

GLOBAL GARBAGE CANS

Towards better household hazardous waste management in developing countries in Asia.

*By Kustini Lim-Wavde
and Robert J. Kauffman*

World-renowned oceanographer Jacques-Yves Cousteau once said, “Water and air, the two essential fluids on which all life depends, have become global garbage cans.”¹ A report by the World Health Organization estimated that, in 2012, more than one in four deaths of children under the age of five were caused by the unhealthy environments in which they lived.² These adverse environmental exposures include air pollution, unsafe water, poor sanitation, and hazardous contaminants (refer to Figure 1). While it is quite well recognised that a large concentration of hazardous pollutants comes from industrial waste, there is a general lack of awareness about the rapidly growing amounts of hazardous waste generated by farmers, households and residences.

Household hazardous waste in our midst

Household hazardous waste (HHW) comprises leftover household products that contain toxic, flammable and corrosive materials.³ These include used computers

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and monitors, mobile phones, electronic appliances and devices, fluorescent lamps, batteries, mercury-containing thermometers, motor oil and paints, pesticides and insecticides, chemical cleaning products, and materials containing polychlorinated biphenyl.

A study conducted across 20 European countries, Mexico, Canada, Greenland, Japan, India, Pakistan, Hong Kong, Nepal and several states in the United States estimated that the amount of HHW generated per person between 1992 and 2013 increased from about 0.4 to 7.9 kilogrammes per inhabitant.⁴ This amount is growing rapidly, and a report by the Institute for the Advanced Study of Sustainability at United Nations University predicts that the generation of global electronic waste may reach 49.8 million tonnes, or around 6.7 kilogrammes per inhabitant by 2018.⁵ Electronic waste, in particular, accounts for a major part of the waste stream. As mobile phones and other electronic gadgets become more affordable, Asia, with its large populations, now contributes the most waste—to the order of 16 million metric tonnes annually as of 2014 (refer to Figure 1).

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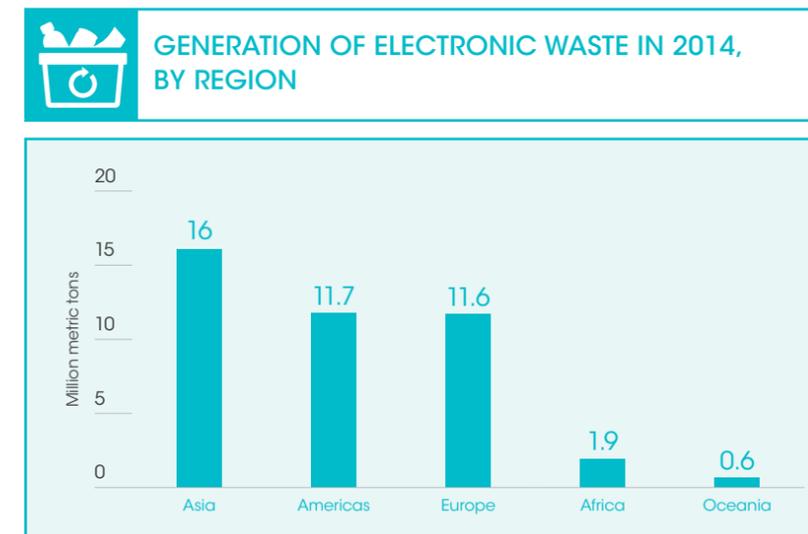


FIGURE 1

Source: United Nations University, Statista 2017

HHW collection systems often do not exist in these emerging markets.⁶ Besides, with endemic corruption and widespread poverty, environmental management is often not at the top of the policy agenda in these countries. There are currently no overarching legal frameworks for governing HHW management. And the general public has very limited knowledge and information about the adverse risks associated with HHW on people's health, as well as on the environments in which they live and raise their children.⁷

Unaware of the risk of contamination, households often pour liquid HHW down the drain or spill it on the ground, and solid HHW is routinely mixed with regular trash. In countries like Indonesia, the Philippines and Vietnam, water contamination increases when HHW substances are flushed down the drain due to the lack of proper wastewater treatment facilities, solid waste management infrastructure, and sewage systems.⁸ These substances also corrode plumbing and can cause failure in septic systems before they are finally released into waterways and seep into the water table. Additionally, if HHW materials end up in conventional landfills, they can leach out and contaminate the soil and the groundwater.

