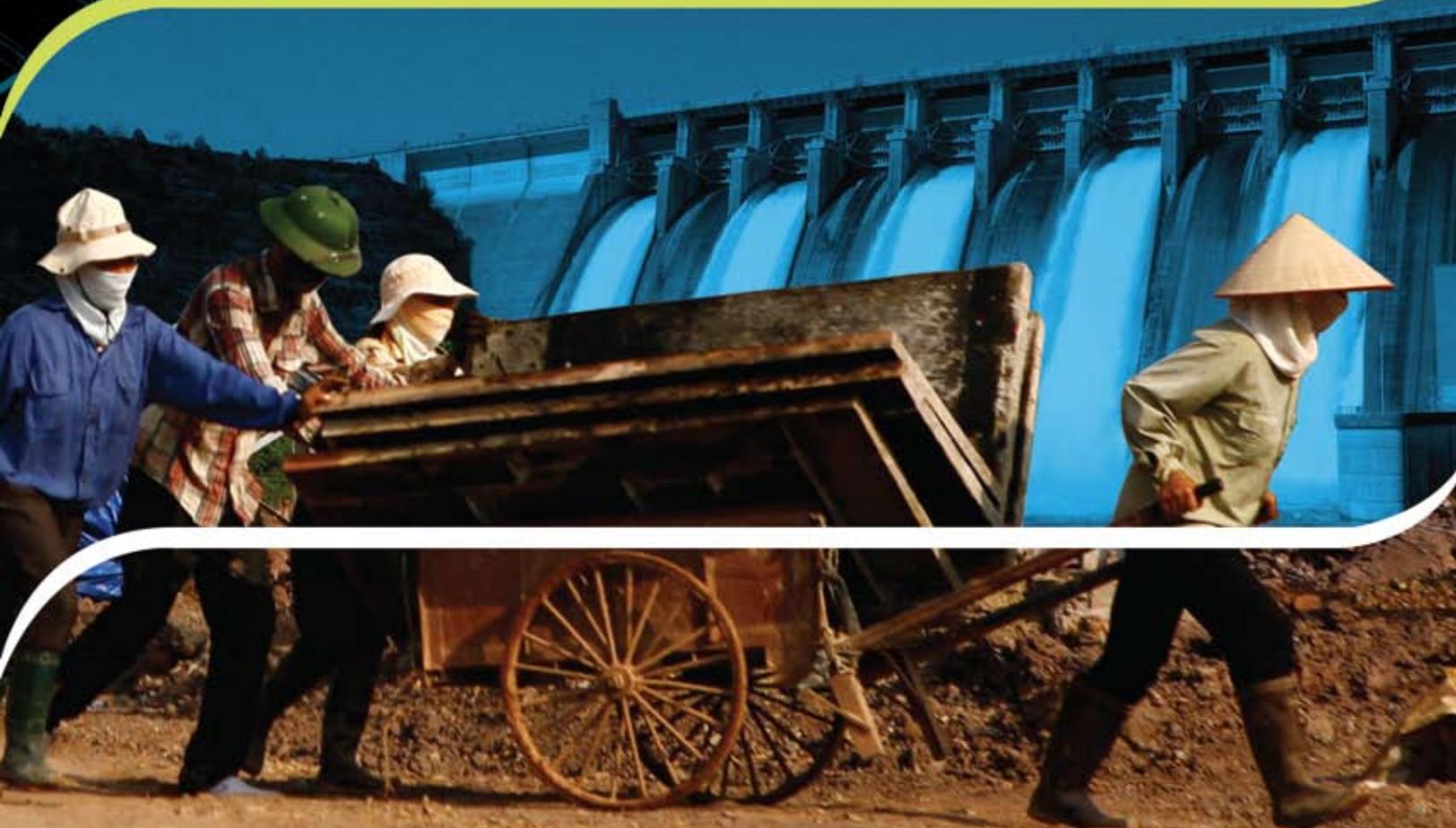


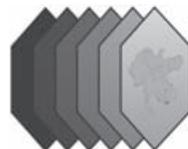
ENERGY FOR ALL

Viet Nam's Success in Increasing Access to Energy through Rural Electrification



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Foreword

Viet Nam provides valuable lessons in effective rural electrification. The national utility, Vietnam Electricity, estimates that in 1975, electrification among poor households in the country was no more than 2.5%.

