



## Keynote: Statistics



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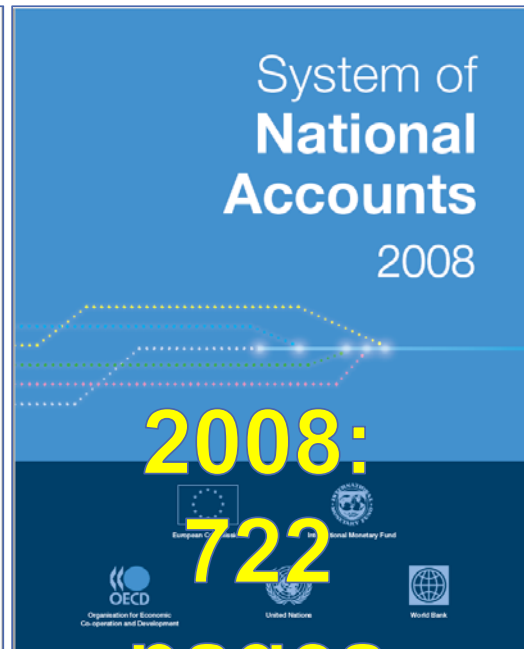
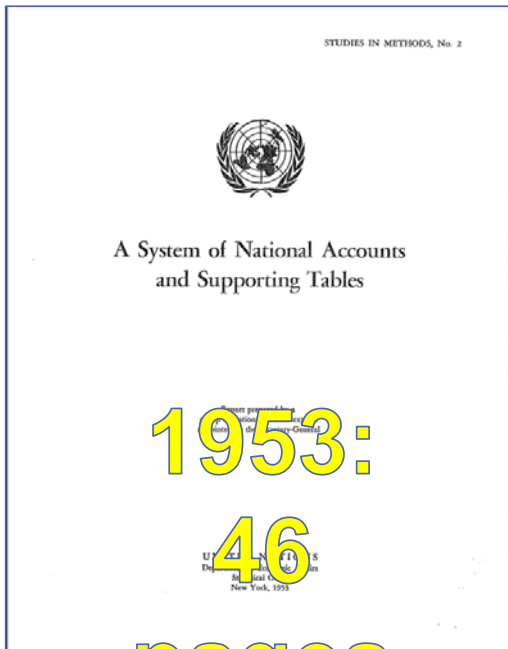
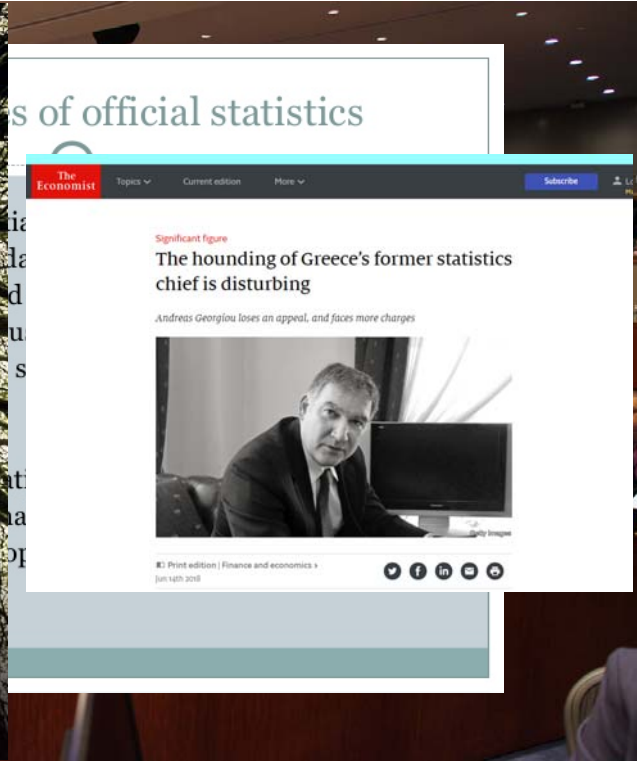
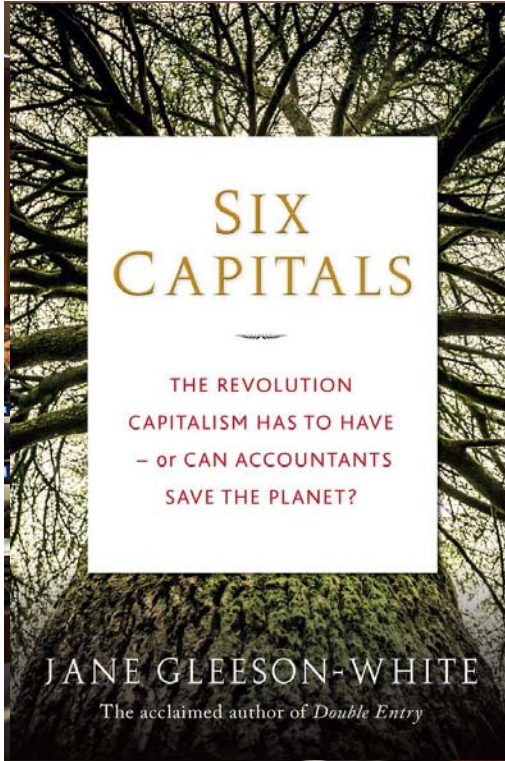


