

# The Politics of Energy and What it Means for the Climate

by Brian Min

On September 4, 1882, Thomas Edison flipped a switch at his Pearl Street Station and electric lights flickered on across lower Manhattan. And so began the era of electric power transmission, setting off the relentless electrification of the modern world. Yet today, 1.4 billion people continue to lack electricity, relying instead on kerosene, wood, and agricultural residues to meet their energy needs. Most of these reside in the developing world where the thirst for modern energy sources remains unquenched. How will these energy needs be met? And what impact will it take on the environment? The story of how governments respond to the energy needs of their citizens must play a larger role in the dialogue over the causes and challenges of climate change.

More human-made greenhouse gas emissions come from electricity production than from any other single activity. Power plants, most of which burn fossil fuels like coal and natural gas, account for a quarter of worldwide greenhouse gas emissions. That is nearly double the contribution that comes from automobiles and the transportation sector. The importance of the electricity sector is magnified by the fact that most of the world's electricity suppliers are owned and managed by governments. Political institutions structure the rules for which supply and demand for energy are regulated. At an everyday level, governments decide how much power to provide, at what cost, and with what restrictions. The way these choices are negotiated is likely to depend on whether governments must rely on popular support to

hold on to office, as in democracies. Simply put, politics determines who gets power, and how much power gets provided shapes the trajectory of climate change.

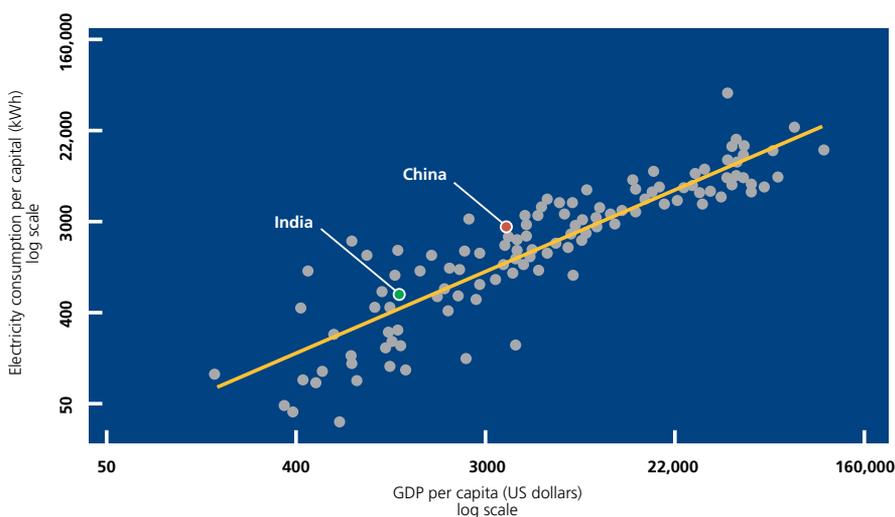
## Electricity and Development

More than simply a modern convenience, access to electricity is a life-altering transformation that improves welfare and enables economic development. Electric light extends a day's productive hours, allowing children to study after the sun has set and enhancing safety at night. Refrigeration allows for the preservation of food and medicines. Powered water pumps reduce the effort needed to collect water. Electric cooking stoves diminish the time needed to gather wood and other biomass fuels. Electricity can improve agricultural productivity by energizing irrigation and drainage systems and encourage industrial development by powering tools and machinery. Electricity is desired everywhere and yet its provision is not universal: only some enjoy its myriad benefits while others do not. Especially in the developing world, access to electricity is a sharp line separating those on the road to modernity from those likely to be mired in persistent poverty.

The accompanying graph shows the relationship between income level and electricity consumption for countries around the world in 2009. The figure depicts a strong and positive relationship: people in richer countries use more electricity per person than those in poorer countries. At first glance, this appears intuitive. Yet, there

## Electricity Consumption and Income Around the World, 2009

Source: World Bank



By comparing the distribution of nighttime lights to the distribution of human populations, it is possible to generate unusually precise estimates of the proportion of a country's population living in lit areas. This approach does not need to rely on government self-reports that might be biased by political factors.



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are at least two striking features worth worrying about. First, there is no evidence that energy demands are satiated with increasing wealth. This is quite different from many other indicators of human welfare that tend to approach some natural limit. Life expectancy, infant mortality rates, literacy rates, calorie consumption, all improve rapidly as societies move up the development ladder, yet progress eventually slows down or reaches a bound set by human biology or by achievement of some goal. Energy consumption appears to exhibit no such willingness to slow down at higher levels of development.

