

Proposal of Household Economy- Environment Accounts by Household Type

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Backgrounds and Objective

- The household sector is an important component of any investigation of future environmental impacts because households are an end consumer and lifestyle changes have a major influence on society.
- In the household sector, however, concrete approaches including technical improvements and construction of environment-friendly systems are not so effective because there are few practical restrictions motivating households to take immediate action even when targets are formulated.
- Under such circumstances, it is essential to quantitatively understand the impacts that lifestyle changes have on the environment in order to select more effective environment-friendly actions.

- We propose household economy-environment accounts as a tool for analyzing lifestyles.
- These accounts make it possible to evaluate the environmental impact of lifestyle changes.

Outline of household economy- environment accounts

- Country and sector
 - Japan - household sector
- Main items
 - Time use, Balance of income and expenditures, Consumption expenditure, Environmental load
- Units
 - physical terms, monetary terms
- Year: 2000

Household economy-environment accounts

1. Income and outlay account

Incomes	
Compensation of employees	
Social benefits	
...	
Expenditures	
Consumption expenditures	
Taxes	
Social contributions	
...	

2. Household production input table

	Commodity			Durable goods stock	Total	Sales of used goods and scrap	Labor outside of household
	1	2	3				
Input goods	(Monetary and physical terms)						
Goods 1							
Goods 2							
Goods 3	(Monetary terms)						
Input services							
Service 1							
Service 2	(Physical terms)					Blank	
Service 3							
Recycled input goods inside household	(Monetary and physical terms)						
Containers and packaging materials							
Total							
Time input							(Minutes)

3. Durable goods stock table

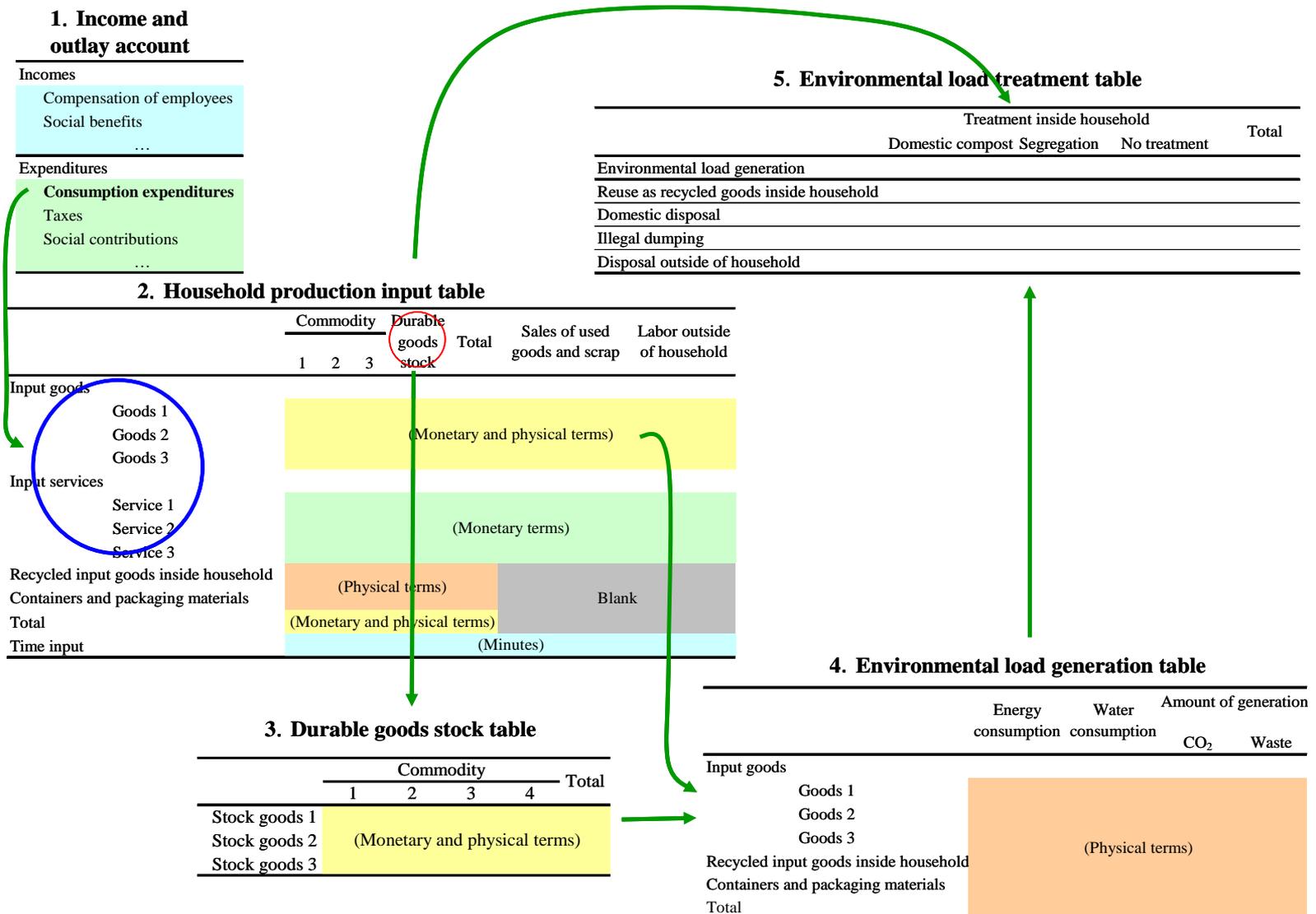
	Commodity				Total
	1	2	3	4	
Stock goods 1	(Monetary and physical terms)				
Stock goods 2					
Stock goods 3					

