STRENGHTHENING BLUE TECHNOLOGY, ENERGY, AND INFRASTRUCTURE TO IMPROVE MARINE GOVERNANCE IN INDONESIA

By:

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I

PERFORMANCE AND STATUS OF DEVELOPMENT OF ASEAN MEMBER COUNTRIES

The Prosperity Level of ASEAN Countries Based on GNI, 2019

No	Country	Land Area (km^2)	Coastline (km)[a]	Population (person)	GDP (million USD)	GNI per capita (USD)	HDI (rank)[b]
1	Singapore	709	193	5,703,569	372,063	59,590	0.935 (9)
2	Brunei Darussalam	5,270	161	433,285	13,469	32,230	0.845 (43)
3	Malaysia	328,550	4,675	31,949,777	364,702	11,200	0.804 (61)
4	Thailand	510,890	3,219	69,625,582	543,650	7,260	0.765 (77)
5	Indonesia	1,811,570	99,083	270,625,568	1,119,191	4,050	0.707 (111)
6	Philippines	298,170	36,289	108,116,615	376,796	3,850	0.712 (106)
7	Lao PDR	230,800	-	7,169,455	18,174	2,570	0.604 (140)
8	Viet Nam	310,070	3,444	96,462,106	261,921	2,540	0.693 (118)
9	Cambodia	176,520	443	16,486,542	27,089	1,480	0.581 (146)
10	Myanmar	653,080	1,930	54,045,420	76,086	1,390	0.584 (145)

COUNTRY STATUS	GNI PER CAPITA (USD)
High Income (Rich)	> 12,535
Upper-Middle Income	4,046 - 12,535
Lower-Middle Income	1,036 - 4,045
Lower Income (Poor)	< 1,036

Source:
World Bank Data (2019)
[a] CIA World Factbook: Coastline
[b] Human Development Report 2019

II

THE MEANING AND DOMAIN OF MARINE (BLUE) ECONOMY

- **Marine economy includes all economic activities taking place within coastal and ocean areas, and on land areas which use raw materials or natural resources originated from coasts and oceans (Dahuri, 2003; Kildow, 2005)**
- **Maritime economy includes sea transportation, ship building and maintenance, port construction and operations, and their related industries and services (Stopford, 2004)**

THE TAXONOMY OF GLOBAL BLUE ECONOMY SECTORS AND ACTIVITIES

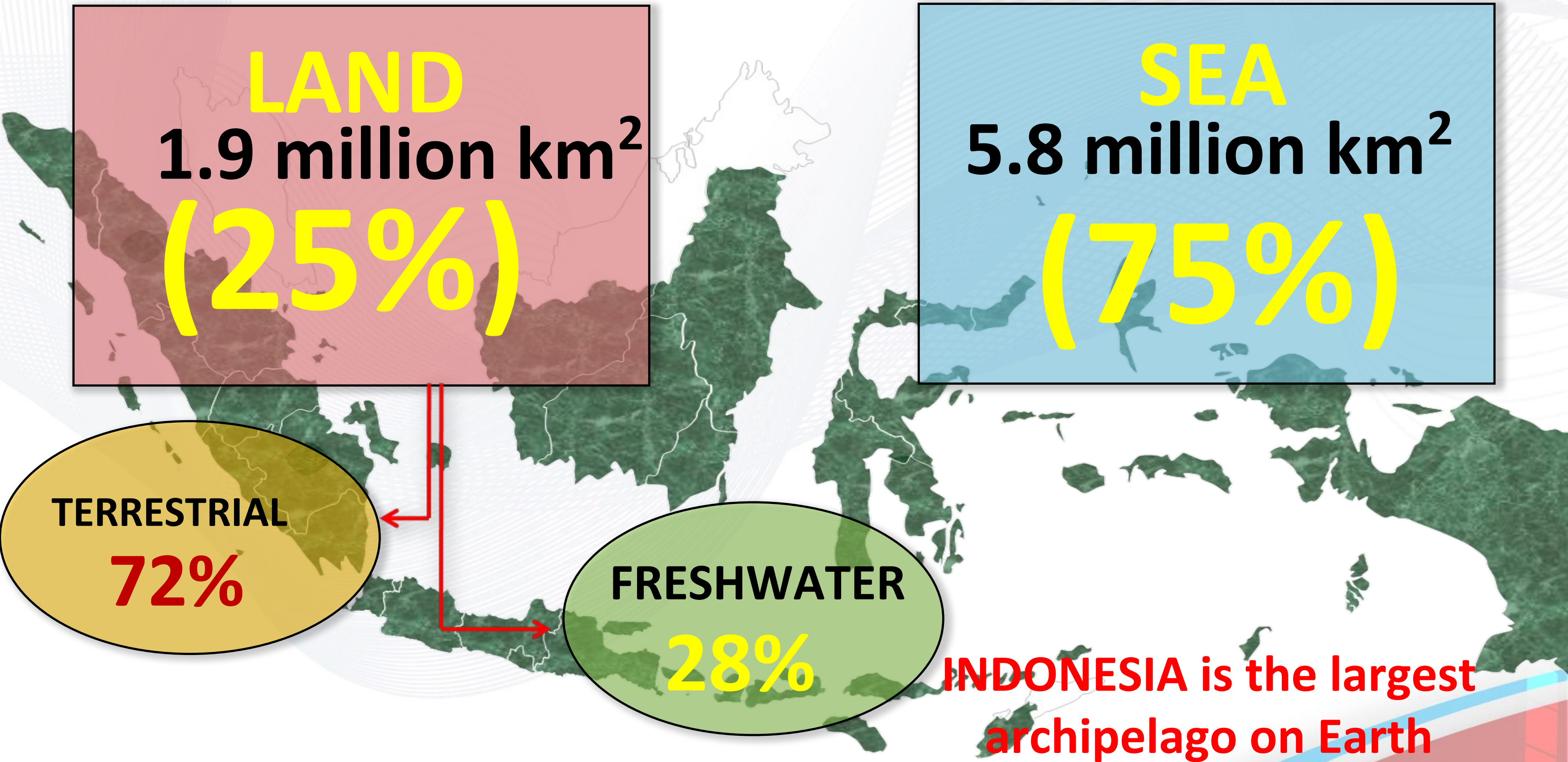
NO	SECTORS	ACTIVITES
1	**Fishing**	Capture fishery, Aquaculture, seafood processing
2	**Marine Biotechnology**	Pharmaceuticals, chemicals, seaweed harvesting, seaweed products, marine derived bio-products
3	**Minerals**	Oil and gas, deep-sea mining (exploration of rare earth metals, hydrocarbon
4	**Marine Renewable Energy**	Offshore wind energy production, wave energy production, tidal energy production
5	**Marine manufacturing**	Boat manufacturing, sail making, net manufacturing, boat and ship repair, marine instrumentation, aquaculture technology, water construction, marine industrial engineering
6	**Shipping, Port & Maritime Logistics**	Ship building and repairing, ship owners and operators, shipping agents and brokers, ship management, liner and port agents, port companies, ship suppliers, container shipping services, stevedores, roll-on roll-off operators, custom clearance, freight forwarders, safety and training

Next...

NO	SECTORS	ACTIVITES
7	**Marine Tourism & Leisure**	Sea angling from boats, sea angling from the shore, sailing at sea, boating at sea, water skiing, jet skiing, surfing, sail boarding, sea kayaking, scuba diving, swimming in the sea, bird watching in coastal areas, whale/dolphin watching, visiting coastal natural reserves, trips to the beach, seaside and islands
8	**Marine Construction**	Marine construction and engineering
9	**Marine Commerce**	Marine financial services, marine legal services, marine insurance, ship finance & related services, charterers, media & publishing
10	**Marine ICT**	Marine engineering consultancy, meteorological consultancy, environmental consultancy, hydrosurvey consultancy, project management consultancy, ICT solutions, geo-informatics services, yacht design, submarine telecom
11	**Education and research**	Education and training, R&D

Source: RIS, 2015

INDONESIA LAND AND SEA AREAS



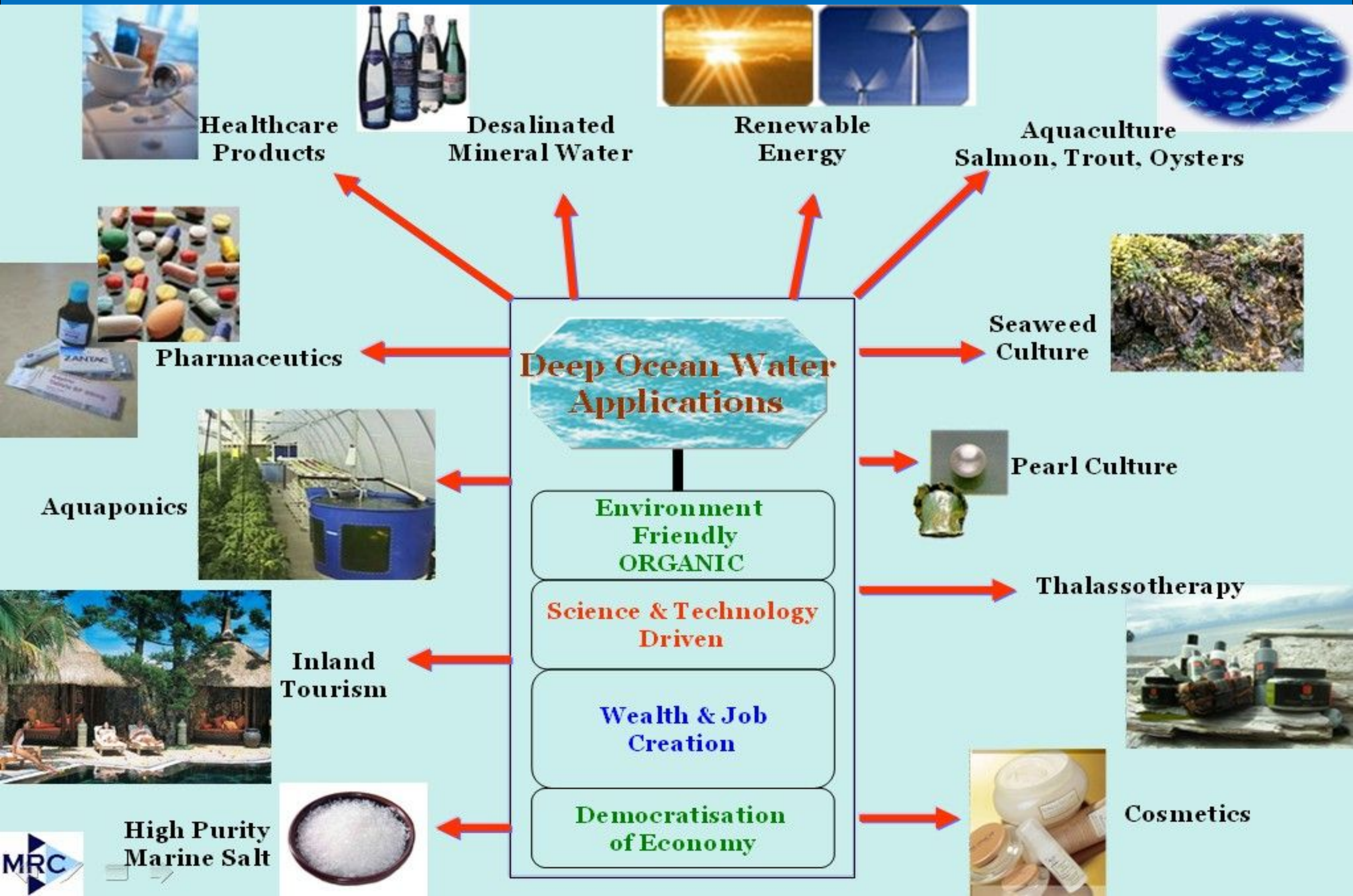
- 17.504 islands, 16.056 islands have been registered at UN in September 2017
- Coastline: 95.181 km (the second longest in the world, after Canada)

Source: Indonesia Geospatial Agency, 2017

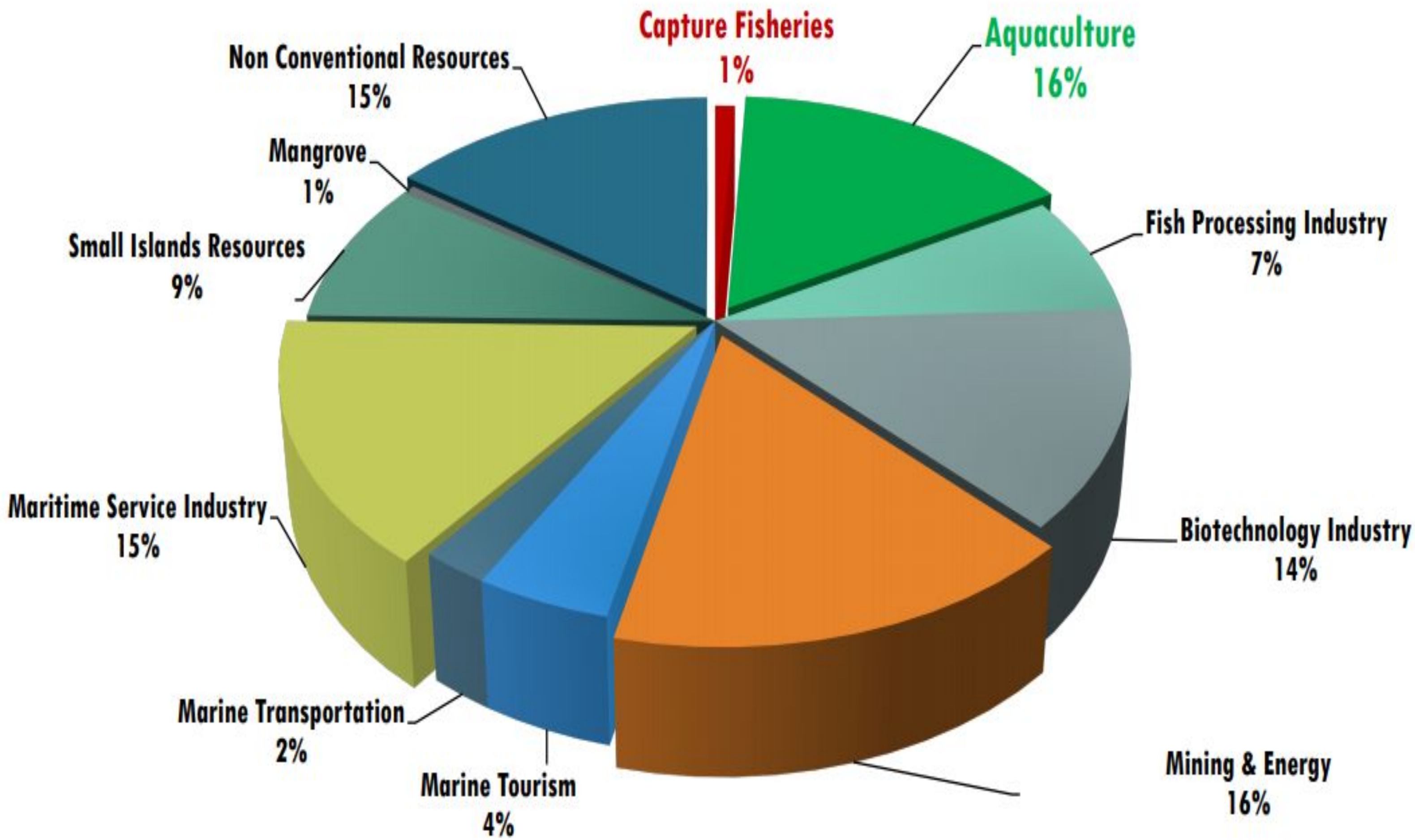
Economic Value of Indonesian Marine Economic Sectors

NO	Marine Economic Sector	Value (US$ billion/year)
1.	Capture Fisheries	20
2.	Coastal and Marine Aquaculure	210
3.	Fish and Seafood Processing Industry	100
4.	Marine Biotechnology Industry	180
5.	Energy and Mineral Resources	210
6.	Coastal and Marine Tourism	60
7.	Sea Transportation	30
8.	Maritime Industry and Services	200
9.	Coastal Forestry	8
10.	Small Island Resources	120
11.	Non-Conventional Resources	200
	Total	1.338

DEEP SEA WATER INDUSTRIES



MARITIME ECONOMICS POTENTIAL



Indonesia Maritime Economics Potential US $ 1.33 trillion per year. (Source: BPS, 2018)

- Total economic value of 11 Indonesia's marine economic sectors is estimated at about **US$ 1.338 trilion /year (1.4 Indonesian GDP).**
- Total employment opportunities of 11 marine economic sectors: **45 million people (35% of total work force).**
- In 2019 the contribution of Indonesia's marine economic sectors to the country's GDP was 10.5%.

