Notes on the structure and contents of the revised FDES

Expert Group Meeting on the Framework for the Development of Environment Statistics

(New York, 4-6 May 2011)

United Nations Statistics Division

Outline

1. Concepts: framework, structure
2. Structural considerations
3. Possible structure based on matrixes
4. Possible non-matrix structure

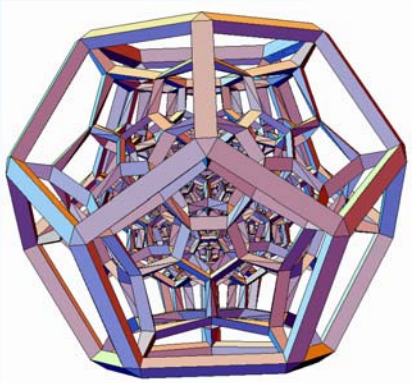
Objectives

- Review elements for the discussions at this EGM
- Present different options for rows, columns and matrixes, as well as some illustrations of a non-matrix structure for the FDES
- Discuss their potential advantages and disadvantages

Notes are preliminary and they do not intend to propose a particular type of structure for the FDES.

Some key questions are proposed to provoke ideas and steer the discussion 

1. Concepts of framework and structure



What is a framework?

- "Essential supporting structure of a building, vehicle, or object", also a "basic structure underlying a system, concept, or text" *(Oxford Dictionary).*

- "Basic conceptional structure (as of ideas, for example, the *framework* of the United States Constitution)" and a "skeletal, openwork, or structural frame" *(Merriam Webster Dictionary).*

- A statistical framework depicts a set of dimensions, components and topics, held together by structure. Organizes elements that constitute the statistical domain in a coherent way.

- Statistical frameworks relate to a specific concept of the object to be framed.

- More specifically, a framework for the development of environment statistics can be understood as a structure and an organizing tool that presents a logical arrangement of environment statistics topics and variables, as well as analytical categories, facilitating the work of practitioners in the production, dissemination and development of environment statistical series and products.

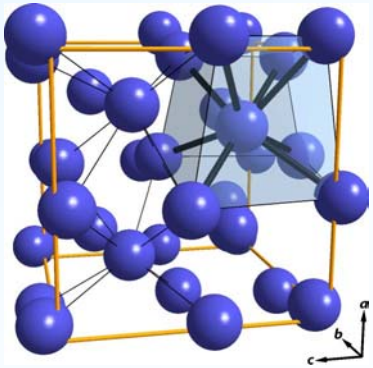
What is a structure?

- The organizational backbone holding the parts together in the right order and allowing the needed interactions among its components.
- Is a means (not and end), but is so critical that without an adequate structure, everything will fall apart.

Recap: Key challenges in developing the revised FDES structure

- Comprehensive framework, be useful for most environmental concerns, topics, dimensions, issues and themes that are globally relevant
- Be adaptable to most countries' needs. Flexible enough to accommodate country- and region-specific dimensions, topics and segments of variables, as needed.
- Satisfies the revised FDES' purpose and criteria
- Statistically feasible (applicable), based on the characteristics of a majority of statistical systems at the national level
- Possibly multi-layered framework, in order to accommodate different levels of aggregation of the topics and information, from the most synthetic to more disaggregated levels

2. Structural considerations



The structure of FDES

Main challenge of environment statisticians: producing statistics to describe the state and the most important dynamics, changes and trends in the state of the environment

How to structure and organize statistics on the environment that is dynamic, interrelated, a system containing subsystems and components in permanent interaction, including interactions with the human subsystem.

Structural complexity

- The 1984 FDES structure has proven difficult to improve without associated costs
- There are considerable losses and trade-offs when moving from one option of rows to another, and additional questions arise when considering their combination with different columns options.
- E.g. when disaggregating the rows aiming to increase resolution, we lose being mutually exclusive and hierarchically leveled

Structure, components and interactions of the environment

How to structure the revised FDES?

- The whole and the parts – environment and environmental components
- The known and the measurable environment - disaggregating and prioritizing
- Adaptation and flexibility - usefulness
- Conceptual soundness and statistical feasi
- Structure and spatial considerations
- Structuring criteria

Structuring criteria

A) Components of the environment. Deconstructing the environment to its main building blocks

- Media components (flora, fauna, water, air, land/soil, etc.)
- Environmental resources (natural resources, ecosystem services)
- Ecosystems categories (components and interactions)
- Themes and sub-themes

B) Analytical (assessment) categories. Information sets that reflect the aspects/attributes of the environment and enable analysis as information categories

- Pressures, Driving Forces, State, Impact and Responses
- Extent, Characteristics or Quality (Biological, Chemical and Physical) and Productivity.
- State and changes of the environment and the activities and events that contribute and/or respond to these changes
- Stocks and Flows
- Quality and Quantity (and its further dissagregation) .