5. Environmental load treatment table

	Treatment inside household			Total
	Domestic compost	Segregation	No treatment	
Environmental load generation				
Reuse as recycled goods inside household				
Domestic disposal				
Illegal dumping				
Disposal outside of household				

4. Environmental load generation table

	Energy consumption	Water consumption	Amount of generation	
			CO ₂	Waste
Input goods	(Physical terms)			
Goods 1				
Goods 2				
Goods 3	(Physical terms)			
Recycled input goods inside household				
Containers and packaging materials	(Physical terms)			
Total				



Income and outlay account

Household economy-environment accounts system

Account group	Payments	Receipts
Allocation of primary income account	Property income Primary income balance	Operating surplus or mixed income Compensation of employees Property income
Secondary distribution of income account	Current taxes on income and wealth Social contributions Other current transfers Disposable income	Primary income balance Social contributions (excluding social transfers in kind) Other current transfers
Redistribution of income in kind account	Adjusted disposable income	Disposable income Social transfers in kind
Use of income account	Final consumption expenditure Savings	Disposable income Variation in pension funds and reserves

- The unit of the table is **monetary terms**.
- The composition of the income and outlay account conforms with that in the household sector of the national accounts
- The income and outlay account is divided into **four groups**.
- Each group achieves a balance by a “balance item”

Household production input table

Household economy-environment accounts system

	Commodity			Durable goods stock	Total	Sales of used goods and scrap	Labor outside of household
	1	2	3				
Input goods							
Goods 1	(Monetary and physical terms)						
Goods 2							
Goods 3							
Input services							
Service 1	(Monetary terms)						
Service 2							
Service 3							
Recycled input goods inside household							
Containers and packaging materials	(Physical terms)				Blank		
Total	(Monetary and physical terms)						
Time input	(Minutes)						

[Sales of used goods and scrap] using a negative value

[Labor outside of household]
The input is basically time spent on labor outside of the household.

[Recycled input goods inside household] Recycled input goods in a household are new input goods to produce commodities.

[Containers and packaging materials] The increase in utility represented by containers and wrappings accompanying purchased goods is considered to be irrelevant to the production of commodities .

- The table includes sales of used goods and scrap, as well as labor outside of the household, and shows the relationships between the commodities and inputs of goods, services, and time.
- The units of the table are both monetary and physical terms.

Durable goods stock table

Household economy-environment accounts system

	Commodity				Total
	1	2	3	4	
Stock goods 1	(Monetary and physical terms)				
Stock goods 2					
Stock goods 3					

This is not the amount of stock goods purchased but the amount of stock required to produce commodities.

Both monetary and physical terms are used as units.

