Introduction to the System of Environmental-Economic Accounting (SEEA)

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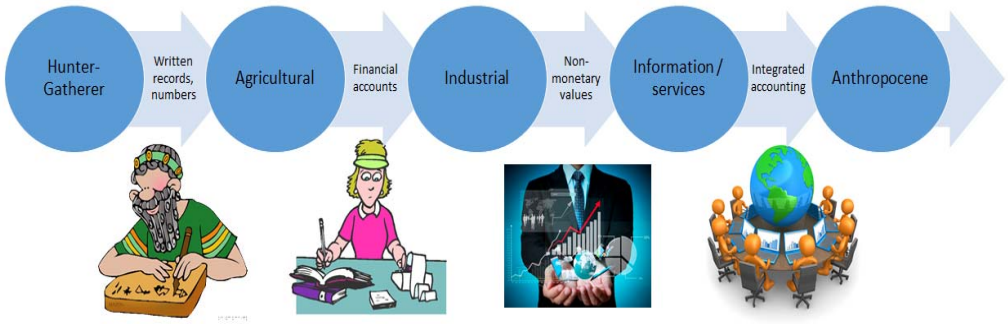
Highlights of Presentation

- *Integrated* decision making requires **integrated data**
- Environmental statistics are:
  - *Interdisciplinary* and *inter-institutional* therefore **fragmented**
- **Official statisticians** are more than "number crunchers"
  - SEEA provides a **coherent measurement framework** for integrating data

Observation on accounting:

If we managed our economy the way we manage our environment, we'd still be hunter-gatherers.

- Michael Bordt, 2015



Why national statistics offices (NSOs)?

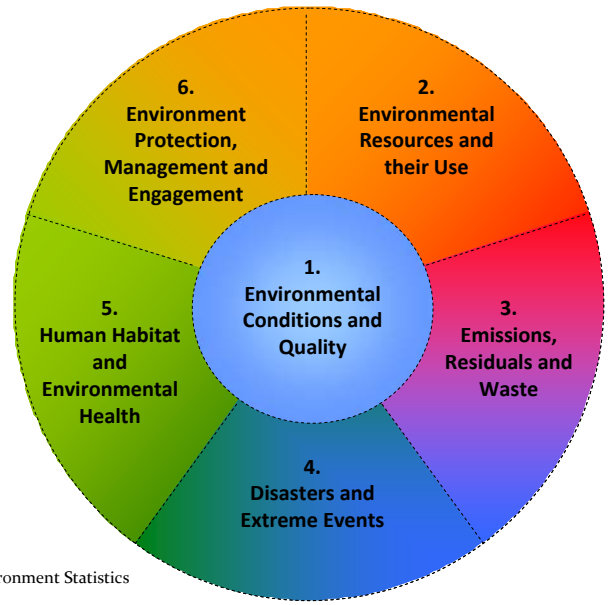
- **Official statistics**
  - Bound by principles of quality, impartiality, confidentiality and relevance
  - Trusted by government, business and civil society
  - See "*Fundamental principles of official statistics*"
- Tools and expertise to collect, organize, analyse, integrate and disseminate **complex data**
- Confidential **data collection processes** (surveys, accounts, administrative data) in place that can be adapted for environment statistics
- Often custodians of the **National Statistical System**

Environment statistics are *interdisciplinary* and *inter-institutional*

Environment statistics are about:

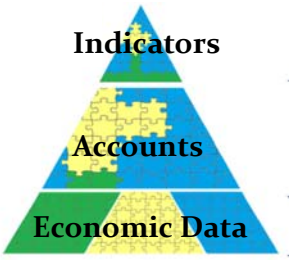
- the **state** of the environment,
- our **dependence** on it,
- our **impact** on it,
- it's **impact** on us (even negative ones), and
- how we **protect** and manage it.

This information comes from many institutions using different methods, concepts and classifications.



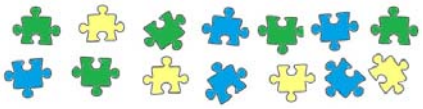
FDES: Framework for the Development of Environment Statistics

Some observations



- **Economic** information has:
  - Basis in macro-economic **theory**
  - Coherent, integrated and comprehensive **measurement framework** (System of National Accounts = SNA)
  - Accepted **indicators** (GDP), interpretations (up is good) and functional relationships (e.g., GDP = **C**onsumption + **I**nvestment + **G**overnment spending + (e**X**ports – i**M**ports))
  - Sustainable statistical **infrastructure** for regular measurement and reporting (classifications, methods, standards, prices, methodology, surveys, accounts, indicators)

More observations

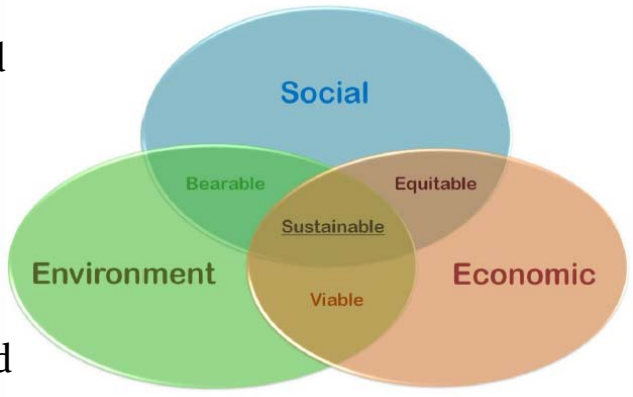


Environmental information has

- **Many** resource and ecological theories
- Data collected for **specific** purposes (e.g., one policy, one regulation or one indicator)
- Few accepted **indicators**, interpretations or functional relationships
- Little "sustainable" statistical **infrastructure** (many indicators, different classifications & concepts…)

The need for integration

- People need water, food and energy
  - While limiting climate change
- **Viable** energy options may limit **equitable** access to water and food while contributing to **unBearable** climate change
- ***Local optimization doesn't work any more!***



New **statistical tools** enable us to quantify these linkages and understand the trade-offs.

Another example

- **Deputy Minister**: "We need an *indicator* of GHG emissions!"
  - **Staff**: "We'll take fuel sales in $, convert to volume…"
- **Deputy Minister (2 years later)**: "*Where* are the GHGs coming from?"
  - **Staff**: "Ummm, energy production, transportation and heating."
- **Deputy Minister**: "No! For policies to reduce GHGS we need to know *what's driving it*! What industries?
  - **Staff:** "Maybe we need to ask the NSO for data."
- **NSO (1 year later)**: "What do you want?"
  - **Staff**: "What do you have?"
- **NSO**: "We have fuel expenditures by industry. We can make bridge tables to link activities with industries. We'll create an **energy account**!"
  - **Staff (3 years later)**: "Thanks, with the **energy account**, we can allocate GHG emissions to final consumption (households, exports, government and inventory. Wow! *42% of GHG emissions go into creating exports!*"
- **Different Deputy Minister**: "We need an indicator of water use."
  - Staff: "Let's talk to the NSO."

