BPS-Statistics Indonesia

Compilation of environmental-economic accounts

BUYUNG AIRLANGGA

International Conference
"Global Implementation Programme for the SEEA"
New York, 17-19 June 2013

Outline of presentation

Current works

- Coverage of SEEA Indonesia
- Data sources
- Compilation process
- Issue/problems
- Composite Index on Env Qualt

Next agenda

- Follow up 44th Session of the UNSC
- Propose experimental energy account
- Introduce FDES to environmental subject matter areas
- Initiate partnership & networking among government institution

urrent progress: SEEA Indonesia

- Asset accounts for selected natural resources*)

  *) Coverage is limited to 9 significant natural resources in Indonesia: **crude oil, natural gas, coal, bauxite, tin, gold, silver, nickel ores, and timber wood**

- Integrating environment and economic account
- Case study on environmental degradation on CO2

Coverage of Assets Account in SEEA Indonesia

Environmental assets

- Mineral and energy resources
  - Oil resources
  - Natural gas resources
  - Coal and peat resources
  - Non-metallic mineral resources
  - Metallic mineral resources
- Land
- Soil resources
- Timber resources
  - Cultivated timber resources
  - Natural timber resources
- Aquatic resources
  - Cultivated aquatic resources
  - Natural aquatic resources
- Other biological resources
- Water resources
  - Surface water
  - Groundwater
  - Soil water

*) Note: ○ Asset accounts for these environmental assets have been compiled

Data sources

- Ministry of Forestry
  - Data on natural & cultivated forest areas
  - Data on reforestation, deforestation, other changes of forest areas
  - Ministry of Energy and Mineral Resources (**crude oil; natural gas; coal; bauxite, tin, gold, silver & nickel ores)**
  - Data on reserves and resources
  - Data on production
- BPS-Statistics Indonesia
  - Data on national account aggregates
- Others
  - Financial reports of some establishments engaged in natural resources exploitation/exploration

Compilation process

Data collecting from various sources → Estimate monetary unit rent of natural resources → Construct tables on deposits of natural resources

↓

Compile assets accounts for natural resources → Integrating environmental & economic account → Comparing GDP, Net Domestic Product (NDP), & Environmentally adj. NDP

From table to account: crude oil

Deposit, Production & Deposit to Production Ratio

Tahun	Cadangan Terbukti dan Potensial		Produksi	Rasio Cadangan terhadap Produksi (3):(4)
	Awal Tahun	Akhir Tahun		
(1)	(2)	(3)	(4)	(5)
2007	8.403,3	8.219,2	348,3	23,6
2008	8.219,2	7.998,5	357,5	22,4
2009	7.998,5	7.764,5	346,4	22,4
2010 *	7.764,5	7.732,3	344,9	22,4
2011 **	7.732,3	7.586,9	329,4	23,0

Sumber: Ditjen Migas, Kementerian ESDM

Physical & Monetary Accounts

Description	2007	2008	2009	2010	2011
I. Physical balance (Million Barrels)					
1. Beginning stock	8,403	8,219	7,999	7,765	7,732
2. Addition	164	137	112	313	184
3. Depletion	348	358	346	345	329
4. Net change	-184	-221	-234	-32	-145
5. Ending stock	8,219	7,999	7,765	7,732	7,587
II. Unit Rent					
1. Price per barel (Rp)	624,365	889,276	610,231	681,766	922,490
2. Production cost per barel (Rp)	99,640	118,518	115,886	150,094	245,455
3. Corporate profit per barel (Rp)	208,529	333,141	194,048	196,173	223,074
4. Unit rent (Rp/barel)	316,195	437,616	300,297	335,500	453,961
III. Monetary balance (Billion Rp)					
1. Beginning stock	2,227,363	2,598,874	3,500,273	2,331,657	2,594,175
2. Addition	51,916	59,866	33,753	104,897	83,544
3. Depletion	110,131	156,448	104,023	115,710	149,535
4. Net change	-58,215	-96,582	-70,270	-10,813	-65,991
5. Revaluation	429,726	997,981	-1,098,346	273,331	915,974
6. Ending stock	2,598,874	3,500,273	2,331,657	2,594,175	3,444,159

