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Article

Societies in Smart Cities: Lessons Learned from Waste Management

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Urbanization continues to gather pace creating wicked problems. Waste management is one such issue which is incongruent to the ambition of the UN Sustainable Development Goals (SDGs), particularly Goal 11 – Sustainable Cities and Communities. This paper draws on two case studies of local councils, Canterbury-Bankstown in Australia and Christchurch in New Zealand, to discuss how the councils are tackling the international waste management challenge as part of their creative smart city programs. In doing so, the paper identifies lessons that shine the light on the use of technology and data, funding, community, and government engagement.

INTRODUCTION

Today, over 55% of the world's population live in cities, while in Oceania 68% is urbanized. These numbers are projected to grow to over 70% in the coming decades, and cities will produce much more than 70% of the world's economic output (United United Nations, 2018). Beyond economics, the political, technological, and social drivers are forcing a rethink of the role of cities in international business because they connect different stakeholders (Cook & Pandit, 2018). One of the key features of wicked problems (WPs) is that they account for the needs and wants of multiple stakeholders, who can in turn be decision makers and solution providers and have different views on how a WP should be addressed (Van Zanten & Van Tulder, 2018). The UN Global Agenda for Sustainability has Sustainable Development Goal (SDG) 11 as achieving Sustainable Cities and Communities, with the focus on making cities and communities inclusive, safe, resilient and sustainable (United United Nations, 2020). So, how well do we understand cities, or smart cities, and the challenge of delivering sustainable communities?

Over the last 15 years, there has been maturation of understanding and interpretation of the concept of smart cities. There are historical points that help categorize the development of smart cities. The early iteration, or smart cities 1.0, was technology driven, a top-down concept where the private sector would focus on selling the technology rather than using the technology for good. In the more recent years, though, cities have taken more ownership and control of this agenda. That is, smart cities 2.0 have become city-led. Governments at different levels have realized that technology and data can aid the addressing of urban challenges if technology is selected, procured, and deployed in a way that helps meet objectives of the smart cities (Bibri & Krogstie, 2017). In some parts of the world the idea of smart cities 3.0 is starting to take shape, which is ground-up, i.e., collaborative governance processes, strong relationships between private sector, the community, industry, and innovation are co-creating smart cities programs and novel ways of addressing challenges. Despite these developments, the concept of smart cities is sometimes subject to different interpretations (Bibri & Krogstie, 2017). However, a common thread runs through them embrace technology and data solutions to help accelerate the liveability, workability, and sustainability outcomes.

Within the international business domain, the issue of addressing so-called grand challenges (i.e., sustainability) and tackling wicked problems (i.e., waste management) which lie at the nexus of society, business and policymaking is still in its infancy. As of January 2021, the Norwegian amendment to the Basel convention, the focus of which is to control of international movement of waste and its disposal, means that New Zealand and Australia can no longer send these overseas (Basel Convention, 2019). This can intensify geo-political issues and international trade of waste. Lack of responsibility for poor waste management can lead to geo-political risks related to climate change, as well as political relations between developed and emerging economies. Poor waste management practices in developing and developed economies presents serious issues for international waste trade because of intensified relations between governments and multinational companies dealing with waste (Kellenberg, 2015), which in fact highlights the wicked nature of the problem.

Oceania presents an interesting context to examine international waste trade and management and how local government and council driven smart cities programs are addressing this challenge. Although both Australia and New Zealand are considered as well developed in the sustain-

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ability space, its efforts in relation to managing waste are poor. This paper draws on the experiences of Canterbury-Bankstown in Australia and Christchurch in New Zealand, to take stock of recent developments that have emerged from the smart cities programs in tackling waste management and how these efforts are consequently aiding the SDG agenda. In doing so, this paper moves away from treating smart cities and sustainability in a vacuum and shows how they complement each other. This paper illustrates insights into how smart cities can provide the means to address the wicked problems of sustainability and waste management, which are also of relevance for international business. The primary target audience of this paper are councils and policymakers in different cities.

WASTE MANAGEMENT AND SUSTAINABLE DEVELOPMENT

Waste management is crucial in relation to developing sustainable smart cities, as well as calls in IB to address grand challenges and tackle wicked problems. Due to increases in population and rapid urbanization (Molina-Sánchez, Leyva-Díaz, Cortés-García, & Molina-Moreno, 2018), smart cities are increasingly under pressure to become ecological and environmentally greener cities (Bibri & Krogstie, 2017). In Figure 1, we present the conceptual framework that addresses the following: Rapid urbanization leads to generation of more waste, which cities are responsible for but not necessarily have the capacity to deal with on their own. Furthermore, urbanization enabled people from different cultural and societal backgrounds to live closer geographically, leading to heterogeneous urban population. This in turn increases stakeholder heterogeneity and compounds the nature of connected wicked problems. As urban population grows, it generates high degree of throw away culture, leading to high levels of waste within the cities. The challenge that all cities face globally is reshaping the global landscape of international waste mainly because of the waste generated in developing markets and waste banned from developing markets.