The amount of stock is calculated from a stock goods-specific remaining rate function (goods remaining rate when x years have elapsed since purchase)

Classification of commodities

Classification	Details	Examples
Clothing (CLO)	Commodities for wearing clothes	Purchase of cloth, cleaning
Food (FOO)	Commodities for having meals	Preparation of meals, purchase of food goods
Housing (HOU)	Commodities for good dwelling environment	Securing and maintenance of house, purchase of air conditioner
Education (EDU)	Commodities for education	School expenses, time for lessons and commuting
Other housework and care (OHC)	Commodities for housework and care not included under clothing, food, and housing	Time for housework and care
Health and personal care (HPC)	Commodities for maintaining sound life	Time for personal care, purchase of cosmetics
Recreation (REC)	Commodities for enjoying recreation	Time for sports and trips, cost of a tour
Sleeping (SLE)	Commodities for sleeping	Time for sleeping, purchase of bedding
Communication (COM)	Commodities for communication	Time for telephone calls
Environmental load treatment in household (ETH)	Commodities for environmental load treatment in household	Purchase of compost appliance, time for segregation
Other (OTH)	Commodities not included above	Others

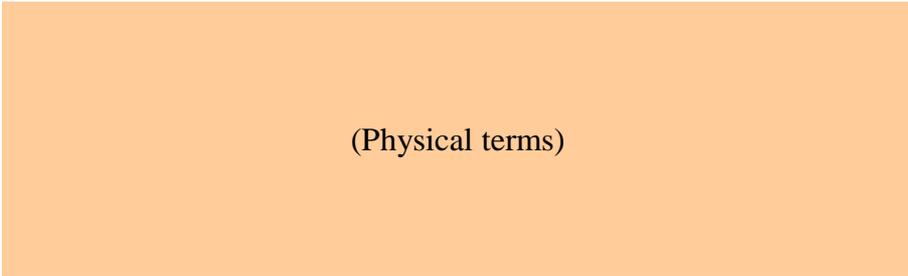
Classification of goods and services (87 items)

Cereals	Repair costs for furniture and floor coverings	Radio and TV sets
Meats	Towels	Cameras
Fish and shellfish	Domestic durables and air conditioners	Personal computers
Dairy products and eggs	Repair costs for domestic durables	Recording media
Oils and fats	Tableware and kitchen utensils	Repair costs for TV sets and PCs
Fruits	Tools and materials for repairs and maintenance	Musical instruments
Vegetables and seaweeds	Domestic nondurable goods	Repair costs for musical instruments
Cakes and candies	Domestic services	Toys
Other foods	Medicines and medical supplies	Sports outfits
Tea, coffee, and cocoa	Medical appliances	Services for pets and garden plants
Other beverages	Medical and dental treatment services	Recreational and sports services
Alcoholic beverages	Hospitalization services	Cultural services
Tobacco	Nursing services	Gambling services
Cloth and thread	Automobiles	Books
Clothing	Motrcycles	Newspapers and magazines
smallclothes	Bicycles and other vehicles	Other reading
Services related to clothing	Automotive parts	Stationery
Footwear	Gasoline	Package tours
Repair costs for footwear	Automotive maintenance and repairs	Education
Rents for dwelling and land	Other automotive services	Eating-out services
Water and sewerage charges	Rail passenger services	Hotel charges
Waste treatment	Bus and taxi services	Personal care services
Electricity	Flight passenger services	Goods and appliances for personal care
Gas	Water transportation services	Jewelry and watches
Liquid fuels	Other transportation services	Other personal effects
Solid fuels	Mail services	Life insurance
Thermal energy	Domestic telephone services	Non-life insurance
Furniture and decorations	International telephone services	Financing services
Floor coverings	Other communication services	Other services

* Stock goods are indicated by **boldface**.

Environmental load generation table

Household economy-environment accounts system

	Energy consumption		Water	Amount of generation			
	Energy 1	Energy 2	Use	Consumption	CO ₂	Waste 1	Waste 2
Input goods							
Goods 1							
Goods 2							
Goods 3							
Recycled input goods inside household							
Containers and packaging materials							
Total							

- The amount of environmental load generated after goods are consumed is recorded in specific physical terms in this table.
- The targeted environmental loads include energy consumption, water consumption, air pollutants, water pollutants, household waste, bulky garbage, house construction waste, etc.
- The effect of stock in a household is to delay the generation of an environmental load from the stock goods.

Environmental load treatment table

Household economy-environment accounts system

	Treatment inside household			Total
	Domestic compost	Segregation	No treatment	
Environmental load generation				
Reuse as recycled goods inside household				
Domestic disposal				
Illegal dumping				
Disposal outside of household				

• The environmental load treatment table presents the relationship between the amount of environmental load generated and the treatment method used.

