

East Asian Seas Region

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1 About

1.1 Overview

East Asia's astonishing variety of political, economic and social systems is matched by its environment: ship-crowded straits, island groups, wide gulfs, shallow estuaries and some of the most heavily populated countries in the world where millions rely on fish for much of their protein. The threats to the region are just as varied, and include erosion and siltation from land development, logging and mining, blast fishing in coral reefs, cutting and conversion of mangroves, overfishing, unimpeded coastal development and disposal of untreated wastes.

Action Plan for the Protection and Development of the Marine and Coastal Areas of the East Asian Region was approved in 1981 stimulated by concerns on the effects and sources of marine pollution and was initially sub-regional, involving only five countries of ASEAN. Another five were welcomed in 1994, bringing to ten the number of countries ready to face up to East Asia's marine environmental challenges.

Among the Regional Seas Programmes, East Asia has steered a unique course. There is no regional convention. Instead, the programme promotes compliance with existing environmental treaties and is based on member country goodwill.

The Action Plan is steered from Bangkok by its coordinating body, COBSEA. The Regional Coordinating Unit (EAS/RCU) serves as Secretariat, and is responsible for coordinating the activities of governments, NGOs, UN and donor agencies, and individuals in caring for the region's marine environment. EAS/RCU works in close cooperation with the region's non-government and government organizations and existing regional programmes and projects to improve co-ordination and co-operation among parties working on the coastal and marine environment. The Action Plan encompasses assessment of the effects of human activities on the marine environment; control of coastal pollution; protection of mangroves, seagrasses and coral reefs; and waste management. Recently this was revised to be a long-term Action Plan that includes technology transfer and environmental governance. The long-term Action Plan that takes into account the Regional Action Plan for the GPA, the UNEP/GEF Project, "Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand," and the work of the International Coral Reef Action Network.

A new strategy for COBSEA has been formulated that focuses on policy-driven processes to implement the Action Plan. In the coming decade, the overriding aim is to maximize the Action Plan's benefits to all our member countries. The catchword, however, is *flexibility*: one must be willing to fine-tune and perhaps even change courses as circumstances dictate.

1.2 Key Dates

1981	Action Plan for the Protection and Sustainable Development of the Marine Environment and Coastal Areas of the East Asian Region was adopted by Indonesia, Malaysia, Philippines, Singapore and Thailand.
1994	A revised Action Plan and a Long-term Strategy for the period 1994-2000

	period was developed. Australia, Cambodia, China, Korea and Vietnam joined the Action Plan.
1996	Twelfth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan. 3-4 December 1996, Manila, the Philippines
1998	Thirteenth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan. 18-19 November 1998 Bangkok, Thailand.
1999	The Fourteenth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA), Bangkok, Thailand.
2000	Fifteenth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan
2001	Sixteenth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan 24-26 October, 2001, Bangkok, Thailand.
2004	Seventeenth Meeting of the Coordinating Body of the Seas of East Asia (COBSEA), 8-10 March 2004, Bangkok, Thailand

1.3 Geographic and General Information

Region: East Asian Seas

Participating States: (10) Australia, Cambodia, China, Indonesia, Malaysia, Philippines, Republic of Korea, Singapore, Thailand and Vietnam (UNEP 2001)

Total Sea Area: Each member state has an EEZ of 200 NM

Length of Coastline: Over 100,000 km (UNEP 2000)

GIWA Regions: (11)

Subregion 32: Kuroshio Current, Subregion 34: Yellow Sea, Subregion 36: East China Sea, Subregion 54: South China Sea, Subregion 56: Sulu-Celebes Sea, Subregion 57: Indonesian Seas, Subregion 58: North Australian Shelf, Subregion 59: Coral Sea Basin, Subregion 60: Great Barrier Reef, Subregion 61: Great Australian Bight, Subregion 63: Tasman Sea

Large Marine Ecosystems: (14)

LME #34: Bay of Bengal, LME #36: South China Sea, LME #37: Sulu-Celebes Sea, LME #38: Indonesian Sea, LME #39: North Australian Shelf, LME #40: Northeast Australian Shelf/Great Barrier Reef, LME #41: East-Central Australian Shelf, LME #42: Vietnam Shelf, LME #43: Southwest Australian Shelf, LME #44: West-Central Australian Shelf, LME #45: Northwest Australian Shelf, LME #47: East China Sea, LME #48: Yellow Sea, LME #49: Kuroshio Current.

1.3.1 Oceanographic Information

The East Asian Seas Marine Region comprises the Andaman Sea, the Oceans of Australia, Straits of Malacca, Straits of Singapore, South China Sea, Java Sea, Flores Sea, Banda Sea, Arafura Sea, Timor Sea, Celebes Sea, Sulu Sea, and the Philippine Sea. The region includes shallow continental shelves, deep sea basins, troughs, trenches, continental slopes and volcanic and coral islands. The numerous large and small islands divide the waters into different seas connected by many channels, passages and straits (Bleakley and Wells 1995).

The prevailing westerly winds in the mid latitudes and easterly winds in the tropics drive the ocean currents in the major ocean basins in large, closed circulation patterns or gyres which intensify towards the western boundary of the ocean basins. The western boundary current off the eastern coast is the East Australian Current (EAC). The EAC moves slowly south along the northeastern coast where it is blocked by a reefs and islands in the Coral Sea. It flows southward along the continental slope until central New South Wales where it tends to turn offshore. Once or twice a year the EAC extends into loops in the Tasman Sea off NSW, and the loops detach into warm eddies 200-300 km wide, and 1,500-2,000 m deep (Kelleher *et al* 1995).

Surface current patterns in East Asia show that the water mass of the region originates from the Pacific Ocean. The North Equatorial Current flows westward across the Pacific Ocean and upon reaching the Philippine islands, splits into two main branches. The northward branch becomes the Kuroshio, and the southward branch, the Mindanao Current. The Kuroshio begins east of northern Luzon as a swift and narrow segment of the western boundary current and flows to the east coast of Taiwan, the East China Sea and the Japan Sea. During the north monsoon, the Kuroshio is deflected into the China Sea. The Mindanao Current flows southeast with a speed of one or two knots along the coast of Mindanao Island with its main part entering the Celebes Sea through the straits between Mindanao, Sangir and Talaut Islands. The tides of the East Asian Seas are influenced by both the Pacific and the Indian Oceans. Diurnal tides predominate in the South China and Java Seas, whereas mixed tides prevail in the eastern Indonesian archipelago, Philippine waters, the Andaman Sea, Straits of Malacca, and the shelf areas northeast of Australia (Bleakley and Wells 1995).

Surface waters in the region have high temperatures and are of low density and salinity (average 34.0‰). Annual temperature variations in surface waters are small (26-30°C) (UNEP 2000). In general, the transparency is high in the deep water (between 10 - 20 m) and in the open seas (20 - 30 m), although low water transparency (less than 10 m deep) is found in the areas of river mouths and in coastal waters around Sumatra, Borneo and the Gulf of Thailand. Water transparency is influenced by silt content, plankton and other particulate matter in the water (UNEP 2000).

1.3.2 Coastal Geography

The shores of Eastern Asia largely follow the tectonically active zones where the Pacific and Indian Ocean plates collide with the mainland Asia plate. Along stretches of coast, structural trends are generally parallel to the coast. Outside these areas, away from the tectonically active collision zones, the coastal regions are generally more stable and the structural trends are usually not parallel to the coast; this is the case along most of the Asian mainland from Thailand to northern Asia (Bleakley and Wells 1995).

Comparatively straight coasts, situated along mountain chains, sometimes with river deltas and local alluvial foreland, are found mainly in western Sumatra, southern Java and northern Viet Nam. A drowned, older topography with an irregular coastline is present in parts of southern Viet Nam, the mainland coast north of the Red River, on the islands of eastern Indonesia, on northern Kalimantan (Borneo) and the Philippines. Elsewhere the coast is predominantly depositional, consisting of beaches, spits, barriers, tombolos, mudflats, marshes, mangrove swamps, and coral reefs (Bleakley and Wells 1995). Four basic regions in Australia are recognised:

Warm Temperate Humid Coasts; Warm Temperate Arid Coasts; Tropical Arid coasts; and Tropical Humid Coasts. In the north, wave energy is generally low (particularly the Gulf of Carpentaria and Great Barrier Reef coast). Mean spring tide ranges are generally small (less than 2m), but are much greater in the north west between Port Hedland and Darwin (up to 10.5 m at Collier Bay), and in the Mackay area of central Queensland. In the south wave energy is higher and calcareous beach and dune sediments have been deposited along the western and southern coasts. 10 % of the coastal zone is high, rocky terrain, and 18 % is cliff (above 2 m). The rest of the coast is low-lying dunes and beaches (23 %), low rocky terrain (9 %), tertiary sands (9 %) supra and intertidal mud (30 %), alluvium (8 %) and estuaries and lagoons (8 %) (Kelleher *et al* 1995).

The East Asian Seas region is strongly influenced by monsoons. The north monsoon lasts from December to February and the south monsoon from June to August. The rest of the year represents the transition from the north to the south monsoons (March - May) and from the south to the north monsoons (September - November) (Bleakley and Wells 1995 and UNEP 2000).

1.3.3 Ecosystem diversity

The East Asian Seas Marine Region includes a rich array of marine animals and plants. An abundance of coral reefs, mangroves and sea grass beds support probably the most diverse marine flora and fauna in the world.

1.3.3.1 Coral Reefs

One fourth of the world's chartered reefs are located in this region (UNEP 2000). Approximately 70 hard coral genera occur in the vicinity of eastern Indonesia, the Philippines and the Spratly Islands, while 50 are present in other parts of southeast Asia. Throughout the East Asian Seas fringing reefs are most common and are present around most small to medium-sized islands. Reefs are less common on mainland coasts and on larger islands, particularly around rivers. The Philippines and Indonesia support the most extensive areas of coral reef in the region. Well-developed reefs are also found off the southern coasts of Myanmar and Thailand, on the offshore islands of Viet Nam, on the east coast of Peninsula Malaysia and off Sabah (Bleakley and Wells 1995). Australia has the largest area of coral reefs in the world. The Great Barrier Reef is the largest complex of reefs (extending for 2,000 km from the low latitude tropics to temperate zones, it is also the most diverse in reef types, habitats and environmental regimes), and the Ningaloo Reef is the largest fringing reef. All types of reefs are represented: fringing, platform, barrier and atolls (Kelleher *et al* 1995).