Yet in a little over 3 decades, Viet Nam was able to connect millions to the national grid. By 2009 the country had electrified 96% of its households, bringing modern power to the Vietnamese people in both urban and rural areas. This high level of electrification is comparable to the People's Republic of China and Thailand, and is remarkable because Viet Nam has a lower average income level than either country.

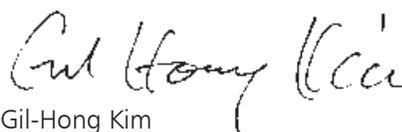
The Southeast Asia Department and the Regional and Sustainable Development Department of the Asian Development Bank (ADB) see the success of Viet Nam as valuable lessons to pass on, especially for other countries of the Greater Mekong Subregion, which seek greater levels of electrification and have similar country profiles to Viet Nam. ADB has been a longtime, trusted development partner of Viet Nam and has also sought greater cooperation among the countries of the Greater Mekong Subregion to improve their economic and social development.

It has been stated that the challenge of energy access is not a matter of technical know-how, but one of making access a priority in both the political and developmental agendas. Viet Nam provides an example of how a government prioritized rural electrification and the substantive steps that were taken to make this priority a reality. A few of the steps Viet Nam took to reach this level of rural electrification are unique to its country conditions, but the majority of them are replicable. Specifically, the establishment of a strong national policy on rural electrification, coupled with an empowered national institution to head the electrification drive allowed Viet Nam to take advantage of its natural hydropower resources and create the infrastructure that allowed this source of electricity to flow, first to its base of farmers and industry, and then into every community.

ADB is committed to supporting energy development for human development, and has emphasized this in its energy policy and through its Energy for All Initiative, both of which seek to maximize access to energy for all, especially the rural poor, by scaling up the best models for increasing energy access. Through the Energy for All partnership, ADB leads a regional response to energy poverty, with a target to provide access to energy to 100 million people by 2015. Part of this response is ensuring that knowledge of successful approaches is spread, and good practices are replicated. We hope this report is useful for the knowledge and experiences it captures.



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Viet Nam's Rural Electrification Programs

Viet Nam's achievement in rural electrification has its roots in the approach and priorities of the country, but further reading will show that some main principles and factors were key in Viet Nam successfully meeting its electrification challenge. It was a substantial challenge. In the devastation of the 1970s post-war period, Viet Nam's infrastructure demanded reconstruction even as its economy needed rehabilitation, and the government needed to address both concerns simultaneously.

Rice production drives Viet Nam's economy, and decided Viet Nam's priorities for electrification. The earliest post-war rural electrification programs connected the rice producing areas of the Red River Delta in the north and the Mekong River Delta in the south to modern power, bringing modern industrial processes to rice production and supporting local industries. The electrification of rice producing areas shored up a cornerstone of Viet Nam's economy. The effects are still felt today, with Viet Nam being the second largest exporter of rice, worldwide.

By the 1980s, Viet Nam's power infrastructure had recovered enough that the country felt confident to expand its network, to tap into the indigenous renewable energy potential in the northern highland areas. The completion of these hydropower plants provided the country with cheap, homegrown power, and led to a necessary next step—the construction of high voltage transmission and distribution lines. These lines ran north to south, connecting the hydropower sources with the industrial base, and meeting the rising power demand of industries.

However, even at this early stage, Viet Nam had a priority system for rural electrification. Irrigation systems were the first priority, small rural industries, second. This ensured that power was not only flowing to major cities, but countrywide, and in support of economic development at the local level. The low prioritization of households, though, created fully electrified districts but full of unelectrified households.

In the 1990s Viet Nam's clear electrification strategy emerged, as new connections expanded outward from provincial capitals into district towns and then gradually into the surrounding communes. The use of electricity among the rural poor rose rapidly.

The establishment of Vietnam Electricity¹ (EVN) in 1995, coupled with the resulting reforms in the power sector led to this surge in rural electrification. Targets and priorities were shifted, away from electrification purely for agricultural areas and businesses, toward electrification for poor households. Electrification levels jumped from a pre-policy reform rate of less than 50% in the late 1980s–early 1990s to 77% by 2001 and 96% by 2009.

Timeline of Rural Electrification Actions

1980s

- **Action.** The government built up the country's generation capacity, and transmission and distribution systems, especially to connect electricity generation with rice producing areas and industrial zones.

