

Missing energy opportunities in a tropical environment

The most recent data from the International Energy Agency (IEA) and the CIA show that in 2008 every Indonesian spent no more than 572 kilowatt-hours (kWh) compared to neighbors in tropical countries like Malaysia (3,428 kWh), Singapore (8,185 kWh) and Brunei (8,472 kWh). While some developed countries in temperate regions, such as New Zealand, consumed 9,492 kWh, the US 13,654 kWh and the UK 6,062 kWh in the same year. This low figure of electricity consumption per capita in Indonesia is due to the low distribution of electricity in many areas of the country. In East Nusa Tenggara, about 70 percent of the population has no access to electricity at all. In contrast, many rich people in Indonesia's big cities consume more than 10 times as much as the average individual. Nowadays, modern society tends to be more concerned with energy related issues. In fact, modern life and modern technology require vast uses of energy, which has escalated exponentially within recent decades. Since most of the energy consumed is fossil fuel-based, huge amounts of carbon dioxide are unavoidably emitted into the atmosphere, resulting in global warming. The prevailing moderate climate, which is neither too cold nor too hot, has actually provided a greater chance for Indonesia to consume less energy than those in temperate climates. To provide a comfortable indoor environment, Indonesia needs less energy than countries with extreme climate conditions, such as close in deserts or those close to the poles.

Since the dependency on energy is small, people in Indonesia actually have a better chance of sustaining their environment by burning less fossil fuel to have thermally comfortable houses or buildings. Sadly, the bad side of modernization has poisoned many Indonesians to live luxuriously. To some extent, to have fully air conditioned houses is a matter of prestige rather than a need. Architects tend to design buildings with air conditioning in mind. They think that building a thermally comfortable house in a climate like Indonesia is impossible without air conditioning, even in the cool locations like Bandung in West Java and Malang in East Java. Many architects are just lazy to find ways of cooling buildings through natural means such as minimizing the sun's radiation and providing more natural ventilation.

They think any building in Indonesia must be automatically air conditioned. This casts a bleak shadow on sustainability in the future. Even though Indonesia is still a natural gas exporter, with 42.33 billion cubic meters exported in January 2011, the country has seen declining oil production. In 2010 Indonesia had to import 40 million liters of oil per day. Considering the future development of this country in which some crucial sectors such as transportation and industry need large amounts of energy, Indonesia will face serious energy problems in the future unless government takes initiatives to develop such schemes to use energy more efficiently. With such a moderate climatic condition, it will be strange if Indonesia faces an energy crisis in the future. Stories of such crises mainly come from temperate and cold countries. In winter, people in countries with four seasons have to face very low outdoor temperatures, which make it impossible for them to live and work without the help of buildings, or the use of particular clothing. Buildings become essential elements for human beings to combat extreme outdoor climatic conditions.

Buildings are not only structures that house our activities. They are also mechanism by which we can modify extreme outdoor weather to make it moderate, thus enabling our bodies to keep the metabolic process at a normal functional level. To make buildings comfortable when outdoor temperatures are very low, it is necessary to heat up indoor spaces. At this stage, the use of energy for space heating is a must, making people highly dependent on energy. Without it they may not be able to stay alive. A report by Max Fordham Engineering Firm in 2007 showed that on average, developed countries consumed 50 percent of their national energy in buildings, 25 percent on transportation and 25 percent on industry. A number of studies in developed countries in temperate climates showed that space heating took about half of the total energy used in the household. Achieving a comfortable thermal environment is likely the best answer as to why buildings are highly dependent on energy in cold climates.

What happens in a warm, humid tropical climate? This climate provides ambient temperatures, higher than cold countries, which are naturally more suitable for human beings to live. In Bandung for instance, the prevailing temperatures range between 18oC and 29oC, which are relatively close to the comfortable temperature of 25oC, based on my study in 2006. Naturally, people in this climate may not need energy for heating or cooling. They may need little energy for normal living conditions due to these prevailing climate conditions. From generation to generation, people have lived comfortably without the use of air-conditioning in their homes, or even heaters. A number of homeless people in this country can still sleep well on the street with a minimum use of clothing, which is certainly not possible for those living in cold climates. As a matter of fact, people living in tropical climates have better possibilities of living naturally without the use of energy. Tropical people need less energy to conduct their indoor activities. From a sustainability point of view, this offers better possibilities for buildings in humid tropical climates to be more sustainable, since dependency on energy is much lower compared to temperate and cold regions. However, as a matter of prestige a great number of people in Indonesia particularly in big cities tend to opt for the high life. Many people tend to use private cars for short distance travel instead of using public transportation or taking a walk. This consumes more petrol. Many buildings in cool cities like Bandung are air conditioned. Since the price of electricity is relatively cheap, many people in this country tend not to turn the light off when the room is empty. Architects and urban designers trained abroad in western countries with cold climates have to be blamed for their mistakes as well. Many have just copied western ideas blindly. Urban areas are openly covered by concrete blocks without being shaded by trees, creating urban island heat effects. Buildings are sealed entirely by glass boxes, creating green house effects, escalating indoor air temperatures. Housing is no longer close to pedestrian paths, which encourages people to use motorize vehicles instead of walking. All these have created a high dependency on fossil fuel energy. Unless we realize our current faults, the potential of using less energy in a tropical environment will be gone with wind.

Tri Harso Karyono The writer, a professor of architecture, is a visiting academic in the School of Architecture and Design at Victoria University of Wellington, New Zealand.