Istituto Affari Internazionali

India's Institutional Governance and the Energy Transition

by Nicolò Sartori and Margherita Bianchi

Sustainable Energy Transition Series

ABSTRACT

The transition to a low-carbon energy system in India has progressed considerably recently, yet the scale of the challenges and the heterogeneity of India's territory and needs warrant more sustained action. The task for India involves providing abundant and cheap energy to support economic development and empower the middle class, while at the same time meeting international commitments on climate change and reducing overdependence on imported fossil fuels. The Indian low-carbon transition is carried forward through a multi-layered governance system, displaying the intricate dynamics between the central government, seven Union territories and 29 state administrations.

India | Energy | Renewables | Climate change | Sustainable development

keywords

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Introduction

In 2014, per-capita electricity consumption in India stood on average at 805 kilowatt/hour (kWh), less than one third of the world's average consumption (3,127 kWh).[1] In a country where two thirds of voters live in rural areas with very limited access to electricity, Prime Minister Narendra Modi skilfully included a pledge to bring power to every Indian citizen during his successful 2014 campaign. Once in office, he devised a plan to connect 18,452 villages by April 2018 – a target that he announced he has reached ahead of schedule.[2] As the 2019 elections approach, power access remains a main priority and debated topic.

Electrification and energy access are indeed major concerns in India, but the effects of environmental degradation and global warming are also critical, estimated to contribute to a loss of 1.8 per cent of GDP each year up to 2050.[3] This situation has prompted the Indian authorities to devise ambitious energy transition policies. Moreover, reducing the ever-growing dependence on fossil fuel imports – which make up around half of India's energy consumption[4] – is another priority of the central government.

[1] World Bank Data, *Electric Power Consumption (kWh per capita) - India*, https://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC?locations=IN-1W.

[2] However, concerns were raised concerning the actual number of people reached, as the government considers a village "electrified" when power cables from the grid reach a transformer in every village and 10 per cent of its households.

[3] Mahfuz Ahmed and Suphachol Suphachalasai, *Assessing the Costs of Climate Change and Adaptation in South Asia*, Mandaluyong City, Asian Development Bank, 2014, p. 76, http://hdl.handle.net/11540/46.

[4] Michael Waldron, "Energy Is at the Heart of India's Transformation", in *IEA Commentaries*, 10 April 2017, https://www.iea.org/newsroom/news/2017/april/commentary-energy-is-at-the-heart-of-indias-transformation.html.

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India is particularly vulnerable to climate change – in 2018 alone it has been hit by unusual and extreme weather events with increased frequency[5] – and a large emitter of carbon.[6] These are reflected in its energy and climate policy, which moreover has to adapt to the wide differences and varying needs across India's states.

Renewables are one huge opportunity as they are potentially able to respond to all energy challenges: access; climate mitigation; and security. With the vast gamma of technological capabilities across states, an increasing demand and more consumers, it is no surprise that Prime Minister Modi frequently defines the country as a "land of opportunities". Investments in clean energy and technology are growing speedily – in the first half of 2018 they rose by 22 per cent compared to the same period in 2017[7] – and solar and wind prices have fallen considerably[8] in the last three years, making building renewable energy facilities cheaper than managing most existing coal-fired power plants.[9] Looking at the impressive growth trends in the energy sector, efficiency will play a crucial role in the country, potentially able to reduce demand by 17 per cent by 2040.[10]

Energy transition is a powerful tool for the government's reform plans to improve the efficiency and sustainability of India's supplies while expanding affordable access to services. However, the energy governance that presides over the energy transition, and which includes federal and state institutions, is particularly complex.

1. India's impressive energy path

With 753.7 million tons of oil equivalent (Mtoe) of final consumption,[11] India is today the third country in the world in terms of energy demand, behind only China and the US. In the coming decades India will become the largest contributor to global demand growth – almost 30 per cent – with a share of global energy use rising to

[5] NASA Earth Observatory, *Weeks of Extreme Weather in India*, 14 May 2018, https://earthobservatory.nasa.gov/images/92196.

[6] In annual emission terms, not in per capita/cumulative terms.

[7] Sushma UN, "India's Investments in Renewable Energy Are Growing Faster than Even China's", in *Quartz India*, 10 July 2018, https://qz.com/india/1323902.

[8] Sushma UN, "Like Solar, Wind Power Is Now Cheaper than Coal-based Electricity in India", in *Quartz India*, 12 October 2017, https://qz.com/india/1098375.

