

Floods and raising the city

Recent news reports stated that the Dutch were ready to help find a solution to Jakarta's severe annual flooding. Coastal development is being considered to prevent the capital from being inundated by seawater. Due to global warming, millions of people worldwide who live in coastal cities like Jakarta will face increasingly serious floods as sea levels rise due to melting polar ice. Global warming, in which the average earth temperature rises, is caused by excessive greenhouse gas (GHG) emissions. Buildings account for around 15 percent, while transportation and industry contributed 14 percent and 21 percent, respectively, and the remainder was emitted by other activities. The 1997 Kyoto Protocol suggested that a number of industrial countries should reduce their carbon emissions by 5 percent from 1990 levels by 2008 through 2012. Levels were evaluated in 2012 to determine the impact of the Kyoto Protocol on reducing global carbon emissions. The evaluation found that some developed countries, like the UK, France and Germany and most of those in Eastern Europe, had successfully reduced their emissions — and by more than the targeted figure; while other industrialized countries, like Canada, Australia and Japan, had failed to reach the mandated goals. Despite the efforts, global carbon emissions are continuing to increase, reaching 34 billion tons recently, and threatening a rise in global temperatures of up to 7 degrees Celsius by 2100. In her 2009 book, *Adapting Buildings and Cities for Climate Change*, Sue Roaf of Heriot-Watt University in Edinburgh, Scotland, stated that sea levels had risen at a rate of 0.1-0.2 millimeters per year over the past 3,000 years, but that in the 20th century alone, this had increased to 1-2 mm per year, or about 10 times faster than previously, due to global warming. This phenomenon creates heavy flooding, particularly in coastal areas, which means that cities like Jakarta would become flooded even in the absence of rain, as rising seawater encroached onto the land. Jakarta has seen massive development with the construction of an increasing number of buildings and roads, creating more land surfaces covered with hard materials. Since the city has no integrated drainage system to accommodate rainwater runoff, it is becoming ever more vulnerable to flooding and increasing the urgency to find a solution.

Our forefathers managed their immediate environment wisely. In a number of vernacular societies, people built houses on stilts to protect themselves from would-be invaders, as well as wild animals such as tigers. Stilt houses also provide good protection against flooding as the ground surface beneath the house is open and uncovered, allowing it to absorb rainwater and other inundations. If we want to create a sustainable city, namely a city that experiences less-frequent flooding or even no floods at all, we should emulate our forefathers. The book, *Time To Eat The Dog: The Real Guide To Sustainable Living* (2009), states that the human race could survive on the planet's natural resources if we all lived in the same way, namely in a way akin to our great-great-grandparents over 100 years ago. A city could be built on stilts, in which its multistory buildings and roads would be elevated, leaving the ground surface open. The open ground surface beneath a building's ground floor would be laid with water-absorbing materials like concrete blocks, to enable the speedy absorption of rainwater. The space would not be allocated for any permanent structures, other than vertical structures such as stairs, escalators and elevators. No basements would be allowed; any that were already built would be used as water tanks to accommodate runoff. The opened ground floor of the building would not only enable the absorption of excessive rainwater, it would also provide space to accommodate excessive rainwater in case of flooding. If this idea was applied to 60 percent of existing high-rises and 100 percent of new buildings, the area of uncovered ground surface in Jakarta would significantly increase, which would substantially reduce the amount of runoff.

By having many multistory buildings with open ground floors, air movement around the city would be accelerated, creating a cooling effect amid Jakarta's tropical climate. Furthermore, in the very near future, we should stop enclosing the land around buildings. Outdoor spaces surrounding buildings in the city should be considered public space that can be used by everyone. This would help to create shortcut access routes, encouraging more people to move around the city on foot and by cycling around and beneath these buildings. Main roads, which would cater to motorized vehicles, would be elevated, while beneath them, there would be smaller arterial roads, pathways and gardens for cyclists and pedestrians. Divisions would be made between non-motorized and motorized vehicles when entering the building. Pedestrians and cyclists would enter the building from the ground floor, while people on motorized vehicles, mainly public transportation like the monorail, would enter the building at the lobbies on the second or third floors, which would be at the same level as the elevated roads. The question is how can we put these ideas into practice? How can we remove the ground floors of many existing buildings in Jakarta in order to make them rainwater absorbent? How can we transform basements from what are mainly car parking areas into rainwater tanks to prevent flooding? The Jakarta administration could issue a decree to oblige building owners in flood-prone areas to transform their buildings. This process could be carried out in stages to avoid the disruption of activities inside the buildings. The local authority could also construct the elevated roads and flyovers in a gradual process. If all these measures were implemented, they would go a long way toward facing global warming and mitigating its threats, and they would also help Jakarta reduce its annual flood risk.

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