



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

IJDR

International Journal of
DEVELOPMENT RESEARCH

International Journal of Development Research
Vol. 5, Issue, 01, pp. 2992-3012, January, 2015

Full Length Research Article

COASTAL ZONE SPACE IN INDONESIA: PRELUDE TO CONFLICT?

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ARTICLE INFO

Article History:

Received 03rd October, 2014
Received in revised form
10th November, 2014
Accepted 11th December, 2014
Published online 26th January, 2015

Key words:

Humanosphere,
Indonesia,
ICZM,
Problems and issues,
Programs.

ABSTRACT

With 17,504 islands (12,000 inhabited) and 95,181 km of coastline, Indonesia represents an amazing maritime country, and of crucial proportion in managing their coastal zones, small islands and ocean. Culturally the coastal zones are mixed ethnically, and socially a zone of conflicting interest which arose in all level of bureaucrat and stakeholders. Indonesia's coastal and small island ecosystems and their marine biological diversity is core of national assets. If our use of them is well managed, they can meet a broad range of economic, social and cultural aspirations. They also provide a range of essential environmental services that would be extremely costly or impossible to restore or replace if ecosystem functioning was impaired. The need for integrated and ecosystem-based coastal, small islands and oceans planning and management are presented and discussed briefly.

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INTRODUCTION

One of the most distinctive features of Indonesia is its sheer physical size; stretching over 5,700 km from Sumatra in the west to the border with Papua New Guinea (PNG) in the east. Indonesia, with land and marine territory of about 7.7 million km² consisting of some 17,504 islands and approximately 95,181 km of coastline (MOMAF, 2007a) (*cf.* Anon, 2003: 108,000 km), is forth only to Canada, USA and Russia in the length of its coastline (World Resource Institute, 2001 *cited* Momaf, 2007a). However, considering economic utilization, biological diversity and ecological importance of the coastal zone and its extent, Indonesia certainly ranks first among all nations of the world. These coastal areas form an important and valuable natural resource with high potential economic value, and a potentially important production area for food. Throughout the Indonesian archipelago, coastal resources have been used by local communities for millennia. Pressures upon them are great to their high biological diversity and productivity (Bappenas, 2003). These coastal resources are in high demand e.g. in the post-tsunami period, the demand

of mangrove forests for mitigation of tsunami impacts are worldwide (Mazda *et al.*, 2007; Forbes and Broadhead, 2007; Alongi, 2008). Approximately 65% or more of Indonesia's population, estimated to total at least 276 million by the year 2020 (BPS, 2004), live adjacent or very near to the coastal zone, increasing the complexities for resource management and the likelihood of coastal degradation (Sukardjo, 1999; 2002). There are 8,090 coastal villages in Indonesia with 3.91 millions households, and totaling of 16.42 millions peoples. Of which the majority of people (32%, 5.2544 millions) within Indonesia's coastal zones live in poverty (Momaf, 2007a). In many ways, coastal zones of Indonesian typify the problems (Mimura 2006) and policy challenges presented by the processes of Global Environmental Change (GEC), Global Climate Change (GCC) and systematic development of the coastal areas themselves in Indonesia (Table 1) (*cf.* UNEP, 2005; UNEP-WCMC, 2006). These zones are under increasing environmental (resource exploitation/over-exploitation) pressure and are exhibiting unacceptable environmental changes as a consequence of population growth, urbanization, tourism and other multiple and often conflicting resource usage trends (Tables 2, 3, 4, 5). Mitigation of the resource conflict and the practical adaptation of the sustainable economic development policy objective require innovative

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Table 1. Database features for coastal environment sensitivity index map

Physical Resources		Ecological Features	Human Use Features	Contingency Planning Features
1. Mudflat		18. Mangroves	28. Tourism/Recreation site & beach	48. River
2. Mud & Sand flat		19. Coral reef	29. Sacred/Historical site	49. Canal
3. Sand & Gravel flat		20. Seagrass bed	30. Salt pan	50. Other water body
4. Sand flat		21. Seaweed bed	31. Agricultural area	51. Helipad
5. Sandy beach		22. Lagoon	32. Intensive fishing ground	52. Road
6. Muddy-sand beach		23. Protected area	33. Village	53. Railway
7. Sandy-gravel beach		24. Rare/Endangered	34. Urban area	54. Airport
8. Gravel beach		25. Peat swamp forest	35. Industrial area	55. Break water
9. Rocky beach		26. Marsh	36. Deep sea port	56. Shipping lane
10. Muddy beach		27. Estuary	37. Commercial port	57. Light house
11. Cliff			38. Fishing port	58. Anchorage
12. Shoreline slope			39. Recreation port	59. Buoy
13. Shoreline exposure			40. Water intake	60. Bathymetry
14. River mouth			41. Harbors limit	61. Bottom sediment
15. Klong mouth			42. Pollution control area	62. Oil & Gas platform
16. River slope			43. Dock	63. Oil & Gas terminal
17. Man-made structure			44. Ferry	64. Oil & Gas depot
			45. Pier & Jetty	65. Oil refinery
			46. Groin	66. Gas separation
			47. Rip-Rap	67. Oil spill Equipment Stockpile
				68. Pipeline route
				69. Cable route
				70. Tidal zone

Table 2. Physical setting of population characteristics in Indonesia by province (based on census 2000-2001) (BPS 2005)

Province (number of district)	Area (km ²)	Population (estimate, 2005)	Population Growth (%) (1994-2000)	Population Density (indiv./km ²)
NAD (21)	57,365.57	4,010,865	5.48	69.92
North Sumatra (20)	71,680	11,467,272	-0.22	159.98
West Sumatra (15)	42,297	4,228,103	-0.95	99.96
Jambi (10)	53,436	2,400,940	6.97	44.93
Bengkulu (4)	19,878.70	1,405,050	6.63	71.00
Riau (12)	94,561	1,405,050	54.44	14.86
Kep. Riau (5)	9,983	4,228,103	See Riau	423.53
South Sumatra (7)	113,339.07	6,806,080	10.85	60.05
Bangka-Belitung (3)	16,100	950,426	See South Sumatra	59.03
Lampung (10)	35,376.64	6,654,354	-1.18	188.10
Banten (6)	8,234	8,052,312	See West Java	977.93
DKI Jakarta (5)	661.62	8,384,853	4.31	12,673.22
West Java (22)	44,176	35,500,611	13.10	803.62
Central Java (35)	36,966	30,856,825	0.20	882.48
DI Yogyakarta (5)	3,142	3,109,142	0.62	989.54
East Java (37)	47,921.98	34,525,588	-0.67	720.45
Bali (9)	563,286	3,124,674	5.99	5.55
NTB (7)	20,153.15	3,821,794	2.00	186.86
NTT (14)	47,349.90	3,929,039	8.42	82.98
West Kalimantan (9)	146,809	2,740,017	-2.55	18.66
Central Kalimantan (14)	153,800	1,801,504	-2.55	11.72
South Kalimantan (10)	37,377.53	2,970,244	5.92	65.19
East Kalimantan (12)	211,440	2,436,545	17.52	11.53
Gorontalo (3)	10,804	840,386	See North Sulawesi	77.78
North Sulawesi (8)	25,768	1,980,453	6.98	76.85
Central Sulawesi (8)	68,033	2,066,394	10.04	30.37
Southeast Sulawesi (5)	38,140	1,771,951	15.23	46.46
South Sulawesi (25)	38,140	7,787,299	16.66	204.18
West Sulawesi (5)	38,40	1,007,034	See South Sulawesi	26.40
Maluku (5)	851,000	1,200,067	2.46	1.41
North Maluku (3)	53,836	784,974	See Maluku	14.58
West Irian Jaya (4)	116,571	535,301	-45.11	4.59
Papua (10)	77,119	468,734	See West Papua	6.08
Indonesia (33, 368)				

Table 3. Global warming: Cities that potentially affected by mean sea level rise (MSLR) and floods (Source: update RTRWN 2003)

Province	City
1. NAD	Lhokseumawe
2. North Sumatra	Tebing Tinggi, Lubuk Pakan, Belawan
3. Riau	Batam, Dumai, Bagansiapi-api, Tanjung Pinang
4. DKI Jakarta	Jakarta
5. West Java	Bekasi, Cirebon, Tangerang, Indramayu
6. Central Java	Semarang, Tegal
7. East Java	Surabaya, Bangkalan, Lamongan, Gresik, Sidoarjo
8. West Kalimantan	Pontianak, Singkawang
9. Central Kalimantan	Sampit
10. South Sulawesi	Makassar, Sungguminasa, Takalar, Maros, Pare-pare, Sinjai
11. Irian Jaya	Timika

Table 4a-b. ICZM in Indonesia: a case study for humansphere**Table 4a. Problems and/or issues post tsunami**

Major issue	Problems/issues	Management Strategy
Coastal zone degradation	Mangroves deterioration: Hyper salinity, over exploitation, pollution and soil erosion	1. Increase river flow. 2. Reforestation. 3. Introduce resistant taxa. 4. Assessment of annual loss.
	Pollution: Industrial sewage, oil, agriculture, toxic wastes, thermal, etc.	1. Pre-treatment of effluents. 2. Monitoring. 3. Clean-up operations. 4. Ship waste be processed or eliminated. 5. Multi-purpose numerical modeling. 6. Reduction of harmful compound.
	Decrease flow of rivers: Soil erosion, hyper-salinity	1. Restore the flow.
	Threat to biodiversity: Disappearance of species, loss of sanctuaries.	1. Improve the habitat. 2. Re-introduce species. 3. Marine parks. 4. Eco-tourism.
	Urbanization: Dredging, channelization, destruction of flora and fauna, soil waste.	1. Regulate coastal development. 2. Dump dredged material far away. 3. Reforestation.
	Sea Level Rise (SLR): Loss of land and biota, great economic loss.	1. Estimation of accretion and SLR. 2. Conservation of mangroves.
	Socio-economic: Poverty, illiteracy, lack of municipal facility.	1. Socio-economic uplift of fishermen. 2. Education. 3. Alternate job. 4. Marine park. 5. Apiculture, mariculture and silvo-fisheries.
	Lack of public awareness and people participation.	1. Local people participation in all coastal matter. 2. Education through mass media.
Lack of harmonization and enforcements of legislation.	1. Central, provincial and district governments cooperate. 2. Penalties.	

