

Overcoming the Not-in-My-Backyard Phenomenon in Waste Management: How Seoul Worked with a Citizens' Opposition Movement and Built Incineration Facilities to Dispose of the City's Waste, 1991–2013



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PROJECT DATA

ORGANIZATION: Seoul Metropolitan Government	COUNTRY: Republic of Korea
ORGANIZATION TYPE: City government	REGION: East Asia
DEVELOPMENT CHALLENGE: Waste management	PROJECT DURATION: 1991–2013
DELIVERY CHALLENGES: Stakeholder Engagement, Opposition or Lack of Consensus	AUTHOR Aham Han
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Executive Summary

Proper waste disposal is difficult, especially when no one wants disposal facilities in his or her neighborhood. A sound waste management plan has to consider both environmental sustainability and the wishes of the local community. In Seoul's case, it took two decades of efforts to develop consensus on building and operating incinerators in the Republic of Korea's capital city to dispose of residents' waste.

City officials held hundreds of open discussions to provide information on waste disposal and to listen to local residents' concerns. Incorporating citizens' demands, the government introduced stringent standards for pollutant emissions and related control systems, and it provided compensation to residents in the affected residential areas. At the same time that it built incinerators to dispose of the city's trash, the government introduced new energy and recycling policies that made energy production more efficient and reduced waste generation. Those policies made residents' heating and electricity bills more affordable and reduced the total amount of waste the city had to dispose of.

Between 1991 and 2005, the city built four waste incineration facilities located in areas that collectively housed about 13,000 residents. The facilities operate harmoniously within those communities under the voluntary watch of residents. By 2013, the incinerators processed almost 80 percent of Seoul's nonrecyclable

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municipal waste—a dramatic change compared with the late 1980s, when more than 90 percent of the city’s waste was dumped in a single landfill site.

Introduction

From 1960 to 1990, Korea experienced rapid industrialization and urbanization, inducing many citizens to move from other parts of the country to Seoul, the capital city. Seoul’s population more than quadrupled in those three decades, growing from 2.4 million to 10.6 million. That population growth, combined with a fast increase in national income and changes in consumption patterns, caused a steep increase in municipal waste.

Until the late 1970s, Seoul had no designated waste disposal sites, and municipal waste accumulated in residential properties and wastelands. To combat the problem, Seoul’s government opened the city’s first landfill in 1978. The landfill filled up faster than expected, however, and by 1986 it was over capacity.

The landfill was located on Nanji Island, a floodplain downstream of the Han River that flows through the heart of Seoul, and it was a blight on the city’s landscape. Not only was the Nanji landfill unpleasant to look at, but also it caused negative environmental effects, such as water contamination, foul odors, and the release of harmful gases. Environmental watchdogs raised the alarm, and many residents complained about the landfill and the problems it caused.

Against the backdrop of the public outcry, the central government built a new landfill site in Gimpo, on the outskirts of Seoul, and introduced a series of waste management policies focused on waste reduction.¹ The Seoul city government launched its first recycling system in 1978, and the national government followed with its own policy three years later. Few citizens recycled their waste, however, until the national government introduced its volume-based waste fee policy in 1995. This new policy was based on the “polluter pays” principle, and it required households and small businesses to dispose of any nonrecyclable waste in designated bags purchased from local governments (Kim 2019).

Increased recycling rates meant less total waste to dispose of, but even so, some unrecyclable waste still had to be dealt with. Policy makers began looking into the most efficient, safe, and sustainable way of disposing of waste using the two options available to them: landfills and incinerators.

Which of those two methods works best in a given situation depends largely on the economic and geographic conditions of the area. Jae-hyo Lee, a researcher at the Seoul Metropolitan Council, said incinerators were often a better option for countries such as Korea and especially for megacities such as Seoul, where the population is heavily concentrated in a limited and expensive land area.² Incineration reduces the total volume of waste, and an incinerator’s operation period is longer than that of a landfill. Moreover, the heat produced during incineration can be used as a source of energy, and the adverse environmental effects of incineration can be reduced by using pollution mitigation equipment to process the harmful substances (such as hydrogen chloride, sulfur oxide, nitrogen oxide, dust, dioxins, and heavy metals) that are released in the combustion gas that the incinerators generate.

