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Mark Lutes
Policy Coordinator, WWF Global Deal Network Initiative
WWF Canada
Phone: (1 416) 484-7723;
Mobile: (1 416) 473-5919;
Email: mark.lutes@wwf.panda.org
www.panda.org/climate

Emerging Leaders

How the developing world is starting a new era of climate change leadership

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1 A New World of Climate Leadership

Climate change is one of the greatest environmental, social and economic threats facing humankind. More than a century of large-scale fossil fuel consumption and deforestation have altered the Earth's climate system as the build-up of greenhouse gases (GHGs) in the atmosphere have led to higher surface temperatures, shifting climate patterns and an overall destabilization of the global climatic system.

According to the Intergovernmental Panel on Climate Change (IPCC), atmospheric greenhouse gas concentrations are higher today than at any point in history, with most of the emissions coming from industrialized countries. Since the year 1800, the nations representing just 25% of the global population have emitted 83% of the world's cumulative fossil fuel-related carbon dioxide (CO_2) emissions. As recently as the 1990s, industrialized countries accounted for more than half of the 6.3 Giga tons of carbon released annually into the atmosphere, primarily from fossil fuel combustion. But today, as developing nations experience increasingly rapid economic and population growth, they are on track to quickly become the major emitters of the future.

There is a widespread belief that developing countries do not take climate change seriously, are not taking steps to reduce emissions and will be an obstacle to reaching a new global agreement to stop climate change. In reality, these countries are not only taking action to reduce their own emissions, but many of them are also playing a constructive role in the international climate negotiations.

This paper focuses on five of the most dynamic emerging economies – Brazil, China, India, Mexico and South Africa – examining the current trends in GHG emissions in these countries, the actions underway to mitigate climate change impacts, the forces driving these efforts, and the potential opportunities to support further emission reductions.

These countries should not be confused with the 'newly industrialized' countries, such as Singapore, South Korea, or Saudi Arabia, whose per capita income levels have risen to levels comparable to developed countries in recent decades. Rather, the countries covered in this report reflect broad economic, demographic and resource consumption patterns of developing countries, but their size and influence ensures that each plays a critical role in the UN climate change negotiations. And each has a strong understanding of the need to address climate change, because they are already experiencing the impacts.

2 Historic Role of Developing Nations

Historically, developing nations have accounted for only a small share of global emissions and even today most of them have very low per-capita emissions. However, they aspire to the same economic prosperity and modern conveniences taken for granted in wealthier nations. Given their pace of industrialization and economic growth, it's not surprising that overall emissions from the major emerging economies are now growing at a faster rate than in the industrialized world. Much of this growth is due to the globalization of trade and the rising demand for emission-intensive products such as beef, aluminum, lumber and cement that is increasingly being met by developing nations. So while the emissions are occurring in the developing nations, industrialized countries continue to be one of the major drivers.

Some developing countries are emerging as leaders in the global fight against climate change, even though the wealthy industrialized nations that are largely to blame for current climatic changes have the greatest onus and capacity to lead the global effort. But many in the developing world have concluded that they can no longer afford to wait for others to take action and need to become pro-active.

The five nations profiled in this document face daunting challenges of high poverty levels, inadequate health, education and transportation infrastructure. They also have to meet demands to promote social development, equity and economic growth and meet the near-term energy requirements of their rapidly growing populations. In China and India alone, almost 1.5 billion people live on less than 2 dollars per day. Given these pressures, it is highly significant that these countries have nonetheless committed to reversing the rising trend in emissions and are pursuing low-carbon development pathways--in many cases, taking a bolder, more ambitious approach to emissions reductions and a new international climate agreement than the wealthy industrialized countries. Here is a brief overview of each of these countries:

- **Brazil:** Brazil is the largest nation and economy in South America, with more tropical rain forest than any other country. Brazil ranks relatively low (18th) in energy-related CO_2 emissions (7th when all six Kyoto gases are taken into account) because it derives more than half of its energy from hydropower and biomass, and has thus been able to reduce its dependence on fossil fuels. Deforestation and fires from clearing land for agricultural purposes account for 75% of GHG emissions. The country has suffered a series of extreme weather events in recent years, such as a hurricane in the South in 2004, a strong drought in the Amazon in 2005, floods and droughts in Southern Brazil and floods in Northeast and North of Brazil in 2009.

- **China:** The world's most populous nation has surpassed the US as the largest emitter of GHG emissions. Although per capita emissions are just one-fifth of the US, China's CO_2 emissions have grown about 140% since 1990 with surging consumption of coal driven by quick expansion of heavy industries and urbanization. The impacts have already been observed in China – sea levels are rising by as much as 2.5 millimeters per year over the last 50 years, glaciers are melting on the Tibetan Plateau, and rivers are drying. These impacts have spurred China to begin taking serious measures to reduce emissions, including very ambitious energy efficiency standards and targets for renewable energy.

- **India:** Although India and China are often lumped together by the world's politicians, India has much lower emissions, higher poverty levels and lower economic capacity relative to China. India's per capita emissions of 1.8 tonnes CO_2 eq are far below the world average. With 17% of the world's population, India contributes only 4.6% of the world's GHG. However, India is the fourth largest GHG emitter in absolute terms. Since 1990, emissions have grown by 65% and are projected to increase by 70% by 2020. Rapid economic growth and provision of energy to those previously without access account for much of this growth. The dangerous impacts of climate change are already visible in the country, e.g. melting glaciers in the Himalayas, or increased variability and unpredictability of monsoon rainfall.

- **Mexico:** Mexico is the 11th highest GHG emitter of the world, per capita emissions are on par with world averages, and one-fifth of US per capita emissions. The major source of Mexico's GHG emissions is the use of fossil fuels, such as coal and oil, for energy. Emissions from land-use changes are also substantial, accounting for 136 $TgCO_2$ per year (185 $TgCO_2$ without accounting for forest re-growth in abandoned lands). A major oil producer and exporter, Mexico is leading the way on climate change while it is also undergoing economic restructuring and reform and becoming more integrated with its North American trading partners. As a member of the 'Environmental Integrity Group', Mexico has been a strong leader on climate change action within the UN process.

- **South Africa:** South Africa is the 20th highest emitter of GHG in the world (19th for energy related CO_2 emission) with emissions per capita closing in on the average for major industrial countries. South Africa's GHG emissions come primarily from the use of coal, which provides about 72% of total primary energy, supports about 90% of electricity generation, and provides feedstock for about a third of the country's liquid fuels via Sasol's coal-to-liquids process.[1] It is the fourth largest coal producer in the world and has the highest emissions of any country in Africa. South Africa has played a constructive leadership role in the UN negotiations and been proactive in developing plans for domestic emissions reductions.

Not only are developing nations beginning to experience the negative impacts of climate change on their economies and their people, their rising sense of urgency is coupled with a keen desire to begin reaping the potential competitive advantages expected to emerge from a low-carbon economy.

[1] www.eia.doe.gov (country analysis brief/South Africa)

3 A Century of Emissions, A Decade of Inaction

Prior to the beginning of the Industrial Revolution in the latter part of the 1800s, the global carbon budget was largely in equilibrium. In the century that followed, the most highly industrialized nations relied heavily upon fossil fuels to grow their economies. We now know that the consequence was an unprecedented increase in GHGs in the atmosphere.

Recognizing that their emissions were responsible for the lion's share of the greenhouse gases resulting in climate change, the major industrialized nations of the world agreed under the auspices of the UNFCCC to make commitments to reduce emissions before expecting the same from developing countries.

As clearly stated in Article 3.1 of the UNFCCC's Convention of the Parties, *"The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities, thus, the developed country Parties should take the lead in combating climate change and the adverse effects thereof"*...

Article 3.2 of the convention went even further by saying, *"The specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change, and of those Parties, especially developing country Parties, that would have to bear a disproportionate or abnormal burden under the Convention, should be given full consideration"*.

Throughout much of the 1990s and into this decade, developing countries held fast to this principle of engagement. Many argued strongly that they had no obligation to take action to reduce their emissions until after the US, the world's largest historical emitter and largest economy, took action.

