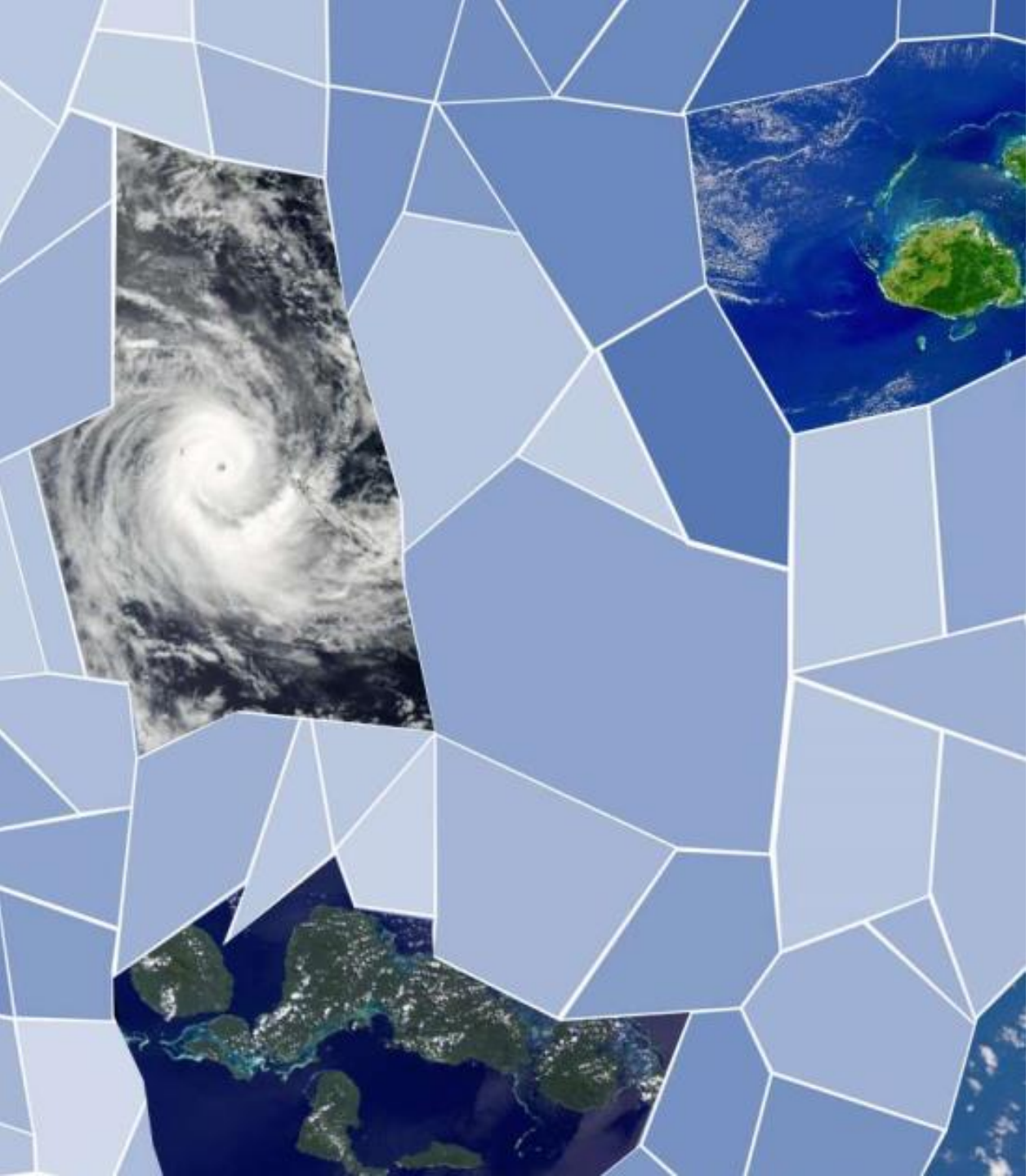


Vietnam Ocean account

Case study in Quang Ninh

UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific

75th COMMISSION SESSION

Why ocean account – from a provincial perpective

Quảng Ninh is among top 5 economic province of Vietnam, a UNESCO heritage site; income from tourism 2018 was ~ 1 billion USD.

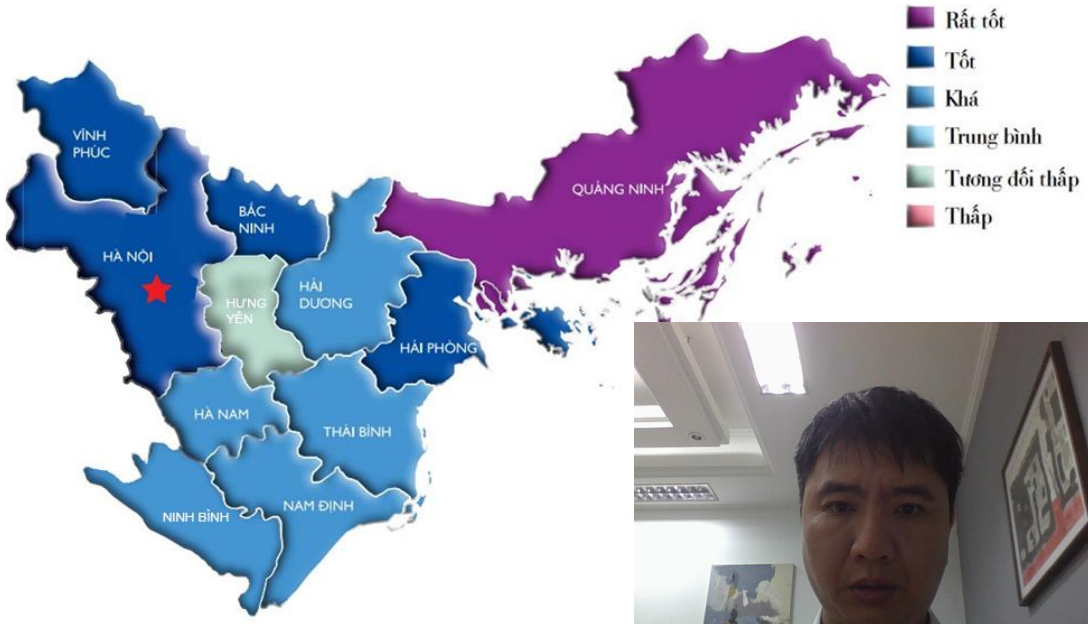
- What if there is no coral reef and sea grass?
- What if there is less and less mangrove forest?
- What if the sea is heavily pollute because of human activity?

We need to measure and report ocean value, its contribution to the economy and its environment condition.

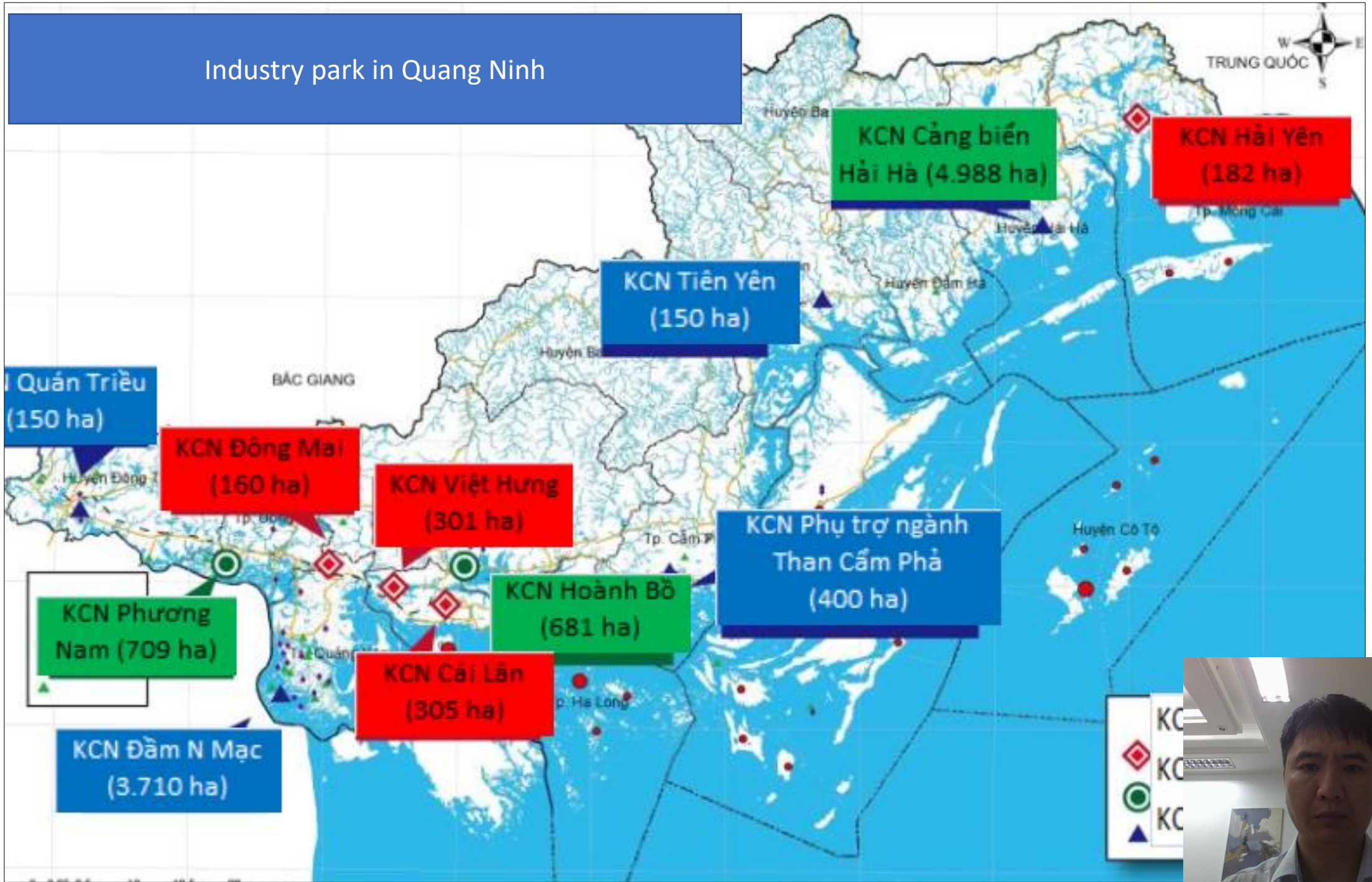
Only when the ocean account is fully recognized, we could start in i
ocean into economic planning more effectively.