[9] Silvio Marcacci, "India Coal Power Is About to Crash: 65% of Existing Coal Costs More than New Wind and Solar", in *Forbes*, 30 January 2018, https://www.forbes.com/sites/energyinnovation/2018/01/30/india-coal-power-is-about-to-crash-65-of-existing-coal-costs-more-than-new-wind-and-solar.

[10] Over the BAU (business as usual) scenario. National Institution for Transforming India (NITI Aayog), *Draft National Energy Policy*, June 2017, https://niti.gov.in/writereaddata/files/new_initiatives/NEP-ID_27.06.2017.pdf.

[11] BP, *BP Statistical Review of World Energy 2018*, June 2018, p. 8, https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/downloads.html.

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11 per cent by 2040.[12] Future patterns are mainly driven by a fivefold increase of India's economy by 2040[13] and by a demographic boom expected to turn India into the most populous country in the world, likely to happen in under a decade.[14]

India is the second coal producer and importer in the world, in both cases behind China.[15] Coal is the key source of energy supply, accounting for 44 per cent of India's final consumption and 66 per cent of overall generation. It is followed by oil (37 per cent of final consumption), while gas and renewables still play a negligible role. Coal accessibility and affordability compared to other fuels have contributed to its rise in particular in the power-generation sector.[16] Coal also constitutes the primary source of revenue for the states located in eastern India: income from royalties accounts for around 50 per cent of revenues for states like Jharkhand or Odisha, while its production, transport, usage, ash disposal and related businesses employ more than one million people.[17]

Massive use of coal has huge implications in terms of CO_2 emissions – India produces around 7 per cent of the world's total, growing at a rate of 5.4 per cent per year since 2000[18] – as well as for environmental degradation and local air pollution. Notably, the Indian energy sector alone accounts for 4.64 per cent of global emissions.[19] However, while India's emissions continue to grow, its per capita footprint remains among the lowest globally[20] – in strong contrast to the other top global emitters.

[12] BP, *BP Energy Outlook: India*, February 2018, https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2018-country-insight-india.pdf.

[13] India sustains one of the fastest GDP growth rates in the world (7.3 per cent). See IMF DataMapper, *Real GDP Growth*, https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD/IND.

[14] Joseph Chamie and Barry Mirkin, "India's Population: Becoming Number One", in *YaleGlobal Online*, 10 August 2017, https://yaleglobal.yale.edu/node/66586.

[15] International Energy Agency (IEA), *Coal Information 2017 Overview*, August 2017, https://www.iea.org/publications/freepublications/publication/CoalInformation2017Overview.pdf.

[16] Arijit Sengupta and Saurabh Kumar, "Roadmap for India in Energy Efficiency", in *The Atlantic Energy Efficiency Policy Briefs*, 2011, http://environmentportal.in/files/file/India_Sengupta.pdf.

[17] Saritha S. Vishwanathan, Amit Garg and Vineet Tiwari, *Coal Transitions in India: Assessing India's Energy Transition Options*, IDDRI and Climate Strategy, 2018, p. 15, https://coaltransitions.files.wordpress.com/2018/09/coaltransitions_finalreport_india_20181.pdf.

[18] Ibid., p. 12.

[19] Johannes Friedrich, Mengpin Ge and Andrew Pickens, "This Interactive Chart Explains World's Top 10 Emitters, and How They've Changed", in *World Resources Institute Blog*, 11 April 2017, https://www.wri.org/node/47041.

[20] 1.7 tCO_2 per capita, well below the global per capita average of 4.3 tCO_2. See IEA, *Global Energy and CO_2 Status Report 2017*, March 2018, p. 4, https://www.iea.org/geco/emissions.

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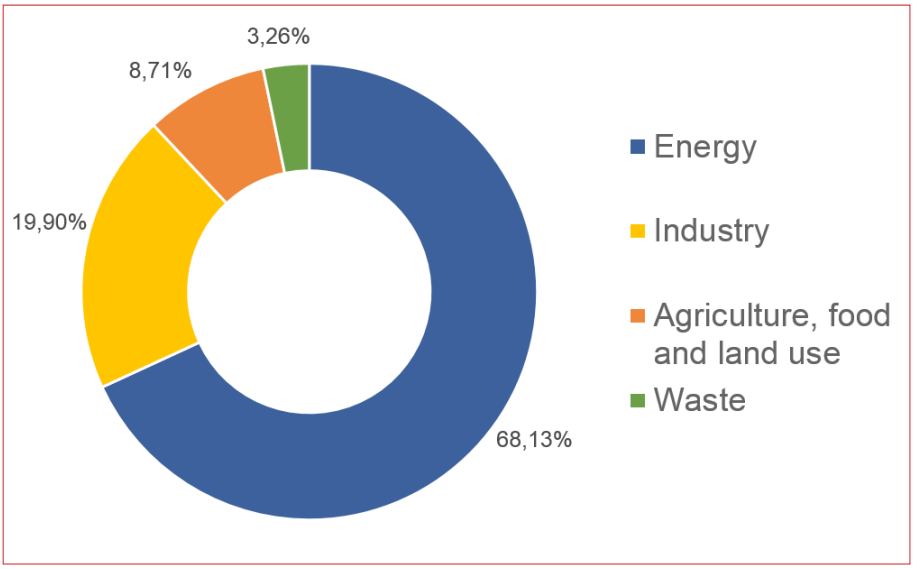
Figure 1 | India's emissions by sector



