



**The Energy Future in  
an Interdependent World**  
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# **Energy efficiency: Striking the Balance**

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- **Great hopes with energy efficiency**
- **Realities**
- **The way forward**

# What is energy efficiency?

**Energy efficiency improvement** refers to a **reduction in the energy used for a given energy service** (indoor temperature, level of lighting, etc.) **or level of activity**, through **different types of actions** by consumers:

- ✓ either through changes of equipment or technologies for **new** ones or refurbishing of **existing** equipment or technologies (“technological changes”),
- ✓ or through better **organisation** and **management** (e.g. transport) or **behavioural** changes (e.g. avoiding “unnecessary” energy consumption) (“non technical factors”)

→ Restrictions in individual behaviours is not energy efficiency

## ➤ Hopes

- **Great priority for all governments**
- **Large potential but uncertainty about the achievable energy savings**

# Energy efficiency: THE answer to many issues for governments

- **Reduction of economic vulnerability** due to high oil price (balance of payment, economic growth) in oil importing countries, especially in less developed countries
- Improving **energy supply security**
- **Reduction of investments** needs in the energy sector, especially in countries with limited capital (e.g. in Africa) or with fast growing demand (e.g. in Asia)
- Possibility to **supply more consumers** with the existing capacity in countries with supply constraints
- **Reduction of** deforestation and the burden on the poorest people
- And on the long term, **reduction of pressure**:
  - ✓ **on climate** (50 to 60% of future reduction in GHG emissions could come from energy efficiency)
  - ✓ **and on resources** by extending the life time of resources (thus lowering tensions on oil price and leaving more oil for future generation)

# Energy efficiency is also important for consumers

## ➤ For companies:

- ✓ Energy efficiency decreases energy expenditures, which means **better competitiveness, increased profits and a protection against energy prices increases**

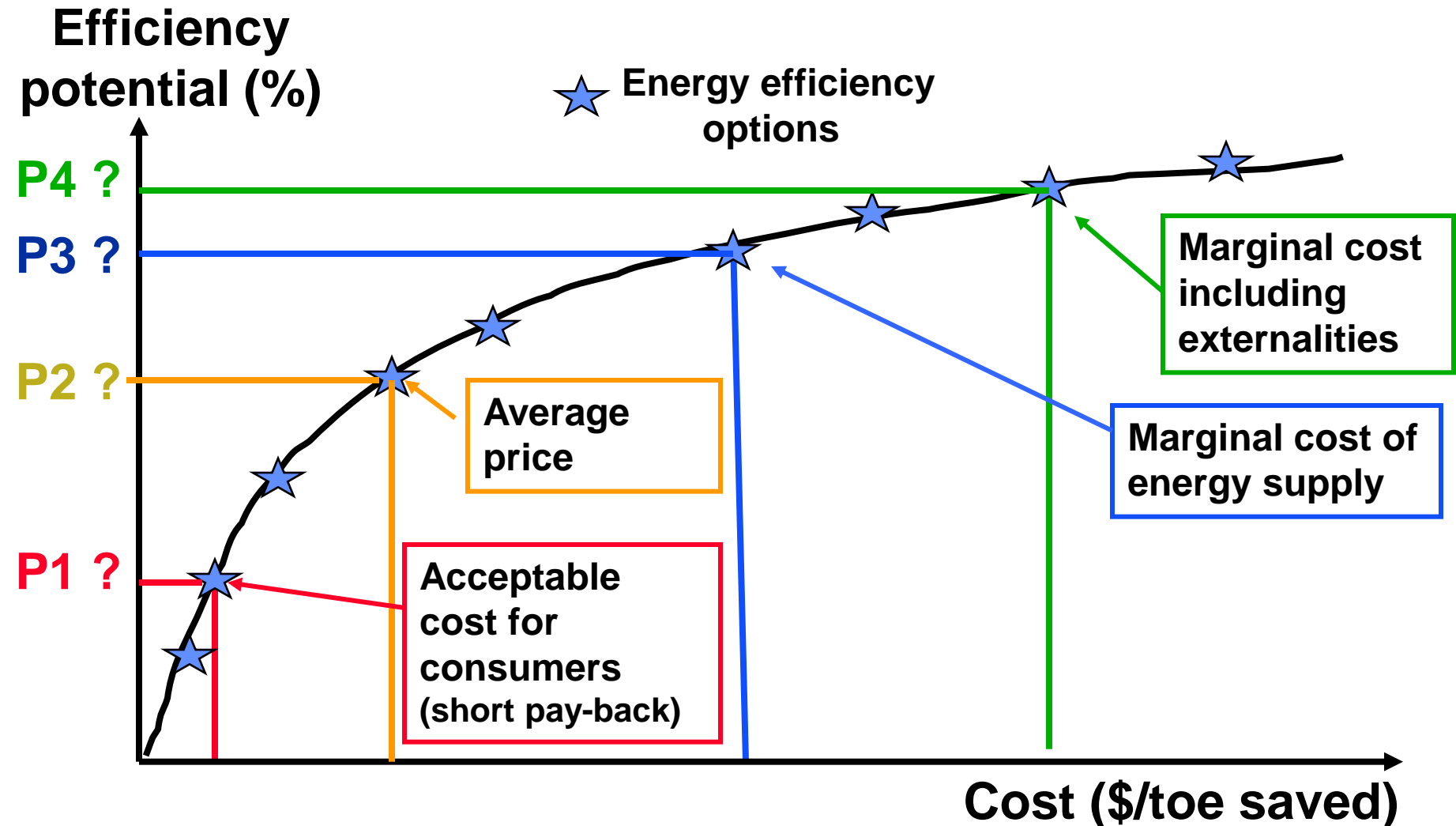
## ➤ For households:

- ✓ Energy efficiency decreases energy expenditures, which means **more money** to spend on other goods and services and a **protection** against energy prices increases
- ✓ Energy efficiency **increases comfort** for low income households, which contributes to poverty eradication