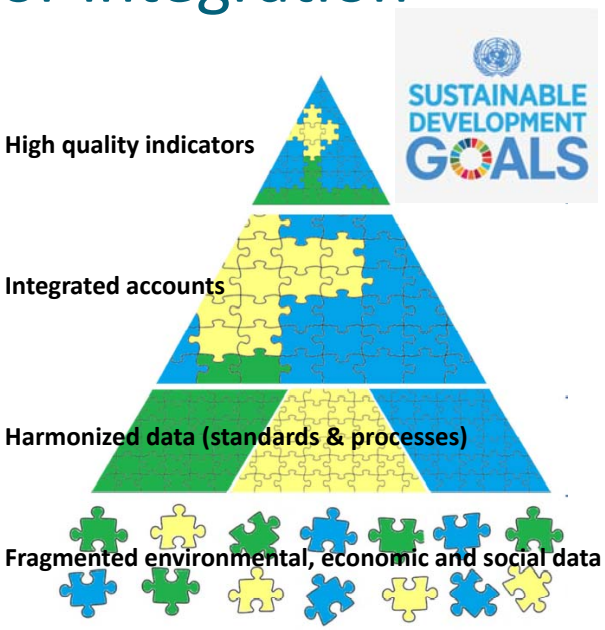
Statistical tools for integration

SEEA: *System of Environmental-Economic Accounting* → Standards for measuring interactions between environment and economy

SNA: *System of National Accounts* →Standards for measuring the economy

FDES: *Framework for the Development of Environmental Statistics* → Core statistics

GSBPM: *Generic Statistical Business Process Model* → Integrated statistical processes
DQAF: *Data Quality Assessment Framework* → Quality guidelines
NSDS: National Strategies for the Development of Statistics
Diagnostic Tool, Inventory Template → Strategic planning and assessment



SUSTAINABLE DEVELOPMENT GOALS

The SEEA and SNA

Indicators with

Quality

Comparability

(Dis)aggregation

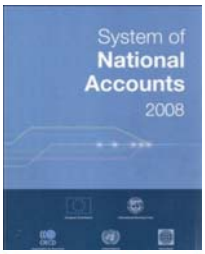
International Statistical Standards

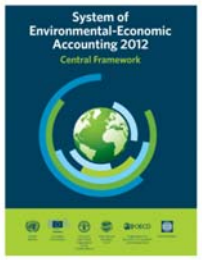
Agreed among NSOs

Aligned definitions and classifications

Comparable statistics from different sectors

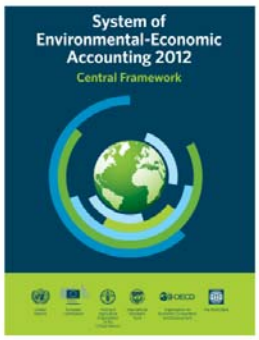
Coherent and comprehensive data sets



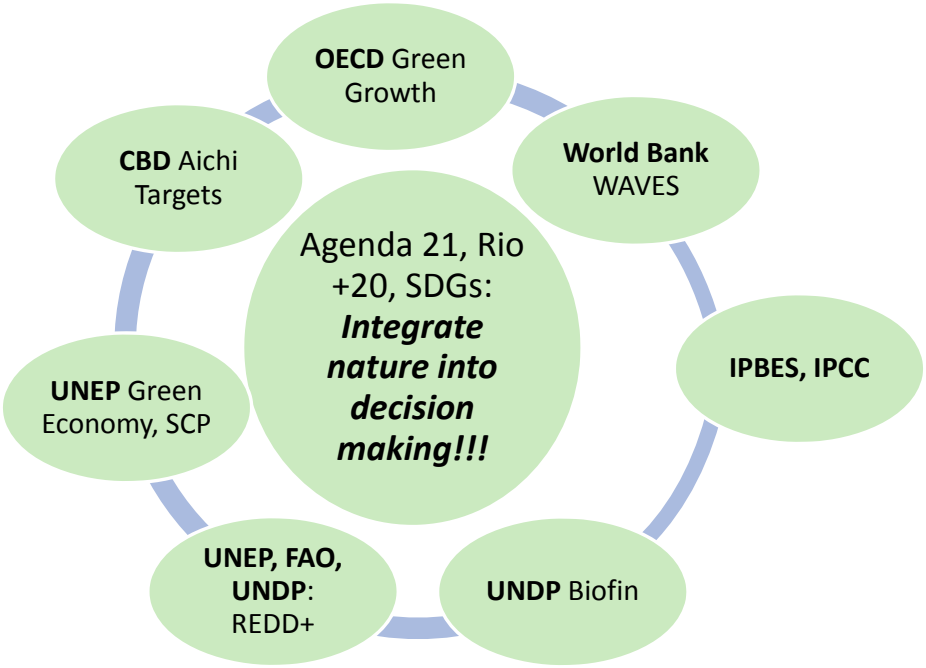


SEEA Features

- A coherent measurement framework linked to SNA:
  - Aligned concepts, classifications and methods
- Based on accounting principles & systems theory:
  - Stock/flow → asset, supply, use
  - Double/quadruple entry → supply = use
  - Time of recording
  - Consistent units of measure & valuation rules
- Flexible and modular
  - Select and adapt components to country needs
  - Don't need to be complete to be useful



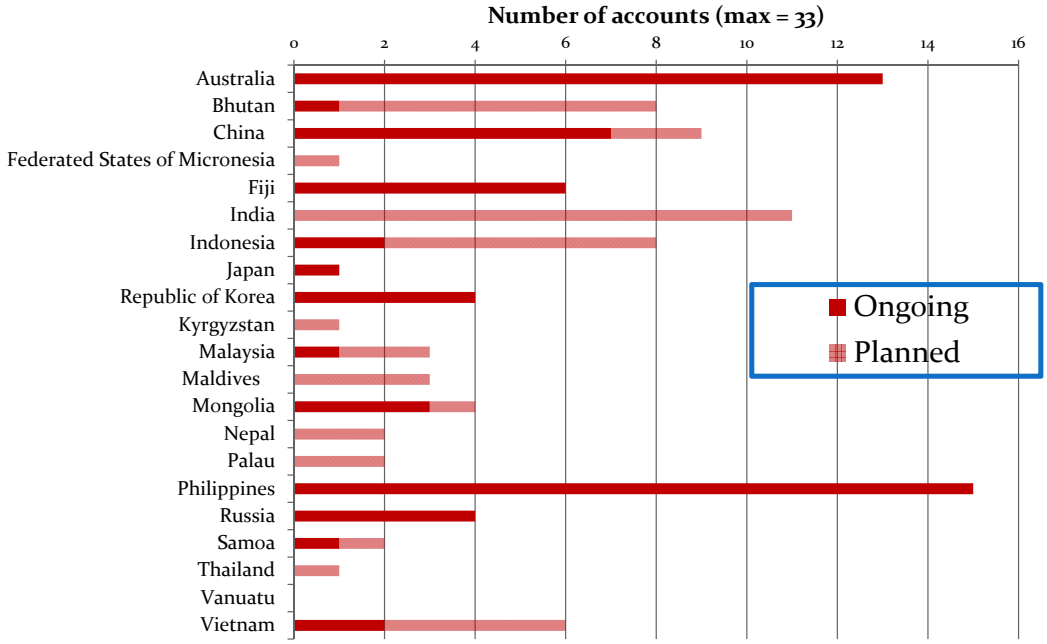
International platforms for integration



The SEEA

- Is accepted as a contributing measurement framework to most international environmental platforms:
  - CBD, SDGs, World Bank WAVES, BioFin, TEEB, REDD+, IPBES, OECD Green Growth, EU Beyond GDP
- Since 1992, has been implemented, in part, by over 90 countries
  - NSOs, natural resource, finance, planning and environment departments
- Supports a sustainable statistical infrastructure to regularly produce relevant accounts and indicators
- Is **NOT**: a model, database or analytical framework