Source: Subrata Chakrabarty, "By the Numbers: New Emissions Data Quantify India's Climate Challenge", in *World Resources Institute Blog*, 8 August 2018, https://www.wri.org/node/64010.

Toxic air is responsible for the loss of around 3 per cent of the country's GDP.[21] The World Health Organization (WHO) has included 14 Indian cities in the list of the 20 most polluted cities in the world, with Kanpur topping it with impressive $PM_{2.5}$ levels[22] (at 173, around 17 times higher than the indicated safe limit), followed closely by New Delhi, with 143.[23] Coal power plants contribute significantly to the accumulation of sulphur dioxide and $PM_{2.5}$ in the air and are frequently temporarily shut down to alleviate the severity of air pollution, as happened to the Badarpur plant supplying electricity to Delhi.

"More than half of India of 2030 is yet to be built", reads India's Intended Nationally Determined Contribution (INDC) document,[24] the text indicating national targets of carbon dioxide emissions that each state party to the 2015 Paris Accord on climate change is expected to produce. With 90 million new urban residences in the last decade alone,[25] urbanization will continue to be one of the dominant trends.

[21] Callum Brodie, "India Will Sell Only Electric Cars Within the Next 13 Years", in *World Economic Forum Articles*, 23 May 2017, https://www.weforum.org/agenda/2017/05/india-electric-car-sales-only-2030.

[22] Fine particulate matter ($PM_{2.5}$) is an air pollutant.

[23] "India Cities Dominate World Air Pollution List", in *BBC News*, 2 May 2018, https://www.bbc.com/news/world-asia-india-43972155.

[24] Indian Ministry of Environment, *India's Intended Nationally Determined Contribution: Working Towards Climate Justice*, 2015, p. 6, https://www4.unfccc.int/sites/NDCStaging/Pages/Party.aspx?party=IND.

[25] Kartikeya Singh, "India: Energy & Geopolitics", in *cogitASIA Blog*, 2017, https://www.cogitasia.com/?p=12000.

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Six hundred and nine million people are expected to live in urban areas by 2030, with a consequent increase in the use of urban-related amenities and electricity demand, which is forecast to rise from 1,102 terawatt/hour (TWh) in 2016 to 2,499 in 2030[26] and 3,606 in 2040.[27]

In 2050, power demand will be mainly driven by air conditioning (35 per cent), followed by industry (24 per cent) and lighting and appliances (23 per cent).[28] Cooling raises a worrying alarm: currently, a mere 5 per cent of households are equipped with air conditioners, but due to income increases, 1.1 billion air conditioning and fan appliances are expected by 2050 – a colossal jump of 4,206 per cent.[29]

India faces important power shortages and access gaps. The good news is that it is on track to reach the target of universal access in the mid-2020s, with half a billion people having gained access since 2000;[30] the bad news is that around 168 million people still have no access to power.[31] India presents different levels of electrification throughout its territory, particularly wide when urban and rural areas are compared, as distributing electricity to rural areas involves dealing with a fragmented and low-density demand as well as with high costs.[32] From Delhi to Bihar (the areas with the highest and lowest levels of electricity consumption per capita, respectively),[33] residential electricity consumption per capita varies also among those who have access, providing another layer of complexity to the country's energy framework.

The country is slowly improving in ensuring clean cooking, despite there being around 800 million people (60 per cent of households)[34] still reliant on biomasses and many still spending around one hour collecting fuel per day,[35] a task falling disproportionately on the female members of households.[36] The International

[26] Indian Ministry of Environment, *India's Intended Nationally Determined Contribution*, cit., p. 62.

[27] IEA, *World Energy Outlook 2017*, November 2017, p. 238.

