Experiences and Lessons from China's Success in Achieving Electricity for All

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What people are focusing on when talking about China's Energy?

- World biggest carbon emitter
- World largest energy consumer
- World largest coal consumer/producer/importer
- China would become a climate leader?

- Often ignored: China achieved electricity-for-all for its 1.4 billion population in 2015

Lighting and cooking without electricity

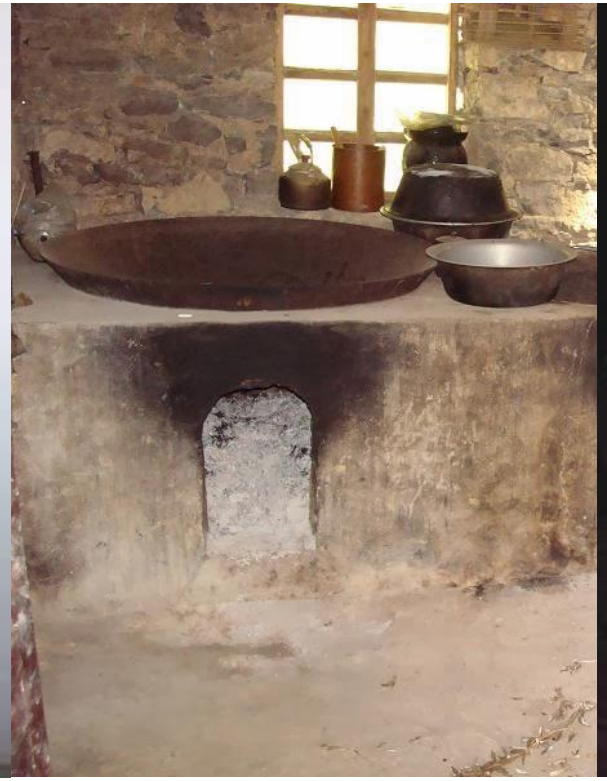
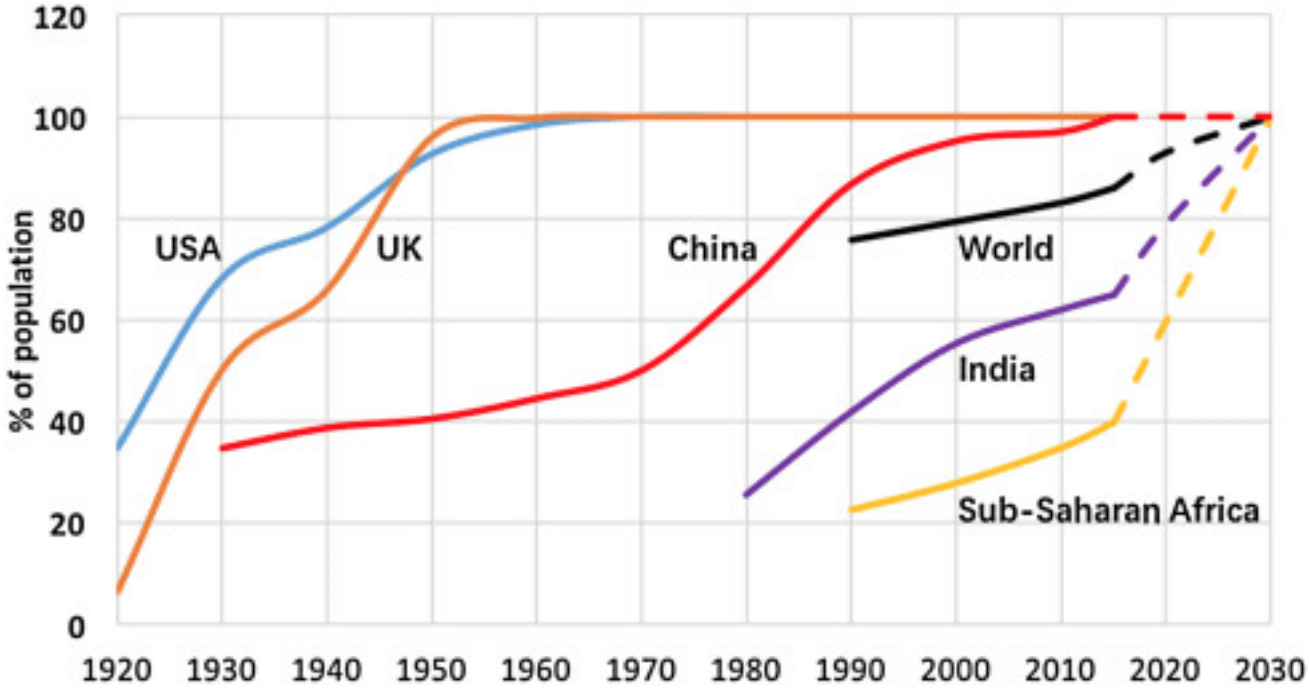


Photo: http://www.nandudu.com/article/16758

What's new?