Meanwhile, despite their clear responsibility to reduce their disproportionately high emissions, the US and most other industrialized nations dragged their heels, arguing that if they were forced to cut emissions when others weren't, their businesses and industries would be unable to compete in the global marketplace. The US failed to ratify

the Kyoto Protocol, while Canada has said it won't even try to meet its commitments. Other industrialized countries appear to be on track to comply with the Protocol, but many are making extensive use of the Protocol's flexibility mechanisms, while allowing domestic emissions to continue to grow.

As the finger-pointing and rhetoric raged for more than a decade, global emissions kept rising. Between 1990 and 2006, CO_2 emissions in the US grew by 18.1%, while Japan's emissions rose by 11.3%, and Canada's by 22.9%. And while China's emissions per capita remain quite low (70th in the world), total annual CO_2 emissions in China and the US are now similar.

The 10 warmest years on record occurred between 1997 and 2008. In its fourth assessment released in 2007, the IPCC did not mince words, stating that "warming is unequivocal" and that most of the observed increase in global average temperatures since the mid-20th century is very likely due to the buildup of greenhouse gases in the atmosphere resulting from human activity.

The assessment also concluded that "evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases" and that increasingly disruptive impacts will be felt by the developing world during the course of the 21st century:

- In Latin America, food security is likely to be jeopardized by declining productivity of key crops and livestock.
- Agricultural production could be "severely compromised" in many parts of Africa, with upwards of 250 million additional people projected to be subject to water stress.
- More than a billion people in Asia could be adversely affected by decreased freshwater availability.

In the two years since the IPCC assessment, worrisome evidence has accumulated that climate changes will be larger and come faster than previously believed. The IPCC reports that widespread changes already have been observed in average temperatures, precipitation amounts, and wind patterns resulting in a greater intensity in extreme weather-related events such as droughts, heavy rains, heat waves and tropical storms.

In China, for example, eight provinces were experiencing the worst drought in half a century in 2009, impacting drinking water for more than four million people and imperiling more than 24 million acres of cropland. In June and July of 2007, it was the opposite extreme with devastating floods and landslides affecting seven provinces.

4 Why Developing Nations Have Decided to Act

Despite not being historically responsible for the current impacts of climate change, emerging economies have determined that it is in their self-interest to be part of the solution. Not only are they very aware of the potentially devastating impacts of climate change, but they increasingly recognize the economic opportunities and advantages of a low carbon pathway.

As the size and scope of climate change impacts continue to grow, countries around the world will soon inevitably reach the limits of their ability to adapt. Economically poorer developing countries are particularly vulnerable to the effects of climate change because of their heavy dependence on natural systems and agriculture for subsistence, and due to their limited capacity to respond and adapt given the lack of financial resources.

For nations with significant populations relying on marginal subsistence agriculture, even modest amounts of climate change are enough to heighten the risk of crop failures, food shortages and loss of key water supplies. For some countries, particularly small island developing states, climate change threatens their future existence. For them a wait-and-see approach is not a viable option.

The volatility in oil and gas prices over the past few years has taught all countries hard lessons of energy security, and the dramatic swings in energy costs have been especially problematic for poorer nations with fewer financial reserves. They are taking a closer look at how energy efficiency and renewable power can ensure a greater degree of energy independence.

With most experts predicting that investments in new energy-efficient technologies will lower energy costs, create jobs and bring economic growth over the long term, developing nations have much to gain by embracing a low carbon future. Their emerging industries already have a decided advantage over the imbedded infrastructures of the existing industrial nations, because they are able to bypass older, polluting technologies in favor of cleaner, more efficient plants and processes.

For all of these reasons and more, many developing countries are working quietly at home to become leaders in the new clean energy economy.

5 Taking a Leadership Role in Reducing Emissions

In advance of the UNFCCC negotiations in Poznan, Poland in December 2008, some of the key emerging economies offered comprehensive proposals to reduce their emissions, with specific targets and timetables for domestic actions and constructive proposals for a strengthened and ambitious global agreement – breaking the logjam of the previous decade and demonstrating new leadership in committing to a low carbon future.

The seriousness with which these key nations have approached emissions reductions and energy efficiency clearly demonstrates their recognition of the threat of climate change, but also their determination to reap the full economic benefits of a low carbon future as quickly as possible.

Already the progress made by developing countries in such areas as emissions intensity, vehicle efficiency, and renewable power is equivalent to or exceeds what has occurred in the US and other industrialized countries.

Examples include:

- **Brazil** developed a national plan to tackle climate change, setting a target to reduce the annual Amazon deforestation rate by 70% by 2017 in comparison to the average rate for the period between 1996 and 2005 (19,500 km^2). In 2004, forest destruction reached a peak of 27.400 km^2 in the region. Since then, Amazon deforestation rates have decreased by 56%. The 70% target marks a significant step towards meeting global emissions trajectories that reduce the greatest impacts of climate change. In 2008, Brazil launched the Amazon Fund, an initiative to attract donations to support actions to reduce Amazon deforestation.
- **China** has committed to reduce the energy intensity of its economy by 20% by 2010 compared to 2005 levels, and has set an aggressive target to produce 10% of its primary energy through renewable sources by 2010 and 15% by 2020.

- **India** has committed to an economy-wide 20% increase in energy efficiency by 2016/17, while expanding its renewable energy program, already one of the largest in the world.
- **Mexico** established an economy-wide plan to cut its projected emission *in half* by 2050, to be implemented through a cap-and-trade program.
- **South Africa** proposed a plan for its emissions trajectory to "peak, plateau and decline", achieving stabilization in the period 2020-2025. This marks a critical step in developing Nationally Appropriate Mitigation Actions (NAMAs) and is particularly ambitious from a country so highly dependent on coal-produced energy.

In the wake of the global financial crisis, many nations around the world adopted economic stimulus plans which included significant investments in energy efficiency and renewable technologies, and in many cases the developing nations have demonstrated a stronger commitment than their industrialized peers. A study by HSBC Global Research found that the US devoted only 12% of its stimulus funding for "investments consistent with a low carbon economy." By comparison, 38% of China's stimulus plan went towards promoting a low carbon economy, with that nation investing significantly more money in these sectors in absolute terms.

6 Why All Emissions Are Not Created Equal

To fully understand the role that each nation plays in the climate change equation, emissions must be considered not only in terms of present-day total national emissions, but in the context of the country's population and historical role in contributing to the build-up of GHGs. In that context, the actions being taken by these developing nations are particularly impressive.

On an annual basis, China has indeed surpassed the US as the world's largest emitter of greenhouse gases. But the US, Japan and other wealthy industrialized countries remain well ahead of China in terms of emissions per capita.

And as it turns out, CO_2 lives for a very long time in the atmosphere and it is more meaningful to look at accumulated emissions over time in the perspective of contribution to climate change. As a result, most of the global warming we are experiencing today can be directly attributed to a build-up of "historical" emissions that have been produced by the world's major industrialized countries since the late 1800s.

Since annual emission numbers do not capture the cumulative effect of these historic emissions, developing countries' contributions to the overall levels of GHG can appear misleadingly large while the industrialized country contributions appears smaller than they actually are. Accounting for both annual and historical emissions in decision-making is vital.

Although China has become the world's largest emitter in terms of annual emissions, Figure 1 shows that the US and the EU are still far ahead of China in terms of cumulative emissions. The cumulative emissions from other emerging economies are even lower. The high historical emissions for developed countries are a result of their industrialization, a period of uncontrolled exploitation of cheap and highly polluting energy sources to generate wealth and build urban, transportation and industrial infrastructure. Developing countries are now building their infrastructures in the context of a carbon-constrained world, to improve the living standards for their citizens, standards that citizens of developed countries already take for granted.