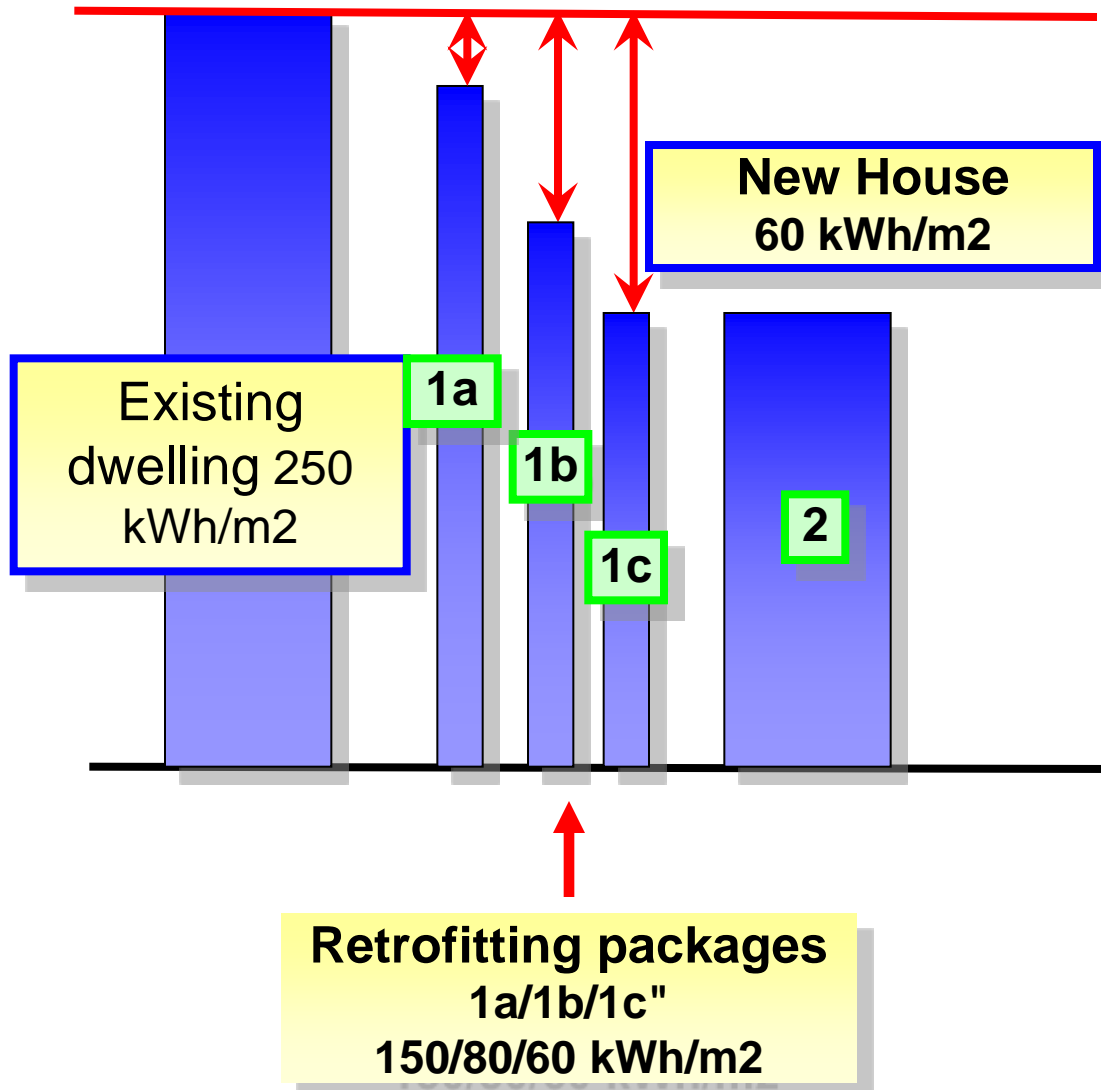
# Consensus on the existence of a large energy efficiency potentials but divergence on what is achievable

- Energy efficiency potentials always seen as large ...
- Leading to more and more ambitious official targets of improvement... often far from present trends
- However size of potentials depends on:
  - ✓ what is economic? depends on energy **prices**, **costs** of more efficient equipment/ technology or of retrofiting **and** viewpoint (acceptable payback time to recover the extra cost (“cost-effectiveness”)) (“subjective”)
  - ✓ what is feasible and acceptable ? taking into account all non economic factors

The energy efficiency potential increases with the cost of the energy saved: magnitude of potential depends on the reference cost → variable size



# What energy saving potentials in existing dwellings?



➤ Different retrofitting packages to raise efficiency (e.g. insulation)

➤ 1c (or 1b) may not be cost effective depending on price, costs, payback

➤ Not all what is cost effective is feasible (“split incentives” between owners/occupants)

## ➤ Realities

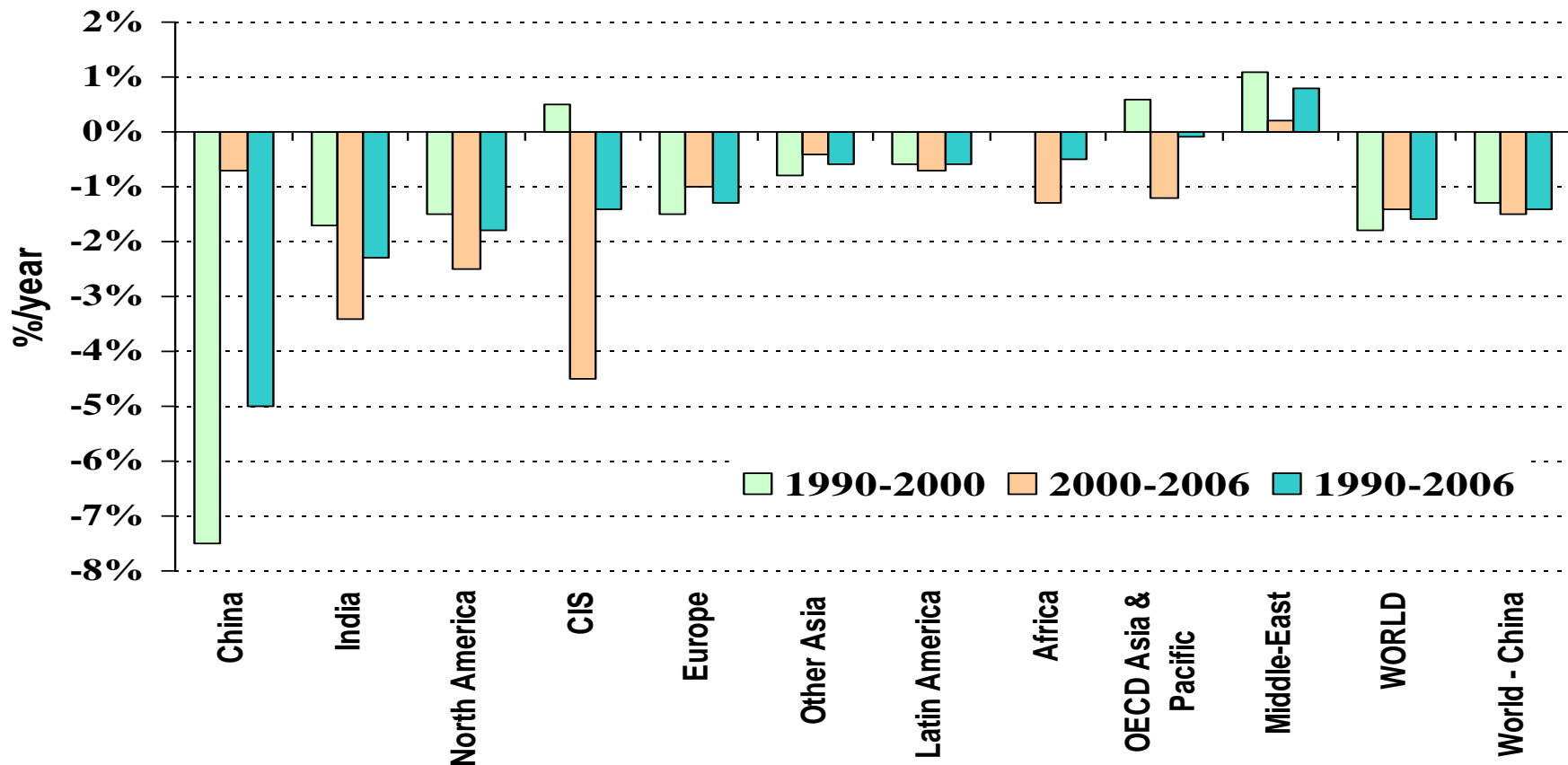
- **What results achieved so far?**
- **Why consumers are not improving energy efficiency: the barriers**
- **Experience with energy efficiency policies**

Based on:

WEC study "Energy Efficiency Policies around the World"  
and ODYSSEE indicators

**In most world regions the amount of energy used per unit GDP is decreasing steadily → "energy productivity" is improving: 1.6% p.a. since 1990 for the world, which reduced the consumption by 4.4 Gtoe in 2006 and avoided 10 Gt of CO2 emissions; since 2000, significant slow down in China but acceleration in most other regions due to oil price**

