

Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Peter Taylor

Acting Head, Energy Technology Policy Division

IEEJ Workshop, 7 July 2008, Tokyo

Worldwide Trends
in Energy Use and
Efficiency

*Key Insights from
IEA Indicator Analysis*

Overview

- IEA indicators work
- Global patterns of energy use and CO₂ emissions
- Understanding energy and CO₂ trends in the IEA
- Energy and CO₂ reduction potentials
- Conclusions

ENERGY
INDICATORS

Worldwide Trends
in Energy Use and
Efficiency

*Key Insights from
IEA Indicator Analysis*

INTERNATIONAL
ENERGY AGENCY 

© OECD/IEA - 2008

IEA Indicators Work

- Establish a harmonised framework for analysis
 - Harmonisation => Comparability
 - Comparability => Understanding of global trends and drivers
- Produce meaningful cross-country analysis to provide guidance to policy-makers on:
 - Underlying drivers (economic activity & structure, income, prices...)
 - Trends in energy use and CO₂ emissions
 - Energy efficiency opportunities and progress
 - Policy effectiveness

ENERGY
INDICATORS

Worldwide Trends
in Energy Use and
Efficiency

Key Insights from
IEA Indicator Analysis

INTERNATIONAL
ENERGY AGENCY 

© OECD/IEA - 2008

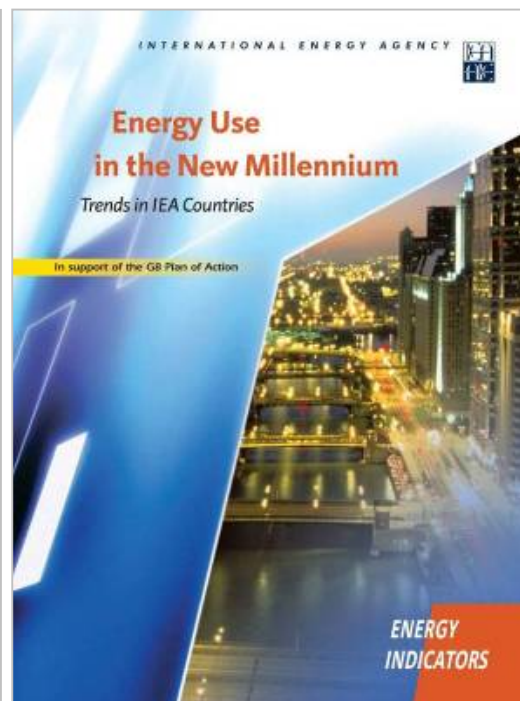
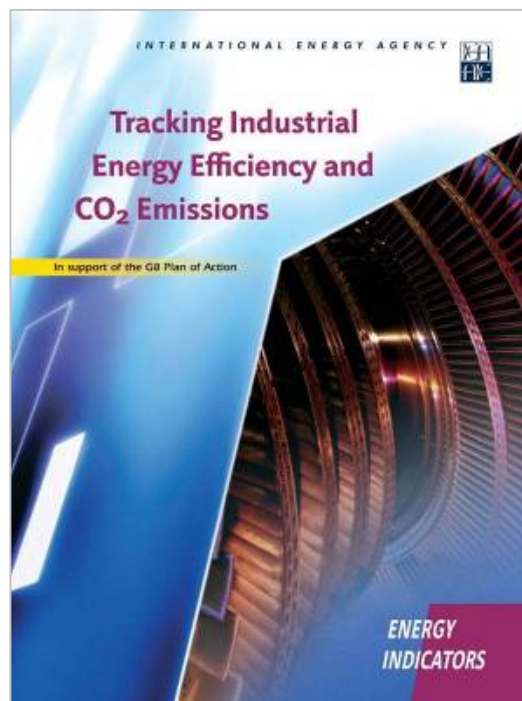
Key Outputs - Published Reports

ENERGY
INDICATORS

In support of the G8 Plan of Action

2007

2008



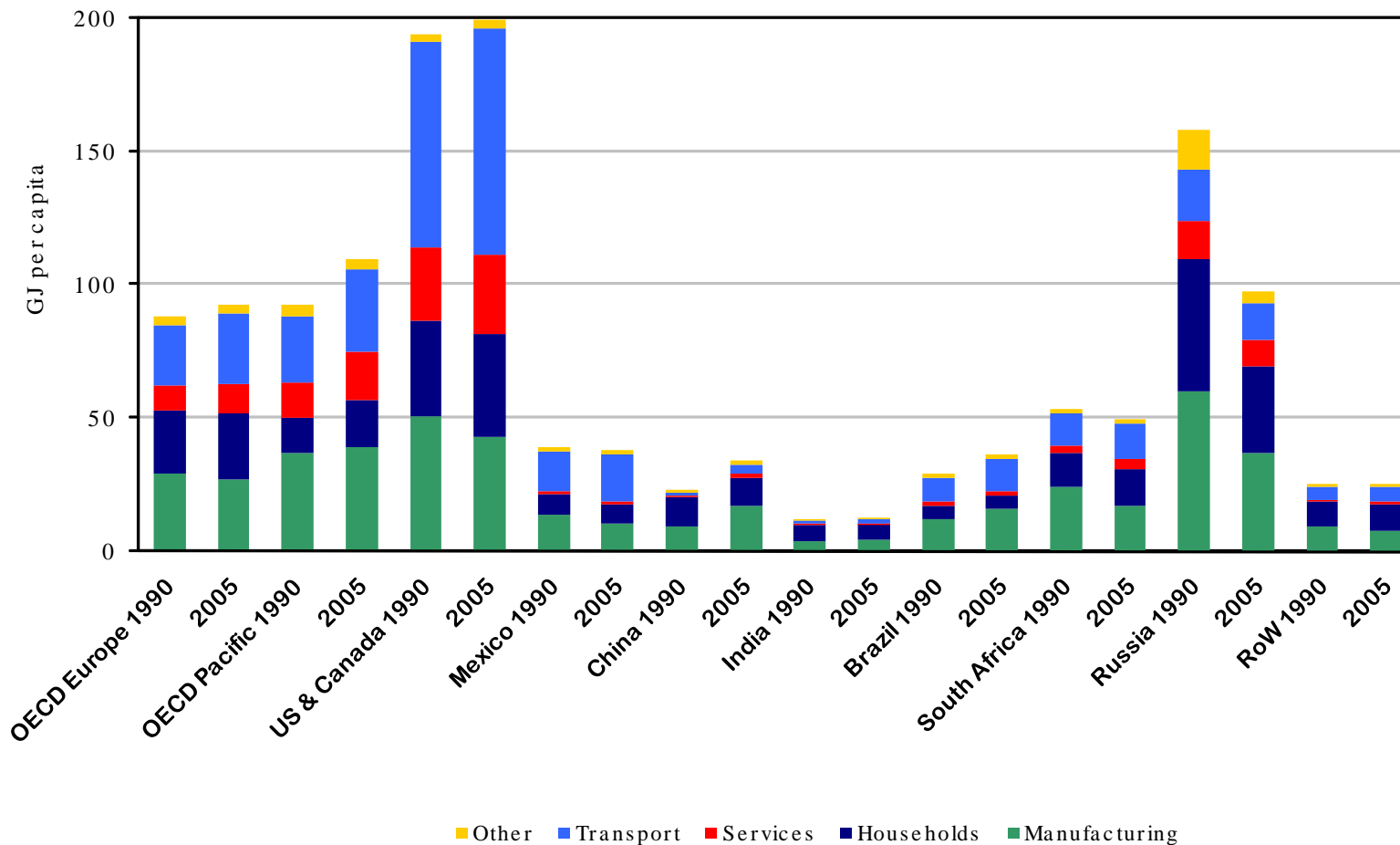
Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

INTERNATIONAL ENERGY AGENCY IAEA

Total Final Energy Consumption per Capita

ENERGY INDICATORS

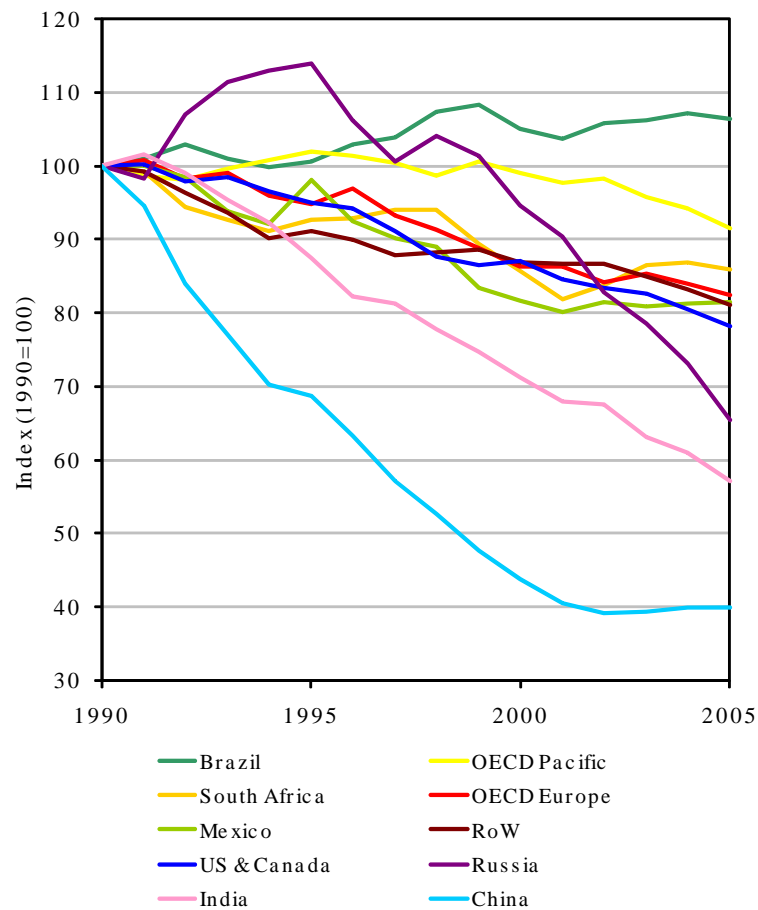


Worldwide Trends in Energy Use and Efficiency

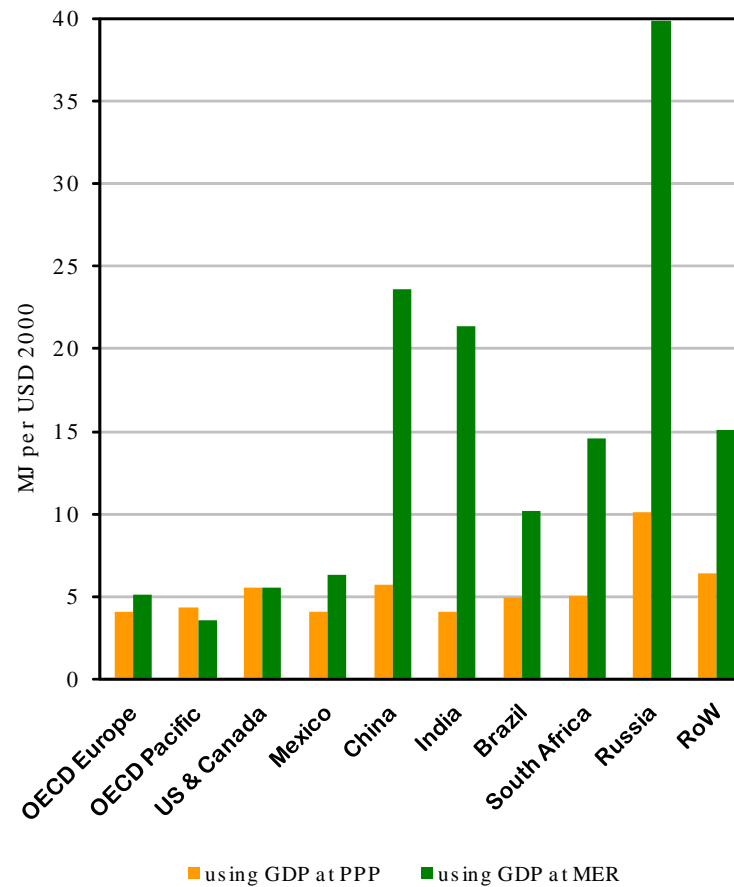
Key Insights from IEA Indicator Analysis

Total Final Energy Consumption per Unit of GDP

Index for 1990 to 2005



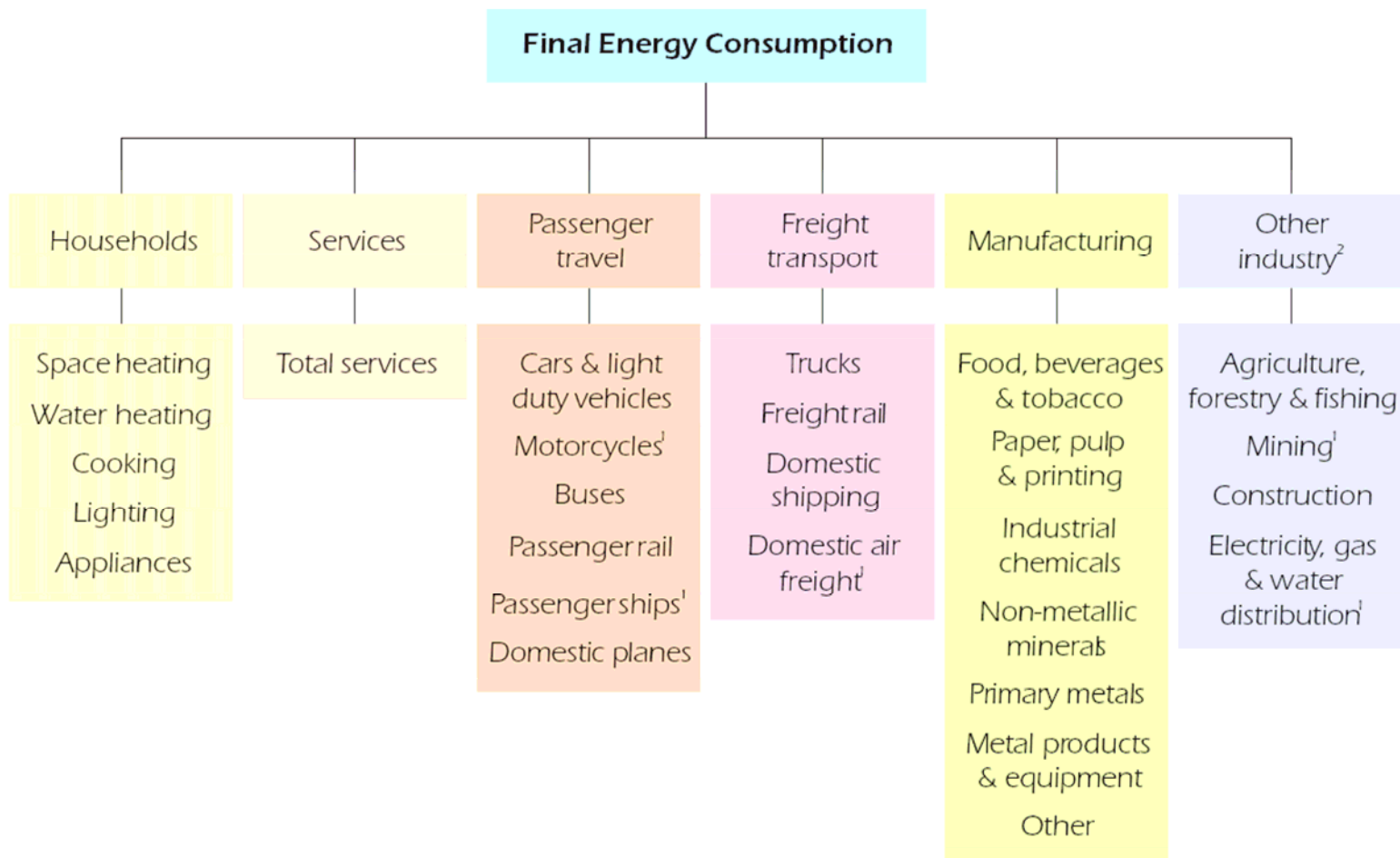
Absolute Values in 2005



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

End-Use Coverage for Indicators



¹ Not included in this study due to lack of consistent and reliable data series.