FIGURE 1

Share of cumulative carbon emissions per capita of major economies

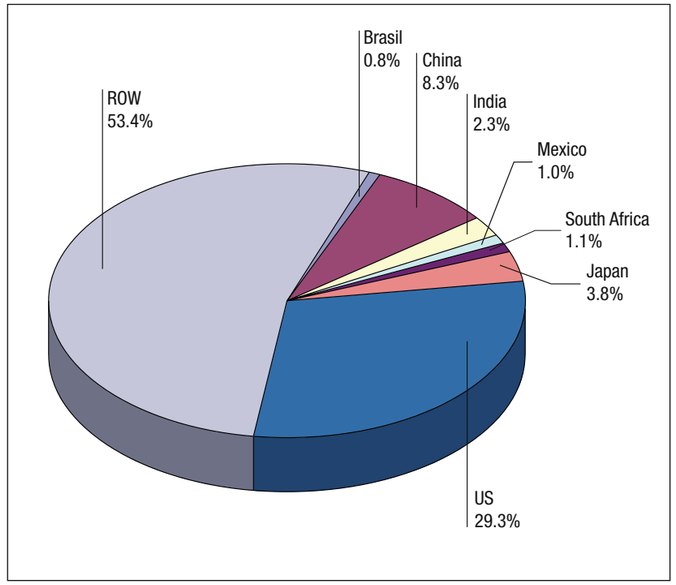
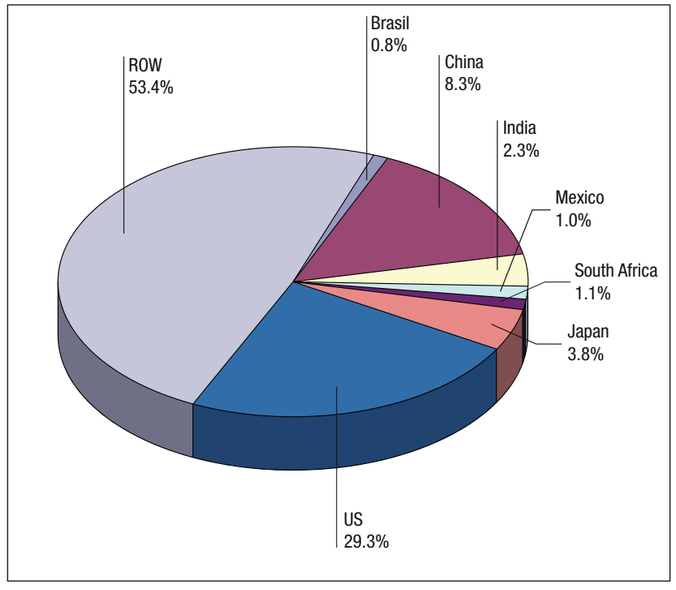


FIGURE 2

Share of cumulative carbon emissions per capita of major economies (1990-2005)



Source: Climate Analysis Indicators Tool, Version 6.0 (Washington, DC: World Resources Institute, 2008)

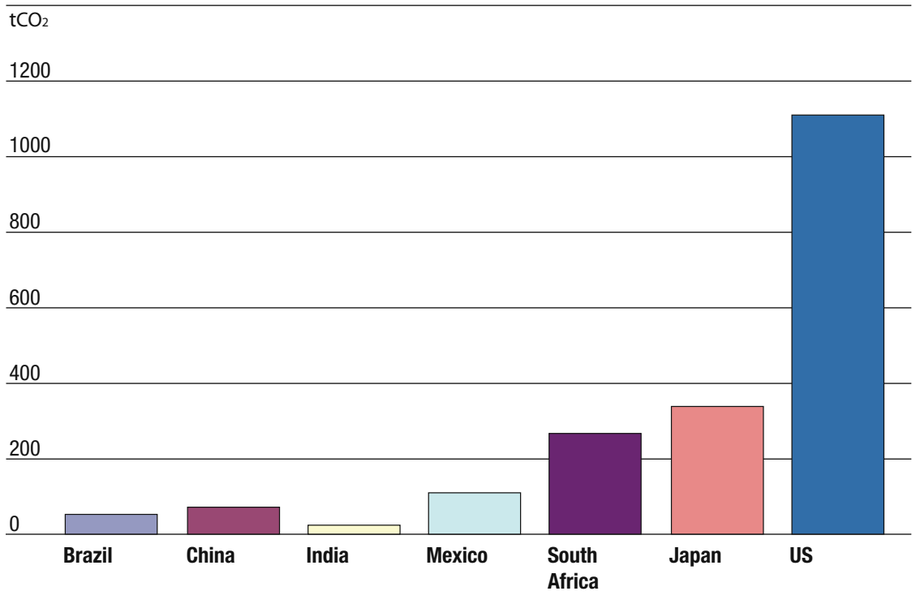
This is why the developed countries must take the lead in cutting global carbon emissions, leaving development space for the developing countries, rather than comparing their post-industrialization annual emissions with those of developing countries that are in the middle of the industrialization process. Figure 2 shows that emission levels of emerging economies rapidly increased notably over the past few decades, in line with their industrialization. At the same time, the share of emissions from the US and EU declined. However, our common climate can only absorb a finite amount of CO_2 emissions by 2100, and if we were to avoid a runaway climate change, developing countries wouldn't be able to enjoy the same freedom as those early emitters. It is vital for the developing countries to reduce carbon emission growth as soon as possible and as much as possible, while they achieve their development goals and reach them through a low carbon path.

To help developing countries deviate from the carbon-intense pathways chosen by industrialized countries in the past, the early emitters have to face their moral obligations and provide developing countries with financial and technological support. The emerging economies, as well as other developing countries, also face a moral responsibility. They have to reduce the adverse impacts of their economic growth as much as they can during their period of industrialization, in order to protect people and nature from climate change, especially future generations and those who are most vulnerable.

While the overall cumulative emissions of emerging economies are now catching up, the levels of cumulative emissions per capita are still very low in the developing countries (Figure 3). The cumulative emissions per capita of an average Chinese person since 1850 ranks 89th in the world – only 6% of the average cumulative emissions of an American or European over the same period. It is ironic that the developing nations – which have only recently begun to enjoy the benefits of living in an industrialized economy and are hardly responsible for historic GHG emissions and the current impacts of climate change – now find themselves most vulnerable to these impacts.

FIGURE 3

Cumulative carbon emissions of major economies (1850 to 2005)



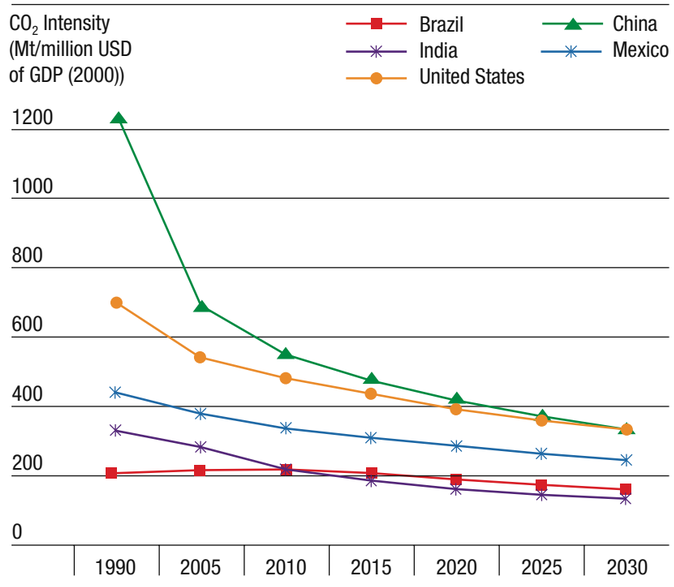
Source: Climate Analysis Indicators Tool 6.0 (Washington, DC: World Resources Institute, 2008)

7 Reducing Emissions Intensity

Regardless of which nations bear responsibility for the GHGs in the atmosphere, the fact remains that if we are to avoid the most dangerous impacts of climate change, global emissions must be slashed by at least 80% below 1990 levels by 2050. One useful way to understand how various nations are progressing towards a goal of absolute emissions reductions is to compare their "carbon emissions intensity" – the level of emissions that are generated per unit of economic output determined by the combination of energy intensity and the fuel mix in a particular country.

FIGURE 4

Carbon emissions intensity of selected economies



Source: Adapted from *International Energy Outlook 2008*: DOE/EIA 0484-2008, Table 13.

Emissions intensity levels are not based on a country's total economy or population but are calculated on th e amount of energy needed to achieve specific levels of economic activity. Emissions intensity allows us to compare the de-carbonization (switching energy to lower carbon fuels, improving energy efficiencies, and/or restructuring economic activities) trends for various nations to better understand how they are progressing towards a goal of absolute emissions reductions. So like per capita emission levels, emissions intensities makes it easier to us, for example, to compare a country like India with nearly 1.2 billion people with a country like the US with only one quarter the number of people.