### Variation of primary energy intensity by world region

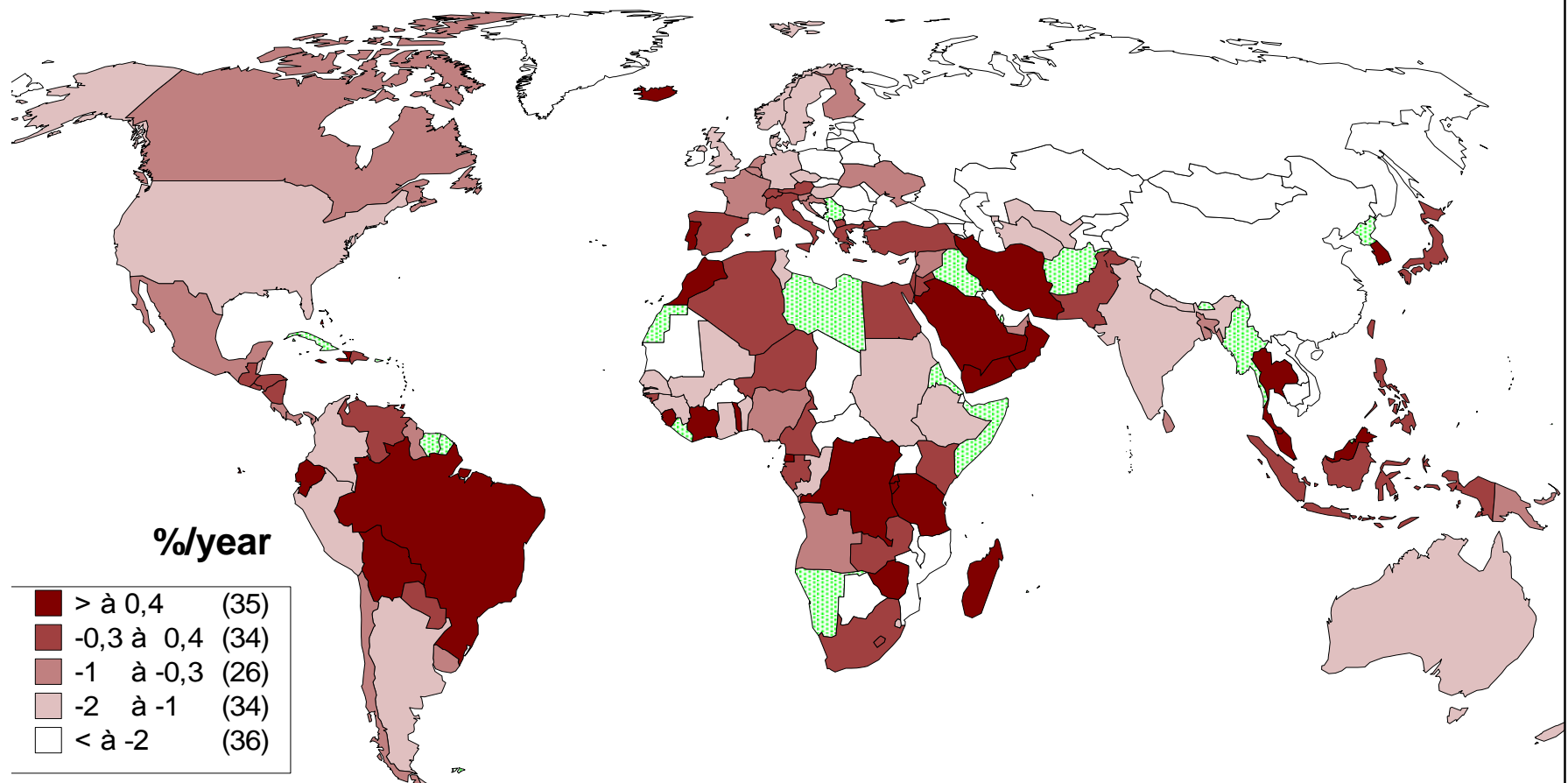


Source: Enerdata

# Almost two thirds of the countries in the world have decreased their energy intensity

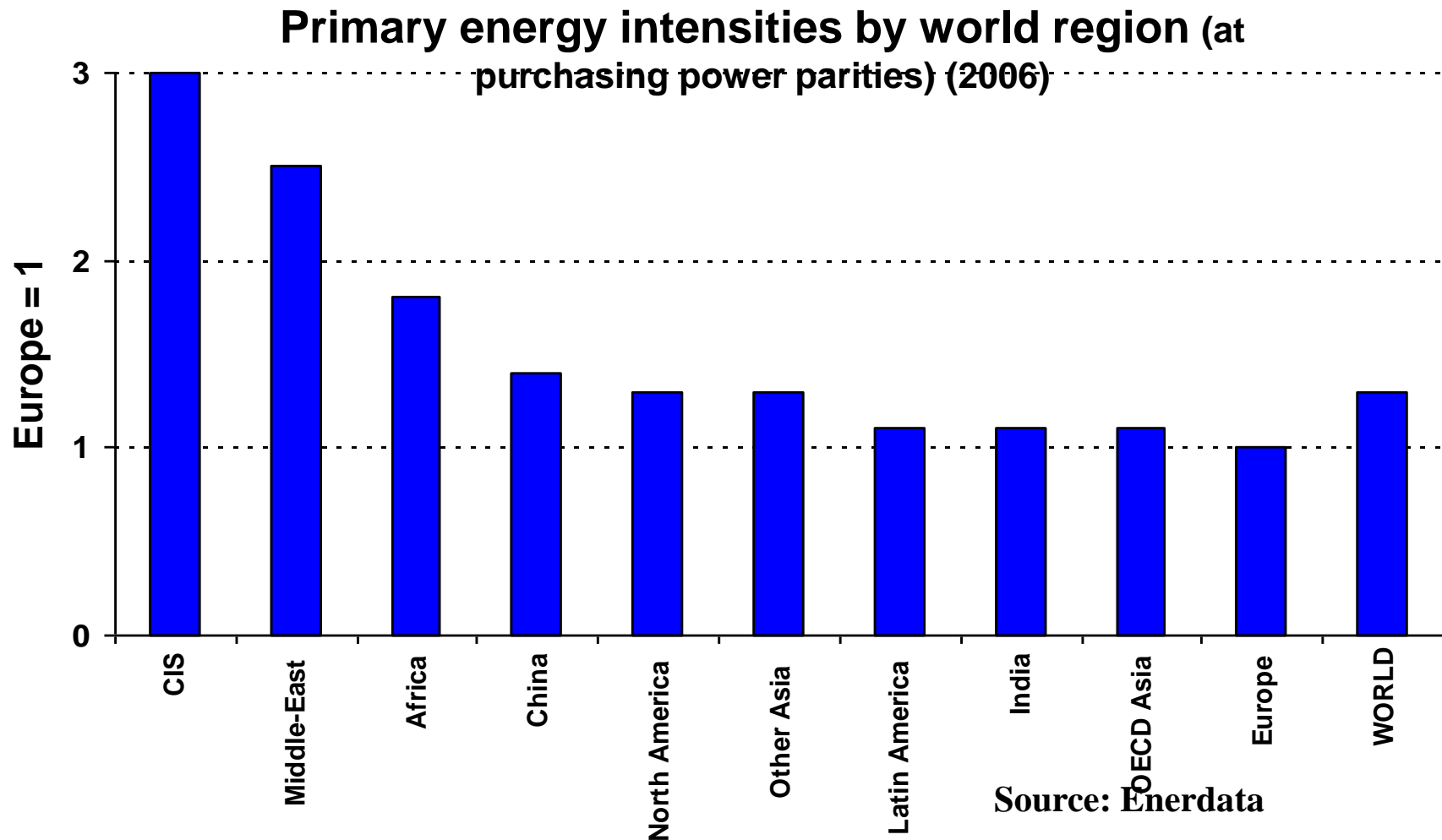
70 countries by more than 1% p.a and 40 countries above 2% p.a

