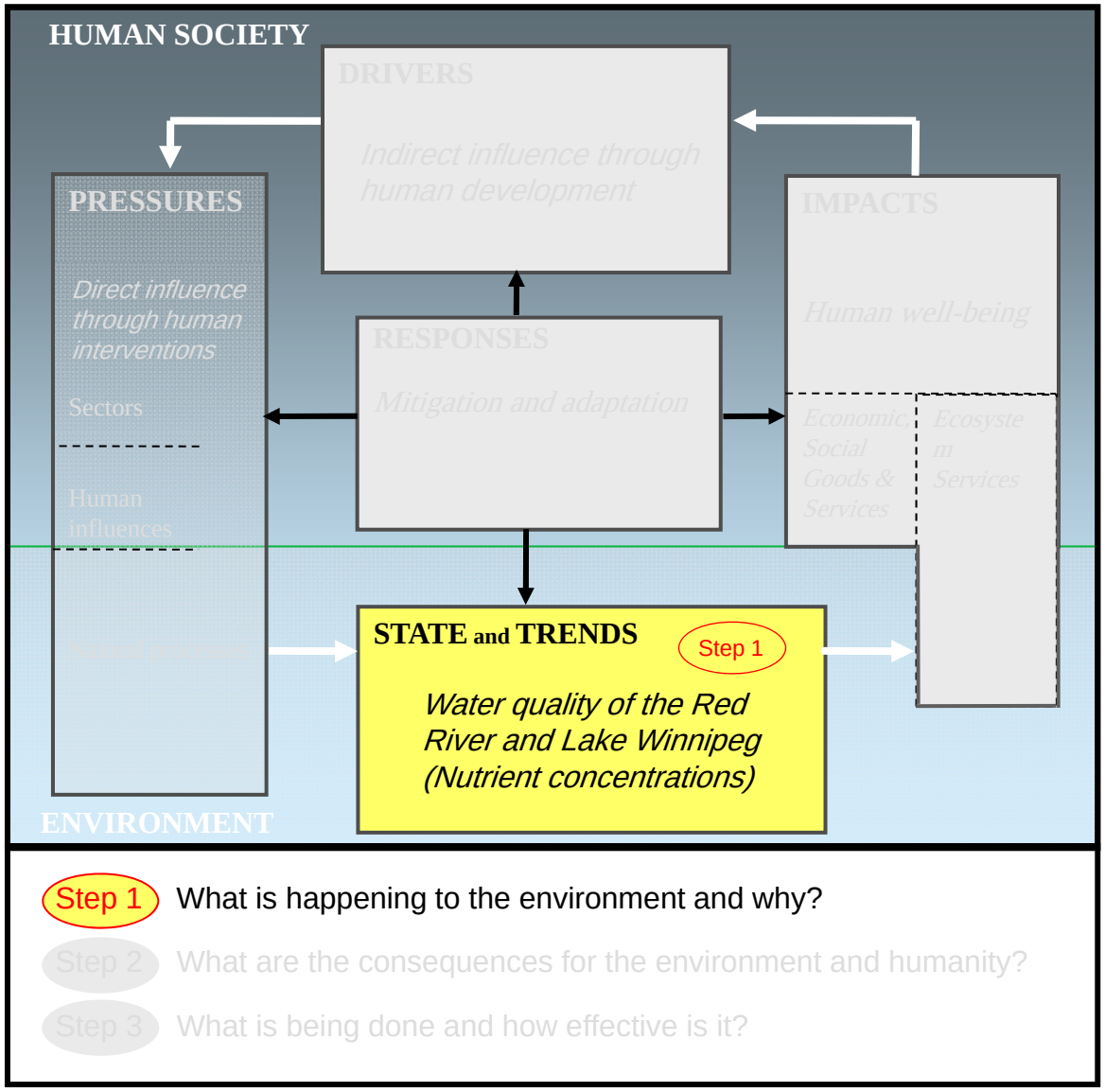
A. What are priority environmental issues and concerns?

B. What is the specific **STATE** of the environment of most concern for each issue and what changes in that state have occurred?

C. What **PRESSURES and DRIVERS** are causing environmental change?

D. What **INDICATORS** are appropriate and necessary to characterize these states, pressures and driving forces?

Case Example
Step 1A: What are the Priority Issues and Concerns?



Examples of Themes

Report	State-of-Environment Themes and Issues
GEO-4	Air: climate change, ozone, air pollution Land: land degradation, forests Water: coastal and marine, freshwater Biodiversity Regional Perspectives
GEO Brazil	Soil and land Water Forests Atmosphere Marine and Coastal Areas Fishery Resources

Exercise: Step 1A - Identifying and Organizing Themes (20 minutes)

- In groups of five,
- Discuss and note key specific environmental issues related to the state of the environment in your country.
- Assign specific environmental issues to general categories.
  - **How many distinctly different themes did your group identify?**
  - **How many specific state-of-the-environment issues?**
  - **Can some of the specific issues under a given theme be expressed as a single issue?**

PRIORITY ENVIRONMENTAL ISSUES IN:

……

Priority environmental issue	General theme
1.	
2.	
3.	
4.	
5.	

Exercise – Part B: Identifying and Organizing Themes (30 minutes)

In plenary, carry out the following tasks:

- Combine the work of all groups into one table (e.g., using flip charts or overheads).
- Determine the general themes for the overall group; organize all specific state-of-the-environment issues according to these themes.
- Combine related specific issues as appropriate

Step 1A: Prioritizing Issues

- Why is prioritization necessary?
- Who should decide what is a priority and what is not?
- Based on what criteria should priorities be established?
- What prioritization process could be used?

Challenges to Prioritizing

- Under what criteria can an issue be considered a priority (e.g., high cost, significant risk, public awareness, political attention, place in issue cycle [ref. Module 3])?
- What are the priorities as listed in official policy statements?
- Whose priorities are represented, and is that a legitimate representation?
- How many issues can be included in a national GEO report?
- What process will you use to agree upon priority issues?

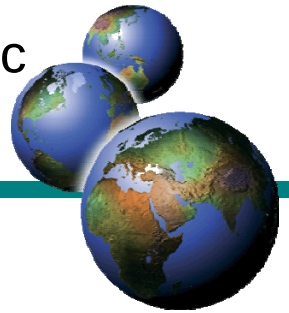
Techniques for Prioritizing

- Traditional voting
- Nominal group methods
- Consensus decision making

Step 1B: What is the Specific STATE-of-the-Environment Concern for Each Priority Environmental Issue?

- It is important to be **more specific** with regard to each priority environmental issue.
- This will make it much easier to identify what is happening to the environment and why.
- For example, the issue of water quality can be more specifically attributed to a **spatial context**, such as a river or lake.

Exercise: Steps 1A & 1B - Prioritizing and Identifying Specific Environmental States of Concern



In your groups of five,

- Using the themes and issues identified in the previous exercise, rank the priority of each issue using a three-point scale (low, medium and high).

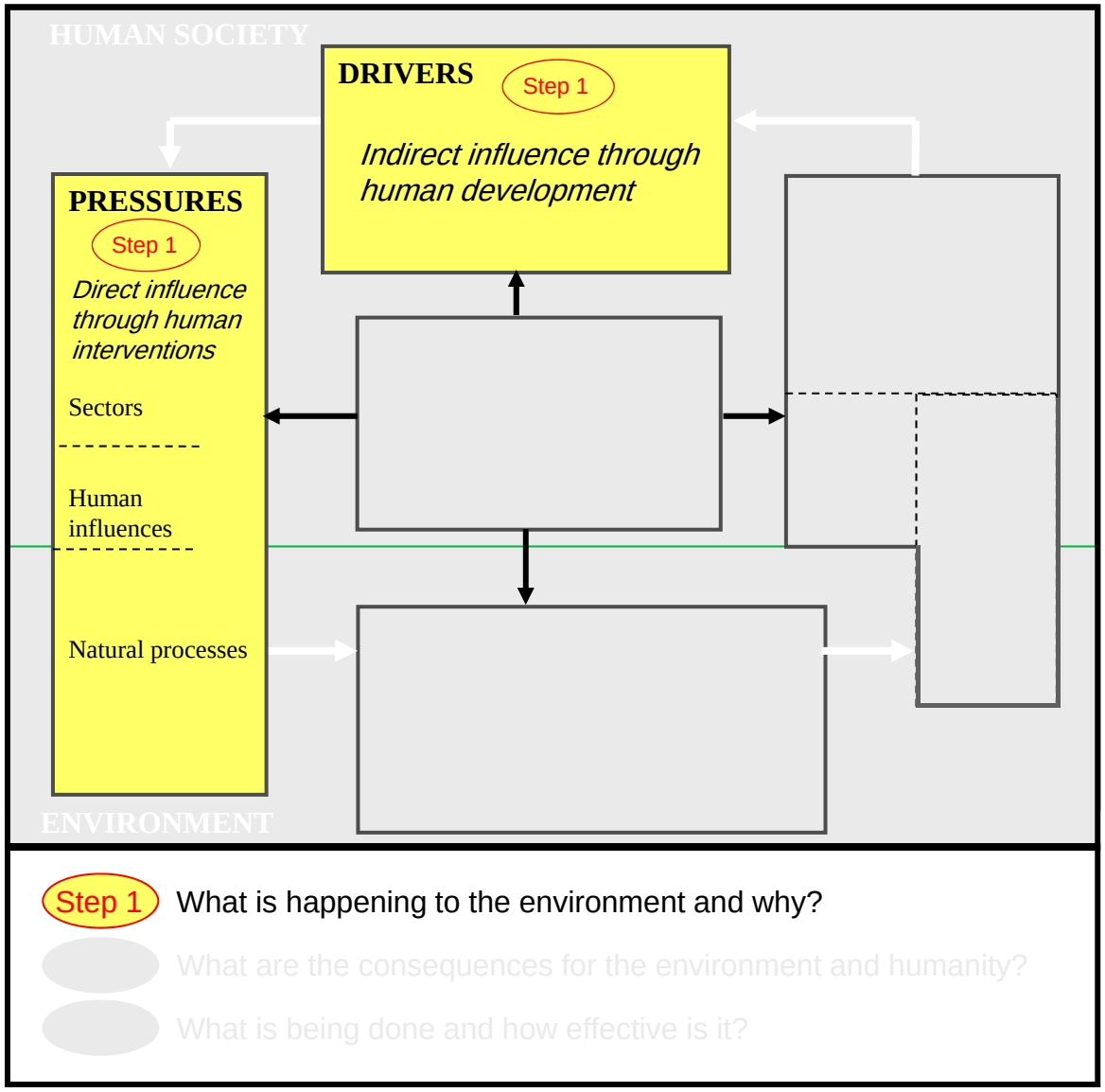
- Compile the results in plenary and establish a priority ranking of the issues (i.e., how many high, low and medium rankings each received).

- Complete the following worksheet for your country.

Worksheet

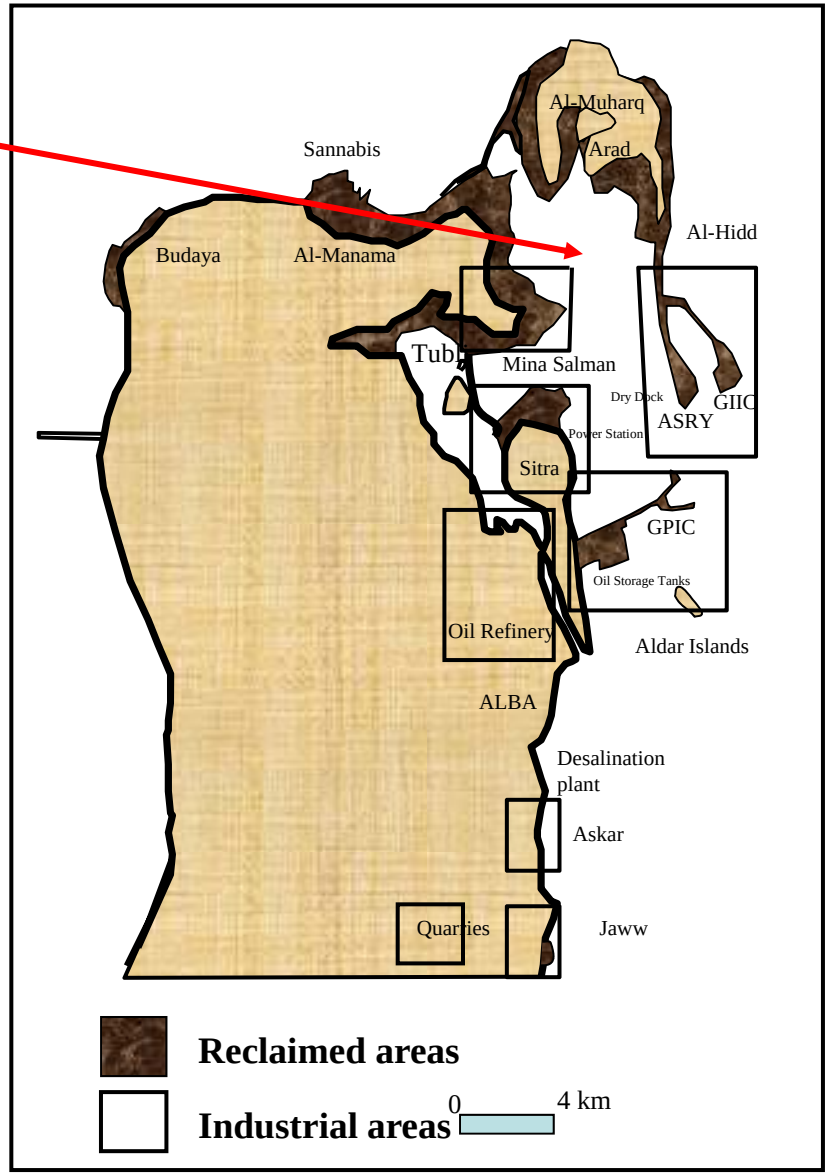
What is the general theme?	**What is the environmental issue?**	**What is the geographical scale / coverage of the problem?**	**What priority should be given to the problem?** Low/Medium/High

Step 1C: What are the PRESSURES and DRIVERS of Environmental Change?