System of  
Environmental  
Economic  
Accounting

<http://www.unescap.org/our-work/statistics>

<b>CI For</b>	<b>Sample Statistic</b>	<b>Margin of Error</b>	<b>Use When</b>
Population mean ( $\mu$ )	$\bar{x}$	$\pm z^* \frac{\sigma}{\sqrt{n}}$	$X$ is normal, or $n \geq 30$ ; $\sigma$ known
Population mean ( $\mu$ )	$\bar{x}$	$\pm t_{n-1}^* \frac{s}{\sqrt{n}}$	$n < 30$ , and/or $\sigma$ unknown
Population proportion ( $p$ )	$\hat{p}$	$\pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$	$n\hat{p}$ , $n(1-\hat{p}) \geq 10$
Difference of two population means ( $\mu_1 - \mu_2$ )	$\bar{x}_1 - \bar{x}_2$	$\pm z^* \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$	Both normal distributions or $n_1, n_2 \geq 30$ ; $\sigma_1, \sigma_2$ known
Difference of two population means $\mu_1 - \mu_2$	$\bar{x}_1 - \bar{x}_2$	$\pm t_{n_1+n_2-2}^* \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$	$n_1, n_2 < 30$ ; and/or $\sigma_1 = \sigma_2$ unknown
Difference of two proportions ( $p_1 - p_2$ )	$\hat{p}_1 - \hat{p}_2$	$\pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$	$n\hat{p}$ , $n(1-\hat{p}) \geq 10$ for each group

<https://www.dummies.com/education/math/statistics/statistics-for-dummies-cheat-sheet/>