1.3.3.2 Mangroves

About 35% of the world's mangroves occur in Malaysia, Thailand, Indonesia, Singapore, Cambodia and Viet Nam. The sub-region has 40% of the global mangrove areas and represents an area with the highest diversity of mangroves in the world (UNEP 2000). Indonesia has the greatest area of mangroves in the region with 4.25 million ha (UNEP 2000), of which about 2.9 million ha is in Irian Jaya. The mangroves in the western parts of this country, particularly Java, have suffered heavily from human impacts. The mangroves in the east are less affected but signs

of degradation have been recorded in some locations (eg Ambon Island and Halmaheira Island) (Bleakley and Wells 1995). Malaysia, with 642,000 ha (UNEP 2000), has the second largest area of mangroves, while Thailand and Viet Nam have about 200,000 ha, the Philippines 100,000, Brunei 7,000 and Cambodia 10,000. In Viet Nam mangrove cover has decreased by about 50 % since 1943 (Bleakley and Wells 1995).

About 91,000 ha (46 %) of the mangroves in Thailand are under some form of use (such as farming, mining, salt farming and infrastructure activities), and there was a 25 % decrease in mangrove cover between 1979 and 1987. In the Philippines, mangroves are estimated to cover about 20 % of that present in the 1920s, and about half the remaining forest is composed of secondary growth. The best stands occur on the islands of Palaw and Mindanao (Bleakley and Wells 1995).

Australia has 39 mangrove species, of which only one species, the newly discovered *Avicennia integra*, appears endemic. Mangroves are most diverse in the tropics (such as 35 species in some estuaries on Cape York), and less diverse in the subtropics and on temperate shores. Only one species, *A. marina*, occurs along the southern coastline. In northeastern Queensland there is a very high species diversity and productivity, trees are very tall (up to 40 m), the canopy is closed, and communities are dominated by *Rhizophora* and *Bruguiera* species. In the arid northwest where water and salinity stress is great, there is a lower species diversity (such as seven species in the Pilbara coast) and they form open canopy woodlands, or low scrub (one to five m high) of low diversity and low productivity. Communities are dominated by *A. marina* along the waters edge, giving way to zones of *Rhizophora stylosa* and *Ceriops australis*. Below latitude 30-S open woodlands of a single species, *A. marina*, dominate mangrove habitats. Trees become stunted (less than five m) in colder waters around 38-S (for example, at Corner Inlet, Victoria) (Kelleher *et al* 1995).

1.3.3.3 Seagrass Beds

Species diversity is highest in Malesia, a region defined by Indonesia, Borneo, Papua New Guinea and northern Australia. East Asia, with about 20 species of seagrass from 50 species worldwide, has the most highly diverse seagrass flora in the world. There are no mangroves in Korea. China has a total of 36 mangrove species, which is about 43 % of the total number of mangrove species in the world. There are 39 mangrove species found in Australia, of which only *Avicennia integra* is endemic (UNEP 2000). Although the number of seagrass species is relatively small in comparison to other groups their numbers are by no means proportional to their ecological and economic importance. They form dense beds, which cover large areas of coastal waters and perform a wide spectrum of biological and physical functions, serving as habitat and nursery areas for fish, many invertebrates, turtles and dugong. Seagrasses are a source of food for the dugong and the green turtle. They also provide alternative feeding sites for commercial and forage organisms (Bleakley and Wells 1995).

1.3.3.4 Sandy Beaches

Sandy beaches occur extensively on the shores of coral islands and are interspersed among other shore formations throughout continental Asia. Steep beaches of coarse sand are built up on ocean-facing coasts exposed to strong surf. Intertidal flats of

mixed sediments, with a narrow sandy fringe at high water mark, develop on more protected shores (Bleakley and Wells 1995). Australia is ringed by hard and soft shores. Sandy beaches are common in all states, but are longest (to 150 km in length) along the east and west, which are swept by the prevailing East Australian and Leeuwin Currents, respectively (Kelleher *et al* 1995).

Only a restricted fauna tolerates the surf forces and instability of an exposed sandy shore. Tropical organisms are further inhibited by high temperatures and desiccation. Most animals must burrow for protection or limit their surface activity to periods when sand is moist. The middle and lower beach animals are absent from shores with severe wave action. The fauna of sheltered sandy beaches is much richer by comparison. On sand flats containing a proportion of silt, burrowing polychaetes, echinoderms, and coelenterates become important components of the fauna and a seaward zone of the marine herb *Enhalus* is developed. Marine turtles nest on the sandy beaches throughout many areas of the East Asian Seas (Bleakley and Wells 1995).

1.3.3.5 Rocky Shores

Rocky shores occur on the coasts of many East Asian islands. The southwest coast of Sumatra and the Pacific coastline of the Philippines and Sulawesi have extensive rocky topographies. Smaller rocky outcrops and boulder formations are common above coral reef flats and on headlands bordering sandy bays. Wave erosion of limestone creates sheer or fissured cliffs with little or no beach formation (Bleakley and Wells 1995).

The zonation of organisms on rocky shores in the region follows the typical pattern with three major zones (supra-, mid-, and sub-littoral), characterized by key organisms (littorinid snails, barnacles, and algae, respectively). High surface temperatures and desiccation greatly limit the tropical fauna and flora in comparison to those of temperate rocky shores. Large seaweeds (such as fucoids and laminarians) typical of cooler latitudes, and the organisms they support, are absent, and there is a general lowering of the zonation levels toward the equator. A rich assemblage of organisms occurs at the lowest tidal level and in crevices, where the environment is less extreme. Tropical rock pools are subject to extreme heating and wide fluctuations in salinity and consequently support a minimal biota (Bleakley and Wells 1995). Rocky outcrops and other hard surfaces provide attachment space for a wide diversity of sessile organisms beneath the sea. In temperate Australia key species such as the large brown algae, provide food and a complex physical structure for fish and many other animals on these reefs (Kelleher *et al* 1995).

Australia's temperate reefs are extraordinarily diverse. Red and brown algae, ascidians, bryozoans and crustaceans have a much higher species richness than in temperate habitats elsewhere in the world. Australia's reefs are distinctive in their ecologic processes. On the temperate east coast of Australia *Ecklonia* and *Phyllospora* are dominant. The latter are common in Port Phillip and Westernport bays in Victoria, and southwest Western Australia. In cooler Victorian, South Australian and Tasmania, the kelps *Macrocystis* and *Durvillea* dominate. Urchins are important algal grazers in temperate reefs. Dominant species in open coastal reef environments vary from *Centrostephanus* and *Heliocidaris* in New South Wales, to *Heliocidaris* alone in South Australia, to a mixture of *Heliocidaris*, *Tripneustes* and *Echinometra* in southwestern Western Australia (Kelleher *et al* 1995).

1.3.3.6 Islands and Submerged Banks

The East Asian Seas Marine Region includes the extensive archipelagos of Indonesia and the Philippines. There are also numerous islands off the coast of mainland Asia. The Spratly islands are located in the South China Sea and are claimed by seven countries. Island types range from coral cays to raised limestone, volcanic and continental islands such as Java and Borneo (Bleakley and Wells 1995).

1.3.3.7 Open Ocean, Deep Sea, Upwelling

Upwelling has been reported during the southwest monsoon in the South China Sea northeast of the Malay Peninsula, along the edge of the shelf southeast of Viet Nam, on the edge of the mainland shelf, west of Luzon and Palawan, and in the Timor and Banda Seas. During the northeast monsoon, upwelling occurs along the edge of the mainland shelf, east of Viet Nam, and off Sarawak (Bleakley and Wells 1995).

1.3.3.8 Estuaries and Saltmarshes

Australian estuaries occur over a very wide range of geological and climatic conditions and consequently display great variety in form. Most are found in the wet tropics, the majority being in the Gulf of Carpentaria and North East Coast biogeographic zones of Queensland. Only a few are found in the South Gulf Coast and Great Australian Bight of South Australia. The estuarine open water and tidal habitats are diverse and are primarily dominated by seagrasses, mangroves and salt marshes. Around 70.5 % of Australia's total mangrove area (11,617 km²) is associated with estuaries (Kelleher *et al* 1995).

Australia has around 13,595 km² of estuarine saltmarsh. It is found on the estuaries of all States, but is most extensive in the tropical north. Where mangroves also occur, saltmarshes are found at higher elevations. Along arid and semi arid coasts the coastal marshes merge with the inland saline habitats, and on cliffs and headlands they are found in areas exposed to salt spray. Saltmarshes are typically low in floristic diversity and are frequently dominated by a single species. Species richness increases with increasing latitude. A northern Australian saltmarsh, although extensive in area, generally has fewer than 10 species, whereas a smaller Victorian or Tasmanian saltmarsh may have more than 30 species. Saltmarshes characteristically show a clear zonation from low to high elevations (Kelleher *et al* 1995).

Two biogeographically distinct saltmarsh types exist in southern Australia. Arid or seasonally arid (Mediterranean climate) marshes are characterized by a diversity of succulent, chubby chenopods with more open vegetation towards the upper tidal limit. On temperate shores denser and more grassland and sedge land communities are present. On the east coast there is a gradual transition from these to the more species-poor subtropical marshes, which are often dominated by *Sporobolus*. Although there is a high degree of endemism in Australian saltmarsh flora, at the generic level there is a strong similarity with those elsewhere in the southern hemisphere, and linkages with those in the northern hemisphere (Kelleher *et al* 1995).