Link to policy

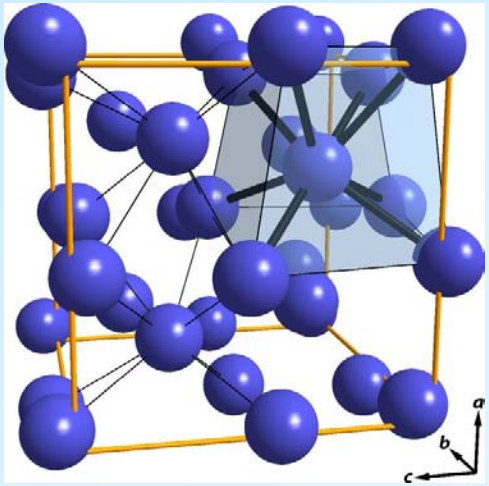
Where should we place the emerging environmental concerns and cross-cutting policy issues within the revised structure?

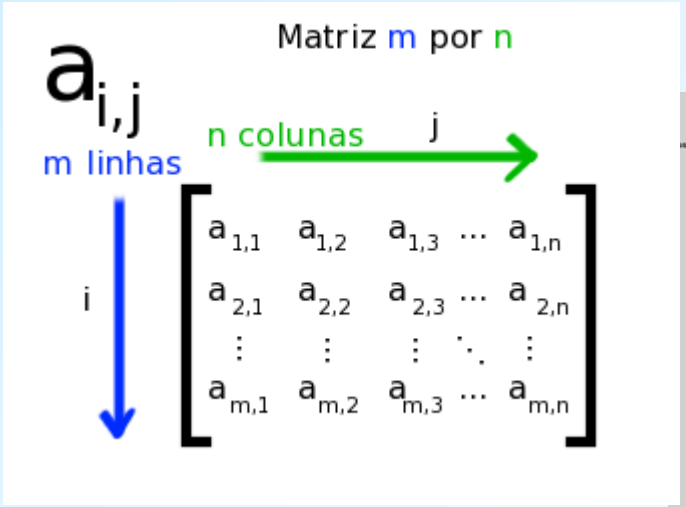
E.g. Climate change, biodiversity change, natural resources managment, production and consumption patterns and green economy, etc.

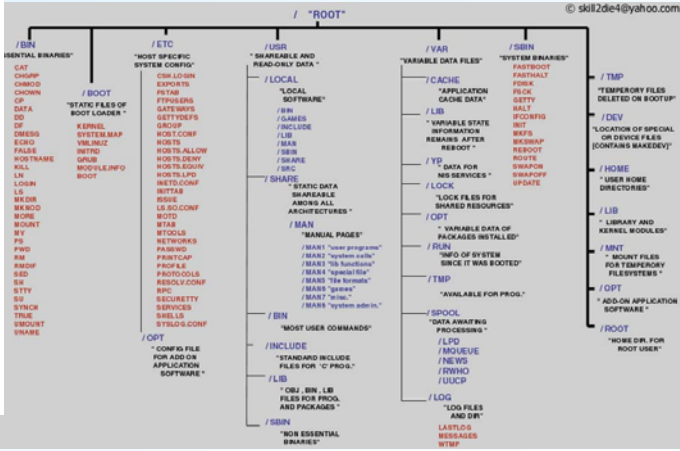
Maybe these issues should be addressed as possible applications of the FW (at a different level)

Q1: Other structuring criteria or a different set of structuring criteria altogether?

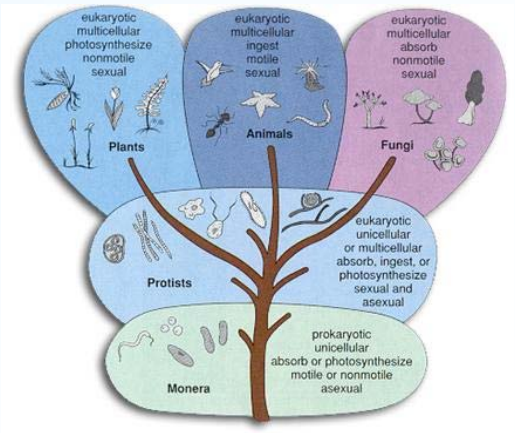
Visualization of the structure: matrix or non-matrix?







