

# When construction noise impacts electricity consumption

By Sumit Agarwal

As a tropical nation, Singapore experiences a climatic phenomenon called urban heat island effect, which causes temperatures to vary up to 7 degrees between morning and evening hours. It is more pronounced in housing estates located near construction sites where noise pollution generated by construction activities mars the quality of indoor living environment.

There is a lot of construction work going on in Singapore, estimated to be worth between US\$28 and US\$35 billion in 2017. The construction covers a slew of projects from the Thomson Mass Rapid Transit Line to Kampung Admiralty retirement village and Sengkang General Hospital.

While such construction is for the greater good of the nation – more convenient transportation, better community environment for the elderly and more medical attention for the sickly – it is an audible nuisance.

In 2014, the National Environment Agency (NEA) received 16,000 complaints of construction noise. Although it found the vast majority of the complaints to be unsubstantiated, perception is reality. As long as people consider the construction noise as noisy, it is noisy.

So how do people respond to noise pollution? They can be passive by adjusting their lifestyle and hope that the noise will end soon or, as most do, take pro-active action against construction noise by shutting the windows and turn on the air-conditioner to cool the indoor space.

But rising energy consumption is a concern, here and globally. Household electricity consumption is growing at an alarming pace in tandem with rapid urbanisation. Also, electricity tariffs are rising. In April, it rose by 6.1 per cent.

According to numbers from the World Bank Group, Singapore uses 8,845 kWh of electricity per capita, higher than industrialised Asian countries such as Japan (7,820 kWh) and Hong Kong (6,073 kWh).

Residential electricity consumption accounts for 15 per cent of Singapore's overall electricity demand, the third largest user after industry (40 per cent) and the commerce and services (37 per cent) sectors.

On average, a Singaporean household consumes about 50,300 kWh per month, most of which is for ventilation and cooling purposes. Air-conditioners and refrigeration appliances account for nearly two-thirds of household electricity bills.

How has construction affected electricity consumption? At the National University of Singapore Business School and School of Design Environment, we investigated electricity consumption of households in HDB blocks located near to or far from a construction site. HDB blocks within a one kilometre radius of a construction site is deemed near while those further are deemed far and not affected by the noise.

There are different strategies to cope with construction noise.

Households can close their windows and use fans and air-conditioners to keep noise and heat

out of the indoor environment. However, they will incur higher costs for such comfort which are reflected in rising electricity bills during the months when construction activities are carried out.

Others may choose not to use this expensive ventilation strategy but instead endure the lower comfort by using natural ventilation without increasing electricity costs.

We studied more than 5,300 HDB blocks over a three-year period where there were 322 construction projects. Monthly data on electricity consumption was obtained from NEA for each block.

## PERMANENT CHANGE

We found that construction activities raise electricity consumption by almost 7 per cent for blocks near the sites compared to those further away.

Exposure to construction noises raised monthly electricity consumption by an average of 3,015 kWh per block. This translates into an annual figure of 36,184 kWh per block. Using April's tariff of 0.2139 cents per kWh, this works out to an additional S\$7,740 spent per block or S\$77 more per household each year when there is nearby construction.

More critical is the permanence in this behaviour of using more electricity. We found that when the construction was over and there's no more noise pollution, households affected by the construction still used more electricity and were less likely to switch back to natural ventilation compared to households that were not affected by the construction noise in the first

place. It appears that there is habit persistence. Households became less adaptable to a lower level of dwelling comfort after construction ends as they have been pampered by the comfortable indoor dwelling when there was construction.

While the increased energy consumption may seem miniscule on a household basis, there are over one million HDB flats in Singapore. With many construction activities going on, the numbers in electricity consumption can quickly add up.

The lesson drawn is we should not give households any reason to switch to a ventilation strategy that affords comfort whenever there is construction. Hence, NEA's Quieter Construction Fund should be pushed further to reduce noise for energy conservation.

From the households' perspective, simply telling them to conserve electricity is insufficient. They need to be shown in real time how much each appliance is costing them as they use it so that the relationship between usage and cost becomes more concrete. Measures such as a smart electricity device attached to a high-energy consuming appliance could be considered.

■ Sumit Agarwal is visiting professor of Finance at the National University of Singapore (NUS) Business School. This research was undertaken with Sing Tien Foo and Rengarajan Satyanarain of NUS School of Design, and Derek Vollmer of Singapore-ETH Centre.

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