
HOW ENERGY EFFICIENCY CUTS COSTS FOR A 2-DEGREE FUTURE



effects, which increase the demand for energy services due to the lower cost per unit of energy services.

It is of the utmost importance to address why many of the cost savings due to EE are not yet being realized by markets, private investors and households. It is well-known that financial barriers are partly to blame, but there are also **several important non-financial barriers** including lack of information, bounded rationality, uncertainty about revenues and the involvement of numerous end-users and actors (Sorrell et al. 2004).

To overcome these barriers, it is important to choose the right mix of policy instruments that specifically addresses the potentials and barriers (Allcott and Greenstone 2012). Standard economic measures such as **removing subsidies for fossil fuels and pricing carbon** are important pillars for the realization of EE measures, but are not sufficient. Non-financial instruments include **lowering transaction costs and supporting the diffusion of EE measures** via capacity building, networks and energy service companies, but also promoting measures for the cost efficiency of EE measures other than payback periods such as the internal rate of return. Incentives that lower up-front investments may be required, especially where large up-front investments are concerned such as for the retrofit of existing buildings.

The study also provides **region-specific pathways and estimates for** six focus regions, which accounted for more than 60% of global GHG emissions in 2010, namely **the US, the EU, China, India, Brazil, and Mexico**:

- For each region, the **additional cost savings of the energy-efficient pathway are significant with respect to domestic GDP**. The shares vary between 0.1% and 0.4% (see Table 1) and are roughly equivalent to the current annual investments in renewable energies in those regions (Frankfurt School-UNEP Centre/BNEF 2014).
- **On average, the specific cost savings are 20 – 23 US Dollar per tCO₂e**. The specific cost savings are slightly lower in China and India, because the gap between EE and the decarbonization of the energy supply is smaller here, i.e. the energy-intensive and the energy-efficient pathways overlap strongly.
- Sensitivity to **rebound effects** is relatively high in India and China due to rising levels of living standards and mobility here. This underlines that most of the reduced savings are not lost, but **result in a higher level of service to end-users**.

In addition to these savings, EE measures bring additional substantial societal benefits by reducing the cost of bringing power to the under-served, and fostering the domestic economy (IEA 2014).

Table 1: Annual savings of the energy-efficient pathway in comparison to the energy-intensive pathway by region in 2030 (based on McKinsey & Company, see Section 4)

	Additional annual energy savings	Additional annual net cost savings		
	Exajoule/year	Total	/ per GDP	/ per abatement
		bUSD05/ year	% of GDP	USD05/tCO ₂
US	5.7 – 6.2	63 – 70	0.31 – 0.34	28 – 30
EU	4.1 – 4.5	79 – 82	0.34 – 0.36	72 – 75
China	4.7 – 6.0	54 – 69	0.24 – 0.31	10 – 12
India	1.1 – 1.3	10 – 15	0.17 – 0.25	6 – 9
Brazil	0.7 – 0.8	12 – 13	0.31 – 0.32	53 – 55
Mexico	0.1 – 0.2	2 – 3	0.11 – 0.15	13 – 17

These findings have **important consequences for the current EE policy debates in the studied regions** (see also Figure 1):

- **In the US**, tightening and expanding fuel economy standards and crediting of EE in the Clean Power Plan represent major steps forward to realizing the cost savings from EE. Nevertheless, incentives are still lacking for significant retrofits of existing buildings, and the reduction of fuel consumption in energy-intensive industries.
- **The EU** is on the right path with the revision of its Energy Efficiency Directive and implementation of the 3rd National EE Action Plans. However, standards for the retrofit of existing buildings are insufficient to exploit the existing potentials, which can be seen as a major shortcoming. Other options for improvement lie in stricter fuel economy standards for cars and stronger policies for freight transport.
- Over the last decade, **China** has embarked on fostering EE policies and measures in all the relevant sectors. The growth of energy-intensive industries and the rising demand for mobility will require even greater efforts, in particular in supporting changes to industrial processes and modal shifts in transport. These issues are planned to be addressed in the upcoming Five-Year Plan.
- In **India, Brazil, and Mexico**, power production, industry and the transport sector hold vast potentials for cost savings via numerous EE measures. This is partially indicated by these countries' Intended Nationally Determined Contributions to the UNFCCC. However, only a limited number of measures are being implemented or considered for these sectors. The potentials in buildings are already targeted by many on-going and planned activities, but are not fully addressed.

In summary, the findings of this study suggest that it is **highly beneficial to society to implement EE policies that boost EE in each of the six regions reviewed and beyond**, because a decarbonization pathway with a strong focus on energy efficiency offers much greater flexibility in decarbonizing the energy supply as well as significant societal cost savings up to 2030.

Energy Efficiency Pathway: Six-regions, \$220-250 Billion in annual savings and reductions of 11,000 Mt CO₂ equivalent in 2030

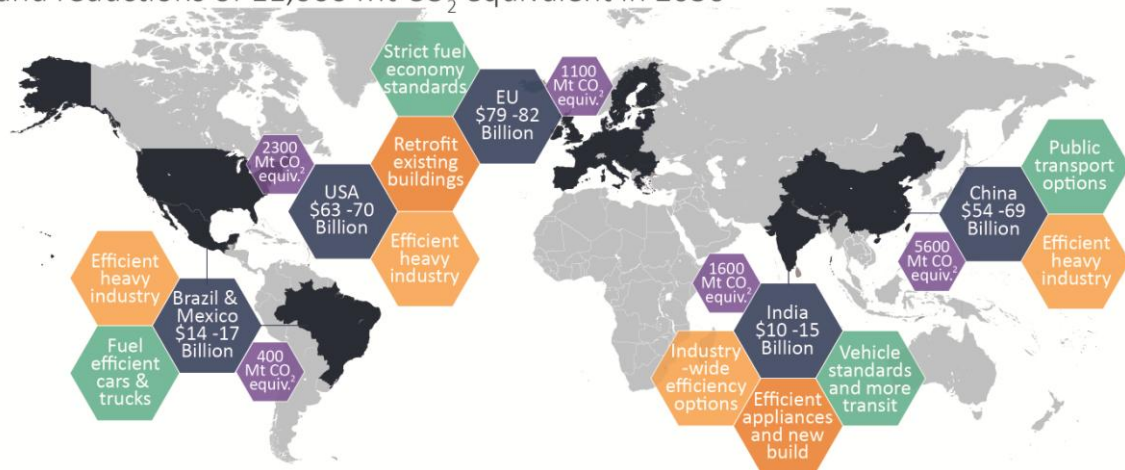


Figure 1: Overview of annual emissions reductions, cost savings and most important additional EE measures of the energy efficiency pathway by region