To achieve these goals, there is a need for effective management of natural resources, to recognize if and how technologies can contribute to achieving better use of natural resources. Consequently, managing waste in a sustainable way becomes imperative (Taelman, Tonini, Wandl, & Dewulf, 2018), and today from a business perspective, the automation of outdated systems enables the development of more value-added jobs wherein treating waste as a valuable resource and commoditisation can be achieved (Molina-Sánchez et al., 2018; Taelman et al., 2018).

Since 2012, Australia and New Zealand have taken a leading role in developing sustainable smart cities. However, waste management continues to be a major challenge. Under the New Zealand Waste Minimisation Act 2008 and the New Zealand Waste Strategy 2010, councils are responsible to promote effective and efficient waste management and minimisation. For instance, one of the key community outcomes in the Christchurch City Councils Strategic Framework is to minimise waste and use resources sustainably. In Christchurch, over 200,000 tonnes of waste is sent to landfill each year, the equivalent of 538kg per person. Another 115,000 tonnes is processed through the City's recycling and organic facilities. In 2012, the recycling volume peaked. Since then it has been in a downward trend due to stricter controls around contamination and reduction on acceptable items. Contaminated recycling materials are diverted to landfill and most of the current recycling is sent overseas for processing into new products. However, recent significant shifts in practices in various international markets have created new challenges for Christchurch as overseas markets, like China, have been returning recycling of Christchurch due to increased levels of contamination (Christchurch City Council, 2020). As a result, this becomes an international trade and relations problem that not only Christchurch but New Zealand as a whole has to tackle. To address this problem, Christchurch City Council, as part of its Smart Christchurch initiative, partnered up with local start-up firms and the University of Canterbury to develop innovative technologies and service approaches to reduce waste. One such solution was the deployment of BigBelly Solar bins and rubbish bin sensors. This reduced bin collection from 21 to once a week. If New Zealand wants to achieve its SDG goal of becoming sustainable by 2030, the Christchurch Council and other councils need to delocalize waste management and make it a national agenda.

On the other side of the Tasman, the Australian Government developed its National Waste Policy in 2009 and updated it in 2019. Australia generates 67M tonnes of waste and recycles 37M tonnes per annum. Of the generated waste, 58% is recovered for energy generation from 2M tonnes per annum. Consequently, the waste management services sector in Australia is valued at $12.6 billion per annum driving an economic development agenda as much as an environmental one. The current geo-political issues that impact New Zealand are also impacting Australia, with 11 councils being refused recyclable material by the Chinese market. This has forced a rethink by governments in Australia on how to be more 'circular' in their management of waste. A rapid rise in policy and funding programs is driving greater innovation in reducing the amount of waste is being witnessed. In New South Wales, the city of Canterbury-Bankstown has the highest contamination rates of 26% in its recycling bins compared to a state average of 16%. Poor community practices wherein the wrong waste is placed in the wrong bins is a key cause for this contamination. With the population of the city estimated to reach 500,000 by 2030 from the current 360,500 in 2020, waste management can evolve into an issue of great concern. Exacerbating the issue, the city is rapidly growing its immigrant footprint with 44% of its residents coming from overseas who speak limited English. Hence, intertwined with the challenge of waste management is one of community engagement, communication and influencing of household behaviours. With a very unique demographic that is immensely diverse and complex, one standard approach of communication in waste management is unlikely to be successful.

As part of its smart city program, the city is currently undertaking a large-scale project in waste management called 'Closing the Loop on Waste'. The key outcomes that the council intends to achieve through this project includes using advanced analytics to detect bin contamination, iden-

