



it is in decline: coal use fell 2.9 per cent in 2014 and a further 3.7 per cent in 2015. Although the details of China's coal statistics are notoriously problematic, the trend seems clear: already China's coal-fired power stations are running below economic levels, with utilization rates characteristically below 50 per cent. But in one sign of a familiar dysfunction in China's policy implementation, even as rates of return on new coal plants were falling below the level necessary for the plant to pay for itself, and the national government talked of promoting the move out of coal, provincial and local governments continued to grant permissions for new coal generation in what risks becoming one of the world's larger stranded asset creation programmes.

According to a Greenpeace analysis, in 2015 China's central and provincial governments approved 210 new coal-fired power plants, with a collective capacity of 169 GW and potential emissions of around 780 million tonnes a year. However, given China's overall energy demand level and the fact that any new demand is likely to be met by renewables, hydro, or nuclear, even if the plants were built they are unlikely to run at anything close to full capacity. In March, in an effort to regain central control of coal plan approvals, the National Energy Administration (NEA) ordered 13 provincial governments to stop issuing approvals for new coal-fired power plants until the end

of 2017 and instructed a further 15 provinces to stop building new coal power plants that have already been approved. It remains unclear how many of the plants approved in 2015 will be affected.

There is less confusion on coal supply: in December 2015, Xinhua News Agency reported that China planned to close 1,000 coal mines and suspend new capacity approvals until 2019, with an expected cull of 1.3 million jobs in the coal sector over the 13th Five Year Plan. Overall, China aims to reduce coal's share of primary energy in 2016 to 62.6 per cent. Over the longer term, some analysts have suggested that China could meet 80 per cent of its energy needs from non-fossil sources by 2050.

Under the 12th Five Year Plan, China surpassed its energy and carbon targets: between 2011 and the end of 2015, energy intensity fell by 18.2 per cent and carbon intensity declined 20 per cent. Slower economic growth and an accelerating decline in heavy industry should make the 13th Plan's carbon and energy intensity targets highly achievable. China's veteran special representative for climate change, Xie Zhenhua, assured an audience in Hong Kong in February ('China's climate envoy bullish on hitting reduction goal for 2020', *South China Morning Post*, 23 February 2016) that China would have no difficulty in hitting its 2020 targets of cutting carbon

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intensity by 50 per cent below 2005 levels, if China met its 13th Plan energy saving goals.

If carbon intensity was cut by 50 per cent by 2020, according to Xie, China could easily peak emissions and cut carbon intensity by 60–65 per cent on 2005 levels by 2030, in line with China's ambition to build a green, service economy. The transition to 2030 would be eased, he said, with investments of 4.1 trillion Chinese Yuan Renminbi (US\$628 billion) in green, low-carbon industries, with the creation of 69 million new jobs.

Over the coming year, planners at every level of China's government will put flesh on the bones of the 13th Plan. How smooth the process will be is uncertain: slower growth, popular discontent at job losses, and the difficulty of implementing reforms to the energy market will need to be dealt with. The temptation to continue with infrastructure investment will be strong, and already the plan has attracted criticism for its projected investment in expanding high speed rail and in building new airports. But if China succeeds, the benefits of its transition will spread well beyond China. If it fails, the impacts will be equally widely felt.



The post-Paris agenda: challenges ahead for Latin America

Lavinia Hollanda

The Paris Agreement indicates that in the coming years, the world is going to move to a low-carbon economy, and the energy sector should be responsible for promoting

big changes in the global climate scenario. The terms of the agreement are comprehensive and ambitious, based on common but differentiated responsibilities among countries, and

the energy guidelines and contribution targets of developed and developing countries differ in many points. This means that both the developed and developing world will have to make

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**'THE ENERGY MIX IN THE REGION CAN BE
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efforts to limit the increase in global temperatures to well below 2 °C above pre-industrial levels – and pursue efforts to achieve the 1.5 °C target. However, the contributions of different countries towards providing solutions will be diverse, and will take into consideration each country's historical and current emissions, as well as its ability to tackle climate change. After the successful results of COP21, each country now has a different – and perhaps more challenging – task of making the Paris Agreement real. In this context, what are the implications of the post-Paris scenario for the energy industry in Latin America?