The Contribution of Marine Economic Sectors to Indonesian GDP

Klaster	Nilai (milyar rupiah)	Kontribusi terhadap PDB Maritim	Kontribusi terhadap PDB Nasional	Nilai (milyar rupiah)	Kontribusi terhadap PDB Maritim	Kontribusi terhadap PDB Nasional
	2010			2018		
Perikanan	1.766,54	22,59%	2,58%	285.635,61	26,33%	2,74%
ESDM	3.721,54	47,59%	5,43%	403.307,24	37,17%	3,87%
Industri Bioteknologi	148,58	1,90%	0,22%	2.249,66	0,21%	0,02%
Industri Maritim	142,32	1,82%	0,21%	18.413,15	1,70%	0,18%
Jasa Maritim	530,20	6,78%	0,77%	97.115,65	8,95%	0,93%
Pariwisata	802,33	10,26%	1,17%	132.923,18	12,25%	1,28%
Perhubungan	444,18	5,68%	0,65%	76.787,01	8,08%	0,74%
Bangunan Laut	129,81	1,66%	0,19%	21.465,72	1,98%	0,21%
Hankam	349,55	4,47%	0,51%	47.073,63	4,34%	0,45%
PDB Maritim	**782.000**	**11,40%**		**1.084.970,85**		**10,41%**
PDB Nasional	**6.859.649**			**10.425.316**		

Catatan:

Kontirbusi sektor perikanan 2,74% terhadap PDB hanya dihitung dari bahan baku (raw materials). Bila dimasukkan produk olahannya (ikan kaleng, ikan fillet, bandeng presto, breaded shrimp, dan surimi-based products), kontribusinya sekitar 6% (Bappenas, 2014).

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Sumber: BPS 2019

III THREATS TO SUSTAINABLE COASTAL AND OCEAN DEVELOPMENT IN THE SOUTHEAST ASIAN REGION

1. Maritime boundary disputes
2. Overfishing, and overexploitation of other coastal and marine resources
3. IUU (Illegal, Unregulated, and Unreported) Fishing
4. Pollution
5. Conversion of coastal ecosystems (mangrove, seagrass beds, coral reefs, and estuaries) into coastal aquaculture, industrial estate, human settlements, and other man-made ecosystems.
6. Biodiversity loss
7. Erosion and Sedimentation
8. Conflicts of spatial uses
9. Poverty
10. Piracy and safety at sea
11. Tsunami and other natural disasters
12. Global Climate Change and its concomitant impacts

State of The World's Fisheries

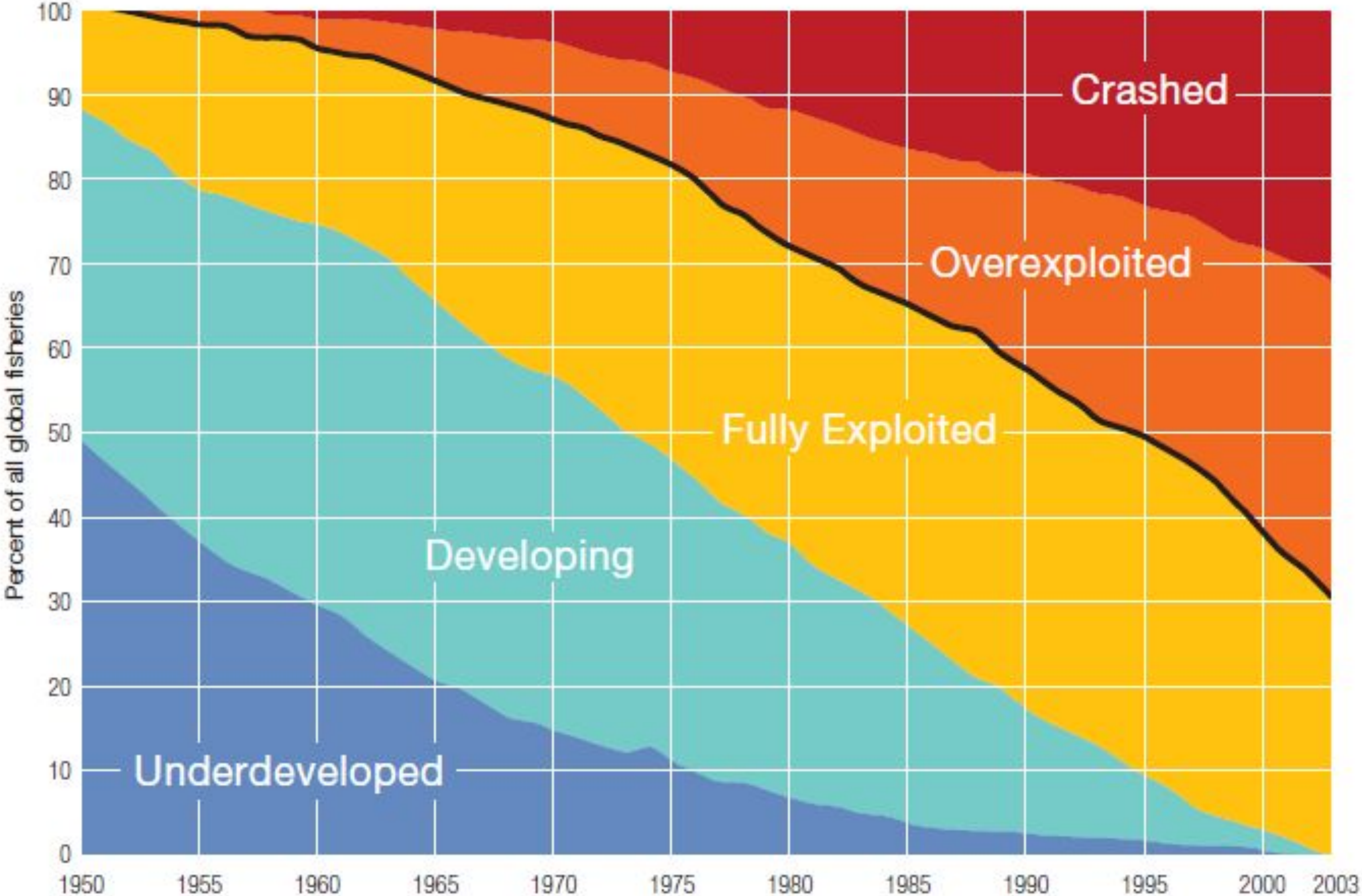
- **Valuable fish stocks, as well as a whole host of other marine life, are severely threatened by overfishing, loss of coastal ecosystems, and pollution.**
- **53% of the world's fisheries are fully exploited, and 32% are overexploited, depleted, or recovering from depletion[1]**
- **Most of the top ten marine fisheries, accounting for about 30% of all capture fisheries production, are fully exploited or overexploited[2]**
- **Several important commercial fish populations have declined to the point where their survival is threatened.**

Sources

[1] FAO (2010) State of World Fisheries and Aquaculture (SOFIA)-SOFIA 2010

[2] Worm, B. et al (2006) Impacts of biodiversity loss on ocean acosystem services. Science, 314:787

Overfishing drives declining fisheries; 70% are crashed or overexploited



Source: United Nations Environment Programme (2006) from the Sea Around Us Project

State of The World's Coastal Ecosystems

- **In 2008 the world has effectively lost 19% of its original area of coral reefs; 15% are seriously under threat of loss within the next 10 – 20 years, and an additional 20% in 20 – 40 years (the Global Coral Reef Monitoring Network, Wilkinson, 2008).**
- **Sea-grasses have been disappearing at a rate of 110 km^2/year since 1980, and 29% of the known areal extent has disappeared since seagrass areas were initially recorded in 1879 (Waycott et al., 2009).**
- **Oyster beds (reefs) have declined by more than 90% from historic levels in 70% of bays and 63% of the world's marine ecoregions.**

Sources

[1] FAO (2010) State of World Fisheries and Aquaculture (SOFIA)-SOFIA 2010

[2] Worm, B. et al (2006) Impacts of biodiversity loss on ocean acosystem services. Science, 314:787

- **With advances in technology, human capacity to reach remote areas has increased, leading to growing threats that include unsustainable fishing and shipping activities, pollution, ocean dumping, and oil, gas, and mineral exploration.**
- **Global Climate Change and ocean acidification increasingly threaten oceans and polar areas.**

Marine pollution

a. Oil Spill Contamination

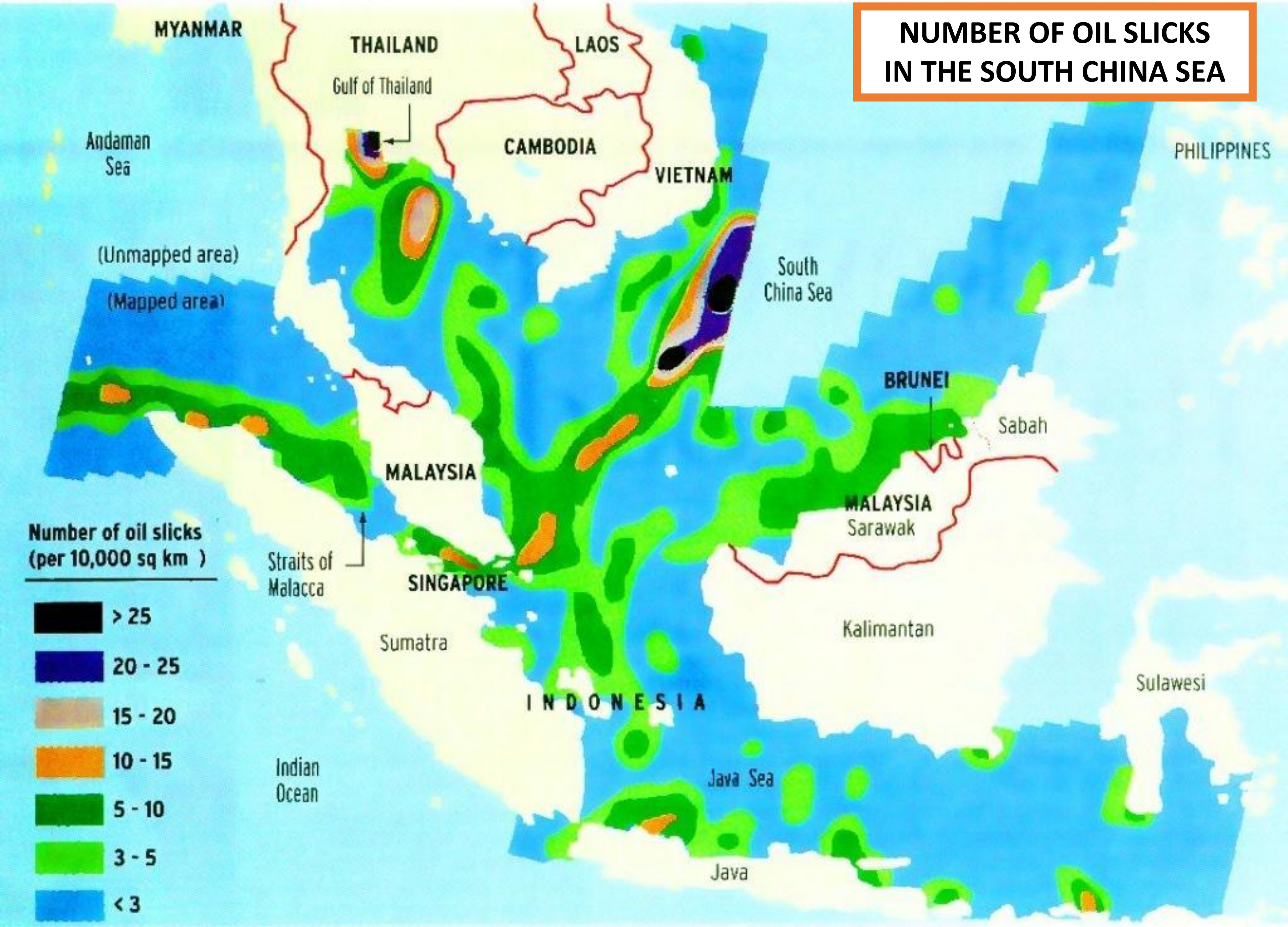
Heavy Metal Pollution

Pattern of Oil Tanker Routes and Oil Spills in East Asia

- Over 220 million gallons of oil were spilled in the Asia-Pacific region since 1965; about 96% of this (212 million gallons) occurred in East Asia.
- The East Asian spills came from a number of sources, though 80% involved vessels.

