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EDITED BY

James Kevin Summers,
United States Environmental Protection
Agency (EPA), United States

REVIEWED BY

Roope Husgafvel,
Aalto University, Finland

*CORRESPONDENCE

K. Shenyoputro,
✉ kelvianto.apu@gmail.com
Thomas E. Jones,
✉ 110054tj@apu.ac.jp

SPECIALTY SECTION

This article was submitted to
Environmental Citizen Science,
a section of the journal
Frontiers in Environmental Science

RECEIVED 22 February 2023

ACCEPTED 23 March 2023

PUBLISHED 04 April 2023

CITATION

Shenyoputro K and Jones TE (2023),
Reflections on a two-decade journey
toward zero waste: A case study of
Kamikatsu town, Japan.
Front. Environ. Sci. 11:1171379.
doi: 10.3389/fenvs.2023.1171379

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Reflections on a two-decade journey toward zero waste: A case study of Kamikatsu town, Japan

K. Shenyoputro* and Thomas E. Jones*

Department of Sustainability Science, Graduate School of Asia Pacific Studies, Ritsumeikan Asia Pacific University, Beppu, Japan

KEYWORDS

zero waste, Kamikatsu town, solid waste management, separation at source, Japan

Introduction

Global waste continues to grow exponentially due to over-consumption, rapid urbanization and lifestyle changes (Malik et al., 2015). Challenges for solid waste management are growing due to increased consumption, waste generation and changes in the composition of waste posing budgetary problems for over-stretched municipal finances (Guerrero et al., 2013). 'Zero waste' is a holistic vision for sustainable waste management (Zaman, 2015) that includes diverse strategies aimed at building capacity for waste reduction, repair, reuse and recycling (Cole et al., 2014). The core concept seeks to combine sustainable consumption with optimized recycling and recovery (Romano et al., 2019). "Zero Waste maximises recycling, minimises waste, reduces consumption and ensures that products are made to be reused, repaired or recycled back into nature or the market place" (Matete and Trois, 2008). Thus the Zero Waste innovation significantly relies on the idea of 'Separate at Source' (SAS) as the most common practice. SAS provides a better recycled material quality and diversion rate, also costing less than most municipal kerbside collection schemes but requires active participation from the communities (Matsumoto, 2011; Seyring et al., 2016).

The concept crossed over from the manufacturing sector where Japanese car companies such as Honda used Total Quality Management techniques to reduce their waste flows by up to 98% (Murray, 2002). Toyota soon followed with its Zero Waste declaration aiming to reduce its waste to zero by 2003. Meanwhile, various government agencies sought to replicate the strategy including Canberra in 1995 followed by several municipalities worldwide (Song et al., 2015). Canberra became the world's first municipality to pass a "zero waste" law and introduce a "no waste" concept which aimed to reduce waste diversion to landfill to zero by 2010 (Murray, 2002), but the project was discontinued ahead of the 2010 target (Connett, 2007). Soon after Canberra's declaration, a zero waste movement began in New Zealand with the establishment of a Zero Waste Trust in 1997 to promote "waste minimization" (Tennant-Wood, 2003). In Japan, Kamikatsu Town has been known as a Zero Waste pioneer following a commitment in 2001 to stop sending any waste to final disposal, either in landfill or incineration. The aim of this paper is to reflect on 2 decades of implementation toward Kamikatsu Town, 2021 target and unpack the barriers hindering completion of the Zero Waste challenge.

Case study site

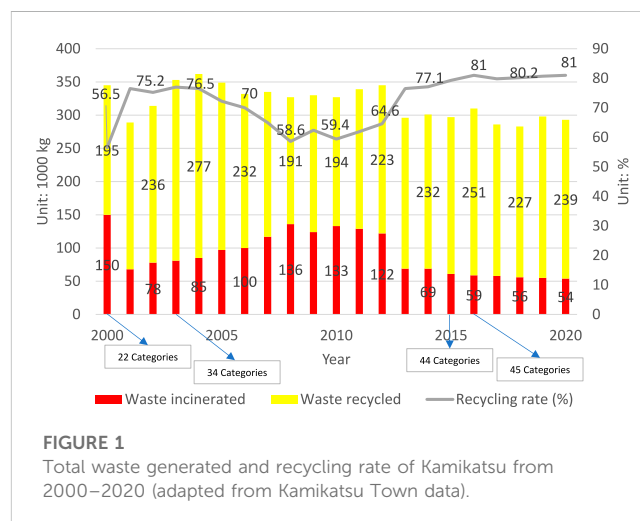
Japanese municipal waste strategies have embraced incineration, demonstrated by the presence of over 1,500 incineration facilities (Tabata, 2013) more than any other OECD