1.3.4 Species Diversity

Despite the basic homogeneity caused by the occurrence of many wide-ranging species, there are great differences in diversity among the various parts of the Indo-West Pacific region. There is a concentration of species in the vicinity of the Philippines, the Malay Peninsula and Papua New Guinea/Irian Jaya. This area has been recognized as a faunistic centre from which other subdivisions of the Indo-West Pacific have recruited their faunas. Moving away from the Indo-Malayan centre and considering the faunas of the peripheral areas there is a notable decrease in diversity correlated with distance. Most of Australia's tropical marine species are widely distributed in the tropical Indo-Pacific. By contrast, in Australia's temperate seas overall species diversity is lower, but a higher proportion of endemic species occur in the waters of the southwest, Bass Strait, and the southeast. South Australian waters are among the richest and most diverse in the world (Kelleher *et al* 1995).

1.3.4.1 Seaweeds

The Asian and Pacific region contains 100 species of seaweeds of economic value. They constitute an important biological resource of the region as part of the food web of marine life (Bleakley and Wells 1995).

1.3.4.2 Invertebrates

The region is the global centre of diversity for marine invertebrates, including mollusks and crustaceans. For the gastropod genus *Strombus* has the greatest number of taxa in the vicinity of the Philippines (26), Okinawa (24) and Indonesia (23). The number of taxa decrease moving east across the Pacific and west across the Indian Ocean. Giant clams used to be abundant, having their centre of distribution in the region, but are now heavily depleted (Bleakley and Wells 1995). The banana prawn (*Penaeus merguensis*) is found to mangrove-lined estuaries of Australia. Bait prawns (*Metapenaeus* spp), mud crabs (*Scylla serrata*) and Tiger prawns (*Penaeus esculentus*) are also found in mangrove areas of Australia (Kelleher *et al* 1995).

1.3.4.3 Fish

The East Asian Seas is a centre of diversity for marine fishes. For example over 2,000 species of shore fishes have been recorded in the shallow waters of the Philippines with 160 shorefish families in the region. The number of families shows a decreasing trend progressively moving east across the Pacific Ocean and away from these centers of diversity (Bleakley and Wells 1995).

Of 3,400 species of fish occurring around Australia, around 900 are pelagic or wide ranging, and 2,500 occur on the shelf and near shore. The greatest number (around 1,900 species in 600 genera and 120 families) are found in the tropics. Most of these species (87 %) are shared with the Indo-West Pacific region. A moderate level of endemism (13 % of species) has occurred because of isolation by the prevailing southward tropical East Australian and Leeuwin Currents. The southern, temperate fish fauna is less diverse (600 species) and the long isolation of species has resulted in very high endemism (85 % of species). A few families with low dispersability, such as viviparous clinids, brooding syngnathids (pipefish and seahorses) and nesting gobiococids (gobies) account for much of the endemism. Among the fish species,

the leafy sea dragon (*Phycodurus eques*), is unique to temperate waters (Kelleher *et al* 1995).

1.3.4.4 Seabirds

The seabird fauna of Australia and its external territories is diverse, and comprises 110 species representing 12 families. Of these, 76 (69 %) breed and many spend their whole lives in the region, while a further 34 species are regular or occasional visitors. Australia's seabirds are made up of tropical, temperate and subantarctic elements, a few of which have a wider environmental distribution. Population estimates for the Australian continent range from two pairs (white-tailed tropic bird), to almost 12 million (short-tailed shearwater). Six species are known from fewer than 100 breeding pairs. Of these, some are recent arrivals (such as kelp gull and white-fronted tern), while the status of the minuscule colonies of white-tailed tropic birds, herald and black-winged petrels is unknown. Eight species exceed 100,000 pairs, three shearwaters, white-faced storm petrel, silver gull and three terns. Of these, the short-tailed shearwater constitutes 77 % of the total breeding seabirds, and the wedge-tailed shearwater a further 8.7 % (Kelleher *et al* 1995).

1.3.4.5 Marine Turtles

Six species of marine turtle nest in the region: the leatherback turtle (*Dermochelys coriacea*); loggerhead turtle (*Caretta caretta*); green turtle (*Chelonia mydas*); hawksbill turtle (*Eretmochelys imbricata*) olive Ridley turtle (*Lepidochelys olivacea*) and flatback turtle (*Natator depressus*). The leatherback, loggerhead, green and hawksbill turtles have pantropical distributions; the olive Ridley is widely distributed in the tropical and subtropical Indo-Pacific; and the flatback has a limited distribution and is effectively endemic to Australia (Kelleher *et al* 1995).

1.3.4.6 Sea Snakes

East Asia is the centre of the world's radiation of true sea snakes (*Hydrophiidae*). This family contains some 14 genera and 47 species. Of these 14 genera containing about 30 species are found in the East Asian region. With the exception of the pelagic Yellow-bellied sea snake (*Pelamis platurus*), which occurs in both coastal and oceanic waters from East Africa throughout the Indian and Pacific Oceans to the west coast of Central America, all other sea snakes are confined to tropical and warm-temperate regions extending from the Persian Gulf to the Fijian islands. The number of species declines west of the East Asian region: to about 20 species in India, 11 in the Persian Gulf and northern Australia (more than 30 species, 50 % endemic). The adjoining Australasian region has 31 species, rapidly declining in diversity in the western Pacific region. The sea kraits (*Laticaudidae*) also occur throughout the region. This family contains only six species in a single genus (*Laticauda*; some taxonomists recognize a second genus, *Pseudolaticauda*). Three of the six species are found in the East Asian region (Bleakley and Wells 1995).

1.3.4.7 Marine Mammals

The dugong (*Dugong dugon*) is present in the region. Australia has significant populations in northern waters, between Moreton Bay in the east and Shark Bay in the west and is the dugong's last stronghold. Dugong populations in northern Australia appear to be secure, with the possible exception of Torres Strait. Systematic aerial surveys indicate that dugongs are the most abundant marine mammal in inshore northern Australia, with an estimated population of over 80,000. Populations in the south have shown a recent decline (Kelleher *et al* 1995).

Three species of pinnipeds breed in Australian waters: Australian sea lion (*Neophoca cineria*); New Zealand fur seal (*Arctocephalus forsteri*) and Australian fur seal (*A. pusillus doriferus*). The Australian sea lion is endemic. A survey of over 200 islands in 1989-90 found 13 breeding colonies of fur seals in Western Australia (of which five were previously known) and four new locations in South Australia (Kelleher *et al* 1995).

Around eight species of baleen whales (*Mysticeti*) and 35 species of toothed whales, porpoises and dolphins (*Odonotceti*) are found in Australian waters. Cetacean taxonomy is considered incomplete which creates uncertainty of the exact number. The patterns of distribution are: cosmopolitan species with global distributions; temperate and polar species; species with a southern hemisphere, and generally circumpolar distribution; and tropical and warm temperate Indo-Pacific species. There are no endemics. Southern right whales (*Eubalaena australis*) breed in southern coastal waters of Australia. Longman's beaked whale is considered the rarest whale in the world, and is known only from two specimens (one found near Mackay, Queensland) (Kelleher *et al* 1995). *Balaenoptera edeni* (Bryde's whale) is the most common cetacean in the south Asian Seas region. Other species recorded are *Balaenoptera acutirostrata* (minke whale), *Balaenoptera borealis* (sei whale), *Balaenoptera musculus* (blue whale), *Balaenoptera physalus* (fin whale), and *Megaptera novaeangliae* (humpback whale). Dolphin and porpoise species include *Sousa chinensis* (Indo-Pacific humpbacked dolphin), *Orcaella brevirostris* (Irrawaddy dolphin), *Neophocaena phocaenoides* (finless porpoise), *Tursiops truncatus* (bottlenose dolphin), *Delphinus delphis* (common dolphin) and possibly also *Sousa borneensis* (white dolphin), *Sousa plumbea* (plumbeous dolphin) and *Stenella malayana* (Malayan dolphin) (Kelleher *et al* 1995).

1.3.4.8 Plankton

Australia's marine phytoplankton comprises representatives of 13 algal classes, including diatoms (5,000 species), dinoflagellates (2,000 species), golden-brown flagellates and green flagellates (several hundreds of species). The phytoplankton flora of the Australian region has strong similarities with the warm- and cold-water phytoplankton floras of the northern hemisphere. There are few endemic species. There are three distinct phytoplankton assemblages in Australian coastal waters: a temperate neritic community in coastal waters of New South Wales, Victoria and Tasmania; a tropical neritic community confined to the Gulf of Carpentaria and North West Shelf; and a tropical oceanic community in the offshore waters of the Coral Sea and Indian Ocean. Depth distribution of phytoplankton is limited by the extent to which photosynthetically available sunlight can penetrate, which ranges from several m in turbid estuaries, to 200 m in the clearest oceanic conditions (Kelleher *et al* 1995).

