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Driving Citizen Behavioral Change for Green Growth Policies : Lessons from Korea

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Executive Summary

This report examines how the Republic of Korea achieved sustained citizen behavioral change in support of its green growth policies. It first provides an operational behavioral framework on which the government policies are formulated based on relevant literature, suggesting increasing the benefits of compliance, increasing the costs of non-compliance, and reducing the barriers to compliance contribute to behavioral change the policy desires from citizens. The report draws on three policy cases: the Volume-Based Waste Fee (VBWF) system, which aligns household economic incentives with waste reduction objectives through pay-as-you-throw pricing; the siting and operation of landfill and incineration facilities, which required overcoming entrenched NIMBY resistance through institutional trust-building, spatial reframing, and transparency; and congestion pricing at Seoul's Namsan tunnels, which achieved lasting shifts in urban travel behavior through targeted corridor pricing and complementary public transport investments. Together, these cases illustrate how behavioral change can be achieved through a combination of economic incentives, reduced behavioral barriers, social norm reinforcement, institutional trust, and effective communication strategies — offering transferable lessons for policymakers and practitioners across diverse country contexts.

I. Introduction

Effective public policy depends fundamentally on meaningful citizen participation across all stages of the policy cycle — a principle widely recognized in international governance frameworks and academic literature as essential for enhancing legitimacy, improving decision quality, and strengthening implementation outcomes (World Bank, 2012; OECD, 2022). This importance is particularly pronounced in environmental policymaking, where public participation helps reconcile technical solutions with societal values, reduces conflict, and increases policy acceptance.

Green growth policies place even greater demands on citizen engagement because they rely extensively on behavioral change at the individual and community levels. Unlike conventional policies centered on regulatory compliance, these policies require shifts in daily practices — such as waste sorting, acceptance of waste-related facilities, and transportation choices.

This report has been developed in response to recurring inquiries from clients participating in inbound Knowledge Exchange programs to the Republic of Korea. A frequently raised question is whether Korea's green growth policies can be realistically applied in other country contexts. Clients often note that **"such policies may be difficult to implement in our country,"** or ask, **"how did Korea succeed in getting its citizens on board?"** These questions underscore a broader challenge: beyond policy design, there is a need to understand the behavioral foundations that underpin successful implementation.

In this context, the experience of the Republic of Korea offers particularly relevant insights. The country's green growth policies were implemented during periods of rapid economic growth, urbanization, and rising environmental pressures, illustrating how behavioral change can be achieved not only through regulatory enforcement, but also through the gradual alignment of incentives, infrastructure, social norms, and public trust. This report aims to equip policymakers, municipal leaders, and World Bank Task Team Leaders with practical insights to design and implement policies that are not only technically sound, but also behaviorally effective and socially accepted.

To this end, the report first builds a conceptual integrated behavioral framework, then applies it through three case studies: Korea's volume-based waste fee system, the siting and operation of waste resource management facilities in the face of NIMBY responses, and congestion pricing at Seoul's Namsan tunnels — each illustrating how citizen behavioral change was actively induced and sustained across distinct institutional and behavioral contexts.

II. Conceptual Framework

This report adopts an integrated behavioral policy framework combining traditional incentive-based models of decision-making with insights from behavioral economics, including the roles of social norms, trust, and cognitive constraints. These perspectives are widely reflected in World Bank analytical frameworks, which emphasize that policy outcomes are shaped not only by formal rules and economic incentives but also by how individuals perceive, interpret, and respond to them in practice (World Bank, 2012, 2015, 2024).

In the context of green growth, effective policy design often requires instruments that go beyond regulatory compliance to actively induce and sustain behavioral change. Successful interventions typically combine financial incentives, institutional design, public communication, and trust-building measures to align individual behavior with broader environmental objectives.

1. Incentive-based Policy Logic: Cost–Benefit Dynamics

Incentive-based approaches assume that individuals respond to changes in the relative benefits and costs associated with different actions, evaluating alternatives and choosing those that maximize their utility (von Neumann & Morgenstern, 1944; Becker, 1968). This logic underpins a wide range of environmental policy instruments, particularly those relying on price-based incentives. In the case of Korea, policy interventions such as the Volume-Based Waste Fee (VBWF) system and congestion pricing were explicitly structured to operationalize this logic through three reinforcing policy levers:

> **Increasing the benefits of compliance:** Korean policy design frequently links compliance with tangible and visible improvements — such as cleaner neighborhoods and improved quality of life — reinforcing the perceived benefits of participation beyond purely financial gains.
>
> **Increasing the costs of non-compliance:** The introduction of user fees, fines, and pricing mechanisms raises the economic cost of environmentally harmful behavior. Effective public communication further strengthens social costs, including stigma and reputational loss associated

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with non-compliant behavior.

Reducing the costs of change (barriers): Governments invest in accessible infrastructure and service delivery to lower time, effort, and financial burdens, often using phased implementation strategies that allow households and communities to gradually adjust to new cost structures.

2. Behavioral Economics: Barriers, Norms, and Trust

While incentive-based approaches play a central role, evidence from behavioral economics shows that financial signals alone are often insufficient to drive sustained behavioral change. Three key mechanisms from recent World Bank behavioral work are particularly relevant:

a. Cost of Change (Barriers)

Even small barriers — such as inconvenience, complexity, or lack of access — can prevent behavior change even when incentives are aligned (World Bank, 2024). These frictions stem from bounded rationality, cognitive constraints, and habitual inertia (Simon, 1955; Kahneman & Tversky, 1979). From a policy perspective, reducing these barriers is essential: simplifying processes, improving access, and applying choice architecture — such as defaults and standardized systems — can lower the burden of compliance and improve behavioral uptake (Thaler & Sunstein, 2008). Capacity-building measures such as information provision and user education are also critical to address limited knowledge, skills, or awareness.

b. Social Norms

Social norms shape behavior by influencing perceptions of what is typical and socially acceptable. Behavioral theory distinguishes between descriptive norms (what others do) and injunctive norms (what others approve), both of which significantly affect decision-making (Cialdini, Kallgren, & Reno, 1991). Policy interventions can leverage norms through visibility, public communication, and peer comparison, gradually transforming externally imposed actions into shared social standards. As norm adoption spreads, compliance becomes self-reinforcing, reducing reliance on enforcement and lowering implementation costs.

c. Trust and Perceived Fairness

Trust and perceived fairness are key determinants of policy acceptance. Individuals are more likely to follow rules when they view them as legitimate, transparent, and equitably applied, even at personal cost (Tyler, 1990). Policies involving costs are particularly sensitive to fairness concerns: resistance is more likely when costs are perceived as unevenly distributed or processes as opaque. Conversely, procedural fairness — through transparency, participation, and accountability — strengthens compliance and reduces reliance on enforcement.

3. Integrated Behavioral Logic

Drawing on both theoretical perspectives, this report conceptualizes behavioral change as the outcome of an integrated policy approach in which incentives, barriers, norms, and trust interact dynamically. In operational terms, citizens are more likely to adopt a desired behavior when the perceived benefits of compliance — together with the financial and social consequences of non-compliance — outweigh the effort, inconvenience, and other costs of behavioral change.

Trust and perceived fairness operate as cross-cutting conditions that influence how citizens perceive benefits, barriers, and penalties. Higher levels of trust increase the perceived legitimacy of policy objectives and strengthen responsiveness to incentives, while low trust can amplify resistance and reduce compliance. Figure 1 summarizes these relationships across the three-pillar framework.

Figure 1. Integrated Conceptual Behavioral Framework

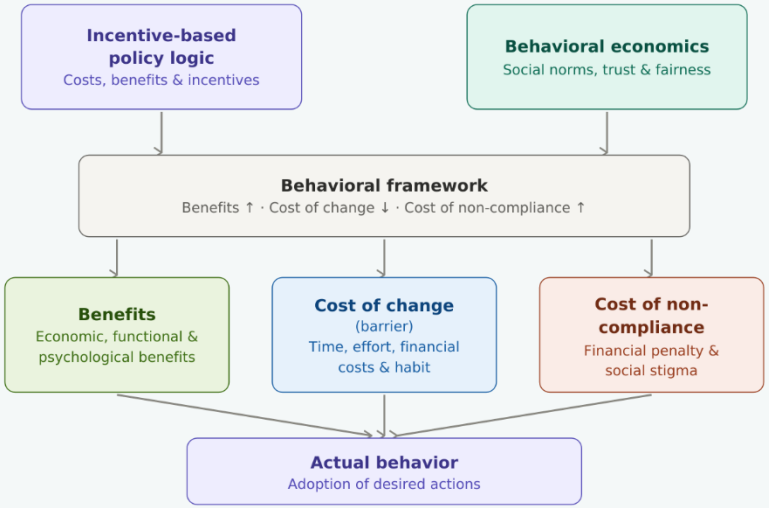


Figure 1. Integrated Conceptual Behavioral Framework

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Table 1. *Three Pillars and Behavioral Components of Policies*

Pillar	Definition	Behavioral Components	Policy Levers
1. Benefits of Compliance	Perceived gains from adopting the desired behavior (economic, environmental, or social)	Economic benefits Functional benefits (convenience, environmental improvement) Psychological & experiential benefits Social recognition and identity	Incentives and subsidies Public awareness campaigns Social norm messaging Co-benefit framing
2. Cost of Change (Barriers)	Total burden of adopting new behavior: effort, time, and behavioral frictions	Time, effort, financial costs Complexity and inconvenience Habit persistence Infrastructure gaps	Process simplification Infrastructure provision Default options / nudges Service accessibility improvements
3. Cost of Non-Compliance	Financial and social consequences of not adopting the desired behavior	Fees and pricing (e.g., PAYT) Fines and enforcement Social stigma; reputational cost Loss of benefits or access	Pricing mechanisms (PAYT, congestion tolls) Enforcement and penalties Visibility of rules; norm-based sanctions Social stigma and reputational loss

