Integrated Coastal and Ocean Management

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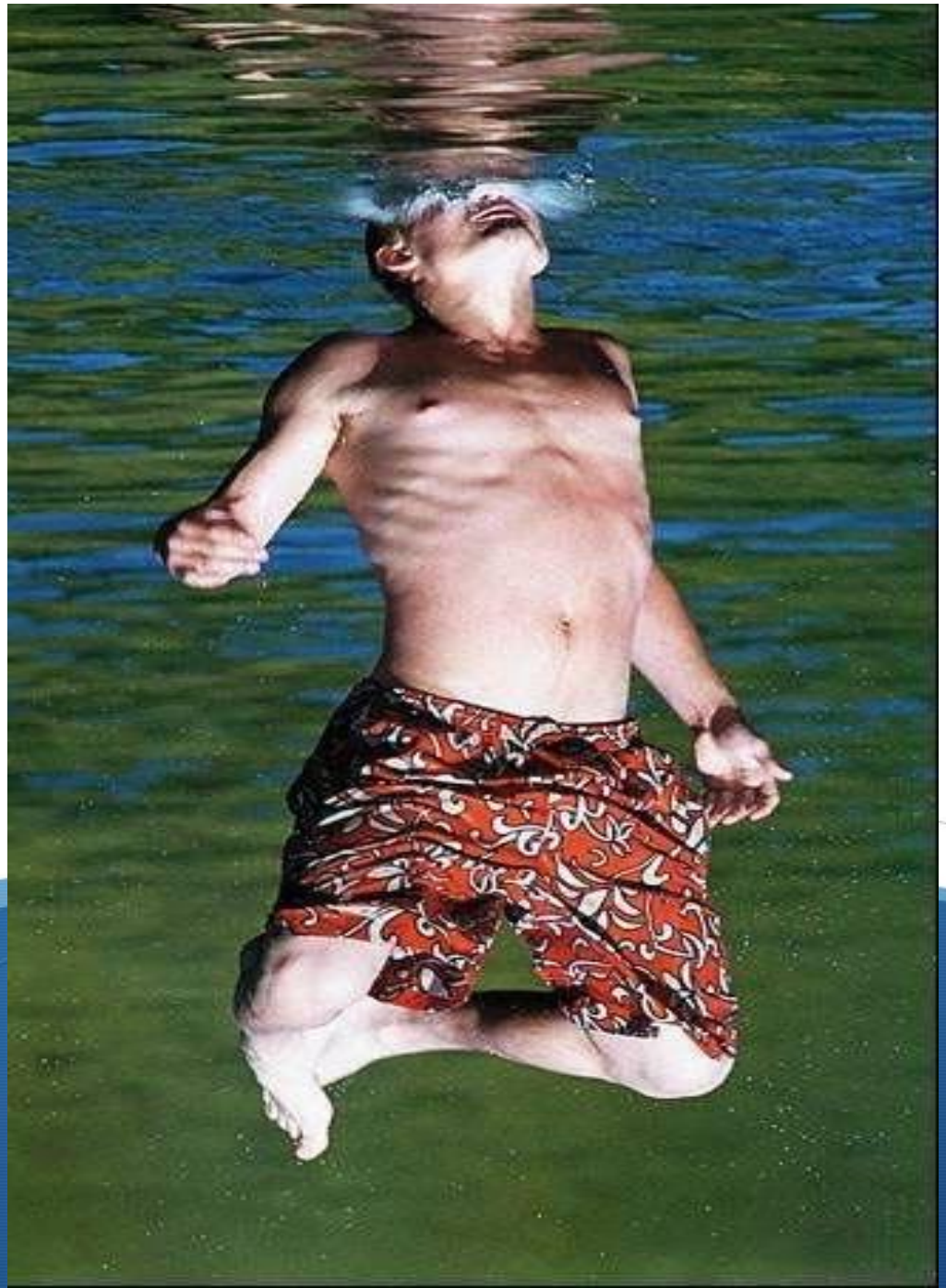
Format

1. Challenges and context of ICOM
2. ICOM objectives
3. Terminology
4. Drivers, pressures and major issues
5. ICOM process and practical exercise

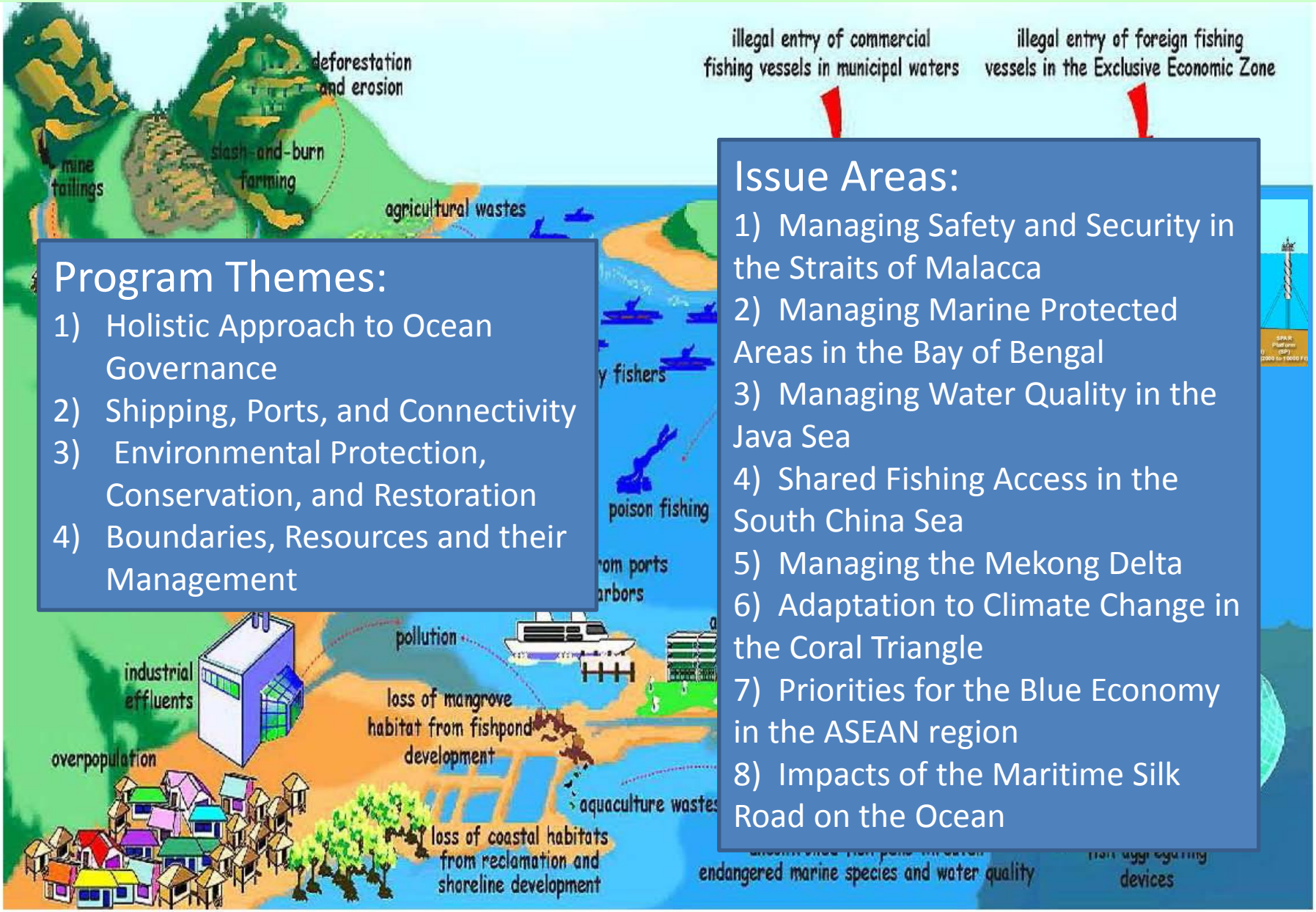
What does Integrated Coastal and Ocean Management (ICOM) mean to you?

- Management?
- Coastal and Ocean?
- Integrated?

Lots of challenges and even a bit of fear!!



1. Challenges to managing activities in the coastal zone? environmentally, socially, economically, legally, institutionally?



Program Themes:

1) Holistic Approach to Ocean Governance
2) Shipping, Ports, and Connectivity
3) Environmental Protection, Conservation, and Restoration
4) Boundaries, Resources and their Management

Issue Areas:

1) Managing Safety and Security in the Straits of Malacca
2) Managing Marine Protected Areas in the Bay of Bengal
3) Managing Water Quality in the Java Sea
4) Shared Fishing Access in the South China Sea
5) Managing the Mekong Delta
6) Adaptation to Climate Change in the Coral Triangle
7) Priorities for the Blue Economy in the ASEAN region
8) Impacts of the Maritime Silk Road on the Ocean

Group Projects

Why is it important to address these issues?

Benefits from Marine and Coastal Ecosystems and Activities

Coastal tourism

The volume of global tourist arrivals increased more than 20 times between 1950 and 1995, making tourism the world's fastest-growing industry. The present number of tourists is expected to double by 2010 – particularly in the Caribbean and Asia-Pacific regions, where much of the industry is concentrated in coastal areas.

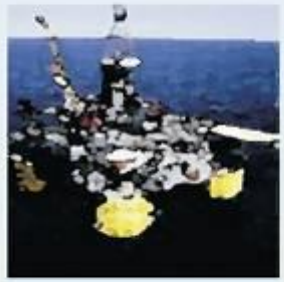
$ 161 billion

Trade and shipping

Since the 1950s, the annual volume of shipping and seaborne trade has risen sixfold, to more than 5 billion tonnes of oil, dry bulk goods and other cargo. In 1995, there were 27,000 freighters over 1,000 tonnes in operation. Industrial countries account for 50% of the cargo loaded – and 75% of that unloaded.

$ 155 billion

Offshore oil and gas



Since gasoline was first used in California a century ago, the oil and natural gas industry has skyrocketed to meet soaring energy demands. Today, about 20% of the world's oil and natural gas comes from offshore drilling installations in the Middle East, the United States, Latin America, and the North Sea.

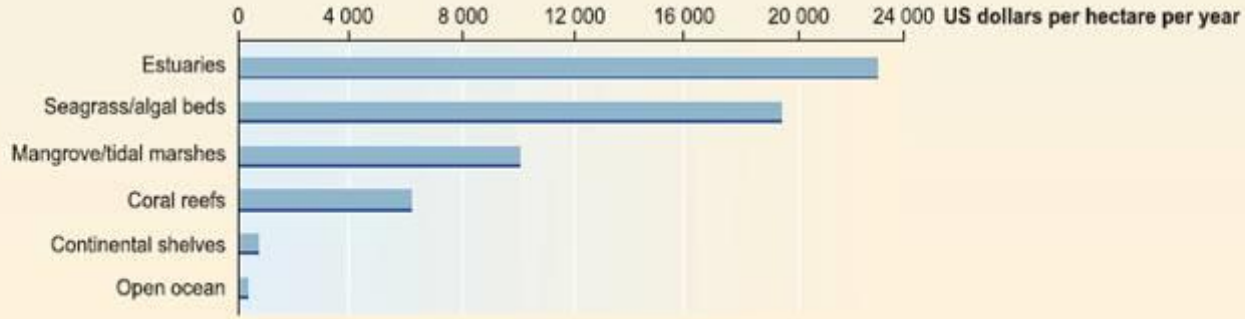
$ 132 billion

Fisheries

Between 1950 and 1997, global fish production from capture and culture fisheries grew from 20 million tonnes to 122 million tonnes, with the per capita supply doubling from 8 kg to 15 kg. Over 200 million people rely on fishing for their livelihoods, with more than 80% of all fish (by value) sold in industrial countries.

