Managing ecotourism on coral reefs and underwater pinnacles in the Western Gulf of Thailand

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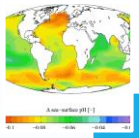
ECOSYSTEM SERVICES OF CORAL REEFS

Provisioning

- Fishing activities and fishery products
- Ornamental resources (fish and invertebrates etc)
- Natural chemicals
- Raw materials for lime and cement production
- Ornaments and coral jewelry for aquarium trade

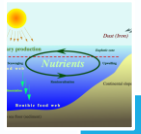


Regulating

- Coastal protection from currents, waves and storms
- Generation of beach and coral sand
- Mangroves and seagrass beds protection
- Maintenance of biodiversity and genetic resources
- Nitrogen fixation
- Carbon sequestration
- Waste assimilation

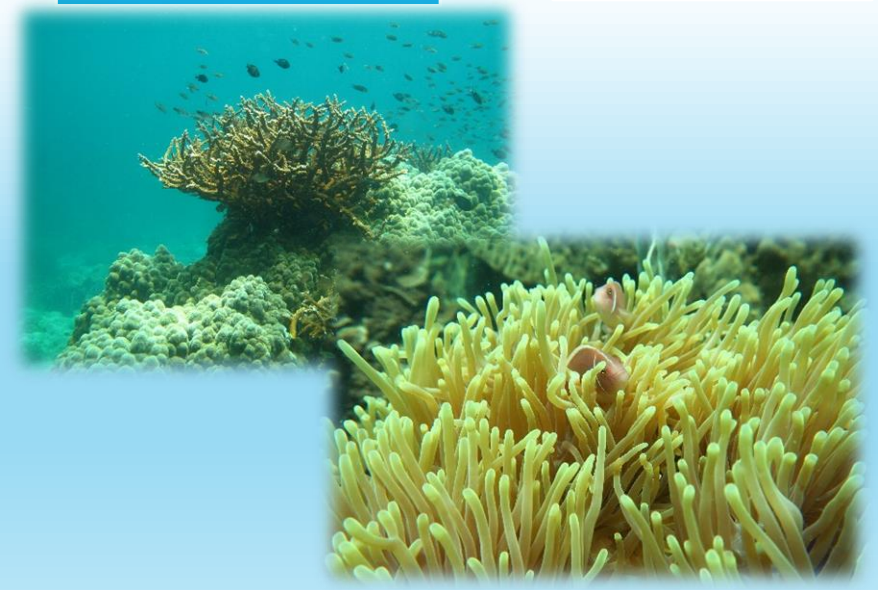
Cultural

- Tourism and recreational activities
- Spiritual and religious value
- Sustaining livelihood of coastal communities



Supporting

- Nutrient Cycling
- Spawning, nursery, breeding and feeding areas
- Primary Production



Millennium Ecosystem Assessment (2005), UNEP-WCMC (2006), EPA (2012)

ECOSYSTEM SERVICES AND BLUE ECONOMY

- Ecosystems and environmental processes

- Provisioning
- Regulating
- Cultural
- Supporting

Modified from Lillebø et al. (2017)

CORAL REEFS IN THAILAND

Three types of coral communities are obviously recognized:

1) coral communities
2) developing fringing reefs
3) early formation of fringing reefs.

About 250 sq. km. of coral reefs was estimated.

About 340 species of hard corals.

(DMCR, 2015)

MAJOR THREATS ON CORAL REEFS IN THAILAND

- Infrastructure development
- Expansion of tourism business
- Unskilled divers
- Lack of awareness of diving operators
- Illegal fishing
- Pollution and Marine debris
- Local communities misunderstanding on marine ecosystem
- Failure of coordination among agencies
- Natural threats e.g. coral reef bleaching, storms, major flooding

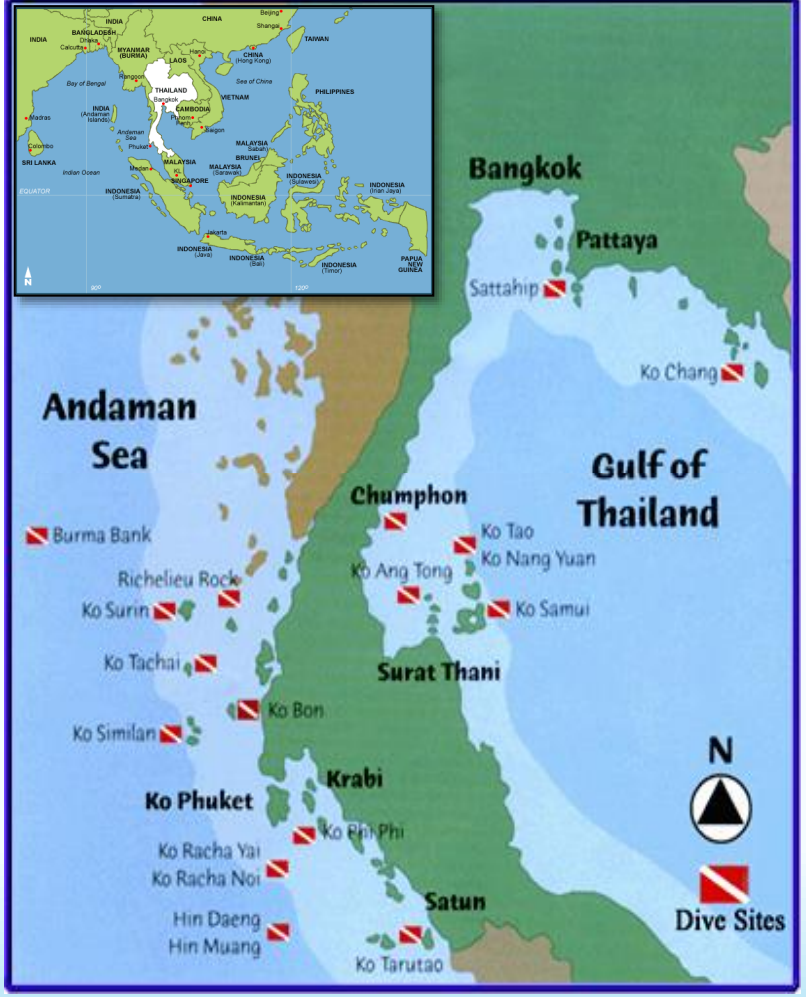
(UNEP, 2006)

Marine tourism in Thailand

The number of tourists in coastal provinces continues to increase.