Table 4b. Coastal pollution post tsunami in Indonesia (Source: many sources)

Pollutant Materials	Example	Source
An-organic waste	Alkali, Acid, Heavy metals (mercury, arsenic, selenium, cadmium, nickels etc.), etc.	Industry, Mining
Organic waste	Food garbage, Faecals, Wood skin, Wood chip, fertilizer, etc	Domestic waste, Industry, Agriculture, Fishery (culture)
Surfactants	Detergents, Waste water, etc.	Domestic waste, Industry
Thermal outflow	Thermal water with > 40oC	Industry, Power plant, Vessel
Plastics	Waste product, garbage	Domestic waste, Industry
Pesticides	Herbicide, Insecticide, Fungicide etc.	Agriculture, Domestic waste
Sedimentation	Mud, Sand etc.	Mining, Forestry, Reclamation, Conversion of mangrove lands
Oil and wax	Oil spill	Oil exploration & refinery, Industry, Shipping
Chemical toxic	Cyanides	Fishing activities

Table 5. Site location for diving and surfing in Indonesia: an ecotourism case study for ICZM

Island	Diving location	Surfing location
1. Sumatra	P. Bintan	P. Nias, P. Bawa, P. Asu, Mentawai, Pantai Saroke
2. Java	Ujung Kulon, Krakatoa, Kep. Seribu	P. Panaitan, P. Deli, Baya, Pelabuhan Ratu, Tanjung Genteng, Tanjung Kucur, Grajagan
3. Bali	Menjangan, Tulamben, Cemeluk, Candi Dasa, Padang Bai, Nusa Dua, Nusa Penida, Sanur Pamuteran	Madewi, Balian, Canggu, Padma, Kuta, Balangan, Uluwatu, Nyangnyang, Nusa Dua, Tanjung, Sanur, Padang Galak, Ketewel, Lebih, Nusa Lembongan, Padang Bai
4. Sulawesi	Manado Tua, Bunaken, Montehage, Bangka, Bitung, Sangihe-Talaud, Makassar, Tukang Besi, Sangalaki, Kakaban, P. Siau, P. Togian	-
5. Nusa Tenggara	Gili (Trawangan, Meno, Air), Komodo, Lembata, Kupang, Roti, Maumere, Alor	P. Safari, Bangko-bangko, Belongas, Selong Belangak, A'an, Grupuk, Gililnus, Ekas, Labuhan Haji, Senggigi, Gili (Tawangan, Meno) Silung Belanak, Pasola
6. Maluku	Ambon, Banda, Pindito	-
7. Irian Jaya	Ayu, Asia, Mapia, Padaido, Sorong, Manukwari, Cendrawasih, Waigeo-Batanta	-

policy responses e.g., replanting the mangroves along Indonesia's (Sukardjo, 2005) (*cf.* Table 6). In the aftermath of the Great Sumatra earthquake and the tsunami, Indonesia has undertaken various investigations (See also Kathiresan and Rajendran, 2005, Serigstad and Muchtar, 2006, Forbes and Broadhead, 2007; Iverson and Prasad, 2007; UNEP, 2005; UNEP-WCMC, 2006). In order to make use of the coastal zones in a sustainable way, Indonesian ministries (MOF, MOMAF, MOHA, and SMOE as lead agencies) and institutions (e.g., LIPI, Bakosurtanal etc. as back

stopping offices) are taking much interest with ICZM as a comprehensive policy/management response option e.g., livelihood species (Heileman, 2006). At the central level, ICZM is a process which enables policy makers to strike a socially acceptable balance between conflicting stakeholders resource demands as they manifest themselves in different economic, socio-political (an institutions), cultural and environmental contexts. The process including the legal and institutional framework necessary to ensure that development and management plans for coastal zones are integrated with

environmental and social goals and are made with the participation of those affected e.g., Law No.27/2007: Coastal Zone and Small Islands Management (cf. MEA, 2005; PEMSEA, 2005; Post and Lundin, 1996; Goldberg, 1994). The tsunami catastrophe in the coastal areas of Indonesia i.e. December 26, 2004 (Danielsen *et al.*, 2005) that struck Aceh and Nias following the severe earthquake off the coast of Sumatra caused incomprehensible suffering and devastation, catalyzed the development of a *National Strategy for ICZM* (NSICZM). in which the coastal marine communities (mangroves: potentially 9.7 million ha covering state and non-state forest areas, coral reef: 42,000-51,020 km², seagrass: 30,000 km²?, and other coastal wetland types: 33.45 million ha?) is emphasized as an important element in the conservation and economic development of the coastal region in Indonesia (cf. Alongi, 2008; MEA, 2005; NOAA, 2004; AIDENVIRONMENT/RIKZ, 2004; Forbes and Broadhead, 2007). NSICZM has embraced a range of general principles (also highlighted in UNCED's Agenda 21 action programmes) and millennium development goals (Pemsea, 2005):

1. Economically efficient resource usage – supplemented by principles such as polluter pays and proper resource accounting;
2. Sustainable resource usage – supplemented by intergenerational and intergenerational equity concerns and transboundary responsibility;
3. Precautionary action – involving a more sophisticated recognition of the problems and issue posed by both scientific and social uncertainties.

Mangrove ecosystems is considered to be a flagship for the humanosphere socialization and implementation of the NSICZM, in which our paper concern.

State of the arts of coastal zones of Indonesia

Indonesian coastal, seas and oceans include an amazing variety of plants and animals which all contribute towards rich marine biological diversity (BAPPENAS, 2003) e.g., Pulau Marore and Pulau Kawio of Kabupaten Kepulauan Sangihe, a small islands of the northern edge of Indonesia (Kertopermono *et al.*, 2008). Indonesia has been described as one of the 17 mega-biodiversity countries in the world (Myers *et al.*, 2000). With many islands and some of which in relative isolation means that an usually large proportion of marine fauna and flora is unique to Indonesian waters, especially in shallow and/or protected coastal areas e.g., mangroves, seagrass bed and coral reefs.

Problems and issues in the coastal zone

Indonesia's coastal zone (being the interface between land and ocean) includes shoreline ecosystems (including mangroves, coral reefs, seagrass beds), and adjacent coastal waters (Heileman, 2006; PEMSEA, 2005; Solomons *et al.*, 1999; Cicin-Sain and Knecht, 1998; Goldberg, 1994), are characteristically by:

1. It is a dynamic area with frequently changing biological, chemical, and geological attributes.
2. It includes highly productive and biologically diverse ecosystems that offer crucial nursery habitats for many marine species.

3. Coastal zone features such as coral reefs, mangrove forests, and beach and dune systems serve as crucial natural defenses against storms, flooding, and erosion.
4. Coastal ecosystems may act to moderate the impacts of pollution originating from land (land-based pollution) (for example, wetlands absorbing excess nutrients, sediments, human wastes).
5. The coasts attracts vast human settlements due to its proximity to oceans "living and non-living resources, for socio-economic activities as well as marine transportation and recreation".

The Indonesian coastal zones over a variety of habitats and often represent a fragile ecosystems (Table 1), directly affected by global climate change, and naturally and administratively considered as potential conflict area among the Government of Indonesia (GOI) agencies and/or between developers. Also represent the ecological domain for many marine biota and human being. Changes in water availability and quality can severely affect local ecosystems. At local level, combination of poverty and over-population (Table 2) will a lead to a number of environmental stresses (Cicin-Sain and Knecht 1998), and become Ecologically Sensitive Areas (ESAs) (SOPAC, 2002; ADB, 1989) if they:

1. Provide protection for steep slopes, especially coastal areas, against erosion.
2. Support important natural vegetation on soils of inherently low productivity which would yield little value to human communities if transformed.
3. Regulate and purify water flow.
4. Provide conditions essential for perpetuation of species of medicinal and genetic conservation value.
5. Maintain conditions vital for the perpetuation of species which enhance the attractiveness of the landscape or the viability of protected areas, or species that are endangered.

With outstanding natural value for hydrological, geologic, scenic, wildlife, or vegetation reasons locally, Indonesia coastal zone is a treasure trove of diverse natural resources, and make up the most fundamental elements of multi-complex environment (See: MOMAF, 2007a,b) are developed with great care e.g., southeastern coast Bali (Table 7) (PEMSEA and BALI PMO, 2004).

GOI and their development agencies are looking again their use of the natural environment post tsunami. Most resources management approaches have been sectoral and fragmented e.g., National Strategies for Mangroves, Coral Reefs, Seagrass and Wetlands, and IBSAP2003-2020, Mangrove friendly-aquaculture (Sukardjo, 2002) (Tables 4, 8, 9, 10).

Historically, mangroves management for instance, has been driven by the socio-economic needs of an area, and little attention has paid to the scientific knowledge of mangrove systems. Seagrass, coral reefs and other type of coastal ecosystem just only recently acknowledge their roles for the decision making. The results of LREP, MREP, CCDFRMP, MCMA and MCRMP projects of MOA and MOMAF, COREMAP, and other projects on coastal resources indicate that environmental pressure builds up via socio-economic driving forces - demographic, economic, institutional and technological – which cause changes in environmental systems

stakes. These changes include increase nutrient, sediment and water fluxes across drainage basins and into the marine environment; land cover and land use changes, fragmentation and degradation of habitats; pollution of soil, water and atmosphere; and climate attention (*cf.* Salas *et al.*, 2006, Marvin *et al.*, 2004; Alongi, 2008; Perry, 2007; Olsen 2003; SOPAC, 2002; Hogarth, 2001; Vitousek, 1994). Deforestation and agricultural activities occurring far inland also give rise to pollution of coastal system through siltation and run-off of fertilizer and pesticides e.g., in Jakarta Bay. The severity of the resulting damages is increased due to the high variability (natural and induced) of coastal processes. The quantitative analysis of inter-connection between marine and/or coastal species and their abiotic environment has therefore been a central issue. In the context of humanosphere, the problems and issues of the Indonesian coastal resources (mangroves, coral reefs, seagrass etc.) can be grouped into:

Ecological and socio-economic issues: In practice, ecological and economic considerations cannot be separated in evaluating management alternatives for mangroves, coral reefs, seagrass and/or other coastal resources. This statement reflects the growing appreciation of the social and economic importance of the coastal ecosystems. To measure the values of mangroves accurately for example, the value of the goods and services produced by the ecosystems needs to be considered and incorporated into the assessment of the relative merits of development alternatives. This requires the application of innovative economic evaluation techniques that take into account such externalities.

Institutional and legal issues for coastal resources management coordination: There is an urgent need for a re-adjustment on the part of government to move away from narrow sectoral interests towards a more integrated multi-sectoral approach to the management of coastal resources (mangroves, coral reefs, seagrass, estuarine, lagoon, gulf, beach forests, sand dune and other coastal vegetations) including its biodiversity, and this can only be strengthening and expanding the planning and coordinating role of BAPPENAS and the SMOE, MOMAF, MOF, MOHA at the central level, and the BAPPEDA at the provincial and local levels. It must never be forgotten that while the central agencies can provide policy guidance to the provinces, it is the provincial authorities at both Tk-I and Tk-II.

Stakeholders conflicts issues at the local levels (provincial, district and sub-district and villages): communities have the right to manage, with others parties (private sector), to gain income in order to repay costs incurred to sustainably conserve their resources. Some of the costs will be borne by government. National and Local Governments cannot avoid responsibility because some situations will not be easily handled by the community itself without Government involvement.

At local level, the key resource use problems, constraints and conflicts with NSICZM implementation in general, and mangroves management in particular, have been identified by Sukardjo (1999, 2000, 2002), and for Bangka Island by Hartoto and Sulastri, 2004) as follows:

1. Loss of mangrove forests and tidal swamps which support traditional fisheries,

2. Improper utilization of the coastal zone by non-coastal investors (e.g., large scale conversion of mangrove forests to tambak fishponds),
3. Declining socio-economic status and employments opportunities of increasingly poor coastal village communities,
4. Increasingly high levels of coastal pollution,
5. Over-fishing and over-exploitation of coastal resources, including the extensive use of destructive methods (e.g., coral reef bombing),
6. Insufficient understanding of the ecological importance of the coastal zone and maintenance of coastal resources on the part of developers and government decision-makers,
7. The emphasis upon agricultural development (e.g., rice production) for income and food security through conversion of the coastal zone.

Proposed Programmes

A synoptic geological, geo-morphological and other related geo-scientific study of the entire coastal zone between landward limit of about 10 m elevation and the adjoining offshore stretch up to 10 m water depth is required for the effective Indonesian coastal management. The detailed bathymetric map of the continental shelf is to be prepared along with other oceanographic parameters and down depth geological configuration. For planning such disaster management programme, basic coastal zones maps are required (Tables 1, 2, 4). The data including information on cultural and anthropogenic feature is available with various institutes and/or GOI agencies, and organizations require a proper synthesis. There is a big need for preparation of theme based coastal Atlas on detail scale (1:25,000 or even larger) depicting information on geological set up, area of neo-tectonic activity, elevated areas, types of coastal landforms and their extent, area covered by mangroves, artificial construction, cultivation, population density, tourism potential, type of industry and the possible effluents, network of roads, extent of aquaculture (e.g., tambak), path of cyclones for last 30 to 40 years with statistical analysis and bathymetric data with oceanographic parameters e.g. Tables 1-2 (*cf.* Mazda *et al.*, 2007).

