Economic and competitiveness indicators in Latin America – selected countries

Indicator	Brazil	Argentina	Venezuela	Mexico	Colombia
2015 GDP growth[1]	–3.8%	0.4%	–10%	2.5%	2.5%
2016 GDP growth (est.)[1]	–3.5%	–0.7%	–6%	2.6%	2.8%
Commodities exports[1] (% of total exports)	45.3%	49.8%	87.1%	11%2	58.5%
2013 renewables[3] (%)	57%	13%	39%	12%	52%
Rank in GCI (Global Competitiveness Index)[4]	75th	106th	131st	61st	66th
GCI – market size[4] (on scale 1–7)	5.6–7.0	4.6–5.5	4.6–5.5	5.6–7.0	3.6–4.5
GCI – innovation[4] (on scale 1–7)	2.6–3.5	2.6–3.5	0–2.5	2.6–3.5	2.6–3.5

1. 'World Economic Outlook 2016', FMI
2. Oil and oil products, INEGI, 2014. Mexico is not a large commodity exporter, but oil accounts for a significant part of government income (31% in 2014)
3. Electricity, including hydro and geothermal, IADB
4. World Economic Forum, Global Competitiveness Index 2015–2016. Ranks out of 140 economies and scores measured on a 1 to 7 scale

this factor, countries like Brazil, Chile, Colombia and Peru lose position in the general ranking, while countries like Mexico, Argentina and Bolivia maintain their relative positions. The main factors influencing negative results for innovation in the region relate to low patent registration and availability of scientists and engineers. In fact, the share taken by Latin America and the Caribbean in total global patent applications has been settled at a figure below 3 per cent since the 1990s ('How can Latin America avoid being left behind?', Alicia Bárcena Ibarra). In addition, despite the accomplishment of significantly increased school enrolment, and in years of education completed, it will be necessary to improve quality in some countries in order to further develop the skills and capabilities of the workforce for the post-Paris scenario. Perhaps the only exception relating to technology development in the region is deep and ultra-deep water technology in the oil and gas sector, where Brazil has been on the frontier with Cenpes (the research centre at Petrobras). Given adequate incentives, this knowledge can be applied to the development of cleaner technologies to this industry.

In summary, even considering its relatively clean energy mix, the use of clean technologies in further expansions of the energy sector will be important for reducing emissions in Latin America. For the region to overcome the political, macroeconomic, financial, and technological obstacles hindering it in its transition to a greener economy, it will be necessary to promote cooperation between the public and private sectors and develop a business environment capable of attracting foreign investment. To this end, governments must define policies that foster collaboration between different stakeholders and encourage agents to invest in low-carbon alternatives. A solid, stable, and transparent regulatory framework will also be pivotal in supporting investment and accelerating the transition.

'IT IS CLEAR THAT DEVELOPED AND DEVELOPING NATIONS HAVE QUITE DIFFERENT CONCERNS OVER CLIMATE CHANGE.'

It is clear that developed and developing nations have quite different concerns over climate change. Similarly, different countries and regions can be expected to experience energy transition at different paces. Discussion of peculiarities in each country's approach to energy transition in the Latin American region can help increase understanding of their individual energy policies, and create a coherent view of the relationship between energy, climate change, and the economic and social dimensions in the region. In the end, if we want to build a greener and more sustainable energy sector in Latin America, we had better start acting now.

India's climate and energy goals after COP21: contradictory or complementary?

Anupama Sen

The agreement reached at the 21st Conference of Parties (COP21) in Paris in December 2015 evoked mixed reactions in India. While its prime minister declared that the deal was a win for 'climate justice', the environment minister reportedly stated that the agreement could have been more ambitious, as the actions of developed nations were 'far below' their historical responsibilities. There was, however, a visible shift in India's stance at COP21

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in comparison with previous climate summits. Arguably, this shift began in 2010 in Cancun, when India pledged its first climate target (to reduce the emissions intensity of GDP by 20–25 per cent by 2020 from 2005 levels, soon after China announced its emissions intensity target), and it was further defined at COP21.