Data from the US Energy Information Administration shows that China, India and Mexico have made good progress in de-carbonizing their economies (Figure 4), achieving significant emissions reductions for each unit of economic activity. In the developing world, cuts in carbon intensity are largely due to the use of more modern and energy efficient technologies. For the US, much of the de-carbonizing is the result of high-emitting industries moving their operations to developing countries and expansion of relatively low emissions sectors of the economy, such as IT.

As illustrated in this chart, the move to more efficient technologies is causing energy intensity levels to decline sharply in most of these developing nations, which will ultimately result in lower emissions over time. The most dramatic reduction has come from China, which has cut its carbon intensity in half between 1990 and 2005, and is seeking an additional 20% reduction by 2010. If reached, this would reduce Chinese emissions by a 20% below business as usual levels. China is making substantial progress toward this goal, with emissions intensity levels falling year by year: 1.79% in 2006, 4.04% in 2007 and 4.59% in 2008.

While the decline in emissions intensity for China is not coming fast enough to offset the country's rapid growth in energy consumption, the ambition level and progress should be viewed as important steps forward and a demonstration of the seriousness and effectiveness of Chinese efforts to reduce emissions. With the latest data from 2009, China is well on track to reach the 20% energy intensity reduction target by 2010, while the economy continues to grow despite the global economic slowdown. In addition, the Chinese government is considering maintaining this trend beyond 2010, reaching 50% reduction in energy intensity by 2020 from 2005 levels. Meeting this goal would mean a very significant transition to a lower carbon economy. Not only is China achieving the greatest reduction in emissions intensity of any major economy during the period, but the country is now firmly on track to match the emissions intensity of the US in the near term. Prospects are good for China to transition to a low carbon economy by the middle of the century.

8 Renewable Energy Standards

While the US has continued to debated whether to adopt any form of a renewable energy standard (RES), Brazil, China, India, Mexico and others have already begun implementing them or other, similar instruments with success, a further demonstration of their commitment to low carbon energy.

- **Brazil:** Reflecting one of the highest percentages of renewable energy in the world, 46% of primary energy comes from renewable sources, while 75% of electricity is produced from renewables. Brazil's high renewable share is largely driven by large hydro-electric facilities. Brazil has implemented a RES of 15% from solar, wind, geothermal and small hydro by 2020. However, at the same time dirty new thermal power plants are planned, and energy emissions have increased by about 50% between 1994 and 2005.

- **China:** China established a RES requiring 10% of its primary energy to be produced from renewable sources by 2010, and 15% by 2020 (compared to 8% in 2006). Small as it is in share, China has the world's largest renewable power capacity in absolute terms, around 76 GW in 2008 without including large hydro power, the equivalent of nearly 80% of the EU-27 combined (REN21, 2009). Although most of this is small hydro, more advanced renewable energy is developing quickly in China. By the end of 2009, China is expected to have the world's second largest wind power capacity after the US, and the world's largest annual installation in 2009. A new feed-in tariff for wind power was recently announced by the Chinese government to replace the previous special concession process. China also has got the world's largest solar PV manufacturing capacity, and two government programs were recently announced to promote installation and use of solar PV in China. In terms of solar thermal energy, China has more than 60% of the world's solar water heaters and installed 80% of the world's total new capacity in 2008.

- **India:** India has the 4th largest amount of installed wind power generating capacity in the world. In 2009, renewable energy power accounted for more than 8% of total power generation capacity in India. The country should meet and exceed its target of adding 10% renewable energy power by 2012. This success is a result of strong incentives from the government for enhancing renewable energy production capacity, generation based incentives for power generation and the development of a framework for integration of renewable energy in primary energy. There is also a proposal to introduce trading of renewable energy certificates.

- **Mexico:** Mexico proposed an instrument similar to a RES of 9% of electricity from renewable sources (excluding large hydro) by 2012. However, no penalization is involved if the aspirational 9% goal is not met, as the electricity is produced by a state-owned power company (CFE), not by the private sector. The Ministry of Energy has announced that the country is on track to meet that standard, driven mainly by installing wind power projects in the State of Oaxaca, which has an estimated wind power potential of over 10,000 MW.

To further encourage the growth of renewable energy, developing countries have adopted various policies as outlined (Table 2) below.

As the chart indicates, China, India and South Africa are the leaders among the major emerging economies in offering up the most comprehensive renewable energy policy mix, followed by Brazil and Mexico. Japan is also taking an active role, while much of the action in the US is occurring at the state level.

TABLE 1

Renewable energy targets implemented in developing countries[1]

Country	*Renewable target*	*Progress*
India	10% by 2012[2]	On track to meet or exceed renewable energy target, having already achieved more than 8% in 2009[2].
Brazil	15% by 2020[3]	Share of primary energy from renewables is currently 46%, among highest in the world, relying heavily on large-scale hydro-electrical generation. This RES is focused on expanding wind, small hydro, and solar production from current levels of less than 4%.
Mexico	9% by 2012[4]	This is divided by 6% of other renewable energies and 3% of mini hydro-energy below 70 MW. The 6% goal is driven largely by new wind power projects in the State of Oaxaca.
China	10% by 2010 and 15% by 2020[4]	By 2006 had achieved 8% of its primary energy production from renewable energy, and is now scaling up wind and solar to meet these goals.
US	No national renewable target	A nationwide target is under discussion in both the House and the Senate. Current percentage of electricity from renewables (not including large hydro-electric) approximately 5% (2006).

[1] Data primarily adapted from Renewables 2007: Global Status Report, REN21: Renewable Energy Policy Network for the 21st Century (2007).
[2] Percent of total power generation in the country from renewable energy
[3] Percent increase in the share of renewable energy in the primary energy supply
[4] Percent of renewable electricity generation excluding large hydro
[5] Percent of renewable energy in the primary energy supply

TABLE 2

Renewable energy promotion policies

Policies	*China*	*US*	*Brazil*	*Mexico*	*India*	*South Africa*	*Japan*
Feed in tariff	✓	*	✓		✓	✓	*
Renewable portfolio standard		*			*		✓
Capital subsidy, grant or rebates	✓	✓			✓	✓	✓
Investments or other credits	✓	✓		✓	✓		
Sales tax, energy tax, excise tax, or VAT reduction	✓	*			✓	✓	
Tradable renewable energy certificates		*				✓	✓
Energy production payments or tax credits		✓			✓		
Net metering		*		✓			✓
Public investment, loans, or financing	✓	*	✓		✓	✓	✓
Public Competitive Bidding	✓	*	✓		✓		

Note: Entries with an asterisk * mean that some states/provinces within these countries have state/province-level policies but there is no national-level policy.

Source: IEA online database (2009)

9 Country Case Studies

9.1 Brazil

Brazil is the world's fifth most populous country and the world's tenth-largest economy in GDP terms. When viewed at a human scale, however, the Brazilian economy is not as strong: in GDP per capita (PPP), Brazil ranks 82nd in the world.

Although no country has a perfect record in responding to climate change, Brazil has become a leader in reducing the emissions intensity of its economy, in generating renewable power and, perhaps most important, in seriously addressing emissions related to deforestation.

Often forgotten as a major source of greenhouse gas emissions, deforestation is actually the second-largest source of emissions by sector, producing approximately 20% of global emissions – more than every car, truck, plane, train and boat on the planet. In the developing world, deforestation-related emissions constitute an even larger share of the total. For example, when deforestation-related emissions are included, Brazil ranks seventh in the world in absolute emissions, despite producing nearly 50% of its electricity from sources that do not emit GHGs.

These high emissions are largely associated with deforestation, which accounts for about 75% of the country's emissions.

Reducing emissions from deforestation in a lasting way requires substantial upfront investment in building monitoring capacity, improving measuring and accounting systems, engaging in extensive land tenure reforms to ensure that local landowners are properly compensated, and increasing investment in law enforcement. These kinds of investments in a national program demonstrate a commitment to ensure that forest programs result in reduced GHG emissions. Without this type of investment, project-level deforestation reduction activities may not provide reliable benefits to the climate.

The required investment is substantial, but Brazil has committed to building this capacity to reduce deforestation-related emissions, including:

- Establishing 148 protected areas covering 620,000 km^2 from 2003 to 2007. Many of these new protected areas are in zones under high deforestation pressure.
- Developing and implementing one of the most sophisticated forest change tracking systems in the world, based on remote sensing methods and linked in to land management databases in state-level governments. This system is so widely regarded that it is being made available to other governments.
- Stepped-up enforcement against illegal logging, deforestation and other environmental crimes.
- Prohibiting financing for landholders without clear tenure or in breach of environmental laws.
- Accelerated land reform to establish clear tenure rights in areas subject to intensive social conflict.
- Developing a legal framework for forestry concessions in public forests.