When Haewon Lee took office as the mayor of Seoul at the beginning of 1991, his administration laid out a blueprint for a new waste management policy through its Basic Waste Treatment Plan, which included a transition from landfills to incineration (Seoul Metropolitan Government 1991). To inform its plan, the government consulted with countries that were facing waste management problems similar to those in Korea, such as Japan and some Western European countries. The government noticed that many countries favored a transition from landfills to incinerators and “waste to energy” as a technological solution for overall waste disposal (European Commission 2005; Japanese Ministry of the Environment 2014; Shabecoff 1987). The waste-to-energy idea of using the heat from incinerators as a source of district heating appealed to government officials, especially because it could be linked with urban development plans. There was high interest in energy efficiency after the first and second oil shocks in the 1970s and the restrictions on using coal briquettes that the government introduced in the 1980s. According to Woong-gi Song, the municipal government’s chief of waste facilities at the time, the advantages of incineration

¹ This new landfill in Gimpo, officially named the Sudokwon (metropolitan) landfill site, has treated waste from Seoul and its surrounding metropolitan area (Incheon and Gyeonggi Province) since February 10, 1992.

² Author interview with Jae-hyo Lee, Seoul, April 2, 2019.

observed in other countries were the main driver of the policy transition.³

To use thermal energy for district heating, the central government had renovated the Seoul Thermal Power Plant in 1987 as a cogeneration facility of combined heat and power. Building on that push for more efficient district heating, the Basic Waste Treatment Plan called for the government to build 11 incinerators at the same locations as district heating facilities, thereby allowing the city to turn its waste into energy. Although any waste that was not incinerable (such as hazardous materials and the ash from the incinerators) would still have to be sent to landfills, the new plan had the potential to reduce the overall landfilled waste by almost 85 percent.

Building and operating waste management facilities often upsets local residents, mainly because of concerns about negative health impacts caused by pollution generated during the treatment process. Seoul was not an exception; the plan to build incinerators faced intense opposition.

Delivery Challenges

The citizens of Seoul had witnessed the environmental problems caused by the Nanji landfill site and were also concerned about the harmful health effects of dioxins, which are highly toxic chemical compounds that can be produced during burning. Dioxins had become a major global health concern after Vietnam War veterans who were exposed to the dioxin-containing herbicide known as Agent Orange began to show side effects in the late 1970s. Dioxins can stay in the human body for several decades and can disturb reproductive organs and the immune system.⁴ News that the incinerators could emit dioxins spread quickly among Seoul's residents, and they organized an anti-incinerator movement when the government made public its plans to build incinerators.

Expecting some opposition to the plan, in early 1991 the government began hosting town hall meetings in the neighborhoods where it planned to build incinerators. At the meetings, officials explained details of the proposed plan in an effort to dispel inaccurate information circulating among local communities. However, the scale of the opposition was much larger than anticipated.

Although the government hosted more than a dozen meetings in each neighborhood of the first two proposed incinerator sites between 1991 and 1992, it made little headway in gaining the trust of the residents, and the conflict only intensified. Although residents understood the need for new waste disposal facilities, they did not budge an inch because of remaining health concerns. Thousands of residents squatted on the construction sites, protesting day and night. The demonstrations went on for as long as 34 consecutive days, and some residents even held nude protests. Protestors also formed a human chain to confine the officials to the protest sites until those officials backed down on their plans. "I felt threatened," recalled Song, who was confronted by protestors at several of the meetings. On numerous occasions, protests turned violent, with protestors destroying facilities and throwing stones at officials. As the situation worsened, the central government intervened by sending 5,000 riot police officers to protect the two sites.

The biggest challenge for the government was to gain the trust of protesting citizens and bring them to the negotiating table. Engaging the residents in dialogue required persistent persuasion based on the objective assessment of environmental effects. The government realized that an effective communication strategy would accelerate the negotiation process to facilitate the talks and to acknowledge the residents' demands while preserving the policy's objectives.