Integrating environmental-economic account

Komponen Neraca	Kegiatan Ekonomi					Kapital Lingkungan yang Tidak diproduksi
	Produksi	Perdagangan Luar Negeri	Konsumsi akhir	Kapital		
				Buatan Manusia	Buatan Alam	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1 Stok Awal						
a. Barang Modal				11.345.984		
b. Hasil Hutan					488.133	
c. Minyak Bumi					2.594.175	
d. Gas Alam					1.579.632	
e.Batubara					3.668.641	
f. Bauksit					9.404	
g. Timah					47.329	
h. Emas					1.121.633	
i. Perak					43.754	
j. Bijih Nikel					36.622	
2 Penyediaan	14.685.057	1.850.474				
3 Penggunaan	7.257.971	1.955.357	4.720.804	2.601.399		
4 Penyusutan	371.354			-371.354		
5 PDN	7.055.732	104.883	4.720.804	2.230.045		
6 Deplesi	293.971				-293.971	
a. Hasil Hutan	8.960				-8.960	
b. Minyak Bumi	149.535				-149.535	
c. Gas Alam	44.811				-44.811	
d.Batubara	47.100				-47.100	
e. Bauksit	893				-893	
f. Timah	3.096				-3.096	
g. Emas	36.550				-36.550	
h. Perak	1.322				-1.322	
i. Bijih Nikel	1.703				-1.703	
7 Penambahan					706.993	-706.993
a. Hasil Hutan					8.782	-8.782
b. Minyak Bumi					83.544	-83.544
c. Gas Alam					18.869	-18.869
d.Batubara					650.152	-650.152
e. Bauksit					6.086	-6.086
f. Timah					-13.575	13.575
g. Emas					-99.434	99.434
h. Perak					-1.785	1.785
i. Bijih Nikel					54.354	-54.354

Komponen Neraca	Kegiatan Ekonomi					Kapital Lingkungan yang Tidak diproduksi
	Produksi	Perdagangan Luar Negeri	Konsumsi akhir	Kapital		
				Buatan Manusia	Buatan Alam	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
8 PDN 1	6.761.761	104.883	4.720.804	2.230.045	413.022	-706.993
9 Revaluasi						
a. Barang Modal				148.224		
b. Hasil Hutan					33.159	
c. Minyak Bumi					915.974	
d. Gas Alam					529.541	
e.Batubara					4.289.791	
f. Bauksit					41	
g. Timah					5.103	
h. Emas					404.120	
i. Perak					34.647	
j. Bijih Nikel					13.852	
10 Stok Akhir						
a. Barang Modal				13.724.253		
b. Hasil Hutan					488.133	
c. Minyak Bumi					3.444.159	
d. Gas Alam					2.083.229	
e.Batubara					4.892.843	
f. Bauksit					14.637	
g. Timah					35.761	
h. Emas					1.389.770	
i. Perak					75.293	
j. Bijih Nikel					103.126	

Comparing GDP, Net Domestic Product (PDN), & Environmentally adj. NDP (PDN1)

Perincian	2007	2008	2009	2010	2011
(1)	(2)	(3)	(4)	(5)	(6)
1. PDB	3.950.893	4.948.688	5.603.871	6.422.918	7.427.086
2. PDN	3.753.349	4.701.254	5.323.678	6.101.772	7.055.732
3. PDN1	3.563.258	4.445.758	5.096.554	5.853.609	6.761.761
4. $\frac{\text{PDN}}{\text{PDB}} \times 100$	95,00	95,00	95,00	95,00	95,00
5. $\frac{\text{PDN1}}{\text{PDB}} \times 100$	90,19	89,84	90,95	91,14	91,04
6. $\frac{\text{PDN1}}{\text{PDN}} \times 100$	94,94	94,57	95,73	95,93	95,83

Summary of Findings

- Over exploitation of timber wood especially outside of Java
- Rate of depletion for some of mineral resources is exceeding the rate of deposit discovery, such as crude oil, natural gas, gold, and nickel ore).
- Valuation for natural resources can be difficult, especially when IRR is used to compute *Net Present Value (NPV)* of Natural Resource.
- A study was conducted in Regency of Musi Banyuasin to implement NPV method, but there was difficulty in choosing the correct IRR.
- Therefore an alternative *net price method* is used to monetary unit rent for natural resources.