$ 80 billion

Estimated Mean Value of Marine Biomes



UNEP

DELPHINE DIGOUT
MAY 2002

ICOM COMPONENTS

Coastal and ocean environment

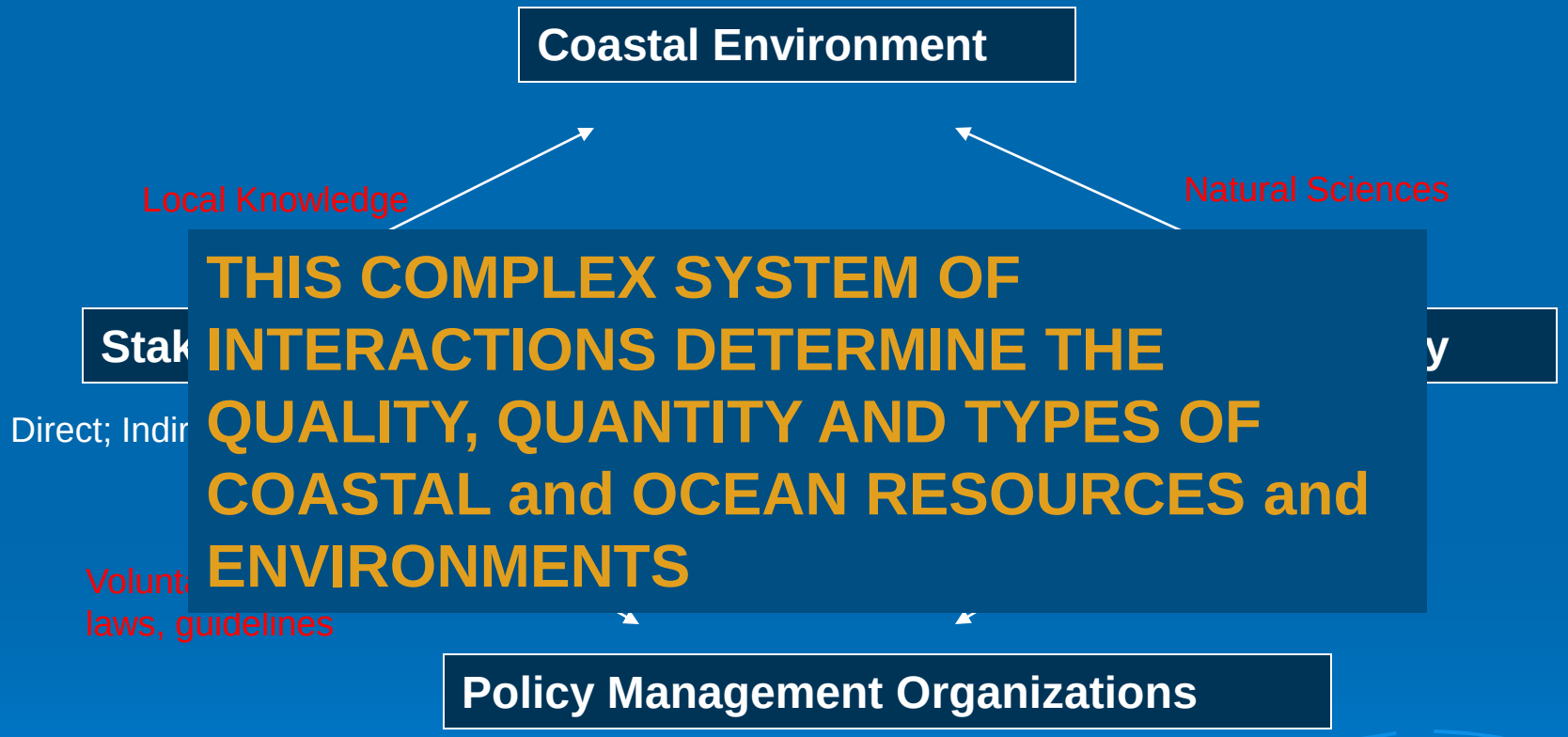
Decision-makers, policy makers, managers

Stakeholders

Advisors and Scientists

The Coastal and Ocean (C&O) Management System:

Cultural-Ecology of C&O Public Policy Making



Adapted from
Orbach, 1995

So, ICOM is about….

TAKING A PRINCIPLED APPROACH to managing a society's direct impacts, indirect impacts and cumulative impacts on coastal and ocean systems **TO ACHIEVE STATED GOALS AND OBJECTIVES**

It's all about the "HOW"!!!

But …….

When perceptions of a problem vary broadly,

When there is uncertainty in the scientific assumptions and outcomes that underlie the process,

When stakeholders have different values and levels of influence

consensus on trade-offs is difficult to achieve.

Weinstein et al., 2007

So what are those **challenges** we need to address?

- Many jurisdictions
- Secondary responsibility of most; primary responsibility of none
- Traditional “silo” focus
- Pursuit of economic and even political goals divorce from environmental and social goals & vice versa
- Lack of agreed priorities
- Failure to appreciate interconnections within coastal and ocean systems (natural and human)
- Inadequate legislation and/or lack of enforcement
- Lack of trained personnel, relevant technologies, equipment, etc.
- Little decentralization of power to lower levels of governance
- Many nations’ governance capacity severely constrained by deep divisions among their populations (e.g., race, religion, ethnic or linguistic group, socio-economic class)

In a nutshell

- Humans depend on the world's coasts and oceans for living space, extractable commodities, and economic growth and influence.
  - Effectively managing how people share resources and space with each other and other biota becomes the great challenge of the 21st century
- Conflict mitigation, consensus building, trade-offs, sacrifice, and compromise will become the norm for sustainable coastal and ocean management
- A sustainable future will also depend on balancing both ecology and commerce management of coastal and ocean resources, proportional to human dominance in the landscape

2. What can be done?

PLAN and MANAGE USING ICOM!

An integrated systems approach, taking into account conflicting goals and inter linkages among environmental issues and humans as well as the geographic scales of both the issues and political jurisdictions.

ICOM

ICOM is a continuous and dynamic process by which decisions are made for the sustainable use, development, and protection of coastal and marine areas and resources.

(Cicin-Sain and Knecht, (1998)

Aim is to maximize benefits while minimizing conflicts while being guided by principles of sustainable development

(World Bank, 1993)

CZ - Most contentious piece of real-estate on the planet!

Space that resources occupy can be more important in institutional design than the functional sectors in which the activities belong!

- **Multi-resource system**
  - Provides space, resources and performs regulatory functions
  - Mismatch between coastal and oceanic systems and administrative authorities
- **Multi-user system**
  - Involves many stakeholders with differing interests and capabilities
  - Involves many agencies at the sub-national and/or national level of government
- **Transition zone**
  - coastal productive and defence functions linked to physical and socio-economic conditions far beyond its physical boundary
  - different coastal processes/systems interact in CZ
  - government authority can change abruptly

The #1 problem of the coastal manager is the problem of the 'dual' mandate

"The need to reconcile society's desire to preserve, restore, and rehabilitate natural ecosystems …

while at the same time …

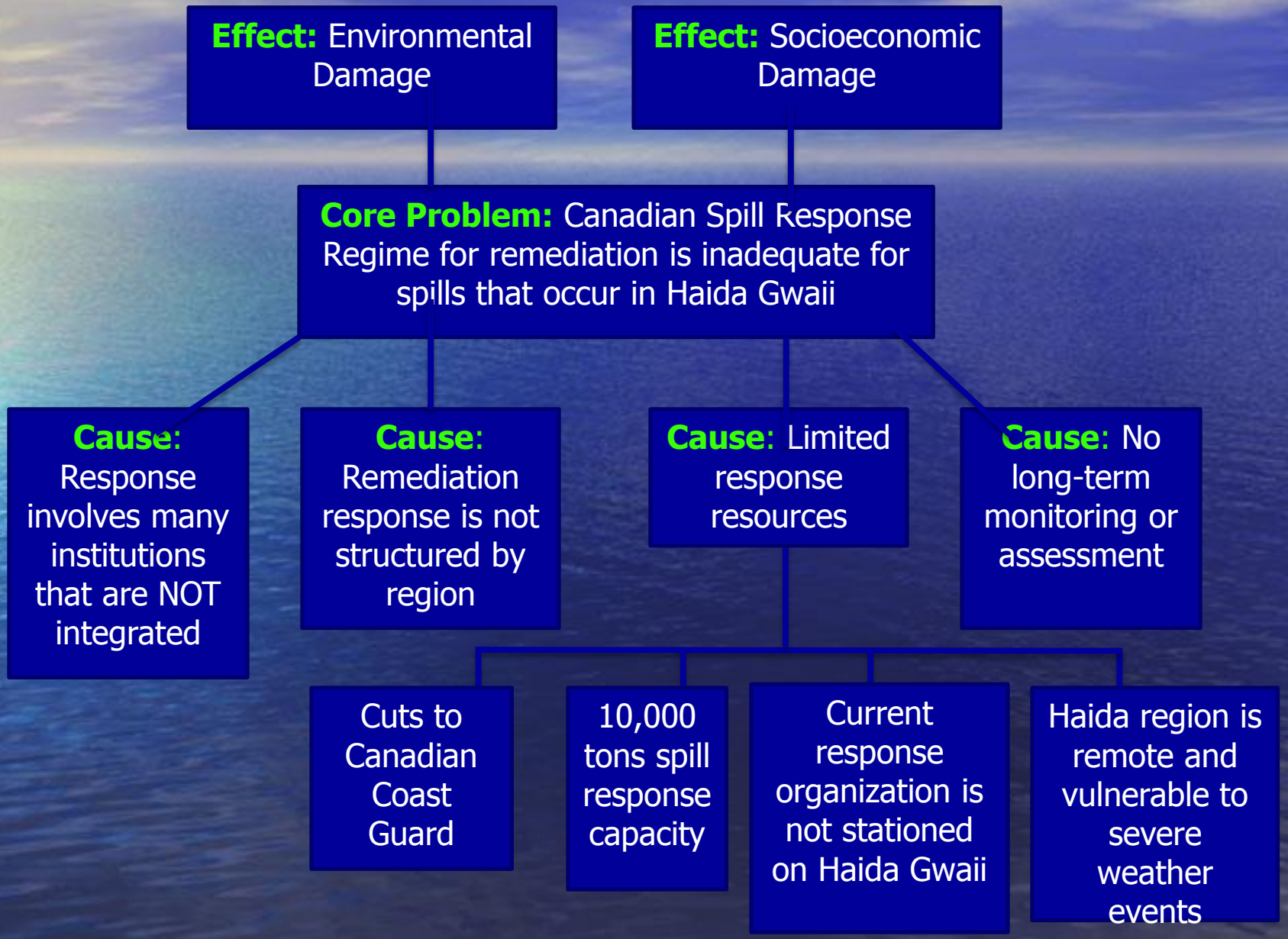
ensuring the provision of reliable, predictable, and stable supplies of goods and services at a time of escalating demand"

(Roe and van Eeten 2001)

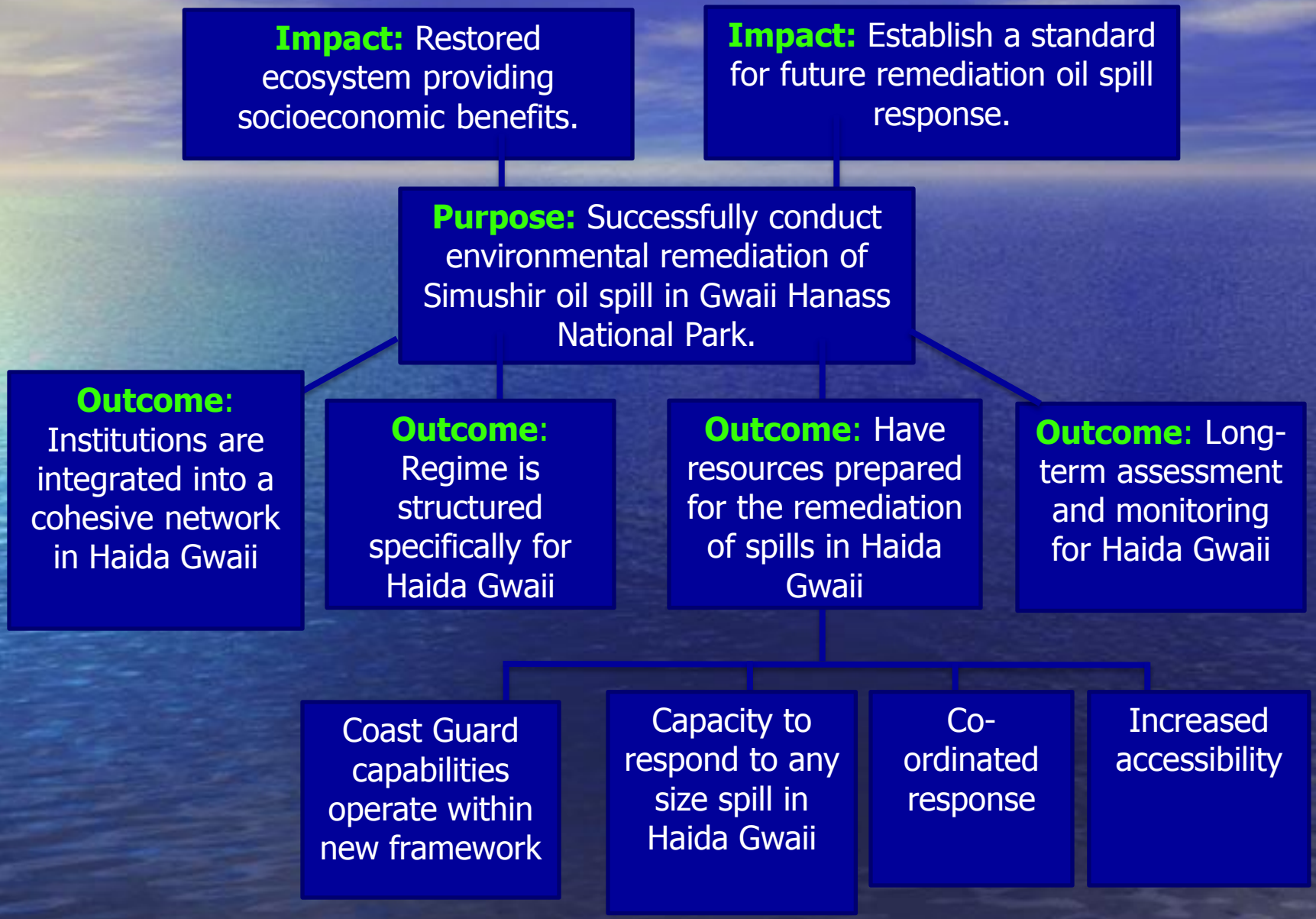
Anatomy of a problem

- Oct. 2014 Breaking News - Simushir Incident
- Indication of Canada's unpreparedness for spill response
  - Left floating for 2 days, relied on U.S. Tug for rescue (20 hrs) - This is a problem!!
- Problem - If this oil did spill: What would happen? What factors contributed to this problem? What can be done to minimize effects? How can we better manage this situation so it doesn't happen again?