Source: pemsea.org/documents/sds-sea

NUMBER OF OIL SLICKS IN THE SOUTH CHINA SEA



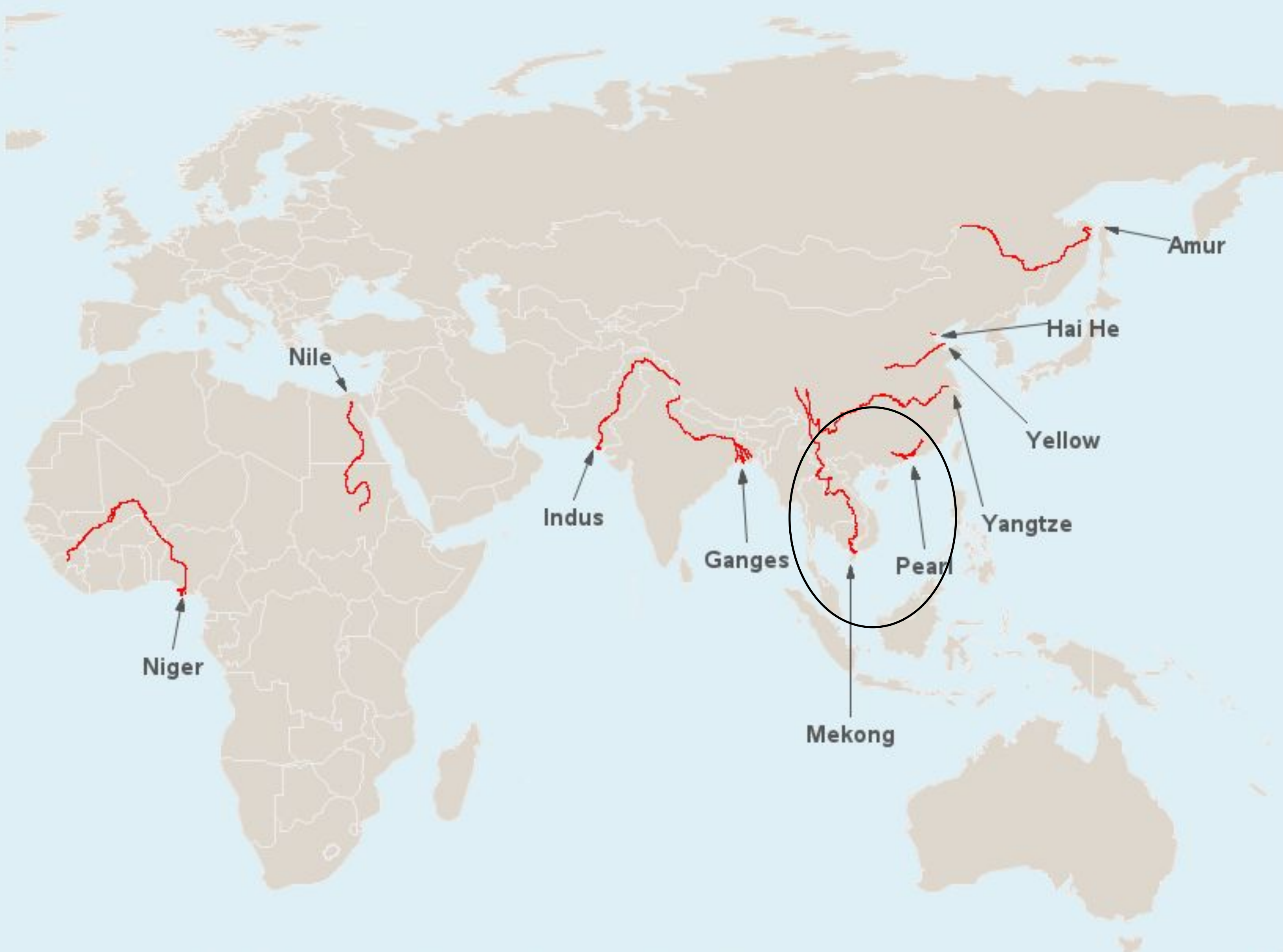
BOD Loading Around Manila Bay

Pollution features in Manila Bay

- **Manila Bay receives an organic load of 250,000 t BOD per year.**
- **Oxygen deficiency in bottom water.**
- **Increasing frequency of plankton blooms (13%, 20%, 23% of measurements in 1996, 1997, and 1998, respectively).**
- **Near extinction of bottom fauna.**

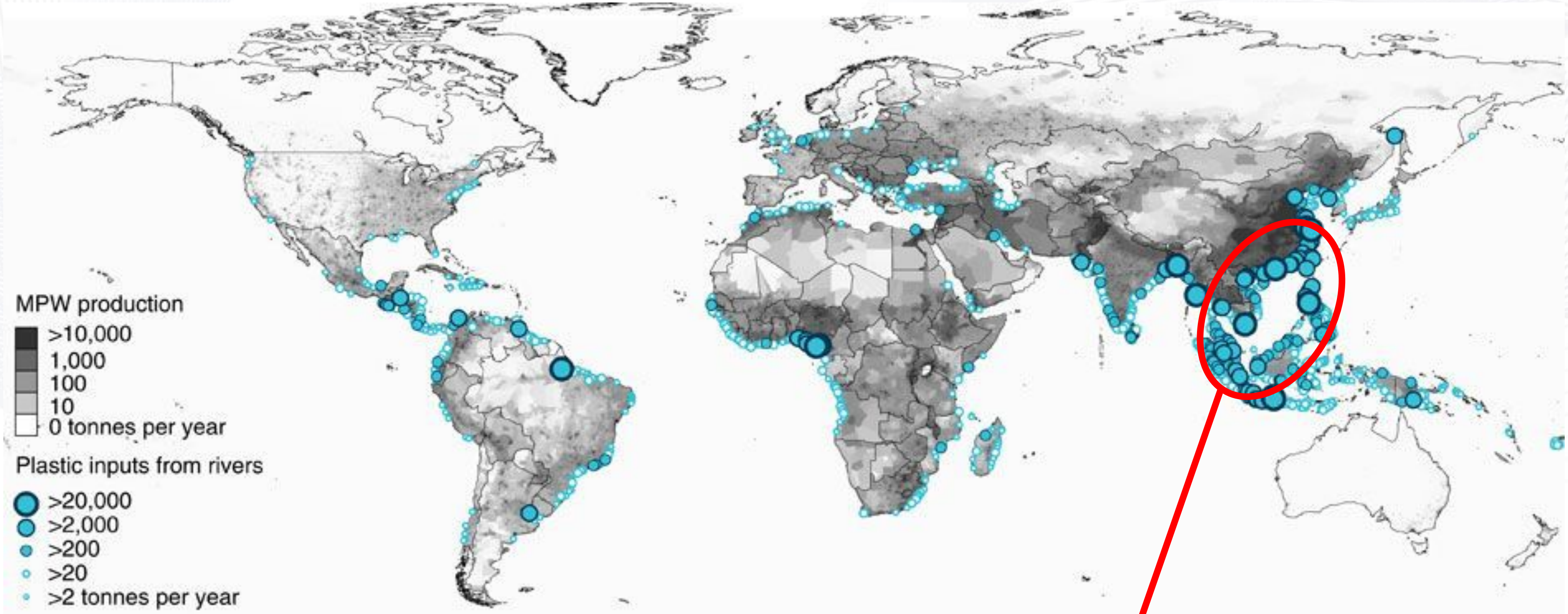
Source: pemsea.org/documents sds-sea

95% Of Plastic Polluting The World's Oceans Comes From These 10 Rivers

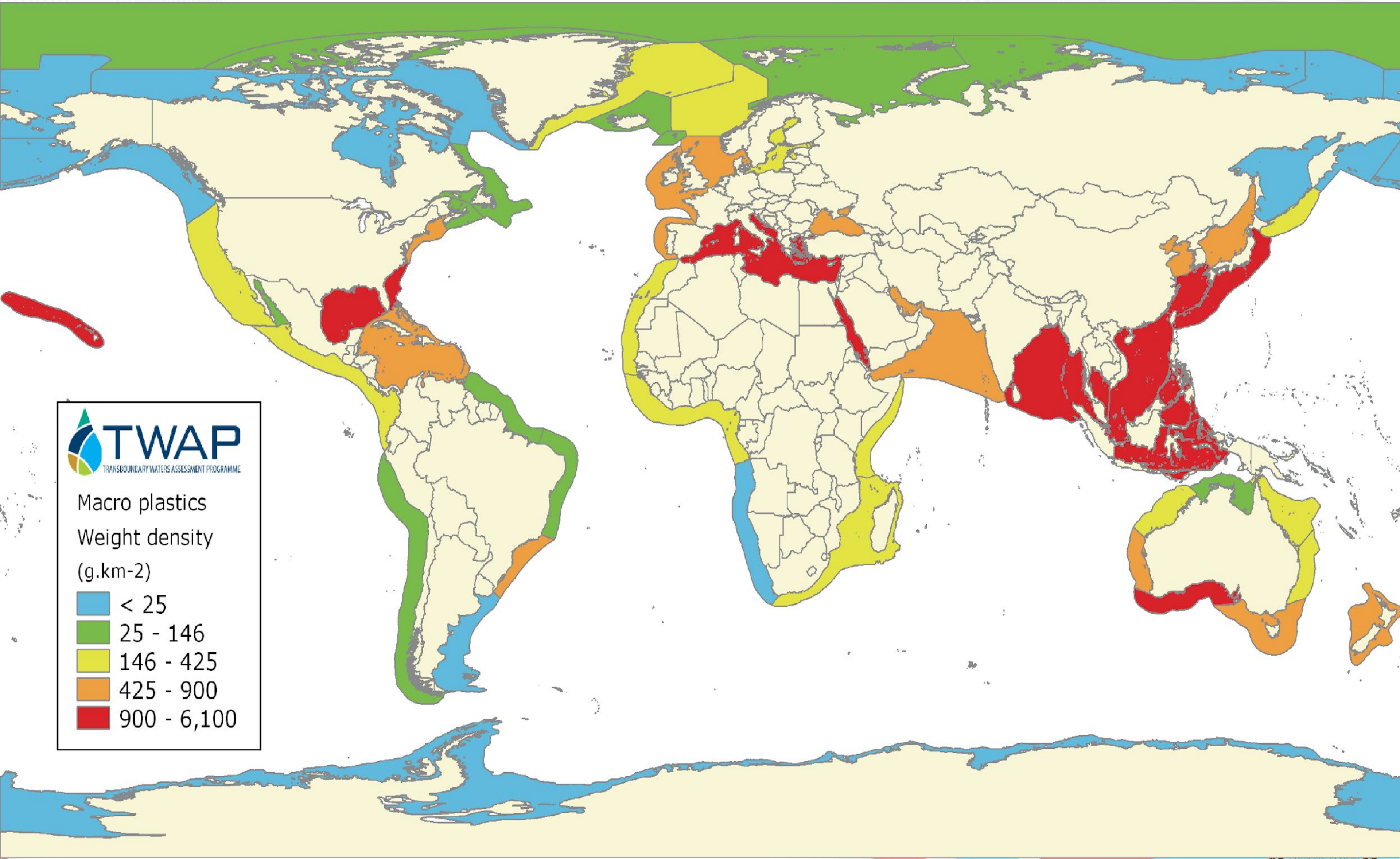


Data source: Schmidt - Export of Plastic Debris by Rivers into the Sea (2017)

PLASTIC INPUTS FROM RIVERS



Plastic inputs from rivers in the area around the south china sea mostly > 20,000 tonnes per year

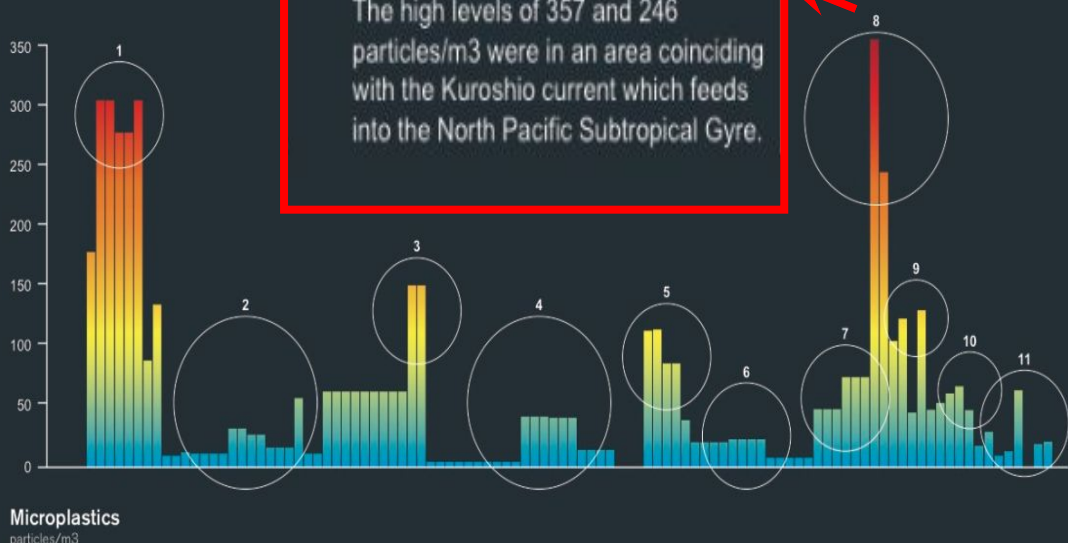

TWAP
TRANSBOUNDARY WATERS ASSESSMENT PROGRAMME
Macro plastics
Weight density
(g.km-2)
< 25
25 - 146
146 - 425
425 - 900
900 - 6,100

Volvo Ocean Race 2017-18

Microplastics Data

Preliminary Data provided by Dr-Ing. Sören Gutekunst and Dr Toste Tanhua, GEOMAR Helmholtz Centre for Ocean Research Kiel

8. South China and North Philippine Sea:
The high levels of 357 and 246 particles/m3 were in an area coinciding with the Kuroshio current which feeds into the North Pacific Subtropical Gyre.



1. **North Atlantic Ocean and Mediterranean Sea:** The highest microplastics levels are attributed to the proximity to the coast, strong ocean currents and main shipping routes.

2. **Atlantic Ocean:** Progressing south, levels decreased with distance from land, with a relative increase closer to South America, an area with strong surface currents.

3. **South African coast:** The higher levels of microplastics near Cape Town partly originated further north as the strong Aguhlas current flows from the northern Indian Ocean and past the South African coast.

4. **Indian Ocean:** Microplastic levels as high as 41 particles/m3 even in these remote areas are likely due to currents originating further north.

5. **Australian coast:** Increased microplastics concentrations due to proximity to coastline & material transported by currents from the northern Indian Ocean/Indonesia.

6. **From Melbourne to Hong Kong:** Levels decreased in the open water areas off Nauru and the Solomon Islands where the density was 7 particles/m³.

7. **Philippine Sea:** Levels of 75 particles/m3 may be due in part to patchiness of particle distribution as higher levels were recorded in a more inshore sample from this area.

8. **South China and North Philippine Sea:** The high levels of 357 and 246 particles/m3 were in an area coinciding with the Kuroshio current which feeds into the North Pacific Subtropical Gyre.

9. **Equatorial Pacific:** Average levels were as high as 118 particles/m³ in the open water of the Pacific and 128 particles/m³ passing north of Vanuatu. Prevailing currents have a significant impact on microplastic distribution in this region.

