

Comparison of “CO₂ Efficiency” between Company and Industry

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Introduction

Eco-Efficiency
┌ **Economic**
└ **Eco**logical (Environment)

An important tool to achieve sustainable development

$$\text{Eco-Efficiency} = \frac{\text{Product or Service value}}{\text{Environmental influence}}$$

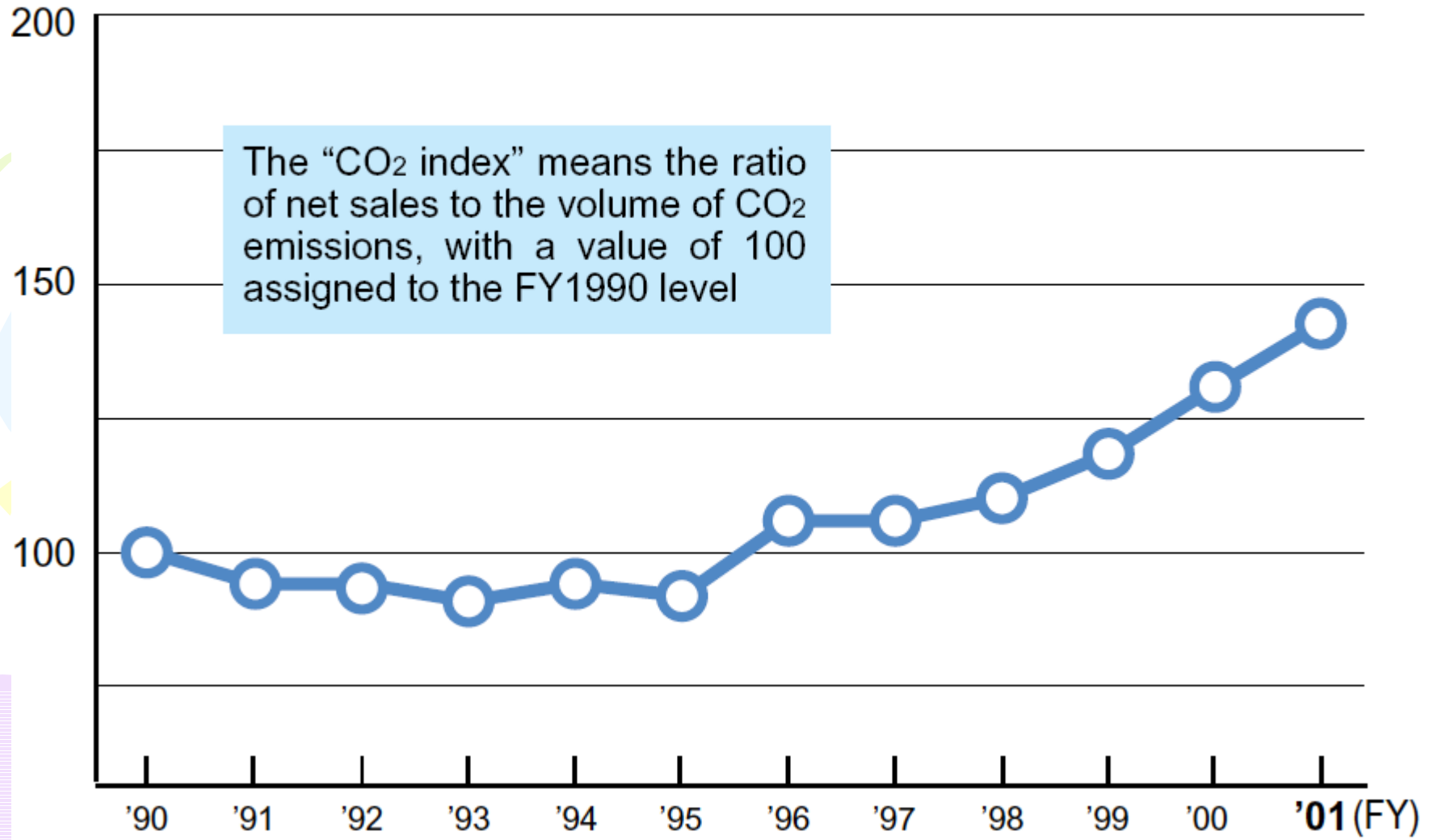
Quantity of goods or services produced or provided to customers
Net sales

Energy consumption
Materials consumption
Water consumption
Greenhouse gas emissions (CO2...)
Ozone depletion substance emissions
.....

<CO₂ Index due to Automobile Production> (Index)

$$\text{Eco-efficiency} = \frac{\text{Net sales}}{\text{Environmental impact}}$$

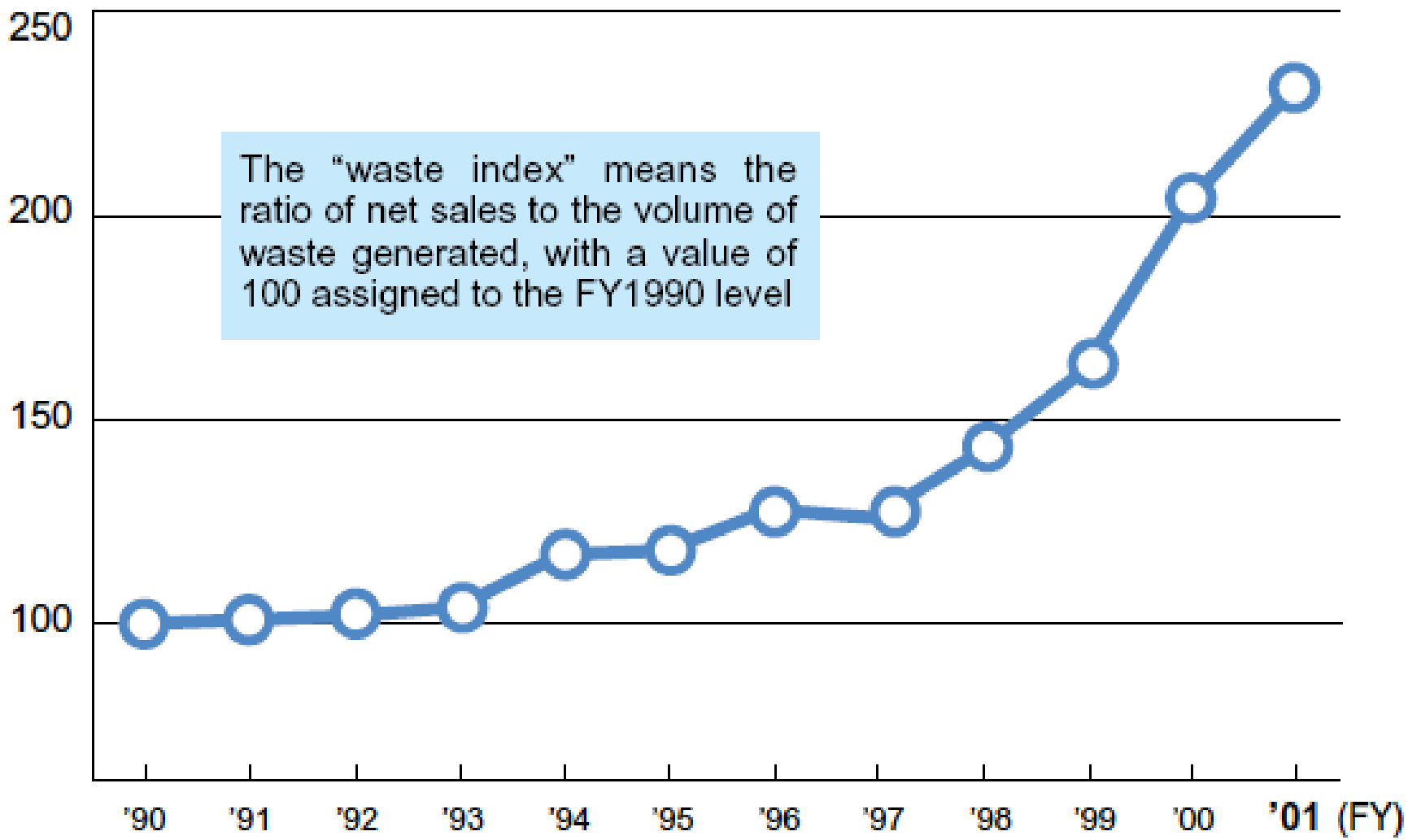
The "CO₂ index" means the ratio of net sales to the volume of CO₂ emissions, with a value of 100 assigned to the FY1990 level