pages

pages

$$GDP = C + I + G + (X - M)$$

C = Spending by consumers

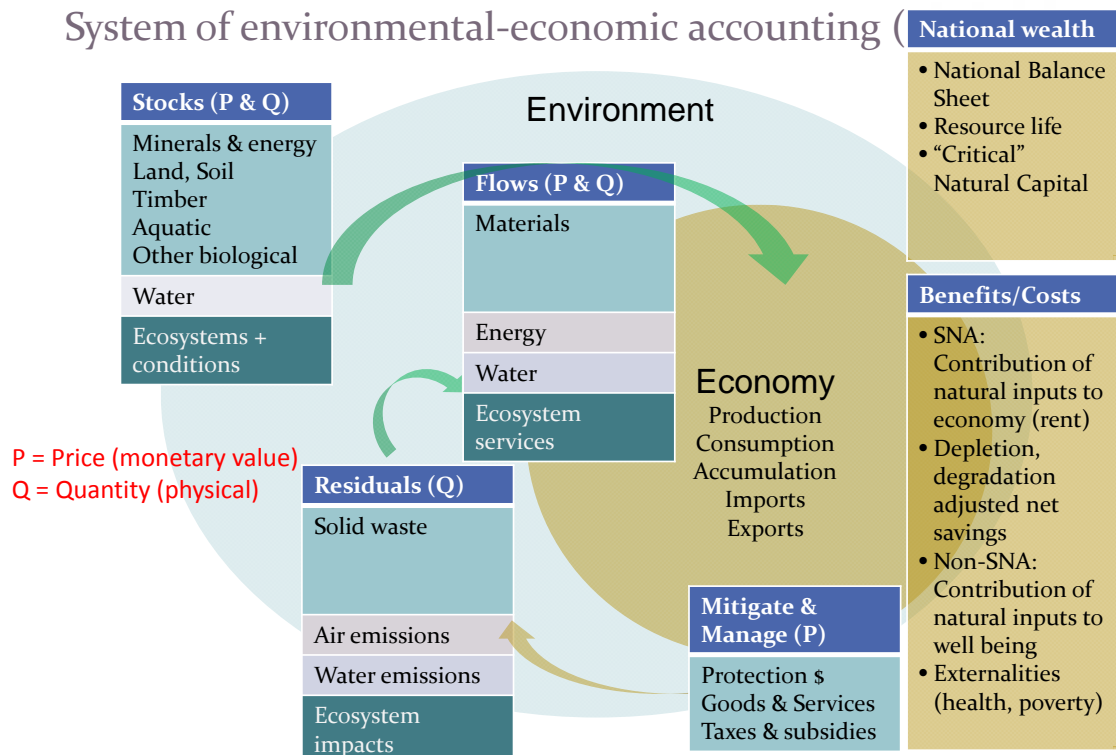
I = Spending by businesses

G = Spending by government

X = Exports

M = Imports

## System of environmental-economic accounting

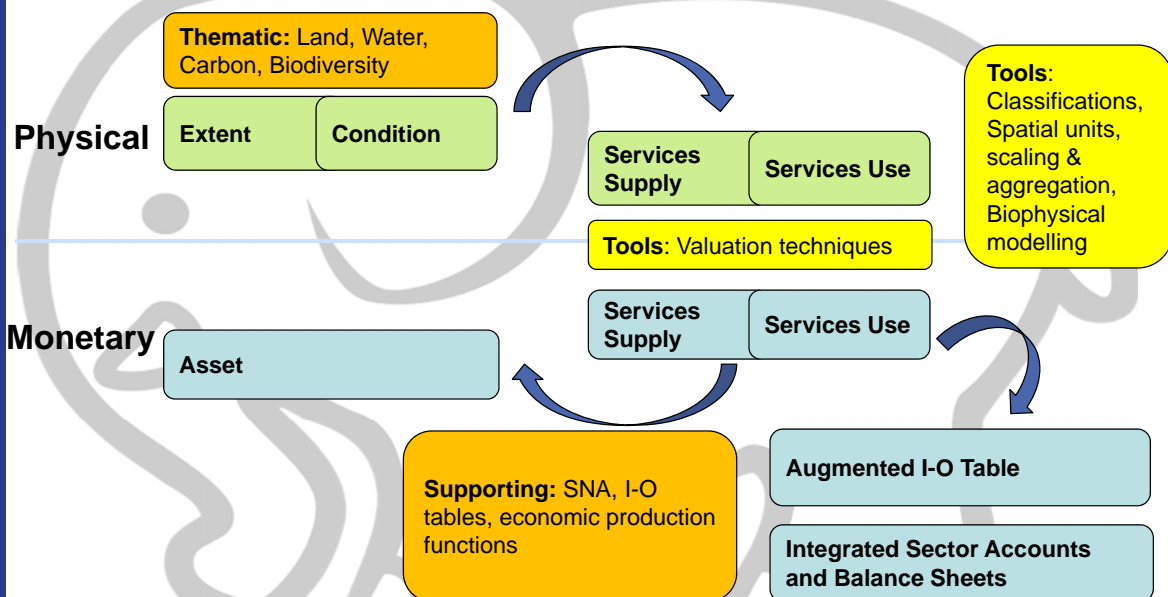




7 Ecosystems & the Ocean

<http://www.unescap.org/our-work/statistics>

## SEEA-Ecosystems (spatially detailed)



8 Ecosystems & the Ocean

<http://www.unescap.org/our-work/statistics>

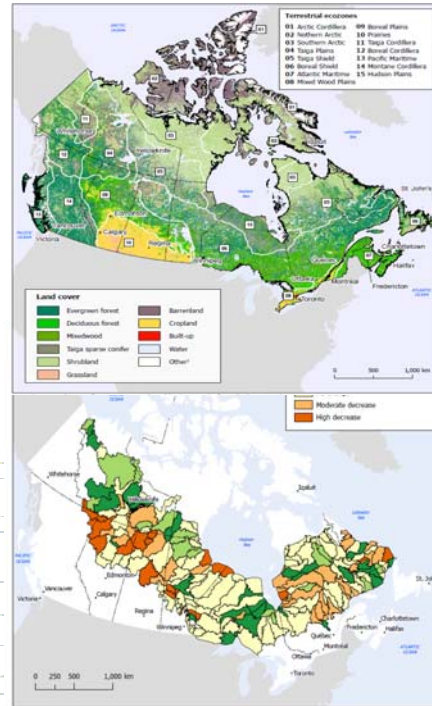


## SEEA Ecosystems Early work



Ecosystem service	Units	Land cover type														
		Urban	Pasture	Cropland	Forest	Wetland	Peat	Water	Surface	Other	Provisional	Total				
<b>Provisioning</b>																
Drinking water extraction	10 <sup>6</sup> m <sup>3</sup> water	4,071	7,520	13,122	3,117	214	-	470	852	26,999						
Crop production	10 <sup>6</sup> kg produce	-	-	1,868	-	-	-	-	-	1,868						
