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The 5<sup>th</sup> International Symposium on Conservation and Management of Tropical Lakes

“Insights and Challenges toward Achieving SDGs”



**AUN/SEED-Net**



Japan Science and  
Technology Agency

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## **Paradox of over-tourism, income opportunities and coral degradation: A case of Maya bay, Thailand**

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### **Abstract**

Tourism plays an important role in the economic development of the country. Tourism contributes to as much as 7% of Thailand national GDP. Pristine beaches in Thailand attracts millions of tourists every year. On one hand, local economy is boosted with tourism. Contrary to that, over-tourism may lead to stress on the local environment. One of the classical examples of impact of over tourism on the environment is the degradation of pristine beach and coral communities in the Maya bay, Phi Phi Leh, southern Thailand. This paper, aims to analyze the paradox of over-tourism, income opportunities and the impact on coral community in Maya bay, based on the literatures. Ever since, Maya bay was known to the world in early 2000's, the number of tourists visiting there every day increased by close to 3000-fold in the last 20 years. Though, tourism helped to increase the local economy dramatically, later, due to impact of probably over exploitation of corals from snorkeling and diving, and wash-off of the toxic UV-filters led to bleaching of the corals. Most of the corals were dead in 20 years of tourism exploitation by 2017. Government of Thailand came up with the strategy to ban Maya bay as a tourist hotspot, and promoted coral recovery. Because of the solid policy, and action plan of the multiple stakeholders, in the last three years, corals has been significantly recovered. This paper discusses about the strength, weakness, challenges, opportunities and threat of the action plan in restoring coral community in Maya bay.

**Keywords:** *Maya bay, UV-filters, coral planting, bleaching, over-tourism, stakeholder management*

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# Paradox of over-tourism, income opportunities and coral degradation: A case of Maya bay, Thailand

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**Feb 5, 2021, Day 2- Session 2- Environment 10:40-10:55 CST**