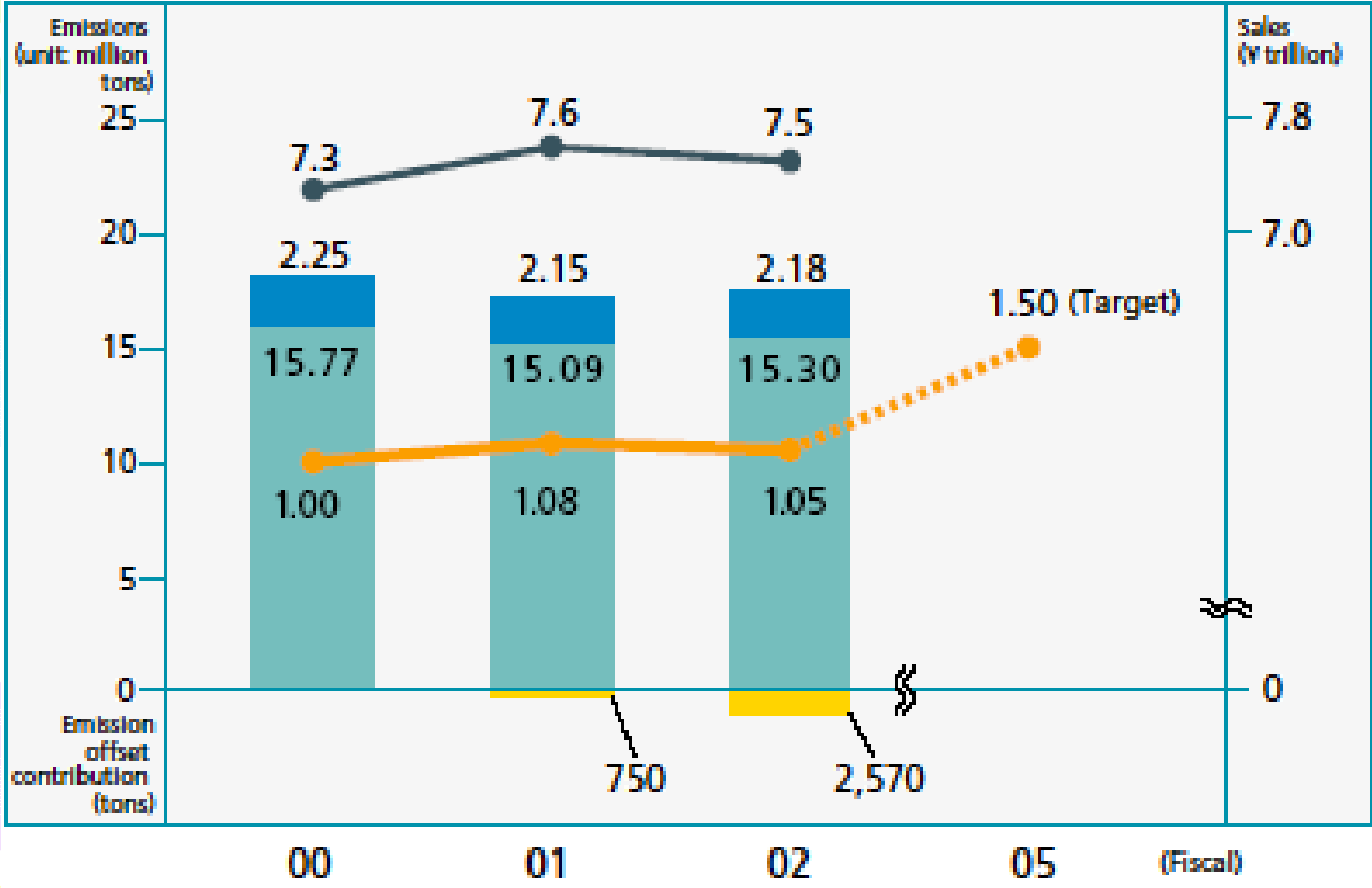
<Waste Index due to Automobile Production> (Index)

$$\text{Eco-efficiency} = \frac{\text{Net sales}}{\text{Environmental impact}}$$

The "waste index" means the ratio of net sales to the volume of waste generated, with a value of 100 assigned to the FY1990 level

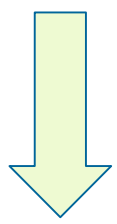


- Sales and operating revenue (¥ trillion)
- CO₂ emissions from business sites (unit: million tons)
- Eco-efficiency (times)
- CO₂ emissions from product use (unit: million tons)
- Emission offset contribution (unit: tons)



Source: Sony Environmental Report 2002

$$\text{Eco-Efficiency} = \frac{\text{Product or Service value}}{\text{Environmental influence}}$$



This study

- Price
- Gross value-added
- Gross income
- Cost

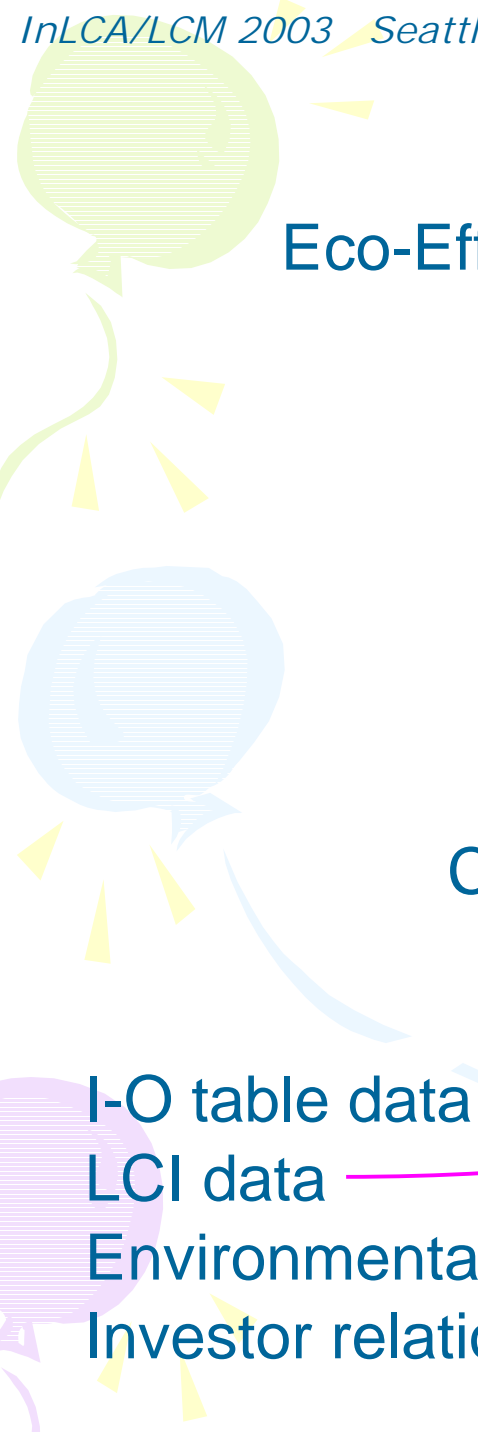
$$\text{CO2 Efficiency} = \frac{\text{Economic index}}{\text{CO2 emission}}$$

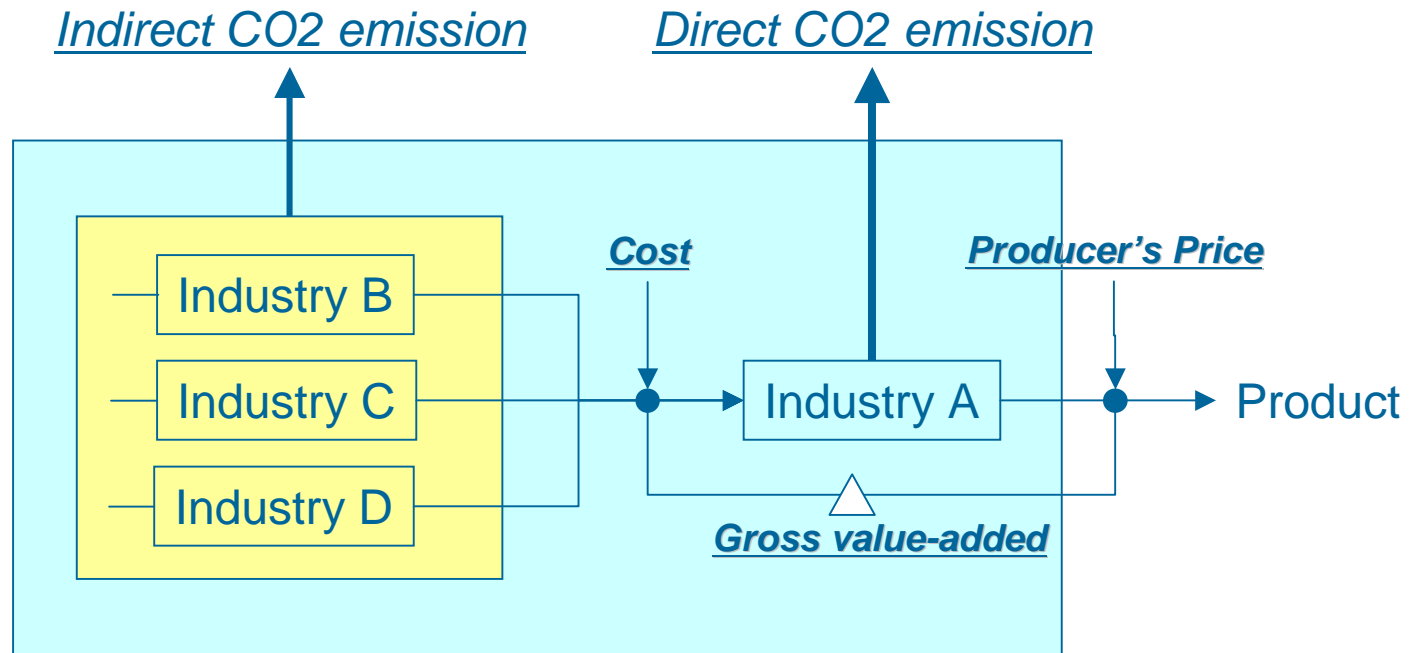
I-O table data

LCI data

Environmental report of company

Investor relation information





$$\text{Total CO2 efficiency} = \frac{\text{Producer's Price}}{\text{Total CO2 emissions}}$$

$$\text{Direct CO2 efficiency} = \frac{\text{Gross value-added}}{\text{Direct CO2 emissions}}$$

$$\text{Indirect CO2 efficiency} = \frac{\text{Cost}}{\text{Indirect CO2 emissions}}$$