The core of India's negotiating position has remained unchanged – relying on the principle of 'common but differentiated responsibility and respective capabilities' within the United Nations Framework Convention on Climate Change. This relates to its main domestic and international challenge which, as described in the *IEA World Energy Outlook 2015*, is to

> *'demonstrate serious intent to reduce emissions, while still preserving sufficient headroom to allow for economic growth'.*

While in the past (prior to 2009) India's focus was on resisting international attempts to impose any emissions limits that could constrain its energy policy, at COP21 it explicitly articulated its stance – namely, that given the limited amount of carbon space (or total amount of carbon that can be emitted before the 'safe' temperature threshold is breached), developing countries should be allocated a 'fair and equitable' share to enable them to pursue critical development and poverty alleviation goals. It simultaneously announced ambitious domestic targets on clean energy, albeit reiterating a proviso that these were contingent upon low-cost technological assistance from the developed world. Another key feature of this 'shift' was India's leadership (jointly with France) in rallying 120 (mostly developing) nations around an international solar alliance, purportedly to seek the financial assistance required to scale up the adoption of solar energy.

Taken at face value, these steps collectively hint towards the beginning of a hitherto unprecedented conflation of climate policy and economic development policy, in contrast to a previously perceived dichotomy between climate change mitigation and economic development (see 'Neither Brake Nor Accelerator: Assessing India's Climate Contribution', Navroz Dubash and Radhika Khosla, *Economic and Political Weekly*, 17 October 2015). Indeed, many of the potential characteristics of renewable energy – such as decentralized solar systems – present potential solutions to the problem of rural electrification, which is one of the centrepieces of the current government's policy pledges. However, a key question arises: is India's shift in its stance on climate and energy at COP21 consistent with the commitments in its Intended Nationally Determined Contribution (INDC)? In other words, are India's goals on climate and energy policy complementary, or contradictory?

India's twin climate targets – commitments versus aspirations

It is in fact important to note that India has *two* sets of climate-related policy targets. The first set is enshrined within its INDC and therefore constitutes firm international commitments. These are:

- To reduce the emissions intensity of GDP by 33–35 per cent from 2005 levels by 2030;
- To achieve 40 per cent of cumulative electric installed capacity from non-fossil fuel sources by 2030, with the help of technology transfer and low-cost international finance, including the Green Climate Fund; and,
- To create an additional carbon sink of 2.5–3.0 billion tonnes of CO_2 equivalent, through additional forest and tree cover by 2030.

The second set of targets reflects the Indian government's domestic policy intentions through its long-running National Action Plan on Climate Change (launched in 2008). These include:

- A five-fold increase in renewables installed capacity to 175 Gigawatts (GW) by 2022;
- Of the above, 100 GW from solar, 60 GW from wind, and the remainder from other sources; and,
- A 10 per cent reduction in total energy consumption (from current levels) by 2018–19.

Notably, the second set of targets has received greater publicity than the INDC targets, and they do not form a part of the INDC commitments; rather, they are listed in the INDC as part of recent government policy initiatives on climate change mitigation – they can therefore be construed as *domestic policy aspirations*, rather than *firm international commitments*.

Several broad assessments of India's INDC targets have been made since December 2015, and the consensus appears to be that they are achievable, but relatively conservative in ambition. For instance, in contrast with other large developing economies (Brazil, China, and South Africa) which had joined India to represent their collective interests in 2009, India's INDC retained its historical preference for an emissions intensity target, while at COP21 Brazil, China, and South Africa moved from emissions intensity targets towards absolute emissions targets. India's emissions intensity of GDP (measured in kilograms of CO_2 per 2011 PPP$ of GDP) is estimated to have fallen by around 7.5 per cent from 2005 levels (*World Bank World Development Indicators, 2015*).

However, India's INDC estimates that its energy intensity has declined by a much higher 17 per cent (given the dominance of fossil fuels, emissions intensity may have followed a similar trend). It is likely to continue to decline as India expands its National Mission on Energy Efficiency (see 'Energy Efficiency: low-hanging fruit for India', Anil Jain, *Oxford Energy Forum*, February 2015) and one assessment puts the likely emissions intensity of GDP at 41.5 per cent below 2005 levels by 2030 (*India Climate Action Tracker, 2015*).

'…NON-FOSSIL FUEL SOURCES ALREADY COMPRISE 30 PER CENT OF INDIA'S OVERALL INSTALLED CAPACITY…'

India's INDC pledge to expand non-fossil fuel installed electric capacity (including hydroelectric and nuclear) is similarly achievable, as non-fossil fuel sources already comprise 30 per cent of India's overall installed capacity – the majority of this 30 per cent being hydroelectricity, while within renewable energy (excluding hydroelectricity) wind takes the largest share. The *IEA New Policies Scenario (NPS) 2015* for instance, predicts that non-fossil fuel capacity will reach 46 per cent of installed capacity in 2040. At the same time, it is important to note that a target for installed capacity does not equate to a target for generation – particularly given India's low capacity utilization, its high transmission and distribution losses, and the inherent intermittency of renewables using current technologies. For instance, Dubash and Khosla, in 'Neither Brake Nor Accelerator', estimate that the target would translate into a 21–22 per cent share of generation, meaning that fossil fuels are likely to continue to dominate.

