

Appendix 2: EMAN Conference 2003, Lüneburg

EMAN-EU 2004 Lüneburg

March 05-06, 2004
University of Lüneburg

Workgroup:
Sustainability Accounting in Practice – Asia
13:30-15:00

Recent Development of Ecological & Eco-Efficiency Accounting in Japan

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RECENT DEVELOPMENT OF ECOLOGICAL & ECO-EFFICIENCY ACCOUNTING IN JAPAN

1. Emergence of *Eco-Efficiency Accounting*

- (1) Age of *Eco-Efficiency Accounting*
- (2) Three Ways to Eco-Efficiency Accounting
 - 1) From “External Reporting” to “Internal Eco-Efficiency Management”
 - 2) From “Environmental Cost Accounting” to “Eco-Efficiency Accounting”
 - 3) From “Ecological Accounting” to “Eco-Efficiency Accounting”
- (3) Eco-Efficiency Contests or Battles?
Too Many Varieties of (Unreliable) Eco-Efficiency Figures

2. JEPIX PROJECT: Measurement of Arm’s Length Ecological Prices: measuring *Eco-factors* for present Japan

3. JEPIX FORUM: Practicing Ecologically Conscious Management by EcoBalances with *JEPIX INDEXES*

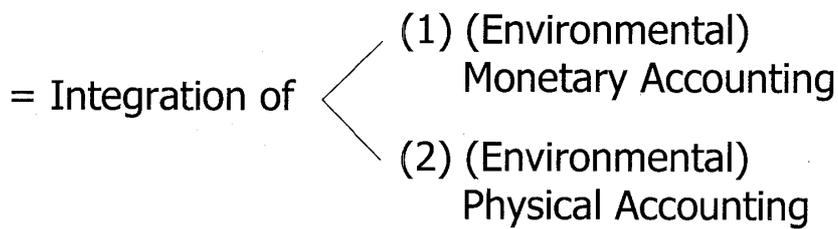
4. Case Study: “Komatu” , first JEPIX actual example in a environmental report, 2003 etc.

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Eco-Efficiency & Eco-Efficiency Accounting

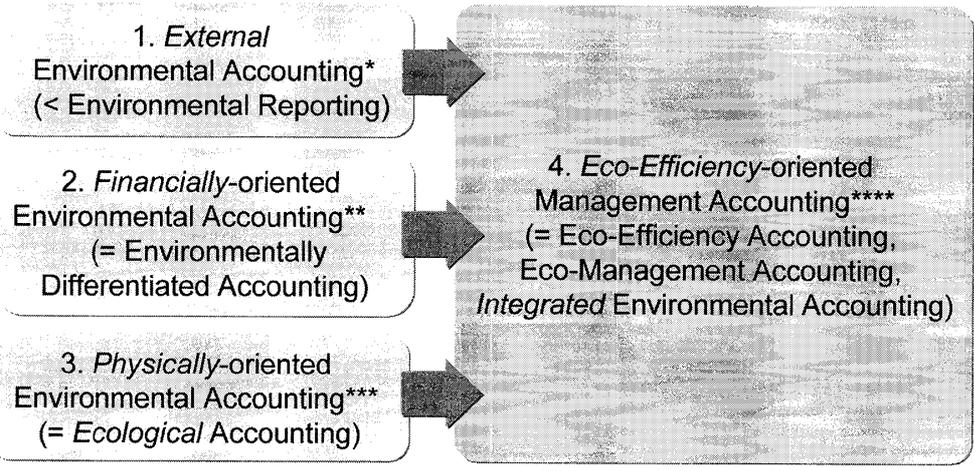
▶ Eco-Efficiency =
$$\frac{(1) \text{ Value Added}}{(2) \text{ Environmental Impact}}$$

▶ Eco-Efficiency Accounting



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Three Ways to *Eco-Efficiency* Accounting



* Environmental Cost (& Benefit) Accounting etc.

** Environmental Cost (& Benefit) Accounting, Environmental Investment Calculation etc.

*** EcoBalance, LCA, EPE in various physical units / in single unit (EIP, Eco-point et.) etc.

**** mainly for *Internal* Management Control, but can be applied also for *External* Environmental Reporting

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Present State of *Eco-Efficiency* Varieties(1)

① Eco-efficiency ([Economic value] / [Environmental impact])