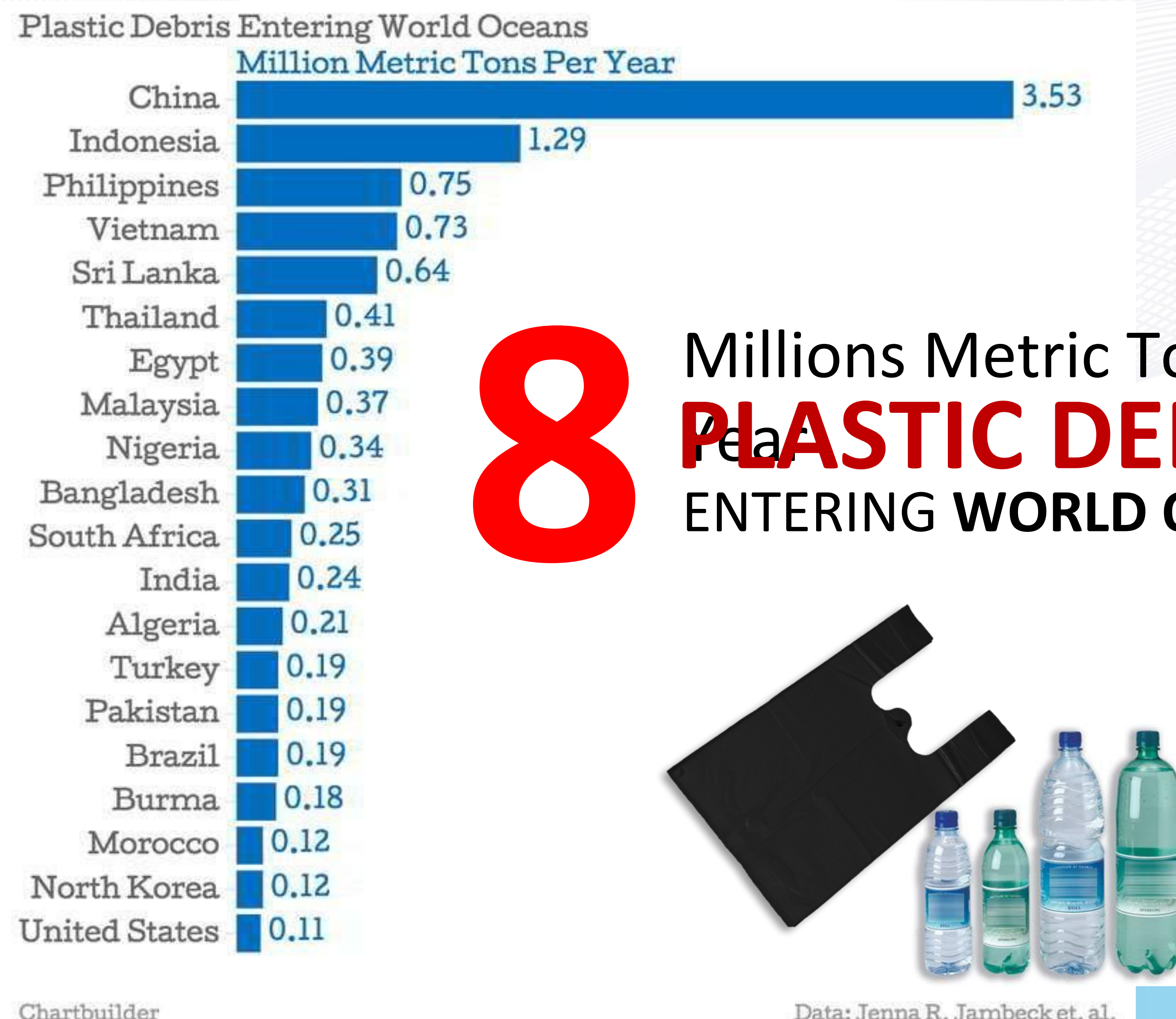
10. **Approach to New Zealand:** Progressing south through the Coral Sea the concentration increased from 45, 50, 56 to 60 particles/m³ in the sample closest to Auckland.

11. **Leg 7:** Remote Pacific near Point Nemo: Microplastic levels of 9-26 particles/m3 in an area further from land than anywhere else on Earth.

    Cape Horn: Off the southernmost tip of South America 57 particles/m3 were recorded.

    South America east coast: Samples contained 0-19 particles/m3.

PLASTIC DEBRIS ENTERING WORLD OCEANS



8 Millions Metric Tons Per Year

PLASTIC DEBRIS

ENTERING **WORLD OCEAN**

THE CONDITION OF MANGROVES IN THE EAST ASIA REGION

- In the last 70 years, nearly 70% of the original mangroves bordering the South China Sea have been destroyed.
- The decline is from 6 000 km^2 to about 2 000 km^2.
- Unless managed, the current rate of loss will result to removal of all mangroves by 2030.
- Mangroves are lost due to conversion to aquaculture ponds, mangrove felling for woodchip and pulp production, urban development and human settlements, and harvesting for domestic use.

Source: UNEP (2010)

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The Condition of Coral Reefs in the East Asia Region

- The coral reefs of Southeast Asia are the most threatened of any region in the world.
- Over 80% of the reefs are at risk: 26% are classified as medium risk and 54% as high risk.
- Almost all of Philippine reefs and 83% of Indonesia's are at risk.
- Coral reefs in Southeast Asia are threatened by reclamation, coral mining, pollution, sedimentation, overfishing, destructive fishing, global warming, and tsunami.

Source: pemsea.org/documents sds-sea

Chinese Fishery Incidents in Disputed Waters, 2000-2015

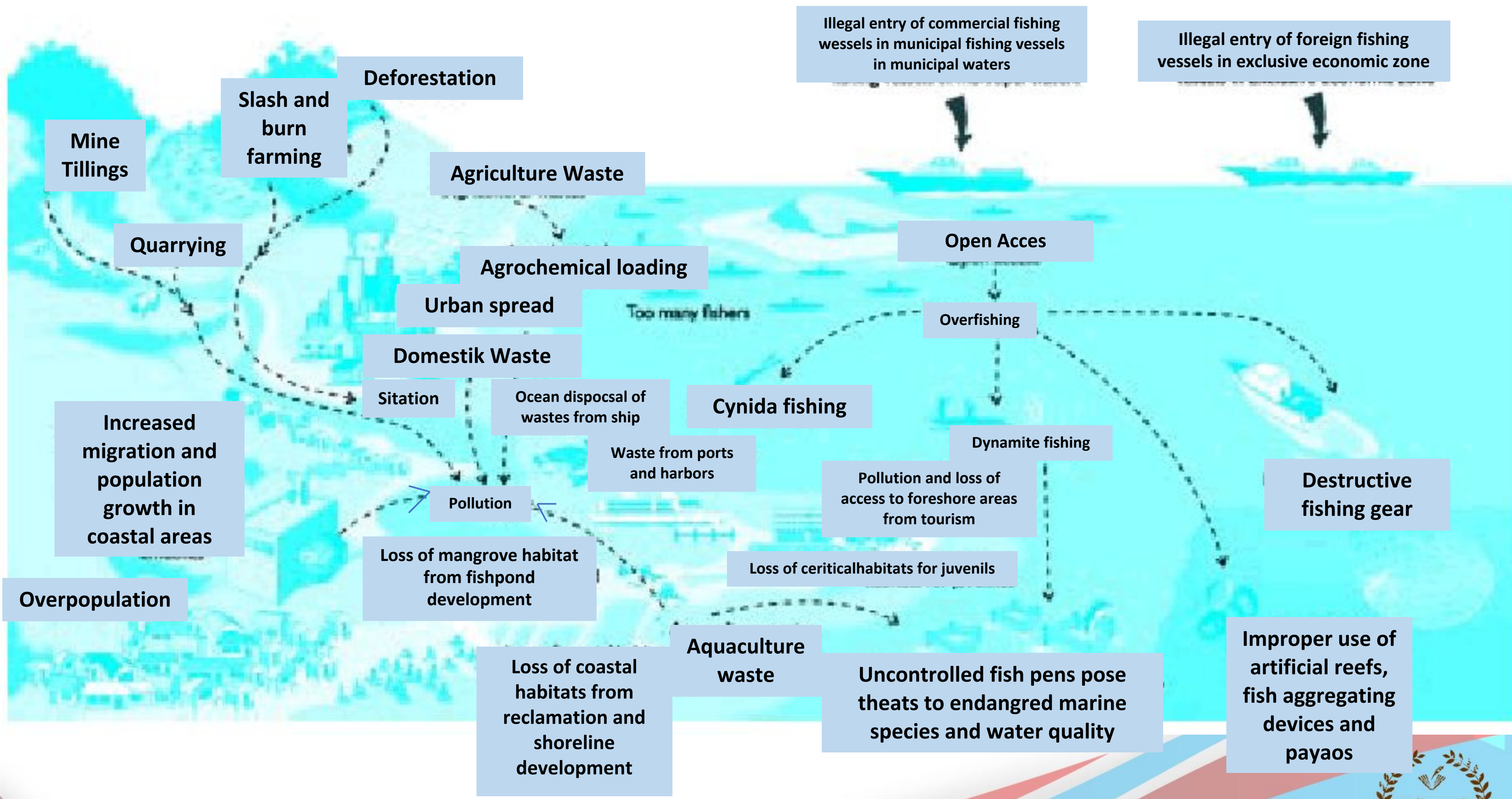
The Pacific Rim has numerous overlapping maritime claims. For years, competing nations have exploited fishing vessels to press their advantage. This can be useful, but can also get out of control, sparking short, sharp crises.

Locations of incidents and parties involved

- **A** Sea of Japan: Russia
- **B** Sea of Japan: Japan
- **C** Bohai Sea: South Korea
- **D** Yellow Sea: United States, South Korea, North Korea
- **E** Southwest of Japan: Japan
- **F** East China Sea (general): United States, Japan, South Korea
- **G** Senkaku/Diaoyu Islands (East China Sea): Japan
- **H** Gulf of Tonkin: Vietnam
- **I** East of Hainan (South China Sea): United States
- **J** Paracel Islands (South China Sea): Vietnam
- **K** Vietnam Central Coast (South China Sea): Vietnam
- **L** Spratly Islands (South China Sea): Philippines
- **M** Tubbataha Reef (Sulu Sea): Philippines
- **N** Arafura Sea: Indonesia

Sources: Council on Foreign Relations; Stratfor research

VARIOUS ECONOMIC ACTIVITIES AND THEIR IMPACT ON COASTAL AND MARINE ECOSYSTEMS



Source : Book of Coastal management orientation and overview, Philippine coastal management guidebook series

“Most problems related to coastal and ocean development are the result of placing too much stress on limited coastal and ocean resources, a condition known as exceeding the carrying capacity”

IV

THE STRATEGY OF IMPROVING MARINE GOVERNANCE FOR SUSTAINABLE COASTAL AND OCEAN DEVELOPMENT IN THE SOUTHEAST ASIAN REGION

Figure : A System Framework for a Regional Cooperation among Legislators in the Southeast Asian Region for Sustainable Coastal and Ocean Development

V

ENHANCING THE ROLES OF BLUE INFRASTRUCTURES, ENERGY, AND TECHNOLOGY

FOR SUSTAINABLE COASTAL AND OCEAN DEVELOPMENT

IN THE SOUTHEAST ASIAN REGION

Blue Infrastructure, Energy, and Technology are those types used in the utilization and development of coastal and ocean ecosystems including their embodied resources, which ensure significant reduction or zero carbon emission and other types of wastes, and sustainable marine economic development for human prosperity and happiness

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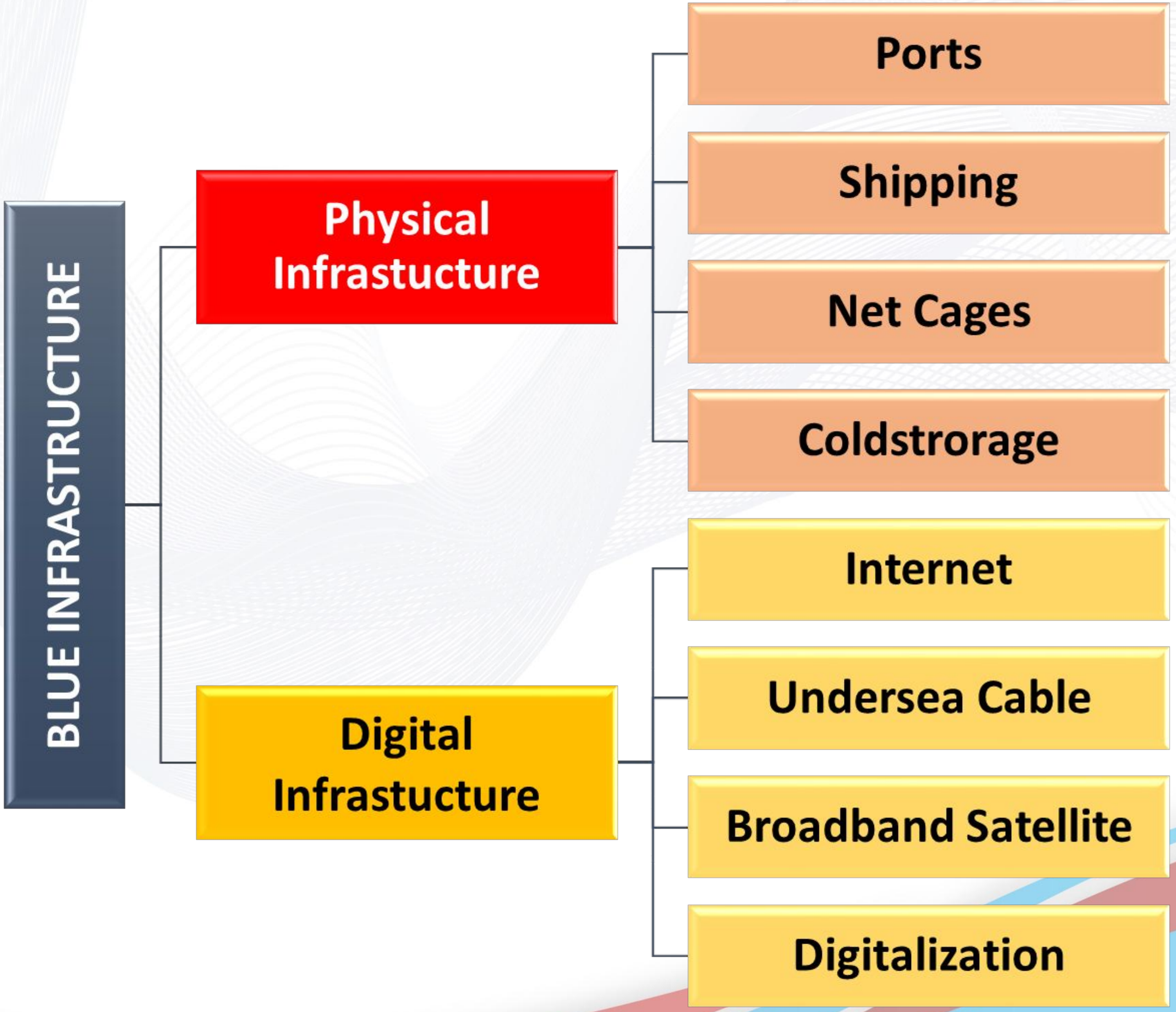
A BLUE INFRASTRUCTURES



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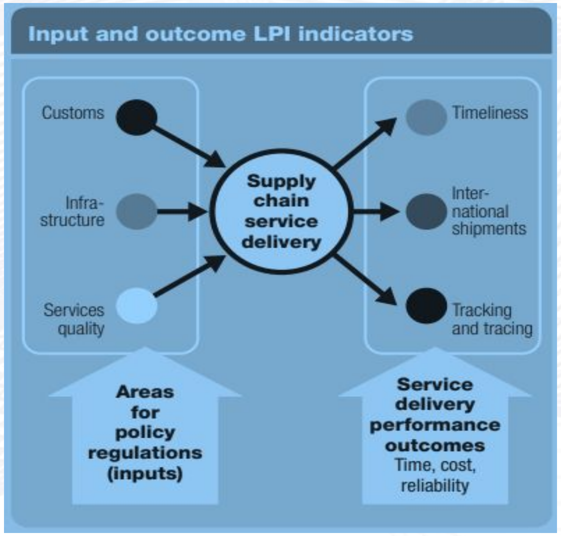
Global Logistics Performance Index (LPI) Rank