Foodstuffs production	10 <sup>6</sup> kg dry matter	-	523	291	-	-	-	-	-	781						
<b>Regulation</b>																
Air quality regulation	10 <sup>6</sup> kg P10 <sub>2.5</sub>	272	484	717	780	85	7	40	90	3,256						
Carbon sequestration	10 <sup>6</sup> kg carbon	876	8,019	278	53,664	263	160	-	1,058	65,429						
<b>Cultural</b>																
Recreational cycling	10 <sup>6</sup> trips	2,690	1,488	2,011	1,912	80	8	289	220	9,241						

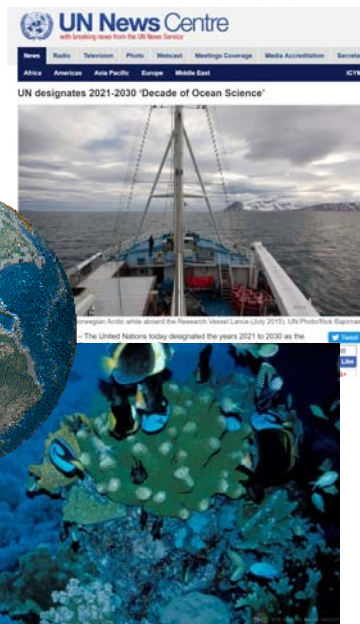
Source: Remme et al., 2014 (Limburg, the Netherlands)



Source: Statistics Canada, 2013

## The Ocean A Different kind of “ecosystem”

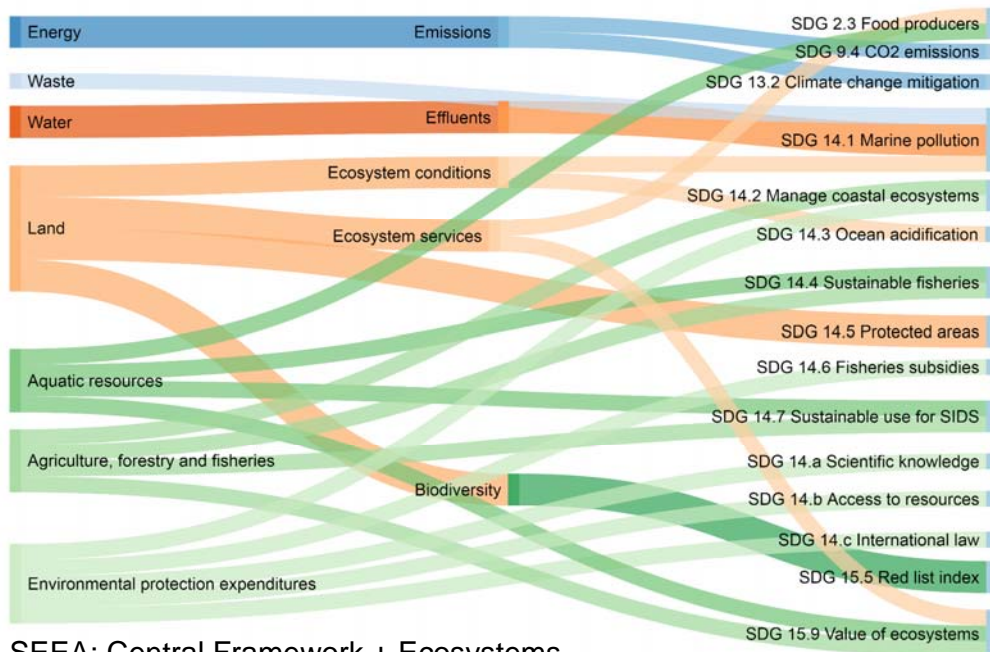
- It's very large
- Water keeps moving
- Multi-layer
- All looks the same from a satellite
- Trans-boundary / shared / most outside of national jurisdictions
- Less studied / known / measured
- Not tested with SEEA