Company name	Index name	Basic formula
Mitsui Chemicals	Eco-efficiency	$\frac{[\text{Recurring profit or sales}]}{[\text{Total environmental impact}^*]}$
Ricoh Company	Profit to environmental impact index (Eco index)	$\frac{[\text{Gross profit on sales}]}{[\text{Total environmental impact}^*]}$
	Sales to environmental impact index (Eco-efficiency index)	$\frac{[\text{Sales}]}{[\text{Total environmental impact}^*]}$
Sony Corporation	Eco-efficiency	$\frac{[\text{Sales}]}{[\text{Individual environmental impact}]}$
NEC	Environmental policy index	$\frac{[\text{Sales}]}{[\text{Individual environmental impact}]}$
FUJITSU	Environmental impact utilization efficiency (EE value)	$\frac{[\text{Sales}]}{[\text{CO}_2 \text{ converted total environmental impact}^*]}$
FUJI XEROX	Environmental efficiency	$\frac{[\text{Sales}]}{[\text{Individual environmental impact}]}$

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Present State of *Eco-Efficiency* Varieties(2)

② Basic unit ([Environmental impact] / [Economic value])

Company name	Index name	Basic formula
ASAHI BREWERIES	ASAHI BREWERIES gross environmental impact index (AGE)	$\frac{[\text{Integrated total environmental impact}^*]}{[\text{Beer production}]}$
KIRIN BREWERY	Environmental impact intensity	$\frac{[\text{Environmental emission}]}{[\text{Added value}]}$
Ito Yokado	CO ₂ converted gross impact index	$\frac{[\text{CO}_2 \text{ converted total environmental impact}^*]}{[\text{Number of stores or sales}]}$
	Eco-efficiency	$\frac{[\text{CO}_2 \text{ converted total environmental impact}^*]}{[\text{Floor space} \times \text{business hours}]}$

Source: NLI Research Institute 6

Confusing/Chaotic Situation around *Eco-Efficiency*

because of

Lack of Reliable *Ecological Accounting System*

because of

Unreliable *Environmental Impact Figures*
(Physical Volume * Valuation Factor)

because of

No GAAP for *Valuation Factors* :

Valuation Factors Have: No Comparability, No Authority, No Sufficient Relevance/Reliability, No Practical Effectiveness
for Company Decision Making

Therefore

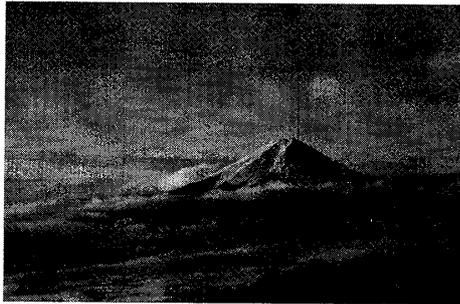
GA Valuation Factors for All the Relevant Environmental Impacts ⇒ JEPIX

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Japan Science and Technology Inc. (JST) Technical Report

JEPIX

(The Environmental Policy Priorities Index for Japan)
Calculation of Ecofactors for Japan



Nobuyuki Miyazaki
Claude Siegenthaler
Satoshi Kumagai
Eiichi Shinozuka
Ayako Nagayama

Japan Agency of Science & Technology: Eco-Rating Project 2001-2003 / Japan Ministry of Education & Science: 21st Century COE (Center of Excellence) Project, World Peace, Safety & Conviviality 2003-2007

Sustainable Management Forum Japan (SMF) Sustainable Management Rating Institute Japan (SMRI)

The Foundation for Earth Environment / Global Environmental Forum / Japan Environmental Management Association for Industry(JEMAI) / Japan Audit and Certification Organization for Environment and Quality(JACO) / International Christian University Social Science Research Institute(SSRI) / International Christian University (Graduate School of Comparative Culture) / Hosei University, Graduate school of Environmental Management / Musashi Institute of Technology (Graduate School of Engineering) / Shiba Institute of Technology (Graduate School of Engineering) / The Japan Corporate Social Accounting & Reporting Association / The Japan Association for Research on Business Administrative Behavior / The Earth Management Association / Green Consumer Tokyo Network / Environmental Auditing Research Group(EARG) / Environment, Forests and Landscape(BUWAL) / Institute for Economy and Ecology, St. Gallen(ToeB) / Institute for Economy and Environment, University of St.Gallen(IWO) / Swiss Association for Environmentally Conscious Management (OEBU) / Swiss Agency for the / Swiss Federal Laboratories for Materials Testing and Reserch(EMPA) / Berlin Science Centre (WZB) / Wuppertal Institute for Climate, Environmental and Energy) / Sustainable Management Center of Lüneburg University / Institute for Management and Environment(IMU)
March 2003

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JEPIX Eco-factors for Japan

(1) *Single Score Index by EcoScarcity Theory*

R. Müller-Wenk (*ökologische Buchhaltung*), BUWAL SRU 133/297

*Distance to Target Method = Actual Emi. Flow / Target Emi. Flow

(2) *Environmental Policies of Japan & International Bodies*

Target Flow : based on Environmental Laws/Regulations of Japan + International Common Recommendations/Guidelines (IPCC etc.)