Tracing the Implementation Process

Getting Residents on Board and Building the First Incinerator

The mayor created a new office, dubbed "waste headquarters," and tasked it with developing plans to generate as much thermal energy as possible while keeping pollution levels low to ensure the safety of local residents. The mayor's office named the incineration facilities "resource recovery facilities" because they were designed to recover thermal energy from the mass burning of solid waste. "We also wanted to dilute the negative impression the residents had about incinerators by emphasizing that they could actually give back energy," said Gi-choon Kim, a section chief at waste headquarters

³ Author interview with Woong-gi Song, Seoul, April 2, 2019.

⁴ For more details on dioxins and their effects on human health, see WHO (2016).

at the time.⁵ The facilities aimed to produce electricity by using the heat created during the process of burning waste. The process would supply high-pressure steam for district heating.⁶

The plan to build 11 incineration facilities for Seoul's 22 districts, with 2 or 3 districts sharing each facility, did not come to fruition.⁷ Initially, the government was able to move forward with its plans at only three sites, all of which had been bought between 1977 and 1986 as part of a new urban development plan.⁸ Song said, "Selection of [the first] three sites in Yangcheon, Nowon, and Gangnam districts was possible only because they had been announced [when] the government bought the sites during the 1970s and 1980s under the former mayors' tentative plans to build incinerators, long before public concerns arose."

As the debate over the incinerators continued, public broadcasters in Korea began reporting on incinerators in operation around the globe. After seeing the prime-time coverage of incinerators in developed countries and hearing interviews with residents who lived near the facilities overseas, citizens in Seoul slowly began to temper their distrust of the government's claims. "The major media coverage . . . was a huge relief because it added objectivity to our claim," said Song. In line with the media's effort to deliver accurate information, the government sponsored field trips for residents to visit the foreign incineration facilities.

In Yangcheon, where the government began to construct its first resource recovery facility in December 1992, the government and the residents reached a consensus reflecting residents' demands in 1993. The government agreed to double the height of the facility's chimney from 75 meters to 150 meters, to develop green spaces, to construct a 3,000-square-meter community center, and to subsidize heating costs for local residents. That agreement laid the foundation for enacting the Promotion of Installation of Waste Disposal Facilities and Assistance to Adjacent Areas Act in 1995, which required the government to support residents near the facilities to promote their welfare. Construction of the Yangcheon facility was completed in February 1996. The

facility had two incinerators, each with the capacity to incinerate 200 tonnes of waste per day.

Additional site selection became increasingly difficult, especially after Seoul began choosing district chiefs by direct election in 1995. Previously, district chiefs had been appointed by the mayor. After the change, candidates running for the district chief position became more sensitive to the negative public sentiment about the incinerator issue.

Eventually, a fourth incinerator site, in Mapo district, was approved after proactive efforts from the district chief at the time. "He was really enthusiastic about convincing his residents of the potential benefits [of having an incinerator in the district], and even sponsored field trips to incinerators in developed countries," said Song.

Constructing Additional Incinerators and Fulfilling Residents' Demands

As citizens realized that the construction of incinerators was inevitable, they began using a two-track strategy of (a) demonstrations to keep pressure on the mayor and the National Assembly and (b) negotiations with government officials to resolve health concerns and demand compensation. "We could not stop, because we could not risk our children's health," recalled one resident who lived in a neighborhood close to the Yangcheon facility.⁹

The construction of the Nowon facility started at about the same time as that of the Yangcheon facility, in 1992. However, it took an additional year—until January 1997—to complete the work at Nowon. The Gangnam facility took seven years to build, from December 1994 to December 2001.

While the administration negotiated with residents, the legislative body of the Seoul Metropolitan Council enacted ordinances to engage citizens and to decide on appropriate compensation for people who lived near the proposed sites. The ordinances, which passed in January 1996, called for the formation of a citizens' committee for each facility. The committees encouraged local residents to engage in the governance of the facilities and helped the government devise compensation that fit local residents' demands.