Anatomy of a Problem (Borland, Dehens, Glynn & Miller, 2015)



Anatomy of a Solution



Group discussion

Identifying the problem:

What is the problem you have identified in your issue area?

What has caused this problem?

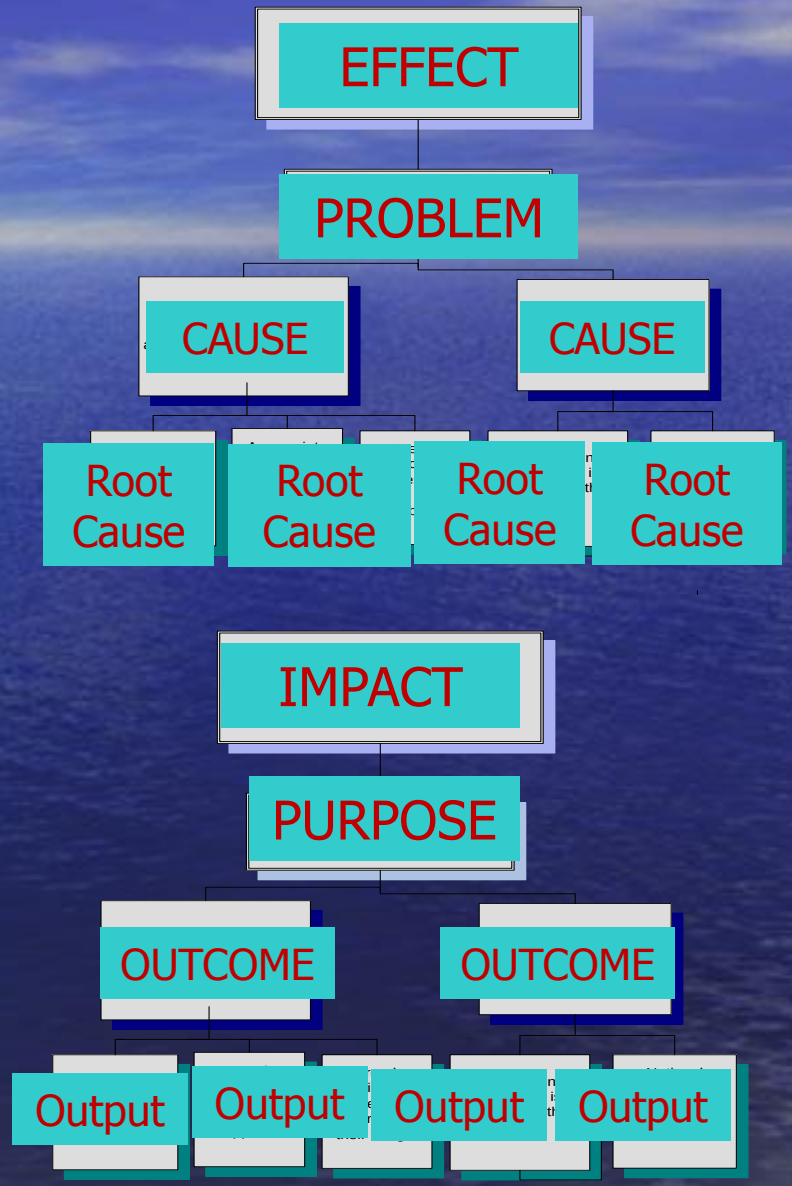
What has been the effects of having this problem?

Identifying the solution:

What are you proposing to do about it?

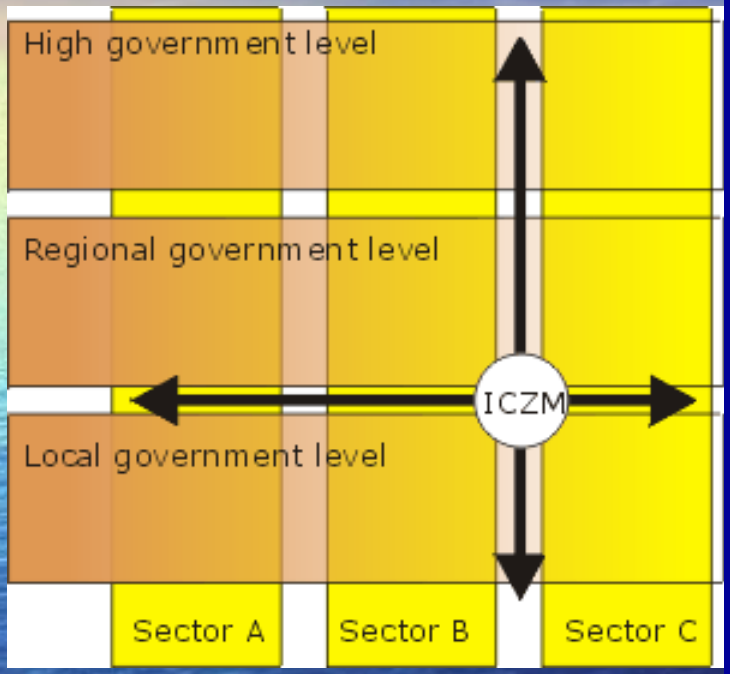
What would be the outcomes?

What would be the resulting impacts from having achieved those outcomes?



So let's think through this from an ICOM perspective - What needs to be integrated?

Integration in ICOM - Vertical and Horizontal

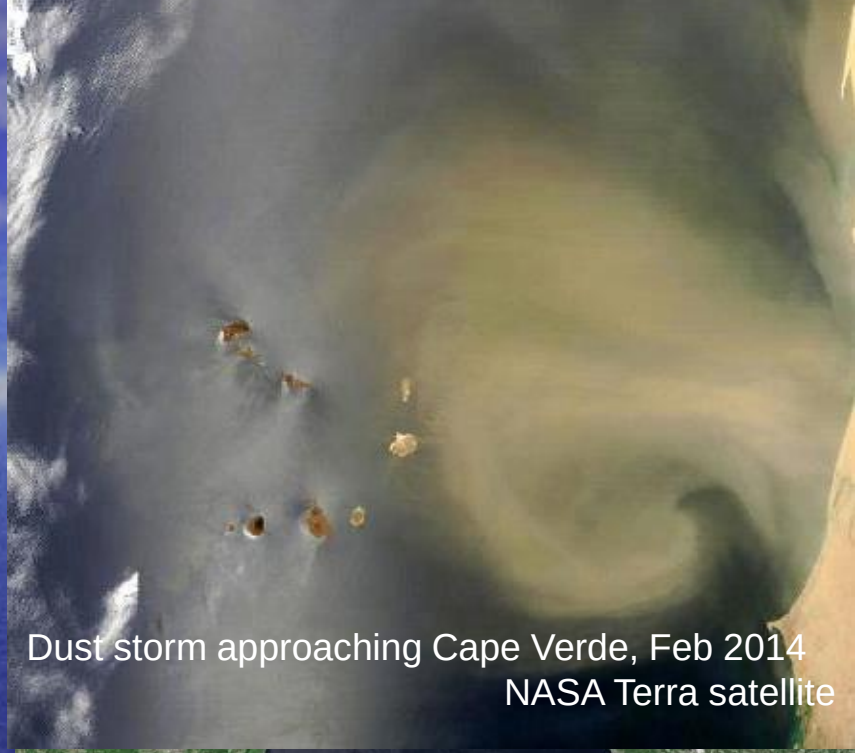


ICOM – helps construct solutions that manage the full breadth and depth of the problem

- **Intergovernmental (vertical)**
  - Among different levels of government (local, nat'l, regional, int'l), all of whom play different roles, address different public needs and have different perspectives
  - Policy and laws need to be comprehensive, coherent and consistent
- **Inter-sectoral (horizontal)**
  - Among different coastal and marine sectors
  - Between coastal and marine sectors and land-based sectors
  - Among government agencies in different sectors
  - Between government agencies and other stakeholders in different sectors
  - Sectoral approaches undervalues importance of other sectors in their analysis

Other Types of Integration

- Spatial integration
  - between inland areas, coastal lands, coastal waters, offshore waters and high seas
- Science-Management integration
  - among different scientific disciplines and management
- International integration
  - to address transboundary issues, etc.

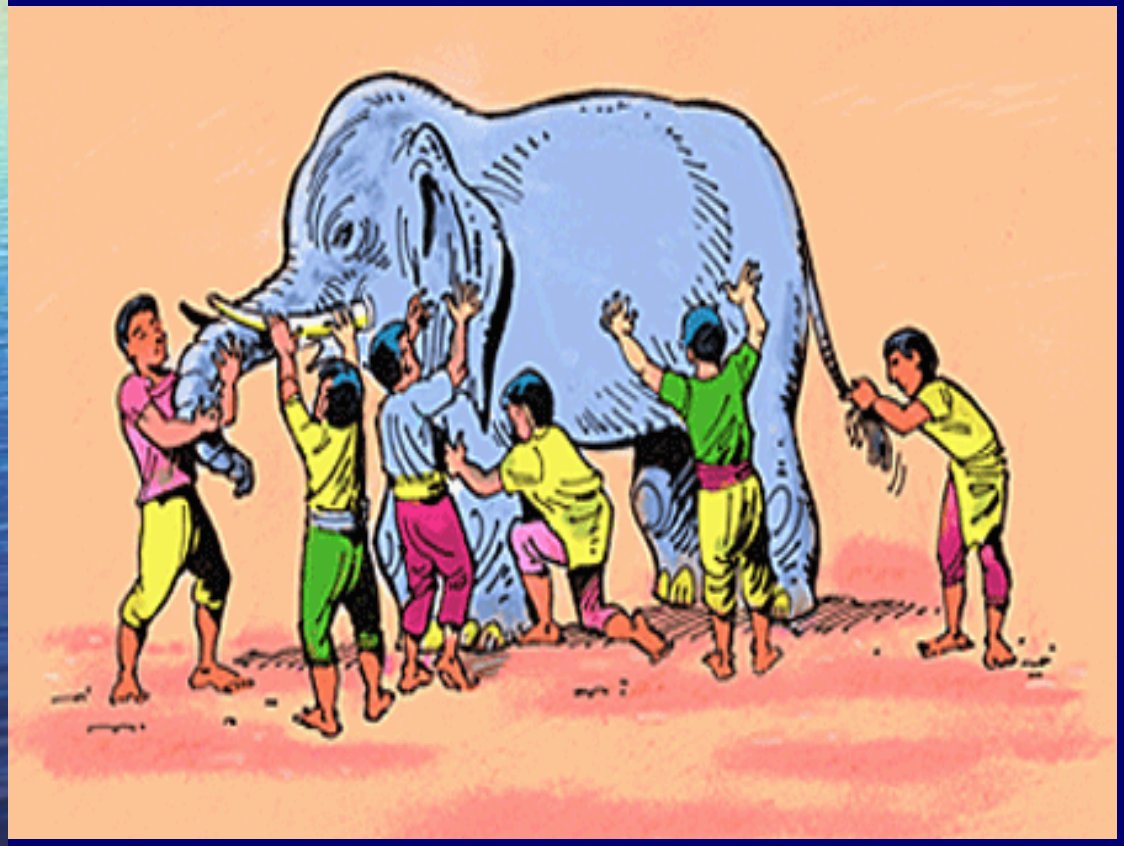


Dust storm approaching Cape Verde, Feb 2014
NASA Terra satellite

What needs to be integrated in addressing your issue area?