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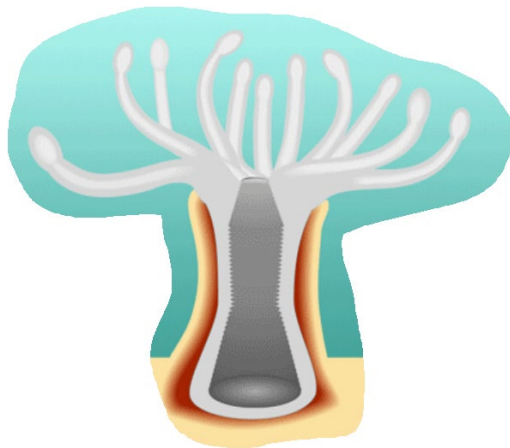
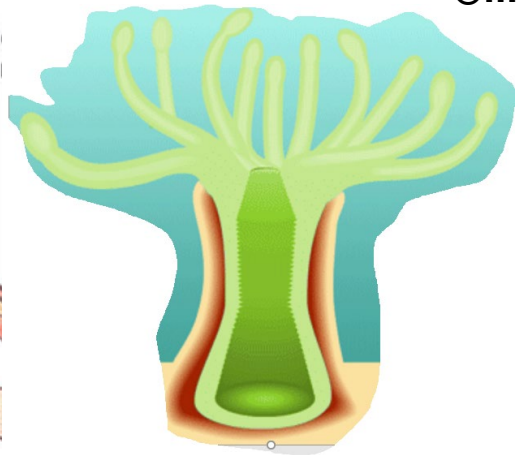
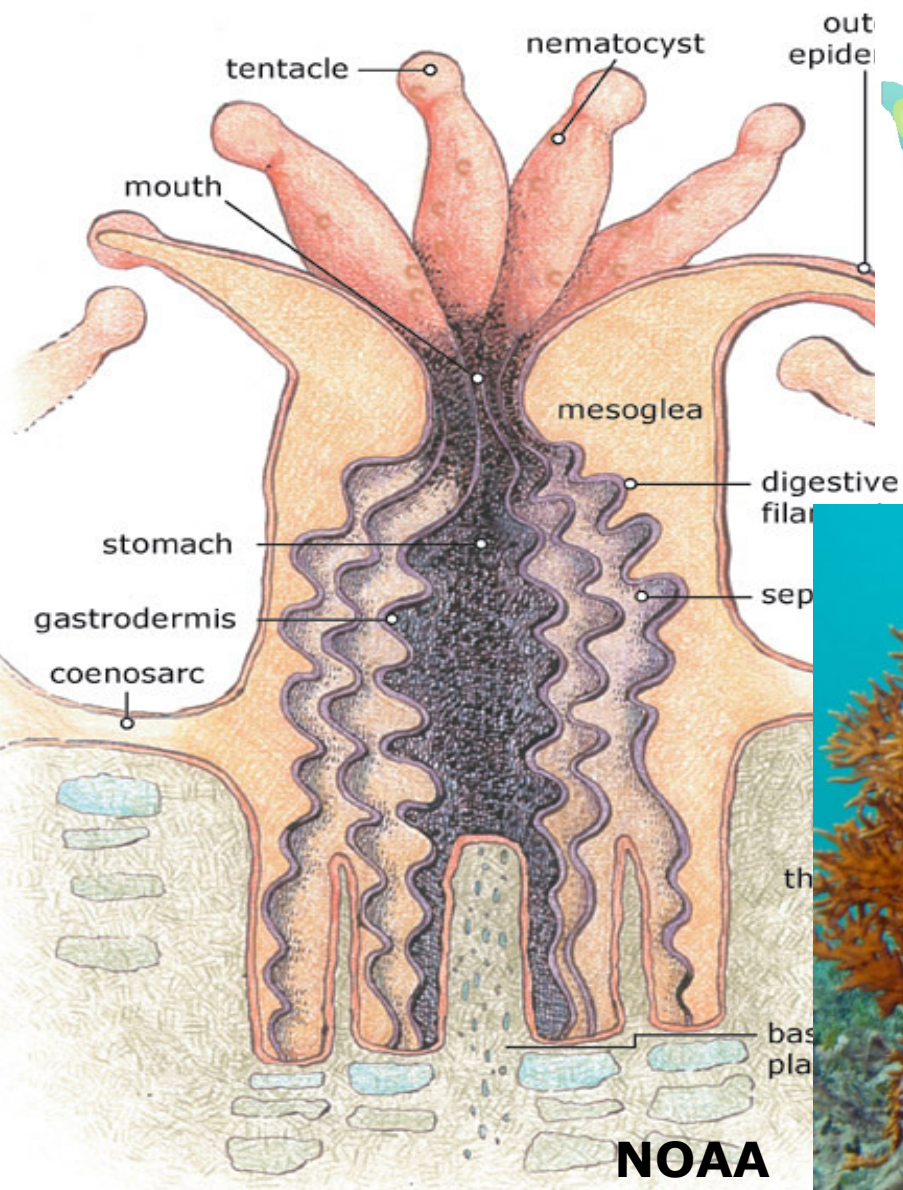


# Tourism



# What are Corals?

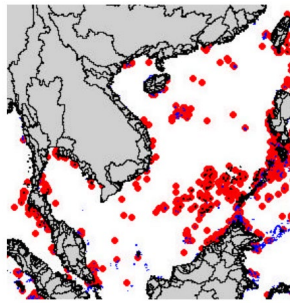
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Gizmodo

Coral polyps (1 – 3 mm)

# Coral Reef in Southeast Asia



## Facts

- 100,000 sq km (34%)
- 600/800 corals
- USD ~10 billion / annum

*Tourism 55% ~ 35 Mil people*  
*8000 business ~ 3 Mil local*

## Risks

- 88% vulnerable
- ~ 95% threatened
- Climate change
- Marine exploitation
- Acidification, Chemicals