The ordinances also mandated the government to create community support funds to finance compensation

5 Author interview with Gi-choon Kim, Seoul, April 2, 2019.

6 Details of the facilities can be found at their official website, <http://rrf.seoul.go.kr/>.

7 There were 22 administrative districts in Seoul from 1987 to 1995; the number increased to 25 on March 1, 1995.

8 For more details on the new urban development plan, see Yoo (2015).

9 Author interview with local resident, Seoul, April 12, 2019.

for affected communities. The compensation included heating cost exemptions, housing subsidies and home improvement programs, and welfare assistance for residents.¹⁰ Both municipal government and districts contributed to the funds. In the community support funds, the amount allocated for each committee depended on the amount of waste the facility disposed of.

When the council introduced heating cost exemption benefits, the policy immediately proved popular among residents because it significantly reduced their cost of living. The heating cost exemption played an instrumental role in bringing the two sides to an agreement. “If the facilities had not been designed to produce electricity and power for heating so that city could provide heating cost exemptions as an incentive for residents, we would have not reached an agreement,” Song said.

Local residents independently managed the community support funds. “Some communities started covering the monthly maintenance cost of their apartment complexes with the fund, and local residents were very happy,” said Byeong-woon Tak, the head of the Nowon committee.¹¹ “Most of the residents living in [the areas near the Nowon incinerator facility] were young couples. They did not want to move to other areas; they preferred to stay where they were and raise their kids. Daycares and kindergartens moved into those areas and they became some of the most child-friendly and popular places [to live],” he said.

Seoul’s government built and operated community centers next to each facility to improve the residential environments. The centers had gyms, swimming pools, libraries, classrooms, and concert halls that were used for various community and extracurricular activities. All the centers offered discounted rates for residents of the affected areas.

In 2000, the government began conducting annual health screenings of residents of the affected areas in collaboration with Yonsei University Hospital. That year and every year following, the hospital conducted studies on the health effects of the facilities by randomly selecting 80 to 100 residents in the affected area of each resource recovery facility and screening them for health issues.

As demanded by the residents, Seoul’s government made significant changes to its initial plan during the

construction period. Those changes reduced the number of facilities and each facility’s individual capacity. The capacities of the facilities in Nowon and Gangnam were reduced by half from what was originally planned. The incineration capacity of the Nowon facility was reduced from 1,600 to 800 tonnes of trash per day, and the capacity of the Gangnam facility was reduced from 1,800 to 900 tonnes. For both facilities, the adjustment took place in the middle of the construction stage, which necessitated redesigning the facilities.

To prevent such inefficiency, the government waited until it had an agreement with local residents on the capacity of the Mapo facility before selecting a company to construct the incinerators. Through negotiations with the local community, the government adjusted the planned capacity of the Mapo facility four times before finally settling on a capacity of 750 tonnes of waste per day, a large reduction from the originally planned capacity of 2,700 tonnes per day (Lee 2009). Because construction did not begin until the negotiations were complete, the construction time for the Mapo facility was shorter than that of the other facilities. Construction began in December 2001, and its three 250-tonne incinerators were completed in May 2005. When Mapo, the final facility, was complete, there were 4 resource recovery facilities operating in Seoul, a big reduction from the 11 facilities the government had originally planned to build.

During the negotiation process, some committees made temporary agreements with the government, some of which contained language stating that the facilities would accept waste only from the local district. Although the government pushed for the facilities to accept waste from neighboring districts as well, residents were strongly opposed to this change. As a result, the first three facilities built accepted waste only from their own districts. Other districts’ waste went to the landfill, along with the ash from the incinerators and any waste that could not be incinerated because of the type and toxicity of the material. The Mapo facility, however, treated waste from three neighboring districts following an agreement made with the community and district chief in 1997.

Expanding the Reach of the New Facilities

The resulting treatment capacity totaled only about 17 percent of the initial 11-facility plan and 44 percent of the adjusted 4-facility plan (a daily capacity of 2,850 tonnes

¹⁰ The affected areas were defined as residences within 300 meters of each; they totaled 12,537 households (3,413 households in Yangcheon, 6,190 households in Nowon, 2,934 households in Gangnam, and none in Mapo).