However it seems that the effectiveness of India's INDC targets, and the scaling up of a potential 'climate as development' narrative, will depend not just on the success of its domestic policy aspirations (specifically on the interactions with INDC commitments) but also on more granular measures, such as efficiency reforms in the electricity sector. The consensus from various assessments appears to be that the successful achievement of its domestic policy aspirations could result in India even exceeding its INDC emissions intensity and non-fossil fuel electricity capacity targets. However, estimates of this vary considerably (see 'India's Climate Pledge Suggests Significant Emissions Growth up to 2030', Sophie Yeo and Simon Evans, *Carbon Brief*, 2 October 2015).

The power sector – the biggest hope, but also the biggest constraint

India's installed generating capacity	
Source	**Percentage of total**
Coal	61%
Oil	0.34%
Gas	8%
Nuclear	2%
Hydro	15%
Renewables	13%

The table 'India's installed generating capacity' gives the percentage composition of India's 289 GW of installed capacity in February 2016. Within renewables, solar and wind were 13 and 65 per cent, respectively.

According to the IEA, CO_2 emissions from electricity comprise the single largest proportion (44 per cent) of total CO_2 emissions from fuel combustion in India (*CO_2 Emissions from Fuel Combustion,* IEA, 2014). Given that roughly a third of its population lacks access to modern commercial energy, India's government in 2014 set a target of providing '24 × 7 electricity to all' by 2019. The viability of this target is contingent not just upon an expansion of installed capacity, but also on massive technical and financial reforms to the electricity sector. Given its dual emissions and development implications, the power sector, therefore, represents the biggest hope for a successful confluence of climate and energy policy, but at the same time, its biggest hurdle. The latter is characterized by *two fundamental problems relating to power sector reform*:

- First, India's electricity reform is largely based on the OECD model, where prices are eventually set based on system marginal cost. As electricity policy in India's federal structure lies with individual states, these are at different stages of reform. However, India is beginning to demonstrate problems similar to those seen currently in the OECD, where a system based on marginal cost pricing cannot cope with the intermittency of renewables, nor provide adequate long-term incentives for investment in desirable (that is, alternatives to coal) backup generation (see 'Divergent Paths to a Common Goal?', Anupama Sen, OIES paper EL10, May 2014). Attempts at incorporating renewables have run into problems. For instance, a 'renewables purchase obligation' (RPO) requires distribution utilities to purchase a certain proportion (set by state regulators) of electricity from renewables, or alternatively an equivalent amount in 'renewable electricity certificates' (each equating to 1 MWh) on India's two main power exchanges. However, the exchanges have reported a growing inventory of untraded certificates since the programme's inception. For instance, the Indian Electricity Exchange, which accounted for over 90 per cent of the domestic electricity trading market in 2015, reported that of 9.6 million certificates available in fiscal 2014/15, only 3.1 million had been traded (see 'Green certificates sale down 58% at 4.01 lakh in January', *Economic Times*, 27 January 2016)
- This leads to the second problem and a fundamental reason why India's previous attempts at reform failed: the insolvency of state distribution utilities,

'CO_2 EMISSIONS FROM ELECTRICITY COMPRISE THE SINGLE LARGEST PROPORTION (44 PER CENT) OF TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN INDIA.'

reflecting a failure to enforce cost-reflective pricing. This has meant that utilities are often unable to fulfil their RPOs. Policymakers are undoubtedly aware of these problems: three recent attempts have been made to restructure the debts of utilities. The latest reform, announced in November 2015, asks state governments to appropriate 75 per cent of distribution utilities' debts over a period of two years. Following this, the debts will be included as part of state fiscal deficits, thereby necessitating parallel measures to be taken by states to increase power sector tariffs and eliminate subsidies. The incentive to states to implement this reform is the awarding of priority in other federal funding – nine out of 29 states had signed up at the time of writing.