[28] Fatih Birol, *The Global Energy Outlook and the Increasing Role of India*, Darbari Seth Memorial Lecture, 29 August 2018, p. 12, http://www.iea.org/media/presentations/DarbariSeth2018MemorialLecture.pdf.

[29] "Is This Why the Govt Wants to Set Default AC Temperature at 24°C?", in *Times of India*, 26 June 2018, http://toi.in/EliDRb58/a24gk.

[30] From 2011 growing at a pace of 40 million each year.

[31] Nearly all of the new users gained access through new connections to the grid, with coal fuelling about 75 per cent of new electricity and renewables only 20 per cent. Data concerning population without access to electricity are available in the IEA website: *Sustainable Development Goal 7: Access to Electricity*, https://www.iea.org/sdg/electricity.

[32] Jaideep Mukherji, "24x7 Power is About 'Access', Not 'Electrification'", in *Smart Power India blog*, 19 September 2017, http://www.smartpowerindia.org/?p=972.

[33] IEA, *World Energy Outlook 2015*, November 2015, p. 22.

[34] IEA, *Energy Access Database*, https://www.iea.org/energyaccess/database.

[35] IEA, *Energy Access Outlook 2017*, October 2017, p. 27, https://www.iea.org/access2017.

[36] Indian Ministry of Finance Economic Division, "Sustainable Development, Energy and Climate Change" (Ch. 5), in *Economic Survey 2017-18. Vol. II*, January 2018, p. 70, http://mofapp.nic.in:8080/economicsurvey.

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Energy Agency (IEA) estimates that by 2030 around 300 million Indians will get access to clean cooking, but still one in three will remain without.[37] The 2011 census provides a clear picture of differences among urban and rural areas in this field, reporting that firewood, crop residue, cow dung, cake, coal, lignite and charcoal are used in 26.1 per cent of urban households compared to the much greater percentage of 86.5 in rural ones – the second source being liquefied petroleum gas (LPG) at 65 per cent in urban and 11.47 in rural areas.[38] This poses a problem considering that household pollution is responsible for around 1 million deaths per year as well as for several respiratory and cardiovascular diseases.[39] Even the agro-food chain suffers from low energy input, hindering efficient production, storage and handling, all of which produces a loss of 14 billion dollars' worth of food each year.[40]

2. Improving the Indian energy sector's sustainability: challenges and policies

The main challenges to the sustainability of India's energy sector concern the high use of coal in the energy mix and the low level of efficiency in appliances and buildings, as well as in crucial sectors such as agriculture and industry. Furthermore, the power sector suffers from weak distribution and transmission systems. Tariff structures are complex, non-uniform across the states and do not adequately reflect the costs incurred in power supply.[41] Around 22 per cent of electricity is lost when transmitted[42] and distribution companies are often in debt, with a limited ability to expand services. India's energy poverty, environmental vulnerability and exposure to energy price shocks subsequent to these weaknesses have resulted in a long list of public initiatives.

Progress is evident in the National Electricity Plan, which states that no additional coal capacity is foreseen until 2022,[43] as the government expects to cover the demand growth with additional capacity of gas, hydro, nuclear and renewables by 2027. The plan expects the country to reach 275 gigawatt (GW) installed capacity of

[37] IEA, *Energy Access Outlook 2017*, cit., p. 13.

[38] World Health Organization (WHO), *Opportunities for Transition to Clean Household Energy: Application of the Household Energy Assessment Rapid Tool (HEART) in India*, August 2018, p. 8, http://www.who.int/iris/handle/10665/274280.

[39] Ibid., p. 3.

[40] IEA, *Energy Access Outlook 2017*, cit., p. 32; and S.N. Jha et al., *Report on Assessment of Quantitative Harvest & Post-Harvest Losses of Major Crops & Commodities in India*, Ludhiana, ICAR-CIPHET, May 2016, http://mofpi.nic.in/sites/default/files/ciphet_mofpi_report1.pdf.

[41] Federation of Indian Chambers of Commerce and Industry (FICCI), *Government to Inject Competition in the Distribution Sector: Power Secretary*, 13 September 2018, http://ficci.in/pressrelease-page.asp?nid=3217.

[42] Transmission losses have however decreased, moving from 27.18 per cent in 2007–8 to 21.30 per cent in 2016–7. See Indian Central Statistics Office, *Energy Statistics 2018*, March 2018, p. 52, http://mospi.nic.in/sites/default/files/publication_reports/Energy_Statistics_2018.pdf.

[43] Except for the coal power plants under construction.