# Reefs at Risk

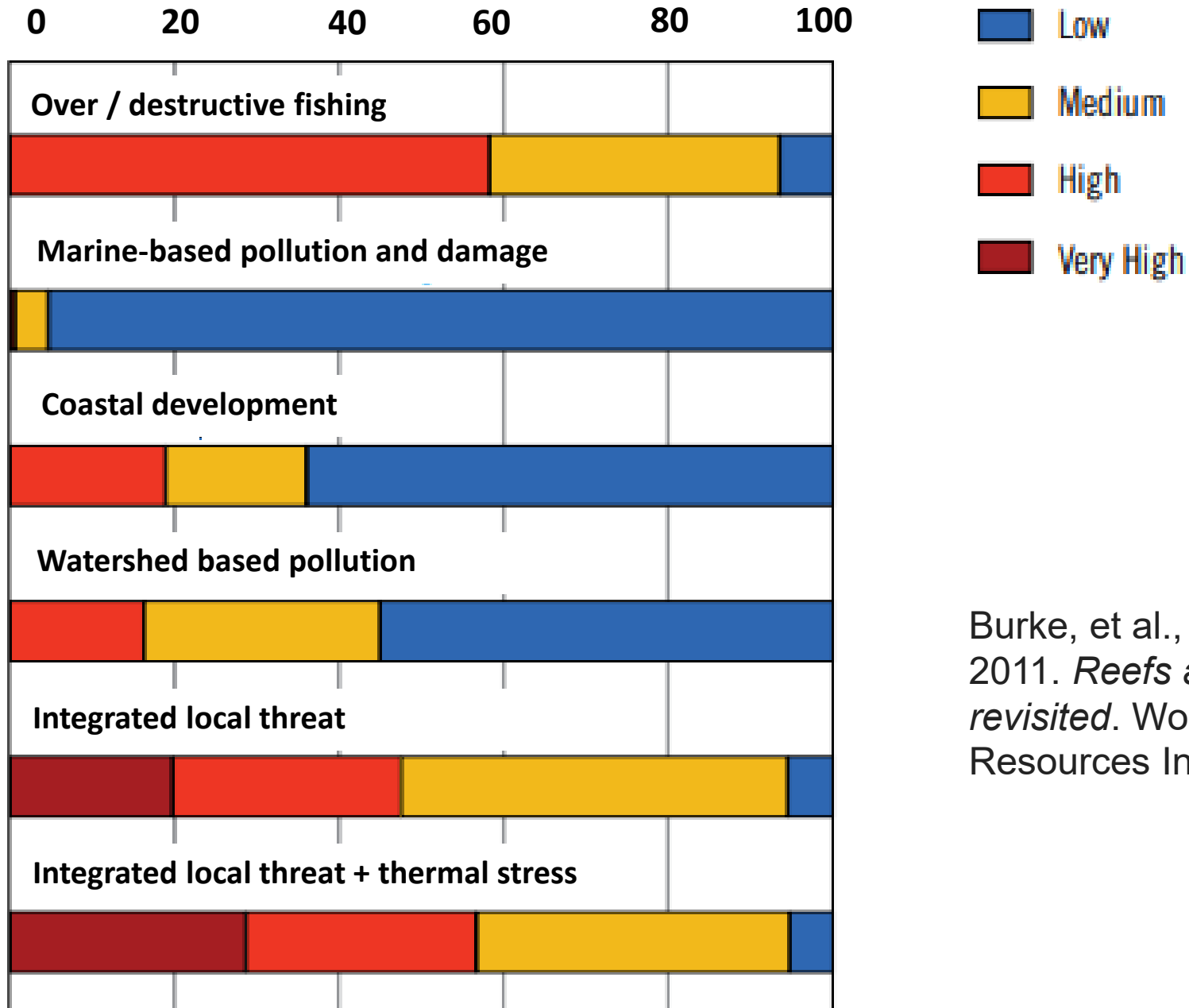
Burke, Laretta, Liz Selig, and Mark Spalding (2002)

## in Southeast Asia

**Globally 75% of coral reefs threatened (2020) –  
 Business as usual - 90% by 2030 and close to > 95% by 2050  
 ~ 30% increment in threatened coral in the past 10 years**



# Coral threats in SeAsia



Burke, et al.,  
2011. *Reefs at risk  
revisited*. World  
Resources Institute.