Fig.1-1 Concept of CO2 efficiency

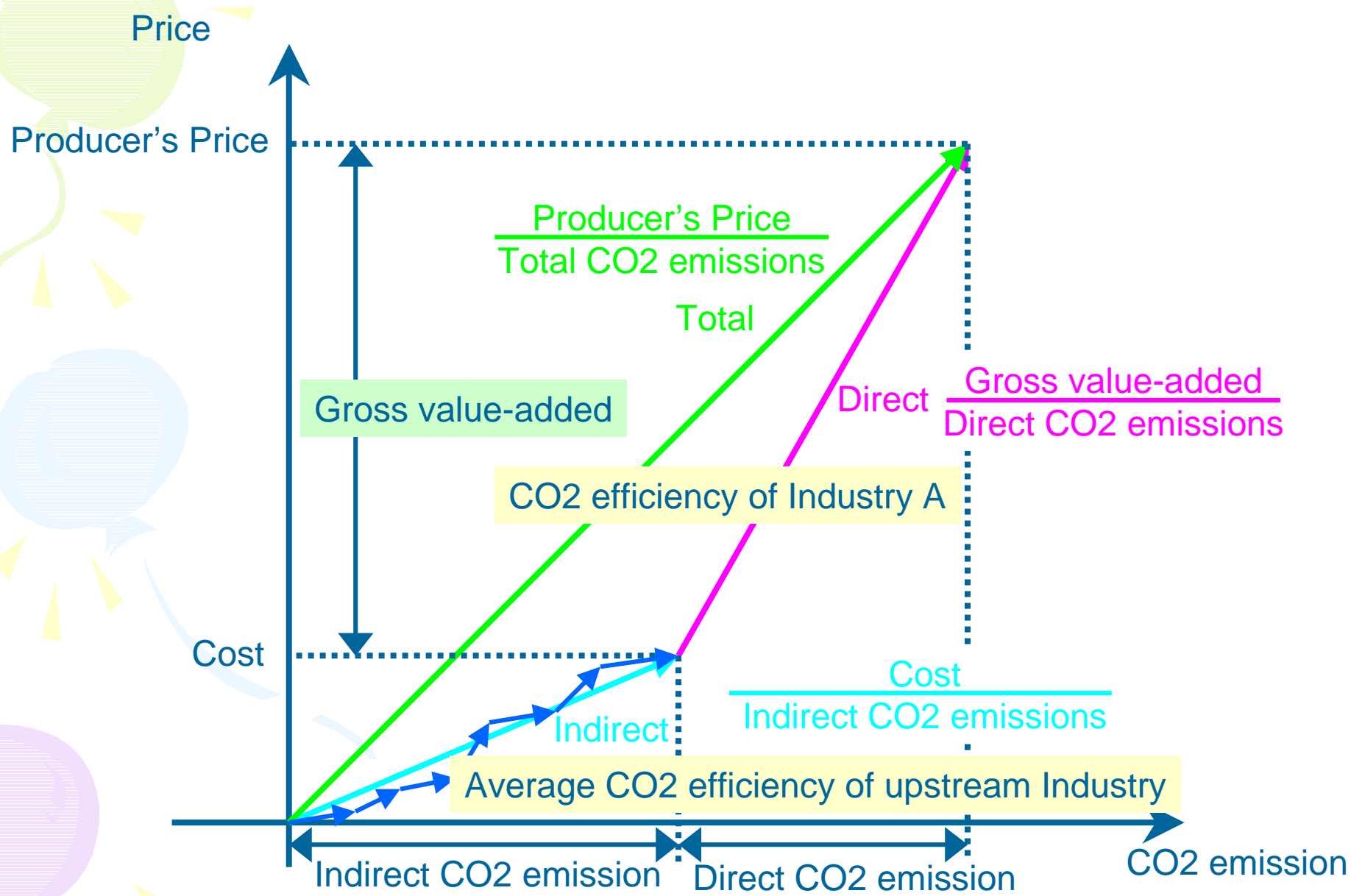


Fig.1-2 Concept of CO2 efficiency

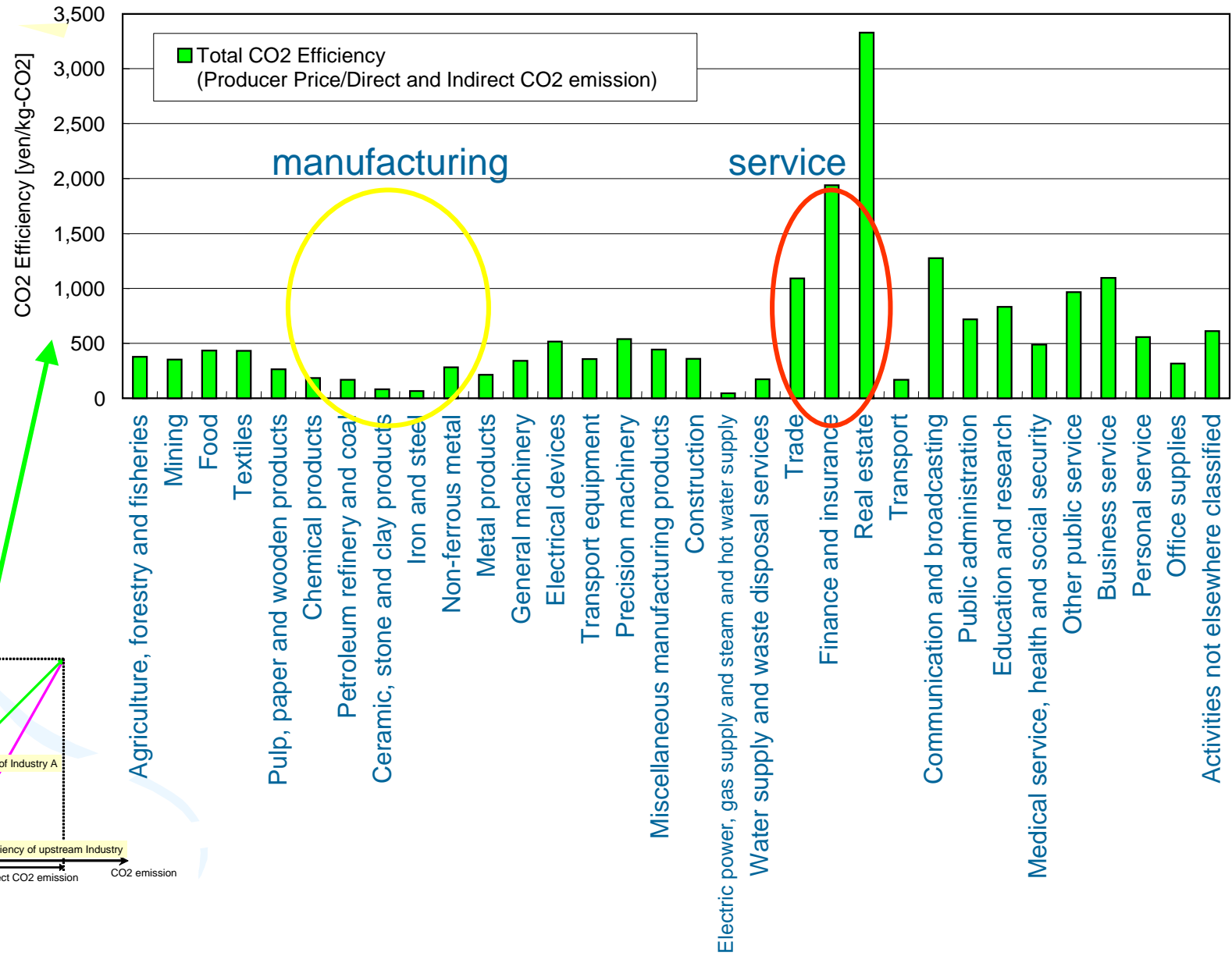


Fig.2 The Total CO2 Efficiency (Producer Price / Direct and Indirect CO2 emission) for each Industrial Sector