• From the viewpoint of the relationships between households and the environment, it is possible to choose

whether or not the environmental load is treated inside the household

either of two possibilities (domestic compost and segregation) when treatment takes place inside the household

- Final disposal methods
 - 1) Reuse as recycled goods inside the household
 - 2) Domestic disposal
 - 3) Illegal dumping outside of the household
 - 4) Disposal outside of the household

Outline of estimation

- We estimated the household economy-environment accounts for 2000.
- An environmental load treatment table was not prepared for this estimation. This was not because such a table was considered to be unimportant, but because of the lack of relevant information. It is necessary to complete this task at the earliest possible opportunity.
- In consideration of the various types of households, the accounts were prepared **by family composition** and **by age group of the household head**.

Household Type

- Households by family composition
 - Single-person household(HT1)
 - Married couple or married couple and
 - Unmarried children(HT2)
 - One parent and unmarried children(HT3)
 - others(HT4)
- Households by age group of the household head
 - Household head aged 65 years or more(HT5)
 - Household head aged 64 years or less(HT6)

Preparation of income and outlay account

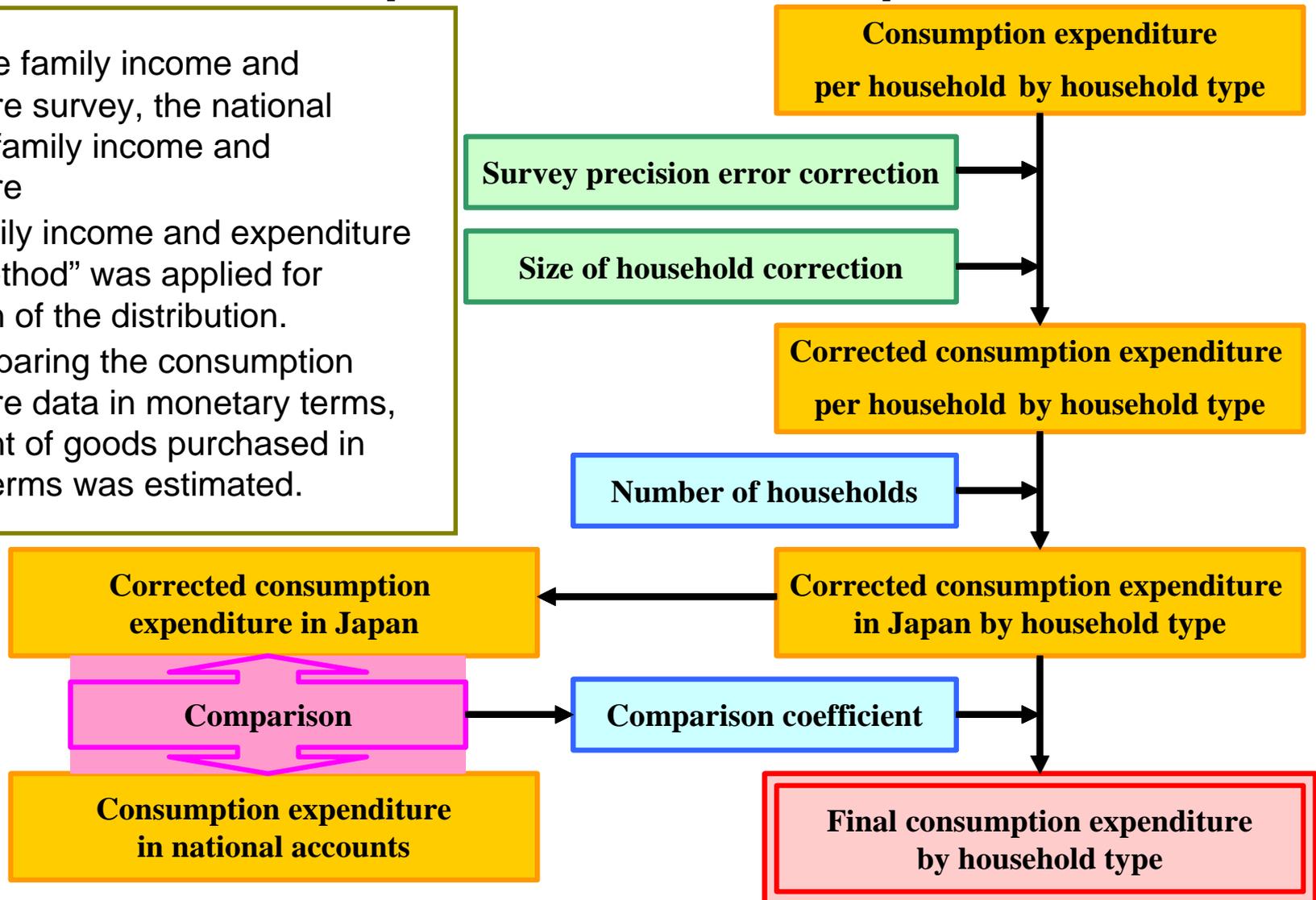
- We estimated incomes and outlays in 2000 according to household type, based on the results of Hamada (2003) for 1999.