- Largest population
- Distributed technologies
- Role of government
- Role of private companies
- Holistic strategy



Source: He, Gang, and David G. Victor. 2017. "Experiences and Lessons from China's Success in Providing Electricity for All." Resources, Conservation and Recycling 122: 335–38.

Three key questions

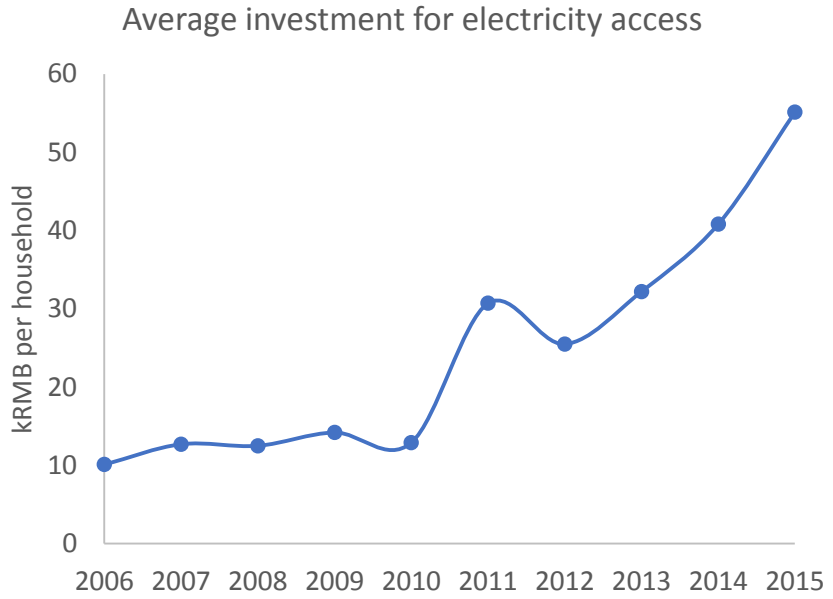
- What China did on electricity for all?
- How China did it?
- What are the implications for global endeavor?

The ROUGH road to full electrification

- Earlier stage: foreign import
- Standard: - 97%
  - 1949-1977: Establishing a Comprehensive Management Network Vertically from the National Level
  - 1978-1997: Central Government Transferring Management of Local Electricity System to Local Government
  - 1998-2002: Promoting Commercial Operation of the Utility Market
- 2003-2015: 97% - 100%
  - 2013-2015: 99.8% - 100% (The last mile, 2.73 million population)