Table 2. *Implementation Categories and Policy Instruments Based on the Behavioral Framework*

Pillar	Objective	Implementation Category	Specific Methods	Policy Instruments
1. Benefits of Compliance	Increase perceived value of adopting the behavior	**Incentive Enhancement**	Subsidies / rebates; Financial rewards; Reduced service fees; Gamification	Fiscal incentives, tax credits
		Co-Benefit Framing	Link to health, cost savings, convenience; Highlight local economic benefits	Communication campaigns
		Social Recognition & Norms	Public recognition programs; Community rankings; "Green citizen" campaigns	Information norm-based tools
		Salience & Feedback	Real-time usage data; Visible metrics (e.g., waste reduction dashboards)	Digital tools, smart systems
2. Cost of Change (Barriers)	Reduce effort, inconvenience, and structural constraints	**Process Simplification**	Streamlined procedures; Standardized systems; Clear instructions	Regulatory design
		Infrastructure Provision	Physical infrastructure (bins, recycling facilities); Service accessibility	Public investment
		Default & Nudge Design	Easy-to-follow defaults; Pre-set options; Behavioral prompts	Choice architecture
		Access & Convenience Improvement	Increased service frequency; Proximity of facilities; Reduced transaction costs	Service delivery reform
		Capacity Building	Education and training; User guidance systems	Public outreach
3. Cost of Non-Compliance	Increase consequences of not adopting behavior	**Pricing Mechanisms**	Usage-based pricing; Congestion charges; Carbon pricing	Market-based instruments
		Penalties & Enforcement	Fines and inspections; Monitoring systems	Legal enforcement
		Visibility of Enforcement	Public signage; Transparent rules; Enforcement campaigns	Regulatory communication
		Norm-Based Pressure	Public disclosure; Community monitoring; Social accountability	Social policy tools
		Loss of Benefits	Withdrawal of subsidies or access	Conditional incentives

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The remainder of this report presents a detailed analysis of three policy cases, using the integrated behavioral framework outlined above to examine how citizen engagement and behavioral change were actively induced and sustained. The selected cases — Korea's volume-based waste fee system, the siting and operation of waste resource management facilities in the face of NIMBY responses, and congestion pricing in Seoul's Namsan tunnels — represent highly successful and policy-relevant interventions, each situated within distinct institutional and behavioral contexts.

These cases were deliberately chosen for their analytical representativeness and diversity. Together, they capture a broad spectrum of green growth challenges: (1) large-scale household behavior change through economic incentives and norm formation (waste management), (2) collective acceptance and trust-building in the context of locally concentrated costs and public resistance (waste facility siting), and (3) individual behavioral adjustment in mobility choices through pricing mechanisms and perceived fairness (congestion pricing). Each case demonstrates how the Government of Korea combined incentives, infrastructure, communication, and governance mechanisms to align citizen behavior with policy objectives under different conditions.

By examining these cases, the report seeks to distill practical lessons on how policies can be designed not only to provide the right incentives, but also to address cost of change (barriers), leverage social norms, and build trust. In doing so, the analysis aims to provide policymakers and practitioners with actionable insights into how successful behavioral change can be achieved across varying policy domains and implementation environments.

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CASE STUDY 1

Waste Management System Reform: Volume-Based Waste Fee (VBWF)

Objective: Reduce waste generation and increase recycling through the 'polluter pays' principle

Case Summary

In response to a severe waste management crisis in the early 1990s, Korea implemented the Volume-Based Waste Fee (VBWF) system, grounded in the "polluter pays" principle. The policy addressed rising waste generation, low cost recovery, and weak recycling outcomes by aligning household behavior with environmental and fiscal objectives. The reform evolved through three sequential phases: pay-as-you-throw pricing through standardized garbage bags; EPR shifting accountability to producers; and food waste separation with weight-based pricing and RFID-enabled bins. These combined financial incentives, convenience-enhancing infrastructure, and social norm reinforcement with penalties for non-compliance, achieving significant reductions in waste generation, substantial increases in recycling rates, and long-term behavioral change among households.



1. Background and Challenges

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In the early 1990s, the Republic of Korea faced a severe "garbage crisis" driven by rapid economic growth and urban consumption. By 1992, daily waste generation had reached 75,096 tons, with an annual growth rate of 7–10% since 1988. Despite rising waste volumes, the existing system was fiscally unsustainable: residents covered only 9% of total waste management costs, while local governments bore the majority of financial burdens. By 1994, disposal costs had surged to 962 billion KRW, compared to only 142.8 billion KRW in collected fees, resulting in a fiscal self-reliance rate of just 15%.

At the same time, recycling policies proved ineffective. A mandatory waste separation system introduced in 1991 failed due to insufficient infrastructure, unclear standards, weak market demand for recyclables, and public skepticism. A key structural issue was the flat fee system, which charged households based on housing size or property tax rather than actual waste generation — disconnecting individual behavior from environmental and fiscal outcomes.

As a result, three core policy problems emerged: (1) the absence of household incentives to reduce or sort waste, (2) rapidly increasing waste management costs, and (3) political infeasibility of disposal infrastructure expansion. In response, the government sought to fundamentally restructure the system by introducing a 'polluters-pay' mechanism that would reduce waste generation and allocate costs directly to waste producers.

2. Policy Design

The Volume-Based Waste Fee (VBWF) system was designed as a sequenced behavioral policy package, combining economic incentives, regulatory frameworks, and infrastructure expansion into an integrated waste management system. Rather than a single intervention, the policy evolved through three interlinked phases: (1) pay-as-you-throw (PAYT) pricing for mixed waste, (2) expansion of recycling through Extended Producer Responsibility (EPR), and (3) separation and treatment of food waste.

Phase 1: VBWF / PAYT — Price Signal for Mixed Waste

Core Logic: Waste disposal becomes a marginal-cost decision | Mechanism: Volume-based pricing through standardized bags

Year	Policy Development	Key Features
1986	Waste Management Act	Established legal foundation for waste categorization and management responsibilities
1992	Act on Promoting Saving and Recycling of Resources	Introduced waste charges, restriction on disposables, and Deposit-Refund System
1994	Pilot projects in 33 cities	Tested PAYT across different urban contexts; NGO-led evaluation improved public acceptance
1995	Nationwide VBWF implementation	Standardized government-designated bags with fees linked to volume, creating direct financial incentives
1999–2002	Legal enforcement and rural expansion	Penalties for improper disposal; adaptation for rural areas to prevent illegal dumping

Phase 2: Recycling Expansion & EPR — System-Level Adjustment

Core Logic: Shift responsibility upstream to producers | Mechanism: Align production incentives with recycling outcomes

Year	Policy Development	Key Features
2002	EPR pilot project	Targeted home appliances and fluorescent bulbs; forced manufacturers to improve product design
2003	Nationwide EPR introduction	Mandatory recycling quotas for producers; monitored by KECO
2016	Fundamental Act of Resource Circulation	Strengthened circular economy approach; reduced landfill/incineration reliance

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Phase 3: Food Waste Separation — Measurement Refinement

Core Logic: Improve measurement accuracy and address externalities | Mechanism: Weight-based pricing, digital monitoring, resource recovery

Year	Policy Development	Key Features
1997	Mandatory separation for large generators	Initial food waste diversion in Seoul-Gyeonggi region, preventing wet waste entering landfills
2003	Weight-based charging	Food waste recycling increased from 9.8% to 57.7% between 1997 and 2003
2005	Complete landfill ban in urban areas	Full separation and recycling mandate implemented nationwide
2013	Nationwide Master Plan for Food Waste	PAYT-style food waste systems and stricter treatment regulations standardized nationally
2010s	RFID-based smart bins	Real-time measurement and user-based charging; machines automatically track disposal amounts

Figure 1. Failure and Success Mechanism of Policy Design

FAILURE MECHANISM	SUCCESS MECHANISM
Limited public acceptance & infrastructure gaps	*Behavioral policy package*
Public resistance to disposal fees Households accustomed to flat-fee systems resisted paying directly for waste disposal and were unfamiliar with mandatory separation requirements.	**Phased pilot & public education** 33-city pilot programs tested the system before nationwide rollout, while sustained education campaigns built trust and reduced public resistance.
Illegal dumping risk Volume-based fees created financial incentives to avoid charges through improper disposal, particularly in low-surveillance rural and peri-urban areas.	**Community enforcement & monitoring** Honorary VBWF squads, multi-level government oversight, legal penalties, and village-based fee systems raised the expected cost of non-compliance.
Underdeveloped recycling infrastructure Early mandatory separation policies failed because collection, processing, and recycling systems were inadequate — increased sorting could not translate into actual resource recovery.	**EPR system & infrastructure investment** Extended Producer Responsibility shifted accountability upstream to manufacturers, creating stable recycling markets and expanding processing capacity.
Measurement challenges for food waste Volume-based bag pricing was poorly suited to food waste given its high moisture content, making accurate and fair pricing technically difficult.	**RFID technology & weight-based pricing** Smart RFID bins enabled real-time measurement, weight-based charging, and user-specific feedback — improving accuracy and reinforcing behavioral change.

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3. Behavioral Mechanisms

The effectiveness of Korea's VBWF system lies in its ability to influence citizen behavior through a combination of economic incentives, reduced behavioral frictions, and social and psychological drivers. The system reflects an integrated behavioral logic by simultaneously targeting the cost of non-compliance, behavioral change, and the perceived benefits of compliance.