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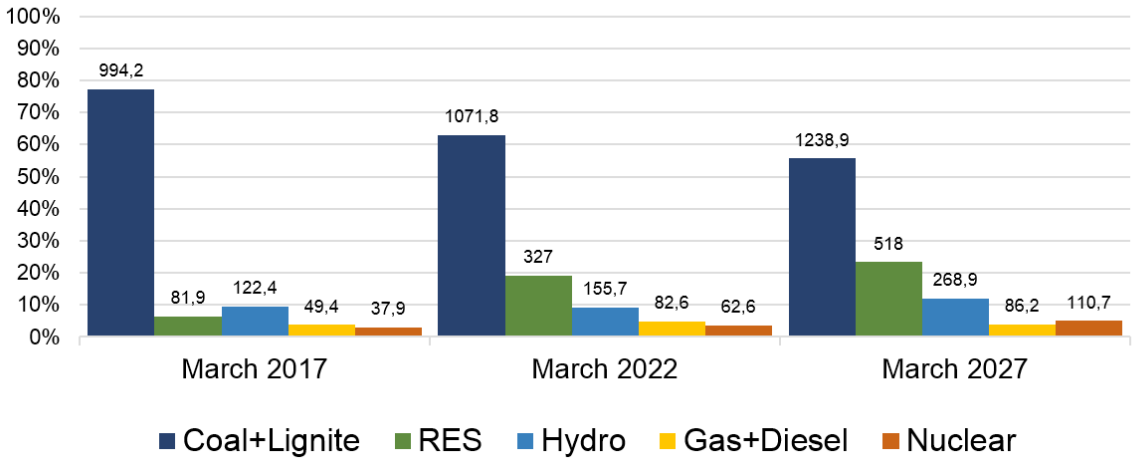
solar and wind, 63,3 GW of hydro and 16,88 GW of nuclear – ultimately achieving the ambitious target of 57.4 per cent installed capacity from non-fossil fuels by 2027. The average CO_2 emission factor – in 2015–16 at 0.721 kg/kWh (renewables included) – is expected to decrease to 0.604 kg/kWh by 2021–2 and to 0.524 kg/kWh by 2026–7.[44]

Figure 2 | Projected electrical energy generation mix in India (in TWh)



Source: Indian Central Electricity Authority, *Report of the Committee on Optimal Energy Mix in Power Generation on Medium and Long-term Basis*, January 2018, p. 13, https://powermin.nic.in/sites/default/files/webform/notices/Report_of_the_Committee_on_optimal_energy_mix_in_power_generation_on_medium_and long_term_basis.pdf.

Similarly, the emission intensity from grid-connected power is expected to decline by 40.51 per cent by 2021–2 and 53.65 per cent by 2026–7 compared to 2005 levels.[45] The government has promoted important initiatives in the power sector.[46] Among the most recent are the Power for All 24x7, the Saubhagya and the Ujwal DISCOM Assurance Yojana (UDAY) scheme. The first aims to provide power across the country by 2019; the second supports universal household electrification by providing last-mile connectivity and electricity connections to all in rural and urban areas; and the third refers to a programme aimed at providing power distribution companies (DISCOMs) with a permanent solution to a legacy of financial debts.

The targets set by India's INDC are evidence of New Delhi's willingness to undertake a serious process of decarbonisation and low-carbon transition. The government

[44] Indian Central Electricity Authority, *National Electricity Plan. Vol. 1: Generation*, January 2018, p. xli, http://www.cea.nic.in/reports/committee/nep/nep_jan_2018.pdf.

[45] Ibid.

[46] Indian Ministry of Power, *Year End Review 2017*, 22 December 2017, http://pib.nic.in/newsite/PrintRelease.aspx?relid=174727.

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has committed to important "2°C-compatible" climate goals,[47] which the country is expected to reach ahead of time: pledges are consistent with the 2009 Copenhagen goal, despite being generally considered not completely in line with the more ambitious 1.5°C limit considered in Paris.[48] Main targets include: a reduction in the emissions intensity of India's GDP by 33 to 35 per cent by 2030 compared to the 2005 level; the achievement of 40 per cent cumulative electric power installed capacity from non-fossil-fuel-based energy resources by 2030; the creation of an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent through additional forestation by 2030; and investments in development programmes targeting sectors particularly exposed to climate change.[49]

The Make in India initiative to re-orientate the Indian economy away from agriculture and services towards manufacturing has given momentum to the modernization of the Indian energy system towards more efficiency, as manufacturing sectors are more energy intensive than services.[50] Furthermore, energy efficiency is an important response to rapid urbanization, and is included in several other initiatives, such as the Power for All initiative or the Smart Cities mission[51] – a competition among cities to receive federal grants and become sustainable. Reduced demand is expected thanks to the Perform, Achieve and Trade (PAT) scheme for industries,[52] the spread of LED lighting and the promotion of efficient pumps in the agriculture sector. As for clean cooking, the government has set a target of providing LPG connections to 80 million households by 2020 through the Pradhan Mantri Ujjwala Yojana scheme.

