

IR-1-3 The Research on the Estimates of the Integrated Environmental and Economic Accounting (Final Report)

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Total Budget for FY1995-1997 35,977,000 Yen (FY1995 14,549,000 Yen)

Abstract

The international standards for the System of National Accounts (SNA) were revised in 1993 and, as a result, the integrated environmental and economic accounting was included as one of satellite accounts. In this connection, the United Nations has drawn up a handbook (interim version) to serve as a guide in the preparation of integrated environmental and economic accounting. It has become an urgent task for Japan too, to secure techniques and statistical data for preparing a precise integrated environmental and economic accounting in response to this international trend. Against this background, the research on the estimates of the integrated environmental and economic accounting has continued from FY1991, and the Economic Planning Agency has announced officially the first trial estimates for 1985 and 1990 in 1995.

The FY1997 research based on the results of the past years review the of trial estimation method of actual environmental costs and imputed environmental costs, the estimation of the imputed environmental costs of global warming, the complication of physical tables, and a time-series estimation and compilation of constant price tables.

Key Words SNA,SEEA, Actual environmental costs, Imputed environmental costs

1. Introduction

With the April 1987 report, "World Commission on Environmental and Development

"(Brundtland Commission) and the convening of the Earth Summit (June 1992) as driving factors, and against a background of growing interest in sustainable development, it has become apparent that there is a necessity to comprehend the environment and the economy of the world's nations in a single common framework. Further, the United Nations grasped the opportunity of the System of National Accounts (SNA) to advance the development of a matrix for the integrated environmental and economic accounting, and in February 1993, published a handbook (interim version) to serve as a guide for the preparation of such accounts. In the "Agenda 21" of the Earth Summit, it was recommended that each country develop integrated environmental and economic accounting currently under examination at the U.N.

2. Research Objective

It has become a pressing issue for Japan too, to invent integrated environmental and economic accounting to adjust to SNA in response to the international trend of sustainable development. Based on the results of the past years and the objectives of the Research on the Estimates of the Integrated Environmental and Economic Accounting are to invent a practical tool for analysis and to recognize the mutual relationship between the environment and economy.

3. Research Methods

(1) Establishment of Research Committee

For the purpose of this research, a Research Committee composed of three academics and specialists was established. In addition to examining the contents of the research, the Committee undertook a theoretical and corroborative analysis of the trial calculation results, checked the problems and, and examined issues for future research.

(2) Hearing research

Hearings from a wide circle of specialists were conducted for the purpose of this research.

(3) Literature and research data research

Overseas and Japanese literature and research data concerning the system and structure of integrated environmental and economic accounting, and of evaluation methods were collected and analyzed.

(4) Project Team Formation

Because a wide spectrum of tasks needed to be undertaken, including the sorting of overseas and Japanese literature, the development of evaluation methods, the collection and analysis of specific reference materials, processing, aggregation, and the development of estimating systems, a Project Team comprised of outstanding specialists drawn from various fields was established, and launched into its investigations enthusiastically.

4. Contents of the Research project

In the FY1997 research, emphasis was placed on activities focusing on the following four points, on the basis of research results of the past years:

(1) Correspondence on the complete improvement of the basic accounts table

Trial calculation method of actual environmental cost and imputed environmental cost were reviewed.

(2) Correspondence on global environmental issues

Focusing on the global warming problem of the many aspects of global environmental issues, the cost of imputed environmental cost of CO₂ was estimated.

(3) Time-series estimation and complication of constant price tables

Current price tables and corresponding constant price tables were estimated with 5 years intervals between 1970 and 1995, making 6 data points available for time series comparisons.

(4) Complication of physical tables

Tables in physical terms were compiled that correspond to tables in monetary terms, focusing on the items that are relevant in calculating imputed environmental cost.