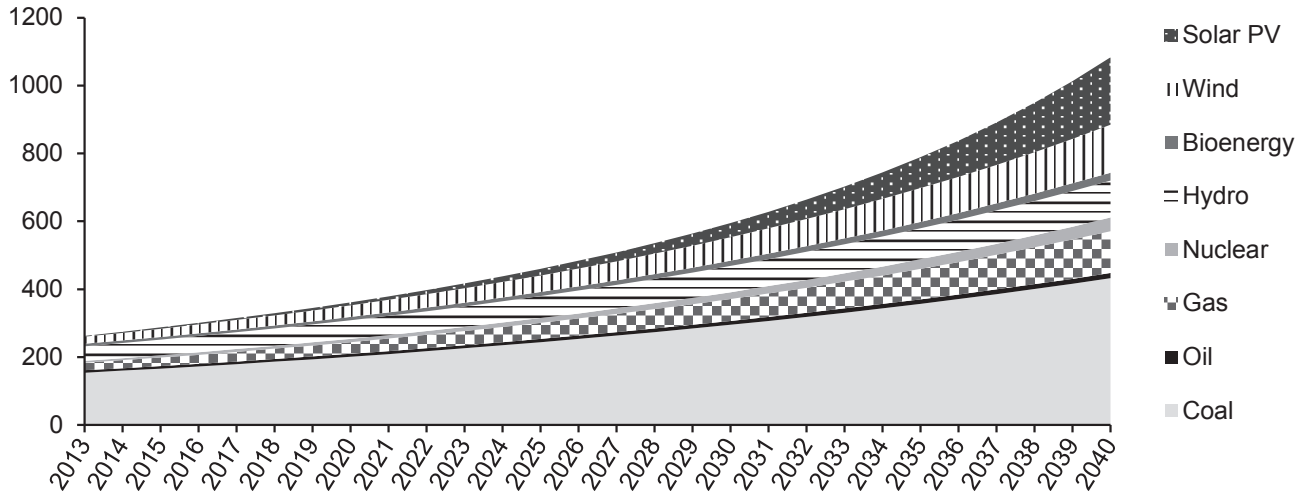
Subsidies have been successfully eliminated for energy products such as gasoline and diesel by liberalizing retail prices (accompanied by direct subsidy payments to eligible consumers through cash transfers). However, the position of petroleum products, where policy is made at federal level, is different from that of electricity, because electricity policy is a state subject; decision making for electricity is therefore fragmented and influenced by regional politics. India's INDC states that the government will enforce a 'renewables generation obligation' requiring fossil fuel generators to invest in solar plants or purchase electricity from renewables equivalent to 10 per cent of fossil fuel capacity. Although this moves the policy impact from the politically sensitive distribution sector to generation, and may help in adding capacity, it is unlikely to resolve the problem of cost-reflective pricing, which requires the building of a political consensus amongst states and greater enforcement powers for electricity regulators.

The unyielding role of coal

An alternative way of scaling up renewables within electricity is to disincentive coal, making it less attractive to consumers. However, this is where contradictions emerge. Aware of its pledge on universal electricity access and its wider ambitions on economic growth, India's government aims to triple domestic coal production to 1.5 billion tonnes by 2020 and, further, to meet this entirely from domestic resources which have a high ash content. Assessments show that these targets are ambitious but not impossible (see 'Indian Steam Coal Imports', Sylvie Cornot-Gandolphe, OIES paper CL3, March 2016). At the same time, it has announced domestic policy initiatives on 'clean coal', including:

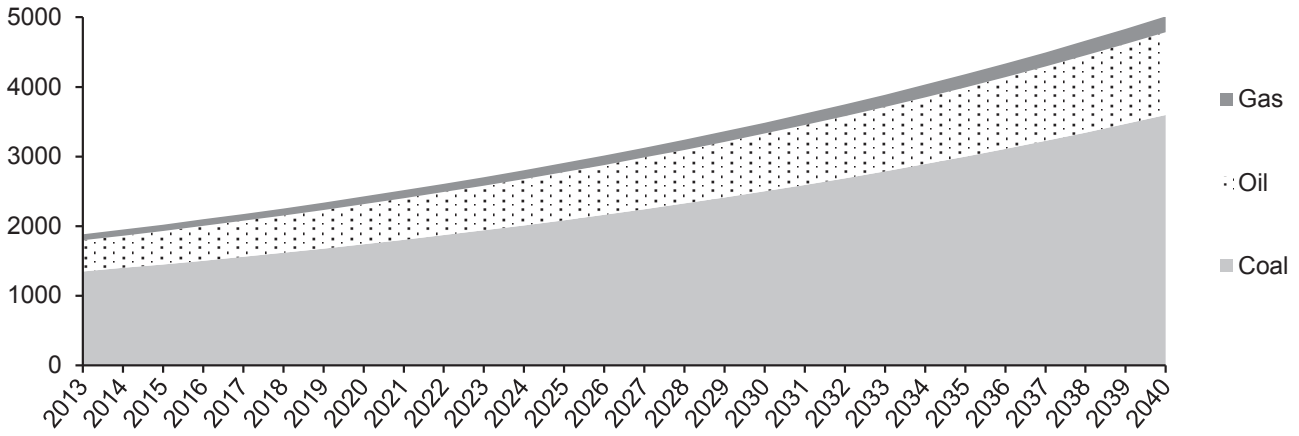
- Mandatory supercritical technologies for coal-fired power plants from 2017 (currently comprising only 16 per cent of the coal-fired fleet);
- The expansion of coal washeries (less than 20 per cent of coal is washed);
- Pricing based on auctions (Indian coal has at times been half the price of internationally traded coal);
- Environmental regulations on transportation of coal with high ash content; and,
- A 'coal cess', which has been doubled every year since its inception in 2014 (now roughly US$6/tonne).