## Variation of primary energy intensity by country (1990-2005) (%/year)

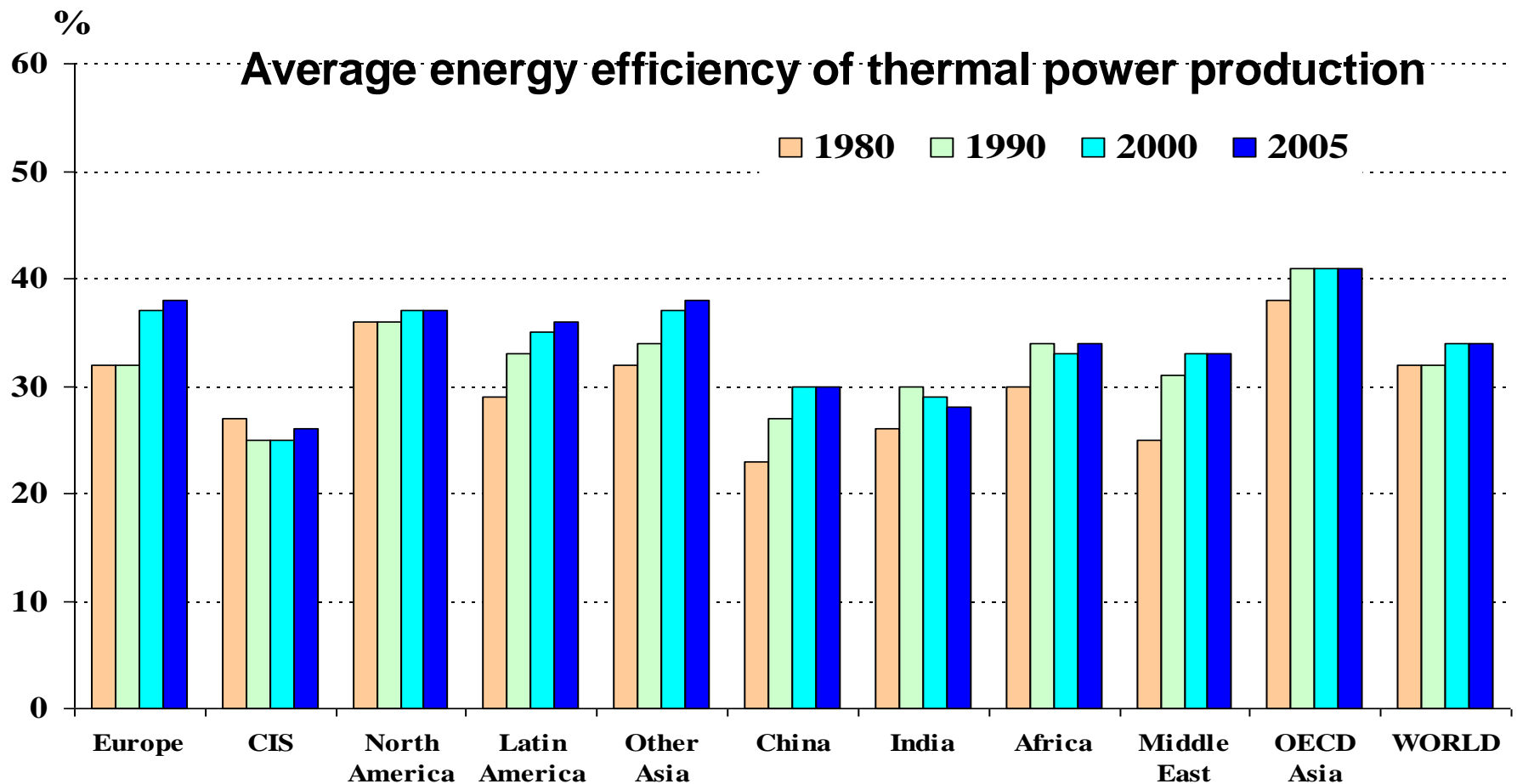


Source: Enerdata

**A factor 3 between CIS and Europe, region with the lowest intensity; 2.5 for Middle East, OECD Asia, India and Latin America (close to Europe); North America, Other Asia and world average: about 30% above Europe; China 40% above; **still potential for improvement in many regions****



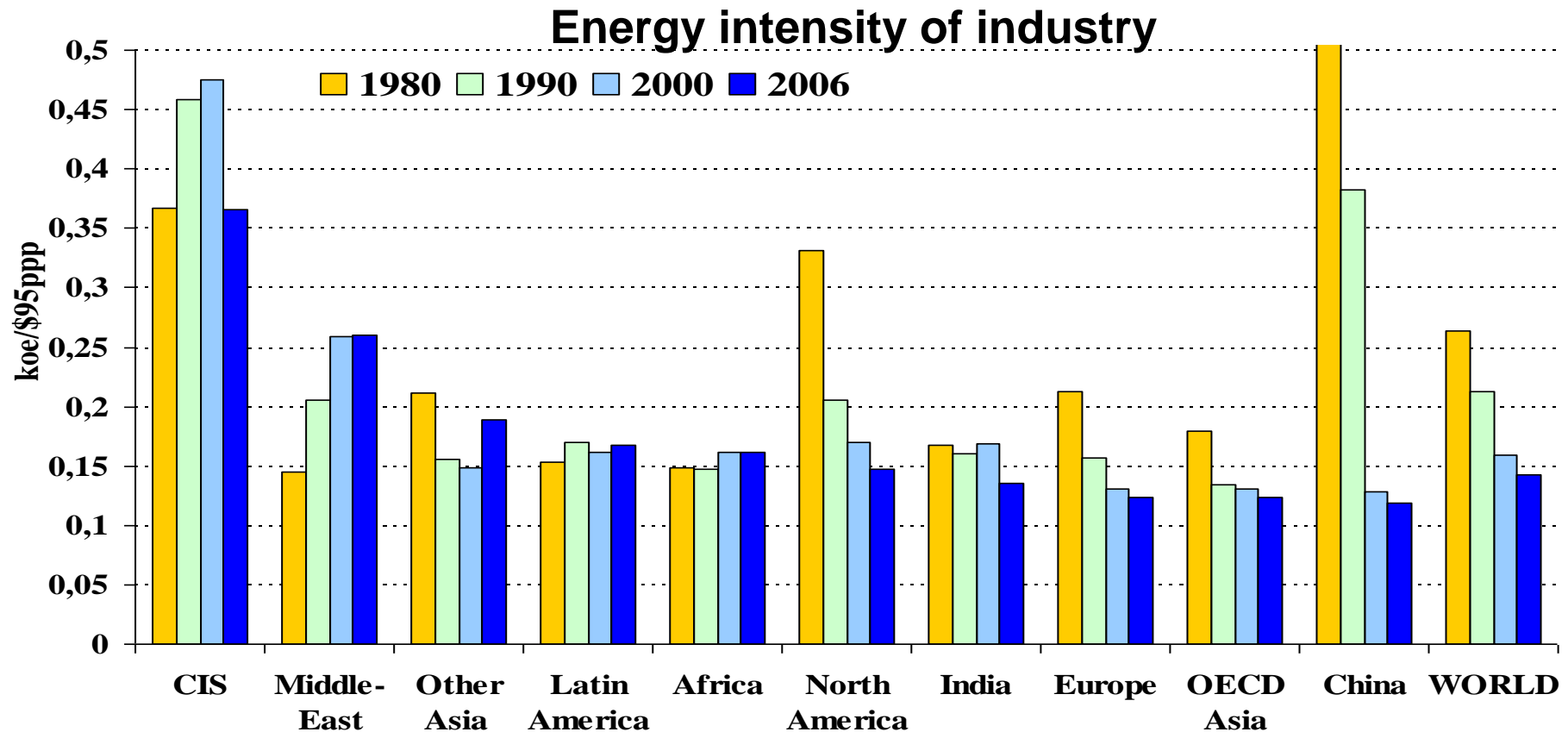
**Slow improvement at world level in the efficiency of thermal power plants ( 2 points between 1990 and 2005); world average (34%) far from EU average (40%) or EU best practice (Spain with 46%). If all regions at 2005 EU level →420 Mtoe savings (1.3 Gt CO2)**