No	Country	2012	2014	2016	2018
1	Germany	4	1	1	1
2	Sweden	13	6	3	2
3	Singapore	1	5	5	7
4	Thailand	38	35	45	32
5	Viet Nam	53	48	64	39
6	Malaysia	29	25	32	41
7	Indonesia	59	53	63	46
8	Philippines	52	57	71	60
9	Brunei Darussalam	-	-	70	80
10	Lao PDR	109	131	152	82
11	Cambodia	101	83	73	98
12	Myanmar	129	145	113	137
13	Afghanistan	135	158	150	160

Source: https://lpi.worldbank.org/international/aggregated-ranking



In 2018, Indonesia ranks 46th out of 160 countries or ranked 5th in ASEAN

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Infrastructure Index in ASEAN Countries, 2018

No	Country	Score	World Rank
1	Singapore	4.06	6
2	Malaysia	3.15	40
3	Thailand	3.14	41
4	Viet Nam	3.01	47
5	Indonesia	2.90	54
6	Philippines	2.73	67
7	Brunei Darussalam	2.46	89
8	Lao PDR	2.44	91
9	Cambodia	2.14	130
10	Myanmar	1.99	143

International Shipments Index in ASEAN Countries, 2018

No	Country	Score	World Rank
1	Singapore	3.58	15
2	Thailand	3.46	25
3	Malaysia	3.35	32
4	Philippines	3.29	37
5	Indonesia	3.23	42
6	Viet Nam	3.16	49
7	Cambodia	2.79	71
8	Lao PDR	2.72	85
9	Brunei Darussalam	2.51	113
10	Myanmar	2.20	144

Source: https://lpi.worldbank.org

Container Port Throughput in ASEAN Countries
(Twenty foot Equivalent Unit/TEU)

Port throughput measures reflect the amount of cargo or number of vessels the port handles over time

No	Country	2015	2016	2017	2018	2019
1	Singapore	31,710,200	31,688,000	33,667,000	37,388,000	37,983,000
2	Malaysia	24,012,700	24,570,000	23,784,100	24,956,000	26,215,100
3	**Indonesia**	**12,031,700**	**12,431,700**	**12,829,600**	**14,060,600**	**14,763,630**
4	Viet Nam	11,089,557	11,086,142	11,965,614	13,008,503	13,658,928
5	Thailand	9,463,000	9,983,000	9,938,000	10,243,600	10,755,780
6	Philippines	7,210,441	7,421,441	8,095,420	8,653,720	8,983,520
7	Myanmar	827,249	1,026,216	1,200,000	1,043,500	1,121,750
8	Cambodia	474,000	482,000	644,500	742,100	779,205
9	Brunei Darussalam	128,026	124,919	132,664	432,200	282,432

Source: UNCTAD, 2020

Ownership of World Fleet, 2017

Rank (dead-weight tonnage)	Country or territory	Number of vessels	Dead-weight tonnage	Foreign flag as a percentage of total (dwt)	Rank (dollars)	Total value (million dollars)	Average value per ship (million dollars)	Average value per dead-weight ton (dollars)
1	Greece	4 199	308 836 933	78.76	3	72 538	17.3	235
2	Japan	3 901	223 855 788	85.89	2	77 898	20.0	348
3	China	5 206	165 429 859	53.97	4	65 044	12.5	393
4	Germany	3 090	112 028 306	90.77	8	38 412	12.4	343
5	Singapore	2 599	104 414 424	39.02	7	39 193	15.1	375
6	Hong Kong (China)	1 532	93 629 750	23.98	9	25 769	16.8	275
7	Republic of Korea	1 656	80 976 874	81.98	11	20 928	12.6	258
8	United States	2 104	67 100 538	85.73	1	96 182	45.7	1 433
9	Norway	1 842	51 824 489	64.62	5	58 445	31.7	1 128
10	United Kingdom	1 360	51 150 767	80.55	6	40 671	29.9	795
11	Bermuda	440	48 059 392	98.93	13	19 691	44.8	410
12	Taiwan Province of China	926	46 864 949	90.62	17	10 857	11.7	232
13	Denmark	920	36 355 509	56.00	15	18 694	20.3	514
14	Monaco	338	31 629 834	100.00	23	7 903	23.4	250
15	Turkey	1 563	27 732 948	71.57	20	9 055	5.8	327
16	Switzerland	405	23 688 303	92.58	22	8 458	20.9	357
17	Belgium	263	23 550 024	67.81	27	6 505	24.7	276
18	India	986	22 665 452	27.35	25	6 938	7.0	306
19	Russian Federation	1 707	22 050 283	67.38	19	9 081	5.3	412
20	Italy	768	20 609 725	29.36	10	23 184	30.2	1 125
21	Islamic Republic of Iran	238	18 838 747	68.80	32	2 799	11.8	149
22	Indonesia	1 840	18 793 019	7.96	26	6 613	3.6	352
23	Malaysia	644	18 351 283	51.07	16	14 641	22.7	798
24	Netherlands	1 256	18 033 334	64.72	12	19 970	15.9	1 107
25	United Arab Emirates	883	17 876 272	97.30	24	7 406	8.4	414
26	Saudi Arabia	283	15 659 518	77.97	30	4 101	14.5	262
27	Brazil	394	14 189 164	72.25	14	19 676	49.9	1 387
28	France	452	11 931 397	69.93	18	10 616	23.5	890
29	Canada	376	10 235 954	75.48	28	5 231	13.9	511
30	Kuwait	86	10 208 147	49.92	31	3 749	43.6	367
31	Cyprus	277	9 257 094	63.95	33	2 711	9.8	293
32	Viet Nam	943	8 801 765	17.84	29	4 161	4.4	473
33	Oman	49	7 490 956	99.92	34	2 215	45.2	296
34	Thailand	393	7 022 484	27.84	35	1 949	5.0	278
35	Qatar	117	6 640 467	87.56	21	8 827	75.4	1 329
Subtotal, top 35 shipowners		**44 036**	**1 755 783 748**	**70.30**		**770 109**	**17.5**	**439**
Rest of world and unknown		*6 119*	*91 847 146*	*64.30*		*58 509*	*9.6*	*637*
World total		**50 155**	**1 847 630 894**	**70.01**		**828 618**	**16.5**	**448**

Source: UNCTAD, 2017

ASEAN SHIPPING LANES AND THE MAIN SEA PORTS

Indonesia and Vietnam are the top two ports with double digits growth

ASEAN Shipping Lanes and the Main Sea Ports

The shipping lane shows the major shipping routes through the region and exemplifies the ASEAN nations prominent position within the global trade network

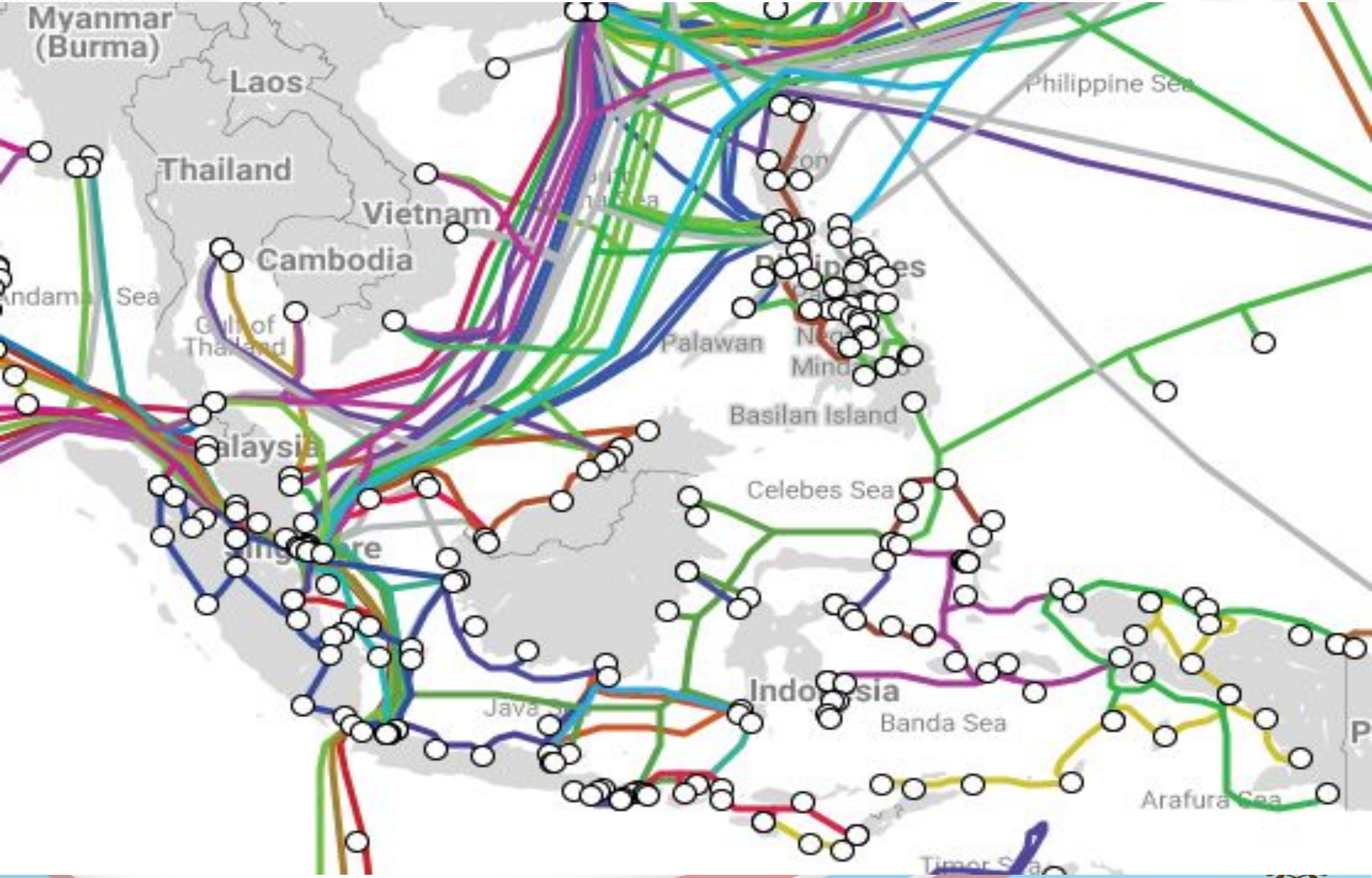
Main Sea Ports in ASEAN	1000 TEU (2013)	CAGR '09 -'13
1. Port of Singapore (SGP)	32,240	6%
2. Port of Klang (MYS)	10,350	9%
3. Port of Tanjung Pelepas (MYS)	7,628	6%
4. Port of Tanjung Priok (IDN)	6,590	15%
5. Laem Chabang (THA)	6,032	7%
6. Saigon New Port (VNM)	5,542	12%
7. Port of Manila (PHL)	3,770	7%
8. Tanjung Perak (IDN)	3,001	7%
9. Bangkok (THA)	1,509	5%
TOTAL MAIN	76,662	651009

Source: UNCTAD Review of Maritime Transport

Designated Ports in the ASEAN (47, including 14 in Indonesia)

Source : zen, 2016 in ERIA, 2019

The Submarine Cable Map in ASEAN



https://www.submarinecablemap.com

No	Country	Value	Rank
1	Iceland	8.98	1
2	Korea (Rep.)	8.85	2
3	Switzerland	8.74	3
4	Singapore	8.05	18
5	Brunei Darussalam	6.75	53
6	Malaysia	6.38	63
7	Thailand	5.67	78
8	Philippines	4.67	101
9	Viet Nam	4.43	108
10	**Indonesia**	**4.33**	**111**
11	Timor-Leste	3.57	122
12	Cambodia	3.28	128
13	Myanmar	3.00	135
14	Lao P.D.R.	2.91	139
15	Eritrea	0.96	176

The Information and Communications Technology (ICT) Development Index

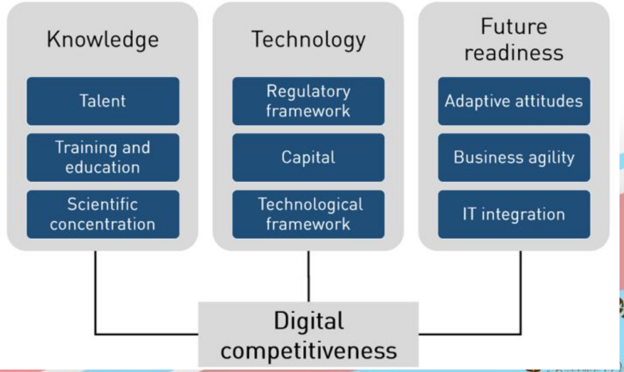
In 2017, Indonesia ranks 111th out of 176 countries or ranked 7th in ASEAN

Source: The ICT Development Index 2017

World Digital Competitiveness Ranking of ASEAN Countries, 2020

NO	COUNTRY	WORLD RANKING			
		OVERALL	Knowledge	Technology	Future readiness
1	Singapore	2	2	1	12
2	Malaysia	26	19	20	32
3	Thailand	39	43	22	45
4	**Indonesia**	**56**	**63**	**54**	**48**
5	Philippines	57	62	53	54

- Digital competitiveness is defined as the capacity of an economy to adopt and explore digital technologies leading to the transformation in government practices, business models and society in general.
- The IMD Digital World Competitiveness Ranking presents the 2020 overall ranking for the **63 economies** covered by the World Competitiveness Yearbook (WCY)



Sumber: IMD World Digital Competitiveness Ranking 2020

Mobile and Fixed Broadband Speeds Ranking of ASEAN Countries, 2020

MOBILE			
No	Country	Speeds (Mbps)	World Rank
1	Singapore	60.52	15
2	Vietnam	33.18	64
3	Thailand	34.38	61
4	Lao PDR	26.86	78
5	Malaysia	25.04	81
6	Cambodia	19.63	105
7	Philippines	16.89	119
8	Indonesia	16.70	121

FIXED BROADBAND			
No	Country	Speeds (Mbps)	World Rank
1	Singapore	226.60	1
2	Thailand	175.22	5
3	Malaysia	91.49	42
4	Vietnam	56.83	60
5	Philippines	26.08	106
6	Cambodia	24.84	108
7	Lao PDR	22.86	112
8	Indonesia	22.35	114