- [ESCAP YouTube Video](#); [UN Environment: Ocean Pollution](#)



## Many SEEA accounts → many related SDGs



SEEA: Central Framework + Ecosystems



## Take home points

- Official statistics is based on **fundamental principles** and agreed standards
- The System of National Accounts is used by **everyone** to measure national wealth and production
  - The SEEA is linked to the SNA and endorsed by **all** official statisticians
- Ocean Accounts are an extension and adaptation of the SEEA to the ocean and SDG14
  - The main components are extent, condition, services supply and use, drivers, and governance.
- We **can** save the ocean!
  - If statisticians collaborate with scientists and policy experts





## Technical Guidance on Ocean Accounts 2019

**OCEAN ACCOUNTS PARTNERSHIP**

Physical    Pollution    Ecosystem    Thresholds

**2019: ACTION FOR OUR OCEAN**

**75 pages**

Ocean cities    Closing the loop    14 goals    14

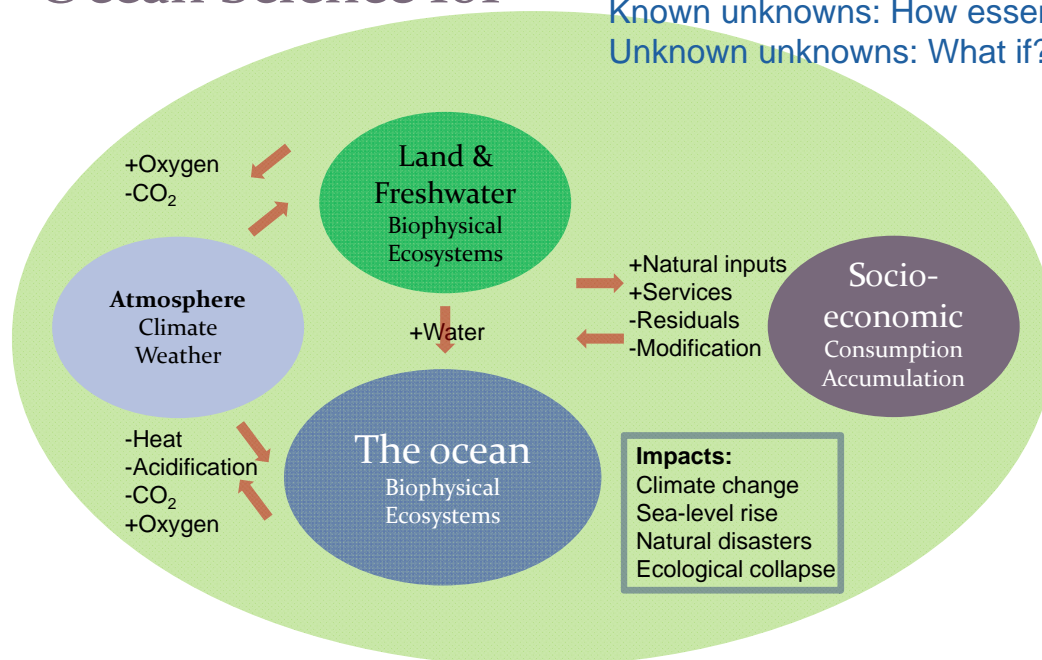
## System of Ocean Accounts 2025

**2025: ??? pages**



## Ocean Science 101

**Knows:** The ocean is essential.  
**Known unknowns:** How essential?  
**Unknown unknowns:** What if?





## A note on valuation of ecosystem services

Section	Division	Group
01. Provisioning	01.01 Nutrition	01.01.01 Biomass
		01.01.02 Water
	01.02 Materials	01.02.01 Biomass
		01.02.02 Water
	01.03 Energy	01.03.01 Biomass-based energy sources
02. Regulation & Maintenance	02.01 Mediation of waste, toxics and other nuisances	02.01.01 Mediation by biota
		02.01.02 Mediation by ecosystems
		02.02.01 Mass flows
		02.02.02 Liquid flows
		02.02.03 Gaseous / air flows
	02.02 Mediation of flows	02.03.01 Lifecycle maintenance, habitat and gene pool protection
		02.03.02 Pest and disease control
		02.03.03 Soil formation and composition
		02.03.04 Water conditions
		02.03.05 Atmospheric composition and climate regulation
03. Cultural	03.01 Physical and intellectual interactions with biota, ecosystems, and land-/seascapes [environmental settings]	03.01.01 Physical and experiential interactions
		03.01.02 Intellectual and representative interactions
	03.02 Spiritual, symbolic and other interactions with biota, ecosystems, and land-/seascapes [environmental settings]	03.02.01 Spiritual and/or emblematic
		03.02.02 Other cultural outputs