² Other Industry is included in the analysis only in the chapter Overall Trends and is not analysed separately.

Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Factors Affecting Energy Use and CO₂ Emissions

Households, services and transport - decomposition approach:

■ Energy Use

- Activity
- Structure (mix of activities)
- Energy intensity of each activity

■ CO₂ Emissions

- Energy use
- Fuel mix
- Carbon intensity of each fuel

ENERGY
INDICATORS

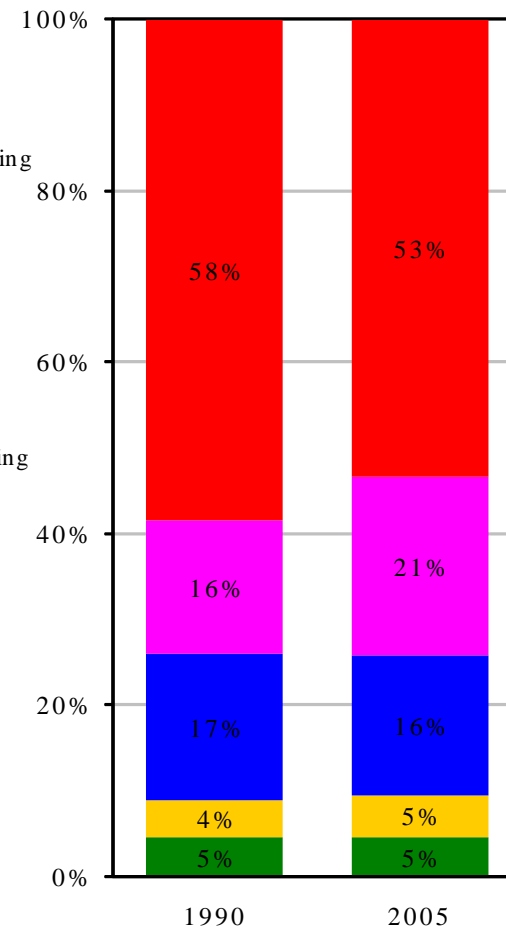
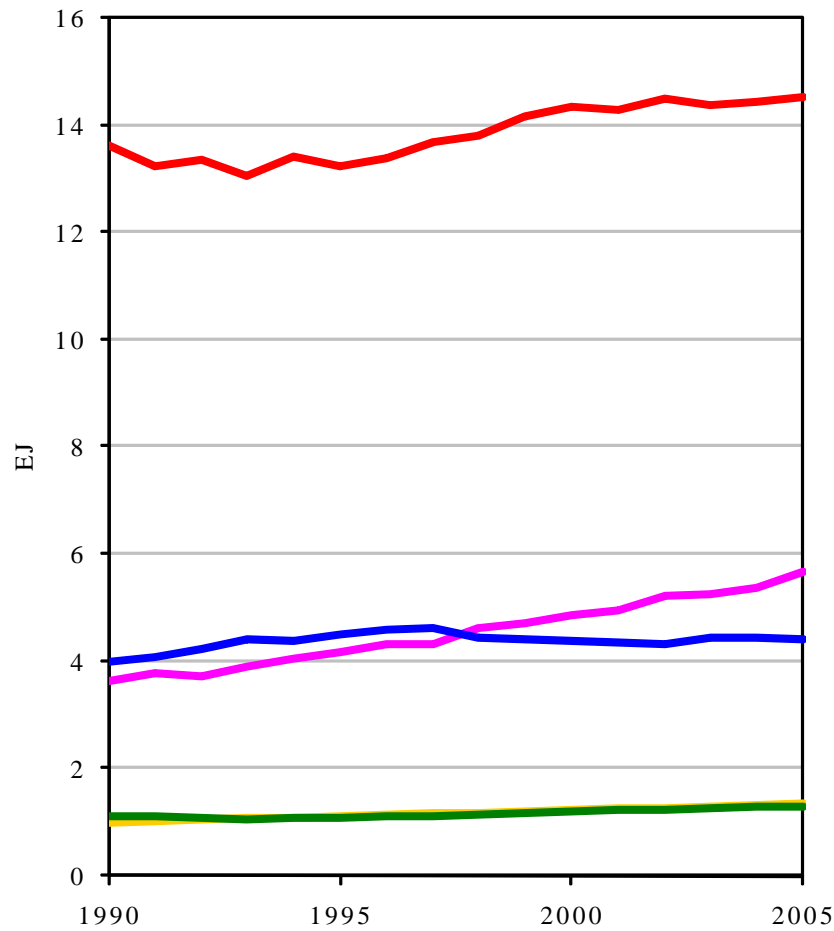
Worldwide Trends
in Energy Use and
Efficiency

Key Insights from
IEA Indicator Analysis

INTERNATIONAL
ENERGY AGENCY 

© OECD/IEA - 2008

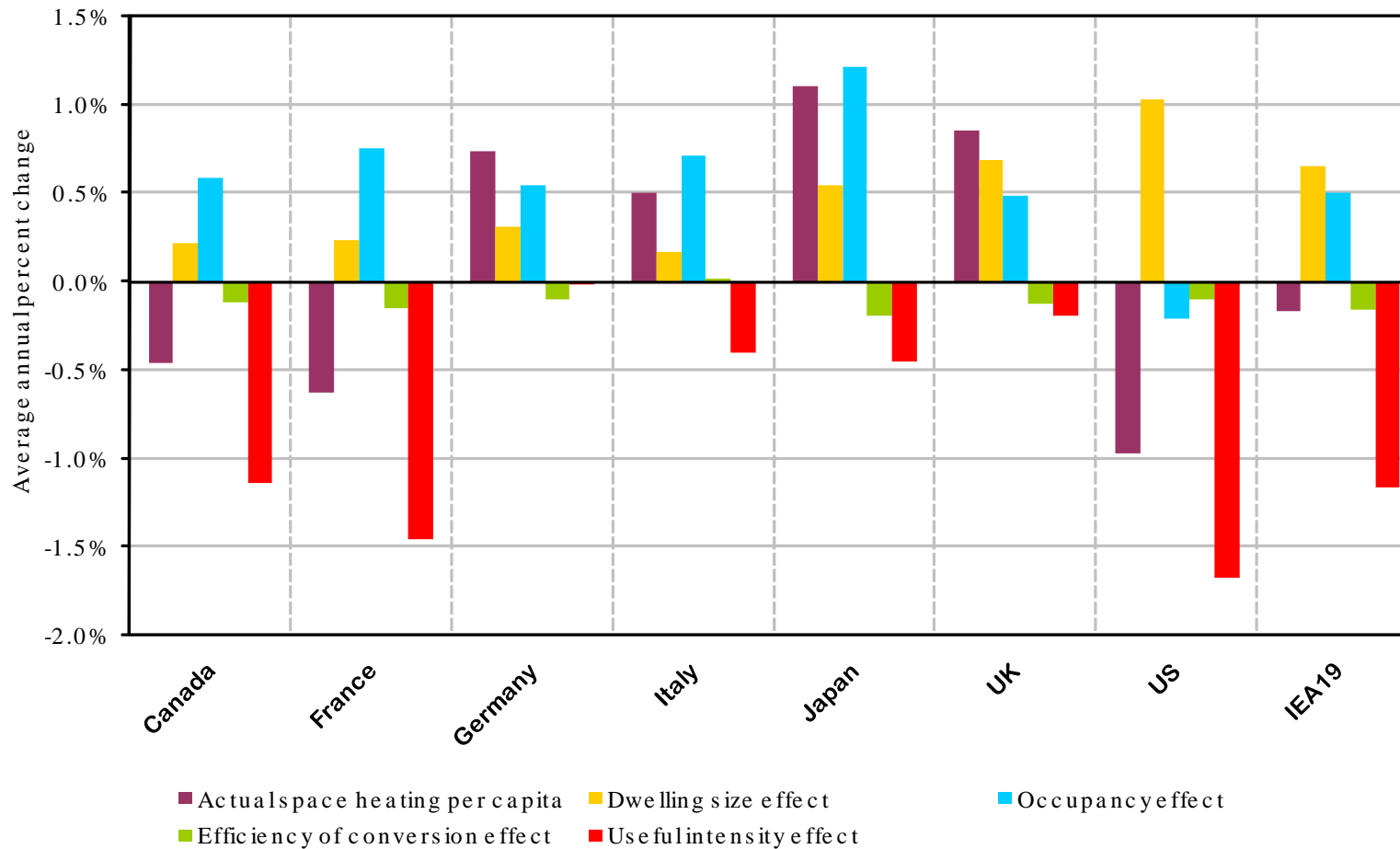
Household Energy Use by End-Use, IEA19



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Decomposition of Changes in Space Heating per Capita, 1990-2005

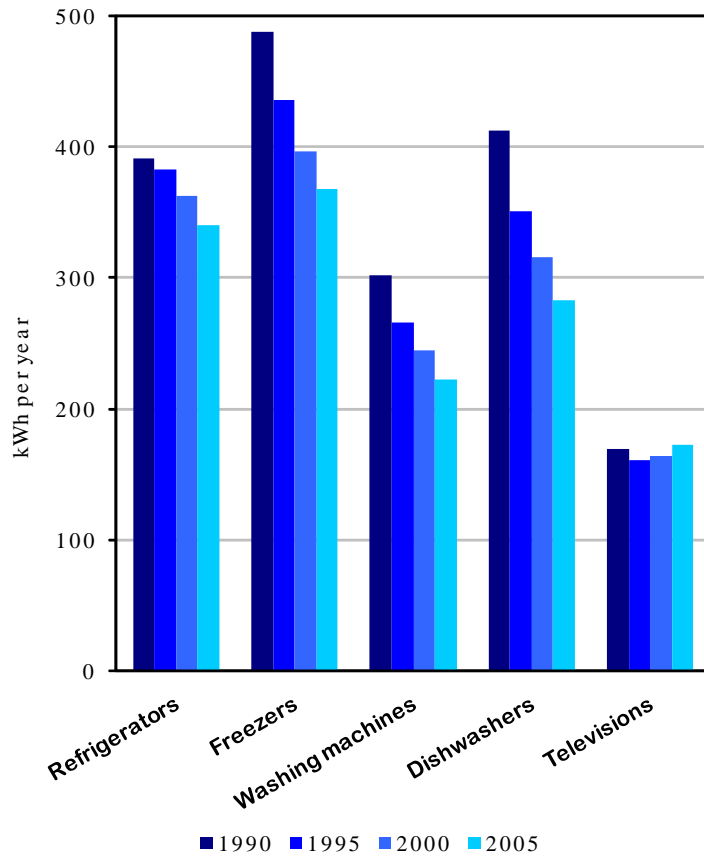


Worldwide Trends in Energy Use and Efficiency

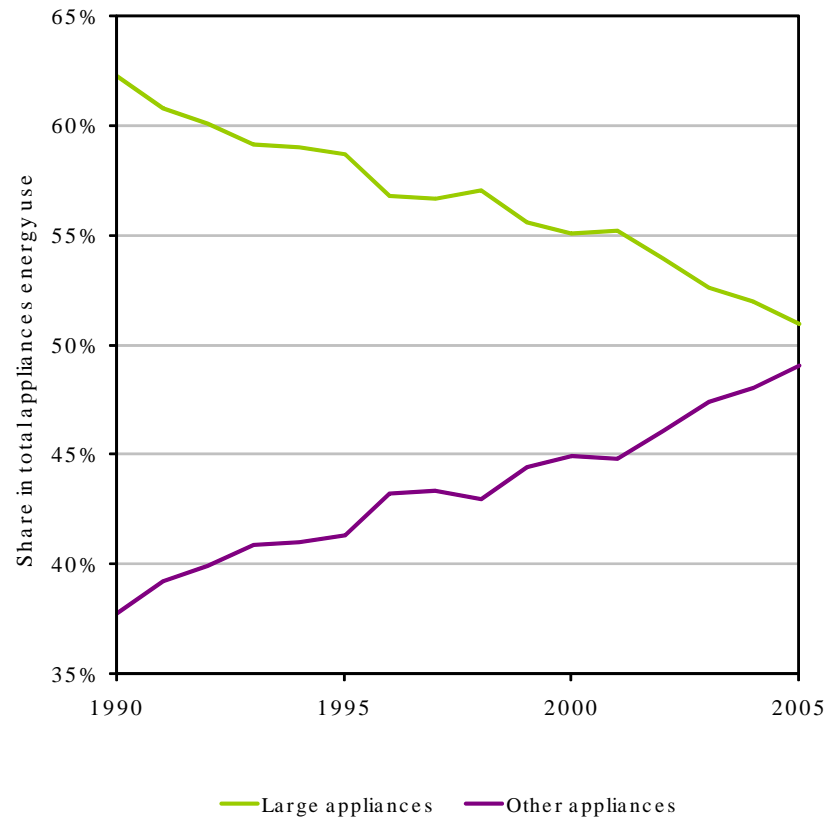
Key Insights from IEA Indicator Analysis