Asia and the Pacific SEEA Progress (preliminary)



Initiatives on environment statistics

Stage	Countries
Requested	Myanmar, Kiribati, Vietnam, Philippines
Planned	Sub-regional assessment/training
Assessment	FSM, Malaysia, Maldives, Palau, Samoa, Vanuatu
Training	Malaysia (with UNSD); Pacific Sub-region
Implementation	Fiji, Nepal
UNSD Pilots	Bhutan, Indonesia, Vietnam

The details

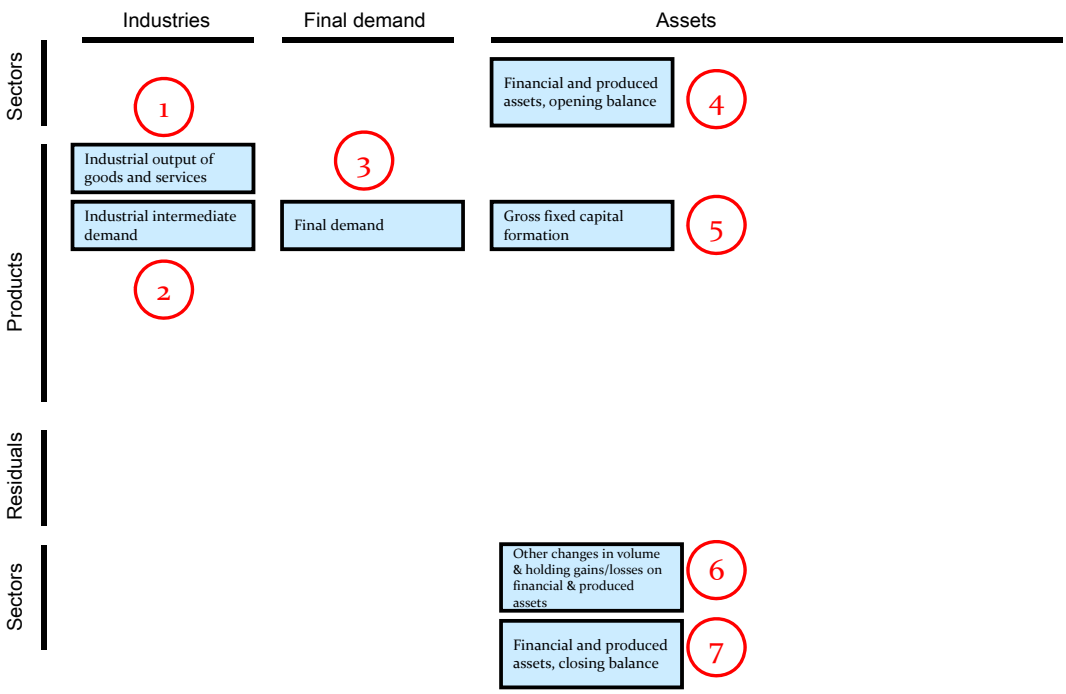
Back to accounting principles

- Stock/flow → assets, supply, use
  - Asset tables: opening balances, additions, removals, closing balance
  - Supply/Use tables: Supplier to user
- Double/quadruple entry
  - Monetary and physical transaction between supplier and user
- Time of recording: When transaction occurred
- Consistent units of measure, concepts, classifications, methods & valuation rules

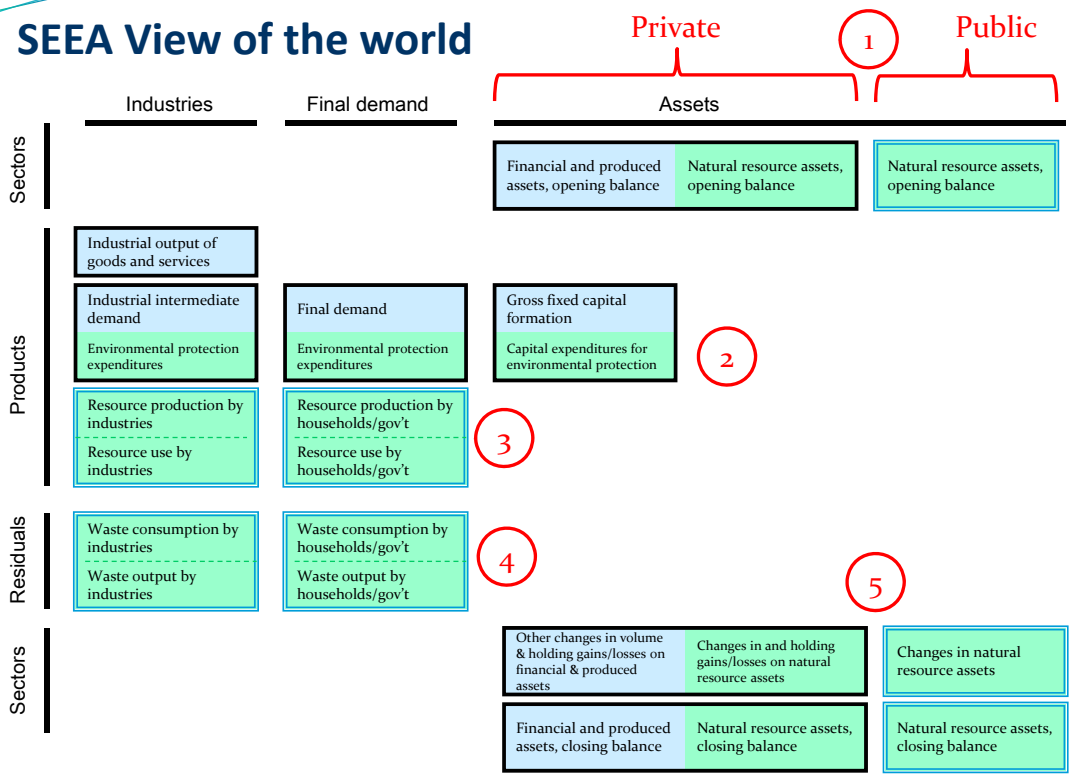
The SEEA and the SNA

- The SNA measures national economic activity, production and assets (wealth):
  - In monetary terms
  - By tracking transactions between **economic units** (businesses, households, governments)
- The SEEA measures environment/economy links:
  - Expands the asset boundary (includes natural assets)
  - Distinguishes expenditures on **environmental protection**
  - Records **physical** quantities of inputs to economy
  - Records **residuals** produced and consumed (by whom)
  - Records changes in private and public **natural assets**

SNA view of the world



SEEA View of the world



SEEA – Two sides of the coin

- Central Framework (SEEA-CF)
  - Focus on natural resources as **commodities**
  - At **national** level, reports on:
    - Asset (stock) accounts
    - Physical flows (including residuals)
    - Monetary flows
- Experimental Ecosystem Accounting (SEEA-EEA)
  - Regards ecosystems as **integrated assets** that support monetary and non-monetary benefits
  - At detailed spatial level

Environment statistics components

SEEA-CF (Central Framework)	• **Assets** • **Physical flows** • **Monetary flows**	• Minerals & Energy, Land, Timber, Soil, Water, Aquatic • Materials, Energy, Water, Emissions, Effluents, Wastes • Protection expenditures, taxes & subsidies
SEEA Water; SEEA Energy; SEEA Agriculture, Forestry and Fisheries	Add sector detail	As above for Agricultural, Forestry and Fisheries sectors
SEEA-EEA (Experimental Ecosystem Accounting)	Adds spatial detail and ecosystem perspective	Extent, Condition, Ecosystem Services, Carbon, Water, Biodiversity
FDES (Framework for the Development of Environment Statistics)	Basic statistics for above plus…	• Extreme events and disasters • Human settlements and health • Protection, management & engagement