¹ Known as Electricity of Vietnam until 2008.

- **Rationale.** Electrification was tied to the objectives of national economic programs focusing on commercial aspects such as production of food, consumer goods, and export commodities. Connecting agricultural areas, industry, and transport took precedence over residential connection in rural areas.
- **Results.** Extensive power sector development resulted, especially among the hydropower rich areas in the north.

1990s

- **Action.** The state utility, EVN, was established in 1995.
Rationale. The government sought to consolidate electricity sector activities under a single entity to rationalize power sector institutions and functions.
- **Results.** Widespread reforms in the power sector resulted, including: (i) commercialization of the operations of sector entities through financial and management restructuring; (ii) introduction of an appropriate legal and regulatory framework for the sector; (iii) encouragement and introduction of private sector capital and direct participation in the sector; and (iv) preparation and implementation of a plan to bring electricity to rural areas.
- **Action.** The power sector policy was updated further in 1997.
- **Rationale.** The government shifted the focus of rural electrification away from agriculture and small industries toward households.
- **Results.** From a pre-reform rate of less than 50%, the electrification rate jumped to 77% by 2001.

2000s

- **Action.** The government increased support for rural electrification, especially for remote communes and villages.
- **Rationale.** After ensuring electricity for agriculture and small industries, the focus of the government shifted to household electrification.
- **Results.** The use of off-grid systems, such as small hydropower, increased in rural areas. Development partners, including the Asian Development Bank (ADB), supported a number of off-grid energy projects. The government set a target for 100% electrification of rural households in mountainous areas by 2025.

International Assistance

The construction of the 500-kilovolt transmission lines that allowed for energy produced by major hydropower plants to flow into the national grid is a major factor to the overall increase in electrification rates, but the government carried out several electrification programs focused on specific regions, such as south Viet Nam, the highland provinces, and the areas of the Khmer people.

These efforts to boost rural electrification were supported by multilateral development institutions, including ADB, the Global Environment Fund, the Swedish International Development Cooperation

Agency, and the World Bank, among others. Funding has also supported the extension and upgrading of the national grid, since increased national energy demand requires new investments in high voltage lines, ranging from 220 kilovolts to 500 kilovolts.

ADB's country partnership strategy for Viet Nam, 2007–2010 emphasized business-led, pro-poor, and sustainable economic growth and recognized the key role that energy plays in development. The country partnership strategy notes that the country's fast growing demand for power is clashing against lagging generation capacity and that addressing this situation is a priority.

ADB aims to help Viet Nam attain an adequate, reliable, and improved quality of electricity to meet the demands of its industries, businesses, and households, with efficient electrical supply systems and financially sustainable utilities. ADB has invested in Viet Nam's power sector to increase capacity in generation and high-voltage transmission and has provided technical support as Viet Nam established competitive power markets and strengthened institutions.

ADB has supported a number of projects that have constructed, expanded, or rehabilitated Viet Nam's transmission and distribution infrastructure, dealing with everything from low-voltage, community lines to the construction, expansion, and upgrading of 220-kilovolt and 500-kilovolt transmission lines as part of the recent Northern Power Transmission Sector Project. The substations that will be constructed by this project will link thermal power plants in eastern Viet Nam and hydropower plants in western Viet Nam with the industrial load centers in Ha Noi and Hai Phong, meeting an increased demand for power.

Viet Nam's high demand for energy has also led ADB to support new thermal and hydropower development in the country. The \$196 million Song Bung 4 Hydropower Project, which is the first hydropower project in Viet Nam to receive financing from a multilateral financial institution, was designed to address environmental and social impacts, while promoting integrated water resource management in the river basin.

ADB has also supported the development of mini-hydropower to supply Viet Nam's remote islands and mountain communes. A project that ADB supported with \$151 million in financing set up between 5 and 10 mini-hydropower plants of less than 7.5 megawatt capacity in the northern and central provinces of Viet Nam. The project also financed the connection of these mini-hydropower plants to the national grid and the expansion of the low voltage network to supply nearby unelectrified villages with electricity.

Factors Contributing to Successful Rural Electrification in Viet Nam

Studies of successful national electrification programs reveal varied approaches due to differing national situations. However, in general, there are commonalities among the most successful programs. While some conditions may be unique to a country, there are valuable lessons to learn with every success story.