Some aspects of Latin America and of its energy sector give the region an advantage in the transition to a low-carbon economy when compared to other parts of the world.

The energy mix in the region can be considered relatively clean compared to the global average participation of fossil fuels – some 70 per cent of the energy demand in the region is supplied by gas, oil, or coal, whereas in the world on average this percentage rises to 82 per cent. When considering solely the power sector, the high participation of hydropower – and, more recently, of the 'new' renewables (wind, solar, biomass) in some countries – brings fossil fuels contribution to approximately 60 per cent of electricity generation in the region, compared to the global average of 73 per cent (IADB based on IEA data, 2013). Going forward, an expected increase in demand, combined with social and environmental constraints on building additional capacity in hydropower plants, indicates that Latin American countries will need structural change

in order to find a path that allows the region to consume more energy, at affordable prices, and in a more responsible way.

Latin America also abounds in natural resources – these could allow energy transition to take place within the region. However, the penetration of 'new' renewables (excluding hydropower) and biofuels in the energy mix varies greatly among the countries in the region. In *Brazil*, for instance, the installed capacity of wind generation has increased enormously in the past six years, from nearly zero in 2009 to more than 8.5 GW in 2016.

Nevertheless, this represents only 6 per cent of Brazil's power generation. In *Argentina*, a country with significant potential for onshore wind generation, particularly in the Patagonia region ('Beyond Paris: Energy Transition in Latin America and the Caribbean', Institute of the Americas, 2016), wind power generation is nearly zero. In the case of solar generation, a comparison of irradiation maps of countries in the region with Germany, where currently 21 per cent of capacity comes from solar generation, indicates that there is much potential for growth in solar projects in Latin America. To illustrate this point, data from SolarGis shows that the maximum irradiation in Germany is around 40 per cent lower than the maximum irradiation in Brazil, for instance.

In the case of biofuels, Brazil is the world's largest sugarcane ethanol producer and a pioneer in this segment. Most of the country's current light vehicle fleet consists of flex fuel vehicles, and there is a government mandate that requires a 27.5 per cent ethanol mix to gasoline. In the past years, the biofuels sector in Brazil has suffered from harsh competition with oil products, which have been heavily subsidized by the government, mainly because of inflationary concerns. The decline in oil prices has given

local governments in Brazil, and in other countries in Latin America, the opportunity to gradually eliminate such subsidies (allowing ethanol to regain competitiveness) and, potentially, to enhance further research in advanced biofuels.

However, in Argentina most of the energy sector relies on fossil fuels, mainly gas, while solar and wind account for less than 1 per cent of installed capacity (an additional 3 per cent comes from biomass, IADB Energy Database, 2013). A new Renewables Law, enacted in October 2015, establishes that 8 per cent of generation must come from renewables by the end of 2017, and 20 per cent by 2025. At the same time, Argentina has the largest gas reserves in the region, located in the Neuquén Basin (Vaca Muerta and Los Molles), with an estimated 20 billion barrels of shale oil and 583 trillion cubic metres of shale gas. Since imports of gas represent a significant proportion of the total domestic supply in countries like Mexico and Brazil, development of the Argentinean reserves could potentially allow natural gas to play a transition role in the region. In addition, the new government in Argentina has raised expectations about the progressive normalization of the macroeconomic scenario and the resumption of more favourable policies for foreign investments.

An additional asset for Latin America is its market size. The evaluation of the Global Competitiveness Index (GCI), calculated annually by the World Economic Forum, shows the relevance of some markets in the region. The index assesses the performance of 140 countries through the evaluation of 12 key pillars that drive competitiveness; these include institutions, infrastructure, macroeconomic environment, education and labour markets, innovation, and market size.

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'LATIN AMERICA FACES GREAT CHALLENGES IN THE IMPLEMENTATION OF THE PARIS AGREEMENT.'

