BOOK 1

TRAINING MODULE

CAPACITY BUILDING TO INTEGRATE DISASTER RISK REDUCTION INTO COASTAL MANAGEMENT IN INDONESIA

Co-organized by :

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Mangroves for the Future
INVESTING IN COASTAL ECOSYSTEMS

UNEP

ISDR
International Strategy for Disaster Reduction

Contents

LIST OF FIGURES

LIST OF TABLES

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HOW TO USE THIS MODULE?

This module is developed to integrate the Disaster Risk Reduction into the Coastal Zone Management in Indonesia. The training is completed with two books, first, training module (book 1) and fieldwork guide (book 2). The book 1 is divided into three chapter consists of (integrated) coastal zone management (ICZM), disaster risk reduction (DRR) on coastal area and lastly is the most crucial part on the integration of DRR on ICZM. In each module, there are objectives and learning outcomes, fact and finding for Indonesian case also provided. In each module, there are some sessions of discussion, which will be elaborated further in the form of power point (attached in the annexes). Each session is completed with the exercise that posited at the end of the book 1.

First part of the book covered three sessions; mostly introduce the physical characteristic of coastal area, the dynamic processes, the ecosystem, the environmental degradation, coastal hazard, and the concept of integrated coastal zone management. Second, the module revealed the importance of Disaster Risk Reduction in the coastal zone management. The session covered on the basic concept of DRR, the implementation and practice in Indonesia, the basic measurement method, the climate change phenomena as the existing condition in the coastal zone (example of hazard) and last but not least is the community empowerment via the DRR. The third chapter includes all possible integration of DRR into ICZM via planning process, program/project or policy analysis. The available data and possible discussion method on integration is provided, however, there are some gaps need to be fulfill, between the national/strategic level with the local/operational level.

In summary, Book 1 will guide the participant to have more acknowledgment on the three basic frameworks on (Integrated) Coastal Zone Management, Disaster Risk Reduction in coastal area, and the integration of both concepts. The integration of both concept is unique in each country, thus, via the training, there will be more exercise emphasize the participant to conduct varied discussion method to came up with suitable integration method for Indonesian case.

Book 2 covered the fieldwork manual. The training is completed with fieldwork to Semarang and Demak, located on the Northern Coast of Java Island. The fieldwork is important to add some insight and provide with real example of coastal environmental problem and disaster related activity via various discussion and data compilation method.

INTRODUCTION

Coastal area is prone area of disaster. It is an area with high population densities. Thus, people are jeopardized or vulnerable towards particular threats or hazard. Where is the coastal area? There are various definitions over the term of coastal, universally and locally identified either by the government, the local people, academics, and practitioners. Varied stakeholder involved in the coastal management, and yet there weren't much consensus over the definition. Thus, similar sharing ideas, thoughts and knowledge would be a benefit for them, so that the management will be initiated based on the similar base of understanding. Why is it so important to do so? As mentioned before, there are indications that people who lived in the coastal area were tending to live in prone area of hazards. What hazard? There are various type of hazard in the coastal area, ranging from natural hazard, social hazard, and technological hazard. These varied types of hazards were induced by various human activities, natural processes and miss-match management system.

Each element of the environment holds significant role to promote sustainable and safer development plan for coastal area. However, without proper integration of the concept, there are not much thing can be coordinated properly. Practically, there are various conflict management and interest in the coastal area, whilst the colliding issue of environment versus economy has been ages being debated. Thus, integration of ICZM and DRR is another proposed action to save available resource in the coastal area and promote better livelihood for the community who lived in the coastal area.

This book is intended as a practitioner's guide in the disaster risk reduction issue of coastal area. Although various references in the (integrated) coastal zone management (ICZM) and the disaster risk reduction (DRR) are available, this module tries to provide more overview and examples which at the end emphasize on the integration of ICZM and DRR. Basic ideas compiling the book are to provide more insight for the coastal stakeholder, which able to promote sustainable and safer development planning for coastal area.

The guidebook tries to introduce the importance of Disaster Risk Reduction in the coastal area due to varied natural hazards. An example of the natural hazards, such as the global climate change issue is rising vastly and cause more negative impact, thus, quick response towards the phenomena is recently needed. Indonesia, as archipelago has different types of coastal area and small island characteristics. Therefore, an initial action to acknowledge the geological, geographical, biological and ecological characteristics will be provided. However, introduction towards its natural system is not adequate, since the various cultural backgrounds exist. The social cultural side of the coastal area promotes different management system. Thus, in each part of the book, the practitioners were introduced to know about the community participation, planning system, livelihood and also other environmental services that exist.

As manual guide, the book consists of varied theoretical understanding, concepts and experiences from various cases occur in Indonesia. The tutorial is nothing without any input from the national expert team to the local practitioners, thus more discussion will be benefit for every stakeholder who reads the book.

ABBREVIATION

CBDRR	: Community Based Disaster Risk Reduction
DRR	: Disaster Risk Reduction
DM	: Disaster Management
DPSIR	: Driving Force-Pressure-State-Impact-Response
FGD	: Forum Group Discussion
ICZM	: Integrated Coastal Zone Management
INGOs	: International Non Governmental Organizations
IPCC	: Intergovernmental Panel on Climate Change
NGOs	: Non Governmental Organizations
RS/GIS	: Remote Sensing and Geographic Information System
RAN	: Rencana Aksi Nasional (National Action Plan)
RPJM	: Rencana Pembangunan Jangka Menengah (Mid Term Development Plan)
RPJP	: Rencana Pembangunan Jangka Panjang (Long Term Development Plan)
PPGIS	: Public Participatory Geographic Information System

MODULE 1 COASTAL ENVIRONMENT AND ICZM

INTRODUCTION

The coastal zone are introduced, how the ecological system are defined, the geomorphological system, and also brief description on the coastal dynamic. This module is intended to give an overview to the participant on how the natural characteristics of coastal and marine area, which lead to comprehensive understanding on how the system works. Existing environmental problems laid in the coastal zone is not limited to any environmental stress or shock.

Integrated Coastal Zone Management perspectives can be expressed in a variety of forms of comprehensives, multi-sectoral resources planning and management especially needed in the coastal zone. It is also the instrument for the costal manager as framework on decision making and planning tools. This module will aim on policy and planning, decision making process and tools, and institutional building and management. In the level of practice the module will also present a Model of D-P-S-I-R and guidelines on zoning and land management in the coastal area. This session also integrate the participant to their major issues in the coastal zone as case study and bridge the gap on the level of conceptual into practices.

OBJECTIVES

1. Comprehend the ecology and geomorphology system of the coastal area
2. Understand the problem exist in the coastal area
3. Define the dynamic coastal processes from various point of view
4. Understanding the integrated approach of coastal zone management
5. Understand zoning, land management and planning for coastal area based on ICZM
6. Introduction of DPSIR Model and its application
7. Understand the program development and institutional building and management

LEARNING OUTCOME

1. Ecological system of the coastal area
2. Geomorphological system and coastal dynamic of the coastal area
3. Coastal area typology
4. Existing problem of the coastal area
5. Integrated approach of coastal zone
6. Zoning, land management and planning for coastal area based on ICZM
7. DPSIR Model and its application
8. Program development, institutional building and management

Session 1.1 The Importance of the coastal and small island

FACTS & FINDING

TABLE 1 COASTAL IMPORTANCE OF THE COASTAL AND SMALL ISLAND IN INDONESIA

Parameter	Unit of measurement	Notes
Total number of island	17.508	5 major island: Sumatra, Java, Sulawesi, Borneo, and New Guinea; 30 groups of smaller island (Indonesian Naval Hydro-Oceanographic)
Coastline length (baseline)	80.791 km	The actual length of the Indonesian coastline may be about 204.000 km (Astuti et.al, 1994)
Total land area	1.926.337 km^2	24.4% of total area under Indonesian jurisdiction
Area of archipelagic (inner) seas	2.820.000 km^2	35.7% of total area under Indonesian jurisdiction
Area of territorial (12 nm zone) sea	420.000 km^2	5.3% of total area under Indonesian jurisdiction
Continental shelf area	1.500.000 km^2	19% of total area under Indonesian jurisdiction
Area of EEZ (Exclusive Economic Zone)	2.730.000 km^2	34.6% of total area under Indonesian jurisdiction
Total area of national jurisdiction	7.892.350 km^2	81% of total area under Indonesian jurisdiction (Indonesian Naval Hydro-Oceanographic)

SOURCE: (TOMASCIK, MAH, NONTJI, & MOOSA, 1997; HTTP://WWW.ASIANINFO.ORG/ASIANINFO/INDONESIA/PRO-GEOGRAPHY.HTM)

WHAT IS COASTAL ECOSYSTEM?

The coast is where land and ocean meet. If this line of meeting did not move, defining the coast would be easy—it would simply be a line on the map—but the natural processes that shape the coast are highly dynamic, varying in both space and time. Thus the line that joins land and ocean is constantly moving, with the rise and fall of tides and the passing of storms, creating a region of interaction between land and sea.

Carter (1988): coastal zone is a space where terrestrial environment effect the marine environment and on the contrary. This environment also indicates with very wide variable, which can change in a particular time.

Sugandhy (1996): coastal zone is transition zone between mainland and sea; by its physiographic define as zone between shore lines to the mainland direction which still affected by tidal, width defines by beach and sea floor slope, and formed by clay sediment, sand and also gravel.

Soegiarto (1976) dalam Sugandhy (1996): coastal zone define as congregation zone between mainland and sea, to the mainland include land part, both dry or inundated which still affected by marine activity such as tidal wave, sea wind and sea water intrusion, while to the sea direction include part of the sea which still affected by natural

processes happened in the mainland such as sedimentation and fresh water flow and also because of human activity in the mainland (deforestation and pollution).

The other definition based on international consensus that coastal zone is transition between sea and mainland, to the mainland include zone which still hit by sea water or tidal wave, while to the sea include continental shelf (Beatly et al., 1994 dalam Sugandhy, 1996).

An expert meeting success to define coastal area as an influence cross path between mainland and sea which have special "geosfer". Direction to the mainland influence by physical condition of sea water and maritime social economy, while to the sea limited by natural processes influence and also because of human activity to the mainland environment. In this case, need to be clear that the term beach eventually miss match with coastal area, is assumed as a part of coastal area, which is landform located between shore line and furthermost limit from the land which still affected by tidal wave and compose with free material such as clay, sand or gravel.

Remember that coastal zone formed through a long process genetically, so the coastal area boundary need to be studied again based on geomorphology aspect. Genetically, coastal zone or by etymology more precise to call as coastal area is landform which begin on the sea boundary line indicated by breakers zone to the mainland direction and end in the landscape genetically still have influence from marine activities like coastal alluvial plain (formulated from CERC concept, 1984; Pethick, 1984; and Sunarto, 2000)

Coastal zone including shore and coast, shore is a zone between mainland and sea which bordered by lowest tidal line average, so called shoreline with highest tidal line average (coastline). Coast is a zone begin from coastline which showing highest tidal line average to the mainland direction until certain zone which formed genetically still influenced by marine activity, usually the last landform is coastal alluvial plain (base on CERC concept, 1984)

Based on geomorphology aspect, coastal area can be identified from its landform originally from marine, fluviomarine, organic or aeoliomarine process. From the biological aspect, coastal characteristic can be found out from distribution of flora and fauna in the beach to the mainland direction. From the climatology aspect, beach characteristic determine based on sea breeze influences. From hydrology aspect, coast characteristic determine from how far tidal wave influences into the mainland (Poniman, 2004).

HOW DYNAMIC IS THE COASTAL AREA?

The coastline of the world, over 440.000 km in length, represent one of the most dynamic of natural environments and one of the most important contexts in which human activity and geomorphological processes interact. Coastline bring together a unique and extraordinarily varied group of processes, not only process associated with the sea itself, but also, in certain locations, those arising from water and sediment transfer by rivers to sea, from the sub aerial degradation of cliffs and similar landforms above the waters edge and from Aeolian, glacial, and periglacial conditions. All are often also closely associated with distinct biological processes in different coastal ecosystem. In this dynamic, complex zone there there are many human conflicts reflecting varied coastal resources and hazards. The coast is a locus for trade transfers and related port, industrial and urban manifestations.

Shore, Beach, Shoreline and Coastline Definition

Shore: the narrow strip of landin immediate contact with the sea, including the zone between high and low water lines. A shore of unconsolidated material is usually called a BEACH.

Beach: the zone of unconsolidated material that extends landward from the low water line to the place where there is marked change in material or physiographic form, or to the line of permanent vegetation.

Shoreline: the line that forms the boundary between the land and the sea; the specific contact line between the sea and the land, although this line shifts with tides, storms, and sea-level adjustments.

Coastline: the line that forms the boundary between the coast and the shore. (Sunarto, 2009)

Processes at work in coastal waters include winds, waves, tides and currents, which together provide the energy that shapes and modifies a coastline by eroding, transporting and depositing sediment. Although waves, tides and currents interact, one process augmenting or diminishing the effects of another, it is convenient to discuss them separately.

SEA LEVEL

The action of the sea in the coastal zone relates in part to the level of the sea and in part to the nature of waves. The sea acts within only a narrow and often varying vertical zone, but the average level of this zone may itself change over time. In the short term (daily, seasonally, annually) tides are the most significant of many factors. Tidal range is important because the higher the range the greater the vertical zone in which sea can act. In addition, tidal currents are generated in some areas and they often have a velocity that can significantly influence the distribution of sediment beneath the sea surface, especially where there is abundant loose sediment and in areas of constricted flow such as estuaries.

On a longer time scale, sea-level can change as a result of such processes as tectonic movements, isostatic recovery of land following deglaciation, or world-wide glacio-eustatic, change accompanying the melting of ice sheets. Such change leads to coasts dominated by the characteristic of submergence or emergence. And the changes are not merely a thing of the past, many coastline are mobile today, treating problems for coastal management. For example, emergence can lead to the shallowing of harbours and the reduction of marine attack, and submergence can cause enhanced flooding hazard and coastal erosion. And a number of coastal scientist have argued that solutions to immediate coastal problems should take into account more than they do at present the fact that sea level rise is continuing and inevitable, as is the consequential erosion. (Doornkamp, 1990)

WAVES

With the exception of earthquake generated waves (tsunamis), the most important waves are wind generated. They are of two basic types: sea, those waves generated locally by contemporaneous winds and swell, waves that are usually lower, longer and have travelled far from the area of their generation. (Doornkamp, 1990)

Waves are undulations on a water surface produced by wind action. The turbulent flow of the wind blowing over water produces stress and pressure variations on the surface, initiating waves that grow as the result of the pressure contrast between their driven (upwind) and advancing (downwind) slopes. Waves consist of orbital movements of water that diminish rapidly from the surface downwards, until the motion is very slight where the water depth (*d*) equals half the wavelength (*L*). (Bird, 2008)

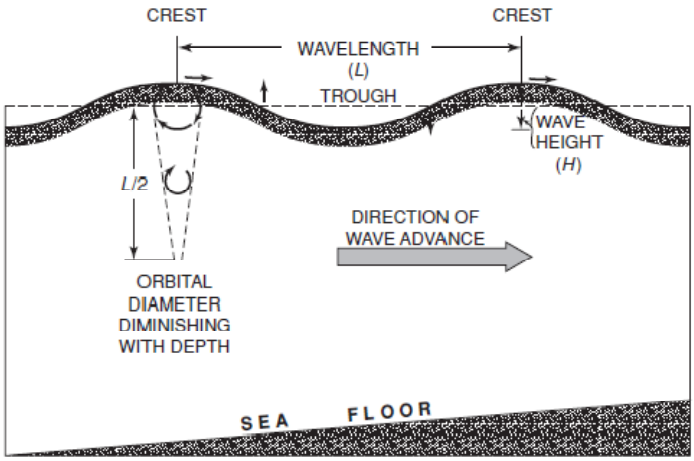


FIGURE 1 WAVE TERMINOLOGY AND THE PATTERN OF CURRENTS AS WAVE CRESTS AND TROUGHS MOVE SHOREWARD

SOURCE: (BIRD, 2008)

The depth at which waves become imperceptible is termed the wave base, and in theory erosion by waves could ultimately reduce the world's land areas to a planed-off surface at this level, providing they remained tectonically stable. Orbital motion in waves is not quite complete, so that water particles move forward as each wave passes, producing a slight drift of water in the direction of wave advance.

Wave height (*H*) is the vertical distance between successive crests and troughs, wave steepness the ratio between the height and the length (*H*/*L*) and wave velocity (*C*) the rate of movement of a wave crest. Wave height is proportional to wind velocity, and wave period (*T)*, the time interval between the passage of successive wave crests) to the square root of wind velocity. Wave dimensions are also determined partly by fetch (the extent of open water across which the wind is blowing) and by the duration and strength of the wind. Large waves are generated by severe storms, and in mid-ocean the largest storm waves, generated by prolonged strong winds over distances of at least 500 km, can be more than 20 m high, travelling at more than 80 km/hr. Waves transmitted across the oceans from storm centers become long and regular, and are known as ocean swell. In coastal waters waves are diminished by friction with the shallowing sea floor, but locally generated storm waves can still be several meters high when they break on the shore.

CURRENTS

Currents are generated in various ways, and some currents are of multiple origin. Some are discussed in sections on waves and tides, but to avoid repetition the various kinds of current are listed here and indexed to the text.

1. *Rip currents* flow back into the sea through breaking waves at intervals along the shore.
2. *Wave-generated currents* flow alongshore when waves arrive at an angle to the shoreline.
3. *Tidal currents* are ebb and flow (flood) currents generated by falling and rising tides.
4. *Ocean currents* are slow mass movements of water in response to variations in water temperature and salinity, atmospheric pressure and wind stress.
5. *Wind-generated currents* flow in the direction of the wind.
6. *Fluvial currents* are the discharge where a river flows into the sea.

There are also *density currents*, which occur where water of higher specific gravity (colder or more saline) moves to displace water of lower specific gravity, but these have no direct effect on coasts.

In general, tidal and other marine currents are more effective in shaping sea floor morphology than in developing beach configuration. The early theory that long, gently curving beaches on oceanic coasts were produced by marine currents sweeping along the shore has given place to the view that these outlines are determined by refracted wave patterns. Nevertheless, changes in the topography of the sea floor, due to erosion by current scour or deposition from slackening currents, modify patterns of wave refraction and may thus indirectly affect beach outlines. Currents often play a part in removing material eroded by waves from the coast, or in supplying the sediment that is subsequently built into beaches by wave action.

TIDES

Tides are movements of the oceans set up by the gravitational effects of the moon and the sun in relation to the earth. They are very long waves that travel across the oceans and are transmitted into bays, inlets, estuaries or lagoons around the world's coastline. Oceanic tides are indeed tidal waves, but this term has been widely misused as a synonym for tsunamis, which are large waves generated by tectonic events.

The ebb and flow of tides produces regular changes in the level of the sea along the coast, and generates tidal currents. The lunar cycle produces semidiurnal tides (two high and two low tides in approximately 25 hours), well displayed around the Atlantic Ocean. The solar cycle produces diurnal tides (one high and one low tide every 24 hours), as registered in the Caribbean, northern Java and the Philippines, and on the Antarctic coast. Elsewhere the two are mixed, yielding unequal high and low tides (e.g. high high, low low, low high and high low), as around much of the Pacific and Indian Ocean coasts. Where the effects of lunar gravity are stronger, high and low tides occur about 50 minutes later each day.

Tidal forces also cause minor fluctuations in land levels (up to 30 cm) as the gravitational pull of the sun and the moon are exerted on the earth's crust: on the Atlantic coasts of Britain the land rises and falls by up to 10 cm twice daily. Tidal oscillations of sea level recorded on a coast are thus resultants of minor land movements as well as the upward and downward movements of sea level. Tidal movements can also influence wave action. In general the transverse profile of the shore and near shore zones is concave, and as the tide raises the water deepens, so that larger wave breaks upon the shore. Where tidal currents flow in one direction they can reduce the velocity and size of waves coming in from a contrary direction.

STORM SURGES

Storm surges occur when strong onshore winds build up coastal water to an exceptionally high level for a few hours or days, and are most pronounced when they coincide with high spring tides. Strong onshore winds also generate large waves accompanying the raised sea level, over washing beaches, flooding low-lying coastal areas and causing extensive changes in a short period. Beach erosion is usually severe during a storm surge, and if the coast consists of soft formations.

TSUNAMIS

Apart from storm surges, exceptional disturbances of sea level occur during and after earthquakes, landslides or volcanic eruptions in and around the oceans. These produce tsunamis, very large waves that may attain heights of more than 30 m by the time they reach the coast. They are most common in the Pacific Ocean, which is bordered by zones of crustal instability, and they are responsible for occasional catastrophic flooding and beach erosion on Pacific coasts. The arrival of a tsunami is preceded by the withdrawal of the sea, an exceptional backwash exposing part of the nearshore area: a phenomenon that should be taken as a warning that very large waves are imminent.

The effects of a tsunami may persist long after the event. In addition to changes effected on the coastline, very large waves may re-shape the nearshore profile and thereby change the pattern and dimensions of waves approaching the coast, resulting in subsequent erosion or deposition that would not otherwise have occurred. Like storm surges, they can throw large blocks and boulders up on to cliffs.

NEAR SHORE WATER CIRCULATION

The combined effects of wind-generated waves, astronomically generated tides, various forms of current flow and other disturbances of the sea produce a highly variable energy flux in nearshore waters. As has been noted, the several processes interact: a rising tide, for example, deepens nearshore water (the nearshore zone being generally concave upward in profile), thereby increasing the height and energy of waves that reach the shore. A tidal current flowing in one direction can reduce the velocity and dimensions of waves moving in the opposite direction. Marine currents in the nearshore zone are the resultant of potential flows generated by winds, waves, tides and other forces, and there is much variation in current direction and velocity. In addition, wave variability results from the arrival of waves of differing height and length, generated from differing distances and directions, and there are often irregular wave patterns arriving in the nearshore zone. The outcome is a complex nearshore hydrodynamic system that moves sediment on the sea floor and onshore, offshore and alongshore, and influences the shaping of the coastline, including beaches, and the nearshore sea floor.

WIND ACTION

In addition to the effects of waves and currents (which may be at least partly generated by wind action), coastal landforms may be shaped or modified by the wind. Strong winds deflate fine grained sediment (sand, silt and clay) from beaches and tidal flats, lowering their surfaces, and causing the movement of rock particles onshore, alongshore or offshore. Sand blown from the beach or foreshore is transferred to the zone above high tide level, and deposited as dunes, which may remain in position or be swept inland or along the coast by wind action. Wind-drifted silt and clay may be deposited down-wind from source areas such as intertidal mudflats that dry out sufficiently for the wind to mobilise this fine grained sediment. Weathering on rocky shores may produce sediment fine enough to be carried away by the wind, which thus contributes to the lowering of shore rock surfaces.

OTHER PROCESSES

Other processes influencing coastal evolution include runoff after heavy rain or from the melting of snow or ice, which causes gravuring of cliff faces and gulleying of coastal slopes, forming downwashed fans, and the outwashing of sand from beaches. Weathering processes that have influenced the shaping of coastal landforms include physical weathering (by insolation, freeze-and-thaw or wetting and drying), chemical weathering (by solution, salt crystallisation, mineral decomposition or base exchange) and biological weathering (by shore organisms, burrowing animals or root penetration).

SUMMARY:

Processes in coastal waters include waves generated by wind action locally (including storm waves) and remotely (ocean swell transmitted from distant storms), tides generated by astronomical forces and related to coastal and nearshore configuration, disturbance by storm surges and tsunamis, and associated currents. They act in combination, but are conveniently treated separately.

Coastal outlines are produced largely by waves, which also generate longshore drifting of sediment. Breaking waves may be constructive (moving sediment shoreward) or destructive (causing erosion), and variations in their energy may be

measured by such parameters as significant wave height (the height of the highest one-third of a set of waves). Coasts may have high, moderate or low wave energy.

Coasts may be microtidal, mesotidal, macrotidal or megatidal, according to the vertical tide range. Tides generate currents that can shape sea floor and intertidal topography and influence the form of estuaries and lagoons. Some coasts may be classified as tide dominated rather than wave dominated.

Storm surges, tsunamis and other giant waves may cause major and persistent changes in coastal landforms. Currents, generated in various ways, may indirectly affect coasts by modifying nearshore topography and therefore incident wave regimes. Other processes shaping coastal features include wind action, water runoff and weathering by physical, chemical or biological agents. These various processes combine in a nearshore water circulation that causes movement of sediment along the coast and on the sea floor, particularly in shallow water.

Many coasts show features that developed when the sea stood at different levels in the past, or when it was rising or falling. The operation of waves, tides, currents and the other processes that have been discussed has sometimes been at a higher level than it is now, and sometimes lowers.

There have been phases of still-stand when the relative levels of land and sea remained constant at particular altitudes and phases when the sea was rising or falling relative to the coastal land. It is now necessary to examine the history of changing levels of land and sea.

Coastal processes involved various element (please refer to annex Power point presentation from Dr. Sunarto, M.S)

COASTAL TYPOLOGY

Shepard classified coast into 2 categories, which is primary coast and secondary coast. Primary coast more controlled by land process or terrestrial for example erosion, depositional, volcanic and diastrophism, while secondary coast mainly formed by organism activity for example reef forming and effect of marine processes or wave activity. Based on terrestrial, organism and marine process, Shepard classified coastal typology shown in the table below:

1. Land erosion coast, this coast affected by erosion in the mainland which followed by inundation process by sea. Including rivers valley, glacial erosion coast, and karsts topographic coast.

2. Sub-aerial deposition coast formed by direct accumulation from rivers sediment material, glacial, wind or landslide effect to the sea direction.

3. Volcanic coast, formed as an effect from volcanic activity in the ocean. This category include lava flow coast, tephra coast which compose from volcanic pieces material such as volcanic ash, cinder, lava block and also volcanic collapse or explosion coast (for example caldera).

4. Structurally shaped coast, this type form as an effect of fault, fold or sediment rock intrusion, for example salt domes or mud lumps.

5. Wave erosion coast, this coast have shoreline formed because of wave activity, which have straight or irregular pattern possibility, based on bed rock composition or structure for example on the wave erosion processes on the cliff.

6. Marine deposition coast, this coast formed by material deposition from marine. This category include barrier coast, for example barrier beaches, barrier island, barrier spits and bays, cuspate foreland, beach plains; for example coastal sand plain without lagoon and mud flat or salt marsh.

7. Coast built by organism, shoreline which formed by flora and fauna activity, including coral reef formed by algae or oyster, or plants like mangroves or marsh grasses. This type can be found in tropical area.

TABLE 2 COASTAL TYPOLOGY CLASSIFICATION BY GENETIC

Coastal typology		Land Erosion Coast	Sub-aerial Deposition Coast	Volcanic Coast	Structurally Shaped Coast	Marine Deposition Coast	Wave Erosion Coast	Coast Built by Organism
Parameter								
Material	Mud		V			V		V
	Sand		V	V		V		
	Rock	V		V	V		V	
	Reef							V
Relief	Flat		V			V		V
	Undulating							
	Hilly	V		V	V		V	
	Mountainous	V		V	V		V	
Genesis	Land erosion	V						
	Wave erosion						V	
	Land deposition		V					
	Marine deposition					V		
	Wind							
	Volcanic			V				
	Structural				V			
	Solutional	V						
	Organism							V

Source: Shepard, 1957 in Mardiatno, 2009 (with modification)

Related to coast classification from Shepard above, there are 3 component of coast typology former which are material, relief and genetic.

1. Material classification used in coast typology formation are:
    a. Beach or coast with mud material
    b. Beach or coast with sand material
    c. Beach or coast with rock material
    d. Beach or coast with organism material (coral reef)
2. Relief classification used in coast typology formation are:
    a. Plain relief, beach with elevation 0-25 meter
    b. Undulating relief, beach with elevation 25-75 meter
    c. Hilly relief, beach with elevation 75-300 meter
    d. Mountainous relief, beach with elevation more than 300 meter
3. Genetic classification used in coast typology formation are:

a. Erosional
b. Depositional
c. Aeolian
d. Volcanic
e. Structural
f. Solutional
g. Organism

There are 13 coastal types in Indonesia. Each of coastal typology characterize by biotic, abiotic and cultural environmental component shown in Table below.Each coastal typology have specific characteristic and distribute "tidak merata" in whole Indonesian coastal area, because formulation of coastal typology very related to geologic conditions, genetic or formation history, geomorphology processes especially marine activity and vegetation ability to growth in the specific coastal area and also human activity which affect coastal area development generally.