# Economic impact of marine pollution

a rapid-emission-reduction pathway, whereby temperatures are estimated to reach 2.2°C above pre-industrial levels by 2100 RCP2.6



a business-as-usual pathway that sees temperatures rising 4.0°C by 2100 RCP6



**Figure 1 VALUATION OF SELECTED CLIMATE IMPACTS ON OCEAN (Billions of 2010 US\$)**

	Low climate impacts		High climate impacts		Difference	
	2050	2100	2050	2100	2050	2100
Fisheries	67.5	262.1	88.4	343.3	20.9	81.2
Sea-level rise	10.3	34.0	111.6	367.2	101.3	333.2
Storms	0.6	14.5	7.0	171.9	6.4	157.4
Tourism	27.3	301.6	58.3	639.4	31.1	337.7
Ocean carbon sink	0.0	0.0	162.8	457.8	162.8	457.8
<b>Total</b>	<b>105.7</b>	<b>612.2</b>	<b>428.1</b>	<b>1,979.6</b>	<b>322.5</b>	<b>1,367.4</b>
<i>Percent of GDP</i>	<i>0.06%</i>	<i>0.11%</i>	<i>0.25%</i>	<i>0.37%</i>	<i>0.18%</i>	<i>0.25%</i>

## Valuing the Ocean Environment Economic perspectives

Frank Ackerman  
Elizabeth A. Stanton



# Coral Threats in SeAsia

<b>Country</b>	<b>Major Threats</b>
Cambodia	Over fishing, blast fishing, poison fishing.
Indonesia	Over fishing, blast fishing, sand mining.
Malaysia	Over fishing, blast fishing, poison fishing, trawling.
Philippines	Over fishing, blast fishing, poison fishing, siltation.
Thailand	Over fishing, coastal tourism, siltation
Vietnam	Over fishing, poison fishing. <b>UNEP 2004</b>