1.3.5 Information on Member States

1.3.5.1 Australia

Total Population: 19,731,984 (CIA 2004)

Total GDP: purchasing power parity - \$525.5 billion (CIA 2004)

Total Sea Area:

contiguous zone: 24 NM

territorial sea: 12 NM

exclusive economic zone: 200 NM

continental shelf: 200 NM or to the edge of the continental margin (CIA 2004)

Length of Coastline: 25,760 km (CIA 2004)

Marine Protected Areas: There are 305 MPAs

Proposed New MPAs:

- Beagle Gulf (proposed) Marine Park (Northern Territory)
- Torres Strait (Queensland)
- Gulf of Carpentaria (Queensland)
- Hervey Bay/Sandy Straits (Queensland)
- Great Australian Bight Marine Park (South Australia)
- Macquarie Island (Tasmania)
- Kent Group (Tasmania)
- Rocky Cape (Tasmania)
- Maria Island National Park (extension) (Tasmania)
- Lord Howe Island Marine Reserve (New South Wales)
- *Existing MPAs which Require Management Support:*
- Cobourg Marine Park (Northern Territory)
- Jervis Bay Marine Reserve (New South Wales)
- Solitary Islands Marine Reserve (New South Wales)
- Ningaloo Marine Park (Western Australia)*
- Shark Bay Marine Park (Western Australia)
- Rottnest Island Marine Reserve (Western Australia)
- Shoalwater Islands Marine Park (Western Australia)

(Kelleher *et al* 1995)

1.3.5.2 China

Total Population : 1,286,975,468 (CIA 2004)

Total GDP: purchasing power parity - \$5.989 trillion (CIA 2004)

Total Sea Area:

contiguous zone: 24 NM

exclusive economic zone: 200 NM

continental shelf: 200 NM or to the edge of the continental margin

territorial sea: 12 NM (CIA 2004)

Length of Coastline:: 14,500 km (CIA 2004)

Marine Protected Areas: 41 Nature Reserves and 18 Fisheries Resources Protected Areas

Some of the main Chinese MPAs are listed below :

- Changli golden seashore National Marine Nature Reserve
- Shankou mangrove ecosystem National Marine Nature Reserve
- Dazhou Island National Marine Nature Reserve
- Sanya coral reef National Marine Nature Reserve
- Nanji Archipelago National Marine Nature Reserve
- Tianjin palaeocoast National Marine Nature Reserve

- Shenhui Bay National Marine Nature Reserve
- Beilun estuary mangrove National Marine Nature Reserve
- Three Jinshan Islands National Marine Nature Reserve
- Xiamen lancelets National Marine Nature Reserve
- Miao Island National Marine Nature Reserve
- Liaodong Bay National Marine Nature Reserve
- Chongming Eastern Beach wetland National Marine Nature Reserve
- Ningbo marine relics National Marine Nature Reserve
- Chengshantou National Marine Nature Reserve

Proposed New MPAs:

- Eastern and Southern Hainan island
- Qinzhou Bay Mangrove Area
- Zhujiang (Pearl river) delta ecosystem
- Zhoushan-Nanji Islands marine ecosystem
- Doshan-Nan Ao Sea area
- Bohai Bay marine ecosystem

(Bleakley and Wells 1995).

1.3.5.3 Cambodia

Total Population 13,124,764

Total GDP purchasing power parity - \$20.42 billion (CIA 2004)

Total Sea Area:

contiguous zone: 24 NM

territorial sea: 12 NM

continental shelf: 200 NM

exclusive economic zone: 200 NM (CIA 2004)

Length of Coastline: 443 km (CIA 2004)

Marine Protected Areas: No information is available concerning MPAs in Cambodia.

(Bleakley and Wells 1995).

1.3.5.4 Indonesia

Total Population 234,893,453 (CIA 2004)

Total GDP purchasing power parity - \$714.2 billion (CIA 2004)

Total Sea Area: measured from claimed archipelagic baselines

exclusive economic zone: 200 NM

territorial sea: 12 NM (CIA 2004)

Length of Coastline: 54,716 km (CIA 2004)

Marine Protected Areas: The following MPAs were recorded for Indonesia:

Central Java

- Kepulauan Karimunjawa Marine National Park

East Java

- Perairan Kangean Game Reserve
- Baluran National Park (seaward extension)
- Bali Barat National Park (seaward extension)

West Java

- Pananjung Pangandaran Strict Nature Reserve (seaward extension) (?)
- Ujung Kulon National Park (seaward extension)
- Kepulauan Seribu Marine National Park
- Pulau Dua Strict Marine Nature Reserve

- Pulau Rambut Strict Nature Reserve (seaward extension)
- Pulau Sangiang Strict Nature Reserve (seaward extension)
- Lewang Sancang Strict Nature Reserve (seaward extension)

Central Kalimantan

- Tanjung Keluang Marine Recreation Park
- *East Kalimantan*
- Pulau Semama Marine Wildlife Reserve
- Pulau Sangalaki Marine Recreation Park

West Kalimantan

- Kepulauan Karimata Strict Marine Nature Reserve
- *East Nusa Tenggara*
- Teluk Maumere Marine Recreation Park
- Pulau Tujuh Belas (North Flores) Strict Marine Nature Reserve

West Nusa Tenggara

- Pulau Moyo Marine Recreation Reserve (Sumbawa)/Marine Wildlife Reserve

Irian Jaya

- Teluk Bintuni Nature Reserve
- Teluk Cenderawasih Strict Marine Nature Reserve/Marine National Park

Lampung, Sumatra

- Bukit Barisan Selatan Strict Marine Nature Reserve
- Kepulauan Krakatau Strict Marine Nature Reserve

Aceh, Sumatra

- Pulau Weh Marine Recreation Park

Maluku

- Pulau Kasa Marine Recreation Park/Marine Wildlife Reserve
- Kepulauan Aru Bagian Tenggara Strict Marine Nature Reserve
- Pulau Banda Marine Recreation Park/Strict Marine Nature Reserve
- Pulau Pombo Marine Recreation Park/Strict Marine Nature Reserve

North Sulawesi

- Arakan Wontulap Strict Marine Nature Reserve
- Bunaken Menado Tua Marine National Park
- Kepulauan Take Bone Rate Marine National Park

Proposed New MPAs:

- Pulau Penyu Strict Marine Nature Reserve
- (Bleakley and Wells 1995).

1.3.5.5 The Republic of Korea

Total Population : 48,289,037 (CIA 2004)

Total GDP: purchasing power parity - \$941.5 billion (CIA 2004)

Total Sea Area:

contiguous zone: 24 NM

territorial sea: 12 NM; between 3 NM and 12 NM in the Korea Strait

continental shelf: not specified

exclusive economic zone: 200 NM (CIA 2004)

Length of Coastline: 2,413 km (CIA 2004)

Marine Protected Areas: In the whole of Korea there is 1 Nature Preserve, 1 Natural Ecological System Protected Area and 4 National Parks

Existing MPAs are as follows:

- Hallyo Haesang Sea NP
- Tadonhae Haesang Sea NP
- Pyonson Bando Peninsula NP
- Tae-An Hae-an Seashore NP

- Hong Do Islands Marine Reserve
- Nakdong River Mouth Migratory Bird Arrival Area

Proposed New MPAs:

- Korea strait area
- (Bleakley and Wells 1995).

1.3.5.6 Malaysia

Total Population: 23,092,940 (CIA 2004)

Total GDP purchasing power parity - \$198.4 billion (CIA 2004)

Total Sea Area:

continental shelf: 200-m depth or to the depth of exploitation; specified boundary in the South China Sea

exclusive economic zone: 200 NM

territorial sea: 12 NM (CIA 2004)

Length of Coastline: 4,675 km (Peninsular Malaysia 2,068 km, East Malaysia 2,607 km) (CIA 2004)

Marine Protected Areas:

Peninsula Malaysia

- Kuala Selangor Nature Reserve
- Matang Forest Reserve (Muara Kuala Gula)
- Pulau Besar (proposed) Marine Park/Fisheries PA (includes the islands of P.Hujung, P.Tengah, P.Rawa, P.Gual, P.Menserip and P.Harimau)
- Pulau Kapas (proposed) Marine Park/Fisheries PA
- Pulau Lang Tengah (proposed) Marine Park/Fisheries PA
- Pulau Perhentian Besar (proposed) Marine Park/Fisheries PA
- Pulau Sembilang and Pulau Seri Buat (proposed) Marine Park/Fisheries PA
- Pulau Sibul (proposed) Marine Park/Fisheries PA (includes P. Sibul Hujung)
- Pulau Tenggol (proposed) Marine Park/Fisheries PA (includes P.Nyireh)
- Pulau Tinggi (proposed) Marine Park/Fisheries PA (includes the islands of P.Mentigi)
- Pulau Langkawi (proposed) Marine Park/Fisheries PA
- Pulau Payar/P. Kaca/P.Lembu/Segantang Marine Park
- Pulau Redang Marine Park (includes P.Pinang, P.Lima, and P.Ekur Tebu)
- Pulau Tioman (proposed) Marine Park/Fisheries PA (includes P.Tulai and P.Chebeh)

Sabah

- Kota Belud (Tempasuk Plains) Bird Sanctuary
- Kulamba Wildlife Reserve
- Pulau Mantanani Bird Sanctuary
- Pulau Sipadan Bird Sanctuary/(proposed) Marine Reserve
- Pulau Tiga Park
- Tunku Abdul Rahman Park
- Turtle Islands State Park

Proposed New MPAs:

- Pulau Sipadan proposed State Park
- Semporna Islands proposed Marine Park

(Bleakley and Wells 1995).

1.3.5.7 Philippines

Total Population: 84,619,974 (CIA 2004)

Total GDP: purchasing power parity - \$379.7 billion (CIA 2004)

Total Sea Area:

continental shelf: to depth of exploitation

territorial sea: irregular polygon extending up to 100 NM from coastline as defined by 1898 treaty; since late 1970s has also claimed polygonal-shaped area in South China Sea up to 285 NM in breadth

exclusive economic zone: 200 NM (CIA 2004)

Length of Coastline: 289 km (CIA 2004)

Marine Protected Areas:

- Tubbataha Reefs National Marine Park
- Taklong Island National Marine Reserve
- Apo Island Marine Reserve/Tourist Zone
- Camiguin Island Marine Reserve/Tourist Zone
- Fortune Island Marine Reserve/Tourist Zone
- Fuga Island Marine Reserve/Tourist Zone
- Guiuan Marine Reserve/Tourist Zone
- Nasugbu Marine Sanctuary/Marine Reserve/Tourist Zone
- Panglao Island-Balicasag Area Marine Reserve/Tourist Zone
- Santa Cruz Island Marine Reserve/Tourist Zone
- Sombrero Islands Marine Reserve/Tourist Zone
- Malampaya Sound Marine Sanctuary
- Panguil Bay Marine Sanctuary
- Pollilo Island Marine Sanctuary
- Puerto Galera Biological Station
- Sumilon Islands Marine Reserve and Fish Sanctuary
- Guindolman Municipal Marine Park
- Carbin Reef Municipal Park
- El Nido Marine Reserve

Proposed New MPAs:

No new MPAs are proposed as priorities.
(Bleakley and Wells 1995).