Energy consumption of Appliances, EU15

Average Unit Energy Consumption



Share of Large and Small Appliances



Source: ODYSSEE

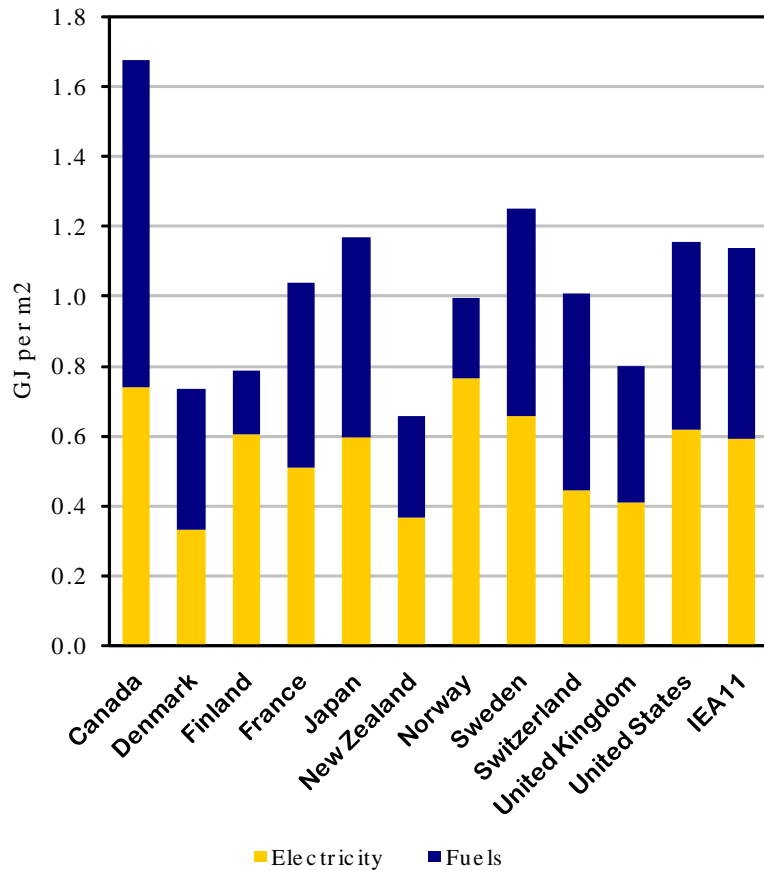
Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

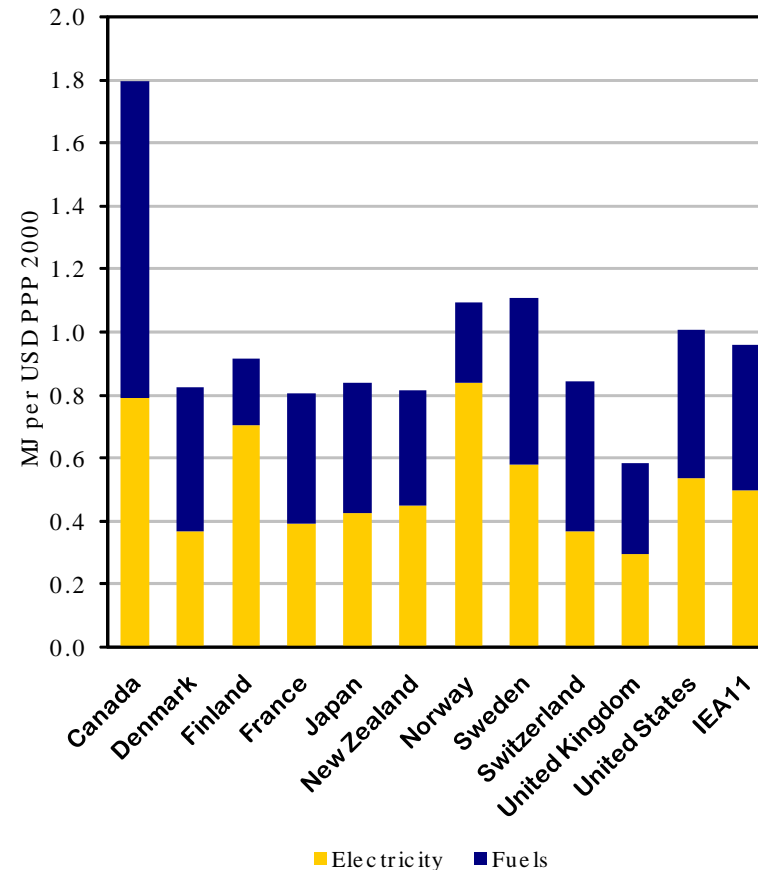
Measures of Energy Intensity in the Service Sector, 2005

ENERGY INDICATORS

Energy Use per Unit of Floor Area



Energy Use per Value-Added

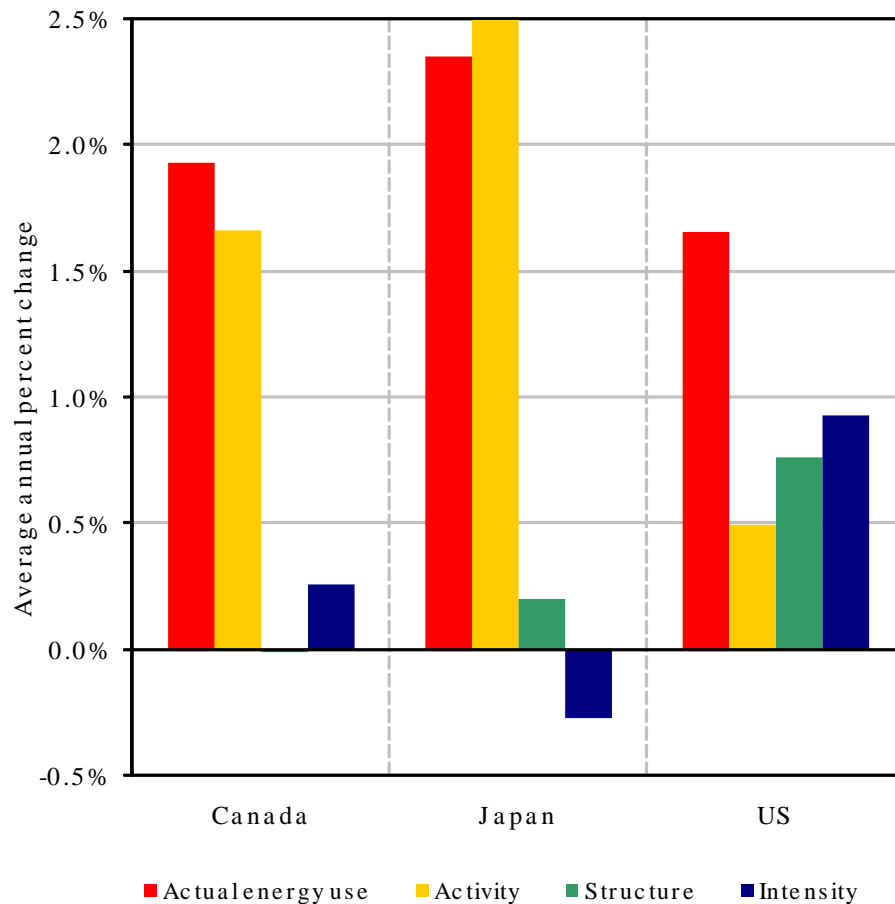


Worldwide Trends in Energy Use and Efficiency

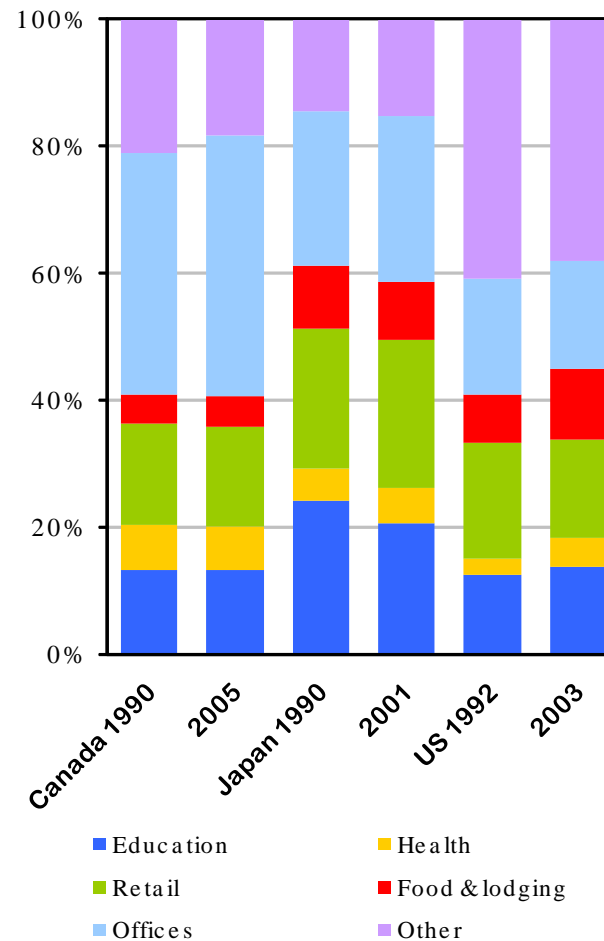
Key Insights from IEA Indicator Analysis