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Experimental Environment Quality Index 2008



Environmental Quality Index (EQI)

General measurement on environmental quality based on EQ domains (water, air, land and population)

Interval :

0	100
worst	ideal

Objectives

To identify factors underlying changes in environmental quality.

To provide a simplified measurement on environmental condition.

Why Capital City???

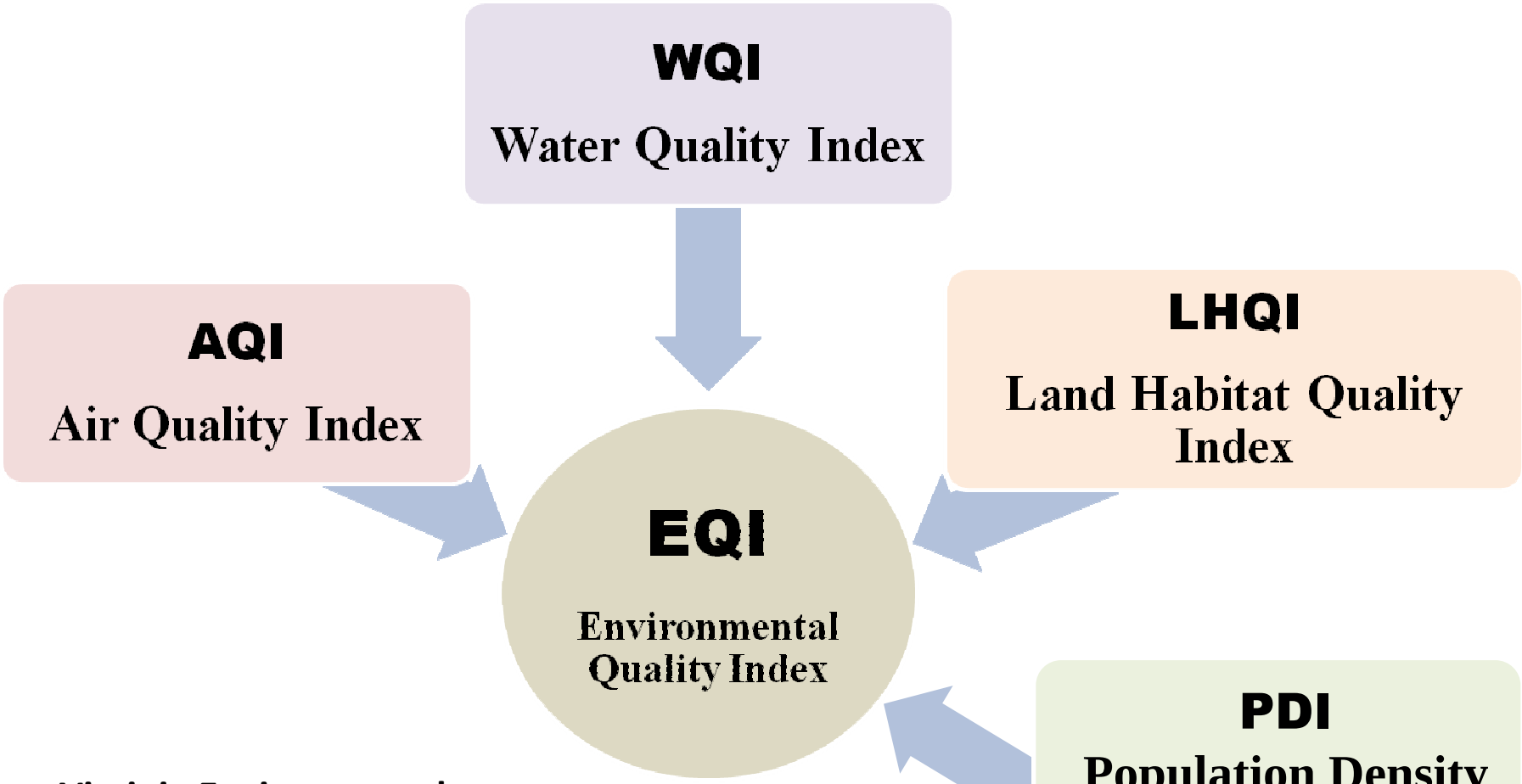
Rapid Development

High potential damage of environment

Lack of data

Table 1. EQI input Scale and Data Resources

Factors	Variable	Data Sources	Weight for EQI Calculation
Air Quality			**18**
	CO(Carbon Monoxide)	•BPS -Statistics Indonesia: Susenas Modul konsumsi •Indonesian Meteorological Climatological and Geophysical Agency	11
	NOx(Nitrogen Oxide)		16
Water Quality			**13**
	BOD	-The Ministry of Environment	1
	COD		1
	DO		1
	NO_3		1
	NH_3		1
	pH		1
	TDS		1
	TSS		1
	SO_4		1
Land Habitat Quality			**10**
	-Proportion of waste volume not transported per km2	Departement of City Sanitation	1
	Persentage of household landf ills as septictank	BPS -Statistics Indonesia:	1
Population Density			**10**
	Population Density per Ha	BPS -Statistics Indonesia:	1



Virginia Environmental Quality Index (VEQI)

$$EQI = \frac{18AQI + 13WQI + 10LHQI + 10PDI}{51}$$

Air Quality Index

Emission power formula:

$$Q = Cx\ EF$$