Quang Ninh province

- Top 5 province to contribute to state budget revenue.
- Annual economic growth rate ~ 10%
- GDP per capital is double the country average
- Key province in the regional development plan
- Key sectors
  - Coal mine (80% national)
  - Thermal energy (20% national)
  - Cement (15% national)
  - Sea transportation
  - Industry
  - Tourism (1 billion USD in 2018)



Industry park in Quang Ninh



Reporting

Ocean accounting

Calculation

Accounting method

Data collection

Social Economic

Ecological service

Environment

Ecosystem landscape

Land

Ocean

Figure 1 A stylized set of ocean accounts

SEEA-CF Mineral and Energy Assets; Aquatic resources

Drivers

Specific units	Industry		% to ocean
SEEA Air emissions			
SEEA Effluents[1]			
SEEA Solid wastes[1]			

1. would benefit from spatial disaggregation

Ocean governance

Specific units	Industry		
Policies, plans and regulations			
Institutions			
Management practices			
Technologies			
SEEA Protection Expenditures			
- research			
- enforcement			
SEEA Goods and Services			
- technologies			

Ocean Assets:

Ocean Extent

hectares	Ecosystem Type[2]			Minerals (T)	Energy (MToE)	Fish stocks (T)
Beginning of period						
+ additions						
- reductions						
End of period						

Ocean Conditions

Specific units	Ecosystem Type[2]			Minerals (T)	Energy (MToE)	Fish stocks (T)
Acidification (pH)						
Eutrophication (BOD)						
Plastics (T)						
Carbon[3]						
Biodiversity[3]						
Temperature (°C)						
Accessibility/quality						

2. Including critical natural capital areas, settlements, coastal infrastructure, protected areas, fishing zones, designated tourist areas, coral reefs, mangroves, coastal beaches…

3 As in the SEEA-EEA, Carbon and Biodiversity could be full accounts.

Note: This is a stylistic representation of the SEEA-EEA with additional components required for including sources of land-based pollution, abiotic services (such as minerals, energy and medium for transport), expenditures and governance. This is not as comprehensive as described in the text. Much of the data on flows of land-based pollution, ecosystem types, and condition would be derived from detailed maps and aggregated as shown in the tables for reporting.

SNA for some services[6]

6. Would benefit from disaggregation by large/small enterprise and linkage to employment by beneficiary type.

Ocean Services Supply (physical)

Service (specific units)	Ecosystem Type		
Provisioning			
Regulating and maintenance			
Cultural			
Abiotic: Minerals, energy, medium for transport			

Ocean Services Use (physical)

Service (specific units)	Beneficiary type[4]		
Provisioning			
Regulating and maintenance			
Cultural			
Abiotic: Minerals, energy, medium for transport			

4. Disaggregated by coastal/urban/rural, high/low income, male/female

Ocean Services Supply (Monetary[5])

Service (monetary unit)	Ecosystem Type		
Provisioning			
Regulating and maintenance			
Cultural			
Abiotic: Minerals, energy, medium			

5. Only some services can be valued

Ocean Services Use (Monetary[4])

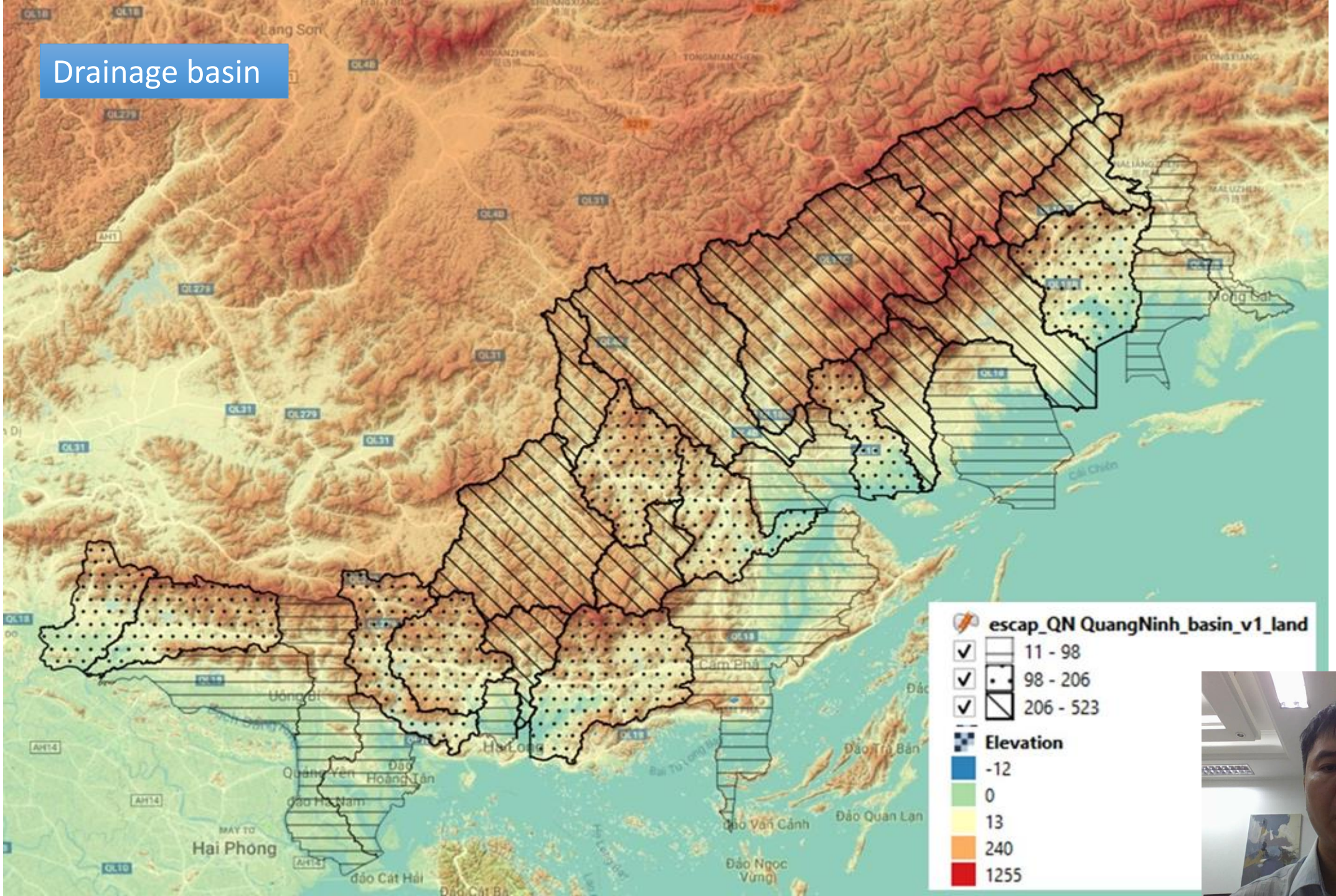
Service (monetary unit)	Bene
Provisioning	
Regulating and maintenance	
Cultural	
Abiotic: Minerals, energy, medium	

Data source

1	Quang Ninh land-based protected area	MARD	vector
2	Quang Ninh marine protected area	IUCN	vector
3	Quang Ninh forest map 2018	MARD	vector
4	Quang Ninh mangrove 2018	MARD	vector
5	Elevation	SRTM	Raster
6	Quang Ninh soil map	MARD	vector
7	Commune population	GSO	vector
8	Quang Ninh land cover	MONRE	vector
9	Hydrology	MONRE	vector
10	Coral reef	WCMC	Raster
11	Sea grass	WCMC	Raster
12	Quang Ninh environmental protection plan	DONRE	
13	Ocean pollution assessment of Quang Ninh and Hai Phong	VASI	
14	Global Urban Footprint in Vietnam	DLR	
15	Quang Ninh LULC 2010 and 2015	MONRE	