### SNA Benefits

- Should be in SNA
  - Benefits produced by economic units
  - Potential to be marketed
  - If require capital, labour... (e.g., timber)
    - Value ecosystem's contribution (rent)
  - If no capital, labour... (e.g., wild food)
    - Value at market price
- Correct undercounting in SNA

### Non-SNA Benefits

- Should NOT be in SNA
  - Produced by ecosystems (e.g., water regulation, pollination, air purification)
  - NO potential to be marketed
- Better to have reliable physical measures  
→ View as part of national wealth  
→ Demonstrate "importance" to well-being

Source: CICES, 2013. [www.cices.eu](http://www.cices.eu)

## Services supply in physical units

Ecosystem service	Units	Land cover type								Provincial total	
		Urban	Pasture	Cropland	Forest	Heath	Peat	Surface Water	Other nature		
Provisioning	Hunting	kg meat	-	9,100	14,732	8,100	678	70	-	1,513	34,193
	Drinking water extraction	10 <sup>3</sup> m <sup>3</sup> water	4,071	7,026	11,227	3,117	214	-	478	862	26,995
	Crop production	10 <sup>3</sup> kg produce	-	-	1,868	-	-	-	-	-	1,868
	Fodder production	10 <sup>3</sup> kg dry matter	-	533	251	-	-	-	-	-	784
Regulation	Air quality regulation	10 <sup>3</sup> kg PM <sub>10</sub>	272	404	717	700	45	7	40	69	2,254
	Carbon sequestration	10 <sup>3</sup> kg carbon	875	8,019	273	50,664	393	149	-	1,056	61,429
Cultural	Recreational cycling	10 <sup>3</sup> trips	2,690	1,863	2,611	1,565	30	3	139	220	9,121



Source: Remme et al., 2014 (Limburg, the Netherlands)



## Take home points

- **SEEA: statistical standard for environmental-economic accounting (including SDG 14 and others)**
- **Ecosystem accounting: a spatially-detailed extension**
  - Standards for measuring ecosystems, conditions and services
  - Especially SDG 15.9 (ecosystem and biodiversity values)
- **Ocean data and statistics are a new challenge**
  - SEEA has not been applied to the ocean
  - Many organizations are working on different aspects
- **Opportunities for harmonization of approaches, collaboration and data sharing**



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## Acknowledgements

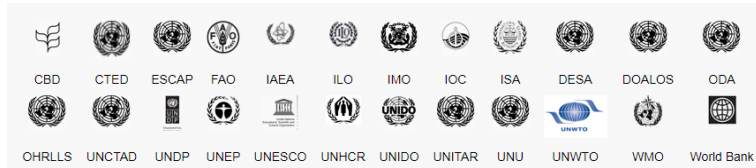
- Prepared by:
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  - [https://unstats.un.org/unsd/envaccounting/eea\\_project/default.asp](https://unstats.un.org/unsd/envaccounting/eea_project/default.asp)
  - Contact: [seea@un.org](mailto:seea@un.org)





## Many stakeholders → many partnerships

### UN Oceans



#### Plus other UN inter-agency and supported

- GESAMP: Joint Group of Experts on the Scientific Aspects of Marine Environment Protection
- GEF: Global Environment Facility
- IPCC: Intergovernmental Panel on Climate Change
- OneSharedOcean
- UNEP: Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA)
- DOALOS: The Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects
- UN Environment: Coordinating Body on the Seas of East Asia (COBSEA); International Coral Reef Initiative (ICRI)
- World Bank: the Pacific Islands Regional

#### Oceanscape Program (PROP)

#### International

- OECD: Ocean Economy
- GEO: Blue Planet

#### Regional

- APEC (Asia-Pacific Economic Forum): Ocean and Fisheries Working Group
- ASEAN: Southeast Asian Fisheries Development Centre (FFAFDC)
- CROP: Council of the Regional Organisations in the Pacific
- FAO: Asia-Pacific Fisheries Commission (APFIC)
- PEMSEA: Partnerships in Environmental Management of the Seas in East Asia