Most tourists tended to visit the major tourism hotspots such as Ko Phi Phi, Ko Samui, Ko Tao etc increasing pressures on coral reefs in the tourism areas and slowing down natural recovery of deteriorated coral reefs.

Developing more marine tourism sites with proper management may help reduce tourism impacts in the major tourism hotspots.



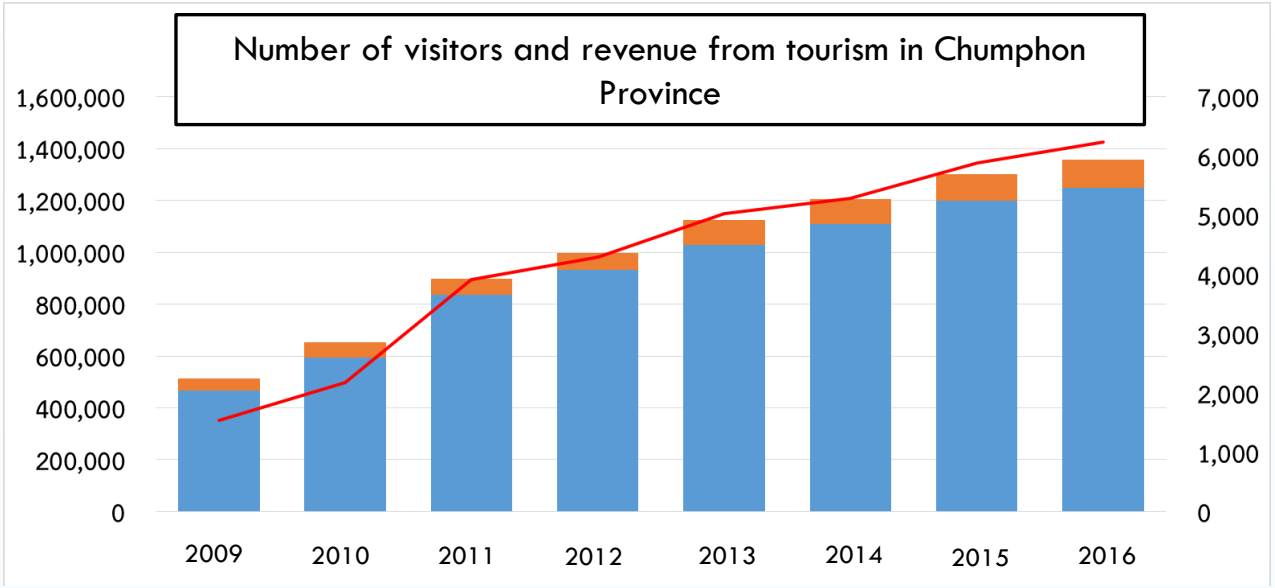
Source of the map: http://www.asiatravel.com

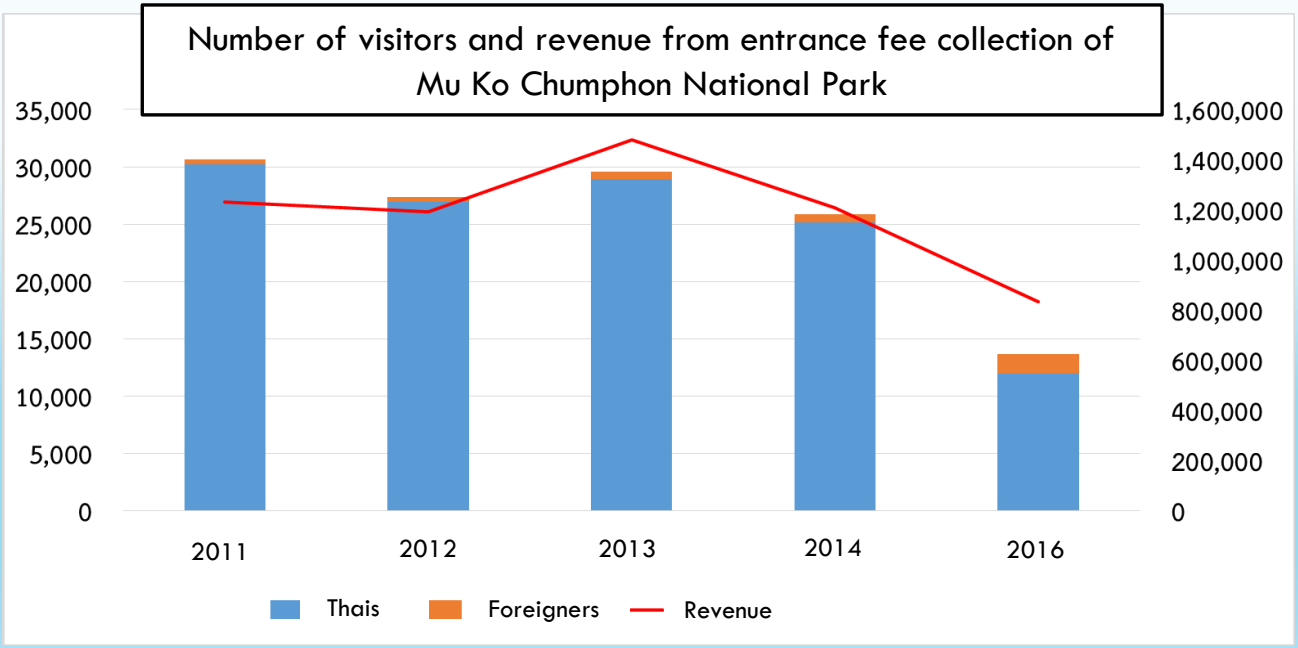
CHUMPHON PROVINCE

- Located in the Western Gulf of Thailand, about 460 km southward of Bangkok.
- There are both terrestrial and marine tourism sites
- Several marine tourism hotspots such as the islands in Mu Ko Chumphon National Park