5. Results of the Research Project

- ① Economic activities and environmental-related external diseconomies in 1990
(Table 1, Diagram2)

i . Actual environmental cost

- GDP was ¥430 trillion in 1990. The gross value added of environmental protection activities was ¥3 trillion in the industry sector, and ¥1.5 trillion in the government sector, for a total of ¥4.5 trillion, or 1.0% of GDP.
- On an output basis, environment-related goods and services were ¥6.1 trillion, or 0.7 % of total output. In addition, intermediate consumption expenditures were ¥3.9 trillion, or 1.0 % of total intermediate consumption expenditures and final consumption expenditures were ¥2.2 trillion, or 0.8 % of total final consumption expenditures.

ii . Environmental protection assets

- The environmental protection assets at the end of the period were ¥35 trillion, or 3.3 % of the total man-made assets of ¥1,052 trillion, ¥2 trillion in the industry sector and ¥33 trillion in the government sector.

iii . Imputed environmental cost

- The total imputed environmental cost was ¥4.2 trillion, or 1.0 % ratio to GDP (1.1 % ratio to NDP)
- In terms of breakdown by type of natural asset, the cost was ¥2.4 trillion for air pollution, ¥0.7 trillion for water pollution, ¥1.1 trillion for land use.
- The reference trial estimation of the imputed environmental cost of the global warming caused by CO₂ was ¥1.9~2.2 trillion.

iv . Eco-domestic product (EDP)

- By deducting the imputed environmental cost (excepting CO₂) from net domestic product (NDP) , EDP was ¥362. 7 trillion.

② A comparison between 1970 and 1995 (Table 3)

i . Actual environmental cost

- GDP in 1995 was 2.5 times in 1970. The gross value added of environmental protection activities grew at 5.6 times, so that the share of GDP rose from 0.5 % to 1.1 %.

- The final consumption expenditures in 1995 were 2.5 times those of 1970. The final consumption expenditures of environmental-related goods and services in 1995 were 3.9 times those of 1970, so that the share of them rose from 0.6 % to 1.1%.

ii. Environment-related assets

- The total man-made assets in 1995 were 4.5 times those of 1970. The environmental protection assets were 11.9 times, so that the share of them rose from 1.3 % to 3.4 %.

iii. Imputed environmental cost

- In 1975 the total imputed environmental costs were most expensive, ¥6.2 trillion and in 1990 were lowest, ¥4.2 trillion.
- The ratio to GDP was the highest, 3.1 % in 1970. It declined rapidly in the 1970's and was 1.5 % in 1980, and 1.0 % in 1990 and 1995.
- In terms of breakdown by type of natural asset, air pollution occupied 72 %, land use occupied 18 % and water pollution occupied 6 % in 1970. In 1995 air pollution declined to 55 %, land use and water pollution rose to 26% and 20 % respective.
- The reference trial estimation of the imputed environmental costs of the global warming caused by CO₂ increased from ¥1.2~1.4 trillion in 1970 to ¥2.1~2.4 trillion in 1995. The ratio to GDP declined from 0.7 % to 0.5 %.