Mapping drainage basin and marine unit

Drainage basin




16
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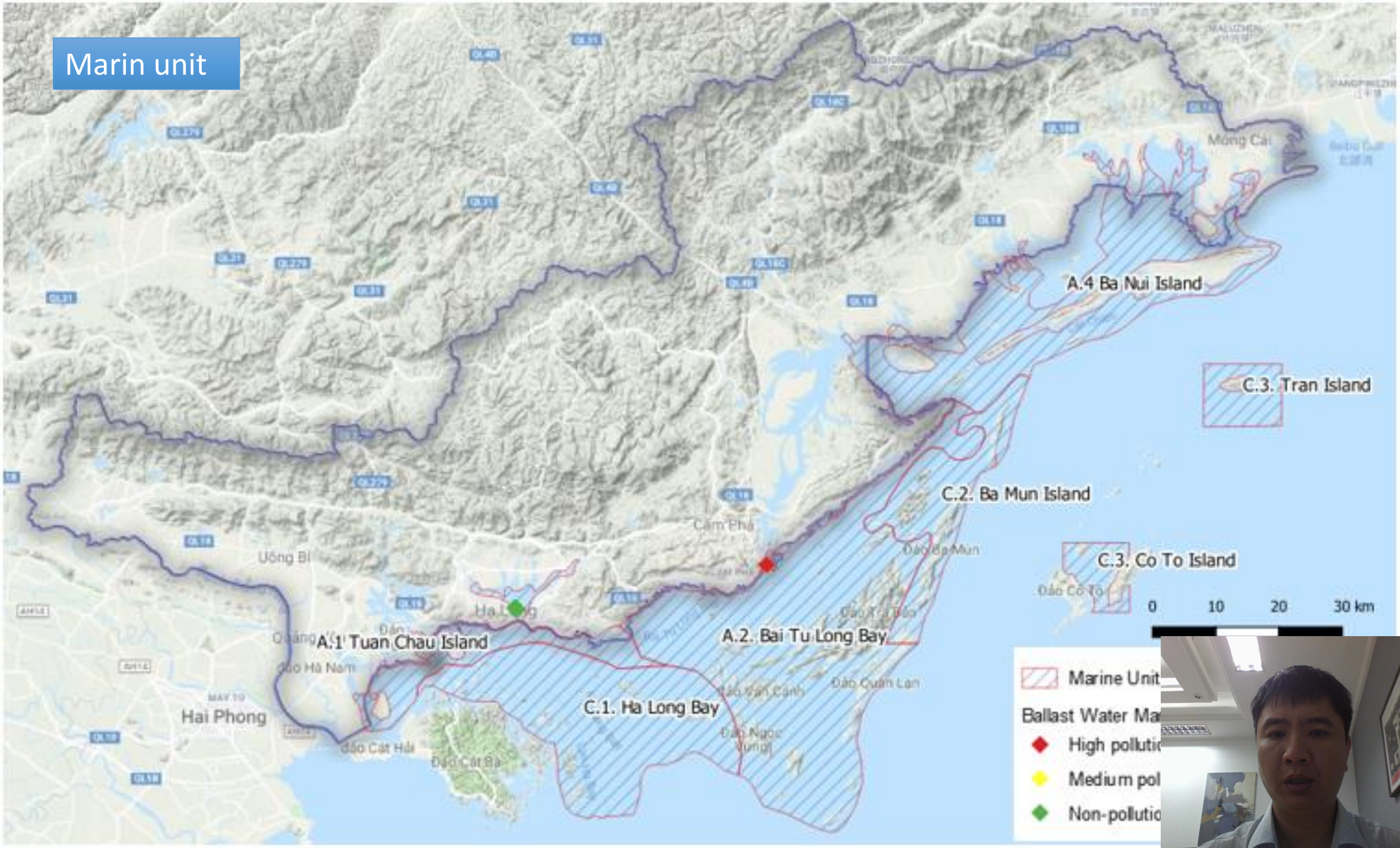
Tp. Hạ Long
Tp. Cẩm Phả
Đảo Ba Mùn
Đảo Cô Tô
Đảo Trà Bản
Hải Phòng
Cat Ba Archipelago
Vịnh Hạ Long
Cát Chiên


Marin unit
A.4 Ba Nui Island
C.3. Tran Island
C.2. Ba Mun Island
C.3. Co To Island
A.1 Tuan Chau Island
A.2. Bai Tu Long Bay
C.1. Ha Long Bay
Hai Phong
Cẩm Phả
Uông Bí
Móng Cái
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Marine Unit
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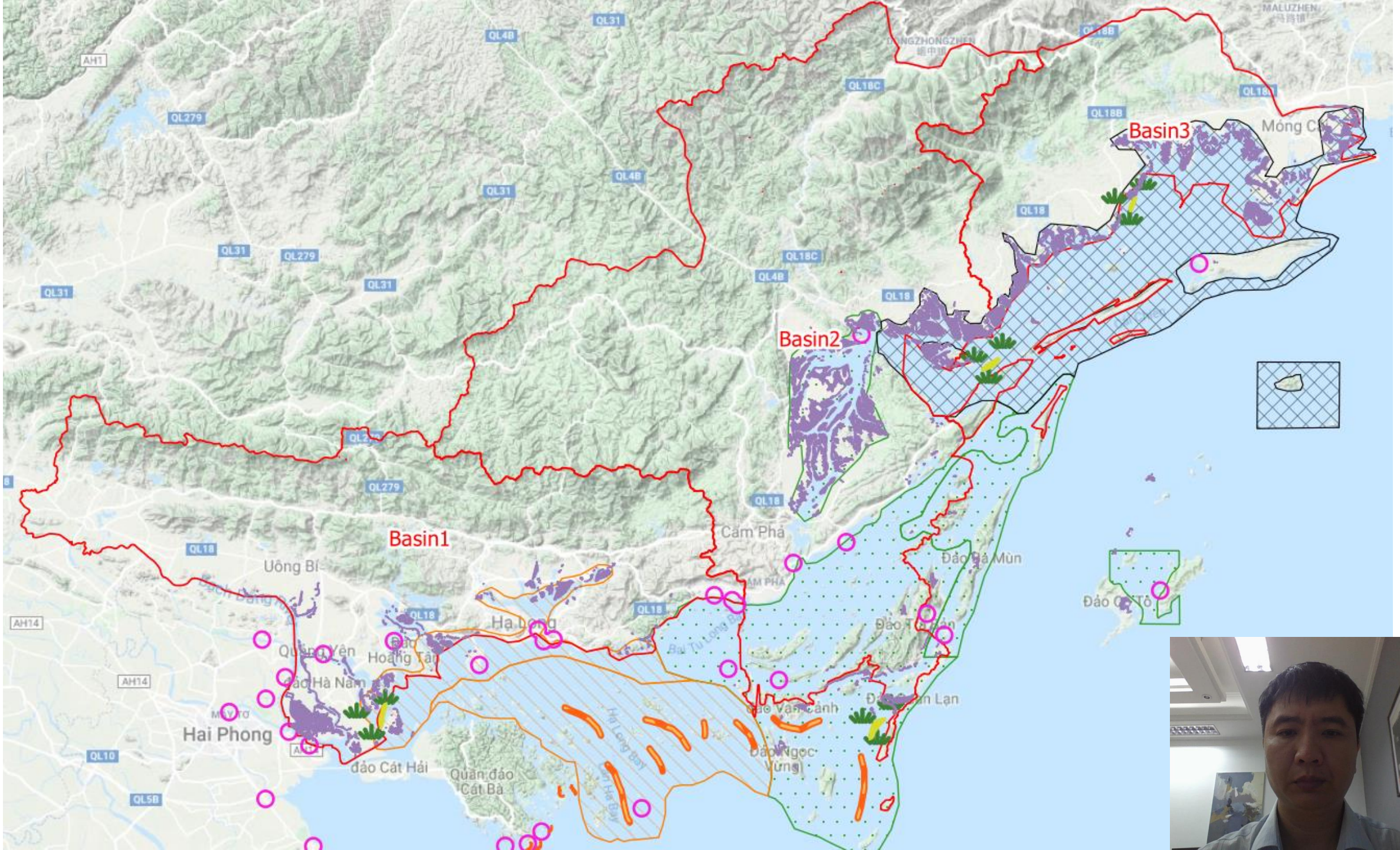
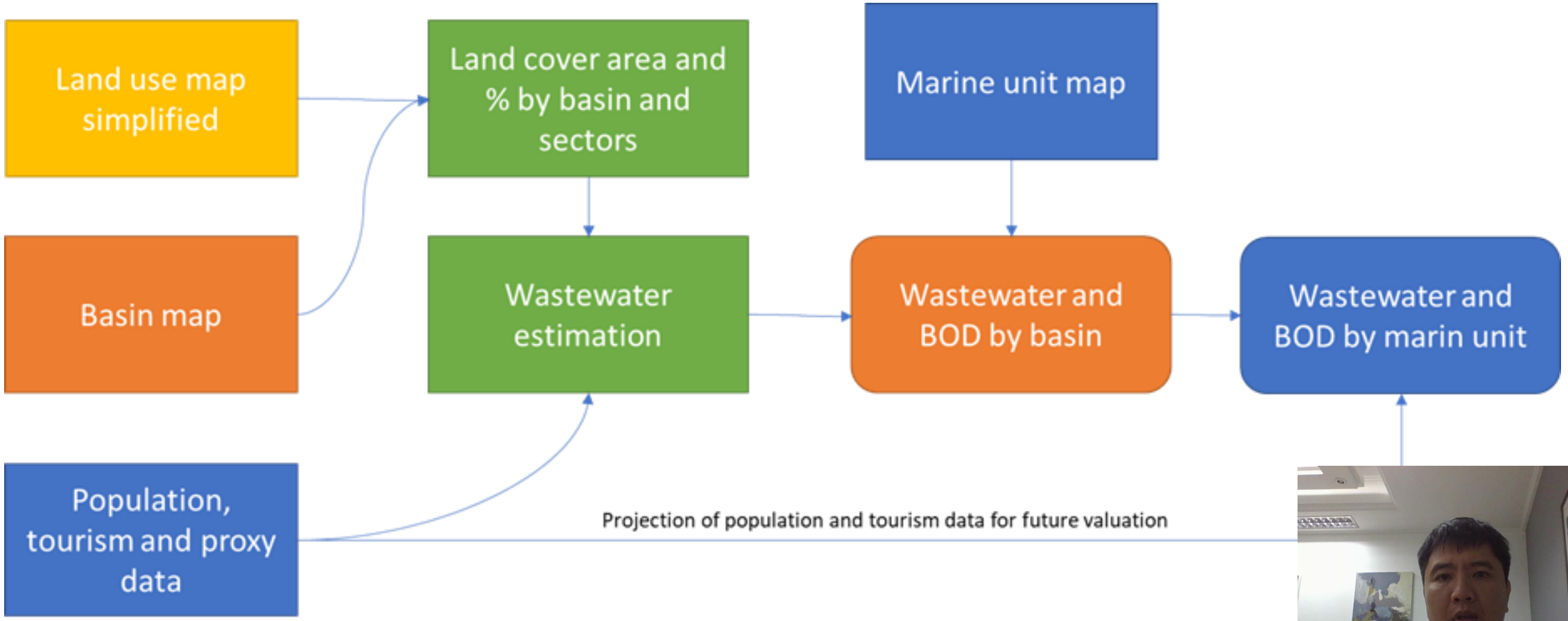