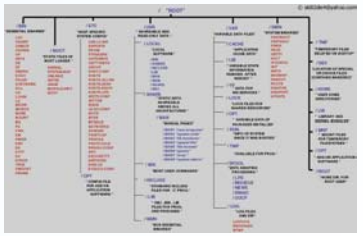
impact category	Wind electricity	Natural gas power	Photovoltaic electricity	Nuclear electricity
Acidification	0.0000103	0.000384	0.000056	0.0000139
Ecotoxicity	0.0277	0.0179	0.178	0.0345
Fossil fuel depletion	0.0000288	0.00126	0.000193	0.0000222
Global warming	0.000234	0.00439	0.0012	0.000221
Human carcinogen	0.0493	0.0695	0.212	0.0456
Human respiratory	0.0000285	0.000502	0.0000955	0.0000254
Human toxicity	0.0163	0.0457	00.0744	0.000136
Ozone layer depletion	0.00000004	0.0000001	0.0000008	0.000004
Photochemical smog	0.0000067	0.0000368	0.0000349	0.0000093
Water eutrophication	0.0000305	0.0000525	0.000165	0.0000227
Total millipoints / kw-hr	0.0936	0.1397	0.466	0.217



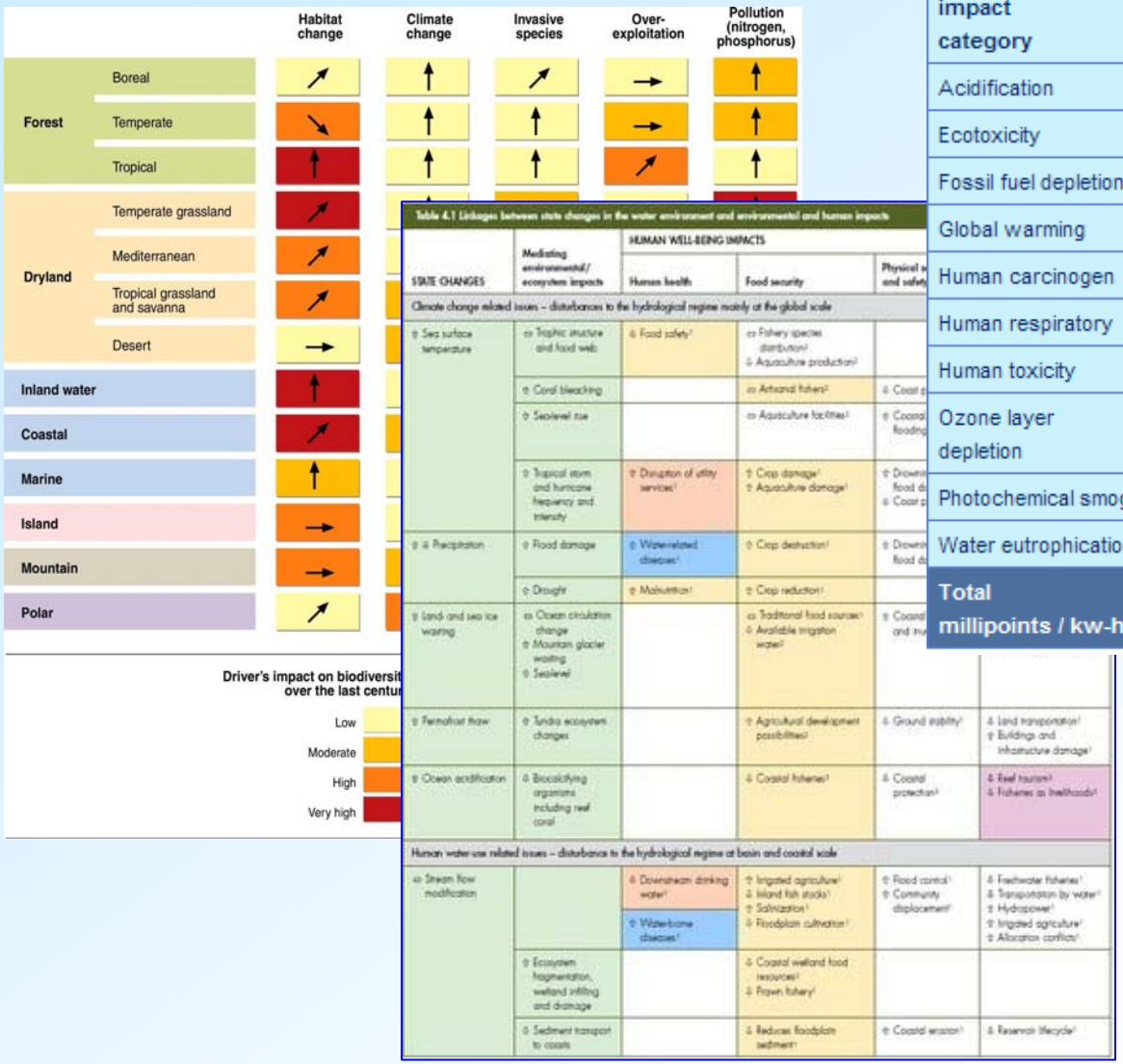
Matrix ..... Non-matrix

- Widely used in statistics and assessment
- Allows 2-dimensional analysis: intersection of rows and columns
- Simple representation
- Difficult to capture relations among components
- Requires overall fit in contents of rows and columns (analytical categories apply and relevant to all environmental components)

- Allows different dissagregation within each theme (no columns needed)
- Representation from simple lists to three-dimensional
- Does not require overall fit among rows and columns contents



Matrixes are common in statistics and assessment



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Q2: Can you think of other ways to portray the new FDES that is not a matrix-type structure ??