Impact of Structure on Service Sector Energy Use

Factors Affecting Service Sector Energy Use



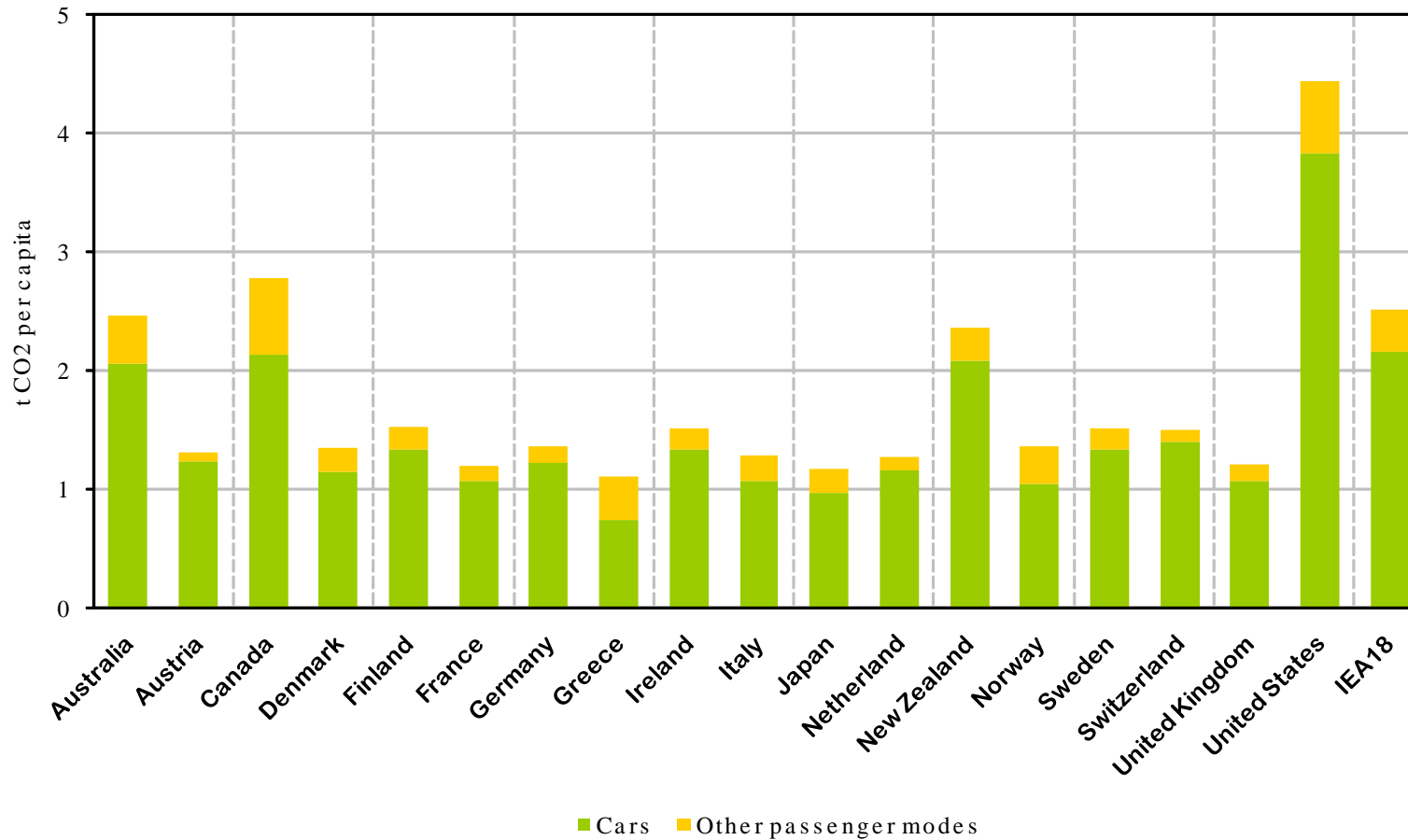
Share of Floor Space by Sub-Sector



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

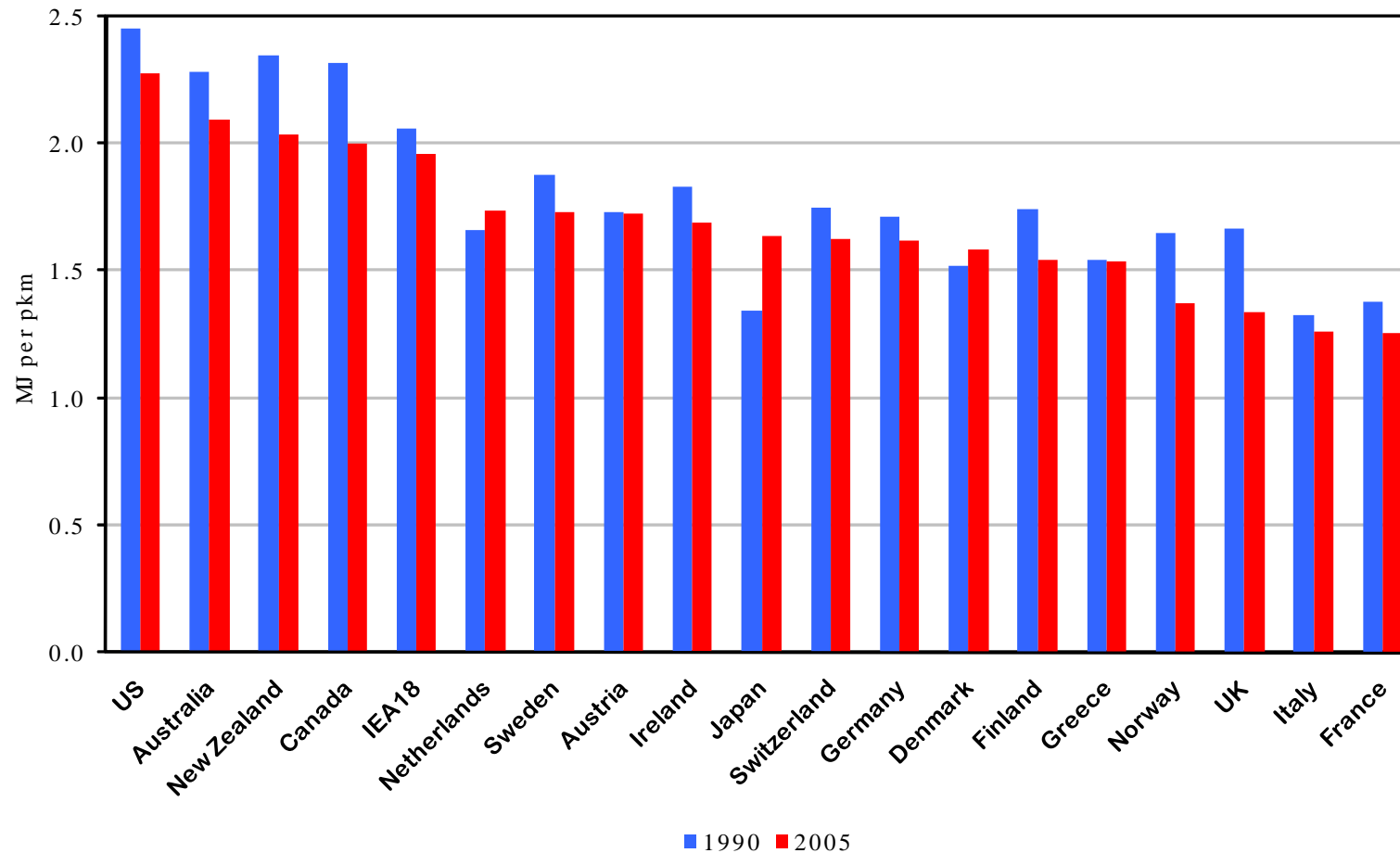
Passenger Transport CO₂ Emissions per Capita, 2005



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Energy Use per Passenger-Kilometre (All Modes)

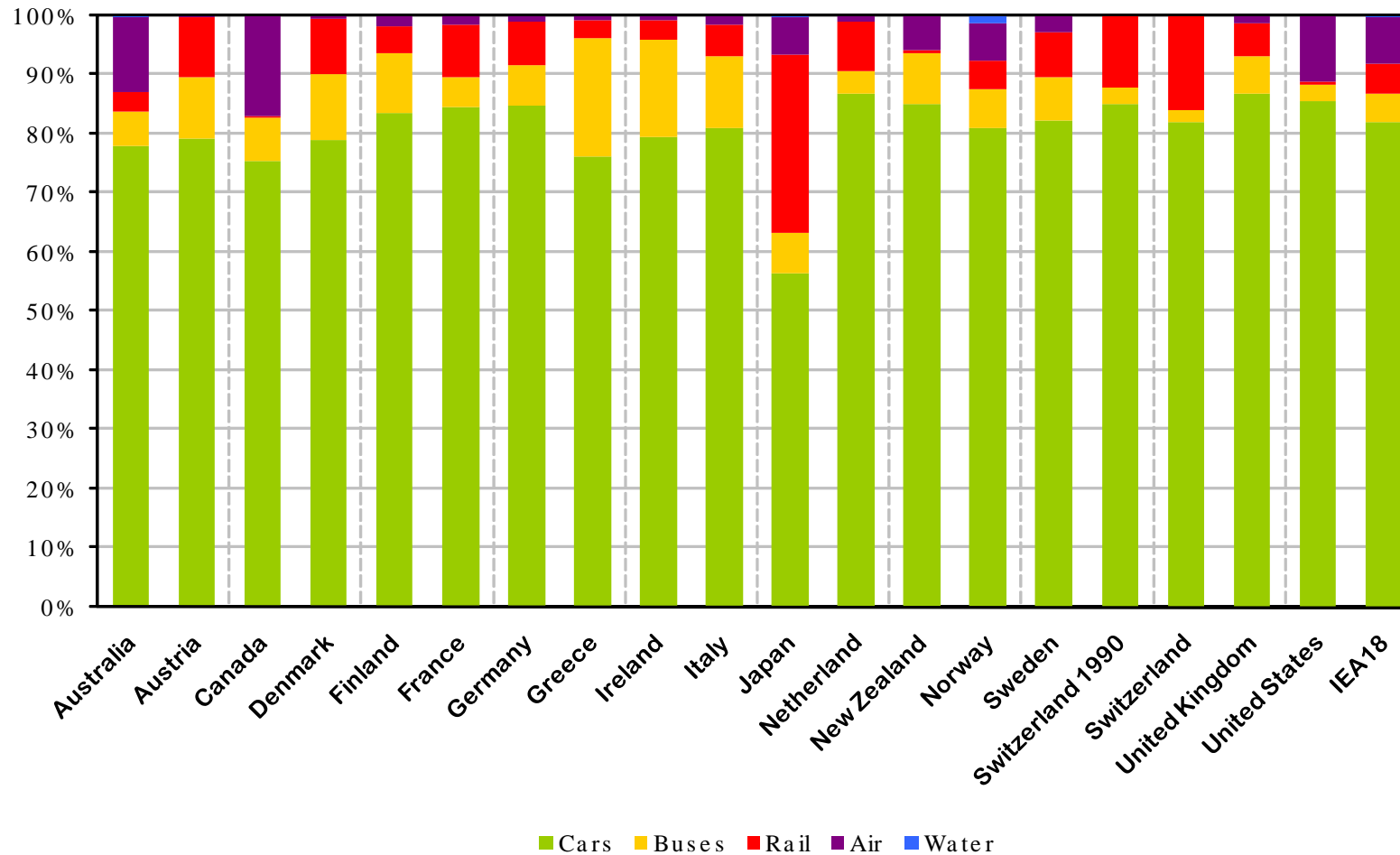


ENERGY INDICATORS

Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Share of Total Passenger Transport by Mode, 2005

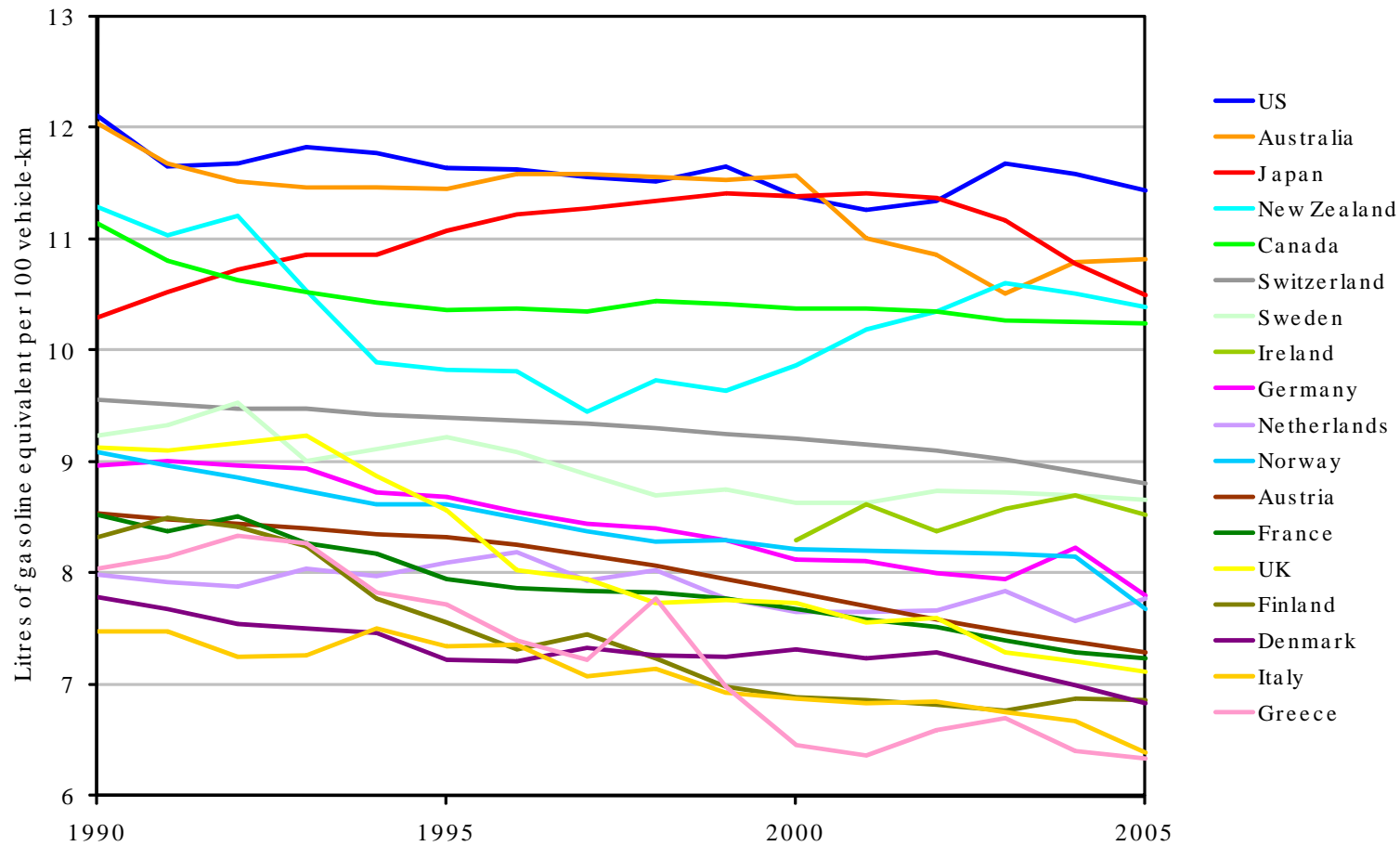


Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Average Fuel Intensity of the Car Stock