3. The many "pieces" playing a role in ICOM

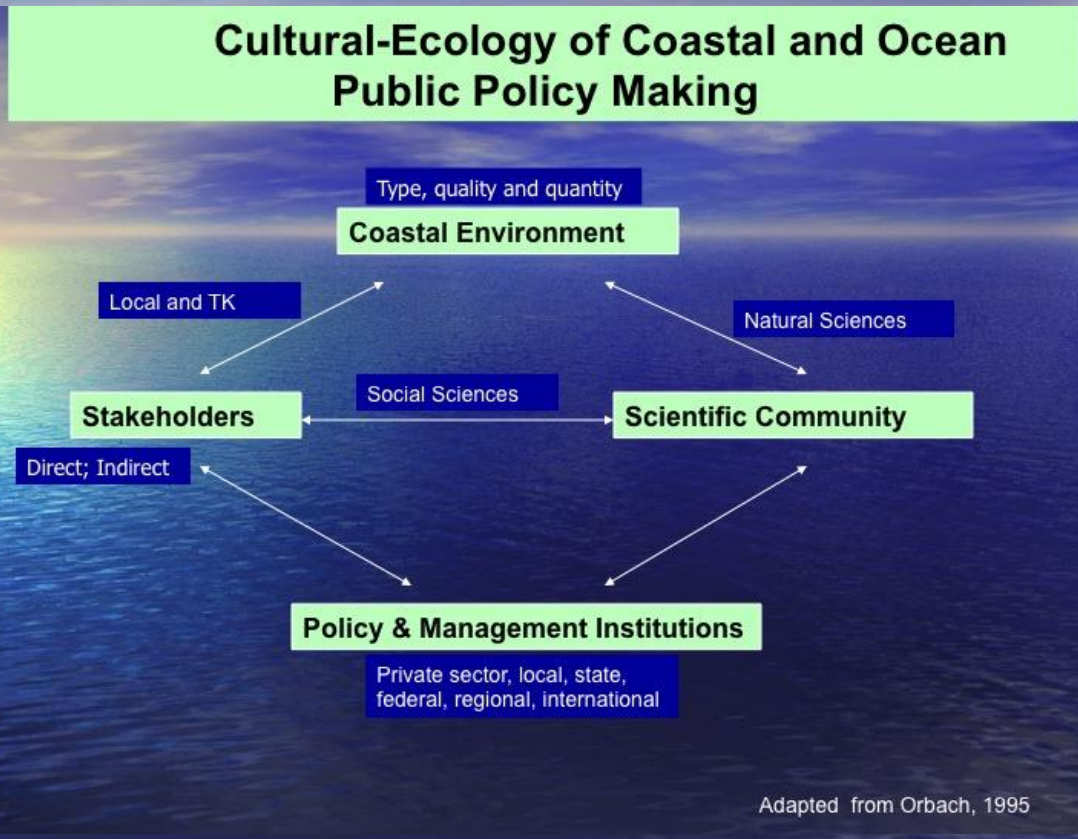
- Terminology changes with knowledge and fashion.



Parable of the 6 blind men:
One's subjective experience can be true but fails to account for other truths or a totality of truth

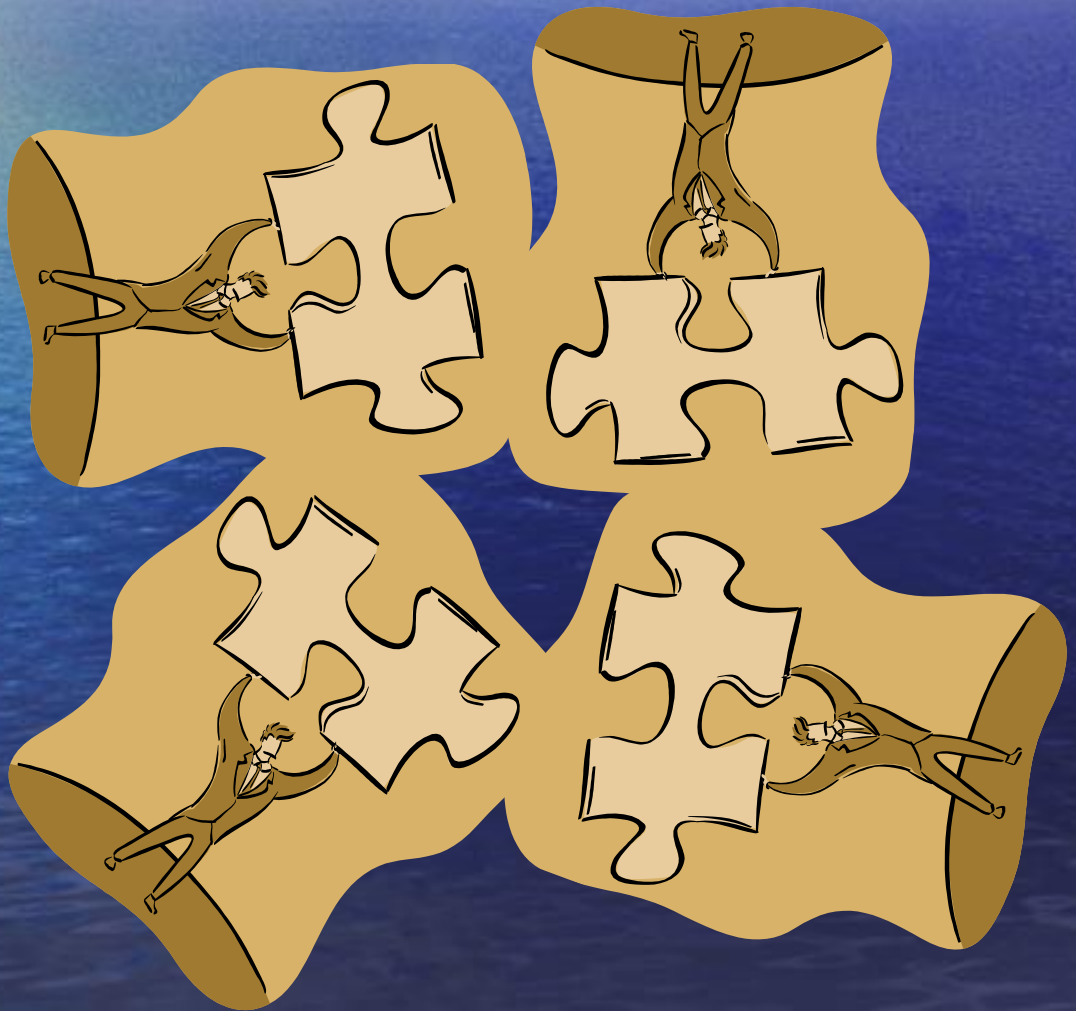
Understanding Terminology

- In ICOM planning, 3 major areas need to be commonly understood
  - The environment
    - Natural system, functions, time scale, how changing
  - The interactions of man with the environment
    - Activities, impacts
  - Management objectives
    - Our attempt to control activities and impacts



Terminology

The ICOM Jigsaw

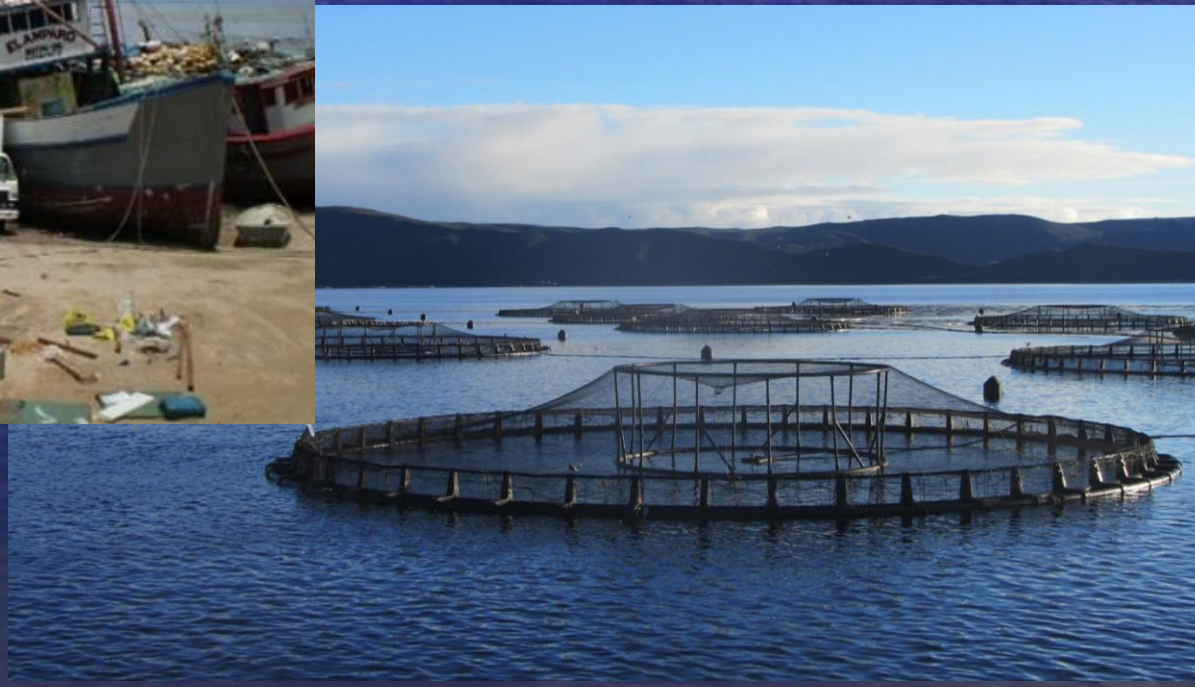


Let's discuss what the following words mean and decide collectively which one or more of the following categories it describes

Term	Environment	Interaction with Environment	Management Objectives
Pollution control			
Set back			
Aquaculture			
Storm surge			
Maritime boundary			
Sustainable use			
Coastal communities			
Climate change			
Red tide			
Beach seining			
Zoning			

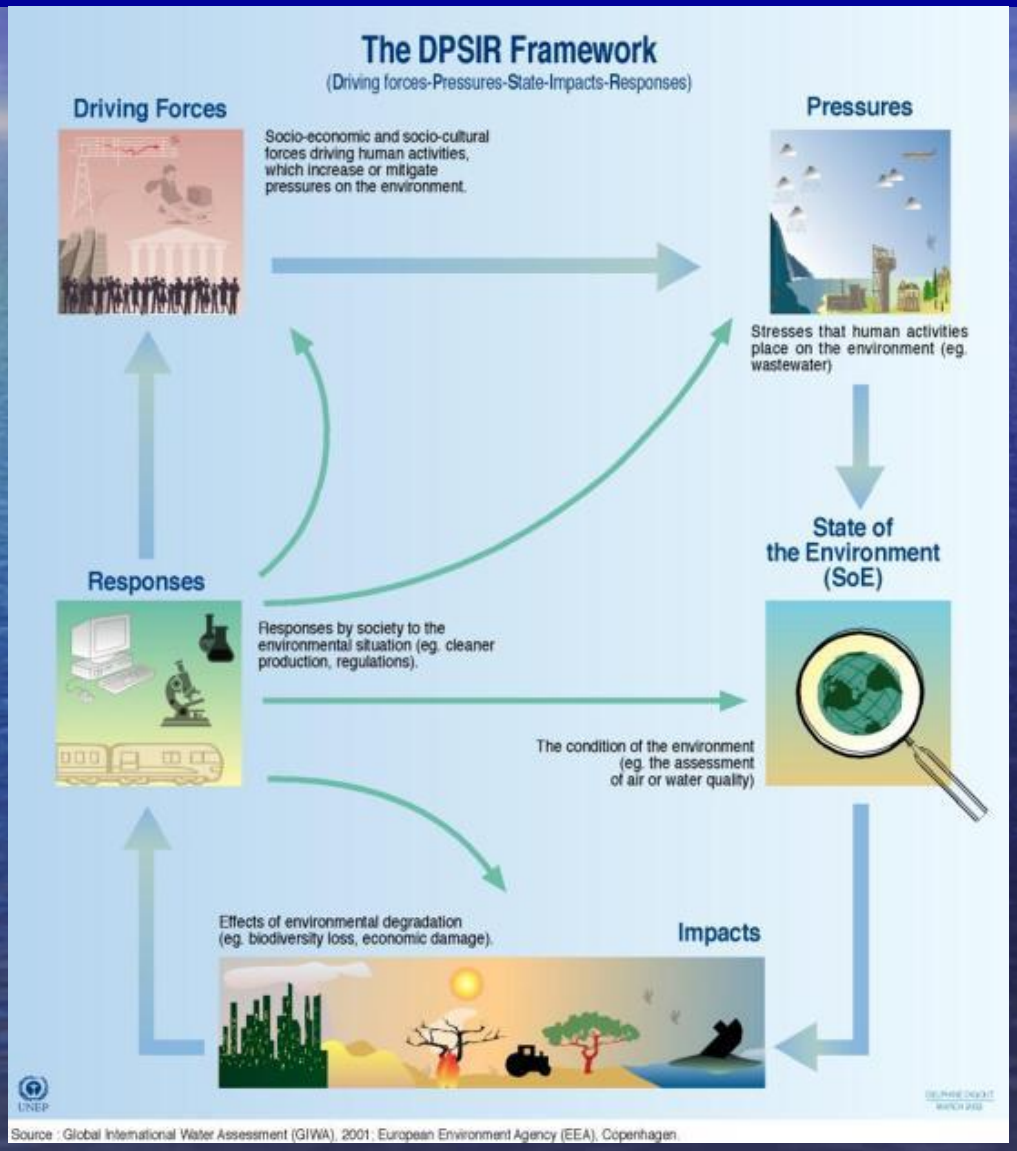
4. Drivers, Pressures and Major Management Issues

