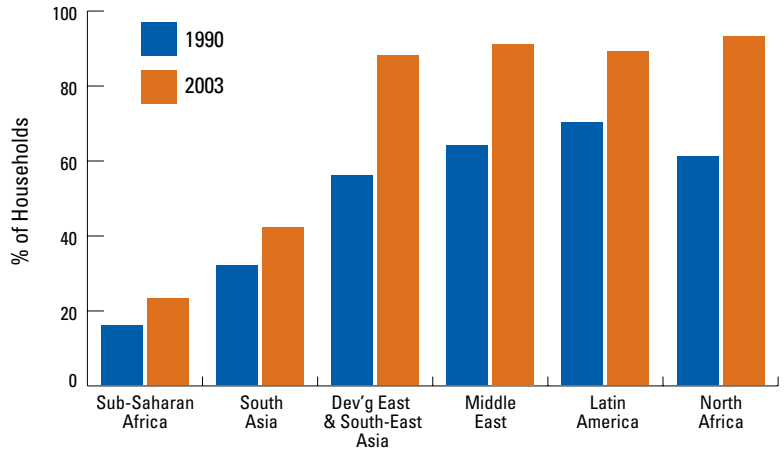
ENERGY FOR SUSTAINABLE DEVELOPMENT

Energy use is closely linked with economic development, poverty reduction and the provision of vital services. Yet, energy production, distribution and consumption can have adverse effects on the local, regional and global environment. Efforts are underway across the globe to improve access to modern energy services, increase energy efficiency, reduce air pollution and shift to cleaner energy sources.

Access to energy is steadily improving

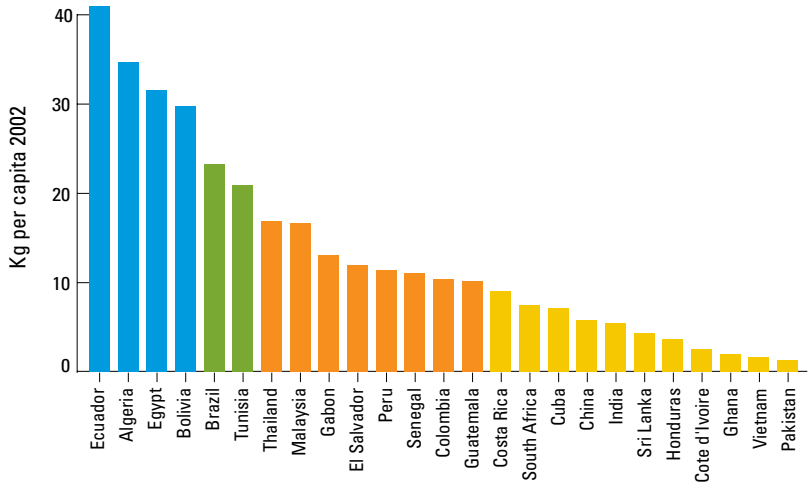
Over the past fifteen years, progress has been made in electrification in all developing regions. However, electrification rates in South Asia and sub-Saharan Africa remain a half to a quarter of those in the rest of the world.

Electrification in Developing Regions



Source: IEA, 2002 & 2005.