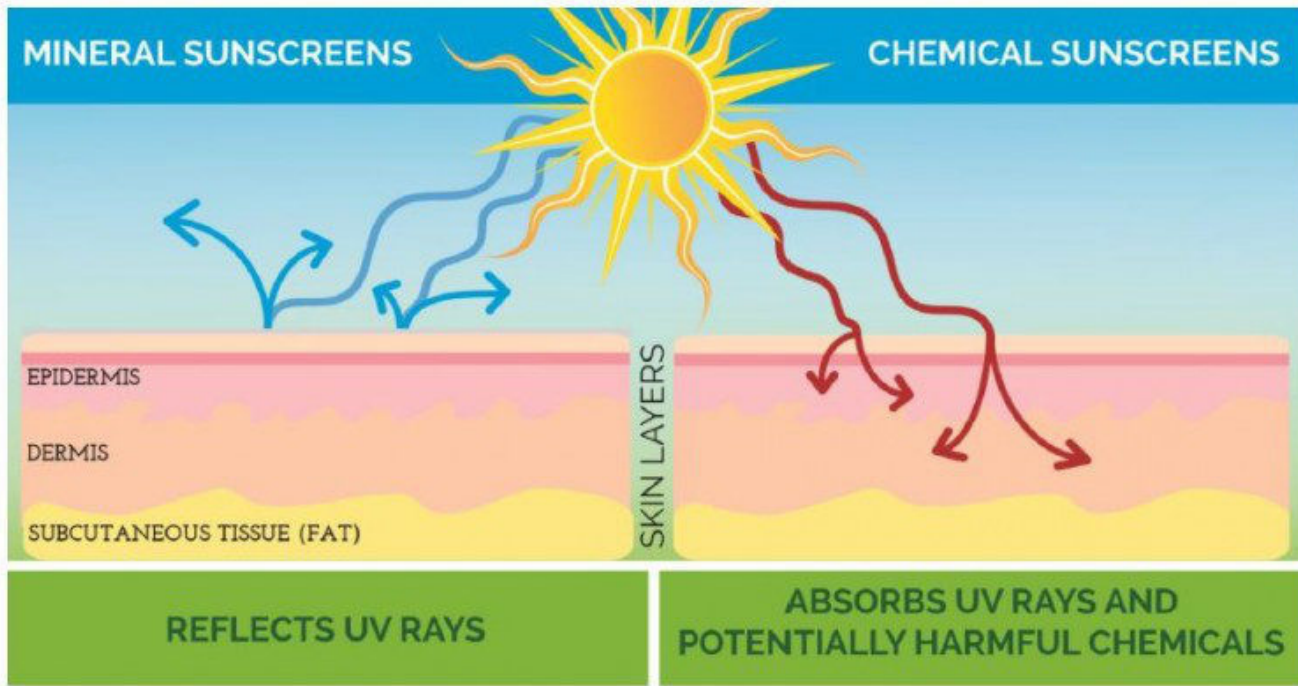


# Tourism



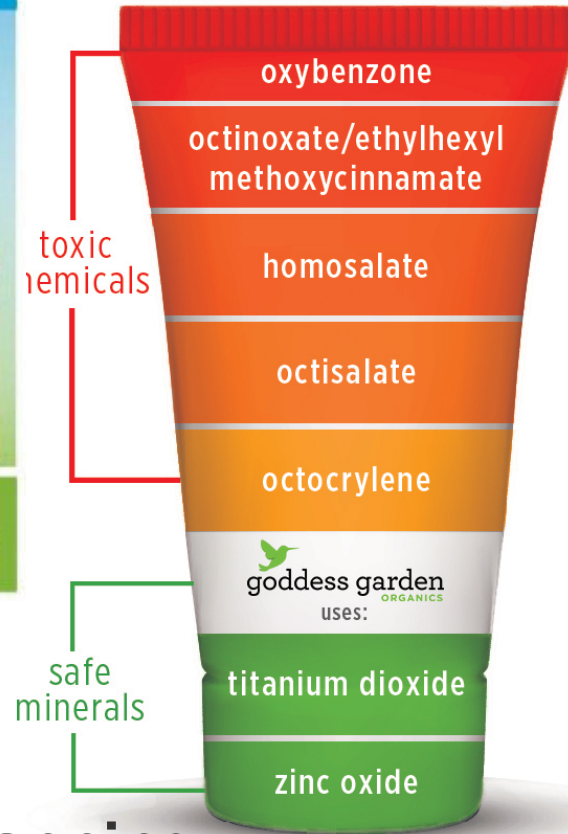
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# UV-filters



## SUNSCREEN TOXICITY RATINGS\*

\*from EWG.org/SkinDeep




**Oxybenzone and octinoxate - banned / planning**

**Republic of Palau, Bonaire island, Hawaii and Mexico**



## Sunscreen bans: Coral reefs and skin cancer

Robert B. Raffa PhD , Joseph V. Pergolizzi Jr. MD, Robert Taylor Jr. PhD, Jan M. Kitzen RPh, PhD, for the NEMA Research Group

### Oxybenzone

**LC50 = 139 – 779 mg/L at 24 h *Stylophora pistillata***

Downs et al., 2016. *Arch Environ Contam Toxicol.* **70**(2):265-288

**Bleaching in *Zooxanthella* (as low as 10  $\mu$ L/L) and temperature-related (greater at 30°C vs 28°C) bleaching.**

Danovaro et al., 2008. *Environ Health Perspect.* **116**(4):441-447

**The concentrations of oxybenzone are said to be 0.8-19.2  $\mu$ g/L at Hawaiian sites and 75-1400  $\mu$ g/L in the US Virgin Islands.**