1.3.5.8 Singapore

Total Population : 4,608,595 (CIA 2004)

Total GDP: purchasing power parity - \$112.4 billion (CIA 2004)

Total Sea Area:

exclusive fishing zone: within and beyond territorial sea, as defined in treaties and practice

territorial sea: 3 NM (CIA 2004)

Length of Coastline: 193 km (CIA 2004)

Marine Protected Areas:

- Sungei Buloh Nature Reserve

Proposed New MPAs:

- Southern Islands

(Bleakley and Wells 1995).

1.3.5.9 Vietnam

Total Population : 81,624,716 (CIA 2004)

Total GDP: purchasing power parity - \$183.8 billion (CIA 2004)

Total Sea Area:

contiguous zone: 24 NM

territorial sea: 12 NM

continental shelf: 200 NM or to the edge of the continental margin

exclusive economic zone: 200 NM (CIA 2004)

Length of Coastline: 3,444 km (excludes islands) (CIA 2004)

Marine Protected Areas:

- Cat Ba Islands National Park
- Con Dao Islands National Park

Proposed New MPAs:

- Nam Du Islands

(Bleakley and Wells 1995).

1.3.5.10 Thailand

Total Population : 64,265,276

Total GDP: purchasing power parity - \$445.8 billion (CIA 2004)

Total Sea Area:

continental shelf: 200-m depth or to the depth of exploitation

exclusive economic zone: 200 NM

territorial sea: 12 NM (CIA 2004)

Length of Coastline: 3,219 km (CIA 2004)

Marine Protected Areas:

- Ao Phangnga National Park
- Hat Chao Mai National Park
- Hat Nai Yang National Park (Ko Phuket reefs)
- Hat Noppharat Thara, Mu Ko Phi Phi National Park
- Khao Laem Ya, Mu Ko Samet National Park
- Khao Lam Pi, Hat Thai Muang National Park
- Khao Sam Roi Yot National Park
- Laem Son National Park
- Mu Ko Ang Thong National Park
- Mu Ko Chang Islands National Park
- Mu Ko Lanta National Park
- Mu Ko Phetra National Park
- Mu Ko Similan National Park
- Mu Ko Surin National Park
- Tarutao National Park

Proposed New MPAs:

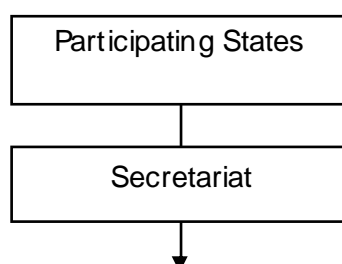
No new MPAs are proposed as priorities.

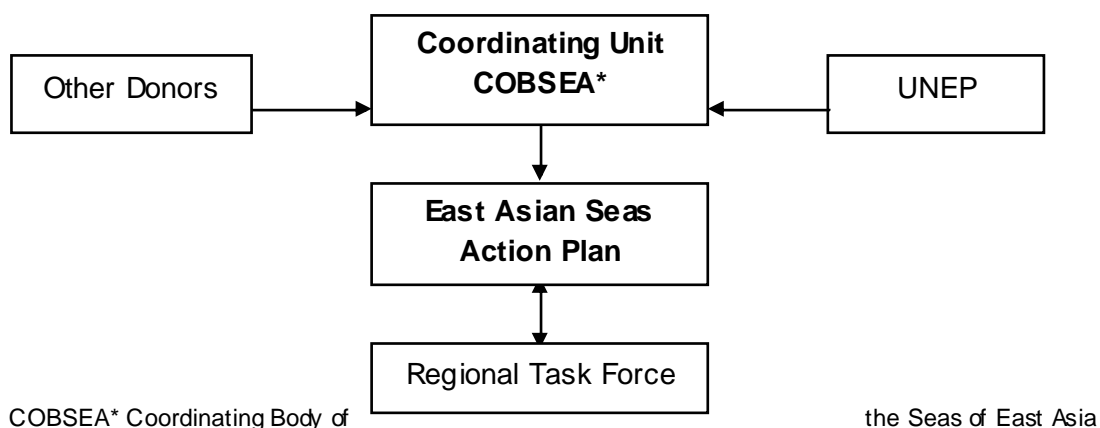
(Bleakley and Wells 1995).

1.4 Organization

1.4.1 Institutional Structure

1.4.2





1.4.3 Coordinating Unit

The Action Plan is steered from Bangkok by its Coordinating Body of the Seas of East Asia (COBSEA).

Last Meeting: Sixteenth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan 24-26 October, 2001, Bangkok, Thailand.

Next Meeting: Seventeenth Meeting of the Coordinating Body of the Seas of East Asia (COBSEA), 8-10 March 2004, Bangkok, Thailand

Contacts:

Secretariat for COBSEA.
 UNEP East Asian Seas Regional Coordinating Unit
 9th Floor, UN Building
 Bangkok, Thailand 10200
 Tel. 66-2-288-1860
 Fax. 66-2-281-2428

1.4.4 Secretariat

The Regional Coordinating Unit (EAS/RCU) serves as Secretariat, and is responsible for coordinating the activities of governments, NGOs, UN and donor agencies, and individuals in caring for the region's marine environment. EAS/RCU works in close cooperation with the region's non-government and government organizations and existing regional programmes and projects to improve co-ordination and co-operation among parties working on the coastal and marine environment.

Contacts:

East Asian Seas
 Regional Coordinating Unit for East Asian Seas
 (EAS/RCU)
 UN Building, 10th Floor
 Rajdamnern Avenue, Bangkok 10200, Thailand
 Tel: +662 288 1860; Fax: +662 281 2428
 E-mail: jiang.unescap@un.org
 Internet: <http://www.unepeasrcu.org>

1.5 Partners

GPA

East Asian Seas Regional Programme of Action (RPA) for the GPA. The RPA focuses on the following objectives: the identification of the regional problems of pollution from land based activities, with reference to the relevant sections of the Transboundary Diagnosis Analysis (TDA) for the South China Sea and the National Overviews of the Effects of Land Based Activities on the Marine Environment; to establish regional priorities; to develop and implement management approaches and processes; the implementation of the activities to mitigate and remediate land based sources of harm to the coastal and marine environment in the region; and the development of pilot projects to provide experience and knowledge for the entire region.

(link to main GPA section under first dropdown)

Global Environment Facility (GEF)

GEF was established in 1991 by the World Bank, with UNEP and UNDP to help developing countries fund projects and programs that protect the global environment. GEF grants support projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants. GEF has played an integral role in funding many projects within the Regional Seas Programmes.

GEF Projects in the East Asian Seas Region

- UNEP/GEF Project, "Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand,"
- UNDP - GEF - International waters:
Building Partnerships for the Environmental Protection and Management of the East Asian Seas
- UNDP - GEF - International waters:
Prevention and Management of Marine Pollution in the East Asian Seas
- UNDP - GEF - Biodiversity:
Wetland Biodiversity Conservation and Sustainable Use, People's Republic of China
- UNEP - GEF - International waters:
Reversing Degradation Trends in the South China Sea
- World Bank - GEF - Biodiversity:
Hon Mun Marine Protected Area Pilot Project, Vietnam
- World Bank - GEF - Biodiversity:
Coastal and Marine Biodiversity Conservation in Mindanao, Philippines
- World Bank - GEF - Biodiversity:
Coral Reef Rehabilitation and Management Project (COREMAP), Indonesia
- UNDP - GEF - Biodiversity:
Community Based Coastal and Marine Conservation in the Milne Bay Province, Papua New Guinea
- UNDP - GEF - Biodiversity:
Establishment and Management of a Biosphere Reserve in the Ramu River Catchment, Papua New Guinea
- UNDP - GEF - Biodiversity:
Conservation of the Ecological Balance of the Sulu-Sulawesi Marine Ecosystems

- UNEP - GEF - International waters:
Formulation of a Transboundary Diagnostic Analysis and Preliminary Framework of a Strategic Action Programme for the South China Sea
- UNDP - GEF - Biodiversity/International waters:
Biodiversity Management in the Coastal Area of China's South Sea
(GIWA 2004)
(link to main GPA section under first dropdown)

ICRAN

The First ICRAN Regional Workshop on Experience Sharing Between Demonstration and Target Sites in the EAS was held in Phuket, Thailand, in 2002. The workshop was the first opportunity for the eight demonstration and target site managers to meet and discuss management issues, such as successful and non-successful management plans, existing legislation and needs for improved management at each site. Other discussion topics included monitoring for better management, identifying needs to increase public awareness, attendance at upcoming conferences to promote the ICRAN Project, and identifying future activities under ICRAN. The Workshop proceedings including a series of reports from demonstration sites identifying good management practices for Marine Protected Areas, Community Based Management, and tourism as related to coral reef resources, and a series of reports from target sites identifying areas for improving management.
(link to main ICRAN section under first dropdown)

WWF

The WWF Wallacea Program Carries out research and training, Coral reef data acquisition and monitoring in the Wallacea Region to protect coral reefs.
(link to main GPA section under first dropdown)

Mekong River Commission (MRC)

In 1995, MRC indicated the commitments of its member states to implementing sustainable utilization and management of water and water-related resources in the Mekong River basin. Within the framework of the Mekong River Commission, MRC is now preparing an ambitious Mekong basin development plan and a comprehensive water utilization program.

The Nature Conservancy

An International NGO that aims to preserve plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. The Nature Conservancy aids the EAS in coral reef data acquisition and monitoring.

Sea Start RC

Sea Start RC implements programs on global environmental change and provides data information services in the form of a metadatabase to the region.

SIDA

The overall goal of Swedish development cooperation is to raise the standard of living of poor people in the world. The Swedish Parliament has adopted the following six specific objectives to achieve this overall goal: economic growth; economic and political independence; economic and social equality; democratic development in society; the long-term sustainable use of natural resources and protection of the environment; and equality between men and women. SIDA provides funding and regional coordination.
(link to main GPA section under first dropdown)

South China Sea Informal Working Group

South China Sea Informal Working Group and an NGO providing assistance on marine policy and law of the sea.

