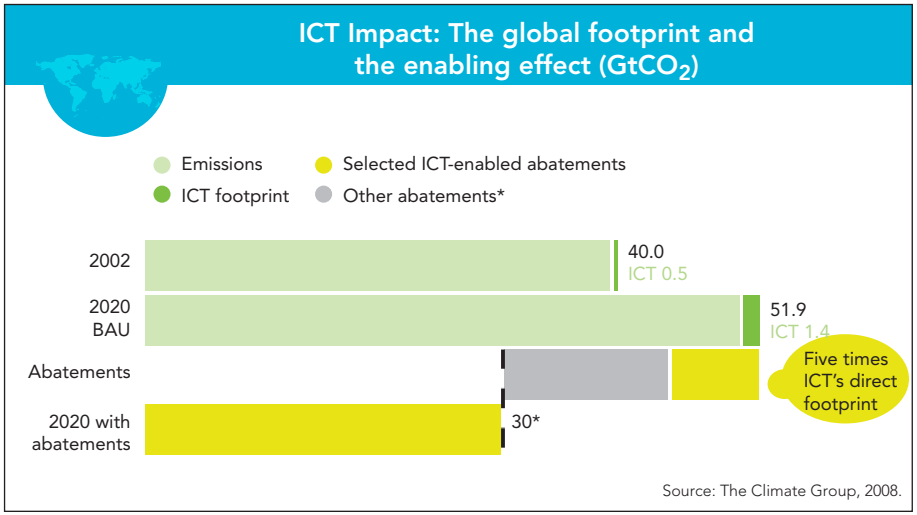
# V. NEW TECHNOLOGIES AND FINANCE

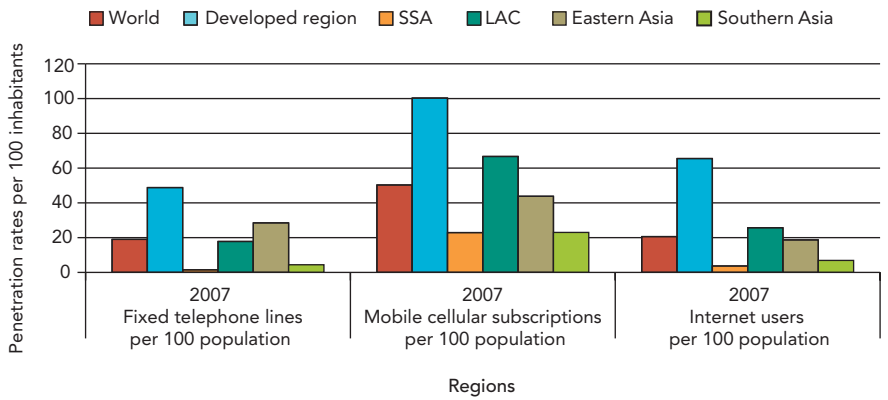
Government policies contribute importantly to setting the incentive and regulatory framework to induce a shift towards sustainable patterns of consumption and production. Often, behavioral responses of consumers or managerial changes of producers can achieve significant results. Nevertheless, to make the major changes needed in coming decades will require more. It will require development of new environmentally sound technologies as well as a much faster scaling up of both current and yet-to-be developed technologies. Technology development and scale-up in turn require significant financing to make the necessary investments.

## New technologies

The most significant technological advance of the past generation has been the very rapid growth and increasing penetration of Information and Communication Technologies (ICT) in both developed and developing countries. While manufacturing ICT equipment produces sizeable new material flows and using ICT generates significant energy demand (still largely supplied by fossil fuels), ICT has at the same time made possible significant improvements in resource and energy efficiency and reductions in waste. By one estimate (see figure), the carbon mitigation opportunities made possible by ICT applications outweigh the ICT sector's own carbon footprint by a factor of five.