Basin1
Basin2
Basin3
Hai Phong
Cẩm Phả
Hạ Long
Uông Bí
đảo Cát Hải
Quần đảo Cát Bà
QL18
QL279
QL31
QL4B
QL18C
AH1
AH14
QL10
QL5B

Ocean condition with impact from land-based pollution



Data collecton period: 2015 - 2016

Table Information of Drainage basins

Pollution Source	DB1	DB2	DB3
Population	61.1%	24.6%	14.3%
Industry	65.3%	0.0%	33.7%
Agriculture	46.4%	22.2%	31.4%
Coal mine	58.8%	40.8%	0.4%
Tourism	95.0%	1.0%	4.0%

Table Pollution factors

Pollution Source	Wastewater (m3/year)	BOD (t/year)
Local Population	21,285,194	18,224
Industry (exclude coal mine)	7,396,725	
Rice	6,785,040	
Coal mine	21,827,000	
Tourism	1,127,183	

BOD received by marine unit and ecosystem

Marine unit area by drainage basin	Ecosystem types	Ecosystem units (ha)	Ecosystem units (%)	BOD received (t / year)	BOD allow (t/year)	Risk mark
DB1 (15,528 ha)	Mangroves	1,310	1.8%	131	1.37	High risk
	Seagrasses	222	0.3%	22	0.63	High risk
	Coral reefs	1,901	2.6%	191	5.39	High risk
DB2 (59144 ha)	Mangroves	6,011	4.4%	122	9.18	High risk
	Seagrasses	283	0.2%	6	0.43	High risk
	Coral reefs	894	0.7%	18	1.37	High risk
DB3 (25543 ha)	Mangroves	7,714	8.2%	134	16.97	High risk
	Seagrasses	325	0.3%	6	0.	
	Coral reefs	-	0.0%			

Mapping protected area, seagrass, coral

Key issue identified from ecosystem mapping

- Mangrove: reduction of 25% mangrove are due to land conversion for industry, urbanization, aquaculture farm
- Seagrass and coral: few systematic study with update status.
  - Seagrass: 3 site loss 100%; 3 site loss more than 80%
  - Coral: reduce 30% on species richness, 70% on area
- Driver: aquaculture, construction, use of toxic chemical in fishing (Water sample in 2007 at Co To island have Xyanua 3-5 time higher than standard); **flash flood pushing** sediment to the sea that kill seagrass.

Seagrass condition

#	Site	Area before 1995 (ha)	Area after 2003 (ha)	Percentage loss (%)
1	Vụng Hà Cối (Q.Ninh)	1200	150	87.5
2	Bãi Đầm Hà (Q.Ninh)	80	2	97.5
3	Quan Lạn (Q.Ninh)	100	1	99
4	Đồng Rui (Q.Ninh)	420	0	100
5	Tuần Châu (Q.Ninh)	120	0	100
6	Bồ Hòn (Q.Ninh)	1	0	100

Coral

Before 200: area of coral 465ha, of which
- Ba Mùn - Sậu Nam island 20ha,
- Hạ Long bay 76ha
- Cô Tô - Thanh Lân island 369 ha

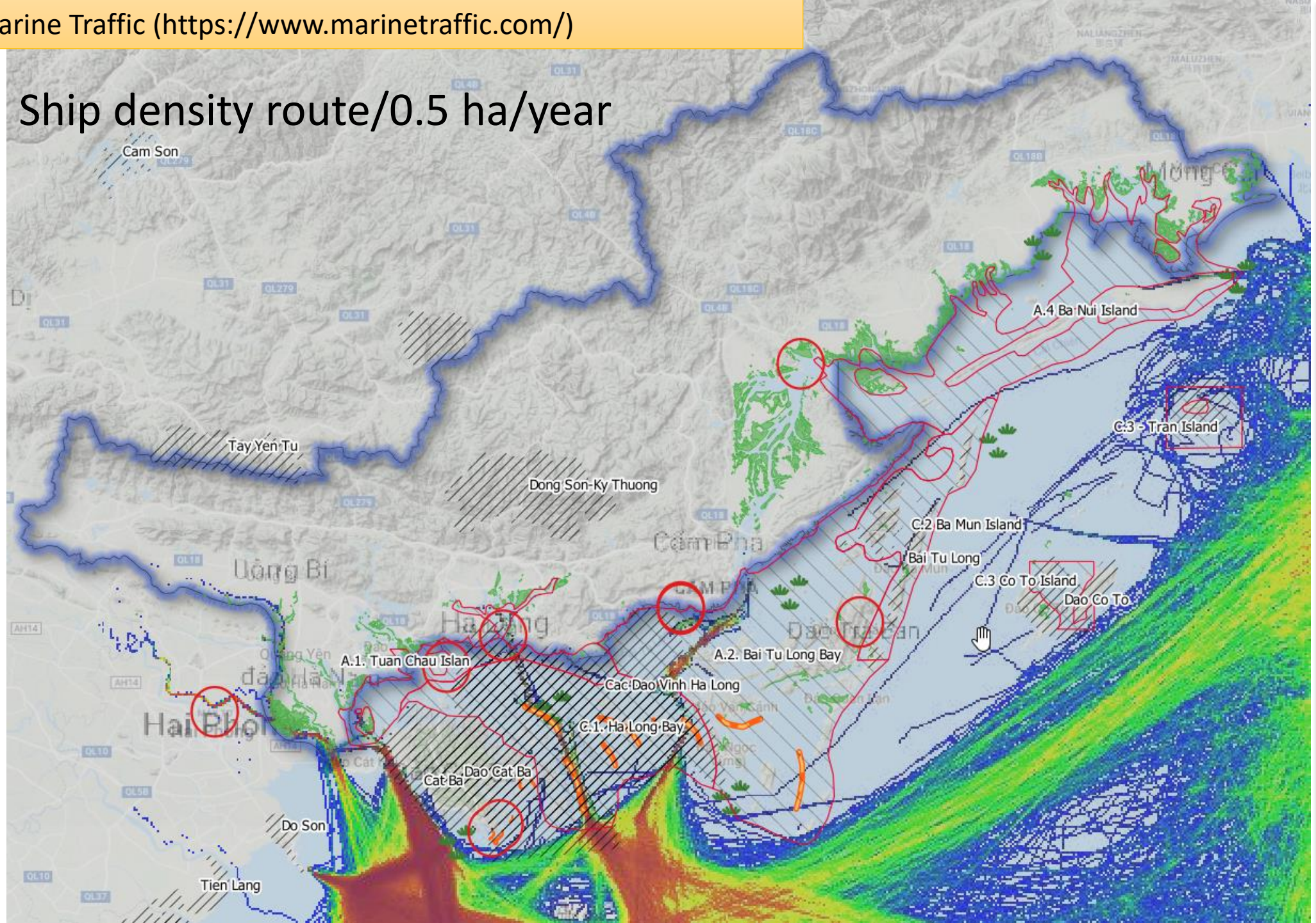
In 2007
- Only remained in Co To island
- Coverage is 1-7%