Q = Emission power

C = Fuel Consumption

EF = Emission factor

$$C_{(x,y,z)} = \frac{Q}{\pi . \mu . \sigma_y \sigma_z} exp\left[-\frac{1}{2}\left(\frac{H}{\sigma_z}\right)^2\right]$$

C = Polutant concentrate (gr/m^3)

Q = Emission power (gr/second)

H = Height of emission resource

x, y, z = receptor coordinate

σ = standard of deviation

U = average velocity of wind (m/second)

$$AQI = \frac{11AQI_{CO} + 16AQI_{NOx}}{27}$$

Classification C and sub-AQI of NOx

Classification	Value C of NOx	a_i	x_i	Value sub-AQI of NOx
1	$0 \leq C \leq 400$	0,025	$x_1 = C\text{-}0$	100 - 90
2	$400 < C \leq 800$	0,05	$x_1 = 400, x_2 = C\text{-}400$	89,99 - 70
3	$800 < C \leq 1200$	0,075	$x_1 = 400, x_2 = 400, x_3 = C\text{-}800$	69,99 - 40
4	$C > 1200$	0,01	$x_1 = 400, x_2 = 400, x_3 = 400, x_4 = C\text{-}1.200$	< 40

Water Quality Index

Water quality formula:

$$WQI = 100 - \sum_{i=1}^{4} a_i \times x_i$$

a_i = 10, 15, 20

a_i = weight for class-i

x_i = range of Contaminent Index in class-i

i = classification of Contaminent Index

$$WQI = \frac{WQI_{BOD} + WQI_{COD} + WQI_{DO} + WQI_{NO_3} + WQI_{NH_3} + WQI_{pH} + WQI_{TDS} + WQI_{TSS} + WQI_{Sulfat}}{9}$$

Classification of CI and WQI

Classification	Contaminent Index	a_i	x_i	Value of WQI
1	$0 \leq CI \leq 1$	10	$x_1 = CI - 0$	100 – 90
2	$1 \leq CI \leq 5$	15	$x_1 = 1, x_2 = CI - 1$	89,99 – 30
3	> 5	20	$x_1 = 1, x_2 = 4, x_3 = CI - 5$	<30