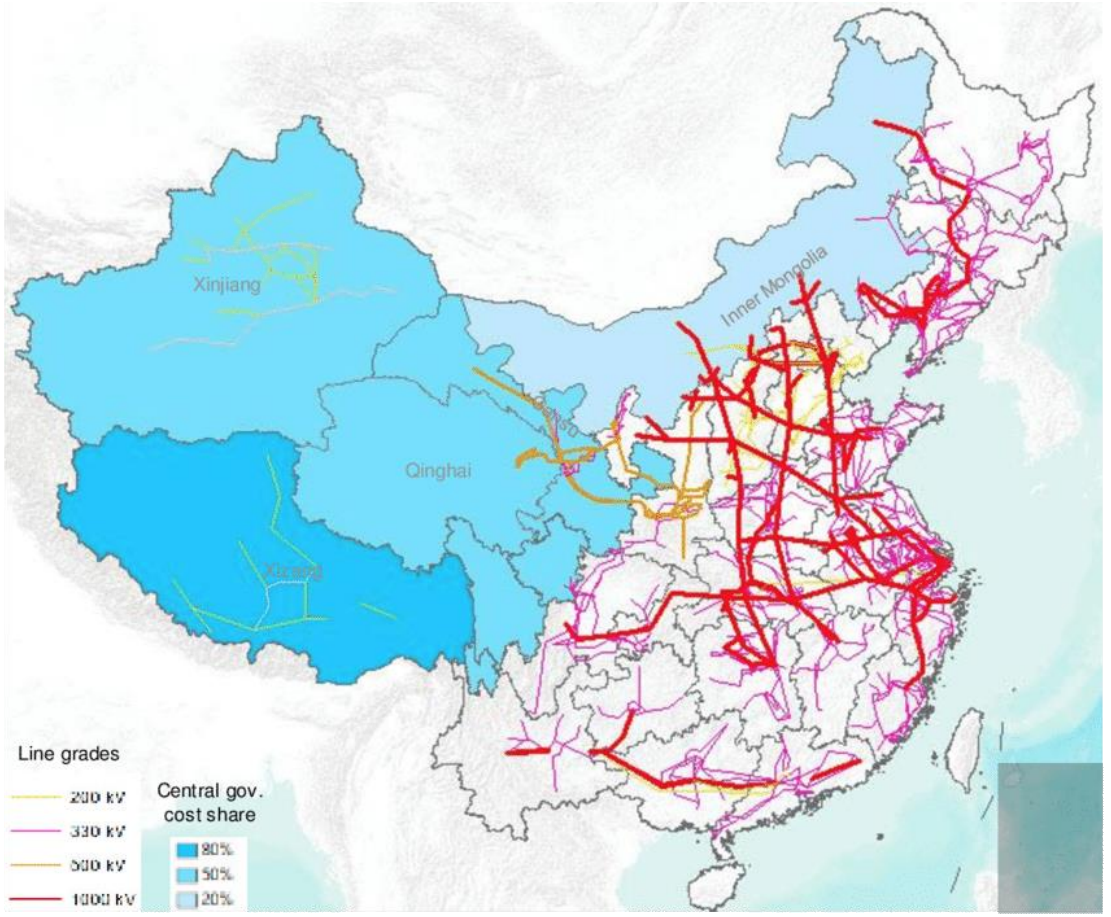
The last mile problem

- “Lao, Shao, Bian, Qiong”(老少边穷)
  - Old revolutionary base area
  - Minority area
  - Remote and border area
  - Poor area
- Xizang, Qinghai, Xinjiang, Gansu, Inner Mongolia, Sichuan, Yunnan
- High elevation, adverse natural condition, natural hazards (landslide, snow, frost, debris flow), no roads for transport



Lessons from the last mile

- Coordination between the central government and local government
- Appropriate technology to fit local condition and demand
- Embed electrification into other social economic development



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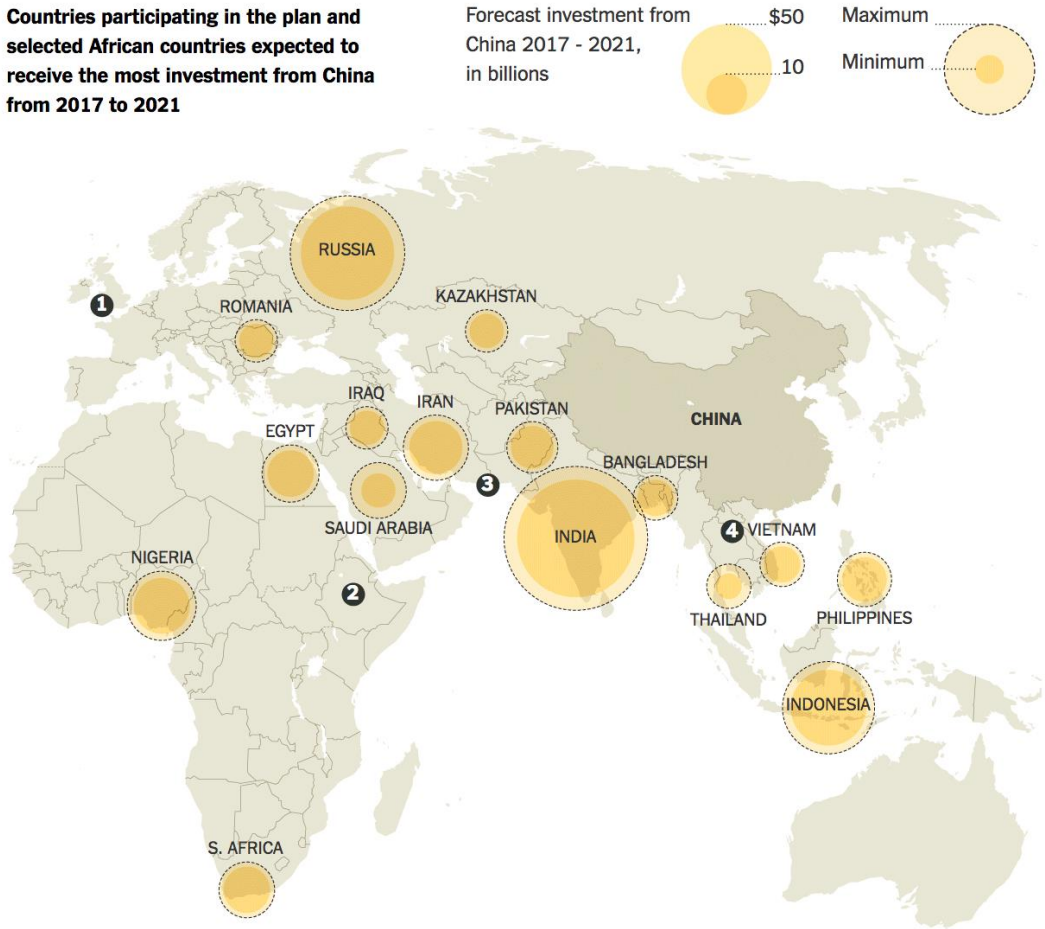
New opportunities for global collaboration