Second, there is no indication that energy efficiency improves with wealth. Richer

countries do not seem to put more effort at becoming more energy efficient. In other words, as countries become richer, it does not appear that wealth enables the production of increased economic output with lower levels of energy inputs. Rather, increases in wealth result in increased electricity use across all levels of income.

Combined, these two features reflect an agonizingly inconvenient fact about development. If current trends hold, poverty alleviation around the world will occur only with a parallel increase in the consumption of electricity. As poverty is reduced, the world's energy use will grow. Because there is no obvious reason to believe that increased wealth will be accompanied

by a slowing down of consumption or by an increase in efficiency, the impacts on the climate are likely to be profound. The environmental strain of meeting this new demand is difficult to fathom. As a result, how to meet the surging energy needs of the poor is likely to represent one of the most daunting challenges facing governments across the developing world.

#### **Electricity and the State**

Throughout the twentieth century, the provision of electricity has been one of the most expansive and expensive undertakings facing societies around the world. No country has ever completed rural electrification without the intensive financial support of its government. At

the founding of the Soviet Union in the 1920s, Vladimir Lenin famously placed electricity at the center of his vision of the future: "Communism is Soviet power plus the electrification of the whole country." The State Commission for Electrification of Russia (GOELRO) sought to extend the power grid to the entire country and formed the basis of the first Soviet plan for national economic recovery. Implementation of GOELRO led to a near doubling of the country's total national power output by 1931 and full electrification of the entire Soviet Union in the years that followed.

In the U.S., meanwhile, early electric power distribution was dominated by private utilities that focused their efforts in urban centers. Extending the power grid from cities to rural areas requires high fixed cost investments in infrastructure including new power plants, long haul transmission lines, substations, and shorter distribution lines to the end user. Rural areas with low customer densities were unattractive markets to profit-minded firms. By the Great Depression, only one in ten rural Americans had access to electricity compared to 90% of city dwellers. With the collapse of the economy, even private power utilities in the most lucrative urban markets were struggling to stay solvent. Yet as critical components of his New Deal, Franklin Roosevelt established the Tennessee Valley Authority (TVA) in 1933 and Rural Electrification Administration (REA) in 1935. At the end of 1934, only 12.1% of all U.S.

farms had electricity, while only 3% were electrified in Tennessee and less than 1% in Mississippi. By 1943, the TVA and REA had brought electricity to four out of ten American farms. Within one more decade, nine out of ten were connected. Former U.S. Secretary of Agriculture Bob Bergland recalled, "The day the lights finally came on at our farm, I remember my mother cried."

Outside of the industrialized world, electrification has been pursued with uneven ambition and success. In China, purposeful government policies have led to the claimed electrification of 700 million people's homes over the last two decades—an achievement of unprecedented scale and scope. Overall, total electricity consumption in rural China increased tenfold between 1978 and 2000. The number of villages without electricity decreased from 55,000 in 1993 to 9,300 in 2002. According to official estimates, over 98% of Chinese homes have an electrical connection today.

Meanwhile just west of China in the world's most populous democracy, India has struggled mightily to electrify its rural lands. More people in India lack electricity than anywhere else in the world, accounting for a third of the world total. Nearly half a billion Indians living in over 100,000 villages still had no electricity as of 2005. That year, the government launched an ambitious initiative to electrify every unconnected village within the following five years. Now in early 2012, the program

continues to struggle with implementation delays. Moreover, many of the thousands of newly connected villagers have discovered that simply being connected to the grid is of limited benefit when the power is not working. India's massive power deficit results in frequent and relentless blackouts across huge swaths of the country.

Juxtaposing the performance of the power sectors in the world's largest autocracy and democracy raises a challenging paradox for political theorists. For theories that expect democracies to provide more public services and to distribute them more efficiently and equitably, the track records of the world's most populous democracy and autocracy represent an exceptional anomaly, indicate a limitation of our theories, or suggest that the data underlying this paradox are unreliable.

### Energy and Democracy

Recent research suggests that despite the strong growth in electricity use in many non-democratic countries, democracies are more likely to prioritize the needs of the residential and rural sectors over the needs of industry.

David Brown and Ahmed Mobarak analyze sectoral data on electricity consumption for a large number of countries and find that democracies direct more electricity to the residential sector than to industry, especially in poorer countries. This suggests that sectors with less financial clout but a stronger voice in elections benefit under democracy. One limitation of this claim is that it must rely on self-reported government data and excludes several countries for which reliable data do not exist. An alternative perspective on energy use comes from looking at satellite imagery of the earth at night.