TABLE 3 COASTAL TYPOLOGY CHARACTERISTIC AND DISTRIBUTION IN INDONESIA

Nr.	Coastal Typology	Characteristic	Distribution
1	Rocky Beach, Non Forest Ecosystem, Productive	Coastal area bed rock materials dominate by stone. Because coastal area already cultivated so this type of coast might experience destruction, especially land erosion. Varied vegetation growth in this coast generally less economics value. Therefore, possibility of cultivation in this type of coast are for the agricultural especially fisheries and dry land agriculture.	Spread over in 20 province Longest part located in Bangka Belitung Province (438, 85 km or 13, 86%) Shortest part located in Lampung Province (3,25 km)
2	Rocky Beach, Forest Ecosystem, Non Productive	This type of coast are original one and very appropriate for conservation area, because less of human intervention in this rocky coast with forest ecosystem (cultivated). This coast possible located in the volcanic and structural area. Direction of the development which might implement in this area with minimal destruction is tourism.	Spread over in 28 Province Longest part located in West Irian Jaya Province (1587, 69 km or 18, 33%) Shortest part located in East Irian Jaya Province (11, 19 km or 0, 13%)
3	Rocky Coast, Forest Ecosystem, Productive	Rocky coast generally have low intensity of cultivation because rocky material relatively difficult to cultivate. Possible development of this coast is mining. Because this coast located in forest ecosystem, so the cultivation on forest and mine sectors need to be taken heed to the coastal area sustainability.	Spread over in 12 Province Longest part located in North Maluku Province (404, 33 km or 36, 83%) Shortest part located in Central Java Province (8, 09 km)
4	Rocky Coast, Coral Reef Ecosystem, Productive	Among the rocky coast, this type is most productive one. Rocky coast is potential area for coral reef ecosystem growth. This coast also potential for varied type of fish and sea or coast vegetation growth, besides beautiful	Spread over in 23 Province Longest part located in Riau Province (1315, 09 km or 15, 92%)

		natural scenery so that have high economic value. Therefore, most of this coast already cultivated. The possible cultivation by human are fisheries and tourism sector.	Shortest part located in Bali Province (27 km or 0, 33%)
5	Sandy Coast, Non Forest Ecosystem, Productive	This coast dominates by sand material. Because in this coast type, there is no forest ecosystem, so the possibility to for coast vegetation or grassland to growth. Therefore this coast productivity relatively low. Nevertheless, this area has experience high intensity cultivation especially for rural settlement activity with cultivation activity on agriculture sector. Another development possibility is tourism sector considered that tourist likes the sandy coast.	Spread over in 19 Province Longest part located in Maluku Province (2892, 90 km or 31, 07%) Shortest part located in East Kalimantan Province (1, 63 km or 0, 02%)
6	Sandy Coast, Forest Ecosystem, Non Productive	According to ecosystem characteristic consist of sandy coast and forest relatively not yet influence by human activity, so this type of coast appropriate to coastal preserve area will protected the backward area.	Spread over in 27 Province Longest part located in Central Sulawesi Province (976, 01 km or 16, 05%) Shortest part located in East Kalimantan Province (8, 02 km or 0, 13%)
7	Sandy Coast, Forest Ecosystem, Productive	Ecologically, this beach characteristic is the same as beach type number 6, but has been cultivated. Cultivation possibilities very depend on natural resources availability. If the forest and mine resources become laboured, the environmental destruction risk will be higher. In the opposite, if develop to tourism sector so the environmental destruction become lower. Besides, in this type of coast there is possibility of rural community growth with agriculture cultivation.	Spread over in 18 Province Longest part located in North Maluku Province (740, 12 km or 34, 94%) Shortest part located in Maluku Province (1, 67 km or 0, 07%)
8	Sandy Coast, Mangrove Ecosystem, Productive	Sandy beach with Mangrove ecosystem usually found at river mouth. This beach type has high productivity and biological diversity since Mangrove provides good nursery habitat for animal, fish, and vegetation. Because of the strategic location and potency, this type of coast mostly cultivated by human intensively even exploitatively, so that tend to over exploitation and lead to environment degradation.	Spread over in 21 Province Longest part located in Riau Province (715, 02 km or 31, 40%) Shortest part located in Lampung Province (1, 62 km or 0, 07%)
9	Sandy Coast, Coral Reef Ecosystem, Productive	Sandy coast type with coral reef ecosystem generally has good fascination. Besides the magnificence of coral reef, the white sand	Spread over in 19 Province Longest part located in

		types (as the pieces of coral reef and animal material), attract the tourist. Therefore, most of the area already occupied by community for settlement besides for the tourism sector development. This type of coast better to protect from the human activity which cause environmental degradation such as sand mining.	Maluku Province (845, 06 km or 32, 84%) Shortest part located in Bengkulu Province (11 km or 0, 43%)
10	Muddy Coast, Non Forest Ecosystem, Productive	Muddy coast usually associated with watershed (river basin) existence. Muddy sedimentation resulted within hinterland processes. Therefore, this type of coast pertained to constructive coast. Delta and mud development in the coast edge is one of the examples. If the existing ecosystem is not forest and already cultivated by human, mostly this type of coast already have settlement. Most of the settlement and urban which developed in Indonesia located on the muddy coast and non forest ecosystem. This type of coast already experience very intensive cultivation and also high environmental pressure. The example is coast reclamation activity.	Spread over in 31 Province Longest part located in Maluku Province (689, 74 km or 12, 26%) Shortest part located in Central Java Province (17, 28 km or 0, 31%)
11	Muddy Coast, Forest Ecosystem, Non Productive	Muddy coast with forest ecosystem which not already cultivated shows that this coast relatively original and environmental degradation not yet take place. This type of coast is a barrier or coastal ecosystem reserve which has to taking care and also protected. This coast better for preserve area.	Spread over in 16 Province Longest part located in Central Sulawesi Province (930, 09 km or 25, 21%) Shortest part located in Riau Province (5, 53 km or 0, 15%)
12	Muddy Coast, Forest Ecosystem, Productive	Muddy coast and forest ecosystem is very good the preserve area. Rarely this type of coast already cultivated. Some of the cultivation type is settlement and fisheries, especially fish ponds. If the cultivation isn't conduct wisely, so there is possibility of coastal environment degradation.	Spread over in 23 Province Longest part located in East Java Province (482, 42 km or 12, 98%) Shortest part located in East Kalimantan Province (7, 37 km or 0, 20%)
13	Muddy Coast, Mangrove Ecosystem, Productive	Muddy coast, mangrove ecosystem and cultivated is the coast type which have high economic value and productivity. But, experience hardest exploitation and environmental degradation. In this coast also happened huge mangrove ecosystem conversion which cultivated into fish ponds,	Spread over in 26 Province Longest part located in East Kalimantan Province (930, 09 km or 25, 21%) Shortest part located in

		salt pan, industry, urban settlement and even coast reclamation. Damage of this type of coast not only in the coastal but also into the land, for example intrusion, sedimentation and urban flood. This coast needs tight controlling and monitoring from the environment degradation threat.	Central Java Province (19, 03 km or 0, 18%)

Source: Interpretation and analysis result (BAKOSURTANAL)

Coastal typology in Indonesia dominate by muddy coast with mangrove ecosystem and productive typology (10.654 km or 16, 45%) while the shortest is rocky coast with forest ecosystem and productive (1.106 km or 1, 71%). For further information about coastal typology please refer to annex Power point presentation from Dr. Sunarto, M.S.

HOW TO DESCRIBE COASTAL ECOSYSTEM?

Our goals in this Module are to examine types of ecosystems in tropical-coastal areas, especially in Indonesia, and why they are important. Ecosystem is the place where the inter-relationship between ecological communities of biology and physico-chemical components occur. Thus coastal ecosystems are many type of ecosystem that lie in the land masses next to the coastlines and the coastal waters. There are many definitions to the coastal term. In this discussion, the term for coastal ecosystems should be taken in their most straight forward based on geomorphology, which include coastal waters and coastal areas on the terrestrial or land masses, such as coastal forests, dunes, and beaches (Figure 2).

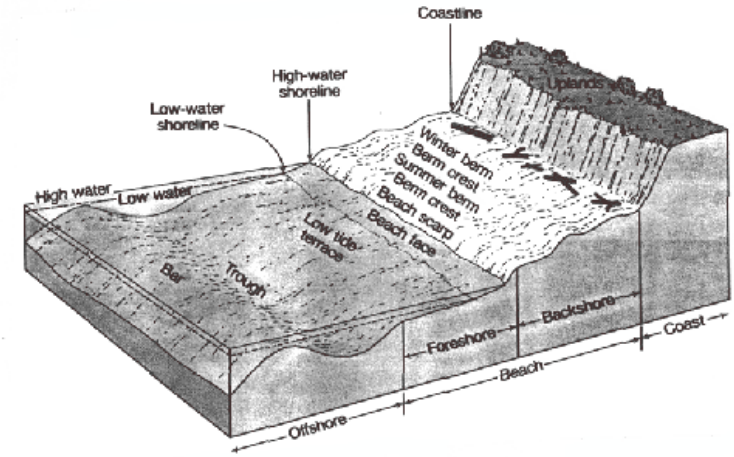


FIGURE 2 PROFILE OF COMMON BEACH IN TEMPRATE REGION BASED ON THE GEOMORPHOLOGY, NOTICED THAT THE UPLAND, COASTLINE, BACKSHORE, AND LOW-TIDE TERRACE

SOURCE: (ANON. 2009 A)

The coastal waters themselves comprise of many kinds of ecosystems near the coastlines of land masses. Most of the systems under discussions lie shore-wards of 200 m depth contour. This contour marks the edge of the continental shelf. However, in places where the edge of the self is close to shore and major upwelling system occur. Hence, we shall discuss tropical estuaries with mangrove forest or we call mangrove ecosystem, estuary without mangrove, coral-reef ecosystem. Coastal areas on the terrestrial or land masses ecosystems are such as coastal forest, coastal dunes, and beaches (Mann1982; Nybakken and Bertness 2005).

In Indonesia, it is interesting to note that in Java and Sumatra, we have to different-coastal areas. In southern coast of Java and western coast of Sumatra, the coastal areas lie in Indian Ocean and they have many types of coastal ecosystem with continental shelves. Based on the mangrove distribution, they have two types of estuaries. Those are the estuaries with protected bays and dominated by mangrove forests, such as Segara Anakan mangrove in Cilacap, Central Java, and the estuary without protection coast which is directly lie next to the ocean, such as estuary of Sungai Progo in Yogyakarta, southern coast of Java. In contrast in northern coast of Java, all the estuaries are habitat for mangroves.

Coastal ecosystem science is the study of interaction among the living organisms, physical features, bio-chemical processes, natural phenomena, and human activities in coastal ecological communities. There are seven categories of ecosystem stressors: 1). Climate change, such as increases in sea level and ocean temperature; 2). Extreme natural events, such as tsunami, hurricane, drought, and harmful-algal bloom; 3). Sedimentation in estuary due to bad watershed managements; 4). Pollution, such as excess nitrogen from agricultural and urban runoff; the waste of heavy metals of gold mine or textile industries, and urban waste; 6). Noxious-predator species, such as the crown-of-thorn starfish (*Acanthaster planci*), and; 7) Land and resource use, such as over-harvested fisheries, over cutting of mangrove trees, or land reclamation of mangrove forest for shrimp industries, or sea-ford, or human settlements.

Coastal ecosystems – In the following we will discuss selected commonly ecosystems in Indonesia, that lie next to the coastline and estuaries such as mangrove, coral reef, sea-grass, estuary, sand dune, beach forest. Coastal ecosystem including mangroves, coral reefs and sea grasses, but estuaries and marshes, lagoon and salt ponds, inter tidal zones, kelp forests, rock and shell reefs and inner shelf are also part of a mosaic of interconnectedness of environments and organism found along the coastline.

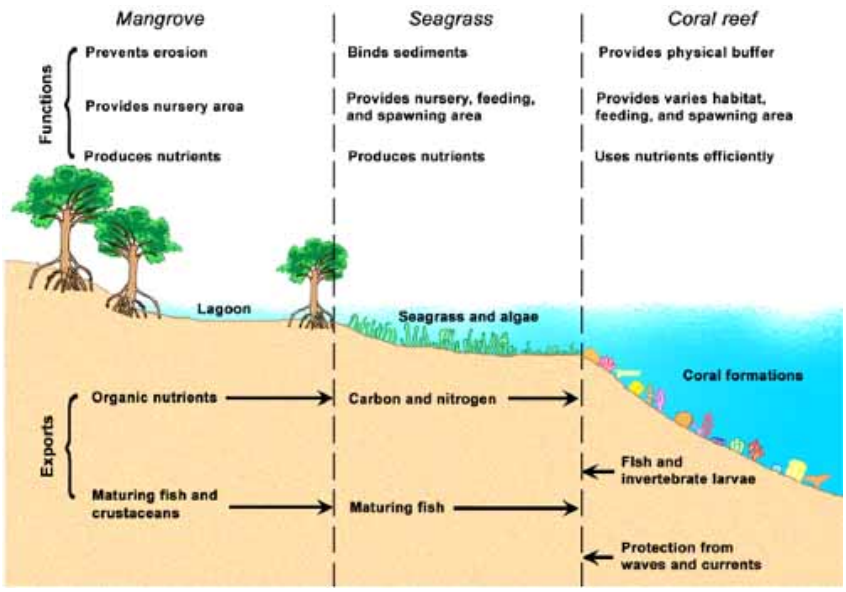


FIGURE 3 ROLE AND FUNCTION OF THREE TROPICAL SEA ECOSYSTEM

SOURCE: (KALLESOE ET AL., 2008)

MANGROVE ECOSYSTEM

Mangrove ecosystems, as mentioned above, are the place where the interaction of mangrove communities, and physico-chemical factors occur. Mangrove communities consist of animals, plants, and microorganism. The mangrove plants can grow only on shores that are sheltered from wave action. Otherwise, their propagules will not be able to ground properly and put down their roots. These shores usually along the lee sides of islands or island chains, on islands, landmasses behind protecting offshore coral-reef ecosystem, where are particularly well developed in estuarine areas of the tropical region (Figure 2). Mangrove forest may also penetrate some distance upstream along the banks of rivers, as far as 300 km, such as in Bian River in Merauke Papua, and Berau River in East Kalimantan.

Mangrove forests or mangals are a general term used to describe a variety of tropical and subtropical inshore communities, which are dominated by several species of trees or shrubs that grows in brackish waters. Mangrove vegetation is terrestrial flowering plants which have re-colonized the fringe of the coastal areas. The term mangrove refers to the individual plants, where mangrove forest, mangrove vegetation, mangrove swamp, tidal forest, mangals refer to the whole mangrove communities, or their association dominated by these plant species.

FIGURE 4 THE *SONNERATIA ALBA* POPULATION WITH PNEUMATOPHOR ROOTS, JAVA NEARLY HIGH TIDES, ON THE SHORE OF NYAMPLUNG VILLAGE, SITUBONDO EAST JAVA ON MARCH 2008.

In tropical, 60-75% of protected bays, estuaries of the tropical regions are lined with mangroves (Nybakken and Bertness 2005). Mangroves are ecological important communities and play significant roles in near-shore of tropical and subtropical system. Mangrove forest buffer tropical shorelines from erosion, serve as biochemical filters on terrestrial runoff, and are important nursery grounds for wide varieties of tropical-migratory organism, such shrimps and fishes. Those organisms are not only has ecologic but also economic values. Beside the ecologic and economics values, mangrove forests are important in protecting the settlement in lowland adjacent to the sea-shore (Ronnback 1999; Mitch and Gosselink 2000).

Mangrove ecosystem is not an ordinary forest, the internal processes such as energy fixations, organic productions, and nutrient dynamics depend on the external factors. These factors especially are freshwater supply regularly, tide period regularly, and stability of substratum (Blasco 1981). If one of these factors does not work properly, the mangrove ecosystem is in trouble. **Biodiversity** -- The biodiversity of species are high at Pacific region, and their center of distribution is in Shout-East Asia, Indonesia and Papua New Guinea, and Queensland Australia (Figure 3). The number of woody species around 50 with 25 genus and 17 family. The total of species in the world is 60 species (Mitch and Gosselink 2000).

Indonesia is an archipelago country with 81.000 km of coastline, it means at estuaries, protected bays, and coastal lagoons are mangrove ecosystems. Healthy-mangrove vegetation plays important roles not only to the mangrove ecosystem itself, but also to the coastal and open sea fisheries. More over, mangrove tree vegetation give protection to the costal settlement from tsunami especially at western and northern coast of Indonesia. However, the present conditions of these ecosystems in Indonesia are threatened due to bad management of watershed areas, and mangrove tree cutting, and mangrove reclamation for intensive-shrimp ponds (Djohan 2007).

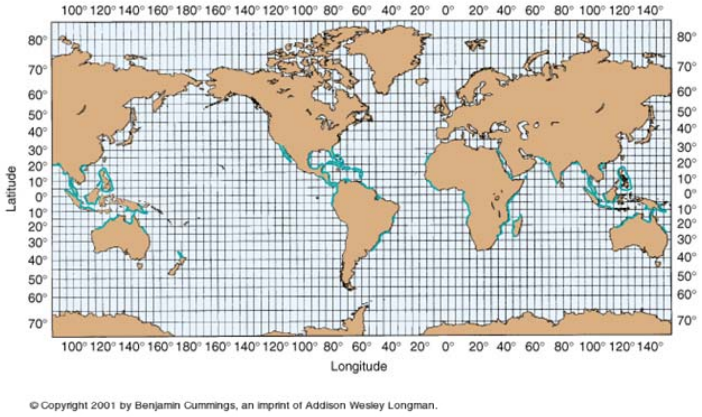


FIGURE 5 DISTRIBUTION OF MANGROVE VEGETATION IN THE WORLD

SOURCE: (NYBAKKEN AND BERTNESS 2005).

The Indonesian coasts next to the Indian Ocean are fragile area for tectonic earth-quake, which creates tsunami. Mangrove trees also protect the coast areas from the tsunami. It was reported that, the mangrove vegetation consists of mangrove tree have ability to reduce the tsunami wave up to 50%. The experience of tsunami in western coast of Aceh on 26 December 2004 showed that if the mangrove trees vegetation in Olele coast was not reclaimed to the shrimp ponds, and this ecosystem was not filled and reclaimed for the settlement areas, perhaps more people of Banda Aceh would survive from this catastrophe (Figure 4).

A. **B.** **C.**

FIGURE 6 A. THE TSUNAMI ATTACHED ON 26 DECEMBER 2004, THE NORTH WESTERN ACEH, BANDA ACEH COASTAL AREA. THIS TSUNAMI WAS DIVIDED IN THREE RING CATEGORIES, WHICH RING ONE WAS WITH HIGH SEVERE CATEGORY, RING TWO MEDIUM SEVERE, AND RING THREE WAS LESS SEVERE; B. OLELE COAST AND PORT BEFORE TSUNAMI, AND C AFTER TSUNAMI TOK PLACE AS RING ONE CATAGORY. ALMOST ALL AREAS OF MANGROVE ECOSYSTEM WERE CONVERTED TO THE SHRIMP PONDS. THE REMNANT MANGROVE AT THE RIGHT TIP OF OLELE COAST (B).

A **B** **C**

FIGURE 7 THE AREA WAS BETWEEN RING ONE AND RING TWO AREAS, AND A BEFORE AND B AFTER TSUNAMI. C. HE CONDITION AFTER TSUNAMI, NOTICED THAT THE LOCAL COCONUT TREE SPECIES IS STILL IN TOUCH ON THE GROUND.

Zonation – The general zonation patterns for Pacific mangrove forests is to have a seaward area which dominated by *Avicennia*, behind this is a *Rhizophora* zone, then is followed by a *Bruguiera* zone, and most landward, a *Ceriops* zone. However at disturbed areas, mangrove zones from seaward to landwards depend on the availability of propagules, and ware dominated by shrubs and liana mangrove of *Acanthus ilicifolius*, and *Derris heterophylla* (Djohan 2007).

A mangrove is a woody plant or plant community which lives between the sea and the land in areas which are flooded by tides for part of the time. Mangrove forests make up one of the most unique ecosystem on earth in that they thrive where no other trees can survive- in the transition zone between the ocean and land. They are among the worlds most productive ecosystems.

Because mangroves are found in this transition zone-where the tide rises and falls daily, where salinity changes with this rise and fall of the tide and where the oxygen content is less- both the flora and fauna of this ecosystem have developed very distinct morphological and physiological adaptations.

FIGURE 8 MANGROVE FOREST (HTTP://AMADEO.BLOG.COM/REPOSITORY/134047/583135.JPG)

Mangroves are found in latitudes of 32^0N and 38^0S of the globe and also in the mouths of estuaries and in other inter tidal areas. Approximately one-fourth of the world's tropical coastline comprises mangrove ecosystem and they are estimated to extend along an area of between 167,000 and 181,000 km^2, in 112 countries (Spalding, 1997; Kathieresan and Bingham, 2001).

Mangroves are one of the most productive ecosystems in the world and provide humans with goods such as food, firewood, fuel wood, timber and medicine, and protective, supporting and regulatory services. However, they are among the worlds rarest and most threatened ecosystems. Globally, coral reefs nearly twice the area of mangroves, and tropical and subtropical forests more than 125 times as much (EJF, 2005).

Why Mangrove?

1. ***Nutrient supplier (feeding grounds)***
2. ***Provide habitat for sea birds (nursery grounds)***
3. ***Breeding section for sea biota (spawning grounds)***
4. ***Control the micro climate***
5. ***Absorb and reduce pollution***
6. ***Sediment trap grounds to prevent from coral reef from destruction***
7. ***Fertile section of the river mainstream***

8. ***Reduce abrasion and coastal erosion***

9. ***Filtrate the seawater to reduce seawater intrusion***

10. ***Natural barrier of the land***

11. ***Controller to the malaria vector***

12. ***Produce organic biomass, medicine and alcohol.***

Mangrove in Indonesia

Mangrove in Indonesia is known as "Bakau", although the term is slightly correct, since Bakau (Rhizopora sp) is one of the mangrove vegetation. Mangrove is a complex ecosystem located along the coastline of tropical countries. According to the local regulation, 400 meter of the area at the coastline to the sea supposedly used as the protection zone, by planting mangrove. Mangrove cutting will be threatened with 5 Million IDR fine. In Indonesia, there are more than 25 types of mangrove vegetation originated from 12 Family, such as Familia Avicenniaceae (Pohon Api-Api), Familia Rhizophoraceae (Phon Bakau) and Familia Sonneratiaceae (Pohon Bogem), Familia Bruguiera, Ceriops, Xylocarpus, Lummitzera, Laguncularia, Aegiceras, Aegiatilis, Snaeda, dan Conocarpus. Percentage of mangrove by country from FAO, 2005 showed that Indonesia posed the largest mangrove area compared to Australia and Brazil (up to 3, 06 hectare). This amount has been reduced up to 50% from the previous amount of 8,6 million hectare in 1995. Data from the FAO is slightly different with those provided by the Ministry of Environment, Republic Indonesia. It was stated by the Directorate General Land Rehabilitation and Social Forestry, that the potential mangrove in Indonesia up to 9.204.840.32 ha with distribution of 25% in good condition, 50% roughly in medium damage, the rest are in bad shape. Other data revealed that the mangrove from the local counting is sum up to 4.390.756,46 ha. Despite difference from the available data, it is clearly defined that the mangrove area in Indonesia is degradating. This is due to conflicting interest occured in the coastal management, dillema between necesity over economic value and protection value. At the other side, the law enforcement to protect the existance of mangrove yet being strengthened.

One of the interesting case to be observed is the condition of mangrove in northern coast of East Java Province. Up to now, the conservation zone for mangrove along the coastline has been transformed into industrial area. The local spatial plan yet promote more protection to the coastal environment. The economic demand has been put aside the environmental sustainability. Thus, the spatial plan is an important tool to promote the conservation zone, however the economic principle is too strong to cover the poor maintanance of the environmental services.

(http://mbojo.wordpress.com/2009/01/01/hutan-mangrove-dan-luasannya-di-indonesia/)

www.freewebs.com/irwantomangrove/mangrove_kelola.pdf

Terramitra, Lembaga Kajian Ekologi dan Konservasi Lahan Basah - 14 Aug 2004

CORAL-REEF ECOSYSTEM

Coral reefs are complex ecosystems with high biological diversity that occur in the shallow waters throughout the tropics. They are also among the productive systems in the world. Similar to mangrove ecosystem, coral reef are biogenic structures built entirely by biological activities. Coral reefs are essentially massive deposits of $CaCO_3$ produced primarily by corals of phylum Cnidaria, class Anthozoa, order Scleretina. The reef support productive fishery with provide an essential source of protein.

The coral reefs are exposed not only to subsistence pressures but also to other anthropogenic stresses such as sedimentation, pollution from industrial, chemical, and sewage. Regardless of the complexity and high biological diversity of these ecosystems, they are fragile ecosystem, which are sensitive to disturbances and highly variables. These disturbances are such as cyclones and the level of recruitment.

Reef distribution and limiting factors – Coral reef development was limit by six major physical factors: temperature, depth, light, salinity, sedimentation, and emergence into air. Coral reefs are found within 20^{o}C surface isotherm. Optimal reef developments occur where the annual mean minimum temperature is between 23-35^{o}C. Coral reefs cannot develop below 18^{o}C, and some of them can tolerate temperatures up to about 36-40^{o}C (Figure 6). In the tropics, coral reefs are absent from the west coast of south and Central America and also from the west coast of Africa. Because in the west coast of both these areas has strong upwelling of cold waters, which reduce the temperature of the shallow inshore waters below the reef requirement. In addition, both coasts have also strong-north-flowing cold currents, the Peru Current on the South American coast and the Benguela Current of West Africa, which keep the temperature of water down (Nybakken and Bertness 2005; English et al. 1994). In the world, the center of distribution of coral reef is in eastern Indonesia.

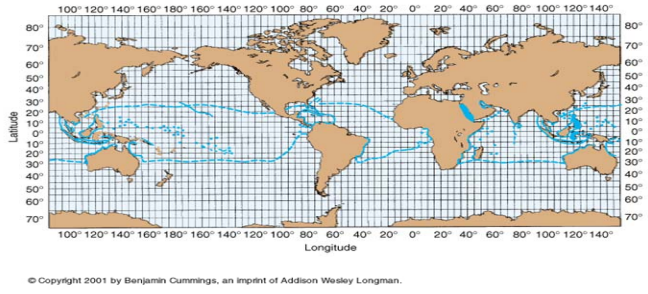


FIGURE 9. THE CORAL DISTRIBUTION IN THE WORLD, WHICH THEIR CENTER OF DISTRIBUTION IS IN THE EASTERN INDONESIA

SOURCE: (NYBAKKEN AND BERTNESS 2005)

Depth and light -- Coral reefs are limited by depth. Coral reefs do not develop in water that is deeper than 25 m. This explains why we only find the coral reefs are restricted to the margins of continent or island. The depth restriction is doe to the light requirements of hermatypic corals.

A. B.

FIGURE 10 A. THE CORAL REEF ECOSYSTEM CONSISTS OF THE REEF CORAL SPECIES AND CORAL-REEF FISH. PIGMENT OF ZOOHANTELLAE COLOR THE REEF CORAL SPECIES. B. ORANGE TUBE CORAL, *TUBASTREA COCCINEA*

SOURCE: (NYBAKKEN AND BERTNESS 2005).

Light is one the most important factors limiting coral reefs to develop. Sufficient lights are needed to allow the photosynthesis by *Zooxhantellae* to occur in the coral tissues. *Zooxhanthellae* area. Kind of phytoplankton lives in the coral tissues, and both of them have mutualism symbioses. The *Zooxhantellae* pigments are diverse and give color to each of the coral species (Nybakken and Bertness 2005).

Salinity and sediment -- Salinity also limits the coral growths and restricts the coral reef development. The corals have the tolerance to the normal salinity between 32-35 ppt. If the freshwater from the river and stream discharges into the seashore continuously high, this will decrease the salinity in the shore, the reefs will be absent. In the tropics, this phenomenon occurs where the stream and the river discharges into the sea which break the coral-reef development, such as in estuary of Nyemplung river in Situ Bondo East Java. Sedimentation is often correlated with surface runoff from streams and rivers. Sediments have and adverse effect on corals. Most corals cannot withstand the heavy sedimentation, because they over power their ciliar- mucus cleaning mechanism for these sediments. The sediments clog the coral feeding structure and suffocate them. Sediment increase turbidity and reduce the available light necessary for photosynthesis by the *Zooxhanthellae* in the coral tissue. Thus, the coral reef developments are reduce and eliminated in areas of high turbidities. In addition, the coral reef developments are greatest in areas subject to moderate wave action. Figure 7 shows the summary of physical factors determining the reef coral which may limit their distribution (Nybakken and Bertness 2005). There are three types of coral reefs: fringing reefs, barrier reefs, and atoll.