Liquefied Petroleum Gas: Residential Use



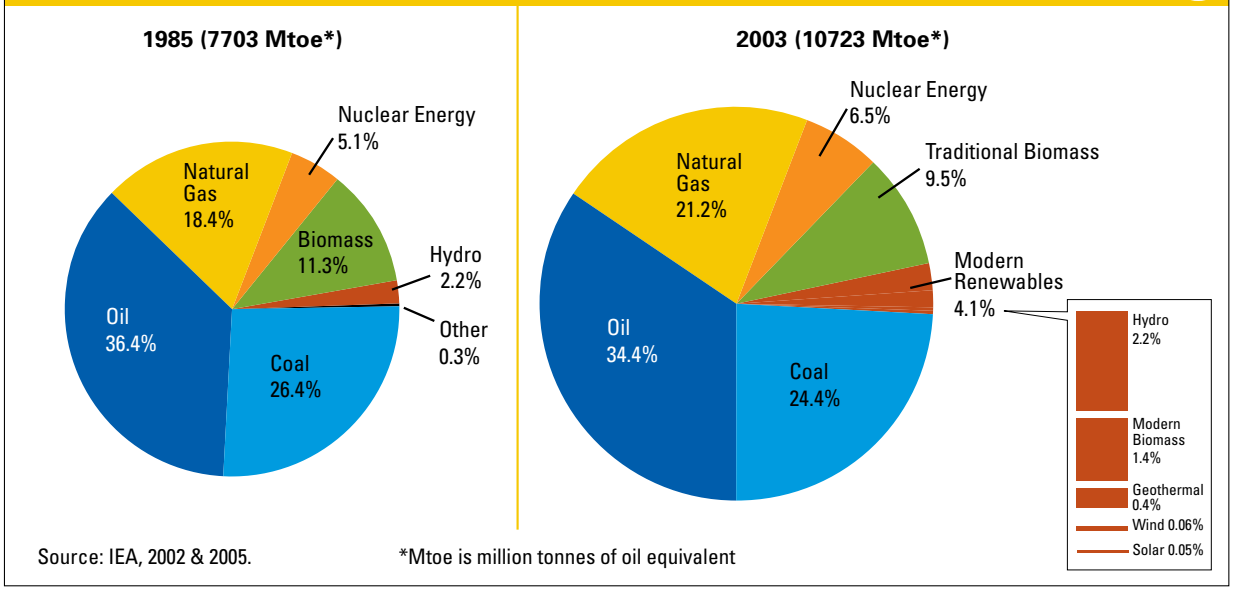
Source: UN, Energy Balances & Electricy Profiles, 2002; UN Demographic Yearbook, 2002; Unpublished data from the World LP Gas Association.

Liquefied petroleum gas distribution networks and household consumption are growing steadily, in some cases replacing traditional biomass, with environmental, social and economic benefits. The switch to modern household energy sources can be of particular benefit to women and girls — in terms of health, schooling, and productive employment.

The world is gradually shifting to cleaner forms of energy, but biomass is still widely used in the household sector of some developing regions

More than 2.4 billion people still rely on traditional biomass, including wood, agricultural residues and animal dung, for cooking and heating, with severe health impacts due to indoor air pollution. Biomass remains the main source of energy in sub-Saharan Africa. South Asia has seen a steep drop in the biomass share of energy since 1980, as has East Asia, as economic growth has enabled people to shift to cleaner and more convenient forms of energy.

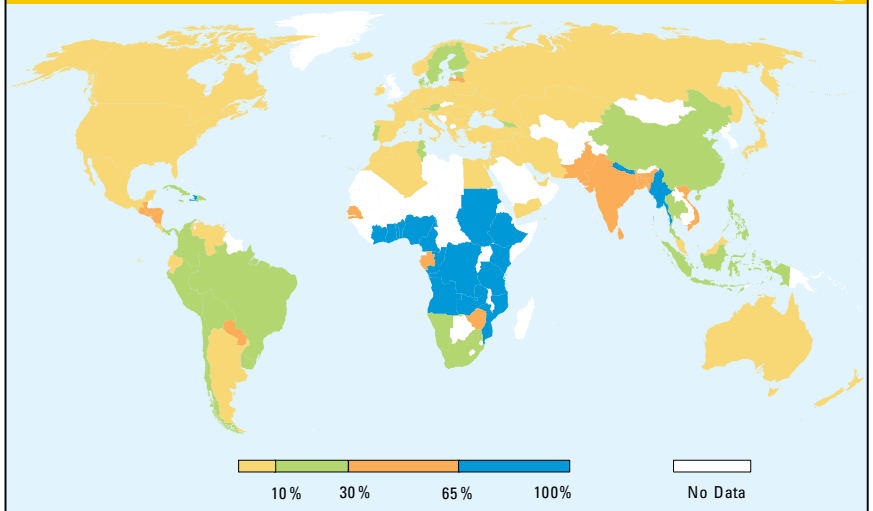
World Total Primary Energy Supply by Source



Source: IEA, 2002 & 2005.