The conditions that Viet Nam faced affected the nature of its rural electrification program. A handful of local factors can be considered instrumental in the rapid success of the program. At least one factor was unique to the country: Viet Nam's extensive hydropower resources were tapped quickly at a scale that generated sufficient electricity for the country. A large, indigenous source of renewable electricity is not a resource that all countries have, and Viet Nam has a clear advantage in this case. But, there are countries with developed central power generation with much lower electrification rates than Viet Nam, so the presence of renewable energy resources alone did not make Viet Nam's rural electrification program successful. The ability to develop renewable energy resources is as important as the presence of the resources themselves, and a majority of developing Asian countries have access to some form of renewable resources whether sun, wind, or otherwise.

A number of other factors contributed to the success of rural electrification in Viet Nam. In very general terms these factors include Viet Nam's strong national commitment to electrification, expressed in the government's dedicated rural electrification policies and institutions, and the premium placed on electrification in Vietnamese culture.

As mentioned earlier, the rapid development of sources of energy, and indigenous energy resources, contributed greatly to Viet Nam's electrification, but it was the parallel development of the transmission and distribution system that enabled electricity to reach the whole country. The natural hydropower resources of Viet Nam also allowed for the development of complementary off-grid hydropower systems at mini and pico scales.

National Commitment to Electrification

Dedicated rural electrification policy and institutions

The prioritization of economic concerns guided Viet Nam's electrification programs from the start. Linking urban–industrial areas to the grid early on enabled enterprise development and the growth of key industries, and increased government revenues through taxes. The later policy shift, to spread electrification among communities, created a second tax base for the government, even as standards of living rose at the household level.

Local governments' close coordination of rural development zones and infrastructure ensured the provision, maintenance, and staffing of rural electrification along with the establishment of schools, clinics, and roads, resulting in key development synergies. Tariff policies, approved by the Prime Minister in consultation with the Ministry of Industry and Trade, were well controlled with a cross subsidy. Low-consumption users and agricultural users have benefited from subsidized tariffs.

The system is characterized by centralized planning in government, with major provincial inputs and initiatives, all within the framework of a comprehensive rural development program.

This centralized planning is best exemplified by EVN, the singular state-owned utility. EVN is the lead agency for grid extension and rural electrification, with operational units found in each district of the country.

The existence of EVN allowed Viet Nam to overcome one of the main barriers in rural electrification—profitability. Rural electrification is not a profitable investment in any country. As the central and sole utility, EVN mobilizes focused and substantial support for electrification. In the absence of EVN, private investors and private sector operators would be wary of entering into rural electrification projects, unless incentives were put in place to meet their return-on-investment requirements.

Viet Nam's rural electrification program involved major government investment at the national level, matched by local contributions. EVN financed many of the programs, but the high premium the Vietnamese place on electricity meant that local governments and consumers were major contributors as well, especially in the early years of these programs. Viet Nam's proven success with its electrification programs attracted international donor funding.

Table 1 Funding Sources for Rural Electrification

Sources	To	Purpose	Mode and Terms
Central Government	EVN	Major projects and some intervention in the operation of EVN	Replenishes EVN's working capital and offers a minor contribution to investment (around \$10 million per year in 1999); Extends loans at a preferential rate of 9.7% (1999); and Can also guarantee EVN's loans and bonds.
EVN or Power Company (Distribution)		Construction of high and medium voltage lines, distribution substations, and household meters	Funds are sourced from EVN's income from tariffs; Accepts funding from government and donors; and Can issue international bonds and use own depreciation funds.
Provincial Government	Power company or local authorities	Contribution to medium-voltage lines (through power company) and low-voltage lines, done in cooperation with local authorities	Uses taxes in contribution from local authorities.
Local Authorities (District, Communes)		Set up low-voltage networks, including clearing and ensuring right-of-way for lines	Uses local taxes and/or district contribution to communes and/or user fees. Local authorities can also take out a commercial loan.
Residential Consumers		Local networks, household connections	Uses own finance or own labor at own or community's risk.
Private		Particular projects	Mostly interested in generation projects; Offer private funding terms.

continued on next page

Table 1 continued

Sources	To	Purpose	Mode and Terms
Banks	Extend credit to local authorities and households		Commercial terms but not covered by EVN.
Donor Agencies	EVN or power company; credit schemes for consumers; increasingly working through provincial and local authorities but province cannot be direct borrower	Generation, transmission, distribution, rural electrification	Project by project or program; Offers a low interest rate for rural electrification (less than 7%).