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Concerning market size, there are seven Latin American countries which rank among the top 50 markets (such as Brazil in seventh position and Mexico ranking eleventh). Even if we consider a likely income reduction in the region in the coming years (loosely due to low commodity prices), some Latin American markets will remain globally relevant.

However, Latin America faces great challenges in the implementation of the Paris Agreement.

How will the transition be financed?

This is probably the region's most immediate challenge as energy and climate change generally have strong links with a country's political and macroeconomic scenario – and this applies to Latin America. The participation of Latin America in the global supply of oil and gas is slightly below 5 per cent, mainly concentrated in Mexico, Venezuela, and Brazil, and to a lesser extent in Colombia and Argentina ('The Geopolitics of Oil and Gas The Role of Latin America', Lins et al., Catavento, February 2016). However, the region's economies are highly dependent on natural resources, with a great deal of revenues relying on commodities exports – oil and gas are particularly relevant in Mexico and Venezuela, and they have a significant impact in Bolivia, Ecuador, Argentina, and Brazil.

Export dependence and commodity price fluctuations Dependence on exports of natural resources has put some countries at the mercy of fluctuations in global commodities prices. Coupled with some questionable economic policies implemented in the past years, this has led to a deterioration in

macroeconomic fundamentals and to turbulence in the political scenarios of most of the countries in the region. There have also been headwinds from abroad: key players in the commodities markets, particularly China, have been showing slower growth rates. Given these factors, it is unsurprising that most countries in the region reported GDP growth deceleration, or even contraction, in 2015 (the figure for Latin America and the Caribbean was –0.3 per cent, largely affected by Brazil's recession); perspectives for 2016 are also weak.

The region faces a trade-off between the short-term economic gains of developing existing fossil fuel resources (once global oil prices allow) and the longer-term benefits of transitioning to a less carbon intensive energy sector ('How can Latin America avoid being left behind?', Alicia Bárcena Ibarra, World Economic Forum, 18 January 2016). In either case, the region will need to attract significant investments in order both to overcome structural gaps and to invest in cleaner technologies. With high levels of debt and fiscal deficits, Latin American governments have very limited scope for maintaining the high levels of public spending seen over the past 10 years and are under enormous pressure to attract foreign investment.

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'...FINANCING THE TRANSITION TOWARDS A LOWER-CARBON ECONOMY IN DEVELOPING COUNTRIES IS A SIGNIFICANT BARRIER TO OVERCOME.'

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Where will the financing come from if Latin America's national governments are unable to provide the necessary financial resources to turn plans into action? The Paris Agreement has acknowledged that financing the transition towards a lower-carbon economy in developing countries is a significant barrier to overcome. Several financing mechanisms to mitigate

and adapt to climate change have been made available for developing countries. These include resources from both public and private funds – an example of the latter is the Breakthrough Energy Coalition, an initiative backed by private individuals. However, other countries and regions more directly affected by extreme weather and climate-related events should have priority in receiving these funds (see 'Beyond Paris: Energy Transition in Latin America and the Caribbean'). As a result, the ability to attract private investments will be crucial in establishing the pace of energy transition in Latin America. The establishment of a predictable regulatory environment, with clear rules and strong institutions, is the key to unlocking foreign private investment in the region. Less government intervention in domestic markets should also help.

The ability of players in Latin America's energy industry to develop and deploy new and cleaner technologies will also be important in dictating how fast the transition will happen in the region. On the consumer side, with the expected increase in the region's urbanization rate, cities should be the locus of technological change and could foster innovation in urban transportation, water and waste management, and in the way energy is delivered to consumers. Moreover, innovation in the supply side, such as Carbon Capture and Storage (CCS) and efficiency improvements, will allow the energy industry to become greener.

However, Latin America as a region is not particularly well positioned in terms of innovation and technology development. A deeper analysis of the innovation pillar in the Global Competitiveness Index (GCI) illustrates the region's poor innovation capacity (see the table 'Economic and competitiveness indicators in Latin America' on page 32). When analysing

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.

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'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