SEEA-CF – The Accounts

- **Assets** (stocks; physical and monetary):
  - Mineral and energy resources
  - Land
  - Soil
  - Timber
  - Aquatic resources
  - Other biological resources
  - Water

SEEA-CF – The Accounts

- **Physical flows**
  - Supply/use for materials (extract → consume)
  - Material flows (through economy) to final demand (e.g., GHGs)
  - Water supply/use
  - Energy supply/use
  - Residuals
    - Air emissions
    - Water emissions
    - Wastes (generated and used/recycled)

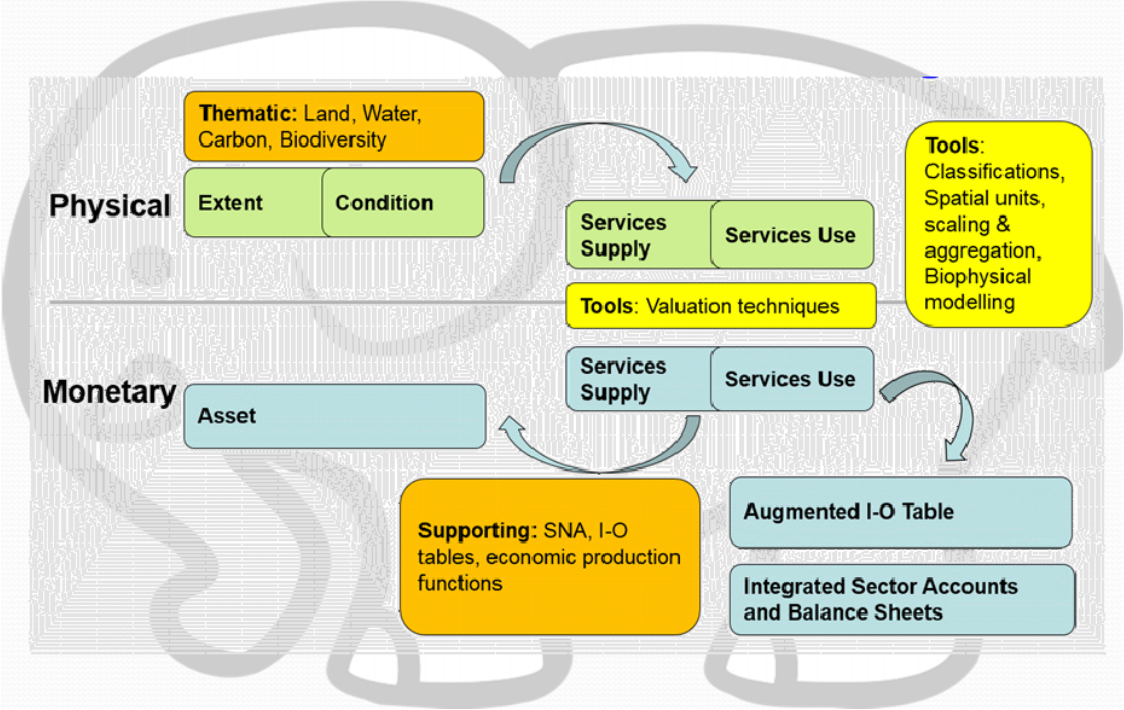
SEEA-CF – The Accounts

- **Monetary flows**
  - Environmental protection expenditures
  - Resource use and management
  - Environmental goods and services sector (supply side)
  - Environmentally-related payments by & to government (fines, fees, taxes, subsidies, concession payments)

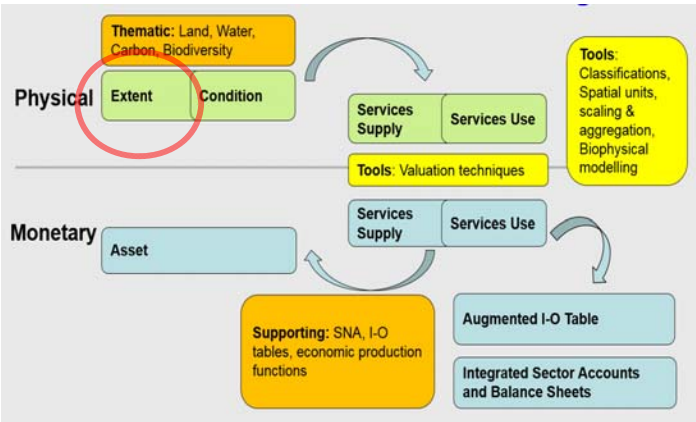
SEEA-EEA (Ecosystem Accounting)

- "Experimental" = in progress
- Spatial framework of ecosystem units (30-100m)
  - ***Extent*** of ecosystem types
  - ***Condition*** of ecosystem asset
  - Classification and valuation of ***ecosystem services***
- Links to SEEA-CF and SNA
- Tested in Canada, Netherlands, Australia, Mauritius, pilot countries (Bhutan, Chile, Indonesia, Mexico, South Africa, Vietnam)

SEEA-EEA Overview



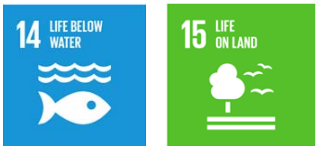
SEEA-EEA Accounts and tools



Extent account

- Ecosystem type
  + ownership and use
- Changes over time

→ land cover change



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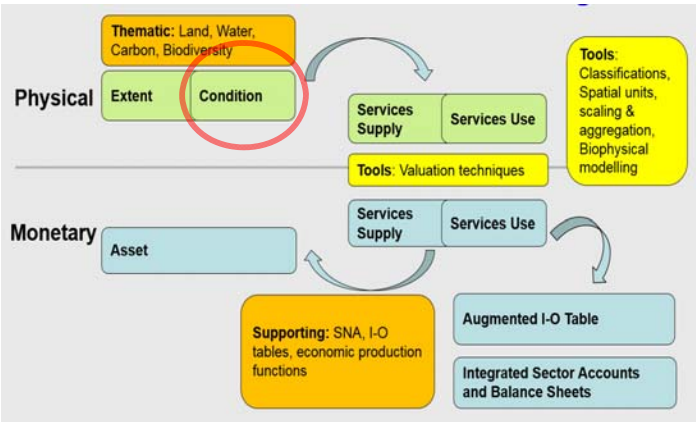