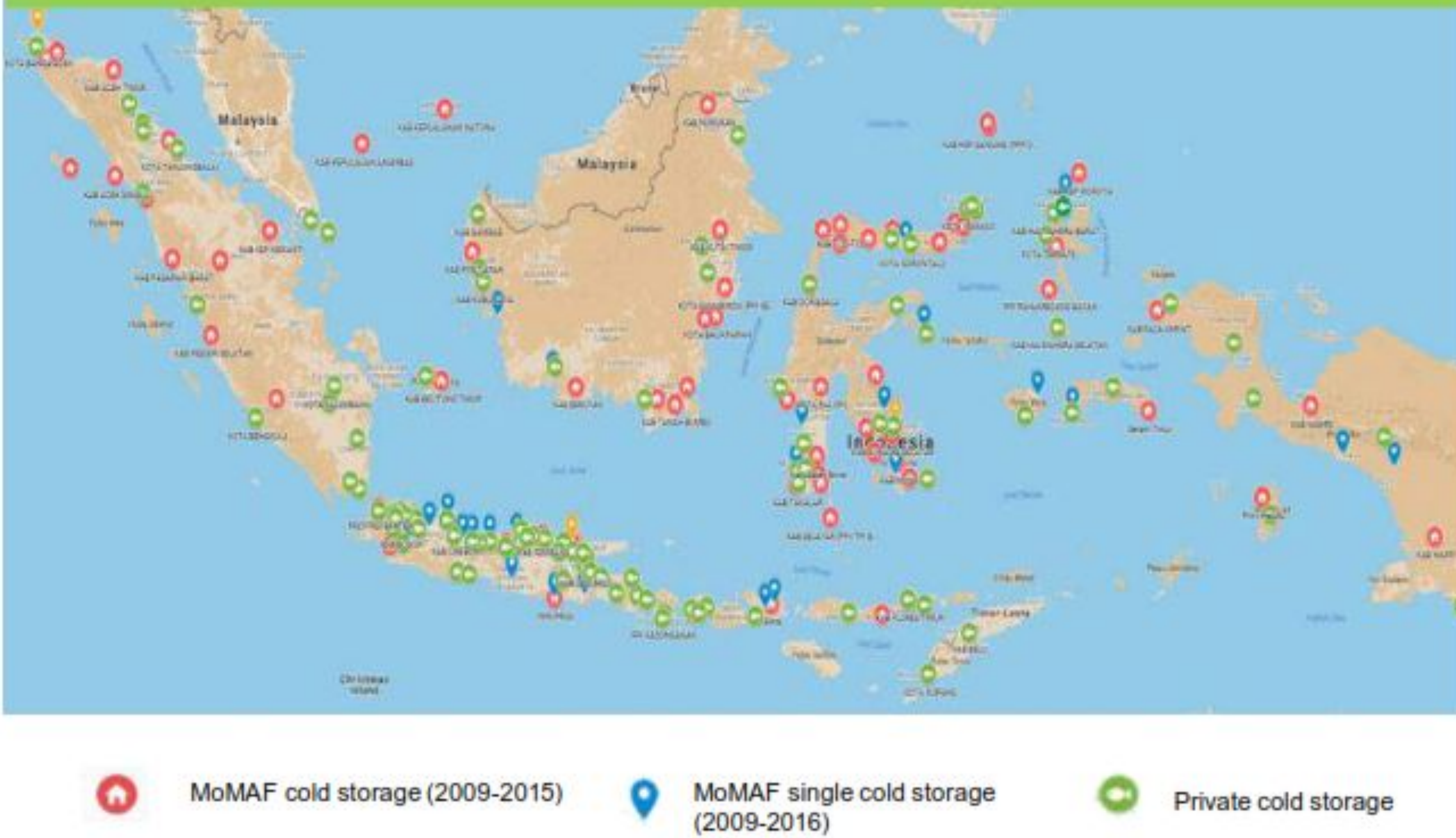
Source: Speedtest Global Index (September 2020)

Ships, boats and floating structures of Indonesia

Ships, boats and floating structures	2012	2013	2014	2015	2016
Indonesia's exports to the World	818.577.342	942.474.406	714.460.834	375.307.498	492.294.853
Indonesia's imports from the World	1.807.631.000	1.131.030.000	1.212.744.000	1.107.534.000	990.342.000
Total trade	**2.626.208.342**	**2.073.504.406**	**1.927.204.834**	**1.482.841.498**	**1.482.636.853**

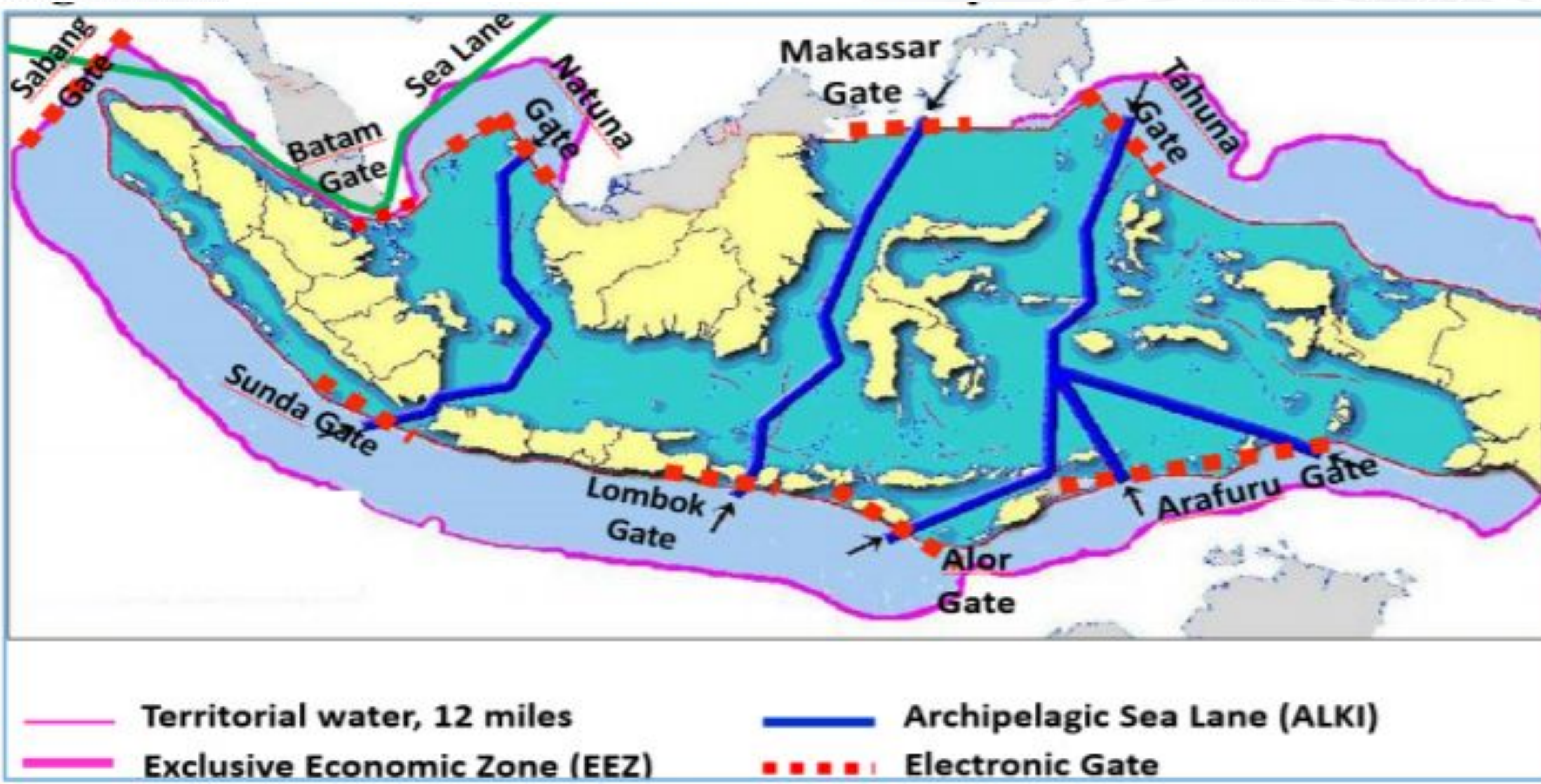
Source : Iperindo, 2017

Cold Storage Location, supported by MoMAF and Private Sector



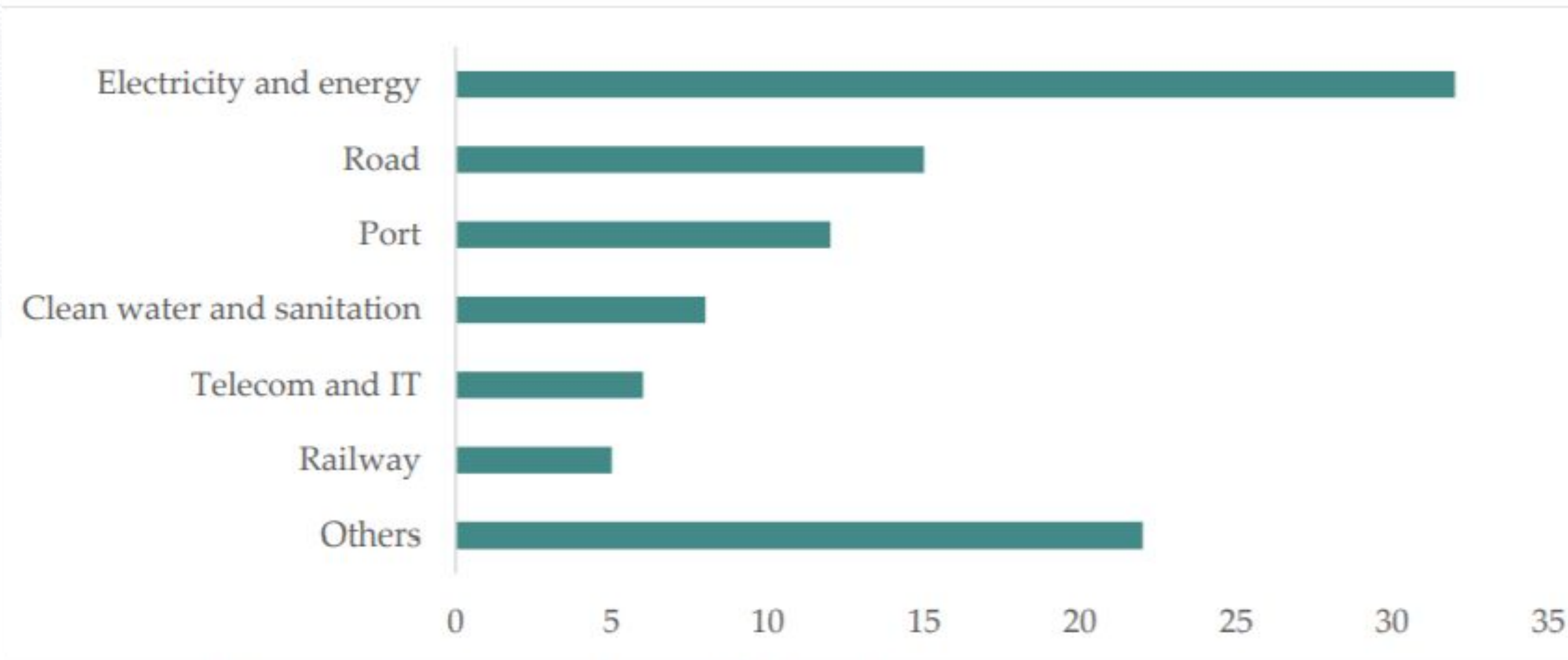
Source : MMAF, 2016

INDONESIA'S ELECTRONIC GATEWAY



Source: CSIS, 2014

Indonesia's Infrastructure Spending Allocation (2015-2019)



Source : National Mid-Term Development Plan (RPJMN) 2015-2019 in CSIS, 2019

Global Innovation Index Rankings

No	Country	2017	2018	2019	2020
1	Switzerland	1	1	1	1
2	Sweden	2	3	2	2
3	USA	4	6	3	3
4	Singapore	7	5	8	8
5	Malaysia	37	35	35	33
6	Viet Nam	47	45	42	42
7	Thailand	51	44	43	44
8	Philippines	73	73	54	50
9	Brunei Darussalam	71	67	71	71
10	Indonesia	87	85	85	85
11	Cambodia	101	98	98	110
12	Lao PDR	n.a	n.a	n.a	113
13	Myanmar	n.a	n.a	n.a	129
14	Yemen	127	126	129	131

In 2020, Indonesia ranks 85th out of 131 countries or ranked 7th in ASEAN

Source: Global Innovation Index 2017, 2018, 2019, 2020

B

BLUE ENERGY

- **With green energy from wind and solar out-competing fossil fuels, governments now hope for another boost – blue energy from the oceans.**
- **The amount of energy generated by tides and waves in the last decade has increased 10-fold. Now governments around the world are planning to scale up these ventures to tap into the oceans' vast store of blue energy.**
- **Now countries across the world with access to the sea are beginning to exploit all sorts of new technologies and intending to scale them up to bolster their attempts to go carbon-neutral.**

- Blue energy takes many forms. One of the most difficult technically is harnessing the energy of waves with devices that produce electricity. After several false starts many successful prototypes are now being trialled for commercial use. Other experiments exploit the <u>tidal range</u> – using the power of rapidly rising and falling tidal streams to push water through turbines.

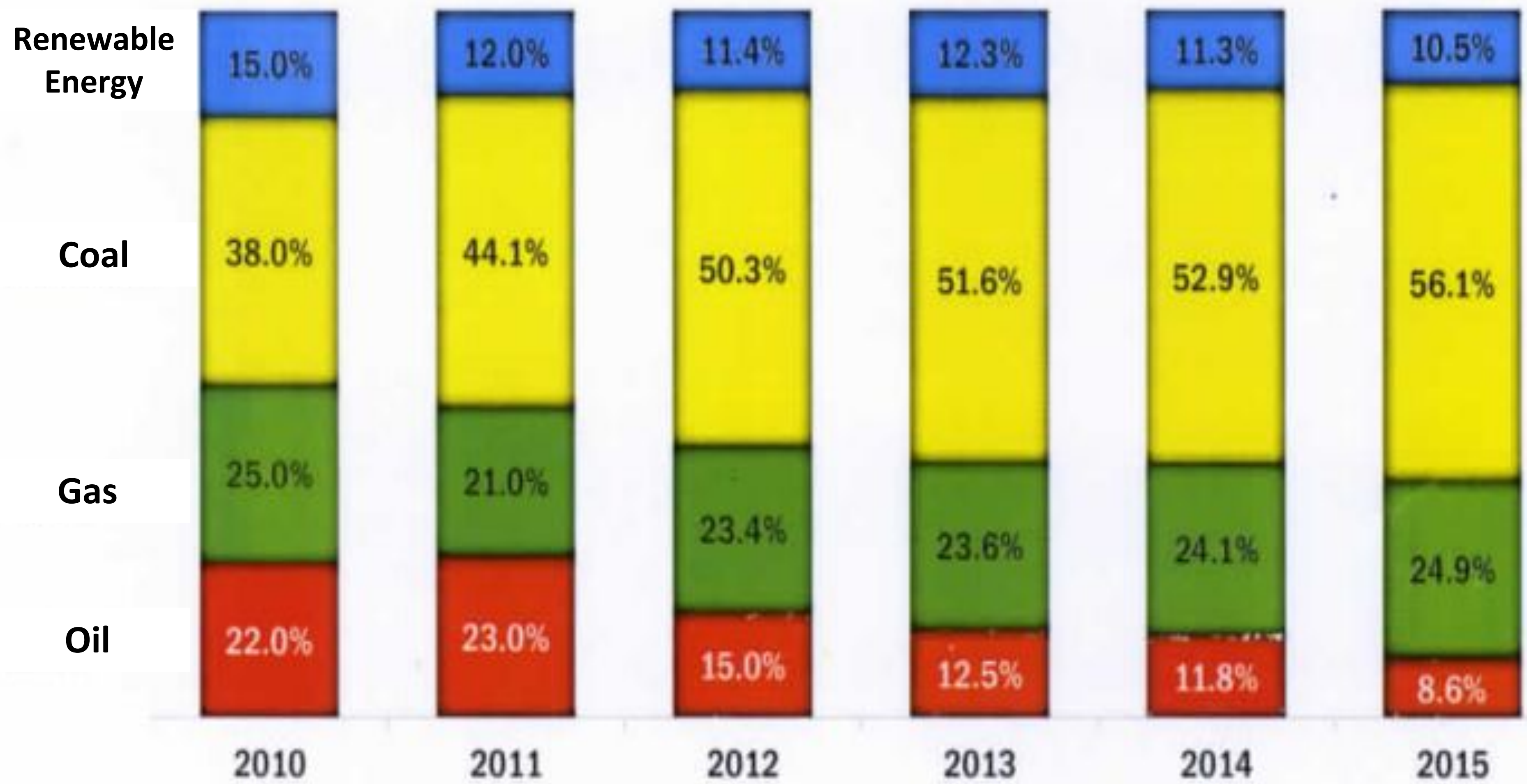
- The most commercially successful strategies so far use underwater turbines, similar to wind turbines, to exploit the tidal currents in coastal regions.