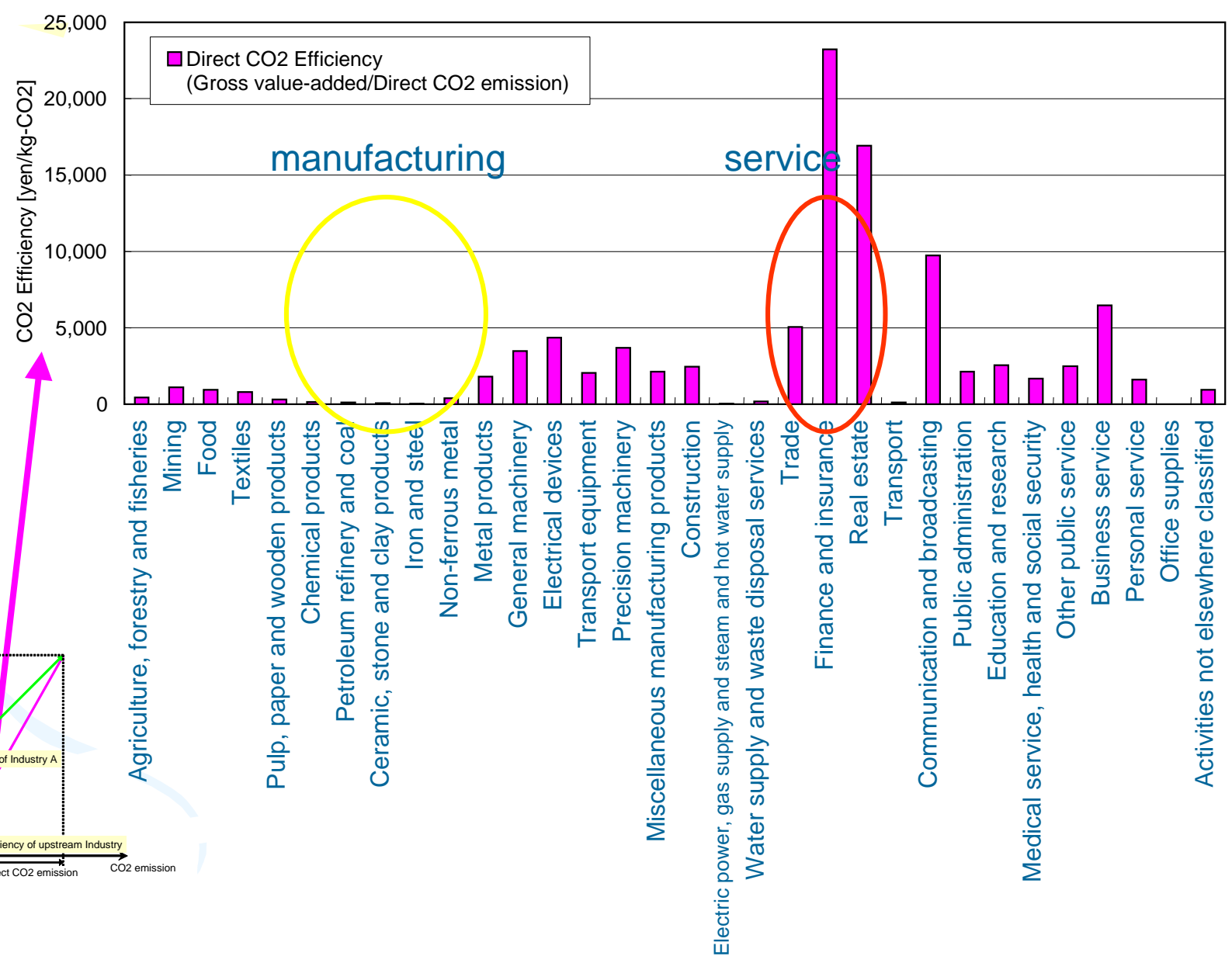


Fig.3 The direct CO2 Efficiency (Gross value-added / Direct CO2 emission) for each Industrial Sector

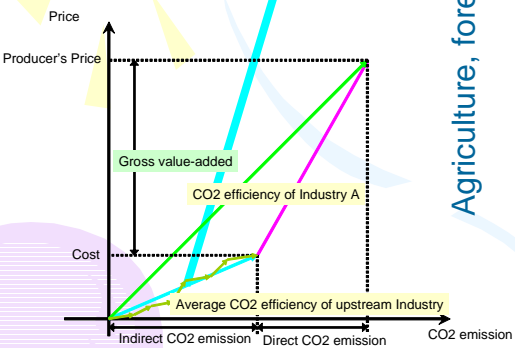
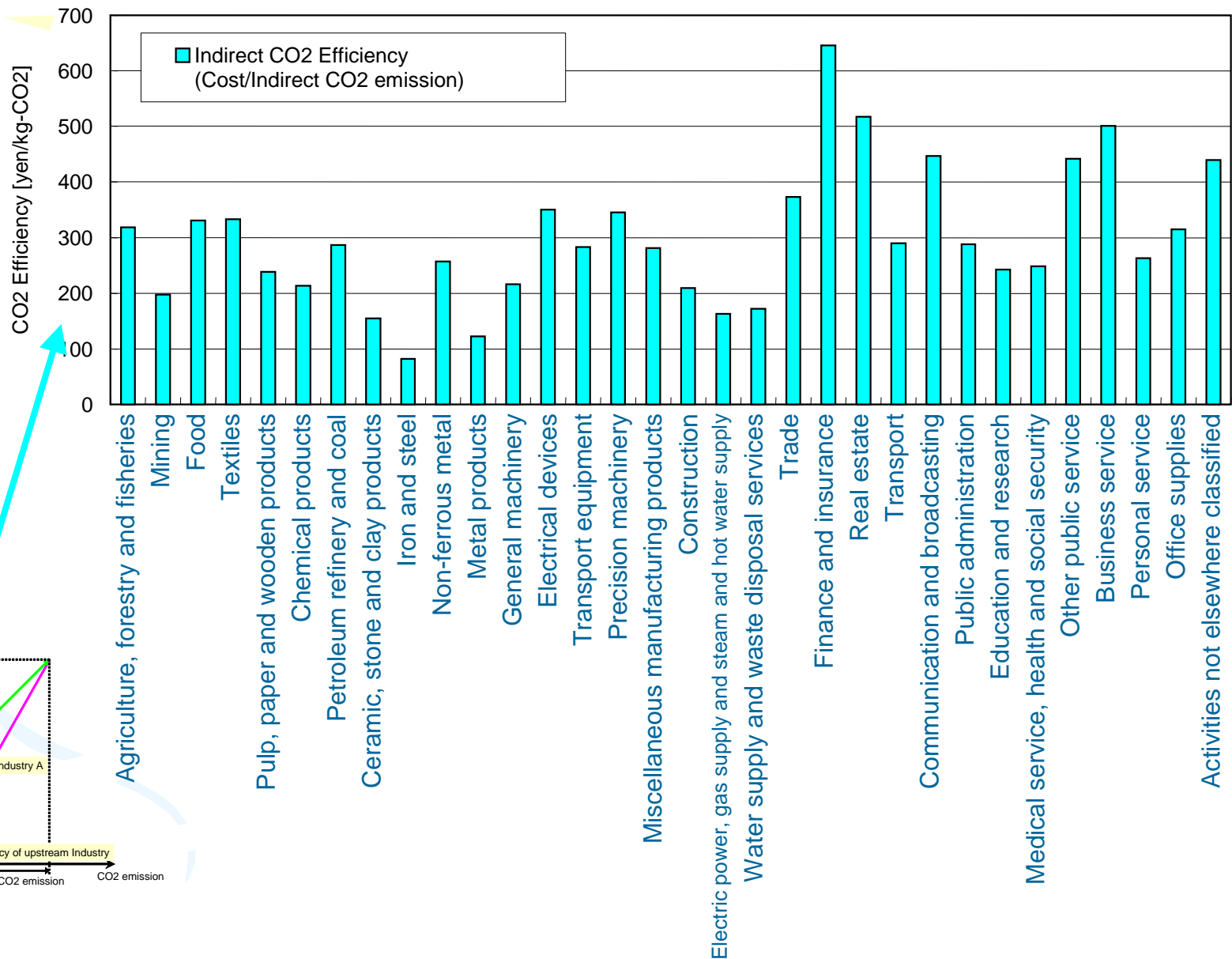


Fig.4 The indirect CO2 Efficiency (Cost / Indirect CO2 emission) for each Industrial Sector