ASEAN

The objectives of ASEAN are:

- To accelerate the economic growth, social progress and cultural development in the region through joint endeavours in the spirit of equality and partnership in order to strengthen the foundation for a prosperous and peaceful community of Southeast Asian nations, and
- To promote regional peace and stability through abiding respect for justice and the rule of law in the relationship among countries in the region and adherence to the principles of the United Nations Charter.

EAS/RCU provided technical assistance to the ASEAN Working Group on Marine and Coastal Environment Working Group.

PEMSEA

PEMSEA is a network of twelve member countries in the region working together to protect the life support systems of the seas of East Asia and to enable the sustainable use of their renewable resources through intergovernmental, interagency and intersectoral partnerships.

Other Partners actively involved in the East Asian Seas Region include:

Australia

- Environment Australia - Department of the Environment and Heritage
- Great Barrier Reef Marine Park Authority
- Australian Institute of Marine Science

Cambodia

- Ministry of Environment
- Department of Fisheries
-

China

- State Environmental Protection Administration
- Hainan Ocean and Fishery Department
- State Oceanic Administration
- South China Sea Institute of Oceanography, Guangzhou
- South China Institute of Environmental Sciences
-

Indonesia

- Ministry of Environment
- Regional Office - Bunaken National Park
- Faculty of Fisheries and Marine Sciences, Bogor Agriculture University
- Indonesian Institute of Sciences
- Yayasan Adi Citra Lestari
- WWF Wallacea Program

Korea

- Korea Ocean Research and Development Institute
- Ministry of Foreign Affairs and Trade
- Korea Environment Institute
- Korea Maritime Institute

Malaysia

- Ministry of Science, Technology, and Environment
- Borneo Marine Research Unit - Universiti Malaysia Sabah
- Universiti Sains Malaysia
- The World Fish Centre

Philippines

- Department of Environment and Natural Resources
- Marine Science Institute, University of Philippines - Dilliman
- Silliman University
- Environmental Management Bureau
- Philippine Reef and Rainforest Conservation Foundation, Inc.

Singapore

- Ministry of Environment
- National University of Singapore
- Singapore International Foundation
- Public Utilities Board

Thailand

- Ministry of Natural Resources and Environment
- Ramkhamhaeng University - Marine Biodiversity Research Group
- Chulalongkorn University Dept. of Marine Science
- Phuket Marine Biological Centre

Vietnam

- Ministry of Science, Technology, and Environment
- Nha Trang Institute of Oceanology
- Department of Science, Technology & Environment of Ninh Thuan Province
- Institute of Mechanics

2 Our Work

2.1 Programme Strategy

Link to Regional Seas Strategic Directions 2004-2007, downloadable document.

2.2 Action Plan

Action Plan for the Protection and Development of the Marine and Coastal Areas of the East Asian Region

Participating Sates: (10) Australia, Cambodia, China, Indonesia, Malaysia, Philippines, Republic of Korea, Singapore, Thailand and Vietnam (UNEP 2001)
Adopted: April 1981 (by Indonesia, Malaysia, Philippines, Singapore and Thailand)
Revised: 1994

A revised Action Plan and a Long-term Strategy for the period 1994-2000 period was developed. Australia, Cambodia, China, Korea and Vietnam joined the Action Plan.

For full text of the Strategic Action Programme for the South China Sea (1999) link to: <http://www.unep.org/unep/regoffs/roap/easrcu/publication/sapV3.doc>.

2.3 Convention

There is currently no convention for this region.

2.4 Issues and Threats

2.4.1 Habitat Loss

2.4.1.1 Coral Reefs

In South East Asia 230 million people live within 100 km of coral reefs. They provide seafood, medicinal materials, tourism income and buffering from storms, and are one of the planet's most biologically rich environments. In some cases the fish taken from reef communities provide over half the protein intake of the local communities. Coral reef fisheries comprise 8 -10 % of the overall fishery production in the Philippines, 5 % in Indonesia and in excess of 20 % in Sabah, Malaysia. Reef and non-reef communities within 15 km of the shore are generally over fished, while offshore subsurface atolls and pinnacle reefs are often beyond the reach of small-scale fishermen. Major destructive forces include excessive sedimentation and nutrients related to deforestation and agricultural activities, and various forms of destructive fishing, especially blast fishing and cyanide fishing (Bleakley and Wells 1995). Tourism associated with coral reefs provides major economic benefits in the region, but also leads to reef degradation if not managed correctly.

Most areas of coral reefs in Australia are under some form of management. The degrees of protection range from preservation zones (no entry) in the Great Barrier Reef Marine Park, to marine parks (no extractive use), to general use areas under fisheries management plans (Kelleher *et al* 1995). Many of the other reefs in the East Asian region are unprotected and heavily fished (often in an unregulated manner). Due to the sensitive nature of these habitats these activities are greatly affecting their integrity and their associated biological communities.

Little is known of the effects of anthropogenic activities on temperate reefs. The most serious potential effects are those on the habitat-forming species, particularly the large algae, whose loss may have dramatic effects on other species. Threats include point-source and nonpoint-source pollution discharges, fishing, collection and introduced species (Kelleher *et al* 1995).

For further information refer to: UNEP (2000) Overview on Land-based Pollutant Sources and Activities Effecting the Marine Environment in the East Asian Seas. Regional Seas Reports and Studies 173
http://www.gpa.unep.org/documents/technical/rseas_reports/173-eng.pdf

2.4.1.2 Mangroves

Mangroves are extremely important habitats, maintaining coastal integrity and supporting vast amounts of wildlife, many of which are of high commercial importance. However, they are threatened habitats mainly from clearing, reclamation and pollution (Kelleher *et al* 1995).

The mangroves in the western parts of Indonesia, particularly Java, have suffered heavily from human impacts, which include illegal cutting, conversion of land area to other uses (such as mariculture and other forms of coastal development) and possible land-based industrial pollution. The mangroves in the east of the region are less affected but signs of degradation have been recorded in some locations (eg Ambon Island and Halmahera Island. In Vietnam mangrove cover has decreased by about 50 % since 1943. About 91,000 ha (46 %) of the mangroves in Thailand are under some form of use (such as farming, mining, salt farming and infrastructure activities), and there was a 25 % decrease in mangrove cover between 1979 and 1987. In the Philippines, mangroves are estimated to cover about 20 % of that present in the 1920s, and about half the remaining forest is composed of secondary growth. The best stands occur on the islands of Palawan and Mindanao (Bleakley and Wells 1995).

Mangroves provide important habitats for fish, including many of commercial importance. Around 197 fish species have been recorded from northern Australian mangroves, 65 from Brisbane mangroves, and 46 from Sydney mangroves. Mangroves also play an important role as habitat for birds, coastal protection and in filtering nutrients. Some of Australia's most important single species commercial fisheries are directly or indirectly linked to mangroves. The early life cycle of the banana prawn *Penaeus merguensis* is confined to mangrove-lined estuaries. In the Gulf of Carpentaria, greatest catches of banana prawns are made in areas with highest concentrations of mangroves. Bait prawns (*Metapenaeus* spp), mud crabs (*Scylla serrata*) and barramundi (*Lates calcarifer*) are directly dependent on mangroves. Juvenile tiger prawns (*Penaeus esculentus*) depend on seagrass meadows adjacent to mangroves. Baitfish (*Clupidae*, *Engraulidae*) which spend their juvenile stages in mangroves mature and move out to sea where they become important food for mackerel and billfish.

For further information refer to: UNEP (2000) Overview on Land-based Pollutant Sources and Activities Effecting the Marine Environment in the East Asian Seas. Regional Seas Reports and Studies 173
http://www.gpa.unep.org/documents/technical/rseas_reports/173-eng.pdf

2.4.1.3 Other Habitats

The estuarine open water and tidal habitats are diverse and are primarily dominated by seagrasses, mangroves and salt marshes. Around 70.5 % of Australia's total mangrove area (11,617 km²) is associated with estuaries. A high proportion of

commercially important fish species in Australia are estuarine dependent for at least some stage of their life cycle (such as 60 % by weight of the New South Wales catch). Australian estuaries have been affected to varying extents by human activities. The clearance of catchments is widespread, particularly in South Australia, Victoria, New South Wales and central Queensland (Kelleher *et al* 1995). The main threats to saltmarshes include reclamation, degradation, weed invasion, insect control and sea level rise (Kelleher *et al* 1995).

For further information refer to: UNEP (2000) Overview on Land-based Pollutant Sources and Activities Effecting the Marine Environment in the East Asian Seas. Regional Seas Reports and Studies 173
http://www.gpa.unep.org/documents/technical/rseas_reports/173-eng.pdf

2.4.1.4 Overfishing

There has been a general decline in fishery resources in the region as a whole, attributed to over-exploitation, particularly in inshore coastal waters. Giant clams used to be abundant, having their centre of distribution in the region, but are now heavily depleted and have been placed on the CITES list (Bleakley and Wells 1995).

For further information refer to: UNEP (2000) Overview on Land-based Pollutant Sources and Activities Effecting the Marine Environment in the East Asian Seas. Regional Seas Reports and Studies 173
http://www.gpa.unep.org/documents/technical/rseas_reports/173-eng.pdf

2.4.2 Endangered Species

2.4.2.1 Birds

The seabird fauna of Australia and its external territories is diverse, and comprises 110 species representing 12 families. Of these, 76 (69 %) breed and many spend their whole lives in the region, while a further 34 species are regular or occasional visitors. Thirteen species or subspecies in the area, mainly those with a very restricted number of rookeries, are considered threatened. Examples of these are the wandering albatross on Macquarie Island, Abbot's booby on Christmas Island, and the Australian subspecies of the little tern *Sterna albifrons sinensis* (all of which are classified as endangered under IUCN criteria). Swamp birds like *Ardea* and *Egretta*, among others are also under threat. Various forms of human disturbance including egg collecting threaten many seabirds nesting sites. Because of their dependence on coastal land areas, which are subject to increasing pressure for nesting, seabirds are amongst the most heavily impacted marine taxa. Some seabird nesting sites that previously were important now are little used or abandoned due to high levels of human disturbance, (Kelleher *et al* 1995).