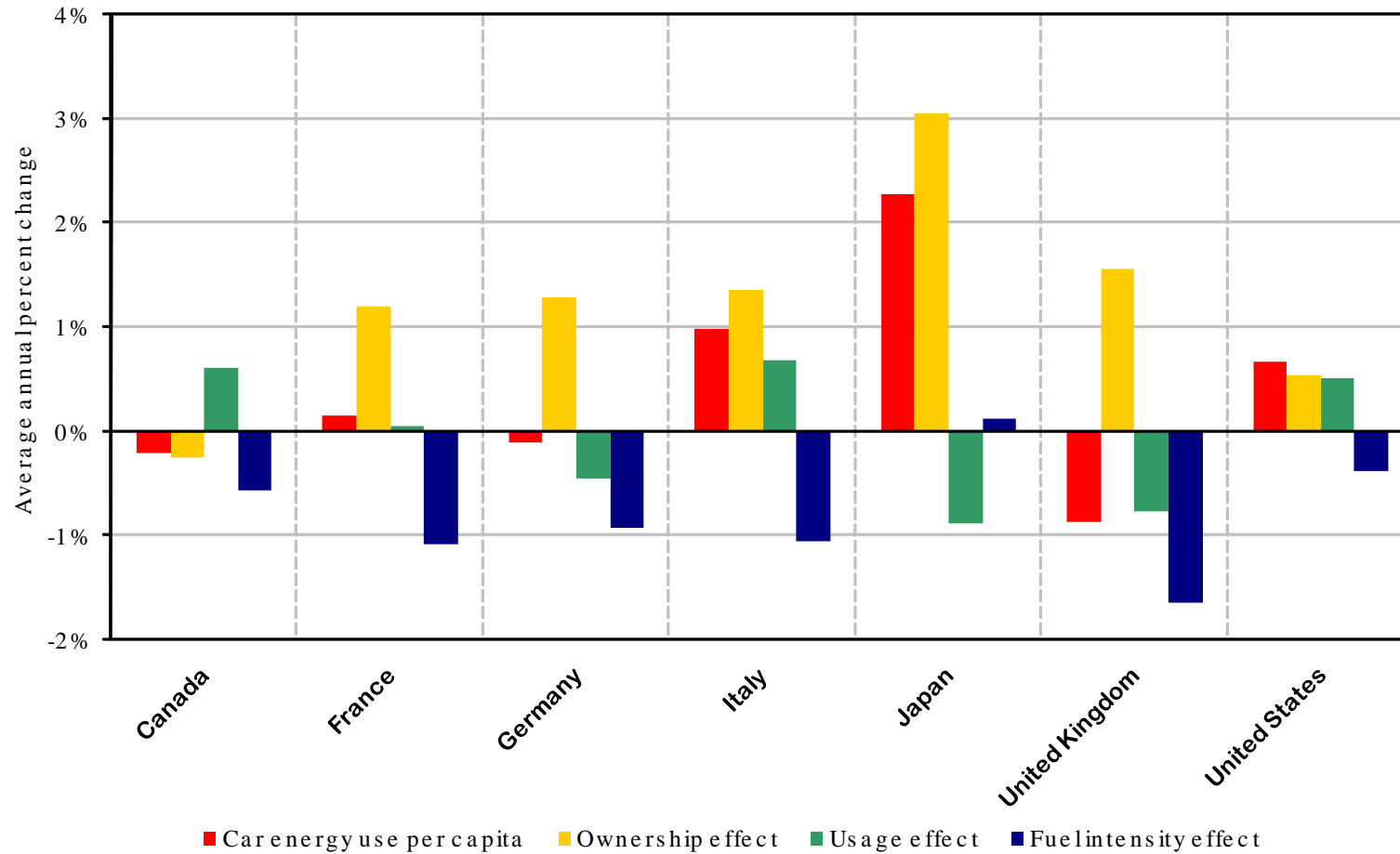
ENERGY INDICATORS



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

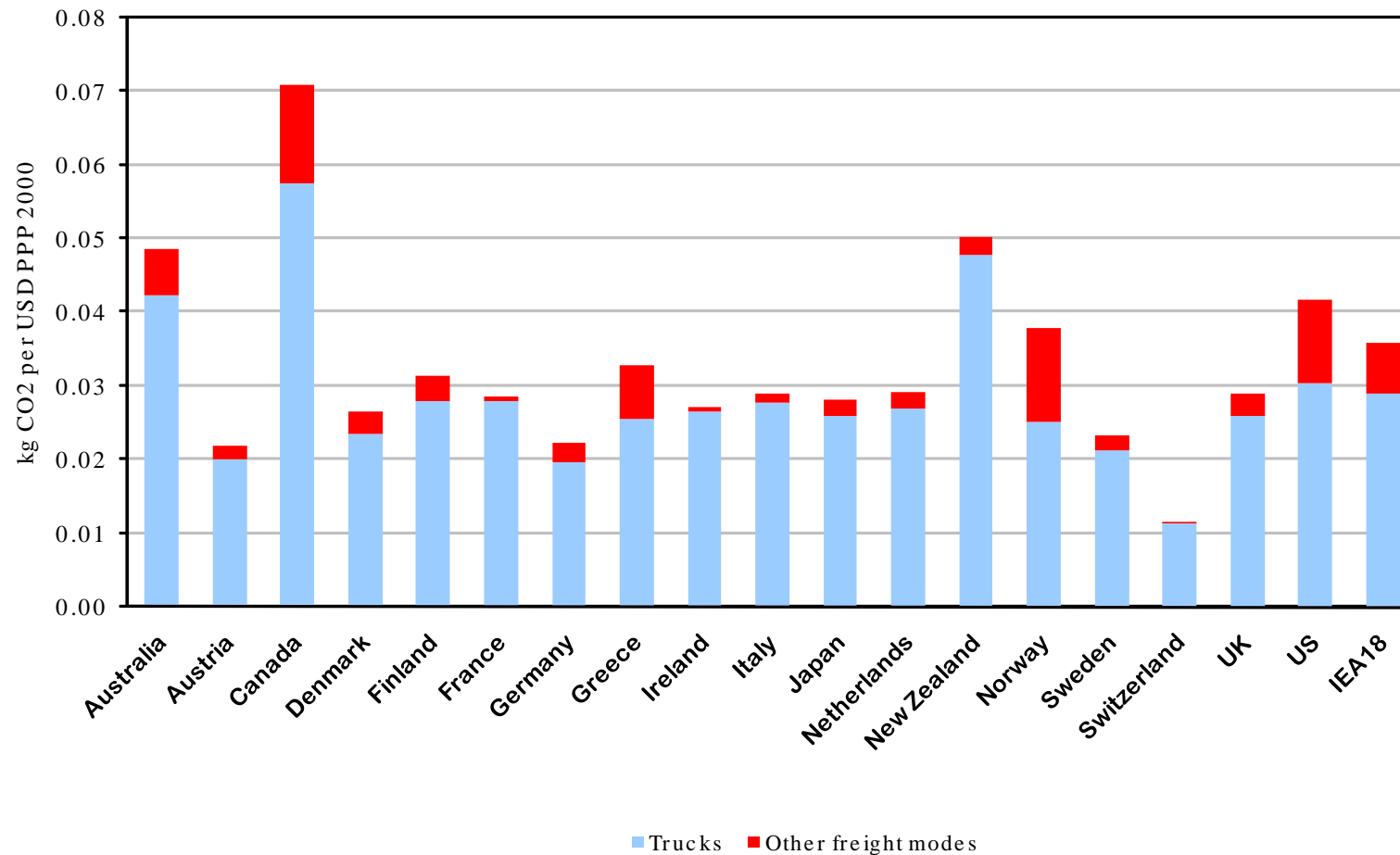
Decomposition of Car Energy Use per Capita, 1990 - 2005



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

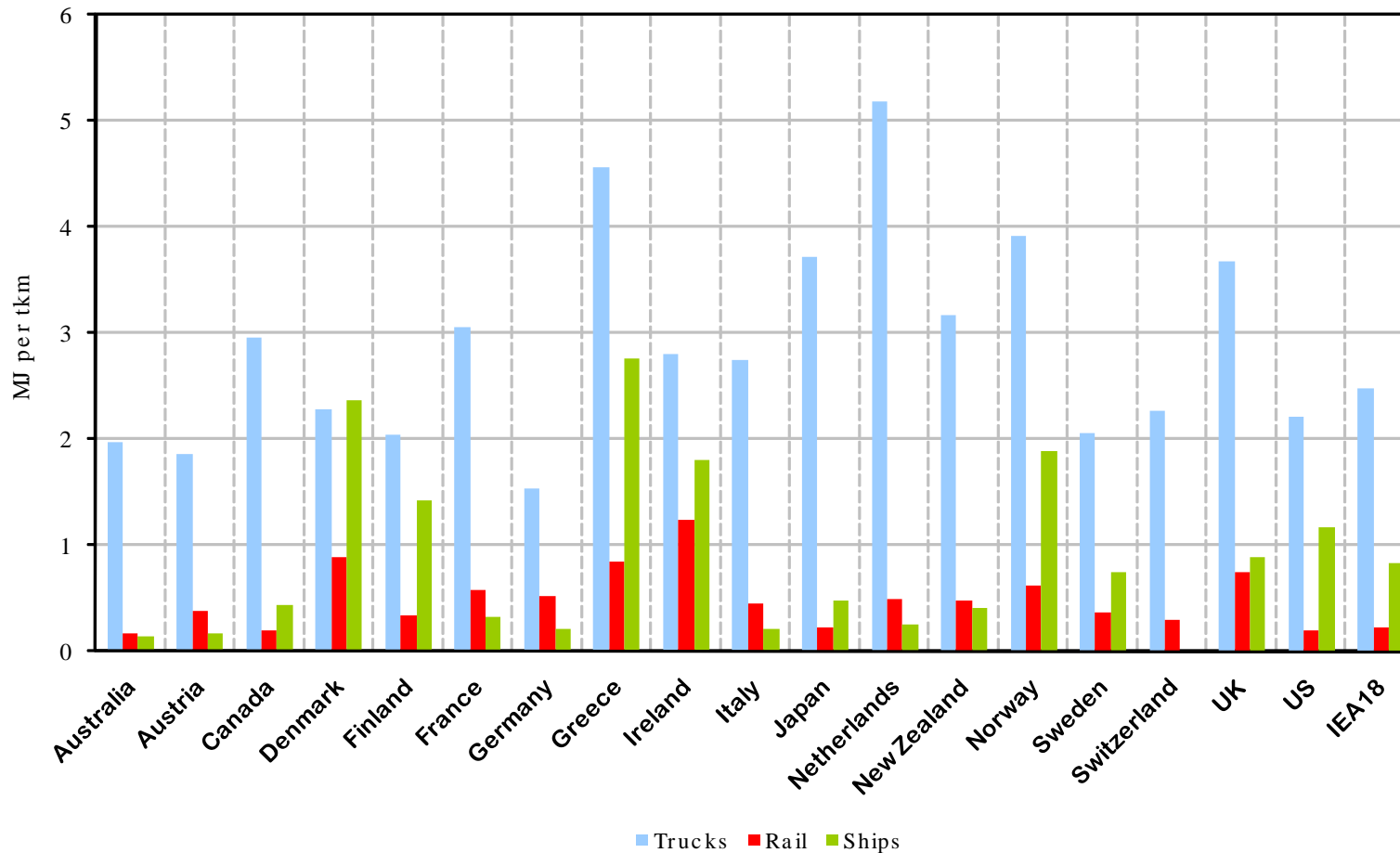
Freight CO₂ Emissions per Unit of GDP, 2005



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

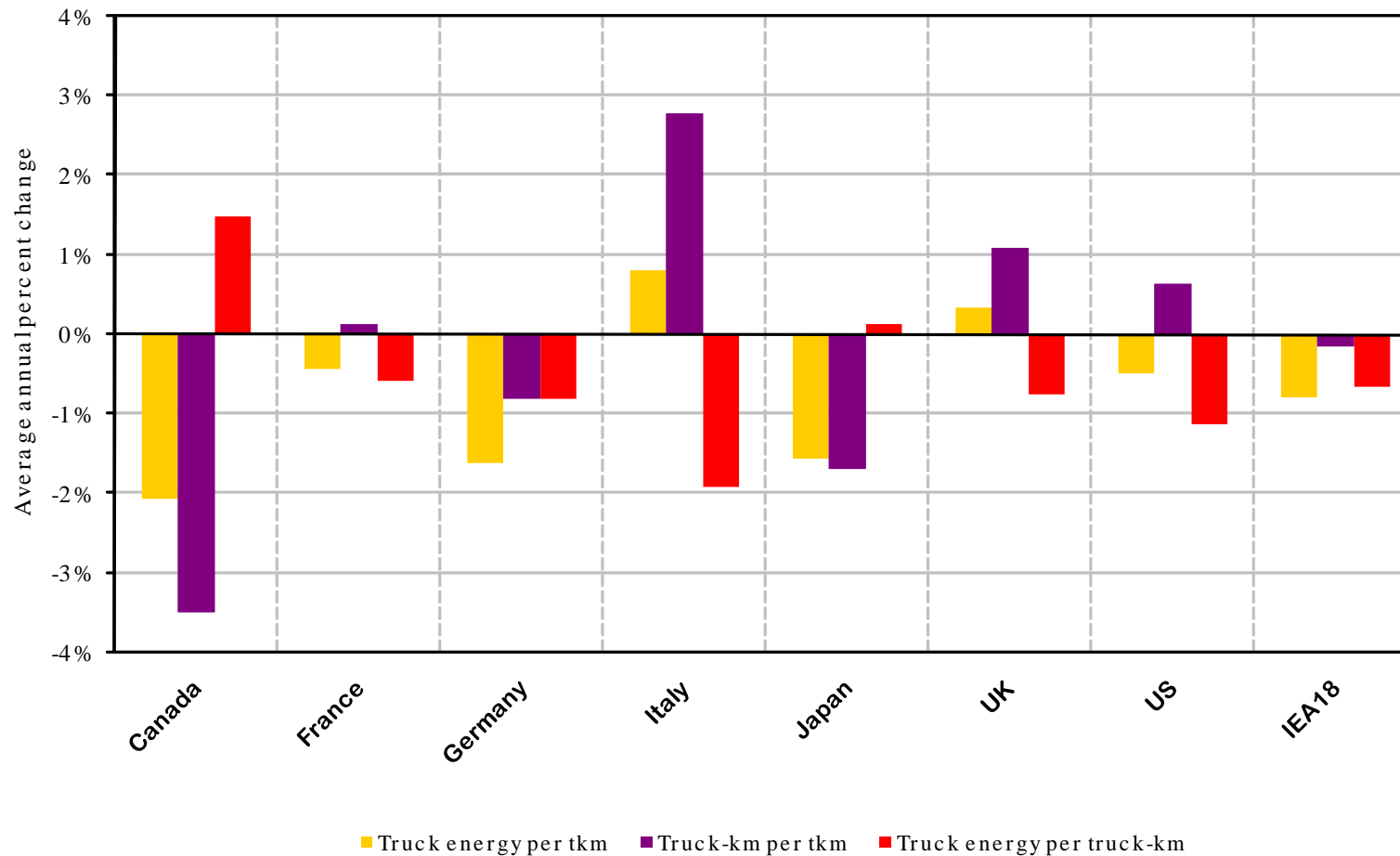
Freight Transport Energy Use per Tonne-Kilometre by Mode, 2005



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Decomposition of Changes in Truck Energy Intensity, 1990-2005



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Industry - New Approach

- Indicators based physical production:
 - Not influenced by price variations
 - Can be directly related to technology choices
 - Allow assessment of efficiency potentials

- Potentials calculation:
 - Uses comparison of actual performance vs BAT/BPT
 - Shows where the potential lies
 - But “instantaneous” potential, not suitable for short-term target setting