EVN = Vietnam Electricity.

Source: COWI Group (Consultancy within Engineering, Environmental Science and Economics).

Viet Nam's Premium on Electrification

A survey of households ranked families' willingness to pay for the following four pillars of development: electricity, roads, schools, and health care, and demonstrated that—for the sample of responders—electricity ranked as the number one priority.

Electricity is considered an important factor to improve the lives of people in general and of the elderly and disabled in particular. For the most part, the income of electrified households using network electricity is higher than that of households without electricity. Many studies have shown that access to electricity helps create jobs in rural areas, as households take up new trades.

Most rural areas are also agriculture areas, where households need electricity for irrigation and crop production, and for small industrial commercial activities from construction to ice making. These activities require a reliable electricity supply and a reasonable price of electricity to be sustained.

Villages without electricity displayed their high desire for electrification during pre-electrification consumer meetings that took place in communes. These meetings allowed power companies to avoid costly and time-consuming disputes over right-of-way and construction damage. The communities also made contributions in Viet Nam. Community contributions in-cash or in-kind, were often the deciding factor that brought areas within the scope of the rural electrification program, due to EVN's limited capability to meet the demand for electrification.

While other countries have not had the intrinsic premium on electrification, the experience of Viet Nam underlines the reason why community organization and capacity building must go hand in hand with electrification. People must be ready for electrification, and understand how best to use it to meet their priorities, whether for lighting, appliances, grain mills, or water pumps.

The direct benefits, impacts, and willingness to pay lead to the effective mobilization of households and local authorities, the combined contributions of which were a substantial share of the electrification program. During the height of the rural electrification program in 1996–2000, the share of household contributions and that of the local government was 59% compared to 40% from EVN.

Public–Private Partnership Case: Rural Electrification in Thai Binh Province

Thai Binh is one of the most populous and important provinces in the Red River Delta with a long history in rice production and other agriculture activities. Rural electrification began in Thai Binh in the 1980s, but due to difficulties in securing financing from public sources, electrification did not expand to all households.

But starting in 1990, with a new government policy to encourage public–private partnerships, the local authority at the village established a village management board for rural electrification. The board took out a government-regulated, low interest rate loan from the Bank for Agriculture and Rural Development to finance the grid extension. Additional funds came from in-kind contributions from households (such as 200 kilograms of rice per household).

Vietnam Electricity (EVN) built the medium voltage lines and transformers, while the management board built the main low voltage lines. Individual households took charge of their own low voltage connections, including the meter. However, these meters were verified, installed, and controlled by an EVN technician.

After electrification, the villagers paid a regulated and subsidized electricity tariff to the management board. These earnings went to paying back the board's loan. However, in 2002, the government annulled the remaining loan and the remaining assets of low voltage grid were transferred to EVN for management.

Source: United Nations Development Programme, 2005

Development of Generation Supply to Match Demand

The development of Viet Nam's extensive hydropower potential gave the country a domestic energy supply. Thermal power generation, through conventional sources such as coal and oil, are the second major source of electricity. The development of both these sources in a timely manner allowed the country to generate enough electricity to reach the majority of the population.

Viet Nam's hydropower potential is especially high, and exists at multiple scales. The country has more than 200 small hydropower plants connected to the national grid or operating in isolated areas to supply electricity to local communes, and these off-grid systems allow electricity to reach even to areas where the national grid cannot be extended.

High Quality Transmission and Distribution System

The development of Viet Nam's hydropower sector would not have had a noticeable effect on rural electrification without similar investments in power transmission and distribution infrastructure.

Viet Nam has had an interconnected power grid since 1995 when a 500 kilovolt line to transfer power from the country's hydropower-rich north to its industrial base in the south was built. Concurrently, it was in the mid-1990s that Viet Nam reached a 50% electrification rate. The power grid was developed extensively from 1995 onward, alongside the growth of hydropower, and now provides a reliable power supply to all of Viet Nam's 63 provinces.

The Asian Development Bank (ADB) and other international agencies have contributed to the improvement of the transmission and distribution system. ADB is particularly focused on the repair and rehabilitation of aging systems to increase energy efficiency and reduce greenhouse gas emissions by avoiding the need for added power generation.