*Mtoe is million tonnes of oil equivalent

Biomass as a Share of Total Primary Energy Supply



Source: World Bank, World Development Indicators, 2005.

Fossil fuels dominate energy supplies

Fossil fuels are expected to continue to dominate energy supplies for the next few decades at least. Oil remains the single most important fuel, amounting to 35% of total primary energy supply, with the largest share of the increase in oil use coming from the transport sector. From 1971 to 2003, global oil consumption in transport increased four times faster than consumption in industry. [4]

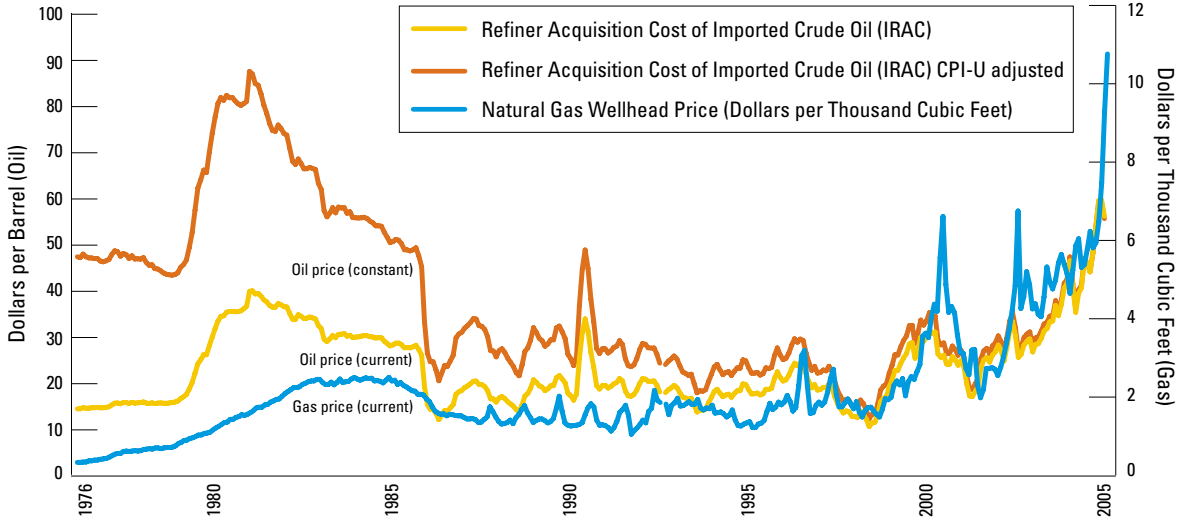
Use of natural gas, which is cleaner and less carbon intensive than oil or coal, is growing faster than other fossil fuels, driven mainly by power generation where technological innovation, economics and regulatory changes have resulted in gas becoming the preferred fuel, at least until recent price hikes.

Renewables other than hydro and biomass, including geothermal, solar and wind energy, are growing faster than any other energy source, but still account for only a tiny fraction of global energy supply.

Higher energy prices are promoting energy efficiency but also causing concerns

International gas prices have risen in late 2005 and early 2006 to the highest levels in history. Oil prices are at record highs in current dollars, but below the peak of the early 1980s when adjusted for inflation. These high prices are promoting energy conservation and efficiency efforts and making alternative energy sources, such as renewable energy, more competitive. However, the possibility of continuing price increases is raising concerns over adverse global economic impacts. Energy price volatility poses problems for sustainable development in both exporting and importing countries.