# Tourism

## Maya bay, Thailand

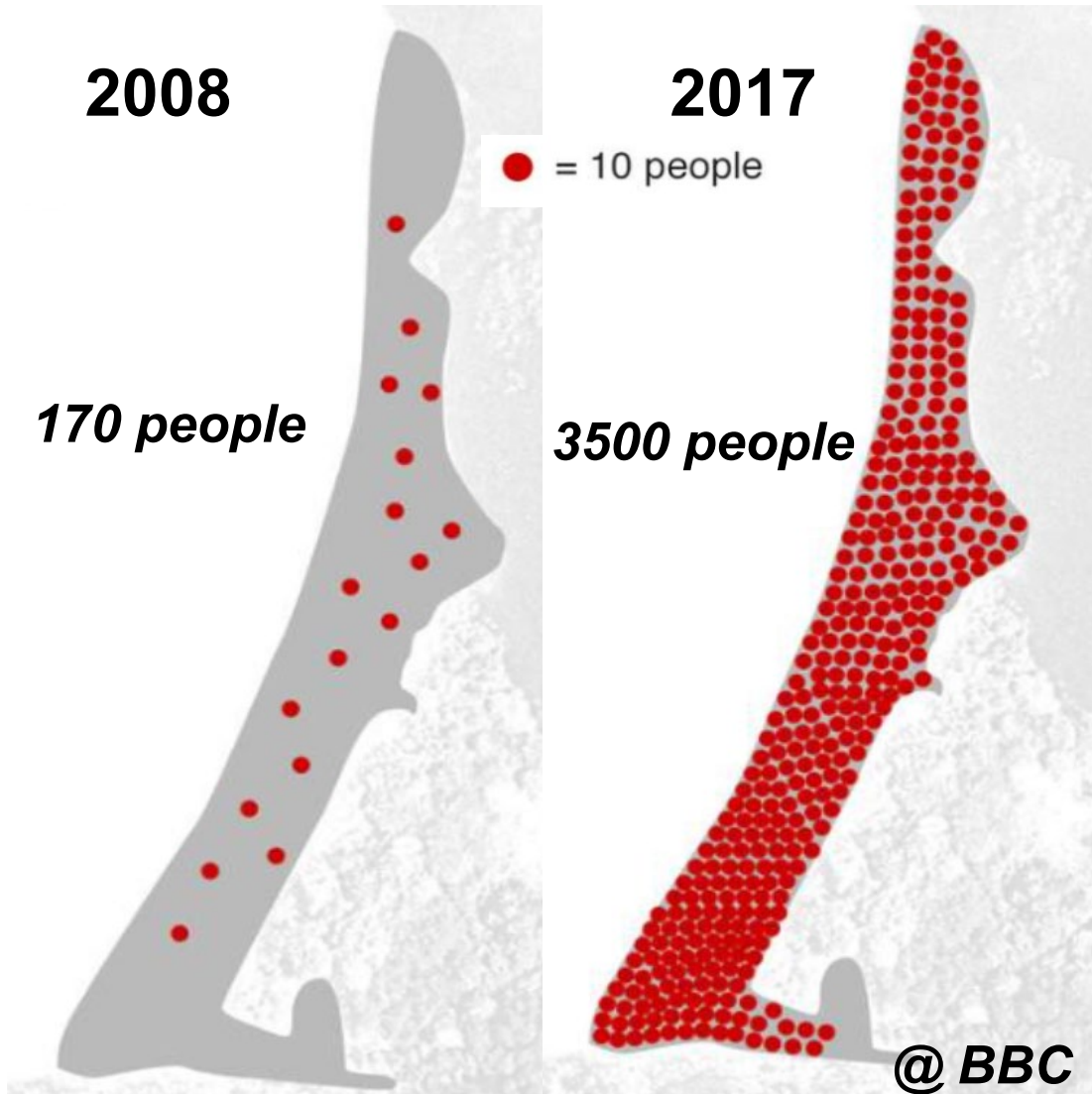
2008

2017

● = 10 people

170 people

3500 people



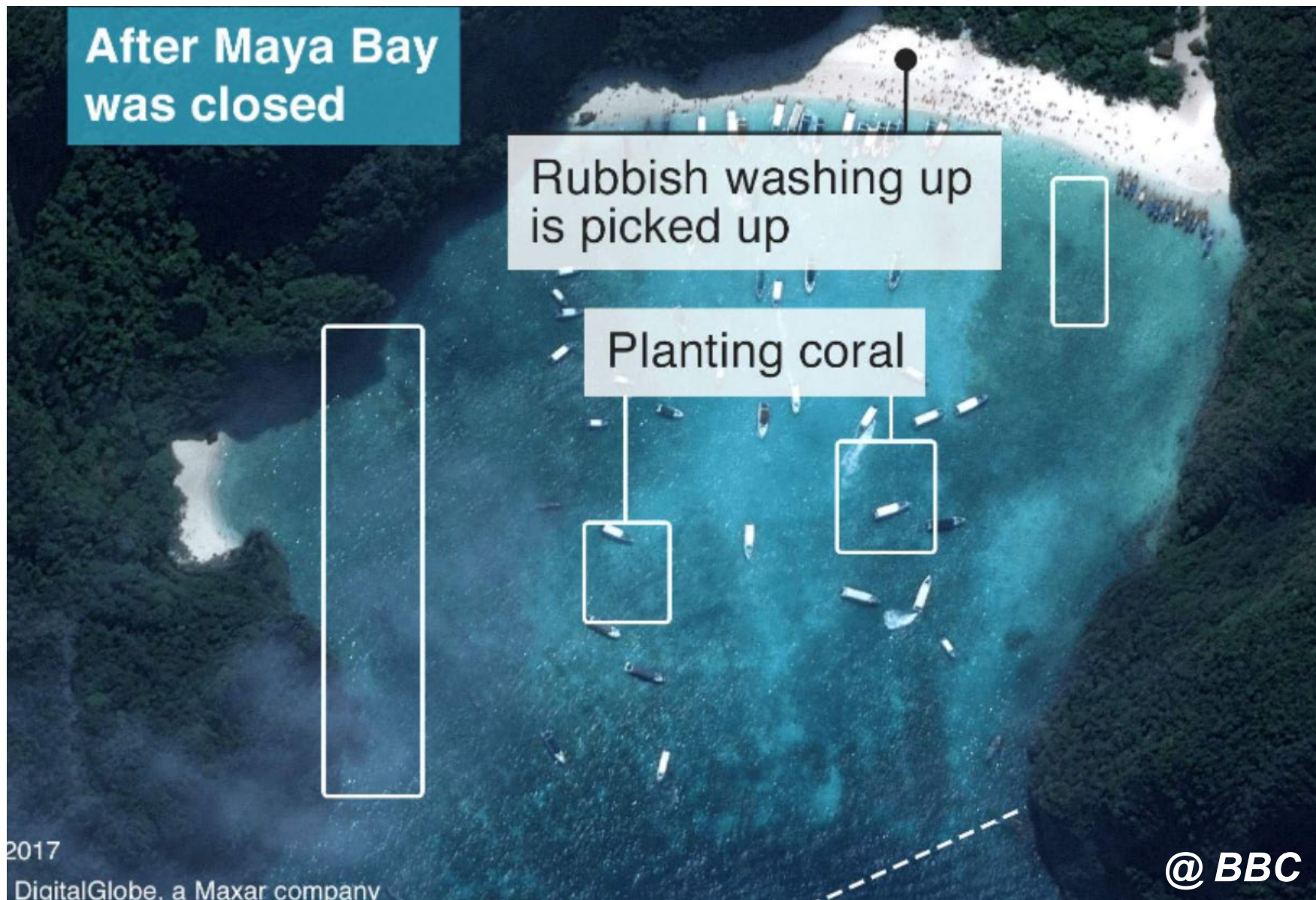
# Maya bay Restoration strategy

Before Maya Bay was closed

Rubbish (straws, plastic bags, cans, etc)

Dead coral

# Maya bay Restoration strategy



# Maya bay Restoration strategy

After Maya Bay was closed

Coral nursery

Coral recovering naturally

Demarcation Line

# Maya bay Restoration strategy

ทีมวิจัยการฟื้นฟูอ่าวมาหยา  
กรมอุทยาน & ม. เกษตรศาสตร์

Blacktip reef sharks can now be spotted at Maya Bay



Thailand  
Coral Reef Restoration Plan

- Reduce threats from
- Strategy 1: Tourism
- Strategy 2: Water pollution
- Strategy 3: Sedimentation
- Strategy 4: Fisheries