Land Habitat Quality Index

$$QI_{waste} = 100 \sum_{i=1}^{4} a_i \times x_i$$

a_i = 10, 15, 20

a_i = weight for class-i

Y = volume of waste per day (m^3) which is not transported per km^2

0 ≤ Y ≤ 1 : good condition

1 ≤ Y ≤ 5 : moderate

> 5 : bad condition

x_i = range of Y in class-i

i = classification of Y

Classification of Y and QI_{waste}

Klasifikasi	Y	ai	xi	Nilai IKA
1	0 ≤ Y ≤ 1	10	x_1 = Y-0	100 - 90
2	1 < Y ≤ 5	15	x_1 = 1, x2 = Y-1	89,9 – 30
3	> 5	20	x_1 = 1, x2 = 4, x3 = Y-5	<30

$$LHQI = \frac{QI_{waste} + QI_{septic\ tank}}{2}$$

Population Density Index

$$PDI = 100 - (P - 96)$$

P = Population density over 96 people per hectare

Tabel 2. Environmental Quality Index of 31 Capital Cities in Indonesia, 2008

Rank t	Regency	AQI	WQI	LHQI	PDI	EQI
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Ternate	94,16	86,70	94,71	100,00	**93,51**
2	Gorontalo	96,10	90,59	80,63	100,00	**92,43**
3	Ambon	95,86	63,41	90,08	100,00	**87,27**
4	Pangkal Pinang	88,03	69,35	90,12	100,00	**86,03**
5	Kendari	86,30	72,84	86,30	100,00	**85,56**
6	Tanjung Pinang	86,70	72,88	81,18	100,00	**84,70**
7	Manado	77,32	78,60	84,75	100,00	**83,55**
8	Palangkaraya	77,02	71,66	91,60	100,00	**83,02**
9	Banda Aceh	63,72	71,35	97,72	100,00	**79,44**
10	Kupang	74,33	76,30	69,38	100,00	**78,89**
11	Palu	62,39	65,84	92,10	100,00	**76,47**
12	Jayapura	79,92	42,52	90,38	100,00	**76,38**
13	Mataram	69,24	80,50	56,10	100,00	**75,57**
14	Bengkulu	75,25	56,73	74,50	100,00	**75,24**
15	Pontianak	28,87	81,86	93,63	100,00	**69,02**
16	Jambi	30,12	88,42	71,79	100,00	**66,85**
17	Samarinda	22,51	82,82	87,91	100,00	**65,90**
18	Padang	26,10	63,74	85,40	100,00	**61,81**
19	Bandar Lampung	20,13	59,75	91,14	100,00	**59,81**
20	Serang	27,09	75,65	54,58	99,22	**59,00**
21	Palembang	12,51	75,06	70,54	100,00	**56,99**
22	Denpasar	17,31	58,89	70,24	100,00	**54,50**
23	Banjarmasin	30,83	60,95	36,85	100,00	**53,25**
24	Makasar	11,96	52,57	75,10	100,00	**51,96**
25	Pekanbaru	0,00	60,36	79,46	100,00	**50,57**
26	Semarang	0,00	86,40	44,42	100,00	**50,34**
27	Yogyakarta	29,72	75,32	46,62	55,41	**49,70**
28	Medan	0,00	69,65	47,16	100,00	**46,61**
29	Surabaya	0,00	52,17	47,62	100,00	**42,24**
30	Jakarta	0,00	51,45	76,90	58,26	**39,62**
31	Bandung	0,00	40,66	19,31	52,52	**24,45**

Ternate is non manufacture and less density city .
EQI= 93.5
Jakarta and Bandung is Manufacturing and quite density Cities
EQI= 39.6 and EQ= 24.5

Source : BPS- Statistics Indonesia

Next agenda: follow up Indonesia Plan*)

Join steering committee

- Statistics Indonesia (as coordinator)
- National Development Planning Board
- Ministry of Environment