Crude Oil & Natural Gas Prices



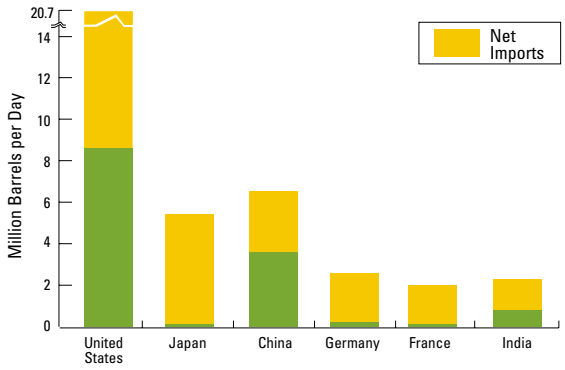
Note: Real oil price in constant 2005 US$: US Bureau of Labor Statistics seasonally adjusted urban consumer price index (CPI-U) is used.

Source: New York Mercantile Exchange (NYMEX); www.bls.gov

Energy integration through trade is a growing trend

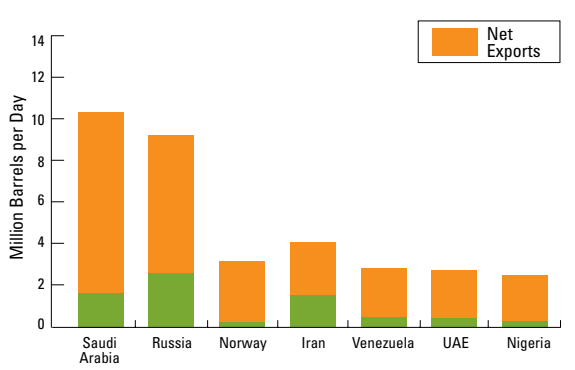
Oil is the most highly traded commodity, as it is essential to all modern economies yet commercially recoverable reserves are found in relatively few countries. Reliance on oil imports is growing rapidly in some major economies: e.g., in China, as recently as 2000 net imports accounted for 30% of consumption, while in 2004 they accounted for half; in the United States, from 1991 to 2004, net oil imports went from 40% to 59% of domestic consumption.

Crude Oil Consumption & Net Imports, 2004



Source: EIA, 2004.

Crude Oil Production & Net Exports, 2004

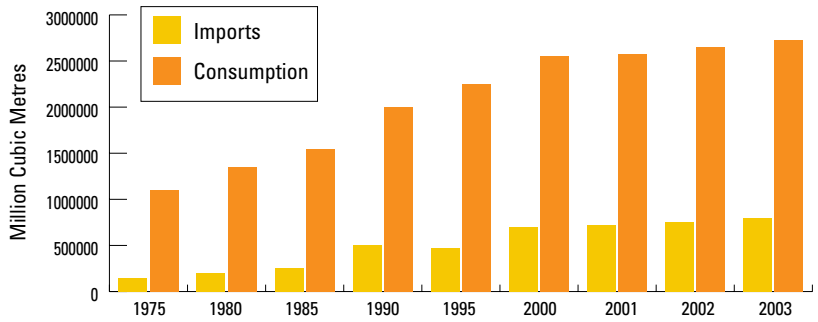


Source: EIA, 2004.

Cross-border gas trade has been growing rapidly, especially LNG trade

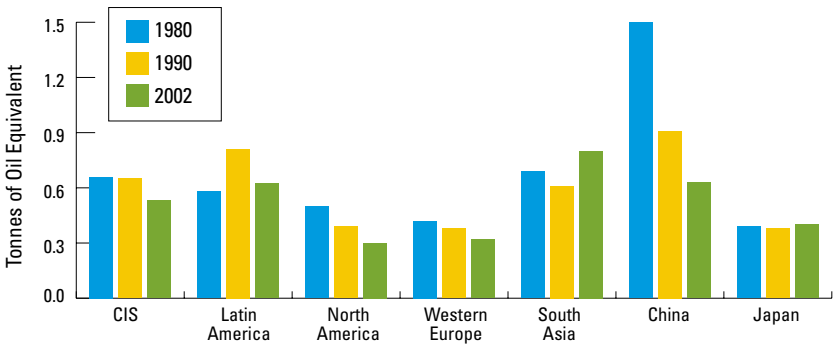
Rapid growth of natural gas networks across national boundaries, particularly in Europe but also in Latin America and North Africa, is putting pressure on legal, regulatory and policy frameworks that have not kept pace.[5a] From 1980 to 2003, world natural gas imports have risen by 6.2% a year, on average, increasing as a share of gas consumption from 13% to 29%.[5b] Over the past decade, global liquefied natural gas (LNG) imports have been growing by 10 billion cubic metres per year — an average annual increase of 7.2%.