@BBC

The coral has begun recovering



# Responsible diving



Avoid excessive use of flash photography



Avoid taking photos in rough conditions; this can lead to reef damage



Photograph marine animals in their natural habitat - don't relocate



Maintain diving skill level and training



Consider all marine life including the subject and its habitat

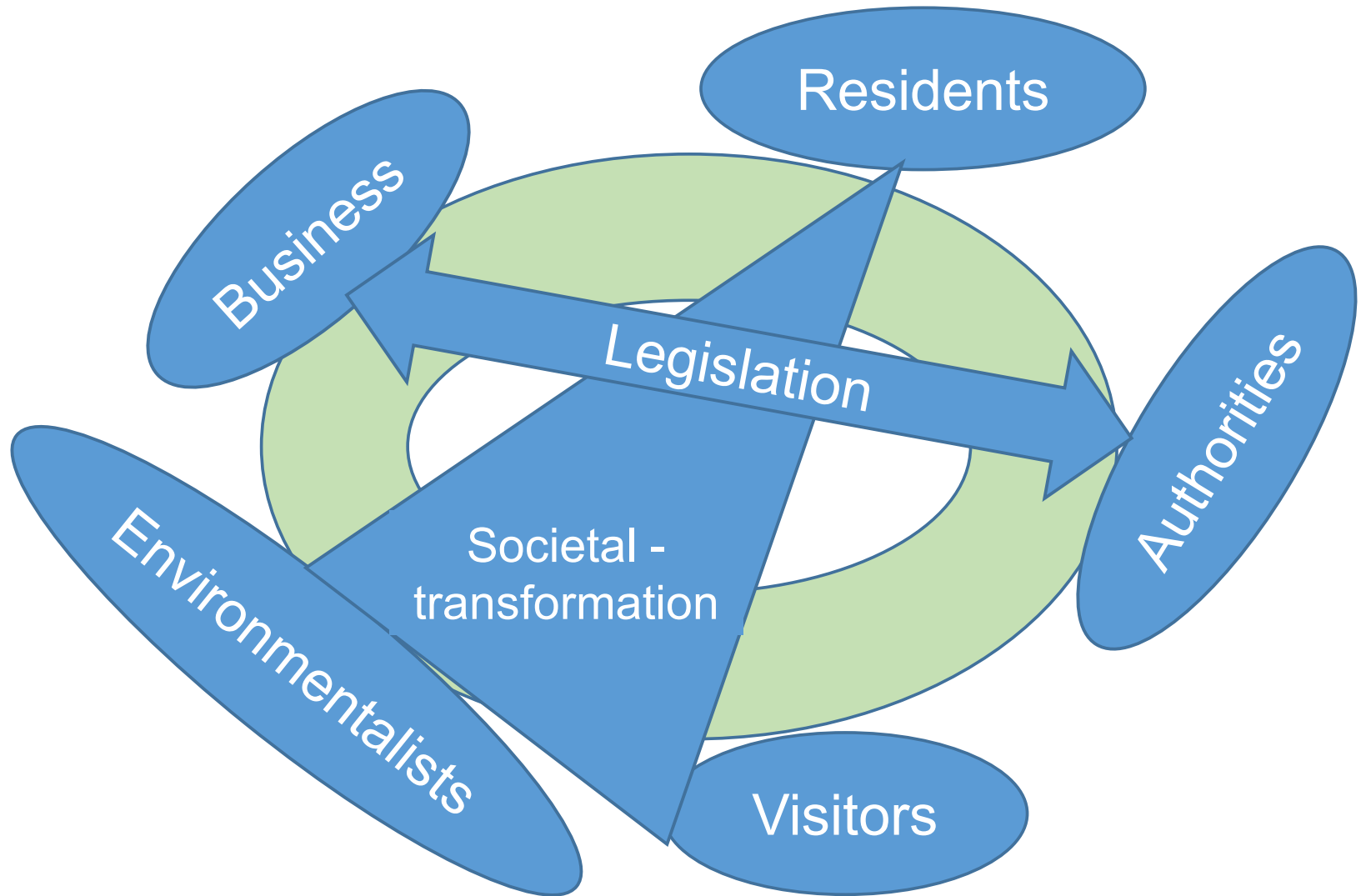
# Low Impact Diving



**Table 1.** SWOT analysis of coral restoration strategy in Maya bay, Thailand

<p style="text-align: center;"><b>Strength</b></p> <ul style="list-style-type: none"><li>• Strong government and local people support</li><li>• Funding opportunities for the restoration,</li><li>• Alternate tourism opportunities</li></ul>	<p style="text-align: center;"><b>Weakness</b></p> <ul style="list-style-type: none"><li>• Quantitative parameters to define sustainable tourism</li><li>• Qualitative and quantitative measure to define pollution, and economy</li></ul>
<p style="text-align: center;"><b>Opportunities</b></p> <ul style="list-style-type: none"><li>• As a model site for studying case of over-tourism</li><li>• Multiple stakeholder engagement</li><li>• Consensus between government, tourism operators, and local people</li></ul>	<p style="text-align: center;"><b>Threat</b></p> <ul style="list-style-type: none"><li>• Poacher tourism</li><li>• Continuity of the preventive measures</li><li>• Change in policy due to socio-economic pressure</li><li>• Lack of trainings on sustainable tourism</li></ul>

# Sustainable tourism



Adapted from Koh and Fakfare, 2019.

# Acknowledgements

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Photo: <http://wallpaperswide.com/>

Let's join our hands to **SAVE the CORAL**