¹¹ Author interview with Byeong-woon Tak, Seoul, April 16, 2019.

compared with the initial 16,500 tonnes and the adjusted 6,500 tonnes). Despite the huge reduction in capacity, the Seoul government was able to manage its municipal waste by implementing waste reduction policies such as those governing the volume-based waste fee system, recycling facilities, and recycling of food garbage. With the combined policies at work, the overall municipal waste generated fell far below the amount that had been projected in the early 1990s.

The huge decrease in waste generation had an unintended side effect: a low level of use at the resource recovery facilities. For example, the Yangcheon facility was designed to accept 400 tonnes of waste from the Yangcheon area per day. However, the actual amount of waste generated in the area amounted to only 212 tonnes per day in 2002, about half of the facility's total capacity. The actual amount of waste in the Nowon area was only one-quarter of its facility's treatment capacity, and in Gangnam, the waste was only one-third. The Mapo facility, the only facility that treated the waste of multiple districts, operated at 60 percent of its treatment capacity. The combined operation rates remained at about one-third of the total treatment capacity until 2005.

Operating so far below capacity sometimes caused equipment to malfunction. When that happened, waste had to be sent to the landfill site 45 kilometers away from the city. Having to transport waste to the landfill created additional costs for the government. Those issues cost the government ₩10 billion (about US\$8.8 million at the time) annually, according to Lee (2009).

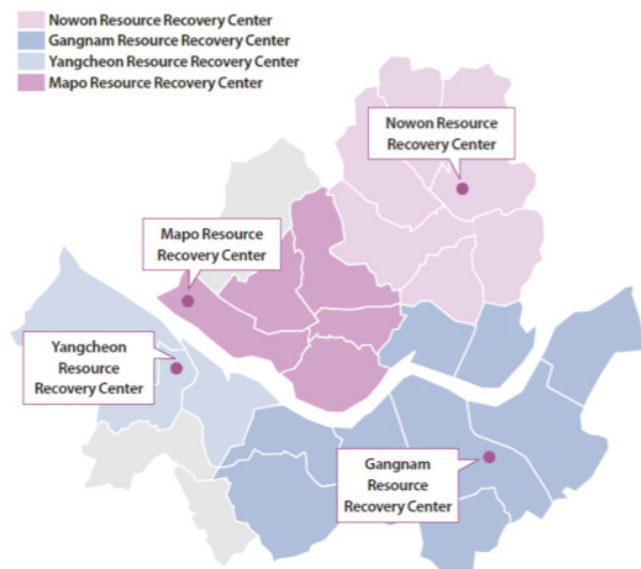
The government had recognized the problems in 2001, when it began meeting with the citizens' committees at the Yangcheon, Nowon, and Gangnam facilities to try to persuade residents to accept waste from neighboring districts. The process of getting the committees to consent was tough; vigorous demonstrations ensued. One major problem was that early agreements between the government and the committees had clauses such as "not to accept waste from other districts," which made it seem to residents as though the government was not sticking to its original promises. In total, the government held 450 meetings with the committees between 2001 and 2010 to try to reach agreements on accepting waste from neighboring districts.

Much of the negotiations revolved around adjusting compensatory benefits. For example, both parties agreed to increase the fee charged for waste from neighboring districts, a fee that accumulated in the community support

funds for the local residents. The city council revised the ordinance to reflect the deliberations. First, the revised ordinance gave residents living within 300 meters of the facility a discount of up to 70 percent on their electric bills. In Yangcheon, the committee agreed to charge two neighboring districts, Gangseo and Yeongdeungpo, ₩21,000 (about US\$17 at the time) for every tonne of waste and to subsidize living expenses for 3,413 affected households (Seoul Metropolitan Government 2014). The Nowon committee received ₩30,000 (about US\$25 at the time) per five tonnes of waste, a quarter of which was used to improve the residential environment for the 6,190 affected households. Some districts agreed to exchange different types of waste to be treated at facilities in other districts. For example, Nowon district agreed to incinerate waste from Dobong district in exchange for Dobong accepting Nowon's food waste. (The food waste treatment facility was located in Dobong.)