Benefits of Compliance

At the core of this approach was incentive enhancement through volume-based pricing. By tying disposal costs directly to the amount of waste generated via standardized bags, the system transformed waste disposal into a marginal cost decision. This was reinforced by a food waste reduction point system, through which households earned points redeemable for taxes and fees, further strengthening the financial rationale for compliance.

The government also deployed co-benefit framing through media campaigns that emphasized cleaner living environments and quantified economic gains from waste reduction, increasing the perceived value of participation beyond mere cost savings. Social recognition and norm reinforcement complemented financial signals through civic group engagement and community-based monitoring. RFID-based systems provided salience and feedback by making individual waste generation immediately measurable, linking behavior directly to incentives.

Cost of Change (Barriers)

Process simplification was central to reducing behavioral barriers. Standardized garbage bags created a clear and uniform disposal system, and by making them widely available through grocery and convenience stores, the government allowed the new behavior to integrate naturally into daily routines. Infrastructure investments reinforced this convenience: RFID-based food waste bins streamlined disposal, and standardized signage improved intuitive sorting in high-density housing.

Default and nudge design reduced friction by accounting for differences in housing types — context-specific disposal systems were introduced for different residential environments, including bins in detached housing areas to reduce bag waste and discourage illegal dumping. Access and convenience were expanded through the growth of recycling centers and diversified collection schedules. Capacity building through public guidance and a pilot-testing approach allowed the system to be refined before nationwide rollout.

Costs of Non-Compliance

Legal penalties formed the foundation of deterrence, with fines for illegal dumping under the Waste Management Act raising the expected cost of non-compliant behavior. Enforcement was made more visible through multi-level monitoring by the Ministry of Environment and local governments, and through community-based monitoring via civic "honorary VBWF policy squads" — trained residents who actively observed and reported violations.

In rural areas, norm-based pressure served as an additional enforcement layer. The rural VBWF system established community-level fee mechanisms through village funds, creating shared responsibility. The designation of waste supervisors and self-monitoring mechanisms meant non-compliance became socially visible and actively discouraged through peer accountability. Finally, the removal of public waste bins and redesign of illegal dumping sites reduced the opportunity for improper disposal.

4. Impacts

Environmental

Following the introduction of PAYT, waste generation in Seoul decreased by 8% in the first year, while recycling rates increased by over 30%. Over 1994–2004, municipal solid waste decreased by 13.96%, and recycling rates rose from 15.4% to 49.2%. Food waste recycling increased from 2% in 1995 to 95% today, with outputs converted into feed, compost, and biogas. Overall, these changes contributed to recycling 30 million tons of materials and reducing approximately 11 million tons of CO_2 emissions.

Economic

The VBWF system improved cost recovery by linking waste generation to direct pricing. The number of households contributing to waste management fees doubled from 1.69 million to 2.97 million, reducing fiscal pressure on municipalities. The introduction of EPR generated an estimated 12 trillion KRW (approximately USD 9 billion) while strengthening recycling markets and creating measurable economic returns from waste reduction.

Social

The policy fundamentally transformed household behavior and social norms around waste management. PAYT internalized the cost of waste, while EPR reframed waste management as a shared responsibility between consumers and producers. Over time, these changes became embedded in daily life, with increased use of reusable products and more consistent recycling behavior. Food waste policies further reinforced behavioral change by shaping consumption habits and reducing waste at the source.

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5. Communication Strategies

Because the VBWF system required households to change everyday disposal routines, communication was essential for reducing confusion, increasing acceptance, and reinforcing waste reduction as a shared social norm. The government's strategy combined broad environmental messaging, direct instruction on the new fee and sorting rules, civic participation, and behavior-specific campaigns.

AWARENESS & INFORMATION MECHANISMS

① 1992 — Waste-Reduction Awareness Campaign
Before the nationwide rollout, KOBACO public service ads used co-benefit framing — communicating that reducing household waste creates a cleaner living environment. This early campaign established the normative groundwork for the policy transition.

② 1994 — Policy Introduction and Co-Benefit Framing
Government newsreels introduced the waste-per-volume concept under the message "less waste, more recycling." By linking the new pricing structure to national goals, this campaign prepared citizens to shift from flat-fee expectations to volume-based thinking.

③ 1995 — Nationwide Rollout Guidance
Official government notices, newspaper coverage, and television news communicated the new VBWF rules directly. The public response revealed that a one-time announcement was insufficient, underscoring the need for sustained and repeated public education.

BEHAVIORAL & SALIENCE MECHANISMS

④ 1997 — Incentive-Based Behavioral Messaging
A KOBACO advertisement introduced one of the campaign's most salient framings — "throwing away waste is like throwing away money" — visually connecting disposal behavior with economic loss. This message reinforced the core logic of the VBWF system.

⑤ 2004 — Sorting Guidance and Behavioral Instruction
A further KOBACO advertisement shifted focus from general awareness to practical instruction, communicating that waste must be separated correctly to be recycled. By providing concrete behavioral guidance on proper separation, this campaign moved citizens from intention to action.

⑥ 2010s+ — Digital Feedback and Smart Disposal Communication
As RFID-based food waste bins and user-based charging were introduced, public communication evolved to reflect that food waste can be measured, reduced, and rewarded. Guidance around smart disposal and point-based programs increased the salience of individual waste generation.

6. Key Barriers to Implementation and Policy Responses

Limited public acceptability
Households accustomed to flat-fee waste collection resisted paying directly for disposal and were unfamiliar with separation requirements. The government responded with extensive public education campaigns, pilot projects in 33 cities, and media campaigns emphasizing environmental and economic benefits. Civic groups were brought into the evaluation process, building public trust and broadening acceptance.

Illegal dumping and non-compliance
Volume-based fees created financial incentives for improper disposal, particularly in rural and low-surveillance areas. The government introduced legal penalties, expanded local government monitoring, and deployed community-based monitoring teams, honorary VBWF squads, and environmental redesign of known dumping hotspots.

Insufficient recycling infrastructure
Early separation policies failed because collection, processing, and recycling systems were underdeveloped — increased sorting could not translate into environmental gains without adequate treatment capacity. The government expanded recycling facilities and introduced the EPR system, which shifted accountability to manufacturers and created more stable demand for recycling infrastructure.

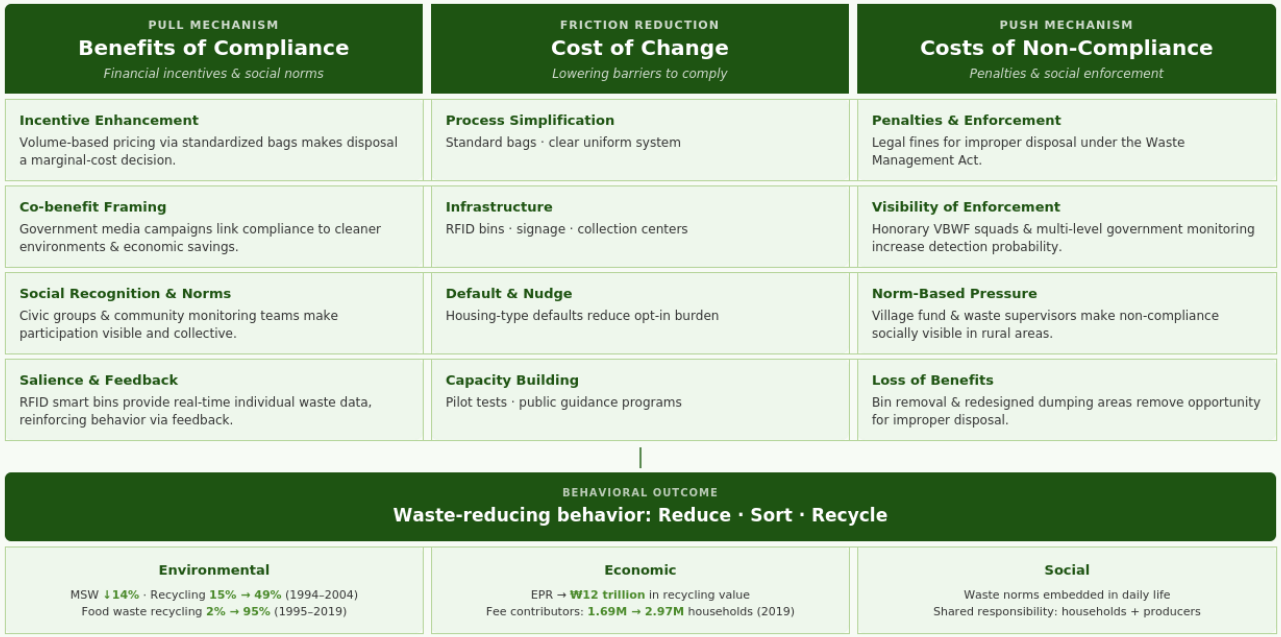
Equity and practicality concerns
Different housing types faced distinct disposal challenges, and uniform implementation risked imposing unequal burdens. Authorities adapted the system to local contexts: alternative collection arrangements for rural areas, community-based fee mechanisms, public waste facilities, and diversified collection schedules. Wide availability of standardized bags through everyday retail reduced inconvenience.

Administrative and measurement challenges
Accurately measuring waste generation was technically demanding in dense urban environments, and volume-based pricing was poorly suited to food waste given its high moisture content. The government progressively refined measurement systems, introducing separate food-waste collection streams, weight-based charging, and RFID-enabled smart bins.

Long-term sustainability of behavioral change
Initial reductions risked eroding as households adapted without continuing to reduce output. Korea addressed this through continuous policy updating, incorporating EPR expansion, food-waste recycling mandates, digital monitoring technologies, targeted incentive programs, and circular-economy legislation.