Case Example

Tubli Bay
Bahrain



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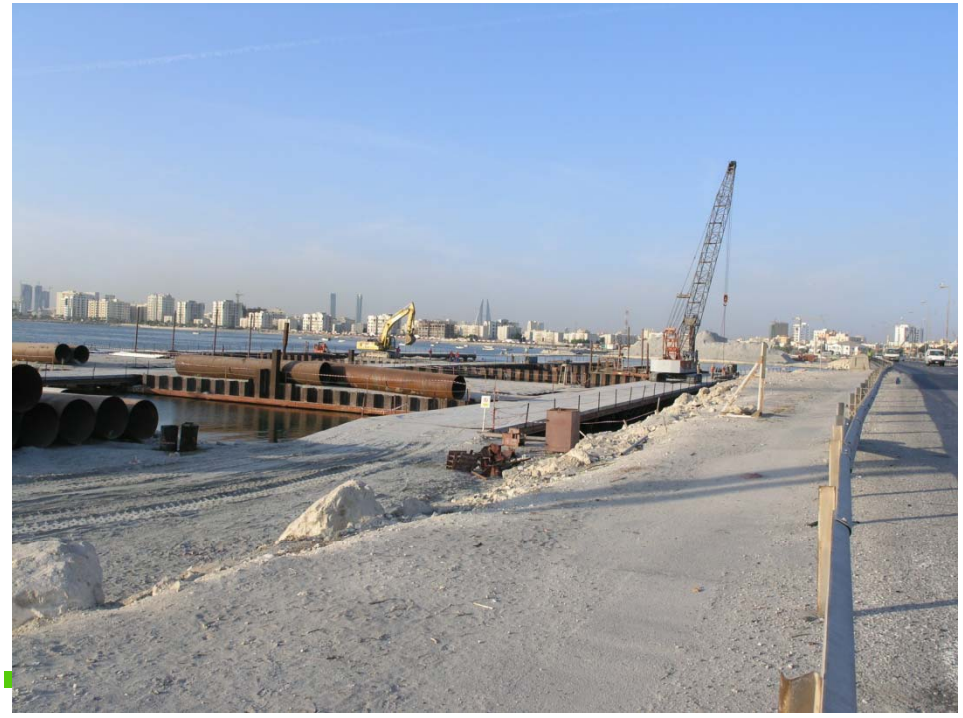
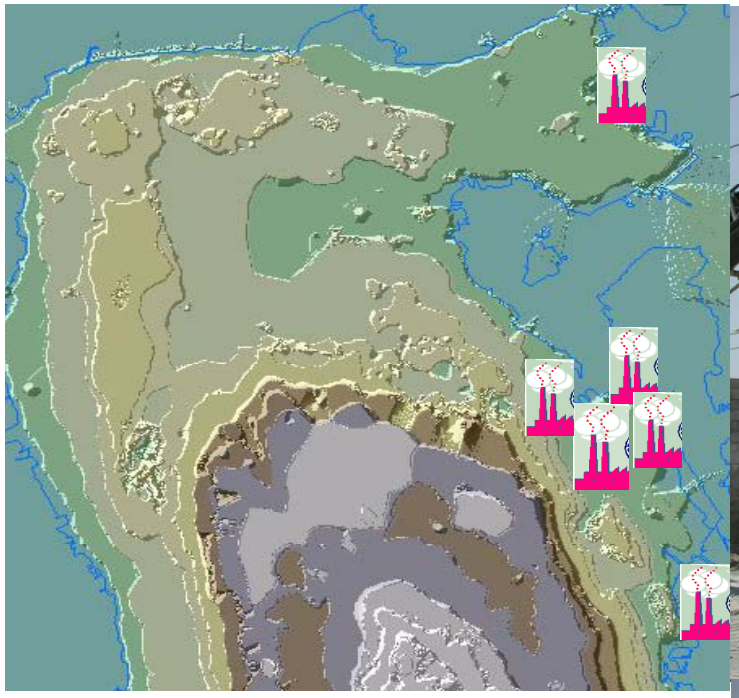
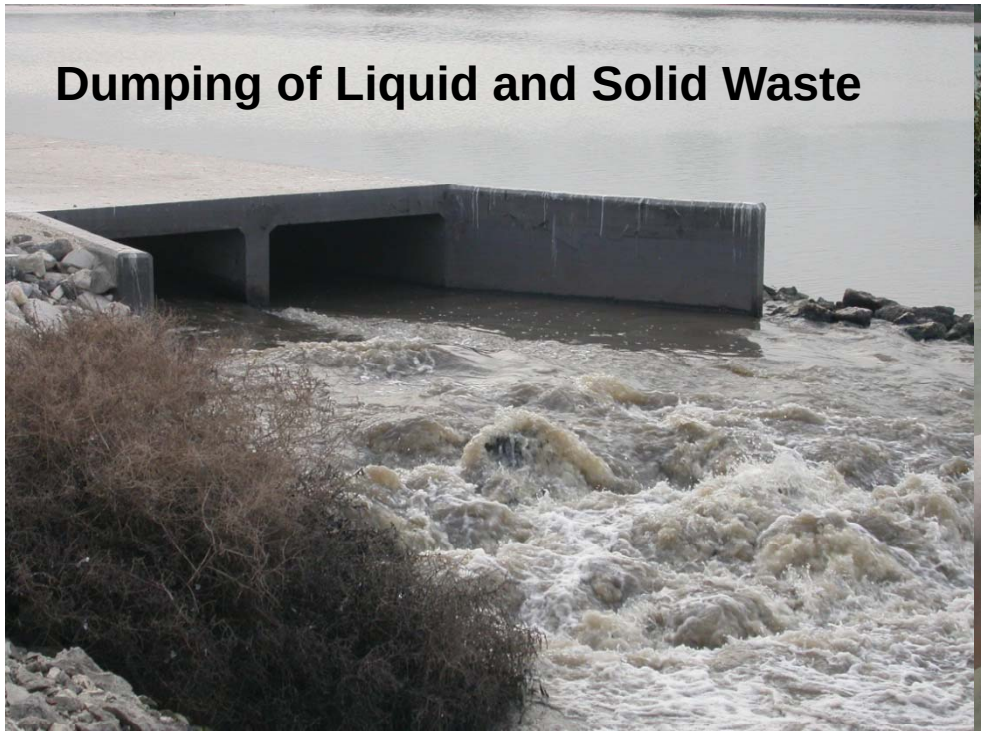




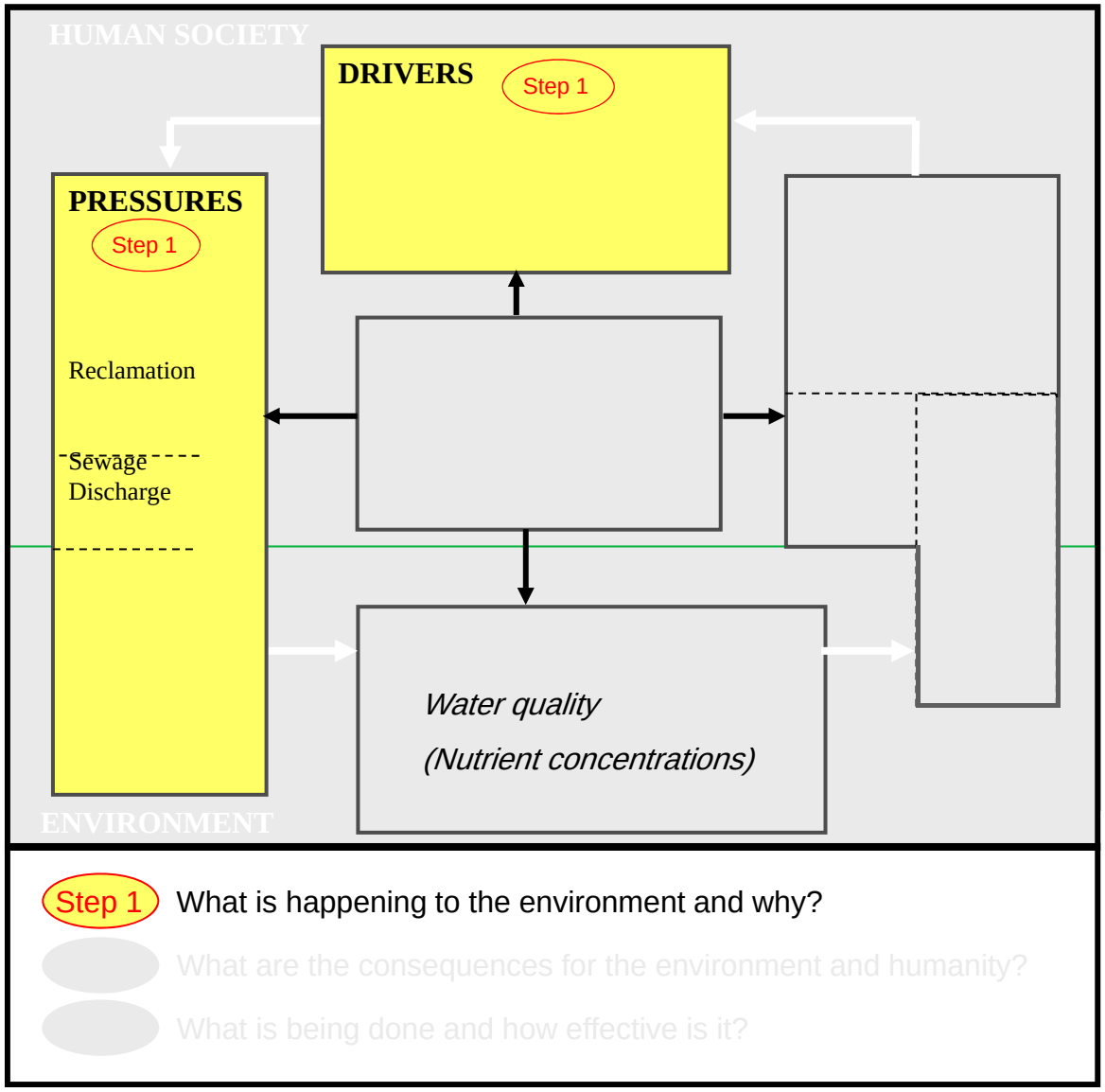
Sea sand washing factories

Dumping of Liquid and Solid Waste



Distraction of mangroves habitat

Step 1C: What are the PRESSURES and DRIVERS of Environmental Change?



Pressures (GEO-4)

- Sectors
  - Agriculture, fisheries and forestry
  - Transport and housing
  - Finance and trade
  - Energy and industry
  - Security and defense
  - Science and education
  - Culture
- Human influences:
  - Pollution
  - Land-use
  - Resource extraction
  - Modification and movement of organisms
- Natural processes
  - Solar radiation
  - Volcanic eruptions
  - Earthquakes

Drivers (GEO-4)

- Consumption and production patterns
- Population and demographics
- Scientific and technological innovation
- Economic demand, markets and trade
- Institutional and social-political frameworks
- Distribution patterns

Exercise: Identifying Pressures and Drivers

- Form groups of four or five; select a specific environmental state upon which to focus for the exercise.

- Identify **PRESSURES and DRIVERS** that influence the environmental state you have selected. Draw lines between the pressures and driving forces that are linked.

- Complete the worksheet for discussion in plenary.

Worksheet

Drivers	**Pressures**	**State** (only one)	Impacts
_____	_____	**Environmental State:**	
_____	_____	_____	
_____	_____		
	_____		
	_____		

Draw arrows connecting specific driving forces to specific pressures

Will address impacts later in the workshop

Exercise: Identifying Pressures and Drivers (continued)

In plenary, discuss the following:

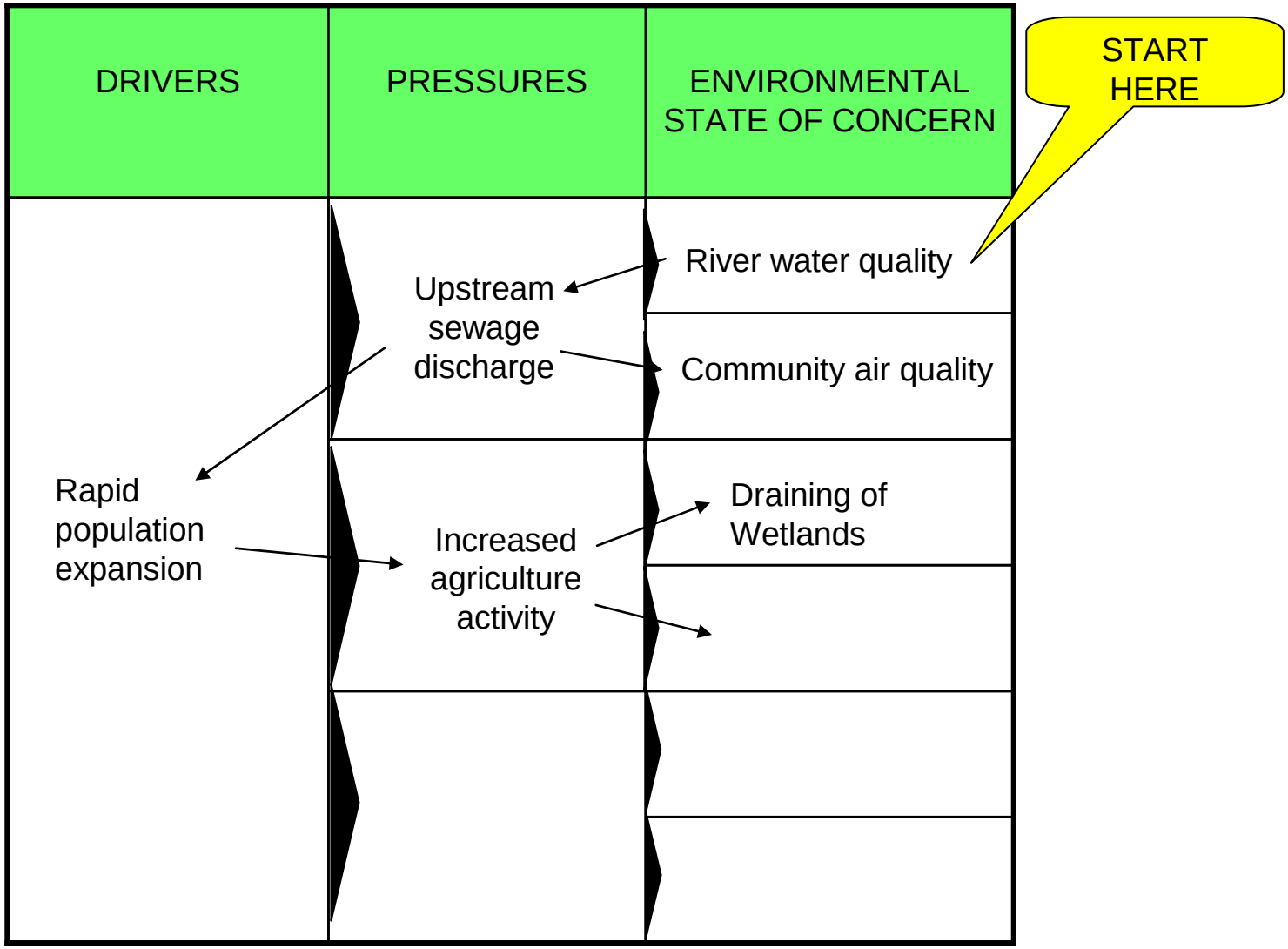
- Does your group have enough knowledge to identify all relevant relationships in a theme, issue, or sector?
- If not, who else would need to be involved to complete the analysis?

Looking for Inter-linkages

- A **driver** identified for one issue could be having an effect on other environmental issues

- A **pressure** for one issue could be affecting the state of different environmental issues

Example


DRIVERS
PRESSURES
ENVIRONMENTAL STATE OF CONCERN
START HERE
River water quality
Upstream sewage discharge
Community air quality
Rapid population expansion
Draining of Wetlands
Increased agriculture activity

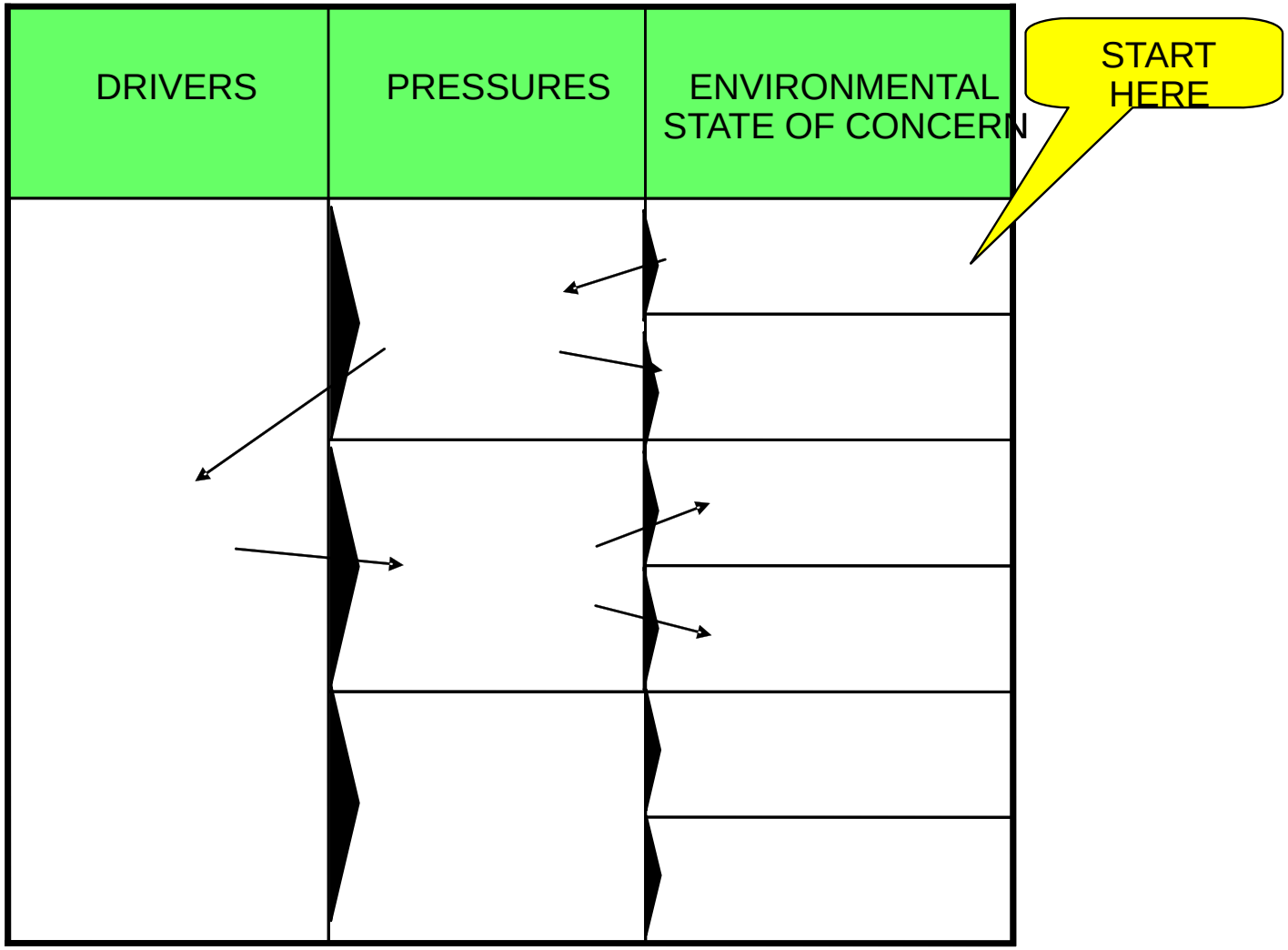
Plenary Exercise – Inter-linkages

(10 minutes)

In plenary,

- Select an environmental state from one of the previous exercises, transfer the environmental state, key pressure and associated driving forces to the Inter-linkages table below.
- Starting from the driver, identify two other pressures and then other environmental states that could change as a result of each pressure. Note the multiple linkages among pressures and environmental states.
- Complete the diagram and discuss in plenary

Worksheet


DRIVERS
PRESSURES
ENVIRONMENTAL STATE OF CONCERN
START HERE

Step 1D: What are the Appropriate INDICATORS Necessary to Characterize Environmental States, Pressures and Drivers?