3. The structure of Indian energy and climate policy

India is a federal country comprising 29 states and seven union territories, with sovereign executive and legislative powers distributed between the Union and the states. The division of powers between the Union government and the states is based on three 'lists': (i) the Union List, defining 97 sectors under the complete responsibility of the central government; (ii) the State List, including 67 sectors

[47] This refers to the global action plan set up in the Paris Agreement aiming to limit global warming to well below 2°C.

[48] Climate Action Tracker: *India*, updated 3 December 2018, https://climateactiontracker.org/countries/india.

[49] Indian Ministry of Environment, *India's Intended Nationally Determined Contribution*, cit., p. 29.

[50] IEA, *India Energy Outlook*, November 2015, p. 14, https://www.iea.org/publications/freepublications/publication/IndiaEnergyOutlook_WEO2015.pdf.

[51] Indian Ministry of Urban Development, *Smart Cities Mission Statement and Guidelines*, June 2015, http://smartcities.gov.in/content/innerpage/guidelines.php.

[52] A market-based energy efficiency trading mechanism targeting the most energy-intensive industrial sectors such as aluminium, cement, chlor-alkali, fertilizers, iron and steel pulp and paper, railways, textiles and thermal power plants. These industries together cover more than half of the total energy consumption in the country. Charles K. Ebinger, "India's Energy and Climate Policy. Can India Meet the Challenge of Industrialization and Climate Change?", in *Brookings Policy Briefs*, No. 16-01 (June 2016), p. 24, http://brook.gs/2br0k8m.

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under the exclusive jurisdiction of state legislatures; and (iii) the Concurrent List defining 44 domains where the central government and state governments exercise concurrent jurisdiction.[53] Although such a governance structure puts a premium on constructive relations between the federal government and the states (on the basis of the cooperative federalism concept[54]), this also risks duplications and inconsistent decision-making.[55]

Energy policy – specifically coal, oil, gas and nuclear – is developed and implemented at the federal government level, with the sole exception of the electricity sector, which is a concurrent prerogative between Delhi and each single state. The newly established National Institution for Transforming India (NITI Aayog)[56] ensures coordination between the energy policies of five different ministries: the Ministry of Power, the Ministry of Coal, the Ministry of Petroleum and Natural Gas, the Ministry of Renewable Energy and the Department of Atomic Energy.[57] A plethora of national agencies, companies and organisations complete an extremely complex scheme of public players involved in the energy domain.[58]

The federal government also plays a central role in defining climate policy.[59] Although India lacks a clear-cut legislative framework on the subject, strategic priorities are set by the Prime Minister's Council on Climate Change – coordinated by a special envoy working within the Prime Minister's Office, which is responsible for the adoption of the National Action Plan on Climate Change (NAPCC).[60] The

[53] The Union List includes banking, communications, defence, foreign affairs, interstate commerce, and transportation. The State List includes agriculture, local government, police, public health, public order, and trade and commerce within the state. The Concurrent List includes criminal law and procedure, economic and social planning, electricity, factories, marriage and divorce, price control, social security and social insurance, and trade unions.

[54] The concept of cooperative federalism dates back to the 1960s, but it has been revived by the government run by Prime Minister Narendra Modi in order to improve the action of the different institutional actors. It involves increased devolution in certain areas and wider regional responsibilities. See IEA, *India Energy Outlook*, cit., p. 42.

[55] Ibid., p. 26.

[56] In June 2017 NITI Aayog released a draft national energy policy document, to be adopted by the Union Government in 2018. See NITI Aayog, *Draft National Energy Policy*, cit.

[57] In an effort of institutional rationalization, the federal government has appointed a single Minister for Power, Coal, New and Renewable Energy, although the individual ministries themselves continue to exist as separate entities.

[58] There are at least 60 bodies reporting directly at the ministerial level, including companies such as Coal India Ltd in the coal sector or Oil and Natural Gas Corporation and Oil India Ltd in the oil and gas sector; regulatory authorities such as the Central Electricity Regulatory Commission and the Petroleum and Natural Gas Regulatory Board; financial institutions such as the Oil Industry Development Board and the Power Finance corporation.