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Figure 2. Behavioral Mechanism of Korea's VBWF System: Failure and Success Dynamics



7. Transferable Lessons

Pilot before you scale: Korea's policy demonstrates that successful implementation is often a process of trial and error. The government tested the VBWF through feasibility studies and pilot programs in 33 cities, making improvements before nationwide rollout. This approach allowed the government to identify barriers, refine design, and build public acceptance before full-scale deployment.

Engage stakeholders early: Civic groups that initially opposed the policy were involved in evaluating and monitoring pilot projects, helping to build trust and gain public support. Inclusive participation converted potential opponents into implementation partners and significantly improved policy legitimacy.

Make compliance convenient: Waste separation was made convenient through widely available standardized bags, context-specific infrastructure, and digital monitoring tools. Reducing behavioral barriers — effort, complexity, and inconvenience — was as important as increasing the financial incentives for compliance.

Build institutional capacity: Local governments required sufficient resources and staff for effective implementation, while national ministries provided financial support, political backing, and a clear legal framework. Strong institutional foundations were essential for sustaining behavioral change over the long term.

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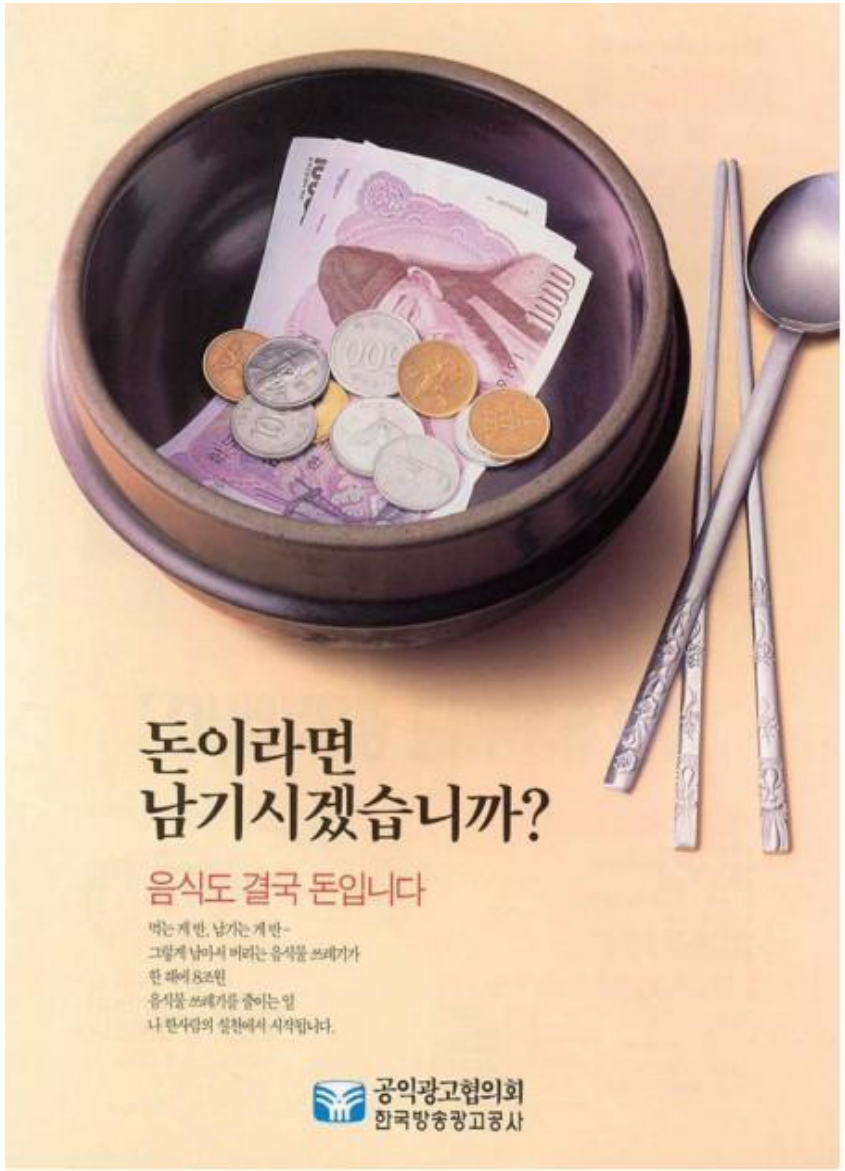
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CASE STUDY 2

Waste Facility Siting and Community Acceptance: Mapo Resource Recovery Facility (Seoul)

Objective: Secure public acceptance for essential waste infrastructure through behavioral incentives, radical transparency, and procedural legitimacy

Case Summary

In response to a decades-long waste governance crisis, Seoul implemented an integrated behavioral policy package to secure community acceptance for landfill and incineration siting. Facing the institutional collapse triggered by top-down DAD (Decide-Announce-Defend) mandates, entrenched System 1 sensory fears from hydrogen sulfide leaks, and a total gridlock in establishing new waste infrastructure, the government restructured its approach through three sequential phases: macro-political and financial incentive restructuring, spatial reframing and targeted transparency, and statutory enforcement with procedural legitimacy. These phases combined direct financial compensation (300B KRW upfront fund; 700k–770k KRW/YR heating subsidies), the transformation of the Mapo incinerator into a community eco-leisure complex, 24/7 real-time CEMS dioxin disclosure on highway LED boards, and legally empowered Resident Inspectors with state salaries. Together, these measures achieved 0.00 ng-TEQ/Nm³ dioxin emissions, a 92.2% reduction in direct landfill inflow following the January 2026 ban, and over 600 daily leisure users at the Mapo facility — demonstrating that behavioral reframing can dismantle long-standing NIMBY stigmas when anchored in institutional trust, co-benefit framing, and democratic rule-of-law protocols.

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1. Background and Challenges

In the early 1990s, the Seoul Metropolitan Area (SMA) faced an imminent waste management crisis as its primary disposal vector, the Nanjido open-air landfill in Mapo-gu, neared absolute capacity. From 1978 until its closure in 1993, Nanjido accumulated over 92 million cubic meters of unsorted municipal solid waste, reaching an unstable height of 95 meters. Operating with zero environmental safeguards, the site generated massive atmospheric methane plumes, spontaneous surface fires, and heavy-metal leachate that drained directly into the Han River. This physical degradation left a profound spatial and psychological stigma on Mapo-gu residents, who perceived their district as an environmental sacrifice zone.

To decentralize this burden, the government inaugurated the 1,541-hectare Sudokwon Landfill Complex in Incheon in February 1992. However, in late 1992, immediately following its opening, the central government unilaterally reversed its statutory agreements with local residents by permitting the inflow of unmonitored heavy industrial and construction waste alongside household refuse to offset regional processing shortfalls. This top-down enforcement shattered institutional credibility.

Compounding this distrust, environmental risk perceptions became hyper-activated through intuitive, emotionally driven System 1 heuristic thinking. During the mid-2011 Sudokwon Landfill gas leaks, failed desulfurization system overhauls led to widespread hydrogen sulfide releases, triggering 982 documented odor complaints within a 30-day window. This empirical crisis demonstrated that rigorous scientific data cannot easily overcome ingrained sensory fears. As a result, three core policy problems emerged: (1) a complete collapse of public trust due to historical policy breaches, (2) the dominance of System 1 sensory fear over objective scientific safety metrics, and (3) a total gridlock in establishing new regional waste infrastructure.

In response, the government sought to restructure waste governance by shifting from top-down administrative mandates to an integrated behavioral intervention framework that balances structural transparency, localized economic incentives, and procedural legitimacy.

2. Policy Design

The waste facility governance system was designed as a sequenced behavioral policy package, combining economic restructuring, technological transparency, and grassroots regulatory oversight into an integrated siting strategy. Rather than a single administrative intervention, the policy evolved through three interlinked phases: (1) macro-political and financial incentive restructuring, (2) spatial reframing and targeted information transparency, and (3) statutory regulatory enforcement and procedural consensus building.

Phase 1: Macro-Political and Market Incentive Restructuring (Financial Attractiveness)

Core Logic: re-engineering the market framework to alter the immediate cost-benefit calculus of host communities and private landholders
Mechanism: downscaling spatial criteria and offering unprecedented financial capitalizations to bypass traditional municipal gatekeeping

Year	Policy Development	Key Features
1992	Sudokwon Operational Commencement	Established regional landfill framework for the SMA; initiated the traditional "Decide-Announce-Defend" (DAD) administrative approach.
2015	The Quadripartite Agreement	An elite-driven macro-political pact signed by Seoul, Incheon, Gyeonggi, and the Ministry to extend landfill usage via large-scale financial transfers.
Oct-2025	4th Replacement Site Bidding Overhaul	Reduced required area to 500,000 m², eased municipal consent rules, allowed private corporate bids, and guaranteed a 300 billion KRW upfront fund.

Phase 2: Spatial Reframing and Targeted Transparency (Information Salience)

Core Logic: transforming the cognitive perception of a despised LULU into an indispensable community asset by neutralizing System 1 sensory fears
Mechanism: combining continuous, unedited automated emission disclosure with high-value municipal public amenities

Year	Policy Development	Key Features
2005	Mapo Facility Asset Reframing	Rebranded the incinerator as the "Mapo Resource Recovery Facility"; physically integrated it with the World Cup Eco-Park.
2005	CleanSys Network Deployment	Installed Continuous Emission Monitoring Systems (CEMS) inside stacks to broadcast real-time pollutant levels 24/7 on massive highway LED boards.
Mid-2010s	Infrastructure Expansion	Integrated the Mapo facility with cheap district heating for 250,000 homes and a luxury community sauna (4,000 KRW entry fee).