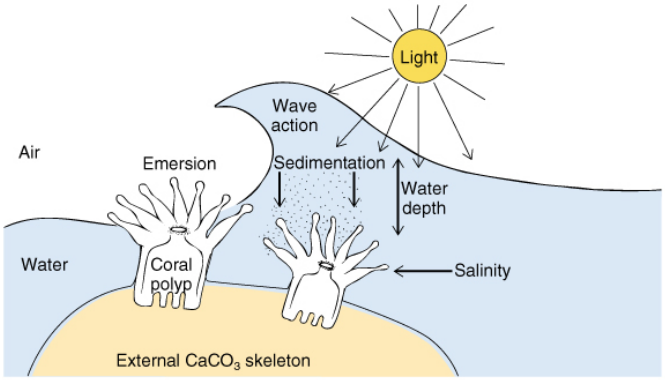


FIGURE 11. SUMMARY OF PHYSICAL FACTORS DETERMINING THE REEF CORAL WHICH MAY LIMIT THEIR DISTRIBUTION

SOURCE: (NYBAKKEN AND BERNTNESS 2005)

Predation – There is a surprising number of animals that feed on live coral and can be classified as coral predator. But only two predator species capable to destroy coral colonies and modify the structure of reefs: the crown-of-thorns star fish, *Acanthaster planci*, and variety of fishes. The crown-of-thorns star fish is very large and feeds on living coral tissue (Figure 8). They have capability to destroy an entire colony during feeding. Their present is rare in the Indo-west Pacific. But, when they are present in moderate number, it can have a massive impact. *Achantaster* prefers to feed on the abundant, fast growing *Pocillapora* colonies, but the present of symbiotic shrimp, (*Trapezia and Alpheleus*), refuse the *Acanthaster* and protect the *Pocillopora*. Therefore, most of the time they feed on the slow-growing, Non branching colonies, in the deeper parts of the reefs. This action reduces the coral cover and diversity, gives severe changes in reef structures (Nybakken and Bertness 2005).

FIGURE 12 A NUMBER *ACHANTASTER PLANCI* ARE ON A HEAVILY INFESTED CORAL REEF IN PALAU 1979.

SOURCE: (COURTESY OF DR. DIANE NELSON IN NYBAKKEN AND BERTNESS 2005)

Achantaster -- The outbrakes of *Achantaster* can cause large-scale coral mortality. It is reported that in 1960 *Achantaster* underwent a population explosion on certain reefs in the western Pacific, with the population density increased tenfold to ten thousand of the sea stars per hectare per year. What cause the trigger explosion of the *Acanthaster*, and are they natural phenomenon ? are still in questions. There are three possibilities of *Acanthaster* out breaks: 1). The predator-prey removal, 2). Runoff hypothesis, which suggest that juvenile recruitments of *Achantaster* are enhanced by combination of unusual salinities, high nutrients, and high temperatures. In this assumption, the occurrence of a year or several years of abnormal heavy rainfall, which coupled with human disturbance of native vegetation of adjacent land or watershed areas, causes increased run-off that lead enough nutrients to stimulate phytoplankton blooms as food source for the large number of *Achantaster* larvae. 3). The El Nino, a naturally recurring periodic phenomenon manifested as a massive influx of nutrient-poor warm water into the usually cold, cold-nutrient rich surface waters of coast of Ecuador and Peru. In fact, El Nino is part of an interacting set of atmospheric and oceanographic conditions called the El Nino-Southern Oscillation (ENSO).

ENSO -- The ENSO is unpredictable, and periodically alters the atmospheric pressure, winds, rainfall patterns, ocean currents, and sea level over large areas of tropical and subtropical Pacific Ocean. The greater the intensity, the greater is the change in oceanographic and meteorological condition, and the larger areas effected, and the greater effect on the organisms. It is reported that the 1982-83 El Nino was the strongest even caused unprecedented disturbances in marine populations and communities. It may have a periodicity 1 into 100 to 1 in 250 years and resulted in a rise of ocean surface temperature, that was 2-4^{o}C above normal remained for several months. **Coral bleaching** – Coral bleaching is a puzzling event which cause catastrophic coral mortality. The coral bleach happen when the *Zooxanthellae, who leave normally in the coral*

FIGURE 13 CORAL BLEACHING ARE THE EXPULSION OF THE *ZOOXHANTELLAE* FROM THE CORAL TISSUES WHICH CAUSE THE CORAL DIE

SOURCE: (NYBAKKEN AND BERTNESS 2005)

Tissues, are expelled from their tissues. Following the expulsion, the coral became white, If the *Zooxanthellae* are absent for significat time, these coral will die (Figure 9). This phenomenon called as coral bleaching. The cause of the coral bleaching is still in question. But most experts relate it with stress induced by water temperature of 30^{o}C or above. The bleaching occurs more common, and there is a concern that the bleaching pattern of occurrence perhaps as an early warning of the onset of the global warming (Nybakken and Bertness 2005).

Human activities – The activities of human can directly cause catastrophic mortalities on reefs through dredging, over fishing, pollution of swage and oil, and anchor of the tourist boots. There is a question when the catastrophic occurs, such as hurricane, how long does it take reefs to recover? There is still not much information on the re-colonization of the reefs destroyed by the hurricane. It was suggested that the reef recovery might take as long as 25 to 30 years.

Long term dynamics – Coral reefs are suffering from heavy stress of both human and natural disturbances over the last few decades. These stresses have degraded and destroyed many reefs. Extensive assessment carried out by 80 countries and the Global Coral Reef Monitoring Network revealed that 27% of coral reefs in the world were destroyed by late 2000. It is predicted that by 2030 the world coral reefs will be destroyed up to 60% (Nybakken and Bertness 2005). The reef at Nyamplung of Situ Bondo coast, East Java was only covered by 40% of coral reefs (Djohan, T. S. 2005: unpublished data).

Coral reefs are two layered invertebrates that live in groups (i.e. they are colonial) and are related to jellyfish and sea anemones. Corals are made up of tiny individuals called polyps. Each polyp is like a fluid-filled bag with a ring of tentacles surrounding its mouth, and looks like a tiny anemone. Polyps within a colony are linked by living tissues and can share their food (Allen & Steene, 1994). In some corals, the polyp extracts calcium carbonate from the sea and secretes it as a cup of calcium carbonate from the bottom half of its body. These cups provide anchorage for the polyps but when threatened, the polyp can retreat into the safety of the hard cup. When the calcium carbonate cups of many billions of these polyps fuse together, they form coral reefs (Veron, 2000).

Some corals obtain their nutrients from one-celled organism called zooxanthellae. Zooxanthellae sre single-celled organism that use sunlight for photosynthesis and transfer 95% of the food they produce to coral polyps. Both coral and the zooxanthellae benefit from this association: the zooxanthellae receive protection from currents and herbivores, while corals obtain their nutrients. This kind of association is called a mutualistic association. These coral are called hermatypic corals. Individual polyps of hermatypic corals secrete calcium carbonate (limestone) skeletons which, in time, form coral reefs. Hermatypic corals are also known, therefore, as reef building corals.

Because of this association with zooxanthellae that need sunlight to produce food, hermatypic corals are dependent on sunlight and only grow in shallow waters less than 60 meter deep, which have a temperature range between 25^0 and 30^0C. To keep the balance of this association, hermatypic corals prefer narrow salinity and low turbidity ranges.

FIGURE 14 EXAMPLE OF CORAL REEF ECOSYSTEM OF KETAWAI ISLAND, BANGKA, INDONESIA

Therefore, coral reefs are found:

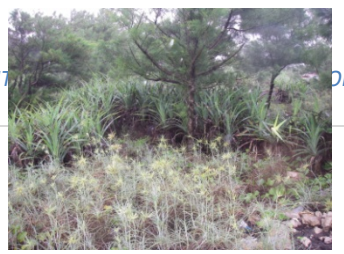
- where the sea is shallow (less than 100m)
- where the sea is warm (between 25^0 and 30^0C)
- and are, therefore, located within the latitude of 30^0N to 30^0S i.e., only in tropical seas

Coral reefs are extremely important as they provide many services to humans. Coral reefs support human life and livelihoods and are important economically. Nearly 500 million people depend-directly and indirectly- on coral reefs for their livelihoods, food and other resources. Further, it is estimated that nearly 30 million of the poorest human populations in the world depend entirely on coral reefs for their food (Wilkinson, 2004).

Despite their immense ecological, economical and aesthetic values, it is estimated that 20% of the world's coral reefs are destroyed with no hope of recovery. Over exploitation, habitat destruction, climate change, pollution and invasive alien species affect coral reefs.

COASTAL SAND DUNE

Dune is an accumulation of wind-blown sand at the coastal areas. Although some dunes are bare, most are vegetated with coastal plants. This vegetation facilitates stabilize of the dune (Figure 10).



A B C

D E

FIGURE 15 THE SAND DUNES AT PANDAN SIMO NORTHERN COAST OF YOGYAKARTA. A. THE COASTAL DUNES WAS COVERED BY THE NATURAL *IPOMAEA PESCAPRAE* AND *SPINIFEX* SP. AND WAS INTRODUCED WITH *CASUARINA MARINA*; B. MIXED SPECIES BETWEEN *CASUARINA MARINA*, *I. PESCAPRAE* SP., *SPINIFEX* SP, AND *PANDANUS* SP. ; C. THE FRUITS OF *CASUARINA MARINA*. D.THE BARE DUNE AREA AND IN THE BACK WITH THE VEGETATION

This vegetation is *Casuarina marina*, *Ipomaea pescaprae*, *Pandanus* sp, and *Spinifex* sp. The vegetation traps the wind-blown sand, and then grows up through the new sand accumulation. This processes are repeated in building larger dunes. The thick root systems of native plants slow coastal erosions during high-wave events and helps trap wave- and wind-deposited sand during post-event recovery. Because of their cultural and environmental sensitivity, many dunes are worthy of all due protection. Dunes are dynamic ecosystems. They erode during periods of high waves and accrete during normal wave conditions. During a storm, waves attack and erode the dune. This process, known as **scarping**, releases sand that was stored in the dune to the active beach. The influx of sand is often carried offshore to build sand bars, which help attenuate incoming wave energy. Erosion of pristine coastal dunes does not release silt to the near-shore area, degrade water quality, or harm the coral reef ecosystem since these dunes are composed of clean sand. When storm waves subside, normal waves take apart the offshore bars and rebuild the beach. Although some sand may be permanently removed from the beach system, and are transported to deep water by sand channels, eventually most of this beach sands are reincorporated into the dune. On undeveloped beaches, the post-storm recovery of the dunes is often complete.

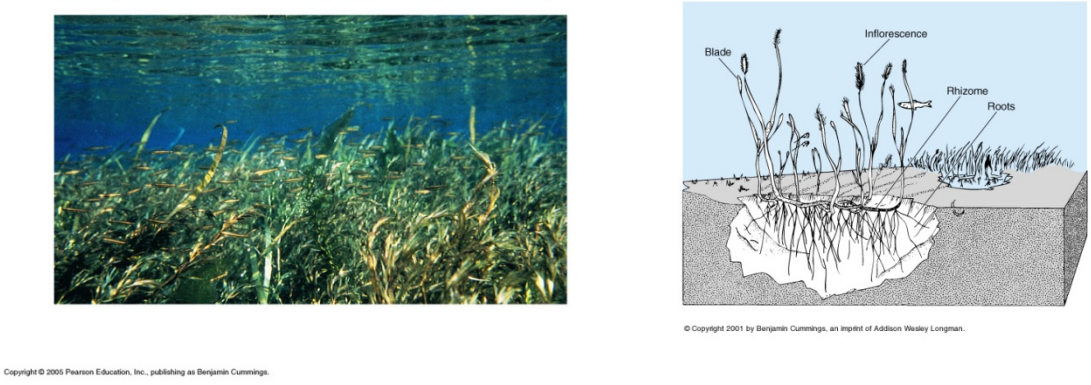
In some tropical beaches, wave action can move easily the sand. Thus, the substratum of the plants which is formed is rather unstable. Wave actions may either blow the sand and exposed the stolon (root system) of the plant. To overcome this situation, some of the plants adapt to creep on the sand and have the rot at the node. As a result this life form makes the plants less exposed to the wind, for example the *Ipomaea pescapre*. This type of plant also helps to hold together the sand dunes formed by the wind. The strong root of coconut can withstand can with stand the exposure cause by the erosion through wind, sea water and tsunami such as in Olele in Banda Aceh.

COASTAL BEACH ECOSYSTEM

This ecosystem is the last join up with normal inland vegetation, called as the shrub evergreen zone. This zone occurs on the landward slopes of offshore bars and final slopes of exposed beaches. The woody vegetation consists of dense low shrub, which is very much wind-cut and trimmed to the level with the top of offshore bars and graded up to vegetation further inland. Some time *Barringtonia* spp dominate to form *Barringtonia* community, which is dense or sparse like savanna. There are also *Terminallia catappa*, *Hisbiscus tiliaceus*, and *Euginea coronata* (Ewusie 1980).

SEAGRASS ECOSYSTEM

Seagrass bed form dense carpets of as many as 4000 blades per square meter, which make them one of the most conspicuous communities in the shallow waters of tropics and temprate seas. They occur from the mid-intertidal regim to depths of 50-60 m. Most seagrass species are similar in appearance. Ecologically, seagrass beds serve a number of important function in inshore areas. They are a major source of primary productivity in shallow waters around the world, In the form of detritus, they are a major source of food for many organisms shallow coastal waters. They stabilize the soft bottoms, on which most species grow, primarily through their dense-matted root system. This stabilization of the bottom by the root system is sufficiently durable to withstand storms as severe hurricanes. Their root is also as a shelter for many organisms. As a result many animals that do not have direct trophic relationship to the grass are common found in the sea grass community (Nybakken and Bertness 2005).



A B

FIGURE 16.A. A POPULATION OF SEAGRASS BED, *POSIDONIA* SP., IN THE MEDITERRANEAN SEA; B. THE ROOT SYSTEM OF THE EEL-GRASS MEADOW

SOURCE: (NYBAKKEN AND BERTNESS 2005)

The seagrass beds are nursery ground for some species that spend their adult lives in other areas, such as shrimp and commercially important fish. Sea grass beds may also trap sediment, and thus built up the bottom. Such situation was recorded for *Posidonia* beds in the Mediteranean sea, which build extensive terraces up from the bottom. When the build up approaches the surface, the floating leaves break the force of the waves, and forming a calm habitat over the bed. The leaves of the seagrass create protected canopy, which shield the inhabitants of the bed from the strong sunlight. Where the bed become inter-tidal, the leave may covers the bottom substrate at low tide, which protects the inhabitants from desiccation. In Indonesia the sea grass bed has link with the mangrove ecosystem and the coral reef in the seascape (Nybakken and Bertness 2005).

There are parts of the coastal environment that clearly have strong interactions between land and ocean, including beaches, coastal marshes, mangroves and fringing coral reefs; other parts may be more distant from the immediate coast (inland or out to sea) but they nevertheless play an important role in shaping it. One of the most important of these is the rivers that bring freshwater and sediment to the coastal environment. In this case, the inland limit to the coast is catchment boundaries that can be thousands of kilometres inland at the head of catchments. For example, the Ganges-Brahmaputra river system whose sediments form much of Bangladesh rises far inland in the Himalayas.

Therefore, the coast may be thought of as the area that shows a connection between land and ocean, and a coastal area defined (Ketchum, 1972) as:

the band of dry land and adjacent ocean space (water and submerged land) in which terrestrial processes and land uses directly affect oceanic processes and uses, and vice versa.

The key element of Ketchum's definition is the interaction between oceanic and terrestrial processes and uses: coastal areas contain land which interacts with the ocean in some way, and ocean space which interacts with the land. Thus coastal areas:

- Contain both land and ocean components;
- Have land and ocean boundaries that are determined by the degree of influence of the land on the ocean and;
- The ocean on the land;
- and are not of uniform width, depth, or height.

The three above elements are depicted in Figure 1.1, which shows, for a sandy beach coast, the strength of interaction between coastal and ocean processes and uses, termed here the 'degree of coastalness', against the distance away from the immediate coast. Figure 1.1 could be repeated for other coastal environments, such as delta coasts, beach/barrier systems and estuarine coasts, where the various physical and biological processes of these environments will determine the 'degrees of coastalness'. On deltaic coasts, for example, important determining factors would be the degree of salt water penetration in to fresh surface- and groundwater systems, and the seaward distance to which sediments of terrestrial origin are moved.

Sea-grasses are seed-bearing, flowering, rooted plants which grow submerged exclusively in marine coastal waters and coastal wetlands. Like grasses in terrestrial habitats, they form meadows on the bed of coastal seas. They are dependent on light penetrating for photosynthesis; therefore they generally grow only in shallow waters, in estuaries and coastal seas. They cannot survive outside water; therefore, they often grow where there is shelter from a sand bar or coral reefs.

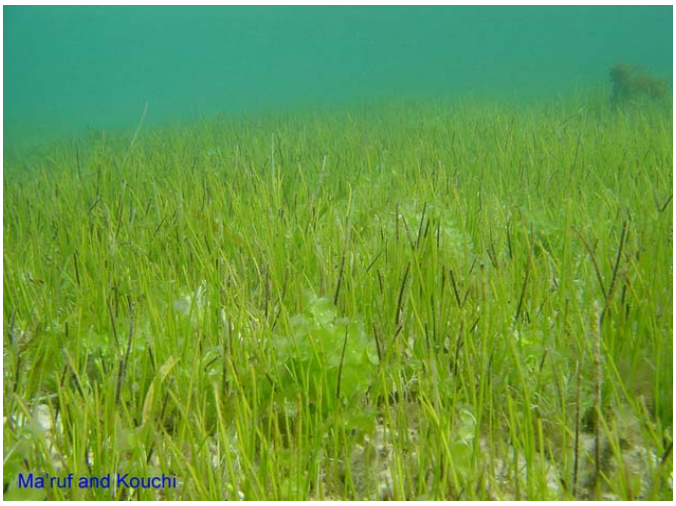


FIGURE 17 SEA GRASS MEADOWS

Sea-grass beds are important because of their provisioning, supporting and regulating services. Sea-grasses have been called 'coastal canaries' (Orth et al., 2006). Like canaries that were taken into coal mines to test the quality of the air, sea-grasses respond to changes in the quality of water, indicating deterioration of the environment by degrading and declining before dying. These changes are visible very quickly, so that it is possible to make management action. They are threatened by pollution, over-exploitation, invasive alien species and climate change.

Sea-grasses are found in coastal waters of every continent except Antarctica. In tropical oceans, they are nearly always found near mangroves and coral reefs.

In the intertidal zones of coastal beaches, sand dunes form where there is enough of sand (sediment between 0.2 and 2.0 mm) and adequate wind. If the beach is large enough, then the surface dries between high tides. This dry sand is blown landwards and deposited above the high water mark. Some of this sand collects behind rocks or clumps of seaweed. Here, the roots and underground part of grasses and other specialized vegetation trap the sand from being blown away. The wind then starts eroding sand particles from the windward side and depositing them on the side protected from the wind. Gradually, this action causes the dune to move inland, accumulating more and more sand as it does so. More and more vegetations grow on these dunes, resulting in an often unique assemblage of flora and fauna (Hesp, 2000).

FIGURE 18 SAND DUNES IN PARANGTRITIS COASTAL AREA, YOGYAKARTA

Sand dunes are found worldwide but are less developed in tropical and subtropical zones, where the are lower wind velocities and damper sand (Packham & Willis, 1997).

An estuary is the last, wide part of a river before it reaches the sea, i.e., it is the tidal mouth of a river. Estuaries are, therefore, important in the movement of sediment from rivers to the sea. Fresh water from the river mixes with the salt water of the sea and creates a transition zone between land and sea. There is always a free connection to the sea in an estuary (NOAA, 2008a).

FIGURE 19 ESTUARY

A lagoon is a body of water cut off from the sea by a sand bank/spit or coral reef (http://www.wordnet.princeton.edu/perl/webwn). Both estuaries and lagoons can have rivers flowing into them. The main difference between the two is the flow dynamic of the water bodies: in estuaries, the water flows fast and strong, while in lagoons the water is more shallow and sluggish. In both estuaries and lagoons, water is brackish.

As Figure below shows, the transition between land and ocean is often gradual, depending on local biophysical conditions.

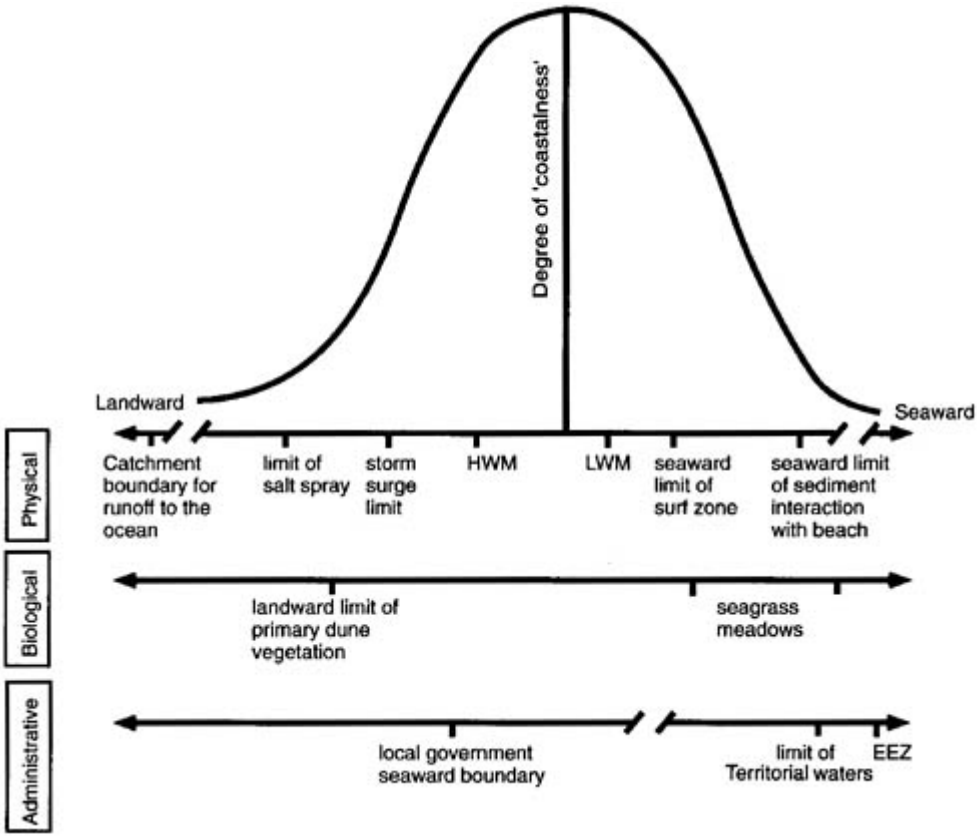


FIGURE 20 EXAMPLE OF 'DEGREES OF COASTALNESS' FOR A SANDY BEACH COAST.

COASTAL ECOLOGICAL LINKAGE

Our goals in this Modul are to link the ecosystems in coastal areas between landscape and sea-scape. Why ecological linkages are important? How are their present conditions ? What are the problems? These questions are significant, because the success in coastal management is depend on how we manage between healthy watershed, estuarine conservation, coastal waters, and open sea ecosystem. Indonesia is an archipelago, the issue of ecological linkage become important since our watershed is so close with coastal waters. It means the management of healthy watershed will determine the sustainable of estuarine, coral reefs, seagrass communities, coastal fisheries, and open-sea fisheries.

Segara Anakan mangrove in central-northern Java. It was reported that in 1980, this ecosystem has received 4.5 ton sediment per year from Citanduy watershed. If the deposit of sediment is persistent, it was predicted this ecosystem will be filled up by sediment, and the mangrove ecosystem will be change to other ecosystem. The problem is in the watershed, not in the Segara anakan lagoon. The cause of sedimentation due to bad management in the watershed areas. The farmer cultivated the land with cash crops, not base on canopy trees. At the 1980, It was suggested that we have to fix the watershed of Citanduy ecosystem. Since then, there are a lot of attempt has been done, but only in the lagoon itself and not in the watershed (Djohan 2007).

At present, some part of the mangrove areas, during rainy season were dominated by the freshwater-aquatic macrophytes. The conservation attempts in Segara Anakan mangrove ecosystem have failed, and the lagoon becomes shallower. The fishery in the mangrove ecosystem has declined. Thus there is a linkage between the

healthy of watershed ecosystem and the mangrove ecosystem in the estuary, and coastal and open sea fisheries. We call this ecological services of mangrove and watershed in the seascape. Thus many ecosystems in the landscape have connection the sea-scape. Since the mangrove play significant role in coastal and open sea fisheries, thus their present is important, and their present depends on the healthy ecosystem of watershed (Djohan 2007; Ronnback 1999).

There is also the linkage between watershed ecosystem and the coral reef ecosystem. In Indonesia the contribution of sediment from un-healthy watershed threats the coral reef and sea grass ecosystem (Figure 1). In the following we will study the linkage between the ecosystems of watershed, river, estuary of landscape and their connection to the coastal, reef and ocean of the seascape (Figure 1) (Figure 1). Figure (2 to 6) represent the un-impacted and impacted ecosystems, which the ecosystem services, their major threats, and management priorities (Anon. 2005).

TROPICAL COASTAL ECOSYSTEMS

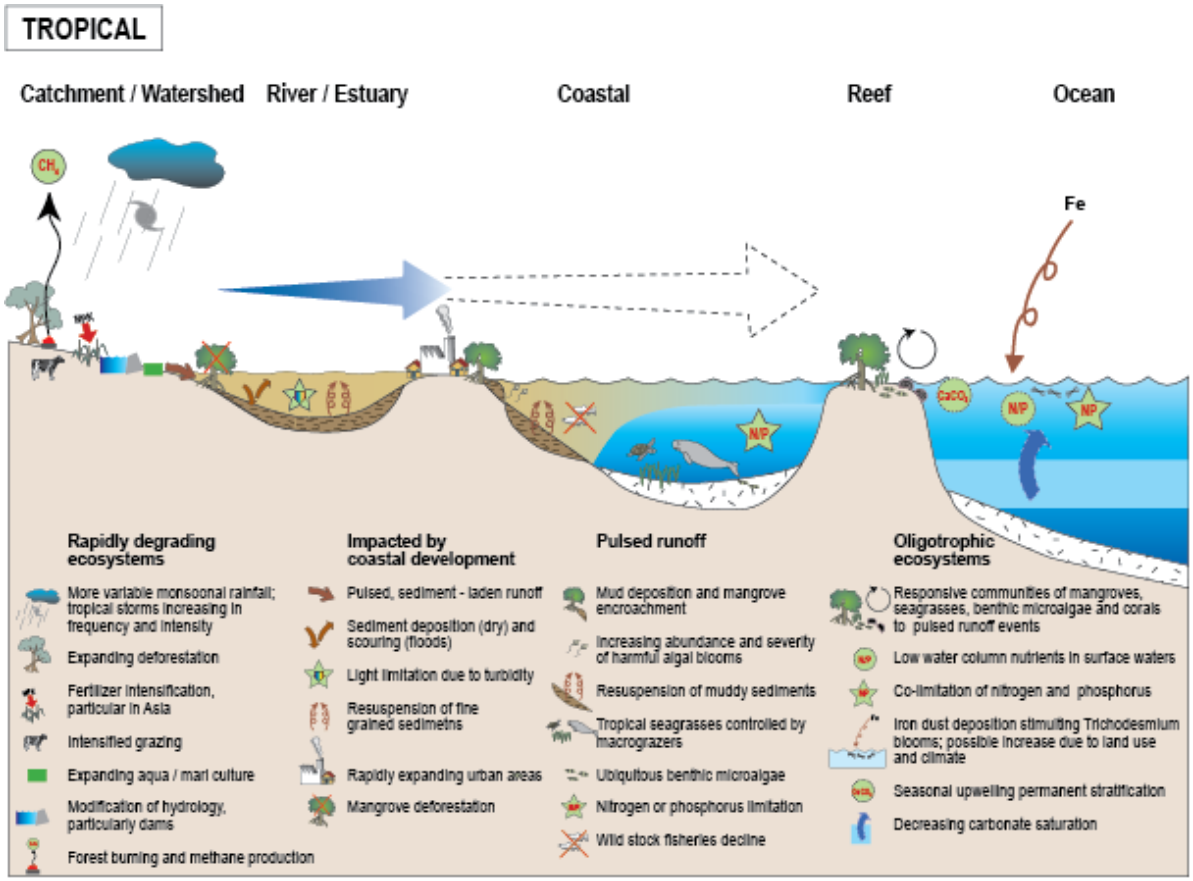


FIGURE 21. THE DIAGRAM REPRESENTS THE LINKAGE BETWEEN WATERSHED, RIVER, AND ESTUARINE OR MANGROVE ECOSYSTEMS IN THE LANDSCAPE, AND THEIR LINKAGE TO THE COASTAL AND OPEN SEA OR OCEAN IN THE SEASCAPE

SOURCE: (ANON. 2005).