(K., Hamada: Estimation of the household sub-sector accounts of SNA, Economic Analysis, No.167, 2003)

$IE_{i,j,99} = ie_{i,j,99} \cdot HN_{j,99}$	$IE_{i,j,99}$: income and outlay i by household type j in 1999
$IE_{i,99} = \sum_j IE_{i,j,99}$	$IE_{i,99}$: income and outlay i in 1999
$r_i = IE_{i,00} / IE_{i,99}$	$ie_{i,j,99}$: income and outlay i by household type j per household in 1999 (data from Hamada (2003))
$IE_{i,j,00} = IE_{i,j,99} \cdot r_i$	$HN_{j,99}$: number of households by household type j in 1999
	r_i : ratio of income and outlay i in 2000 to that in 1999

Preparation of household production input table

- Data: the family income and expenditure survey, the national survey of family income and expenditure
- The “family income and expenditure survey method” was applied for calculation of the distribution.
- After preparing the consumption expenditure data in monetary terms, the amount of goods purchased in physical terms was estimated.



How do goods correspond commodities?

- The majority of these goods and services correspond to one commodity.
 - However, some of the energy, water services, and transportation classifications correspond to two or more commodities.
→ these goods and services are like intermediate inputs.
- Ex) Rail passenger services are used for shopping or making a trip.
- Consumption expenditure was distributed to each commodity according to final purpose.

Data on amount of stock goods

- The amount of stock goods is estimated from the amount of goods purchased.

$$S_{k,t} = \sum_x X_{k,t-x} \cdot f_k(x)$$

$S_{k,t}$: amount of stock of goods k in year t

$X_{k,t-x}$: amount of goods k purchased in year $(t-x)$

$f_k(x)$: remaining rate function of goods k after x years since purchase

▪ A specific remaining rate function was determined as follows for each of the stock goods other than the housing stock.

Estimation of amount of environmental load

- The amount of environmental load generated in each year is the total of the amounts generated from the flow goods and the stock goods.
- The amount of environmental load from flow goods is estimated from the amount of purchased flow goods **in the same year**.
- The amount of environmental load from stock goods is estimated from the amounts of purchased stock goods **in past years** and remaining rate function to consider time lag between purchase and disposal.

Income and outlay account Result 1

By age group of household head

Account group	Payments			Receipts				
	Average	HT5	HT6	Average	HT5	HT6		
Allocation of primary income account	Property income	331	154	372	Operating surplus or mixed income	1631	1830	1500
	Primary income balance	6942	3545	7796	Compensation of employees	5246	1117	6398
Secondary distribution of income account					Property income	399	665	303
	Current taxes on income	547	329	596	Primary income balance	6942	3545	7796
	Compulsory actual social contributions	934	311	1107	Social security benefits and social assistance benefits in cash	953	2561	438
	Other current transfers	366	297	380				
	Gross disposable income	6366	5284	6530				
Redistribution of income in kind account	Adjusted disposable income	7177	6186	7284	Gross disposable income	6366	5284	6530
					Social transfers in kind	799	905	740
Use of income account	Final consumption expenditure	5521	4912	5555	Gross disposable income	6366	5284	6530
	Savings	859	408	981				

Unit: 10³ yen

- The income from compensation of employees is large in HT6, while the income from social security benefits and social assistance benefits in cash is large in HT5.
- With the aging of society, there is a possibility of major changes taking place in the social security system in the future. The balances in such a case can be considered in this table.