Date	Time	Interviewee	Channel
7 September 2020	10:00 a.m.-11:00 a.m.	Mr. N (PANGEA Field)	In-person
7 September 2020	13:00 p.m.-14:00 p.m.	Ms. F (ex-director of NPO Zero Waste Academy)	In-person
14 December 2020	13:24 p.m.-13:34 p.m.	Mr. N (PANGEA Field)	Telephone call
18 May 2021	14:45 p.m.-14:53 p.m.	Mr. N (PANGEA Field)	Telephone call
26 May 2021	10:37 a.m.-10:52 a.m.	Ms. S (officer Environmental Division, Kamikatsu Town)	Telephone call

country (OECD, 2018). Furthermore, the average recycling rate across Japanese municipalities over a 6-year period from 2005–2010 was around 20% which ranked among the lowest OECD countries (Yamamoto and Kinnaman, 2022). Kamikatsu Town in rural Shikoku opted to buck both trends with the declaration in 2001 of a “Zero Waste” goal aiming to stop sending any waste to incineration by 2020. The “Zero Waste” strategy also reflected the reality of the town’s demographic decline and lack of funds to build an incineration facility. Kamikatsu used to have an incinerator in operation since 1991, but the plant was shut down in 2001 when the “Law Concerning Special Measures Against Dioxins” was enacted by the Ministry of Environment. The town’s older generation incinerator lacked the specialist filter system necessary for stricter mitigation of toxic emissions such as dioxins and furans in accordance with the new law and embarked instead on a Zero Waste journey of 20 years (Jarman-Walsh, 2019). With the aim of becoming “waste-free” by 2020, Kamikatsu’s waste minimization strategy is spearheaded by rigorous ‘separate at source’ practices whereby waste is separated by citizens. A 5-year pilot project was initiated in 1998 with the set-up of 22 waste categories prior to the “zero waste” declaration in 2003. By 2020, the number of categories had increased to 45. This study investigated 2 decades since implementation to take stock of Kamikatsu’s progress toward the 2020 target. On-site interviews with keypersons were conducted in September 2020, followed by subsequent phone calls and online interviews with actors including staff from the Kamikatsu Environmental Division.

Methodology

In various national and international media channels, Kamikatsu Town has been lauded as a good example of solid waste management by demonstrating how the government and community can work hand in hand as typified by the Zero Waste Academy, an NGO set up in 2003. Evidence includes the town’s 81% recycling rate in 2020, one of the highest recycling rates in the country after Toyoura in Hokkaido and Ozaki in Kagoshima (Kamikatsu Town, 2021). Yet despite the attention of Kamikatsu’s Zero Waste declaration, the 2020 target was not met in terms of a strictly waste-free society. To better reflect first-hand insights into the two-decade campaign this research employs the triangulation approach suggested by Yin (2009) with a combination of primary and secondary data supported by ethnographic fieldwork. Qualitative data for this research is obtained through structured and semi-structured interviews with two of the interviewees



conducted during the field trip to Kamikatsu on 7 September 2020. A structured interview was conducted in the morning with Mr. N, the CEO of a company responsible for organizing and accommodating the zero-waste tours to Kamikatsu, followed by semi-structured interviews with Ms. F who the ex-director of the NPO Zero Waste Academy. The interview consisted of 10 questions detailing the history of the Zero Waste declaration, current barriers, and the longevity of the policy. After the in-person interviews, three follow-ups were conducted by telephone due to coronavirus travel restrictions.

