New System of Integrated Environment and Economic Accounting (Trial Calculation on Hybrid Accounting System integrating Environmental Pressures and Economic Activities)

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New SEEA

Based on the SEEA (System of Integrated Environment and Economic Accounting) proposed by the United Nations in 1993, Department of National Accounts, Economic and Social Research Institute (ESRI), Cabinet Office has been making researches[1)] on a proper SEEA approach to identify the relationships between the Japanese economy and environments.

Traditional research approaches aimed to calculate Green GDP by evaluating economic activities' environmental pressures on the monetary basis, recognizing them as external diseconomies and deducting them from domestic economic activities. However, there is no international consensus on how to properly value environmental pollutants on the monetary basis; in addition, the United Nations also started revising SEEA based on new philosophies. In this context, Department of National Accounts developed new "Hybrid Accounting System integrating Environmental Pressures and Economic Activities."[2)] ESRI's new hybrid accounting system indicates national accounts (representing domestic economic performances) in parallel with resultant environmental pressures. Based on this new hybrid accounting system, the research team did some trial calculations for the years 1990, 1995 and 2000. When developing this new accounting framework, the research team adopted the Dutch framework called NAMEA (National Accounting Matrix including Environmental Accounts) and made some adjustments in a suitable manner to Japan.

ESRI's new hybrid system has successfully identified the correlation between "driving forces" and "environmental pressures." To be more specific, the research team newly created "Environmental efficiency improvement index," which shows economic and environmental sustainability based on the estimated figures for the years 1990, 1995 and 2000.

In addition, the team has also developed Japan's "Supply and Use Table for Environmental Protection Services" in accordance with UN's "SEEA 2003 (final draft)." This table lists up who is providing/consuming environmental protection services (e.g., sewerage treatment, waste disposal and recycling services) for a certain purpose. This table and ESRI's new hybrid accounting system provide the overall relationships among economic activities, private/public sectors' environmental protection services and environmental pressures in Japan.

[1)] This research project is financed with Environment Ministry's Global Environmental Research Promotion Budget Fund (Project name: Research on Developing a new Sustainability Evaluation Method at Corporate, Industrial and National Economic Levels based on Environmental Accounts and Environmental Indexes). The Cabinet Office commissioned the Japan Research Institute (JRI; President: Noboru Nishifuji) to conduct this research project. In the process of this research project, JRI held expert meetings (chairperson: Professor Kimio Uno, Keio University) and also gained cooperation from statistic experts.

[2)] For more information on ESRI's new hybrid accounting framework, see the public document, "New System of Integrated Environment and Economic Accounting," and JRI's document, "Research Project entrusted from the Cabinet Office: Research on Restructuring Environmental and Economic Activities based on Revised SEEA " in FT2003.

Calculation Results (excerpt)

1. Environmental Efficiency Improvement Index[1)]

Environmental Efficiency Improvement Index (EEII) represents how much environmental pressures (EPs) vary in comparison with driving forces (DFs). The index is defined as follows:

$$\text{Environmental Efficiency Improvement Index (EEII)} = 1 - \left(\frac{(EP/DF)_{\text{Term end}}}{(EP/DF)_{\text{Term's start}}} \right) \times 100$$

From this definition,

- EEII≧0 ⇒DF's growth rate ＞EP's growth rate ⇒"Environmental efficiency is improving"
- EEII＜0 ⇒DF's growth rate≦ EP's growth rate ⇒"Environmental efficiency is deteriorating

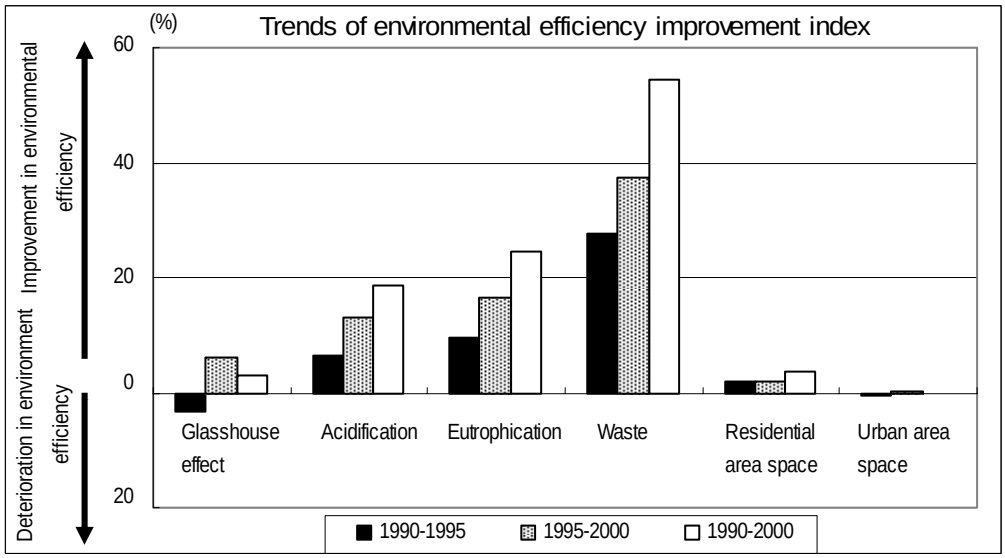
1) OECD calls this type of index "the decoupling indicator." Improvement in EEII is one of the main goals of "OECD Environmental Strategy for the First Decade of the 21st Century," which was adopted at the OECD Environmental Ministers meeting in 2001.