Source: http://www.sawadee.co.th/chumphon/divesite.html

TOURISM IN CHUMPHON PROVINCE





(Department of Tourism, 2017; Department of National Parks, Wildlife and Plant Conservation, 2018)

CHALLENGES

- Lack of detailed information
- Lack of tourism promotion and marketing
- No tourism identity
- Low tourism preferences

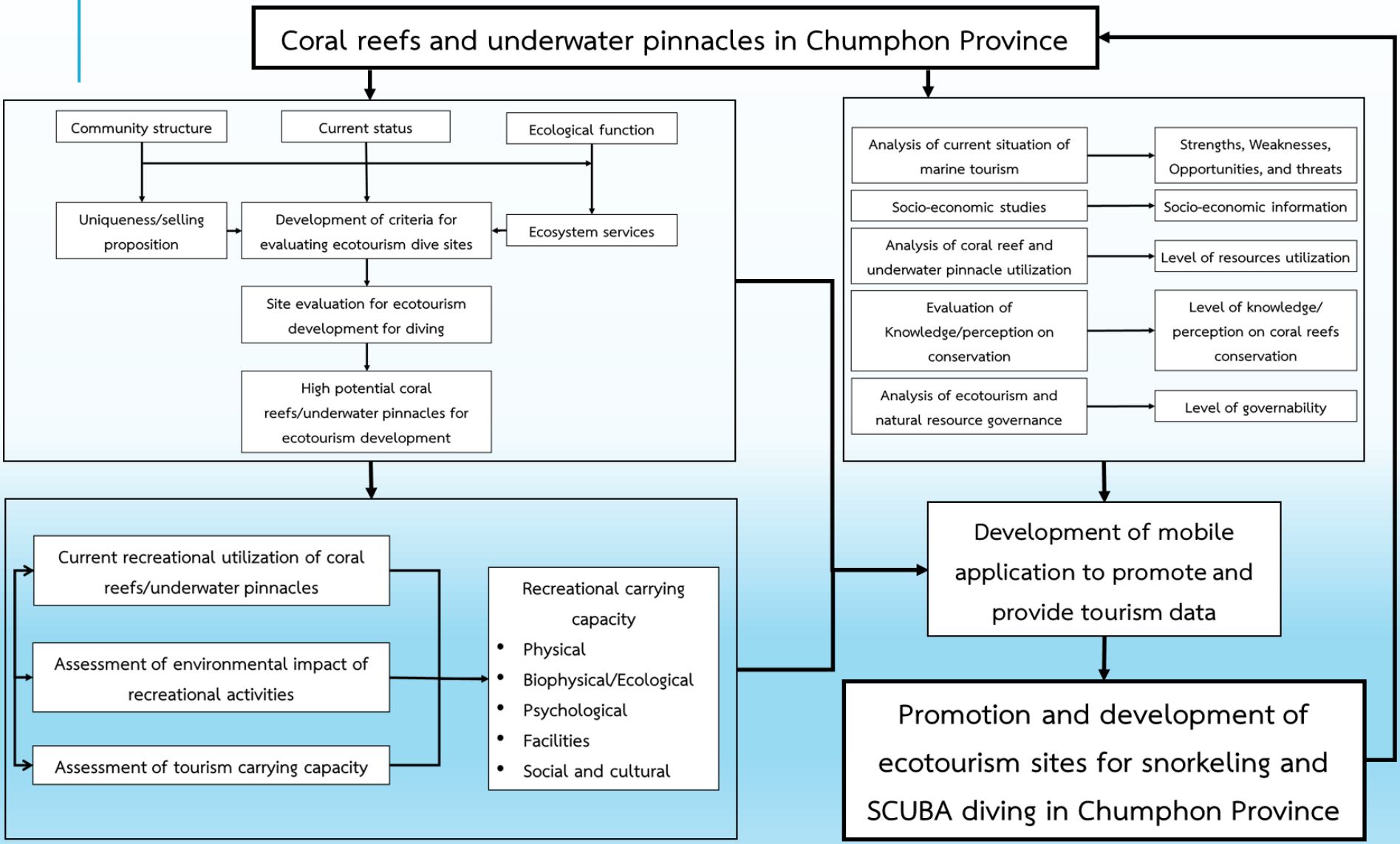
PROJECT ON "*PROMOTION AND DEVELOPMENT OF ECOTOURISM SITES FOR SNORKELING AND SCUBA DIVING IN CHUMPHON PROVINCE*"

- **An ecological study of some important coral reefs and underwater pinnacles in Chumphon Province**
- **Tourism carrying capacity assessment of some important coral reefs and underwater pinnacles in Chumphon Province**
- **A study on the situation of marine tourisms and socio-economic condition in Chumphon Province**