Setting the context, rationale and motivation behind your issue area



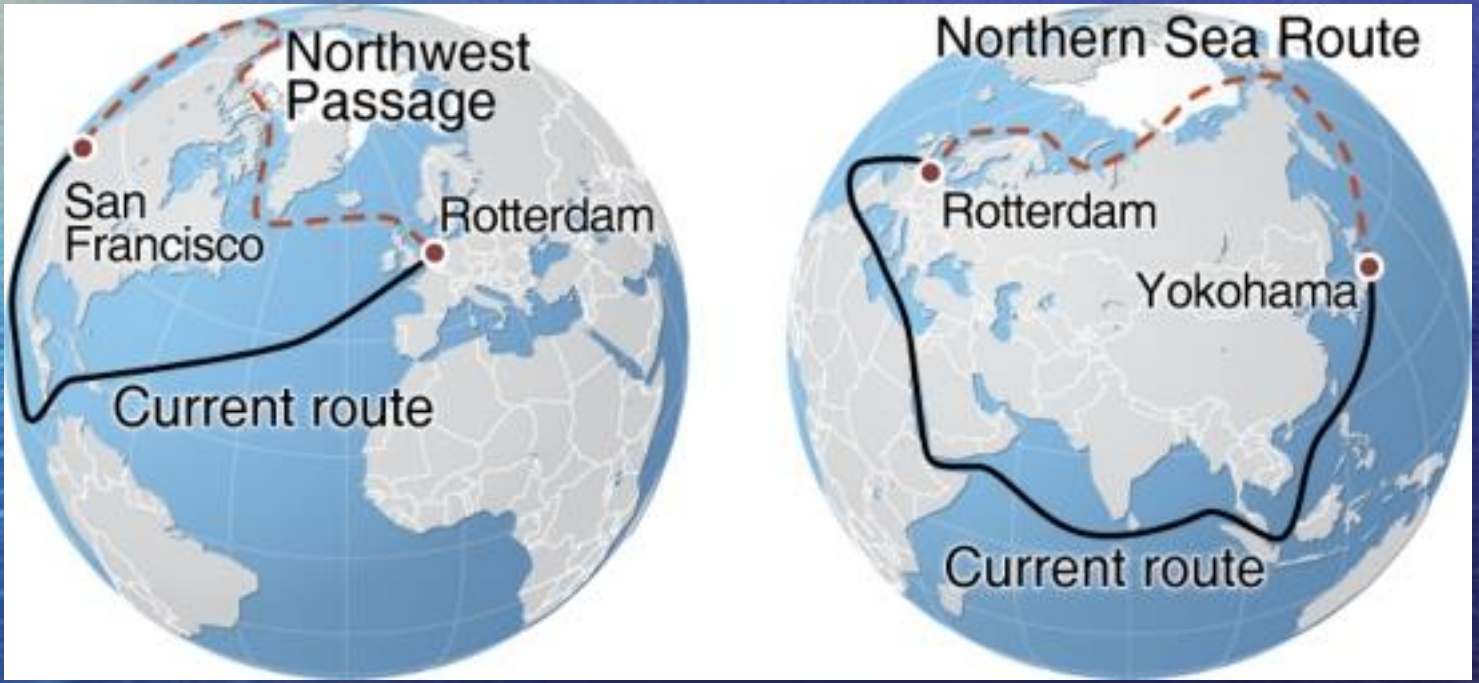
Identifying and selecting appropriate responses

DPSIR Framework



Coastal and Ocean Drivers

- Population growth
  - 20X increase in consumption by 2100
  - Coastal pop 4X US national avg.
- Global climate change
  - Green House Gases
  - Changes in distribution and species composition
  - Changes in water chemistry
  - Changes in ocean circulation
- Others?



From 9000miles to 7000 miles

(Borgerson, 2008)

From 11,200 miles to 6500 miles
From $17.5M per trip to $14M

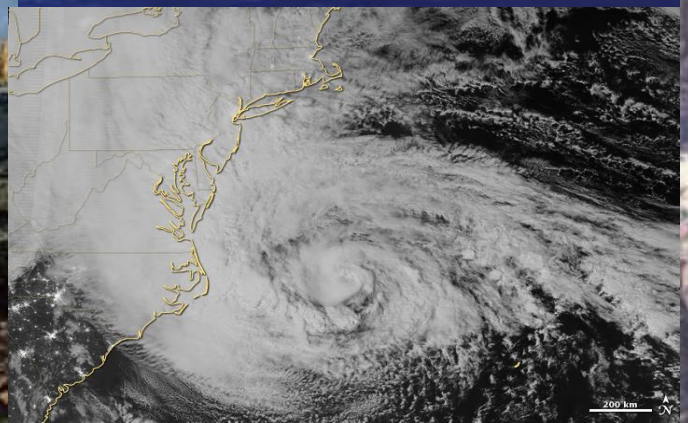
Coastal and Ocean Pressures

- Land use patterns and CZ alterations -LBSP
- Resources Uses
  - Fisheries, aquaculture, forestry, O&G, mining, tourism
- Patterns of ownership and control at multiple levels from local to international

What are the major impacts of uses in the coastal and marine environment?

- **Pollution**
- **Loss of biodiversity**
- **Increase coastal hazards - who pays?**

What issues need to be managed?



Problems	Causes and Source of the Problem?
Marine Pollution	Indonesia?
Decreasing coastal/marine resources	Malaysia?
Deforestation and soil erosion	The Philippines?
Ground water contamination	Brunei?
Urban growth/ industrialization	Singapore?
Raw sewage discharge	Cambodia?
Haz/solid waste disposal	Laos?
Beach erosion	Myanmar?
Coral reef degradation	Thailand?
Sea-level rise	Vietnam?
Illegal hunting/fishing	China?
Civil war	Malaysia?
Rapid population growth	Cambodia?
Air pollution	The Philippines?
Desertification	China?

Critical Management Issues

- Protection of coastal wetlands/habitats, biodiversity
  - large scale filling and draining
  - legacy type impacts
- Protection of coastal waters
  - BMPs (agriculture, urban areas, forestry, fishing)
  - environmental level "playing field"
  - challenge of non-point sources of pollution
- Coastal storm mitigation
  - evacuation times vs warning times
  - structural reinforcement
  - hazard zone avoidance
  - building code and elevation






Critical Management Issues

- Shoreline erosion and SLR
  - 40% of coastlines have significant erosion
  - perverse incentives
  - resist or battle coastal forces(protect), accommodate or engage in strategic retreat?
- Protection of public access
  - conflicts between developers, private property owners and public
  - private property vs public interest
- Coastal Planning
  - social equity - "gentrification of CZ"
  - urban design and community character
- Safety and security/customs/illegal activities/terrorism, etc.


TIME FOR A BREAK!!!!
Sunrise on Fraser Lake,
Timberlea, Nova Scotia,

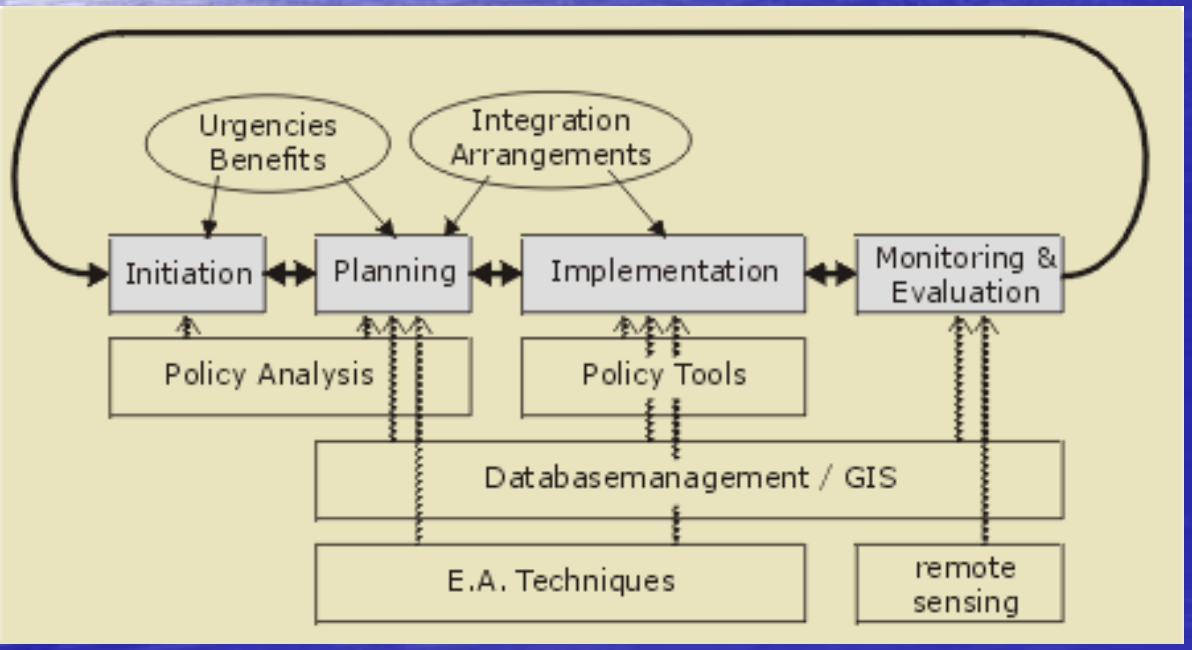
5. How can a manager make sense of current uses and issues and better plan for emerging uses?