(3) *Bottom Up Approach (? Top Down Approach of the Guideline)*

GAAP for Ecological Accounting by Support of More Than 30 Ministries, National Agencies and Research & Academic Institutions of eminent World Authority

Definition of JEPIX

Environmental impact of a substance (EIP)

= **Emission Flow (kg)** × **Eco factor** of the substance (EIP/kg)

*EIP : Environmental Impact Point

$$\text{Environmental impact (EIP)} = \frac{F}{F_k} \times \frac{a}{F_k} \times c$$

F: Actual flow
 F_k: Critical flow
 a: Emissions
 c: 10¹²

First term: Overall conditions of environmental damage
 Ratio of actual value F to target value F_k

Second term: Individual conditions of environmental damage
 Ratio of a, the value to calculate, to target value F_k

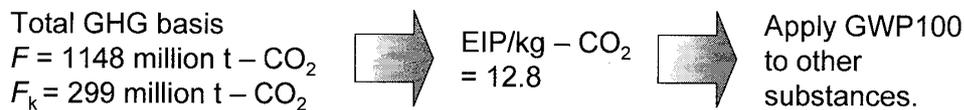
Calculation Example (GHG)

■ Actual flow

1999 emission data from Japan's Third Report on the Framework Convention on Climate Change, published by the Ministry of the Environment in 2002

■ Target flow

Average of target emission values to reduce CO₂ levels to 450 ppm or 550 ppm, based on the IPCC Third Report on Global Warming



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Range Covered by JEPIX

12 categories covered by JEPIX

- Greenhouse gases
- Ozone-depleting gases
- Toxic substances including dioxin
- Photochemical oxidants
- NOx
- SPM10
- BOD
- COD
- N
- P
- Land reclamation
- Road noise

Laws and measures covered by JEPIX

- IPCC guidelines
- Montreal protocol
- Ozone Layer Protection Law
- PRTR law
- Voluntary control plan of toxic air pollutants
- Automobile NOx Law
- Air Pollution Control Law
- Water Pollution Control Law
- Environmental guidelines set by the Ministry of the Environment, etc.

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List of Data Sources

	Actual flow	Target flow	Main data sources and remarks
Greenhouse gases (GHG)	Japan's Third Report on the Framework Convention on Climate Change, by the Ministry of the Environment	IPCC Third Report on Global Warming	Calculates GHG other than CO ₂ , on a GWP100 basis.
Ozone-depleting substances (ODP)	National CFC Phase-out Plan (July 2001)	Same as the left. Amount of foaming agent stock	Calculates substances other than R11, on an ODP basis.
Photochemical oxidants	The Ministry of Economy, Trade and Industry's voluntary control plan of toxic air pollutants. OECD.	Calculated based on differences from environmental guidelines	Numerical environmental databases of the Environmental Information Center, National Institute for Environmental Studies
Dioxin and other toxic substances	12 substances are listed in the Ministry of Economy, Trade and Industry's voluntary control plan of toxic air pollutants.	12 substances are listed in the Ministry of Economy, Trade and Industry's voluntary control plan of toxic air pollutants.	Materials of the 5th meeting of the WG on toxic air pollutants under the Risk Management Subcommittee, Chemicals and Bio-industry Committee, Industrial Structure Council, Ministry of Economy, Trade and Industry Third report on PRTR research by the Japan Federation of Economic Organizations
Biochemical oxygen demand (BOD)	Estimates based on household emission data from the White Paper on the Environment and data from experts in Japan	Estimated from environmental guidelines	Lake research data and chronological tables of flow by the Ministry of Land, Infrastructure and Transport
Chemical oxygen demand (COD)	Estimates virtual flows based on the actual flows of Tokyo Bay, Ise Bay, and the Seto Inland Sea	Same as the left	Office of Environmental Management of Enclosed Coastal Seas, Water Environment Management Division, Water Environment Department, Ministry of the Environment
Total nitrogen, total phosphorus	Report to the Japanese government and the secretariat of the UNFCCC	Calculated based on the target values of 6 prefectures	Automobile NOx Law, reports of the Investigative Committee on Reduction of Total Automobile NOx Emissions
NOX	Estimates based on the composition ratio of PM emissions	Calculated by comparing data in observatories that do not meet environmental guidelines against average concentrations in prefectures that meet the guidelines	Investigation of fixed sources of air pollution in 1999 by the Ministry of the Environment Numerical environmental databases of the Environmental Information Center, National Institute for Environmental Studies
SPM10	Materials published by the Ministry of the Environment (OECD)	Same as the left	Environmental Performance Review
Emission control, landfill capacity	Total travel distance of regular cars and large-size cars	Calculated based on the achievement ratio of the environmental guidelines on noise.	Hearing from the Ministry of Land, Infrastructure and Transport HP of the Ministry of the Environment