## ICT penetration rates per 100 inhabitants, 2007

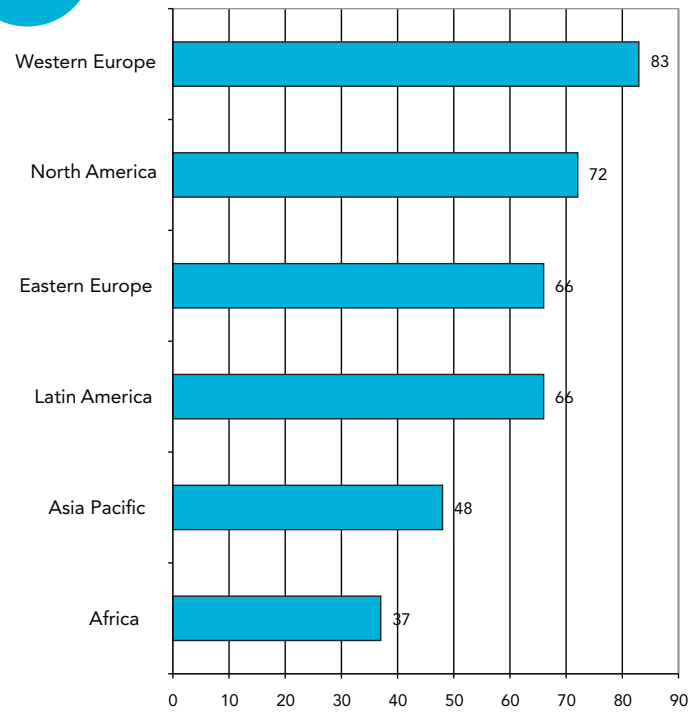



Source: ITU, 2010.

ICT — and in particular mobile telephony — represents a case of technology leapfrogging which has brought affordable communications to rural areas of the developing world, leaping over fixed-line phone technology. Sub-Saharan Africa's and Southern Asia's negligible fixed-line coverage but significant mobile cellular coverage (see figure) illustrates this well.

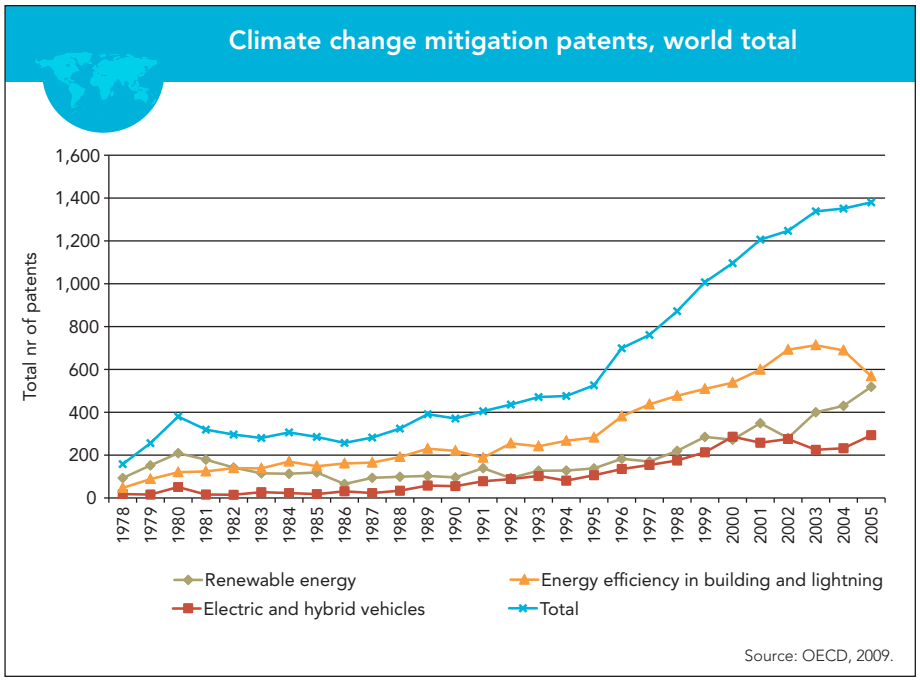
> **"As the world economy begins to recover from one of the worst economic crises in decades, information and communication technologies (ICT) are bound to play an increasingly prominent role as a key enabler of renewed and sustainable growth, given that it has become an essential element of the infrastructure underpinning competitive economies."**
>
> *— WEF, The Global Information Technology Report 2009–2010.*

## Mobile penetration (% of population), 2008




Source: Pyramid Research Data, WCIS, 2008.