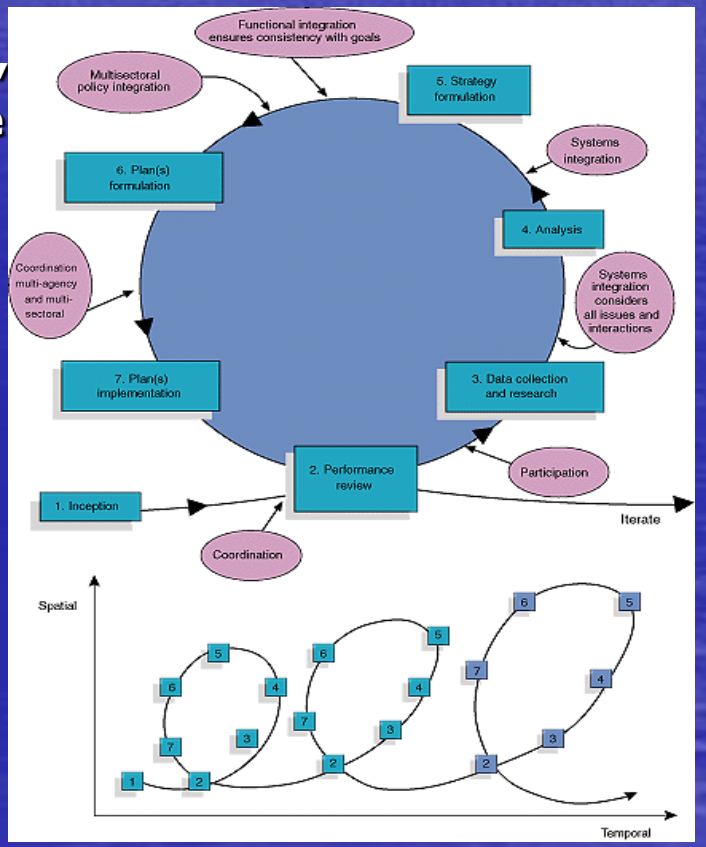
ICOM Process

Stages of the ICOM Process

- **Initiation** – evidence of a problem with existing approaches
- **Planning** – what is it, why do we need it, what would it do, who supports it, etc.
- **Implementation and Operation** – formal adoption, funding, legislation, communication, coordination, etc.
- **Monitoring & Evaluation** – hypothesis testing,

How has context changed: priorities, state, governance



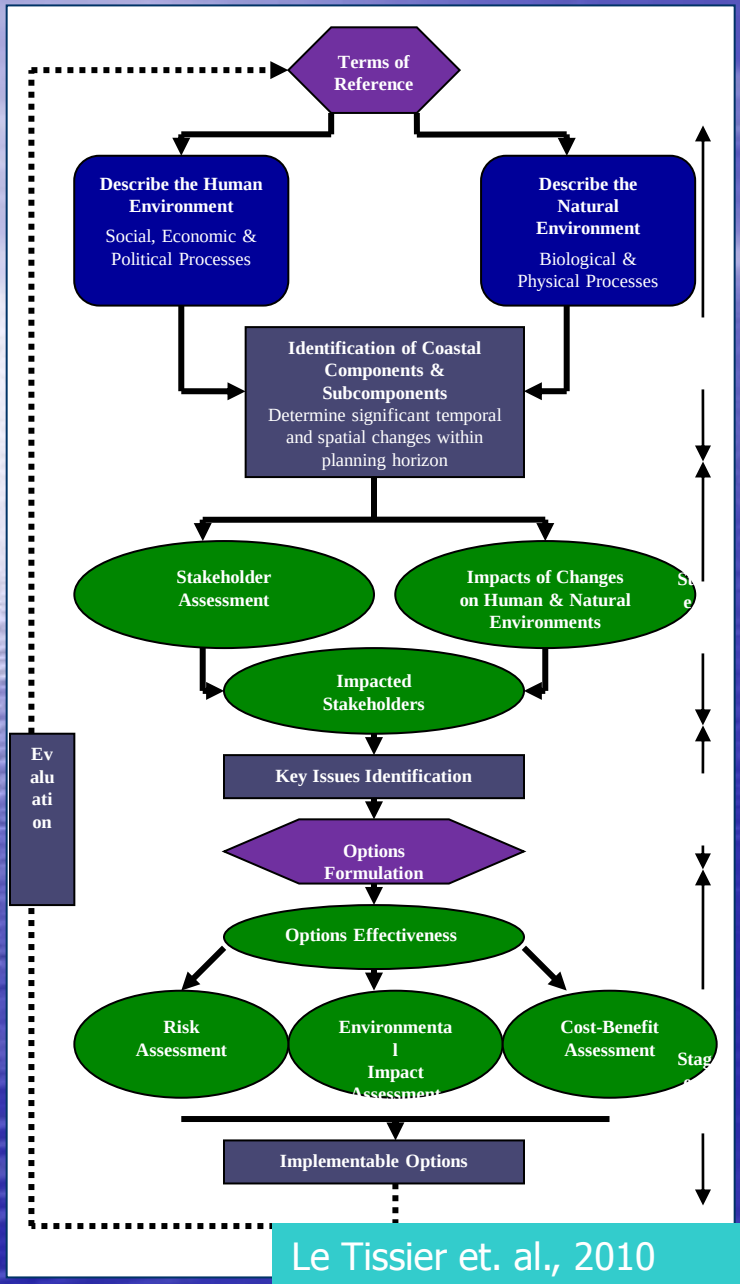


ICOM Management Plan Components

An ICOM Plan should include:

- description of area to be managed
- description of problems/opportunities, goals, objectives and targets
- statement of principles and policies to guide the program
- timeframe
- statement of management actions to be taken
- description of required institutional arrangements, laws and policies, responsibilities, support needed
- funding and staffing requirements
- actions needed to adopted plan and timetables for action

ICOM Planning Critical Path Analytical Framework



Le Tissier et. al., 2010

- **Terms of reference** defining spatial and temporal boundaries, principles for decision making and goals, objectives and targets of the plan
- **Stage 1** - gather information on natural and human components and anticipated change in the plan area
- **Stage 2** - assimilate and integrate the information in a non-sectorial manner and determine impact of change
- **Stage 3** - identify key issues and management options
- **Stage 4** - evaluate and assess options against goals, objectives and targets in the ToR

Task 1. Discuss what might be the Terms of Reference for your issue area?

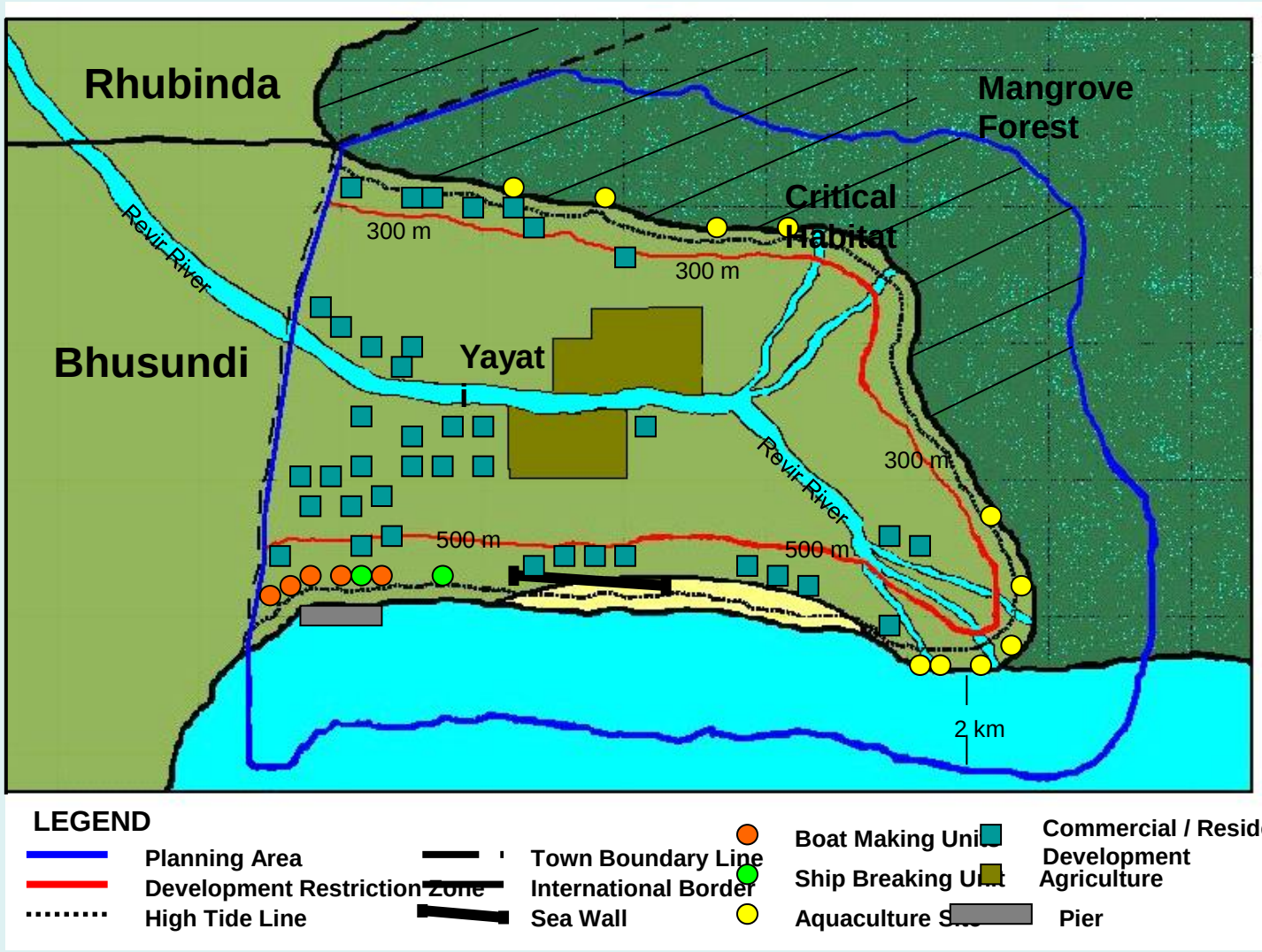
Geographic boundaries?
- Administrative?
- Functional?
- Issues-driven?

Time scale?
- Short term
- Long-term

Specific issues to address?

Goals and objectives?

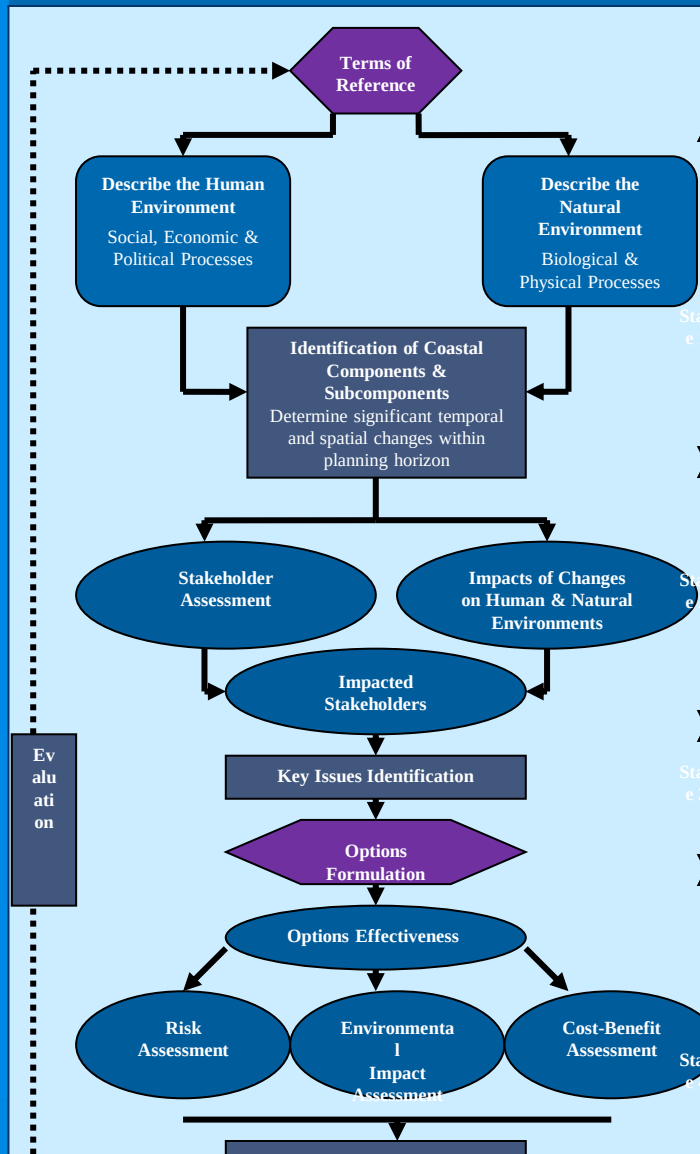
Specific targets to achieve?