Structure of the 1984 FDES

(synthesis matrix)

Columns

Rows

Components of the environment	Information categories			
	Social and economic activities, natural events	**Environmental impacts of activities/ events**	**Responses to environmental impacts**	**Inventories, stocks and background conditions**
1. Flora	Topic	Topic	Topic	Topic
2. Fauna	Topic	Topic	Topic	Topic
3. Atmosphere	Topic	Topic	Topic	Topic
4. Water • **freshwater** • **marine water**	Topic	Topic	Topic	Topic
5. Land/soil • **Surface** • **Sub-surface**	Topic	Topic	Topic	Topic
6. Human settlements	Topic	Topic	Topic	Topic

About the structure of the 1984 FDES

(synthesis matrix)

Overall

Application of 1984 FDES (rows, columns, topics) to different cros cutting issues is not straight forward. The link to policy is not evident

This needs to be improved in the revised FDES since environment statistics routinely needs to deal with these types of themes or cross-themes.

Rows

- Highly aggregated
- They are mutually exclusive, but inter-relationships among components are not facilitated by 1984 structure
- Human Settlements is problematic (partially overlapping)

More dissagregation is needed, enable the explicit interrelations among environmental components

About the structure of the 1984 FDES (2)

(synthesis matrix)

Columns

- Require careful consideration of alternative ways of **re-structuring columns** or analytical categories (consider developments and user needs for analysis, reporting, policy making and information to the public).
- **PSR and** derivate sequences (DPSIR, etc.) implicitly suggest **causality (**or have been **interpreted** as such).
- The **PSR** (and derivate sequences) might work better when used for analytical purposes of specific topics and dimensions of the environment (not so much for organizing environment statistics as a whole). Allocation in specific context easier than ES as a whole.

Columns should be significantly improved in revised FDES, so that analytical categories can be more integral and straight forward

3. Possible FDES structure based on matrixes

impact category	Wind electricity	Natural gas power	Photovoltaic electricity	Nuclear electricity
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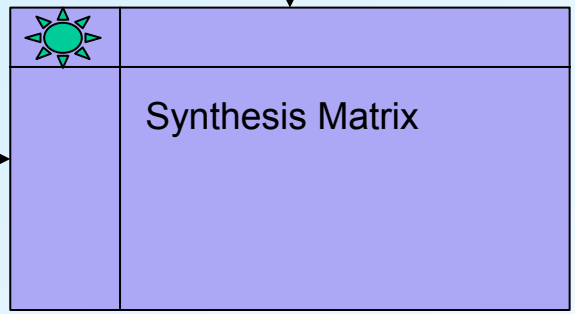
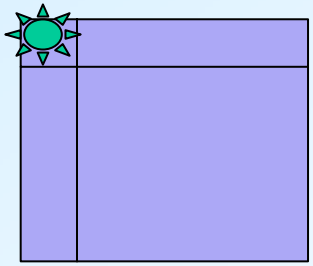
Multi-layer, matrix type Structure