This is the topic of Module 4.

Indicators, when well-selected and used properly, can offer:

- **historic trends** related to priority issues
- **spatial and non-spatial** information about coverage of priority issues
- **targets** / benchmarks / reference values

Indicator Development

- Use of Indicators (Module 4)
- Need to describe change in quantitative and/or qualitative terms
- Indicators to be identified based on selection criteria, such as:
  - Data availability
  - Relevance for issue
  - Scientific validity
  - Potential resonance with public and policymakers
- Indicators can be related to driving forces, pressures and environmental states

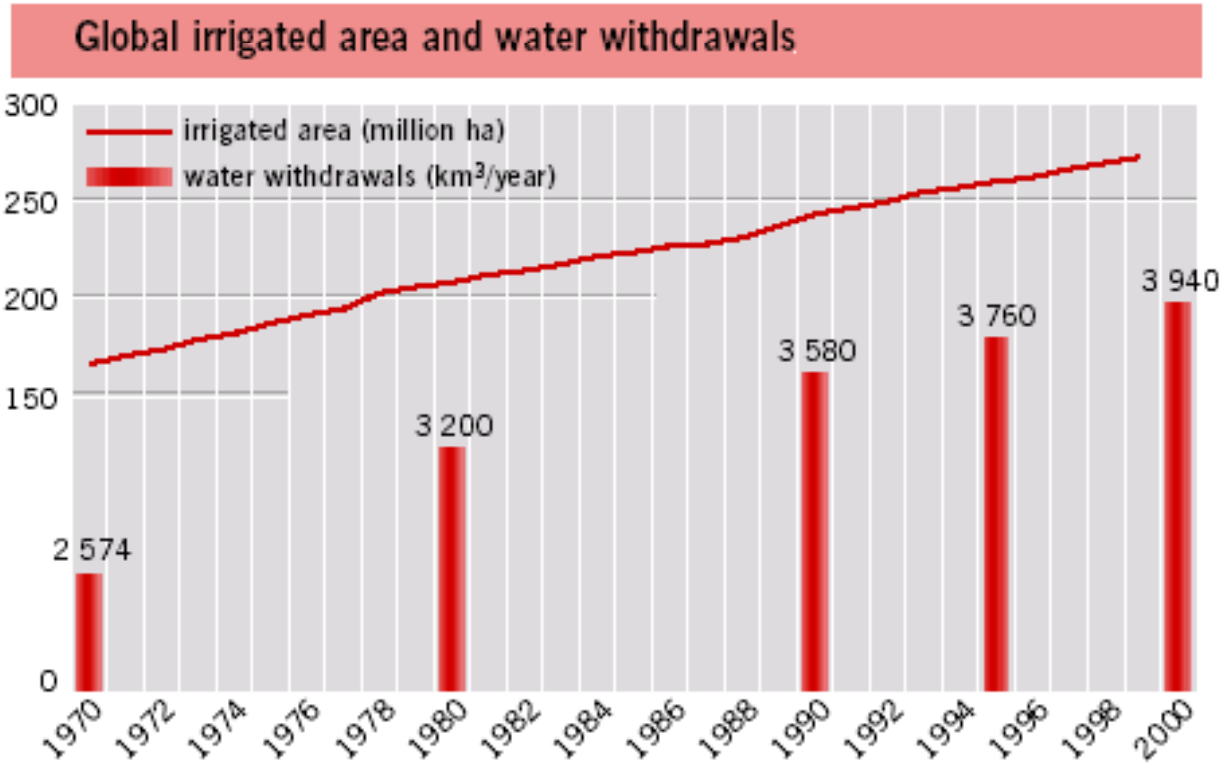
Indicator Selection Criteria

- Be developed within an accepted conceptual framework
- Be clearly defined and easy to understand
- Be subject to aggregation
- Be objective
- Have reasonable data requirements
- Be relevant to users
- Be limited in number
- Reflect causes, processes or results (World Bank 1997)

SMART Indicators

- **S**pecific
- **M**easurable
- **A**ggressive, but achievable targets
- **R**elevant
- **T**ime-bound

Example: Indicator Related to Environmental Issue (State)



Since 1970 global water withdrawals have mirrored the rise in irrigated area. Some 70 per cent of withdrawals are for agriculture, mostly for irrigation which provides 40 per cent of the world's food

Source: FAO 2001, Shiklomanov 1999

Exercise: Identifying Indicators

(20 minutes)

- In groups of five, identify indicators for each priority theme/issue from the previous exercise using the following matrix.

Thematic / Issue Category			
Problems	**Framework element (Driver, Pressure, State)**	**Indicators**	**Data source**

Sessions at a Glance

Session 1: Introduction

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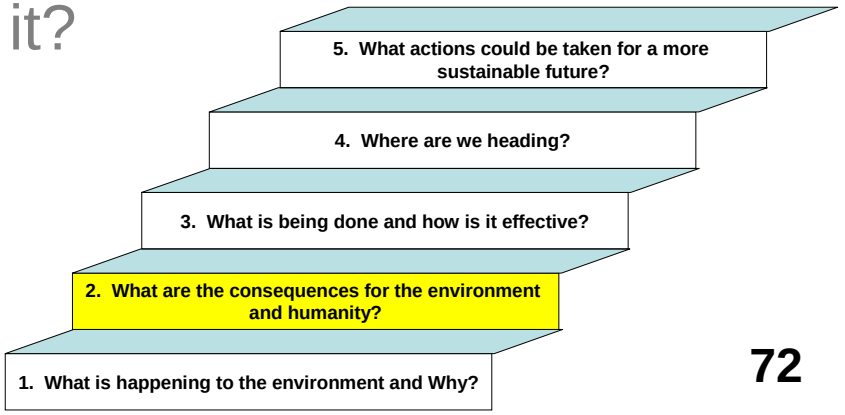
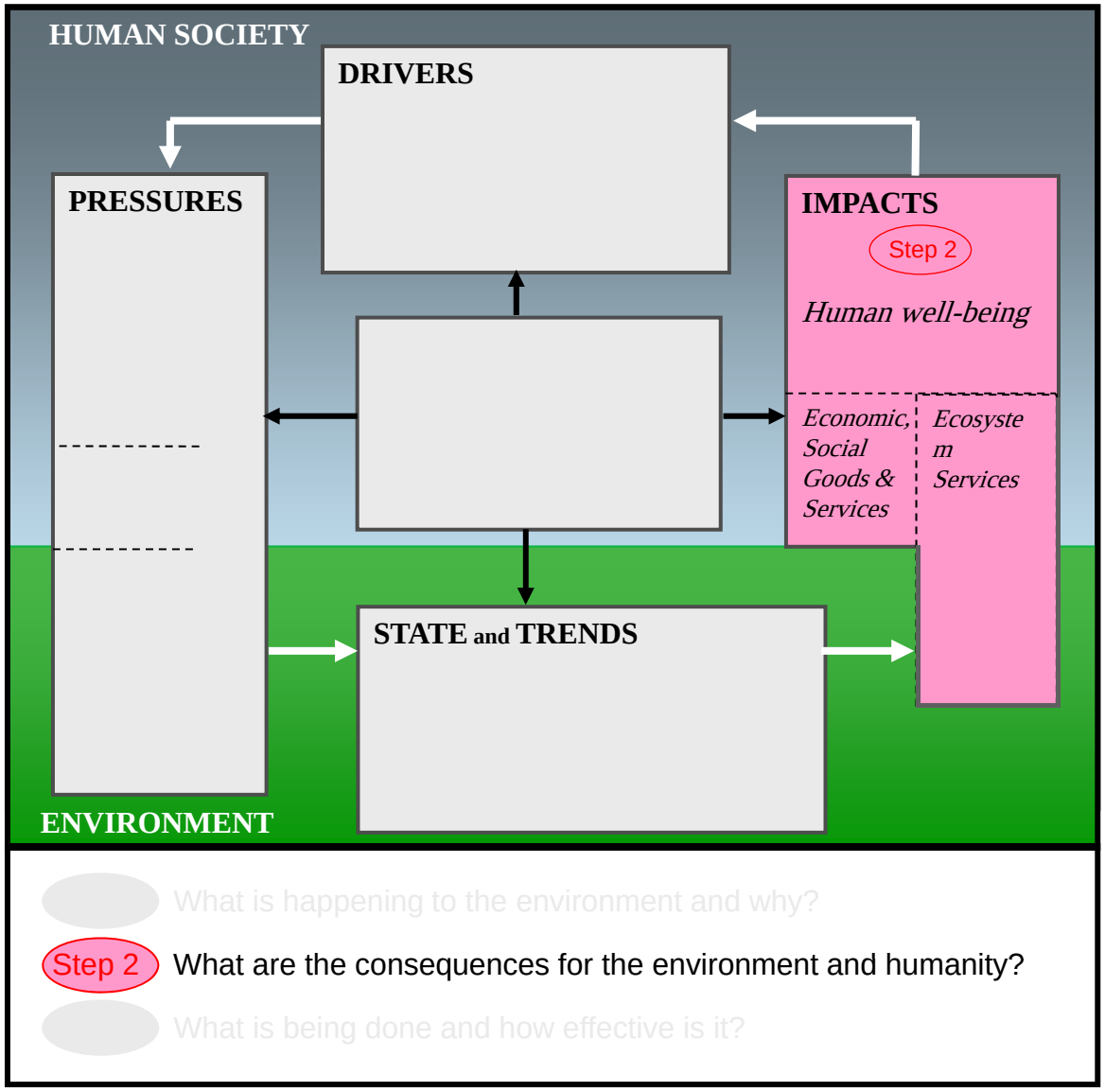
Session 6: Step 3. What is being done and how effective is it?



Step 2: What are the Consequences for the Environment and Humanity?



Sustainable Development as a Guideline for Identifying Potential Impacts

Sustainable Development…

- was popularized by the World Commission on Environment and Development in 1987
- tells us that economic, social and environmental conditions are **inherently inter-related**
- actions to meet our needs today should not compromise the ability of **future generations** to meet their needs.

Exercise: Identifying Potential Impacts

(35 minutes)

- Re-join your group of five and,
- identify potential impacts for the changes in environmental states your group selected previously.
- Use the concept of sustainable development to help you identify impacts.
- Complete your DPSI Story Sheet using the template provided.

Worksheet (basic analysis)

Drivers	**Pressures**	**State** (only one)	**Impacts**
_____	_____	**Environmental State:**	_____
_____	_____	_____	_____
_____	_____		_____
	_____		_____
	_____		

Draw arrows connecting specific driving forces to specific pressures

Identifying Impacts Using the Concepts of Ecosystem Services and Human Well-being

(intermediate analysis)

- Ecosystem services are the benefits that people gain from ecosystems
- A change in an environmental state can impact on a range of ecosystem services
- A change in an ecosystem service can in turn, impact on various aspects of human well-being
- These impacts can be identified with an ecosystem services and human well-being framework

Impacts: Consequences of environmental change for the Environment and Humanity

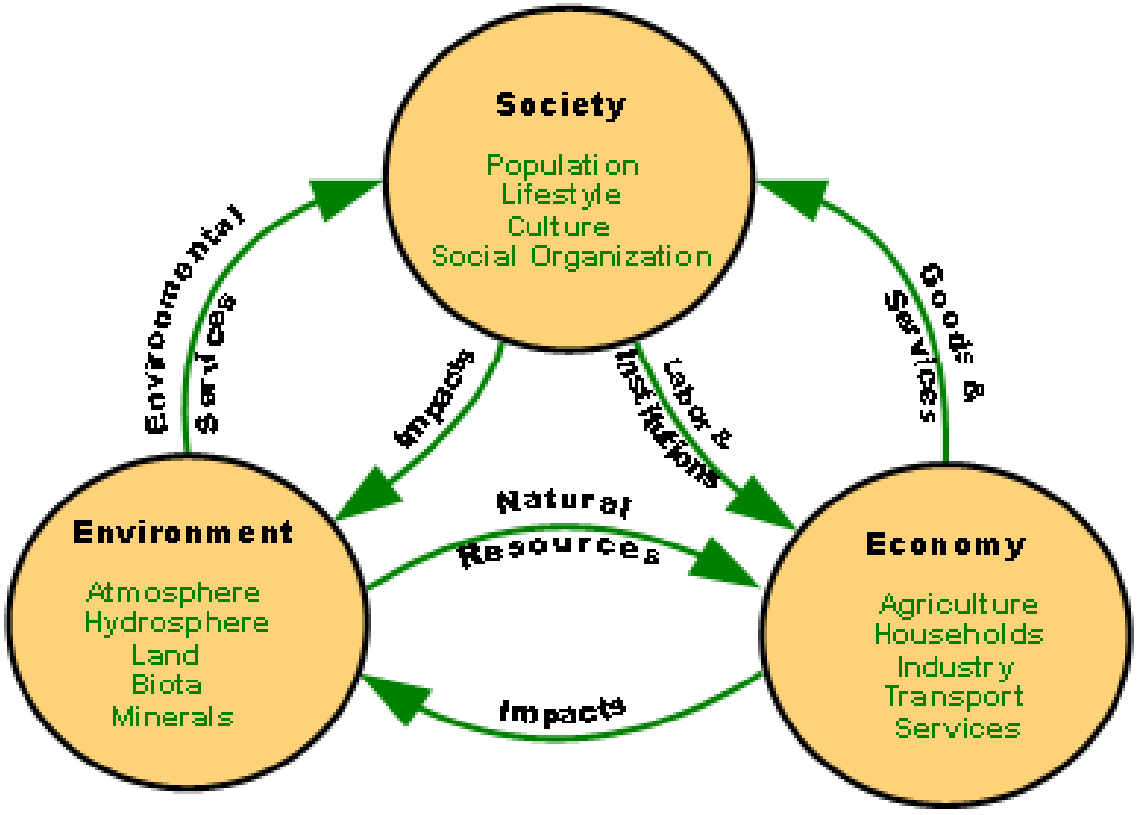
- Basic Analysis: Identifying Impacts based on an Understanding of Sustainable Development.
- Intermediate Analysis: Identifying Impacts Using the Concept of Ecosystem Services and Human Wellbeing.
- Advanced Analysis: An Introduction to Identifying Economic Costs and Benefits for Impacts on Ecosystem Services and Human Wellbeing

Step 2: What are the impacts?

a. Basic Analysis

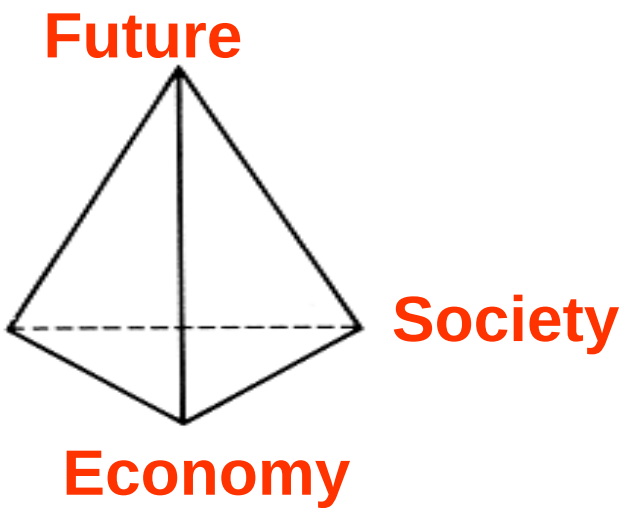
Basic Analysis: Identifying Impacts based on an Understanding of Sustainable Development

Impacts



The sustainable development concept tells us that conditions **economic, social and environmental conditions are inherently inter-related** – that is, it is not possible to change the condition of one the three dimensions without impacting on the conditions of the other dimensions.