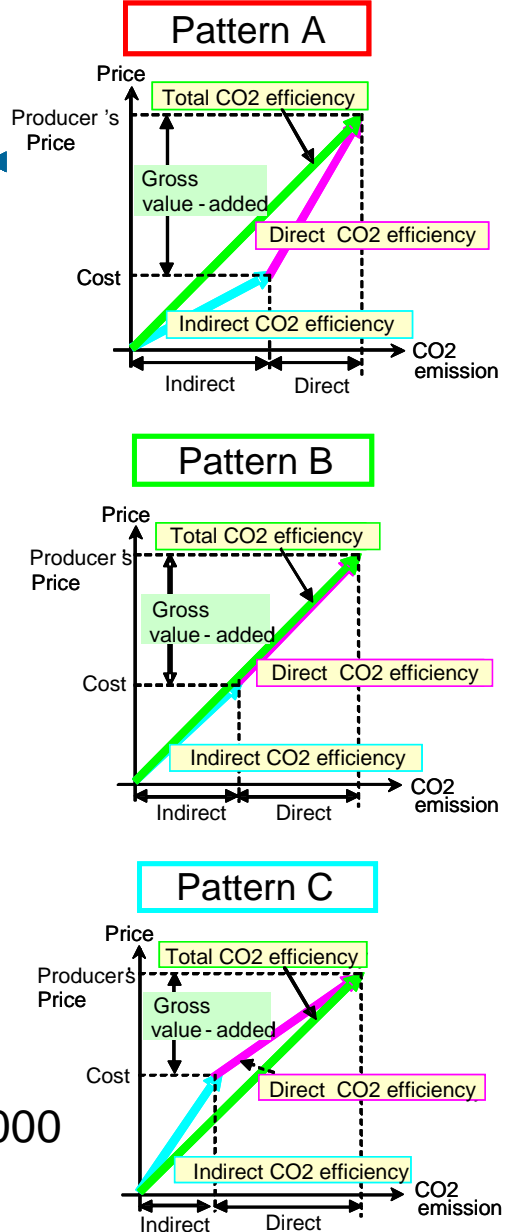
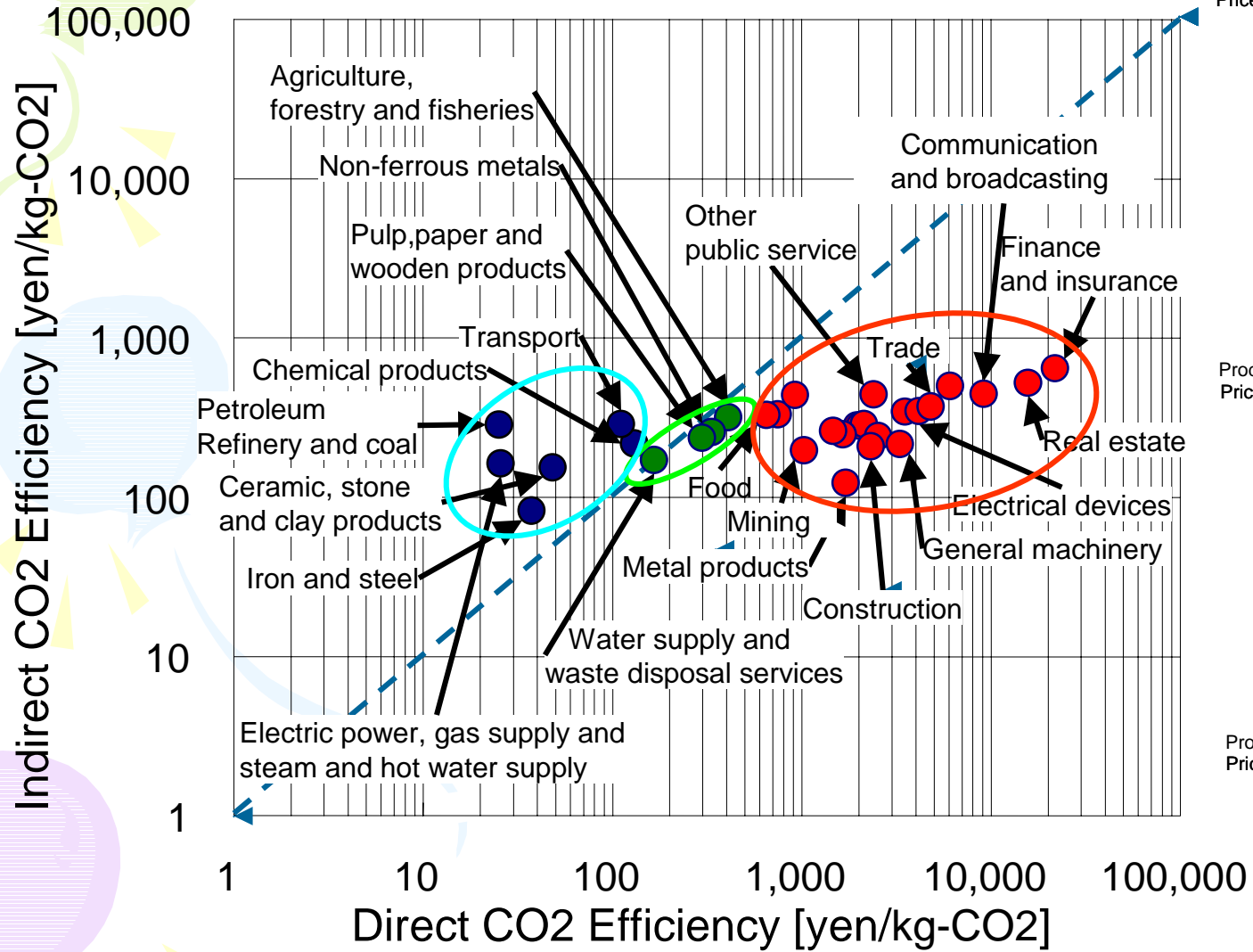