Mobile phones (increasingly wifi capable) have extended a range of services to the rural poor, such as e-banking (including microfinance and remittance management), on-the-spot agricultural information and advice (e.g. weather, pests, prices) and remote access to medical information and advice, including veterinary medicine.




Patent filings and awards show an acceleration in recent years of innovation in climate change mitigation technologies, with renewable energy and energy efficiency in buildings and lighting roughly on a par in numbers of patents issued.

Ecological footprints of new and emerging technologies are still uncertain. Industrial biotechnology has a number of potential applications for enhancing sustainability. For instance, enzymes have been developed that reduce the heat of water needed to wash clothes; others are being developed to convert cellulosic biomass from agricultural waste or energy crops into fermentable sugars for producing bio-ethanol; still others to reduce nitrogen emissions from animal farming.

Energy savings from nanotechnologies are expected to be significant. For example, they will enable: solar cells that are produced at reduced costs and provide higher efficiency; light-weight transportation components that improve fuel economy in automobiles and trucks; more efficient lighting (i.e., LEDs) at homes and offices; and better performing catalysts/ separations/ materials technologies that enhance the energy efficiency of manufacturing[9].

On the other hand, their environmental and health impacts are still imperfectly understood. Potential occupational and public exposure to manufactured nanoparticles will increase dramatically in the near future due to the ability of nanomaterial to improve the quality and performance of many common consumer products as well as the development of medical therapies and tests which use manufactured nanoparticles[10]. Yet, there is still a paucity of information on nanoparticle toxicology and exposure assessments and they are also very resource intensive.

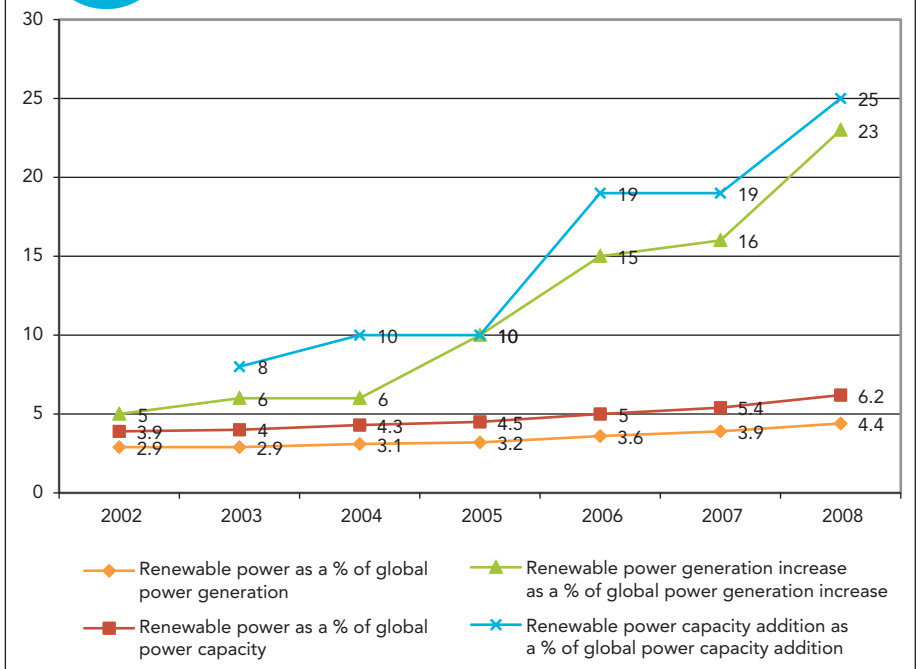
## Finance

Finance is needed both to develop new technologies for more sustainable consumption and production, and to build the infrastructure and plant and equipment to realize more sustainable consumption and production patterns and make more sustainable products.

Of particular importance in the future will be the development of a low-carbon energy infrastructure and provision of low-carbon energy and transportation services in developing countries to support strong economic growth and social development.

The following figures provide a snapshot of trends in new investment in renewable energy technologies in particular, but also in other technologies which can help reduce carbon footprints while improving energy access.