These efforts have helped substantially reduce deforestation in the Brazilian Amazon by 56% since 2004. This alone represents a decrease of 1.3 billion tons of CO_2 emissions in relation to the previous four-year period, or nearly 20% of the US's current annual emissions of CO_2-e (7.0 billion tons in 2006). Building on these actual reductions, in December 2008 the Brazilian government announced a new target of reducing deforestation by 70% below the average rate between 1995 and 2006 by 2017. This would avoid 4.8 billion tons of CO_2 emissions – equivalent to more than two-thirds of current annual emissions in the US.

In 2008, the Government of Brazil launched the Amazon Fund, a private fund with the purpose to provide an incentive for Brazil and other developing countries with tropical forests to continue to increase voluntary reductions of greenhouse gas emission from deforestation and degradation. The Government of Brazil aims to raise donations above US$ 21 billion

by 2021 from governments, multilateral institutions, non-governmental organizations and corporations. The Government of Norway, which committed to donate US$ 1 billion, has already transferred US$ 110 million to the Fund.

In November 2009, Brazil announced a goal of reducing its total emissions by up to 39% by 2020 from BAU.

However, meeting the new, ambitious deforestation reduction goal and other targets will not be easy, and Brazil cannot do it alone. But its commitment to making the necessary early investments and continuing to press for even greater reductions shows Brazil to be a leader. And it further helps to replace the old conventional wisdom about developing countries with a new reality: These nations are taking action and looking to partner with the rest of the world to do even more.

9.2 China

9.2.1 Overview

China has recently become the world's largest annual emitter of GHG, but is also leading the world's most ambitious efforts on energy efficiency, with a strong focus on renewable energy.

Successful implementation of these efforts has the potential to reduce China's GHG emissions intensity by 20% by 2010, compared to 2005. These reductions will come primarily from the power, industrial and transportation sectors.

In the power and industrial sectors, the focus will be on retiring inefficient power plants, increasing overall energy efficiency and moving from intensive fossil fuel sources to renewable energy. In the transportation sector, switching to cleaner fuels, imposing higher fuel economy standards and increasing the use of hybrid vehicles are some of the policies aimed at reducing emissions.

9.2.2 Sector-based mitigation policies and measures

Industry: China has implemented several policies and measures targeting energy efficiency and demand-side management. Plans include energy conservation and agreements from the top 1,000 energy-intensive companies to reduce their consumption. They also foresee the implementation of more stringent energy efficiency standards for equipment, as well as information measures such as energy conservation management systems or the environmentally-friendly company award which includes "green credits" (credit connected to the environmental performance of a company). Table 3 presents the potential emission reductions through implementation of these policies in China.

Buildings: For the residential and commercial sectors, guidelines and standards for energy conservation in buildings have been set, the China energy label being established, and the government is now procuring energy-saving products on a systematic basis. As a result, China's Ministry of Construction forecasts a total energy-saving potential for buildings of 380 Mtce by 2020 (Lai, 2007 cited in Romm Energy 2008). This comprises about 280 Mtce from heating supply, 32 Mtce, and 68 Mtce from residential buildings and public buildings respectively. In the current five-year plan, the target for total energy savings in buildings will be 120 Mtce, which will be achieved through energy savings from newly constructed buildings, the introduction of energy-saving services in government agencies, more advanced and efficient heating and lighting technologies, and labels on household appliances identifying their efficiency levels.

The target for energy savings from newly constructed buildings in urban areas is 50% compared to 2005 levels, based on total space heating and space cooling consumption. By 2010, the energy consumption per government building is expected to decrease by 10% compared to 2002 levels. The green lighting program is aimed at reducing consumption by 10% by 2010.

Transportation: China has enacted some of the toughest fuel economy standards in the world, exceeding those in the US. Pump prices have been raised in Beijing to finance cleaner fuel sources, and the world's first mass production plug-in hybrid electric car was introduced by end of 2008.

What's notable about China's fuel economy standard is that it is based on weight category for each vehicle rather than fleet average. To achieve this standard, the government has implemented taxation policies for passenger vehicles based on their engine capacity, with rates of 9% to 20% for those that are 2 liters and above. At the same time, tax breaks are offered to owners of energy-efficient cars and hybrid vehicles.

Other policy programs, including alternative transportation fuels, alternative fuel technology, environmentally friendly technology and the use of public transportation, are designed to make the transportation sector energy efficient in China. Alternative transportation fuels like advanced biofuels are expected to achieve a 15% to 20% CO_2 reduction compared with conventional gasoline vehicles. In order to stimulate public transportation, subway fares in Beijing were heavily subsidies by the government since 2007.

China adjusted its refined oil price mechanism. In January 2009, the new fuel tax was introduced across the country. The purpose of the new mechanism is to link the prices of refined oil products in the domestic market in China more closely to their international equivalents.

Electricity: On the supply side, major improvements in energy efficiency are being made in the power sector, and China aims at utilizing the most advanced coal fired power plants for newly installed capacity. The Chinese government is closing down inefficient power plants, replaced by state of the art super-critical and ultra super critical power plants. Since 2006, 54 GW of small inefficient power plants have been closed down, approximately 8% of the country's total generating capacity.

Renewable Energy: Renewable energy is promoted through a renewable energy target. 10% of energy consumed shall be produced from renewable sources by 2010, and 15% by 2020.

To achieve this, China enacted a renewable energy law that sets the financial and regulatory framework for renewable electricity production. However, selling renewable electricity to the grid can prove difficult for producers. Furthermore, a local content requirement of no less than 70% restricted the import of wind power equipment from outside China.

To sum up, China has set a total energy intensity target of 20% by 2010, with a potential emissions reduction of 20% compared to BAU. This represents a step forward in China's commitment to fight dangerous climate change. China has cut the carbon intensity of its growing economy by half between 1990 and 2005, avoiding the emission of 1800Mt CO_2 between 1991 and 2005. The current five-year plan aims at reducing energy intensity further, by an additional 20% below 2005 levels by 2010. The country is making good progress towards this goal, as illustrated by the performance over the last three years.

TABLE 3

China's CO_2 emission reduction options by 2010

Source	*Potential emission reduction by 2010 (Mt)*
10 key energy conservation priority programs[1]	550
Technology (thermal power generation)	110
Coal mine Methane	200
Total	**860**

[1] The ten key energy priority programs are: (1) Upgrading of Low efficiency coal-fired Industrial Boiler (Kiln); District heat and Power Cogeneration; (3) Recovery of Residual Heat and Pressure; (4) Oil saving and Substitution; (5) Energy Conservation of Motor Systems, (6) Optimization of Energy system; (7) Energy Conservation in Building; (8) Green Lighting Projects; (9) Energy Conservation in Government Agencies; and (10) Energy Conservation Monitoring and Technological Support System.

Source: Romm Energy, (2008)

9.3 India

9.3.1 Overview

India is a country with many poor people, but not a poor country. Despite being a growing economy, it is ranked 115th in the world in terms of per capita GDP, according to the World Bank, largely because 267 million people live on less than a dollar per day. India, being the fourth largest economy in the world, also accounts for less than 5% of global emissions, and is the fourth largest GHG emitter after the US, China and Russia. However, India's per capita emissions are far below the world average, and less than a tenth of the US. Since 1990, India's emissions have grown by 65% and are projected to increase by 70% by 2020. As India has started to succeed in reducing poverty, an increasing percentage of the population has begun to have access to commercial energy and the means for greater consumption.

India's economy has progressively de-carbonized since the early 1990s. Its energy intensity has declined from 0.25 in 1990 to about 0.16 in 2005. It has also implemented a renewable energy and energy efficiency programme, and put strong incentives in place for their further promotion. India's action on integration of renewable energy and energy efficiency can be traced back to the early 1980s, when the country started to focus on harnessing alternative sources of energy and – more specifically – locally available resources. These gave genesis to large national level programmes on renewable energy (biogas, biomass, solar PV and thermal) and energy efficiency (e.g. improved energy efficient wood fuel stoves, energy efficiency in industries). With the opening of the economy and a greater role of the private sector, throughout the 1990s and beyond, India diversified and scaled up its ambition on renewable energy and energy efficiency. These plans are spelled out in the many existing policies that are aimed at reducing GHG emissions.