Sustainable Development



In addition, the concept of sustainable development tells us that our actions to meet our needs today should not compromise the ability of future generations to meet their needs.

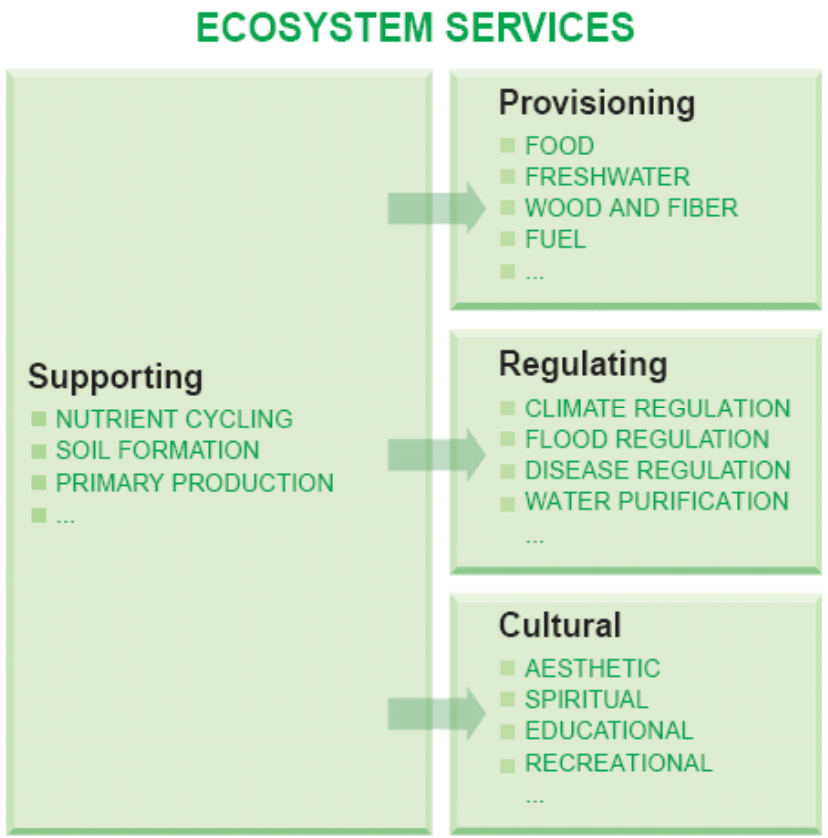
Therefore, as a basic guideline for analyzing impacts, sustainable development helps us think in four dimensions – economic, social, environmental, and the future.

Step 2: What are the inputs?

b. Intermediate Analysis

Millennium Ecosystem Assessment 2005

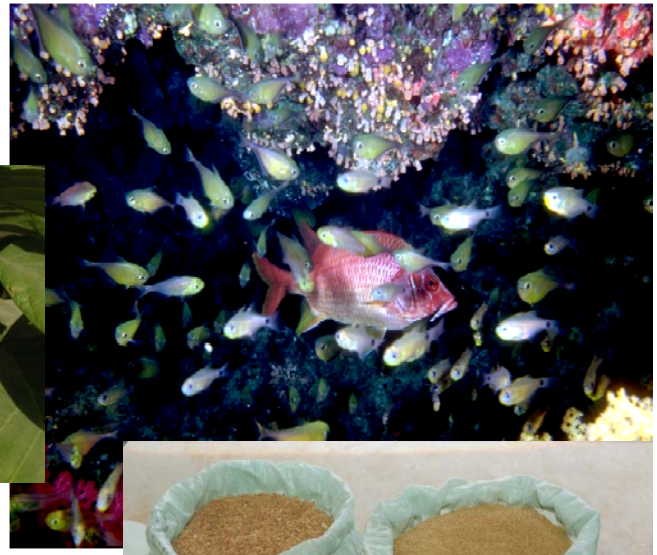
Intermediate Analysis: Identifying Impacts Using the Concept of Ecosystem Services and Human Wellbeing



Provisioning Services

Goods produced or provided by ecosystems

- Food
  - Crops
  - Livestock
  - Wild Foods
- Fiber
  - Timber
  - Cotton, hemp, silk
  - Wood Fuel
- Genetic resources
- Biochemicals
- Traditional medicines
- Freshwater



Regulating Services

Benefits obtained from regulation of ecosystem processes

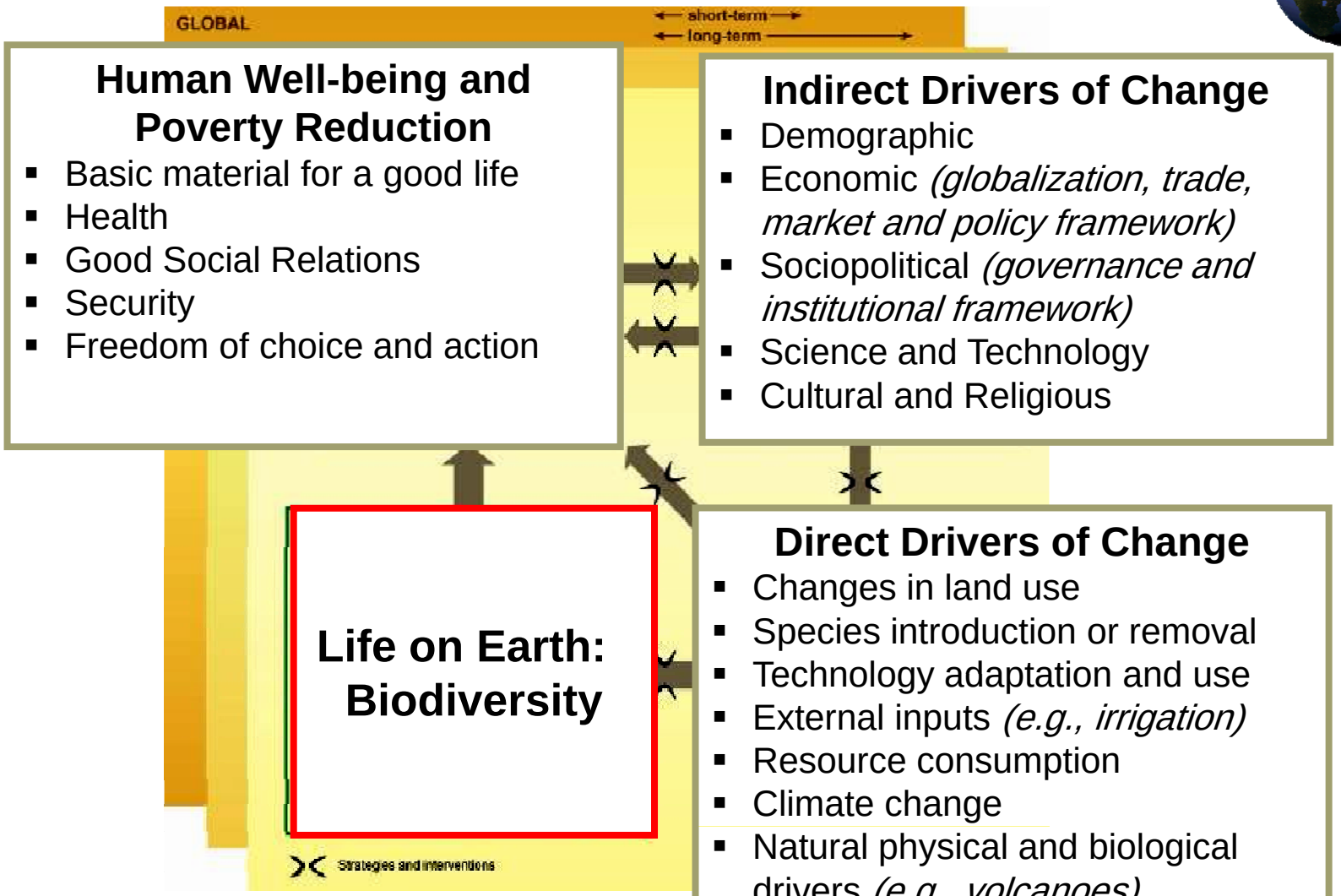
- Air Quality Regulation
- Climate Regulation
- Erosion regulation
- Water purification
- Disease regulation
- Pest regulation
- Pollination
- Natural Hazard regulation

Cultural Services

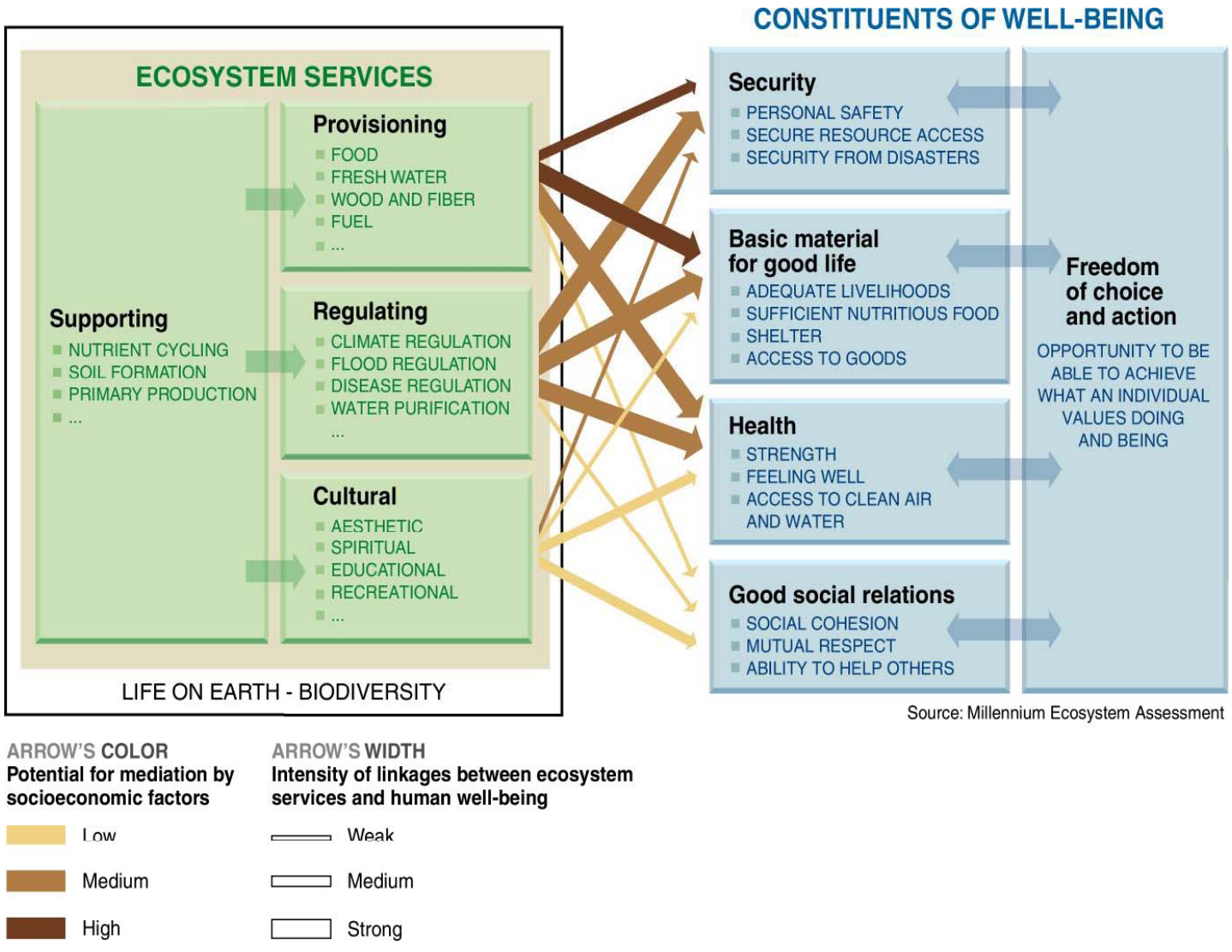
Non-material benefits obtained from ecosystems

- Knowledge Systems
- Educational values
- Inspiration
- Aesthetic Values
- Social Relations
- Sense of Place
- Recreation and Ecotourism
- Spiritual and Religious (Meditation)

MA Conceptual Framework



Consequences of Ecosystem Change for Human Well-being



Source: Millennium Ecosystem Assessment

Impacts of Increases in Total N&P Levels in Tubli Bay-Bahrain

- **Ecosystem**
  - Massive and rapid eutrophication
  - Species not able to tolerate high nutrient levels and consequences are at competitive disadvantage (fish, invertebrates etc.)
- **Human system**
  - Impacts are just emerging
  - Loss of fish
  - Property values
  - Human health (E. coli, etc.)
  - Need for major and costly remediation and mitigation effort
  - Tourism, beach closures
- **Emerging / potential direct impacts of climate change**
  - Altered water temperatures
  - Altered water quality
  - Methane emission from dead fish

GROUP EXERCISE

START HERE

DRIVING FORCE	PRESSURES	ENVIRONMENTAL STATE OF CONCERN	IMPACTS

Types of Ecosystem Services (MA 2003)

Category	Service	Description
Provisioning	• Food and Fibre	• This includes the vast range of food products derived from plants, animals, and microbes
	• Fibre	• Materials such as wood, jute, hemp, silk, and many other products derived from ecosystems.
	• Fuel	• Wood, dung, and other biological materials serve as sources of energy.
	• Genetic Resources	• This includes the genes and genetic information used for animal and plant breeding and biotechnology.
	• Biochemicals, Natural Chemicals and Pharmaceuticals	• Many medicines, biocides, food additives such as alginates, and biological materials are derived from ecosystems.
	• Ornamental Resources	• Animal products, such as skins and shells, and flowers are used as ornaments, although the value of these resources is often culturally determined.
	• Freshwater	• Freshwater is another example of linkages between categories—in this case, between provisioning and regulating services.

Types of Ecosystem Services (Cont.)

Regulating	• Air Quality Maintenance	• Ecosystems both contribute chemicals to and extract chemicals from the atmosphere, influencing many aspects of air quality.
	• Climate Regulation	• Ecosystems influence climate both locally and globally. • For example, at a local scale, changes in land cover can affect both temperature and precipitation. At the global scale, ecosystems play an important role in climate by either sequestering or emitting greenhouse gases.
	• Water Regulation	• The timing and magnitude of runoff, flooding, and aquifer recharge can be strongly influenced by changes in land cover, including, in particular, alterations that change the water storage potential of the system, such as the conversion of wetlands or the replacement of forests with croplands or croplands with urban areas.
	• Erosion Control	• Vegetative cover plays an important role in soil retention and the prevention of landslides.
	• Water Purification and Waste Treatment	• Ecosystems can be a source of impurities in freshwater but also can help to filter out and decompose organic wastes introduced into inland waters and coastal and marine ecosystems.
	• Regulation of Human Diseases	• Changes in ecosystems can directly change the abundance of human pathogens, such as cholera, and can alter the abundance of disease vectors, such as mosquitoes.
	• Biological Control	• Ecosystem changes affect the prevalence of crop and livestock pests and diseases.
	• Pollination	• Ecosystem changes affect the distribution, abundance, and effectiveness of pollinators.
	• Storm Protection	• The presence of coastal ecosystems such as mangroves and coral reefs can dramatically reduce the damage caused by hurricanes or large waves.

Types of Ecosystem Services (Cont.)