The decline in important habitats of mangroves, coral reefs, seagrass beds might have had adverse affects on the reproduction and survival of various aquatic species that relied on these environments at various stage of development (Sukardjo, 2004). Most of these species are source of foods for humankind. The sea food technology area (both traditionally and high-technologically), can create many job opportunities, and Indonesia seawater quality standard has been improved (Table 11). From social points, Indonesia waters are expected to have a well of history both socio-economically and politically (*cf.* Tables 3, 5, 6). As a fundamental measure, the vast Exclusive Economic Zone (EEZ) and the continental shelf need to be explored in detail to complete geological, chemical, biological and physical mapping. A GIS – based mapping of the geo-morphological cells using satellite, aerial photography and real-time ground truthing is adopted to estimate coastal vulnerability against geological, climatologically, biological, chemical and physical extremes (Table 1). Indonesia's coastal zone is the prime affects the livelihood of the majority of the peoples, in one way or the other e.g. Table 12.

Table 6. List of the most relevant legal, policy, and planning instrument for ICZM in Indonesia

Law/Government Regulations/Decree, etc.	Mangroves	Coral Reef	Sea grass	Other type of coastal wetlands and small islands
1. The Indonesian Constitution 1945 (UUD45, ps 33:3)	+	+	+	+
2. Law No. 12/1951 – Weapon and explosive Material	-	+	-	-
3. Law No.5/1960 – Land-use (Agraria)	+	+	+	+
4. Law No. 11/1967 – Mining	-	+	+	-
5. Law No. 5/1984 – Industry	-	+	-	-
6. Law No. 9/1985 – Fisheries	+	+	+	+
7. Law No. 17/1985 – Marine Law Convention of 1982	-	+	?	?
8. Law No. 5/1990 – Natural Resources Ecosystem and Conservation	+	+	+	+
9. Law No. 9/1990 - Tourism	+	+	-	-
10. Law No. 4/1992 – Housing and Settlement	-	+	-	-
11. Law No. 16/1992 – Quarantine	-	+	?	?
12. Law No. 21/1992 – Sail	-	+	-	-
13. Law No. 23/1992 – Chemicals, Health	+	+	+	+
14. Law No. 24/1992 – Spatial planning	+	+	+	+
15. Law No. 5/1994 – Biodiversity Convention of 1992	+	-	-	?
16. Law No. 6/1994 – Convention on Climate Changes	-	+	-	?
17. Law No. 6/1996 – Waters	+	+	+	+
18. Law No. 23/1997 – Environmental Management	+	+	?	?
19. Law No. 22/1999 – Local Government	-	+	?	?
20. Law No.25/1999 – Financial Balance between Central and Local Gov	-	+	+	-
21. Law No. 36/1999 – Cable-Telecommunication	+	+	?	+
22. Law No. 41/1999 – Forestry	+	?	?	+
23. Law No. 25/2000 – PROPENAS	+	-	-	+
24. Law No. 7/2004 – Water Resource Management	+	+	+	+
25. Law No.31/2004 - Fisheries	+	+	+	+
26. Law No.26/2007 - Spatial Planning	+	+	+	+
1. Government Regulation (GR) No. 28/1985 – Forest Protection	+	-	-	+
2. GR No. 15/1990 – Fisheries	+	+	?	?
3. GR No. 20/1990 – Water Pollution Monitoring	+	+	-	?
4. GR No. 27/1991 – Swamps	+	+	-	?
5. GR No. 35/1991 – Rivers	+	-	-	+
6. GR. No.18/1994 – Ecotourism Enterprise	+	+	-	?
7. GR No. 47/1997 – Spatial Planning for National Region	+	+	-	?
8. GR No. 68/1998 – Nature Reserve Area and Nature Conservation Area	+	-	-	+
9. GR No. 27/1999 – Environmental Impact Assessment	+	+	-	?
10. GR No. 29/1999 – Controlling and/or Marine Damage	-	+	-	-
11. GR No. 25/2000 – Province, District/City Authority as Autonomy Reg.	+	+	?	?
12. GR No. 34/2002 – Forest Zone, Forest Management and Utilization Plans, Forest Area Usage	+	-	-	?
1. President Decree (PD) No. 43/1978 – CITES Ratification dated 15/12/78	-	+	?	?
2. PD No. 32/1992 – List of Closed Business for Investing	-	+	-	-
3. Decree of Forestry Minister No. 687/Kpts-II/1989 dated 15/11/89 – Tourism Forest Business, National Parks, Forest Park & Marine Tourism Park	-	+	-	-
4. Decree of Forestry Minister No. 688/Kpts-II/1989 – Permit Approval on Tourism Forest Business, National Park, Forest Park & Marine Tourism Park	-	+	-	-
5. Decree of Forestry Minister No. 400/Kpts-II/1990 – Establishment of Steering Committee on Forest Boundary	-	+	-	-
6. Decree of Tourism, Post and Telecommunication Minister No. KM.13/PW.102/MPPT/93 – Tourism Infrastructure for Business	-	+	-	-

The tambak area in East Java for instance, reaches as far as 20 km from the costs. Also, the dense growth of mangroves, many thousands of large birds and an appreciable number of other animals make the tambak area to a biologically interesting region. Monitoring change in shoreline is an important task for the concerned e.g., MOMAF and research institutions e.g., LIPI, BAKOSURTANAL. Another aspect of long-term measure for protection against tsunami destruction centers on land-use practices in coastal areas vis-à-vis adherence to coastal zone regulation e.g., Law No.27/2007, Law No.26/2007 (Table 6) and Table 3. The Indonesia Green Coast Programme (IGCP) (See: Regulation of SMOE No.3/2006: Program Menuju Indonesia Hijau, GNRHL Presidential Decree, Green Belt Regulations, Spatial Land-use Planning Law No.26/2007) is restoring and managing coastal ecosystems to increase livelihood security for people in tsunami hit region (e.g., NAD, Nias). Also, MOMAF with the MCMA-MCRMP implement the grass-root resolution on fisheries livelihood stability in the 15 provinces.

Moreover, the projects provide an ignition for the local people concern with their resource based-life e.g., Table 12. The relevant points in the context of global warming era and climate changes programmes include in the proposed Indonesian NSICZM programmes (e.g., Table 3). Some important issues to be addressed for advanced capacity building programmes are:

1. Ecology of coastal regions/water/biotic/abiotic.
2. Environmental monitoring (theory, method, data transfer and use, organization).
3. Legislation and administration.
4. Planning and control (EIA, planning permission, etc.).
5. Protected areas (administration, management, access).
6. Controlling of oil pollution and shipping.
7. Environmental accounting and environmental economics, monetarisation of resources and social impact assessment.
8. Case studies of aquaculture, fishery, extraction of raw materials, agriculture and forestry, tourism and its directing in coastal regions.

Table 7a-g. Retrospective Risk Assessment in the Bali Integrated Coastal Management area (Source: PEMSEA and Bali PMO 2004)

Table 7a. Detailed Retrospective Risk Assessment for Mangroves in the Southeastern coast of Bali

Mangroves	1	2	3	4	5	6	7	8	9	10
1. Is the target exposed to the agent?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2a. Was there any loos/es that occurred following exposure	ND	ND	ND	ND	ND	Y	Y	Y	Y	Y
2b. Was they any loos/es correlated through space?	ND	ND	ND	ND	ND	Y	Y	Y	Y	Y
3. Does the exposure concentration exceed the threshold where adverse effects start to happen?	ND	ND	ND	ND	ND	Y	Y	Y	Y	Y
4a. Do the results from controlled exposure infield experiments lead to the same effect?	ND	ND	ND	ND	ND	Y	Y	NR	NR	NR
4b. Will removal of the agent lead to amelioration?	ND	ND	ND	ND	ND	Y	Y	N	?	?
5. Is there an effect in the target that is known to be specifically caused by exposure to the agent (e.g., biomarkers)?	ND	ND	ND	ND	ND	Y	ND	Y	Y	Y
6. Does it make sense (logically and scientifically)?	ND	ND	ND	ND	ND	Y	Y	Y	Y	Y
Likelihood	?	?	?	?	?	VL	VL	VL	VL	VL

Legend: Y-Yes, ND-No Data, ?-Unknown, NR-Not Relevant, VL-Very Likely.

1: Oil & related substances, 2: BOD/COD, 3: DO, 4: Heavy metals, 5: Pesticides, 6: Solid waste, 7: Sedimentation, 8:Reclamation, 9: Clearance, 10: Land conversions.

Table 7b. Detailed Retrospective Risk Assessment for Coral reefs in the Southeastern coast of Bali

Coral Reefs	1	2	3	4	5	6	7	8	9	10	11	12
1. Is the target exposed to the agent?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2a. Was there any loos/es that occurred following exposure	ND	Y	ND	ND	Y	ND	Y	Y	Y	Y	Y	Y
2b. Was they any loos/es correlated through space?	ND	ND	ND	ND	ND	ND	ND	Y	Y	Y	Y	Y
3. Does the exposure concentration exceed the threshold where adverse effects start to happen?	N	Y	Y	Y	Y	Y	Y	Y	M	M	M	M
4a. Do the results from controlled exposure infield experiments lead to the same effect?	ND	ND	ND	ND	ND	ND	Y	ND	ND	ND	ND	ND
4b. Will removal of the agent lead to amelioration?	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5. Is there an effect in the target that is known to be specifically caused by exposure to the agent (e.g., biomarkers)?	ND	Y	ND	ND	ND	ND	ND	Y	Y	ND	Y	Y
6. Does it make sense (logically and scientifically)?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Likelihood	U	L	P	P	L	P	L	L	L	L	L	L

Legend: Y-Yes, M-Maybe, ND-No data, L-Likely, P-Possibly, U-Unlikely.

1: Oil and related substances, 2: Nutrients, 3: BOD/COD, 4: DO, 5: TSS, 6: Heavy metals, 7: Sedimentation, 8: Coral mining, 9: Destructive fishing, 10: Marine tourism activities, 11: Anchoring, 12: Collection.

Table 7c. Detailed Retrospective Risk Assessment for Seagrass beds in the southeastern coasts of Bali

Seagrass bed	1	2	3	4	5	6	7	8	9	10	11
1. Is the target exposed to the agent?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2a. Was there any loos/es that occurred following exposure	ND	ND	ND	ND	ND	ND	ND	Y	ND	Y	Y
2b. Was they any loos/es correlated through space?	ND	ND	ND	ND	ND	ND	ND	Y	ND	Y	Y
3. Does the exposure concentration exceed the threshold where adverse effects start to happen?	ND	ND	ND	ND	ND	ND	ND	ND	ND	Y	Y
4a. Do the results from controlled exposure infield experiments lead to the same effect?	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	NR
4b. Will removal of the agent lead to amelioration?	ND	ND	ND	ND	ND	ND	ND	ND	ND	Y	ND
5. Is there an effect in the target that is known to be specifically caused by exposure to the agent (e.g., biomarkers)?	ND	ND	ND	ND	ND	ND	ND	ND	ND	Y	ND
6. Does it make sense (logically and scientifically)?	ND	ND	ND	ND	ND	ND	ND	Y	ND	Y	Y
Likelihood	?	?	?	?	?	?	?	P	?	L	L

Legend: Y-Yes, ND-No data, NR-Not relevant, L-Likely, P-Possibly.