ENERGY
INDICATORS

Worldwide Trends
in Energy Use and
Efficiency

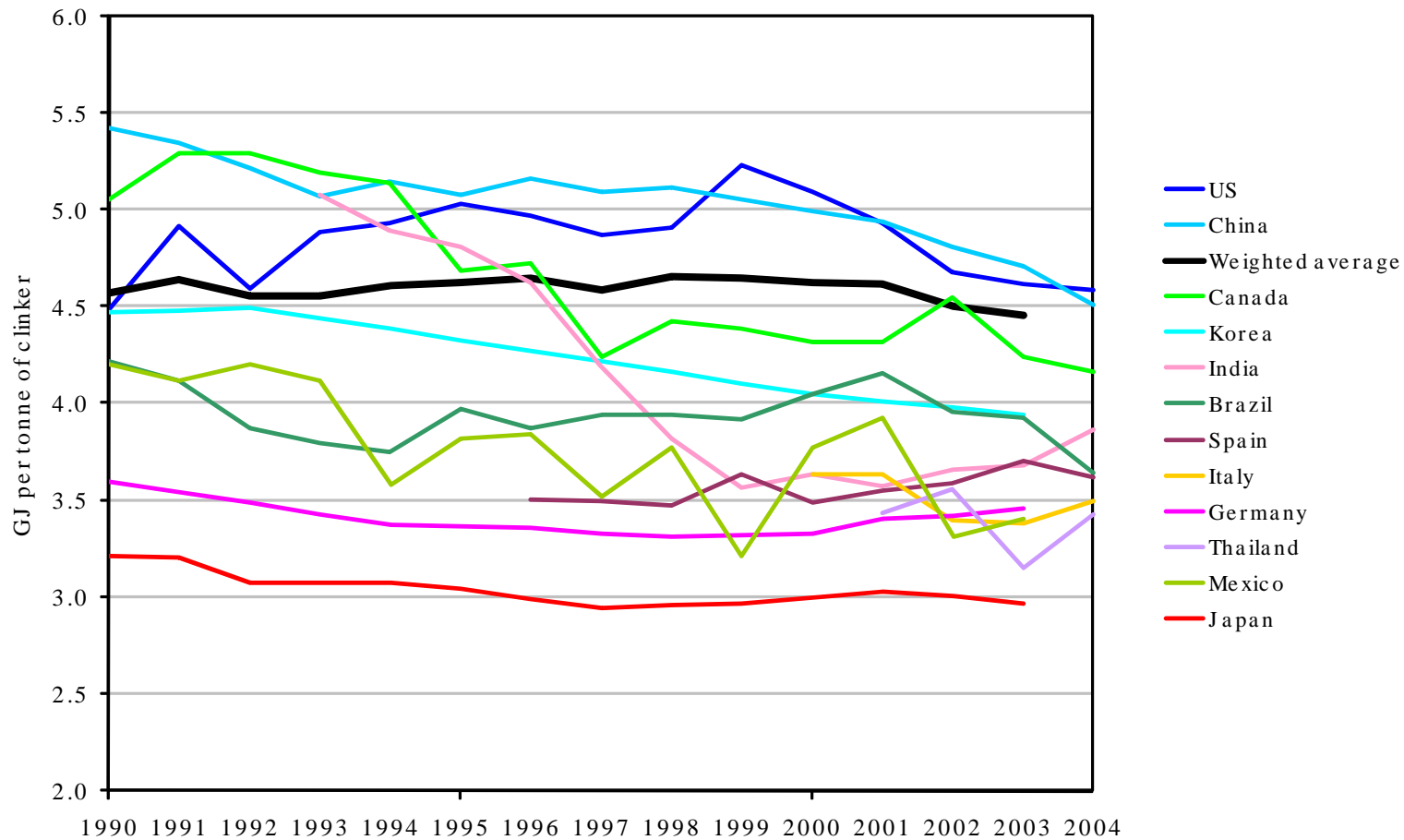
Key Insights from
IEA Indicator Analysis

INTERNATIONAL
ENERGY AGENCY 

© OECD/IEA - 2008

Energy Requirement per Tonne of Clinker by Country, Including Alternative Fuels

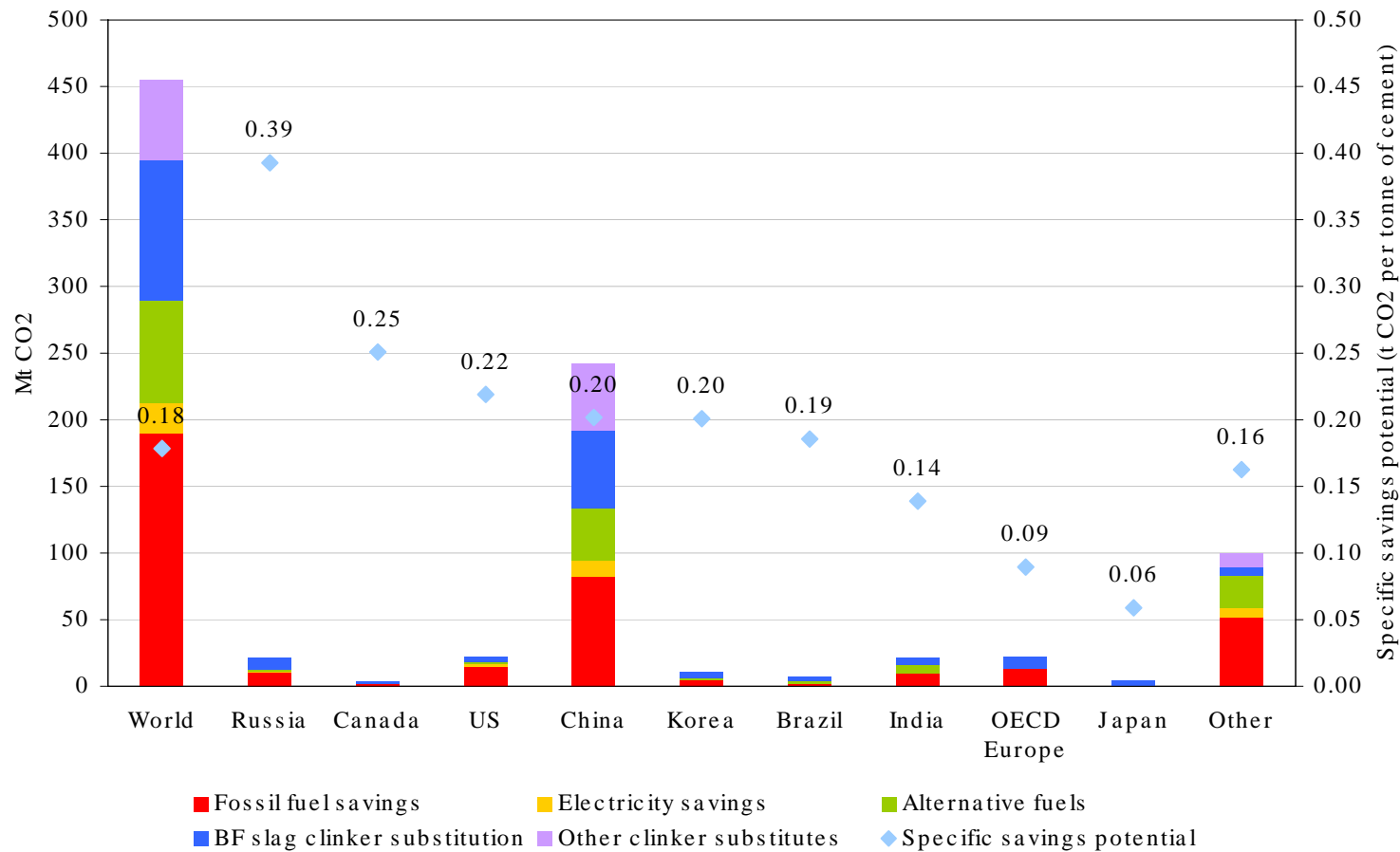
ENERGY INDICATORS



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

CO₂ Reduction Potentials in Cement in 2005, Based on Best Available Technology



ENERGY INDICATORS

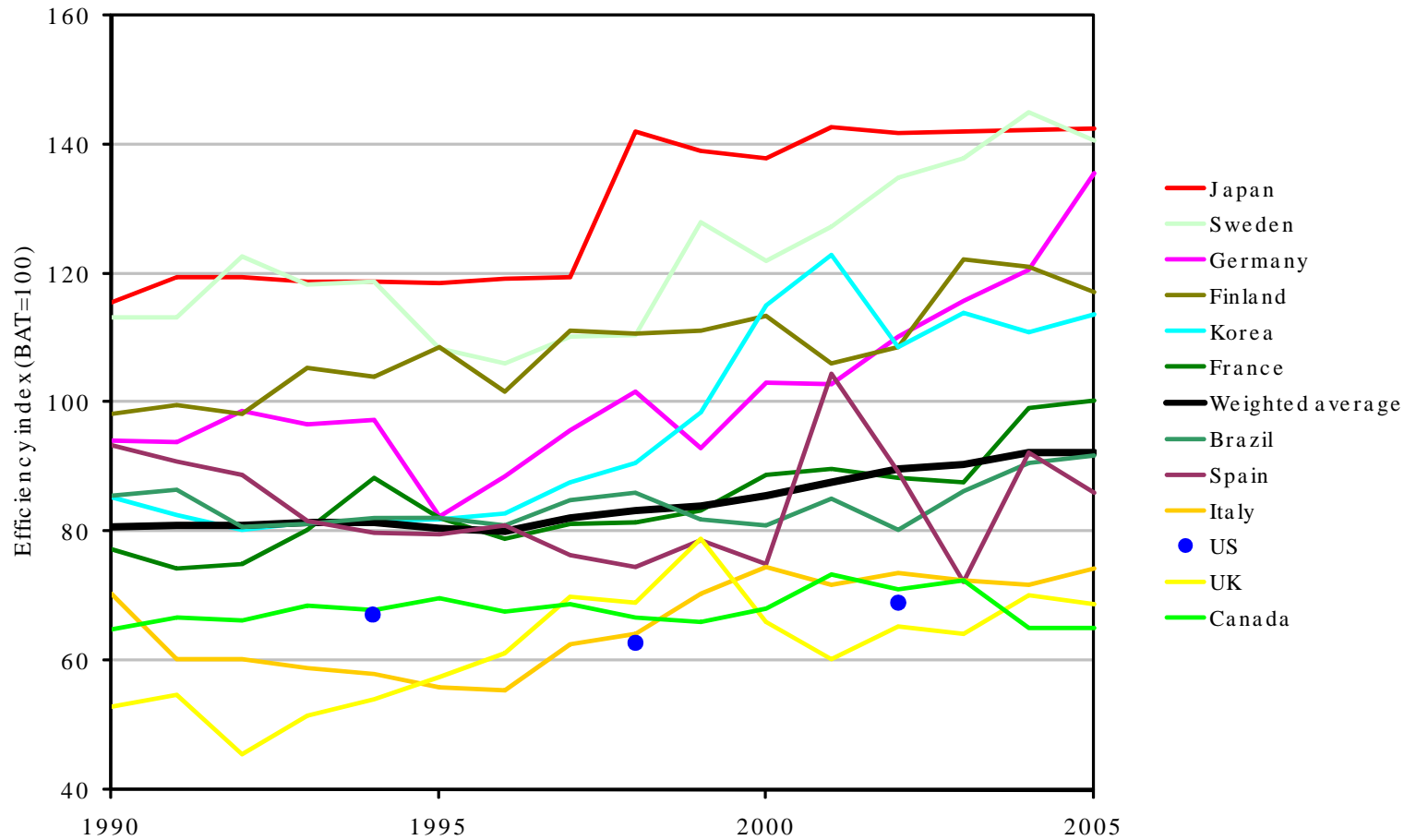
Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

INTERNATIONAL ENERGY AGENCY

© OECD/IEA - 2008

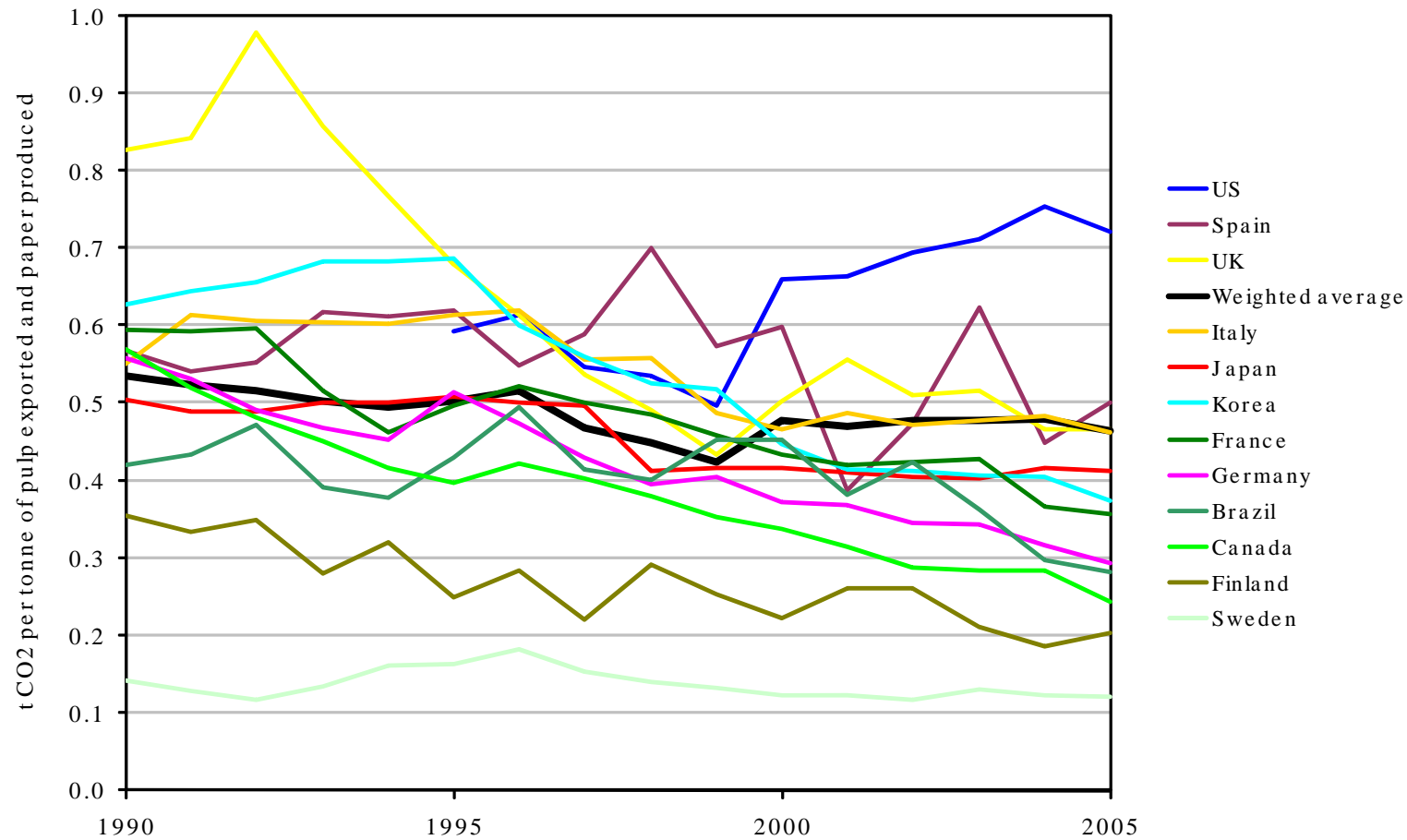
Heat Consumption in Pulp and Paper Production versus Best Available Technology