By comparing the distribution of nighttime lights to the distribution of human populations, it is possible to generate estimates of the proportion of a country's population living in lit areas. Since satellite imagery can detect low levels of light output from areas as small as a couple square kilometers, it can be used to generate unusually precise estimates of electricity provision down to the local

*Risky and chaotic electrical wiring in Old Delhi, India. The unsatisfying condition of wiring causes power problems in Delhi.*



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level. Moreover, the approach does not need to rely on government self-reports that might be biased by political factors, like the temptation for some agencies to manipulate their electricity access figures. Additionally, the satellite-derived estimates rely on sensor data that are measured consistently across all countries without respect to national borders. This is important since many official statistics are heavily dependent on country-specific definitions of what it means for a village or household to be classified as “electrified.”

The satellite-derived estimates of electricity access count some 1.4 billion people living in areas that emit no consistent light output detectable from space. Almost all of these are concentrated in the developing world, mostly in South Asia and Sub-Saharan Africa. Yet while level of development is an important predictor of electricity access, there are also dramatic differences across regime types. Overall, democracies provide electricity to 10% more of their citizens than do non-democracies. This is true even after accounting for the potential confounding effects of wealth, population density, geography, and other factors. The results strongly affirm the power of democratic elections in inducing higher public service delivery, even in contexts where state capacity appear low.

### Democracy and the Climate

Both theory and empirical evidence demonstrate that democracies differ fundamentally from non-democratic regimes in the way they empower citizens via elections. To win the necessary support required to maintain office, democratic leaders must court large numbers of voters, resulting in an institutional incentive to invest more heavily in public goods and services. In the developing world, basic public services like electricity, clean water, and education are priority issues for voters.

The provision of a public service like electricity is an appealing strategy for democratic politicians since they are highly valued by the poor, provide broad benefits to large numbers of voters at once, and serve as a visible accomplishment that politicians can claim credit for in campaigns. Within the local geographic purview of these basic services, positive externalities are high and their benefits are often non-rival and non-excludable. Electrification benefits everyone in a village by providing streetlights at night, bringing in entertainment and news via televisions and radios, and enabling local market opportunities. The spillover benefits that flow from public services are especially valued by the poor who have few outside options to acquire these benefits. Even for those who cannot afford a direct household connection or pricey electrical appliances, there are still many conveniences of living in an electrified village that are absent in places that go pitch black once the sun sets. Moreover, since states are near-monopoly providers of many public services, politicians can act as influential middlemen, mediating the delivery of critical public services to their voters.

What do such patterns mean for the climate? First, it suggests that not all governments are likely to respond in the same way to the growing energy demands of their citizens. Democracies are likely to be more responsive to their citizens, but that implies a potentially double-edged sword in which the broader provision of electrical power is accompanied by growing strains on the environment.

Second, acknowledging the constraints imposed by the domestic political environment can also help in understanding why achieving a global consensus around a course of action to mitigate climate change is so difficult. The unwillingness of the American Congress to consider the

landmark Kyoto Protocol, and Canada’s recent withdrawal from the pact to which it was an original signatory, reflect political calculations as much as they do economic and environmental ones.

Third, understanding the variation in political systems may help identify why some policy proposals regarding climate change are more welcome in some nations and less in others. The key sources of domestic opposition and support might differ substantially across countries with different political systems like India and China. Recognizing this implies that one-size-fits-all solutions are unlikely and more innovative proposals are needed that reflect the political constraints shaped by national leaders in different kinds of political environments.

All of this implies the need to incorporate improved political analysis in the dialogue regarding climate change. As economies grow, so too will the thirst for electricity. The ways in which that thirst is quenched—and the attendant impacts on our climate—will be shaped by political institutions in ways that should not be ignored.

### About the Author

Brian Min is Assistant Professor of Political Science and a CICS International Security and Development Fellow for 2012. He studies the political economy of development with an emphasis on India and Sub-Saharan Africa. His current research uses satellite imagery of nighttime lights and other geo-coded data to show how the distribution of electricity is shaped by electoral politics across the developing world. His dissertation on the subject received APSA’s 2011 Gabriel Almond Award. He has also conducted research on ethnic politics and conflict, with publications appearing in *World Politics* and the *American Sociological Review*.