TROPICAL CORAL REEF ECOSYSTEMS

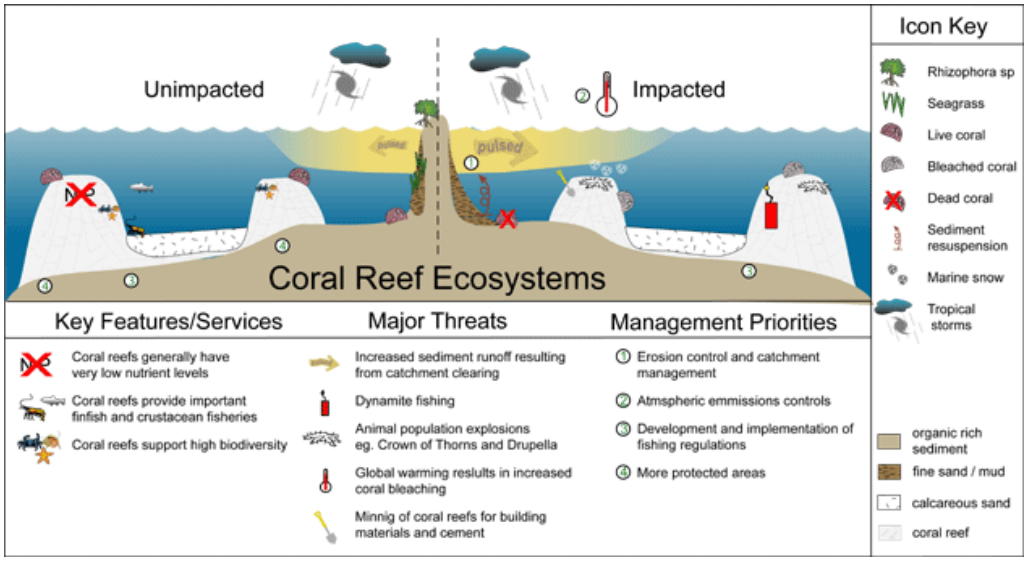


FIGURE 22. THE DIAGRAM REPRESENTS THE CORAL REEF IN THE UN-IMPACTED AND IMPACTED ECOSYSTEMS. NOTICED THAT CORAL REEF ECOSYSTEM SERVICES, ITS MAJOR THREATS, AND THE MANAGEMENT PRIORITIES
SOURCE: (ANON. 2005)

TROPICAL SEAGRASS ECOSYSTEMS

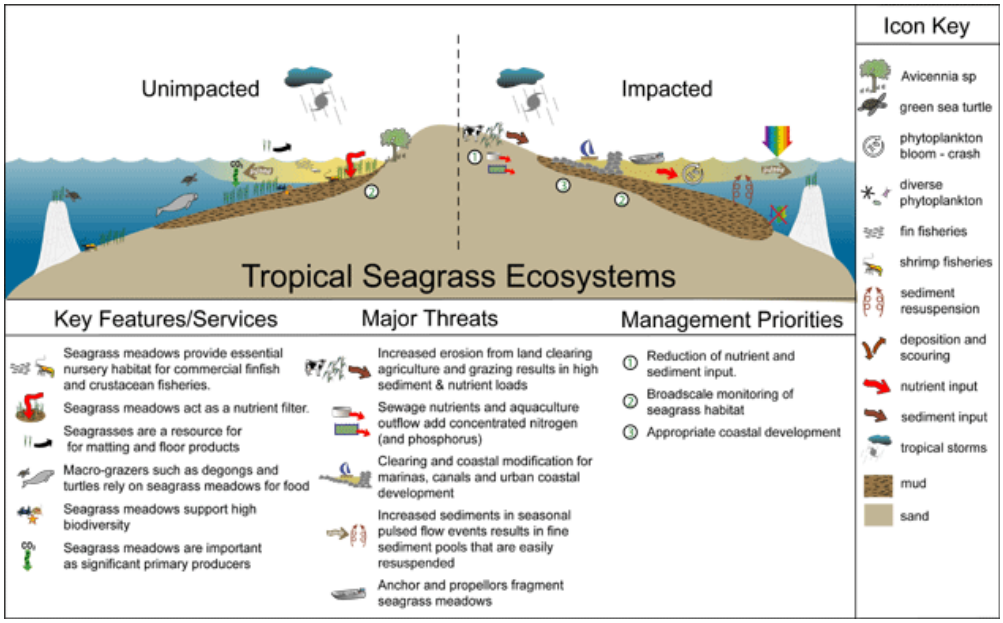


FIGURE 23. THE DIAGRAM REPRESENTS THE TROPICAL SEA GRASS COMMUNITY IN THE UN-IMPACTED AND IMPACTED ECOSYSTEMS. NOTICED THAT SEA GRASS ECOSYSTEM SERVICES, ITS MAJOR THREATS, AND THE MANAGEMENT PRIORITIES

SOURCE: (ANON. 2005)

TROPICAL SOFT SEDIMENT ECOSYSTEMS

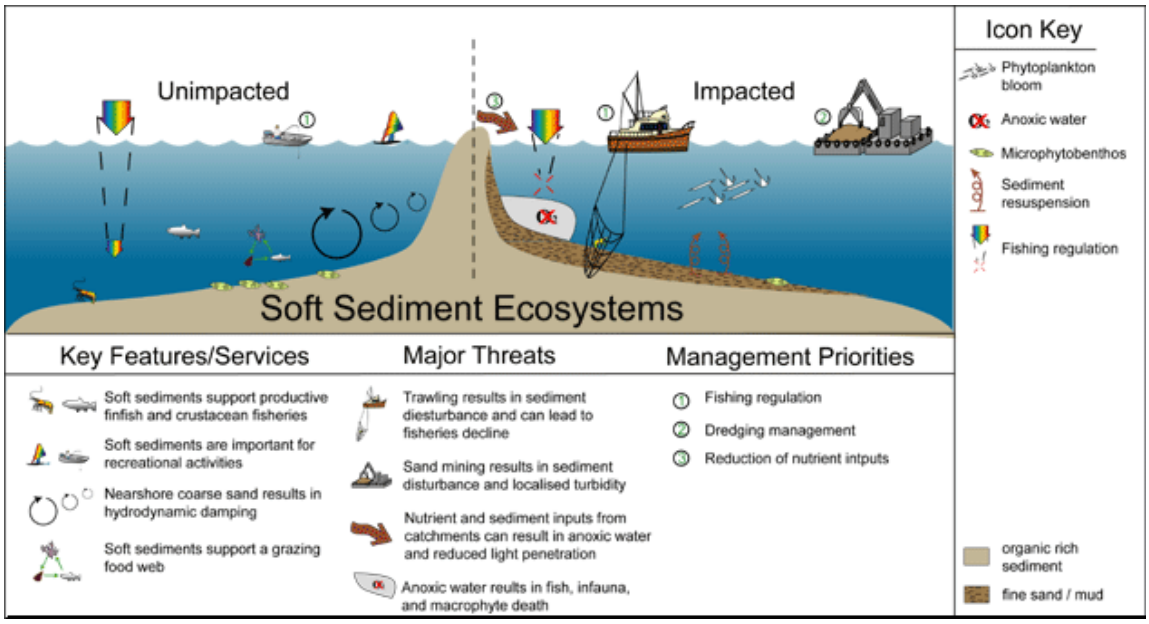


FIGURE 24 THE DIAGRAM REPRESENTS THE TROPICAL-SOFT SEDIMENT IN THE UN-IMPACTED AND IMPACTED ECOSYSTEMS. NOTICED THAT THE SOFT SEDIMENT SERVICES, ITS MAJOR THREATS, AND THE MANAGEMENT PRIORITIES

SOURCE: (ANON. 2005)

Bottom trawlings cause physical disturbance to sediments particularly in shelf sea areas (Figure 4). The disturbance due to trawling is most significant in deeper areas with softer sediments. The soft sediment has levels of natural disturbance due to wave and tidal actions are low. In heavily fished areas, trawls may impact the same area of seabed more than four times per year. A single pass of a beam trawl, the heaviest gear routinely used in shelf sea fisheries, can kill 5–65% of the resident fauna and mix the top few cm of sediment. Simulation results suggest that the effects of low levels of trawling disturbance will be similar to those of natural bioturbators but that high levels of trawling disturbance prevent the modelled system from reaching equilibrium due to large carbon fluxes between oxic and anoxic carbon compartments (Duplisea et al. 2001).

The presence of macrobenthos in the natural disturbance scenario allowed sediment chemical storage and fluxes to reach equilibrium. This is because the macrobenthos are important carbon consumers in the system whose presence reduces the magnitude of available carbon fluxes. In soft sediment systems, where the level physical disturbance due to waves and tides is low, model results suggest that intensive trawling disturbance could cause large fluctuations in benthic chemical fluxes and storage (Duplisea et al. 2001).

TROPICAL ESTUARINE ECOSYSTEMS

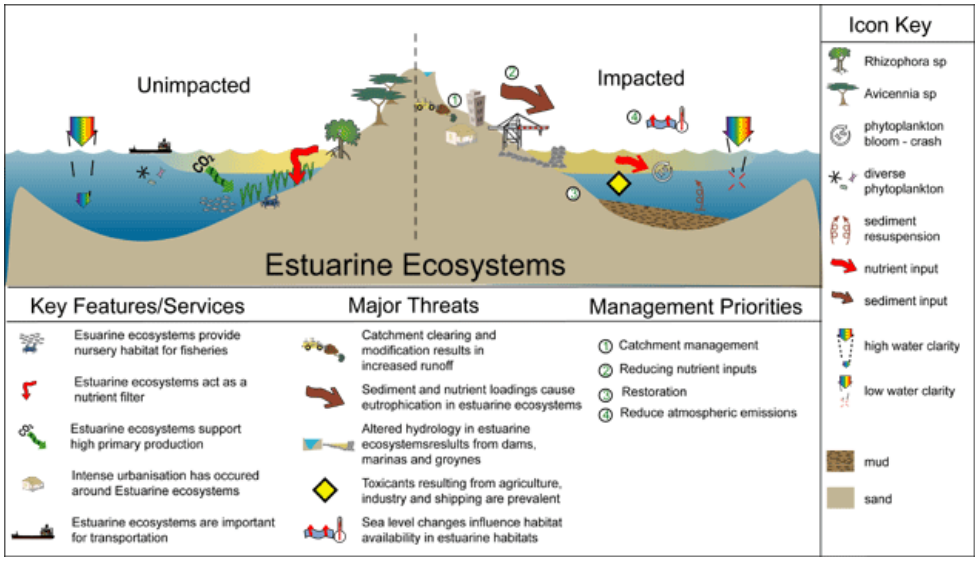


FIGURE 25. THE DIAGRAM REPRESENTS THE TROPICAL ESTUARINE IN THE UN-IMPACTED AND IMPACTED ECOSYSTEMS. NOTICED THAT THE TROPICAL ESTUARINE SERVICES, ITS MAJOR THREATS, AND THE MANAGEMENT PRIORITIES
SOURCE: (DUPLISEA ET AL. 2001)

TROPICAL MANGROVE ECOSYSTEMS

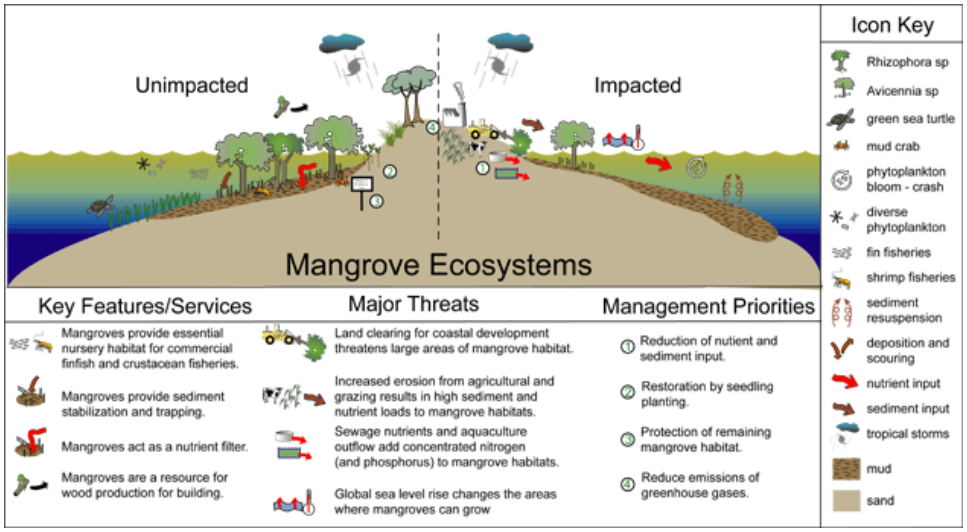


FIGURE 26 THE DIAGRAM REPRESENTS THE MANGROVE IN THE UN-IMPACTED AND IMPACTED ECOSYSTEMS. NOTICED THAT THE TROPICAL ESTUARINE SERVICES, ITS MAJOR THREATS, AND THE MANAGEMENT PRIORITIES
(SOURCE: DUPLISEA ET AL. 2001)

WHAT ARE THE COASTAL ISSUES?

The history of coastal occupancy and coastal development around the globe shows a pattern of depletion of coastal resources and loss of biodiversity. Critical habitats have been destroyed, ecosystem processes disrupted, and waters heavily polluted. But with the ecological knowledge that we have now accumulated and the techniques that are available for coastal zone management, this trend can be reversed. Appropriate actions are available by which coastal communities can both conserve their natural resources and invigorate their economies.

A problem in detecting resources damage and lowered biodiversity is that many critical marine habitats are often not visible or evident to most observers. To take one example, submerged sea grass meadows are major marine habitats and ecological component of shallow tropical coastal waters, but most people are not conscious of their existence, much less of their importance role. Consequently, they are being depleted by widespread dredge and fill activities and by water pollution, including brine disposal from desalination plants and oil production facilities, waste disposal around industrial facilities, accidental spill of petroleum and petroleum products, and thermal discharge from power plants. The loss of seagrass-an important habitat and source of nutrition-can cause a significant loss in marine life and fisheries production. Because so much of the damage is unseen or unrealized, it is often overlooked. The same may be said for coral reefs (usually submerged) and other undersea features.

Shorelands of the coastal zone are used for human settlement, agriculture, trade, industry, and amenity and as shore bases for maritime activities such as shipping, fishing and sea mining. These various uses of the coast are not always compatible and may result in a wide array of conflicts and problems for resources users and decision makers.

Coastal resources are also affected by activities far distant from the coast, such as the discharge to coastal seas pesticides, heavy metals, coliform bacteria, and other harmful substances, changes in salinity regimes as a result of the damming of rivers, and siltation due to deforestation and cultivation. Coral reefs have been destroyed and shellfish beds degraded by siltation, increased nutrients from nearby sources, and sewage and agricultural runoff.

Coastal waters are the “sink” for the continents; they receive and concentrate all kinds of pollutants-sewage, pesticides, factory wastes, garbage, street runoff, waste oil, and so forth. Pollution issues arise in all coastal nations, irrespective of the degree of the development or variation in environmental and soci0-economic conditions. The greater the rate of economic development, is the greater the threat to environmental resources.

Lagoons, estuaries, wetlands, and shallow nearshore waters are particularly vulnerable. Every coastal nation with a major metropolitan area bordering an estuary seems to have a pollution problem, usually as a function of municipal sewage, industrial toxins, and/or polluted land of runoff entering the lagoon or estuary.

There may also be pollution from dumping at sea and an array of conflicts due to the interaction among user groups in congested marine areas. Then, too, nearly every coastal nation that actively harvests its coastal fishery stocks seems to have an overfishing problem. Coastal nations with intertidal forest almost always experience mangrove forest depletion from aquaculture, pollution, filling and the overharvesting of timber for fuel.

Diposaptono (2009) expressed that the coastal zone were distinguished into three zonations: 1) Multiple zone; 2) corridor zone and 3) conservation zone (mangrove). See the figure below.

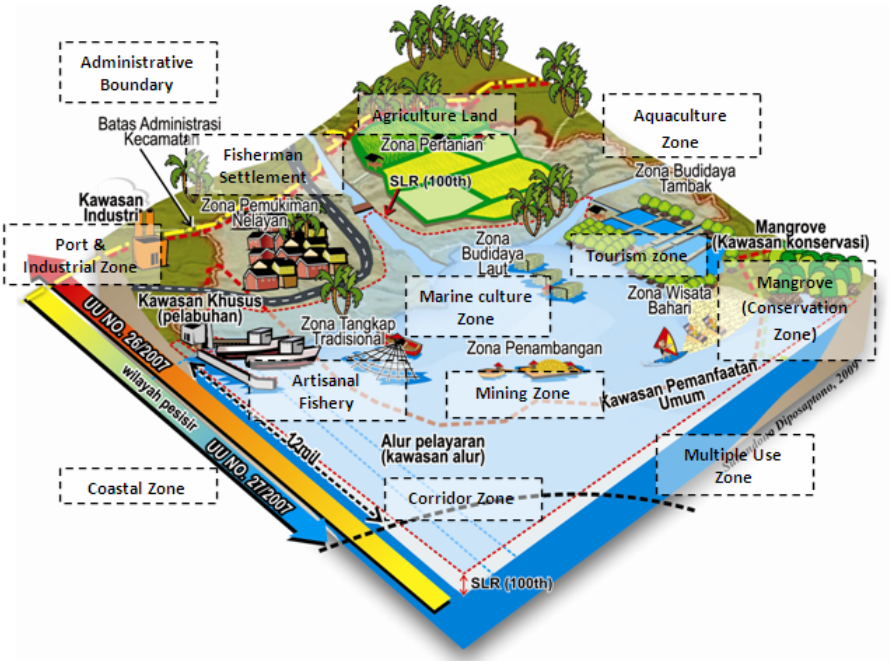


FIGURE 27 COASTAL ZONATION

SOURCE DIPOSAPTONO, 2009

Coastal zone have significant economic purposes, resulted from ecosystem variation and biodiversity. Now days, coastal zone is use as most dense settlement and very complex land use. More than 60% population live in coast and this bring consequences which is very high natural resources exploitation. Human activity in the coastal area has high intensity, for example industry, urban activity, settlement, conservation, mining, etc. This high intensity of human activity makes possibility to create conflict between each land use. (Poniman, 2004)

People have always like living along the coast. The climate is tempered by the large heat reservoir of the ocean, there is the additional source of food and the recreational and aesthetic opportunities are special. But the coastal zone also presents problems, such as hurricane surges, large waves, and cliff collapses. The problem have inspired attempts to control coastal environment, the works have had mixed success. (Abbott, 2004)

DAMS

Despite the immense volume of ocean water, there commonly is not enough water in the coastal zone for people to drink. Thus, many dams have been built across rivers leading to the coast. The reservoirs impound freshwater for home and farm use, and the dams allow falling water to create the kinetic energy that is converted to electricity.

CLIFF PROTECTION

The views from coastal cliffs are among the most enticing In the world. Sea cliff properties are in such heavy demand that they sell at premium price. But sea cliffs retreat under the attack of large waves and dump the cliff-edge buildings onto the beach. The solution is to keep buildings away from the cliffs. This however is easier said than done.

Most homeowners who can afford beach cliff property also have the money to buy protection. Typically they prefer barriers are no match for the power of storm waves at work over time. It the waves do not destroy a protective wall or mass of riprap by frontal assault; they may erode underneath and around the sides, undermining the barrier and helping break it apart. Barriers also reflect waves hitting them, and the rebounding water surges powerfully erode the beach, thus removing protective sand.

The long term picture is an unstoppable retreat of sea cliffs under the attack of ocean waves. Humans can delay their inevitable, but they cannot stop it. Anything built on the sea cliffs must be thought of as a temporary structure, it will be destroyed.

GROINS

Because beach sands are disappearing in so many places, various structures are built to trap and retain sand. One of the most popular techniques is to place sets of short, elongate masses perpendicular to the coastline, the so-called groins. Groins interfere with longshore drift, causing sand to deposit on the up-drift side, but erosion take places on the down drift side. Emplacement of groins usually must be accompanied by artificial replenishment of sands.

Others problems with groins include the erosion of sand by storms coming from other directions and their tendency to direct rip currents offshore, carrying sand beyond the breaker zone and thus out of the longshire drift system.

JETTIES

Even larger masses called jetties are built perpendicular to the coastline to create inlets to harbors and channels for boat passage. The trick is to design jetties of the right length to create a large enough tidal prism (in and out volume of seawater) to naturally scour the channel and keep it open. Of course, this means the jetties will extend beyond the breaker zone and will interfere with the longshore drift system. Beach sand will build up large volumes on the up drift side, while significant amounts of erosion will occur on the down drift side.

BREAKWATERS

Another class of structures, known as breakwaters, is built to protect shorelines or harbors from wave attack. Breakwaters may either be attached to, or detached from, the shoreline. The goal of providing boats a safe haven from heavy waves is reasonable, but preventing waves from hitting the shoreline also cuts off the energy that drives the longshore transport system. The sand, deprived of the energy that moves it, just stops its travels and fills in the area behind the breakwater. To keep the harbor or sheltered area open, a permanent dredging operation must be set up to move the sand back into the long-shore transport system down-drift from the breakwater.

ISSUE ANALYSIS

In a program of coastal management, the conservation issues and problems must first be identified before counter-measures can be proposed. This identification process – known as "issues analysis" – is mainly done in the "strategy planning" stage. Issues analysis means more than just listing the items; it requires categorizing, weighting, balancing, evaluating, and prioritizing the issues in the light of political, social, and economic, background of coastal zone development. Because ICZM – type program can not solve all community problems, the issues to be addressed may be prioritized in a kind of " triage" exercise. The easily resolved issues can be put in a category for modest effort because they can be worked out with minimum effort. The intractable issues can also be given a lower priority on the basis that much time would be wasted on them with little to be gained. Most effort would then go toward the realistically resolvable issues.

A few common themes emerge from issues analysis. Virtually every coastal nation with development bordering lagoons or estuaries appears to have special pollution problems, usually because municipal sewage and industrial toxins. The lagoons or nearshore pollution issue arises in all coastal nations, irrespective of the degree of development or variation in environment and socio-economic conditions. Coastal nations with substansial mangrove acreage almost always experience stresses from watershed practices, pollution, filling, and the overharvesting of mangrove for fuel. As a result, nearly every coastal nation that activately harvests its coastal fishery stocks appears to be suffering from depletion of fish stocks, partly as a consequence of these environmental factors.

The following is a list of generic issues to be explored and questiones to be answered :

- Which coastal resources are seriously degraded; to what level have yields fallen; what are the economic consequences; what actions needed to correct the situation?
- What are the causes of the degradation; what type of development and activities need to be controlled; what are the economic effects of the controls; in consideration of the variety of possible tradeoffs and their effects, what actions are recommended?
- Who are the principle users of coastal renewable resources; how many jobs are at stake; how much income and foreign exchange earnings are involve in tourism, fisheries, and other resource dependent industries; what further losses are expected if ICZM is not implemented?
- What are the priority issues; what critical habitats need special protection; what species need protection; what is the best approach, regulation or protected areas?

It is not enough to simply identify and list the issues. Each issues should be evaluated for important aspects, including at least the following : (a) the extent of socio-economic disturbance and resource loss that it causes; (b) the degree to which it could be resolved by an ICZM-type approach; and (c) the consequences of not resolving it.

Fisheries conservation and the maintenance of tourism or recreation quality clearly emerge as universal arguments for ICZM. The economic importance of fisheries and tourism will strongly influence the extent to which developing nations will want to initiate coastal resources management programs. Mangrove forestry operated on a sustainable yield basis is a significant matter for many nations, as is coral reef conservation. Other major issues are water quality, beach management, allocation of scarce waterfront land, and natural hazards protection.

WHAT IS COASTAL HAZARD?

The measures best suited to conserving ecological resources are often the same as those needed to preserve the natural barriers to storms and flooding. Human activities that remove or degrade protective landforms-removing beach sand, weakening coral reefs, bulldozing dunes, or destroying mangrove swamps-diminish the degree of natural protection the coast affords. For example, if dunes are removed by sand mining or because of obstruction to ocean views, the risk to coastal development behind the former dunes is greatly increased. Similarly, mangroves serve to dissipate wave energy and to stabilize the land areas behind them from the erosive forces of storms. The value that these natural resources have for hazard prevention reinforces the need to identify them as critical areas and to give them strong measures of protection.

In fact, a "hazards loss reduction program" should begin with preservation of coastal habitats that provide natural resistance to wave attack, flooding, and erosion. Many communities have found that a combined approach to hazards and resource management simplifies the process of coastal management and leads to more predictable decisions on what constitutes sustainable development. For example, the same setback requirement that protects beachfront settlement from erosion and storm waves could also preserve turtle nesting sites there. Similarly, a zoning restriction on development of mangrove swamps could not only conserve an economically valuable resource, but also help maintain a physical defense against storm waves. In a final example, a seashore or coral reef park can protect these natural landforms from both natural hazards and resource depletion.

HYDROMETEOROLOGICAL HAZARDS:

1. Floods
2. Tropical Cyclones
3. Severe Storms
4. Drought
5. Extreme Temperatures
6. Air Pollution, Haze and Smoke
7. Dust and Sandstorms
8. Snow Avalanches and Winter Weather Hazards
9. Famine

GEOLOGICAL HAZARDS:

1. Earthquakes
2. Tsunamis
3. Volcanoes
4. Landslides
5. Near-Earth Objects

BIOLOGICAL HAZARDS:

1. **Epidemics**
2. Locust Swarms

ENVIRONMENTAL DEGRADATION:

1. **Desertification**
2. ***Wildland Fire***

Coastal natural disaster cut across all economic sectors. Wind or water damage from a cyclone (hurricane), inundation by a tsunami, wreckage from an earthquake, or coastal erosion from sea storms can affect tourism, the fishing industry, port operations, public works, and transportation. Others sectors such as housing and industry are also vulnerable.

Sinking shore lands must be given special attention. Land subsidence may be caused by natural processes (e.g. soil compaction) or by human activities such as excessive pumping of water or oil from underground. The effects of coastal subsidence are multiplied by global sea level rise, causing even greater potential for the shoreline to move on inland and settlements to be submerged during flood periods.

The consequences of development in coastal hazard-prone areas are also potentially devastating as to require serious governmental attention.

SESSION 1.2 COASTAL ENVIRONMENT DEGRADATION AND HAZARD

FACTS & FINDING

Indonesian coastal area prone towards various hazard, such as earthquake, tsunami, drought (fresh water shortage), erosion, abrasion, land subsidence, flood, inundation, intrusion, hurricane, sea level rise, sedimentation and other consequences such as poverty, malnutrition, land use conflict, etc. More than 15 earthquake occurrences originated in the Indonesian coastal area in 2004. It was followed with physical destruction along the coastal area and also put the community in the vulnerable state. The following table showed the period, location and magnitude of the earthquake.

TABLE 4 EARTHQUAKE HAZARD IN COASTAL AREA

Location	Magnitude	Time of Occurrence
Mataram & Bali	6.1 SR	Jan 2nd, 2004
Sangir (Talaud)	5.8 SR	Jan 23rd, 2004
Ambon	6.8 SR	Jan 30th, 2004
Mataram & Lombok	5.0 SR	April 17th, 2004
Manado	5.4 SR	June 18th, 2004
Madura	4.8 SR	July, 2004
Yogyakarta, Wonosobo & Cilacap	6.3 SR	August, 2004
Palu	5.3 SR	Nov, 03rd, 2004
Cirebon	5.0 SR	Nov 11th, 2004
Aceh (Weh Island)	4.5 SR	Nov 18th, 2004
Alor	7.3 SR	Nov, 2004
Nabire	6.5 SR	Nov 26th, 2004
Aceh – Sumatra Utara	6.5 SR	Dec, 26th 2004
Nias & Simeulue	8.6 SR	March, 28th 2004
Mentawai	6.7 – 7.5 SR	April, 10th 2004

As the Indonesian coastal area generally prone towards the earthquake and tsunami event, different types of natural hazards likely occurred in different location. An example of northern coast of Java Island prone towards various type of coastal inundation, flood, land subsidence and sedimentation problems. Since the coastal area in the northern coast of Java Island was rapidly inhabited, thus there was extensive use of natural resource which leads to environmental degradation. Long listed impacts have been identified, series of legal binding scenarios was proposed, however, more and more natural degradation in coastal area continuously occurred.

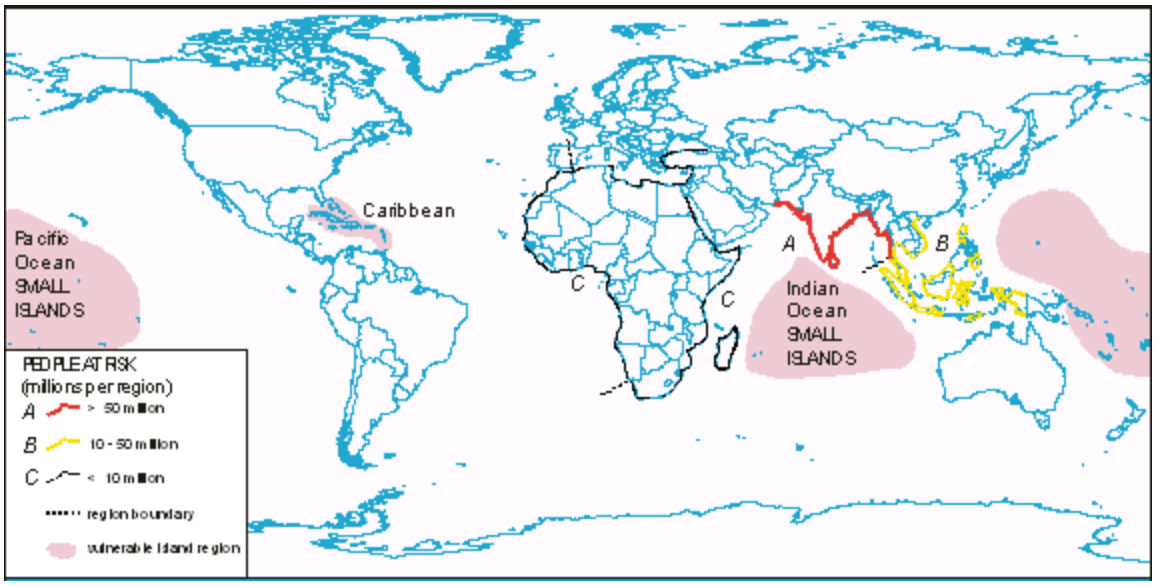


FIGURE 28 MAP OF THE LAND SUBSIDENCE

SOURCE: (SUPANGAT, 2009)

WHAT IS COASTAL ENVIRONMENTAL DEGRADATION?