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Phase 3: Statutory Enforcement and Procedural Legitimacy (Regulatory Shocks & Limits)

Core Logic: accelerating circular resource diversion while formalizing strict democratic rule-of-law protocols to ensure institutional trust
Mechanism: enforcing outright physical bans on direct landfilling while embedding resident representatives into active oversight roles

Year	Policy Development	Key Features
Late 2010s	Resident Inspector Ordinance	Passed local statutes granting resident representatives' full legal authority and state salaries to run unannounced technical audits.
Jan-2026	Direct Landfill Ban Enforcement	Statutory prohibition of raw household waste direct landfilling under the amended Waste Management Act, slashing landfill volumes.
Mar-2026	Judicial Siting Cancellation	Administrative appellate court completely terminated Seoul's new 1,000-ton Mapo incinerator plan due to a 10/11 member quorum deficit.

Figure 3. Failure and Success Mechanism of Policy Design



3. Behavioral Mechanisms

The effectiveness of South Korea's waste facility siting governance lies in its ability to influence citizen behavior through a combination of economic incentives, reduced behavioral frictions, and social and psychological drivers. Siting-related behaviors are shaped by the interaction between external incentives and internal motivations, including institutional trust, perceived equity, and the mitigation of sensory anxiety. The governance system reflects this integrated behavioral logic by simultaneously targeting the benefits of compliance, the cost of behavioral change, and the costs of non-compliance.

Benefits of Compliance

The effectiveness of the siting strategy relied on strengthening the perceived benefits of compliance, ensuring that households recognized clear, immediate, and localized value in accepting waste infrastructure. By linking facility operations directly to household-level financial rewards, highlighting real-time safety data, and introducing spatial benefits, the system increased the attractiveness of the facility and motivated residents to shift from physical avoidance to active integration. At the core of this approach was incentive enhancement through direct financial compensation. Households within the 300-meter impact zone received annual

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heating cost subsidies ranging from 700,000 to 770,000 KRW, and local entrepreneurs were offered 1.0% ultra-low interest small-business loans. Together, these measures altered the immediate financial cost-benefit calculus for individual residents, ensuring that tangible household utility visibly outpaced the perceived cost of proximity to the facility.

Co-benefit framing extended these incentives into the realm of daily life and community identity. Toxic landfills and incinerators were rebranded and physically transformed into eco-leisure complexes — most notably "Dreampark," a 2.9 million m² space featuring a public 36-hole golf course — while affordable public saunas and sports centers were installed within the facility grounds. This repositioning rewired residents' daily physical habits, transforming a stigmatized LULU (Locally Unwanted Land Use) into an essential community asset utilized voluntarily by families and students alike. Social recognition and norm reinforcement complemented these material benefits. Neighborhood representatives were formally integrated into the municipal regulatory apparatus as paid, legally authorized "Resident Inspectors," granting them institutional standing and real oversight authority. This mechanism leveraged trusted peer messengers to deliver safety validation from within the community itself, gradually shifting collective social norms from defensive resistance toward collaborative oversight.

Finally, salience and feedback mechanisms addressed lingering perceptual fears through radical transparency. The CleanSys automated display system broadcast unedited emission statistics — including readings such as "Dioxin: 0.00%" — continuously, 24 hours a day on urban LED boards. This provision of effortless, real-time data served as an immediate cognitive shortcut aligned with the EAST framework's principles of 'Easy' and 'Timely' delivery, directly intercepting confirmation bias and neutralizing the System 1 sensory fear that proximity to waste facilities typically provokes.

Cost of Change

The effectiveness of the system relied on reducing the practical, cognitive, and behavioral barriers associated with environmental monitoring and risk communication. These design choices lowered the cognitive load, allowing citizens to easily process technical safety data and participate in governance, which significantly lowered public resistance. At the foundation of this approach was process simplification through radical distillation of technical information. Complex, multi-page epidemiological reports were converted into a single, high-visibility public indicator — "Dioxin 0%" — displayed prominently on a giant highway board. This translation bypassed the demanding System 2 mental processing that technical documents typically require, dramatically reducing the cognitive effort citizens needed to expend in order to independently verify the facility’s safety record.

Infrastructure provision further reduced informational barriers by addressing the structural gap between state authorities and civil society. High-end filtering systems and Continuous Emissions Monitoring Systems (CEMS) telemetry were constructed and directly connected to public communication networks, streamlining data delivery in real time. This removed the information asymmetry that had previously allowed public distrust to persist, ensuring that citizens had access to the same emissions data as regulators without needing to actively seek it out.

Finally, default and nudge design embedded transparency into the routine operation of the facility itself. The Resident Inspector framework was structured so that community members functioned as the default gatekeepers for facility data verification, rather than passive recipients of government assurances. By making citizen oversight the baseline operational norm, the system restored democratic accountability at the grassroots level and reduced the behavioral effort required for meaningful public participation.

Costs of Non-Compliance

The system reinforces policy stability and institutional integrity by increasing the legal, administrative, and political costs of procedural violations and uncoordinated enforcement. Together, these design elements reinforce that technical metrics cannot bypass democratic rule-of-law protocols, creating a strong deterrence against top-down administrative shortcuts.

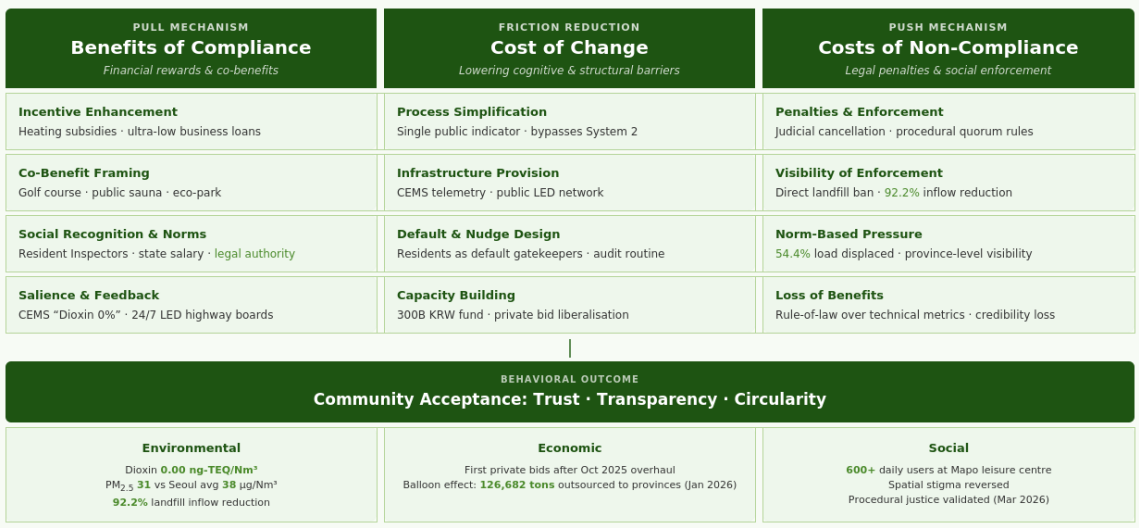
The most direct expression of this deterrence was penalties and enforcement through judicial intervention. Large-scale infrastructure plans were subject to court cancellation when statutory administrative quorums were breached — most notably in the March 2026 Mapo ruling — establishing an unambiguous precedent that procedural legitimacy is non-negotiable. This forced state actors to strictly adhere to regulatory protocols, signaling that technical or political rationales cannot substitute for due process in waste facility governance.

The visibility of enforcement consequences was further demonstrated through the premature and uncoordinated execution of the January 2026 direct landfill ban, which proceeded before localized municipal incineration networks had been fully completed. Rather than concealing this policy misalignment, its public exposure increased detection and strengthened accountability within affected communities, making the administrative costs of poorly sequenced implementation impossible to overlook or dismiss.

Norm-based pressure compounded these institutional penalties by rendering non-compliance socially visible at the regional level. The displacement of 54.4% of Seoul's private incineration load — 126,682 tons — to external provinces in January 2026 made the city's capacity shortfall tangible and geographically identifiable. This spillover effect ensured that non-compliance was both a legal failure and a socially visible outcome subject to community-level pressure in areas absorbing Seoul's excess waste burden

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Figure 4. Behavioral Mechanism of Korea's Landfill Siting Policy



4. Impacts

Environmental

Modern atmospheric filtration architectures at the Mapo facility successfully maintained recorded dioxin emissions at an absolute 0.00 ng-TEQ/Nm³. Ambient air quality telemetry verified that particulate matter (PM2.5) concentrations immediately adjacent to the facility borders (31 μg/m³) were lower than the broader Seoul municipal urban average (38 μg/m³). Furthermore, the statutory enforcement of the January 2026 direct landfill ban yielded an immediate 92.2% structural reduction in raw household waste inflow to the Sudokwon Landfill Complex during its first quarter.

Economic

The market-driven restructuring of the 4th bidding round in October 2025 successfully altered the financial motivations of private institutional entities, attracting two competitive private land bids after years of municipal gatekeeping failures. However, the premature enforcement of the direct landfill ban without sufficient local incinerators created a severe "balloon effect," forcing Seoul to outsource 54.4% — 126,682 tons — of its private incineration load to distant provinces in January 2026 alone, incurring massive, compounding logistical transport overheads and economic inefficiencies.

Social

The policy package fundamentally transformed community behavior and spatial norms around waste infrastructure. By pairing information salience with high-value community amenities, the Mapo integrated leisure center achieved an average of over 600 daily local users, proving that behavioral reframing can successfully dismantle long-standing psychological stigmas and physical avoidance habits. Conversely, the March 2026 judicial cancellation of the new Mapo incinerator due to a minor 10/11 member quorum deficit sent a profound social signal: validating that technical engineering safety metrics cannot substitute for or override strict procedural justice and grassroots representation.