Fig.5 CO2 efficiency pattern for each Industrial Sector

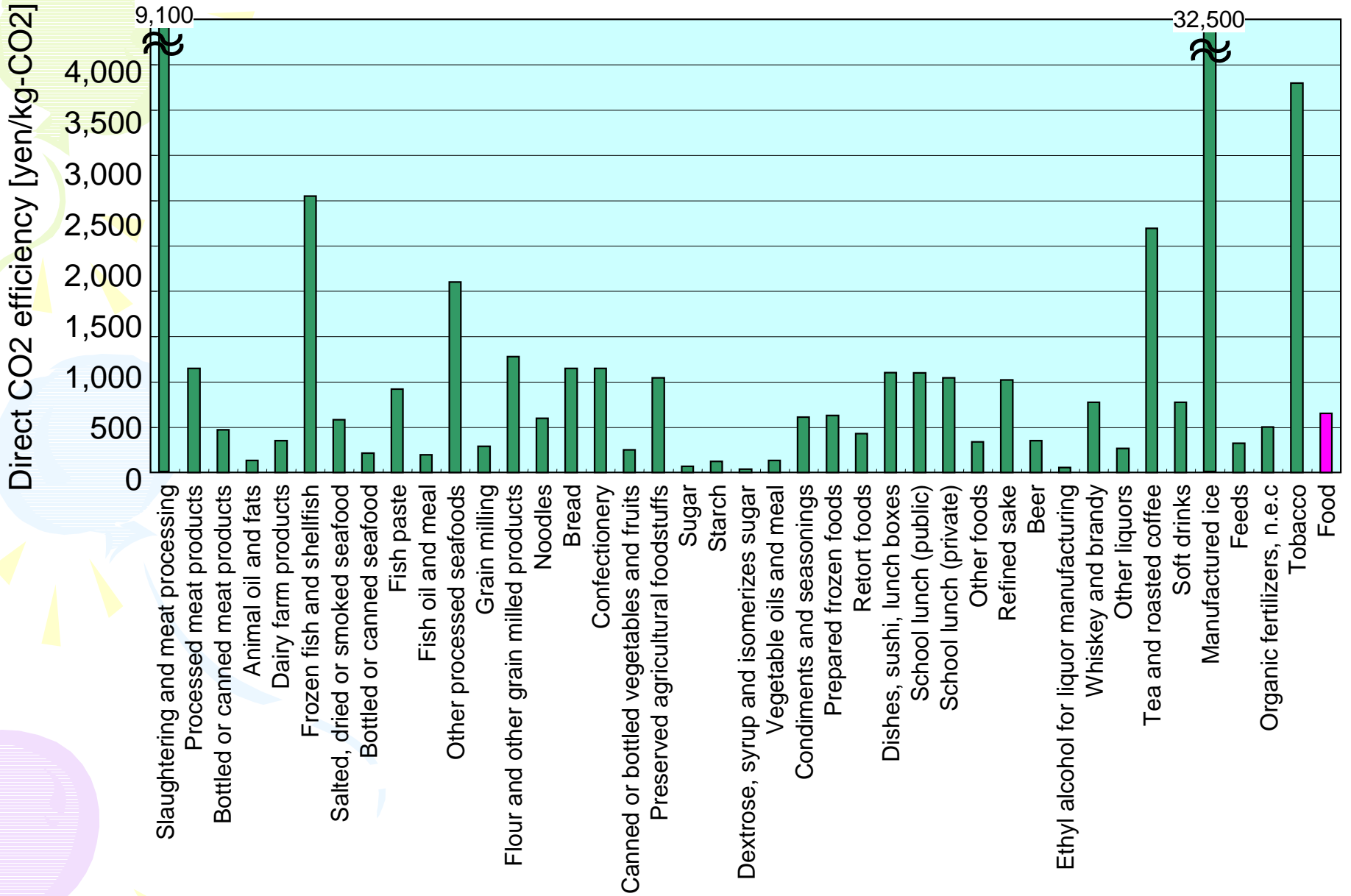


Fig.6 The direct CO2 Efficiency of Food Industrial Sector

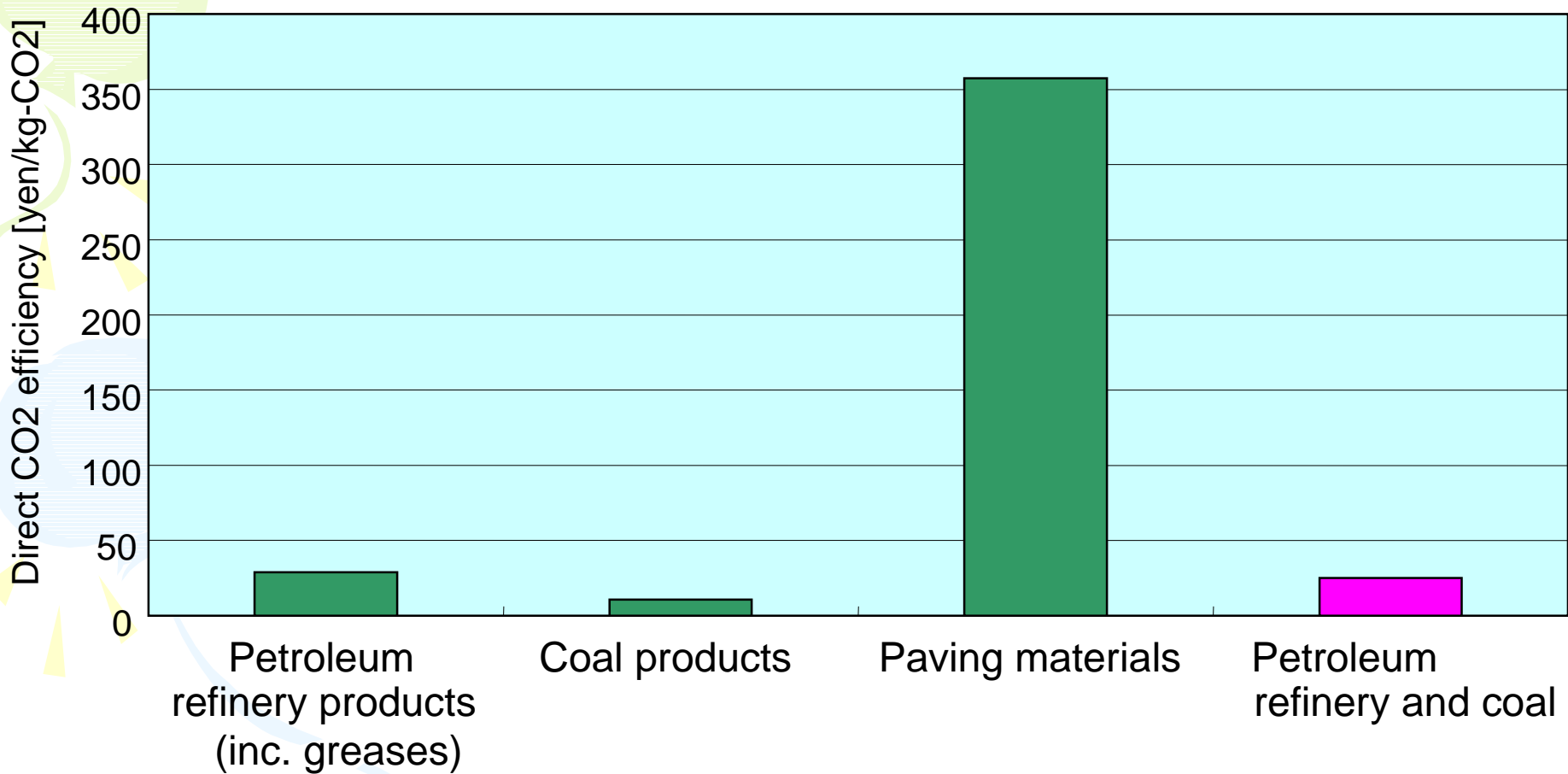
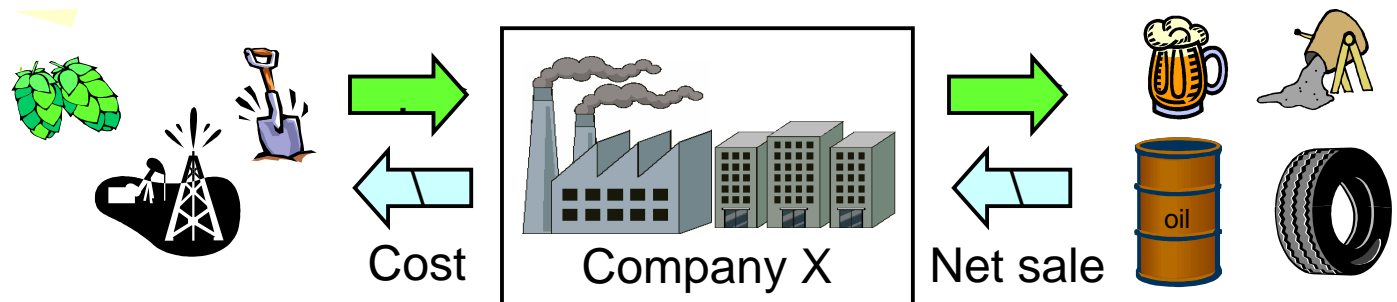


Fig.7 The direct CO2 Efficiency of Petroleum refinery and coal Industrial Sector



$$\text{Net sale} - \text{Cost} = \text{Gross Income}$$

$$\text{Direct CO2 efficiency} = \frac{\text{Gross Income}}{\text{Most of Direct CO2 emissions}}$$

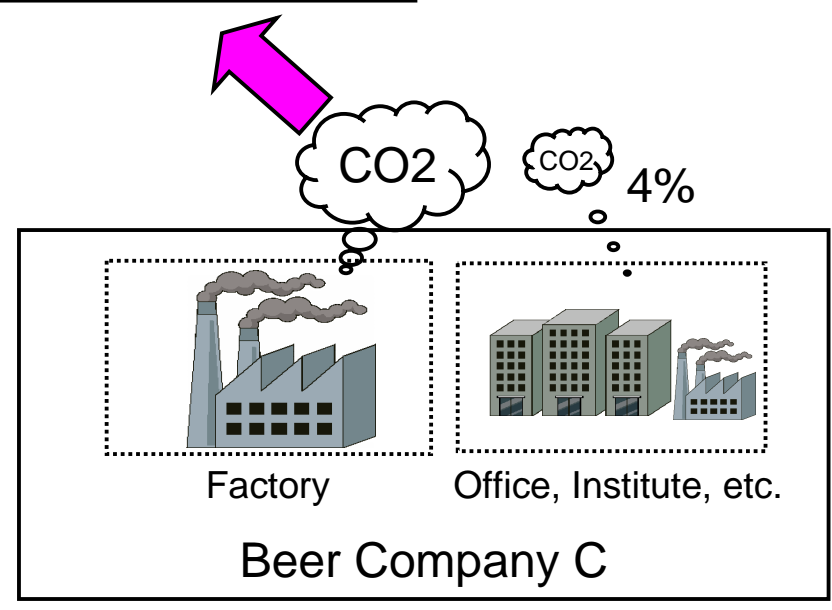
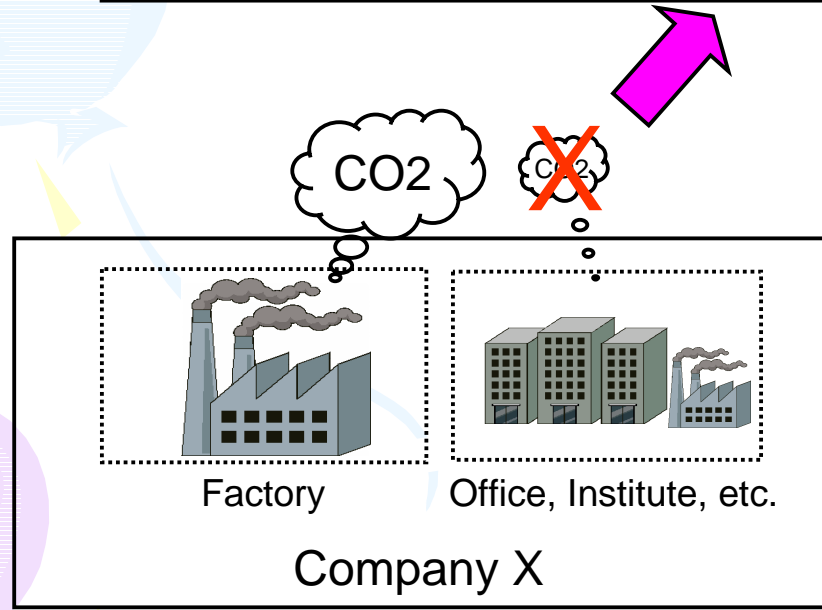


Fig. 8 Concept of Direct CO2 efficiency for companies

Beer

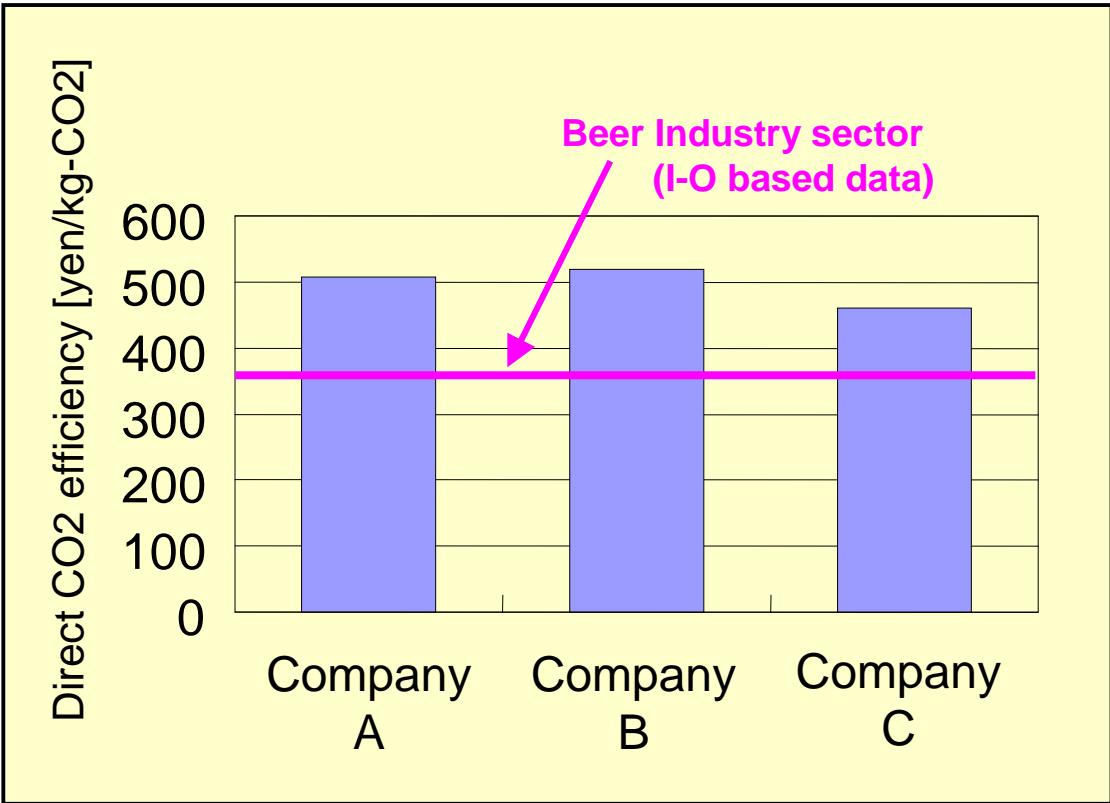
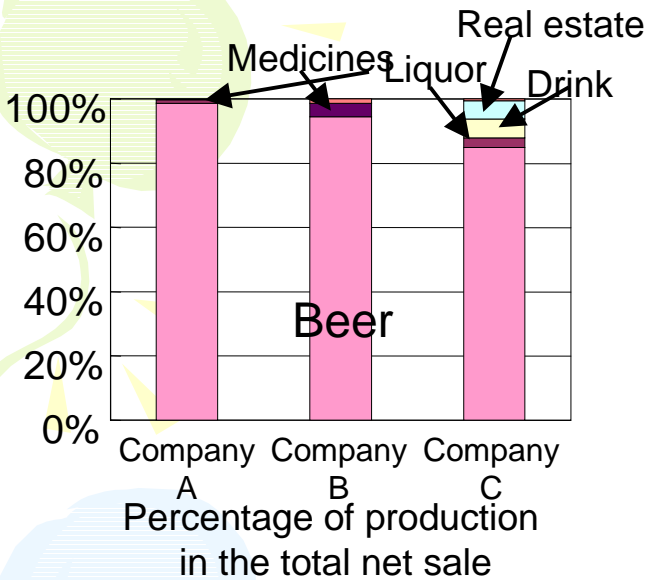