1: Oil and related substances, 2: Nutrients, 3: BOD, 4: DO, 5: Heavy metals, 6: Pesticides, 7: TSS, 8: Sedimentation, 9: Collection, 10: Land reclamation, 11: Seaweed culture.

Table 7d. Detailed Retrospective Risk Assessment for beaches in the southeastern coasts of Bali

Beaches	Coastal Mining	Land Reclamation	Coastal Engineering Structure	Setback Invasion
1. Is the target exposed to the agent?	Y	Y	Y	Y
2a. Was there any loos/es that occurred following exposure	Y	Y	Y	Y
2b. Was they any loos/es correlated through space?	Y	Y	Y	Y
3. Does the exposure concentration exceed the threshold where adverse effects start to happen?	ND	ND	ND	ND
4a. Do the results from controlled exposure infield experiments lead to the same effect?	NR	NR	NR	NR
4b. Will removal of the agent lead to amelioration?	Y	Y	Y	Y
5. Is there an effect in the target that is known to be specifically caused by exposure to the agent (e.g., biomarkers)?	Y	Y	N	N
6. Does it make sense (logically and scientifically)?	Y	Y	Y	Y
Likelihood	P	P	P	P

Legend: Y-Yes, ND-No data, NR-Not relevant, P-Possibly.

Table 7e. Detailed Retrospective Risk Assessment for fisheries in the southeastern coasts of Bali

Fisheries	Domestic waste	Industrial waste	Over fishing	Destructive fishing	Habitat degradation
1. Is the target exposed to the agent?	Y	Y	Y	Y	Y
2a. Was there any loos/es that occurred following exposure	M	M	Y	Y	M
2b. Was they any loos/es correlated through space?	?	?	Y	Y	Y
3. Does the exposure concentration exceed the threshold where adverse effects start to happen?	Y	Y	Y	Y	Y
4a. Do the results from controlled exposure infield experiments lead to the same effect?	ND	ND	ND	ND	NR
4b. Will removal of the agent lead to amelioration?	?	?	Y	Y	M
5. Is there an effect in the target that is known to be specifically caused by exposure to the agent (e.g., biomarkers)?	?	?	?	?	ND
6. Does it make sense (logically and scientifically)?	Y	Y	Y	Y	Y
Likelihood	P	P	L	L	P

Legend: Y-Yes, M-May be, ND-No data, NR-Not relevant, L-Likely, P-Possibly, ?-Unknown.

Table 7f. Detailed Retrospective Risk assessment for shrimp culture in the southeastern coasts of Bali

Shrimp culture	Solid waste	TSS	Oil & Grease	Heavy metals	Pesticides	BOD	DO	Nutrient	Bacteria & Viruses
1. Is the target exposed to the agent?	Y	Y	Y	Y	Y	Y	Y	Y	Y
2a. Was there any loos/es that occurred following exposure	ND	ND	ND	ND	ND	ND	ND	ND	Y
2b. Was they any loos/es correlated through space?	ND	ND	ND	ND	ND	ND	ND	ND	Y
3. Does the exposure concentration exceed the threshold where adverse effects start to happen?	ND	Y	N	Y	ND	Y	Y	Y	Y
4a. Do the results from controlled exposure infield experiments lead to the same effect?	ND	ND	ND	ND	ND	Y	Y	ND	Y
4b. Will removal of the agent lead to amelioration?	ND	ND	ND	ND	ND	ND	Y	ND	Y
5. Is there an effect in the target that is known to be specifically caused by exposure to the agent (e.g., biomarkers)?	ND	ND	ND	ND	ND	ND	ND	ND	Y
6. Does it make sense (logically and scientifically)?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Likelihood	?	P	U	P	?	P	P	P	VL

Legend: Y-Yes, ND-No data, ?-Unknown, VL-Very likely, P-Possibly, U-Unlikely.

Table 7g. Detailed Retrospective Risk Assessment for Seaweed culture in the southeastern coasts Bali

Seaweed culture	Domestic waste	Oil & Grease	Sedimentation	Pesticides	Salinity	Nutrients	Ice-ice disease
1. Is the target exposed to the agent?	Y	Y	ND	ND	ND	?	ND
2a. Was there any loos/es that occurred following exposure	ND	ND	ND	ND	ND	ND	Y
2b. Was they any loos/es correlated through space?	?	ND	?		Y	ND	Y
3. Does the exposure concentration exceed the threshold where adverse effects start to happen?	ND	ND	ND	ND	ND	N	Y
4a. Do the results from controlled exposure infield experiments lead to the same effect?	ND	ND	ND	ND	ND	ND	Y
4b. Will removal of the agent lead to amelioration?		?	?	ND	?	ND	Y
5. Is there an effect in the target that is known to be specifically caused by exposure to the agent (e.g., biomarkers)?	ND	ND	ND	ND	ND	ND	Y
6. Does it make sense (logically and scientifically)?	ND	ND	ND	ND	Y	N	Y
Likelihood	?	?	ND	?	?	U	VL

Legend: Y-Yes, ND-No data, N-No, ?-Unknown, VL-Very likely, U-Unlikely.

Table 8. Mangrove areas recommended for conservation in the context of humansphere (Modified from NSMEMI-2006, National Strategy for Mangrove Ecosystem Management in Indonesia)

1. Mangrove forests which are primary/pristine	Regardless of location virgin mangrove forest should be preserved or declared as forest reserves because these areas are important in maintaining ecological balance in the mangrove ecosystem. These areas are also needed for riverbank and shore protection, wildlife sanctuaries and for educational and research purposes.
2. Mangrove areas subjected to significant environmental hazards for example storms, erosion, floods	Mangrove forests which act as natural barriers/buffers against shore erosion, strong winds and storm floods should be left untouched.
3. Mangrove areas near or adjacent to traditional productive fry and fishing grounds	Considering the importance of mangroves for breeding, spawning, feeding and nursery grounds for a variety of fish and shellfish mangroves near or adjacent to traditional productive fry and fishing grounds should not be alienated or released for development. These mangrove areas should be converted for utilization by people either those whose are dependent on the mangrove forest products for their livelihood/domestic needs (e.g. firewood, crabs, molluscs) or for tourism.
4. Mangrove areas near populated areas/urban centers	These mangroves serve as a major ecological component of the island ecosystem and should in no case be disturbed.
5. Mangrove forests on small islands	To maintain the ecological balance of estuarine areas there should be buffer zone areas of mangroves preserved on both sides of the river fronting the sea.
6. Mangrove areas adjoining the mouth of major river systems	

Proposed selected sites for action

The FAO Code of Conduct for Responsible Fisheries (FAO 1995) states in Article 6.8 that ‘*All critical fisheries habitats in marine and freshwater ecosystems, such as wetlands, mangroves, reefs, lagoons, nursery and spawning areas, should be protected and rehabilitates as far as possible and where necessary*’. The summary of the likelihood of agents causing decline in resources and habitats of coastal zone in Indonesia are presented in Table 12. No single agency or authority is at present responsible for coastal resources and/or environmental management in Indonesia (see: Table 6). How can humanity best face catastrophes such as the tsunami, on the 26th December? About 65% or more of Indonesia’s population lives within 60 km of the coastline and they suffered severely from hazards and damage to life and property. The National Strategy for the Mangrove Ecosystem Management in Indonesia (2006) proposed a general guidance with mangroves protection for GOI agencies concerned. The principal goal of area protection is conservation. Mangrove areas recommended for preservation or to be declared as mangrove forest reserve are shown in Table 8.

Simultaneously, capacity building should be a prime activity for the Indonesia marine community involving rewarding collaboration among the various institutions (e.g., MOF, MOMAF, MOHA, MOA and SMOE). I suggest that the characteristics of the lead agency should include (see: Table 6; cf. Pirot *et al.*, 2000):

1. Willingness and capacity to take on role of lead agency.
2. An understanding of mangrove ecosystem management.
3. An appreciation of the role of the local and traditional knowledge in management.
4. An appreciation of the importance of involving local communities in management.
5. Negotiating, participatory and facilitation skills.
6. Ability to establish and provide a point of coordination for the network of stakeholders.
7. High degree of political sensitivity.

The following seven sites plus Aceh and Nias are attractive sites for the implementation of NSICZM in the frame of humansphere in Indonesia, and in the context of MOMAF (2007b) programmes and Millennium Development Goals (PEMSEA, 2005), viz.:

Demak, Central Java: The project ‘Cope with the *Rob*’ (rising of sea water) initiated by the Directorate General of Marine, Coasts and Small Islands, MOMAF is actually running an adaptation project to the climate changes impact at the northern coast of Central Java since 2003. The project components includes mangrove planting e.g. in Bedono village, temporary break water, house retrofitting, village infrastructure rehabilitation, socialization and community awareness and development of village management plan. The project activities executed by NGOs, OISCA an international Japanese NGO, local community as well as local governments (sub-district, villages) in conjunction with MOMAF for the managing fisheries productivity and sustaining the income generating activities. ICZM strategic plan for Demak has been implemented and therefore, issues pertaining to the local sense mostly deals with the conflict interest among the people and/or

between the peoples in site areas due to their social perceptions.

Bone Gulf Fishery, South Sulawesi: The main issues are the conflict between artisanal, semi-industrial and industrial fishing interest. The resolution of these conflicts in the gulf requires that the open access fishery policy be dealt with. It is a challenging task in term of Mangroves for the Future (MFF) Indonesia and ICZM, and the goodwill between the interested parties is often lacking.

Bulungan Marine Protected Area, East Kalimantan: The typical small islands ecosystem management issues arise in connection with development activity and conservation measures of marine biota for eco-tourisms, and utilization. Berau district represent an important site as such, that establishment of the Local Marine Conservation Area (KKLD, Kawasan Konservasi Laut Daerah) have been set-up to support Mangroves Information Centre (MIC). There are an endemic jelly fishes which is found only in Kakaban island and Palau and endangered turtle with Sangalaki island is their nursery grounds. Derawan island also the interesting site for research and as resort for ecotourism. Marine National Park (MNPs) and reserves may be labeled as biological sanctuaries while the real reasons for designation are that there is no alternative land-use or because there is pressure from interest groups to engage in tourism.

Apar-Adang Gulf, Pasir district, East Kalimantan: Conflict interest arose between local government (District) and MOF regarding the status of Mangroves Nature Reserve and development activities by district government as per their spatial land-use planning. Tambak is the main issues of conflict, and illegal occupations are taken places in the area of nature reserve.

Lampung Gulf, Lampung: Mangrove rehabilitation activities vs local perceptions in term of who will be manage the man-made forests. Local government (Province, District, Sub-district and village) are in the debates position of uncertain final decision.

Eastern Coast of Sumatra-Malacca strait: Represent an acute area of marine traffics and marine pollution along with the conflict interest in managing the Malacca strait bilaterally and/or multi-laterally.

South-eastern Coast of Bali: Most excellence spot of coastal development for eco-tourism and the development of their facilities in line with integrated coastal zone management perspectives are vital.

Aceh and Nias tsunami affected areas: Totally damaged areas by tsunami, and for special cases to be used for the MFF implementation projects. There are many projects have done in Aceh and/or other tsunami affected areas to be used as further references e.g., KOICA (Korean International Cooperation Agency) project.