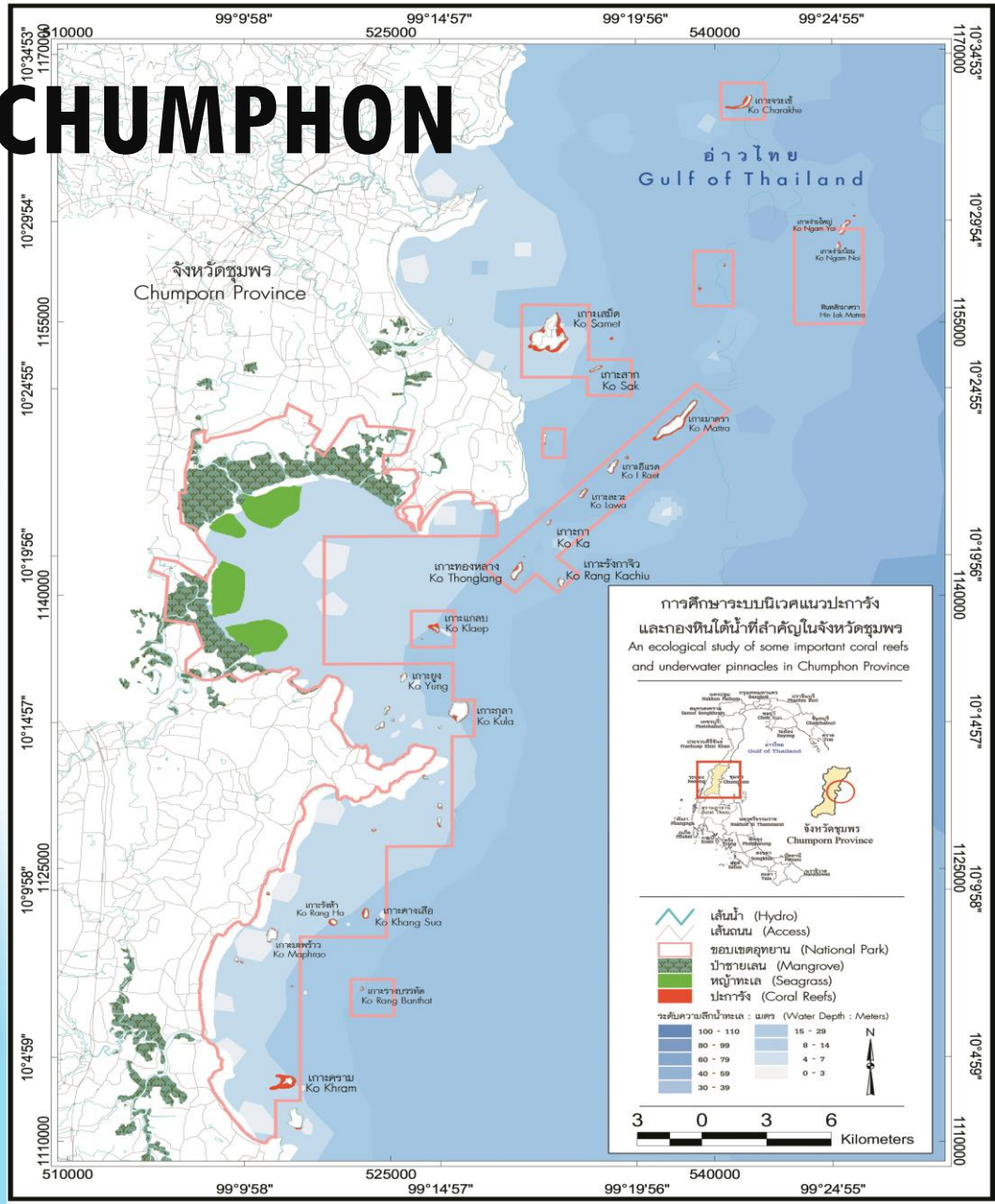
Supported by Thailand Research Fund (TRF)

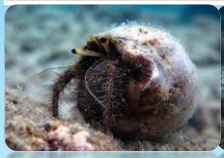
Collaborating organizations: Department of National Park, Wildlife and Plant Conservation, Universities, Marine Science Association of Thailand, Local authorities, local communities, Tourism operators etc.