2.4.2.2 Reptiles

Six species of marine turtle nest in the region: the leatherback turtle (*Dermochelys coriacea*); loggerhead turtle (*Caretta caretta*); green turtle (*Chelonia mydas*); hawksbill turtle (*Eretmochelys imbricata*) olive Ridley turtle (*Lepidochelys olivacea*)

and flatback turtle (*Natator depressus*). Sea turtles have long been important to coastal and island communities throughout the Indo-Pacific region as a source of food (eggs and meat), shell and as totems. However, the development of large-scale commercial trade in "tortoise shell" (from the hawksbill), meat, eggs, and leather has placed severe pressures on stocks (Kelleher *et al* 1995).

Sea snakes are widely utilized in the region for their skins, and significant skin trades are centered in Singapore and Thailand, although the total number of skins traded is uncertain. Sea kraits are also utilized for their skins, and large quantities are exported from the region to Hong Kong and Japan for food and for oriental medicine. Relatively little is known of sea snake biology and ecology, so that the impacts on wild populations of either trade or fishing by-catch mortality are unknown (Bleakley and Wells 1995). The crocodile *Crocodylus porosus* is also under threat.

2.4.2.3 Marine Mammals

The dugong (*Dugong dugon*) is present in the region but is endangered by hunting and by destruction of its natural habitat and is the only Sirenia to occur in Australia. Australia has significant populations in northern waters, between Moreton Bay in the east and Shark Bay in the west and is the dugong's last stronghold. The dugong is protected throughout Australia except for Aboriginals and Torres Strait Islanders using traditional methods in their traditional waters (although modern technology has led to significant advancements in "traditional methods") (Kelleher *et al* 1995). Humans have had the greatest impact on dugong populations through hunting, gillnets and shark nets. Natural events such as cyclones and floods also have also reduced numbers by destroying habitat. Dugong populations in northern Australia appear to be secure, with the possible exception of Torres Strait. Systematic aerial surveys indicate that dugongs are the most abundant marine mammal in inshore northern Australia, with an estimated population of over 80,000. Populations in the south have shown a recent decline.

The main impacts to the pinnipeds in Australia include fisheries, oil pollution, entanglements in man-made objects, and disturbances (from tourism, for example). Pinnipeds within state waters are managed by a variety of state conservation and fisheries agencies. Outside the three-mile territorial limit they are managed by the ANCA. The Australian sea lion is considered as rare by the South Australian and Western Australian governments. The Australian breeding population of southern right whales is now around 300-600 (from a low of a hundred or so earlier this century). The Tasmania population is extinct. Western Australian southern right whales have increased at 11.7 % per year since 1977. Two different estimates of humpbacks migrating along eastern Australia in 1987 were 790 (with an increase of 14.4 % per year), and 1,107 (with an increase of 9.7 % per year). It is estimated that the Western Australian population of humpbacks has increased at 8.8 % per year since the cessation of whaling in 1963 (Kelleher *et al* 1995).

Until recently the major impact on populations was hunting. Other threats include drowning in tuna purse seines, drift gillnets and pollution from organochlorides (particularly poly-chlorinated biphenyls or PCBs). Impacts on especially inshore species may include: loss of habitat through coastal development; reduction in prey numbers because of fish habitat loss and over fishing (difficult to quantify); increasing numbers of motor boats and therefore risks of collision (evident in injured strandings); entanglement in gillnets, protective shark nets and discarded fishing nets; ingestion

of plastic bags and disturbance of migrating and breeding populations by boat traffic and noise pollution and by "w hale w atching" tourists (Kelleher *et al* 1995).

2.4.3 Land Based Pollution

Land based sources account for 77% of marine pollution with marine transport and dumping constituting the remainder (UNEP 2000). Cities in the coastal areas of the South China Sea are large and growing, e.g. Guang Zhou, Hong Kong, in China, Ho Chi Minh City in Viet Nam, Bangkok in Thailand, Manila in Philippines, Jakarta in Indonesia and Singapore. Few have sewage treatment facilities, so that waste is released directly into the rivers and seas. This inappropriate management results in severe pollution through high BOD loadings, eutrophication, fish kills, red tides, damage or loss of seagrass habitat and public health hazards (UNEP 1999).

As insects and weeds become more immune to chemicals, larger applications are made. These pesticides have varying effects on the marine environment. Some may be persistent and accumulate in animal or plant tissue, others may accumulate in the sediment and be released during storms. The damage they do is also variable and ranges from causing impotence in gastropods to moving up the food-chain to human food (UNEP 1999).

For the "hotspots" or areas of most concern refer to: UNEP (1999) Strategic Action Programme for the South China Sea. Draft Version 3, 24 February 1999 UNEP SCS/SAP Ver. 3

UNEP (2000) Overview on Land-based Pollutant Sources and Activities Effecting the Marine Environment in the East Asian Seas. Regional Seas Reports and Studies 173

http://www.gpa.unep.org/documents/technical/rseas_reports/173-eng.pdf

2.4.4 Sea Based Pollution

Oil-spills from wrecked ships are not the major cause of oil pollution in the sea. Marine sources of hydrocarbon pollution in coastal and marine waters are ships and oil and gas exploration and production platforms. The amount of ship traffic - commercial, fishing, leisure and bulk oil carriers, is likely to increase in the region and with it the risk of pollution from ship-based oil. Hydrocarbon pollution may be limited in extent but have severe consequences for the marine environment because some of the substances are not easily biodegradable and highly toxic. Methods exist to contain the effects of major oil spills and there are standards established for oil and gas exploration and production activities to reduce pollution. These need to be followed and monitored. Yet, in spite of precautions, accidents will occur, and countries need to be prepared to deal with these emergencies in order to contain the damage. For a large spill there is not enough equipment to contain the oil and not enough is known of the whereabouts of vulnerable areas to make decisions on where to place limited clean-up equipment. A mapping program to map vulnerable underwater habitats would be useful if seagrass meadows and coral reefs are to be saved. Co-ordination between companies and countries within the Region may help save some of the more valuable ecosystems if a large spill occurred (UNEP 1999).

For further information refer to: UNEP (1999) Strategic Action Programme for the South China Sea. Draft Version 3, 24 February 1999 UNEP SCS/SAP Ver. 3

2.4.5 Erosion

Inappropriate agricultural practices and deforestation leave bare soil available to erosion by wind and rain. Land clearing of forests for agricultural crops is a major supply of suspended solids and silt in rivers and coastal areas. The recent floods in China, although the largest on record did not result from the largest rainfall on record, rather, the amount of deforestation caused vast areas of loose sediment to be removed which silted up rivers and hence river water broke over the rivers' banks and flooded the land. Inappropriate engineering practices also lead to large volumes of sediment being washed into rivers and the sea. The slope of unprotected earth walls in shrimp farms, causeways, bridge approaches and roadsides are potential sites for erosion. Reduced water quality in this case means less light to benthic plants and may result in a loss of benthic vegetation (UNEP 1999).

For further information refer to: UNEP (1999) Strategic Action Programme for the South China Sea. Draft Version 3, 24 February 1999 UNEP SCS/SAP Ver. 3

2.5 Current Activities

2.6

2.6.1 Land Based Sources

The Regional Programme of Action for the Protection of the Marine Environment of the East Asian Seas from the Effects of Land-based Activities for the GPA was approved by COBSEA at its Fourteenth Session. The RPA focuses on the following objectives: the identification of the regional problems of pollution from land based activities, with reference to the relevant sections of the Transboundary Diagnosis Analysis (TDA) for the South China Sea and the National Overviews of the Effects of Land Based Activities on the Marine Environment; to establish regional priorities; to develop and implement management approaches and processes; the implementation of the activities to mitigate and remediate land based sources of harm to the coastal and marine environment in the region; and the development of pilot projects to provide experience and knowledge for the entire region. The regional GPA project concerning the sources of pollution from hotspots is now underway. The proceedings of the Toyama Workshop on Protecting Coastal and Marine Ecosystems from Land-based Activities in the Asia-Pacific Region is now being distributed and a series of GPA workshops are being planned. In addition the UNEP/GEF Project 'Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand' is now underway.

2.6.2 Coral Reefs

A Coral Reef Monitoring and Data Acquisition Workshop, was held 9 June 2000 in Phuket, Bangkok and focused on gaining information so that coral reefs can be mapped, monitored over time, and successfully managed. About 25 representatives from academic, government, non-governmental organisations (NGOs) and commercial agencies were at the meeting.

The First ICRAN Regional Workshop on Experience Sharing Between Demonstration and Target Sites in the EAS was held in Phuket, Thailand, in 2002. The workshop was the first opportunity for the eight demonstration and target site managers to meet and discuss management issues, such as successful and non-successful management plans, existing legislation and needs for improved management at each site. Other discussion topics included monitoring for better management, identifying needs to increase public awareness, attendance at upcoming conferences to promote the ICRAN Project, and identifying future activities under ICRAN. The Workshop proceedings including a series of reports from demonstration sites identifying good management practices for Marine Protected Areas, Community Based Management, and tourism as related to coral reef resources, and a series of reports from target sites identifying areas for improving management.

In addition small grants have been presented to seven agencies working towards management of coral reefs, with funding provided by the International Coral Reef Initiative (ICRI) and International Coral Reef Action Network (ICRAN).

2.6.2.1 Projects

Name	Cost	Period	Partners	Objective	Expected Outputs
International Coral Reef Action Network (ICRAN)	1,129,000 for EAS Component only	June 2001 – May 2005	CAR/RCU, EAF/RCU, SPREP, WWF, WRI, UNEP-WCMC, GCRMN, ICLARM World Fish Center, Reef Check, MAC, TNC, CORAL, ICRIN, ICRI, UNF, UNFIP, and numerous local institutions	To halt and reverse the decline of the world's coral reefs through: improving capacity to manage coral resources, increasing public awareness, exchanging information and experiences with well-managed MPAs	Increased public awareness, understanding, and capacity to manage and protect coral reefs. Monitoring manuals and awareness leaflets published in local languages. Enhanced community involvement in coral management. Creation of additional MPAs.
Coral reef data acquisition and monitoring	232,808	2000 - 2003	COBSEA member countries	To obtain data and identify data gaps for coral reefs, and implement a coral reef monitoring network	Standard monitoring programme for the region with network of monitoring sites Development of meta database for marine data.