Strategies and action plans - proposed solution analysis for immediate, long-term and priorities

Indonesia arose from the existing coastal resources management problems and/or issues. The Strategy and the

Table 9. Indonesian commercial marine product and their management status: a fishery case study for ICZM

Marine product	Number of species	Population Status	Distribution status	Commercial status	Level of usage	Management effort
Shark	>100	??	??	Commercial, Traditional	??	??
Tuna	6	??	Known, Not updated	Commercial, Industry	?? Known	CPUE
Sea horse	9	??	??	Commercial, Traditional	??	??
Sea cucumber	30	??	??	3 species: commercial, industry & traditional	??	??
Turtles	5	??	Known, Not updated	?? Traditional	??	Protected
Whales	9?	??	Known, Not updated	?? Traditional	?? Known	Protected
Coral	>100	??	Known	Commercial, Industry, Traditional	?? Known	Some protected

Table 10. Problem faced by coastal-fishery development project in the line of implementation of NSICZM: lesson learn from all previous projects

Problem category	Problem type
1. Conceptual	Too many or unbalanced component, Too big, Schedule too tight, Non-sustainable, Inflexible (Or, expressed differently, an absence of mechanisms intended to enable the project to respond to changing circumstances.
2. Technical	Production technology deficiency, Poor engineering.
3. Financial/Economic	Under-estimated costs, Counterpart and recurrent budget shortage, Low output prices or market problems.
4. Social	Inequitable benefit distribution, Slow adoption.
5. Institutional	Bad management or staffing, Unsuitable organizational structure, Ineffective technical assistance, Procurement difficulties, Land acquisition difficulties, Poor monitoring and evaluation.
6. Environmental	Natural disaster, Resource degradation.
7. Political	Turmoil or war, Insufficient Government commitment

Plan are also characterized by a long-term perspective, with flexibility to respond to changes in priorities for sustainable marine development e.g. Sustainable Mangroves Management (SMM), and marine science and technology. This will help maintain a consistent connection between the strategies; the plan and NSICZM policy (*cf.* BAPPENASm 2004, King and Adeel, 2002). GOI (central – provincial/district) goals are to increase existing capabilities for development and implementation NSICZM especially in the era of post tsunami. Population growth (Table 2), coupled with economic and social development are placing a heavy burden on coastal resources, often resulting in depletion of natural resources and their environment. Destruction of natural areas in the coastal zones will lead to protecting habitats by establishing protected areas is essential. Also, values concerning coastal resources and specific institutions for dealing with coastal resources use evolve in response to societal interests and pressures. Therefore, appropriate planning and integrated management of resource use and allocation becomes as essential task e.g. Table 9.

The broad topic of NSICZM can be approaches from different perspective e.g., for the southeastern coast of Bali (Table 7). Also, in the assessment some 22 types of general problem were identified from the 15 provinces of the MCMA-MCRMP are grouped into several major category as shown in Table 10, and this is a common problems faced by fishery development project in the context of ICZM in Indonesia, and what has been termed as the *tragedy of the commons* (Stobutzki and Garces, 2003). Using the ICZM approach for the coastal resources e.g. Sustainable Mangroves Management at the project sites in Indonesia will be a dynamic process, requiring repetitive and adaptive solution to often complex economic, social, environmental, legal, and regulatory constraints, and opportunities. Adopting an inter-medium approach between general – strategic and detailed – operation, it takes the form of an issue-based action plan. In this context, it contains long-term strategic element (e.g., plan philosophy: UUD45 ps.33:3, goal and objectives), and medium-term program components of sufficient detail for adoption and operational programming by implementing institutions (Table 6).

The NSICZM plan sets-out the essential elements in this direction. The goal of this plan is sustainable development of the coastal zone and the marine areas in general (See: Chapter 32 of the Mid-term Development Plan 2004-2009 of the GOI) (BAPPENAS, 2004) and to ensure that resources aftermath the tsunami for the benefit of the present and future generation. In pursuit of this goal and consistent with the principles from Sustainable Development of Indonesia (e.g., IBSAP, 2003-2020), the NSICZM plan adopts the following objective:

1. Ensure optimal sustainable flow of economic, social and environmental benefits from the coastal ecosystems and resources.
2. Limit exploitation of renewable coastal resources within their natural regenerative capacity.
3. Promote equitable distribution of benefits from utilization of the coastal ecosystem and resources in a manner that prevents or minimizes incompatibilities and conflicts.
4. Undertake conservation and protection measures to maintain or enhance the functional integrity, aesthetic quality and biodiversity of the coastal ecosystems.
5. Develop viable and responsive laws and legal – institutional structure and capabilities, and
6. Generate and utilize sound and appropriate scientific knowledge and technology.
7. Also the objectives of NSICZM into a mangroves context, seek to directly and effectively involve the traditionally mangrove dependent communities in the management and protection of the mangrove resources.

The planning process for NSICZM involved a comprehensive review and elaboration of:

1. The coastal zone environment and resources utilization.
2. Current and potential coastal zone issues.
3. Functional management components of the plan (consisting of actions and projects packaged into program) in response to the issues, and
4. Appropriate plans for implementation arrangements.

Table 11. Seawater quality standards for Indonesia

Parameter	Unit	Criteria for tourism & recreation (bath, swim & dive)		Criteria for marine biota & fisheries	
		Maximum	Minimum	Maximum	Minimum
Physic					
1. Color	CU	50	30	50	30
2. Odor		Natural	Natural	Natural	Natural
3. Transparency	m	10	30	3	5
4. Turbidity	TU	30	10	30	5
5. Suspended solids	mg/l	23	20	80	25
6. Floating materials		Nihil	Nihil	Nihil	nihil
7. Oil surface		Nihil	Nihil	Nihil	nihil
8. Temperature	C	Natural	26-30	Natural	Natural
Chemistry					
1. pH		6-9	6.50-8.50	6-9	6.50-8.50
2. Salinity	‰	±10% Natural	Natural	±10% Natural	Natural
3. DO	mg/l	5	5	4	6
4. BOD5	mg/l	40	10	45	15
5. COD	mg/l	40	20	80	40
6. Ammonia (NH4-N)	mg/l	4	Nihil	0.300	0.1
7. Nitrite (NO2-N)	mg/l	Nihil	Nihil	Nihil	Nihil
8. Cyanide (CN)	mg/l	0.20	0.05	0.200	0.500
9. Sulfide (H2S)	mg/l	-	-	0.030	0.010
10. Oil & Grease	mg/l	5	1	5	1
11. Phenol	mg/l	0.002	Nihil	0.002	Nihil
12. Pesticide	mg/l	0.042	Nihil	0.020	Nihil
13. PCB	mg/l	0.001	Nihil	0.001	Nihil
14. Detergent (Surfactant)	mg/l	0.500	Nihil	1.000	Nihil
Metal/Semi-metal					
1. Hg	mg/l	0.005	0.00010	0.003	0.00010
2. Cr	mg/l	0.010	0.00004	0.010	0.00004
3. As	mg/l	0.050	0.00260	0.010	0.00260
4. Se	mg/l	0.060	0.00045	0.005	0.00045
5. Cd	mg/l	0.010	0.00002	0.010	0.00002
6. Cu	mg/l	1	0.00100	0.060	0.00100
7. Pb	mg/l	0.05	0.00002	0.010	0.00020
8. Zn	mg/l	1.5	0.00200	0.100	0.00200
9. Ni	mg/l	0.1	0.00700	0.002	0.00700
10. Ag	mg/l	0.05	0.00040	0.050	0.00030
Biology					
1. E. coli	Cell/100 ml	1000	10	100	10
2. Patogent	Cell/100 ml	Nihil	Nihil	Nihil	Nihil
3. Plankton	Individual	Not bloom	Not Bloom	Not bloom	Not bloom

Based on all available national strategies, IBSAP, 2003-2020 (BAPPENAS, 2003) and mid-term development plans for 2004-2009 of the GOI (BAPPENAS, 2004), and the above seven objectives, a proposed Strategy and Action Plan for Indonesia in the context of NSICZM is presented in Table 13. This includes the IGCP program under the NSICZM, especially for the areas hit tsunami, namely:

Coastal biodiversity and socio-economic assessment: (1a). Damage to the natural landscape was determined by assessing the impact on vegetation and on physical environment using GIS and topographic maps, (1b). Impact on livelihoods were documented and ranked based on interview with the communities. (1c). The studies were carried out to identify major habitat/vegetation type affected, the severity of the impact, the potential for restoration, and to identify priority areas for restoration within specific coastal stretches in Aceh. These included biodiversity assessments, social and economic impact assessments and assessment of views, rights, capacities and needs of local communities and Badan Rehabilitasi dan Rekonstruksi (BRR) with regards to rehabilitation efforts.

Restoring mangroves for the people by the people: (2a). To restore coastal livelihoods through participatory mangrove rehabilitation and co-management. (2b). The economic values of selected tsunami affected mangrove ecosystem will be assessed, prior to the implementation of a restoration and

conservation programs. (2c). Improve awareness on the economic values of mangroves.

Restoring lagoon, estuarine, and marsh environments: (3a). To build stakeholders capacity to re-establish and access to sustainable livelihood resources. (3b). To restore ecosystem that can provide vital natural resources for local communities. (3c). To facilitate the natural re-growth of Mangroves Green Belts will be planted as natural buffer zones in sites identified as significantly vulnerable. (3d). A series of awareness campaigns will be conducted to develop the capacity of local communities to appreciate; conserve and sustainability use those resources.

Beach vegetation and/or forests for protection: a bioremediation of selected sites in Aceh, Nias, Pangandaran West Java: (4a). Enhancing the quality of life of the communities by improving the productivity and sustainability of coastal resources upon which they depend and to rehabilitate the sand dunes and/or beaches damaged by tsunami. (4b). Mapping the sand dunes and/or beaches is urgent as a barrier to protect houses and people in the site areas.

Greening a new tsunami resettlement site in Aceh, Nias, etc.: (5a). To establish a beach forests (e.g. *Casuarina equisetifolia*, *Morinda citrifolia*, *Pandanus tectorius*, *Terminalia catappa*, *Barringtonia asiatica*, *Calophyllum*

inophyllum, *Pongamia pinnata*) in the form of a Green Belt in Aceh, Nias etc. (5b). To set-up micro watersheds in selected areas through a re-forestation programs around drinking water wells (Coastal Village Development). Cleaning of wells that have not yet been dewatered will also form a part of this initiative.

Plant nurseries and income generating: paving the path for a green coast: (6a). Established green belt of 5 ha by growing of coastal vegetation (*Calophyllum* and/or *pes-caprae* formations), which will serve as a natural barrier against natural and man-made disasters. (6b). Enhance capacity of the community to sustainably use coastal resources and to conserve biological diversity. Awareness and training programs will be conducted to educate officers, community members and school teachers on the importance of protecting natural forests and sand dunes and/or beach vegetation as well. (6c). Empower the women in the community through community development e.g. women in Development – Women will play an important role in community development planning and implementation, including the leading role in savings and credit groups and, through these, in the development of new-income-generating activities. To provide villages with further incentives and immediate benefits from MFF project participation, the MFF project will

fund, on a grant basis, small items of infrastructure (e.g. small bridge, walk-ways, landing stages or pier, improvement of water supplies. The social analysis carried out by MRMP, CCDFRMP, MCMRP identified activities in which women participation will contribute positively to the project's success. (6d). Revise, in sustainable ways, economic opportunities for self-employment.

A green belt protection: re-establishing mangrove-friendly aquaculture in Aceh and North Sumatra.

Activities under the NSICZM approach include six main components of humanosphere, which are mutually supportive, namely summarized as (See Table 13 for the detail):

1. Community organizing and training.
2. Mangrove rehabilitation, reforestation and/or afforestation, include coral reef, seagrass and other coastal ecosystem types.
3. Mangrove forest stands and/or other coastal ecosystem type's improvement.
4. Small-scale coastal ecosystem resources utilization.
5. Livelihood improvement and marketing opportunities (poverty reduction).
6. Forest protection and conservation.