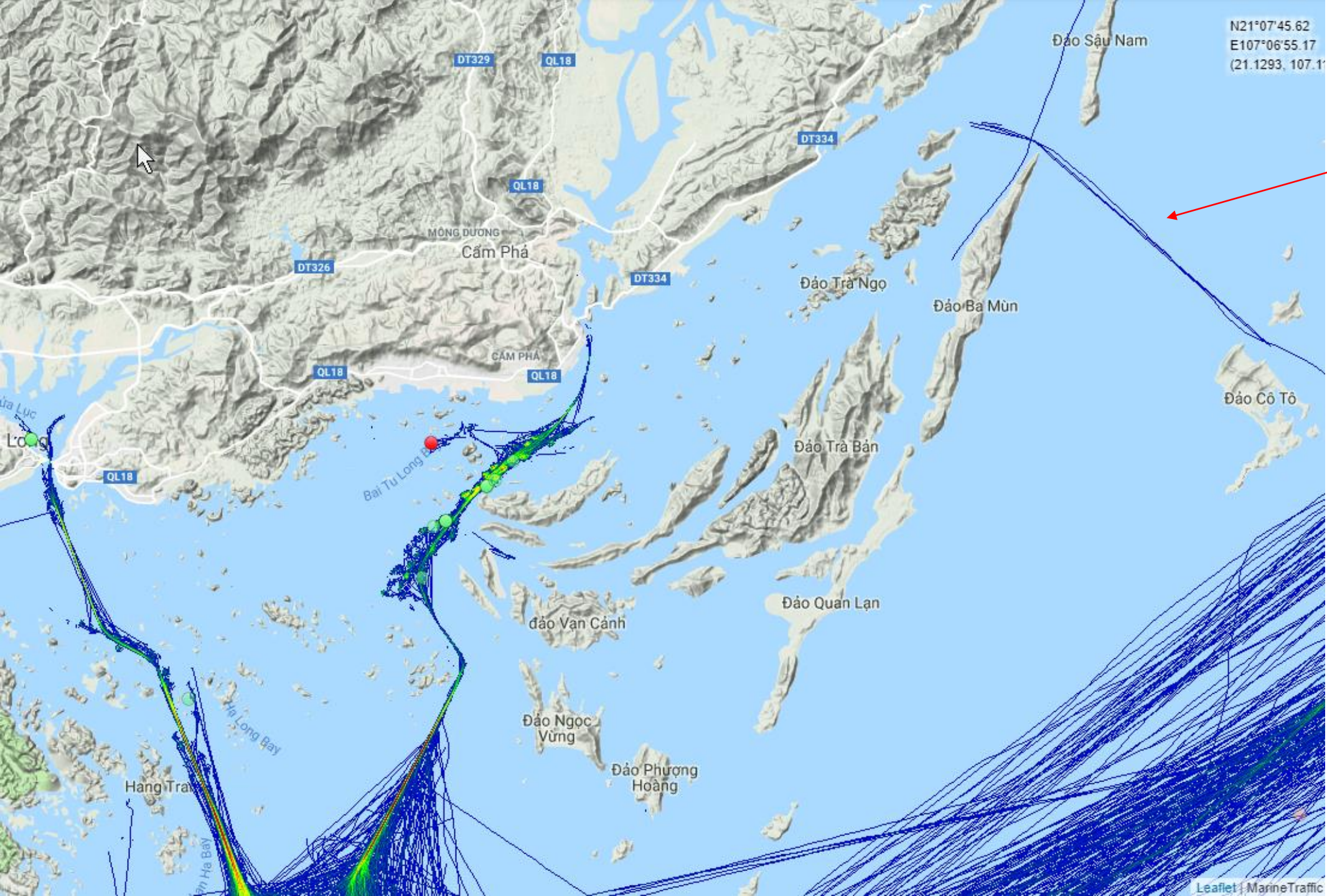
No.	Family	Genus	Species	Dominant genus
1	Pocilloporidae	1	1	
2	Acroporidae	3	28	Acropora, Montipora
3	Poritidae	3	13	Porites, Goniopora
4	Siderastreidae	3	5	Psammocora
5	Agaricidae	2	4	Pavona
6	Fungiidae	3	3	
7	Oculiniidae	1	2	Galaxea
8	Pectinidae	4	4	Echinophyllia
9	Mussidae	2	2	
10	Merulinidae	2	3	Hydnophora
11	Faviidae	12	33	Favia, Favites, Goniastrea, Leptas
12	Dendrophyllidae	1	5	Turbinaria

Location	Number of species	Diverse index (H')
Anh Tham	17	0.72
Hon May	16	0.65
Cat Dua	17	0.82
Van Boi	10	0.59
Vung Vua	9	
Tung Ngon	12	
Tung Gio	7	
Coc Cheo	12	

Source: Marine Traffic (https://www.marinetraffic.com/)