Household production input table Result 2

Part of the household production input table per household (monetary terms, 2000)

	CLO	FOO	HOU	EDU	OHC	HPC	REC
HT1	275042	903320	814995	21637	15265	197125	381560
HT2	484181	1649792	1596792	216384	57188	488963	562554
HT3	395189	1179257	1219040	116699	49355	409573	352450
HT4	587698	2172596	2338068	294404	70333	601482	591680
HT5	396936	1303807	1475980	89631	44994	444054	412184
HT6	447661	1539251	1452719	192433	45732	411871	528582

Unit: yen

	SLE	COM	OTH	Labor	Capital stock	Total
HT1	11494	215841	328692	159634	245548	3570153
HT2	32051	274539	675063	277792	555794	6871093
HT3	20814	213067	589005	160264	281374	4986086
HT4	41159	314669	879291	293827	624462	8809670
HT5	28453	205700	536042	166511	325619	5429912
HT6	26272	276229	610366	264752	500380	6296249

Unit: yen

- Differences in how consumption expenditure is distributed among commodities can be examined according to the household classification.
- Expenditure on education is extremely small while expenditures on recreation and communication are high in HT1. This is because HT1 mainly consists of single young people and senior citizens who do not have a family to feed.

Durable goods stock table

Result3

Per household

	By family composition				By age group of household head		Average
	HT1	HT2	HT3	HT4	HT5	HT6	
Size of household	1.00	3.06	2.41	4.67	2.43	2.74	2.67
Household appliances for housework	46	189	138	232	144	154	152
HVAC equipment	49	145	117	171	132	117	120
Equipment for recreation	54	93	45	106	47	91	81
Automobiles	499	1909	851	2478	652	1789	1518

Unit: kg/household

Per person

	By family composition				By age group of household head		Average
	HT1	HT2	HT3	HT4	HT5	HT6	
Household appliances for housework	46	62	57	50	59	56	57
HVAC equipment	49	48	48	37	54	43	45
Equipment for recreation	54	31	19	23	19	33	30
Automobiles	499	624	353	531	268	653	569

Unit: kg/person

- The larger the household size is, the smaller amount of durable goods stock per person is.
- The stock of household appliances for housework is smaller than the national average in HT1.
→ Rather than doing housework themselves, people in this group tend to rely on housework services, and the rate of households that do not possess such appliances is large.

Environmental load generation Result4

Per person / Household garbage

	By family composition				By age group of household head		Average
	HT1	HT2	HT3	HT4	HT5	HT6	
Paper (disposal)	21.0	21.5	22.5	17.4	20.8	20.5	20.5
Paper (other)	2.4	1.0	1.1	0.7	1.1	1.1	1.1
Plastic	5.2	4.1	4.2	3.1	4.2	3.9	4.0
Textiles	18.5	13.3	12.7	10.3	13.4	13.0	13.1
Rubber	2.5	1.6	1.6	1.2	1.3	1.7	1.6
Leather	1.5	0.9	0.8	0.7	1.1	0.9	0.9
Glass	0.5	0.6	0.5	0.4	0.5	0.5	0.5
Metal	4.7	4.6	5.0	3.6	4.6	4.3	4.4
Plants	5.0	3.0	2.7	2.2	2.7	3.0	3.0
Wood	2.7	3.1	3.4	2.4	2.9	2.9	2.9
Pottery	1.2	1.4	1.4	1.1	1.3	1.3	1.3
Kitchen garbage	127.7	105.8	99.5	97.2	124.7	100.2	105.5
Other	18.3	7.7	7.6	6.0	6.8	8.8	8.4
Bulky waste	40.7	28.8	25.5	22.7	30.4	27.7	28.3
Transportation equipment	62.3	65.5	21.2	49.8	26.2	67.1	58.2

Unit: kg/person

- The environmental load generated per person in HT1 is large while that in other household types is small.
- Household garbage may continue to increase despite the population reduction if lifestyle patterns related to purchasing, consumption, and disposal of goods continue, particularly with a conspicuous increase in HT1 households.

Final remarks

- I developed household economy-environment accounts for Japan and have proposed a framework for the accounts and made estimates for Japan in 2000 using the presently available data.
- I believe that the most important application for these accounts is as a tool to propose eco-friendly lifestyles. For the further advancement of this work, the following tasks lie ahead:
 - (1) Compilation of a complete set of accounts including parts that have not yet been prepared.
 - (2) Remake of these tables using more available data
 - (3) Estimation of the impact of social changes on the environment in the medium or long term.