Cultural	Cultural Diversity	The diversity of ecosystems is one factor influencing the diversity of cultures.
	Spiritual and Religious Values	Many religions attach spiritual and religious values to ecosystems or their components.
	Knowledge Systems	Ecosystems influence the types of knowledge systems developed by different cultures.
	Educational Values	Ecosystems and their components and processes provide the basis for both formal and informal education in many societies.
	Inspiration	Ecosystems provide a rich source of inspiration for art, folklore, national symbols, architecture, and advertising.
	Aesthetic Values	Many people find beauty or aesthetic value in various aspects of ecosystems, as reflected in the support for parks, "scenic drives," and the selection of housing locations.
	Social Relations	Ecosystems influence the types of social relations that are established in particular cultures. Fishing societies, for example, differ in many respects in their social relations from nomadic herding or agricultural societies.
	Sense of Place	Many people value the "sense of place" that is associated with recognized features of their environment, including aspects of the ecosystem.
	Cultural Heritage Values	Many societies place high value on the maintenance of either historically important landscapes ("cultural landscapes") or culturally significant species.
	Recreation and Ecotourism	People often choose where to spend their leisure time based in part on the characteristics of the natural or cultivated landscapes in a particular area.

Indicators for an Impact Pathway Diagram

Change in Lake Water Quality
Indicator: Phosphorus Concentration, or alga count, or extent of weed coverage

Impact on Ecosystem Services	Possible Indicators	Enhanced or Degraded?
Provisioning services		
• Food – a change in the magnitude of fish catches	• Average annual fish catch	Assess based on indicator trend
• Ornamental resources – a change in availability of shells	• Ornamental shell count	
• Fresh water – a change in the quantity of drinking water of an acceptable quality	• Drinking water quality exceedances, or water treatment costs	
Regulating Services		
• Regulation of human diseases – a change in the surface algae and weeds can impact on the prevalence of mosquitos and other insect pests	• Mosquito counts, or occurrence of malaria	Assess based on indicator trend
Cultural Services		
• the cultural inspiration of an originally pristine lake could be negatively impacted by a predominantly weedy lake	• Local opinion survey results	Assess based on indicator trend
• the loss of a commercial fishing resource could alter social relations of a community	• Number of commercial fisherman	
• potential for a reduction in a culturally or spiritually important fish or bird species common to the lake	• Species count for specific species	
• a higher algae and weed count in the lake could negatively impact the use of the lake for recreational swimming and fishing.	• Local tourism revenue	

Example Impact Pathway Diagram

	A. Impact on Ecosystem Services?	B. Impact on Human Wellbeing?
Change in Lake Water Quality	• Food – a change in the magnitude of fish catches	• Basic material - Sufficient nutritious food
	• Freshwater – a change in the quantity of drinking water of an acceptable quality	• Health – access to clean air and water
	Other pathways…	

Case Example: Tubli Bay

Potential impacts due to increasing nutrient concentration in the Tubli Bay.

- fear that massive and rapid eutrophication will occur due to changes in nutrient loads.
- The ability of the bay to provide human food through fresh fish could be negatively affected because the numbers and composition of fish species will change under the high nutrient levels.
- The ability of the bay to provide cultural service could also be negatively impacted
- The impact on human well-being can be through changes to the livelihood of local fishers, degraded recreational opportunities and tourism revenue, as well as human health impacts through ingestion of water while swimming.

Exercise: Developing an Impact Pathways Diagram (60 minutes)

- Working in groups of five, choose a specific environmental state to analyze. Conduct the following tasks in your group (30 minutes):
- Identify which ecosystem services potentially could be impacted by an adverse change in the environmental STATE.
- For each impacted ecosystem service, identify which aspects of human well-being would likely be impacted
- Describe possible indicators for each of the ecosystem services and human well-being impacts that you identified.
- Designate one spokesperson from each group to report results in plenary (40 minutes).

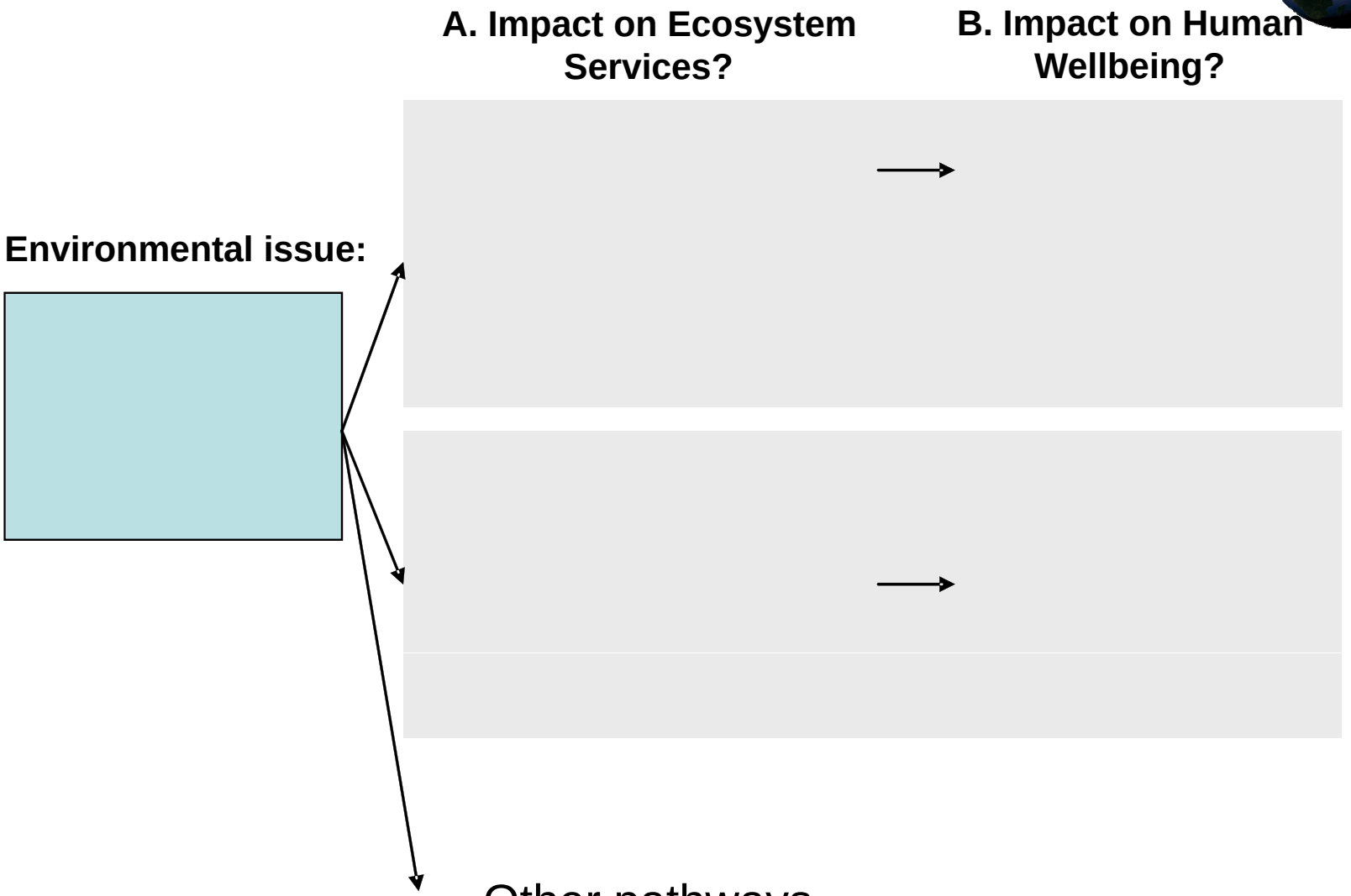
Assessing Economic Impacts (advanced analysis)

- Environmental change can have real economic costs and benefits
- Many environmental goods and services do not have a market price, therefore these costs and benefits are often hidden
- Measuring real but hidden environmental costs and benefits is important, but usually difficult and involves significant uncertainties
- Often referred to as environmental valuation or full-cost pricing

Impact Pathway Diagram with Costs

	A. Impact on Ecosystem Services?	B. Impact on Human Wellbeing?	C. Cost or Benefit?
Change in River Water Quality	• Food – a change in the magnitude of fish catches	• Basic material - Sufficient nutritious food	• Cost of food substitute or import • Loss of income from commercial fishing
	• Freshwater – a change in the quantity of drinking water of an acceptable quality	• Health – access to clean air and water	• Increased health costs • Increased water treatment costs
	Other pathways…		

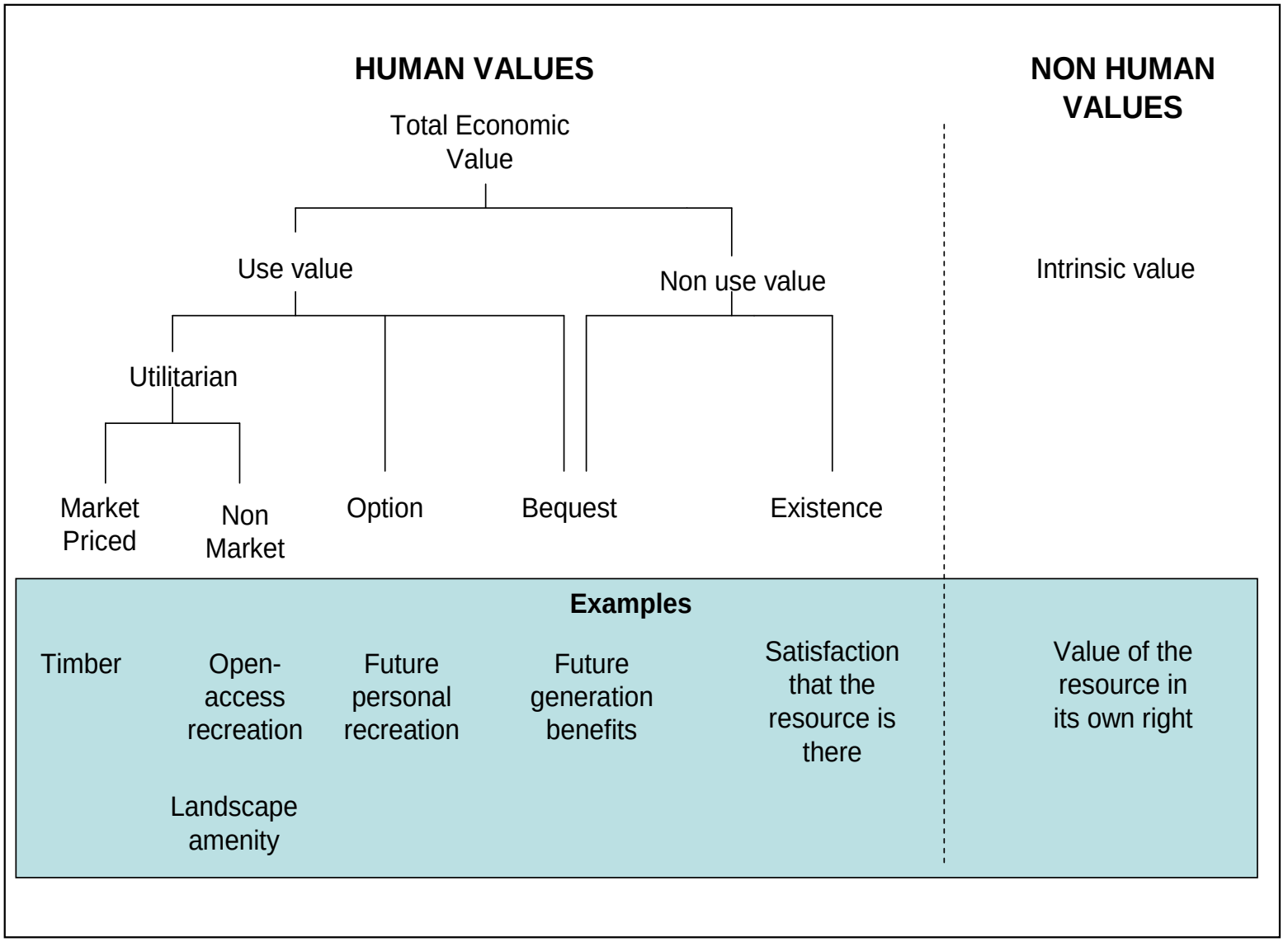
Example Impact Pathway Diagram



Frameworks for Environmental Valuation: Total Economic Value

- **Use Value:**
  - **Direct use value:** Value of the use of the resource, for whatever purpose.
  - **Indirect use value:** Value of "ecological functions"
  - **Option values:** Willingness to pay to maintain the availability for potential future use.

- **Non-Use Value:**
  - **Existence value:** Willingness to pay with no expectation of receiving direct benefit.


HUMAN VALUES
NON HUMAN VALUES
Total Economic Value
Use value
Non use value
Intrinsic value
Utilitarian
Market Priced
Non Market
Option
Bequest
Existence
Examples
Timber
Open-access recreation
Landscape amenity
Future personal recreation
Future generation benefits
Satisfaction that the resource is there
Value of the resource in its own right

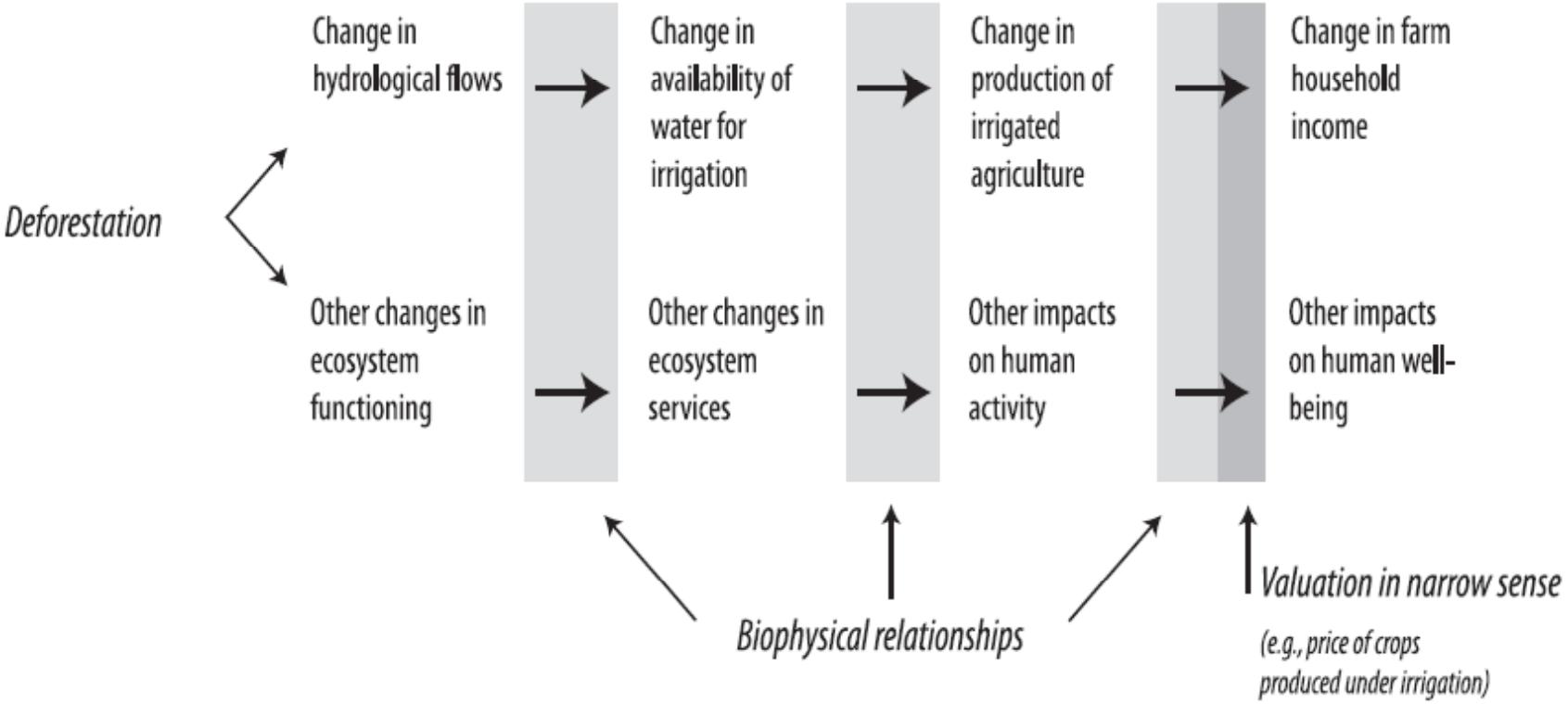
Millennium Ecosystem Assessment (MA) Valuation

- Valuation considered by MA as a:

  "tool that enhances the ability of decision-makers to **evaluate trade-offs** between alternative ecosystem management regimes and courses of social action that alter the use of ecosystems and the multiple services they provide (MA 2003)."