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5. Communication Strategies & Public Engagement

Because waste facility siting directly affects the daily lives of host communities and triggers deeply rooted sensory fears, communication was essential not only for conveying safety information but for rebuilding institutional trust, reframing spatial stigma, and securing procedural legitimacy. Seoul's strategy evolved from top-down administrative mandates toward participatory transparency and rule-of-law enforcement, reflecting the lesson that technical data alone cannot overcome System 1 anxieties without sustained, credible public engagement.

AWARENESS & INFORMATION MECHANISMS

① 1992

Traditional Administrative Announcement

The initial governance approach relied on top-down enforcement and unilateral statutory agreements, framing the landfill as a necessary regional infrastructure decision. This bypassed local consent entirely, triggering a complete collapse of institutional trust that would constrain facility siting for decades.

② 2005

Spatial Asset Reframing Campaign

Facing entrenched NIMBY resistance, the government shifted its message — rebranding facilities as eco-friendly community assets rather than toxic hazards, and physically integrating them with the World Cup Eco-Park. This dismantled deep-seated psychological stigmas and achieved over 600 daily local amenity users.

③ 2005+

Automated Salience and Nudge Disclosure

Alongside spatial rebranding, the CleanSys CEMS system began broadcasting unedited emission statistics — including dioxin readings of 0.00% — continuously on highway LED boards. This provided an effortless, real-time cognitive shortcut that intercepted residents' confirmation bias and neutralized System 1 sensory fears.

④ Late 2010s

Procedural Legitimacy Formalization

Communication shifted from messaging to structural empowerment, as the Resident Inspector Ordinance formally appointed paid community members to conduct independent audits. The core message — that civic representatives are the direct gatekeepers of environmental data — restored democratic accountability.

⑤ 2026

Rule-of-Law Statutory Enforcement

The final phase reinforced that technical safety metrics cannot substitute for procedural justice, communicated through the publication of quarterly measurement archives and the judicial cancellation of siting decisions where statutory

6. Key Barriers to Implementation and Policy Responses

Limited Public Acceptability

Historical stigma from the Nanjido landfill and sensory trauma from the 2011 H_2S leaks entrenched high levels of NIMBY resistance among affected communities. The government responded by rebranding facilities as Resource Recovery Facilities; and integrating premium public leisure amenities — including saunas and a golf course — to reshape how residents perceived and experienced proximity to waste infrastructure.

Structural Waste Dependency

Rising urban waste volumes and raw household refuse continued to strain existing regional landfill capacities beyond sustainable limits. A statutory ban on direct landfilling under the Waste Management Act was enforced to accelerate diversion toward circular economy pathways and reduce over-reliance on land disposal.

Long-Term Operational Risks

Sensory fears continued to distort public interpretation of technical risk data, threatening permanent gridlock if local municipal opposition persisted. The government responded by overhauling the 4th replacement site bidding process — lowering spatial criteria, easing municipal eligibility rules, and permitting private corporate bids — to expand the pool of viable sites.

Equity & Distributional Concerns

Host communities bore disproportionate environmental burdens and local spatial degradation relative to the broader urban population. To address this imbalance, large-scale financial transfers were introduced, including a 300 billion KRW upfront community fund and annual heating subsidies of 700,000–770,000 KRW per household within the impact zone.

Legitimacy & Institutional Trust

DAD (Decide-Announce-Defend) approaches had shattered institutional credibility and generated intense public distrust. In response, local ordinances were enacted granting resident representatives full legal authority and state salaries to conduct unannounced technical audits, embedding accountability directly into facility governance.

Administrative Measurement Challenges

Accurately tracking waste streams and enforcing compliance required significant institutional investment. The government progressively refined enforcement systems, introducing separate waste collection streams, weight-based auditing, and RFID-enabled monitoring to ensure accountability at the household and facility level.

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7. Transferable Lessons

Rebuild institutional credibility first: Public acceptance of controversial infrastructure cannot be achieved through technical evidence alone. Communities evaluate risks through trust, past experiences, and emotional perceptions. Policymakers should prioritize rebuilding institutional credibility through consistent commitments, transparency, and meaningful engagement before expecting citizens to accept potentially undesirable facilities.

Reframe infrastructure as community benefit: Opposition can be reduced when infrastructure is reframed as a source of local benefits rather than a burden. By linking waste facilities to tangible community gains — heating subsidies, public amenities, and economic opportunities — the government altered the perceived balance between costs and benefits. Compensation and co-benefit strategies are most effective when they provide visible, everyday value to affected residents.

Ensure radical transparency and participatory governance: Real-time environmental monitoring, public disclosure of emissions data, and the inclusion of resident inspectors reduced information asymmetry and gave communities a direct role in oversight. Such measures can strengthen trust by allowing citizens to verify government claims independently rather than relying solely on official assurances.

Uphold procedural legitimacy above technical metrics: Procedural legitimacy is as important as technical effectiveness. Even when facilities meet environmental standards, projects may fail if decision-making processes are perceived as unfair or legally flawed. Governments should ensure that infrastructure planning follows transparent, inclusive, and legally robust procedures, recognizing that long-term acceptance depends not only on outcomes but also on how decisions are made.

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CASE STUDY 3

Congestion Pricing at Namsan Tunnel No. 1 and No. 3

Objective: Reduce downtown congestion and encourage modal shift through targeted corridor pricing

Case Summary

In response to worsening urban traffic congestion, the Seoul Metropolitan Government introduced a congestion pricing scheme at Namsan Tunnel No. 1 and No. 3 in November 1996, targeting critical bottlenecks connecting southern Seoul to the central business district. The policy imposed a KRW 2,000 charge on vehicles carrying fewer than three occupants, making the social cost of road use directly visible to drivers while providing a clear behavioral alternative — carpooling or public transportation — to avoid the charge. The scheme was further refined through adaptive governance, with a 2024 revision restricting the charge to inbound downtown-bound vehicles based on empirical evidence from a phased suspension experiment. As a result, Seoul achieved a sustained 14% reduction in traffic volume, a 30–40% decline in peak-hour private car use, significant increases in bus and taxi ridership, and measurable travel speed improvements. The Namsan Tunnel scheme is now recognized as a leading example of how corridor-targeted demand management, paired with behavioral design and adaptive governance, can produce durable shifts in urban travel behavior.



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1. Background and Challenges

During the late twentieth century, rapid economic growth, urban expansion, and rising household income in South Korea led to a sharp increase in private vehicle ownership and automobile use. In Seoul, this trend placed growing pressure on urban road infrastructure and intensified congestion in major commuting corridors. Seoul's transportation policy gradually shifted from a road-supply-oriented approach toward Transportation Demand Management (TDM), which aims to reduce excessive private car use, redistribute travel demand, and encourage alternative modes of transportation.

Within this broader policy shift, Namsan Tunnel No. 1 and No. 3 became important targets because they function as major entry routes connecting southern Seoul with the central business district. By the 1990s, the two tunnels had become critical bottlenecks during commuting hours, causing longer travel times, lower transport efficiency, higher fuel consumption, increased air pollution, and reduced reliability in daily commuting.

In 2022, the national road traffic congestion cost was estimated at KRW 74.56 trillion, equivalent to 3.21% of GDP, with passenger cars accounting for KRW 48.25 trillion (64.7% of the total). Seoul's traffic congestion cost alone was estimated at KRW 14.30 trillion — approximately 19% of the national total — underscoring that the Namsan Tunnel case was not simply a localized tolling policy, but part of a wider effort to manage the economic, social, and environmental costs of urban traffic congestion.

2. Policy Design

The Namsan Tunnel congestion pricing scheme was designed as a targeted TDM policy rather than a citywide tolling system. Seoul selected Namsan Tunnel No. 1 and No. 3 because they were strategic bottlenecks for vehicles entering the city center. The core policy instrument was a KRW 2,000 congestion charge imposed on low-occupancy private vehicles: vehicles with only one or two occupants were subject to the charge, while vehicles with three or more occupants were exempted — creating a direct financial disincentive for single-occupancy vehicle use while providing a clear behavioral alternative.

Development of Seoul's Transportation Demand Management (TDM) Programs

Year	TDM Program	Key Description
Late 1980s	**Initial discussion of congestion pricing**	Seoul began discussing congestion pricing as part of broader demand-management strategies, but implementation was delayed due to public acceptance concerns and institutional constraints.
1990	**Congestion Impact Fee System**	Seoul introduced a congestion impact fee on large traffic-generating facilities such as department stores and commercial buildings. Revenue was used to improve urban transportation infrastructure.
1995	**Employer-based TDM Program**	Large employers and building operators were encouraged to implement travel demand reduction measures: carpooling, commuter buses, parking management, and public transport incentives.
1996	**Congestion Pricing at Namsan Tunnel No. 1 and No. 3**	Seoul introduced a KRW 2,000 charge on vehicles with fewer than three occupants passing through Namsan Tunnel No. 1 and No. 3 during weekday peak hours.
1997+	**Parking restraint and management**	Parking policies were used to discourage private car use in congested urban areas, complementing the tunnel pricing scheme.
2000s	**Public transport reform and voluntary demand management**	Seoul expanded voluntary demand-management tools, including weekly no-driving programs, car sharing, and public transport incentives.
2024	**Revision: inbound-only charging**	The KRW 2,000 charge was revised to apply only to vehicles entering downtown Seoul (inbound), while outbound vehicles were exempted, based on the phased suspension experiment.