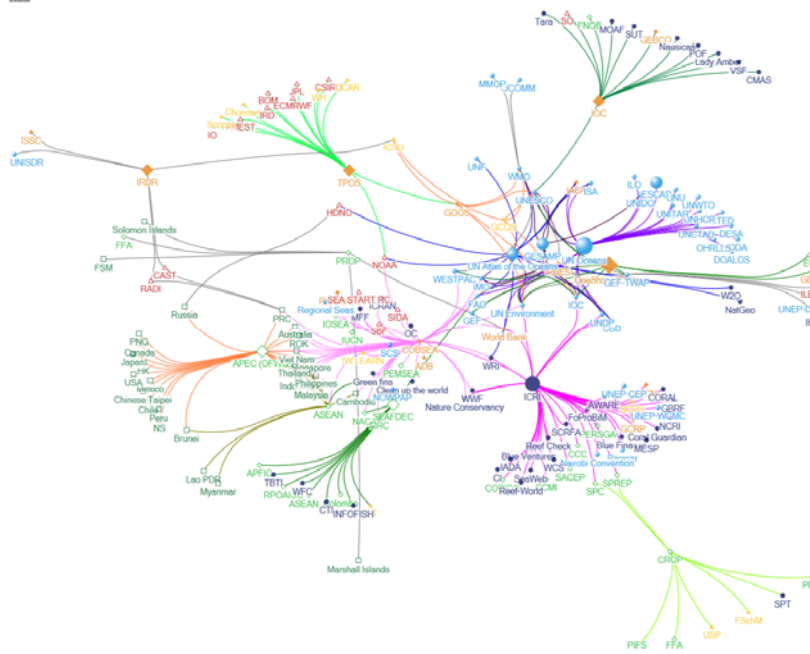
#### Academic

- ICSU: International Council for Science
- Journal of Ocean and Coastal Economics