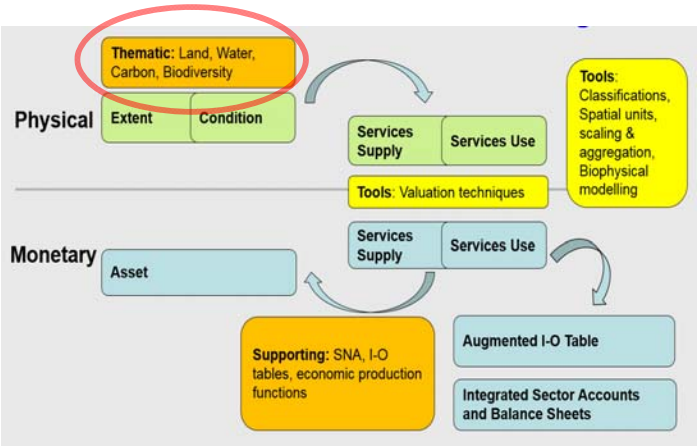
Condition account

- "Quality" and biophysical measures important to ecosystem services

→Overall condition, changes, location of changes

→Future flows of ES

SEEA-EEA Accounts and tools



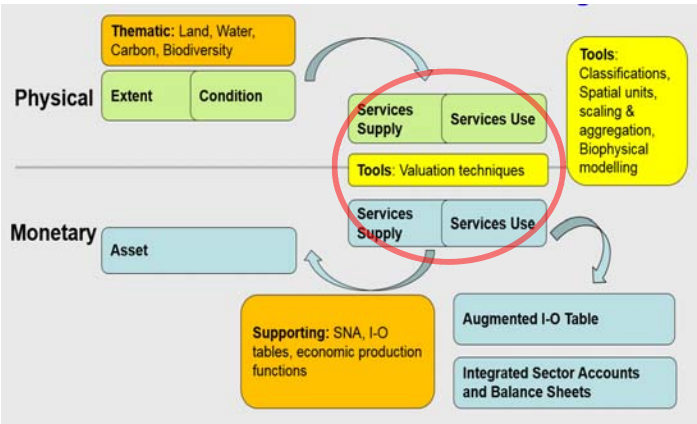
Thematic accounts

- Land (cover)
- Water (spatial detail, quality, ecosystems as beneficiaries)
- Biodiversity (species ranges, characteristics, populations)
- Carbon (focus on biocarbon)

→ Contribute to **Condition Accounts**

→ Focus on specific issues

SEEA-EEA Accounts and tools

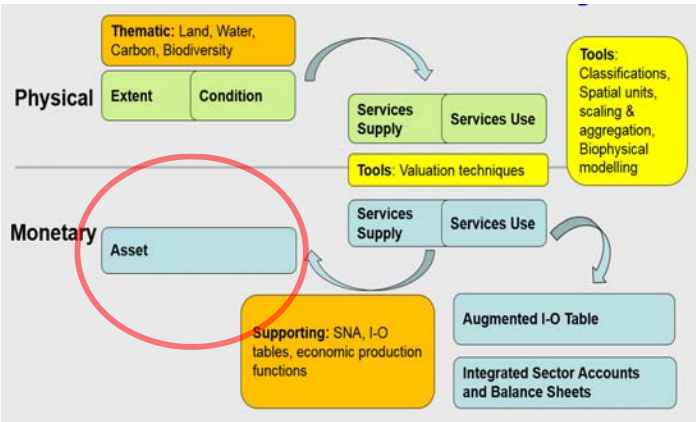


Ecosystem Services supply/use

- Physical measures
- Use by beneficiaries
- Valuation to estimate monetary values

→ Contribute to monetary **Asset Account** & links to SNA

SEEA-EEA Accounts and tools



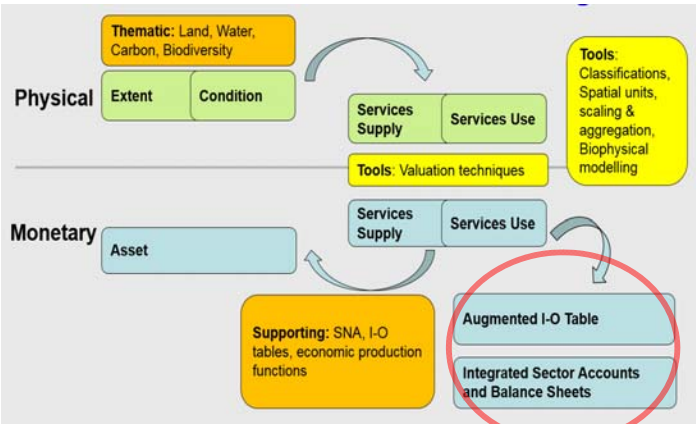
Monetary Asset

- Net Present Value of future flow of services

→Trade-offs

→Contribute to **Balance Sheets**

SEEA-EEA Accounts and tools

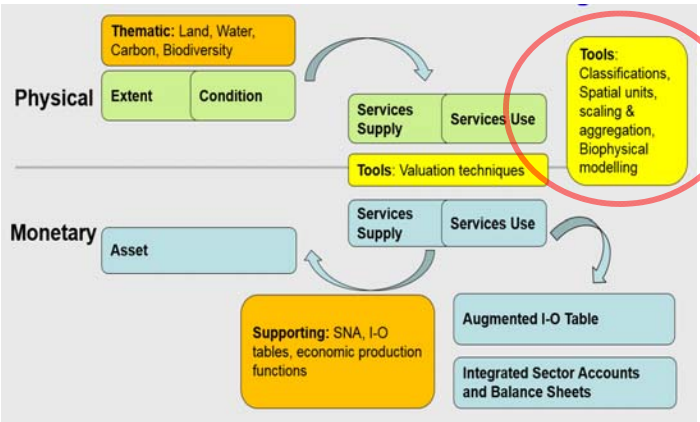


Links to SNA

- Ecosystem services in economic production functions
- Degradation and depletion-adjusted aggregates (e.g., value added minus depreciation)

→ Trade-offs

SEEA-EEA Accounts and tools



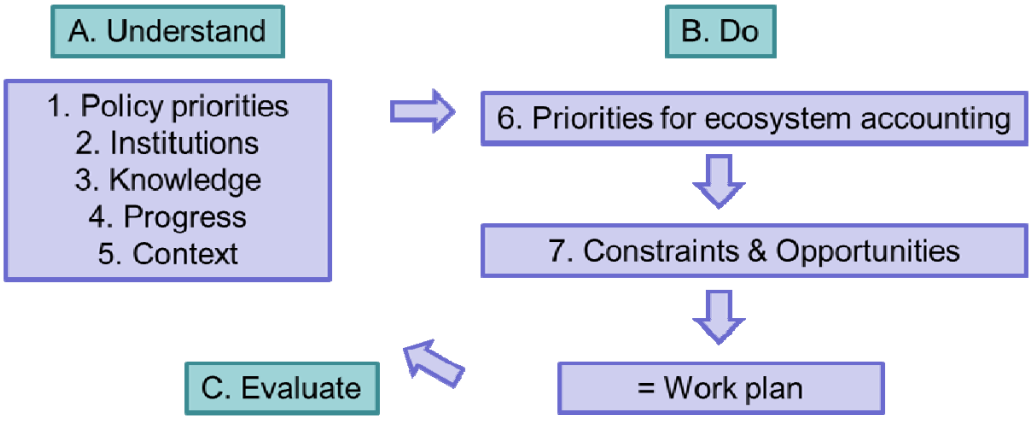
Tools

- Classifications (land cover, ecosystem services)
- Methods (Spatial units, scaling & aggregation)
- Biophysical modelling (future flows & filling gaps)

Other tools

Diagnostic Tool

- Guide conversation strategic planning



Training modules

- 90 minutes each (about every 2 weeks)
- Content
  - Rationale (What is? Why?)
  - Basic concepts (4 things you need to know)
  - Group exercise (Combine your expertise!)
  - Data sources
  - Country examples
- Choose priority modules by filling in **the form**

Training modules

SEEA-EEA
- Spatial Units, Scaling and Aggregation
- Extent Account
- Classifications
- Service Supply Account
- Condition Account
- Water Account
- Biodiversity Accounting
- Carbon Accounting
- Biophysical modelling
- Implementation and Diagnostic Tool

SEEA-CF
- Minerals and Energy Assets
- Energy supply and use
- Environmental protection expenditures
- Air emissions
- Wastewater
- Physical supply and use
- Solid Waste

FDES
- Overview

Take home messages

"Good statistics are cheaper than bad decisions."