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Figure 5. Failure and Success Mechanism of Policy Design

FAILURE MECHANISM	SUCCESS MECHANISM
Public acceptance & car-use lock-in	*Behavioral policy package*
Car-dependent commuting habits Rapid motorization and downtown commuting pressure made private-car access a persistent default behavior.	**Salient pricing signal** KRW 2,000 charge on vehicles with fewer than three occupants makes congestion cost immediate and visible.
Public acceptability concerns A congestion charge could be seen as an added financial burden on daily commuters rather than a demand-management tool.	**HOV & modal-shift incentive** Vehicles with three or more occupants are exempt, giving drivers a clear pathway: carpool or use public transport.
Equity & local burden concerns Low-income drivers, car-dependent households, and residents near charged corridors raised fairness concerns.	**Evidence-based redesign** The 2023 suspension experiment informed the 2024 inbound-only charge, aligning the rule with downtown congestion impact.
Long-term effectiveness risk A fixed KRW 2,000 charge and changing mobility patterns required monitoring, experimentation, and redesign.	**Legitimacy & fairness measures** Public consultation, detour routes, resident discounts, exemptions, and broader TDM measures increased acceptance.

2-2. Core Policy Design Elements

A. Targeted Peak-Hour Tolling

The central mechanism is the imposition of a visible monetary cost on low-occupancy vehicle use: a KRW 2,000 charge on vehicles with only one or two occupants. This transforms driving alone through congested downtown corridors into a cost-bearing decision, making the social cost of congestion directly visible to individual drivers. In January 2024, the scheme was revised so that the charge applies only to inbound vehicles entering downtown Seoul, based on monitoring showing that inbound traffic had a stronger effect on downtown congestion.

B. High-Occupancy Vehicle Exemptions

Vehicles carrying three or more passengers are exempted from the charge. This exemption structure was intended to encourage carpooling and increase the passenger-carrying efficiency of each vehicle. The policy therefore combines a penalty-like price signal with a positive behavioral pathway: citizens can avoid the charge by increasing vehicle occupancy or shifting to public transportation, not only by avoiding the tunnels.

C. Strategic Infrastructure Targeting

The policy targeted Namsan Tunnel No. 1 and No. 3 rather than imposing a charge across the entire city. This approach made the policy more feasible because the tunnels were clearly identifiable bottlenecks and major gateways into central Seoul, while avoiding the stronger public resistance that a citywide system might have triggered. The 2024 revision also required Seoul to designate seven alternative detour routes to preserve mobility access while discouraging unnecessary private car use.

D. Policy Experimentation and Data-Based Redesign

In 2023, Seoul temporarily suspended the congestion charge in phases to examine how traffic volume and speed would change. Phase 1 (inbound only suspended) saw traffic volume increase by approximately 5.2% and tunnel-adjacent speeds decrease by 5–8%. Phase 2 (both directions suspended) saw traffic volume increase by 12.9% and downtown road speeds decrease by up to 13%. These results confirmed that inbound charging was more directly related to downtown congestion management, leading to the 2024 reform. This approach demonstrates that Seoul treated congestion pricing as a data-driven demand-management tool subject to evidence-based adjustment.

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3. Behavioral Mechanisms

The Namsan Tunnel congestion pricing scheme influences citizens' travel behavior through a combination of price signals, incentives, choice architecture, and perceived fairness. The policy does not prohibit car use — instead, it changes the relative cost of different mobility choices and encourages citizens to reconsider when, how, and whether they drive into the city center. The behavioral mechanism can be analyzed through three pillars.

Benefits of Compliance: Reduced congestion leads to shorter travel times, improved traffic flow, and direct cost savings for drivers who shift to public transportation — functional benefits that make compliant behavior more efficient. Compliance also yields environmental benefits: reducing private car traffic lowers fuel consumption, air pollution, and greenhouse gas emissions. Public transport reform and expanded shared mobility services actively improve alternatives, ensuring that compliance is rewarded with genuinely appealing options rather than simply penalizing car use.

Cost of Change: Changing from private car use to public transport, carpooling, or time-shifting involves real practical and psychological costs: reduced convenience, coordination requirements for carpooling, and disruption to established routines. Structural barriers compound these challenges — Seoul's persistent car-dependent urban structure and unequal access to public transportation mean that compliance costs are not evenly distributed. The policy addresses these barriers through improvements in public transport speed and accessibility and through a simple, clearly communicated rule that reduces cognitive burden.

Cost of Non-Compliance: The central mechanism is the KRW 2,000 toll applied to low-occupancy vehicles, incurred immediately at the point of tunnel entry. This salience makes the cost of non-compliance impossible to overlook and reinforces behavioral awareness through repeated daily exposure. The pricing mechanism is embedded within a choice architecture that restructures default options: driving alone is costly; carpooling or public transport avoids the charge. Revenues reinvested in public transportation and targeted exemptions and discounts for eligible residents strengthen the perceived fairness of the cost structure.

4. Outcomes and Metrics

↓ Traffic Volume Reduction

Traffic volume on roads linked to Namsan Tunnel No. 1 and No. 3 decreased by 24.2% one month after the charge was introduced. One year later, traffic volume remained 13.6% lower, and by August 1998 the average reduction was approximately 14%. A separate empirical evaluation by Lim and Kim found that traffic volume decreased by 14% during the first two years of operation and remained relatively stable afterward, suggesting that the behavioral change was durable rather than temporary.

↔ Reduction in Private Car Use

The policy was particularly effective in reducing private passenger car use. Private car volume during peak hours declined by 30% one year after implementation, while vehicles with only one or two occupants decreased by 40.2%. Lim and Kim's evaluation also found that the number of passenger cars decreased by up to 34%, confirming the scheme's effectiveness in targeting low-occupancy driving specifically.

↑ Increase in Buses and Taxis

The policy encouraged a shift toward higher-capacity and shared transport modes. Buses increased by 62% and taxis by 211% after congestion pricing was implemented. During peak commuting hours, the share of buses increased from 3.3% to 8.0%, and the share of taxis increased from 7.8% to 26.4%, demonstrating a significant modal shift toward more efficient forms of urban transportation.

▶ Travel Speed Improvement

The scheme improved travel speeds in the affected corridors. Average travel speed increased by 11.8%, from 24.5 km/h to 28.3 km/h. Lim and Kim's study found a more pronounced increase from 22 km/h to 32 km/h during the first two years of operation, suggesting that the initial behavioral response to the pricing scheme was particularly strong and then stabilized at a higher level.

⇔ Limited Diversion Effects

A key concern was whether drivers would simply divert to nearby roads, shifting congestion elsewhere rather than reducing demand. However, traffic volume on four nearby detour roads increased by only 5.7% one year after implementation — a limited spillover effect suggesting that the policy contributed to actual travel demand reduction, including genuine mode shift and time-shifting, rather than merely displacing traffic to adjacent corridors.

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5. Communication Strategies

Because congestion pricing directly affects citizens' daily mobility and imposes a visible financial cost, communication and policy legitimacy were essential to the implementation and long-term adjustment of the Namsan Tunnel scheme. Seoul's approach evolved from initial public guidance through convenience-oriented campaigns, FAQ-style explanation, participatory consultation, data-based redesign, and equity-framing measures.

POLICY INFORMATION & DESIGN

① 1996

Initial Guidance Period

Prior to fee collection, the government deployed public guidance to discourage single-occupancy vehicle use and familiarize citizens with the new system. Early avoidance behavior and adjustment costs were still observed, signaling that pre-implementation communication alone was insufficient.

② 2017

FAQ-Style Public Explanation

Seoul reframed the tunnel charge with the message that it was not simply a paid tunnel but a congestion management instrument. By explaining the policy purpose, exemptions, and discounts accessibly, this outreach reduced informational barriers and helped citizens understand the scheme as a demand-management tool.

③ 2024

Data-Based Redesign Communication

Following the suspension experiment, the government communicated its reform decision through official announcements grounded in traffic analysis. The 2024 inbound-only redesign was justified by empirical evidence showing that inbound traffic had a stronger impact on downtown congestion.

PARTICIPATORY & EQUITY COMMUNICATION

④ 2015

On-Site Convenience Campaign

Promotional materials communicated that the congestion charge could be paid with a standard transportation card. By reducing payment friction and framing compliance as easier and faster, the campaign lowered a key practical barrier to acceptance.

⑤ 2023

Participatory Policy Experiment

A temporary suspension experiment, paired with online civic voting and a formal public hearing, signaled that the city was genuinely open to citizen input. This increased procedural legitimacy by embedding empirical evidence and public voice directly into the policy redesign.

⑥ 2025

Equity-Framing and Resident Relief

A KRW 1,000 discounted charge for eligible Jung-gu residents was framed not as a retreat from congestion pricing but as a conflict-management tool — a targeted adjustment to sustain policy legitimacy by addressing the disproportionate burden placed on nearby residents.

6. Key Barriers to Implementation and Policy Responses

Limited public acceptability

Congestion pricing can be perceived as an additional financial burden on daily commuters, particularly those with no viable alternative to private car use. Seoul managed this by introducing the scheme in a limited corridor rather than across the entire city, reducing the scale of initial resistance and allowing the public to adjust gradually. The government also framed the scheme clearly as a demand-management tool rather than a revenue measure.

Equity concerns and distributional burden

Low-income drivers, commuters with limited access to public transportation, and residents living near the charged corridors faced disproportionate burdens. Seoul reviewed multiple conflict-management options, including monthly vouchers and discounts for nearby residents. Ultimately, a KRW 1,000 toll discount for eligible residents of six Jung-gu administrative districts was selected as the most feasible option, as it minimized additional downtown congestion impacts and required no additional administrative costs.