→ **Launch environment indicators partnership**

→ **Initiate research to develop ecosystem indicators**

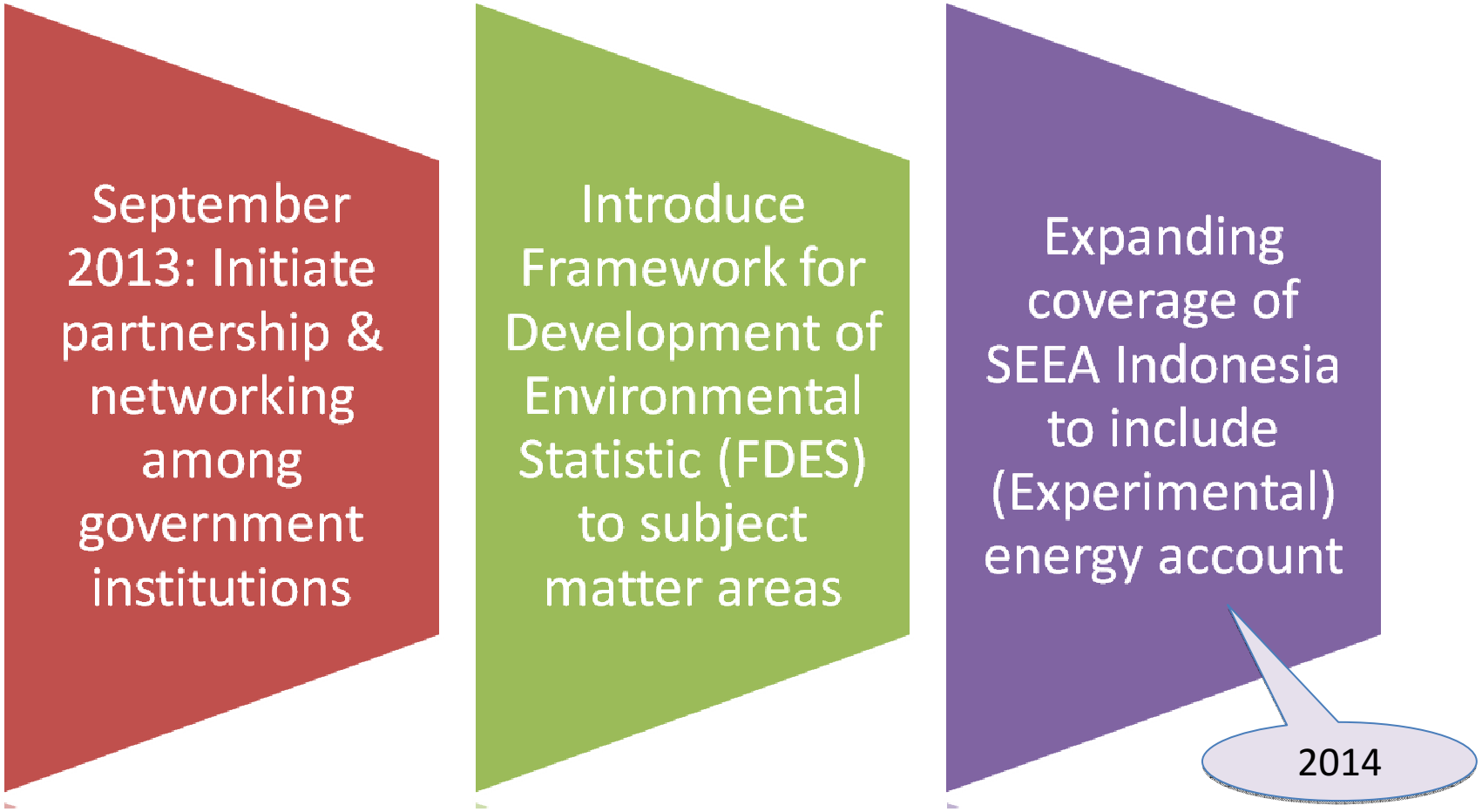
Commitment among stakeholders to develop data sharing/warehousing