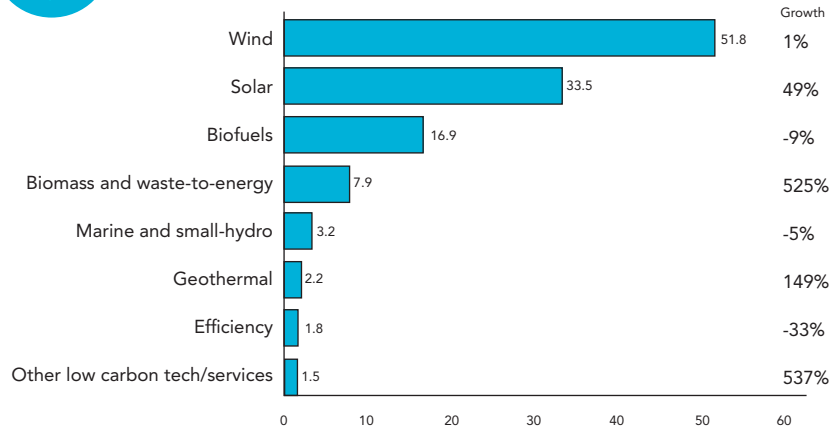
## Renewable power generation and capacity as a proportion of global power, 2002-2008, % share




Source: Bloomberg New Energy Finance, 2009.

While renewable energy remains a small share of global capacity in the power sector, its share of added capacity in that sector has been growing steeply during the past decade, reaching one-quarter of power capacity additions as of 2008.

## Financial new investment, by technology, 2008 $ billion and % growth on 2007

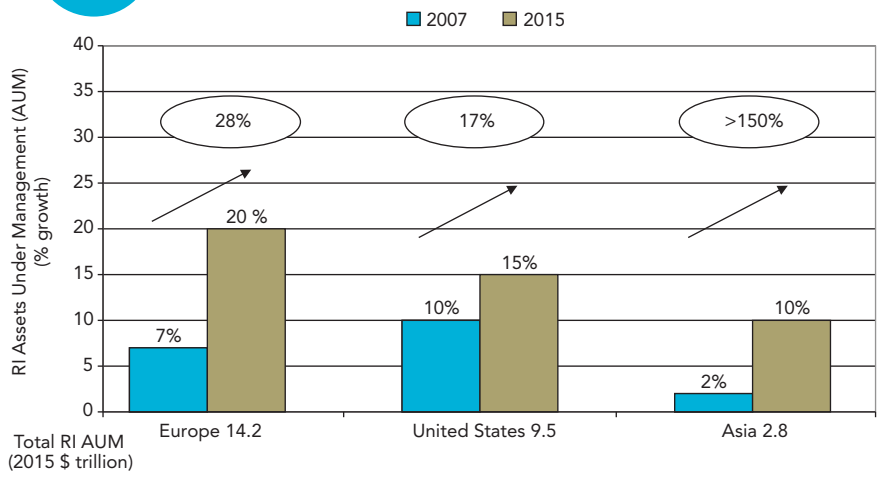



Source: Bloomberg New Energy Finance, 2009.

Developing countries' share of total global financial investment in renewables increased to 31% in 2008, from 26% in 2007. China led investment in Asia, with $15.6 billion of new investment, mostly in new wind projects, and some biomass plants. Investment in India grew 12% to $3.7billion in 2008, of which asset finance represented $3.2 billion, up 36%. Brazil accounted for almost all renewable energy investment in Latin America in 2008, receiving $10.8 billion, up 7% from 2007[11].

Socially and environmentally screened investments have become more popular over the past decade, as evident from data on "responsible investments (RI)". The RI penetration is expected to reach between 15 to 20 percent of total Assets Under Management (AUM) or around $26.5 trillion by 2015. If the RI market enters a proliferation phase the global RI growth rate could rise to 30 percent per year. Europe — especially Switzerland and the UK — will drive much of this growth. With its growth rate of 28 percent per annum, the European RI market is expected to reach $14.2 trillion, overtaking the US RI market. Currently the largest RI market, the US, is expected to grow to $9.5 trillion by 2015.