Coastal environmental degradation is an on going environmental degradation process occurred in the coastal area. There are various indication of environmental degradation in coastal area, which naturally unique in different habitat. In tropical countries, resource conservation programs may be centered on one or more of the following major resource or critical habitat type: mangrove forests, salt marshes, coral reefs, sub merged seagrass meadows, beach dunes systems, tidal flats, shellfish beds, and lagoons/estuaries (including embayments). Small, offshore islands are sometimes listed as a critical habitat category, but they are only aggregation of the various habitats mentioned above. All types are in jeopardy wherever they co-exist with human society.

> ***Environmental Degradation is the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems and the extinction of wildlife. Source: Wikipedia, the free encyclopedia.***
>
> ***Environmental degradation is one of the ten threats officially cautioned by the High Level Threat Panel of the United Nations. The World Resources Institute (WRI), UNEP (the United Nations Environment Programme), UNDP (the United Nations Development Programme) and the World Bank have made public an important report on health and the environment worldwide on May 1, 1998.***
>
> ***Environmental degradation is of many types. When natural habitats are destroyed or natural resources are depleted, environment is degraded.***
>
> ***source : http://en.wikipedia.org/wiki/Environmental_degradation***

Types of impacts affecting certain critical habitats include the following, as listed by Sri Lanka ICZM program:

Critical habitat at coastal area	Key activity impacted the critical habitat.
Coral reef	Physical damage to coral reef; Collection of reef organism; Increase in freshwater run off and sediments; Introduction of waterborne pollutants.
Estuary/Lagoon	Encroachment; Changes in sedimentation pattern; Changes to the salinity regime; Introduction of waterborne pollutants; Destruction of submerged and fringing vegetation; Inlet modifications; Loss of fishery habitat
Mangrove	Changes in freshwater runoff, salinity regime and tidal flow patterns; Excessive siltation; Introduction of pollutants; Conversion of mangrove habitat and overharvesting of resources.
Sea grass beds	Physical alternations; excessive sedimentation of siltation; introduction of excessive nutrients or pesticides
Salt marshes	Degradation of bird habitat or seed fish collection sites Obstruction of storm water run off
Barrier beaches, sand dunes and spit	Sand mining; erosion; dune migration

Source: Clark, 1995

In addition to Mangrove, intertidal areas of the coast include salt marshes and open tide flats. Salt marshes, where they exist, serve many of the same ecological purposes as mangrove forests. They assimilate nutrients and convert them to plant tissue, which is broken into fine particles and swept into the coastal waters. In addition, the marsh provides a special habitat for many valuable species.

Extensive areas of tide flat (mudflats, sand flats, etc.) are often found in estuaries and lagoons. Such flats are important in processing nutrients for the ecosystem and providing feeding areas for fish at high tide or birds at low tide. Mud flats are often important energy storage elements of the estuarine lagoon ecosystem. The mud flat serves to catch the departing nutrients and hold them until the returning tide can sweep them back into the wetlands. In many estuaries and lagoons, tideflats also produce a high yield of shellfish. At the higher latitudes there are extensive beds of kelp in certain area (e.g., Southern California and Western South Africa), which provide food and shelter for marine species.

Cited from (Clark, 1995)**:**

It should be recognized that, in the administrative context, three categories of ecologically critical areas (ECAs) might be recognized for coastal zones:

1. **Generic types of habitat** that are widely recognized as highly valuable and that should be given a high degree of protection through *regulatory* mechanism-wetlands, seagrass meadows, coral reefs, species nesting sites. In the process of project review and EIA, developers would be told they must not disturb these types og habitats. Therefore, developers should be informed ahead of time, before they design projects, that restrictions exist. In addition to ecologically critical areas, other generic types of area should be identified, such as flood-prone lowlands (those that are regularly flooded), which would be designated under the natural hazards prevention category.
2. **Geo-spesific habitats** that would be identified as *specific* areas needing *regulatory protection*. These would include certain named and specifically delineated lagoons, estuaries, islands, mangrove forests, rivers deltas, coral reefs, etc. Each would be described, mapped, and announced for the knowledge of all

interested parties. Such geographic specific habitats would be given special consideration for protection by the reviewing authority as "red flag" areas in the development review process, regardless of ownership. Parts or all of such areas might be government owned or might be privately owned-but the controls should apply to all categories.

3. **Nature reserves**, a third administrative category, which excersises control by *right of ownership*, include nature parks, reserves, and other protected natural areas. Their formation and care is an existing, traditional, and well recognized governmental responsibility in most countries. In this category, the areas have boundaries and are designated for particular type of nature protection, special protection rules are created, and government ownership is maintaned.

An area would be categorized as "ecologically (or environmentally) critical" and listed as a critical area if (a) it contained an outstanding example of one of the generic habitats, (b) it contained two or more of the critical habitats that individually were not outstanding but in combination created a major coastal or marine ecosystem, or (c) it had other outstanding characteristics.

In practice, the identification process might proceed in the following order : (a) identification of generic habitats to be given protection nationally (regionally, if there are regional ICZM programs), (b) delineation-listing and evaluation of sites that qualify as environmentally critical and that would receive special regulatory attention, and (c) selection from the list of critical areas those that should receive the highest level of protection through government proprietorship.

The result would be a single integrated set of "environmentally critical" sites for the entire coast, which then would be sorted out for two different kinds of protection : (a) *regulatory* protection under an ICZM approach and (b) *proprietary* site protection under a traditional protected areas approach. In the selection of habitats for special forms of environment protection-either regulatory or proprietary-it is useful to employ a spesific method. Various schemes are used for determining whether a coastal/marine area is "critical" (or "ecologically sensitive", "sensitive", "vital", "of concern", etc.). most of these schemes depend on professional judgment rather than determinative analysis to evaluate importance and establish priorities, that is, to distinguish the *more valuable* from the *not as valuable*. Such judgments must be exercised against the background of social purpose underlying the mandate for identification and designation of critical areas.

These terms of reference vary greatly from program to program-e.g., the terms of reference that apply to designating a UNESCO/MAB Bioshpere Reserve site would be quite different from those that apply to designating the local nesting place of a particular bird species. Nevertheless, there are generic types of coastal and marine areas that are widely accepted as being especially valuable ecological resources. It is often better for an ICZM program to coordinate with the protected areas, or nature reserves, function rather than try to take over it. One exception would be where protection of environmentally critical areas is not being attempted in a systematic way by the agency in charge; then, it might be appropriate for an ICZM – type program to take over their care.

A summary list of generally recognized types of coastal and marine critical areas might include coral reefs, giant kelp beds, dunefileds, saltmarsh wetlands, mangrove wetlands, estuaries/lagoons, beaches, tideflats, seagrass beds, shellfish beds/reefs and ridges, raised banks, dropoffs, and other "high profile" features. Factors that lead to identification of an area within any of the generic types mentioned previously as spesific habitats, include *inter alia* : **size, ecosystem context, structural characteristics, species present, and geographic location**. For example, a coral reef of several thousand hectares sorrounded by seagrass … (page 105)

How to describe environmental degradation in coastal area?

Environmental degradation in the coastal area cannot easily be identified in particular point or delineated area. The destruction generally revealed using spatial unit. Therefore, geographic information system is applicable for further analysis for the case. Please refer to annex 2 (Presentation of Dr. Hartono).

Session 1.3 Integrated Coastal Zone Management (ICZM)

Fact & Finding

An estimated 50 to 70% of the estimated 5.3 billion people alive today live in coastal zones (Edgren, 1993); Today, the world's population in coastal areas is equal to the entire global population in the 1950s (Beukenkamp, Gunther et al., 1993); In 30 years more people will live in the world's coastal zones than are alive today (NOAA, 1994a); Up to 75% of the world population could be living within 60 km of the shoreline by 2020. (Edgren, 1993) [Kay, 2002].

Coastlines are the world's most important and intensely used of all areas settled by humans. It is this simple fact that directs special attention to the planning and management of coastlines. Coastal resources have been, and will continue to be, placed under multiple, intense and often competing pressures. The use of techniques which attempt to assist in managing the resulting conflicts in a sustainable way will therefore become increasingly important in both developed and developing countries. (Kay, 2002).

Indonesia is a rapidly developing country. Like many Asian nations it had until recently a strong economy, experiencing an annual real economic growth rate of 7.4% in 1990 (Department of Information, 1992). Corresponding with this growth has been an expanding urbanization and an annual population growth of 1.8%. However, coastal populations have been growing at twice the national rate (Asian Development Bank, 1987). This rapid economic growth, continuing population growth and urban expansion have strained coastal environments. Eastern Indonesia has been the focus of many economic initiatives and rapid urban development; one area which has experienced rapid growth is the province of South Sulawesi (Kay, 2002)

What is ICZM?

It would be relatively easy to identify he coastal zone, but for effective ICZM program to work and implementing the legislation would need to identify clearly the area over the management authority would be able to exercise direct administrative and regulatory powers. This area should reflect and include the main area problems (Clark, 1994) as shown in Figure 4.3.

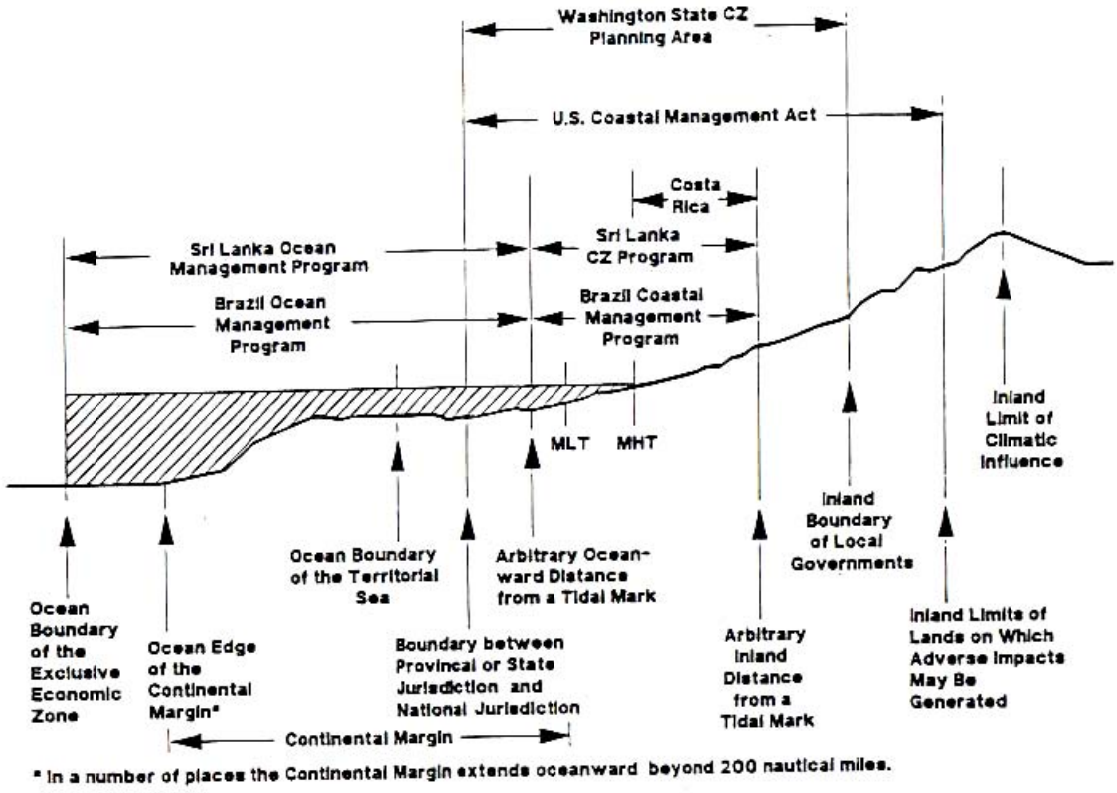


FIGURE 29 BOUNDARIES OF THE COASTAL ZONE -JURIDICTIONAL AND BIOPHYSICAL

SOURCE: (CLARK, 1995)

The following are definitions of the coastal zone used to define areas within which coastal management policies apply.

FIXED DISTANCE DEFINITION

Country	*Inland boundary*	*Ocean boundary*
Australia (State of New South Wales)	1 km from LWM	3 n mile from coastal baseline
Brazil	2 km from MHW	12 km from MHW
Costa Rica	200 m from MHW	MLW
China	10 km from MHW	15 m isobath (depth)
Spain	500 m from highest storm or tide line	12 n mile (limit of territorial sea)
Sri Lanka	300 m from MHW	2 km from MLW

Example Fixed Definition Boundaries of the Coastal Zone (Coastal Committee of New South Wales, 1990; Sorensen and McCreary, 1990)

SRI LANKA COAST CONSERVATION ACT (1990)

The area lying within a limit of three hundred metres landward of the Mean High Water Line and a limit of two kilometres seaward of the Mean Low Water Line and in the case of rivers, streams, lagoons, or any other body of

water connected to the sea either permanently or periodically, the landward boundary shall extend to a limit of two kilometres measured perpendicular to the straight line base line drawn between the natural entrance points (defined by the Mean Low Water Line) thereof and shall include waters of such rivers, streams and lagoons or any other body of water so connected to the sea.

Variable Distance Definitions

The South Pacific Regional Environment Program (1993)

The coastal zone is a region of indeterminate and variable width. It extends from and includes, the wholly marine (i.e. the seabed, the overlying waters and their resources) to the wholly terrestrial (i.e. beyond the limits of marine incursion and the reach of salt spray). Linking these two environments is the tidal area which forms a transition between land and the sea.

According to Use

United States Federal Coastal Zone Management Act (1990) section 304

The term 'coastal zone' means the coastal waters (including the lands there in and there under) and the adjacent shorelands (including the lands therein and there under), strongly influenced by each other and proximity to the shorelines of the several coastal states, and includes islands, transitional and intertidal areas, salt marshes, wetlands and beaches. The zone extends, in Great Lakes waters, to the international boundary between the United States and Canada and, in other areas, seaward to the outer limit of State title and ownership… [continues with list of Acts]. The zone extends inland from the shorelines only to the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters.

Australian Commonwealth Coastal Policy (1995)

For the purpose and actions of the Commonwealth, the boundaries of the coastal zone are considered to extend as far inland and as far seaward as necessary to achieve the Coastal Policy objectives, with a primary focus on the land-sea interface.

United Kingdom Government Environment Committee Report on Coastal Zone Protection and Planning (1992)

We conclude that definitions of the coastal zone may vary from area to area and from issue to issue, and that a pragmatic approach must therefore be taken at the appropriate national, regional or local level.

World Bank Environment Department (1993)

For practical planning purposes, the coastal zone is the special area [original holding], endowed with special characteristics, of which the boundaries are often determined by the special problems to be tackled.

OECD Environment Directorate (1991, 1993)

What constitutes the coastal zone depends on the purpose at hand. From both the administrative and scientific viewpoints, the extent of the zone will vary depending on the nature of the problem. Accordingly, the boundaries of the coastal zone should extend as far inland and as far seaward as necessary to achieve the objectives of management.

AUSTRALIAN COMMONWEALTH HOUSE OF REPRESENTATIVES INQUIRY (1980)
Any definition of the coastal zone should be flexible, and should depend on the issue being confronted.

NEW SOUTH WALES GOVERNMENT DRAFT REVISED COASTAL POLICY (1994)-OPTION 5
an issues based definition where the boundaries of the coastal zone extend as far inland and as far seaward as necessary to achieve the policy's objectives, with a focus on the land sea interface…

INDONESIA ON ZEE (1983)
Exclusive Economic Zone (ZEE) measured from regional base line of Indonesia to the sea shore. This concencus follow by Law number 5 Year 1983 about ZEE. Consequences from this Law implementation which is Indonesian area width increase 2,7 million km^2, so now the width is 5,8 million km^2 (Dahuri, 2003). With 200 mile wide, ZEE is the great and important area for Indonesian archipelago.

HOW TO IMPLEMENT ICZM?

ICZM has been defined by the EU as a dynamic, multi-disciplinary and iterative process to promote sustainable management of coastal zones covering the full cycle of information collection, planning, decision-making, management and monitoring of implementation. This cycle was originally developed by GESAMP and modified by Olsen who suggested that a typical ICZM cycle would require 8–15 years from an issue identification to evaluation (see Fig. 4.4) A.H. Pickavera,_, C. Gilbertb, F. Breton, 2004.

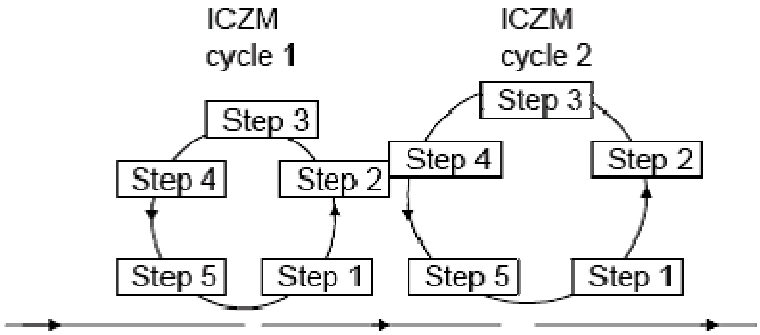


FIGURE 30.THE CYCLICAL NATURE OF ICZM, ADAPTED FROM GESAMP. THIS DYNAMIC METHOD OF COASTAL MANAGEMENT REQUIRES FEEDBACK BETWEEN VARIOUS STEPS OF THE SEQUENCE. THE FIVE STEPS IN THE PROCESS CORRESPOND TO THE FIVE PHASES. PROGRESSIVELY, LARGER CYCLE LOOPS INDICATE INCREASED COMPLEXITY OF ISSUES BEING ADDRESSED. IT HAS BEEN SUGGESTED THAT EACH CYCLE WOULD REQUIRE 8–15 YEARS.

There are numerous approaches of CZM and the WCC 1993 was the first attempt to produce general guidelines for all countries that wished to follow the (I)CZM concept in order to control problems and negative impacts in the coastal zone and make a sustainable development there possible. With the time many local projects emerged. As the comparison of various set-ups has illustrated even a successful local CZM structure cannot be implemented nationwide without significant modification and careful evaluation of involved power structures. While it is generally accepted that the contents of each project have to be modified to the local conditions found, i.e. biological, geographic or even demographic, the political perspective had been neglected so far. Through emphasizing the structure of CZM organization and its position as embedded in a country's political system, this

study shows that a concept's content and organizational structure are likewise decisive of its successful implementation. Since China has formulated no national guidelines for ICZM yet, this theoretically leaves the decision and the formulation of ICZM-structures to the local level. This study contributes to the ICZM discourse in China by drawing an elementary structure of a conceptual organizational set-up that is likely to be suitable for most localities.

Apparently, all CZM structures must be considered very carefully for all kinds of issues and different local interests involved. Therefore, it is still very difficult to gain information on examples of planned and implemented projects or reaction to unexpected development or disasters that could be used to determine the success of CZM and the decision making processes involved. Nevertheless there is a need for extended research with such case studies to assess the effectiveness of CZM, e.g. on prevention of loss due to storm surges or the management of conflicts in the coastal zone, to fill in the theoretical framework.

To integrate every possible problem and development into a concept is a difficulty. Therefore, it is recommended to launch testing or demonstration projects for evaluation of strategies and technologies. This evaluation can be regarding issue or implementation factors likewise. The latter aspect of planning and implementation tools is most important and holds a great variety. For the CZM approach functional zoning was defined as a major tool. It divides the coastal zone into units of different use. If more than one use is applied to a unit, the activities need to be compatible. The emphasis of the functional zoning can differ, either regarding its various uses (economic focus) or along its environmental value (ecological focus). The former takes as a fact, that a use will be applied therefore it can be regarded more as a tool of preventing e.g. multi-use conflicts, and at the same time always being dedicated to the objective of sustainable development. In contrast, the latter indicates which sort of use, if any, may be applied. In this case, the environmental aspect seems to be more important. The program takes the latter approach, while categorizing at least the marine part of the coastal zone into zones ranging from no use to extended use. Nonetheless this ecologically focused attempt at zonation is by far a guarantee in favor of environmental interests and in opposition to economic planning. The determining aspect is, who makes the decisions about the way to categorize and who undertakes the categorization and is responsible for its implementation. This is subject of the organization of CZM.

WHO ARE INVOLVED IN COASTAL AREA?

NOTE SUBSTANCE: identify STAKEHOLDERs/coastal area managers and their roles

Coastal dwellers and users are knowledgeable about local resources and can provide some of the biophysical information needed to make appropriate resource allocation decisions. Similary, users can provide socioeconomic information more efficiently and effectively than most agencies (Kay, 1999).

On the integrated coastal area development formed a commitee which moving in the local instutional range including institute which related to coastal area environment issues. This commitee can work with good coordination and consist of Marine and Fisheries Agency, Development and Planning Agency, Environment Agency, Forest Agriculture Department, Local Goverment, Tourism Agency, Industrial Department, HNSI, Muspika, University, Non Goverment Organization, Community figure, Legislative, harbour and group of people. Their role are very needed to cooperate each others with 3K function (coordination, cooperation, and consultation) so there will be a synergic relationship and good colaboration to conduct integrated program. The role of each stakeholders on the integrated coastal management can be identified in the table below.

TABLE 5 ROLE OF STAKEHOLDERS ON THE INTEGRATED COASTAL MANAGEMENT

No	Stakeholders	Roles
1	Marine and Fisheries Agency	- Retribution withdrawal - Development of environmental vision fish mart - Giving accomodation for the fisherman - Saving and loan
2	Tourism Agency	- Beach arrangement - Tourism development
3	Environmental Impact Agency	- Coastal planning and development - Coastal reboisation
4	Local Goverment	- Making/executor of law and regulation - Construction and funding - Coastal supervisor - Regulation - Licensing - Active facilitator
5	Harbour	- SIUP (Trading license) - Monitoring - Law enforcement - Parole - Sea security
6	AIRUD (Coastal Security)	- Monitoring and law enforcement - Tracking fisherman lost boat - Beach supervisor - Pirates operate
7	TPI (Fish Mart)	- Sea product management - Sea product consign - Sea product selling - Providing bert for fiserman boat - Fish mart - Saving and loan cooperation - Giving amenity for the fisherman - Helping fish distribution - Not yet permanently fish mart
8	HNSI (Indonesian Fisherman Organization)	- Fisherman organization - Fisherman arrangement - Fisherman license - Assist fatality business
9	KUD Mina (Village Cooperation Unit)	- Provide funds for fisherman - Fisherman social - Fisherman community welfare
10	Enterpreneur/Industry	- Waste dismissal - Investor
11	Society	- Coastal security participation - Coastal exploiting - Agriculture - Community live - Fisherman labour - Environmental pro-active

12	Fisherman	- Fish gathering - Protect coastal continuity - Lack of sea product seller - Protect fisherman and ponds continuity - Protect water biota - Sea/river resources exploitator
13	Breeder	- Damaged the environment especially mangrove as livestock - Diversivication of fish food usage - Protect the mangrove - Protect crop continuity
14	Fish pond farmer	- Active role as a environment user - Improve effort result - Protect mangrove - Protect fish pond irrigation - Protect water level - Fish pond potency development
15	Shrimp Seed	- Giving shrimp seed suply to be plant in the fish pond
16	Fish Merchant	- Help fish pond farmer and fisherman to distribute their products - Shorten water transportation distance

Source: survey result with Focus Group Disscussion in Tegal Regency (Jati, 2005)

While the sectoral institution on the local government which have function on the coastal management must have good cooperation with 3K function to suport integrated activities. The sectoral institution must be consist of several aspect as shown in the table below.

TABLE 6 ROLES OF SECTORAL INSTITUTE

No	Sectoral Institution	Roles
1	Marine and Fisheries Agency	Manage, develop and arrange fisheries activities in the coastal area and sea (fishery catch, cultivated fishery, processing fisheries product)
2	Forest Departement	Manage sea and coastal ecosystem conservation activities such as selecting and managing sea conservation zone (Taman Nasional Laut, Suaka Margasatwa)
3	Sea Networking Department	Responsible in the sea management as transportation media including sea pollution management (example: oil spill)
4	Mining and Energy Department	Manage certain activities which related to oil and gas exploitation in the coastal or sea shore area
5	Education and Cultural Department	Responsible on the human resources development in coastal aspect and research
6	Defence and Security Department (DIHIDROS)	Security of sea teritory barrier, hidrooceanography data collection and produce sea map
7	Trading and Industry Department	Arrange industry development in the sea and coastal including sewage management
8	Regional Accomodation and Settlement Department	Manage all activities in beach engineering, for example built infrastructure, prevent beach erosion, etc
9	Tourism Departement	Develop and manage sea and coastal tourism activities
10	Cooperation Ministry	Develop cooperation effort especially fishery cooperation in the village

Source: Sloan dan Sugandhy, 1994 on Dahuri et al, 1996

Integrated coastal management need an oragnisation or local commitee which directly can be participated as their competency and coordination each others.

Coastal resource management requires involvement by all levels of government. The local governments are involved because they govern where development takes place, where resources are found, and where the benefits or disbenefits are mainly to be felt. The central government has to be involved because responsibility and authority for marine affairs inevitably rests here (navigation, national security, migratory fish, international relations, etc). Intermediate levels of government-e.g., state (provincial or regional-are involved because all entities that have responsibility in the coastal area have a role in the ICZM process. It should be made clear that ICZM is an overlay program; it doesn't replace existing institutional arrangements in most cases but rather is meant to strengthen them.

But the integration of multiple agency interests into a single program is very difficult. Without exception, institutions will defend their turf and only yield authority and prerogative grudgingly. Getting institutions cooperate in multi sectoral activities toward ICZM goals that no single institution can accomplish singly is certainly one of the toughest jobs for the ICZM authority.

HOW TO EMPOWER COASTAL COMMUNITY?

NOTE SUBSTANCE: community development

Linkages between community development, coastal management, and disaster management processes and activities are needed to build CCR to both chronic and episodic coastal hazards.

Community-based planning and assessment of coastal hazards and risks is a fundamental first step in building CCR. Plans must be regularly reviewed and updated based on new information and experiences and lesson learned from implementation and monitoring.

Assessment is the first step in providing inputs to planning decisions to address primary issues of concern in a community. A CCR assessment provides an opportunity to initiate dialogue among key stakeholders in the area.

The following figure revealed that to accommodate varied problem within an area there should be an alternative methods, such as finding the problem, defining the problem at various scale such as household, community level and regional level, generate alternative approach to address the problem, decides which strategy that applicable for each scale, develop the implementation plan and monitor the result.

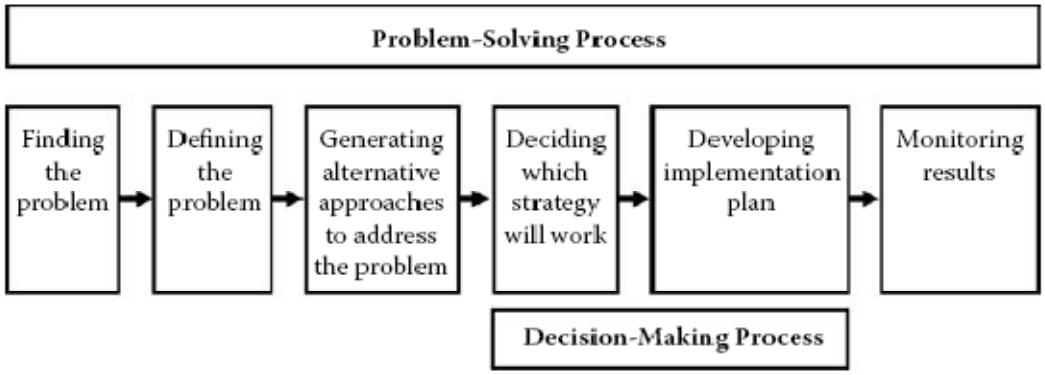


FIGURE 31 PROBLEM SOLVING PROCESS

SOURCE: (PINE, 2009)

HOW ICZM IN THE FUTURE?