- The SEEA is a very useful measurement framework to "disentangle" environment data
- Many countries are implementing it as a way of harmonizing, prioritizing, estimating data
- It is linked to many SDGs
- ESCAP would be happy to schedule ongoing training courses

References

- ESCAP: http://www.unescap.org/
- IMF-DQAF: http://dsbb.imf.org/Pages/DQRS/DQAF.aspx
- Paris 21. NSDS: http://www.paris21.org/
- Saner, M. and Bordt M. 2016. Building the consensus: The moral space of Earth measurement systems. *Ecological Economics* 130 (2016): 74-81.
- Statistics Canada, 2013. Human Activity and the Environment 2013: Measuring Ecosystem Goods and Services: http://www.statcan.gc.ca/pub/16-201-x/2013000/aftertoc-aprestdm1-eng.htm
- UNSD. 2013. Fundamental principles of official statistics. http://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx
- UNSD. 2013. FDES: http://unstats.un.org/unsd/environment/fdes.htm
- UNSD. 2014. SEEA: http://unstats.un.org/unsd/envaccounting/seea.asp
  - Training materials: http://unstats.un.org/unsd/envaccounting/workshops.asp?fType=2
- World Bank. WAVES: https://www.wavespartnership.org/

Thank you

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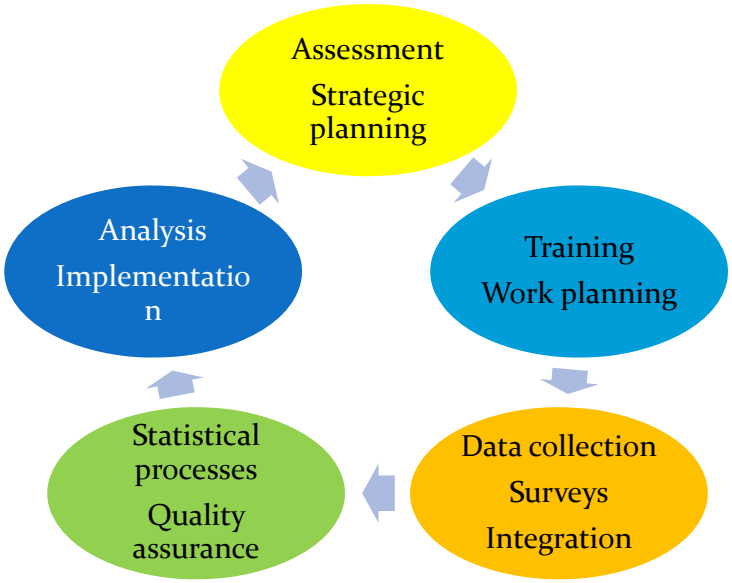
ESCAP Vision

...to be the most comprehensive multilateral platform for promoting cooperation among member States to achieve inclusive and sustainable economic and social development in Asia and the Pacific

ESCAP: Statistics Division

- Coordinates the ESCAP **Committee on Statistics**
  - Key trends
    - *ESCAP Statistical Database*
    - *Statistical Yearbook for Asia and the Pacific*
    - *Did You Know?*
  - **Data** requirements and international **standards** for analysis
  - **Capacity building / Advisory services** on
    - Economic
    - ***Environment, Agriculture and Disaster***
    - Population, Social and Gender
    - Civil Registration and Vital Statistics
    - Modernization of statistical production and services
    - Statistical governance
- Co-manage Statistical Institute for Asia and the Pacific (SIAP)

Advisory services



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Assessment	FSM, Malaysia, Maldives, Palau, Samoa, Vanuatu
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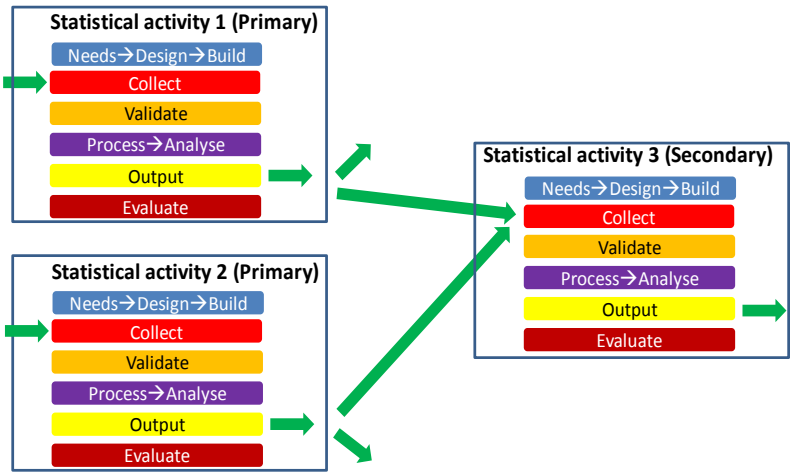
Implementation	Fiji, Nepal
UNSD Pilot	Bhutan, Indonesia, Vietnam

Basic tools

Inventory template for environment statistics

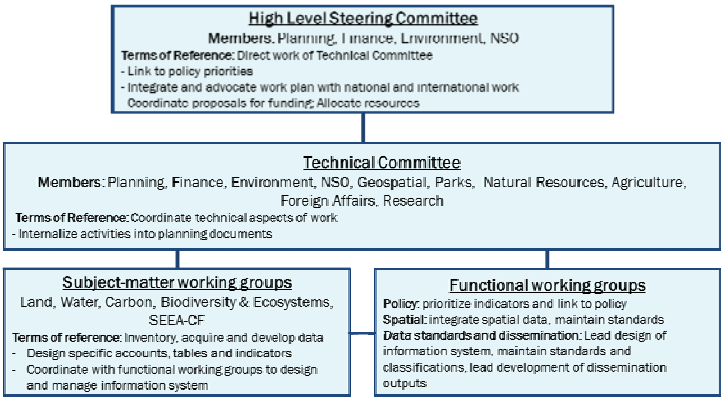
- To document external statistical "supply chain"



Basic tools

Statistical and institutional mechanisms

- Leadership
- Funding
- Monitoring
- Implementation plan



Advanced tools

- Indicators, reporting, communications
- Surveys, administrative data
- SEEA Accounts
- Statistical processes (GSBPM)
- Data exchange (SDMX)
- Geographic Information Systems (GIS)
- Modelling
- “Big data” & alternative data sources