World Natural Gas Supply



Source: IEA, Natural Gas Information 2004 Online Database.

Energy Consumption per Tonne of Steel

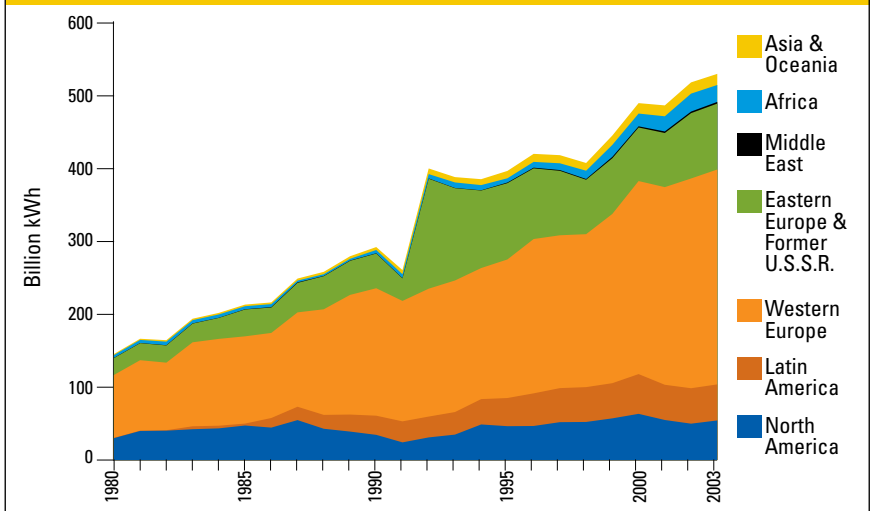


Source: World Energy Council, based on data from ISII and ENERDATA.

Electricity grid interconnections enhance energy security

Electricity trade among countries is also growing, particularly in Europe, enhancing security of supply and increasing competition among suppliers. For a few countries (e.g. Paraguay, Mozambique, and Lithuania), exports represent a very sizeable proportion of total electricity generation.[6a] In southern Africa, a power pool with 12 interconnected countries has been operating successfully for the past decade. Although electricity trade within the pool is relatively small, it is growing at over 20% per year. [6b]

Electricity Imports



Source: IEA, 2004.

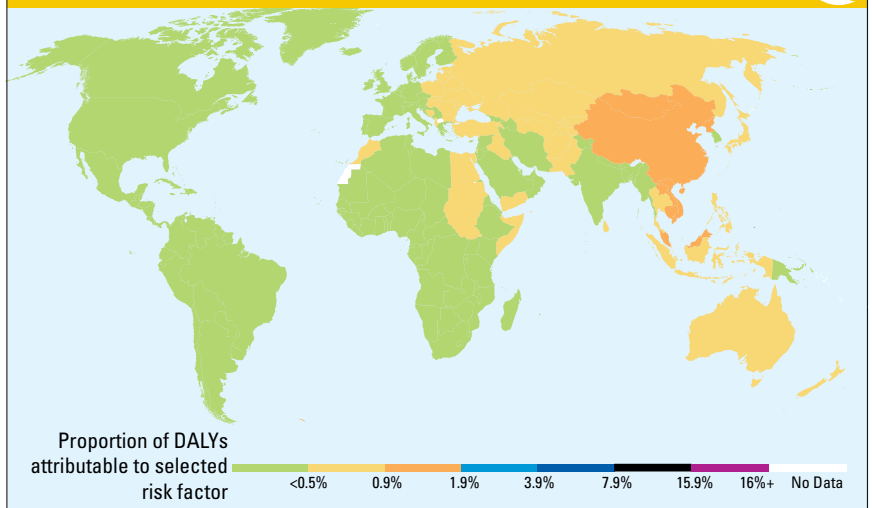
Energy efficiency in industry is improving