COLUMNS: analytical categories

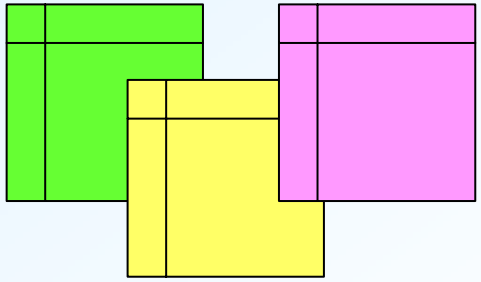
ROWS: Environmental Components



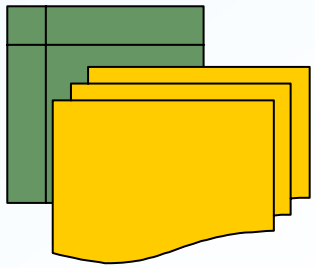
FDES Layers: **1** **2** **3**



Synthesis Matrix



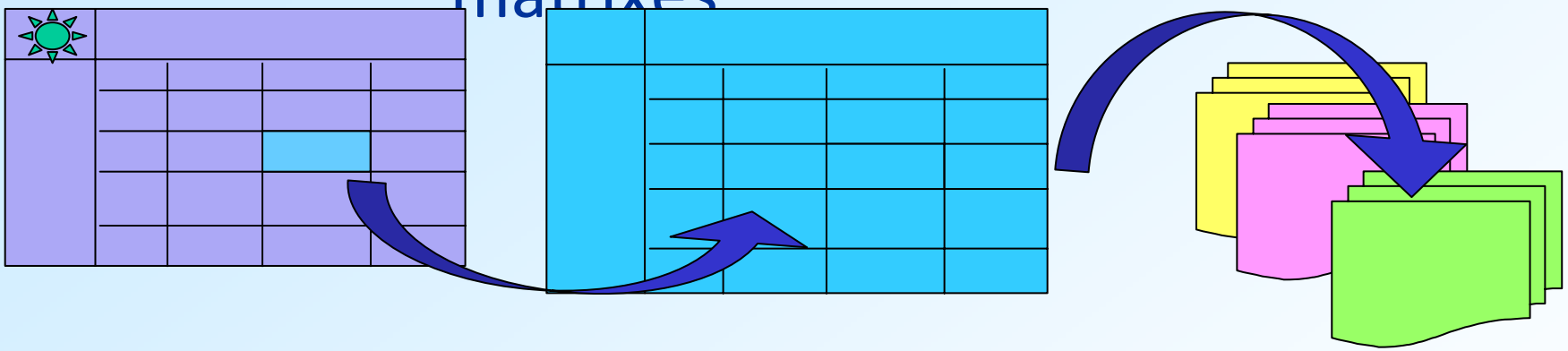
Theme specific matrixes and issue applications – topic level



Theme specific – variable set level

Aggregated …….... ….disaggregated

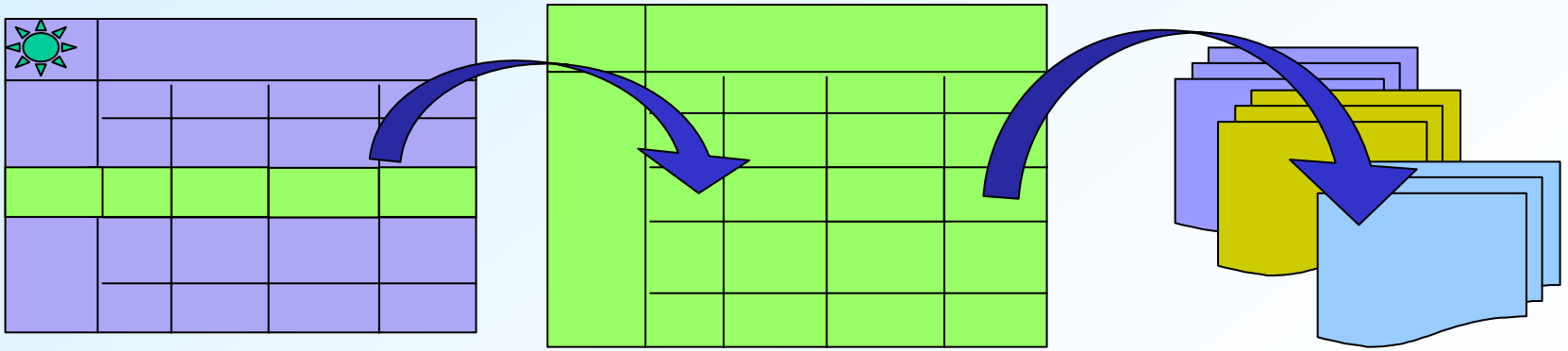
Expansion of topic from synthesis matrix to secondary and tertiary matrixes



Layer 1

Layer 2

Layer 3



Q3: Other layers or possible windows opening the info to more specific levels?

Multi-layer, matrix type structure

Pros:

- Each user (country, agency) can decide components to prioritize and which other contents to incorporate: flexibility characteristic
- For each issue or high profile environmental concern, there is a subset of components of the environment that are relevant and can be presented as a subset of cells and rows

Cons:

- Matrix requires the same rows and columns at all levels, but some contents of the columns do not work well or do not apply to all of the rows in such a wide theme as the environment.

Matrix structure: pros and cons of different options for rows

Rows that are mutually exclusive and at a similar level

Components of the environment (1984 FDES)
1. Flora
2. Fauna
3. Atmosphere
4. Water (a)freshwater (b)marine water
5. Land/soil (a)Surface (b)Sub-surface
6. Human settlements