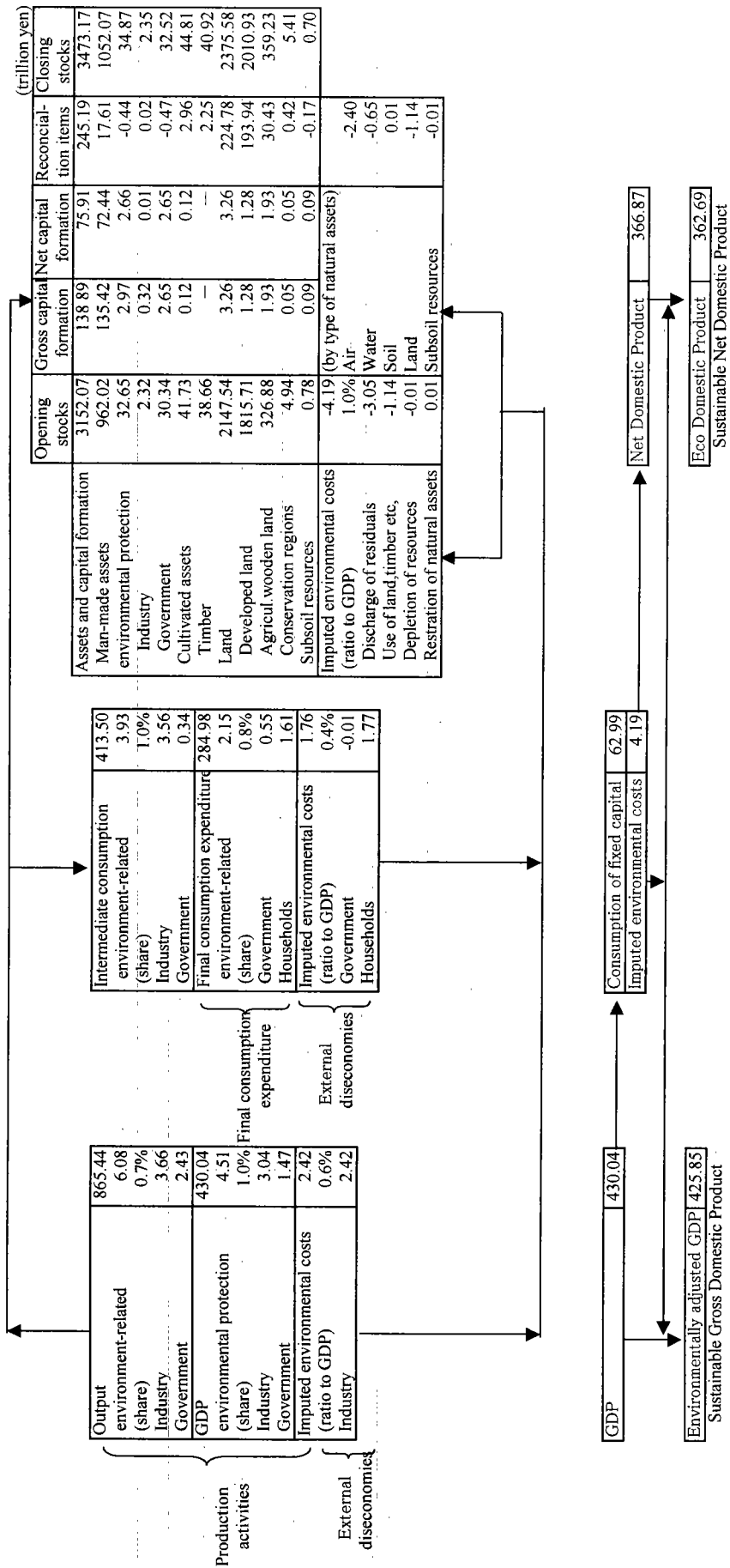
iv. Environmentally adjusted GDP

- Environmentally adjusted GDP (by deducting the imputed environmental cost from GDP) increased 2.56 times from 1970 to 1995 and GDP increased 2.51 times. As a result, The stretch of environmentally adjusted GDP was higher than the one of GDP.

Table 1 Trial Estimates of Integrated Environmental and Economic Accounting

Serial No.	Description	Production activities (Million Yuan)											Final consumption expenditures (Million Yuan)											Exports
		(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	
(01)	Domestic value added	374,865.9	41,072.2	65,468.0	688,557.4	412,480.2	364,874.9	1,388.7	832.6	514.1	392,443.1	13,784.8	652.8	13,104.0	4,558.4	284,872.2	38,885.6	3,154.4	243,025.7	543,025.7	120,044.7	0.0		
(02)	Government	4,015.3	68.9	68.9	8,004.8	3,925.6	3,558.9	0.0	0.0	0.0	3,558.9	2.1	2.1	328.0	34.3	2,162.2	188.0	0.0	188.0	0.0	0.0	0.0		
(03)	Private non-profit institutions serving households	2,426.0	0.0	0.0	2,426.0	461.1	405.1	0.0	0.0	0.0	405.1	49.7	2.1	47.8	6.9	1,984.3	1,907.3	0.0	297.0	0.0	0.0	0.0		
(04)	Other goods & services	786,524.6	43,073.2	65,416.4	682,200.3	408,353.9	391,312.2	1,388.7	832.6	514.1	390,321.5	13,445.1	650.8	12,764.4	4,602.0	282,524.9	37,189.3	3,154.4	242,407.7	543,044.7	120,044.7	0.0		
(05)	Government	41,044.8	0.0	0.0	42,558.1	548.9	520.9	0.0	0.0	0.0	520.9	17.9	11.7	6.2	10.1	40,029.2	37,189.3	0.0	5,829.8	0.0	0.0	0.0		
(06)	Private non-profit institutions serving households	14,300.1	0.0	0.0	14,300.1	1.4	1.4	0.0	0.0	0.0	1.4	0.2	0.2	0.0	0.0	13,281.0	0.0	0.0	10,158.1	0.0	0.0	0.0		
(07)	Use of produced assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(08)	Use of natural assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(09)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(10)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(11)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(12)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(13)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(14)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(15)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(16)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(17)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(18)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(19)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(20)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(21)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(22)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(23)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(24)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(25)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(26)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(27)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(28)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(29)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(30)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(31)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(32)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(33)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(34)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(35)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(36)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(37)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(38)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(39)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(40)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(41)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(42)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(43)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(44)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(45)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(46)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
(47)	Use of man-made assets	362,848.8	0.0	0.0	362,848.8	62,848.8	62,848.8	0.0	0.0	0.0	62,848.8	2,508.8	2,508.8	1,974.4	955.9	0.0	0.0	0.0	0.0					