Fig.9 Direct CO2 Efficiency in the beer industry sector: 3 Companies' data from environmental reports against I-O based data

Petroleum

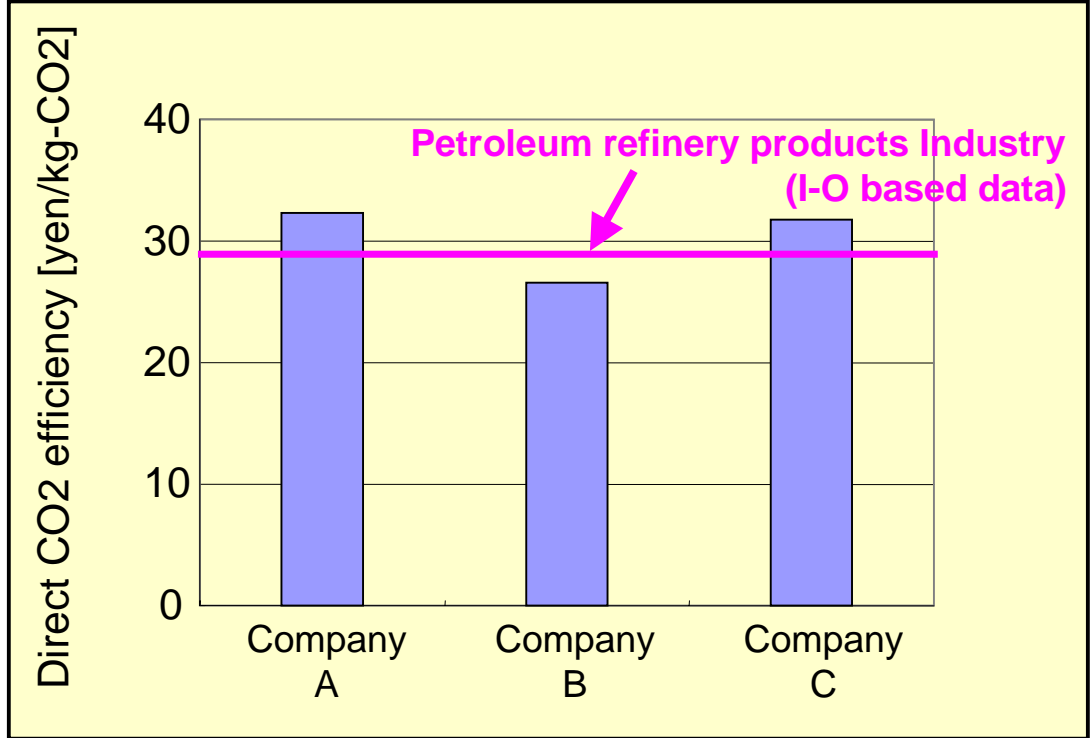
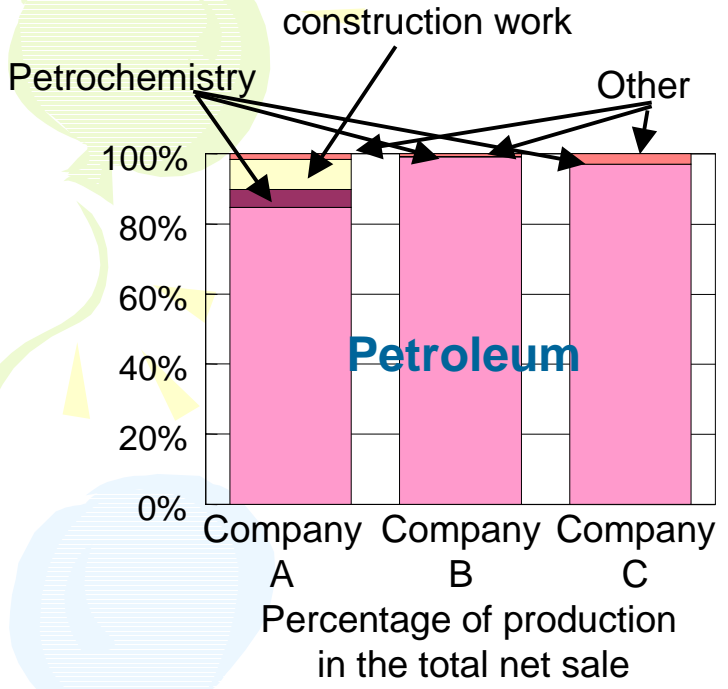


Fig.10 Direct CO2 Efficiency in the petroleum industry sector: 3 Companies' data from environment reports against I-O based data

Tire

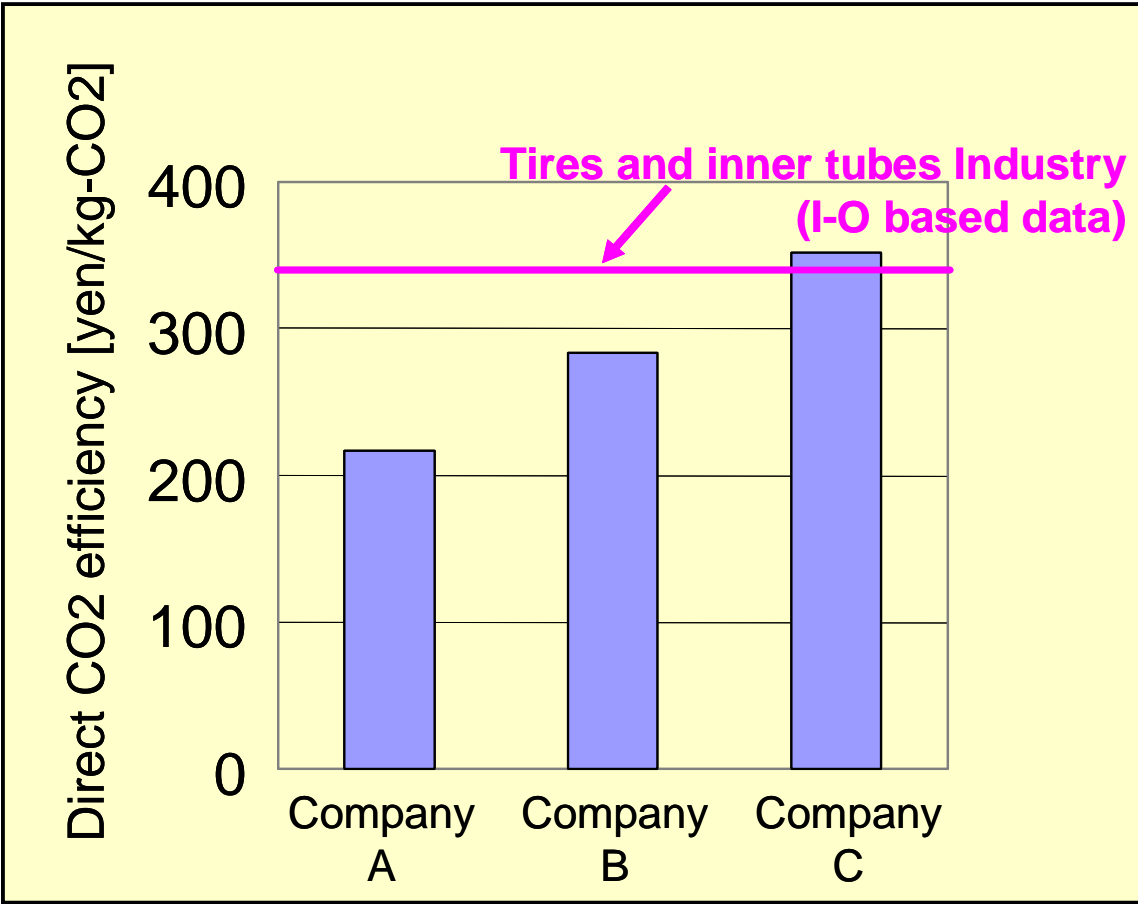
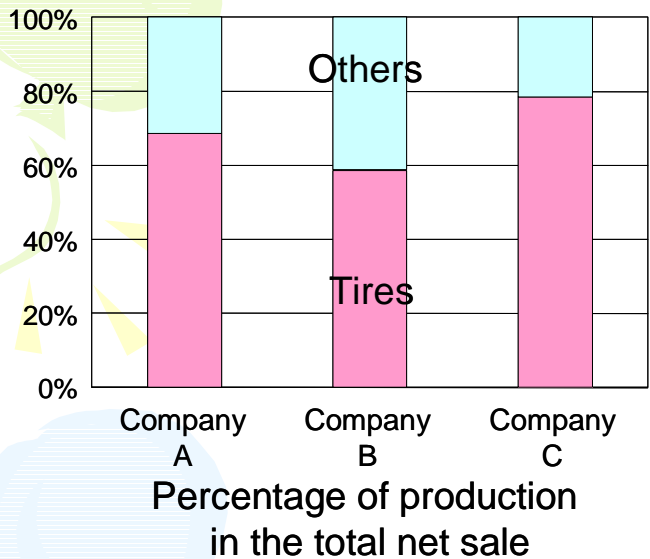
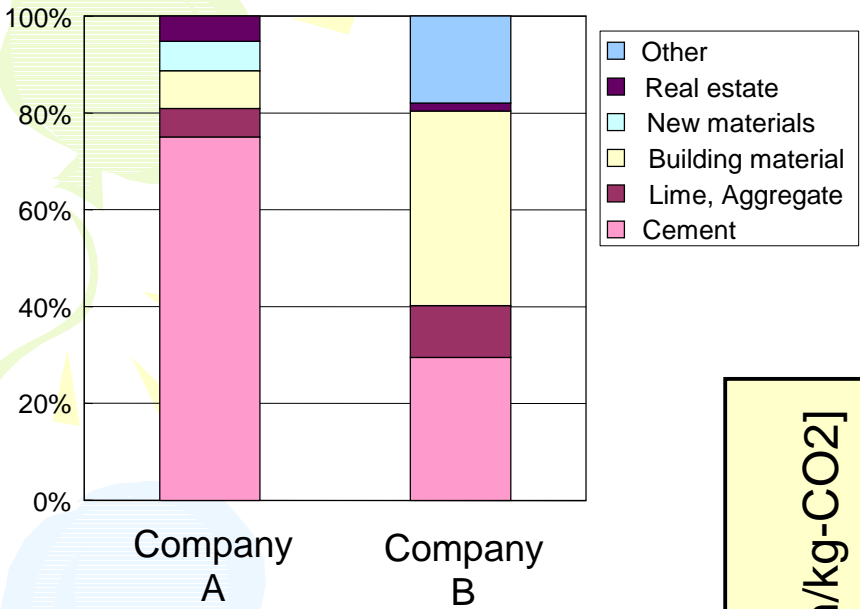