India: Sun is the Goal

- Targets by 2020:
  - 20,000 MW of Solar Power
    - Utility grid power – 12,000 MW
    - Roof-top – 3000 MW
    - Rural installations – 3000 MW
    - Other distributed applications – 2000 MW
  - 20 million solar lights
  - 20 million sqm. for solar thermal heating
- 4-5 GW of solar manufacturing capacity by 2017
- Supported by regulatory policies, tariff incentives and minimum portfolio standards

The National Action Plan on Climate Change (NAPCC), released in June 2008, is the most recent effort by the government. The NAPCC focuses – among other things – on harnessing renewable energy and provides a framework for following an ecologically sustainable development path, ensuring energy security and social and economic development while yielding co-benefits of climate change impacts. It also describes other ongoing initiatives – including energy efficiency, renewable energy and de-carbonising power generation – and outlines eight priority missions that will promote sustainable development and mitigate the impact of climate change. These national missions are:

- Solar Mission
- Enhanced Energy Efficiency
- Sustainable Habitat
- Water Mission
- Sustaining Himalayan Ecosystem
- Green India (focus on forests)
- Sustainable Agriculture
- Strategic Knowledge for Climate Change

Some of these missions in one way or another have been ongoing for several decades and are institutionalized through policies, programs and the creation of specific institutions.

Of the eight, the National Solar Mission is regarded as the major priority. This is partly due to the potential availability of 5,000 trillion KWh of solar energy that most parts of India enjoy for 250 to 300 days per year. Because of this potential, emphasis is on the solar mission to tap this natural resource, make the country's solar energy industry as competitive as the fossil fuel industry, and deliver change from the Kilowatt scale of distributed solar thermal and solar PV to the Giga-watt scale within the next 20 to 25 years[2]. Estimates show that if solar power is properly developed, 1% of India's land mass has the potential to meet India's entire electricity requirement by 2030[3].

Preliminary reports suggest that the Solar Mission aims at adding 20,000 MW of solar energy through photovoltaic and thermal by 2022, and 200,000 MW by 2050.

9.3.2 Sector-based mitigation polices and measures

Energy and Industry: The energy sector is responsible for 94% of CO_2 emissions, while the industrial sector, comprising mainly iron, steel, cement, aluminum and fertilizer, accounts for the remaining 6% in 2005 (WRI, 2008). Improving the efficiency of these sectors will significantly reduce CO_2 emission. Since 2001, the use of washed coal has been mandated at all power plants more than 1000 kilometers from the mining source, or in urban, sensitive and critically polluted areas.

India enacted the Energy Conservation Act of 2001, which requires large energy-consuming industries to undertake energy audits and an energy-labeling program for appliances. The energy-labeling program was launched in 2006, and comparative star-based labeling has been introduced for fluorescent tube lights, air conditioners and distribution transformers. An energy audit of large industrial consumers was made mandatory in 2007.

The Bureau of Energy Efficiency (BEE), national agency for implementation of the Energy Conservation, has developed mandatory energy efficiency labels for a range of consumer durables such as refrigerators, air conditioners and other appliances. This has brought down average specific energy consumption in existing units and even more in new efficient units[4]. BEE has also introduced a voluntary Energy Conservation Building Code (ECBC) guideline for building energy efficiency in commercial buildings and guidelines for the residential sector through TERI-GRIHA guidelines.

Improvement in energy efficiency has been driven partly by policy and incentives intended to conserve energy. In the major energy-consuming industrial sectors, such as cement, steel, aluminium and fertilizers, average specific energy consumption has been declining because of energy conservation in existing units, and (much more) due to new capacity addition with state-of-the-art technology. For example, in the cement sector, the specific energy consumption of the most efficient plants in India is now comparable to that of the most efficient plants in the world.

A report from Centre for Science and Environment on benchmarking the performance of the Indian cement industry has rated some of the Indian plants close to the global standards. Nowadays, India owns some of the most efficient energy plants in the world. To further increase energy efficiency, the Indian government plans to retire 7% of the country's inefficient coal plants by 2012, and an additional 10,000 MW by 2017. It has also said that about 90% of the new capacity that will be added between 2007 and 2031/32 would come from more efficient super-critical, ultra super-critical and IGCC power plants.

A recent government publication indicates that actions envisaged under the mission on Energy Efficiency will result in 10,000 MW of energy savings by 2020.[5]

Transportation: The Indian government is also taking specific actions in the transportation sector by institutionalizing Bharat Stage III emission norms (similar to Euro III emission norms), and complying with Euro IV standards

[2] NAPCC, P22.
[3] NAPCC, P20.
[4] http://envfor.nic.in/divisions/ccd/Addressing_CC_09-10-07.pdf
[5] http://www.envfor.nic.in/mef/presnt_CC.pdf

for all new four-wheeled vehicles in 11 cities by 2010. Mass transportation options outlined in the NAPCC, including buses, railway and mass rapid transit systems, are targeted to reduce energy use, and mitigate associated GHG emission and air pollution in urban areas. The mission on Sustainable Habitat under the NAPCC proposes to extend the Delhi Metro subway system to cover the entire metropolitan area by 2021, and to also extend the efficient public transportation system in major metropolitan cities. With the completion of the first two phase of Delhi Metro, it is projected that daily number of passengers will reach 2.6 million by 2011. The Bangalore Metro Phase I is expected to be operational by 2011 and projected to provide transportation for a million passengers per day.

Renewable Energy: Apart from energy conservation and efficiency improvements, the need to develop and exploit cleaner energy sources and renewables has long been recognized by the Indian government (Parikh and Parikh, 2002). It believes that development of clean energy technologies, though primarily sought for energy security, generates co-benefits in terms of reducing GHG emission. The NAPCC presented an aggregate installed capacity of 23,500 MW through various renewable energy sources: Wind farms, micro-hydroelectric plants, biomass and cogeneration power plants, biomass-based gasifier systems and solar photovoltaic systems are expected by 2012. In 2009, renewable energy power accounted for more than 8% of total power generation capacity in the country and is expected to exceed its target of 23,500MW (10%) by 2012. Wind will make up 72%, with biomass and hydro power about 14% each. A further breakdown of renewable energy achievements and plans and targets is presented in Table 4.

To achieve the RES targets, incentives including concessional customs duties and income tax exemptions for 10 years to small hydropower projects (up to 25 MW), wind energy, biomass power and solar energy, exemption of photovoltaic components from excise duties, a feed-in tariff of 12 rupees (about 25 cents) per kilowatt-hour for solar photovoltaic power and 10 rupees (about 22 cents) per kWh for solar thermal power generation are being introduced. There is also an accelerated depreciation benefit for wind farms and solar energy for non-generation based incentive projects.

In sum, besides a commitment to reduce the use of fossil fuel by increasing the share of renewable energy in the energy mix, the NAPCC provides a framework for an ecologically sustainable low carbon development path. So far, the plan is the most comprehensive document crafted to address climate change within the context of sustainable development. The NAPCC uncovers India's readiness to commit to a gradual shift from economic activity based on fossil fuels to one based on renewable sources of energy. India's policy action on climate change is broader than carbon emissions reductions and incorporates a vision of following an ecologically sustainable development pathway. It aims at enhancement of the country's energy security while meeting its social and economic development objectives, and yielding co-benefits of addressing climate change effects at the same time.