[59] Due to the international scope of the problem, as well as the constitutional competency of the Union Government for international agreements and treaties, the main responsibility for climate change agreements lies with the Union Government. See Kirsten Jörgensen, Arabinda Mishra and Gopal K. Sarangi, "Multi-level Climate Governance in India: The Role of the States in Climate Action Planning and Renewable Energies", in *Journal of Integrative Environmental Sciences*, Vol. 12, No. 4 (2015), p. 267-283, https://doi.org/10.1080/1943815X.2015.1093507.

[60] The Council is responsible for the drafting of the NAPCC. See Indian Prime Minister's Council on Climate Change, *National Action Plan on Climate Change*, 2008, http://www.moef.nic.in/ccd-napcc.

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Ministry for Environment, Forest and Climate Change supports the Council in the planning, co-ordination and oversight of the implementation of climate-related policies and programmes.

Notwithstanding the strong legislative and executive powers held at the Union level and the strategic guidance role of NITI Aayog,[61] India's governance model provides the subnational state level with a number of legislative and enforcement powers in the energy domain. Since the 1980s, a few states have gradually gained relevance as players in the country's energy policy. Over the past decades, governments and state agencies began to push for the strengthening and activation of specific states' capacities, but it is only with the Energy Conservation Act of 2001 and the Electricity Act of 2003 that the division of tasks between the national level and the state governments was clarified, and a supportive framework for state action designed. Similarly, the involvement of state governments in the implementation of the country's climate policy is growing: each state and Union territory has developed its State Action Plans on Climate Change (SAPCC), which attempt to integrate climate change issues into the policy-planning process and incorporate local needs and priorities into India's INDC, adopted and presented at the Conference of Parties to the UN Framework Convention on Climate Change that took place in Paris (COP21).[62]

In the electricity sector, each state has its own power ministry with the related departments and companies (i.e. the state-run DISCOMs) operating along with bodies dependent on the Union government. In this context, State Electricity Regulatory Commissions (SERCs) have jurisdiction for the planning and promotion of electricity generation, for establishing tariffs for public-owned utilities involved in the power sector in a single state, and for dealing with investors to set up power purchase agreements.[63]

In the case of energy efficiency the situation is slightly different. Indeed, the establishment of the State Designated Agencies (SDAs) – which are counterparts to the central Bureau of Energy Efficiency (BEE) to enforce at the state level the provisions of the Energy Conservation Act – has positively contributed to creating awareness of the efficient use of energy among consumers at the state and local level.

[61] Established with the aim of achieving Sustainable Development Goals and to enhance cooperative federalism by fostering the involvement of state governments of India in the economic policy-making.

[62] Indian Ministry of Environment, *India's Intended Nationally Determined Contribution*, cit., p. 25-26.

[63] Charles K. Ebinger, "India's Energy and Climate Policy", cit., p. 20.

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4. An obstacle to Indian ambitions?

The multi-layered governance has, on balance, a mixed record of success. In some cases the "devolution" from central government to states works, while in others it negatively affects the quality of results.

On energy targets, the pursuit of the ambition to reach 175 GW by 2022 from renewable energy has been given a boost by the renewable purchase obligation (RPO), a measure which obliges states to reach a certain amount of generation from renewable sources. Energy savings and efficiency have similarly progressed, with the PAT scheme having attained results on labelling and minimum performance standards. The rapid transformation of efficient lighting in several parts of India is another success story: the Energy Efficiency Services Limited is achieving significant progresses in replacing wasteful lamps with modern, efficient and longer-lasting LED lamps.[64]

Other than the successful village "electrification" initiative promoted by Modi, another important step achieved recently concerns targets over clean-cooking access: around 50 million free LPG stoves and initial refills have been provided to poor households via the Pradhan Mantri Ujjwala Yojana scheme since 2015.[65]

There are furthermore some positive models of electricity transformation throughout India. One is represented by the southern state of Karnataka, which has been relying on imported coal for its electricity needs in the past decade and has recently became the first state in India for renewable energy capacity, with 12.3 GW of total installed capacity as of March 2018, with 5 GW added in 2017–18 alone.[66] Moreover, it has developed a policy for battery storage and electric vehicles, and has launched an initiative to provide free cooking gas connections to the poor.[67]

Despite these encouraging results one may however observe a number of obstacles related to India's multi-layered governance system that still prevent the full implementation of policies.