IDENTIFICATION OF REGIONAL "HOTSPOTS" ON LAND-BASED POLLUTION, THEIR CHARACTERISTICS AND IMPACTS	250,000	August 2001 - December 2003	COBSEA member countries	To identify regional problems of pollution from land-based activities, and implement management approaches to mitigate and remediate these sources of harm to the coastal and marine environment	Determination of hot spots of pollution from land-based sources in the region. Provision of relevant information in the format of a database and a Geographic Information System (GIS) to provide a useful means for the participating countries to control and manage pollutant discharge into the seas. Reports of workshops and training programmes including recommendations for further implementation of activities to be done in the EAS region.
Mapping Coral Reefs for Management	25,000 for first stage	July 2003 – June 2004	Nha Trang Institute of Oceanography, Viet Nam	To produce a map showing the distribution of coral reefs along the coast of Ninh Thuan Province, Viet Nam, to assist with conserving and managing corals	Increased capacity of personnel in collecting data, preparing and reading maps, and translating the data into direct management and conservation action. Increased understanding of, and appreciation for, conserving marine resources. Development of a model of a tool that other coral reef managers in the ICRAN site network can use to conserve their reef resources.
Promoting public awareness through "Green Fins"	24,000 for first stage	November 2003 - April 2005	ICRAN site managers in Thailand, Philippines, Indonesia, dive shops and associations	To initiate a "Green Fins" program to establish a network of dive operators to assist with increasing public awareness	A network of environmentally-friendly dive operators protecting coral reefs. Increased awareness of good diving practices. Data for socio-economic monitoring.
Inter-agency cooperation workshop	20,000	On-going	UNESCO, WWF, FAO, IUCN, other marine-related organizations	To hold a workshop with regional and international agencies working in the coastal and marine environment to discuss better coordination and establish a pool of resources for marine related projects	Improved collaboration with other agencies working on coastal and marine environmental issues. Reduced redundancy of regional marine projects. Available pool of resources for regional marine projects.

Promoting sustainable and environmentally sound shrimp farming	620,000	5 years	FAO, regional aquaculture centers, Ministry of Environment (Thailand, Cambodia, Indonesia, Viet Nam, Philippines, Malaysia)	To promote sustainable shrimp farming techniques and better management practices to reduce the rate of farm abandonment and mangrove conversion. To promote restoration of abandoned shrimp farms to mangrove or return them to productive shrimp farms. To enhance capacity of governments to manage their aquaculture sector in a more sustainable manner.	Causal Chain Analysis reports identifying root causes of non-sustainable shrimp farming, loss of mangrove and biodiversity. Draft Regional Action Plan identifying priority activities to address the problem. Project briefs identifying activities to be implemented. Increased capacity to develop and implement mechanisms to regulate development of mangrove areas.
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3 Publications

3.1 Regional Seas Reports and Studies

[Link to the Regional Seas Reports and Studies](#)

3.2 Meeting Reports

UNEP. 1996. Report of the Twelfth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan. 3-4 December 1996, Manila, the Philippines

UNEP. 1998. Report of the Thirteenth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan. 18-19 November 1998 Bangkok, Thailand. .and annexes

UNEP. 1999. Report of the Fourteenth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan. 23-25 November, 1999, Bangkok, Thailand.

UNEP. 2000. Report of the Fifteenth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan (Special Session for the UNEP GEF Project in the South China Sea and report of the Meeting of National experts for the UNEP GEF Project in the South China Sea. Pp. 80 and the Project Brief as Annex

UNEP. 2001. Report of the Sixteenth Meeting of the Coordinating Body on the Seas of East Asia (COBSEA) on the East Asian Seas Action Plan. 24-26 October, 2001, Bangkok, Thailand. Pp.26.

UNEP. 2000. Vision and Plan – A Systematic Approach. Long-term Plan of East Asian Seas Regional coordinating Unit. EAS/RCU, UNEP, Bangkok, Thailand. Pp. 22.

Full texts of the above meeting reports are available at:
http://www.unepasrcu.org/Publication/COBSEA/cobsea_reports.htm

3.3 Other Publications

UNEP (1999) Strategic Action Programme for the South China Sea. Draft Version 3, 24 February 1999 UNEP SCS/SAP Ver. 3. link to:
<http://www.unep.org/unep/regoffs/roap/easrcu/publication/sapV3.doc>

UNEP (1999) Transboundary Diagnostic Analysis for the South China Sea. Version 3, 3 February 1999. UNEP SCS/TDA Ver. 3. Link to:
<http://www.unep.org/unep/regoffs/roap/easrcu/index.htm>

UNEP (2000) Overview on Land-based Pollutant Sources and Activities Effecting the Marine Environment in the East Asian Seas. Regional Seas Reports and Studies 173 http://www.gpa.unep.org/documents/technical/rseas_reports/173-eng.pdf

For a full list of publication link to the East Asian Seas website:
http://www.unep.org/unep/regoffs/roap/easrcu/publication/eas_publications.htm

3.4 Website Links

East Asian Seas Website <http://www.unep.org/unep/regoffs/roap/easrcu/index.htm>
EAS/RCU East Asian Seas Regional Coordinating Unit <http://www.unepasrcu.org>
ROAP Regional Office for Asia and the Pacific
<http://www.unep.org/unep/regoffs/roap/>

Ministry of Environment Singapore www.env.gov.sg/

Ministry of Environment of Australia www.deh.gov.au

Pollution Control department, Thailand <http://www.pcd.go.th/>

Thailand Institute of Scientific and Technological Research (TISTR), in Thai.
<http://www.tistr.or.th/>

People's Republic of China

Maritime Safety Administration <http://www.msc.gov.cn/>

State Environmental Protection Administration <http://www.zhb.gov.cn/english/>

State Oceanic Administration <http://www.soa.gov.cn/>

National Marine Data & Information Service <http://www.nmdis.gov.cn/enmdis/index.html>

Center for Coastal & Atmospheric Research <http://ccar.ust.hk/>

Ministry of Communications <http://www.moc.gov.cn/>

Chinese Government Homepage <http://www.gov.cn/index.jsp>

State Environmental Protection Administration <http://www.zhb.gov.cn/english>

Institute of Oceanology Chinese Academy of Sciences, China <http://www.qdio.ac.cn>

China Oceanic Information Network State Oceanic Administration, China

<http://www.soa.gov.cn/>

Center for Coastal & Atmospheric Research <http://ccar.ust.hk/>

National Marine Data & Information Service, China <http://www.nmdis.gov.cn>

Ocean University of Qingdao <http://www.ouqd.edu.cn>

Hejiang Ocean University <http://www.zjou.net.cn>

National Marine Environmental Institute & Monitoring Center

<http://www.nmemc.gov.cn>

Ocean Technical School of Qingdao, Shandong, China <http://www.otsqd.com> The Institute of Seawater Desalination and Multipurpose Utilization, SOA (Tianjin)

<http://www.sdmu.com.cn>

Republic of Korea

National Maritime Police Agency <http://www.nmpa.go.kr/>

Korea Ocean Research & Development Institute (KORDI)

<http://www.kordi.re.kr/eng/index.asp>

Korea Research Institute of ships & Ocean Engineering (KRISO)

<http://www.kriso.re.kr/english/index.html>

Korea Oceanographic Data Center(KODC) <http://www.nfrda.re.kr/kodc/>

Korea Government Homepage <http://www.korea.net/>

Korea Ocean Research & Development Institute <http://www.kordi.re.kr> Korea

Research Institute of Ships & Ocean Engineering <http://www.kriso.re.kr> National

Maritime Police Agency <http://www.nmpa.go.kr>

National Fisheries Research and Development Institute

<http://www.nfrda.re.kr/english/main.htm> Korea Maritime Pollution Response Corp

<http://www.kmprc.or.kr> Korea Maritime Institute <http://www.kmi.re.kr> Korea

Oceanographic Data Center

(KODC) <http://www.nfrda.re.kr/kodc/> Ministry of Maritime Affairs & Fisheries

<http://www.momaf.go.kr>

4 References

UNEP (1999) Strategic Action Programme for the South China Sea. Draft Version 3, 24 February 1999 UNEP SCS/SAP Ver. 3

UNEP (2000) Overview on Land-based Pollutant Sources and Activities Effecting the Marine Environment in the East Asian Seas. Regional Seas Reports and Studies 173 http://www.gpa.unep.org/documents/technical/rseas_reports/173-eng.pdf

UNEP (2001) Ecosystem-based Management of Fisheries. Opportunities and challenges for coordination between marine Regional Fishery Bodies and Regional Seas Conventions. UNEP Regional Seas Reports and Studies No.175.

CIA (2004) Central Intelligence Agency. World Fact Book (Accessed 11/06/04) <http://www.cia.gov/cia/publications/factbook/>. (Updated 11/08/04)

GWA (2004) Global International Waters Assessment, GWA Website (last Updated 27/12/2001) <http://www.gwa.net/areas/area50.phtml> (Accessed 05/08/2004)

Kelleher, G., Bleakley, C., and Walls, K (1995) MARINE REGION 18: AUSTRALIA/NEW ZEALAND. A Global Representative System of Marine Protected Areas. Great Barrier Reef Marine Park Authority/The World Bank/The World Conservation Union (IUCN) 1995. A Report to the World Bank Environment Department.

Bleakley, C and Wells, S (1995) MARINE REGION 13: EAST ASIAN SEAS. A Global Representative System of Marine Protected Areas. Great Barrier Reef Marine Park Authority.The World Bank/The World Conservation Union (IUCN) 1995. A Report to the World Bank Environment Department.