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

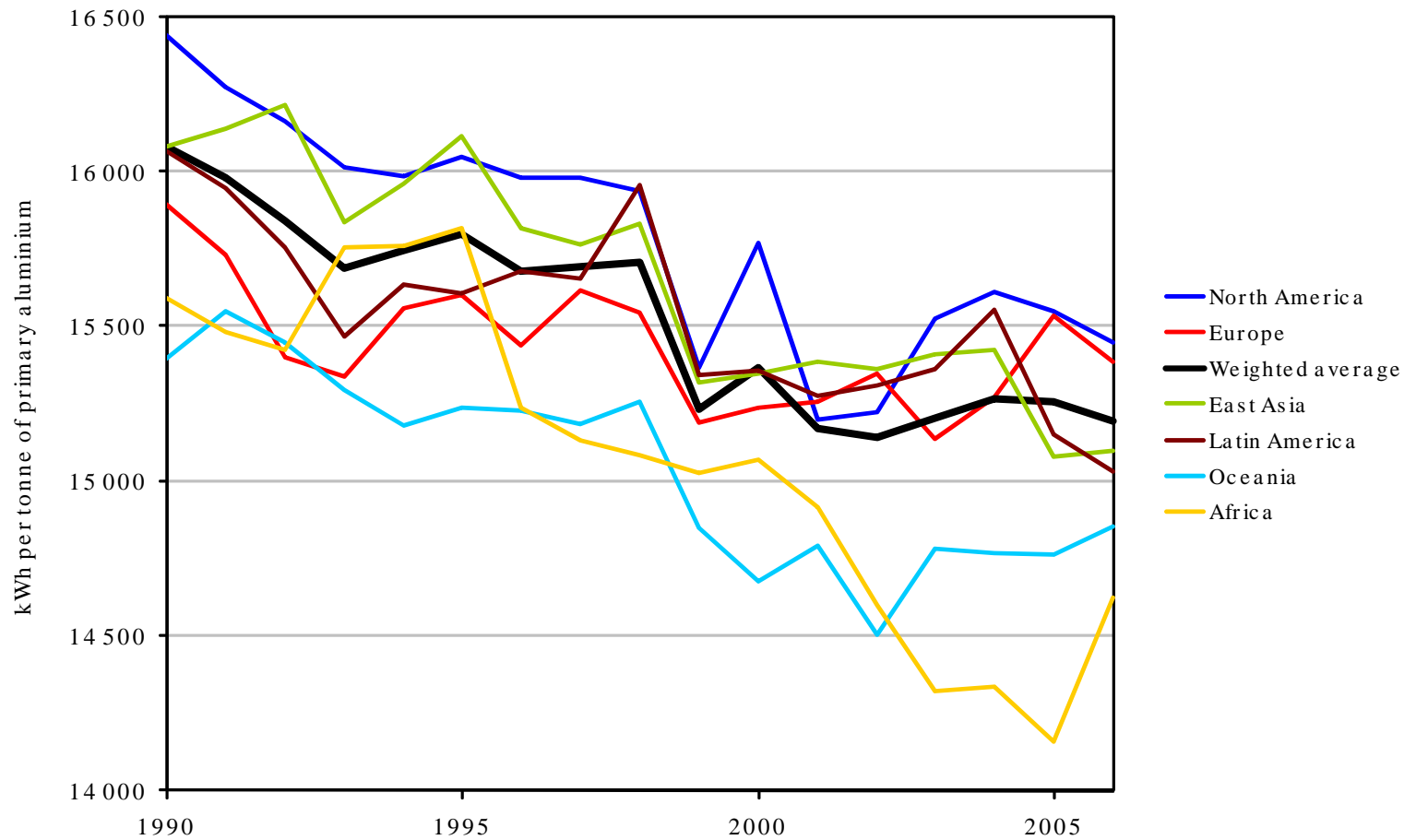
CO₂ Emissions per Tonne of Pulp Exported and Paper Produced



Worldwide Trends
in Energy Use and
Efficiency

Key Insights from
IEA Indicator Analysis

Specific Power Consumption in Aluminium Smelting

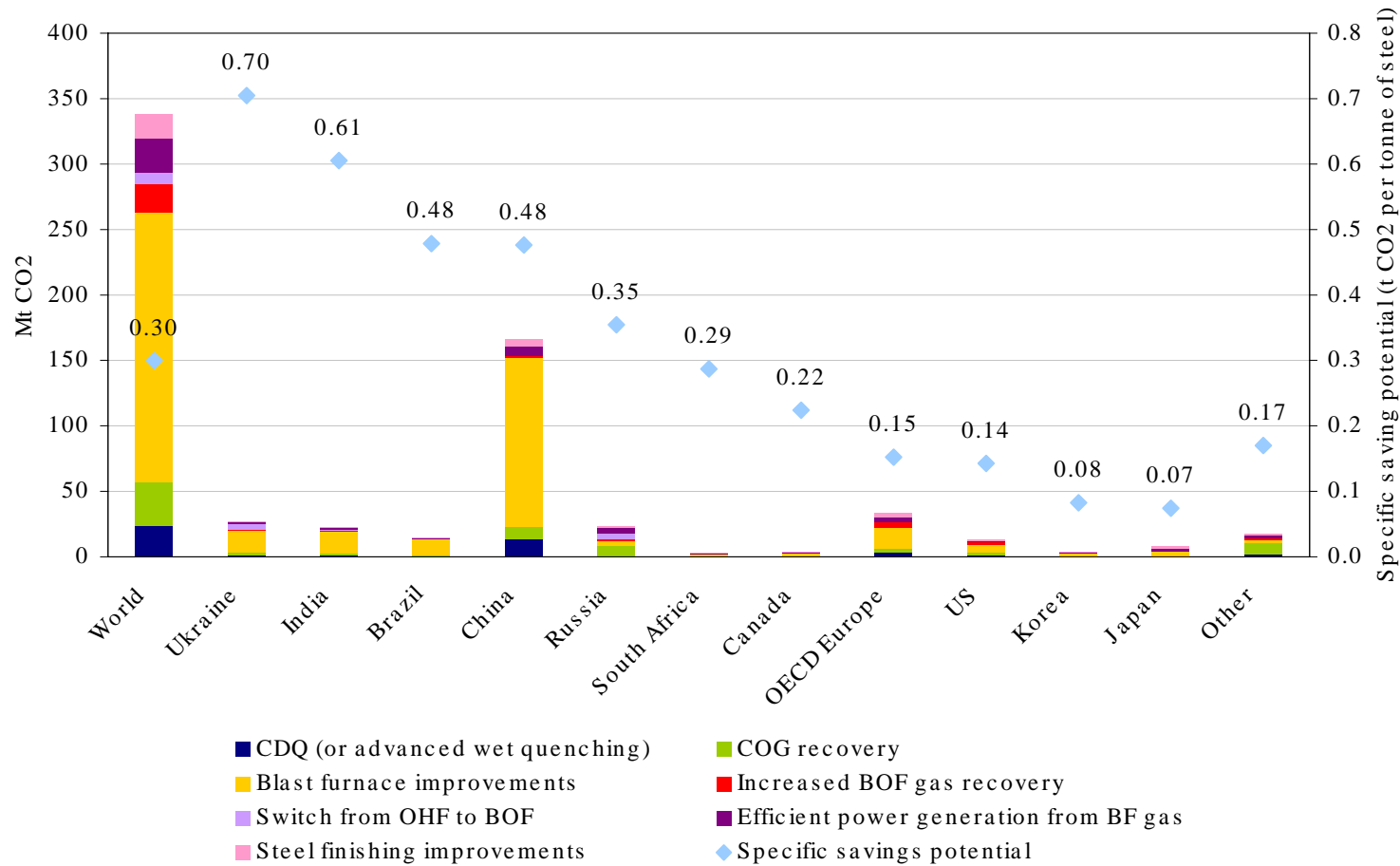


Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

CO₂ Reduction Potentials in Iron and Steel in 2005, Based on Best Available Technology

ENERGY INDICATORS



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Energy Saving Potentials in Chemicals in 2005, Based on Best Available Technology

ENERGY
INDICATORS

	Energy use (incl. electricity)				Energy use (excl. electricity)			
	Reported Energy Use EJ	BPT Energy Use EJ	EEI	Improvement Potential	Reported Energy Use EJ	BPT Energy Use EJ	EEI	Improvement Potential
United States	7.8	5.2	0.67	33%	6.9	4.6	0.67	33%
Saudi Arabia	1.2	0.9	0.75	25%	1.2	0.9	0.75	25%
Taiwan	0.9	0.7	0.75	25%	0.7	0.6	0.76	25%
Netherlands	0.7	0.5	0.78	22%	0.6	0.5	0.78	22%
Brazil	0.7	0.5	0.79	21%	0.6	0.5	0.8	20%
India	1.1	0.9	0.82	18%	1.1	0.9	0.82	18%
China	4.4	3.7	0.84	16%	3.6	3.1	0.86	14%
France	0.7	0.6	0.86	14%	0.6	0.6	0.87	14%
Japan	2.2	1.9	0.86	14%	2	1.7	0.87	13%
Germany	1.3	1.1	0.87	14%	1.1	1	0.88	12%
Italy	0.5	0.4	0.86	14%	0.4	0.3	0.88	12%
Republic of Korea	1.5	1.3	0.88	12%	1.4	1.2	0.89	11%
Canada	0.9	0.8	0.92	8%	0.8	0.7	0.94	6%
United Kingdom	0.5	0.5	0.93	7%	0.5	0.4	0.96	4%
Total	33.4	26.1	0.78	22%	30.0	23.6	0.79	21%

Worldwide Trends
in Energy Use and
Efficiency

Key Insights from
IEA Indicator Analysis

INTERNATIONAL
ENERGY AGENCY 

Power Generation - New indicators

- Look at supply-side efficiency
- Good IEA statistics available
- Calculate efficiencies by fossil fuel and aggregate for key countries / regions
- Issues around the treatment of CHP
- Calculate savings potentials based on
 - Best country average by fuel (low case)
 - Best practice for new plant (high case)

ENERGY
INDICATORS

Worldwide Trends
in Energy Use and
Efficiency

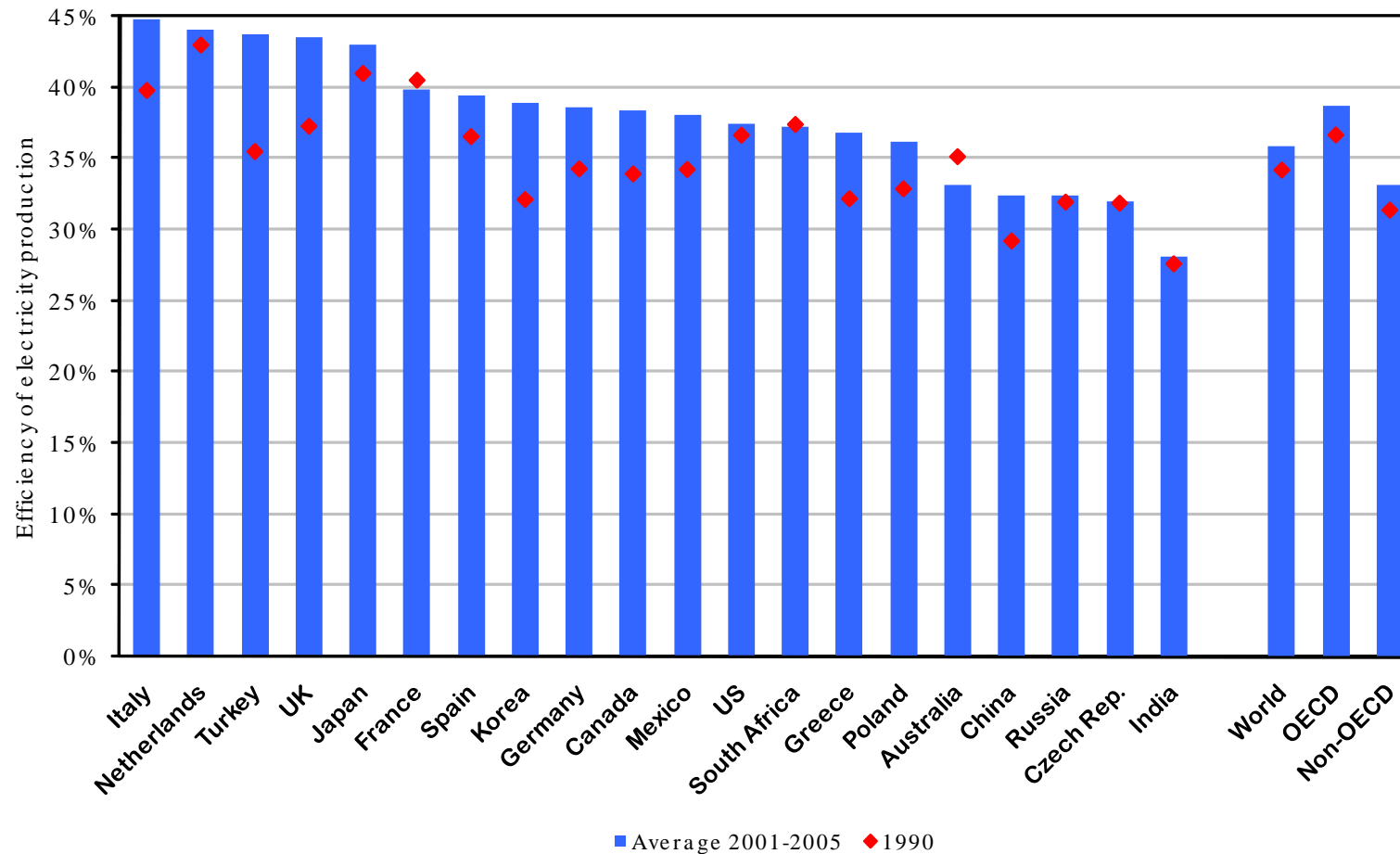
Key Insights from
IEA Indicator Analysis

INTERNATIONAL
ENERGY AGENCY 

© OECD/IEA - 2008

Efficiency of Power Production from Fossil Fuels in Public Electricity and CHP Plants