CONCEPTUAL FRAMEWORK



CORAL REEFS IN CHUMPHON

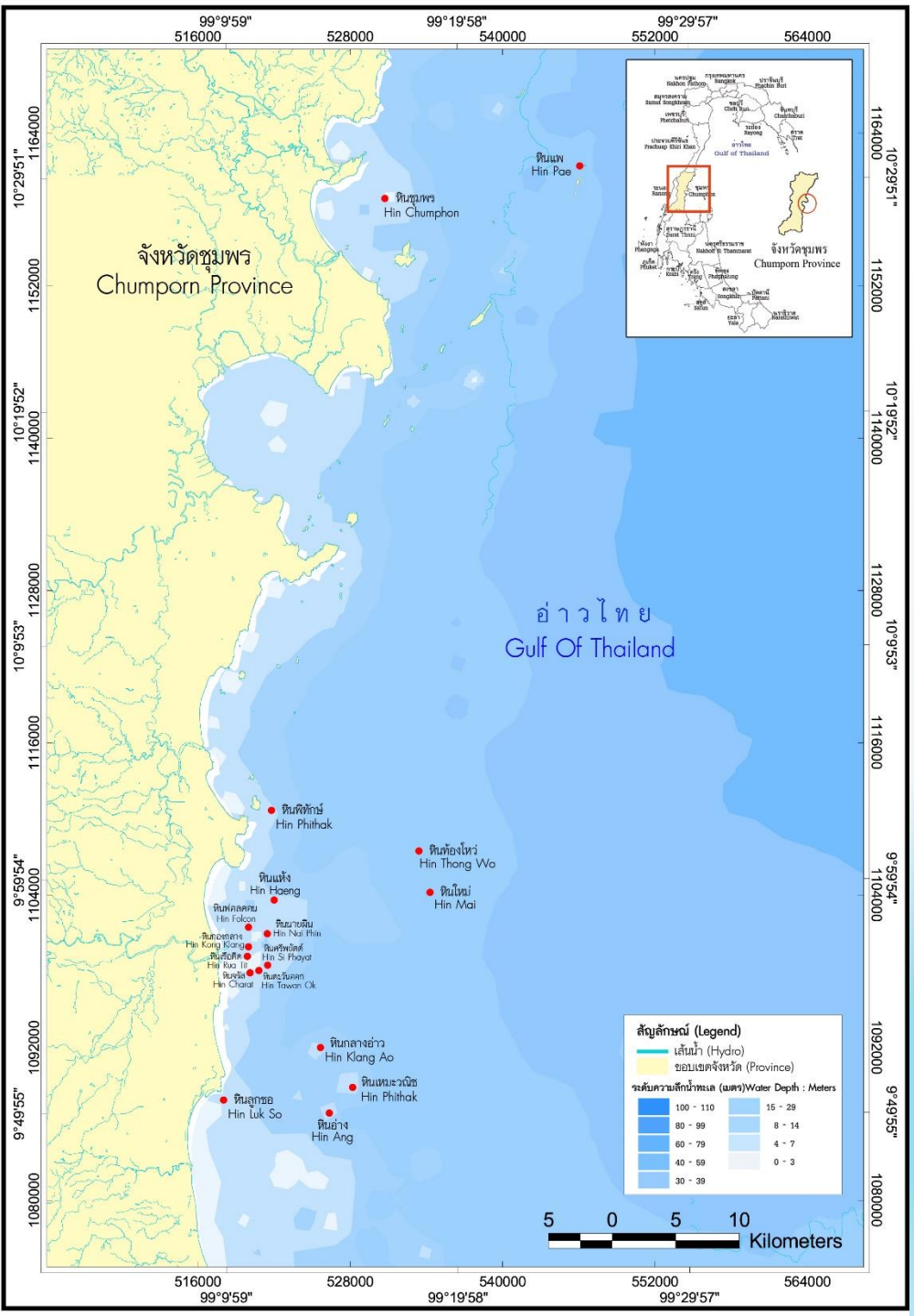




CAN UNDERWATER PINNACLES BE USED AS DIVE SITES?

- Underwater pinnacle in the tropical region is one of important marine habitats that provide similar functions and services as coral reefs.
- In Thailand, many underwater pinnacles are found in the Gulf of Thailand.
- However, many underwater pinnacles have not yet discovered.
- Some of them could be potentially developed as dive sites.

LOCATION OF SOME UNDERWATER PINNACLES IN CHUMPHON PROVINCE



Factors and criteria for assessing the potential of ecotourism development at some coral reefs and underwater pinnacles in Chumphon Province

	Factors	Score (Ri)					Wi
		1	2	3	4	5	
Physical factors	Depth (suitable for diving) (m)	<1 .5	1 .5- 2	2 - 2.5	2.5 - 3	>3	0.1
	slope (degrees)	> 40	31 - 40	21 - 30	10 - 20	< 10	0.005
	Topographic complexity	Very Low	Below Average	Average	Above Average	Very High	0.005
	Sand cover (%)	>90	61 – 90	31 – 60	10 – 30	<10	0.005
	Rock cover (%)	>90	61 – 90	31 – 60	10 – 30	<10	0.005
	Topographic uniqueness	Rare	Scarce	Common	Abundant	Dominant	0.025
	Transparency of seawater (m)	<1	1 - 2	2 - 3	3 - 4	>4	0.1
	Water temperature (ºC)	<20	20.0- 22.5	22.6 - 25.0	25.1 - 28.0	28.1 – 30.0	0.005
	Current (m/s)	> 2.5	2.1 - 2.5	1.6 - 2.0	1 - 1.5	<1	0.01
	Wave height (m)	>1.5	1 - 1.5	0.5 - 1	0 - 0.5	0	0.005
	Distance from shoreline (km)	> 10	8 - 10	6 - 8	3 - 5	< 3	0.01
	Site accessibility	Difficult	Somewhat difficult	Normal	Somewhat easy	Easy	0.025

Factors and criteria for assessing the potential of ecotourism development at some coral reefs and underwater pinnacles in Chumphon Province (cont.)

	Factors	Score (Ri)					Wi
		1	2	3	4	5	
Biological factors	**Hard corals**						
	Live coral cover (%)	<5	6–25	25–50	50–75	>75	0.025
	Acropora spp. (%)	<5	6-10	11–15	16 –20	>20	0.02
	Pavona spp. (%)	<5	6-10	11–15	16 –20	>20	0.005
	Plerogyra sinuosa (%)	<5	6-10	11–15	16 –20	>20	0.02
	Platygyra spp. (%)	<5	6-10	11–15	16 –20	>20	0.005
	Pocillopora spp. (%)	<5	6-10	11–15	16 –20	>20	0.005
	Symphylia spp. (%)	<5	6-10	11–15	16 –20	>20	0.005
	Fungia spp. (%)	<5	6-10	11–15	16 –20	>20	0.005
	Goniopora spp. (%)	<5	6-10	11–15	16 –20	>20	0.02
	Soft corals and macroinvertebrates						
	Soft corals (%)	<5	6 –25	25 –50	50 –75	>75	0.02
	Mushroom anemones (%)	<5	6 –25	25 –50	50 –75	>75	0.005
	black corals (colonies/ 10 m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.005
	Gorgonian (colonies/ 10 m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.02
	Sea whips (colonies/ 10 m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.02
	Feather stars (ind./10 m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.005
	Sponges (colonies/ 10 m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.025
	Nudibranch (ind./m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.02
	Christmas trees (ind./m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.02
	Giant clams (ind./m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.02
	sea stars (ind./m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.02
	sea anemones (ind./m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.02
	Sea cucumbers (ind./m^2)	<1	1.0 - 2.0	2.1 - 3.0	3.1 - 4	>4	0.005

Factors and criteria for assessing the potential of ecotourism development at some coral reefs and underwater pinnacles in Chumphon Province (cont.)