## Responsible investments (RI) market growth, 2007-2015

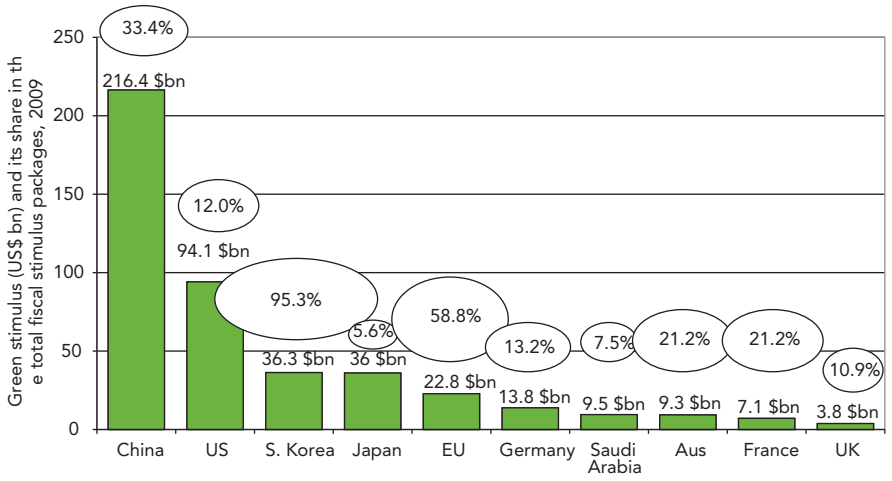



Source: Robeco, Booz & Company, 2008.

Socially responsible investing has been depressed, along with other investments, by the ongoing global recession. Clean energy investment funds have also suffered the effects of the ongoing uncertainty in the global climate regime following the inconclusive Copenhagen climate change negotiations. On the other hand, government spending on "green" investments has received a significant boost during the recession, with substantial portions of stimulus packages in many countries earmarked for environmentally sound investments.

Socially and environmentally screened investments (Socially responsible investment, or SRI) and assets managed according to environmental, social and governance (ESG) criteria represent an increasing share of assets under management, reaching 10% in the US, 7% in Europe and 2% in Asia in 2007. Growth is expected to continue in Europe and the US and to explode in Asia to 150% to bring SRI penetration to 10% by 2015. Total assets under management that are socially and environmentally screened

## Green stimulus (US$ bn) and its share in the total fiscal stimulus packages in 2009

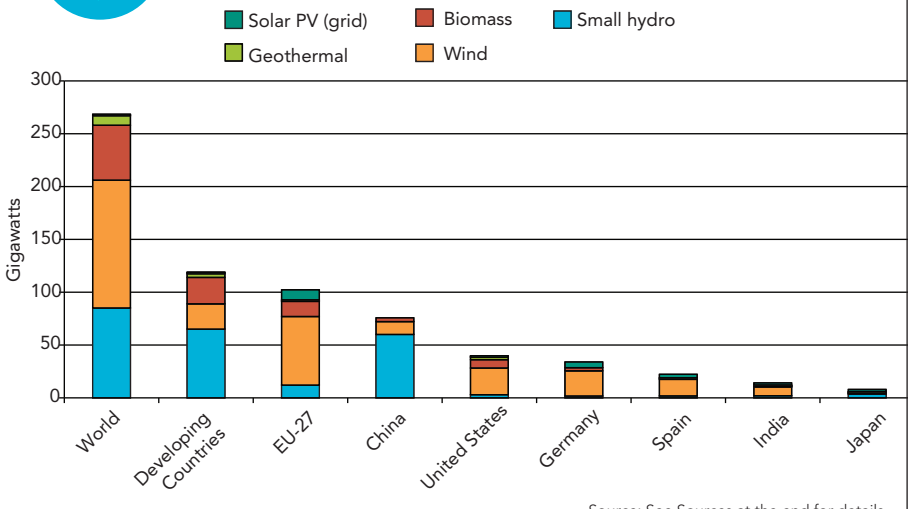



Source: Barbier, 2009.

are expected to reach $26.5 trillion by 2015. The UN Principles for Responsible Investment have attracted 640 signatories with combined assets under management of $14 trillion. The trend is toward ESG that, instead of or in addition to screening out undesirable corporate citizens, selects leading companies in their sectors to drive continuous improvement.