So the pressing question is: How can HHW be better managed in developing countries in Asia?

Learning from California

To answer the question, we studied how the state of California in the U.S. has developed and implemented its HHW collection and recycling programmes. California successfully collected approximately 100 million pounds of HHW in 2016, of which 79 percent was recycled or reused.⁹ The secret behind California's success is the collaborative involvement of state and local governments, businesses, as well as local communities and residents. In 2006, the California state government banned HHW in trash.¹⁰ Local governments across the state established hundreds of HHW facilities, drop-off locations, curbside pickup services, and other collection programmes. Random load checking at landfills and facility inspections were conducted to catch unacceptable waste.

In addition, separate laws were passed to regulate the collection of specific HHW materials by retailers and manufacturers. Examples include The Electronic Waste Recycling Act of 2003 that requires retailers to collect electronic waste recycling fees from consumers at the point of purchase for some categories of electronic products; the California Paint Stewardship Statute of

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2010 that regulates the recycling of leftover oil-based and latex paint; and the California Oil Recycling Enhancement Act of 1991 which requires oil manufacturers to pay fees to the Department of Recycling for lubricating oil sold to consumers.

Since 1990, the California Department of Recycling, or CalRecycle for short, has provided annual grants to help local governments and waste agencies establish or expand their HHW collection and recycling facilities and provide educational information to the public. Along with state-sponsored schemes, legislative measures and regulations, the success of HHW collection in California has relied heavily on the participation of local communities and households in identifying, separating, storing and transferring HHW safely to waste collection and recycling systems.

The next question is: What motivates California to undertake such committed actions?

HOUSEHOLD INFORMEDNESS

Our research focused on household informedness, i.e., the degree to which households have the necessary information to make utility-maximising decisions in their daily activities. Household informedness is influenced by two factors—public education about HHW and information about environmental quality.¹¹

Public education about HHW typically provides information on the best practices for handling HHW, know-how about the dangers of not disposing of such waste properly, and how to gain access to various HHW collection and recycling programmes. The information made available to the public is intended to guide households in identifying, storing, separating, and transferring HHW appropriately, all of which goes towards increasing the amount of HHW collected and recycled. The impact of public education on HHW is multifaceted. When households are well informed about alternative household products, they switch to those that have no hazardous materials, which further mitigates the amount of waste that results in contamination of the environment.

Information about environmental quality also influences household decisions related to their waste disposal. For example, the number of maximum contaminant level (MCL) violations in the drinking water at the county level is likely to inform households about the quality of the environment in which they live. A higher number of violations represents worse environmental quality, all else being equal. Our study confirmed that higher MCL violation counts resulted in a higher amount of HHW collected, but only when information about MCL violations was sent directly to households via mail. This result suggests the importance of the direct channel for information sharing. This may have had more impact on household informedness and their subsequent recycling behaviour compared to other indirect channels, such as public notices and newspaper announcements.

We also found that location matters in HHW collection activity. The waste collection programmes seem to have had a more positive effect in Northern California, where the residents are known to be more aware of and engaged in pro-environmental behaviour. This finding indicates that governments should consider locality (in terms of awareness and engagement levels) when planning their HHW programmes and policy instead of following a one-size-fits-all approach.