Source: Enerdata

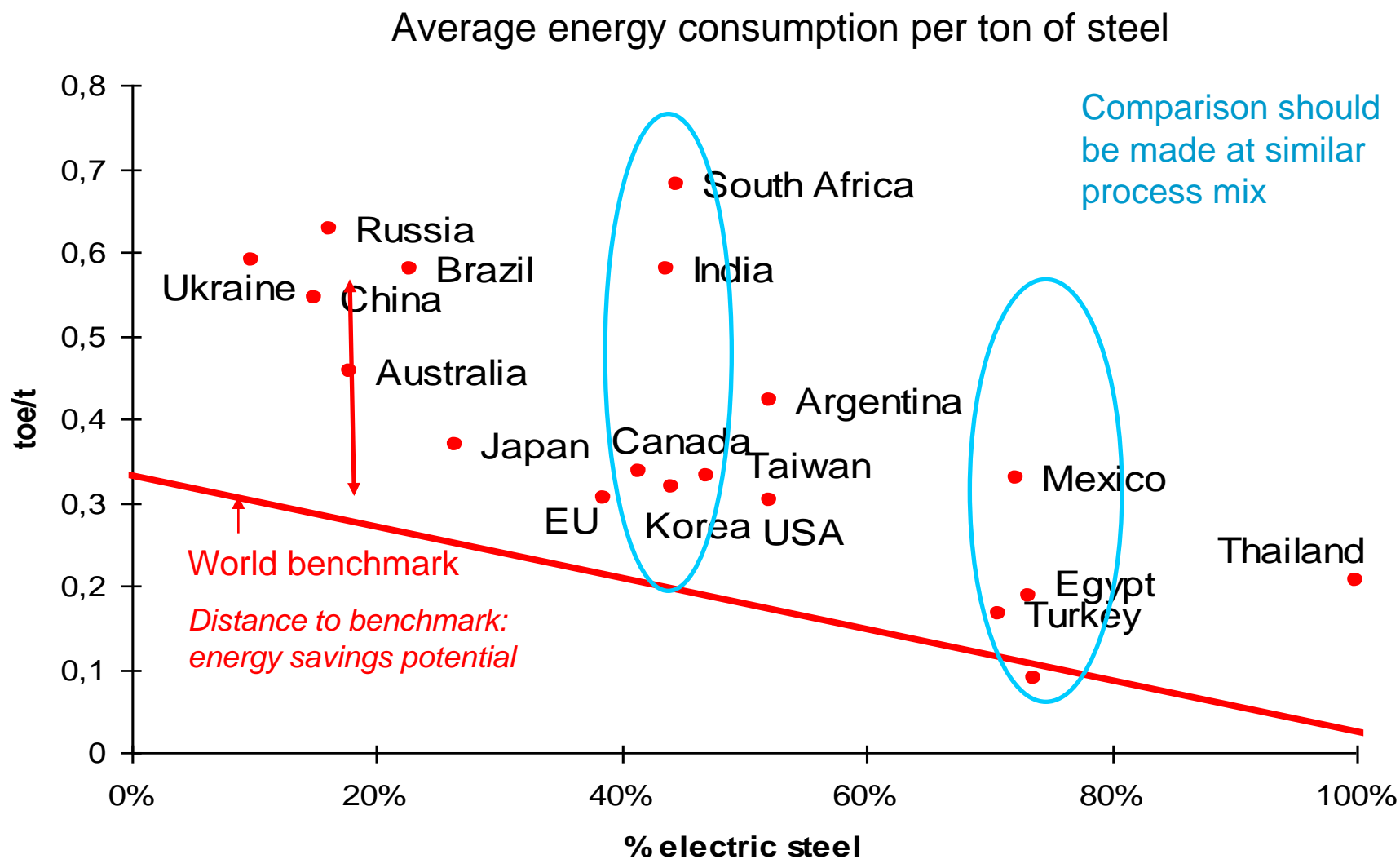
# Industry: the sector with the most rapid energy efficiency improvements (twice more rapid than for total at world level); convergence of performance because of globalisation

Part of the variation due to changes in industrial activities (towards more energy intensive production in the Middle East)



Source: Enerdata

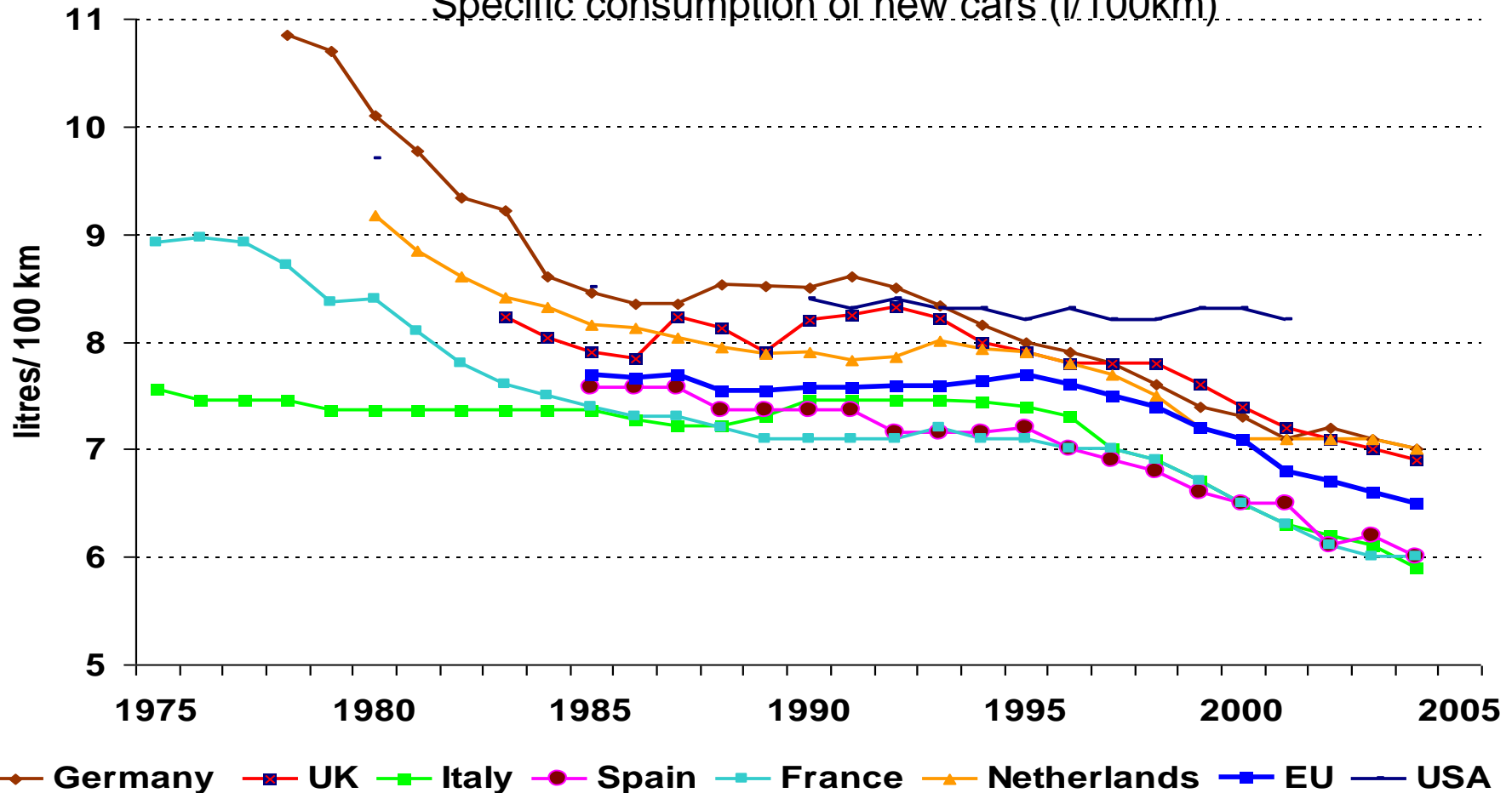
# In industry, the best world practices are no longer found only in the most developed countries