Diagram 2. Economic activities and environment-related external diseconomies in 1990



Note: Gross Domestic Product (GDP) and Net Domestic Product, as shown in the diagram, do not exactly correspond to each other because of statistical discrepancies.

Table 3

Comparison tables of long term

(1) succession of environmental protection activities

unit: billion yen (at constant prices)

	1970	1975	1980	1985	1990	1995
Gross Domestic Product	185,467.5	230,371.4	290,288.3	342,399.8	429,860.4	464,883.1
environmental protection (share of GDP)	876.5 0.5%	1,458.6 0.6%	3,029.0 1.0%	4,137.4 1.2%	4,503.5 1.0%	4,915.5 1.1%
industry	424.3	782.2	2,713.9	2,801.3	3,038.2	3,266.8
government	452.2	676.4	855.1	1,336.1	1,465.3	1,648.7

(2) succession of environmental protection assets at closing stocks

	1970	1975	1980	1985	1990	1995
man-made assets	282,496.8	493,389.7	668,225.7	824,166.9	1,052,073.8	1,263,008.5
environmental protection assets	3,552.6	9,479.1	18,206.3	26,793.6	34,640.7	42,445.6
industry	295.7	1,386.8	1,748.4	2,282.9	2,346.2	2,016.0
government	3,256.9	8,092.4	16,457.9	24,510.7	32,294.5	40,429.6

(3) succession of imputed environmental costs

	1970	1975	1980	1985	1990	1995
Gross Domestic Product	185,467.5	230,371.4	290,288.3	342,399.8	429,860.4	464,883.1
Environmentally adjusted GDP	179,722.6	224,188.2	285,911.4	337,734.9	425,674.0	460,350.3
Imputed environmental costs (ratio to GDP)	5,744.9 3.1%	6,183.2 2.7%	4,376.9 1.5%	4,664.9 1.4%	4,186.4 1.0%	4,532.8 1.0%
Air (ratio to imputed environmental costs)	4,132.4 71.9%	3,830.9 62.0%	2,884.4 65.9%	2,832.1 60.7%	2,398.3 57.3%	2,476.9 54.6%
Water (ratio to imputed environmental costs)	319.2 5.6%	459.6 7.4%	332.3 7.6%	528.8 11.3%	645.4 15.4%	896.7 19.8%
Soil (ratio to imputed environmental costs)	0.0 0.0%	-4.8 -0.1%	-6.1 -0.1%	-7.1 -0.2%	-5.7 -0.1%	-8.4 -0.2%
Land (ratio to imputed environmental costs)	1,016.4 17.7%	1,846.0 29.9%	1,137.3 26.0%	1,279.7 27.4%	1,140.7 27.2%	1,164.2 25.7%
Timber (ratio to imputed environmental costs)	177.2 3.1%	27.0 0.4%	0.0 0.0%	0.0 0.0%	0.0 0.0%	0.0 0.0%
Subsoil resources (ratio to imputed environmental costs)	99.7 1.7%	24.7 0.4%	29.0 0.7%	31.4 0.7%	7.7 0.2%	3.4 0.1%
Global warming by CO ₂ (reference trial estimate) (ratio to GDP)	1,198.5~ 1,381.5 0.65~0.74%	1,528.5~ 1,761.9 0.66~0.76%	1,625.1~ 1,873.2 0.56~0.65%	1,576.8~ 1,817.6 0.56~0.65%	1,875.2~ 2,161.6 0.46~0.53%	2,079.7~ 2,397.2 0.45~0.52%

Diagram 4