A wide variety of energy efficiency policies and programmes have been implemented in many countries to increase productivity while reducing energy consumption. Many of these measures were initiated between 1973 and 1986 in response to energy price increases and have achieved substantial gains, as illustrated by the steel sector, where process improvements have played an important role. The recent increase in fuel prices is promoting further investments in energy efficiency, which will increase productivity in the future. [7]

Energy consumption is a main source of urban air pollution

Urban air pollution has its source mainly in industry and transport. Lack of emissions control technologies in industry, power generation, district heating and transport vehicles is a main reason for much of the observed air pollution in cities. Rapid growth in motor vehicle traffic has compounded the challenge of controlling air pollution in many metropolises.

Urban Air Pollution



Source: WHO, World Health Report, 2002.

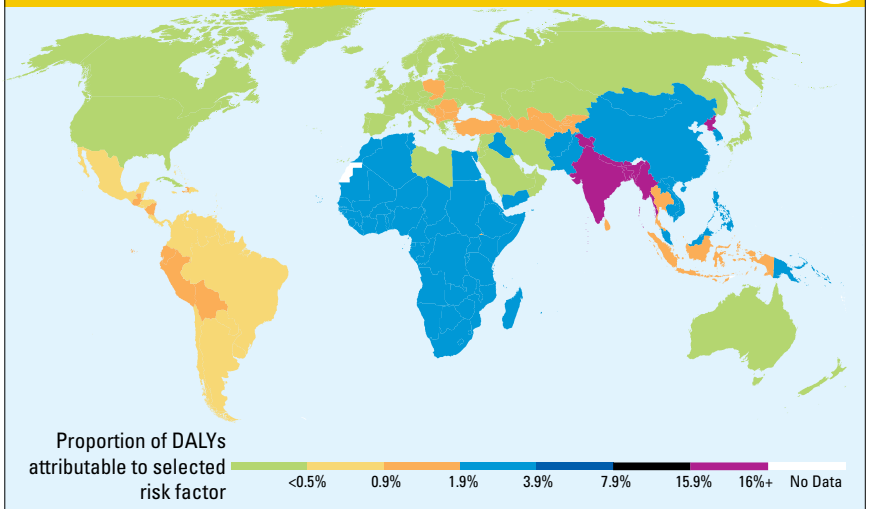
Note: Disability Adjusted Life Years (DALYs) is a measure of disease burden which incorporates both mortality and morbidity.

Indoor air pollution is a major cause of mortality in Africa and Asia, while outdoor air pollution is damaging health in cities worldwide.

Lack of modern energy services contributes to ill health and early death

Reliance on traditional fuels for cooking and heating in poorly vented conditions has serious health impacts on women and children in developing countries. Almost 2 million children die each year from respiratory infections caused in part by such indoor air pollution, with countries in Africa and Asia suffering the most. Indoor air pollution has a bigger health impact than urban air pollution by a large margin. [8]

Indoor Smoke from Solid Fuels

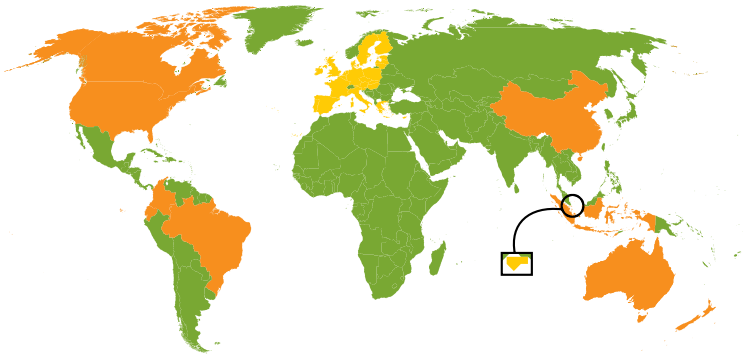


Source: WHO, World Health Report, 2002.