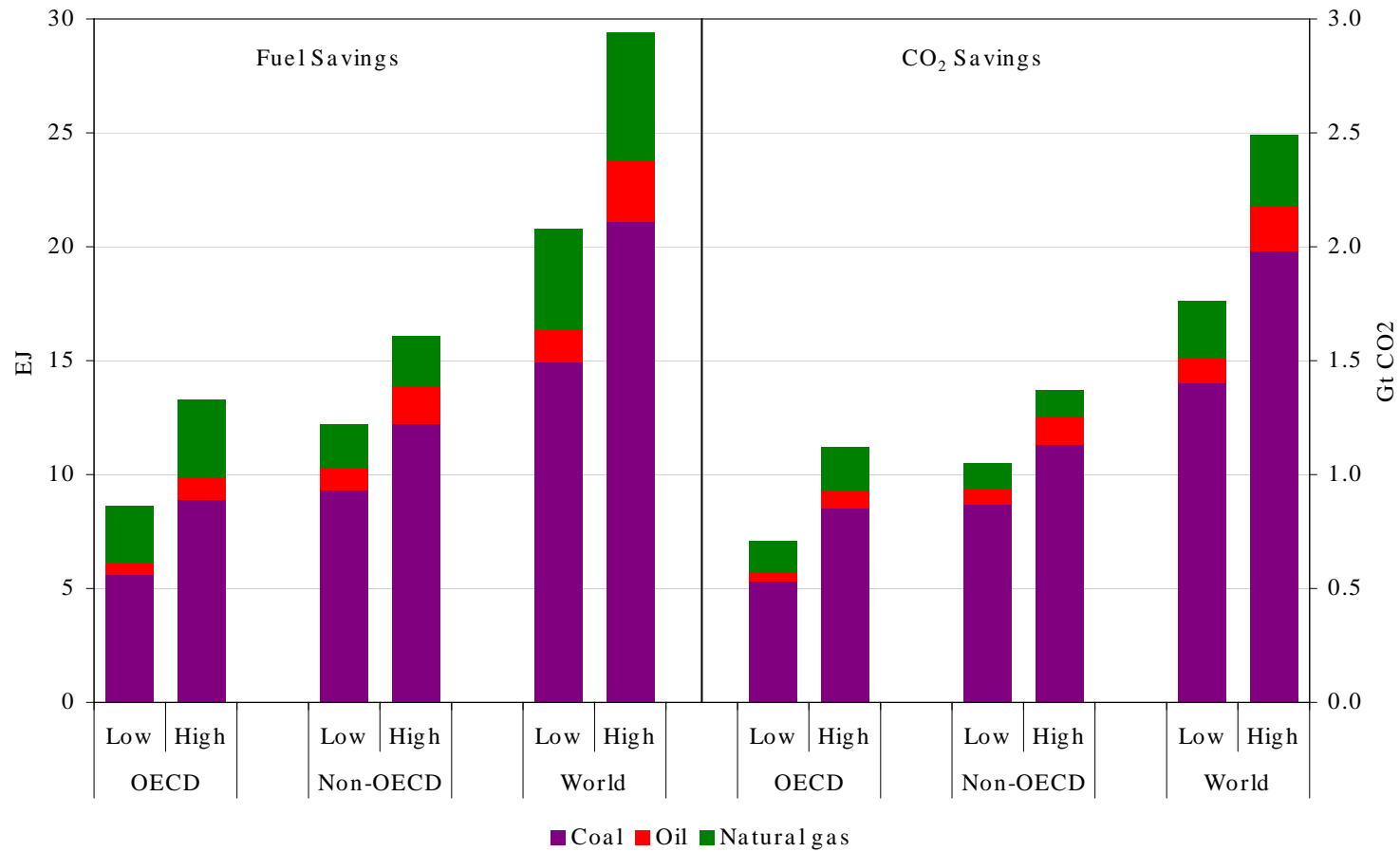
ENERGY INDICATORS



Worldwide Trends
in Energy Use and
Efficiency

Key Insights from
IEA Indicator Analysis

Technical Fuel and CO₂ Savings Potentials in 2005 from Improved Efficiency



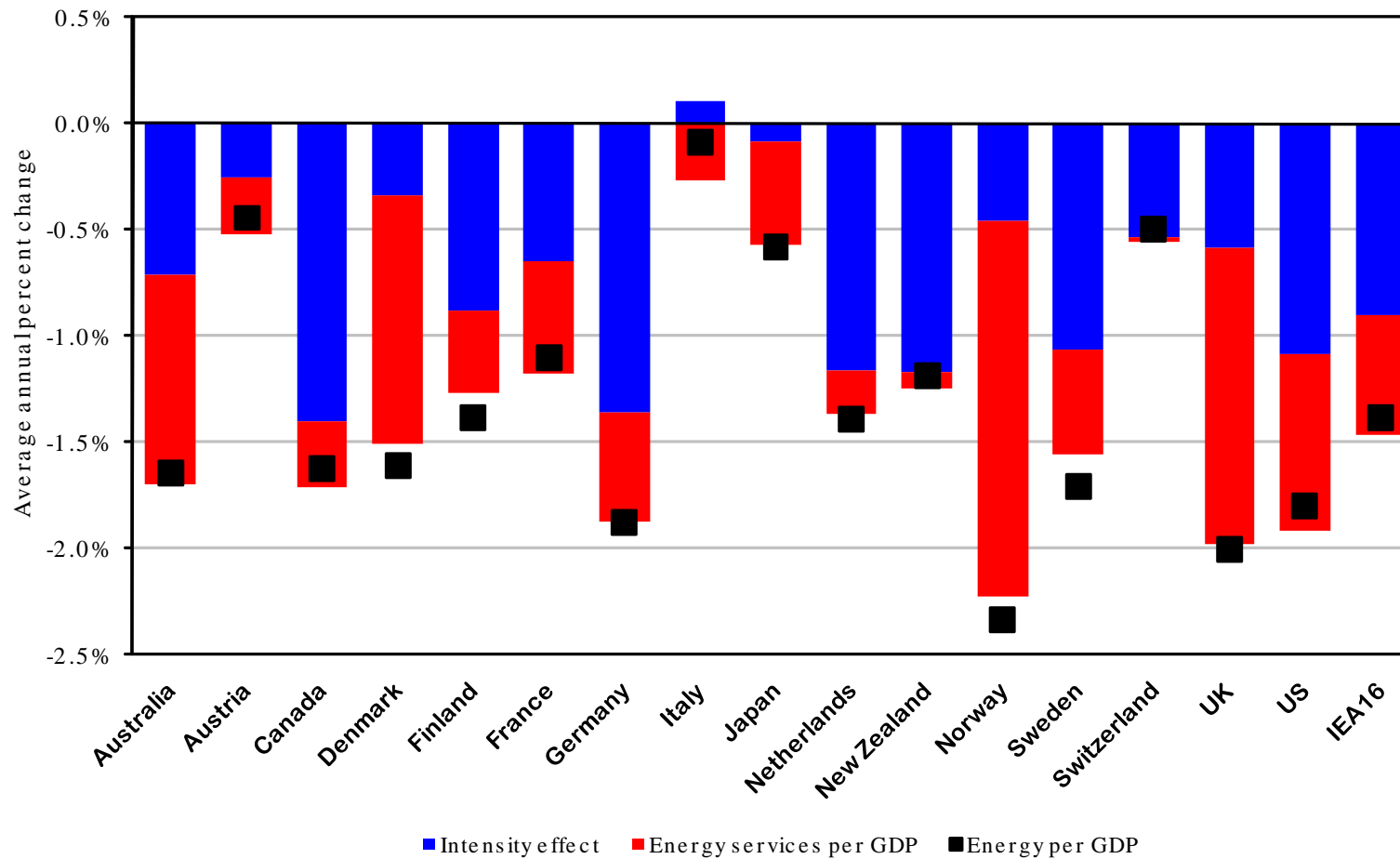
ENERGY INDICATORS

Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Changes in TFC/GDP Decomposed into Structural and Intensity Effects, 1990-2005

ENERGY INDICATORS

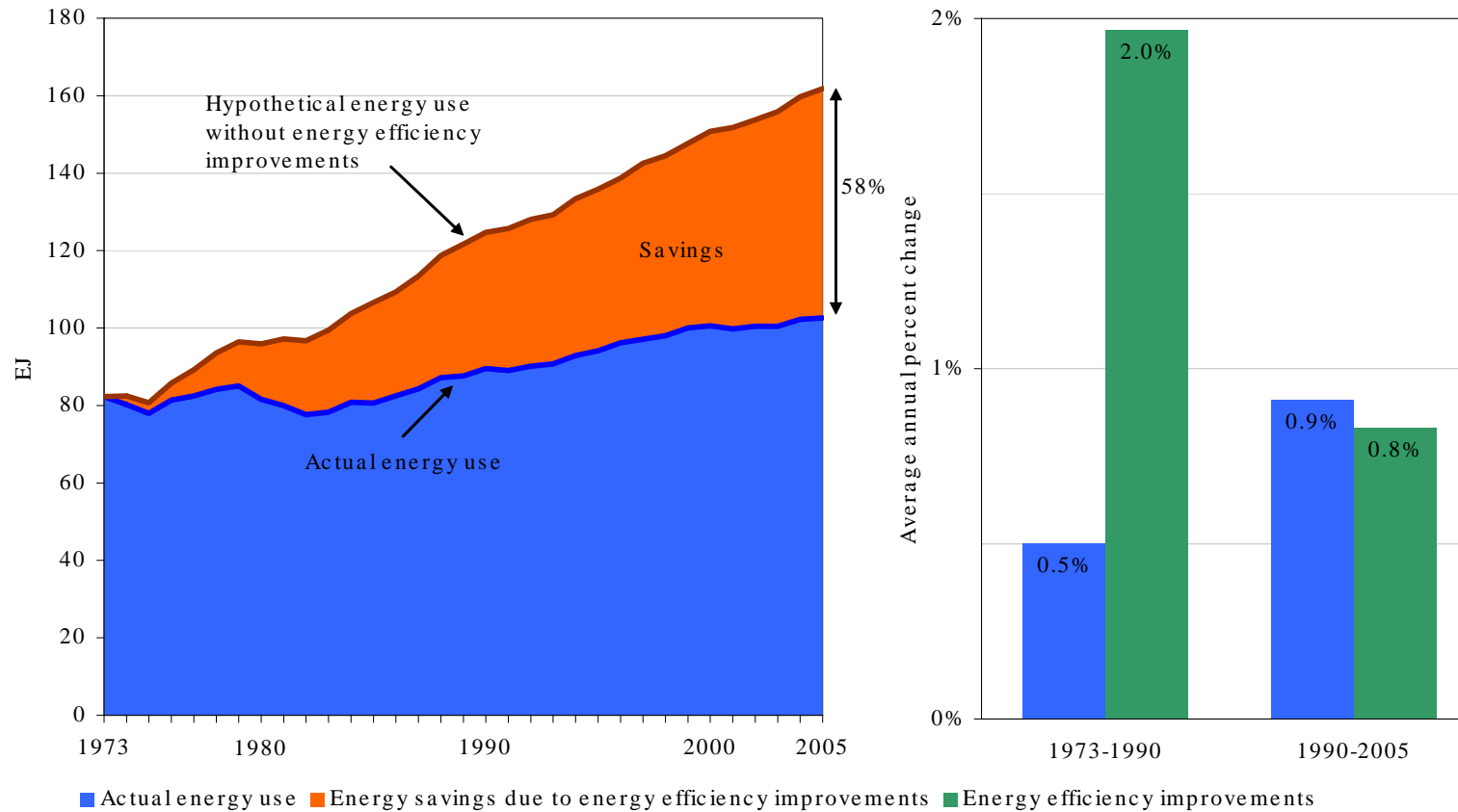


Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Long-Term Energy Savings from Improvements in Energy Efficiency, IEA11

ENERGY INDICATORS



Worldwide Trends in Energy Use and Efficiency

Key Insights from IEA Indicator Analysis

Key Conclusions and Policy Messages

- Indicators are a powerful tool for analysing trends in energy use and CO₂ emissions, and calculating potentials for further savings
- Results show the important role of energy efficiency in shaping patterns of energy use and CO₂ emissions in IEA countries, but gains are often offset by other factors
- Large potential for further energy and CO₂ savings in many industries and power generation (and other sectors)
- CO₂ emissions growth can and must be decoupled from economic growth, but will require strong policy-action from Governments
- Urgent need for governments to enhance framework for monitoring end-use energy consumption and address the gaps in available statistical data

ENERGY
INDICATORS

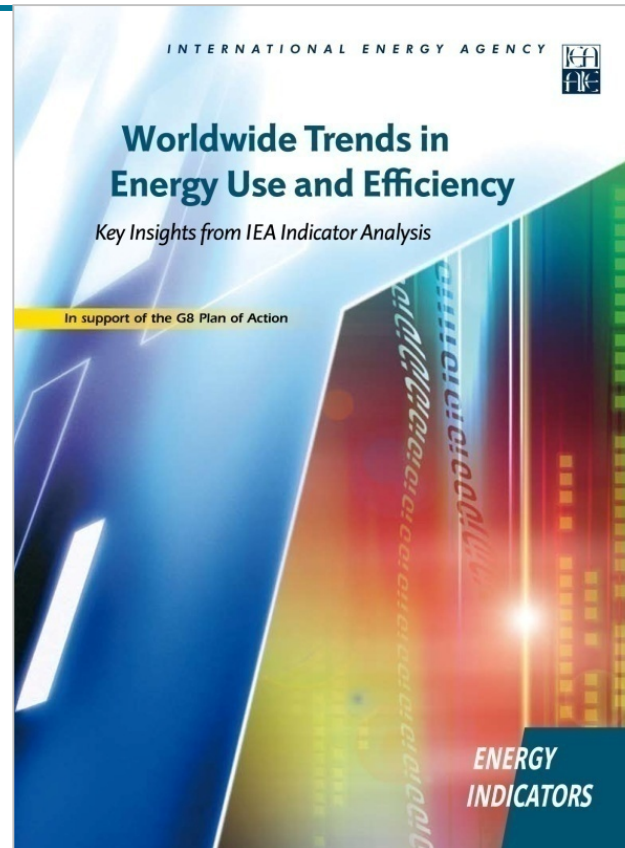
Worldwide Trends
in Energy Use and
Efficiency

Key Insights from
IEA Indicator Analysis

INTERNATIONAL
ENERGY AGENCY 

© OECD/IEA - 2008

Thank you !



Worldwide Trends
in Energy Use and
Efficiency

*Key Insights from
IEA Indicator Analysis*

www.iea.org/Textbase/Papers/2008/Indicators_2008.pdf

energyindicators@iea.org