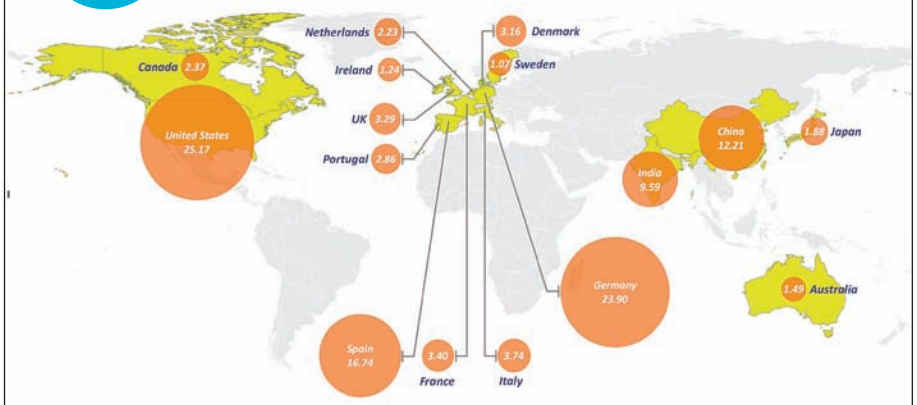
The recent increase in renewable energy investment and green stimulus spending has not been limited to the developed countries. Emerging economies play an increasingly prominent role in these technologies and sectors. China registered the largest absolute amount of green stimulus spending, while Republic Korea registered the largest green share of its stimulus. In the case of renewable energy, Brazil is a world leader in production of biofuels, while China and India both have sizeable installed capacity of wind and solar PV.

## Renewable power capacities, by source



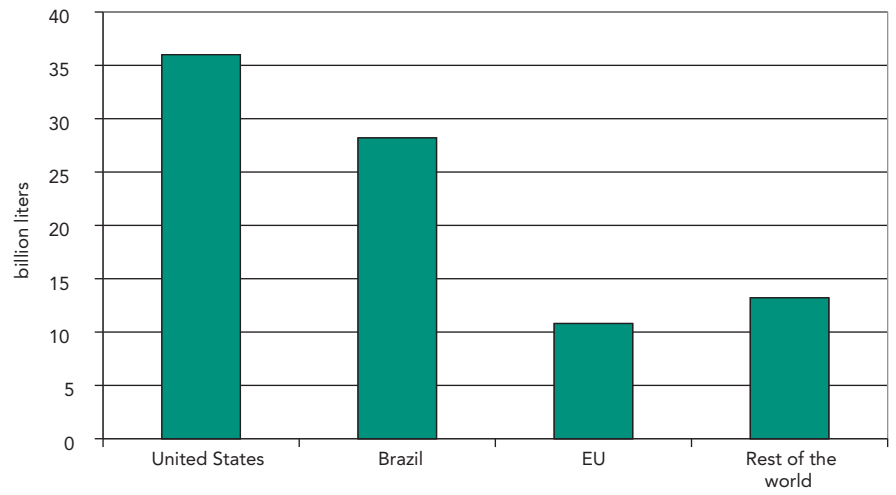

Source: See Sources at the end for details.

## Wind energy capacity, Total power installed 2008 (gigawatts)



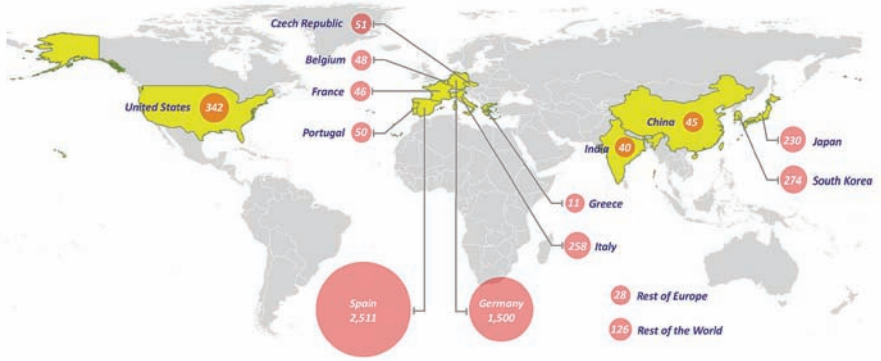

Source: Global Wind Energy Council, 2008.

## Main Biofuels Producers in 2008




Source: See Sources at the end for details.

## Photovoltaic energy, Global market 2008 (megawatts)




Source: European Photovoltaic Industry Association, 2008.