Structural car dependency

Many citizens were accustomed to private car use, and latent demand for automobile travel remained high even after the pricing scheme was introduced. Seoul addressed this by combining congestion pricing with broader TDM measures — public transport incentives, parking management, car sharing, and employer-based programs — creating a more comprehensive environment for behavioral change.

Legitimacy challenges

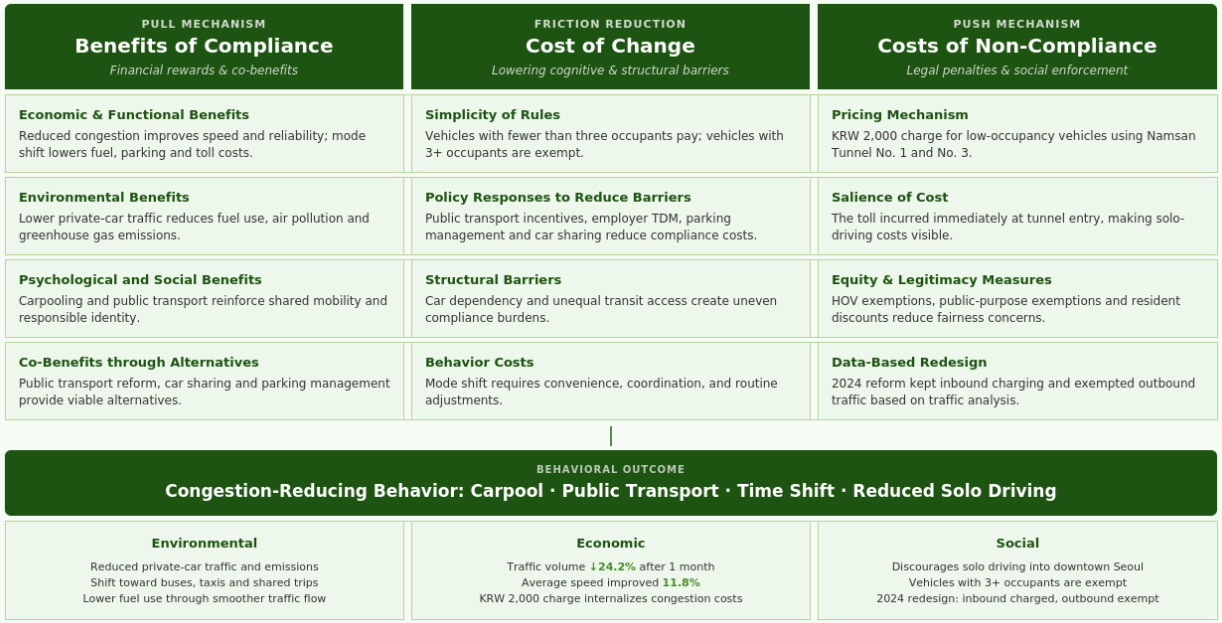
Some citizens questioned why the government was charging drivers rather than expanding road capacity. Seoul responded by framing the scheme as a demand-management tool in a context where road expansion alone cannot solve congestion, and by reinvesting toll revenues in public transportation — making the link between individual charges and collective benefit visible.

Long-term effectiveness and price rigidity

A static KRW 2,000 toll risks becoming less effective over time as inflation rises and mobility patterns shift. Seoul addressed this through ongoing policy experimentation, culminating in the 2024 revision that applied the charge only to inbound downtown traffic, reflecting updated evidence about where congestion impacts were most significant and demonstrating a commitment to adaptive governance.

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Figure 6. Behavioral Mechanism of Seoul's Namsan Tunnel Congestion Pricing



7. Transferable Lessons

Targeted corridor pricing is more feasible than citywide schemes: Seoul's decision to limit the initial scheme to Namsan Tunnel No. 1 and No. 3 made the policy politically and administratively achievable, allowing the public to experience and evaluate congestion pricing in a defined context before any expansion.

Pricing works best when genuine alternatives exist: The Namsan scheme succeeded partly because Seoul simultaneously expanded bus lanes, improved public transit, and developed shared mobility options. Behavioral change toward compliance becomes more durable when compliant options are genuinely convenient rather than merely less costly.

Evidence-based iteration strengthens legitimacy: The 2024 inbound-only revision — based on a phased suspension experiment and public consultation — demonstrated that long-running policies must be periodically re-evaluated using current data, citizen feedback, and changing urban conditions. Adaptive governance increases both effectiveness and public trust.

Exemptions and fairness measures shape policy acceptance: The HOV exemption simultaneously reduced opposition and incentivized carpooling. The Jung-gu resident discount illustrated that even technically justified policies generate distributional concerns that must be actively and transparently managed.

Demand management requires integration with broader mobility policy: Congestion pricing is most effective when citizens have viable alternatives, including reliable buses, shared mobility, and pedestrian-friendly infrastructure. The policy's long-term success depended on parallel investments in making non-car travel more attractive.

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Discussion & Conclusion

Understanding How Behavioral Change Was Achieved Across Cases

Although the three cases examined in this report address different policy challenges, they point to a common conclusion: Korea's success did not stem from regulation, pricing, or communication alone. Rather, it resulted from a deliberate combination of behavioral instruments that aligned citizen choices with environmental objectives.

Returning to the framework introduced in Section II, the cases demonstrate that lasting behavioral change is most likely when governments simultaneously **increase the benefits of compliance, reduce the costs of change, and increase the costs of non-compliance**, while maintaining public trust and perceptions of fairness.

The Three Behavioral Pillars in Practice

Benefits of Compliance

Across all three cases, policymakers strengthened the **benefits of compliance**. The VBWF system rewarded waste reduction through direct cost savings and cleaner communities. In waste facility siting, host communities received financial compensation, public amenities, and local development benefits. In the Namsan congestion pricing scheme, compliance generated shorter travel times, mobility improvements, and environmental gains. In each case, citizens were given visible reasons to support the desired behavior.

Increase the Costs of Non-Compliance

The third pillar involved **increasing the costs of non-compliance**. Volume-based waste fees, illegal dumping penalties, congestion charges, and landfill restrictions all created consequences for environmentally undesirable behavior. Importantly, these measures were accompanied by accessible alternatives, ensuring that enforcement was viewed as reasonable rather than punitive.

Reduce Barriers

At the same time, Korea worked to **reduce behavioral barriers**. Waste sorting became easier through standardized bags, recycling infrastructure, and RFID systems. Waste facility governance reduced uncertainty through real-time monitoring and transparent information. Congestion pricing was supported by alternative travel options, public transport improvements, and simple, easily understood rules. These measures recognized that citizens are more likely to change behavior when compliance is convenient and practical.

Essential Conditions and Factors

Trust and Fairness as Essential Conditions

The cases also demonstrate that incentives alone are rarely sufficient. Public acceptance depended heavily on trust, transparency, and procedural fairness.

This was most evident in waste facility siting. Community resistance was driven not only by environmental concerns but also by distrust and perceptions of unfairness. Financial incentives became effective only when combined with transparent monitoring, resident participation, and legally protected oversight mechanisms. Likewise, congestion pricing gained legitimacy through public consultation, evidence-based policy revisions, and measures addressing distributional concerns.

These experiences suggest that **trust functions as a force multiplier for policy effectiveness**. **Citizens are more willing to accept costs, respond to incentives, and alter established behaviors when they believe policies are legitimate and fairly implemented.**

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Social Norms and Long-Term Sustainability

Another important lesson is the role of social norms. **Financial incentives often initiate behavioral change, but norms help sustain it.**

Over time, recycling and waste separation became socially expected behaviors rather than regulatory obligations. Similarly, citizen oversight of waste facilities contributed to new expectations regarding transparency and accountability. In transportation, congestion pricing helped normalize alternative forms of mobility. As behaviors become socially accepted, compliance increasingly becomes self-reinforcing and less dependent on enforcement.

The cases also reveal that **behavioral change is not a one-time achievement**. Each policy evolved through experimentation, learning, and adaptation. The VBWF system expanded beyond basic pricing into broader circular economy policies; waste facility governance became increasingly participatory; and congestion pricing was repeatedly adjusted based on evidence and citizen feedback. Successful behavioral policies therefore require continuous refinement rather than static implementation.

Implications for Policymakers

For policymakers seeking to apply these lessons elsewhere, the key takeaway is not to replicate specific Korean policies but to adopt the behavioral logic underlying them. Four questions are particularly useful during policy design:

1. ***Are the benefits of compliance sufficiently visible and meaningful to citizens?***
2. ***Have practical, financial, social, and cognitive barriers to compliance been minimized?***
3. ***Are the costs of non-compliance credible, enforceable, and perceived as fair?***
4. ***Do citizens trust the institutions implementing the policy and perceive decision-making processes as legitimate?***

Policies that perform well across these dimensions are more likely to generate durable behavioral change than those relying solely on regulation or financial incentives.

Final Reflections

The central question of this report has been: **How did Korea succeed in securing citizen support for green growth policies?**

The evidence suggests that Korea's achievement was ***not the result of a single policy instrument or unique national characteristic***. Instead, it reflected a ***systematic effort to align policy design with the realities of human behavior***. Across waste management, infrastructure siting, and transportation, governments consistently made **desired behaviors more rewarding, easier to perform, and more socially accepted, while maintaining trust and legitimacy.**

The integrated behavioral framework developed in this report captures this common logic. The three cases demonstrate that successful green growth policies emerge when governments simultaneously strengthen the benefits of compliance, reduce barriers to change, increase the costs of non-compliance, and cultivate trust throughout implementation.

Ultimately, Korea's most transferable lesson is that green growth is fundamentally a behavioral challenge. Technical solutions matter, but their success depends on whether citizens are willing and able to participate. **When incentives, infrastructure, social norms, communication, and institutional trust are aligned, meaningful and lasting behavioral change becomes possible.**

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