Revised FDES

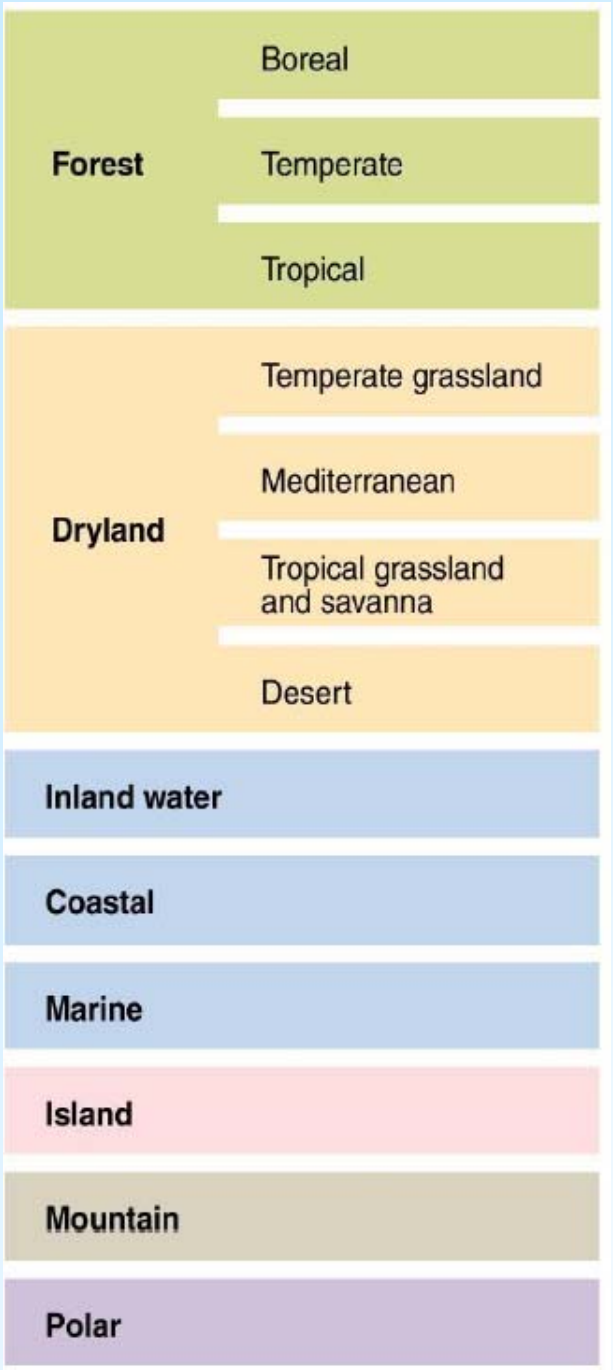
- What other components are needed?
- Break down to 2-digits?
- What would be in the rows?

Q 4: What would be new components of the environment (more disaggregated) ?

	Environmental Component	Sub-Component (examples from different categorizations)
1	Biota	1.3 Threatened Species 1.4 Biodiversity
2	Coast and Oceans	2.1 Coasts and marine extension (territorial) 2.2 Coastal pollution 2.3 Surface temperature 2.4 Sea level 2.5 Marine ecosystems health (coastal, tidal, coral reef, etc).
3	Inland Water	Rivers Underground …. 3.2 Quality 3.3 Management
4	Forests	4.1 Extent 4.4 Quality… or same as in 3 (stocks – flows)
5	Land, Soil and Subsoil	5.1 Territory 5.2 Land Use and Land Cover 5.3 Subsoil …. Further disaggregated in stocks and flows)
6	Energy	6.1 E Production, Consumption 6.2 E Renewability 6.3 Energy Intensity (carbon and in relation to GDP)
7	Atmosphere, Air and Climate	7.3 Precipitation 7.4 UV Radiation
8	Extreme events - natural disasters	8.1 Geological 8.2 Meteorological 8.3 Hidrological
9	Human settlements	10.1 Total, urban and rural population 10.2 Safe Water 10.3 Sanitation 10.4 Waste 10.5 Vulnerable, precarious settlements 10.6 Green areas
10	Cross cutting issues	SCP, Green Economy, environmental instruments (taxes, eco-labelling, subsidies), Environmental Management, Environmental expenditure. Environment and cultural heritage.

Common environmental components: overlapping and not at the same level

Q5: Other way to structure the rows or break down the components?



STATISTICS CANADA'S PROPOSAL 2010		
Aquatic	Marine	Open ocean
		Coastal
		Estuaries
		Seagrass algae beds
		Coral Reef
		Shelf
	Wetlands	
	Tidal Marsh/Mangrove	
	Swamps	
	Lakes/Rivers	
	Groundwater	
Terrestrial	Forest	Tropical
		Tempered Boreal
	Grass/Rangelands	
	Desert	
	Tundra	
	Ice Rock	
	Cropland	
	Settled	
Atmosphere		
Subsoil Assets		

Ecosystem Components: may overlap

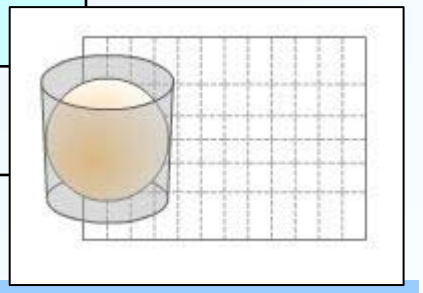
USA STATE OF THE NATION'S ECOSYSTEMS, 2008
Fresh Waters
Coast and Oceans
Forest
Grasslands and Shrublands
Farmland
Urban and suburban landscape
Core National indicators

Matrix structure: pros and cons of choices for columns

P-S-R derivation, such as DF-**S**-R or D-P-S-I-R columns

In this example the different PSR derivations can be considered, i.e DF-S-R with a stress on the State statistics:

Components of the environment …	Driving Force/ Pressure	**STATE/Impact**	Response
. . .			