Table 12. Summary of the likelihood of agents causing decline in resources and habitats

A. Resources

Resource	Very Likely	Likely	Possibly	Unlikely	Don't Know
Fisheries		Over-fishing Destructive fishing Habitat Degradation	Domestic waste Industrial waste		
Aquaculture	Bacteria & Virus		BOD, DO, TSS Nutrients Heavy metals	Oil & grease	Solid waste Pesticides
Seaweed	Ice-Ice Diseases			Nutrients	Domestic waste Oil & grease Sedimentation Salinity

B. Habitats

Habitat	Very Likely	Likely	Possibly	Unlikely	Don't Known
Mangrove	Reclamation Solid waste disposal Land conversion Clearance Sedimentation				Heavy metals Oil & related substances Pesticides BOD / COD / DO
Coral reefs		Coral mining Destructive fishing Anchoring Collection Marine tourism activities Sedimentation Nutrients TSS	BOD / COD / DO	Oil & related substances	
Seagrass beds		Land reclamation Seaweed culture extension	Sedimentation		Pesticides Collection Nutrients BOD, DO, TSS Heavy metals
Beaches			Coastal mining Coastal engineering structure Setback invasion Reclamation		

Table 13. Strategies and Action Plans for long-term (LT) and immediate-term (IT)

Strategy	Action Plan	Activities	Time frame work
1. Empowerment of coastal communities whose livelihoods are directly and indirectly dependent on the sustainable management of coastal ecosystems includes small islands.	<ol style="list-style-type: none"> 1. Development of sustainable alternatives of income generating activities for coastal communities. 2. Development of appropriate and environmentally friendly technologies for coastal community exploiting coastal ecosystems. 3. Enhance the awareness of the coastal community and officials on their responsibility in the Sustainable Management of Coastal Ecosystems. 4. Enhance the participation of NGOs and Private Sectors empowering coastal community. 5. Delegation of rights, responsibility and legal status for the Sustainable Management of Coastal Ecosystems to coastal community. 	<ol style="list-style-type: none"> 1.1. Identify areas where IAG (Income Alternative Generating) activities could be undertaken. Implementation should be phased following pilot activities. 1.2. Develop a portfolio of potential IAG activities for each location. The alternative income generating activities should be based on the existence of a market and should be demand based. 1.3. The IAG developed must be easy adopted by the community and be in conformity with community characteristics (customs and tradition, culture and community structure). The IAG activities developed must be productively sustainable and have minimum risk, produce result quickly and need affordable capital. 1.4. Seek possible non binding funding or subsidy mechanism for IAG activities and prepare a fund raising plan. Assistance for IAG in the form of funds or subsidies should be for both initial activities and maintenance. A number of factors should be taken into consideration in ant financing plan. The nature and current income levels of the beneficiaries. The value of the fund or subsidies should be able meet minimum living incomes. The period of assistance should be limited to a certain time in accordance with the success of the activities. 1.5. Determination of the environmental impact. The IAG activities have to take into consideration environmental aspects in general (carrying capacity, environmental characteristics) and obtaining support from the local community, not just moving resource management problems from one resource to another. Each activity must be considered for potential environmental impact as well as for the cumulative effects that may be brought about by the combined impact of several small scale operations in any location. 1.6. Develop a system for MonEv performance. Prepare technical as well as non-technical tools for planning, implementation, monitoring and evaluation. In addition the human and institutional resources needed to support a smooth implementation of the programs need to be reviewed and developed as necessary. 2.1. Prepare an inventory of possible new and alternative technologies for utilization of coastal ecosystem resources. Identify types or forms of alternative technologies which are friendly to the environment and meet the requirements state above. 2.2. Investigate of the financial feasibility and production efficiency of these techniques. Meaning that the alternative technology to be developed is less expensive compared to the previous technology and is affordable to the community. In addition, the product generated by the alternative technology is not less or at least the same as produced by the previous technology. 2.3. Assessment of the accessibility of the alternative technology. The technology to be developed must be easy and supported by a market mechanism. And adopted easily by the community and not contradict social and culture values. 2.4. Conduct Human Resource Development program. Carry out socialization before the implementation of the selected technologies in targeted communities. 2.5. Develop MonEv program. Prepare technical and/or non-technical tools for planning, implementing, MonEv, and provide market and institutional supports. 3.1. Identification of target groups, including other users, the government and local communities. 3.2. Analysis of the need assessments covering levels of understanding, perception possessed etc. 3.3. Selection of packages and methods of delivery in agreement with specific conditions of the target groups. 3.4. Involvement of all community groups (NGO, LCO, traditional/religious institutions, and government officials) in the effort of enhancing public awareness. 4.1. Prepare an inventory of NGOs directly involved in programs on empowerment of coastal community. 4.2. Foster mutual respect between all cooperating parties through stimulating dialogue. 4.3. Prepare and agree working mechanism for cooperation. 4.4. Observe and evaluate the capacity of NGOs involved in program on empowerment of coastal community and to develop coordination with the local government. 4.5. Facilitate the access of information related to policies taken by the government in efforts to empower coastal community. 4.6. Raise the capacity and capability of both government institutions and NGOs through various training and education programs. 5.1. Establish the legal, rights and obligations of a community in the Sustainable Management of Coastal Ecosystems in relation to the typology of the region (type of coastal ecosystems and area characteristics). 5.2. Assess the structure of the local community (capabilities & capacities, social status, education, economy & culture) as well as development through exchanging experiences and interaction trough training and education. 5.3. Establish the history of management and authority in the area (local characteristics/type of coastal ecosystems). 5.4. Identify the stakeholders within the communities and establish the relationships between them. 5.5. Investigate current use of incentives and disincentives and modify according to findings. 5.6. Determine the resources of the Coastal Ecosystems which can be delegated to the community. 5.7. Create and determine mechanism procedures and requirements for the delegation of rights and revocation of rights. Establish forums for the exchange of views and process of settling conflicts. 5.8. Facilitate the access on information relating policies taken by government in the efforts of empowering communities, and also develop mechanism, procedure and requirement on the delegation of authority. 5.9. Prepare and carry-out MonEv of the implementation of the delegation of rights. 5.10. Provide a mechanism to protect the rights delegated. 5.11. Strengthen the government coordination function toward the existing institutions in the community. 	IT

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2. Reduce the rate of Coastal Ecosystem degradation.	<p>1. Development of specific Sustainable Management techniques or technical interventions, which are in conformity with local conditions.</p> <p>2. Formation of appropriate criteria on the evaluation system for the preparation of EIAs for development projects which directly or indirectly influence Coastal Ecosystem.</p> <p>3. Preparation and dissemination of appropriate methods to enhance and strengthen voluntary compliance.</p> <p>4. Development of conservation programs for Coastal Ecosystem integrated with the economic needs of Coastal Communities.</p> <p>5. Enhancement on the effectiveness of law enforcement for various activities causing degradation of Coastal Ecosystem.</p> <p>Control and limitations on the Coastal Ecosystem resources having commercial value as well as preventing the trade of protected Coastal Ecosystem biota.</p>	<p>1.1. Identify priority areas for consideration. Develop a list of selection criteria and apply to long-list of sites. Select a series of pilot sites.</p> <p>1.2. Identify the type of activities in the Coastal Ecosystem area which potentially generate negative impacts. Identify the scope and magnitude of the impacts.</p> <p>1.3. Develop strategies for dealing with different kinds of impact either at the local or national levels.</p> <p>1.4. Study the characteristics of the environment and the communities to evaluate the suitability of management techniques or technological interventions required to bring about an improvement in the environment.</p> <p>1.5. Review the capacity of the agents or executors of the management techniques to undertake any intervention. Make recommendations for capacity building program.</p> <p>2.1. Identification of activities which have the potential of creating direct physical damage to Coastal Ecosystem (mangroves, coral reef etc.).</p> <p>2.2. Identification and application of standard water qualities for Coastal Ecosystem, such as temperature, turbidity, salinity, currents, pathogenic bacterial content and level of eutrophication.</p> <p>2.3. Identification of activities which are able to change or influence parameters causing disturbances to life in Coastal Ecosystem e.g. the impact of increases in water temperature and of the level of eutrophication in the coral ecosystems, etc.</p> <p>2.4. Identification and application of changes in licensing and other processes required to bring about improvements in Coastal Ecosystem.</p> <p>3.1. Identify established cultural values that have been developed in the society. It has been proven that adherence to culture values or beliefs in communities can prevent degradation of Coastal Ecosystem</p> <p>3.2. Identify the rational values i.e. the codes of ethics which are formulated in a manner acceptable to everybody that certain activities generate negative impacts on Coastal Ecosystem.</p> <p>3.3. Identify activities which prevent degradation of Coastal Ecosystem.</p> <p>3.4. Identify internationally or nationally standardized human behavior which can prevent degradation of Coastal Ecosystem.</p> <p>3.5. Provide a mechanism for conflict resolution. As optimally as possible prevent conflicts with religious norms and local cultural values which prevent degradation of Coastal Ecosystem.</p> <p>3.6. Provide a mechanism for the dissemination of information. Share experience between Coastal Communities to avoid duplication of mistake and allow positive experiences to be shared.</p> <p>4.1. Identification of alternative income generating activities, both the income generating activities existing in the communities and potential alternative generating activities in the area under conservation.</p> <p>4.2. Identification of existing natural resources in the area to be established as conservation area. Development of zoning plans and management plans to allow for the protection of critical resources and for the rational utilization of others.</p> <p>4.3. Seeking support from local communities as a manifestation of awareness or expectations.</p> <p>4.4. Enhance the capacity and capability of the local community, so that actual assistance needed can be identified and provided.</p> <p>4.5. The development of alternative income generating activities should be realities and appropriate from the market demand, production inputs, technology, management and capital.</p> <p>5.1. Strengthen and implement enforcement of the law governing the prevention of using explosives and poisons in the utilization of Coastal Ecosystem e.g., in coral reef ecosystem.</p> <p>5.2. Clarify laws and mechanisms; including which activities are allowed and what are not allowed, the legal characteristics of criminal and civil violations, sanctions, procedures and court mechanisms (verbal official reports, supporting data, witnesses, investigation, prosecutor and the accused, verdict).</p> <p>5.3. Law enforcement based on the existing laws and regulations.</p> <p>5.4. Evaluate the state of readiness and the adequacy of the enforcement agencies (police, attorneys and judges) and apparatus (patrol boats, communication, field monitoring system, etc) and take immediate follow up action on any report from the public.</p> <p>5.5. Adequate means and facilities (patrol boats, communication, field monitoring equipment etc.).</p> <p>5.6. Recognize and strengthen the role of Coastal Communities in supporting law enforcement and regulations.</p> <p>5.7. Re-actualization of traditional institutions.</p>	LT
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3. Manage Coastal Ecosystems on ecosystem characteristics, utilization potential, its legal status and the existing Coastal Community's wisdom.	<ol style="list-style-type: none"> 1. Development of information and mapping system for the utilization and Sustainable Management of Coastal Ecosystem. 2. Development of research and study agenda related to the rehabilitation and recovery of Coastal Ecosystems and the sustainable utilization of Coastal Ecosystem resources by utilizing the active roles of the research institutions and universities. 3. Classification and grouping of Coastal Ecosystem characters into several types of SM categories. 4. Development of demo-sites and/or pilot Sustainable Management program for each type of Sustainable Management categories. 5. Protection and conservation of invaluable Coastal Ecosystem with respect to local, provincial, national, regional and international considerations. 	<ol style="list-style-type: none"> 1.1. Create a basic map and a database of the resources, including their potentials, users and intensity of utilization of Coastal Ecosystem, based on the local spatial plan. 1.2. Develop simple methods for monitoring and evaluating the biological conditions of Coastal Ecosystem (mechanism and procedures or standard methods including reporting system and their implementation) with participative approach by involving local research institutions, universities and NGO. 1.3. Design a system of information dissemination to those responsible for management. Establish forums for information exchange. This is particularly important if a community-based approach is to be successful. 1.4. Identify areas for implementation using a phased approach. Establish a realistic timescale. 1.5. Try to integrate efforts of Coastal Ecosystem conservation into the local contents of school curriculum. 2.1. Identify research and study needs, which are directly related to utilization and rehabilitation aspects and define research priorities. 2.2. Determination of practical constraints (who does the research, capacity and capability of the researches, time, location, cost etc.) and the type of program (international, national, local, specific). 2.3. Conduct research on new utilization alternatives, e.g. the use of coral reef products in the production of cosmetic and pharmaceuticals. 2.4. Coordinate all institutions having the capacity and capability to do research and to avoid overlap and duplication. 2.5. Establish a system for the dissemination of the research results. 3.1. Determine various criteria for the grouping of Coastal Ecosystem e.g. legal status, National Park, Marine Park etc.; environmental condition: good, bad, etc.; distance from human settlements: far, near etc.; condition of Coastal Ecosystem: seriously damage, moderately damage, good etc. 3.2. Create a classification analysis matrix and grouped Indonesian Coastal Ecosystem into several categories. 3.3. Make available a mechanism to utilize the results of classification in a ICZM plans for a certain location. 4.1. Priority setting of the areas, which will become management pilot models. 4.2. Typology of the grouped clusters of Coastal Ecosystem e.g. coral reef. 4.3. Apply specific management techniques and monitor effectiveness. 4.4. Mechanism to learn from the results of the implementation of a management program. 4.5. Mechanism to replicate a management program considered being successful in other areas. 4.6. Arrangements of funding directly from the government or from foreign donors. 5.1. Review the status of existing group of Coastal Ecosystem, e.g. clusters of coral reefs (legal status, management, boundaries, authority and management models). 5.2. Provide funds continuously for special treatments e.g. the implementation of specific management techniques and promotion activities. 	LT
4. Formulate and coordinate action programs of GOI and local government agencies, private sectors and other sectors of communities in the CBM of Coastal Ecosystem.	<ol style="list-style-type: none"> 1. Integrate Sustainable Management and utilization of Coastal Ecosystem involving the government, local government, private sectors, NGOs, universities & research institutes (back stopping office) and local communities. 2. Provision of technical and financial assistance to strengthen the capability and capacity of community and local government to prepare Coastal Ecosystem management plan (ICZM). 3. Preparing personnel and facilities for Management of Coastal System in the field including assessment mechanisms on Coastal Ecosystem management by involving all levels of communities. 	<ol style="list-style-type: none"> 1.1. For effectiveness and efficiency it is necessary to put various program activities in an integrated program. 1.2. It is more useful and easier to develop a small working mechanism and simple program activity than trying to work together directly on a complex and larger scale program 1.3. Creating an atmosphere of thrust and support among individuals as well as relevant institutions is the key for successful planning and implementation of Coastal Ecosystem management. 2.1. To provide technical and financial assistance to the local government in the preparation of Coastal Ecosystem management program. 2.2 To approve the proposed management program. 2.3. To evaluate the implementation of the management program by using accepted national criteria and standard. 2.4. To assist in the process of improving the management program. 2.5. To carryout various research and studies. 2.6. To strengthen the capacity and capability of the local governments. 3.1. The system should be cost effective, i.e. not too expensive but with optimal results. 3.2. The implementation should involve groups of local community. 3.3. The system should be an integrated effort among relevant sectoral agencies in the marine and coastal areas. 3.4. Ensure good planning process, including the availability of manpower, appropriate equipment, suitable with the local conditions, its operation and maintenance. 3.5. Utilize the existing equipment and facilities in accordance with their function. 	IT