NOTE SUBSTANCE: Institutional building and management (review on existing constrain in indonesia)

ICZM is a complex undertaking in terms of numbers of stakeholders. In comparison, most social policy areas (e.g. criminal justice, drug enforcement, public health) involve relatively fewer government setors that does coastal management. The greater number of sectoral division within the policy area (such as ICZM) is the greater potential for fragmentation of the government responsibility and duplication of effort. The ICZM authority must have influence of wide range of ministries and agencies-e.g. finance, agriculture, economic planning, commerce, tourism, forestry, and transportation, and must often take position on coastal development or conservation that may be viewed as adverse by one or more of the agencies. To enhance strategy planning it is important to create a strong interagency coordinating mechanism. This will ensure the widest and most effective participation of government agencies. (Clark, 1994)

SUSTAINABLE FRAMEWORK ON ICZM

Sustainability has emerged as the dominant paradigm of the world's coastal management programmes in the late twentieth century. The historical context of this emergence is described in the previous section; here we describe the concept of Sustainability and discuss its influence on coastal programmes, from broad scale strategic planning to day-to-day management regimes. This discussion forms the basis for the more detailed treatment in Chapters 3, 4 and 5 of tools and techniques to help to achieve the sustainable development of coastal areas.

The concept of Sustainability came into prominence with the publication of the World Commission on Environment and Development (WCED) report called *Our Common Future* (World Commission on Environment and Development, 1987). The WCED group was chaired by Gro Harlem Brundtland, hence the report came to be known as the Bruntland Report. The message of the Brundtland Report (WCED, 1987, p. 8) was that: it is possible to achieve a path of economic development for the global economy 'which meets the needs of the present generation without compromising the chances of future generations to meet their own needs'.

A central precept of Sustainability, to quote Pearce *et al.* (1989, p. xiv), is that sustainable development leaves 'future generations a wealth inheritance—a stock of knowledge and understanding, a stock of technology, a stock of man-made capital, and a stock of environmental assets—no less than that inherited by the current generation'. Young (1992) recognizes a number of themes underlying the Sustainability concept, summarized by his 'three Es':

- environmental integrity;
- economic efficiency; and
- equity, defined to include present and future generations and recognize cultural as well as economic considerations.

Though precise definitions of sustainability may be rather elusive, it is clearly not a set of prescriptive actions; rather it is the basis for a fundamental reassessment of the way in which resource, environment, social and equity issues are considered in decision making. The profoundness of its implications has caused sustainability to be compared with such basic societal values as freedom, justice and democracy (Buckingham-Hatfield and Evans, 1996a). Seen in this light, sustainability becomes a 'way of thinking', helping to modify the context to which it is applied (Turner, 1991). Thus, sustainability principles can 'highlight unsustainable systems and resource management practices' (Turner, 1991, p. 209). The tests of sustainability having been applied and unsustainable practices revealed, the way opens for new, sustainable management approaches to coastal area management to be devised and adopted.

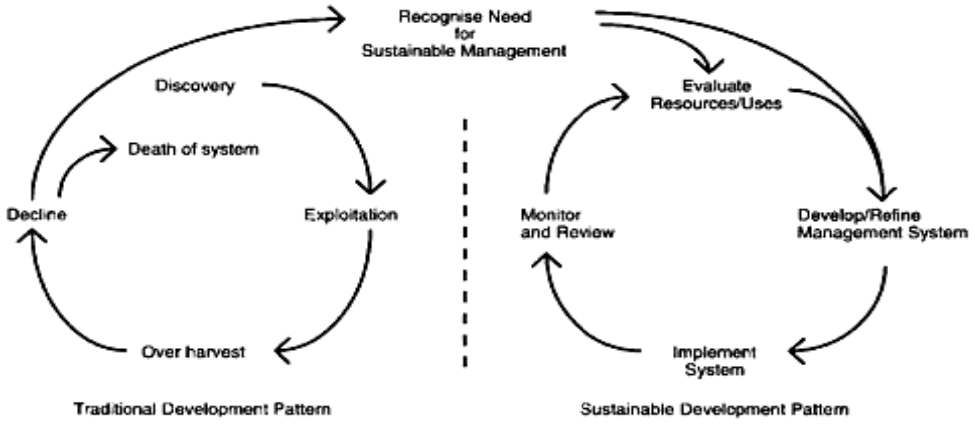


FIGURE 32 SUSTAINABLE AND UNSUSTAINABLE APPROACHES TO COASTAL RESOURCE USE

SOURCE: (DUTTON AND HOTTA, 1994).

As a 'way of thinking', sustainability has not only become part of the mainstream of decision-making processes; it has also in many nations become a political reality (Buckingham-Hatfield and Evans, 1996a)— though remaining elusive in many others (Kirkby *et al.,* 1991). However, the idea that the present generation can through the application of sustainability principles act as stewards of the earth for future generations is as much an act of faith as it is one based on technical or scientific evidence (Buckingham-Hatfield and Evans, 1996a). This raises two important issues: the weight to be given to technical information, and the time-dependence of decision making.

Sustainability has acted as the catalyst for a new mix in the information sources on which decisions are based. It has seen the 'hard science' emphasis of the 1970s and 1980s evolve into a more balanced appreciation of scientific

and non-scientific inputs into decisions. This balancing has manifested itself in various ways—for example, the Best Practicable Environmental Option system in the United Kingdom (Gerrard, 1995)— but its most pervasive expression is the 'precautionary principle' (Cameron, 1991), commonly defined in the language of Principle 15 of the Rio Declaration (UNCED, 1992):

In order to protect the environment, the precautionary approach shall be widely accepted by the States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation.

This principle is now incorporated into the London and Hague Declarations dealing with marine pollution.

Precautionary action has three central components. First, there is an economic dimension of cost-effectiveness; second, decisions which may have irreversible impacts, so providing a legacy for future generations, gain heightened importance in the decision-making process; and third, the lack of a requirement for complete scientific information in the face of economically inefficient and/or irreversible impacts—a substantial shift from a rational-comprehensive view of decision making, as will be shown in Chapter 3. It is important to note that a precautionary approach to guiding decision making is a very recent phenomenon and its use is not uniform around the world (O'Riordan and Cameron, 1994). However, its current use in some coastal nations, and probable spread to many more, is likely to see precaution entering the lexicon of most coastal managers in the next few years.

A central part of the 'way of thinking' introduced in this section is the consideration of time dependence in decision making; that is, consideration of the effects of present-day activities on future generations (Young, 1992). Sustainability thinking requires that future effects and impacts of decisions, and not simply those in the present day, be considered. Relating to this concept, many planners have seized upon Sustainability with the notion that planning and Sustainability principles are similar, and that a convergence of planning and sustainable development is emerging under the banner of environmental planning (Blowers, 1993; van Lier *et al.*, 1994; Buckingham-Hatfield and Evans, 1996b).

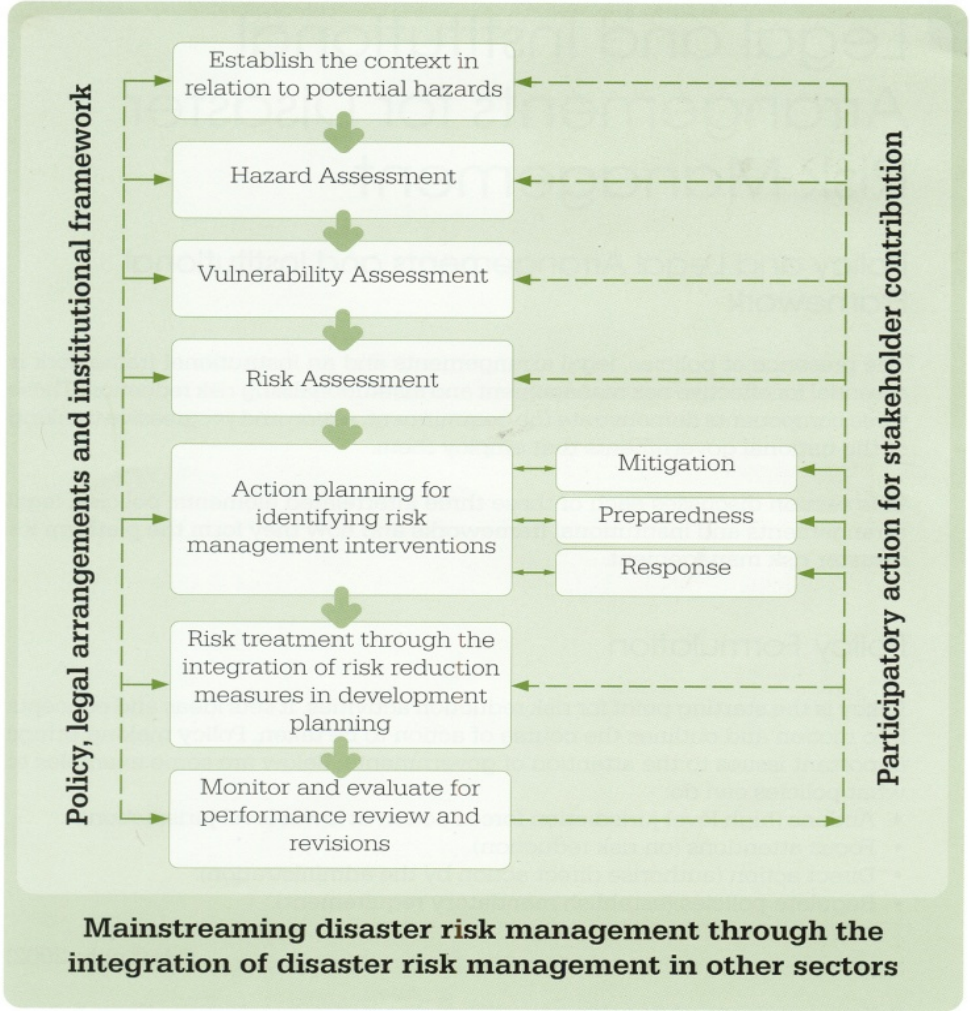


FIGURE 33 DISASTER RISK MANAGEMENT FRAMEWORK

MODULE 2 DISASTER RISK REDUCTION IN COASTAL AREA

INTRODUCTION

Within the colliding dynamic natural, economic, social and political system of coastal zone, at some point there will a disruption. The disruption can be in any form of environmental stress or shock. Scholar had long been intervened with such disruptions using the framework of disaster risk reduction. The disaster risk reduction aim at the identification of hazard, vulnerability and end up with risk analysis. Many approaches are introduced to analyze the hazard, vulnerability and risk using varied type of cases. This module try to elaborate on how the methodological of disaster risk reduction being developed, and how this method can be applied for such case, which enable the decision maker and all stakeholder involved to quantify the hazard, vulnerability and risk in coastal zone.

OBJECTIVE

1. Comprehend DRR concept, mainstreaming DRR into policy and planning
2. Identify, analyze, and access the coastal hazard
3. Measure the vulnerability of coastal hazard
4. Analyze and measure the risk of coastal hazard
5. Understand adaptation climate change in the coastal area

LEARNING OUTCOME

1. Understanding the DRR concept
2. Able to identify coastal hazard, vulnerability and risk
3. Comprehend the community capacity in coastal area
4. Additional introduction towards global climate change as potential hazard in coastal area

SESSION 2.1 DISASTER RISK REDUCTION (DRR)

FACT & FINDING

Indonesia broke new ground on disaster risk reduction with the passing of Disaster Management Law 24/2007 in 2007. The scope of the law is far-reaching, affording Indonesian citizens individual rights to protection from and during disasters. This law represents an achievement for the Indonesian Society for Disaster Management (Masyarakat Penanggulangan Bencana Indonesia – MPBI), a national organization supported by UNDP Indonesia, which played a critical role in ensuring that the law's provisions were concrete enough to make disaster risk reduction a reality in Indonesia. Most importantly, this law has teeth. It lists penalties in the form of substantial fines and jail sentences applicable to individuals and organizations, including those of the government, public and private sectors, for failing to abide by the law. The law includes specific language on direct protection and response services in disasters and outlines the rights of individuals to information, education and training on disaster risk reduction. The law also calls for the establishment of a new National Disaster Management Agency, which will act as a coordinating entity to make disaster risk reduction operational across relevant ministries. It will also set up provincial disaster management agencies. These agencies will allow for the active participation of community-based organizations, non-governmental organizations and indigenous groups.

With the passing of this law, the government has now made disaster risk reduction one of its nine national development priorities and substantially increased funding for this issue. In 2008, USD 150 million was allocated for pre-disaster mitigation; a significant increase from the USD16 million approved the year before. (www.undp.org)

WHAT IS DRR?

"…disaster is an event impact on the loss of life, injury, damage to and destruction of property, damage and destruction of subsistence and cash crops, disruption of production, disruption to lifestyle, loss of livelihood, disruption to essential services, and government services, national economic loss, and sociological-psychological after-effects…" (Carter, 1991)

"…an uncontrollable events that concentrated in time or space, which a society undergoes severe danger and incurs such losses,…that the social

structure is disrupted and the fulfillment of all or some of the essential functions is prevented…" (Handmer & Dovers, 2007)

HOW TO DIFFERENTIATE BETWEEN DRR & DM?

Components of Disaster Risk Management

ADPC (2005) stated that to successful the disaster risk management (DRM similar with DRR) requires the implementation off all these four phases of the disaster management cycle (DM).

1. Mitigation-measures to be taken before and after an event, including activities or actions : hazard assessment, vulnerability analysis, risk assessment, risk evaluation, vulnerability reduction/mitigation strategies (structural and non-structural), integration of disaster risk reduction (DRR) activities in all development activities making it mandatory, with a mechanism similar to Environmental Impact Analysis (EIA) process or making it a part of the EIA process.
2. Preparedness-measures to be taken before and after an event. Preparedness includes : prediction and warning for different disasters, emergency preparedness (for monitoring, alert and evacuation, immediate disaster assistance to set up medical operations, deployment of search and rescue teams and distribution of disaster supplies and equipment), education, training and public awareness.
3. Response-measures to be taken during and immediately after an event including : mobilization, assessment, requirement analysis, rescue and evacuation, emergency assistance (medical care, shelter, distribution of foot, water and supplies).
4. Recovery-post disaster measures (long and after the disaster). Recovery consist of : rehabilitation, reconstruction, psychological counseling, and long-term assistance to rebuild the community is critical to survival.

During the past these four aspects were represented in form of a continuous cycle as four phases **Mitigation, Preparedness, Response and Recovery** to explain their relationship to development. However, that concept is not being used now as it poses a danger that it may lead to certain misinterpretations, such as :

- Each are independent, unrelated activities
- Mitigation is carried out only before a disaster
- Reconstruction can be done without consideration for any recurrence of disasters in the future (especially in rare, but events with high consequences).
- Development activities in the country can take place irrespective of the impact of potential threat from natural hazards.
- No need to relate the relief, response and recovery activities to development planning, as in the case of mitigation and preparedness.

The ideal disaster risk management framework based on ADPC report (2005) requires a set of implementation tools. Policies, institutional and legal arrangements are three pillars of the DRR, it serve as these tools that address the need for each action displayed in the framework as well as identifying the role and responsibilities of the actors and the resources required to put the framework in to practice.

The disaster risk management framework play a vital role in establishing a disaster risk management framework that applies to all government levels, non-government organizations, institution and sectors. Good

governance and strong leadership are necessary to generate the political will to drive the development, implementation and maintenance of the national disaster risk management framework including :

- Recognizing the need for national disaster risk management policy
- Establishing a policy formulation process
- Defining the main policy elements
- Arranging for implementation and maintenance procedures, including monitoring and reviewing the effectiveness of risk reduction actions (Carter, 1992 in ADPC, 2005).

SESSION 2.2 IMPLEMENTATION OF DRR

FACT & FINDING

Marine and Fisheries Department in cooperation with OISCA Japan and related agency, since 2003 already plant mangrove in Bedono Village, Sayung Sub District, Demak Regency. As all known that the village located in the North coast of Central Java since 1988 already hit by tidal flood (rob), erosion, pollution and mangrove degradation. Though, long time before that (year 1974) the mangrove have very good condition. But since 1984 there is mangrove damage due to fish pond development. The impact of this is since 1988 the sea level reached settlement cause by erosion in Bedono Village. Before mangrove plantation, breakwater tool (APO) already built to protect mangrove development. There are many APO and also mangrove seed which already plant in this area. In 2003, there is 10 APO and 50.000 mangrove seed plantation. A year after, another 10 APO was built and 20.000 mangrove seed was planted. And then in 2005, 10 APO and 25.000 mangrove seed plantation. The purpose of this detached breakwater, besides to declining wave and block the current and also for tombolo forming in the area between breakwaters tool and coastline. The wave which approaching the breakwaters tool will be blocked. Meanwhile, the wave beside the breakwater tool will be fractioned in the back of the breakwater tool. This process will cause sand or mud sedimentation because less of the current energy along the coast behind the breakwater tool and will formed salient or tombolo.

HOW TO IMPLEMENT DRR?

WHO ARE THE STAKEHOLDERS INVOLVED?

> ***What is a National Platform for Disaster Risk Reduction?***
>
> ***A national platform for disaster risk reduction is a nationally owned and led forum or committee of stakeholders. It serves as an advocate of disaster risk reduction at different levels and provides coordination, analysis and advice on areas of priority requiring concerted action through a participatory process. It should be the coordination mechanism for mainstreaming disaster risk reduction into development policies, planning and programmes in line with the implementation of the Hyogo Framework. It should facilitate the participation of key players from line ministries, disaster management authorities, scientific and academic institutions, NGOs, the National Society of the Red Cross or Red Crescent, the private sector, opinion shapers and other sectors closely related to the disaster risk reduction purpose (www.isdr.org)***

In most countries a priority goal of coastal management should be arranged for the most extensive participation possible (starting with the strategy planning stage). Consultation should be held with all relevant agencies of central and local government, with developers, with resource users and other interests that would be affected by ICZM (fisherman, farmers, etc.), environmental advocacy groups, and investment sources (including international donor institutions). Coastal areas and coastal resource system are governmentally complex because of the degree of shared jurisdiction and the amount of common property resources involved. Therefore, resource management programs need to involve all levels from national to village governments, regardless of the particular institutional arrangement at the central level. People live in the environment right along with other flora and fauna. People affect their environment and in turn the environment affects people, immensely. In addition, it is within the context of human action and reaction that all impacts are assessed.

The need for public awareness and education is often emphasized in discussion on integrated coastal zone management strategies. The recent emphasis on *integrated* coastal zone management is particularly appropriate as it may also help focus the need for integration of the public into the ICZM process-specifically at policy formation, programming of action and implementation stages. Four major objectives of participation according to Renard are:

1) Participation is a way to ensure that popular knowledge and experience is indeed integrated into the planning and management process.
2) Participation gives a better guarantee for the quality of the sollution identified and for its adaptation to a particular condition.
3) Participation in planning and problem identification promotes involvement in the actual implementation of decisions.
4) Participation ensures that all needs and priorities are taken into account in the formulation of management decisions.

Many people are upset by private and government projects because they have had limited access to decision-making process. People have marched in protest to stop projects, sunk a patrol boat, destroyed signs and structures, and burned down a factory. Planners themselves may claim that the users have no planning experience, they can not contribute effectively. Regarding participation in conservation for coral reefs, mike Gawel

says a major stumbling block “is lack of concern for long range impacts and apathy toward planning”. Groups of interests he lists to involve:

1) Civil service officials
2) Elected officials
3) Community leaders
4) Commercial resource users:
    - Fishery companies and organizations
    - Sand and coral dredgers and extractors
    - Marine oil producers
    - Salvage companies
    - Mariculture developers
    - Businesses supporting tourism
    - Aquarium and aquarium fish sellers
    - Coral and shell harvesters
    - Driving schools
5) Local interest groups :
    - Boat owners and their organizations
    - Shell clubs
    - Other natural history or conservation clubs
    - SCUBA associations
    - Scientific researchers
    - Science teachers
    - Subsistence fishing clans
    - Groups supporting traditional rights.

Stakeholders who have been involved in the formulation of policies and rules on resource use in coastal areas are more likely to support them (particularly people living along the coast who have traditionally depended on marine resources for their livelihoods). Public participation should be encouraged by the entire management community (resource users, public agencies, NGOs, social groups, and local communities) to ensure the quality, the effectiveness, and the equity management proposals. Communities with exclusive rights 9traditional or modern) to coastal or marine resources (such as fishermen) could be given active responsibility for their mangement. The incentive to conserve resources is much stronger where access is limited according to the ability of the resource to provide sustained yields.

The ISDR aims at building disaster resilient communities by promoting increased awareness of the importance of disaster reduction as an integral component of sustainable development, with the goal of reducing human, social, economic and environmental losses due to natural hazards and related technological and environmental disasters.

Recognizing that natural hazards can threaten any one of us, the ISDR builds on partnerships and takes a global approach to disaster reduction, seeking to involve every individual and every community towards the goals of reducing the loss of lives, the socio-economic setbacks and the environmental damages caused by natural hazards. In order to achieve these goals, the ISDR promotes four objectives as tools towards reaching disaster reduction for all.

SESSION 2.3 DRR MEASURE

HOW TO MEASURE DRR?

The disaster risk reduction is a framework to comprehend unresolved problem of development – addressing the disaster occurrence – using a systematic framework aim at risk reduction (UNEP; IUCN; ISDR; ADPC, 2008). There were abundant activities in the disaster risk reduction framework. The following figure showed that disaster management consisted from the response, recovery and continued to the development process at the aftermath of disaster event. In order to reduce risk, increase capacity, lowering the vulnerability level and deal with hazards, there are prevention, mitigation and preparedness activities.

At the aftermath of disaster event, an analysis towards disaster prediction carried out. There are three fundamental aspects to identify the disaster events, such as hazard, vulnerability and risk. At the development of the ideas, capacity measurement aspect was added, and highlight to societal exposure was also illuminating. The disaster risk reduction aspects are consisted of the hazard. Hazard can be in any form. Each ecological system posed different types of exposure and exposed element. Thus, hazard identification is quite unique and dynamic in nature. Some physical susceptibility are hazard-dependant, it means that different types of hazards posed different types of exposure. The existing hazard put certain element in the risky position. At general, there are three types of risk situation, they are: 1) Acceptable Risk; 2) Moderate Risk and 3) Unacceptable Risk.

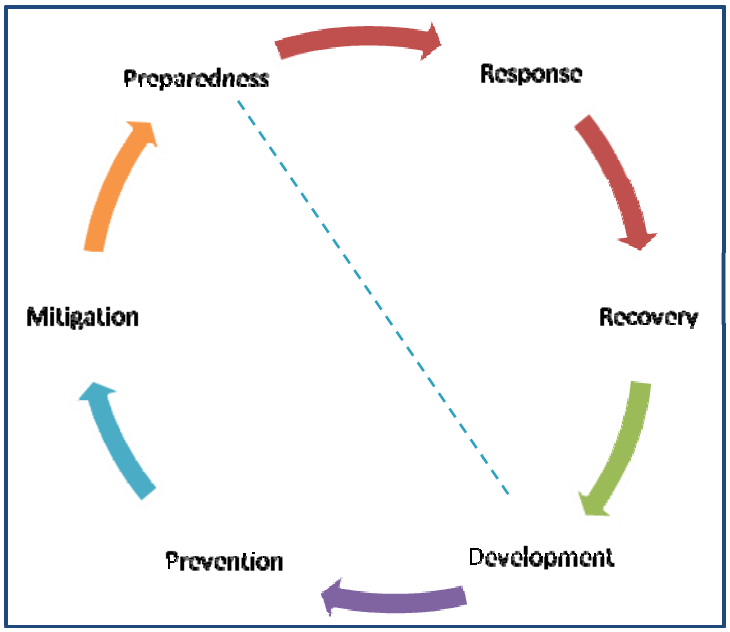


FIGURE 34 DISASTER MANAGEMENT CYCLE

SOURCE: (CARTER, 1991, P. 50)

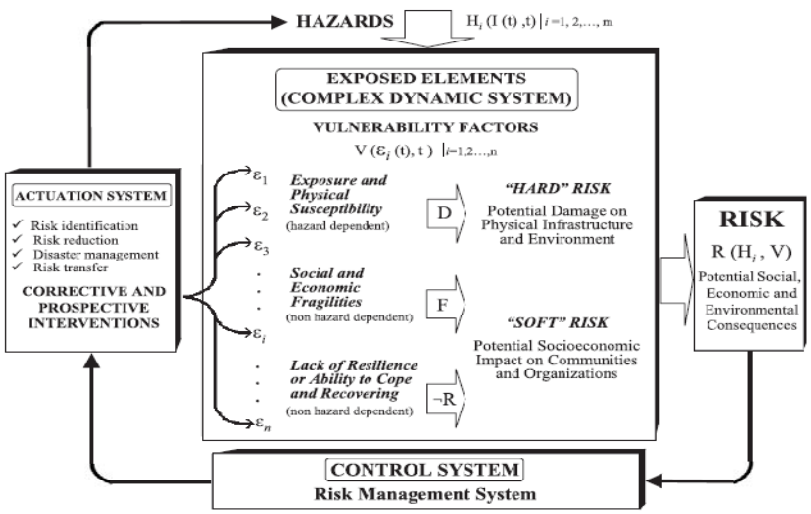


FIGURE 35 ASPECTS OF DISASTER RISK REDUCTION

SOURCE: (BIRKMANN J. , 2006)

HAZARD

This following table indicates the general steps on creating the hazard identification, vulnerability analysis and risk analysis. There are variety of "list to do", which will be addressed in more detail in the next sub chapter.

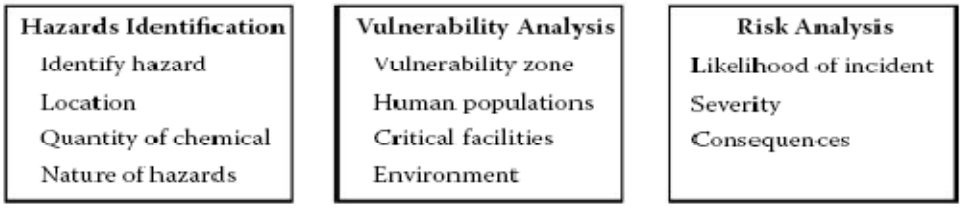


FIGURE 36 HAZARD ANALYSIS IN THE DISASTER RISK REDUCTION FRAMEWORK

SOURCE: (PINE, 2009)

Steps:

- Identification of existing hazard in coastal area
- Description on existing exposure (natural related or socially related exposure)
- Identification of vulnerability
- Risk Analysis
- List of priority action via participatory process
- Dissemination of vulnerable group, element at risk and other threatened properties
- Set up environmental based planning via ICZM

There are several hazard types for which there is widespread concern (UNDP, 1992). They can be categorized as follows:

- *Sudden onset hazards*–(geological and climatic hazards) earthquakes, tsunamis, floods, tropical storms, volcanic eruptions, landslides
- *Slow onset hazards*–(environmental hazards) drought, famine, environmental degradation, desertification, deforestation, pest infestation
- *Industrial/technological*–system failures/accidents, spillages, explosions, fires
- *Wars and civil strife*–armed aggression, insurgency, terrorism, and other actions leading to displaced persons and refugees
- *Epidemics*-water and/or food–borne diseases, person-to-person diseases (contact and respiratory spread), vector-borne diseases and complications from wounds

Identified natural related hazard in coastal area (Chamley, 2003):

1. On going erosion processes
2. Coastal storms
3. Tsunamis
4. Long beach subsidence
5. Etc.

These following phenomena indicated that there was natural degradation in coastal zone (Chamley, 2003):

1. Loss of wet land zone
2. Coastline retreat
3. Sea level rise
4. Retreat of deltaic front
5. Disappearance of several island
6. Etc.