JEPIX Forum ökologisch bewusste Unternehmensführung : ÖBU JAPAN

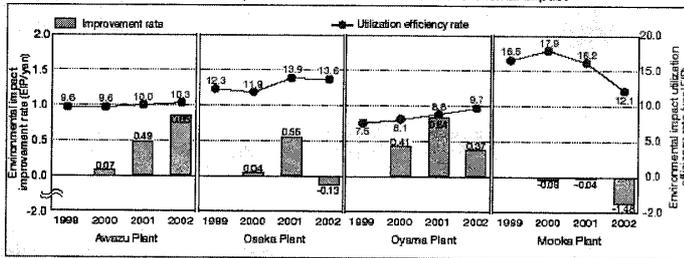
Company name	Sales amount	Type of industry
CANON	¥3,198 billion	Copying machine, Digital cameras, Video Camcorders, Printers
SEKISUI CHEMICAL	¥845 billion	Housing, High Performance Plastics, Urban Infrastructure
BOSCH in JAPAN	¥192 billion	Automotive Technology, Power Tools, Industrial Technology
ALPS Electronic company	¥602 billion	Magnetic devices, Automotive products, Peripheral products
Mitsubishi Estate	¥681 billion	Building Business, Residential Development, Urban Development
Railway Technical Research Institute	¥17 billion	Research Institute
FUJIFILM	¥795 billion	Copying machine, Film, Digital camera, Information media
J-POWER	¥546 billion	Power supply
KAO	¥900 billion	Fabric and Home Care, Personal care, Chemical Products Health care
SUNTORY	¥1383 billion	Alcohol(Whisky, Beer, Wine), Soft drink, Food
TEPCO	¥4,919 billion	Power supply
KOMATSU	¥1,089 billion	Lift Trucks, Outdoor Power Equipment & Hobby Engines, Diesel Engines & Hydraulic Equipment, Industrial Machinery
Yamatake	¥50 billion	Industrial automation systems, Building automation systems

Application Case (Komatsu, Environmental Report)

- Uniformly index environmental load based on BUWAL297, the forerunner of JEPIX
- Calculation of total environmental load improvement efficiency and total environmental load utilization efficiency

➔ Ecological business management

■ Comparison of utilization efficiency rates and recent trends for environmental impact

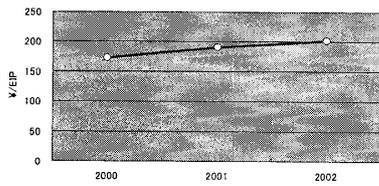


Source: Komatsu Environmental Report 2003

Application Case: Canon

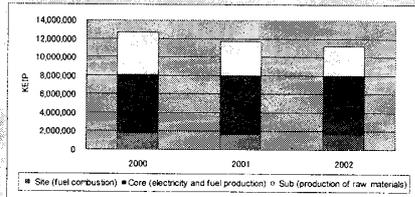


- Eco-efficiency in Japan calculated
- Iron and resin included as sub-balances in addition to core and site balances



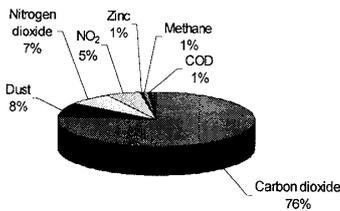
Eco-efficiency (JEPIX, '00 to '02)

- Reduced consumption of raw materials reduced the load of sub-balances, resulting in a **10% reduction** of environmental load



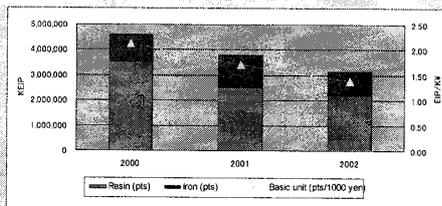
Breakdown of Eco-balances

- Carbon dioxide accounts for 76% of the total amount of pollutants.



Inventory Results in 2002

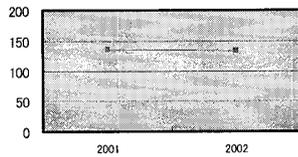
- Sub-balance load decreased by 65% on a sales basis from 2002.