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5. Develop and strengthen commitments, capacities and capabilities of all parties on the implementation of the Sustainable Management of Coastal Ecosystem.	<ol style="list-style-type: none"> 1. Enhance the quantity and quality of human resources of various relevant institutions through recruitment, training, and formal and informal education e.g. MIC Bali. 2. Strengthening the local institution in the framework of Sustainable Management of Coastal Ecosystem. 3. Strengthen the capacity and capability local government in the Sustainable Management of Coastal Ecosystem. 4. Actualization on the tradition of communication and consultation with an orientation to strengthen community commitments in the framework of managing Coastal Ecosystem. 	<ol style="list-style-type: none"> 1.1. Identify key stakeholder institutions, organizations and representatives of civil society and complete a needs assessment and gap analysis. 1.2. Develop training systems in line with needs assessment for identified personnel and associate with advancement in careers both in government as well as in the community. 1.3. Create a requirement system in agreement with the needs of the management program as identified through the gap analysis. 1.4. Create a climate within the organizations that promotes knowledge transfer and improves staff retention. 2.1. Prioritize local government institutions having a role in the management of Coastal Ecosystem using established criteria. Those most involved in Coastal Ecosystem management will receive priority training. 2.2. Development of a local government capacity building program. 2.3. Create or adapt an existing institution which will be the lead agency for information management. Establish information system and coordinating mechanism for information flow between institutions that have a role in Coastal Ecosystem management. 2.4. Clarify the function, responsibilities and authority of central government and local government in the management of Coastal Ecosystem. 3.1. Implement Law No.22/1999 and Law No.27/2007 by developing and socializing the variety of legal products and their derivatives in the framework of ICZM. 3.2. Assess the need for changes in local government institutions, functions and organization, and restructure accordingly in the framework of ICZM. 3.3. Develop network of cooperation between local government and national, regional as well as international institutions. 3.4. Prepare the capability of the local government in transforming and understanding the importance of developments in science and technology in the management of Coastal Ecosystem. 4.1. The existing tradition of communication and consultation in the community should be enhanced and developed further. 	LT
6. Develop, safeguard and strengthen community supports in the efforts of managing Coastal Ecosystem nationally by increasing awareness of community at all levels on the ecological, socio-economic importance of Coastal Ecosystem.	<ol style="list-style-type: none"> 1. Dissemination of information on laws and regulations on the Sustainable Management of Coastal Ecosystem. 2. Increase community participation in activities related to efforts in managing Coastal Ecosystem. 3. Promotion and dissemination of Coastal Ecosystem management programs to the community at large. 4. Obtaining political supports in the promotion on the importance of Sustainable Management of Coastal Ecosystem for Indonesian economic development. 	<ol style="list-style-type: none"> 1.1. Information materials should be well packaged with the right mode of dissemination. 2.1. The activity should be in the form of entertainment play, so that public will be able to participate. 2.2. Activity should be inexpensive. 2.3. Disseminated through various mass media for greater impact and to reach wider audiences. 2.4. Try to direct public for voluntary compliance on rules and regulations on Sustainable Management of Coastal Ecosystem. 2.5. Explore the possibility of announcing special Coastal Ecosystem day. 2.6. Giving awards to individuals, group and institutions involved and having merits in protecting the Coastal Ecosystem (mangroves, coral reef etc.). 3.1. In preparing the program, the followings should be considered: <ol style="list-style-type: none"> 3.1.1. The promotion and dissemination activities should use the mass media means that can reach as much publics as possible, such as electronic means (TV, Radio), printed matters (newspapers, magazines, brochures, etc.) and other media (training, extension, education etc.) 3.1.2. The packaged information materials should be practical, simple, easily learnt and understood by the community in general. 3.1.3. Although the overall target is the community at large, however, it could also be directed towards specific groups of the community e.g. women, children, the youths etc. as the main target group. 4.1. Organize environmental seminars, symposia and workshops on Coastal Ecosystem that can be attended by wider sectors of community, such as government officials, politicians, private and business man, academicians, economic practitioners etc. 4.2. Request audience to various authorities with the main subject on sustainable environment issues in the Coastal Ecosystem. 4.3. Promote Coastal Ecosystem as national issues as the last resort for future development (MFF). 4.4. Relate Sustainable Management of Coastal Ecosystem theme with issues such as job opportunities, economic potential, foreign devise earnings, global warming, climate change, MSLR, and international opinion on Indonesian environment as a whole. 	LT

<p>7. Improve various laws, regulations, and regulatory systems concerning the Sustainable Management of Coastal Ecosystem and redefined development success criteria in order to be more relevant to efforts related to the conservation of these ecosystems.</p>	<p>1. Improve various laws and regulations on the Sustainable Management of Coastal Ecosystem. 2. Improve and redefine various local development success criteria by including various success indicators, among others (a) economic efficiency, (b) equity in the distribution of development products, and (c) Sustainability of the environment function and the conservation of the coastal resources.</p>	<p>1.1. Identify gaps in current legislation through consultative process with all relevant stakeholders and members of the judiciary. 1.2. Make priorities for the development of new legal instruments and draft laws and regulations as required. 1.3. Present the new laws and regulations to community through public hearing in order to gain local support and consensus. 1.4. Implement laws and regulations. Work with local government, law enforcement agencies and local communities to develop adequate system. 2.1. Obtain consensus in perception for the change in indicators among experts, the government and in the community at large. 2.2. Constantly noted the aspect of economic efficiency and development equity. 2.3. Develop a system of integrated indicators that can be applied to a variety of situations and which are transparent. In particular, when considering mangroves, attention should be paid to a balance between local economic development and sustainable environmental functions, i.e. the economic and ecological functions of the environment, which support a sustainable existence of mangrove resources.</p>	IT
<p>8. Increase and strengthen partnership among the government, local government, private sectors, and the community in developing environmentally friendly economic activities in the framework of sustainable utilization of Coastal Ecosystem resources.</p>	<p>1. Provision of environmentally friendly technical and non-binding financial assistance by the government, local government and private sectors to community groups involved in economic activities with Coastal Ecosystem and its surroundings. 2. Improve services provided by the government, local government and private sectors to facilitate people's access to sciences and technologies, capital, markets, management and information, which are relevant to economic activities in Coastal Ecosystem and its surroundings.</p>	<p>1.1. Develop criteria for environmentally friendly economic activities. 1.2. Establish a mechanism for the provision of assistance, which is beneficial to the community but does result in dependency. 1.3. Possibility of opening job opportunities and alternative of income generations. 1.4. Assist with appropriate technologies, which are high manpower requirement and environmentally friendly. 1.5. Assured availability of long-term market. 2.1. Provide easily accessible information service centers and supply these with the relevant information from the science and technology sectors. Ensure that all those who wish to access information can do so rapidly and accurately. 2.2. Facilitate or speed up related bureaucratic and administrative procedures. 2.3. Provide fast tract and correct services. 2.4. Foster a climate of change in those government institutions responsible for providing services to the people. Ensure an adequate response to requests for information from the public.</p>	LT
<p>9. Increase and reaffirm the commitments of government, local government and local communities as well as to seek support s from domestic and foreign institutions in providing funds for managing Coastal Ecosystem.</p>	<p>1. Provide budgets to manage Coastal Ecosystem from National Development Budget (APBN) as well as from the Local Development Budget (APBD). 2. Effort in obtaining non-binding foreign funding sources. 3. Mobilize and utilize community-funding sources to manage Coastal Ecosystem.</p>	<p>1.1. Clarify of the objective, target and activities of the Coastal Ecosystem management program to government and local government so that the budget could be managed effectively and efficiently. 1.2. Clearly identify the opportunity cost associated with Coastal Ecosystem on a local and national scale, so that appropriate funds can be provided from local government and national budgets. 1.3. Determine the scale of priorities on programs related to the Sustainable Management of Coastal Ecosystem, and apply fund in an equitable way. It is realized that not all programs can be implemented with limited budget. 2.1. Canvass all countries that have concern for the utilization of mangroves and coral reef ecosystems. 2.2. Identify possible sources of funding fro the major bi-lateral and multi-lateral donors. 2.3. Promote biological diversity of Coastal Ecosystem through tourism and science exhibitions. 2.4. Make inventories of possible grants used in worldwide research programs that are related to research in coastal and marine systems and devise ways of harnessing these resources. 2.5. Investigate private sector initiatives, possible through the tourism or pharmaceutical industry that may give rise to potential funding sources. 3.1. Before mobilizing community funding sources, it is imperative that the scheme should be first socialized through public hearings with various sectors of the community, in particular as how the flow of funds, objectives and targets once the funds are available have to be transparent. 3.2. Identify possible sources of funding and develop a system for allowing all relevant sectors of society to agree on the usage of the funds. Establish regulations concerning use of the fund, methods of collection, aims and targets. 3.3. Establish willingness to pay in the community. It is necessary to explore whether the object of community obligation such as to pay for electricity, water, parking tickets could be use as evidence of fund collection from the people for the management of Coastal Ecosystem. 3.4. Identify funds flow. If the mobilization of community fund could be implemented, clarification of flow of funds is needed in order that the objective and target could be achieved.</p>	LT