- Methodology based on TEV framework with emphasis on **intrinsic ecosystem value**

Millennium Ecosystem Assessment Framework



Trade-offs among ecosystem services

Mangrove ecosystem

housing

shrimp

crops

Mangrove services:

- Nursery and adult fishery habitat
- Fuelwood & timber
- Carbon sequestration
- Traps sedimen
- tDetoxifies pollutants
- Protection from erosion & disaster

Source: Millennium Ecosystem Assessment, 2005

UNEP

Mangrove Conversion

Public Net Present Value per hectare

Mangrove: $1,000 to $3,600

Shrimp Farm: $-5,400 to $200

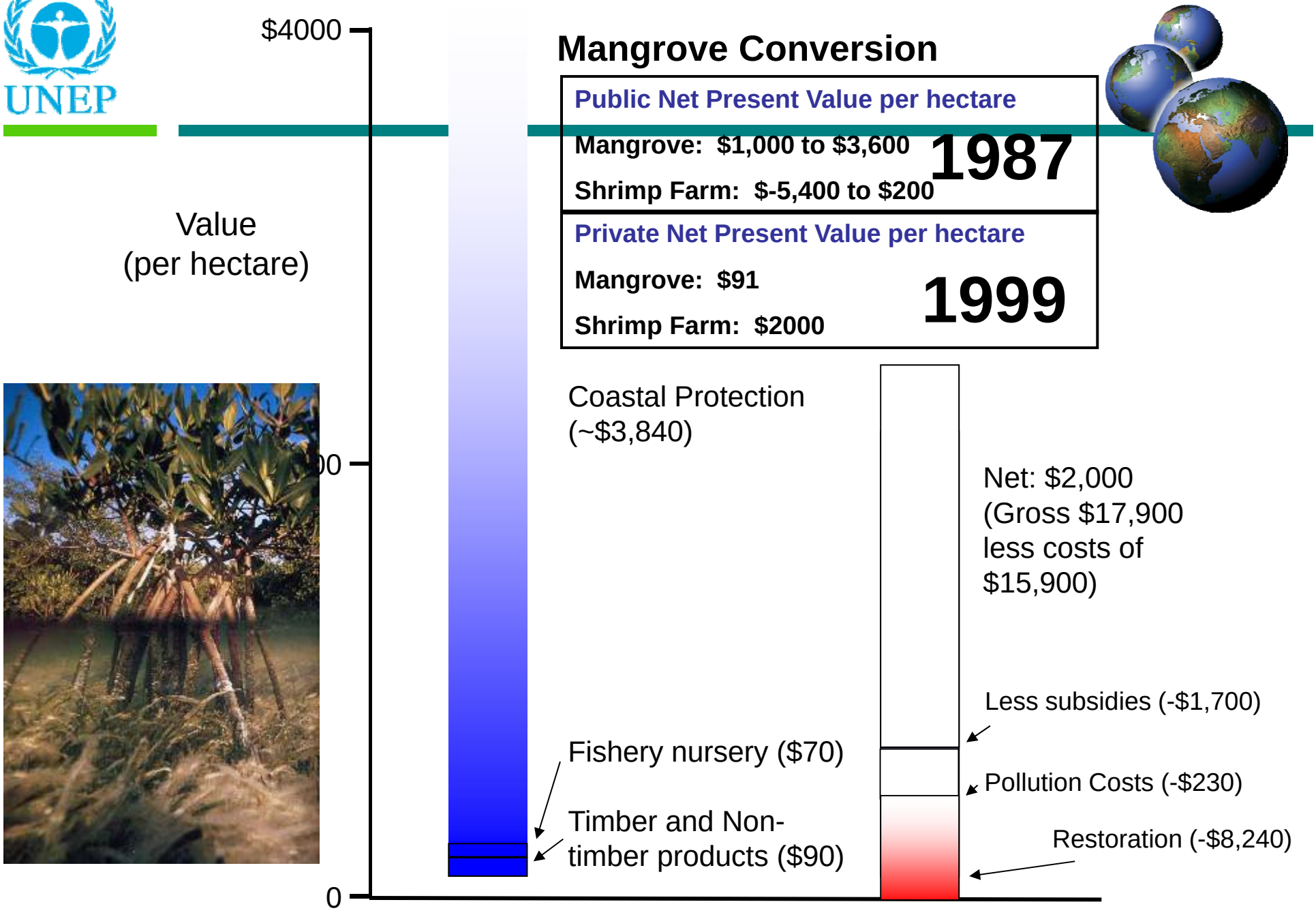
1987

Private Net Present Value per hectare

Mangrove: $91

Shrimp Farm: $2000

1999



Source: Millennium Ecosystem Assessment; Sathirathai and Barbier 2001

Source: UNEP

Methods for Estimating Costs

- **Market prices and revealed willingness to pay**
  - Direct estimation of producer and consumer surplus
  - Productivity method
  - Hedonic pricing method
  - Travel cost method
- **Circumstantial evidence and imputed willingness to pay**
  - damage cost avoided
  - replacement cost
  - substitute cost methods
- **Surveys**
  - Contingent valuation methods
  - Contingent choice methods
- **Benefit Transfer**

Plenary Discussion: Valuation Methods

(15 minutes)

- With which of these methods have you had experience?
- What were some of the main difficulties that you had in using these methods?
- Did your use of these techniques have a policy impact? If so, describe the impact

Exercise: Identifying Economic Costs and Benefits (60 minutes)

- Return to your group of five and select one of the impact pathways from this exercise:
- Identify the costs and/or benefits associated with the change in ecosystem service or human well-being (market or non-market)
- What types of values do these represent (e.g., market, non-market, bequest, existence, intrinsic)?
- Designate one spokesperson from each group to report results in plenary

Time: 30 minutes group, 30 minutes plenary

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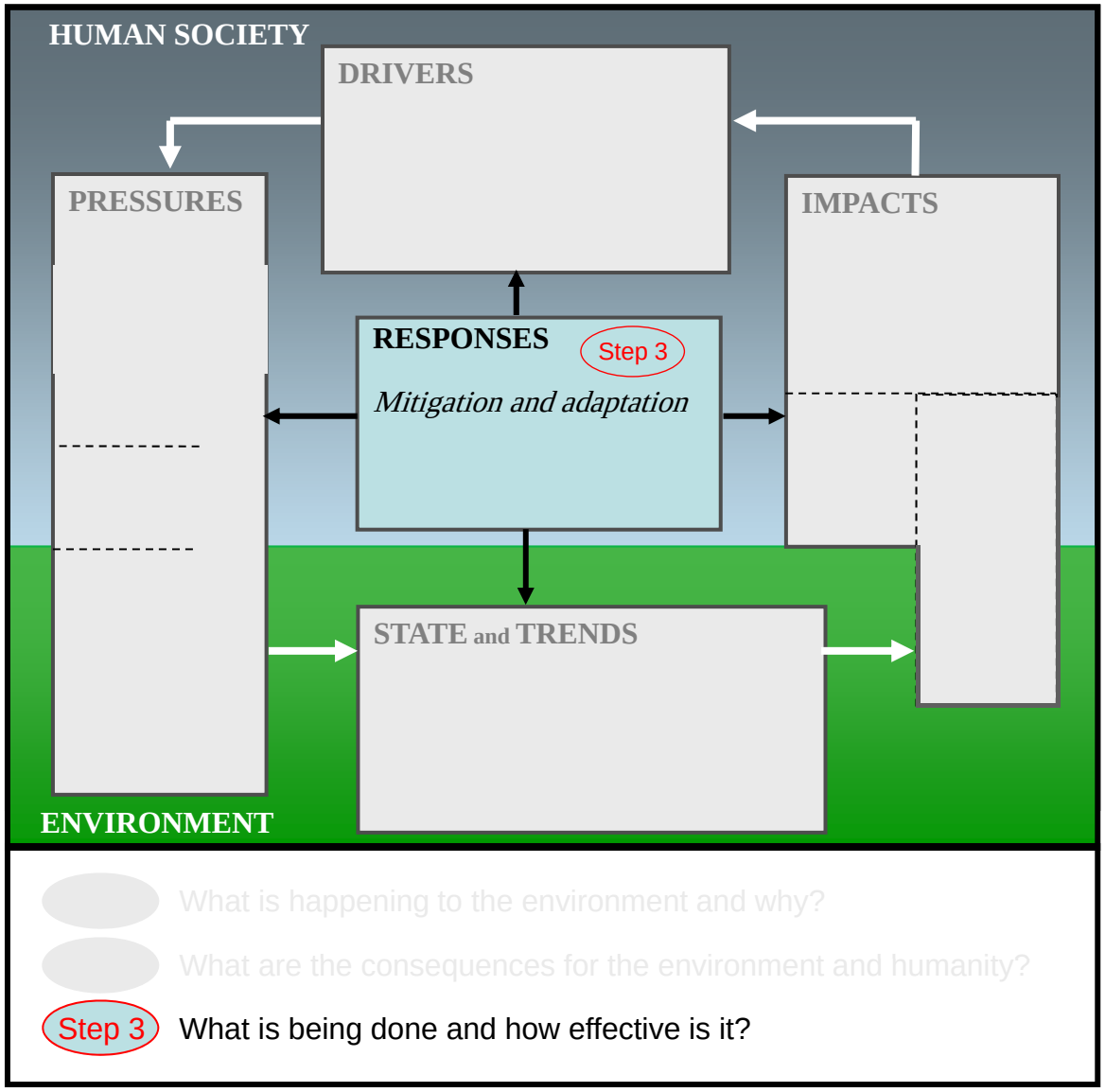
Step 3: What is Being Done and How Effective Is It?



Step 3: Responses

This session will cover:

- Types of responses
- Policy Background
- Policy analysis methods

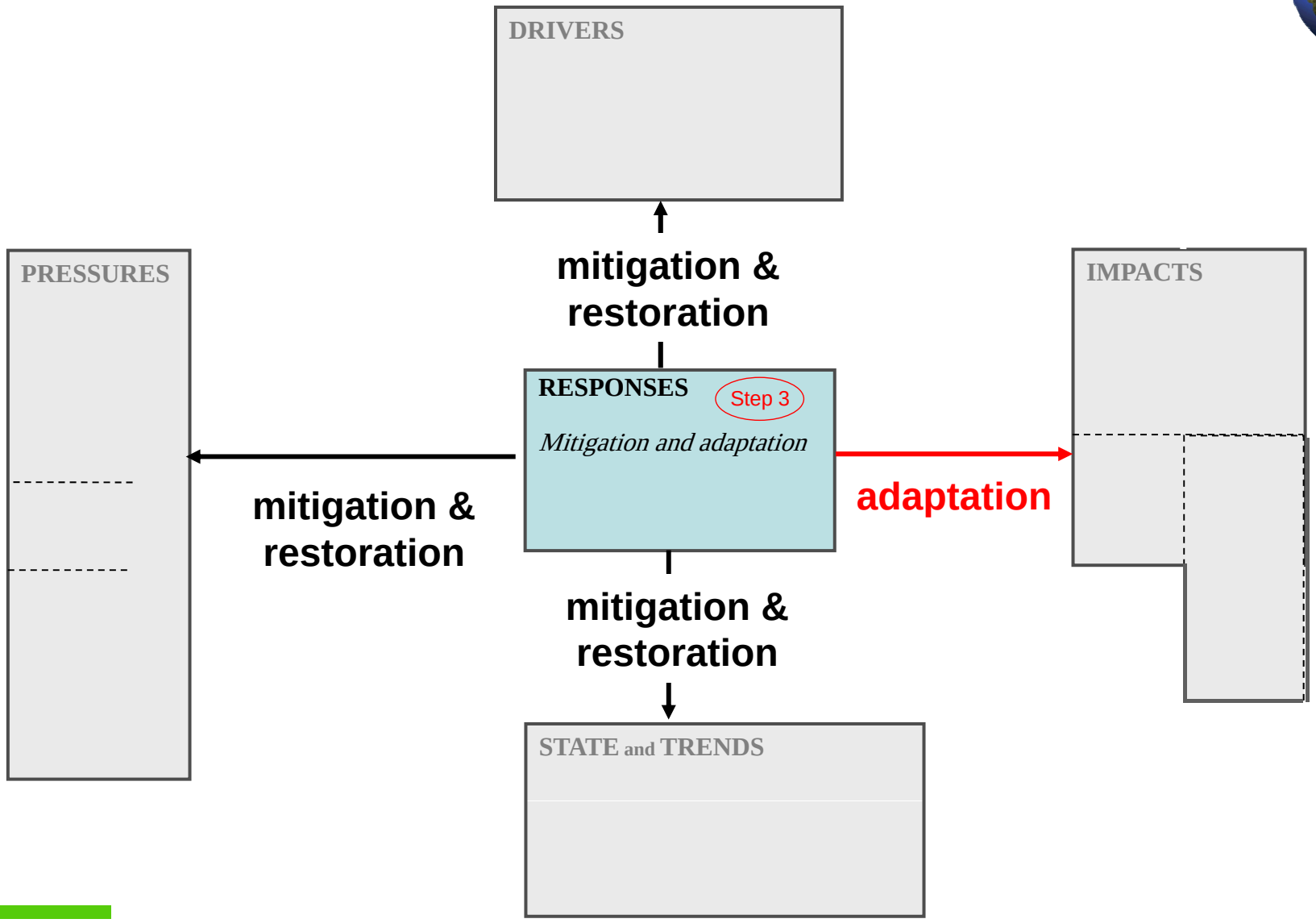
Types of Responses

GEO-4 interprets responses as….

- *Formal and informal adaptation and mitigation to environmental change by altering human behaviour through:*
  - *science & technology;*
  - *policy, law & institutions;*
  - *and coping capacity.*

- This module focuses on understanding policy responses

Responses for Mitigation and Adaptation



Policy Responses in the IEA Context

- Understanding the role of human decisions and policies in influencing environmental conditions
- Policies are formal or informal ‘rules of the game’
- They may apply to:
  - Driving forces
  - Pressures
  - States
  - Impacts

Policy Background:

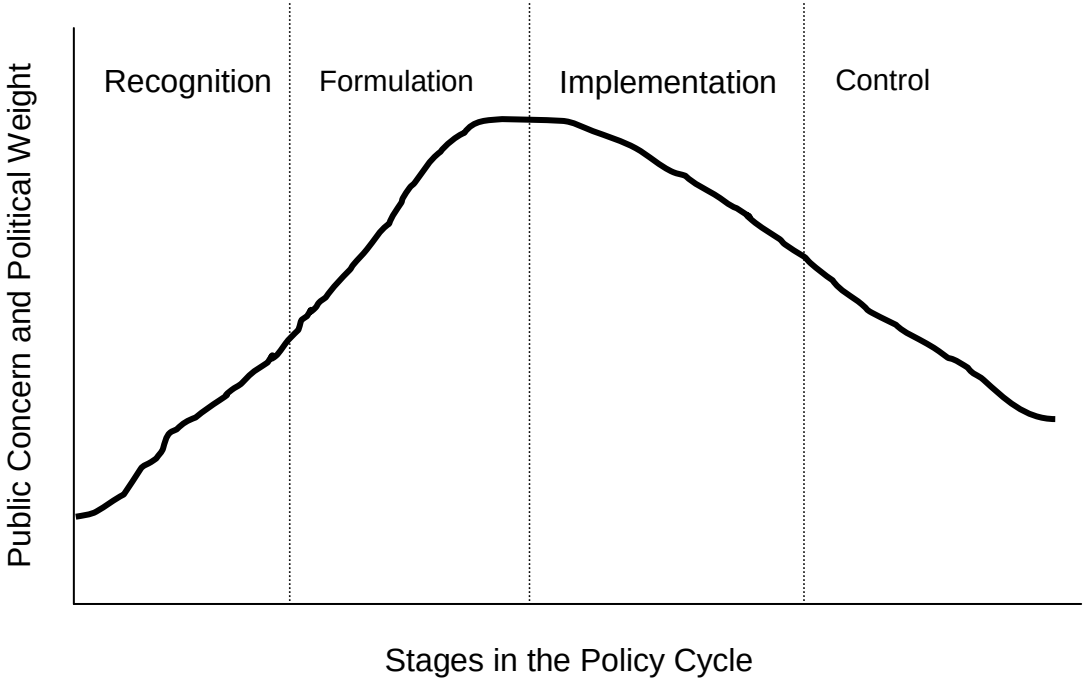
A definition of policy

A set of **interrelated decisions** taken by a political actor or group of actors concerning the **selection of goals and the means of achieving them** within a specified situation where these decisions should, in principle, be within the power of these actors to achieve.