PROS	CONS
Flexible Widely known Widely used	Difficulty to attribute specific ES dataset to general PSR-type (depends on context) At more disaggregated levels (such as the second or third layers), response contents are difficult to attribute to a specific row or set of rows. (This could be solved by transforming the response column into a sub-row or a cross cutting issue).

Stocks and Flows
(natural assets and their changes)

Components of the environment …	Stocks (natural assets)	Flows (changes)

PROS	CONS
Works very well with natural resources	This could be a possible partial application, for it doesn't work well with the topics (rows) of climate, natural disasters, and urban environment. Does not work at all within the human response nor with environmental management topics and variables

Quantity, Quality and Changes of environmental components (water, forests… etc)

Components of the environment …	Quantum	*Changes in quantum (per unit of time)*	Quality	*Changes in quality (per unit of time)*
Water	Water availability	*Change in t time period*	Potable water Recreational water pollution	*Change in x-parameter of quality over t time period*
Forest	Forest extend	*Change in t time period*	Forest composition	*Change in t time period*

PROS	CONS
It could be more easily applied to bio physical sets of variables	It might not work well with human responses and actions

Extent/pattern – Characteristics (physical and chemical) – Biological Components (biodiversity) – Productivity (goods and services).

[Used by USA State of Ecosystem and proposed by CANADA]

Components of the environment (Ecosystems)…	Extent/ pattern	Characteristics (physical and chemical)	Biological Components (biodiversity)	Productivity (goods and services)

PROS	CONS
Works best when rows are specific ecosystems or biomes	Doesn't work very well with components or topics (rows) such as climate, natural events or disasters or energy.

Keep in mind

impact category	Wind electricity	Natural gas power	Photovoltaic electricity	Nuclear electricity
Acidification	0.0000103	0.000384	0.000056	0.0000139
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Total millipoints / kw-hr	**0.0936**	**0.1397**	**0.466**	**0.217**

- The actual content of the rows affects the columns contents and vice versa…

- Both determine the cell content

- Aggregation level determines the resolution of the information of each layer and cell

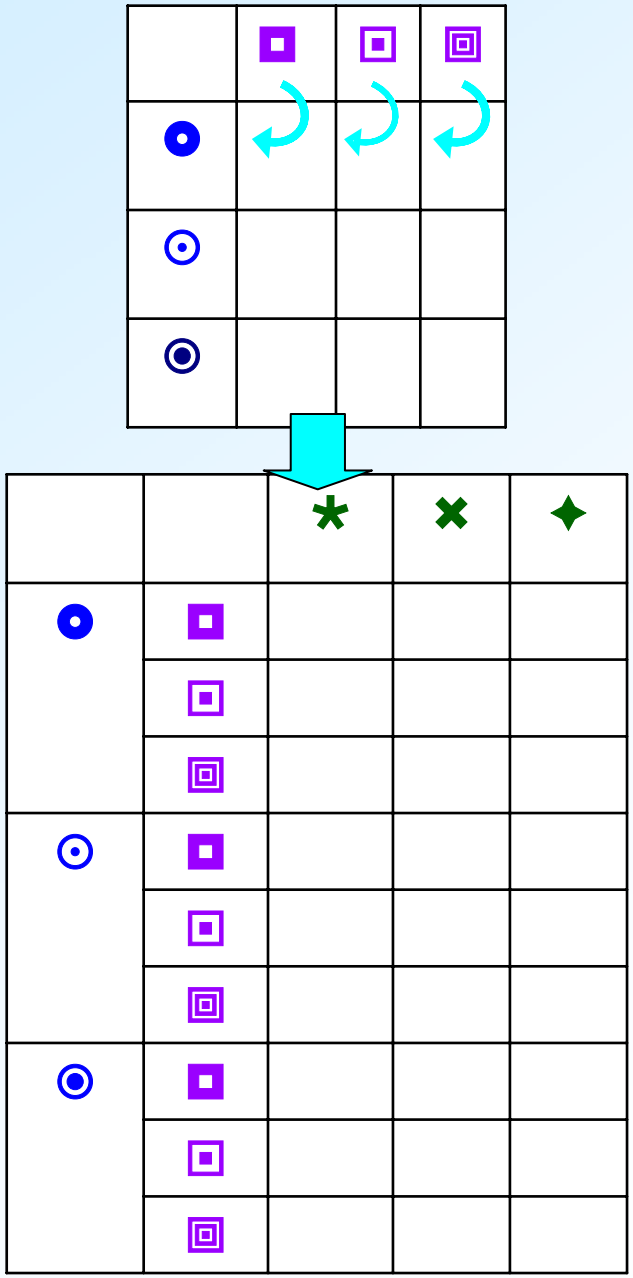
Q6: Other ways to structure the columns?