Hope for Asia

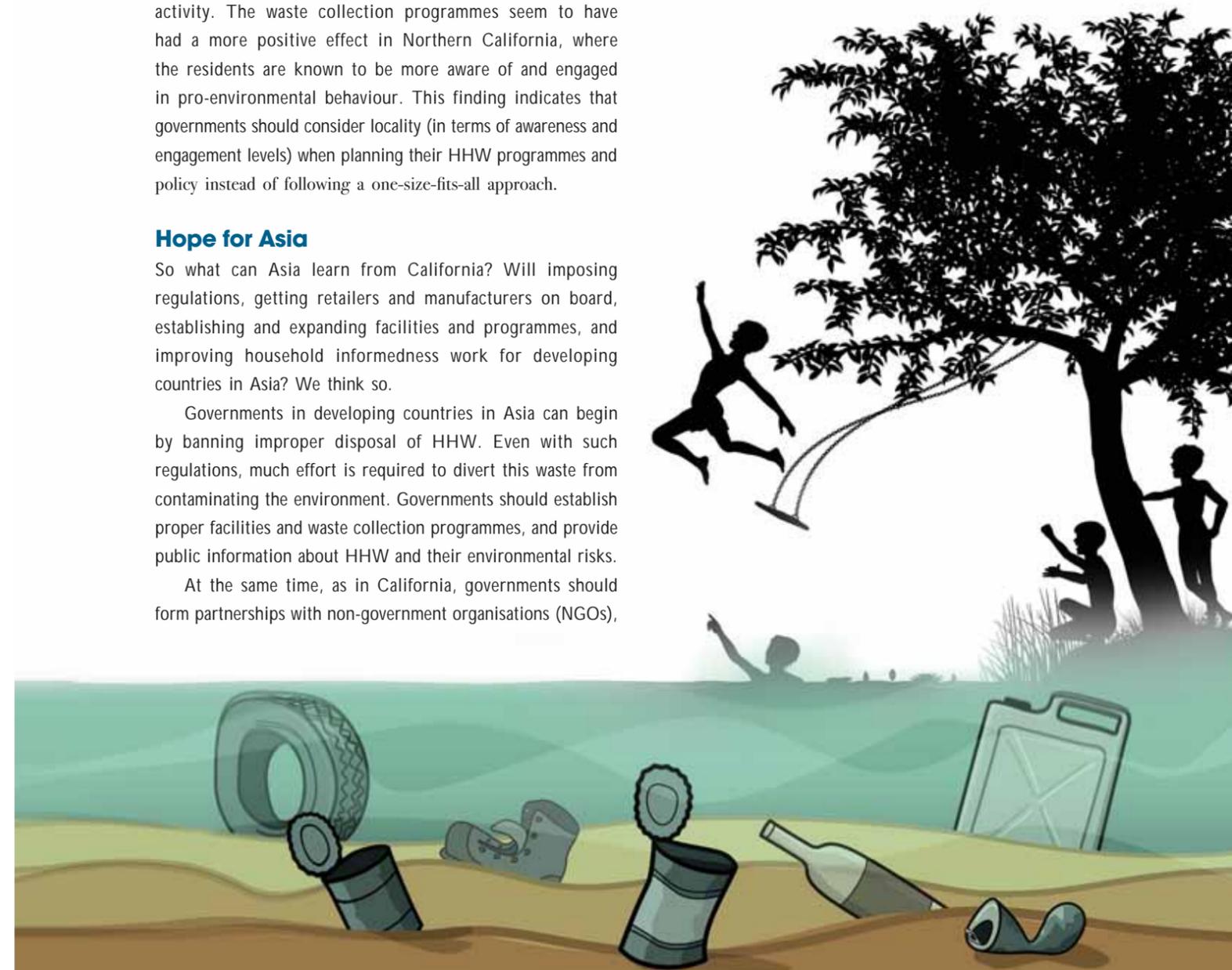
So what can Asia learn from California? Will imposing regulations, getting retailers and manufacturers on board, establishing and expanding facilities and programmes, and improving household informedness work for developing countries in Asia? We think so.

Governments in developing countries in Asia can begin by banning improper disposal of HHW. Even with such regulations, much effort is required to divert this waste from contaminating the environment. Governments should establish proper facilities and waste collection programmes, and provide public information about HHW and their environmental risks.

At the same time, as in California, governments should form partnerships with non-government organisations (NGOs),

businesses, and individuals to promote product stewardship and extended producer responsibility for products that contain hazardous materials. This will lead to the sharing of more responsibility for managing post-consumption waste with businesses and residents. The World Economic Forum's Grow Asia and Indonesia's PISAgrO are successful examples of such tri-sector collaboration in agriculture.¹² Grow Asia, for instance, brings together companies, governments, NGOs and other stakeholders to help smallholder farmers improve their production and livelihood through access to information, knowledge, markets and finance.¹³

A household's level of informedness matters for the amount of hazardous waste collected and recycled. Thus, it is worthwhile to invest more in raising the level of household informedness,





Research approach

Our research developed an economic model to explain the relationship between the amounts of HHW collected and recycled, and the household informedness variables that characterise different counties in the state. For this part of our work, the data for analysis came from CalRecycle and various other public data sources, including California's Department of Public Health, and the U.S. Census Bureau's American Community Survey.