	Factors	Score (Ri)					Wi
		1	2	3	4	5	
Biological factors	**Reef fishes**						
	butterfly fish (ind./100 m^2)	1.0 - 5.0	6 -10	11-15	16-20	>20	0.02
	parrot fish (ind./100 m^2)	1.0 - 5.0	6 -10	11-15	16-20	>20	0.015
	Anemone fish (ind./100 m^2)	1.0 - 5.0	6 -10	11-15	16-20	>20	0.02
	Indo-Pacific sergeant (ind./100 m^2)	<10	10 -20	21-30	31-40	>40	0.015
	blue spotted stingray (ind./100 m^2)	1.0	2	3	4	>4	0.025
	Stone fish (ind./100 m^2)	1.0	2	3	4	>4	0.01
	groupers (ind./100 m2)	1.0 - 5.0	6 -10	11-15	16-20	>20	0.005
	Snappers (ind./100 m2)	1.0 - 5.0	6 -10	11-15	16-20	>20	0.005
	Scorpion fish (ind./100 m2)	1.0	2	3	4	>4	0.025
	Angle fish (ind./100 m2)	1.0 - 5.0	6 -10	11-15	16-20	>20	0.025
	Moorish Idol (ind./100 m2)	1.0 - 5.0	6 -10	11-15	16-20	>20	0.025
	Barracudas (ind./100 m2)	1.0 - 5.0	6 -10	11-15	16-20	>20	0.015
	Rabbit fishes (ind./100 m2)	1.0 - 5.0	6 -10	11-15	16-20	>20	0.005
	Seahorse (ind./100 m2)	1	2	3	4	>4	0.025
	Occurrences of other marine species						
	Sea turtle (time/year)	1	2	3	4	>4	0.05
	Whale and whale shark (time/year)	1	2	3	4	>4	0.05
	Dolphin (time/year)	1	2	3	4	>4	0.05

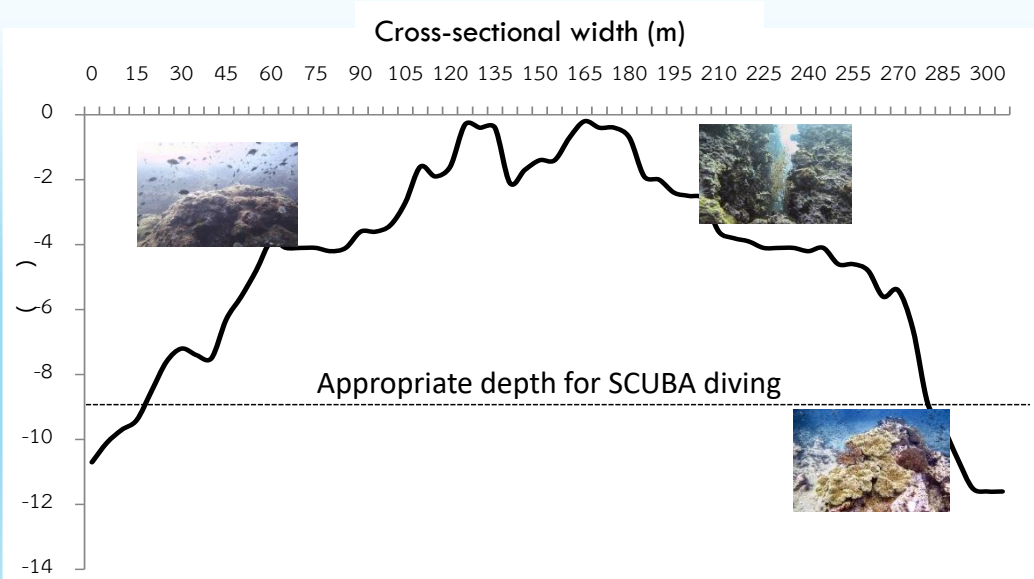
Levels of potential for ecotourism development of some coral reefs and underwater pinnacles in Chumphon Province

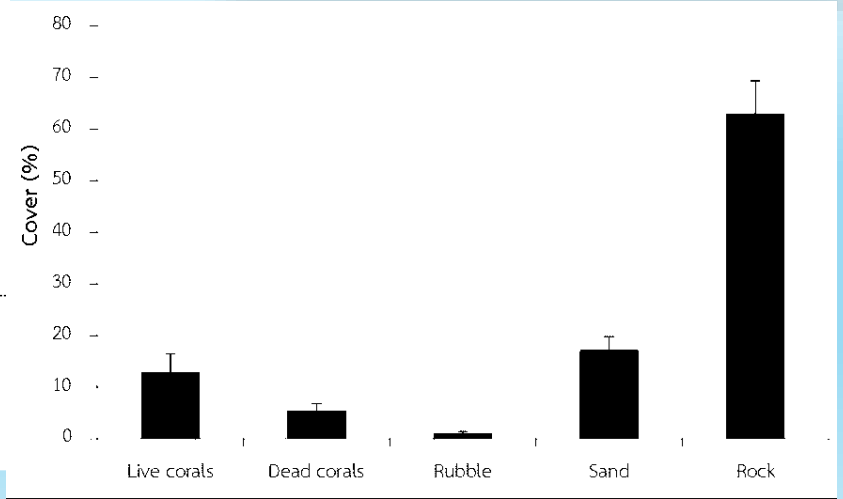
Levels of potential for ecotourism development (total score)			
High (4 sites)	**Medium (11 sites)**	**Low (21 sites)**	
Ko Ngam Noi (4.11)	Ko Kula (3.41)	Ko Maphrao (2.27)	Ko Bart (1.94)
	Ko Rang Kachiu (3.35)	Ko I Raet (2.16)	Ko Lok (1.92)
Ko Lak Ngam (4.08)			
Ko Thalu (3.71)	Ko Kalok (3.02)	Ko Sak (2.13)	Ko Maeo (1.9)
Hin Pae (3.69)	Ko Ngam Yai (2.95)	Ko Klaep (2.1)	Ko Yung (1.87)
	Hin Mai (2.85)	Hin Kong Klang (2.08)	Hin Hemawanit (1.81)
	Hin Klang Ao (2.84)	Ko Hua Krachong (2.06)	Ko Ka (1.79)
	Ko Thonglang (2.83)	Hin Si Phayat (2.03)	Hin Chumphon (1.73)
	Ko Lawa (2.53)	Hin Charat (2.01)	Hin Folcon (1.72)
	Ko Mattra (2.47)	Ko Nu (1.97)	Hin Nai Phin (1.69)
	Hin Haeng (2.4)	Hin Tawan Ok (1.97)	Hin Rua Tit (1.56)
	Ko Chorakhe (2.36)	Ko Samet (1.95)	