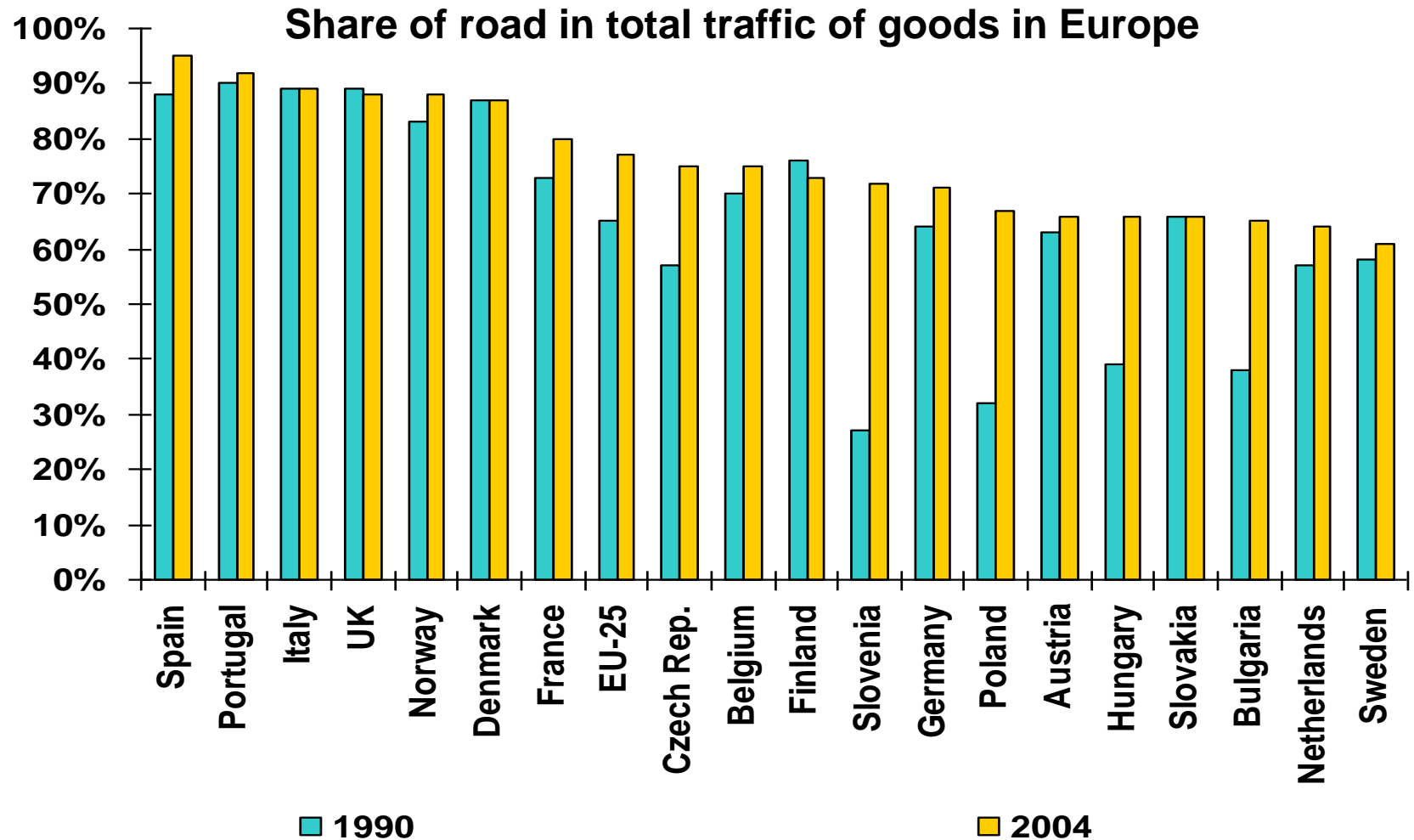
# For passenger transport, part of the energy efficiency gains have been offset by non technical factors

New cars in Europe have been more efficient since 1995 because of EU agreement with ACEA/JAMA/KAMA. Part of the technical progress offset by increase in engine power and weight (+14% and +8%) ... and increase in the share of trips made by car

Specific consumption of new cars (l/100km)

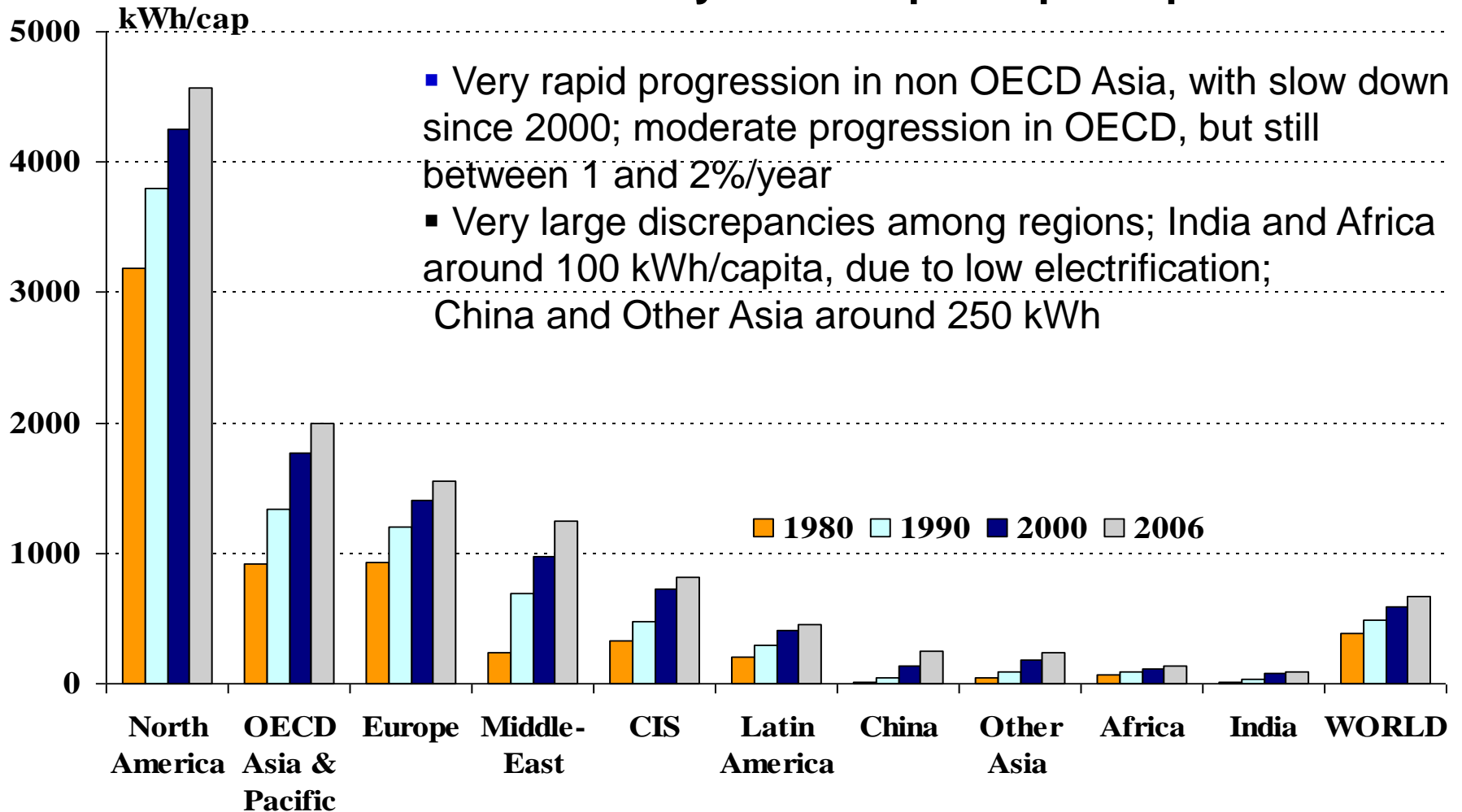


For the transport of goods, modal shift to road transport almost everywhere...although energy efficiency implies an increased market share for rail and water transport