(1) Environmental efficiency improvement index from macro perspectives

EEII has improved sharply in waste disposal, while it has increased slightly in land use (i.e., residential area space and urban area space)

The team calculated EEII for the periods 1990-1995, 1995-2000 and 1990-2000 in terms of six categories, such as glasshouse effect, acidification, eutrophication, waste final disposal and land use.

According to our calculation, the category "waste" enjoys a sharp rise in environmental improvement. Acidification and eutrophication also see environmental improvements. On the other hand, there is almost no improvement in land use (i.e., residential area space and urban area space).



Environmental efficiency improvement index						
	Glasshouse effect	Acidification	Eutrophication	Waste	Residential area space	Urban area space
1990-1995	(3.4%)	6.5%	9.5%	27.6%	2.1%	(0.5%)
1995-2000	6.0%	13.1%	16.5%	37.3%	1.8%	0.3%
1990-2000	2.8%	18.7%	24.5%	54.6%	3.8%	(0.2%)

(2) Environmental efficiency improvement index from micro perspectives

In the industry sector, environmental efficiency is improving for CO_2 (in the power generation industry) and NOx (in transport industry) but deteriorating in SO_2 (in the agriculture, forestry and fisheries industry)

The research team calculated EEII in terms of some industries that emit significant amount of pollutants (CO_2 from the power generation industry, NOx from the transport industry and SO_2 from the agriculture, forestry and fisheries industry).

Environmental Efficiency Improvement Index by Industry Category

1) CO_2: Power generation industry

	CO_2 emission (in 2000)		Total electricity demand (in 2000)		EEII
	1,000 tonnes (CO2)	①1990＝100	1 million kWh	②1990＝100	(1-①/②) ×100
1990-1995	356,535	104	989,880	115	9.7%
1990-2000	366,300	107	1,091,500	127	15.9%

Estimation formula $\frac{(EP)}{(DF)} = \frac{\text{(CO2 emission)}}{\text{(Total electridcity demand)}} = \frac{\text{(CO2 emission)}}{\text{(Fossil fuel input)}} \times \frac{\text{(Fossil fuel input)}}{\text{(Power generation level)}} \times \frac{\text{(Power generation level)}}{(kWh)}$

2) NOx[1)]: Transport industry

	NOx emission (in 1995)		Output (in 1995)		EEII
	1,000 tonnes (NOx)	①1990＝100	¥1 billion	②1990＝100	(1-①/②) ×100
1990-1995	2,123	105	54,110	122	13.7%

Estimation formula $\frac{(EP)}{(DF)} = \frac{\text{(NOx emission)}}{\text{(Output level in the transport/ telecommunication industries)}} = \frac{\text{(NOx emission)}}{\text{(Road transport mileage)}} \times \frac{\text{(Road transport mileage)}}{\text{(Total transport mileage)}} \times \frac{\text{(Total transport mileage)}}{\text{(Output level in the transport/ telecommunication industries)}}$

3) SO_2[1)]: Agriculture, forestry and fisheries industry

	SO_2 emission (in 2000)		Output (in 1995)		EEII
	1,000 tonnes (SO2)	①1990＝100	¥1 billion	②1990＝100	(1-①/②) ×100
1990-1995	123	90	16,329	88	(1.6%)

Estimation formula $\frac{(EP)}{(DF)} = \frac{\text{(SO2 emission)}}{\text{(Output level of the agriculture, forestry and fisheries industy)}}$

Note 1): The above tables do not indicate the 1990-2000 data for the transport industry and the agriculture, forestry and fisheries industry, because of unavailability of basic data.

Estimating EEIIs at final consumption level

Environmental efficiency at the household level is deteriorating for CO_2 in the civilian purpose category but improving for SO_2 in the transport purpose category (automobile).

The research team estimated EEII at the household final consumption level by calculating CO_2 and SO_2 volume in the two categories: the "civilian purpose category (household)" and the "transport purpose category (automobile).”In this context, "civilian purpose" corresponds to pollutant volume resulting from burning oil or coal (for hot-water supply and space heating purposes), while "transport purpose" refers to the pollutant volume coming from burning gasoline or diesel.

EEII for CO_2 is deteriorating in the civilian purpose category as well as in the transport purpose category, but it gets worse in the transport purpose category than in the civilian sector. EEII for SO_2 almost remains flat in the civilian purpose category, but it improves sharply in the transport purpose category.