THE UNDERWATER PINNACLE ‘HIN PHAE’

General characteristics

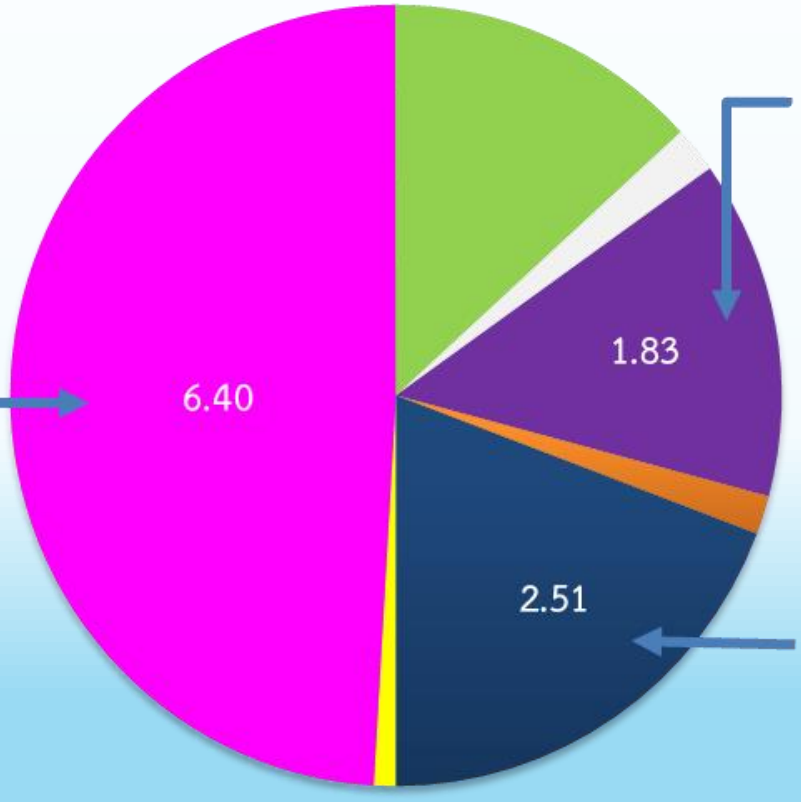
- Distance from the coast: 20 km.
- Cross-sectional width: 300 m.
- Depth: 0.2 – 12 m.
- Most area is characterized by rock (65%)
- Live coral cover: 13%
- Dead coral cover: 2%





COMPOSITION OF CORAL COMMUNITY AT HIN PHAE

Galaxea fascicularis



Symphyllia radians

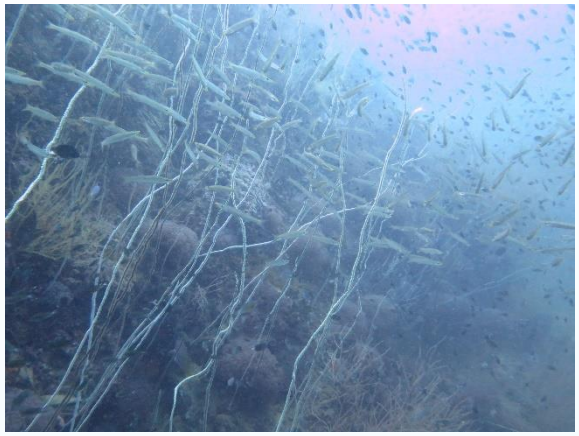
Porites lutea

Montipora *Galaxea* *Pavona* *Fungia* *Symphyllia* *Favia* *Potites*

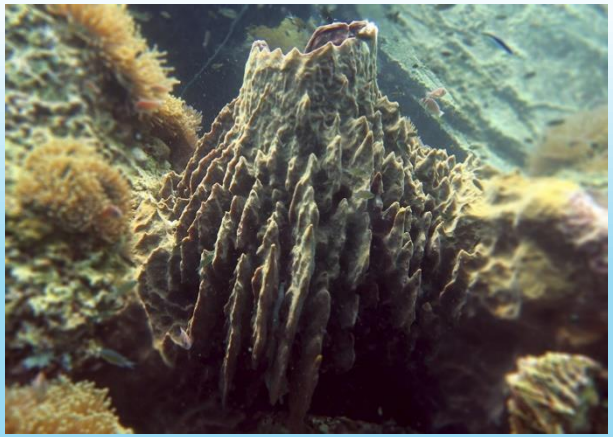
SOME OTHER BENTHIC ORGANISMS FOUND AT HIN PHAE

Soft corals
(*Sarcophyton sp.*)

Sea anemone
(*Heteractis magnifica*)



Sea whip
(*Viminella* sp.)



Sponge
(*Xestospongia testudinaria*)

Giant clam
(*Tridacna squamosa*)

REEF FISH AND OTHER ORGANISMS FOUND AT HIN PHAE

Copperband butterflyfish
(*Chelmon rostratus*)

Bluespotted ribbontail ray
(*Taeniura lymma*)

Moorish idol
(*Zanclus cornutus*)

Anemonefish
(*Amphiprion perideraion*)

Hawksbill sea turtle
(*Erethmochelys imbricate*)

Whale shark
(*Rhincodon typus*)

BRYDE'S WHALE FOUND IN MU KO CHUMPHON NATIONAL PARK DURING FIELD SURVEYS

Carrying capacity concept

- Carrying capacity concept is recognized as a useful tool for tourism management, especially in providing limits of the interaction of tourist activities and the environment.
- It can support the preservation of the high quality and quantity of coastal resources while meeting the present needs as well as sustaining long-term socio-economic benefits and ecological values for future generations.