TABLE 4

Renewable energy plans and targets

Renewable Source	*Cumulative Achievements (till 2009, in MW)*	*Targets for Additional Capacity (2007-2012, in MW)*
Biomass	683.30 MW	1200
Wind	9755.85 MW	10,500
Small Hydro	2344.67 MW	1400
Cogeneration-bagasse	1033.73 MW	500
Waste to Energy	58.91 MW	
Solar	2.12 MW	10002
Off-Grid/Distributed Renewable Power	346.18 MWeq	

Source: Ministry of New and Renewable Energy/Annual 5 year plan 11th summary: http://mnes.nic.in/

9.4 Mexico

9.4.1 Overview

The Mexican government released its National Strategy on Climate Change (ENACC) in May 2007. The objective of ENACC was to identify a wide range of mitigation and adaptation opportunities, with a strong focus on progressively decoupling the increasing GHG emissions from economic growth. After the publication of the strategy, the Inter-ministerial Commission on Climate Change (CICC) worked together to elaborate the Special Program on Climate Change (PECC). It brought together representatives of the Ministry of Environment, the Ministry of Social Development, the Ministry of Energy, the Ministry of Economy, the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food, the Ministry of Foreign Affairs and the Ministry of Transport and Telecommunications. On June 2009, the PECC was launched by Mexican President Calderón. The coordinated CICC effort probably represents the most ambitious progress towards mainstreaming public policy on sustainable development.

The information presented here is taken from the official version of the PECC, a document made available for public consultation in March 2009. During the current administration, Mexico commits to reduce 260 Millions tons of CO_2 emissions in the period 2008-2012, with the strongest effort, 100 $MtCO_2e$ million, in 2012. The PECC has four main components: Long Term Vision, Mitigation, Adaptation and Cross-cutting policy elements. Within each component a number of objectives and goals have been established.

Long Term Vision: The aspirational aim for Mexico is to reduce 50% of its emissions for 2050, with the year 2000 as its baseline. Mexico plans to go from 6.8 tCO_2e per capita to 2.8 tCO_2e in 2050. Mexican emissions will reach their inflexion point before 2012, to gradually decrease until the indicated level for 2050 is reached: around 340 MtCO2e. In this section, Mexico highlights that in order to reach its reduction target, a multilateral regime needs to be established and developed countries need to provide financial and technological support mechanisms at an unprecedented scale.

Mitigation: The PECC intends to consolidate a development pattern in which economic growth is not highly affected by an increase on GHG emissions. By inducing a fall on carbon intensity, the PECC gives an initial boost to the "de-carbonization" of the Mexican economy. The 260 $MtCO_2$ emission reductions for the period 2008-2012 will be based on actions in sectors like the use and generation of energy, agriculture, forests and other land uses (AFOLU) as well as waste.

Adaptation: The Mexican Government considers that adaptation tasks need to be focused on reducing the country's vulnerability to climate change. In some cases (mainly in the sectors related to land use management), adaptation measures match up with those for mitigation. The PECC identifies the need to develop integrated risk management, especially in cases related to external hydro-meteorological phenomena.

Elements of a Cross-cutting Policy: It engages all federal government entities in the fight against climate change with actions, objectives and methodologies. Inter-sectoral and inter-institutional coordination is considered to ensure efforts are enhanced around the economy, education, capacity building, research, sharing of information and communication. The Program builds on activities that include capacities and competencies within the Federal Government as well as from different levels of government and the private sector.

The PECC represents an important step forward for Mexico's policies to tackle climate change. However, it is seen as an ongoing revision process due to the very dynamic national and international circumstances.

9.4.2 *Sector-based mitigation policies and measures*

Preliminary data from the most updated version of the National Greenhouse Gas Inventory (INEGEI) shows that in 2006, Mexico's total national emissions were 715.2 $MtCO_2e$. The total emissions are grouped as table 5.

Generation and Energy use: In oil and gas production, the mitigation objective for the period 2008-2012 is equivalent to 50% of the emissions in 2006, in electric power the same objective reaches 16%, and in transport 8%. These figures suggest the need to intensify mitigation efforts in these three sectors, given that in 2006, together they emitted almost 50% of the total national emissions. Emissions in the oil and gas sector represented 11.7% of the total Mexican emissions in 2006, electricity accounted for 16%. Development of mitigation activities for both sectors focuses on energy efficiency and use of renewable energies.

Transportation: The transport sector represents 20% of the national emissions emitted in 2006, with a total of 144.6 $MtCO_2e$, classified as table 6.

The Mexican mitigation policies focus mainly on strengthening actions to save energy through fostering best practices and energy efficiency norm application; reducing energy consumption in weight and passenger transport; renovating vehicles; enhancing urban public transport with sustainability criteria and high social impact; promoting suburban public transport; increasing railways for federal transport and fostering energy efficiency in the fishing sector.

TABLE 5

Mexico's emissions and mitigation objectives by sector

Category	*INEGI * ($MtCO_2e$)*		*Mitigation Objective*		
	2006		*2008-2012 ($MtCO_2e$)*		*2012*
Energy Generation	**196.53**	**27.5%**	**59.85**	**23%**	**24.16**
Oil and Gas	84.07	11.8%	42.15	16%	13.39
Electricity	112.46	15.7%	17.7	7%	10.77
Use of energy	**233.5**	**32.6%**	**31.92**	**12%**	**13.47**
Transport	144.63	20.2%	11.35	4%	5.74
Residential, Comercial and Municipal Sector	24.88	3.5%	16.72	6%	6.77
Industry	56.83	7.9%	3.6	1%	0.88
Federal Public Administratio	-	-	0.25	0%	0.08
Other uses	7.16	1.0%	-	-	-
AFOLU	**131.56**	**18.4%**	**160.09**		**57.17**
Agriculture			2.12	1%	0.83
Livestock	42.56	5.9%	37.84	15%	16.66
Forest			73.33	28%	24.28
Limits of Forest/Livestock	89	12.4%	46.8	18%	15.4
Waste	**100.42**	**14.0%**	**8.58**		**5.46**
Urban Waste Management	53.83	7.5%	7.58	3%	4.44
Discharge and Residual Water Treatment	46.39	6.5%	1.02	0%	1.02
Other wastes	0.2	0.0%	-	-	-
Others	**53.29**	**7.5%**	**-**	**-**	**-**
Total	**715.3**	**100.0%**	**260.44**		**100.27**

Source: Preliminary data from INEGI, to be published in 2009

TABLE 6

Mexico's transport emissions by mode of transport

Type of transport	*GHG emissions on 2006 ($Mt\ CO_2e$)*
Auto-transport	135.0
Railway	1.8
Aviation	5.4
Maritime	2.4
Electric	Insignificant

Renewable Energy: Mexico hopes to generate about 9% of electricity from renewables by 2012. In 2000, Mexico had 41,000 MW of installed power generation capacity, of which 11,000 MW was based on renewable energy. From 2000 to 2006, a total of 13,400 MW of new generation capacity were added. Around 2,000 MW were based on renewable energy. Most of this green energy came from large hydro projects and only 480 MW was produced by private investment. Mexico's Ministry of Energy expects to reach the country's 2012 goal primarily through new wind power projects in the state of Oaxaca. Oaxaca, in the southern part of the country, has an estimated wind power potential of more than 10,000 MW. A total of 2,500 MW of wind energy is expected to be installed there by 2012.

If everything goes as planned, 12,400 MW of new capacity will be installed across Mexico between 2006 and 2012. As mentioned above, 2,500 MW of this new capacity will come from wind energy projects in Oaxaca. Another 890 MW will be made available through a new large hydroelectric project, and 310 MW will be based on other renewable energies. The challenge is to increase the country's transmission infrastructure to allow the interconnection of green-project-generated electricity around the country. Mexico is well-positioned to take advantage of the international carbon-emission markets and hence, be a part of the solution on climate change. The country is trying to use its renewable energy sources to achieve its institutional goal of having 25% of its installed capacity from renewables in a 10-year time span. The first steps have been taken. However, a lot of challenges (and potential business opportunities) are ahead. A correct and timely planning of the country's green infrastructure is needed[6]. However, existing financial incentives such as depreciation rules for RES technologies, a green fund and financial support for solar water heating may promote to some extent the expansion of renewable energy sources and increase the success of the 2012 RES target.

Agriculture, forests and other land use: This category represents the second most important source of GHG emissions, with a total of 131.56 $MtCO_2e$, contributing almost 19% of the country's total emissions. In agriculture, the main policy objectives are to turn agricultural degraded lands with low potential productivity into sustainable systems; to foster green harvest of sugar cane; enhance sustainable agricultural practices in order to maintain carbon reserves and increase carbon capture capabilities. The main mitigation measures for livestock involve sustainable shepherding, land management, and management from enteric fermentation derived products and animal excretes.