The committees also requested that the government replace the facilities' pollution prevention and monitoring equipment to better control dioxin emissions. In addition, the agreement made the emission standards of air pollutants 10 times more stringent than the national standard. The government monitored the air pollutants discharged from the facilities 24 hours a day through an automatic measurement system. The pollutant levels were posted in real time on an electric sign board outside the facility and on the government website. Pollutant levels that could not be measured in real time were posted on the website when they became available, which was three months after the measurements were taken. The government hired independent organizations to conduct additional measurements to ensure objectivity.

Residents were proactive in monitoring the waste that went to their local facilities. Six times each month, a voluntary group of three residents from each facility's district visited each neighboring district that sent waste to their facility to monitor the waste being sent. If the monitoring group found any inappropriate waste, such as food waste or toxic materials, it could issue a warning and ban the district in question from sending waste to the facility for one week. The fees collected from the user districts covered the cost of the monitoring activities, including the printing of warning stickers that volunteers put on improperly disposed of waste bags. According to Tak, the monitoring groups "improved the quality of waste and reduced overall pollution while promoting active resident participation."

FIGURE 1. LOCATIONS AND COVERAGE OF THE RESOURCE RECOVERY FACILITIES IN SEOUL

Source: Seoul Metropolitan Government 2015.

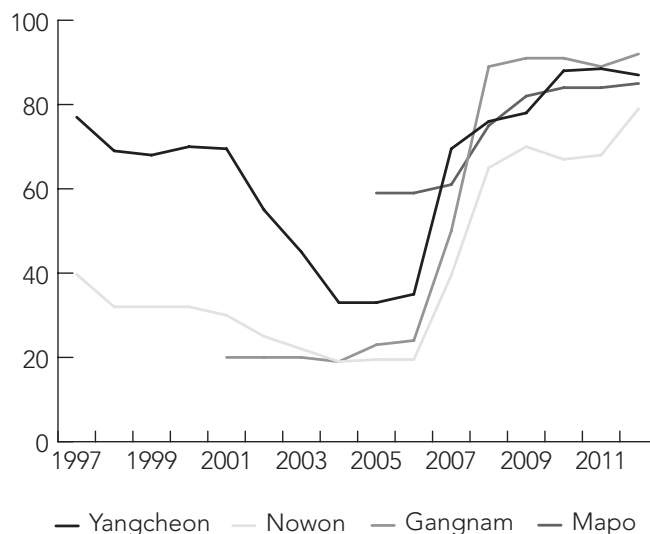
It took several years of negotiations for each committee and the government to reach an agreement on accepting waste from neighboring districts. The Gangnam facility started admitting waste from neighboring districts in May 2007, after having 160 meetings over five years. It took six years and 100 meetings before the Nowon facility began to accept neighboring districts' waste in July 2007.¹² Although the Mapo facility, the last of the four, planned to treat waste from three districts from its inception, it still took 40 meetings over a year to reach an agreement on the terms. In the Yangcheon facility, an agreement was finally reached in 2010 after 150 meetings over nine years.¹³ See figure 1 for the locations and coverage of the facilities.

Outcomes

Despite the not-in-my-backyard activism that involved hundreds of complaints and numerous violent protests, Seoul's government was able to reach agreements on the construction of four new incineration facilities and come to mutually beneficial agreements with local communities. The efforts to appease public health concerns yielded more stringent standards and controls

12 Nowon and Gangnam each added one district, in February 2012 (Dongdaemun) and May 2013 (Gwanak), respectively, which increased the number of user districts to 22 by May 2013.

13 The agreements between the Seoul government and each committee were reached on the following dates: May 7, 2007, in Gangnam; June 30, 2007, in Nowon; February 10, 2009, in Mapo; and May 10, 2010, in Yangcheon.

FIGURE 2. CHANGES IN OPERATION RATES BY FACILITIES

Sources: Based on Yoo and Ko 2006; Seoul Metropolitan Government 2006, 2013.

on pollutant emissions. As the government promised the residents, the levels of pollutants discharged from the facilities were maintained at a much lower level than the standards. During the early operation period between 1996 and 2005, new legislation was also introduced for participatory governance and compensation for residents.