[64] See the Energy Efficiency Services Limited (EESL) website: *About UJALA*, http://eeslindia.org/content/raj/eesl/en/Programmes/UJALA/About-UJALA.html; and the case study: EESL, *India's UJALA Story. Energy Efficient Prosperity*, 2017, http://indiaenergy.gov.in/?p=1261.

[65] Laura Cozzi et al., "Population Without Access to Electricity Falls Below 1 Billion", in *IEA Commentaries*, 30 October 2018, https://www.iea.org/newsroom/news/2018/october/population-without-access-to-electricity-falls-below-1-billion.html.

[66] Tim Buckley and Kashish Shah, *Karnataka's Electricity Sector in Transformation. India's Leading Renewable Energy State*, Cleveland, Institute for Energy Economics and Financial Analysis (IEEFA), July 2018, p. 3, http://ieefa.org/?p=24959.

[67] Kartikeya Singh, "Business Reforms in 2018: Leaders and Laggards", in *LiveMint*, 7 June 2018, https://www.livemint.com/Opinion/fFB9WTbA8khgmvxfkC5eBN/Business-reforms-in-2018-leaders-and-laggards.html.

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First, states frequently display problems with shaping the mechanisms and the municipal procedures to implement central policies. State-level implementation of national laws is not always straightforward, as attested to by the case of the Energy Conservation Building Code (ECBC) launched in 2007 and updated ten years later, which is expected to achieve a 50 per cent reduction in energy use by 2030.[68] Enforcement of the Code is largely insufficient, due to a lack of local institutions' capacity, coordination among layers of national, regional and local institutions and a weak focus on energy efficiency across most Indian states.[69]

Second, blurred processes for the implementation of central policies down to state level do prevent their success. This is surely the case of climate policy, a field where several states are moving slowly and have not foreseen long-term climate change adaptation plans. Budgetary allocation frequently does not meet climate vulnerability and challenges faced by specific sectors largely vary among states, irrespective of concrete needs.[70]

Third, there are some problems with funding mechanisms. As an example, under the Saubhagya programme recently launched by Prime Minister Modi, project proposals are prepared by the state DISCOMs and power departments and presented to the federal government, which evaluates and sanctions their feasibility without upfront allocation of funds to state organizations and companies. In a framework where differences in available funding are recorded across states, many of which are struggling to fund the many initiatives, a clearer allocation of both state and federal funds received from fiscal redistribution over energy and climate policies might result in faster and more successful implementation of policies.

Conclusion

India's efforts to respond to its many energy and climate challenges are tangible, resulting in a broad range of targets, tools and initiatives that are showing encouraging results. Energy access, one of the country's main challenges, is constantly improving. Undoubtedly, India has the potential to expand its renewable energy ambitions along with the manufacturing industry, and hopefully the country will reach its ambitious 2027 goals and succeed in transforming the current energy sector while ensuring sustainable economic growth and access to clean and affordable energy for its citizens.

[68] Indian Ministry of Power, *Shri Piyush Goyal Launches Energy Conservation Building Code 2017*, 19 June 2017, http://pib.nic.in/newsite/PrintRelease.aspx?relid=165748.

[69] Alliance for an Energy Efficient Economy (AEEE), *Regional Workshops on Energy Conservation Building Code Implementation in States. Workshop Proceedings*, June 2017, p. 1, http://www.aeee.in/?p=10778.

[70] Vineet Kumar, *Coping with Climate Change: An Analysis of India's State Action Plans on Climate Change*, New Delhi, Centre for Science and Environment, 2018, https://www.cseindia.org/volume-ii-coping-with-climate-change-8489.

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Some initiatives might however progress faster to help achieve these goals, and several reasons behind their timid results can be found in the lack of proper coordination mechanisms among the actors involved and the limited financial tools available for the many initiatives.

Policy alignment between the centre and the states does not always result in fast and smooth implementation, as energy and climate change provisions produce inconsistencies. More integrated planning should thus be established, with mid-term targets at state level to provide a better sense of direction of existing policies. It seems moreover equally crucial to support and build on the responsibility of single states' policy-makers and their capacity for designing and enforcing policies. Indeed, obstacles at the state level include lack of leadership and political will, poor local governance schemes and resource scarcity.

The latter, in particular, is a key factor frustrating effective decentralization towards states, due to the financial bottlenecks generated by the dependency on money transfers from New Delhi, as in the case of the funding schemes foreseen by the Saubhagya initiative. A better allocation of federal funds considering energy and climate as a specific chapter would better support the related initiatives in single states.

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