See the concept note for a more complete list



## A partner mapping (to be continued)



## ...or convergence?



## Three solitudes...



## Governing the ocean needs “Big Statistics”

+ Big Science

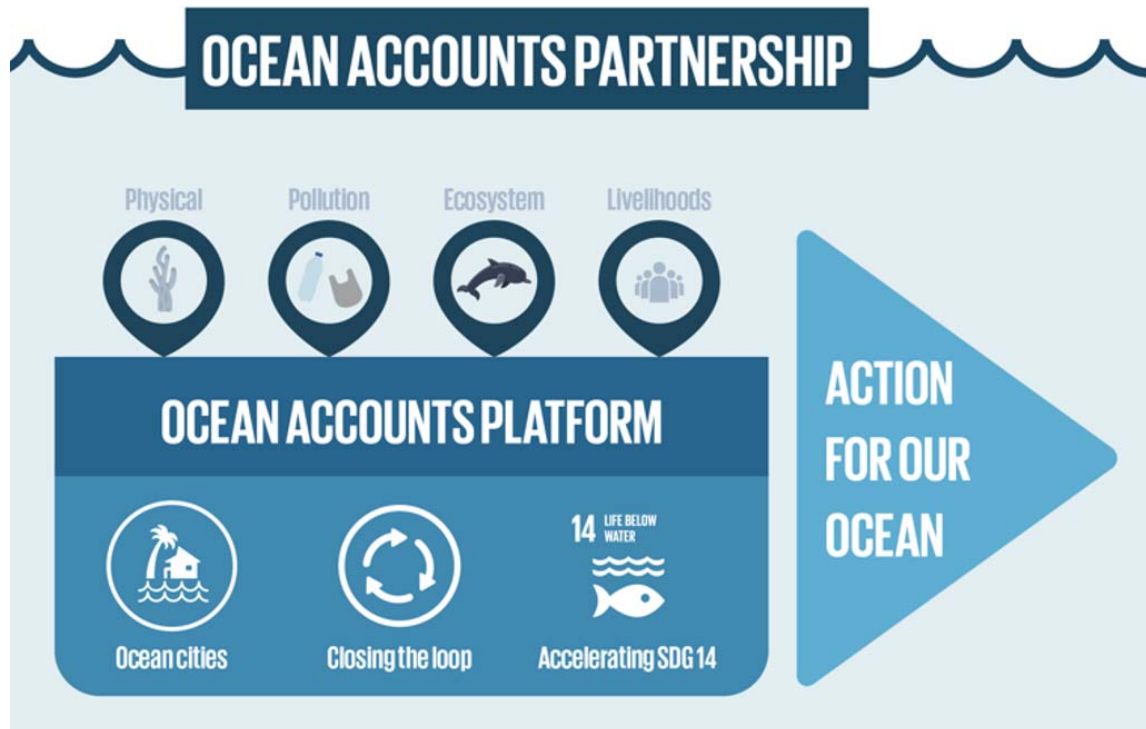
+ Big Policy

- **A shared language:**
  - Standards: Concepts, Classifications, Methods
- **To:**
  - Integrate what we already know and identify gaps
  - Collaborate on solving and avoiding problems → **evidence**
  - Put it into context → **messaging** → “killer” indicators
  - Ensure quality, coherence and **relevance**
- **Environmental-economic accounting is “Big Statistics”**
  - A integrated framework → language
  - Combine data from different sources → collaborate
  - Link to economic accounts → context

## Group discussion: Ocean Accounts

- **Specific interests or perspectives to include?**
- **Interest in contributing?**
  - To expert workshop papers? (even if not attending)
  - Using resulting guidance for upcoming work
  - Advising on spatial or other data products
- **Who should be engaged?**





## Implementing ocean accounts



- **Partnerships**
  - International, regional and national
  - UNSC: ESCAP & UNEP lead SEEA ecosystems revision on ocean
- **Capacity needs assessment**
  - Review national ocean priorities, policies, institutions, data
- **Case studies & pilots**
  - Assessment, establish working group, compile priority accounts
- **Regional expert workshop (1-3 August, 2018)**
  - Establish community of practice; produce guidance
- **Future**
  - Coordinated implementation
    - e.g., neighbouring countries to address transboundary issues
  - Regional & national “centres”: data hubs and research



## Capacity needs assessment

- Online questionnaire and interviews:
  - National priorities for the ocean?
  - Capacity to address SDG14
  - Policies, regulations, frameworks, institutional mechanisms
  - Obstacles, challenges; priorities for development
  - Priority SDG14 targets
  - Stakeholder engagement
- **First results (ocean experts):**
  - 92% → SDG14 is a national priority
  - 70% → Have national mechanisms in place
  - Regional: need capacity, coordination and funding
  - International: clearer mandates, standards



## Case studies and pilots

- **Detailed scoping study**
  - National vision, policies, regulations, institutions, plans
  - Policy gaps, coherence, good practices
  - Data providers, users and stakeholders
- **Support national working group**
  - Integrate data for priority subset of ocean accounts
  - Release pilot accounts, publish selected data
- **Volunteers?**



## Regional expert workshop Bangkok, 1-3 Aug. 2018

- Objective
  - New community for ocean statistics
  - Standards for SEEA and case studies
- 60+ national, regional and international experts
- Coordinate contributions **now**
  - Groups of experts co-author: options & recommendations
  - Plenary discussions of preferred options
- Keynote lectures, posters, side events



## Regional expert workshop

### The issues

1. Spatial units and ecosystem classification: delineate units
2. Ecosystem services: expand on existing classifications
3. Disaster risk & climate change: establish shared standards
4. Social: identify communities, artisanal fishers, target groups
5. Economic: links to SNA & valuation of non-SNA
6. Global data: What's available and how to use it
7. Measuring SDG14: indicator metadata
8. Ocean governance: international, regional and national
9. Modelling: experience and opportunities
10. Priorities for case studies and research

Which one do you like best?





## Good news!

- Accounts don't need to be complete to be useful
- Growing international interest and support
  - Oceans Conference, UNSC, COP23, GEO
  - Partnerships, platforms and pathways
  - Evidence for good governance
- ESCAP support for partnerships for governance & statistics
  - Horizontal (topic, country) & vertical (international, regional)
- We can learn from each other
  - European Environment Agency workshop
  - National data online: Thailand, Pacific
  - Australia, NZ, NOAA, OECD: marine economy
  - Canada: Ocean ecosystem services & coastal communities

**Total Supply of Goods and Services = Total Use of Goods and Services**

**Total Supply in the economy:**

1. Production/Output (Formal & Informal) - GO
2. Import - M

**Total Use in the economy:**

1. Intermediate Consumption - IC
2. Private Final Consumption - PFC
3. Government Final Consumption Expenditure - GFCE
4. Gross Capital Formation – GCF
5. Export - X