- More ambitious but along the same lines are attempts to capture the energy from the immense ocean currents that move vast quantities of water round the planet.

- Also included in blue energy is ocean thermal energy conversion, which exploits the temperature differences between solar energy stored as heat in the upper ocean layers and colder seawater, generally at a depth below 1000 metres.

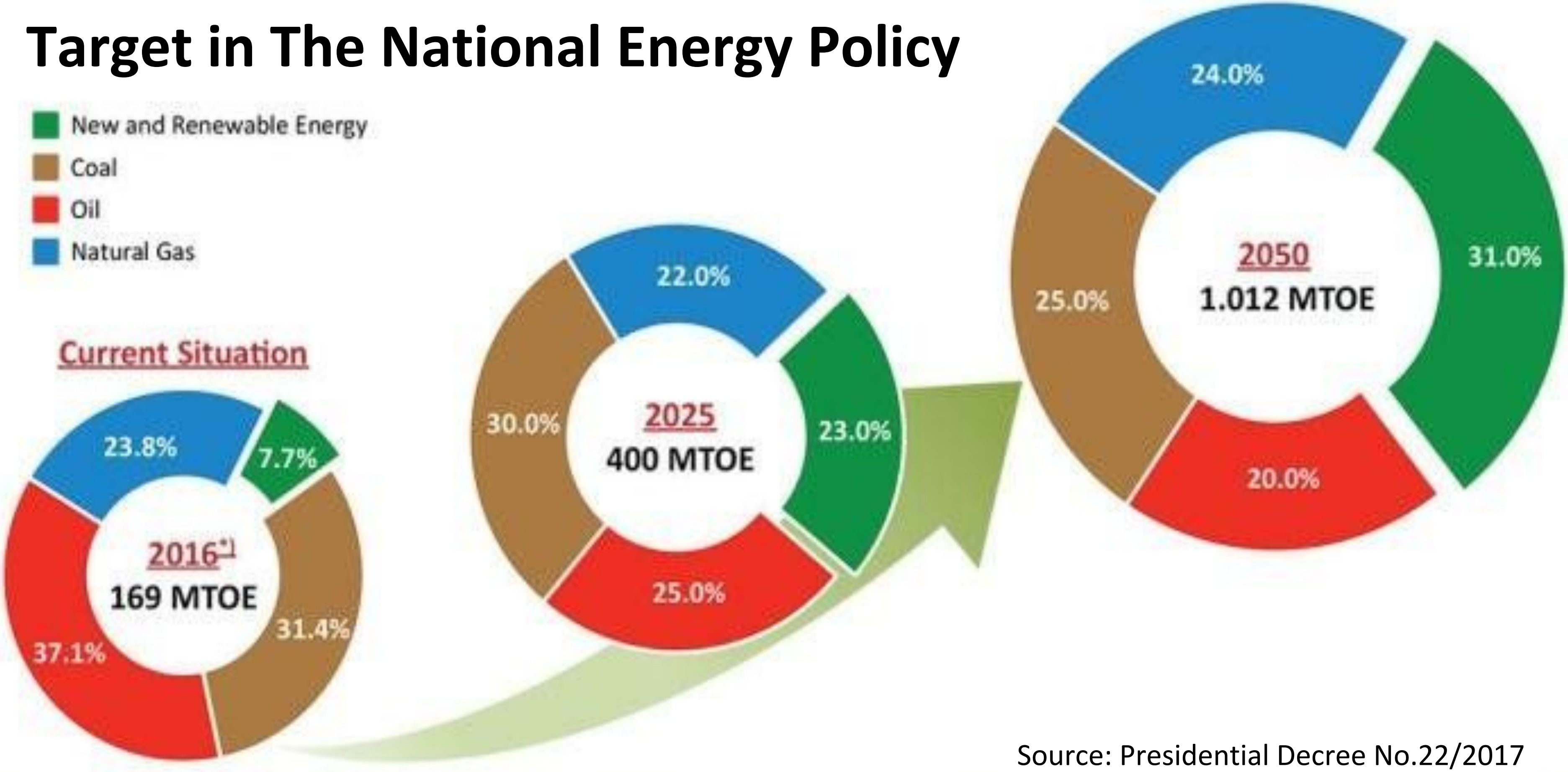
- The potential from all these ocean energy sources is so great that an organisation called Ocean Energy SystemsThe potential from all these ocean energy sources is so great that an organisation called Ocean Energy Systems (OES), an offshoot of the International Energy Agency, is pooling all the research in a bid to achieve large-scale deployment.
- There are now 24 countries in the OES, including China, India, the US, most European nations with a coastline, Japan, Australia and South Africa. Most of them have already deployed some blue energy schemes and are hoping to scale them up to full commercial use in the next decade.
- As with wind and solar when they were being widely developed ten years ago, energy from the oceans is currently more expensive than fossil fuels. But as the technologies are refined the costs are coming down.

Energy Mix for Power Generation in Indonesia



Source: Presidential Decree No.22/2017

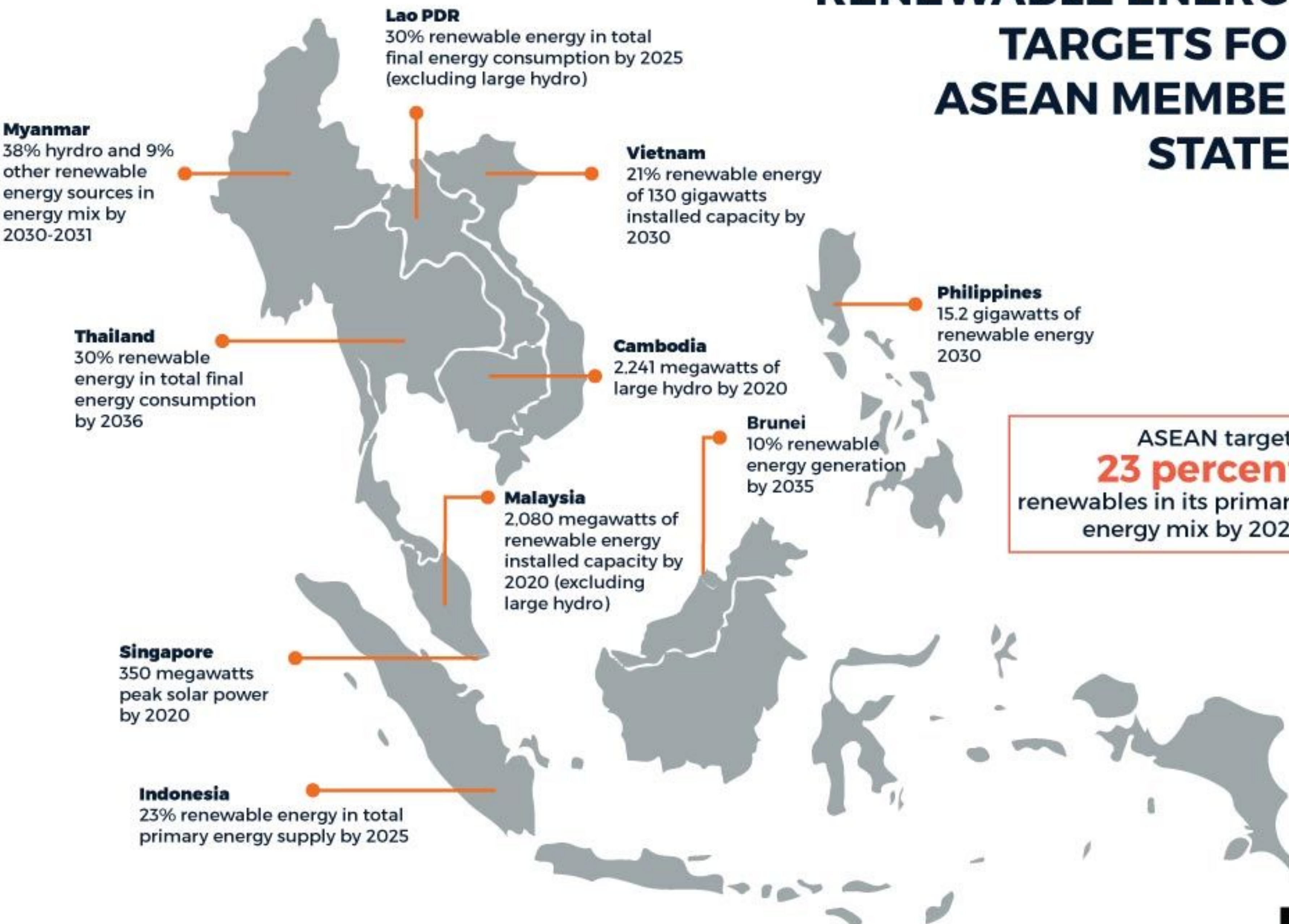
Target in The National Energy Policy



Source: Presidential Decree No.22/2017

	2016	2025	2050
NRE Mix	7.7 %	23%	31%
Energy Supply	169 MTOE	400 MTOE	1.012 MTOE
Generation Capacity	59 GW (NRE 8 GW)	136 GW (NRE > 45 GW)	443 GW (NRE > 167 GW)
Electricity/Capita	956 kWh	2.500 kWh	7.000 kWh
Electrification Rate	91%	~100%	~100%

RENEWABLE ENERGY TARGETS FOR ASEAN MEMBER STATES



ASEAN targets
23 percent
renewables in its primary energy mix by 2025

Indonesia's Non-Renewable Energy Potential in 2015

No	Energy Type	Resource	Reserve	Production	Lifespan*
1	Crude Oil	151 billion barrels	3.6 billion barrels	288 million barrels	12 years
2	Natural Gas	487 TCF	98.0 TCF	3.0 TSCF	33 years
3	Coal	120.5 billion tons	32.4 billion tons	393 million tons	82 years
4	CBM	453 TSCF	-	-	-
5	Shale Gas	574 TSCF	-	-	-

Notes: *if no new reserves are found

Source: Presidential Decree No.22/2017

Rokhmin Dahuri Institute

Rokhmin Dahuri ID

Indonesia's Renewable Energy Potential In 2015

No	Energy Type	Potential	Installed Capacity	Utilization
1	Geothermal	29,544 MW	1,438.5 MW	4.9%
2	Water	75,091 MW	4,826.7 MW	6.4%
3	Mini & Micro Hydro	19,385 MW	197.4 MW	1.0%
4	Bioenergy	32,654 MW	1,671.0 MW	5.1%
5	Solar	207,898 MW (4.8 kWh/m^2/day)	78.5 MW	0.04%
6	Wind	60,647 MW ($\geq$ 4 m/s)	3.1 MW	0.01%
7	Ocean	17,989 MW	0.3 MW	0.002%
Total		443,208 MW	8,215.5 MW	1.9%

Source: Presidential Decree No.22/2017

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C

BLUE TECHNOLOGY

Blue Tech

A rising tide of maritime technology and aquaculture reflects a big blue boom for San Diego

A new Blue Tech incubator

"San Diego has the largest concentrated maritime technology cluster in the U.S. And probably the world. Blue Tech represents a diversity of jobs, from blue-collar manufacturing to PhD-level research. The industry tackles our greatest challenges, like drinking water, conservation, atmospheric research, and sustainable food; and provides solutions that will benefit the rest of the country." **—County Supervisor Dave Roberts, in the *Marine Technology Reporter*.**

Scripps Institute of Oceanography spends $140 million a year on scientific research and discovery, operating four research vessels and the platform FLIP. It is one of the largest academic fleets in the world, with a staff of 1,300, including 300 scientists, 250 graduate students, and 100 faculty members as a part of UC San Diego.

Port of Call

46,000 "BLUE JOBS"

$14B+ IN SALES

1,400 BLUE-TECH COMPANIES

5,500 acres OF LAND AND WATER IN SAN DIEGO PORT'S JURISDICTION

8,000: traditional, exclusively maritime industries

19,000: blue tech

18,700: jobs that include maritime activities but are not exclusively maritime

The Case for More Aquaculture

- The U.S. imports 90 percent of the seafood we eat—an $11.2-billion annual trade deficit.
- By 2030, 60 percent of the seafood consumed globally will be farm raised. Why not build those farms here?
- Rose Canyon Fisheries is planning an aquaculture farm four miles off the San Diego coast that would raise up to 11 million pounds of yellowtail and sea bass annually.

60% of seafood in 2030 will be raised via aquaculture

Strength in Numbers

12% GROWTH IN EMPLOYMENT. THAT'S 6,000 NEW JOBS BY 2020.

14 sectors MAKE UP THE MARITIME INDUSTRY, WITH 71 SUB-SECTORS. DIVERSITY IS GOOD.

40–60% OF THE GOODS PRODUCED HERE ARE EXPORTED (AND MONEY IS IMPORTED!)

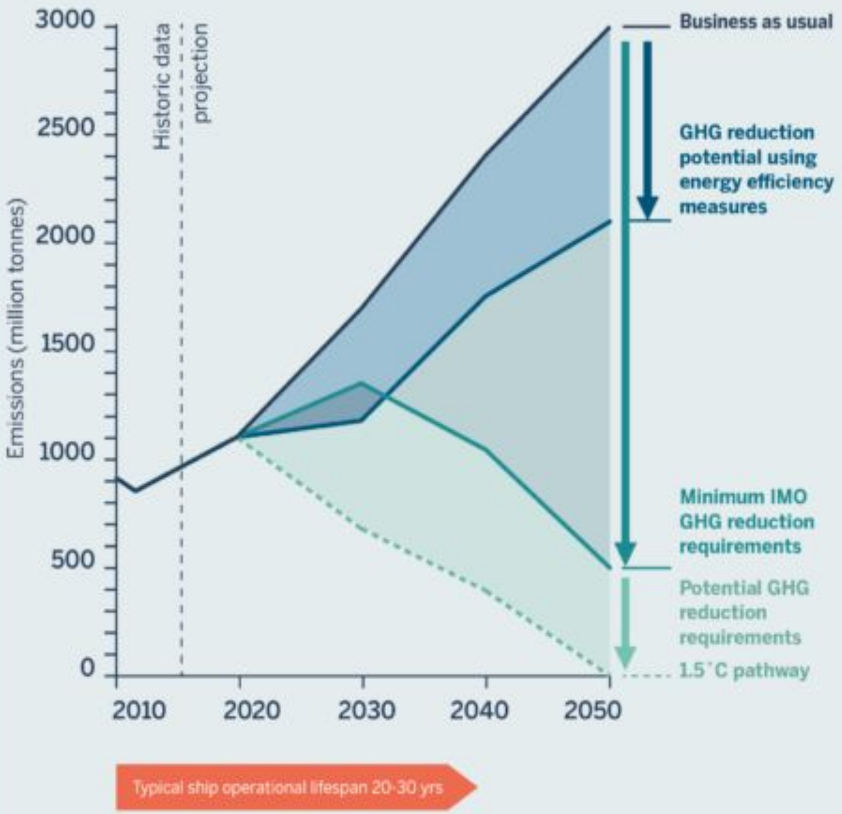
What is Blue Tech?