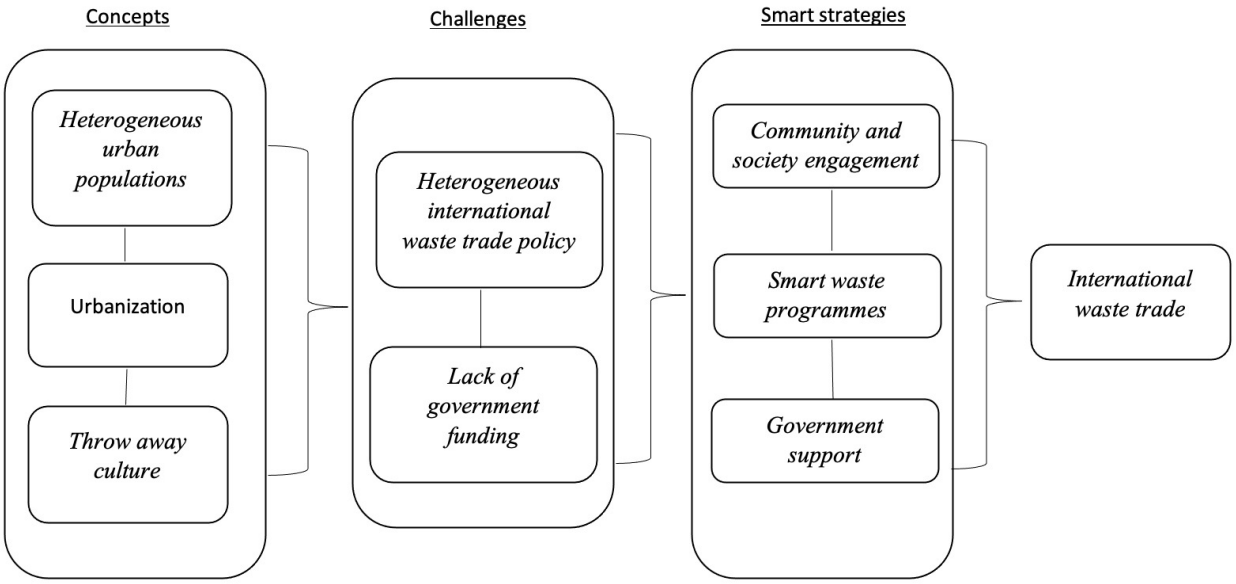

Figure 1: Conceptual Framework

tify when bins have been missed, and investigate illegal dumping. Another objective is to upgrade residents' access to information regarding bin collections days and other programmed services thus improving the residents experience around council waste services enabling them to have a seamless waste service experience. The city received a smart cities grant of AUD $1 million, which the council matched. Over a period of 18 months, the council initiated the project and set up partnerships with the Institutive of Sustainable Future, Western Sydney University, and Blue Chilli for industry support and expertise on specific subject matter areas. The use of GPS data and live traffic information, to minimise potential delays on collection routes and enabling residents to request services or report incidents, via a real-time and customisable format, that takes into account the diversity of the local community are some other objectives. The city was also able to identify that waste as a subject area accounted for 31% of all enquiries between residents and Council's customer service team, which equates to approximately 30,000 phone calls a year. This helped the council realise that there were 30,000 opportunities to engage with residents to help improve their experience with waste management services.

LESSONS LEARNED AND RECOMMENDATIONS

- A common challenge across the two councils was gaining access to funding to commercialise and scale up technology. To overcome this challenge, both councils were able to use its smart cities program as the channel to create in-roads. The Canterbury-Bankstown 'Closing the Loop on Waste' project was financially supported by the national AUD $50 million Smart Cities and Suburbs Program focused on development of liveable and sustainable cities; and the Smart Christchurch program secured private sector funding for the development of BigBelly Solar bins. We recommend that councils tap into the public and private sectors to initiate smart city initiatives to tackle WPs including international waste management.
- Community engagement was another significant challenge as well as an opportunity that the councils worked through creatively. Adopting the smart cities banner the councils were able to collaborate and co-create approaches between the public and private sectors. Policymakers and councils need to collaborate internationally with trading countries like China and other emerging economies, to ensure that human engagement continues.
- There is no question that technological advancements such as artificial intelligence can detect contamination faster, which is a breakthrough for any council. However, while technology is a necessary condition it is not sufficient. The reality as evident through the experiences across Australia and New Zealand, the technology will only be as good as the people using it. Hence, policymakers and councils need to drive smart cities initiatives through technological solutions such as analytics to detect bin contamination and GPS data, as well as teaching people about the use and benefits of technology.
- The involvement and support of government departments at different levels – central, regional and local, as well as host governments – is critical to enable cities to reach the SDG of making cities and communities inclusive, safe, resilient, and sustainable. Government funding remains problematic. For example, eDay in New Zealand was an initiative to raise awareness about waste, however it was not viewed as strategic, hence the government funding was not provided.

FUTURE DIRECTIONS

In relation to the specific issue of waste management and the SDGs, international trade can play a valuable role by providing incentives to various stakeholders and set examples of best practices (Gonzalez-Perez, 2015); however, poor waste management practices can seriously impact international relations between New Zealand, Australia, and emerging economies like China. This was the case for both councils when China returned waste from both Australia and New Zealand (Kellenberg, 2015). Taking a lead from the experiences across councils in Australia and New Zealand, councils need to better design their smart cities programs to tackle the waste management challenge and identifying local solutions to local problems, in essence developing a circular economy. The lessons for councils and policymakers can have implications for how cities and countries can tackle WPs for cross-border trade and international relations. Smart cities can be the means to fulfil the SDGs' purpose of different cities. Smart cities can provide a data sharing platform for businesses, communities, and governments that will enable to deal with grand challenges and tackle WPs through the creation of smart societies, as well as play a role in destination branding.

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Anna Earl is a Lecturer in Management at the University of Canterbury, New Zealand (PhD from The University of Auckland Business School). Her research interests include: the relationship between government and multinational enterprises, internationalization of multinational enterprises from emerging economies and methodological issues related to conducting research in emerging economies. Anna has published in *Journal of Business and Industrial Marketing*. Anna is on editorial boards of *Journal of International Management* and *Review of International Business and Strategy*.

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Adam Beck is the founding Executive Director of Smart Cities Council Australia New Zealand, an organisation that is part of the world's largest network of smart cities practitioners and policy makers. Adam was a sociology lecturer at the University of Queensland for four years. He was active in numerous programs with the World Green Building Council and the C40 Cities Climate Leadership Group. Adam sits on the Steering Committee for the US-based STAR Community Rating System, and is on the editorial board of cities publication, Foreground.

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