→ Ensure data availability and quality

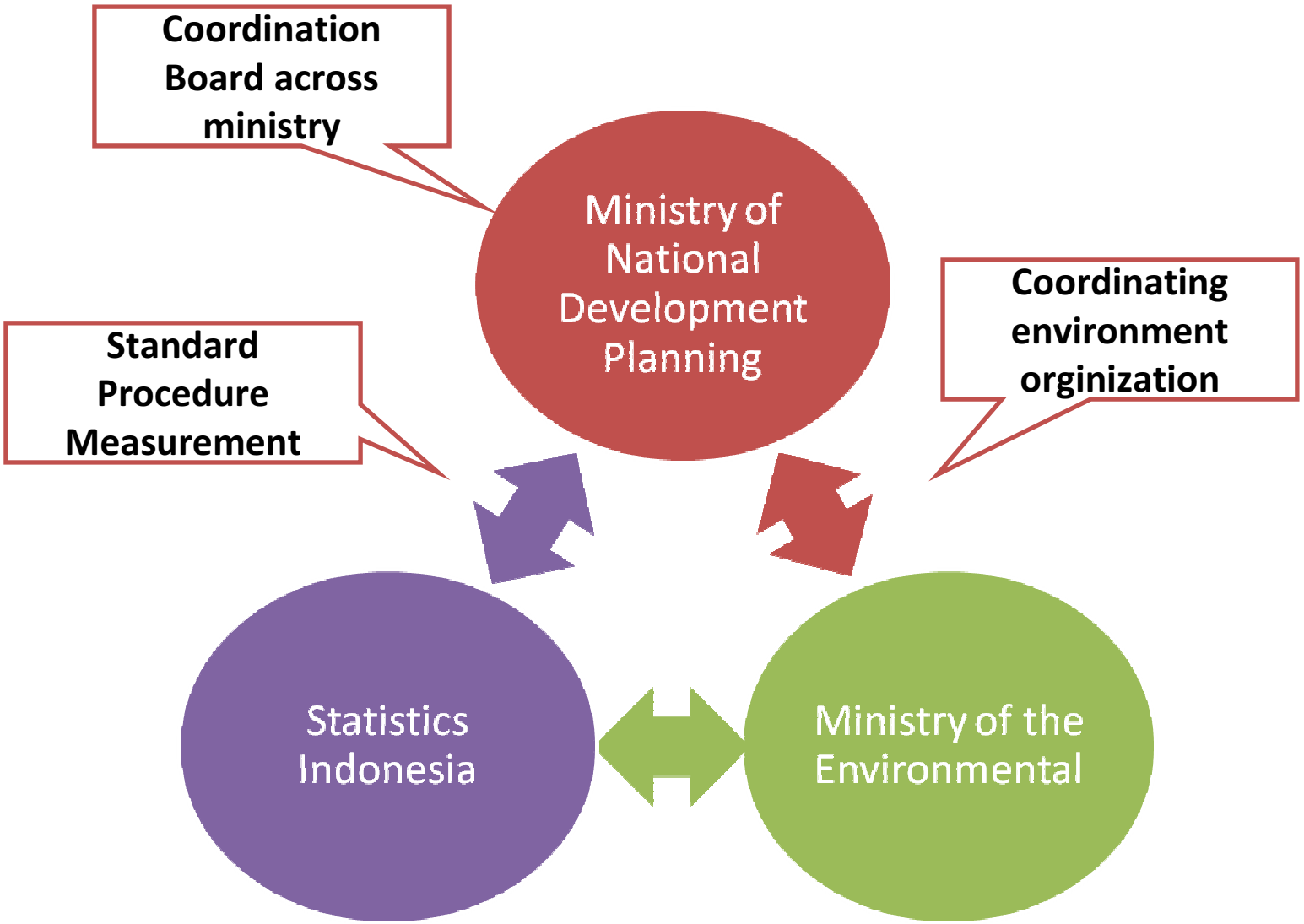
- Include more ecosystem query in subject matter area data compilations
- Improving data gathering and reporting

*) as address in the **44th Session of the United Nations Statistical Commission February 25th 2013**

Moving forward



Initiate partnership & networking



Introduce FDES to subject matter areas

DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS
STATISTICS DIVISION
UNITED NATIONS

Framework for the Development of Environment Statistics (FDES) 2013

Final Draft

Prepared by the United Nations Statistics Division

- The FDES 2013 is expected to improved monitoring and measurement of the environmental dimension of sustainable development agenda.
- The use of the FDES 2013 in national statistical systems will enhance developments in this field of statistics, as it is both a multi-purpose and flexible tool that can be tailored to specific environmental policy concerns and priorities of the countries, as well as accommodate their different levels of statistical development.

2014: (Experimental) energy account

- After the completion of Indonesia SUT in 2014, we are planning to construct experimental energy account.
- Energy account compilation process begin with identifying the source of energy:
  - Non-renewable energy: fossil & non-fossil energy (28 commodities)
  - Renewable energy: such as, wind, water current, Solar, and geothermal heat, etc.

Thank you