Fig.11 Direct CO2 Efficiency in the tire industry sector: 3 Companies' data from environment reports against I-O based data

Cement



Percentage of production in the total net sale

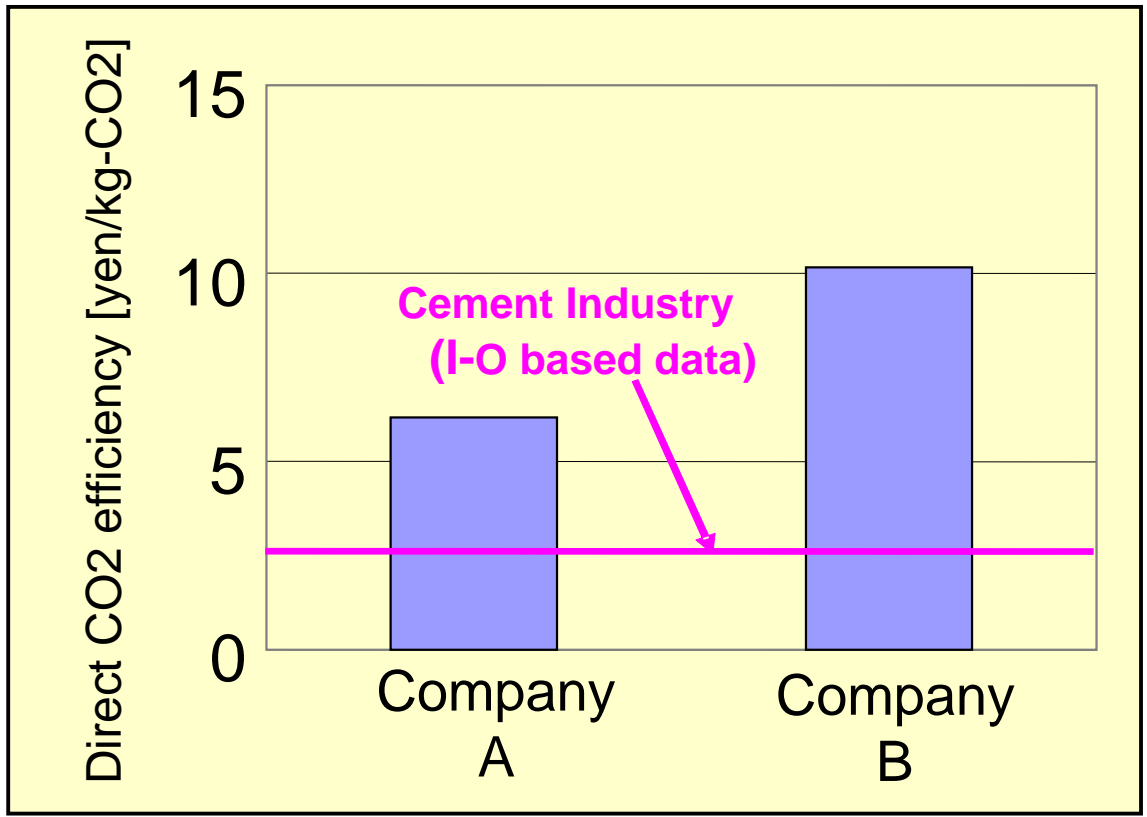


Fig.12 Direct CO2 Efficiency in the cement industry sector: 2 Companies' data from environment reports against I-O based data

Gross income/
Gross value-added

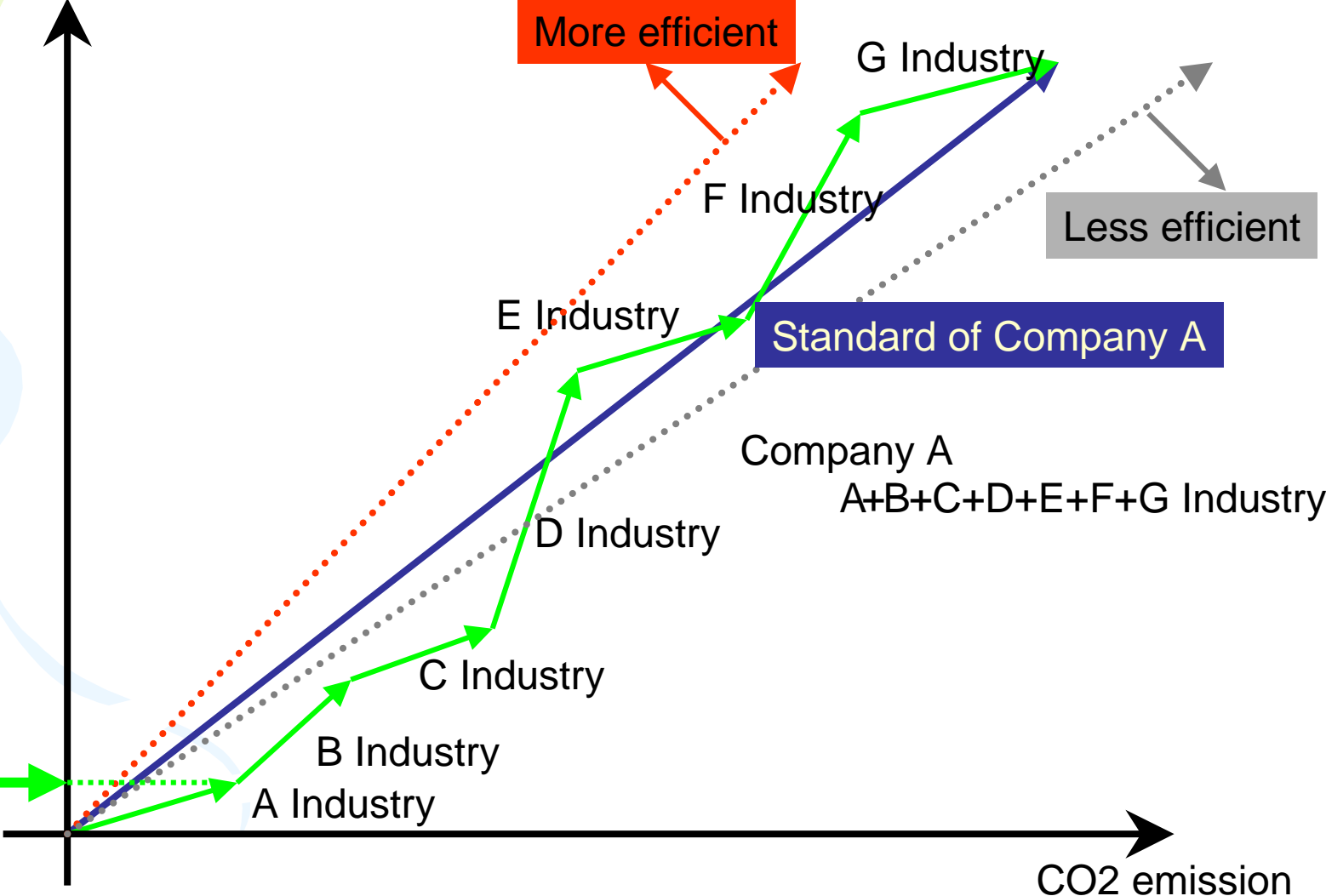


Fig.13 Concept of company evaluation

Conclusion

- CO2 efficiency index was developed from I-O table data for the evaluation of industry sectors.
- The CO2 efficiency varies by industry sector.
- The comparison of companies' CO2 efficiency against I-O based industry sector CO2 efficiency is possible.
- A clear definition of system boundary will be necessary for better resolution of company's CO2 efficiency.
- Further examination and comparison of company's "eco-efficiency" and its detailed investigation in relation to economic value index should be explored.