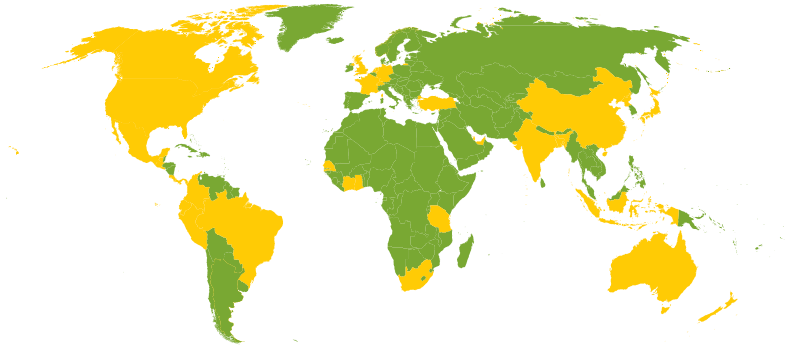
Transport Policies to Enhance Energy Efficiency & Reduce Air Pollution

Note: Key country and regional examples of particular measures are highlighted in orange and yellow in the maps.

Clean Fuels & Vehicles:
Vehicle fleets in many cities around the world are converting to compressed natural gas (CNG). This is substantially reducing air pollution in Asian cities as 3-wheelers are converted. Ethanol is also being blended with gasoline to reduce pollution and dependence on oil. On the vehicle side, governments are adopting more rigorous vehicle standards, such as EURO3 and EURO4, particularly in the major cities of Asia. Cities are also phasing out 2-stroke engines, which are highly polluting. [9a]

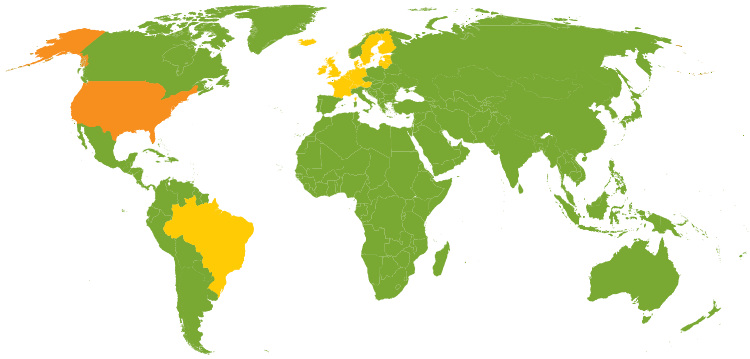


Integrated Urban Road Pricing:
Singapore has long had a road pricing scheme with tolls for those entering the city center. This has now been fully automated and the tolls are variable with the time of day and day of week, to reflect congestion. A similar system has been established in London and the EU has launched a European Transport Pricing Initiative involving eight other cities.[9b]



Bus Rapid Transit Systems:
A new paradigm in urban mass transit is being developed in a number of cities, particularly in Latin America and Asia, which shows promise for revolutionizing bus systems around the world. BRT systems get buses out of traffic, increase their average speeds, improve their reliability and convenience, increase system capacities and attract high ridership levels, thus increasing the profitability of systems. They are much less expensive and represent a significantly more efficient use of capital than construction of rail-based metros and, can be implemented in a fraction of the time.

Intelligent Transport Systems (ITS):
ITS encompass a broad range of communications-based information, control and electronics technologies to help monitor and enhance system wide performance, reduce congestion, provide alternate routes to travelers and enhance productivity. [9c]



Pedestrian & bicycle facilities:
As cities change their vision of future development toward a more people-centered approach, they are building more infrastructure dedicated to pedestrians and bicycles as a means of encouraging a safer and healthier environment.