Breakdown of Sub-Balances (Raw Materials)

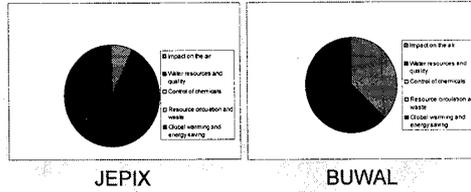
Application Case: Bosch Automotive Systems **BOSCH**

- Eco-efficiency in Japan
- Target site and core.



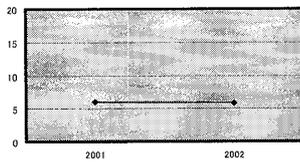
Eco-efficiency (JEPIX, '01 - '02)

- Difference in evaluation of SOx results in difference in balances.



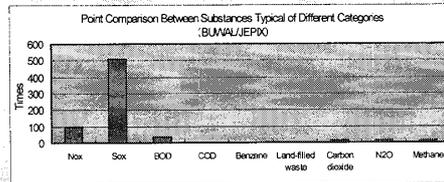
Environmental Category Balance Comparison

- Evaluate the same substance amount based on BUWAL.



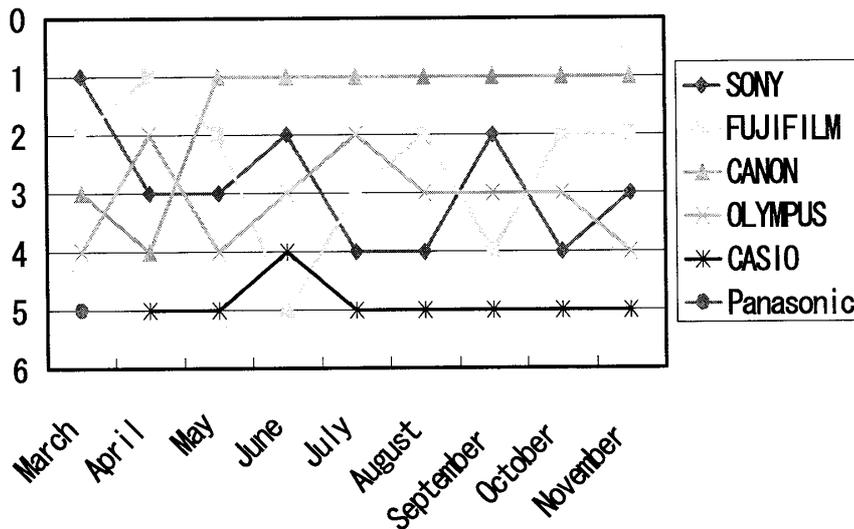
Eco-efficiency (BUWAL, '01 - '02)

- Because Japan has achieved the Sox target, the coefficient of SOx is significantly different from BUWAL.



Coefficient Comparison Between Typical Substances (BUWAL/JEPIX)

Share of Digital Camera market



Economic Value Added and Environmental Impact of Products

Eco factor calculated by JEPIX	Supplier		RICHO	CANON	FUJIFILM	FUJIFILM	OLYMPUS
	Product name		Caplio-G4wide	IXY DIGITAL L	FinePix F410	FinePix S7000	E-1
12.8	CO ₂	Inventory data from Ecoleaf (kg)	1.39E+01	5.24E+00	7.05E+00	2.17E+01	1.93E+01
104	SOx(※1)		2.54E-02	4.29E-03	6.85E-03	4.64E-02	1.79E-02
677	NOx		2.26E-02	7.28E-03	8.67E-03	3.50E-02	2.35E-02
6510	N ₂ O		1.35E-03	3.51E-04	4.31E-04	1.92E-03	1.29E-03
268.8	CH ₄		1.07E-04	6.84E-05	9.60E-05	1.65E-04	2.54E-04
59	CO		5.79E-03	8.85E-04	1.50E-03	9.11E-03	3.56E-03
1062	NM VOC		2.09E-04	1.34E-04	1.88E-04	3.23E-04	4.97E-04
1062	CxHy(※2)		5.09E-04	1.49E-04	1.84E-04	4.98E-04	5.45E-04
5053	Dust(※3)		2.59E-03	8.47E-04	7.93E-04	4.34E-03	2.17E-03
58.67	Landfilling waste(※4)		5.87E+01	4.96E-01	7.48E-01	5.93E+00	2.06E+00
Environmental Impact of Products			385.788315	108.511713	148.001507	690.360926	406.65774
Economic Value Added supposed by sales amount			Low	High	High	Low	Low

Utilization as a indicator of Environmental Accounting

Environmental Accounting Portfolio (Sekisui Chemical Co., Ltd)