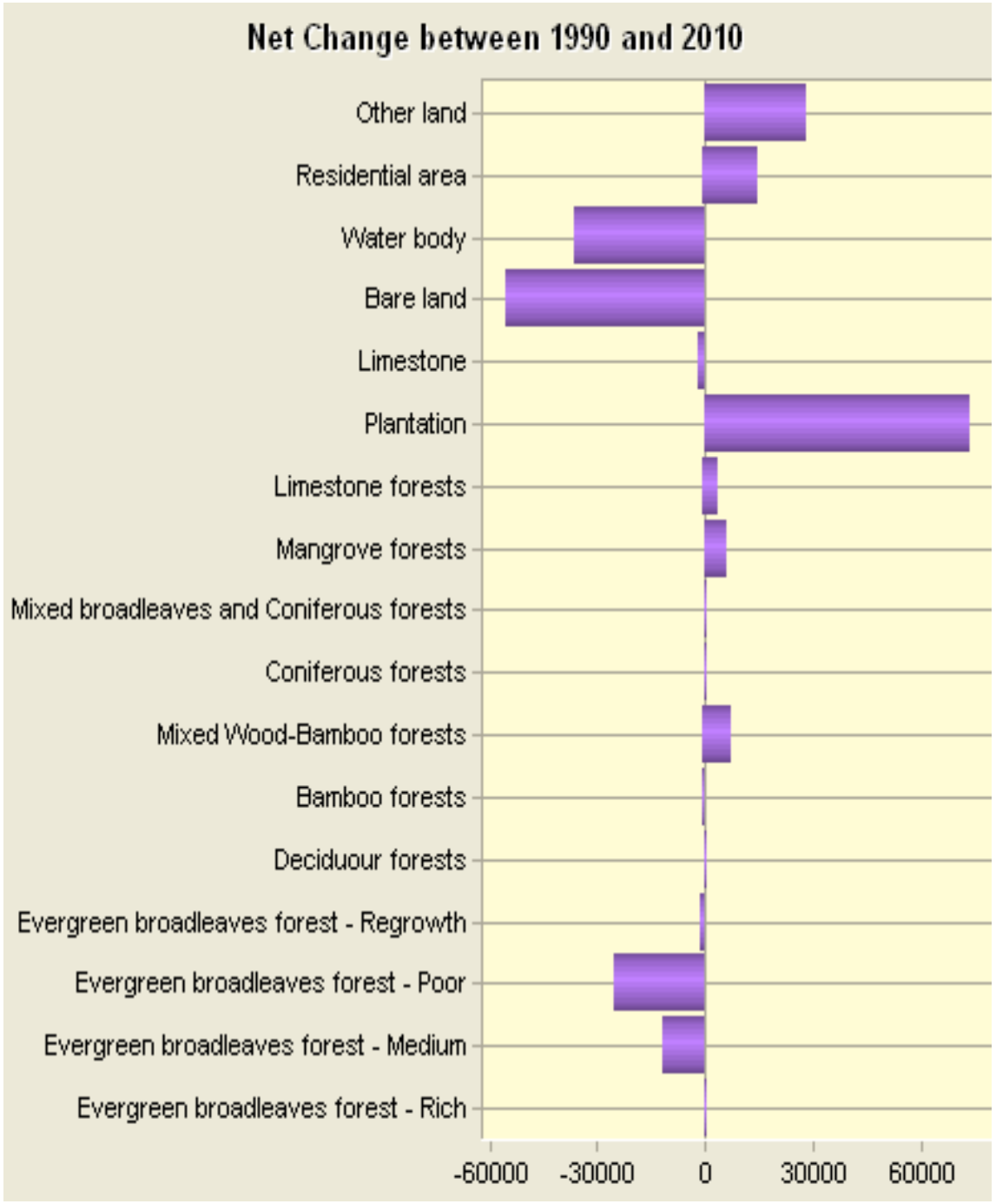
Ship density route/0.5 ha/year



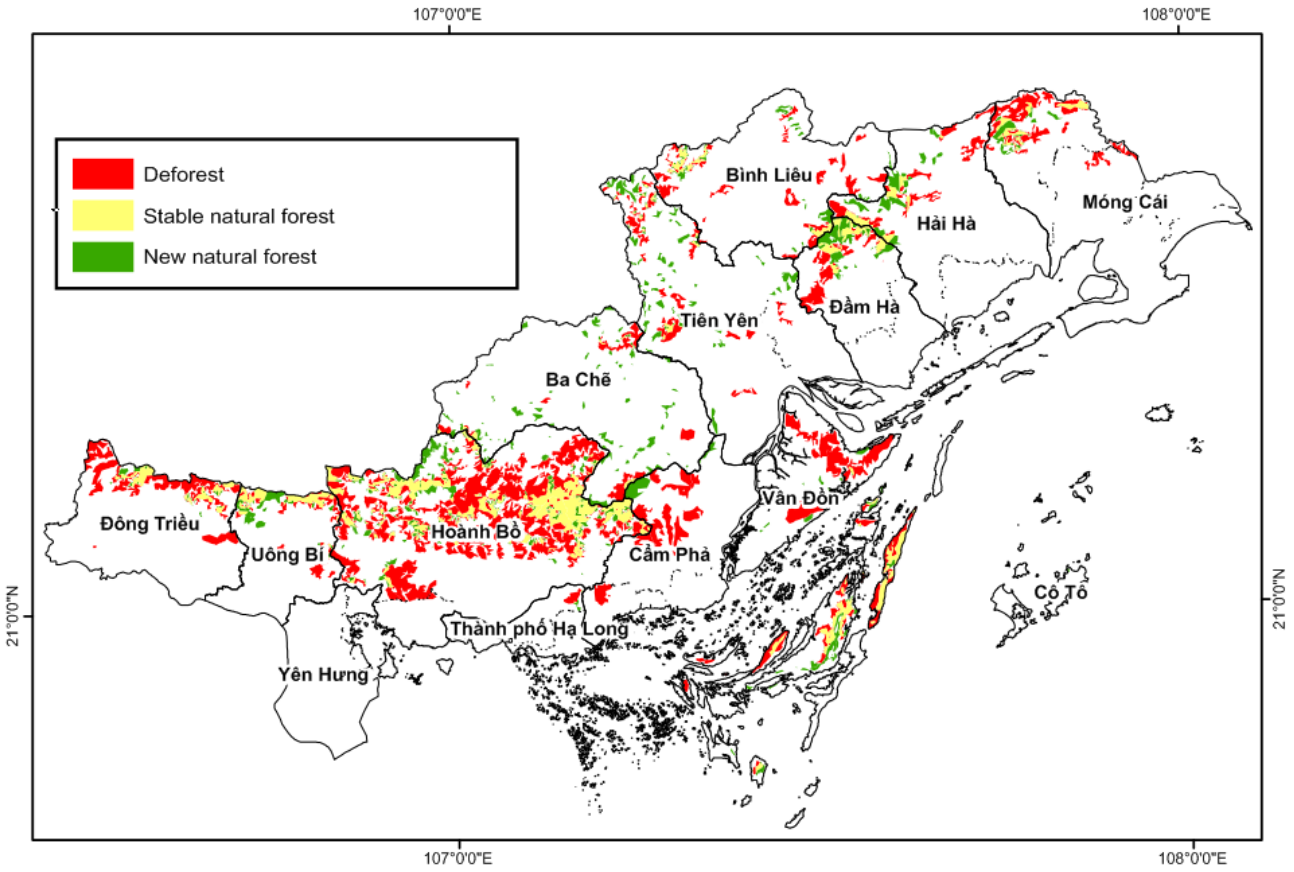


New ship route to Co To island in 2018 due to tourism

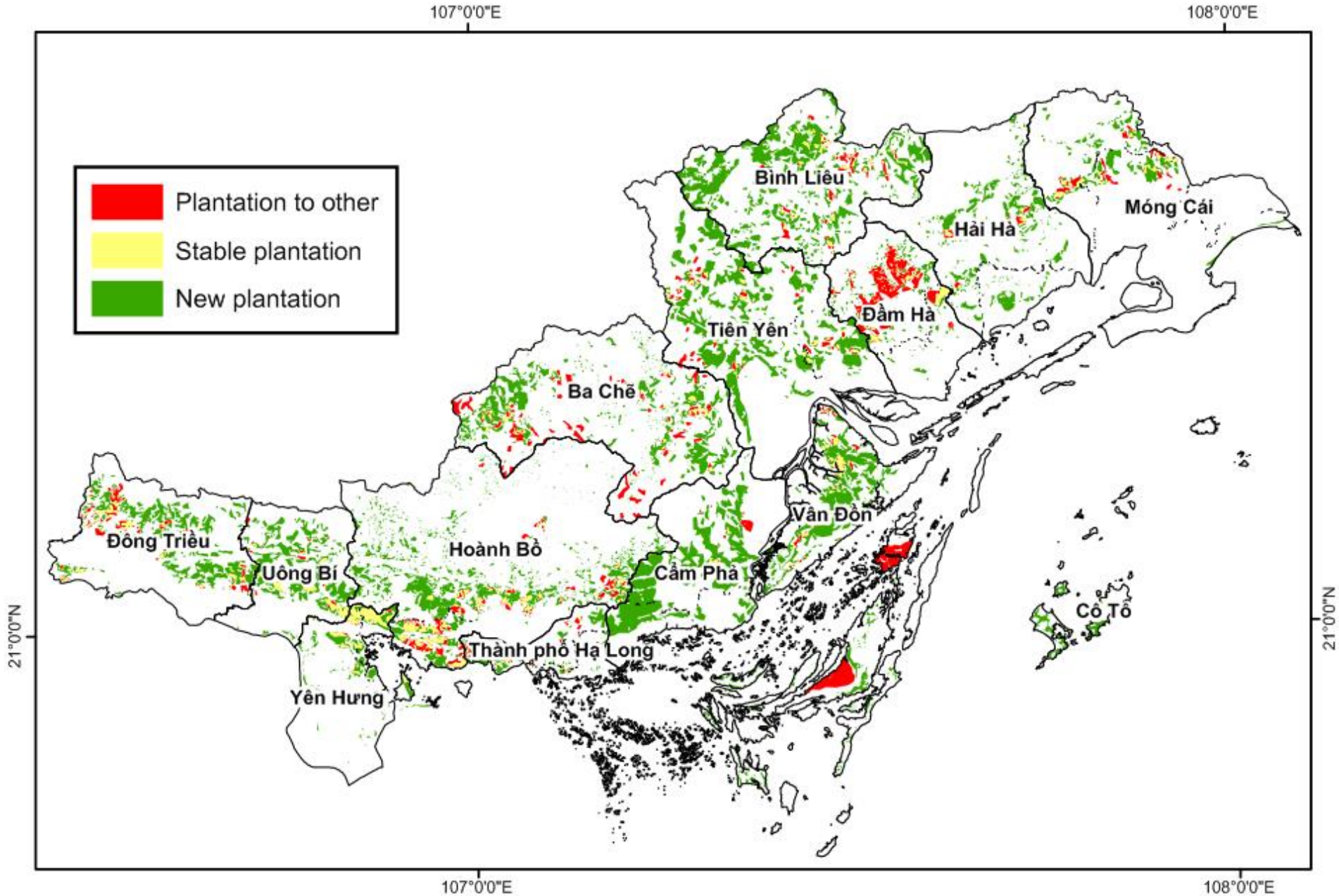
Forest change 1990 - 2010



Change in natural forest



Change in production forest



Mangrove matrix 1990 - 2008

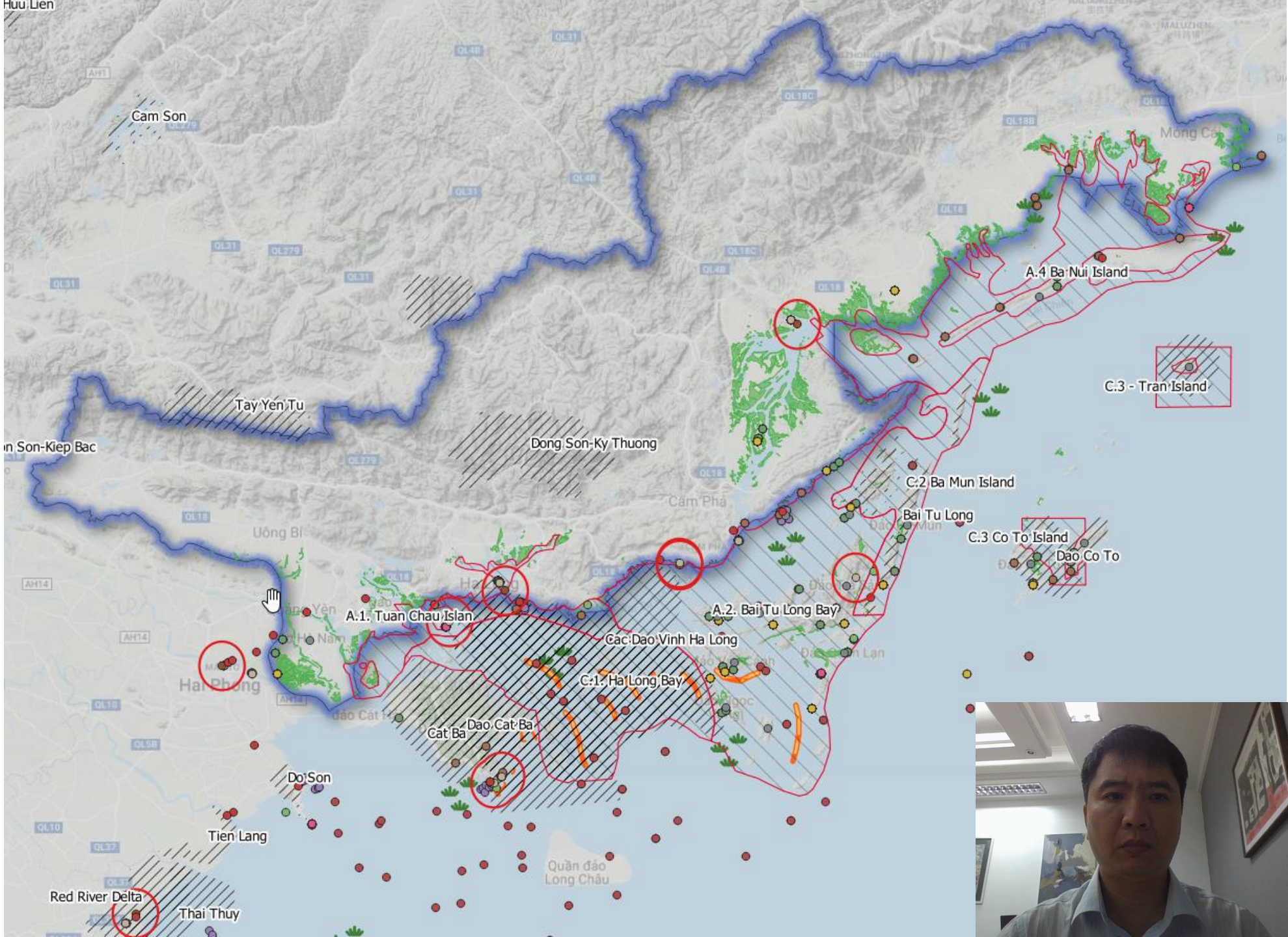
1990 \ 2008	Aquaculture	Mangrove 1	Land	Tide flat 1	Tide flat 2	Sand	Sea	Mangrove 2
Land	1.200,3	93,2	185627,9	154,1	99,5	4,0	45,1	2,3
Mangrove 1	5.072,9	16.356,7	1.370,0	2.371,7	328,3	0,0	168,3	476,9
Tide flat 1	2.757,1	2.085,2	3.084,0	29.345,0	251,4	50,0	456,7	9,5
Aquaculture	2.282,2	4,5	108,8	87,8	1,0	0,0	1,8	42,7
Tide flat 2	2.928,8	1.267,9	1.043,1	782,6	1.080,8	8,4	8,6	7,6
Sand	18,5	8,7	9,0	42,5	0,0	3.105,9	0,0	0,0
Sea	159,8	4,7	293,5	210,4	0,0	0,0	350.917,9	0,0
Mangrove 2	1.465,5	18,3	0,0	2,0	0,0	0,0	0,0	

Source: Distributive change of typical ecosystems in Quang Ninh coastal area (Nguyen Van Thao, Insti
environment and resources – VAST). Marine Science and Techology. Vol 13, Issue 4; 2013: 349-356