Complementary Off-Grid Systems

At the earliest stage of rural electrification, many of Viet Nam's communes developed abundant hydropower potential to build mini and pico hydropower systems to supply their own isolated communities.

Mini grid systems are relatively simple, and so are their operation and maintenance. These can be built locally at a low cost and have a moderately reasonable capacity to serve private investors. These are easy to install and the power output is sufficient for a single house or small business.

Over time, as the national grid reached them, these small hydropower set-ups either connected to the grid or stopped operating. However, large number of communities still depend on such systems. As of 2009, it is estimated that around 56,000 households still use such generation sources.

According to the latest survey of the Institute of Energy, Viet Nam, there are 169 off-grid projects operational with a total capacity of 132 megawatts. Most are located in the North Mountain Region. All projects were sponsored by the government or other international organizations. A thousand solar home systems (with the average size of 50-watt peak) have also been installed in Viet Nam.

Table 2 Off-Grid Renewable Energy in Viet Nam

Off-Grid Renewable Energy System	Installed Capacity (kW)	Number	Average Capacity (kW)
Small Hydropower	9,393	37	254
Biomass	121,950	29	4,205
Wind	42	8	5
Biogas	692	78	9
Isolated PV	152	17	9
Total	132,229	169	

kW = kilowatt, PV = photovoltaic, RE = Renewable Energy.

Small hydropower here also includes mini-grid and/or isolated hydro grid installations.

Biomass here may be misleading due to the high level of installed capacity. This number includes the cogeneration (heat and electricity) plants powered by bagasse (agricultural residue) from sugar factories. These factories use biomass generation to power their own production.

Biogas here refers to electricity generation.

Isolated PV here includes solar home systems and community PV systems.

Source: Institute of Energy, Viet Nam. 2008.

Conclusion

The success of Viet Nam's rural electrification program provides a practical lesson to mobilize the various layers of society on a clear and systematic path toward national prosperity.

Viet Nam's progress in rural electrification benefited greatly from numerous factors that contributed to impressive gains over a relatively short number of years. These included natural advantages such as an abundance of hydropower, the key role of infrastructure and multiple funding sources. But Viet Nam also had a population that strongly prioritized electricity and widespread commitment of the government, at all levels, to greater electrification, which encompassed public-private partnerships.

The prioritization of electrification for income-generating sectors created the stable base of taxation that gave Viet Nam the resources for nationwide development. That access to modern energy drives enterprise development is no secret. The expansion of the electrification grid into rural areas marked a reprioritization by the government, but by providing its people with modern energy it spurred them up the economic ladder. The experience of Asian Development Bank (ADB) with clean energy shows how useful small systems (whether hydro, solar, or otherwise) can be in bringing modern energy to remote areas. Viet Nam's hydropower resources are not unique to countries in the Greater Mekong Subregion, making this a viable solution in other such countries. ADB's Energy for All Initiative has tracked a number of small-scale renewable power success stories.

Most critically though, Viet Nam's people understood electricity's value and its ability to create new economic opportunities. Their high valuation of electricity was a major factor in convincing Vietnam Electricity and local authorities to support electrification.

Can the remarkable success in rural electrification in Viet Nam be replicated in other countries?

The conditions of Viet Nam's rural communities prior to electrification resemble those faced by many developing countries in the Asia and Pacific region. It can be argued that the social and governmental structures that served as the medium of implementation for Viet Nam's electrification program can be organized, mobilized, and incorporated in the infrastructure of other countries, no matter their specific conditions. The commitment to electrification, by government and society, can adapt to any location.

Viet Nam's Success in Increasing Access to Energy through Rural Electrification

The Asian Development Bank (ADB) is committed to helping achieve access to energy for all people in the region. Modern, affordable energy is an integral part of any development strategy and creates immediate and life-changing benefits for the poor. Increasing access to energy is a pillar of ADB's Energy Policy and part of the long-term strategy for inclusive regional growth. ADB's Energy for All Initiative supports the development and implementation of access to energy projects and builds on ADB's internal capabilities to meet the critical energy needs of its developing member countries. The Energy for All Initiative is supported by funding from the Government of Japan and the Government of Denmark.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor: 1.8 billion people who live on less than \$2 a day, with 903 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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