# For households, effect of policies on large appliances visible but lifestyles (more equipment, multiple ownership) offset part of the progress achieved

## Household electricity consumption per capita

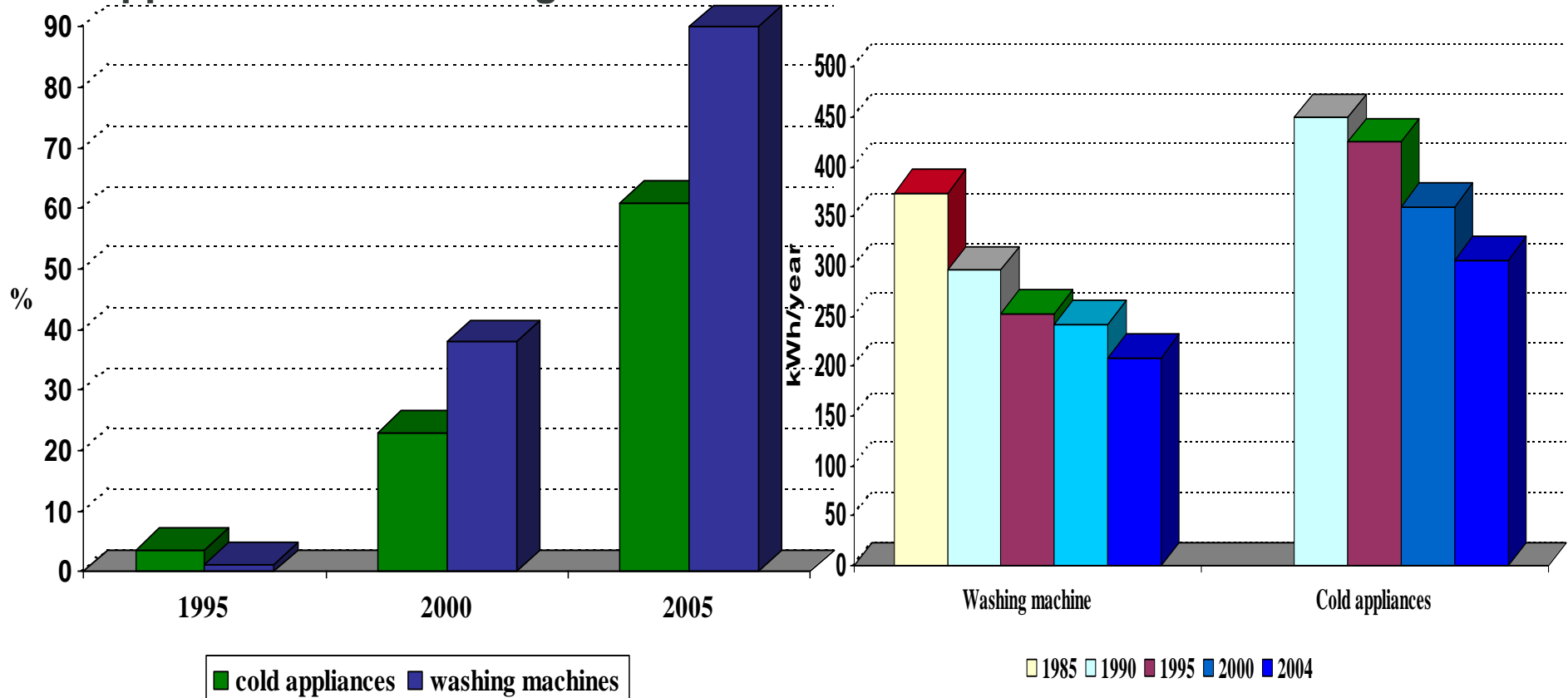


# Large appliances are more efficient because of labelling and minimum efficiency standards in most OECD countries and an increasing number of developing countries

## Case of the European Union (EU)

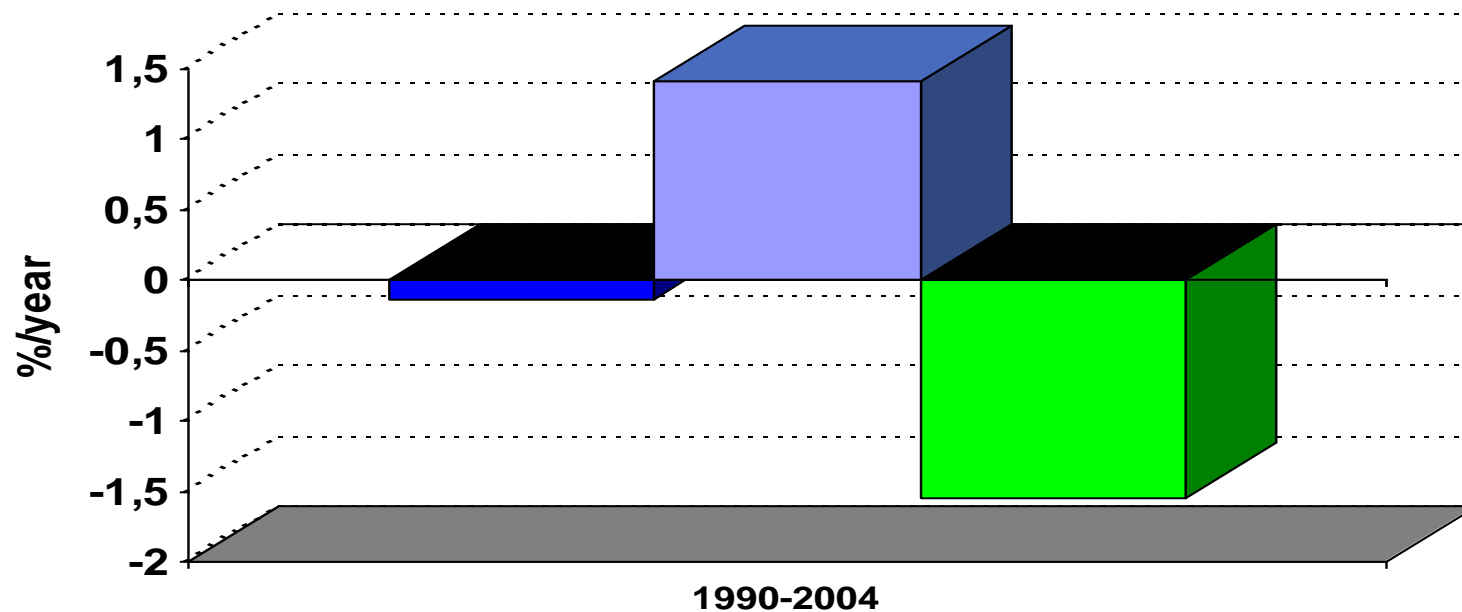
Market share of label A and A+ for cold appliances and washing machines

Specific consumption of new washing machine and cold appliances



In Europe, almost all energy efficiency gains for large appliances offset by an increase in equipment ownership  
→ almost no reduction in the electricity consumption per dwelling for these appliances... and rapid progression of the electricity used for small appliances (ICT's, standby)

Variation of the electricity consumption per dwelling for large appliances (EU-15)



