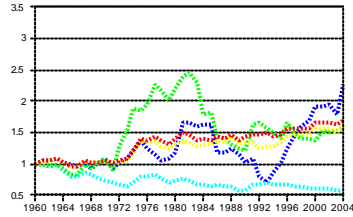


# Jukka Hoffrén: The Eco-efficiency Analysis of a National Economy - The Case of Finland

Development of different eco-efficiencies of Finnish economy 1960-2004



The Finnish eco-efficiency of production has improved by Factor 1,7 in the period 1960-2004. Industrial and societal eco-efficiencies have improved by Factor 1,6 in the same period.

The potential eco-efficiency of production measure indicates possibility to Factor 2,7 improvement.

The human eco-efficiency measure shows Factor 0.59 decline in overall potential for welfare.

The different eco-efficiency measures indicate that not all possibilities to increase eco-efficiency are utilised in Finnish economy.

**Eco-efficiency formulas utilised :**

Eco - efficiency 1 =  $\frac{GDP}{DMF}$  (= Eco - efficiency of production )

Eco - efficiency 2 =  $\frac{EDP1}{DMF}$  (= Industrial eco - efficiency)

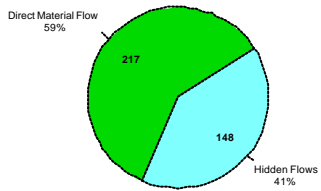
Eco - efficiency 3 =  $\frac{ISEW}{DMF}$  (= Societal eco - efficiency)

Eco - efficiency 4 =  $\frac{HDI}{DMF}$  (= Human eco - efficiency)

Eco - efficiency 5 =  $\frac{SBM}{DMF}$  (= Potential eco - efficiency)

**GDP** = Gross Domestic Product  
**DMF** = Direct Material Flow  
**EDP1** = Environmentally adjusted Domestic Product 1  
**ISEW** = Index of Sustainable Economic Welfare  
**HDI** = Human Development Index  
**SBM** = Sustainable Benefit Measure

The Finnish Total Material Flow in 2003 (Million tonnes)

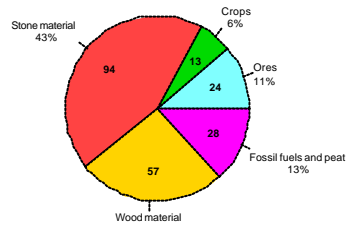


The Finnish Total Material Flow (TMF) totalled some 376 million tonnes in 2003.

The hidden flows now count for 41 percent of the DMF. In 1990 this ratio was only 32 per cent and in 1980 some 37 per cent

The driving force behind these increases is the material intensive growth of economy.

Division of Finnish Direct Material Flows in 2003 (million tonnes)

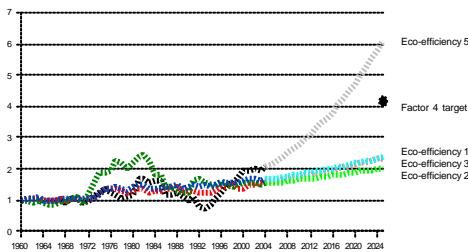


In 2003 the Direct Material Flow to Finnish economy totalled 222.8 million tonnes.

Since 1993 the Finnish DMF has risen some 48 million tonnes. Increase from 2002 to 2003 was some 8.7 million tonnes ie. 3.9 per cent

Preliminary data suggest that in 2004 the Finnish DMF will be some 220.8 million tonnes

Projections of different Finnish Eco-efficiencies till 2025

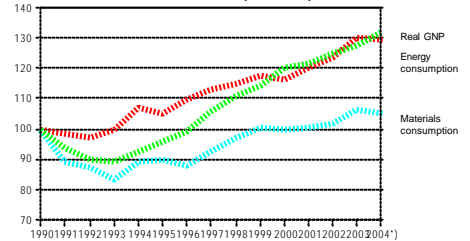


Different Finnish Eco-efficiency indicators shows quite different scenarios for future development.

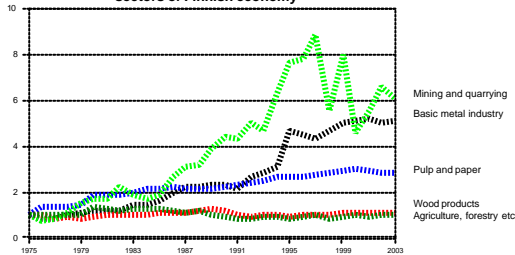
The potential eco-efficiency of production measure indicates possibility to Factor 6 improvement by 2025. More traditional measures indicate Factor 2-3 improvements by 2025.

The interpretation of these different eco-efficiency measures suggest that not all possibilities to increase eco-efficiency are utilised in Finnish economy.

Trends in real GNP and the consumption of energy and materials in Finland (1990=100)



Eco-efficiency of certain primary production sectors of Finnish economy



Eco-efficiencies of mining and quarrying and basic metal industry have improved most.

Also eco-efficiencies in pulp and paper and wood sectors have developed towards positive direction.

Eco-efficiencies of agriculture, forestry, fishing, civil construction, building as well as transport have been decreasing.

**Eco-efficiency of sector :**  

$$\text{Eco - efficiency 6} = \frac{\text{Value added}}{\text{Material flow}}$$

**Further steps to be taken**

Research will continue from macro-level studies to closer examinations of sector and especially company level eco-efficiencies.

Aim is to develop a suitable indicator to measure and evaluate the eco-efficiency performances of certain specific forest industry companies.

Benchmarking, based on sectoral eco-efficiency indexes, will be the basis for evaluating companies' eco-efficiency performances within the whole forest industry.

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