However, by most assessments, and despite current policy measures, coal will continue to meet the major proportion of India's energy demand (set to



Trend in growth of installed capacity to 2040 (GW)

Source: Author's estimates using compound annual average growth rates from IEA World Energy Outlook, *2015*



CO_2 emissions to 2040 (million tonnes)

Source: IEA World Energy Outlook *CPS, 2015; Author*

increase by 2.5 times) to 2040 (see the figure 'Installed capacity to 2040' on page 35).

The *IEA World Energy Outlook* estimates that coal-fired capacity in the *NPS* will be 17 per cent lower than in the *Current Policies Scenario (CPS)*; in contrast, non-fossil fuel capacity will be 48 per cent higher in the *NPS* than *CPS* – but this is starting from a very low base, particularly for solar. In reality, solar is estimated in the IEA-NPS at 28 GW of capacity in 2020, 100 GW in 2030, and 182 GW in 2040, implying that India could fail to achieve its ambitious 2022 domestic solar target.

The resultant impact on emissions has been estimated by the IEA at around 5.2 billion tonnes of CO_2 in 2040 in the *NPS* (15 per cent lower than the *CPS*) – see the figure 'CO_2 emissions to 2040'. Although in absolute terms India would remain one of the largest emitters of CO_2, in per capita terms emissions would be around 3.4 tonnes (assuming UN population projections of 1.5 billion), up from 1.6 tonnes at present – placing it below predicted 2040 per capita emissions for the USA, China, and the EU ('India's Climate Pledge', Yeo and Evans, 2015).

'THE BIGGEST UNCERTAINTY IS, HOWEVER, NOT WHETHER INDIA'S CARBON EMISSIONS WILL CONTINUE TO GROW, BUT WHEN THEY WILL PEAK.'

Turning the coal tide

The biggest uncertainty is, however, not whether India's carbon emissions will continue to grow, but when they will peak. India has, thus far, resisted putting forward a target for this (as China has done), but its INDC states that it

> *'reserves the right to make further submissions as and when required'.*

A related uncertainty is over whether the path to peak emissions could be speeded up or moved to a lower trajectory. This is where India's proviso of

> *'access to low cost international finance and technology transfer'*

comes into play. It is likely to be the basis of future negotiations and of adjustments to India's INDC targets going forward through the 'update and ratchet' mechanism. India's INDC puts forward a preliminary estimate of US$2.5 trillion (2014 prices) as the cost of implementing enhanced climate actions to 2030 – higher than all other developing countries combined ('India's Climate Pledge', Yeo and Evans, 2015). In contrast, global renewable energy investments in 2016 were estimated at US$286 billion, the majority being in developing countries (*United Nations Environment Programme*). Although India prefaces its INDC contribution with 'sanguinity' about the availability of international finance, the weight of evidence is against such sanguinity (as noted in 'What do India's climate contributions mean, and are they implementable?', Lavanya Rajamani, *Economic Times*, 23 October 2015). There is an urgent need for greater clarity on how much of India's estimated cost can be funded domestically, and how much internationally.

India's climate and energy goals, as they currently stand, are still contradictory, but there is room for complementarity and for exploiting the growing synergies between the two. This has not been sufficiently explored by governments (and not just India's), fearful of yielding sovereignty over domestic policy. What may turn the tide in the next few years is the move towards decentralized solutions to energy access and development, along with rising public concerns over environmental issues such as abysmal urban air quality (this has recently caused a slew of litigation by citizens against India's administrative authorities), which could force climate and energy policy closer together.