Reflecting on two decades of zero waste

The separation at source policy in Kamikatsu has brought environmental and economic benefits. Better separation at source has reduced the volume of waste sent to incineration and the recycling rate of Kamikatsu town reached 81% in 2020. More rigorous rules for waste separation have managed to reduce the amount of waste generated by the residents by 65% from the initial 150 tons in 2000 to 54 tons in 2020. After declining to 59% in 2008, Kamikatsu’s recycling rate recovered to 81% in 2020 (Figure 1). However, “recycling rate” here is defined as waste diverted from incineration or landfill, and is no guarantee that the waste will actually be recycled (Silva et al., 2017). Besides the environment benefit from the waste separation policy, the town had also benefited from fiscal savings as better waste separation managed to reduce the

annual disposal bill born by the town according to the first interviewee (Mr. N). The second interviewee (Ms. F) also noted that the town used to allocate around 25–30 million JPY annually for disposal of waste sent to neighbouring Tokushima City to be incinerated. The recycling activities also offered additional revenue streams, with price tags displayed on the basket at the collection point used to persuade residents that their steel or aluminium cans were helping to offset waste disposal cost.

Overall, the separation at source policy implemented by the town has managed to significantly increase the recycling rate of the town since its implementation in 2000. The “zero waste” goal has reduced the fiscal burden of annual waste disposal cost borne by the town while increasing revenues earned from recycled materials such as aluminium. Various initiatives from the town and the NPO have been introduced such as loyalty point cards waste separations exchangeable as shopping coupons. Financial subsidies encouraged the purchase of electric composters, as Kamikatsu has made it mandatory for home-generated organic waste to be composted. Also, a “Kuru-kuru” shop was established to showcase recycled items such as clothes, tableware and household items. Only locals are allowed to drop off unwanted items, but anyone can collect for free. Each product that goes in and out of the shop is weighed to calculate the amount of waste saved by reusing instead of simply throwing things away. Such incentives have fostered cooperation from local residents, although a lack of compliance still exists among certain residents (Bartl, 2011). In addition, provision of waste collection trucks since 2019 has also managed to increase the participation of waste separation at source from the residents, especially amongst the elder population.

Barriers to zero waste

The current global development paradigm tends to focus more on the increase of consumption while ignoring the importance of recovering those resources which is deemed to be unsustainable (Zaman and Lehmann, 2011). Therefore, there is a need to raise recycling awareness amongst consumers and residents (Manomaivibool et al., 2018). Reflecting on Kamikatsu’s recycling rate over the past 2 decades (Figure 1), there was a rapid increase after 2001 when the first separate-at-source pilot project started. The rate declined to 59% in 2008 and 2010 due to the uptick in waste sent for incineration. Thereafter, the recycling rate has increased to a peak in 2016 of 81% after which it flat-lined. Interviewees claimed that this stagnation was due to the “unrecyclable” nature of the remaining 20% of the waste, of which 43% was comprised of cigarette butts, leather, and sanitary products such as diapers worn by infants and elderly while the rest was comprised of paper and plastic packaging that are not washed

or separated properly. If these issues could be resolved by implementing a more rigorous inspection on waste separation, it seems feasible that the town’s recycling rate could close in on the target of 100% (Cornett, 2007). Yet considering the aging population in Kamikatsu, coupled with the frequency of diapers used per day and the associated sanitation risk, it seems that a small but significant volume of waste will continue to be sent to incineration. However, this should not detract from the overall success of Kamikatsu’s achievements that have rightly been praised. Japanese waste management tends to be reliant on incineration, but Kamikatsu has followed a different path since 2001 as the town has reduced the volume of waste generated and increased the recycling rate. The Kamikatsu case could turn operationalize Zero Waste *via* three key principles: recycling and resource recovery through separation at source; cooperation between residents and government to reduce fiscal burden and finally, encouraging product manufacturers to rethink and redesign their product in a sustainable way.

Author contributions

Conceptualization, KS and TJ; Methodology, Writing—Review and Editing, KS and TJ. Both authors have read and agreed to the published version of the manuscript.

Acknowledgments

Thanks to all individuals that contributed to this research, including interview participants from Environmental Division Section of Kamikatsu Town, to the on-site interviewees (N and F) and lastly to R.N. for his guidance and hospitality during the author’s site visits.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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