Explicit and Implicit Policy

- **Explicit** policies are articulated and announced clearly.
  - i.e., green papers, ministerial speeches, legislative statements, laws and regulations, white papers and press releases
- **Implicit** policies are not as clearly stated or explained, but can be equally powerful.
  - i.e., the practice of rubber stamping
- Often, policies result simply from the **incremental accumulation of decisions** made over time, with far-reaching effects.

Stages in the Policy Life-cycle



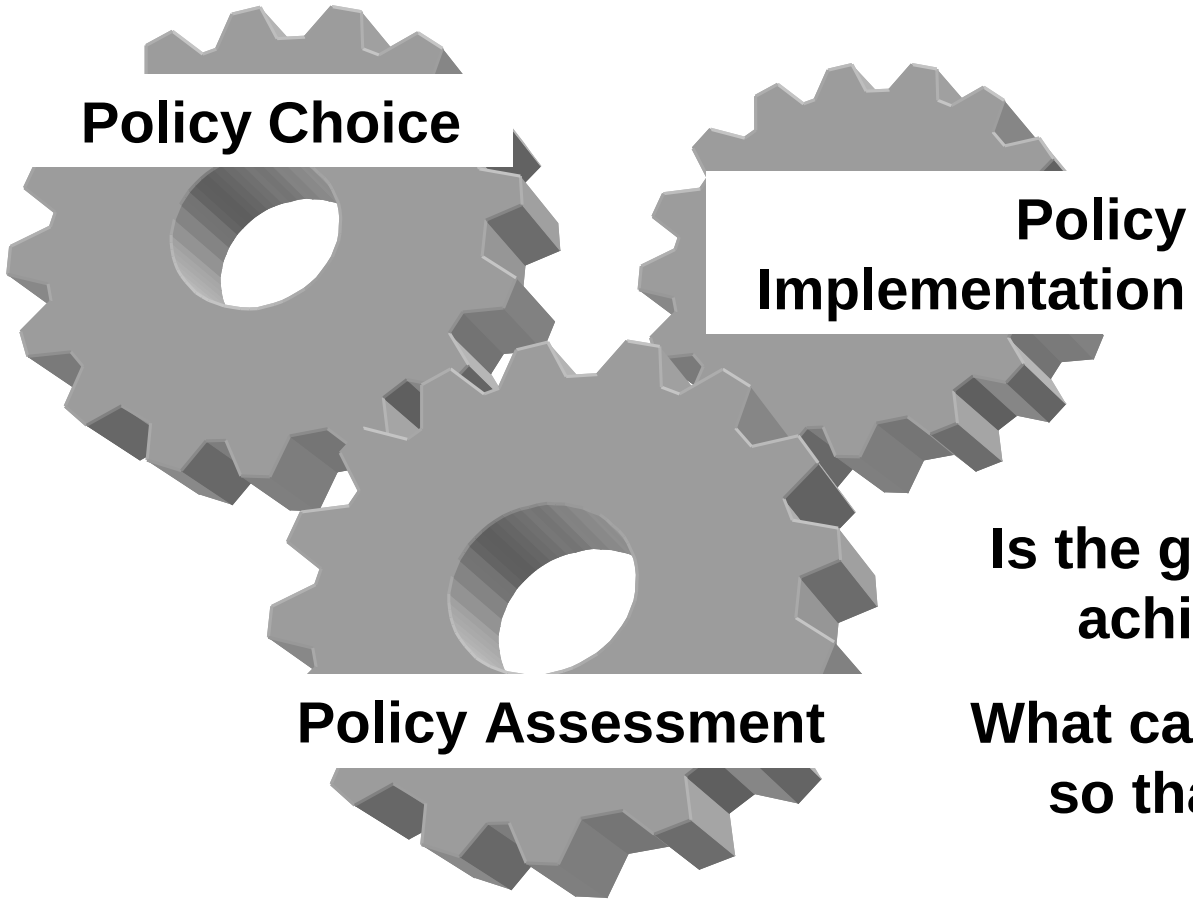
Examples of policy types

- **Economic Instruments**
  - Tradable permits
  - Deposit refund
  - Performance bonds
  - Taxes
  - Earmark taxes and funds
  - User fees
  - Subsidies
  - Administered prices
- **Direct Expenditures**
  - Programs and projects
  - Green procurement
  - Research and development
  - Moral suasion
- **Regulatory**
  - Legislative instruments
  - Enforcement activities
  - Liability
  - Competition and deregulation policy
- **Institutional**
  - Internal education
  - Internal policies and procedures

Understanding Policy Actors

- **Public policy-makers** are usually elected or appointees of elected officials.
- **Private sector policy-makers** are CEOs, Boards of Directors and other top-ranking corporate officials.
- Policy-makers usually are influenced by **special interest groups**
  - lobbyists, political groups, individuals, corporations, donors, NGOs, and many others
- **Technical Advisors** advise and inform policy-makers on alternative options and likely effects of those alternatives.
- **The general public** participates by voting for elected officials in democratic societies.

What is policy analysis? …systematic analysis of any and all components of the policy process…



Is the goal being achieved?

What can be done so that it is?

Discussion: Policy Actors
(30 minutes)

In small groups,

- What is an environmental issue of concern in your region?
- Who are the government actors involved in addressing the issue?
- How do you get multiple stakeholders involved in the policy analysis to ensure that policy choices are more robust?
- Can you think of examples in your country of policies which had impact on a specific state of the environment? Was this impact good or bad?
- Is it possible that other policies also had an impact on this environmental state?

Steps in the Analysis of Existing Policies

A.
What is happening to the environment and why, and What are the consequences to the environment and humanity

What is Being done and How Effective Is It?
Analysis of Existing Policies and Policy Instruments

B.
The policy report card (issue goals, targets, and strategies)

C.
Policy instrument scan (mix of instruments and their effectiveness)

D.
Policy gap and coherence analysis

E.
Policy narrative sheet

- Identify **causal chain** of Direct drivers – Indirect drivers – State – Impact for a given environmental issue.

- Develop of a specific, measurable and time-bound **indicator** for the key driving forces, pressures, state and impacts.

- Identify of key **points in time** where policy(ies) had impact. Time-bound information is important for this, particularly for the state indicator.

Exercise: Select and Characterize Environmental Issue (State) of Concern

(20 minutes)

- In groups of four or five,
- Select drivers – pressures – state – impact chain from your exercises in sections 5 and 6 and input this into the first row of the table shown on the next slide.
- In the second row, identify an indicator an approximate trend line that in your best judgment describes reality, or use actual data if available.
- Note major changes in the indicator trend over time

	Drivers	Pressures	State	Impact
Description				
Indicator and trend				

Step B: The Policy Commitment Review

- What **level of attention** do your issues have with government?

- **High-level strategies** and policies provide a big-picture glimpse into the policy landscape.

- Use the Policy Commitment Review to take stock of high-level strategies and action plans **directed at your priority environmental issues** and proposed targets.

Policy Report Card – the example of Climate Change

Issue	Goal and Target	Strategy or Action Plan	Status of Implementation
Climate Change Environmental State: Atmospheric CO_2 concentration	6% reduction in GHG emissions by the period 2008-2012 (Kyoto Protocol)	Climate Change Plan for Canada – 2002 Moving Forward on Climate Change - 2005	Some policy instruments being implemented, but overall GHG emissions are still rising.

Issue	Goal and Target	Strategy or Action Plan	Status of Implementation
Climate Change **Atmospheric** **CO_2 Concentration**	**50% reduction in GHG emissions by 2050 (G8-June2007)**	**Climate Change plan for G8**	**Some policy instruments being implemented in few countries**

Exercise: Completing a Policy Commitment Review for your Priority Environmental Issues

(30 minutes)

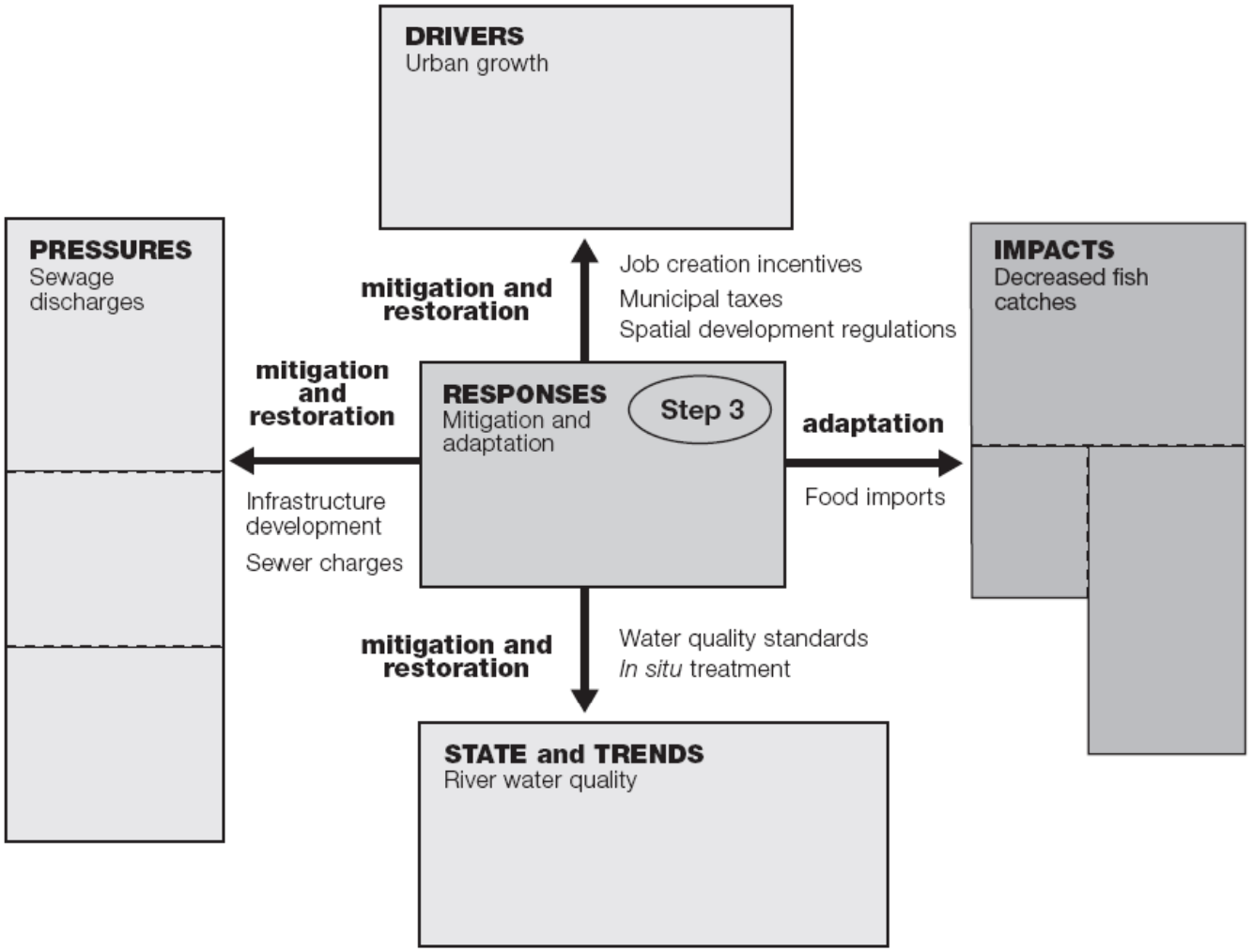
- In groups of four or five, carry out the following tasks:
- Select two priority environmental issues from amongst the members of your group
- Complete a Policy Commitment Review for each issue.
- Include in the report card the following information:
  - Name of the issue and the specific environmental state that the issue focuses on
  - Any goals or targets which have been established for the issue
  - The names of a strategy or action plan for achieving the goal and target
  - The status of implementation in terms of progress in implementing policy instruments and progress in achieving the goal and target set for the issue.

Issue	Goal and Target	Strategy or Action Plan	Status of Implementation

Step C. The Policy Instrument Scan

- Provides the **detailed picture** on policy.
- Includes **mix of policies** having an effect on your environmental issues.
- **Assesses the effectiveness** of these policies in achieving positive change.

Example


DRIVERS
Urban growth
PRESSURES
Sewage discharges
mitigation and restoration
Job creation incentives
Municipal taxes
Spatial development regulations
IMPACTS
Decreased fish catches
mitigation and restoration
RESPONSES
Mitigation and adaptation
Step 3
adaptation
Infrastructure development
Sewer charges
Food imports
mitigation and restoration
Water quality standards
In situ treatment
STATE and TRENDS
River water quality

Criteria for Selecting Policies for Policy Analysis

- Relevance for the public and decision-makers
- Link with key environmental priorities identified in the SOE section
- Affecting the health, income and well-being of a large number of people
- Importance of policy response to an environmental situation that is:
  - physically severe
  - changing rapidly
  - irreversible
- Related to the country's international obligations
- Potential for policy to cause disruption or conflict
- Potential for easy and feasible solutions
- Uniqueness of current policy initiative for region

Understanding Policy Effects and Policy Effectiveness

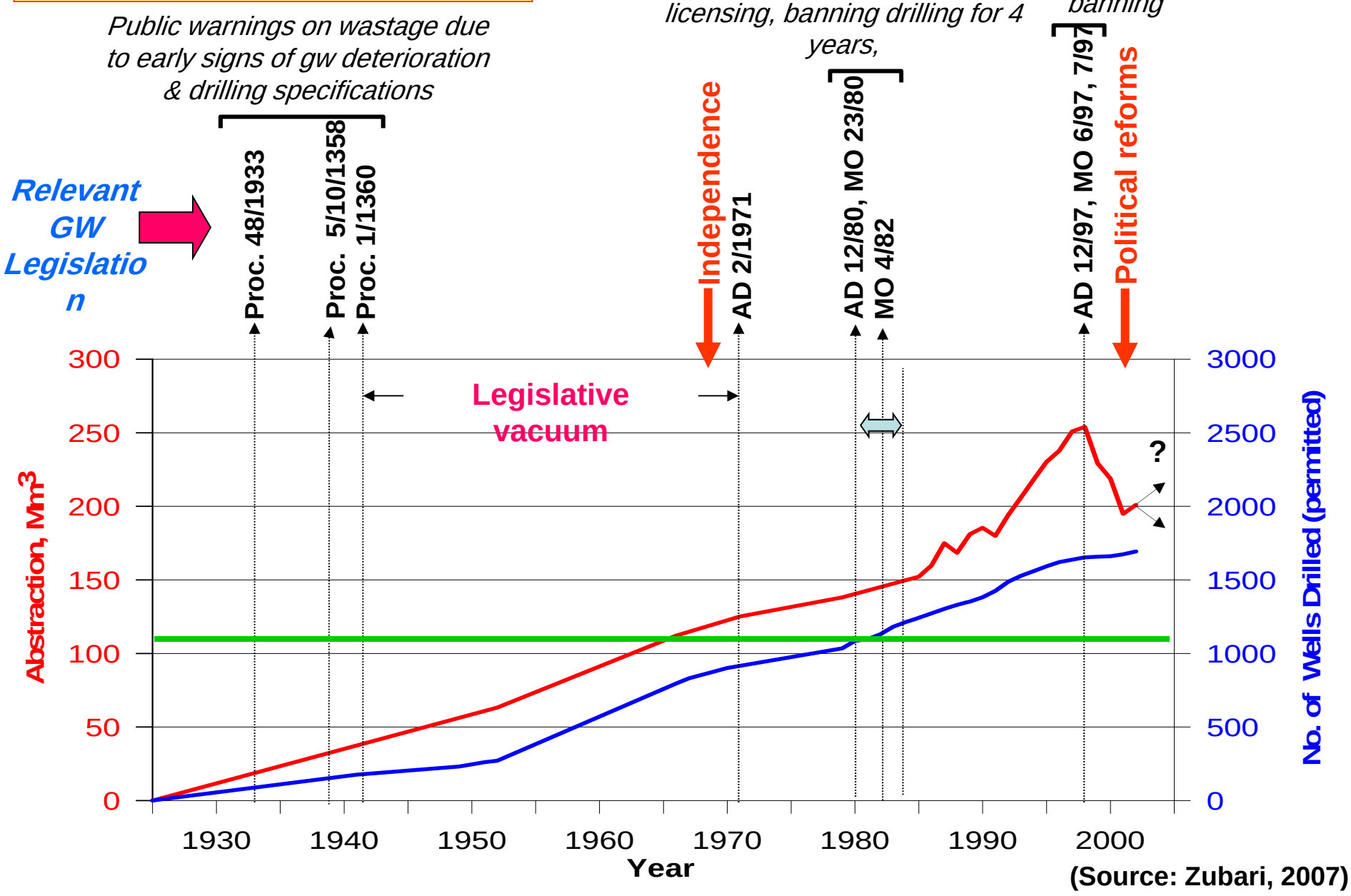
- **Policy Effect**

  Implies **causality** between policy and a change in a driving force, pressure, state, or impact.