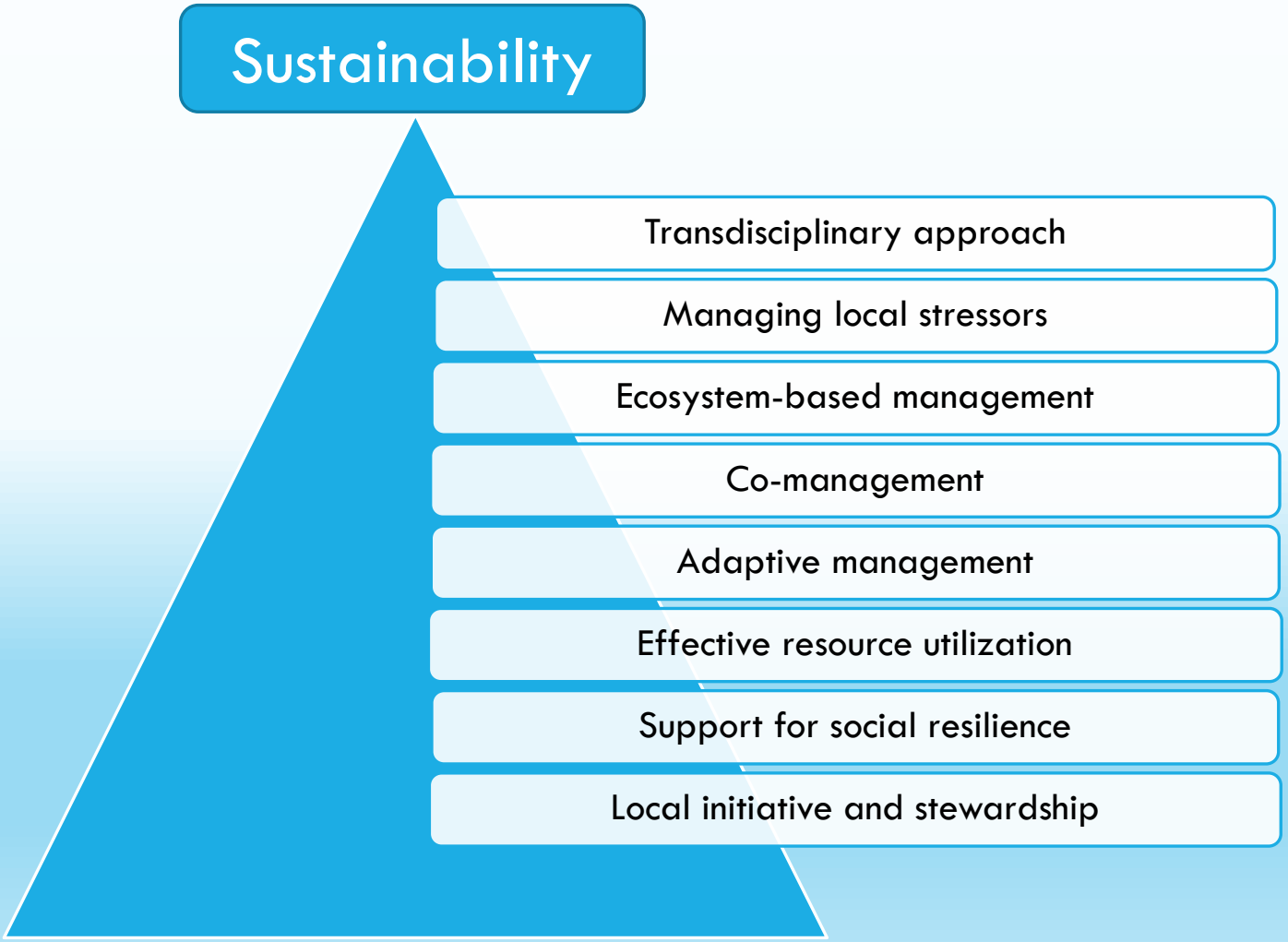
Carrying capacity as a planning and management tool

The concept was used as a management tool to generate guidelines for managing visitors in protected areas and national parks consisting of five categories:

1. **Physical Carrying Capacity**
2. **Ecological Carrying Capacity**
3. **Psychological Carrying Capacity**
4. **Facility Carrying Capacity**
5. **Social and Cultural Carrying Capacity**

MANAGEMENT ASPECTS

Our main aim of this project is to develop ecotourism site for diving activity with proper management to achieve the sustainability of coral reef ecosystem and society. The management regime covers:



TOURISM DEVELOPMENT STRATEGY

Ecotourism

- Minimising impact.
- Building environmental and cultural awareness and respect.
- Providing positive experiences for both visitors and hosts.
- Providing direct financial benefits for conservation.
- Providing financial benefits and empowerment for local people.

(The International Ecotourism Society, 1990)

Marketing/promotion

- Developing a 'brand' for ecotourism site
- Programming ecotourism and related activities
- Building business partnership/alliance
- Developing internet-based marketing through various media.

Local participation

- Managing conflicts between conservation and ecotourism
- Involving local people in planning and decision making processes.
- Building up local capacity
- Producing local tour guide

SUMMARY

- Chumphon Province is one of the provinces that has coral reefs and underwater pinnacles to be potentially developed and promoted as ecotourism sites.
- Besides tourism, the coral reefs or underwater pinnacles can be reserved for fisheries resources, or other proposes depending on their suitability.
- Having more dive sites may help reduce pressures and support natural recovery in major dive sites.
- Proper ecotourism management tools and regulations should be established prior to developing and promoting the dive site.
- Enhancing local participation and co-management for managing the effective use of coral reefs and the underwater pinnacles is needed.

THANK YOU

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