Stage 1 - Information gathering on human and natural components and change in the plan area

- **What data and information do you need to describe the natural and man-made physical components of the plan area that are important features of the area being managed?**
- **Where would you get this data and information?**

- **What are the significant temporal and spatial changes taking place in the planning horizon which impact people or coastal and ocean resources and the causes of change**
- **Where would you get this data and information?**



Stage 1 Outputs

Outputs

- Knowledge base of the natural and human dynamics taking place in the plan area
- Understanding of changes taking place in the plan area and the causes of change
- Foundations for understanding the interdependencies between natural system and the users and uses that are made of the resources and space available within the planning area

Natural or human-made physical component categories and significant temporal and spatial changes

Components	Sub-components	Changes
Coastal environment	Beaches and dunes, estuary and creeks, mangroves, ground water, etc.	Erosion, cyclone, sea-level, species depletion/introduction
Land use	Agriculture, forestry, seawall and breakwater, etc.	Conversion to aquaculture, seawall construction, etc.
Ports & Harbours	Jetty, storage, etc.	Dredging, expansion jetty construction, etc
Industry	Fishing, tourism, ice plants, aquaculture	Increase in pollution, increase in fishing effort, modernization
Housing & Infrastructure	Hotels, residential, govt offices, etc.	Tourist inflow, increase population, cities

Natural or Human-made Physical Features

Components	Sub-Components	Changes
1. Coastal environment Formed by natural processes	Delta, beaches and dunes, estuaries, mangrove forest, groundwater and surface water	• Erosion, sea level rise; • decrease in species composition/biodiversity; • destruction of ecosystems/ habitats by storms, cyclones, tsunamis, etc.; • flooding and salt water intrusion. [1]
2. Land Use Natural or man-made	Agriculture, mangrove forest, seawall, beaches and roads.	• Conversion of natural ecosystems for agricultural use; • pollution of water, soils, and biota by agrochemicals; • increase in nutrients from fertilizer use; • erosion and soil loss from deforestation; • alteration of hydrology, increased salinization of soils from irrigation and canal development; • increase in water consumption; • chemical contamination of freshwater and coastal waters; • mangrove degradation, pollution, and depletion; • accelerated erosion; • decrease in coastal protection against storms, tsunamis; • loss of fish and wildlife habitats; • increase in pollution resulting from paved surface runoff; • increase in resource use conflicts or competition for space use/ access to resources; • changes in erosion patterns from seawall construction; • changes in hydrology, use of soils, and ecosystem disturbance from road construction. [2]
3. Ports and marine transportation / Navigation structures	Wharves; shipping, ship building, ship breaking, storage and maintenance sheds; channel markers or coastal navigation beacons.	• Pollution of water, air, sediments, and biota from waste; • alteration of the sediments from dredging; • water consumption; contamination from dredge spoil disposal; • introduction of invasive species; • pollution of air, water, soils, biota from accidental spills of oil/ hydraulic fluids and chemical use/ discharge/ spills; • impacts of construction on marine habitats/ species; • increased ship strikes/ collisions with navigational aids. [2]
4. Industry and associated structures	Tourism, fishing, prawn collection, aquaculture, boat building, ship breaking, ice plants.	• Increase in potable water demand/reduction in water supply; • degradation of natural habitats (mangroves) from tourism pressures; • loss of fish from fishing due to by-catch practices; • alteration of sea and river beds from trawling; • overexploitation of fish and mangrove resources; • mangrove waters contamination from dredging for prawn; • loss of coastal protection from storms and habitat; • contamination of wild fish genetic strains; • spread of fish diseases; • increase in contamination of soils and water (heavy metals, oil, hazardous substances) from industrial activities. [2]
5. Housing and infrastructure for service provision	Resort hotels and associate amenities; government buildings.	• increase in population numbers; • alteration of hydrology from construction; • increase in water consumption; • increase in pressures on natural resources and wildlife; • conversion of vegetation, ecosystems and soils by construction; • loss of habitat; • increase in pollution of water, air, and soil pollution from wastes; • increase in public health risk from contaminated fish; • decrease in groundwater supply; • urban expansion. [2]

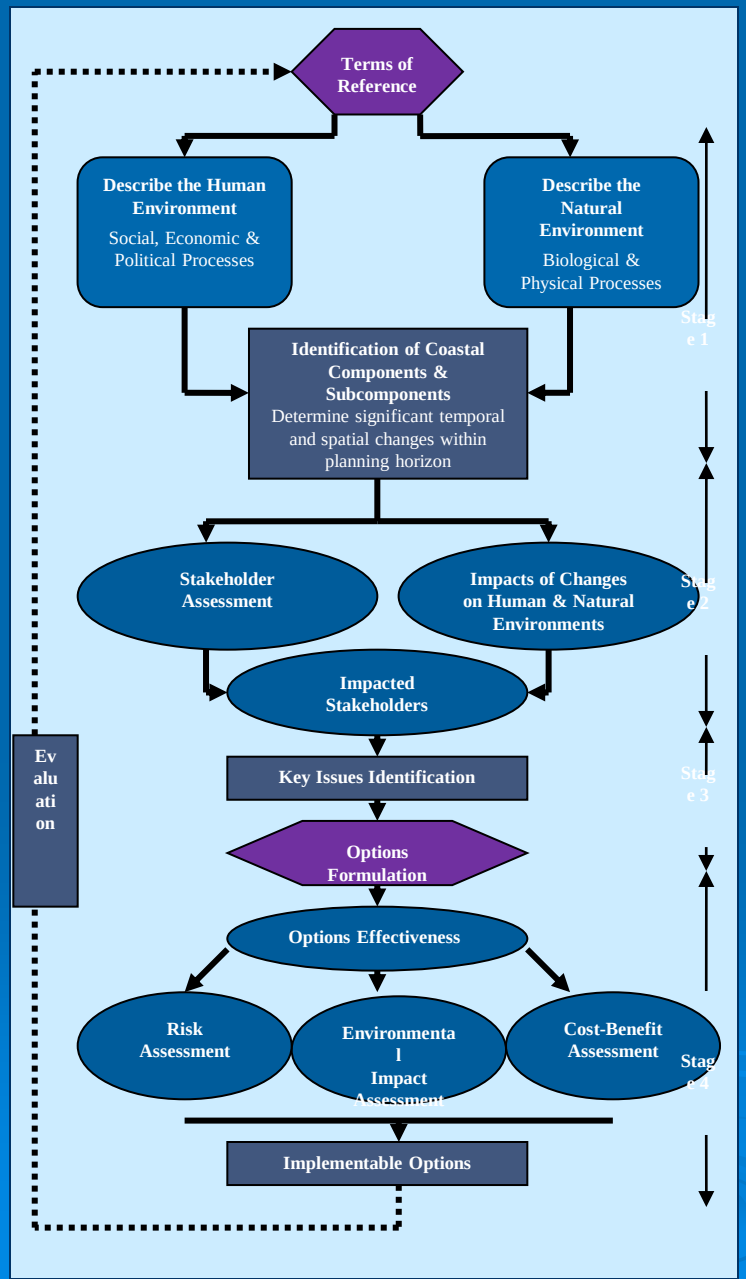
ICOM plan – Stage 1

Task 2: Determine information required to develop knowledge base for the plan area

- Identify the important natural or human-made physical sub-components which are important features of the plan area

Task 3: Identify significant existing and predicted changes within the planning horizon which impact significantly on people or coastal resources, **in the absence of any form of ICOM intervention**

ICOM Planning Critical Path Analytical Framework



Stage 2 - Determining the impacts of change

- Interaction matrix
- Stakeholder assessment
- Stakeholder Matrix

Outcome of stage 2

- Recognition that ICOM is a **negotiated process** focused on stakeholders rather than disciplinary or sectoral interests
- Understanding **different impacts on different stakeholders** for each change
- **Prioritization** of target activities for management action
- Greater understanding of **dynamics** of the plan area and their **impacts on users** and uses of the resources and space

Interaction Matrix - Moving decision-making away from "expert mystic" to consensus group outcome

			Components															
			Coastal Environment						Land use						Ports and Harbours		Industry	Housing & Infrastructure
			Dry flood plain (>2m)	Wet flood plain (<2m)	Shoreline	Creeks	Mangroves	Forestry	Agriculture	Aquaculture	Ponds	Kitchen gardening	Animal sheds	Wells	Fishing harbour	Jetty	Saw Mill	Houses
Changes	Coastal Environment	Sea level rise		√	√	√	√			√				√	√	√		
		Cyclones	√	√	√	√	√		√					√	√	√		√
		Erosion		√	√													
		Accretion		√	√		√		√									
		Siltation				√	√			√					√			
	Land use	More wells							√									
		More agriculture	√	√														
		More nat. resource exploitation		√			√	√							√			
	Ports and Harbours																	
	Industry																	
	Housing & Infrastructur	More Houses							√									√

Figure 2. Example of an Interaction Matrix from a low lying coastal area in area in Bangladesh.

Interaction matrix – what is its value?

- provides a structure for **priorization of information** and to ensure discussions become clearly directed and nonsectorally entrenched.
- allows for **decisions to be accountable as it provides an evidentiary trail** of the decision-making process

Placement of interactions provide interpretation of dynamics in the area

- Interactions arising from changes in **the coastal environment** might **not be able to be modified by human intervention** --- but the consequences of this change must be reduced.
- Interactions arising from changes in **the human categories** suggests human activity is the prime driver of change and management could be more related to **changing the drivers through intervention** rather than coping with consequences

Who are the stakeholders in your issue topic?

- Different groups have diverse economic, social and political interests associated with resource use in the coast and ocean environment.
- Need to understand who the “users” of the resource are and the dimensions of their interest in particular “uses” of the resources of a given locality

Stakeholder – Interaction Relationship Matrix
Impacted stakeholders

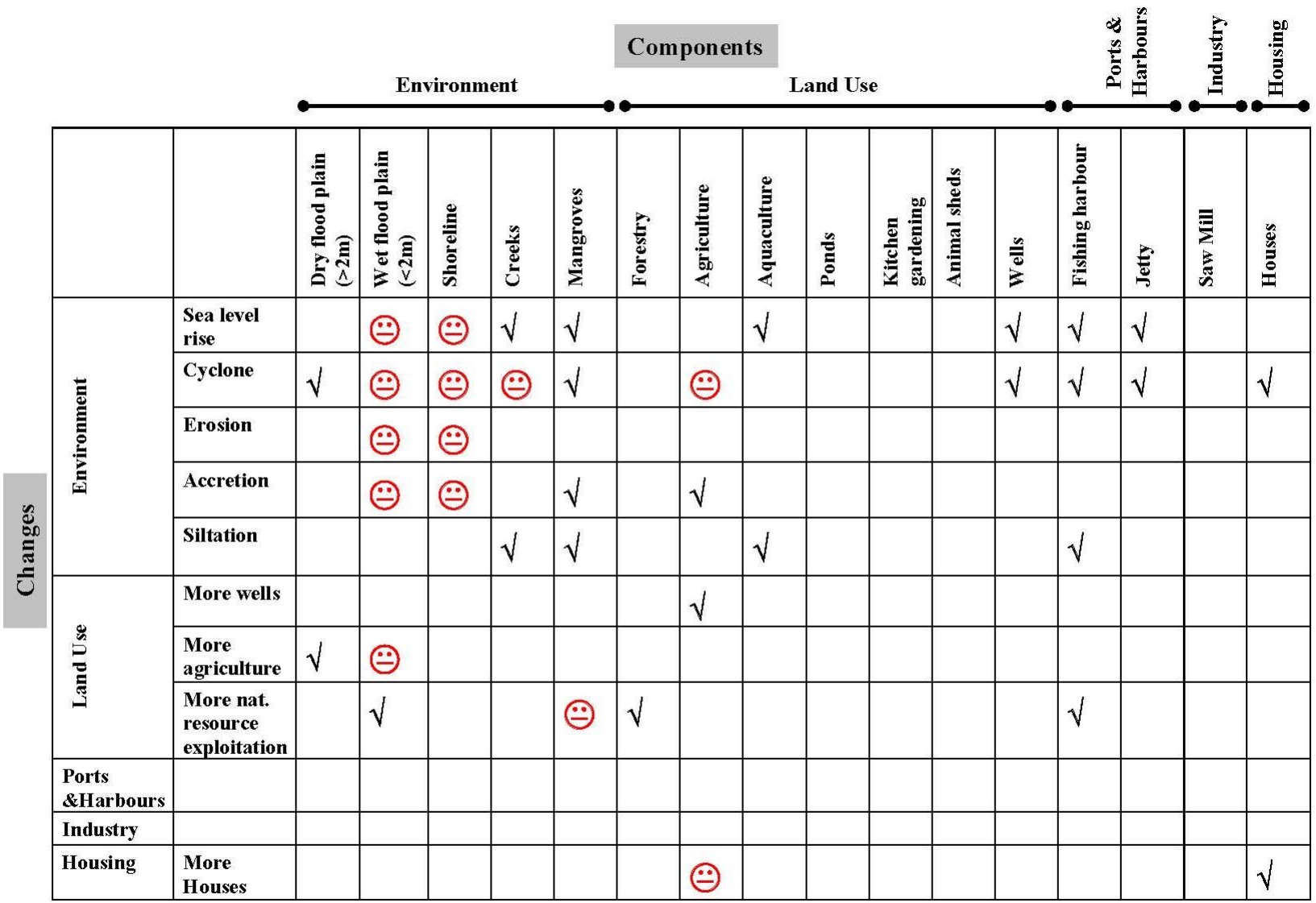


Figure 3a. Example of Stakeholder Matrix for in-migrating landless people (faces symbol) in a low-lying coastal area of Bangladesh.