Ocean pollution

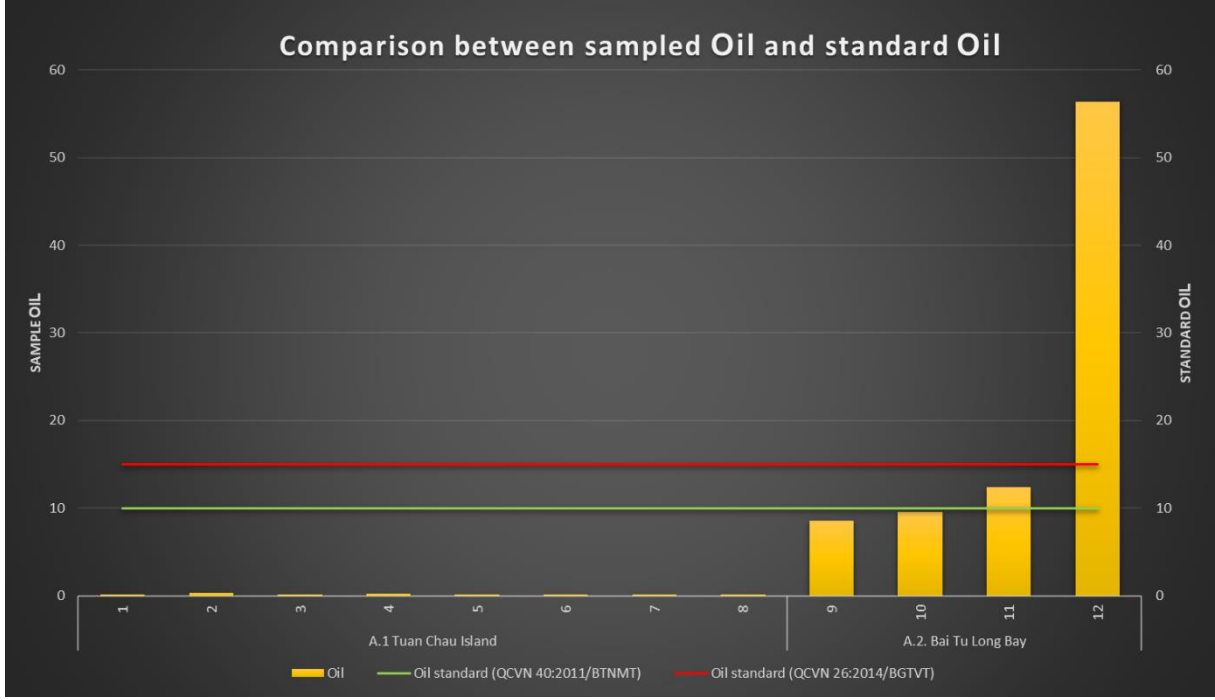
120 measurement point for boat, acquaculture, island with human activity

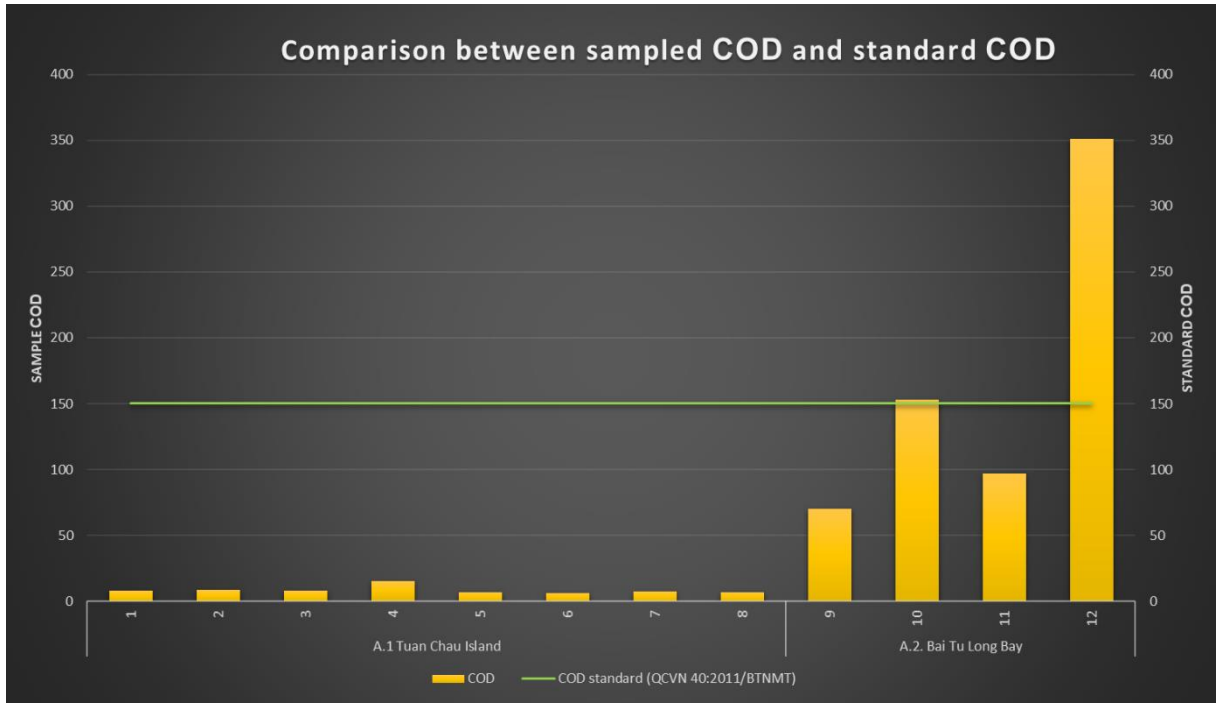
pH, NH4, Oil, BOD, TDS PO4, NO3, Coliform

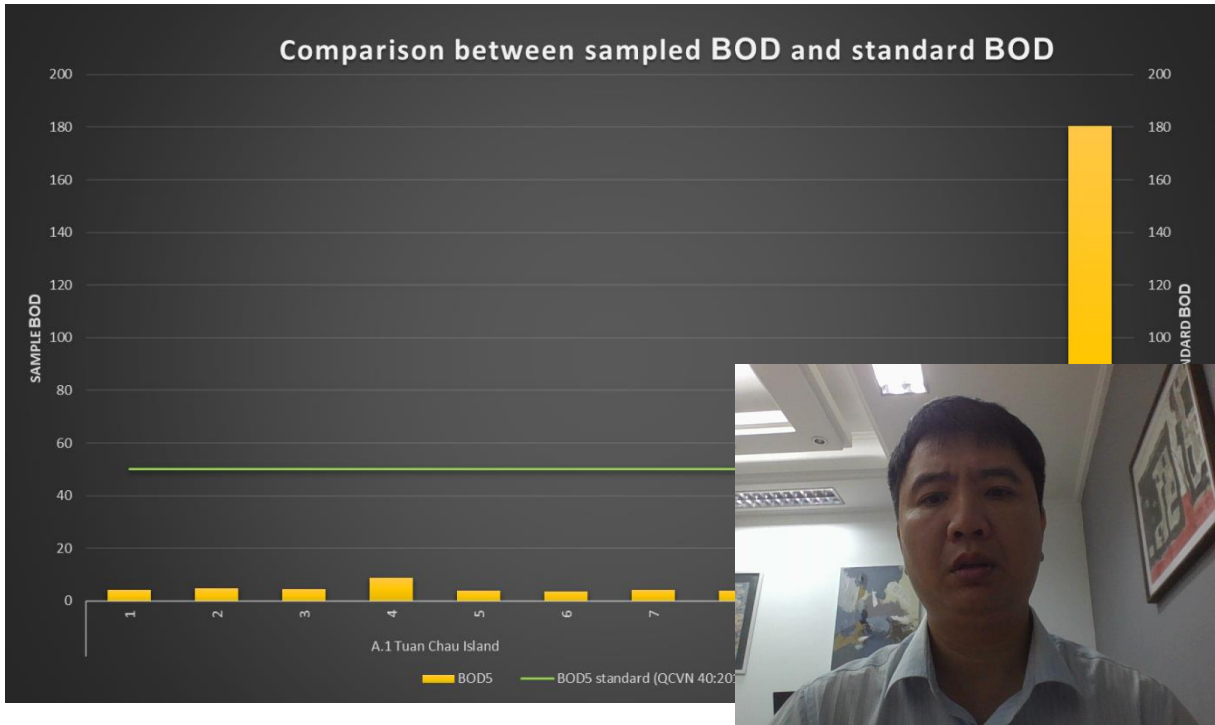


Example: Ballast water from marine ship

Marine Unit	Rank pollution	Count of sample
A.1 Tuan Chau Island	Non-pollution	8
A.2. Bai Tu Long Bay	High pollution	1
	Medium pollution	2
	Non-pollution	1
Grand Total		12







Pollution by Ocean unit

Table 2. Area of Marin Units (0: Non-pollution; 1: Low pollution; 2: Medium pollution; 3: High pollution)

No.	Units	Area (km2)	%	Polluted by marine boat		Polluted by tourist boat		Polluted by fishing boat		Polluted by Aquaculture	Polluted by human activities in the island		
				Ballast water	Bilge water	Waste water	Bilge water	<90CV	>90CV		Sed.	Waste water	Sea Water
1	A.1 Tuan Chau Island	164.02	6.83	0	0	-	-	0,1,2	-	3	-	-	-
2	A.2. Bai Tu Long Bay	890.47	37.07	0,2,3	0	0	0-1		1,2	3	0	0,2	2,3
3	A.4 Ba Nui Island	516.72	21.51	-	-	-	-	-	-	3	-	-	-
4	C.1. Ha Long Bay	489.45	20.38	-	-	-	-	-	0,1,2	-	-	-	-
5	C.2. Ba Mun Island	208.43	8.68	-	-	-	-	-	1,2	-	0	0	2,3
6	C.3. Co To Island	54.26	2.26	-	-	-	-	-	-	3	0	0	2,3
7	C.3. Tran Island	78.49	3.27	-	-	-	-	-	-	-	-	-	-