- **Policy Effectiveness**

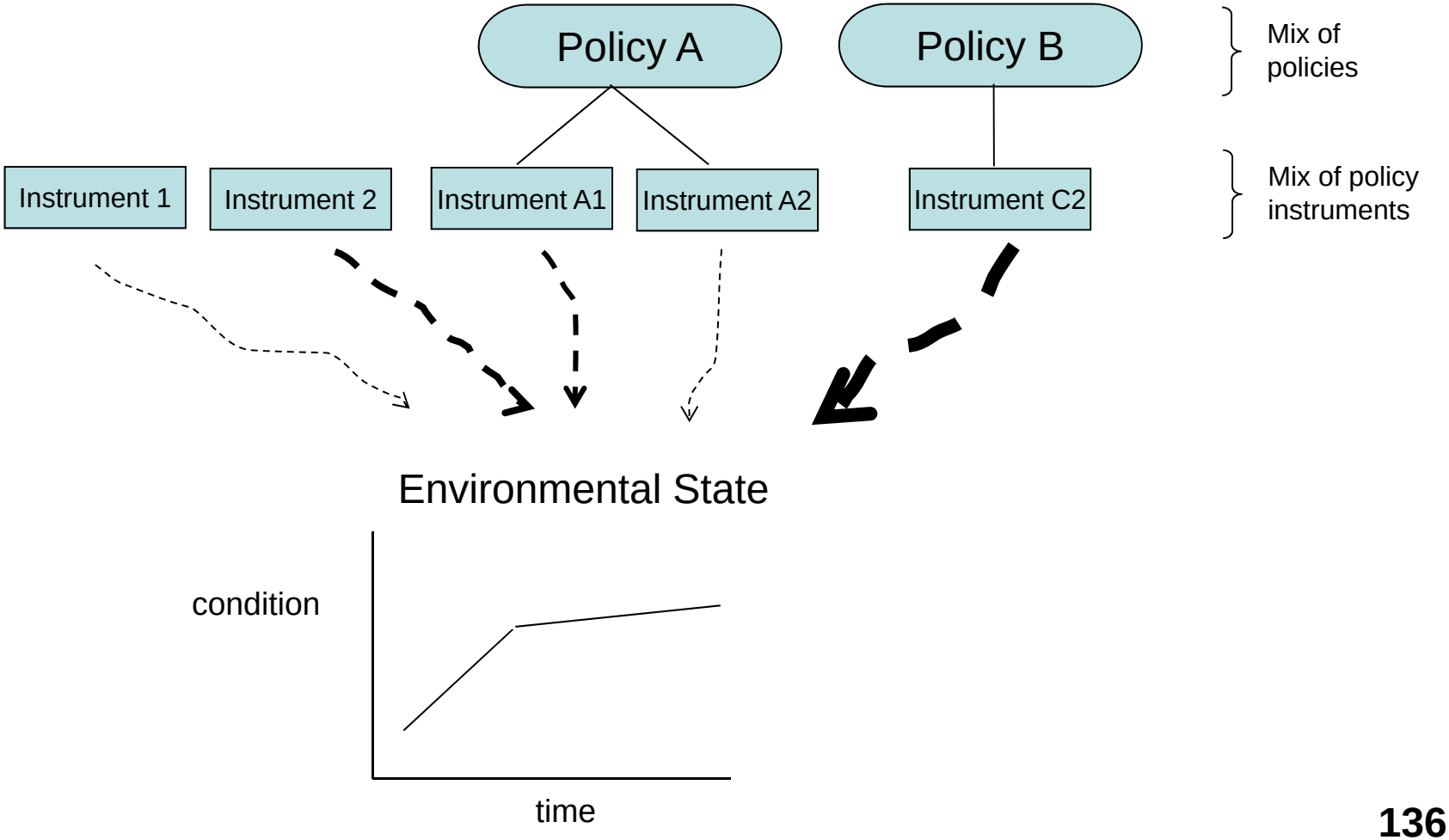
  Judges how the **actual effect** measures up to the policy objective. It's a performance assessment of the policy.

GW Legislation and Enforcement in Bahrain



(Source: Zubari, 2007)

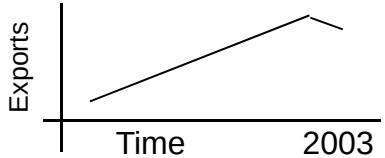
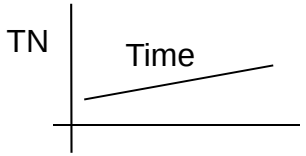
Policies and Policy Instruments with an Effect on a STATE of the Environment



Assessing Policy Effectiveness – *Is the Environmental Issue Managed Using Targets?*

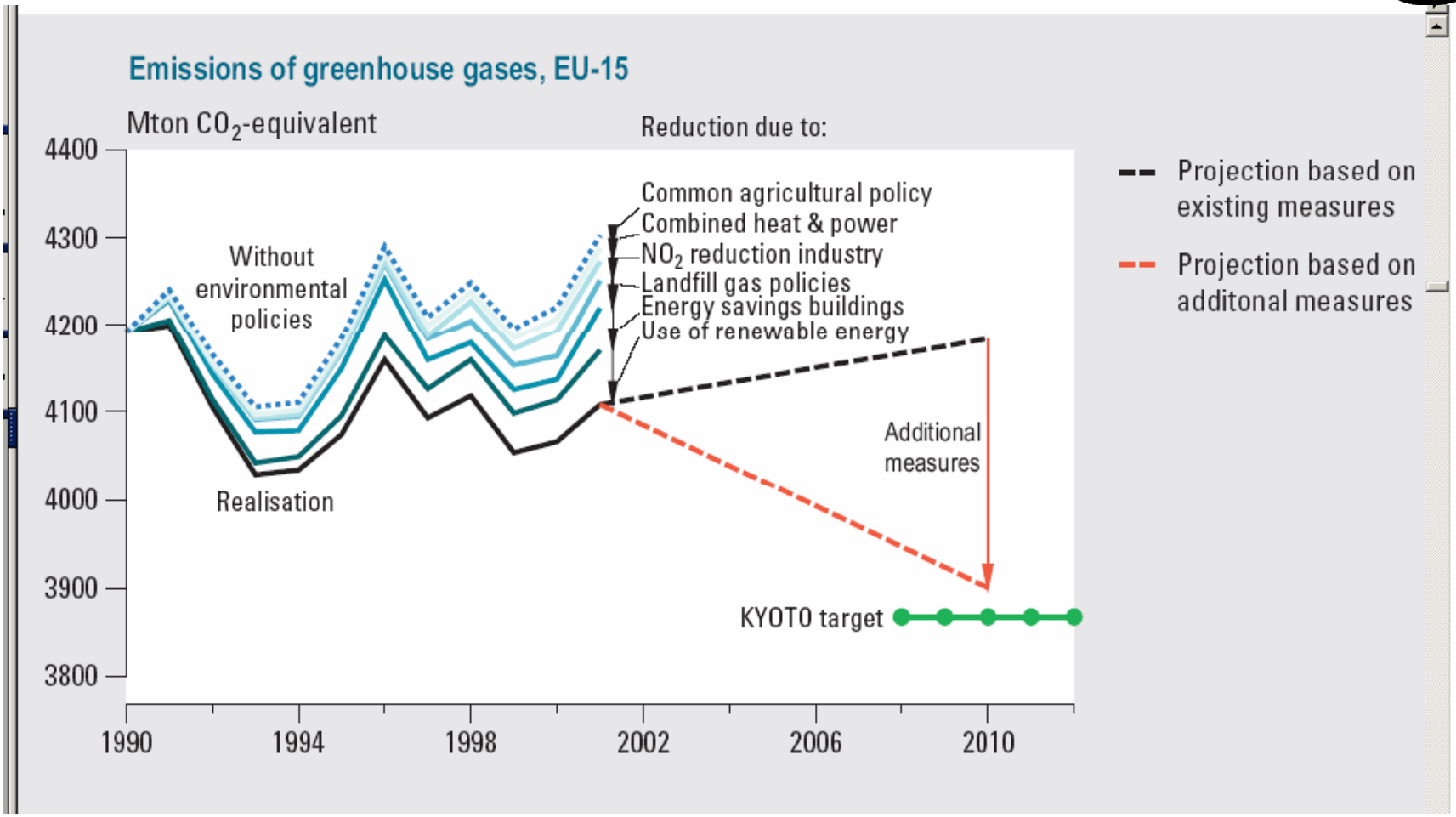
Type of criteria	Example
Benchmark	Comparison with a documented best-case performance related to the same variable within another entity or jurisdiction. The policy is evaluated based on its impact in a given jurisdiction compared with conditions in the benchmark or reference jurisdiction. ***Example: highest percentage of households connected to sewage system in a comparable jurisdiction.***
Thresholds	The value of a key variable that will ellicit a fundamental and irreversible change in the behaviour of the system. The policy is evaluated based on its role in making the system move toward or away from the threshold in any given period. ***Example: maximum sustainable yield of a fishery.***
Principle	A broadly defined and often formally accepted rule. If the definition of the principle does not include a relevant performance measure, the evaluator should seek a mandate to identify one as part of the evaluation. ***Example: the policy should contribute to the increase of environmental literacy.***
Standards	Nationally and/or internationally accepted properties for procedures or environmental qualities. The policy is successful if it helps keep performance within specified limits. ***Example: water quality standards for a variety of uses.***
Policy-specific targets	Determined in a political and/or technical process taking past performance and desirable outcomes into account. ***Example: official development assistance shall be 0.4 percent of national GNP.***

Example

	Driving Force	Pressure	State	Impact
Description	Increased agriculture exports	Nutrient loading from agriculture	water quality	Fish catches
Indicator and trend				
Targets:		10% reduction in nutrient loads 12% annual reduction in residual nitrogen from Farmlands		

- Determine the individual effects of different trends, technological changes or policy measures.
- Show the impacts of different policy instruments.
- Use in retrospective and in forward-looking modes.
- The analysis is data and labour intensive.
- It is considered to be an advanced part of policy analysis.

Breakdown of the Effects of Environmental Policies on Greenhouse Gas Emissions in the EU-15



Exercise: Policy Instrument Scan and Analysis of Effectiveness (60 minutes)

In groups of four or five, use the following table to:

- Identify policy instruments which are having a significant impact on:
  - Reducing the extent of environmental change via **drivers, pressures** and **state**(s)
  - Helping society adapt to the **impacts** of environmental change
- Identify **performance criteria** for the indicator which describes the environmental state indicator and the indicators for the key driving forces, pressures and impacts.
- How does the indicator trend compare to the performance critiera?
- Present your results in plenary

	Driving Force	Pressure	State	Impact
Description				
Indicator and Trend				
Policy Instruments • Economic • Regulatory • Expenditure • Institutional • Etc.				
Performance Criteria • Targets • Benchmarks • Thresholds • Principles • Standards • Etc.				
Comparison of observed trends and expected performance				

Step D: Policy Gap and Coherence Analysis

- Understand why a policy did not result in improvement in the state of environment or,
- Did not facilitate adaptation
- Also, the factors that led to successful performance of a policy

Two methods presented:

- Identifying gaps in the policy mix; and
- Assessing policy coherence.

Identifying Gaps in the Policy Mix

Policy gaps can take many forms, such as:

- Relevant policy not in place
- A policy type is under-represented
- Policies not focused on relevant driving force or pressure

Policy Gap Matrix

	Driver	Pressure	State	Impact
Description of DPSI				
Economic instruments				
Regulatory instruments				
Expenditure instruments				
Institutional instruments				

Exercise: Assessing Policy Gaps

In groups of five, carry out the following tasks in relation to one DPSI driver-pressure-state-impact chain used in the previous exercises:

Characterizing the policy mix

- Copy the descriptions of your drivers-pressure-state-impacts chain from the previous exercise to the first column of the policy mix matrix.
- Using shorthand or code, transfer policies influencing the driving force, pressure, state and impact from previous table to the appropriate cell in the policy mix matrix. Can you think of any additional policies to add to the table that you did not identify previously?
- Use the examples of policy types described previously in Table 8 as possible categories, but you may also create new categories, if necessary.

Exercise (Cont.)

Estimating the policy effect

- Working with the results of the table just completed, indicate your ***perceived effect of the policy on the given environmental issue***, based on existing information, by placing the appropriate symbol in the cell representing the policy. You could use a scale similar to the following:
  - Highly positive effect: +++
  - Moderately positive: ++
  - Slightly positive: +
  - Neutral: 0
  - Slightly negative effect: -
  - Moderately negative: - -
  - Highly negative: - - -
  - Policy effect unclear: ?

Exercise (Cont.)

In plenary, carry out the following analysis of policy gaps:

- Identify policy types that appear to be over- or under-represented.
- Note if there are policies directed at each part of the issue chain (driving force, pressure, state and impact).
- Identify policy types and/or specific policies that are currently absent, but might have significant potential for positive effect.
- Discuss opportunities and barriers for optimizing the policy mix, either by adding new or discontinuing existing policies or policy types.

Assessing Policy Coherence

- Any environmental trend will be a combined result of **interacting policies** and natural factors.

- It may well be that a policy does well with one type of environmental impact, **but fares poorly** with another.

Action-Impact Matrix (Sample)

Simple example of an action impact matrix (AIM)

Action/Policy	Main objective	Impacts on key sustainable development issues			
		Land degradation	Air pollution	Resettlement	Others
Macroeconomic and sectoral policies	Macroeconomic and sectoral improvements	Positive effects because of removing distortions, Negative effects mainly because of remaining constraints			
• Exchange rate	• Improve trade balance and economic growth	(-H) (deforest open-access areas)			
• Energy pricing	• Improve economic and energy use efficiency		(+M) (energy efficiency)		
• Others					
Investment projects	Improve efficiency of investments	Investment decisions made more consistent with broader policy and institutional framework			
• Project 1 (Hydro dam)	• Use of project evaluation (cost-benefit analysis, environmental assessment, multi-criteria analysis, etc.)	(-H) (inundate forests)	(+M) (displace fossil fuel use)	(-M) (displace people)	
• Project 2 (Re-forest and relocate		(+H) (replant forests)		(+M) (relocate people)	
• Project N					

Discussion: Action Impact Matrix (45 minutes)

- In plenary, identify five key policies from among those identified in your *Policy Instrument Scan*.
- Additionally, select four other environmental issues in your country.
- Develop an action impact matrix (AIM).

Step E: The Policy Narrative Sheet – Summarizing Policy Failures and Successes

The policy narrative sheet helps you…

develop **credible statements** regarding the adequacy of current policy responses for restoring and maintaining the state of the environment and facilitating adaptation to impacts.

Policy Narrative Sheet

Describe the Environmental Issue in terms of indicator trends for the State and key Drivers, Pressures and Impacts.
…
How effective is the policy mix that currently influences the environmental State and the key Drivers, Pressures and Impacts (compare indicator data to targets or benchmarks)?
…
What are the key policy gaps? ▪ **Is a policy type under- represented (economic, regulatory, expenditure, institutional policy instruments)**? ▪ **Are policies not focusing on key Drivers, Pressures, the State or the Impacts?** ▪ **Are relevant policies missing?**
…
What are the key policy inter-linkages and are they positive or negative?
…
What are some of the key policy success stories?
…
What improvements are necessary for the current mix of policy instruments influencing this environmental issue to improve their overall effectiveness?
…

Exercise: Developing a Policy Narrative Sheet

(45 minutes)

- Individually prepare a Policy Analysis Sheet.
- Share your results with your work group.
- Select one Policy Analysis Sheet from among your group to share in plenary.
- Time: 30 minutes group; 15 minutes plenary.

End