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10. Coastal Ecosystem identification and specification	Coastal	Implementation of a Nation - wide country study of Coastal Ecosystem.	1. Rank provincial Coastal Ecosystem data in term of reliability. 2. Initially concentrate conservation and sustainable management activities in the areas with large tracts of mangroves (e.g. Irian Jaya), coral reef, and seagrass intact.	LT
11. Coastal Ecosystem management plan	Coastal	Prepare provincial strategic action and Coastal Ecosystem management plans for the conservation and sustainable use of Coastal Ecosystem.	National committee and/or NCB to liaise with Indonesia MFF projects, and other marine and coastal projects.	LT
12. Mangroves conservation in Irian Jaya	Mangroves	The inclusion of the mangrove forests in the Carthenz National Park and declaration of the Park as a World Heritage Site	1. Detailed study and inventory of the mangroves in Bintuni Bay, the Asmat area and the north coast of the Bird's Head. 2. Mangrove conservation and management plan for Irian Jaya. 3. Liaison with international agencies e.g. IUCN, WWF, UNEP, Ramsar Convention and Wetland International for support for the initiatives and financing of the studies.	LT
13. Coastal Ecosystem environmental aspects	Coastal	Identification and evaluation of the damage to Coastal Ecosystem caused by external factors such as watershed degradation.	1. The SMOE co-ordinates the environmental impact studies. 2. The MOF, MOMAF, MOHA and MOA evaluate the Coastal Ecosystem management plans and/or MFF plans recommended for implementation. 3. LIPI co-ordinates the methodology for Coastal Ecosystem resource evaluation and evaluates the results.	IT
14. Amalgamation of relevant National Committee.	National	The amalgamation of the National Committee on Mangrove Ecosystems and Coastal Zone Management with the recently formed KKMN to form a committee with the prime objective of planning ICZM.	BAPPENAS to issue an invitation to all national committee with an interest in coastal zone and wetland resources to attend a workshop on the rationale for the formation of such a committee. The agenda to include the objectives, scope of work or mandate, membership, structure and financing of the committee.	IT
15. Public awareness and extension.	Public awareness	Initiation of national Coastal Ecosystem awareness program in the media and in the educational establishments.	1. Formation of Coastal Ecosystem awareness sub-committee or Working group within the National Committee to prepare details of the programme. 2. LIPI, MOF, MOMAF, MOHA, MOA, and SMOE to prepare written and video technical materials for distribution in schools and through the media. 3. Prepare local community awareness programme with the assistance of relevant dinas offices, NGOs and village council. 4. Prepare programme of national and international TCs in Coastal Ecosystem and Coastal Resource Management for government officers to be run by LIPI, ITB, IPB, MOF, MOMAF, MOHA and MOA Training Agencies and other provincial universities in Indonesia, and suitable international institutions of higher education.	IT
16. Economic evaluation system.	Economic	Formation of a Coastal Ecosystem evaluation Sub-Committee or Working Group in the KKMN and/or NCB address these issues and act a clearing house for proposed methods of measuring externalities and management plans.	1. LIPI to coordinate research findings on cause and effect relationship between Coastal Ecosystem depletion and yields of fish and shrimp. 2. LIPI to coordinate research findings of various agencies for other sustainable uses of Coastal Ecosystem e.g. silvofishery, tambak, mariculture, honey production medicine, nipa industrial alcohol and handicrafts. 3. MOF and MOMAF to evaluate management plans generated by projects for sustainable Coastal Ecosystem production models from Coastal Ecosystem.	IT
17. Mangroves management model.	Mangroves	The establishment of Mangrove Management Unit in areas representative of the various Mangrove Ecosystem present in Indonesia, and the undertaking of comparative studies of Sustainable Mangroves Management models in Indonesia and elsewhere in other countries where mangrove exist.	1. MOF, MOMAF, MOHA, SMOE, research agencies, and related ministries identify the existing Sustainable Mangroves Management models and analyze their socio-economic and ecological aspects. 2. MOF and MOMAF established some Mangrove Management units in specific location as Pilot Mangrove Management Models e.g., small islands (Non-State Forest Area). 3. Related agencies support the establishment of the Pilot Units as members of a Steering Committee.	IT
18. Legislation awareness.	Legislation	Initiate a National Workshop on the Application of the Spatial Planning Act – Law No.24/1992, and Law No.27/2007: Coastal Zone and Small Islands Management.	1. The KKMN and/or NCB for MFF to co-ordinate the Workshop. 2. Bappenas and the Bappeda to prepare a step-wise framework for the preparation of a provincial and district spatial plan in conjunction with MFF. 3. The KKMN/NCB to prepare methodology for integrating coastal zone planning including mangroves, coral reefs, seagrass and other types of coastal wetlands into a spatial plans.	IT
19. Legal recognition.	Legal	The coastal environment should receive special legal recognition through the issuance of a Law No.27/2007 that fosters an integrated approach to coastal issues including the management of Coastal Ecosystem.	KKMN and/or NCB, MOMAF, MOF, MOHA, SMOE, Bappenas prepare a national workshop on MFF in accordance with the Law No.27/2007.	IT
20. Coastal Ecosystem Resources Data Base	Coastal	Establishment of a GIS for Coastal ecosystem.	All nations in the world concern with Indonesia MFF.	LT
21. Mangrove Land Use Classification	Mangrove Land Use	Implementation of a Land-Use Classification for Mangrove Forest in Indonesia	Indonesia MFF – mangroves as flagship	LT

Concluding Remarks

Indonesia is pan-tropical region, rich with diverse biological resources and habitats along with their ecosystem types. However, Indonesia is known as one of the hotspot areas where biodiversity is under constant threat from over-harvesting, pollution, over-population, and poverty (Tables 3-12) (Myers *et al.* 2000). The commercial and social demand for the terrestrial, coastal and marine resources, and their land cover changes has resulted in high rates of biodiversity loss (Chapin *et al.*, 2000; August *et al.*, 2002) e.g., Bali (Table 7). Indonesia has by far for the largest potentially economically active coastline in the world. All provinces have coastline with at list with a mangrove belt (at 27 provinces), and access to significant marine assets, albeit of different types e.g., Raja Ampat Islands district (PEMERINTAH KABUPATEN RAJA AMPAT, 2007). The marine resource supports a diverse and productive fishing industry (e.g., Tables 9, 12), and socially should be evaluated due to local demands (Table 2) (*cf.* NOAA, 2005).

The social and political changes post December 26, 2004 tsunami's in Indonesia can reorder the priorities in coastal space utilization (Tables 3, 5) and their action programmes (Table 13) (MOMAF, 2007b). All ecosystems, including marine ecosystems, vary in space and time, support food security for peoples. Several food safety issues (e.g., Table 9) require immediate attention during natural disasters (INFOSAN 2005) and should be managed in the frame of ICZM at local levels (Provincial-District). Ecosystems are naturally in a state of constant flux within limits or trends that under natural conditions are characteristic of each system; provide healthy environments (e.g., Tables 4, 7) e.g., for ecotourisms (Table 5) (Rice 2003). Fully-functioning natural ecosystems are significant community assets, providing a range of essential environmental services and other direct benefits that can be sustainable in the long-term. For example, mangroves in the marsh are host to frogs, turtles and crabs, and the ocean includes 1,000 species of plants and animals. Unfortunately, human induced stress and associated poor peoples can have major adverse consequences for coastal ecosystem (e.g., mangroves degraded up to 85.40 ha in Klabat Bay, Bangka island: Hartoto and Sulastrri, 2004) and its resources (e.g. Table 11).

Local and large-scale ecosystem processes (mangroves, coral reef, seagrass bed, lagoon, estuarine, etc.) are the driving forces in the health and productivity of the Indonesian seas. Nation-wide there is a growing understanding that particularly these areas should be intensively protected e.g., Sulu-Sulawesi Marine Eco-region (Cola *et al.*, 2003). By 2020 Indonesia will have 20 million ha of marine conservation areas, mainly for support the fishery. Fishery, mainly dependent on the coastal zones is an essential food source for the population. It must be considered that the fishery is a complimentary economic activity for many people (Sukardjo, 2004). It is therefore, in order to practice effective NSICZM; planners need to understand the way the natural environment and human activities are inter-connected to form a system. One form of NSICZM is through the formulation of laws and roles (Table 6) (Sukardjo, 2009). Practically in the implementation, rulers with various areas and descending orders of authority. The GOI has endorsed the Law No.27/2007 – Coastal and Small Islands Management and Law No.26/2007 – Spatial Planning.

It reinforces the ICZM's approach of a comprehensive and long-term framework for growth in our nation (Table 13). Involvement of people in the policy and planning process of NSICZM (Table 4) i.e. of rehabilitation and reconstruction after tsunami is often characterized by conflicts at local levels (Sukardjo, 2005, Castro and Nelson, 2001) and sites (Amri, 2005) (Tables 3, 11, 12). Different interest groups have different objectives towards the environment. For instance, to date the world's attention has focused for Aceh, North Sumatra and Nias rehabilitation. But this is a slow process. Also, the relation between people and Mangroves National Parks for instance is not always without problems (Table 8) (*cf.* Salm *et al.*, 2000). There are impediments to the potential or extended use of the coastal zone through activities on land e.g., Klabat bay, Bangka Island (Hartoto and Sulastrri, 2004).

Today, mangroves are a social-political trove in Indonesia (Table 6). The permitting processes undertaken by various governmental agencies represent various forums for evolving coastal ecosystems values. There are several techniques for handling these conflicts e.g., environmental impact procedures, public hearings, environmental mediation techniques, research and studies (MOMAF, 2007b; Amri, 2005; Olsen, 2002; Small and Nicholls, 2003; Mazda *et al.* 2007; Salas *et al.*, 2006). Main goals of NSICZM are to underline the importance of a cross-sectoral search for decisions within the development process in economically intense growing provinces – and to define instruments for effective co-management strategies involving the public and private sectors (see Table 2 for illustration) (*cf.* BAPPENAS, 2004; Olsen, 2003; PEMSEA and BALI PMO, 2004) e.g., South Sulawesi (Amri, 2005). It especially takes into consideration the threatening retrogression of resources and the need for effective planning and control (*cf.* PEMSEA, 2005; Rice, 2003). Above all, planning and management in the face of uncertainty and variability is complex, coastal environments require more commitment by managers, scientists and local community groups to the ideal that environmental well-being is more important than shorter-term goals and political struggles.

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