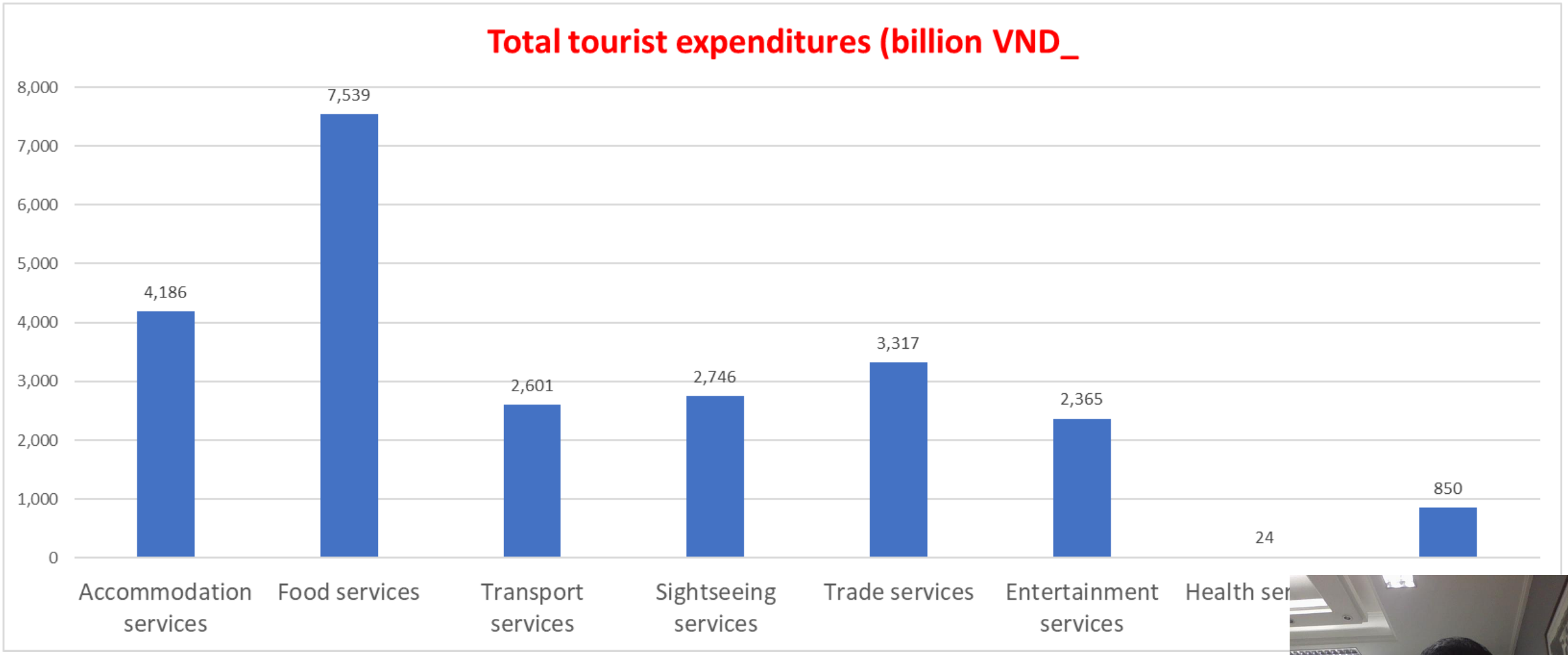
All acquaculture sites is heavily polluted: site with more than 3 parameters above ocean water standard

Bai Tu Long unit is most heavilty polluted among 7 unit: the source of pollution is very broad inclduing r
fishing boat, tourist boat, acquaculture and human activity

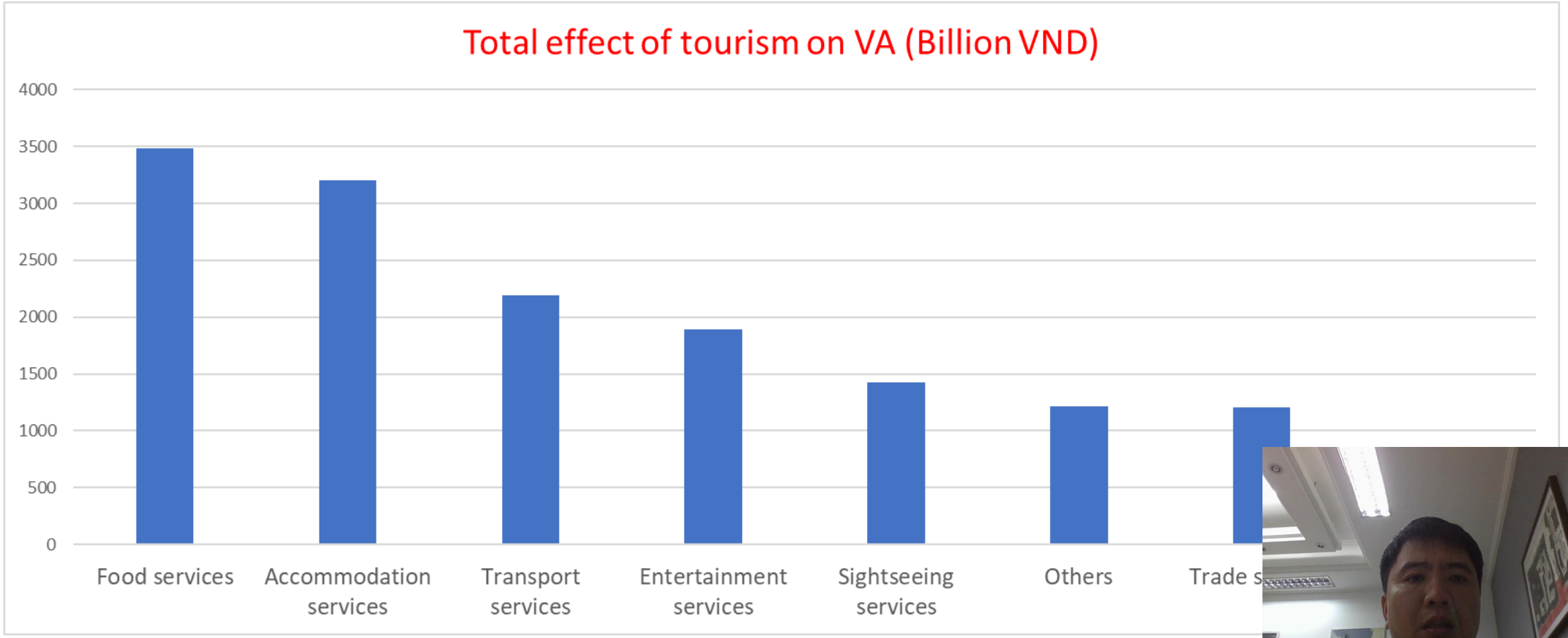
2 small island (Ba Mun and Co to) that include a marine protected area is heavily polluted by human act

Tourism Satellite account

No	Indicators	2016	2017	2018
1	The number of tourists (1000 person)	8,350	9,872	12,246
2	Total revenue (billion dong)	13,327	18,445	23,628
3	Contribution to GRDP (billion dong)	10,400	13,460	16,679
4	The number of jobs created by the aggregate impacts of QN tourism sector	128,728	170,714	


Total tourist expenditures (billion VND_
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
4,186
7,539
2,601
2,746
3,317
2,365
24
850
Accommodation services
Food services
Transport services
Sightseeing services
Trade services
Entertainment services
Health ser

Effect of tourism on Quang Ninh VA in 2018- Unit billion VND



Effect of tourism on Quang Ninh GRDP in 2018

	Total contribution	**Direct contribution**	**Indirect contribution**	**GRDP estimate in 2018**
Effect of tourism on VA (Billion dong)	14,868	8,964	5,904	
Product taxes (Billion dong)	1,811	*1,092*	719	
Effect of tourism on GRDP (Billion dong)	*16,679*	*10,055*	*6,624*	*152,250*
Share of GRDP (%)	**10,96%**	**6,61%**	**4,35 %**	

Waste discharge from tourists in Quang Ninh province

No	Indicators	Pollution load (kg/person/year)	Treatment efficiency (%)	
			Primary sedimentation	Biological treatment
1.	COD	20-55	10-20	30-60
2.	BOD_5	10-25	10-30	50-80
3.	T_N	4.0	20-40	20-50
4.	T_P	0.5-1.1	10-20	10-30
5.	$NO_3 + NO_2$*	0.04	20-40	20-50
6.	NH_4*	2.2	20-40	20-50
7.	PO_4*	0.27-0.594	10-20	10-30
8.	TSS	20-30	50-70	70-95

Value transfer: Unit of domestic waste load in according to UNEP, 1984 and calculated of San Deigo-McGlone et al., 2000

No	Indicator	Waste discharge from tourists (ton / year)		
		2016	2017	2018
1	COD	1062.4	1071	1585.3
2	BOD_5	531.197	1071	1585.3
3	T_N	188.870	535.522	792.635
4	T_P	26.560	190.408	281.826
5	$NO_3 + NO_2$*	1.889	26.776	39.632
6	NH_4*	103.879	1.904	2.818
7	PO_4*	14.342	104.724	1
8	TSS	590.219	14.459	

Next step

- Finalize land base pollution and land-base ecosystem service
- Improve marine unit
- Allocate land base service and pollution to drainage basin
- Linkages of ecosystem service to environmental protection and issue