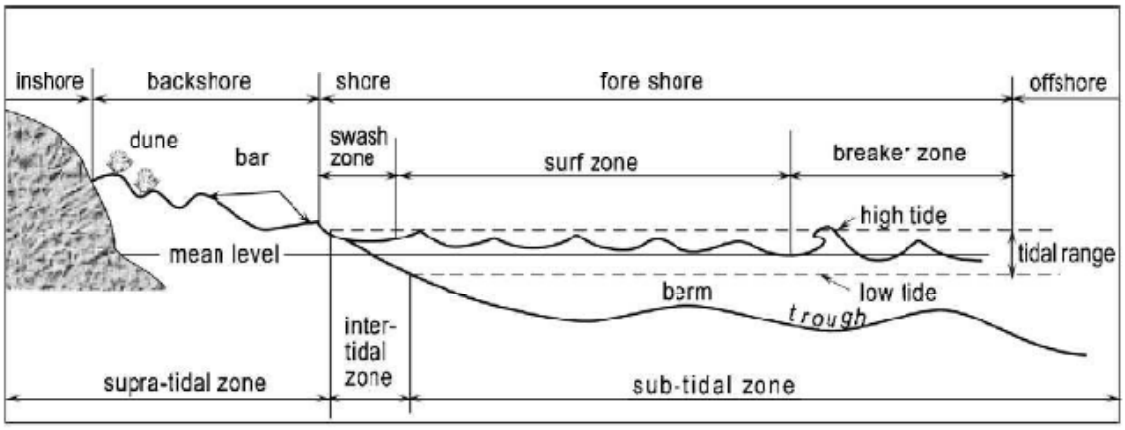


FIGURE 37 PROFILE TO COASTAL ZONE

SOURCE: (CHAMLEY, 2003)

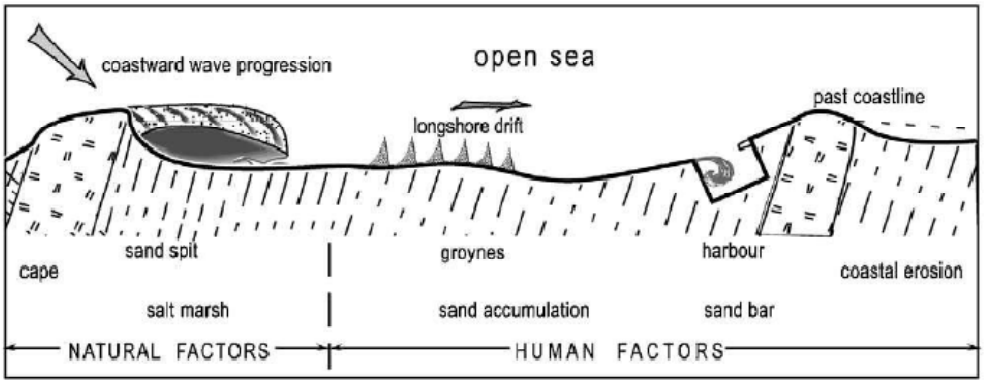


FIGURE 38 SEDIMENTARY CONSEQUENCE OF THE LONG SHORE DRIFT DUE TO NATURAL AND MAN MADE INDUCED FACTOR

SOURCE: (CHAMLEY, 2003)

TERMINOLOGY OF HAZARD

"…A hazard is a rare or extreme event in the natural or human-made environment that adversely affects human life, property or activity to the extent of causing a disaster" (UNDP, 1992)

"…hazard is an event or occurrence that has the potential for causing injuries to life and damaging property and the environment" (ADPC, 2008)

"…hazard was once translated as physical phenomena with technological solution, it has wider perspective to see it as complex interaction between potentially damaging physical and the vulnerability of a society, its assets which determined by human behavior…" (Birkmann, 2006)

"..hazard is any substance, phenomenon or situation, which has the potential to cause disruption or damage to people, their property, their services and their environment" (ADPC)

KEY QUESTION TO HAZARD

1. Is there any phenomenon in the coastal zone subjected to environmental degradation?
2. What is the level of the occurrence?
3. Where is the location?
4. Who are suffered from the phenomena?
5. When is the phenomena occurred?
6. How often is the phenomena occurred?
7. How to solve the problem?
8. Who will take the responsibility?

HAZARD IDENTIFICATION

Hazard identification can be done using the hazard analysis via mapping, image processing or constructing hazard profile.

Conduct vulnerability analysis means to work with the human aspect of hazard. Scholar explicitly noted that hazard was naturally given, while the disaster was not. Disaster is a result of socio-economic-politics-natural aspects mixture. If scholar or authorized institutions able to delineate the hazard within particular geographical boundary, it will have less meaning without any human-related information. The state of people being vulnerable is defined on the various aspects, such as ability to sustain daily basic need, choose location to live, build secure housing, access the proportional social security, etc (Pelling, 2004). Thus, the context of vulnerability was closely attached to the poverty discussion, unfortunate events (disaster and environmental stress), imbalance resource distribution (development studies) or clash and social conflict discussion.

The Indonesian government posed more than 32 coastal province, and 198 coastal districts, whereas most of the inhabitant live dependently on the primary sector of coastal and marine use, such as fisheries, mining, agriculture, tourism etc (Kay & Alder, 2005). Since the coastal zones were extensively exploited, varied environmental degradations occurred. Environmental stress and shock may occur at any time, promote more negative impact to the inhabitant. Remaining task of coastal managers within the context of disaster risk reduction will be in the basis of identifying the potential human related assets and productive investment which were engendered by the precarious environmental and social threats (see the following sub chapter to identify the terminology of vulnerability).

VULNERABILITY

Terminology of Vulnerability

"…the potential to suffer harm or loss in terms of sensitivity, reliance, and reliability (World Bank, 2003)

"...a set of conditions and processes resulting from physical, social, economical, and environmental factors, which increases the susceptibility of a community to the impact of hazards" (ISDR, 2004)

"...a human condition or process resulting from physical, social, economic and environmental factors, which determine the likelihood and scale of damage from the impact of a given hazard" (UNDP, 2004 in Birkman, 2006)

"...a function of the exposure (who or what is at risk) and the sensitivity of the system (the degree to which people and places can be harmed)" (Cutter, et al., 2008)

"...vulnerability within the scope of coastal and marine population address to the ability of one being sustain, adapt, or extinct among the dynamic coastal and marine system..." (Dulvy, Sadovy, & Reynolds, 2003)

> ***"...the extent to which a population or an ecosystem is liable to be affected by hazard event, and mitigated by the capacity of a population or ecosystem to cope with these effects...." (UNEP, 2004)***
>
> ***"..vulnerability is a concept which desribes factors or constraints of an economic, social, physical or geographic nature, which reduce the ability to prepare for and cope with the impact of hazards.."(ADPC)***

VULNERABILITY ANALYSIS

The vulnerability analysis aimed at bridging the hazard importance in the language of anthropocentric realm. The level of the analysis is depending on the geographic boundary that might be affected (Pine, 2009). It dealt with the number of population at stake, belonging and productive assets which assure community welfare. Vulnerability ranging from 0 – 1, if the value is closer to 1, it means that the vulnerability is higher than those value close to 0.

Nature of Vulnerability
MULTI DIMENSIONAL, DIFFERENTIAL, SCALE DEPENDANT, DYNAMIC, PREDICTABLE.
(BIRKMANN, 2006)

There are different types of vulnerability analysis. Each type of hazard bring different methodological consequence in quantifying the vulnerability. Some schoolars prefers to identify the vulnerability using the following type of analysis:

TABLE 7 TYPE OF VULNERABILITY ANALYSIS

Type of analysis	Quantitative Methods	Qualitative Methods	Unit of analysis
1. Assessment to different social groups	Questionnaire based (structured, semi-structured, in depth etc)	Literature Studies In depth interview Expert interview Forum Group Discussion Observations	Sample location and selected area by Household
2. Assessment to general condition of social groups	Cencus and local statistics	Literature studies In depth interview Expert interview Forum Group Discussion Observations	Households scale
3. Asessment to the built environment with remote sensing	Remote sensing	Transect with key informant Observations Public Participatory GIS (PPGIS)	Administrative scale
4. Asessment to the critical infrastructure and other sectors of vulnerability	Remote sensing	Transect with key informant Observations Public Participatory GIS (PPGIS)	Administrative scale

Source : (Birkmann, et al., 2007)

How to analyze vulnerability?

1. Define the type of hazard
2. Collect the indicator to define vulnerability
3. Define the type of vulnerability assessment will be chosen
4. Assess the indicator using geographic/spatial boundary in order to have comparison among different zone ordinance
5. Applied simple statistical method weighing to scoring in order to promote the classification
6. Compare the result and make further recommendation using the hazard information

What is the key Questions to Vulnerability?

- Who or what vulnerable to the impacts of hazard?
- Where or when them vulnerable?
- What social, physical and environmental factors make them vulnerable?
- How vulnerable are they?

Risk

Risk is defined differently by people in different situations. Risk as understood by a politician is different from risk to a seismologist, or to an insurance company executive, or to a family living in an earthquake zone. Risk is also different to local and national governments involved with disaster management. In this text we will consider the point of view of these local and national public policy authorities who make decisions for the well being of the community. For these policy makers, the *community elements at risk* include its structures, services, economic and social activities such as agriculture, commercial and service businesses, religious and professional associations and people. *Risk* is the expected losses to a community when a hazard event occurs, including lives lost, persons injured, property damaged and economic activities or livelihoods disrupted. he relationship of these elements can be expressed as a simple mathematical formula which illustrates the concept that the greater the potential occurrence of a hazard and the more vulnerable a population, then the greater the risk (UNDP-DHA, 1997).

Formula (1) : $$Risk = hazard \; x \; vulnerability$$

Source: (Alexander, 1993; United Nation, 2004, p. 36; Ikeda, 2006)

Formula (2):

$$Risk = \frac{Hazard\ (Probability) x\ Loss\ (Damage)}{Preparedness\ (Resilience)}$$

Source: (Smith, 2001; Ikeda, 2006)

Formula (3): $$Risk = R(S_i, P_i, D_i), \ldots$$

Source: (Ikeda, 2006)

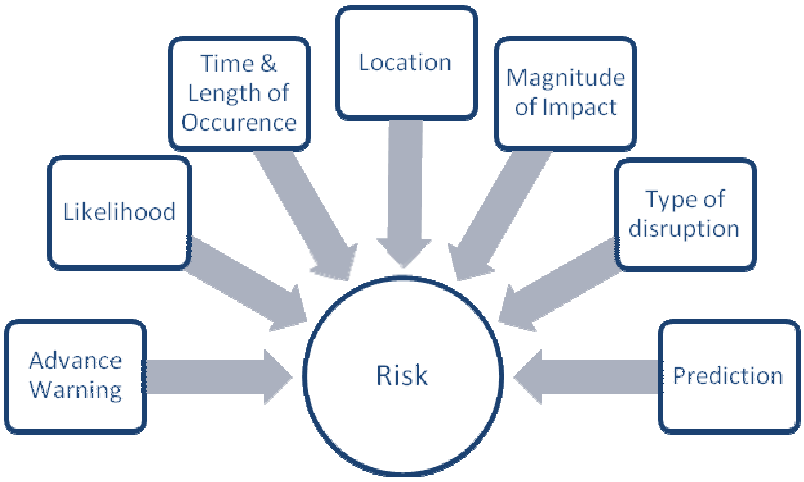


FIGURE 39 RISK ATTRIBUTES

(WEBBER, 2004, P. 31)

Risk assessment is value laden. The assessment is socially constructed, in other words it can be interpreted independently or based on the objectivity. Risk assessment can be very useful for additional tool in the environmental decision making. Somehow, risk assessment is not value-free, in the decision making process, public perception are interfering which finally construct the final risk reduction priority (Catron, 1996)

Terminology of RISK

"…a potential for the realization of unwanted, adverse consequences to human life, health, property or the environment."

"…potential harm which threatens our social, economic and natural capital on a community, region, or country scale" (Pine, 2009) The disaster risk reduction framework is composed of the following fields of actions, as described in IDSR (2004) "

..risk is the probability that negative consequences may arise when hazards interact with vulnerable areas, people, property, environment."(ADPC)

Risk awareness and assessment is including hazard analysis and vulnerability/capacity analysis. Knowledge development is including education, training, research and information. Public commitment and institutional frameworks, is including organizational, policy, legislation and community action. Application of measures is including environmental management, land use and urban planning, protecting of critical facilities, application of science and technology, partnership and networking, and financial instruments. Early warning system is including forecasting, dissemination of warnings, preparedness measures and response capacities.

WHAT ARE THE INDICATORS OF VULNERABILITY?

At some point, scholars deem that vulnerability is not limited to disaster itself. Social scientist argued that the level of vulnerability affected by one socio-economic state such as (Cannon et al, 1993 in Birkmann, 2006):

- Initial well being (nutritional status, physical and mental health)
- Livelihood and resilience (assets, capitals, income and qualification)
- Self protection (capability, willingness to build safer environment)
- Social protection (communal preparedness, mitigation, early warning system)
- Social fabric (political, organizational, group support)

Other common indicators that reflect the community vulnerability are (Pine, 2009):

Social indicators	Household income Household who rent Household without vehicle Household with single parent and children under 18 years Household without telecommunication setting Number of person injured/killed Number of elderly over 65 years old Number of disabled individuals Number of unemployment Percentage of population forced to evacuate Percentage of population lived in the prone area Percentage of population lived under poverty line Etc.
Economic Indicators	Number of residential unit destroyed Number of public utilities destroyed/damaged Number of electrical system shut down Percentage of industrial sector damaged Loss percentage of productive land Etc.
Environment Indicators	Population density Per capita water use Area contaminated by disaster event Amount of rainfall per month/annual Rate of deforestation Etc.

In the practical level, the fastest quantification on vulnerability will be addressed to these following indicators:

1. Number of people lived in the hazardous area
2. Number of housing unit in the hazardous area
3. Number of public utilities in the hazardous area
4. Number of productive land in the hazardous area

TABLE 8 SELECTED INDICATORS TO MEASURE HUMAN VULNERABILITY

Environment	• net energy imports (*% of commercial energy use*) • soil degradation (*tonnes'yr.*) • safe water (*% of population with access*) • arable land (*hectares per person*)
Economy	• real GDP per capita (*US$*) • GNP per capita growth (*annual %*) • adult illiteracy rate (*% of population 15+*) • value of imports and exports of goods and services (*% of GDP*)
Society	• urban population growth (*annual %*) • young male population (*% aged 0–14 of total population*) • maternal mortality ratio (*per 100,000 live births*) • life expectancy (*yrs.*)
Institutions	• public expenditures on defence versus education, primary and secondary (*% of GDP*) • gross domestic fixed investment (*% of GDP*) • degree of democratisation (*on a scale of 1–7*) • human freedoms index (*on a scale of 0–40*)

Source: Lonergen et al, 2000 in (Kok et al, 2006)

These following indicators are quantifiable in different manners, either with statistical analysis or RS/GIS-Based analysis. The identification of vulnerable element using RS/GIS Based analysis required different input compared to simple descriptive statistical method. The RS/GIS Based applied the statistical method as well, in the black-box manners.

How is the Technical Guidance to Vulnerability Analysis

Some technical guidance to conduct vulnerability analysis:

1. Formulation of hazard-community related problems
   How to formulate roots of the problem?
   - Identify the coastal use system
   - Identify the coastal problems
   - Identify the driving force of the problems
   - Discuss the list of things to do
2. Creating community profile and mapping the community assets
   How to create community profile?
   - Address some questions via questionnaire or check list
   - Conduct multi years or historical questions
   - Empower the community via forum group discussion or other community-based action
3. Interdependence of social fabric
   How to identify the interdependence of social fabric
   - Identify the stakeholder involved within the problematic-area
   - Conduct in-depth interview or expert interview to identify the name of organization, expertise, status of current activity, person in charge and any other related activity program in the disaster risk reduction
   - Analyze the relation using "organizational tree" method

Weighing and Scoring

Why weighing and scoring are important?

Many vulnerable aspect are in the dynamic condition, thus it has been difficult to quantify it. Weighing and scoring is the most common method developed to identify the importance of each indicator among others. Afterward, the subjective score should be multiplied with the existing weighing factor of each variable. The multiplication between the indicators scores and variables weighs will illustrate the range of total score. Among those total score, there will be a division into three or four category which represents the classification of the vulnerability.

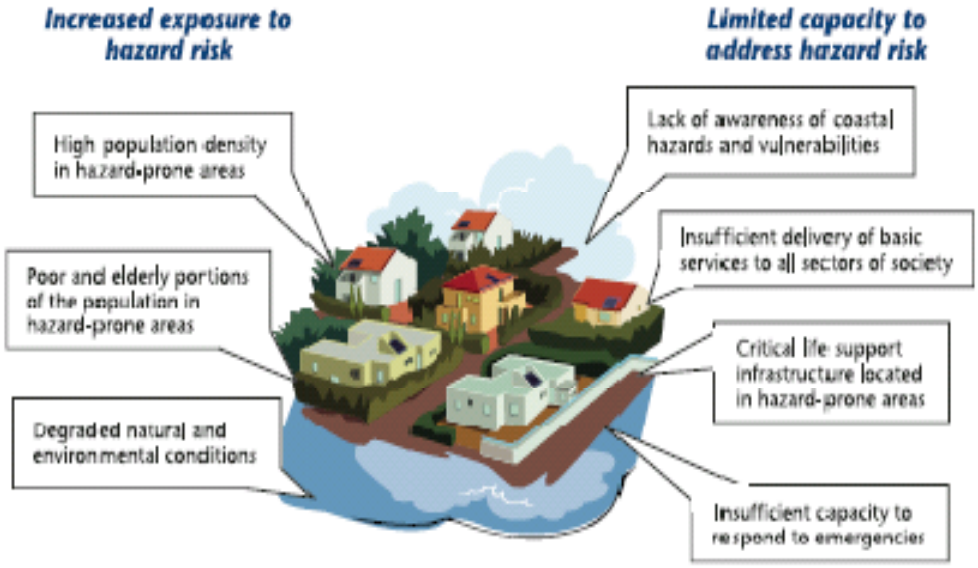


FIGURE 40 FACTORS THAT CONTRIBUTE TO VULNERABILITY IN COASTAL POPULATIONS

SOURCE: (USAID ASIA, NOAA, US IOTWS, COASTAL RESOURCES CENTER, THE NATURE CONSERVANCY, ADPC, 2005)

Session 2.4 Climate change in coastal area

FACT & FINDING

Climate change cause change on rainfall pattern. This change indicates with late rainy season. While end of rainy season become faster. In the other side, although rainy season is shorten but still have high intensity. With this shorten rainy season cause longer dry season. This happen especially in the south part of equator. This kind of rainfall pattern change already started in North coast of Java. Based on analysis result by Geophysics, Climatology and Meteorological Agency (BMKG), early season already change. On the certain area, early season is retreating. While in the other area is going forward. Besides, there is also increasing of rain intensity and longer dry season for example in North coast of Banten to Central Java.

Based on the National Mapping Coordination and Survey Agency (Bakosurtanal) in 2002, there are several coast in Indonesia have increasing the sea level. Based on the record from tidal station In Jakarta, Semarang, Jepara, Batam, Kupang, Biak, and Sorong have experience sea level increasing since 1990 until now. Average of accelerating sea level is 5-10 mm per year.

Tidal analysis result in several location of Indonesian coastal shows that the increasing of sea level is varied from one place to another. Based on ITB study, yearly sea level rise in Belawan is 7,83 mm, Jakarta 4,38 mm, Semarang 9,27 mm and Surabaya 5,47 mm. while study from Oceanography Development and Research Centre by LIPI showing that sea level rise in Panjang, Lampung is around 4,15 mm per year.

WHY IS THE CLIMATE CHANGING?

Climate change is the main environmental problem facing humanity. It is the cause of the multiplication of extreme weather events, such as draught, floods, heat and cold waves. Its consequences are aggravated desertification and erosion processes as well as irreversible changes in ecosystems and loss of biodiversity. 1

"Climate" refers to the average weather experienced over a long period, typically 30 years. This includes temperature, wind and rainfall patterns. The Earth's climate is not static, and has changed many times in response to a variety of natural causes.

The term "climate change" usually refers to changes that have been observed since the early 1900s. These changes in global climate are likely to be due to a combination of both natural and human causes:

1. Natural causes
   The Earth's climate varies naturally as a result of interactions between the ocean and the atmosphere, changes in the Earth's orbit fluctuations in energy received from the sun, and volcanic eruptions.

2. Human causes

   The main human influence on global climate is likely to be emissions of greenhouse gases (GHG) such as carbon dioxide (CO2) and methane (CH4).

"Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land use change, while those of methane and nitrous oxide are primarily due to agriculture".2

WHAT ARE THE IMPACTS & CONSEQUENCES?

Greenhouse gases remain in the atmosphere for some time. Long-lived greenhouse gases (LLGHGs) - for example, CO2, methane (CH4) and nitrous oxide (N2O) - are chemically stable and persist in the atmosphere over time scales ranging from a decade to centuries or longer. Thus, their emissions have a long term influence on climate.

"...number of climate-related disaster is increasing far-faster than the number of geological disaster, particularly since late 1970s, whilst 75% of the world's most population lived in area that have been affected at least by geological disaster called earthquake, tropical cyclone, flood and drought...".(UN, 2007 in Surjan & Shaw, 2008)

This means that even if we were to stop emitting these gases today, the Earth would take more than a hundred years to stabilize its GHG atmospheric concentrations, which would keep temperature growing for 200 more years.

Climate varies naturally and the average temperature at the Earth's surface normally varies between 5-6°C every 100,000 years. Within these long periods of time, living beings have time to adapt to changes in temperature. Mankind however is inducing drastic changes in the climate in a very short period of time. This means that all species have to adapt to these changes very quickly, which is not possible in many cases.
Rises in temperatures are one of the multiple consequences of climate change. Rises in the level of the oceans, changes in wind patterns and a multiplication of extreme weather events are other examples. Fragile and vulnerable species are already suffering from consequences of these changes, and will in the future face the worst part.

Human beings will also have to adapt to new climatic conditions. Yet, the indirect consequences of climate change will possibly be even harder to assume (changes in agriculture, water availability, etc).

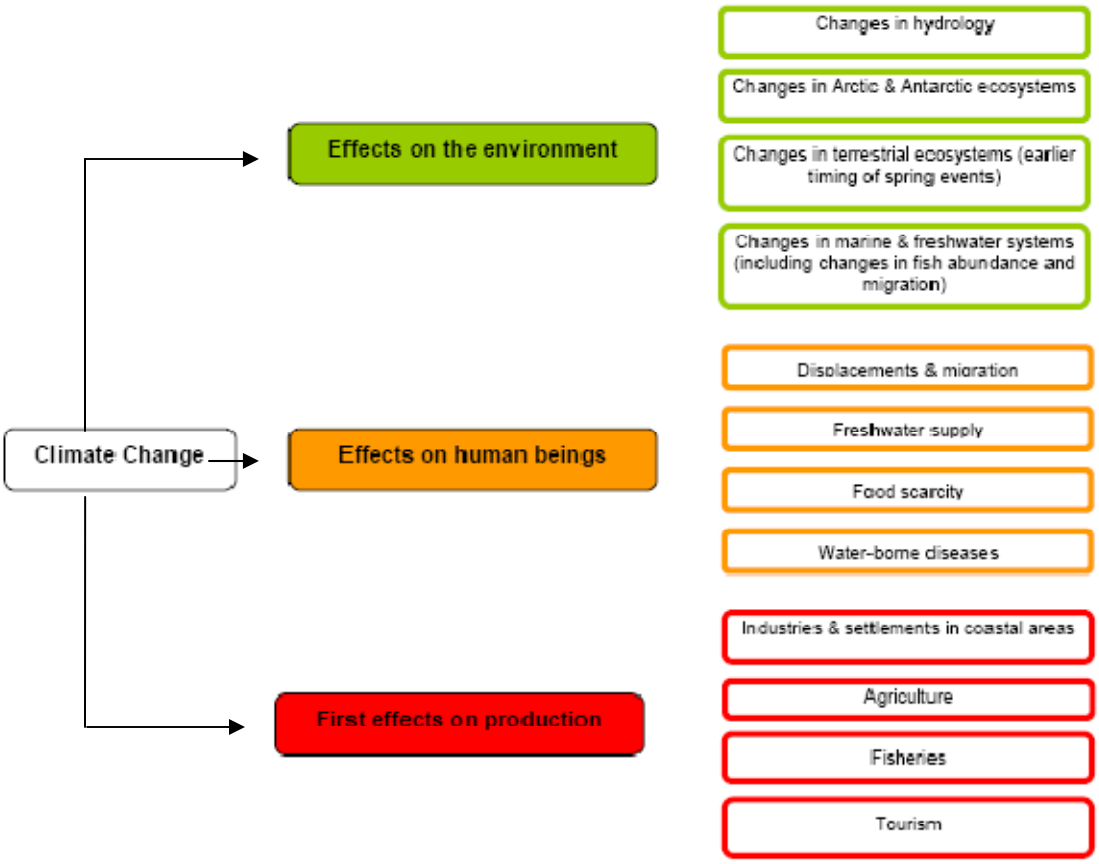


FIGURE 41 EFFECTS OF CLIMATE CHANGE ON THE ENVIRONMENT, HUMAN BEINGS AND PRODUCTION

(SOURCE: IPCC, 2007)

Our goals in this Module are to discuss the impact and consequences of the global warming and climate change on the coastal areas. The questions are what are the impacts and how? and what are the consequences? The rising level of carbon dioxide and other industrial gases in the atmosphere have lead to global warming with rise the sea-level. Mangrove ecosystems in tropical and sub-tropical regions and are likely also to be early indicators of the effects of climate change on estuarine in coastal areas. It is suggested that a rise in mean sea-level may be the most important factor influencing the future distribution of mangroves. However, their effect will vary dramatically depending on the local rate of sea-level rise, and the availability of sediment to support reestablishment of the mangroves (Field 2007).

The predicted rise in mean air temperature will probably be of little consequence to the development of mangroves in general but it may mean that the presence of mangroves will move further north and south, though this will depend on a number of additional factors. The effect of enhanced atmospheric CO_2 on the growth of mangroves is unknown at this time but that there is some evidence that not all species of mangroves will respond similarly. The socio-economic impacts of the effects of climate on mangrove ecosystems may include increased risk of flooding, increased erosion of coast lines, saline intrusion and increased storm surges (Field 2007).

The IPCC (Intergovernmental of Panel on Climate Change) Third Assessment Report (TAR) predicted for the area average annual mean warming over the land regions of Asia as follow: 1). About 3^{o}C in the decade of the 2050s; 2). About 5^{o}C in the decade of 2080s. The increasing the temperature of sea water in tropical coastal waters will lead to the coral bleaching and thus the coral ecosystem will die (Nyibaken and Bertnes 2005).

Krebs (2009) discussed that global warming has been underway since 1970s. The average of global temperature has increased about 0.5^{o}C. The cause of global warming is increased of greenhouse gas emission from the burning of fossil fuels and land clearing. The atmospheric CO_2 is increasing at 0.5% per year. Global warming and CO_2 enrichment increase plant primary production, but carbonsquestration by plant is limited by the nutrient such as nitrogen. Increased primary production from CO_2 enrichment may not result in additional carbon storage in soils. There is a limit to how much CO_2 global ecosystems can absorb.

The global warming speeding spring flowering and breeding events and allowing organism to move their geographic range toward the poles. Disease vectors and pathogens can increase emergent disease problems for plants and animals as the climate warms and they extend their range. It increased the ENSO event, which has impact to the rainfall. There will be the volume of rainfall will increase, but the number of day rain will decrease. The brackish estuarine ecosystem will be the most impacted by the increasing volume of rainfall. This rainfall will change the salinity range in the estuarine. The brackish estuarine has daily salinity ranges 4 – 35 ppt. During the low tide this estuarine will be dominated by the freshwater. In contrast, during the high tide it will be dominated by the marine water. Every day this ecosystem has two periods of low tides and two periods of high tides. The organisms in this ecosystem have wide tolerance to the daily salinity change, we call as euryhaline. Due to the ENSO event, in Indonesia during the wet season the estuary will be dominated by the volume of rainfall and the salinity will not response to daily change, but most seasonal change. The estuarine becomes hypohaline and in contrast, during the dry season, this ecosystem will be hyperhaline. These conditions will harm the organisms suchas plankton and will go into the food web, and will impact the coastal and open sea fisheries.

HOW TO ADAPT THE CLIMATE CHANGE IN COASTAL AREA?

Adaptation is a process which determining how certain strategy to push, adapt, and able to take benefit from a climate change event which extended, developed and implemented (UNDP, 2004). As we all know, climate change has a huge impact to the coastal area and small islands. Knowledge about adaptation capability to the climate change in coastal area and small islands is still limited.

There are several methods and tools to evaluate impact and adaptation strategy of climate change. UNFCCC secretariat recently announces Compendium of Decision Tools to Evaluate Strategies for Adaptation to Climate Change as a part of support to give best real action about climate change adaptation. While, UNDP working plan provide 4 basic principal which are very relevant for tourism sector (UNDP, 2005). The basic principal are:

i. Addressing adaptation in the development context

ii. Construct recent adaptive experience to deal with future climate change

iii. Recognize that adaptation walking on different level, especially in the local level

iv. Recognize that adaptation process is continuous

The Assessment of Impacts and Adaptation to Climate Change in Multiple Regional and Sectors (AIACC) develop to increase technical and science ability of developing countries to assess climate change impact and design effective adaptation act plan. There are 9 important steps which can be summarized based on 24 project done by AIACC in Africa (11), Asia (5), Latin America (5) and small islands below:

1. Adapted now
2. Create condition which able to adapt
3. Combine adaptation with the whole development
4. Increase carrying and knowledge level
5. Strengthen the institutional aspect
6. Protect natural resources
7. Provide financial support
8. Entangle the risky community
9. Using the site specific strategy

On the climate change adaptation at least there are 7 steps. This steps are not linear process but as a cyclic process to identified problems, adaptation execution, and benefit evaluation which will give feedback between each step.

- Role of the stakeholders
- Define the problems
- Studied the adaptation capacity
- Identified adaptation choices
- Evaluate chosen adaptation and define the action
- Carry out the adaptation
- Evaluate and monitor the adaptation

SESSION 2.5 COMMUNITY INVOLVEMENT & CAPACITY IDENTIFICATION

WHAT IS CBDRR?

Terminology of CBDRR

"…The CBDRR is not merely dealing with the decision making process of the community and local people within the disaster management principle (include the risk assessment, mitigation, preparedness, response, rehabilitation), it also covering the application and adaptation of local indigenous risk-coping wisdom to ensure the resilience and sustainability…" (Torrente, et al, 2008)

"…process in which the risk community are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risk in order to reduce vulnerability and enhance their capacity…" (ADPC, 2008)

HOW TO INVOLVE THE COMMUNITY INTO THE PROCESS IN CBDRR?

The disaster is another development problem calls for solution, thus the community based disaster risk reduction promote an option to approach the problem. The community participation is a hidden capacity within the social fabric need to be developed. Abundance activities, programs, and project can be attained using the community participation.