Using data on historical HHW for 39 counties from 2004 to 2012, related county demographics, projects involving HHW-related public education, and environmental violations in drinking water in California, we estimated the simultaneous effects of household informedness on the amounts of HHW collected and HHW recycled. The estimates enabled us to calculate the *household informedness elasticity of HHW collection and recycling output* in California over the study period. This estimate enables policymakers to gauge the responsiveness of households in terms of the amount of HHW collected and recycled as more public education and environmental quality information are provided to them.

particularly in Asian countries, where the current level of household informedness about HHW is still relatively low. As society becomes more informed about the risks of household hazardous waste to the environment and people's health, this will lead to better management of this waste by policymakers, producers, retailers, and households.

Having said that, what works in California may work in Asia, but would need far more effort. The developing world faces some unique challenges alien to the developed world. Pollution is on the rise in developing countries such as China and India. Some countries are still struggling to eradicate corruption and political instability. Weak policy design, implementation, and enforcement have further degraded the environmental quality. So a solid and effective legal framework for managing HHW may take time to realise.

If governments do not take action today, environmental quality will worsen and the cost of environmental improvement will be even higher. To jump-start the initiative, businesses in Asia need to take on a bigger role than those in the developed world. Established multinational companies (MNCs) operating in Asia can help by creating used product and waste take-back programmes for recycling. One example is Unilever, an MNC with a strong distribution network that extends from major cities to remote villages.¹⁴ The Unilever Sustainable Living Plan states that the corporation's commitment is to move towards a circular economy by reducing, reusing, and recycling packaging waste. Based on its success stories, other corporations may follow in Unilever's footsteps.

Low income and less-educated households in remote villages may be more concerned with putting food on their plates. Some of them have worked as waste-pickers and unknowingly live in hazardous environments. One such example is the village of Sangrampur, located south of Kolkata in India, which has become a dumpsite for electronic waste. Fortunately, local NGOs, such as Toxics Link, have helped spread a new level of awareness about the dangers of electronic waste.¹⁵ Similarly, Microsoft and GIZ, a German organisation, have developed a partnership programme to support safe recycling of electronic waste in Kolkata and Ahmedabad.¹⁶

It is also crucial to provide information on air, land and water pollution to people to increase their awareness of the quality of the environment they live in. Information empowers people to improve their quality of life and demand regulatory change from their governments.

Given the impact of location on the success of HHW programmes, we recommend that Asian countries start their campaigns in large cities or regions where pro-environmental behaviour is understood and encouraged. This will take advantage of the spillover effects of good pro-environmental behaviour. Good behaviour is, in fact, just as contagious as bad habits.

The application of environment-focused data analytics should be even more beneficial to policymakers in developing countries in Asia. Due to their critically limited budgets though, it is necessary to allocate resources efficiently to achieve feasible waste collection targets. To meet this need, data



Kustini Lim-Wavde

is a PhD candidate in Information Systems and Management at the School of Information Systems, Singapore Management University

Robert J. Kauffman

is Associate Dean (Faculty) and Professor of Information Systems at the School of Information Systems, Singapore Management University

analytics initiatives have spread fast in Asia. The United Nations Global Pulse, an initiative to adopt big data analytics for sustainable development and humanitarian action, established an analytics lab in Jakarta in 2012.

As the cost of sensors and information technologies decreases, more comprehensive data, such as data on waste, environment and household behaviour, will become available for policy research in Asia. Recent advances in data management and monitoring technologies also allow more intelligent management of processes in countries.¹⁷ We expect that future research will involve more complex data analytics methods combined with deep learning via artificial intelligence and cognitive systems that are applied to analyse the vast data and transform it into meaningful information for policymakers and the public. They may even perform some automated tasks for improving the management of waste and pollutants in the environment. With falling technology prices, it is hoped that frugal and effective solutions will be possible.

Leading NGOs and MNCs are increasingly taking the initiative to achieve sustainable living environments in cities and villages in developing Asian nations. We encourage local government leaders to jump on the bandwagon, and encourage other organisations to follow suit.

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