The Seoul government had to bear the costs of operating the facilities well below capacity during their first years in operation. However, the facilities began to recover when they managed to convince residents to accept waste from multiple districts beginning in 2005. Adding more user districts drove a dramatic increase in operation rates (see figure 2). Operation rates were low until 2005, when more districts began using the facilities. By 2012, the number of districts sending waste to the facilities increased to 21 (out of 25 total districts in Seoul), and one more district was added in 2013. Of the remaining three districts, just one sent its waste to the landfill. One sent its waste to a neighboring province, and one had its own district incineration facility (which operated autonomously from the Seoul government).

When the facilities began accepting waste from multiple districts, Seoul significantly decreased the amount of waste it sent to its landfill. In 1991, 30,000 tonnes per day went to the landfill. By 2012, that figure was only 700 tonnes per day. By sending less waste to the

landfill, the government saved on transportation costs and extended the life of the landfill by at least a decade.¹⁴

The incinerators increased the city's energy generation capacity and provided thousands of houses with heating at reduced cost. By 2012, the energy generated by the Yangcheon facility covered 16 percent of the heating for 140,000 homes in the area. The facilities' energy coverage for heating reached 23 percent in Nowon and 27 percent in Gangnam, for 128,000 and 176,000 homes, respectively. The Mapo facility covered 57 percent of the heating for 70,000 homes from its energy (see Yoo 2015).

Lessons Learned

Linking Waste Management and Energy Production

During the planning stages to implement the Basic Waste Treatment Plan, the government's decision to link the installation of incinerators with urban development plans added justification for site selection and the shift in policy away from landfills. Because one of the major objectives of the policy was to use heat from the incinerators for district heating, the location of the incinerators had to match the location of the district heating facilities. By linking those plans, the government was able to promote the benefits of having an incinerator facility in the neighborhood, and the heating cost exemption benefit worked as a trump card in the negotiation process with residents.

Complementing Waste Disposal Policies with Waste Reduction Policies

While the incinerator facilities were being built, the government introduced the volume-based waste fee system and other recycling policies that resulted in a reduction in the amount of waste being produced city-wide. That reduction made it possible for the government to agree to citizens' demands to have lower-capacity facilities and later made it easier for the government to convince residents to accept waste from neighboring districts at their local facilities. The community support fund depended on the amount of waste treated at the

facilities, and as waste generation decreased, the local residents needed to accept more waste from neighboring districts to sustain the funding they received.

Building Trust with Citizens

Public health concerns raised by citizens were reasonable, and the government had an obligation to resolve the issues. Although the government had anticipated such concerns and prepared for open discussions through consultation sessions, the low level of trust in the government hindered any dialogue. The government slowly built trust with residents through transparency and by fulfilling its commitments. The government published every step of its plan and made environmental assessments from both government institutions and independent institutions public, which verified the claims the government made. Medical checkups and a visible display of the pollutants produced by the facilities gave the residents a sense of security. "[Now], the residents in the affected areas are not as worried about their health effects, especially after observing no significant changes in their health condition for the last twenty years," said Tak, the head of the Nowon committee. The government also raised the facilities' emission standards and replaced equipment at the facilities as the residents demanded. The transparency and response to residents' concerns were key in quelling the protest movement and keeping citizens at the negotiating table.

Engaging Citizens through Participatory Governance

Having a committee formed of the residents' representatives and professionals enabled residents to voice their demands more directly. This participatory governance mechanism gave the residents leverage to ask for compensatory benefits that fit their needs, which included heating cost exemptions, subsidies for rent and maintenance, and discounts for the use of community centers. The committees received funding from the city government and fees for accepting waste from neighboring districts. The financial support for the committees encouraged their activities, including voluntary monitoring of the waste being treated at their local facilities.

¹⁴ At the beginning of its operation in 1992, the Sudokwon (metropolitan) landfill site in Gimpo was estimated to run out of space by 2016. As a result of successful reduction of waste, however, the site extended its operation to 2025 and reserved room for an additional extension that is under discussion.

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