ICOM plan – Stage 2

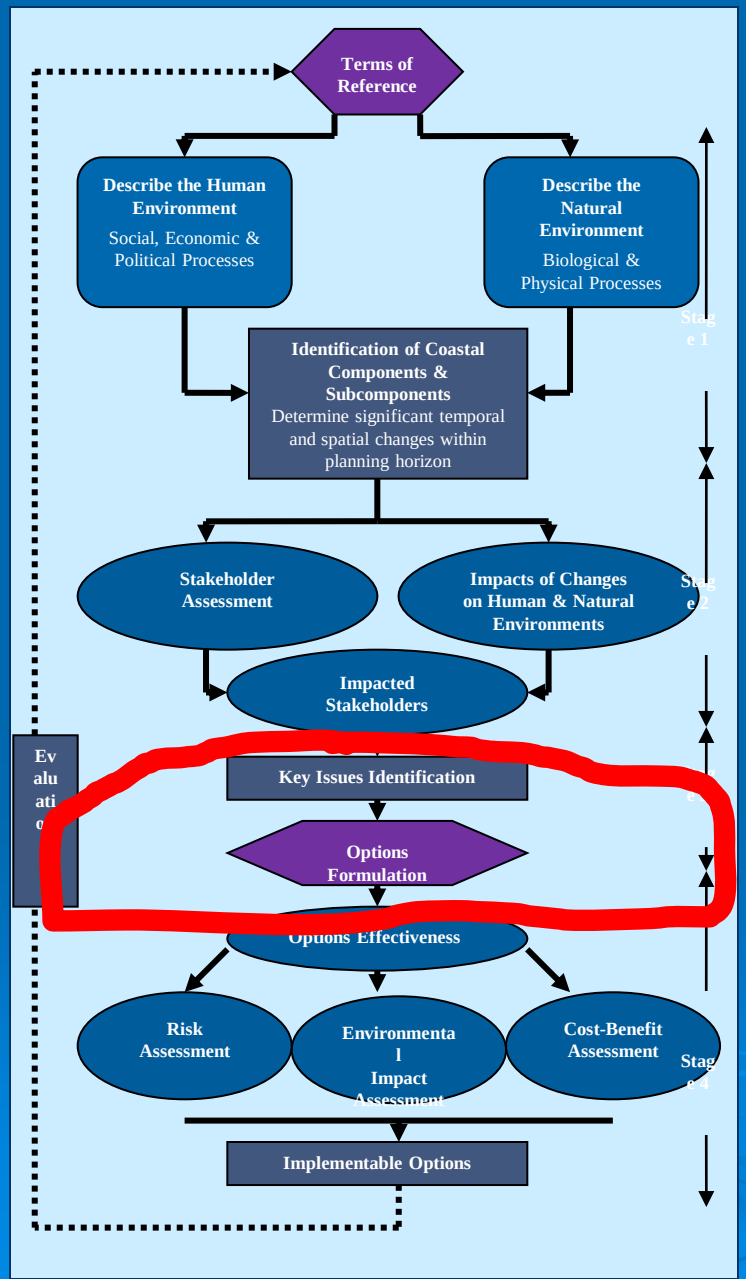
Task 4: Identify stakeholders for your topic area

- Are they local, national, international?

Task 5: Complete a stakeholder-interaction matrix for 3 if the identified stakeholders

- Examine results of interactions with stakeholders and focus on those that impact a number of different stakeholders

ICOM Planning Critical Path Analytical Framework



Stage 3 - Determining potential management options

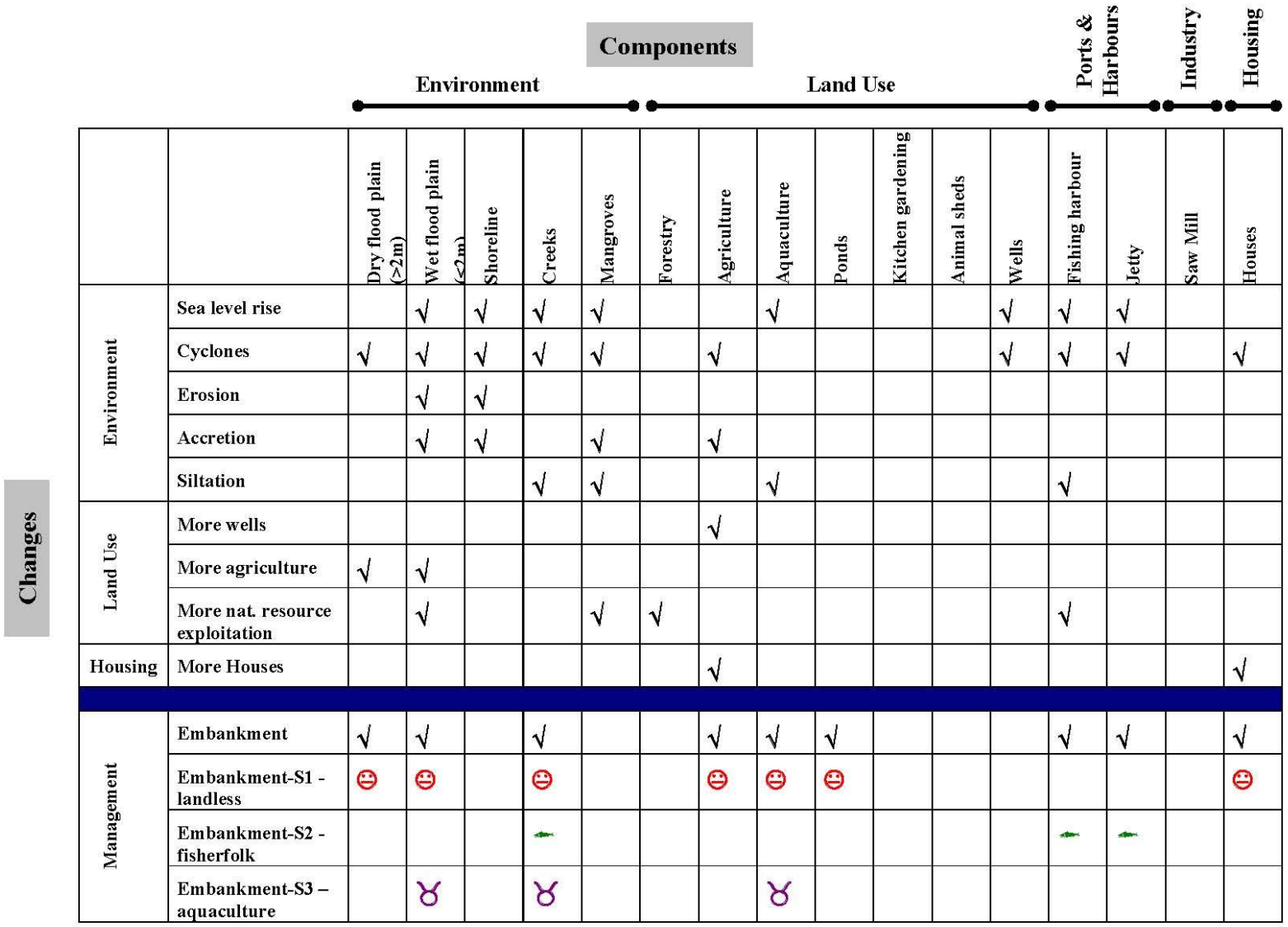
- Options matrix

The Options Matrix

- Each proposed option, if implemented will effectively impose a new “change” on the plan area
- Single management intervention
  - e.g. relocation of vulnerable communities away from hazard zones
- Suite of complementary management interventions
  - e.g. early warning system
  - e.g. construction of cyclone shelters
  - e.g. rehabilitation of buffer ecosystems such as mangroves
  - e.g. relief management response to storm hazards

Management options which impact on a wide range of components require careful consideration to determine if the change produces interactions that did not exist previously

Options/Interventions Matrix



Changes		Components: Environment						Land Use								Ports & Harbours	Industry	Housing
		Dry flood plain (>2m)	Wet flood plain (<2m)	Shoreline	Creeks	Mangroves	Forestry	Agriculture	Aquaculture	Ponds	Kitchen gardening	Animal sheds	Wells	Fishing harbour	Jetty	Saw Mill	Houses
Environment	Sea level rise		√	√	√	√			√				√	√	√		
	Cyclones	√	√	√	√	√		√					√	√	√		√
	Erosion		√	√													
	Accretion		√	√		√		√									
	Siltation				√	√			√					√			
Land Use	More wells							√									
	More agriculture	√	√														
	More nat. resource exploitation		√			√	√							√			
Housing	More Houses							√									√
Management	Embankment	√	√		√			√	√	√				√	√		√
	Embankment-S1 - landless	☹	☹		☹			☹	☹	☹							☹
	Embankment-S2 - fisherfolk																
	Embankment-S3 – aquaculture																

Figure 4. Example of an Options Matrix showing the impact of the construction on landless, fisherfolk and aquaculture stakeholder groups.

ICOM plan – Stage 3

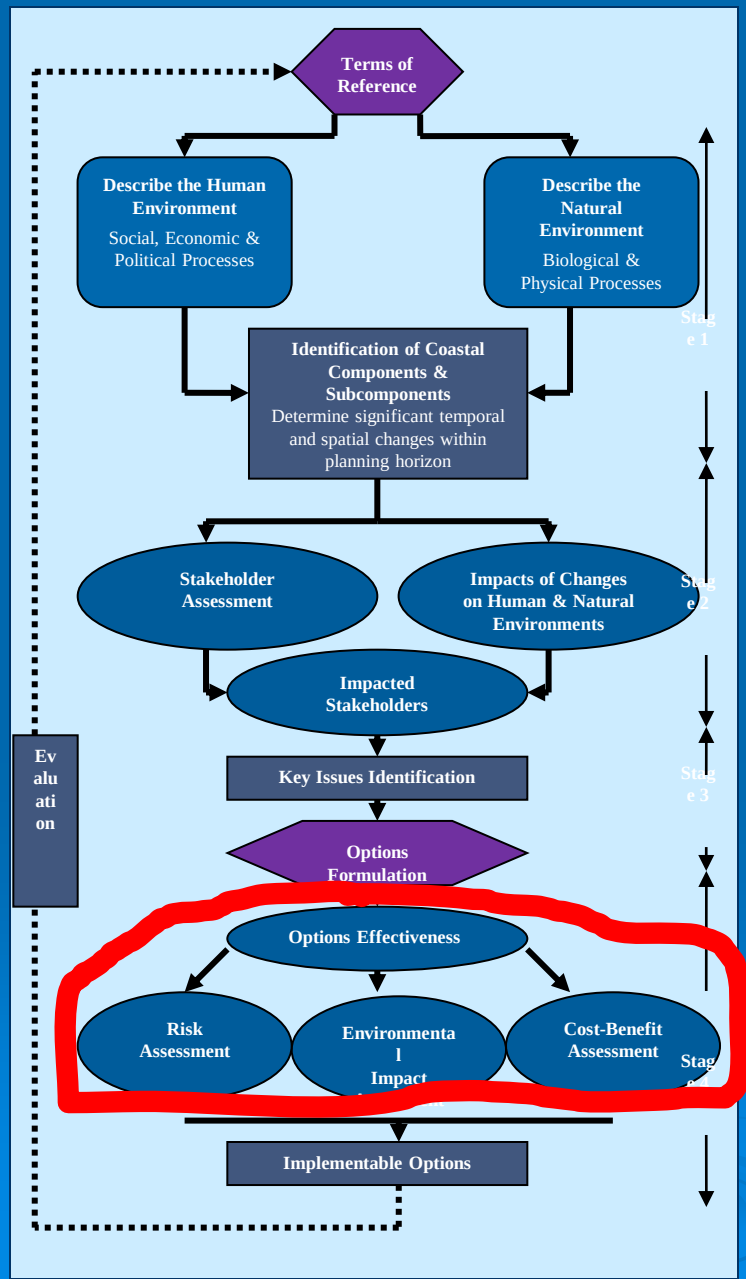
Task 6: Identify at least 1 option for addressing your major stakeholder-interactions matrix results for your topic area

Task 7: Complete a stakeholder-interaction matrix for the identified option on 3 of your identified stakeholders

- Based on the results, is this a good option to recommend?

Only if the answer is "YES" would be proceed to Stage 4 and assess the policy implications, costs and risks associated with implementing it!

ICOM Planning Critical Path Analytical Framework



Each step represents a distinct event that must be adequately completed before it is logical to proceed to the next stage

謝謝

Thank you

ขอบคุณมาก

Terima kasih

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Salamat

cảm ơn bạn

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chei-zu tin-bar-te