Upgrade and renovation



One Road, One Belt

Source: https://www.nytimes.com/2017/05/13/business/china-railway-one-belt-one-road-1-trillion-plan.htm

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Review

Experiences and lessons from China's success in providing electricity for all

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ABSTRACT

In 2015 China provided access to electricity to its entire population—the first of the large emerging and developing countries to achieve that landmark goal that most advanced industrialized countries met decades earlier. We found some key experiences and lessons to be learned from China's successful program to provide electricity for all. Substantial funding from the central government, delivered by mechanisms sensitive to local provincial needs, were essential to success. Also vital was use of off-grid solar home systems for the most remote users for whom grid connection would be quite costly.

1. Introduction

Energy, electricity in particular, is vital for development. The industrialized countries largely achieved full access to electricity for their populations between the 1950s and the 1970s, but developing countries are understandably still lagging behind (Fig. 1) (GEA, 2012). In total, today 1.2 billion people still lack "electricity access"—meaning the ability to obtain electricity at the household level—and another roughly 1.5 billion people have unreliable service (IEA, 2015). Without fixing the access problem many other elements that are essential to human development—such as providing modern public health services and access to information and narrowing the digital divide—are more daunting to solve (Cameron et al., 2016; World Bank, 2016). For these reasons there have been many initiatives—such as the United Nations' "Sustainable Energy for All (SE4All)", the World Bank's "Lighting Africa" and the Clean Energy Ministerial (CEM) Global Lighting and Energy Access Partnership, aimed at providing ubiquitous electric power service (United Nations, 2012).

These efforts stand to learn a lot from China, which in 2015 became the first large emerging economy to achieve full electricity access. Indeed, China's success in providing electricity to 900 million people between 1949 and today stands out as, numerically, the most impressive achievement in the history of electrification (Bhattacharyya and Ohiare, 2012; Luo and Guo, 2013; Pereira et al., 2011).

While every country is different, success in China offers insights and warning signs for the ambitious global effort to provide reliable electric power service promptly to the entire human population. First, the Chinese experience suggests that the state is indispensable. Full electricity access required central government leadership, funding and support—in China, about 20% to 80% of the total cost depending on the local conditions—but that state intervention was effective only when coordinated with local authorities and providers for implementation. Second, unlike in the advanced industrialized countries whose electrification programs were achieved nearly completely through grid extensions, it is now possible to use off-grid systems effectively. Most of China's electrification happened by extending the grid, but when the country made its last big push to providing electricity to a few million of the most remote populations it relied on off grid systems for about half the effort—notably with small solar photovoltaic (PV) systems. Third, the Chinese experience reinforces what has been known for a long time in other settings—electrification yields empowerment, economic growth, improved public health, and other benefits.

China has addressed rural electrification on two distinct waves of effort. The first, which was synonymous with economic development of the country, ran through the late 1990s and resulted in China enabling electricity service to 97% of the population (Bhattacharyya and Ohiare, 2012). About four-fifths of the rural population gained access through extension of the power grid while the rest were electrified by interconnecting small hydro and small (< 50 MW) coal-fired plants into local and regional grids (Peng and Pan, 2006). The second front of effort, to provide electricity for the last 3%, was much harder and offers perhaps the lessons of greatest relevance to other countries that are struggling to sending electricity to remote, poor populations. In this end game for remote rural electrification China made notably advances by extending and renovating rural grids (Peng and Pan, 2006). But grid extensions could not reach everyone in a cost-effective manner, which is why in 2012, the central government released its *Electricity for all three-year action plan (2013–2015)* that outlined a plan to assure

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Q&A?