Within the context of disaster risk reduction, the community participation covered the activity of risk prevention, emergency preparedness, emergency procedure and recovery after disaster (ADPC, 2008). CBDRR, as noted by ADPC is aimed at risk management (reduce vulnerability and increase capacity of household), preparedness/mitigation plan and coping mechanism. Effective community participation may lead to (Pribadi, 2007; ADPC, 2008):

1. Measurement to manage risk via hazard, vulnerability and risk analysis
2. Preparedness towards disaster occurrence (empower the pro-active approach instead of rely on the reactive approach)
3. Assessment towards the decision making process, monitor and evaluate the implementation
4. Coordinate resources during the emergency response
5. Proper support and endorsement from varied local stakeholder
6. Avoiding any overlapping initiatives/activities with other donor
7. Possible synergy with other organizations/agency working in the same field
8. Socialization towards any intervention of disaster-based programs from various stakeholder (government, NGOs/INGOs, and other international organizations)

The process of community participation as noted by Chen et al, (2006) are depicted as follow:

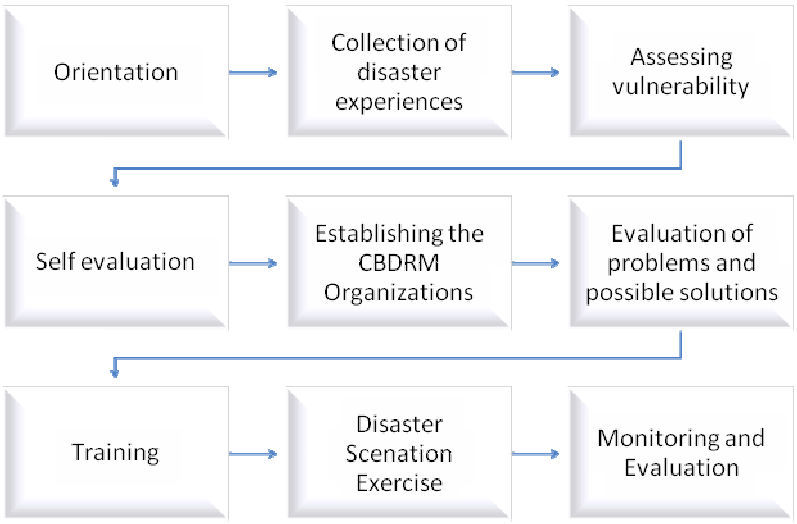


FIGURE 42 PARTICIPATION PROCESS

SOURCE: (CHEN, LIU, & CHAN, 2006)

Who is the community? a group of people that share common thoughts, experiences, problems, and behaviors; a group of people that share common place, issues and problems which leads to certain sense of belonging.

Who is the other stakeholder?

Indonesian stakeholder within the context of coastal management is addressed to "mitra bahari". The "mitra bahari" includes varied stakeholder involved in the coastal management, such as government organization (Dinas Kelautan dan Perikanan – DKP),

There are abundant format of community participation in Indonesia, such as CAP (Community Action Plan), CSP (Community Settlement Plan), School Based Disaster Risk Reduction, TOT (Training of Trainers), etc.

HOW EFFECTIVE CBDRR TO PROMOTE COMMUNITY RESILIENCE AND SUSTAINABLE LIVELIHOOD?

In coastal areas many rural communities are dependent on resources that are rapidly declining and yet they have few other means to survive. Such marginalized people do not have the cushion to risk management actions that might deny their means to a livelihood even for a short period. In this situation, politicians may be willing to put a program in place but not enforce it if it means forcing people beyond the margin. (Clark, 1995)

Environment impacts and their social economic ramifications are especially important aspects of planning for economic development. While environmental impact assessment and socio-economic impact assessment are usually done for spesific project, they can be done in a general or "programmatic" sense for regional type planning; that is, a generic assessment can be done based upon possible development proposals and the environmental vulnerabilities of coastal ecosystems. Also relevant in addressing rural communities is the human ecology perspective, which takes into account traditional uses, rights, and special needs of tribal minorities and how

environmental change might affect them. Migration and population expansion also must be considered. This can often be efficiently accomplished by use of rapid rural appraisal methods.

Economic development should be premised on the concept of social benefit, thus, the equity aspects of social impact assessment (SIA) of development are an important part of the planning and evaluation process. SIA is a vital part of Environment Impact Assessment (EIA) for people live in the environment right along with the natural flora and fauna. Environmental changes affect people and in turn, people affect their environment. These changes would affect social well-being.

Since people are the subject of development, opportunity and social equity should be the important parameters. In addition, it should be within the context of human action and reaction that all impacts are assessed. Environmental impacts also have economic consequences, which should be evaluated in terms of their effect on the people involved. Ecological and economic impacts should be jointly evaluated. It is possible to improve the economic expression of their value to society with increased perception of ecological function. Mangroves once thought of as worthless swamps unless developed for real estate or converted to shrimp ponds. Now, Mangrove are seen as extremely valuable resources capable of supporting a variety of activities. If economic analysis is done carefully, it is feasible to incorporate the full range of products and services and to demonstrate their value, either in explicit monetary terms or in a qualitative manner that is fully defensible. One goal of an economic analysis is to help decision makers to identify all relevant factors and to assess the benefits versus costs to society from different management altrnatives.

Data collection and assimilation is an important part of strategy Plan formulation phase. In this phase, the most important decisions will be made about the future of ICZM program or even whether we will have a future. Clearly, these decisions should be made in the most data-rich circumstances, so that the consequences of taking or not taking spesific actions are knowable. The information needs for a strategy plan depend upon the issues to be addressed and because these vary considerably from country to country, it is not possible to set forth a standard list of information requirements for an ICZM program from which to prescribe a data compilation program.

The kinds of information needed for the strategic plan are those that will enhance the decision-making process, that clearly depict the tradeoffs between the present situation and an integrated approach, and that lead to the clearest and lleast ambiguous set of objectives and mandates to the governmental agencies who are to manage the ICZM program. Data collection and synthesize information include :

- **Users of coastal areas and resources** : tourism, manufacturing, maritime trade, mining, urban and oil industries; jobs, revenue, investment, and tax yield

- **Coastal renewable resources** : fisheries and aquaculture activity and yields, by species and season; mangrove forest exploitation, activities, and products

- **Environmental impacts** : impairment of coastal resources and ecosystems ; pollution, habitat losses, species depletion, sedimentation, and visual degradation

- **Upland effects** : impairment of coastal resources from river dams and diversions, accelerated sediment transport, reduction of freshwater inflow, disruption of natural hydroperiod, and reduction of beach nourishment with erosion and pollution

- **Socio economic conditions** : economic statistics for coastal communities; social organization of coastal communities and dependencies on coastal resources

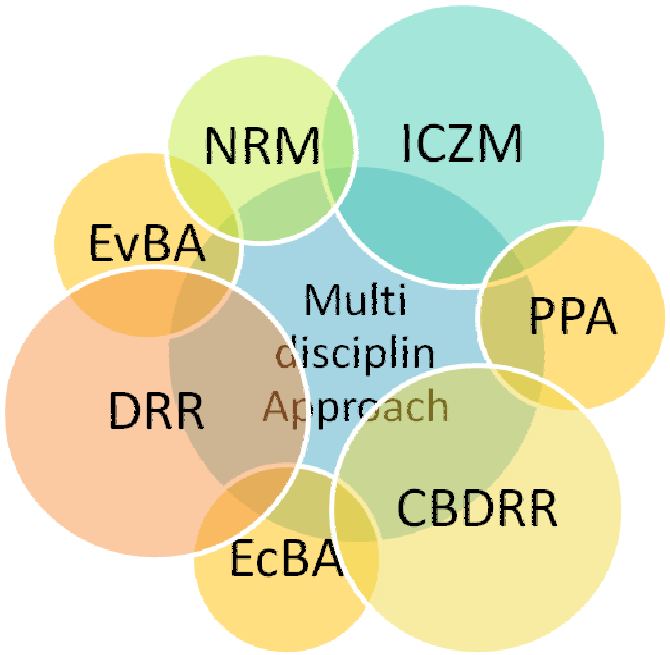
- **Critical habitats** : habitat of critical importance (ECAs) such as Mangrove and other wetlands, beaches, dune fields, seagrass meadows, coral reefs, tideflats, estuaries, lagoons, shellfish beds, and special breeding and feeding areas for coastal species; restoration needs

ALTERNATIVE LIVELIHOODS

In coastal areas many rural communities are dependent on resources that are rapidly declining and yet they have few other means to survive. Such marginalized people do not have the cushion to risk management actions that might deny their means to a livelihood even for a short period. In this situation, politicians may be willing to put a program in place, but not enforce it if it means forcing people beyond the margin. One might say management does not translate into reduced livelihood, but a management regime that prevents dynamits fishing directly translates into reduced catch for short term. Moreover, there exist the question of perceived threat to livelihood, which is just as serious as the reality of the situation with respect to political will for controls, enforceability, and effectiveness of management.

Therefore, a desirable ICZM approach in those rural areas undergoing new conservation regulation is the development of alternative livelihood systems designed to provide relief during a waiting period while resources are generated. One assumes that the rehabilitation will, in turn, provide a more productive long–term natural resources base and support a truly sustainable system of resource utilization.

MODULE 3 INTEGRATION OF DRR INTO ICZM



Multi disciplinary approach is a proposed approach to accommodate wide range of problems and needs. Within the coastal management, abundance problems and needs are colliding, often trigger conflicts and complicated-long term issues. Predictive root cause for the conflict is the unequal access toward the natural resource. On the other hand, excessive natural resource use may lead to environmental degradation, worsened to environmental hazard. Thus, a natural resource management (NRM) is an important initiative to manage better coastal area. The environmental based approach (EvBA) limited to the environmental concern, whilst varied decision making process considerably put the economic based approach (EcBA) among other consideration. The prevailing environmental and economic based approaches are initial in the disaster risk reduction framework and integrated coastal management. To bridge the gap among reality and community understanding, some financial calculations are essential to attract attention. Tons of shared knowledge and understanding should be shared. The local wisdom, understanding and traditional life styles are abundant and unorganized. Thus, the public participation approach (PPA) as the reflection of this strength should be developed. Via the combination of multi disciplinary approach, the bigger conceptual framework such as Integrated Coastal Zone Management, Disaster Risk Reduction and Community Based Disaster Risk Reduction shall be applicable towards various dynamic cases in coastal areas.

REFERENCE

Abbott, P. L. (2004). *Natural Disasters, Fourth Edition.* New York: Mc Graw Hill.

ADPC. (2008). *Monitoring and Reporting Progress Community Based Disaster Risk Management in Indonesia.* ADPC; UNESCAP; DIPECHO.

Alexander, D. (1993). *Natural Disaster.* London: UCL Press.

Bird, E. (2008). *Coastal Geomorphology, An Introduction, 2nd Edition.* USA: John Willey and Sons.

Birkmann, J. (2006). Measuring vulnerability to promote disaster-resilient societies: Conceptual Frameworks and definitions. In J. Birkmann, *Measuring Vulnerability to Natural Hazards - Towards Disaster Resilient Societies* (pp. 39 - 55). UNU EHS.

Birkmann, J. (2006). Measuring vulnerability to promote disaster-resilient societies: Conceptual Frameworks And Definitions. In J. Birkmann, *Measuring Vulnerabilty to Natural Hazards: Towards Disaster Resilient Societies* (p. 9). Hongkong: UNU EHS.

Birkmann, J., Fernando, N., Hettige, S., Amarasinghe, S., Jayasingam, T., Paranagama, D., et al. (2007). *Rapid Vulnerability Asessment in Sri Lanka - Post Tsunami Study of Two Cities: Galle and Batticaloa.* Munich: SOURCE No. 7.

Carter, W. N. (1991). *Disaster Management: A Disaster Manager's Handbook.* Manila: Asian Development Bank.

Catron, B. L. (1996). Ethics and Values in Environmental Risk Assessment - A Synthesis. In C. R. Cothern, *Environmental Risk Decision Making Values, Perceptions and Ethics.* Boca Raton: Lewis Publisher.

Chamley, H. (2003). *Geosciences, Environment and Man.* Amsterdam: Elsevier Science.

Chen, L.-C., Liu, Y.-C., & Chan, K.-C. (2006). Integrated Community Based Disaster Management Program in Taiwan: A Case Study of Shang-An Village. *Natural Hazards Vol 37* , 209-223.

Clark, J. R. (1995). *Coastal Zone Management Handbook.* Boca Raton, Florida: Lewis Publisher.

Cutter, S. L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., et al. (2008). *Community and Regional Resilience: Perspective From Hazards, Disasters and Emergency Management.* Columbia, South Carolina: Hazard and Vulnerability Research Institute .

Doornkamp, R. C. (1990). *Geomorphology in Environmental Managemment: a New Introduction, 2nd Edition.* Great Britain: Clarendon Press.

Dulvy, N. K., Sadovy, Y., & Reynolds, J. D. (2003). Extinction Vulnerability in Marine Populations. *Fish and Fisheries Vol 4* , 25 - 64.

Handmer, J., & Dovers, S. (2007). *Handbook of Disaster and Emergency Policies and Institutions.* London: Earthscan Publisher.

Ikeda, S. (2006). An Integrated Risk Analysis for Emerging Disaster Risks: Toward a better risk management of flood disaster in urban communities. In S. Ikeda, T. Fukuzano, & T. Sato, *A better integrated management of disaster risks: Toward resilient society to emerging disaster risks in mega-cities* (pp. 1-21). Terapub and Nied.

ISDR. (2004). *Living with Risk - A Global Review of Disaster Reduction Initiatives.* United Nation [www.unisdr.org].

Kay, R., & Alder, J. (2005). *Coastal Planning and Management.* New York: Taylor and Francis Group.

Pine, J. C. (2009). *Natural Hazards Analysis.* Boca Raton, Florida: CRC Press, Taylor & Francis Group.

Pribadi, K. S. (2007). *Community Based Disaster Risk Reduction in Indonesia.* Kobe, Japan: NIED - DRH.

Smith, K. (2001). *Environmental Hazards: Assessing risk and reducing disaster (3rd edition).* Routledge: Routledge, London.

Supangat, A. (2009, March). *Kerentanan Masyarakat Pesisir Indonesia akibat Perubahan Iklim Laut.* Retrieved June 3, 2009, from Inovasi Online: http://io.ppi-jepang.org/article.php?id=295

UNEP. (2004). *Assesing Coastal Vulnerability: Developing A Global Index for Measuring Risk.* The United Nations Environment Programme.

UNEP; IUCN; ISDR; ADPC. (2008). Disaster Risk Reduction : Concept and Measure. *Mangrove For Future Regional Training Course - Module on Climate Change considerations in the coastal zone and disaster risk reduction.* Semarang.

United Nation. (2004). *International Strategy for Disaster Reduction: Living with risk - focus on disaster risk reduction.* Washington: United-Nations.

Webber, M. W. (2004). *The Disaster Recovery Handbook.* New York: AMACOM.

World Bank. (2003). *Disaster Management Series No 3 : Building Safer Cities - The Future of Disaster Risk.* Washington: The World Bank.

Field, C. D. 1995. Impact of expected climate change on mangroves Journal Hydrobiologia 295(1-3): 75-81. DOI 10.1007/BF00029113.

Krebs, C. J. 2009. Ecology:The experimental analyses of distribution and abundance. 6th edit. Bejamin Cummings. San Fransisco.

Nybakken, J. W., and Bertness, M. D. 2005. *Marine biology: An ecological approach*. 6th edit. Pearson- Benyamin Cummings. San Francisco.

Anon. 2009 a. Coastal ecosystems. www.soest.hawaii.edu/seagrant/bmpm/coastal_ecosystems. html: access on 20 June 2009.

-------. 2009 b. National Ocean Services. www. oceanservice.noaa.gov/topics/coasts/ ecoscience/welcome.html. Access on 21 June 2009.

Blasco, F. 1981. *Mangrove ecosystem. Training on vegetation analysis with remote sensing technique*. UNESCO – BIOTROP. Bogor

Djohan, T. S. 2007. Mangrove Succession in Segara Anakan. *Berkala Ilmiah Biologi* 6(1): 53-62.

Djohan, T. S. 2006. *Post-tsunamiAceh Indonesia: Survey of environmental damage*. Seminar Department of Environmental Science and Policy University of California at Davis. USA.

Ewusie, J. Y. 1980. *Elements of tropical ecology: With reference to the African, Asian, Pacipic and New World Tropics*. Anchor Brendon Ltd. Essex.

Man, K. H. 1982. *Ecology of coastal waters: A system approach*. University of California Press. Berkeley.

Mitsch, W. J. and J. G. Gosselink. 2000. *Wetlands*. J. Willey and Sons, Inc.

Nybakken, J. W., and Bertness, M. D. 2005. *Marine biology: An ecological approach*. 6th edit. Pearson- Benyamin Cummings. San Francisco.

Ronnback, P. 1999. The ecological basis for economic value of seafood production supported by mangrove ecosystems. *Ecol. Econ.* 29: 235-252.

CAPACITY BUILDING TO INTEGRATE DISASTER RISK REDUCTION INTO COASTAL MANAGEMENT IN INDONESIA

Exercise for Training Module

Many of the theories and concepts in the module training are explained in a way to understand the Coastal Environment, ICZM, DRR, CBDRR, sustainable development of the coastal area. Best way to learn and understand is by working actively to find solutions of various problems and challenges in which must apply the theories and concepts. These exercises are a good way to understand all of the contents of the modules, which can be completed in the training for the participants. These exercises will deliver and encourage to experiment with different ways of illustrating the DRR into ICZM concept.

Assignment during the training were distinguished into three types:

SESSION ASSIGNMENT

The session assignment will be delivered at the end of the session. Participant will be equipped with the material. The session assignment is varied, mostly comprise of group assignment, practical assignment and promote the technical analysis.

Session Assignment

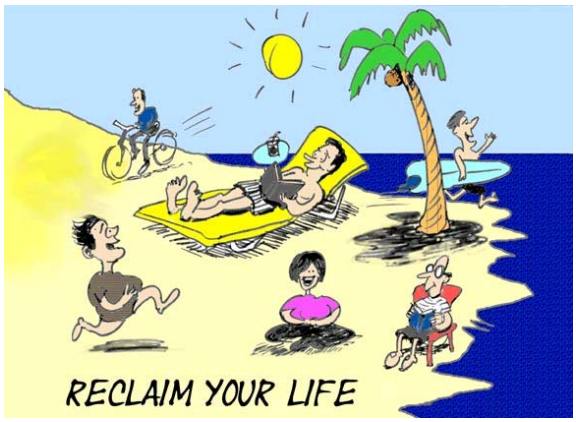
1. COGNITIVE MAPPING EXERCISE: COASTAL ENVIRONMENT AND CHARACTERISTIC

(Related Module 1: Session 1)

The purpose of this exercise is to gain the understanding into the nature of environments on the coastal area, how they affected the people/communities surrounding, and how they might relate to the views of sustainable coastal development. The cognitive mapping exercise is a technique to draw and understand the environmental design research. The drawing will include maps of the coastal environment and how the people/communities perceive the surrounding region as a whole.

Instruction to Participants:

- Imagine the coastal environment in where community live; include all coastal area surrounding cities, rural, or any location of the place.
- What elements in the human or natural environment were important to their daily life?
- Who are involved in the coastal environment?
- What are the characteristics of the coastal area?
- What is the typology of the coastal area?
- How does the communities adapt with the environment?
- What can you do?



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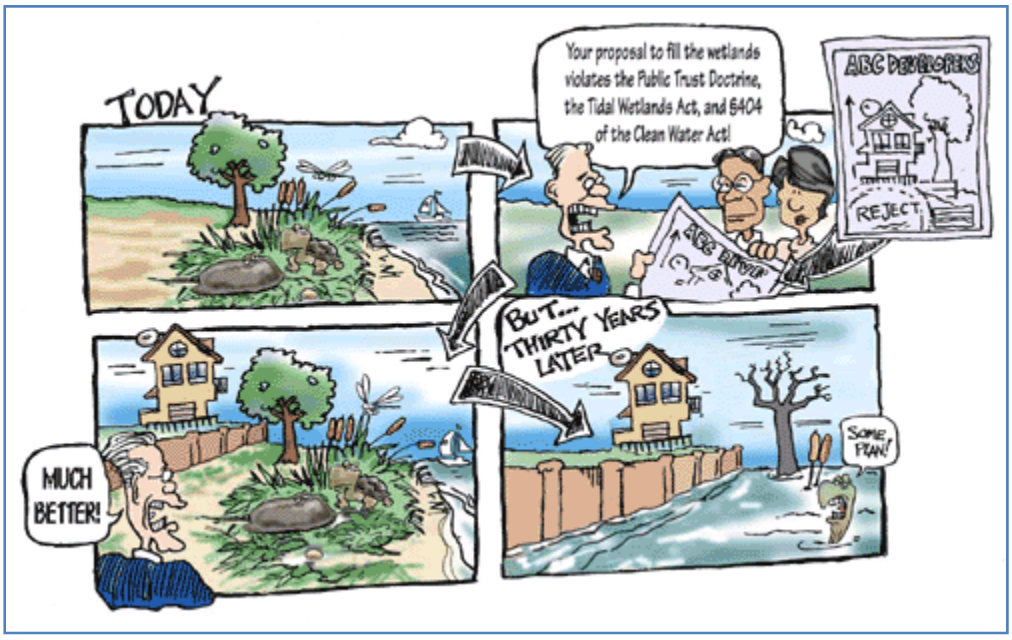
- Try to draw it on a big sheet of paper with color markers and express the things that you feel and understand;
- Fill the paper with drawing and labels, so the other participant can understand the impression;
- Drawing skills does not matter, the important thing is to deliver the impressions to other participant;
- Gather into small groups 2-3 persons and start to discuss it, focus on how the coastal environment affected the people and functioned;
- Analyze this coastal environment and its social, environment, utilization, and economic implication.
- Present the result into the forum.

Session Assignment

2. Coastal Hazards and its Impact Exercise

(Related Module 1: Session 2)

This exercise explores types of coastal hazards and its impact to the natural and human elements. First, review the type of coastal hazard (human induced or natural hazards). Define the element of causes into environmental degradation issues, which lead to other impacts in the coastal area. Second, the impacts will affected the human activities, such as economic aspect, social, and culture. Other natural impacts will lead to destruction of the environment, which must be describe and put it in problem priorities. The participant will write down their formulation and discuss it in the group.



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Instruction for the Participant:

- Write down in a big sheet of paper and draw a matrix related on the key question bellow;
- Define all type of coastal hazard that could happen in Indonesia?
- How these hazards are can be define?
- What can of impacts that can occur in the coastal area?
- Which natural and human elements will have been affected?
- How big are these impacts and what are their consequences
- Try to put them in priorities based on the impacts.
- Discuss into a small group of 2-3 persons through different point of views highlight some perspectives and or worldview that might most endorse

Session Assignment

3. Role Playing of Coastal Stakeholders: Planning Process, Concept, and Decision Making Process

(Related Module 1: Session 3)

In order to understand the practical ICZM, the participant will play the roles as different stakeholders in the coastal area. The objective is to re-enact a recent coastal planning decision in the coastal area and to analyze how the ICZM concept are put into debate. Usually an interesting subject of role playing is controversial development case, such as conflict of interest among the stakeholders. The role playing will represent the coastal developers, environmentalist, authorities/government, and communities. In the role play, the participant should also pay attention on sustainable development concept in the process of planning, implementation, monitoring, and evaluation. They should also analyze how the ICZM concept values, nationally, regionally, trans-disciplinary, and assumptions of each party will affect their views and debate.

Instruction for the Participant:

- The participant are divided into groups of stakeholders consist of developers (development firm, landowner, landscape/planner, consultant), environmentalist (NGOs, communities), government (Bappeda/Agency of Regional Planning, Bapedalda/ Regional Agency for Environmental Management, DKP/Ministry of Fisheries and Marine Affairs, other sectors), communities (community leader, organization of communities, women organization/PKK);

- First ten minutes, the participant review their roles and make assumption of interest to their plan for the development of the coast, put the ideas/concept on a sheet of paper;

- Fifteen minutes of discussion on round table meeting to try include their interest on the coastal development plan;
- The chairman of the round table will try to accommodate their interest into a plan and review it together with all the stakeholders involve on the ICZM concept;
- What is the dominant concept (environmental, economic, regional growth, social)?
- Does the exiting development best contribute for the coastal area?
- How does the ICZM concept can be well implement?
- What kind of tools to monitor and evaluate the development of coastal area?
- What are the future plans that include ICZM concept for the coastal area?
- How and what kind of indicators for decision making process in the coastal area?
- Each group should present result of their consensus

Session Assignment

4. Risk, Hazards, and Vulnerability Assessment Exercise

(Related Module 2: Session 1-4)

The purpose of this exercise is to identify the hazards and its assessment which can be done in a simple ways and also introducing the tools (images interpretation and map reading) of the various hazard maps. The vulnerability analysis will be exercised in simple way especially how to assess the progression of vulnerability. Finally they are able to conduct risk assessment and to minimize the risk at the various mitigation measures.

Instruction for the Participant:

1. Each group will be provided with hazard map. The hazard map can illustrate single hazard and-or multiple hazards, dependant on the various hazards that threat in the coastal area. Participant should describe the difference between single hazard and multiple hazards.
2. Assess the intensity and magnitude of each hazard,
3. In the vulnerability assessment, please do the progression of the vulnerability based on the theory, it should cover the root causes, dynamic pressures, and of course the unsafe condition respectively (optional)
4. Then provide with risk matrices to come up with risk classification. Based on the risk assessment process theory, please do step by step to assess the risk.
5. Estimate the risk level based on the formula Risk = hazard x vulnerability.
6. Discuss on risk perception, risk communication, and acceptable risk for supporting the conclusion.

Session Assignment

5. PARTICIPATORY PLANNING: COMMUNITY INVOLVEMENT AND CBDRR

(Related Module 2: Session 5)

Participatory Planning is a method for involving community in assessing needs and planning activities. The participatory planning is a valuable process which is part of the entry stage of community development. It is also a good way of involving communities in needs assessment–active methods better than just holding a meeting. The community as leading actor for planning their environment and improve community's resilience to disaster. The participatory approach is also performing as awareness enhancement to organize disaster risk reduction actions. The exercise will be a walking tour in a coastal community to involve them in the planning process.

Instruction for the Participant:

- The participant is dividing into groups of five or six and prepares the tools: big sheets of paper, color markers, camera, recorder, etc.
- The groups try to prepare the checklist of open question which issued on the DRR and participatory planning, and try to identify the communities into different of groups/level;
- The groups with different of communities make a transect walk also mapping of the area;
- Then the description are put into Diagram Venn or Chapatti or institutional maps
- Try also to identify the area which might be the hazard zone with a Seasonal Calendars.
- After that try to define the daily activities in a Daily activity charts.
- Put them all problem in a Problem Ranking matrix

FIELDWORK ASSIGNMENT

The fieldwork assignment will be a group assignment. The guidance is rapidly explain at the end of day 2. The participant should fill in all the listed questions during the fieldwork and provide with short analysis at the end of the fieldwork. On the next day, participant should present the result and discus it with other group.

Fieldwork Assignment

(Related to Book 2)

Location : Moro Demak, Demak, Central Java, Indonesia

Questionnaire:

1. Who are the stakeholders?
2. What are the existing resources (natural, infrastructure, etc)?
3. What is the major economic activity?
4. What is the existing program/project in the coastal area?
5. How is the community involvement in the planning process of coastal area?
6. What the existing problem and impacts?

Task to be evaluated:

1. Prioritizing the problem
2. Future plan
3. Addressing the DRR into the planning process
4. Strategy Plan, Action Plan and Projects DRR into ICZM
5. Management plan design

The participant will be divided into 4 group consist of 5 person to conduct fieldwork assignment. Some of the participant is obliged to obtain questionnaire data, while the other may conduct transect and ground check. At the end of the fieldwork the participant should discussed their findings and try to analyze the 5 points that should be evaluated. Point 4 & 5 need supporting data, thus, the desk study will be added later on. The result of the assignment should be presented at the day 4 of the training.

FINAL ASSIGNMENT

The final assignment is the most important deliverable for the training. The participant should provide proposed project of their area using the method that has been acknowledge during the fieldwork and session assignment. The result of their proposal shall be an input to promote the protection of their coastal area.

Final Assignment

(Related to Book 2)

Location : Varied Location along the Northern Coast of Java.

Questionnaire:

1. Who are the stakeholders?
2. What are the existing resources (natural, infrastructure, etc)?
3. What is the major economic activity?
4. What is the existing program/project in the coastal area?
5. How is the community involvement in the planning process of coastal area?
6. What the existing problem and impacts?

Task to be evaluated:

1. Prioritizing the problem
2. Future plan
3. Addressing the DRR into the planning process
4. Strategy Plan, Action Plan and Projects DRR into ICZM
5. Management plan design

Each participant from the same area should propose future plan for their area and to be submitted at the end of the training session. The task will be delivered at the beginning of the training, thus, each participant can start to compile data and information at the assignment session.