Major EEIIs at Final Consumption Level

1) CO_2

	Pollutant volume at final consumption level		Final consumption expenditures of Japanese households (in real terms)		EEII
	1,000 tonnes (CO2)	①1990＝100	¥1 billion	②1990＝100	(1-①/②) ×100
Civilian purpose (household)					
1990-1995	66,847	117	269,399	111	(4.8%)
1990-2000	69,070	121	281,521	116	(3.6%)
Household consumption for transport purpose (automobile)					
1990-1995	128,074	122	269,399	111	(9.5%)
1990-2000	152,354	145	281,521	116	(24.6%)

2) SO_2

	Pollutant volume at final consumption level		Final consumption expenditures of Japanese households (in real terms)		EEII
	1,000 tonnes (SO2)	①1990＝100	¥1 billion	②1990＝100	(1-①/②) ×100
Civilian purpose (household)					
1990-1995	44.9	150	269,399	111	(34.4%)
1990-2000	34.9	116	281,521	116	0.1%
Household consumption for transport purpose (automobile)					
1990-1995	13.0	60	269,399	111	45.7%
1990-2000	9.6	45	281,521	116	61.6%

2. Environmental Protection Services and Environmental Pressures

Waste final disposal volume falls sharply due to increased recycling volume and expanded intermediate treatment activities

Wastes from business enterprises, households and the government are divided into two categories: wastes directly recyclable on the one hand, and those requiring intermediate treatment at bulky garbage treatment plants or incineration facilities. From 1990 to 2000, the government took various measures, including Recycling Law. Because these government measures have pushed up recycled volume and intermediate treatment activities, the final disposal volume in 2000 decreased by 47.5% from the 1990 level.

Intermediate treatment costs for industrial wastes have been increasing. This is probably because an increase in recyclable volume has pushed up the percentage of industrial wastes that require larger disposal costs. On the other hand, the public sector is in charge of intermediate treatment of nonindustrial wastes and usually burns them at incineration facilities. The disposal volume of nonindistrial wastes has been increasing, but the growth rate of intermediate treatment cost is smaller than that of nonindustrial waste disposal volume. In this sense, waste disposal efficiency is getting better.

Waste Disposal Volume vs. Intermediate Treatment Costs[1)]

(a) Recycled volume[2)] In 1,000 tonnes

	Production		Consumption	
	Industrial wastes	Nonindustrial wastes	Nonindustrial wastes	Total
2000	184,000	2,700.7	5,159.3	191,860
1995/1990	(2.7)	94.3	94.3	(1.0)
2000/1995	27.2	52.4	51.2	26.1
2000/1990	21.9	196.1	193.6	24.9

(a)-1. Recycling costs In ¥1 billion

2000	1,398.8
1995/1990	(33.4)
2000/1995	115.6
2000/1990	43.6

(b) Net waste volume (gross waste volume less (a) recycled volume) In 1,000 tonnes

	Production		Consumption	
	Industrial wastes	Industrial wastes	Nonindustrial wastes	Total
2000	222,000	16,139.9	30,833.1	268,973
1995/1990	1.2	(1.0)	(1.0)	0.9
2000/1995	(10.1)	0.2	(0.6)	(8.6)
2000/1990	(9.0)	(0.7)	(1.6)	(7.8)

(c)-1. Intermediate treatment volume In 1,000 tonnes

	Industrial wastes	Nonindustrial wastes		Total
		Production	Consumption	
2000	177,000	12,527.3	23,931.7	213,459
1995/1990	14.8	8.9	8.9	13.9
2000/1995	(0.6)	9.4	8.5	0.9
2000/1990	14.2	19.1	18.1	14.9

(c)-2. Disposal costs In ¥1 billion

	Industry	Government	Total
2000	2,112.5	1,275.2	3,387.7
1995/1990	17.6	15.3	16.7
2000/1995	12.9	4.3	9.5
2000/1990	32.8	20.3	27.8

(d) Final disposal volume In 1,000 tonnes

	Production		Consumption	
	Industrial wastes	Industrial wastes	Nonindustrial wastes	Total
2000	45,000	3,612.6	6,901.4	55,514
1995/1990	(22.5)	(19.1)	(19.1)	(21.9)
2000/1995	(34.8)	(22.3)	(22.9)	(32.8)
2000/1990	(49.4)	(37.1)	(37.6)	(47.5)

1) The intermediate treatment cost is calculated from "Supply and Use Table for Environmental Protection Services" and "Contingency Table for Environmental Protection Services."
Treatment cost does not include export/import.
Wastes consists of two categories: Industrial wastes and nonindustrial wastes.
Industrial wastes: animal feces and urine, waste metal, wreckage, paper waste, scrap plastic, etc. (Waste in the environmental account corresponds to "wastes" in I-O Table.)
Nonindustrial wastes (households + industries): collected trash + garbage directly accepted by disposal facilities. It does not include the disposal volume at the waste sources.

2) (a) Recycled volume = directly recycled volume + waste volume recycled after intermediate treatment