Advisory approach

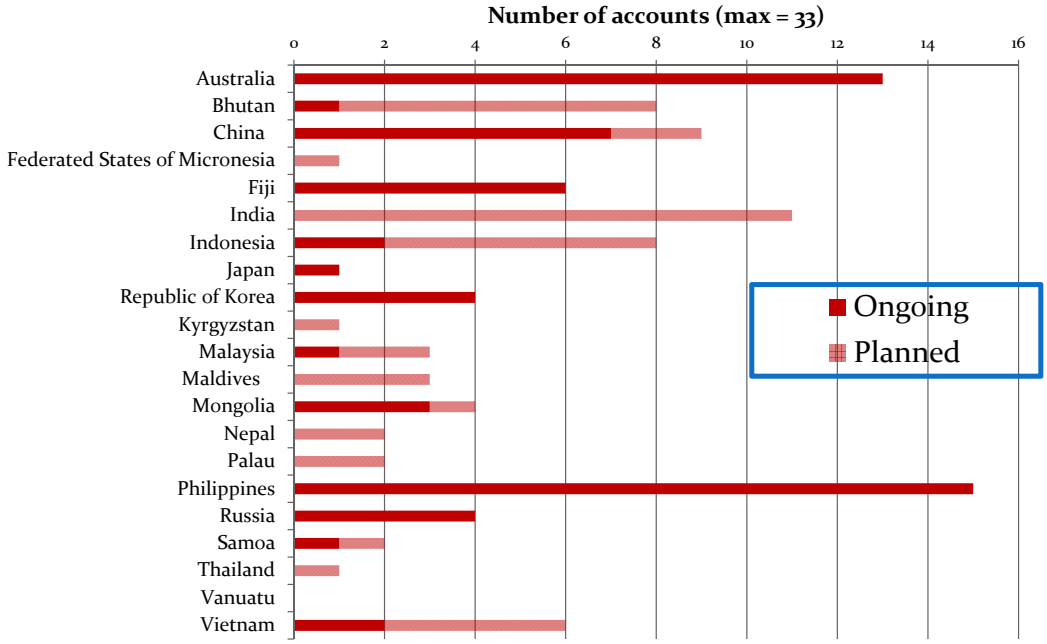
1. **Letter of introduction** → all NSOs and ACPR (Advisory Committee of Permanent Representatives)
   - Informal request for services
   - Teleconference to focus on requirements
   - Formal request for services
2. **Scoping/Assessment**
   - **Diagnostic Tool**: Vision, stakeholders, policy priorities, available data/knowledge, technical capacity, constraints, opportunities → priority statistics
   - **Inventory Template**: Metadata for environmental databases
3. **Training/Work Planning**
   - High-level stakeholder meeting → Work Plan
   - Focussed training (country & sub-regional)

Regional* SEEA implementation

- Globally, 54/85 countries have **ongoing** SEEA accounts
  - 15/85 are **planning** SEEA accounts
- Asia/Pacific region (23 responses)
  - 14 with ongoing SEEA accounts (+5 planning)
- Regional initiatives to advance SEEA implementation
  - ESCAP
    - Committee on Statistics encouraged implementation
    - Member country requests
  - UN DA programme on statistics and data
  - UNEP/SCBD/UNSD project (2014-15) in 3 regional pilots
  - World Bank WAVES

*UNSD 2015 Global Assessment; 85 countries responding (44% response rate).

Asia and the Pacific SEEA Progress (preliminary)



Conclusions

- ESCAP is here to help in improving environment statistics
  - Start with self-assessment (Diagnostic Tool)
  - Request services
  - Work on basic tools & capacity building
- We can
  - assist with assessment, inventory, work planning, training & implementation
  - work with you and partners to develop proposals for funding

Highlights of Presentation

- Environmental statistics are *interdisciplinary* and *inter-institutional*
- Environmental statistics are being *transformed* by the need for integrated decision making
- This transformation requires well-functioning and integrated National Statistical Systems
- We have (some of) the technology!
- ***There is a demand for support. How can we collaborate?***

Constraints and opportunities

Constraints

1. No statistical standards for many social and environmental SDG indicators
   - SNA, SEEA and FDES don't cover all SDGs
   - Indicators don't use international standards (use sectoral standards)
2. Countries overwhelmed by demands for statistics from ESCAP and other international organizations
3. General lack of data (from NSO perspective)

Opportunities

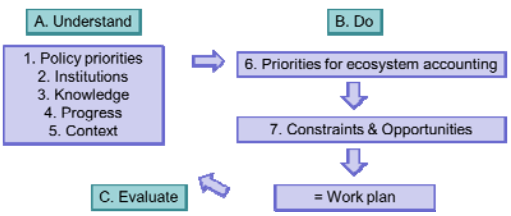
1. Develop statistical standards across SDGs → International Statistical System
2. Coordinate knowledge about & demands on target countries
   - ESCAP focal points
   - Internal training program
3. Focus on statistical development (2-3 year programs) to build environmental statistics capacity of National Statistical Systems with NSO as focal point

Implementing the measurement framework

4 stages

1. Strategic planning (Diagnostic Tool): Iterative understanding of priorities and capacities

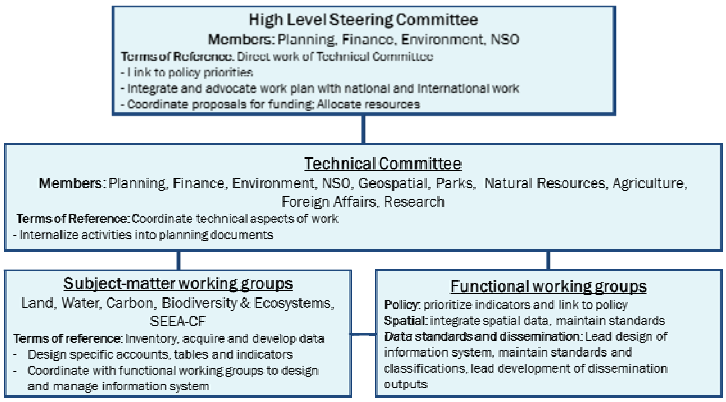
- National vision
- Engage NSS



Implementing the measurement framework

2. Build statistical and institutional mechanisms

- Leadership
- Funding
- Monitoring
- Implementation plan

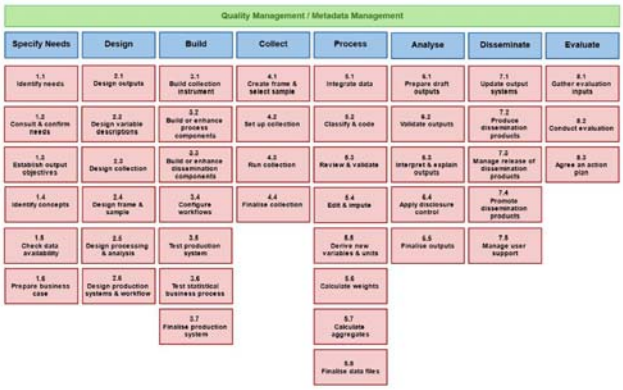


Implementing the measurement framework

3. Strengthen National Statistical Systems

- International guidance on statistical production
- Share data
- Centralize processes
- Quality guidelines

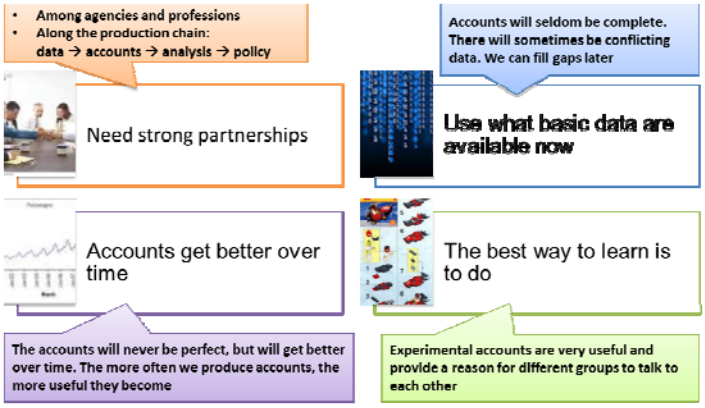
Generic Statistical Business Process Model (GSBPM)