- variation
- increased equipment ownership
- energy efficiency progress

# Why consumers are not doing all energy efficiency actions that benefit to them?

## Barriers to energy efficiency

- **Low energy prices** in many emerging/developing countries
- **Lack of information** for consumers about what they can do
- **Income restrictions** for investment in efficient appliances
- **Short term visibility**: consumers decide to buy energy efficiency equipment according to short pay back time (< 2 years) whereas cost effective investment correspond to longer pay back time
- **Split incentives**: decision for energy efficiency investments (in buildings, appliances, equipment, etc.) is not always made by the final users who have to pay the heating or cooling bills (e.g. building owners/occupant or operating/investment budget )
- **Inseparability**: the fact that energy consuming goods are often purchased with the dwelling

# Policy measures have worked well in some sectors and less in others

- Various types of policy measures have already been implemented to remove the barriers to energy efficiency and give incentives to consumers to purchase energy efficient equipment
  - ✓ Institutions and programmes
  - ✓ Regulations
  - ✓ Financial incentives
  - ✓ Information measures
  - ✓ Market instruments
  - ✓ R&D measures
  
- Diverse results:
  - ✓ Rather good for large appliances, new buildings and cars
  - ✓ More limited results for existing buildings or for modal shift in transport
  
- Measures need to be innovative when a multitude of consumers is concerned, especially for households and passenger transport (cars)

# More and more energy efficiency agencies and programmes with quantified long-term targets

## ■ Institutions

- ✓ 2/3 of countries with a national agency (90% in EU)\*
- ✓ More than 90% of countries with a Ministry department on energy efficiency\*
- ✓ Half of countries with regional / local agencies (70% in OECD): about 600 in the EU\*

## ■ National programmes of energy efficiency

- ✓ Increasingly programmes include ambitious quantitative targets that generally require yearly monitoring and reporting obligations
- ✓ Slightly less than half of the countries have a national programme on energy efficiency with quantitative target\*

# Example of official targets in the field of energy efficiency

## EU

- **1% annual energy saving** for a 9 years period starting in 2008 for each EU member country (9% target of cumulative annual savings for 2016 ) (New Directive adopted in May 2006 )
- **20%** energy efficiency progress by 2020

## France

- **EU target**
- **2%/year** reduction of the energy intensity of the GDP until 2015

# Regulations remain the favourite measure for households energy uses

- MEPS (Minimum Energy Performance Standards)
  - New buildings and new households electrical appliances
  - Cars, electric motors: few examples
- Obligation of information of consumers :
  - energy efficiency labels for household electrical appliances: mandatory for most large appliances in all European countries; well spread for refrigerators and air conditioning in many countries (transfer of label patterns)
  - industrial motors
  - dwellings (building certificates) *(new)*
  - cars
- Obligation of energy savings for utilities: case of 6 EU countries, extending to new countries (first one UK, last one France with **54 TWh** of mandatory energy savings imposed on energy utilities for 2006-2008 (with possibilities of trading) (“White certificates”))

# Transfer of labels for electrical appliances between countries

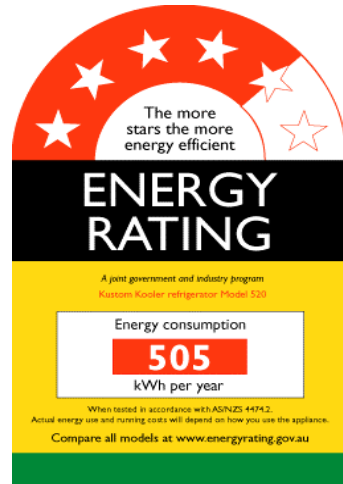
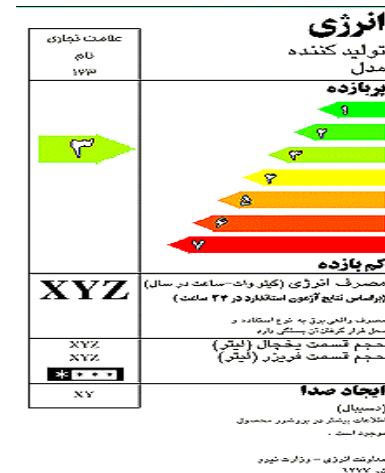
Thailand



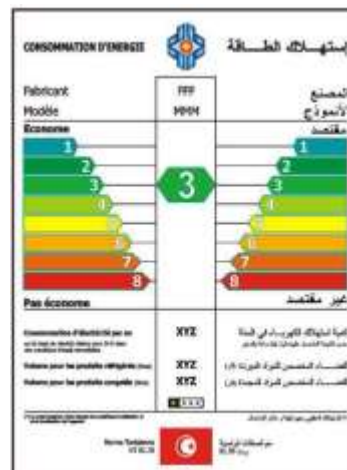
Brazil



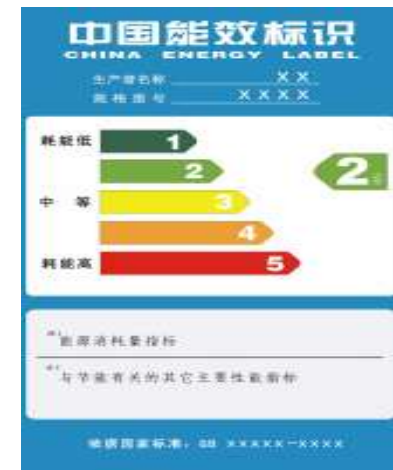
Iran



Australia



Tunisia



China

# Financial measures rely more and more on tax incentives than on direct subsidies

- **Economic incentives:** direct subsidies for audits or investment and soft loans
  - ➔ Subsidies from public budget or special funds (revolving funds); need resources and a manager (hence additional administration cost)
  
- **Fiscal measures:** tax credit, accelerate depreciation: (industry and services mainly), reduction of VAT (or import tax) on energy efficient equipment (e.g. CFL, efficient motors), on labour cost (Europe), reduction of annual tax and purchase tax for efficient cars (mainly in Europe)
  - ➔ Fiscal measures mainly used in industrialised countries
  - ➔ Easier to manage through normal tax system

## The way forward:

# Appropriate strategies are needed to increase the impact of energy efficiency programmes

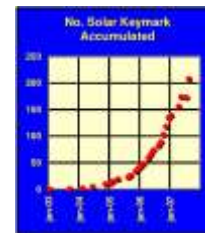
- **Incentive prices** for energy and equipment is a prerequisite;
- **Combination of several measures** (“package of measures”) has the greatest impact: information + subsidies + standardization + certification of installers
- **Collaboration between the public and private sector is necessary** to develop complete energy efficiency services offer, including access to funding (banks, ESCO’s);
- **Regulations** should be planned in advance, strengthened regularly and enforced

## The way forward:

# Appropriate strategies are needed to increase the impact of energy efficiency programmes (cont'd)

- **Quality** of promoted equipment and services (installers) is essential → need of certification and standards (e.g. Keymark label in Europe for solar heaters);

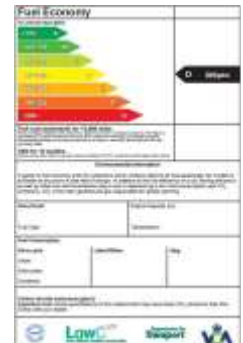
Keymark  
label



- Policies have to better address **new end-uses** where remain a significant energy efficiency potential (e.g. modal shift in transport, existing buildings, stand-by, lighting) and to promote technologies that make **daily energy use** more efficient (sensors, thermostat);
- **Ex-post evaluation** of implemented measures and a monitoring of their impacts with indicators should be carried out to understand whether measures work and if not why?

# The way forward: Innovative measures should be transferred

- Efficiency standards for existing buildings and buildings certificates
- Energy performance contracting and results guaranty (third party investors, such as ESCO's)
- Tax on cars that reflect the energy efficiency with feebates mechanisms
- Labelling and standards for cars



- Reduced or credit tax on energy efficient equipment
- Energy efficiency obligations for energy utilities

# Thank you for your attention

For more information: ADEME/WEC report on energy efficiency 2007, and:

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- [www.worldenergy.org](http://www.worldenergy.org)
- [www.mure2.com](http://www.mure2.com)