- Aquaculture and fishing
- Biomedicine
- Cables and connectors
- Boat and shipbuilding
- Defense and security
- Desalination and water treatment
- Marine recreation
- Ocean energy and minerals
- Ocean science and observation
- Ports and marine transportation
- Robotics and submarines
- Telecommunications
- Very large floating platforms
- Weather and climate science

How can shipping decarbonise?

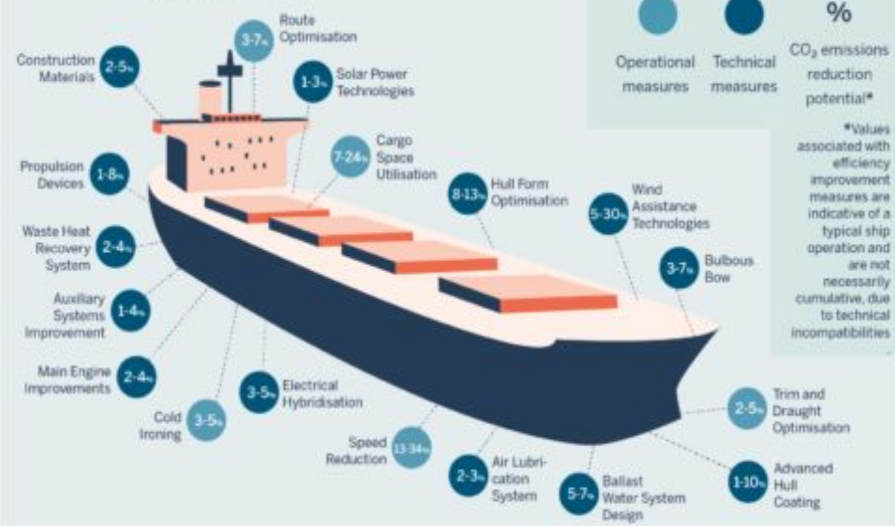
1 Pathways for international shipping emissions

The International Maritime Organization (IMO) has committed to reducing greenhouse gas (GHG) emissions from international shipping by **at least 50%** by 2050 (compared to 2008 emissions), with a strong emphasis on reaching zero emissions.



2 Efficiency measures

Some of the needed emissions reductions can be achieved immediately using technical and operational energy efficiency measures.



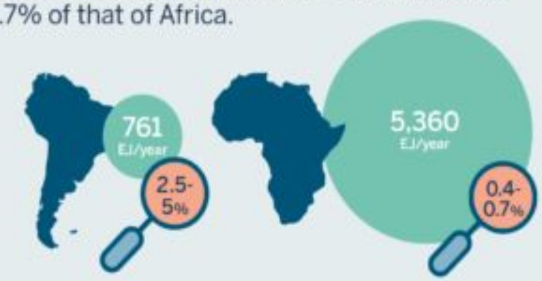
3 Renewable energy potential

Efficiency gains alone can't achieve the IMO's GHG reduction targets. A transition to zero-carbon fuels and electricity from renewable energy resources is needed.

International shipping will need approximately **20-40EJ of energy a year**. For example, this is about 2.5-5% of South America's total renewable energy potential or 0.4-0.7% of that of Africa.

Regional renewable energy potential

Proportional share of global shipping's future energy needs



Sources: ICCT (2017) Greenhouse Gas Emissions from Global Shipping, 2013-2015; IEA (2017) Renewable energy for industry. From green energy to green materials and fuels; IMO (2015) Third IMO GHG Study 2014; IMO (2018) Initial IMO Strategy on Reduction of GHG Emissions from Ships; UMAS (2016) CO2 emissions from international shipping. Possible reduction targets and their associated pathways.

Infographic produced by UMAS: www.u-mas.co.uk
Designer: Margherita Gagliardi

Zero-carbon fuels for shipping

1 Using a mix of electro-fuels and electricity, both made from renewable energy, plus some limited bio-fuels, shipping can achieve the IMO GHG target and reduce its emissions further.

Renewable energy source options + products

Electro-fuels

Production of gaseous/liquid zero-carbon electro-fuels from sustainable sources.

Electrification

Production of electricity from renewable energy resources in combination with battery storage technology.

Hydrogen, Methane, Ammonia, Dimethyl Ether, Methanol, Gas Oil

Bio-fuels + limitations

1st Generation

Produced from food resources, such as wheat and sugar.

Resource competition
Life-cycle emissions

2nd Generation

Produced from bio-mass resources such as wood and organic waste.

Resource competition
Land use alteration

3rd Generation

Produced from sustainably cultivated organic materials such as algae.

Life-cycle emissions
Commercial viability

4th Generation

Produced from bio-mass resources in combination with carbon dioxide capture and storage.

Resource competition
Land use alteration

A number of limitations are associated with bio-fuels. That is why electro-fuels and electricity generated from renewable energy are likely the more sustainable option.

No one solution fits all. Different solutions suit different vessel types based on size, power and range requirements.

Renewable energy generation

Electro-fuel production

Short-sea or domestic shipping suitable for electrification

Relatively small tonnage and limited range requirements, including small cargo ships and tankers, barges, ferries.

2

Deep-sea shipping requiring electro-fuels

Large tonnage and considerable range requirements, including large container ships, bulk cargo and gas carriers, larger tankers, cruise ships, RoRo ferries, etc.

3 Further work is needed to transition the maritime industry to zero-carbon fuels.

- **Infrastructure**: Scale up production of renewable energy production & zero-carbon fuels; Improve availability and reduce costs
- **Ship level**: Scale up deployment of zero- emission vessels
- **Regulations**: Develop supportive policy, standards and rules

Sources: Brynolf et al. (2018) Electrofuels for the Transport Sector: A Review of Production Costs. Renewable and Sustainable Energy Reviews, 81(2), 1887-1905; LR & UMAS (2019) Zero-Emission Vessels: Transition Pathways (incl. supporting documents); Royal Academy of Engineering (2017) Sustainability of Liquid Biofuels.

IV

STRENGHTENING BLUE TECHNOLOGY, ENERGY AND INFRASTRUCTURE TO IMPROVE MARINE GOVERNANCE

1. **Improving data reporting and policy analysis, since good decisions require good data and comprehensive analysis of the long-term impacts of policy options**
2. **Redefining and clarifying emissions targets, since emissions have to be measured and targets set if emissions are to be managed**
3. **By minimize landuse requirements of the power sector and reduce the greenhouse gas emissions**
4. **Develop ocean energy technologies by utilising waves and tides to generate electricity**
5. **Develop marine macroalgae for biofuel production because macroalgae has higher productivity rates than terrestrial biomass such as corn and switch grass**

Source : Kathijotes, 2017

6. **Improve energy efficiency, to maximize the energy extracted from untreated water and eventually from sludge, and to recover other renewable energies**
7. **Improving treatment technological practices and following 'best practice' suggestions for low energy consumption**
8. **Enforce and Expand Industrial Energy Efficiency ; enforce existing PP 70/2009 regulation on energy audit and introduce MEPS for electric motors**
9. **Develop zero-emission ships to eliminate harmful environmental impact**

Source : Kathijotes, 2017

FUTURE MARINE FUELS

PATHWAYS TO DECARBONIZATION

IMO has developed the ambitious target of a minimum **50% reduction** in greenhouse gas (GHG) emissions **by 2050.**

Shipowners have **alternative fuel options** to help them meet IMO's ambitions, each with its own advantages and challenges.

Advantages

Challenges

CARBON FUELS

Liquefied Natural Gas (LNG)

Established infrastructure
Long-term solution
Global fuel availability
Safe to handle
Increased CAPEX

+ Clean fuel, rapidly developing infrastructure
− Methane slip

Liquefied Petroleum Gas (LPG)

Global fuel availability
Safe to handle

+ CO_2 emissions

Methanol / Ethanol

Increased CAPEX
High fuel cost

+ Easy-to-handle, well developed terminal network
− Refueling challenges, flammable

CARBON NEUTRAL

Biofuels / Biomethane

Safe to handle
High fuel cost

+ Increasingly used as marine fuel, can be used as drop-in fuel
− Sustainable scaling up needed

Synthetic methane / SNG

Safe to handle
High fuel cost

+ Easily adapted to LNG infrastructure, can be used as drop-in fuel
− Large-scale production challenges, requires renewable energy source

ZERO CARBON

Hydrogen

Long-term solution
Increased CAPEX
High fuel cost

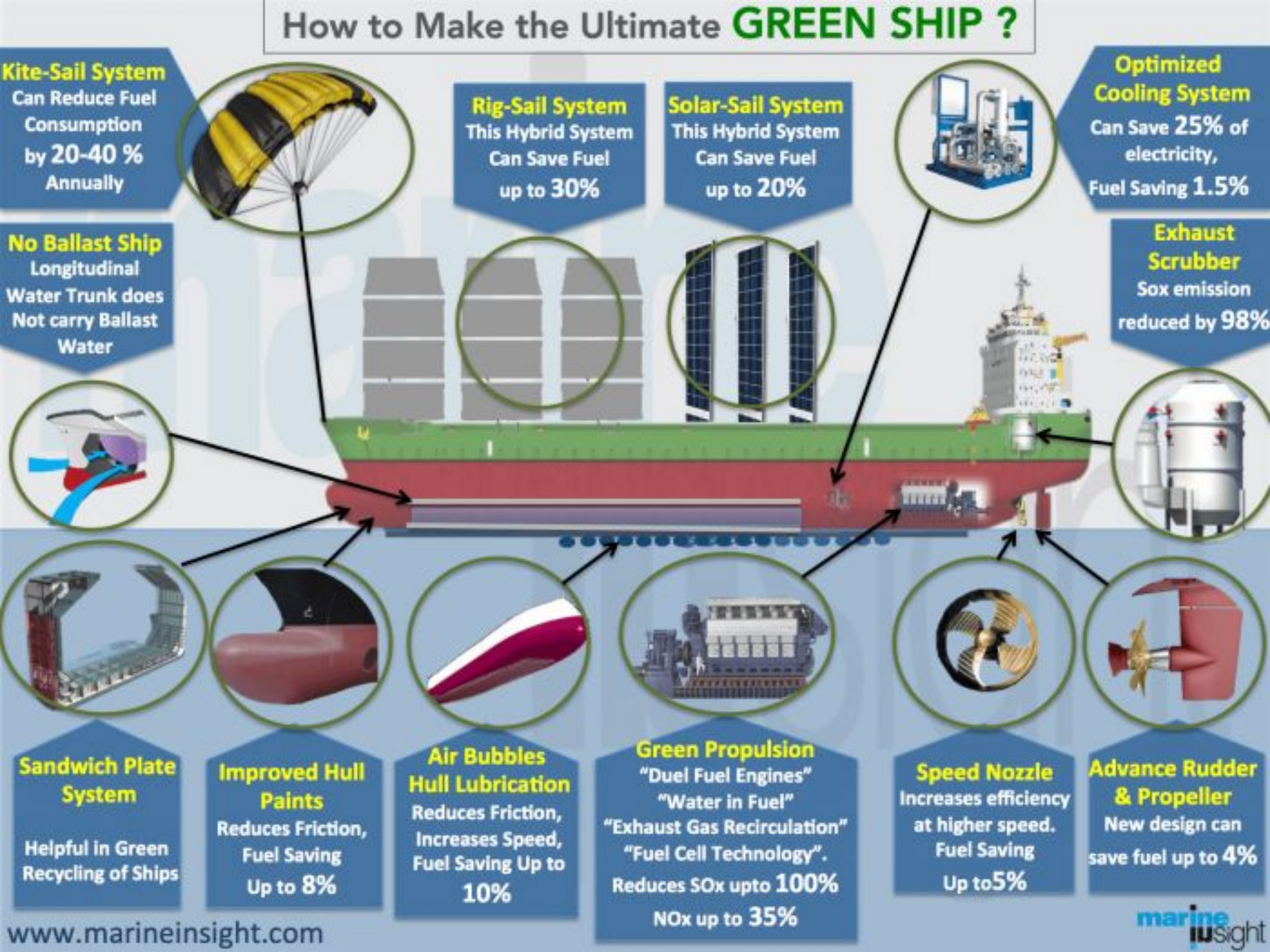
+ Low energy density per volume and favorable specific density by mass
− Storage challenges, flammable

Ammonia

Long-term solution
Increased CAPEX
High fuel cost

+ Solution for internal combustion engines and fuel cells
− Limited bunkering, toxic effects on human health

Decarbonization by 2040
Newbuilds and retrofits: e-ammonia, blue ammonia, bio-methanol
Drop-in: bio-MGO, e-MGO, bio-LNG and e-LNG
100% reduction in absolute emissions
2020
2030
2040
Very strict design and operational requirements, or
High carbon pricing
IMO ambitions
Fossil VLSFO/MGO and LNG
Newbuilds and retrofits: e-ammonia, blue ammonia, bio-methanol
Drop-in: bio-MGO, e-MGO, bio-LNG and e-LNG
50% reduction in absolute emissions
70% reduction of the carbon intensity
2020
2030
2040
2050
Strict newbuild and operational requirements, or
Moderate carbon pricing
Very strict design and operational requirements, or
High carbon pricing
No ambitions
Absolute emissions could more than double, depending on seaborne transportation demand
Fossil fuels dominate the fuel mix
2020
2050


How to Make the Ultimate GREEN SHIP ?
Kite-Sail System
Can Reduce Fuel Consumption by 20-40 % Annually
Rig-Sail System
This Hybrid System Can Save Fuel up to 30%
Solar-Sail System
This Hybrid System Can Save Fuel up to 20%
Optimized Cooling System
Can Save 25% of electricity, Fuel Saving 1.5%
No Ballast Ship
Longitudinal Water Trunk does Not carry Ballast Water
Exhaust Scrubber
Sox emission reduced by 98%
Sandwich Plate System
Helpful in Green Recycling of Ships
Improved Hull Paints
Reduces Friction, Fuel Saving Up to 8%
Air Bubbles Hull Lubrication
Reduces Friction, Increases Speed, Fuel Saving Up to 10%
Green Propulsion
"Duel Fuel Engines"
"Water in Fuel"
"Exhaust Gas Recirculation"
"Fuel Cell Technology".
Reduces SOx upto 100%
NOx up to 35%
Speed Nozzle
Increases efficiency at higher speed. Fuel Saving Up to5%
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New design can save fuel up to 4%
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RENEWABLE ENERGY AND INNOVATIVE AQUACULTURE

Solar PV *Movable Cold Storage*

Millenial's Schrimp Farms

Sumber: Kemenko Bidang Kemaritiman dan Investasi RI, 2020

THANK YOU

Rokhmin Dahuri ID