Keep in mind

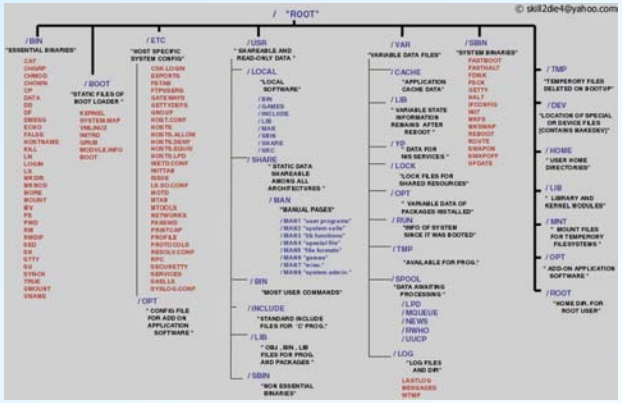
Conversion of

two dimensional <-> three dimensional

- Any proposed “columns” can be easily transformed into sub-rows, and vice versa
- By converting the former columns to sub-rows, a third dimension can be added to a 2-dimensional matrix
- For structuring the same contents, the more disaggregated the rows, the less dissagregation is needed in the columns, and vice versa



4. Possible FDES structures not based on matrixes



Forest	Boreal
	Temperate
	Tropical
Dryland	Temperate grassland
	Mediterranean
	Tropical grassland and savanna
	Desert
Inland water	
Coastal	
Marine	
Island	
Mountain	
Polar	

Non matrix structure

- Trees, tree-dimensional arrays, hierarchical and simple ideas have been mentioned during discussions
- A “list” of components (and subcomponents) of the environment can be used as a simple, straight forward arrangement of environment statistics:
  - Structure based on the classifications of environmental components
  - Structure consisting of an arrangement of environmental themes and sub-themes
- Any set of rows associated with matrix-type FWs could be transformed into a non-matrix by not considering any kind of columns.

Non matrix structure

- A “list” could constitute a rows-only, non-matrix FDES
- By not having columns needing to match every single row/component a thematic classification of the subcomponents beyond the 1 digit is possible. Different break-downs of each component are feasible. A great advantage over the matrix-type arrangements
- Finally, suitable columns could be added offering methodological guidance and references. Another advantage
- One of these possibilities – hierarchical- will be presented later by our experts

Ecosystem component	Level 2	Level 3	Level 4	Existing UN standards and guidance	Stock	Flow	D	P	S	I	R	Links to other ecosystem component or cross-cutting issues
Fresh water	Quality	**State**	Physico-chemical parameters	IRWS	x				x			
			Biological parameters		x					x		Flora and fauna
		Pollution	Physico-chemical parameters by Industry	SEEA-Water Emission Accounts		x		x				Land and soil
			Biological parameters by Industry			x		x				
	Quantity	**Surface Water**	Lakes	SEEA-Water Asset Accounts; IRWS	x				x			
			Rivers	SEEA-Water Asset Accounts; IRWS					x			
			Artificial reservoirs	SEEA-Water Asset Accounts; IRWS	x				x		x	
		Grou										
			Fossil GW	SEEA-Water Asset Accounts; IRWS	x				x			
		Natural flows	Internal flow (precipitation, evapotranspiration)	SEEA-Water Asset Accounts; IRWS		x			x			Atmosphere, Air and Climate
			External inflow and outflow	SEEA-Water Asset Accounts; IRWS		x			x			Atmosphere, Air and Climate
			Transfers between internal ressources	SEEA-Water Asset Accounts; IRWS		x			x			
Fresh water			Extreme events					x	x	x		Atmosphere, Air and Climate
		Abstraction and use	Abstraction by industry	SEEA-Water PSUT; IRWS		x		x				
			Use by industry	SEEA-Water PSUT; IRWS		x	x					
			Consumption and losses by industry	SEEA-Water PSUT; IRWS		x		x				
	Management	**Waste water treatment and sewage sludge generation**	Wastewater treated by type of treatment (primary, secondary, tertiary)	IRWS							x	Human Settlements
			Sewage sludge generation and disposal	IRWS				x			x	Land and Soil, Human Settlements

Example of a non-matrix, hierarchical framework

What is next?

- Experts will share their thoughts on the re-structuring process
- General discussion in plenary
- Working groups will create a **framework structure**:
  a) Matrix type: propose a set of rows and columns with real environmental topics (cells)
  b) Non-matrix type: propose a thematic or list type structure with real environmental topics, themes and sub-themes


Gracias
Thank you
Danke
Xie xie
Khawp khun
Yum ôpiņ
Mahalo
Salamat
Obrigada
Spacibo
Arigato