Under an appropriate policy, the forest sector has the capacity to compensate emissions generated in other sectors, turning it into one of the most important mitigation options in the short and medium term. To induce the conservation, capture and substitution of forest carbon, the main policy objectives are to mitigate emissions from the forest sector and from land use change through programs that protect, conserve and manage forest ecosystems and their soils in a sustainable way; to increase forest carbon storage through forestation and reforestation; and to stabilize forest-agriculture limits in order to reduce emissions from land use changes from forest surfaces to agricultural uses.

[6] http://www.noruega.org.mx/Business_eng/sector/environmental_technology/Environmental+techology.htm

TABLE 7

Mexico's main mitigation measures

Goal	*Concept*	*Mitigation $MtCO_2e$*			
		2008-2012	*2012*	*Accumulated on 2012*	*%*
M87	REDD Pilot projects	44.8	14.9	14.9	15%
M72	Planned shepherding in 65 million ha of pastureland	37.75	16.59	31.49	31%
M1	Re-inject bitter gas with high nitrogen concentration in the largest Oil field in Mexico, Cantarell, in order to reduce gas flare in activities off-shore	27.6	6.9	38.39	38%
M75	Incorporate 2.175 million ha for EPS	15.29	3.25	41.64	42%
M74	Incorporate 2.5 million ha of land ecosystems to Management Units for wildlife use (UMAS, for its acronym in Spanish)	12.55	4.18	45.82	46%
M63	Increase 2.95 million ha if Sustainable Management of Forests	11.88	4.37	50.19	50%
M81	Landfills	7.56	4.44	54.63	55%
M2	Thermal energy efficiency in PEMEX	7.5	2.5	57.13	57%
M82	Establish 500,000 ha of commercial forest plantations	6.88	3.44	60.57	61%
M42	Energy savings from electro domestic appliances substitution in households	4.97	1.17	61.74	62%
M37	Increasing railway participation in the weight federal transport (from 26% to 28.3% in terms of ton-km)	3.9	1.6	63.34	63%
M11	Thermo electrical central power in Manzanillo	3.75	3.75	67.09	67%
M22	Enhance private sector participation for electricity using RE and Co-generation by increase energy self sufficiency private investments for up to 2,500 MW.	3.65	3.65	70.74	71%
M44	Substitution on 47.2 million incandescent light bulbs for saving fluorescent lights	3.53	1.68	72.42	72%
M76	Incorporate 750,000 ha of forest ecosystems in Natural protected areas	3.36	1.12	73.54	74%
M18	Electricity generation with wind power (507 MW)	2.4	1	74.54	75%
M17	Hydroelectric central power constructed in La Yesca (750 MW)	2.05	1.02	75.56	76%
M51	600,000 wood stoves installed	1.62	1.62	77.18	77%

Source: Mexican Special Programme on Climate Change, March 2009 version

Waste: According to INEGEI 2006, the volume of emissions from solid urban wastes and sewage water was 100.4 $MtCO_2e$, which contributes to 14% of the total national emissions. The main mitigation opportunities in this category are by avoiding uncontrolled methane emissions on final solid waste management disposals.

The PECC has established 41 objectives and 95 goals for mitigation action for the four main categories, energy generation, use of energy, AFOLU and waste.

The 18 main mitigation measures in the PECC – accounting for 62% of the total emissions – are as table 7.

9.5 South Africa

9.5.1 Overview

At its climate summit held in March 2009, South Africa's environment minister declared that his country expects to put in place a binding climate change policy within three years to cap emissions by 2020 to 2025. He cited abundant sunlight, wind and other renewables as effective and cheap alternatives for the country to exploit. South Africa has a target for new renewable energy of 10 000 GWh equivalent by 2013, which is equivalent to 4% of anticipated electricity consumption by the time. A policy review has been initiated that will consider a medium term target for electricity. Plans for mass deployment of solar water heating are being finalized.

South Africa's emissions and GDP per capita are well above the world average and its emissions per capita are close to the Annex I average. Due to the extensive use of coal, South Africa's emissions per kWh electricity are among the highest in the world. Almost 50% of GHG emissions in South Africa come from the state-owned utility Eskom, with Sasol being the second largest emitter, mostly from producing liquid fuels from coal. Coal supplies 72% of primary energy and 90% of electricity. Biomass (10%), oil (12%), nuclear energy, gas and hydropower only play a minor role today.

A number of policies and measures targeting energy efficiency and demand-side management have been introduced in recent years to cope with the limited power-generating capacity. The framework for energy efficiency policy is set by the South African energy efficiency strategy, which aims at reducing final energy consumption by at least 12% compared with the Business as Usual scenario until 2015 (with the year 2000 as the basis).

9.5.2 Sector-based mitigation policies and measures

South African emissions reductions can be achieved in the industrial sector by increasing efficiency and moving to renewable energy sources (Hohne et al, 2008). There is also the possibility of reducing emissions in the transportation sector, including through scaling up public transport. A gradual transition to more natural gas and biomass use is considered an option, as is electric vehicles.

Industry: The existing policy mix in the industrial sector already has a number of promising measures. The framework is set by a sectoral target (which is linked to the general energy efficiency strategy), which aims at energy savings of 15% until 2015. Specific measures include variable speed drives, efficient motors, compressed air management, efficient lighting, heating, ventilation and cooling as well as thermal savings (more efficient use and production of heat). An Energy Efficiency Accord, which includes the 37 largest industries in South Africa, established technical committees to discuss how to fulfill the energy efficiency target.

Transportation: Current climate policies in the transportation sector include targeted economic and fiscal measures (e.g., financial support for efficient and low-polluting vehicles, subsidies for scrapping old taxis and finance for bus services), regulations (e.g.,emission standards) and information measures (e.g., public awareness campaigns for using public transportation). The ambitious potential of about 42 $MtCO_2eq$ in 2020 can be realized by introducing additional measures. Other policy measures include a phase-out of subsidies and energy taxation on fuels.

Renewable Energy: Renewable energy is promoted through a renewable electricity target (additional 10,000 GWh from renewables until 2013). The Renewable Energy Finance and Subsidy Office, whose mandate includes managing renewable energy subsidies and providing advice to developers and other stakeholders on renewable energy finance and subsidies, was established in 2005. Feed-in tariffs for electricity from four renewable energy technologies were set in early 2009, and for additional technologies in mid-year, and the implementation procedures are due to be finalized soon. There is also an off-grid electrification PV program.

10 Conclusion

For over a decade the perception has persisted that major emerging economies were not acting to reduce their own emissions. In the US in particular, this perception has been used as a reason for inaction on climate change. This justification for inaction was always flawed, as it ignored the seriousness of the problem, the historical responsibility of the industrialized, the commitments made under the UNFCCC, and the power of industrialized country leadership. But flawed or not, today it is gone. Developing countries, in particular the major emerging economies, are taking action to reduce their emissions, even in the absence of industrialized country leadership and action.

These actions are but the first important steps on a long journey. Without an investment in new technologies and a commitment to efficiency, emissions trends indicate that the majority of new emissions will be produced in the developing world in the coming decades. As they grapple with both climate change and desperate poverty, developing countries will need help to fully make the transition towards low-carbon economies. Based on industrialized country historical responsibility for the climate crisis and greater economic capacity, this help is justified.

Climate change is a global problem and its impacts can only be slowed through a global response. In addition to transitioning to a clean energy future themselves, industrialized countries must provide measurable, reportable and verifiable revenues to provide predictable financing for emissions reductions and adaptation needs within the developing world. Only by helping developing countries continue to move toward low-carbon pathways and reducing emissions from tropical deforestation can we bring global emissions under control. Importantly, this is not a zero-sum game. Improving the global market for clean energy technologies will help spur greater advancements throughout the industry, which will also help the transition to low-carbon pathways everywhere in the world.Their recent actions show that these emerging economies will be good partners in this global effort. They have demonstrated their serious commitment to addressing climate change and have sent a strong message to the world that they are ready for a new era of international cooperation. They have taken actions and developed plans to begin to decouple their economic growth from their greenhouse gas emissions, so that they can grow sustainably without disrupting the climate system.

Of course they can always do more, more than they do and pledge now, and they should. But increased financial and technical assistance from industrialized countries can also be expected. Rather than ignoring emerging leadership by developing countries, the developed world has to support these important efforts to protect people and nature from dangerous climate change – and match them with more ambitious action at home, to reflect their historic responsibility and their current capability to act.

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