Implementing the measurement framework

4. Produce accounts

- Partnerships
- Get started
- Learn by doing
- Incremental improvement



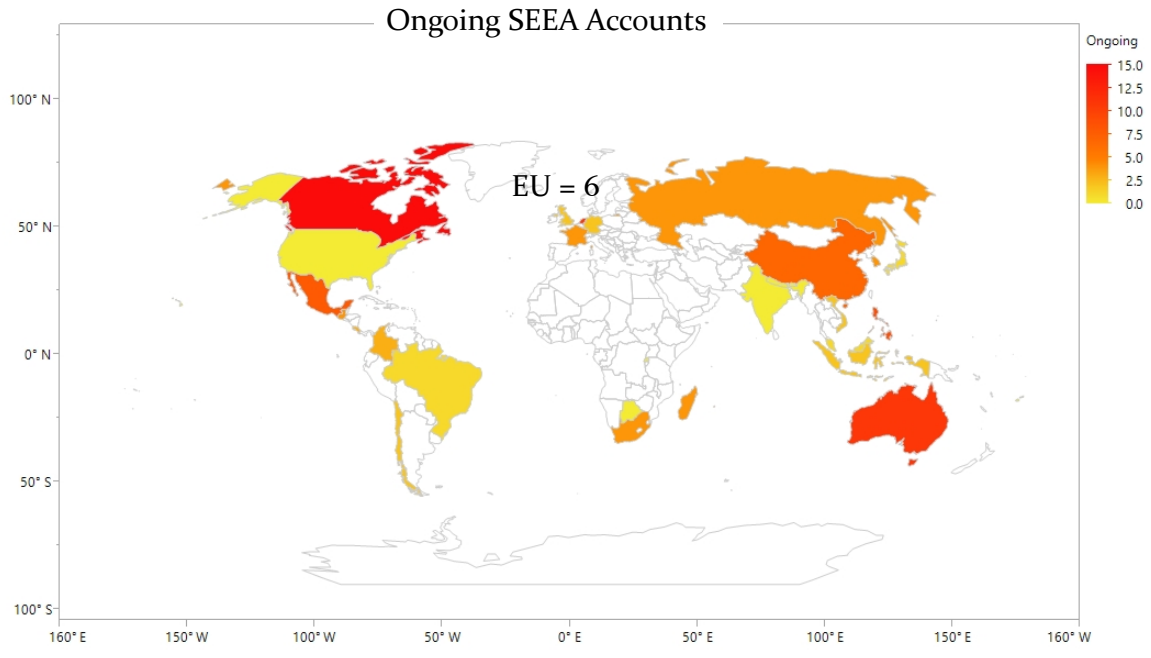
History (1970s-1990s)

- NSOs engaged to provide *objective* source for environment and natural resource information
  - Supply driven (e.g., mapping population by drainage area)
  - Indicator driven (e.g., pollution indices)
  - Environment **or** Economy
  - Disjoint, opportunistic (many indicators, many processes)
  - **Organizing frameworks**: State of Environment (OECD), Pressure/State/Response, FDES (UNSD)
  - Opportunities for new surveys (expenditures, households)
  - **Many countries are still in this mode of multiple disjoint indicators and statistical processes**

History (1990s-present)

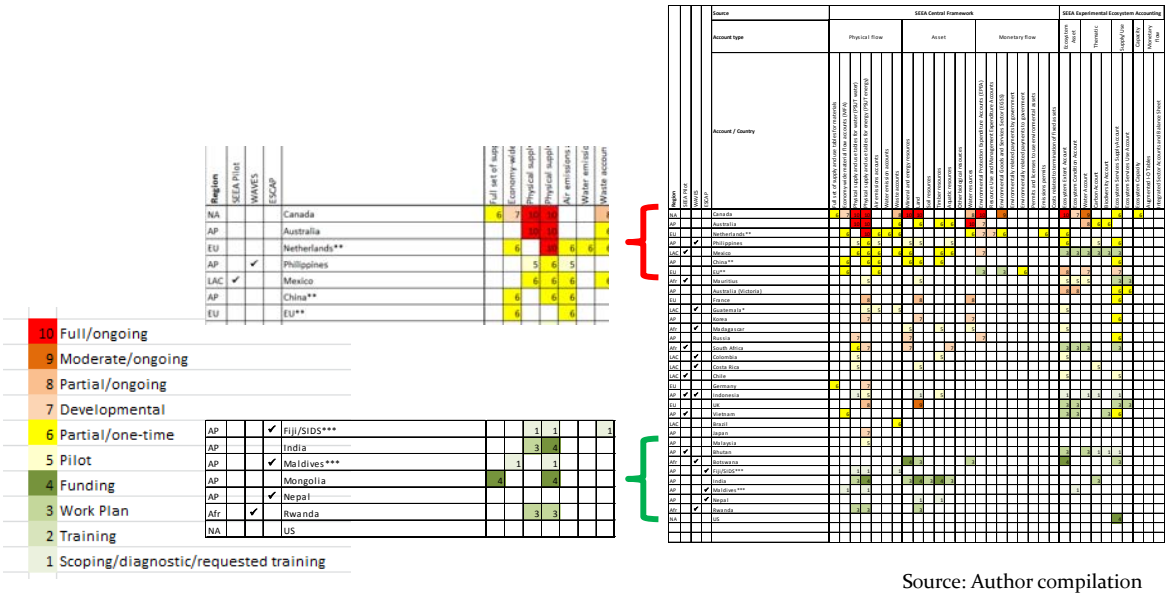
- Integrated decisions (SDGs, biodiversity, green economy, climate change)
  - Demand driven (e.g., contribution to national wealth; trade-offs)
  - Account driven (e.g., asset, stock/flow, link to National Accounts)
  - Environment **and** Economy → trade-offs
  - Integrated and coherent: Common concepts and classifications; ongoing statistical processes; links to national policies
  - **Measurement frameworks**: SEEA* (Central Framework), SEEA-EEA (Ecosystems), SEEA-Energy, SEEA-Water, SEEA-Agriculture
  - More focussed surveys (water use, activities, wastes) & maps
  - **At least 54 countries are producing ongoing SEEA accounts**
    - **Accepted by most international SD platforms (TEEB, WAVES, CBD)**

*__SEEA__: System of Environmental Economic Accounting (UN, EC, FAO, IMF, OECD, WB)



Source: Author compilation

Heat map of countries by account



Source: Author compilation

References

- ESCAP: http://www.unescap.org/
- FDES: http://unstats.un.org/unsd/environment/fdes.htm
- GSBPM: http://www1.unece.org/stat/platform/display/metis/The+Generic+Statistical+Business+Process+Model
- Gleeson-White, Jane. 2015. *Six Capitals: The revolution capitalism has to have – or can accountants save the planet?* https://janegleesonwhite.com/six-capitals/
- Holling, C.S., *Two Cultures of Ecology*. http://www.ecologyandsociety.org/vol2/iss2/art4/
- IMF-DQAF: http://dsbb.imf.org/Pages/DQRS/DQAF.aspx
- NSDS (Paris21): http://www.paris21.org/
- SEEA: http://unstats.un.org/unsd/envaccounting/seea.asp
  - Training materials: http://unstats.un.org/unsd/envaccounting/workshops.asp?fType=2
- World Bank WAVES: https://www.wavespartnership.org/